
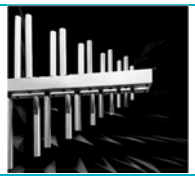
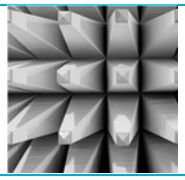

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# TEST REPORT

**Test report no.: 1-3178/16-01-02**

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

## Testing laboratory


**CTC advanced GmbH**
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com


**Accredited Testing Laboratory:**
The testing laboratory (area of testing) 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-12076-01-01

## Applicant


**Pacific Industrial Co., Ltd**
Godo-Cho, Anpachi
Gifu 503-2397 / JAPAN
Phone: -/-
Fax: -/-
Contact: Kunitaka Yano
e-mail: knyano@pacific-ind.co.jp
Phone: +81 584 28 01 11


## Manufacturer


**Pacific Industrial Co., Ltd**
Godo-Cho, Anpachi
Gifu 503-2397 / JAPAN


## Test standard/s

| | |
|---|---|
| 47 CFR Part 15 | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |
| RSS - 210 Issue 9 | Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment |

For further applied test standards please refer to section 3 of this test report.

## Test Item

| | |
|---|---|
| **Kind of test item:** | **Tire Pressure Monitoring System Transmitter** |
| **Model name:** | **PMV-C11A** |
| **FCC ID:** | **PAXPMVC11A** |
| **IC:** | **3729A-PMVC11A** |
| Frequency: | 314.98 MHz |
| Technology tested: | Modulated carrier |
| Antenna: | Integrated PCB antenna |
| Power supply: | 3.0 V DC by lithium battery |


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.

## Test report authorized:

cn=Stefan Boes, o=CTC advanced GmbH, ou=BOE-161129, email=Stefan.Boes@ctcadvanced.com, c=DE 2017.02.09 10:44:13 +01'00'

Stefan Bös
Lab Manager
Radio Communications & EMC

## Test performed:

cn=Marco Bertolino, o=CTC advanced GmbH, ou=BTL-161128, email=Marco.Bertolino@ctcadvanced.com, c=DE 2017.02.08 16:22:03 +01'00'

Marco Bertolino
Lab Manager
Radio Communications & EMC

# 1 Table of contents

# 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. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations 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 handwritten 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: | 2016-12-13 |
| Date of receipt of test item: | 2017-02-03 |
| Start of test: | 2017-02-03 |
| End of test: | 2017-02-07 |
| Person(s) present during the test: | -/- |

## 2.3 Test laboratories sub-contracted

None

# 3 Test standard/s and references

| Test standard | Date | Description |
|---|---|---|
| 47 CFR Part 15 | -/- | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |
| RSS - 210 Issue 9 | August 2016 | Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment |

| Guidance | Version | Description |
|---|---|---|
| ANSI C63.4-2014 | -/- | American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz |
| ANSI C63.10-2013 | -/- | American national standard of procedures for compliance testing of unlicensed wireless devices |

# 4 Test environment

| | | | |
|---|---|---|---|
| Temperature | : | $T_{nom}$<br>$T_{max}$<br>$T_{min}$ | +22 °C during room temperature tests<br>No tests under extreme conditions required.<br>No tests under extreme conditions required. |
| Relative humidity content | : | | 35 % |
| Barometric pressure | : | | 1021 hpa |
| Power supply | : | $V_{nom}$<br>$V_{max}$<br>$V_{min}$ | 3.0 V DC by lithium battery<br>No tests under extreme conditions required.<br>No tests under extreme conditions required. |

# 5 Test item

## 5.1 General description

| | | |
|---|---|---|
| Kind of test item | : | Tire Pressure Monitoring System Transmitter |
| Type identification | : | PMV-C11A |
| HMN | : | -/- |
| PMN | : | PMV-C11A |
| HVIN | : | PMV-C11A |
| FVIN | : | -/- |
| S/N serial number | : | Radiated unit 1: 0000003<br>Radiated unit 2: 0000004 (EUT) |
| HW hardware status | : | -/- |
| SW software status | : | RF test software |
| Frequency band | : | 314.98 MHz |
| Type of radio transmission<br>Use of frequency spectrum | :<br>: | modulated carrier |
| Type of modulation | : | F2D |
| Number of channels | : | 1 |
| Antenna | : | Integrated PCB antenna |
| Power supply | : | 3.7 V DC by lithium battery |

## 5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-3178/16-01-01_AnnexA
1-3178/16-01-01_AnnexB
1-3178/16-01-01_AnnexD

# 6 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

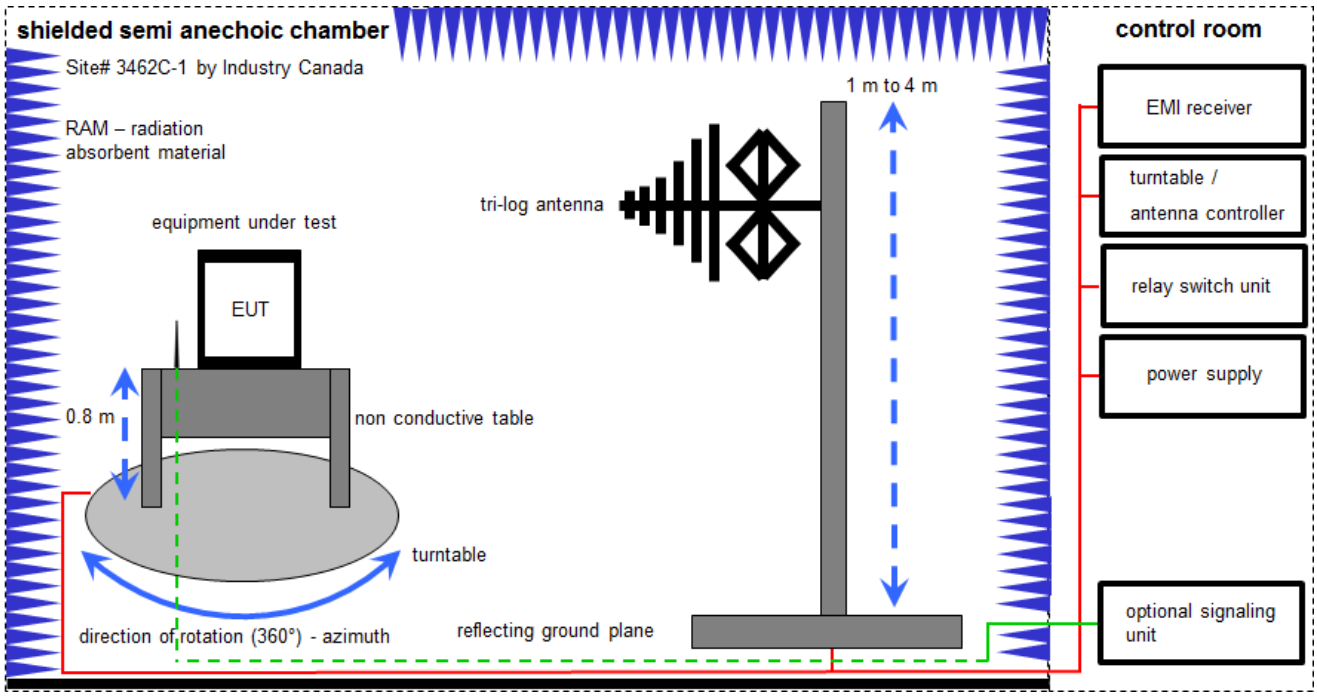
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

**Agenda:** Kind of Calibration

| | | | |
|---|---|---|---|
| k | calibration / calibrated | EK | limited calibration |
| ne | not required (k, ev, izw, zw not required) | zw | cyclical maintenance (external cyclical maintenance) |
| ev | periodic self verification | izw | internal cyclical maintenance |
| Ve | long-term stability recognized | g | blocked for accredited testing |
| vlkl! | Attention: extended calibration interval | | |
| NK! | Attention: not calibrated | *) | next calibration ordered / currently in progress |

## 6.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 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 confirmed with specifications ANSI C63. 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.




Measurement distance: tri-log antenna 10 meter

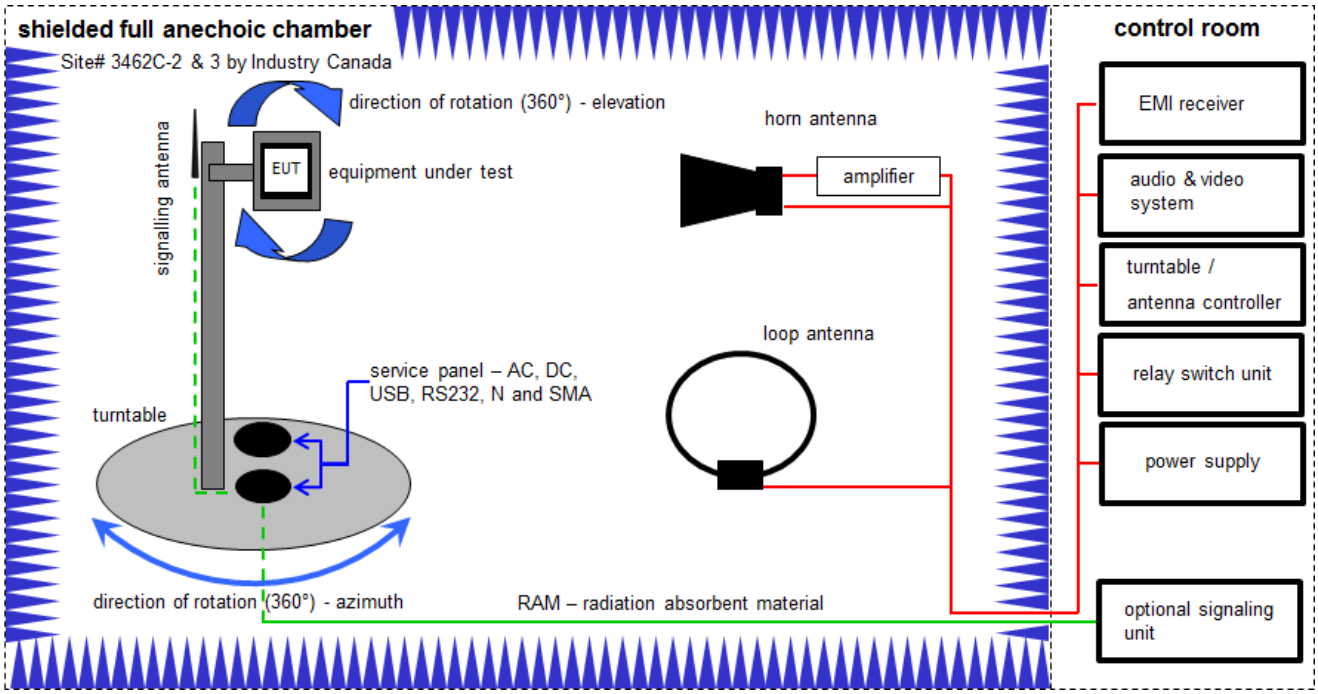
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

*Example calculation:*
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Switch-Unit | 3488A | HP | 2719A14505 | 300000368 | ev | -/- | -/- |
| 2 | A | EMI Test Receiver | ESCI 3 | R&S | 100083 | 300003312 | k | 08.03.2016 | 08.03.2017 |
| 3 | A | Positioning Controller | Model 2090 | ETS-Lindgren | 64672 | 300003746 | izw | -/- | -/- |
| 4 | A | Turntable Interface-Box | Model 105637 | ETS-Lindgren | 44583 | 300003747 | izw | -/- | -/- |
| 5 | A | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163 | Schwarzbeck | 295 | 300003787 | k | 25.04.2016 | 25.04.2018 |

## 6.2 Shielded fully anechoic chamber




Measurement distance: horn antenna 3 meter; loop antenna 3 meter

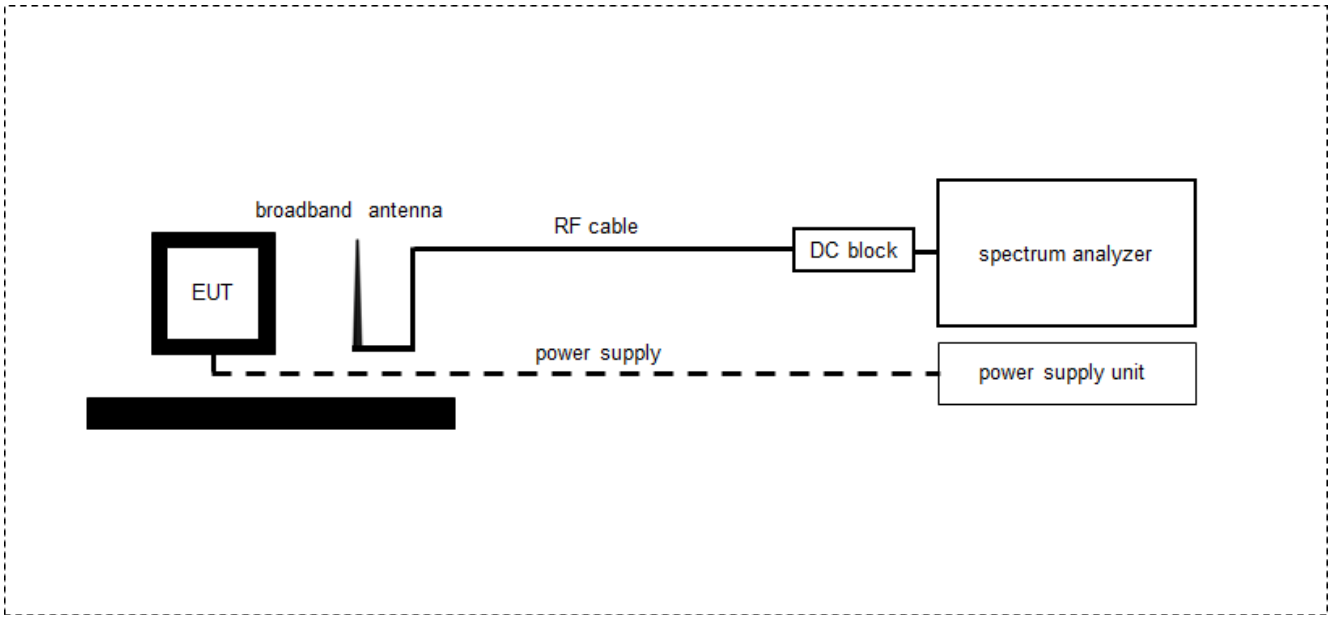
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

*Example calculation:*
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115 | EMCO | 8812-3088 | 300001032 | vlKl! | 20.05.2015 | 20.05.2017 |
| 2 | A, B | Anechoic chamber | FAC 3/5m | MWB / TDK | 87400/02 | 300000996 | ev | -/- | -/- |
| 3 | A, B | Switch / Control Unit | 3488A | HP | * | 300000199 | ne | -/- | -/- |
| 4 | B | Active Loop Antenna 10 kHz to 30 MHz | 6502 | EMCO/2 | 8905-2342 | 300000256 | k | 24.06.2015 | 24.06.2017 |
| 5 | A | Amplifier | js42-00502650-28-5a | Parzich GMBH | 928979 | 300003143 | ne | -/- | -/- |
| 6 | A, B | 4U RF Switch Platform | L4491A | Agilent Technologies | MY50000037 | 300004509 | ne | -/- | -/- |
| 7 | A, B | EMI Test Receiver 9kHz-26,5GHz | ESR26 | R&S | 101376 | 300005063 | vlKl! | 13.09.2016 | 13.03.2018 |

## 6.3 Test setup for normalized measurement configurations




**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Signal Analyzer 40 GHz | FSV40 | R&S | 101042 | 300004517 | k | 23.01.2017 | 23.01.2018 |
| 2 | A | RF-Cable | ST18/SMAm/SMAm/72 | Huber & Suhner | Batch no. 699714 | 400001184 | ev | -/- | -/- |
| 3 | A | DC-Blocker 0.1-40 GHz | 8141A | Inmet | Batch no. 699714 | 400001185 | ev | -/- | -/- |

# 7 Sequence of testing

## 7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

**Setup**

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

**Premeasurement**

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

**Final measurement**

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

## 7.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

**Setup**

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

**Premeasurement**

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement**

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 7.3 Sequence of testing radiated spurious 1 GHz to 4 GHz

**Setup**

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

**Premeasurement**

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

**Final measurement**

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 8 Summary of measurement results

| | |
|---|---|
| ☒ | No deviations from the technical specifications were ascertained |
| ☐ | There were deviations from the technical specifications ascertained |
| ☐ | This test report is only a partial test report.<br>The content and verdict of the performed test cases are listed below. |

| TC Identifier | Description | Verdict | Date | Remark |
|---|---|---|---|---|
| RF-Testing | CFR Part 15<br>RSS 210, Issue 9 | See table! | 2017-02-08 | -/- |

| Test specification clause | Test case | Temperature conditions | Power source voltages | C | NC | NA | NP | Remark |
|---|---|---|---|---|---|---|---|---|
| § 15.35 (c)<br>15.231(a + e)<br>RSS-GEN | Timing of the transmitter (Duty cycle correction factor) | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | -/- |
| | | | | | | | | |
| § 15.231 (a + e)<br>RSS-210 Issue 9 | Silent period between transmissions | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | -/- |
| | | | | | | | | |
| § 15.231 (c)<br>RSS-210 Issue 9 | Emission bandwidth | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | -/- |
| | | | | | | | | |
| § 15.231 (a + e)<br>RSS-210 Issue 9 | Fieldstrength of Fundamental | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | -/- |
| | | | | | | | | |
| § 15.209<br>RSS-210 Issue 9 | Fieldstrength of harmonics and spurious | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | -/- |
| | | | | | | | | |
| § 15.209<br>RSS-GEN | Receiver spurious emissions (radiated) | Nominal | Nominal | ☐ | ☐ | ☒ | ☐ | 1* |

**Note:** C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

1* No receiver mode integrated.

### 8.1 Additional comments

Reference documents: TPMS_Technical_Document_PMV-C11A (EUT information and timing)

Special test descriptions: None

Configuration descriptions: None

# 9 Measurement results

## 9.1 Timing of the transmitter and silent periods between transmissions

**Measurement:**

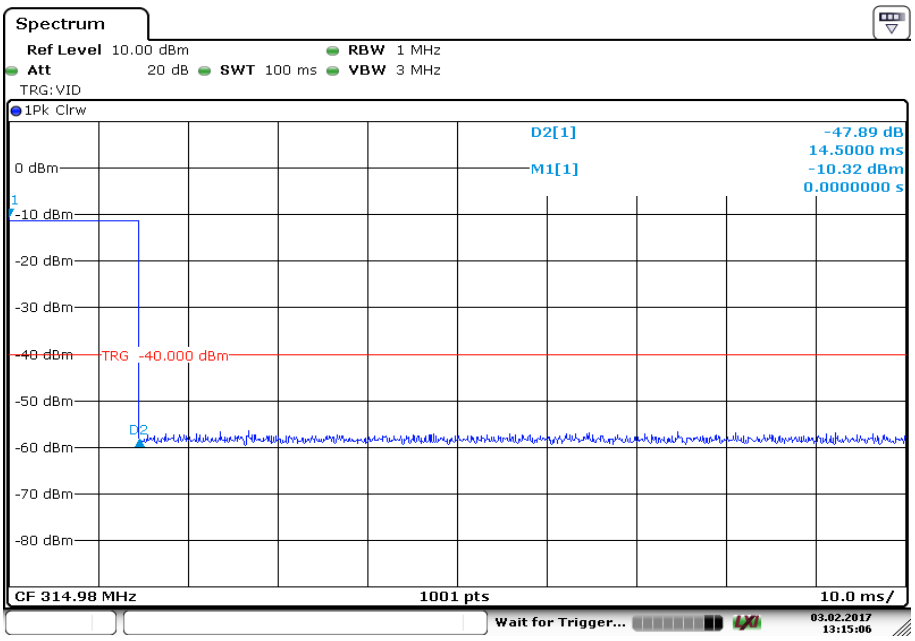
| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | See plots |
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Span: | Zero |
| Trace mode: | Single sweep |
| Test setup: | See chapter 6.3 A |

**Limits:**

| FCC | IC |
|---|---|
| (c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification. | |
| §15.231 (e)<br>In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds. | |

**Result:**

**Plot 1:** Transmit burst

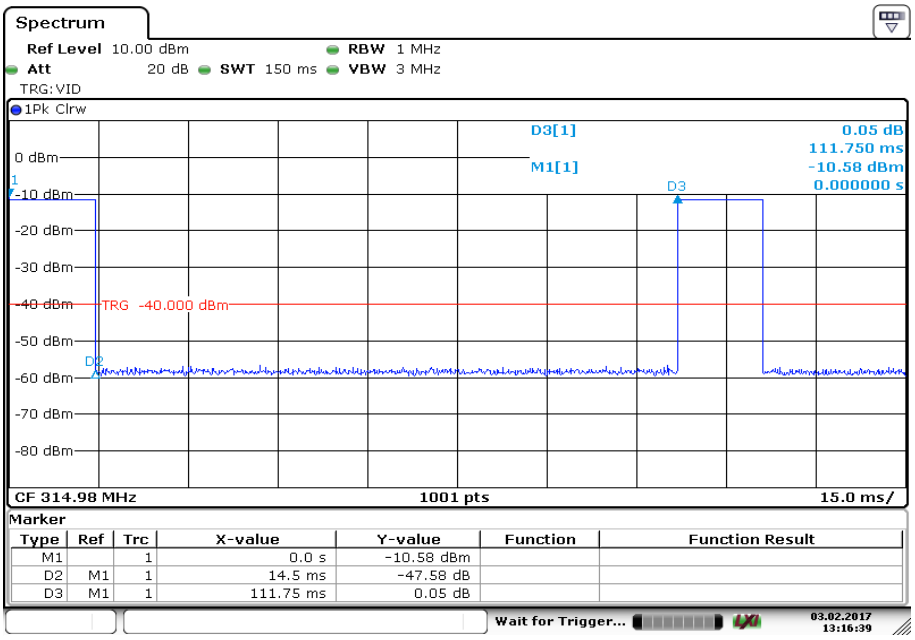



Date: 3.FEB.2017 13:15:07

Transmit time (Tx on) = 14.5 ms @ 100 ms

The peak-to-average correction factor is calculated with 20Log [Tx on/(Tx on + Tx off)].
Hereby the peak-to-average correction factor is 16.8 dB

**Plot 2:** TX on time




Date: 3.FEB.2017 13:16:40

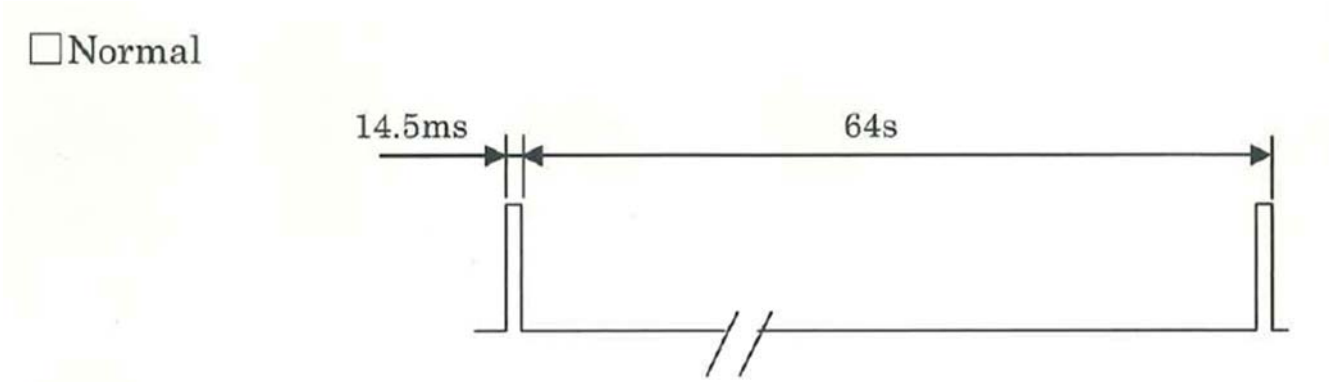
**Timing according to the technical document TPMS_Technical_Document_PMV-C11A:**

Normal mode: acc. §15.231

1 burst within 14.5 ms = 14.5 % correction factor: 20 log (0.145) = 16.8 dB

**Minimum silent period:** 64 sec – 14.5 ms = 63.9855 sec

Limit: 1. > 30 times of the transmission = 30 * 14.5 ms = 435 ms
(only relevant if greater than 10 sec)
2. **> 10 sec**

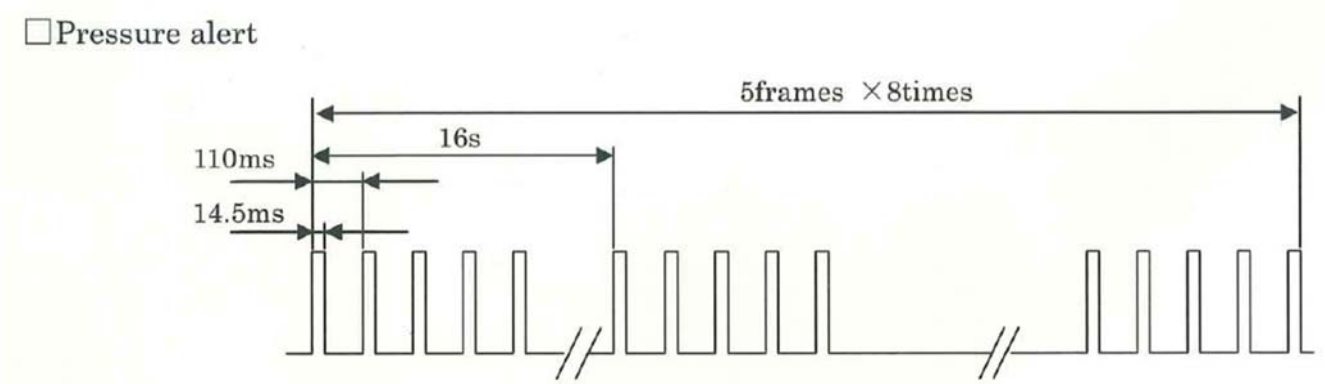


Pressure alert mode: acc. §15.231

Transmission time: 4 * 111.75 ms + 14.5 ms = 461.5 ms < 1 sec

Minimum silent period: 16 sec – 461.5 ms = 15.5385 sec

Limit: 1. >30 times of the transmission = 30 * xxx = xxx (only relevant if greater than 10 sec)
2. **> 10 sec**

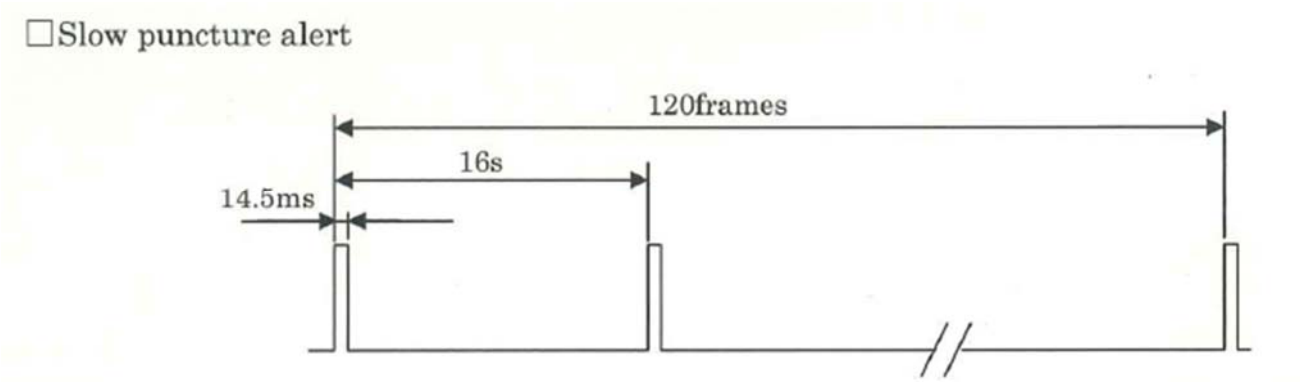


Slow puncture alert mode: §15.231

Transmission time: 1 x 14.5 ms = 14.5 ms < 1 sec

Minimum silent period: 16 sec – 14.5 ms = 15.9855 sec

Limit: 1. >30 times of the transmission = 30 * xxx = xxx (only relevant if greater than 10 sec)
2. **> 10 sec**

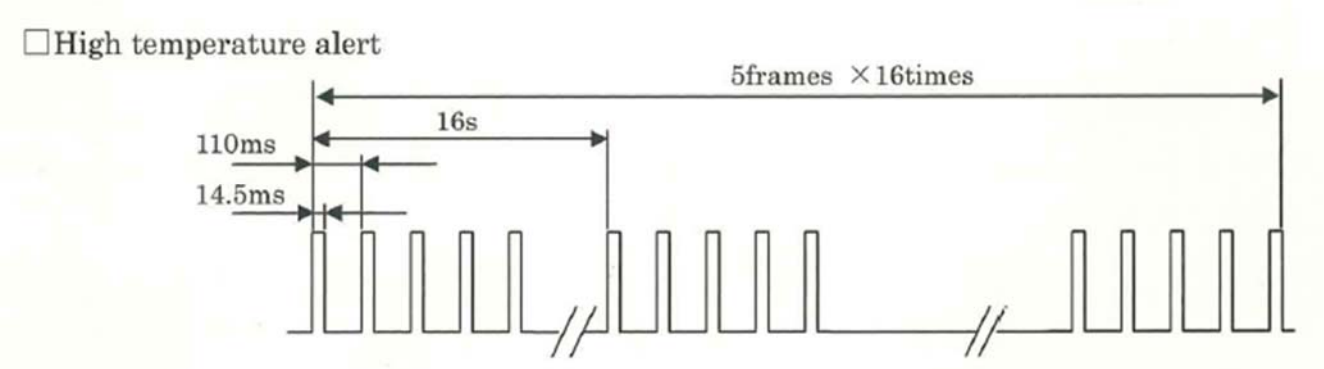


High temperature alert: §15.231

Transmission time: 4 x 111.75 ms + 14.5 ms = 461.5 ms < 1 sec

Minimum silent period: 16 sec – 461.5 ms = 15.5385 sec

Limit: 1. >30 times of the transmission = 30 * xxx = xxx (only relevant if greater than 10 sec)
2. **> 10 sec**



## 9.2 Emission bandwidth

**Measurement:**

Measurement of the 99 % bandwidth of the modulated signal

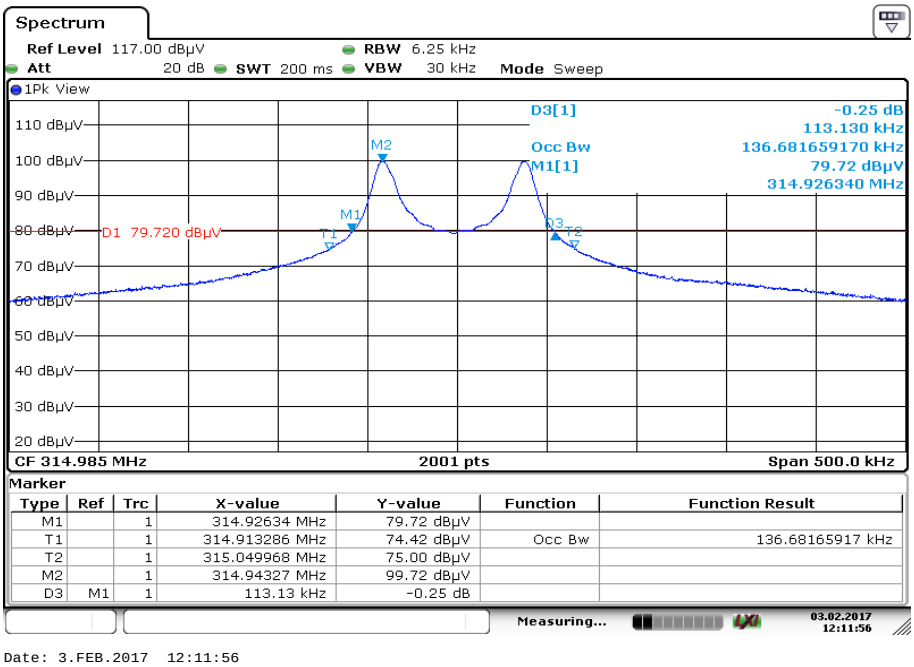
| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | 200 ms |
| Resolution bandwidth: | 1 % of the span (5 kHz) FCC<br>1 % – 5 % of the OBW<br>(1.4 kHz - 6.8 kHz) RSS |
| Video bandwidth: | 3 x RBW (30 kHz) |
| Span: | 500 kHz |
| Trace mode: | Max. hold |
| Test setup: | See chapter 6.3 A |

**Limits:**

| FCC | IC |
|---|---|
| The OBW shall not be wider than 0.25% of the centre frequency, here maximum 787.5 kHz. | |

**Result:**

**Plot 1:** Emissions bandwidth




Date: 3.FEB.2017 12:11:56

99 % emission bandwidth: 137 kHz
20 dBc bandwidth: 113 kHz

## 9.3 Field strength of the fundamental

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Peak / pulse averaging / quasi peak |
| Sweep time: | Auto |
| Resolution bandwidth: | 120 kHz |
| Video bandwidth: | 3 x RBW |
| Trace mode: | Max. hold |
| Test setup: | See chapter 6.2 A |

**Limits:**

| FCC | | IC |
|---|---|---|
| Field strength of the fundamental.<br>In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following: | | |
| **Fundamental Frequency (MHz)** | **Field strength of Fundamental (µV/m)** | **Measurement distance (m)** |
| 40.66 – 40.70 | 1,000 | 3 |
| 70-130 | 500 | 3 |
| 130-174 | 500 to 1,500 | 3 |
| 174-260 | 1,500 | 3 |
| 260-470 | 1,500 to 5,000 | 3 |
| Above 470 | 5,000 | 3 |
| **314.98** | **3,249.64 [70.24 dBµV/m]** | **3** |
| | | |
| 40.66 – 40.70 | 2,250 | 3 |
| 70-130 | 1,250 | 3 |
| 130-174 | 1,250 to 3,750 | 3 |
| 174-260 | 3,750 | 3 |
| 260-470 | 3,750 to 12,500 | 3 |
| Above 470 | 12,500 | 3 |
| **314.98** | **8,123.95 [78.20 dBµV/m]** | **3** |

**Result:**

| TEST CONDITIONS | | Field strength (dBµV/m @ 3 m distance) | |
|---|---|---|---|
| Frequency | | MHz | MHz |
| Mode | | Peak | Average |
| $T_{nom}$ | $V_{nom}$ | 71.1 | 54.3* |
| Measurement uncertainty | | ±3dB | |

*Value recalculated from Peak-to-Average correction factor calculated in 9.1

## 9.4 Field strength of the harmonics and spurious

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Peak / average / quasi peak |
| Sweep time: | Auto |
| Resolution bandwidth: | 200 Hz / 9 kHz / 120 kHz |
| Video bandwidth: | 3 x RBW |
| Span: | See plots |
| Trace mode: | Max. hold |
| Test setup: | See chapter 6.1 A<br>See chapter 6.2 B |

**Limits:**

| FCC | | IC |
|---|---|---|
| Field strength of the fundamental.<br>In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following: | | |
| **Fundamental Frequency (MHz)** | **Field strength of spurious (µV/m)** | **Measurement distance (m)** |
| 40.66 – 40.70 | 100 /225 | 3 |
| 70-130 | 50 / 125 | 3 |
| 130-174 | 50 to 150<br>125 to 375 | 3 |
| 174-260 | 150 / 375 | 3 |
| 260-470 | 150 to 500<br>375 to 1,250 | 3 |
| Above 470 | 500 / 1,250 | 3 |

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

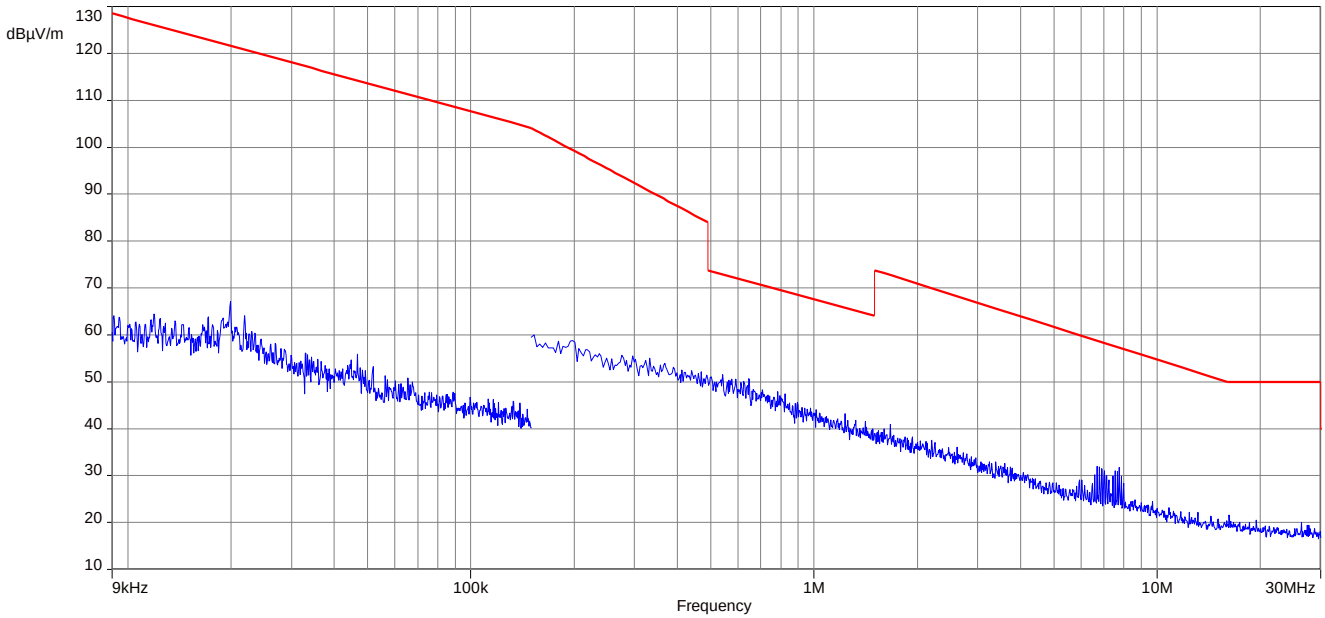
| FCC | | IC |
|---|---|---|
| **Frequency (MHz)** | **Field strength (µV/m)** | **Measurement distance (m)** |
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 – 960 | 200 | 3 |
| above 960 | 500 | 3 |

## Results:

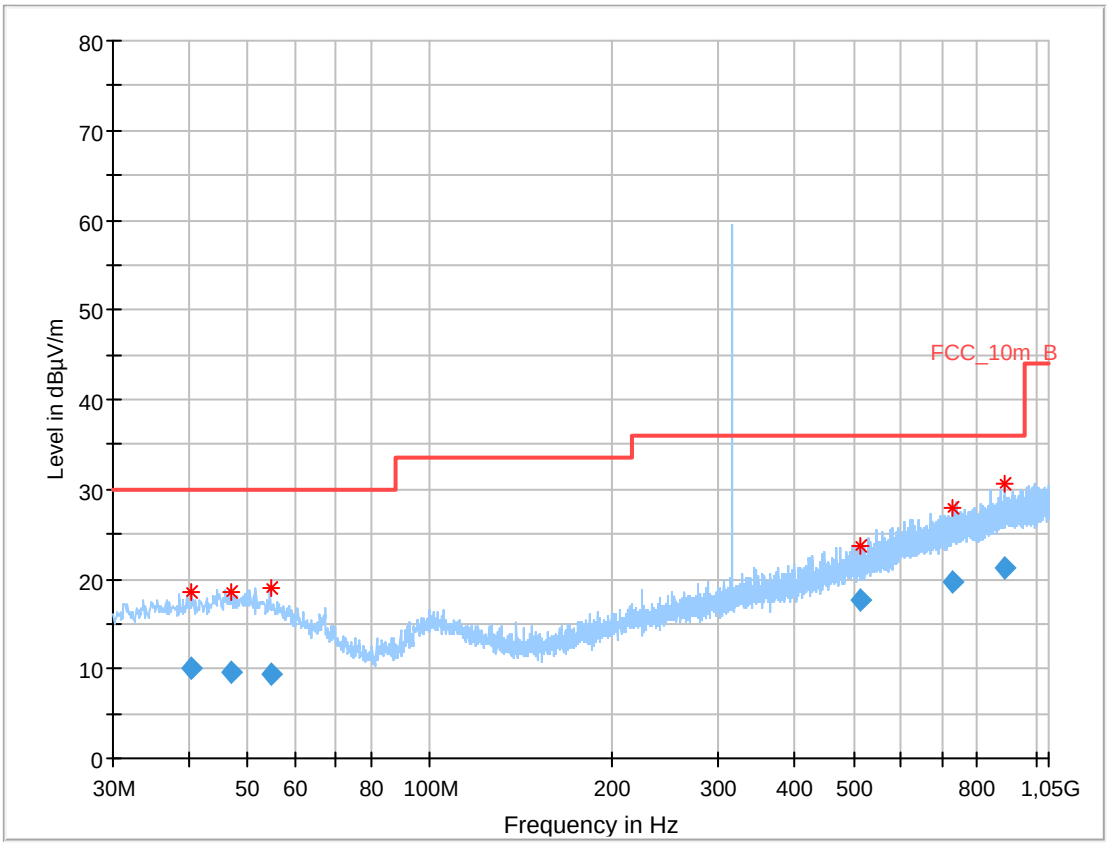
| f [MHz] | Detector | Limit max. allowed [dBµV/m] | Amplitude of emission [dBµV/m] | Results |
|---|---|---|---|---|
| For emissions below 1 GHz, please look at the table below the 1 GHz plot. | | | | |
| 1260 (No RB) | Peak | -/- | 58.0 | Compliant |
| | AVG (duty cycle average) | 62 | 41.5 | Compliant |
| 1575 | Peak | 74 | 51.8 | Compliant |
| | AVG (duty cycle average) | 54 | 35.0 | Compliant |
| 1890 (No RB) | Peak | -/- | 52.2 | Compliant |
| | AVG (duty cycle average) | 62 | 35.4 | Compliant |
| 2205 | Peak | 74 | 57.8 | Compliant |
| | AVG (duty cycle average) | 54 | 41.0 | Compliant |
| 2520 (No RB) | Peak | -/- | 56.5 | Compliant |
| | AVG (duty cycle average) | 62 | 39.7 | Compliant |
| 2835 | Peak | 74 | 50.0 | Compliant |
| | AVG (duty cycle average) | 54 | 33.2 | Compliant |
| 3150 (No RB) | Peak | -/- | 54.3 | Compliant |
| | AVG (duty cycle average) | 62 | 37.5 | Compliant |
| 3465 (No RB) | Peak | -/- | 55.9 | Compliant |
| | AVG (duty cycle average) | 62 | 39.1 | Compliant |
| 3779 | Peak | 74 | 56.5 | Compliant |
| | AVG (duty cycle average) | 54 | 39.7 | Compliant |

**Plots:**

**Plot 1:** 9 kHz to 30 MHz



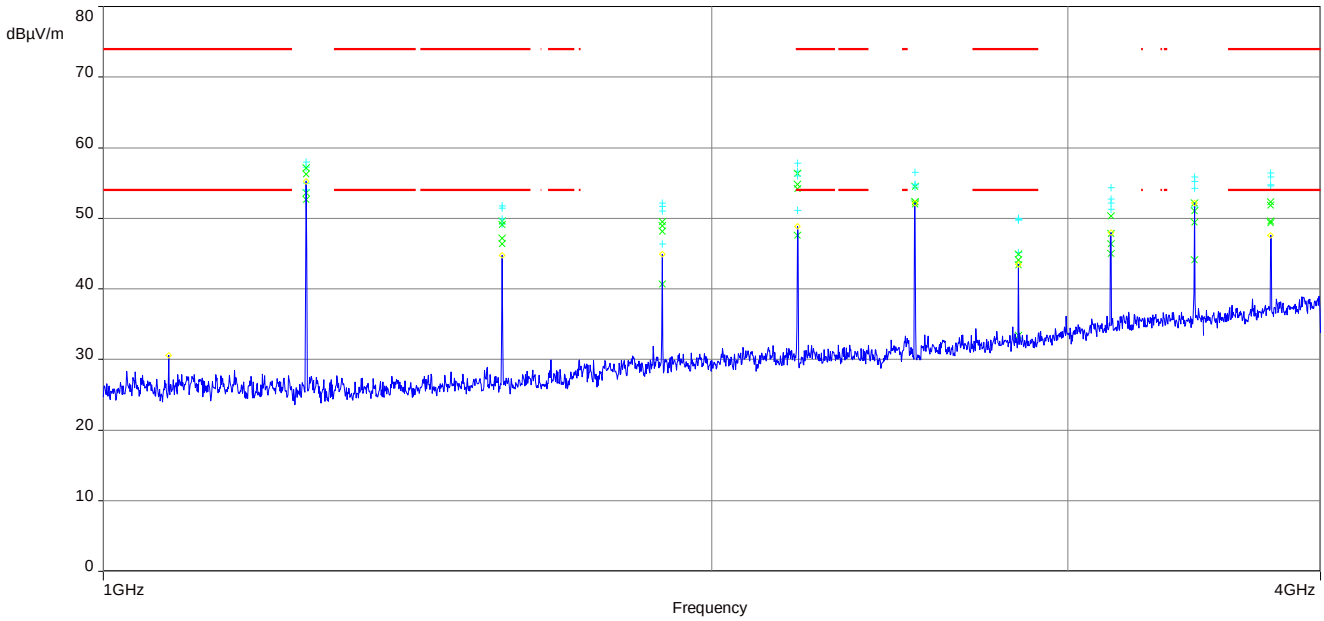
**Plot 2:** 30 MHz to 1000 MHz, vertical & horizontal polarisation




**Final_Result:**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 40.246650 | 10.00 | 30.00 | 20.00 | 1000.0 | 120.000 | 101.0 | H | 109.0 | 13.2 |
| 47.119650 | 9.68 | 30.00 | 20.32 | 1000.0 | 120.000 | 185.0 | V | 272.0 | 13.7 |
| 54.552300 | 9.40 | 30.00 | 20.60 | 1000.0 | 120.000 | 101.0 | H | 328.0 | 13.2 |
| 512.027550 | 17.66 | 36.00 | 18.34 | 1000.0 | 120.000 | 98.0 | H | 77.0 | 18.9 |
| 730.896750 | 19.57 | 36.00 | 16.43 | 1000.0 | 120.000 | 179.0 | H | 109.0 | 22.3 |
| 886.357500 | 21.28 | 36.00 | 14.72 | 1000.0 | 120.000 | 185.0 | H | 286.0 | 24.0 |

**Plot 3:** 1000 MHz to 4000 MHz, vertical & horizontal polarisation



## 10 Observations

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

## Annex A Document history

| Version | Applied changes | Date of release |
|---|---|---|
| | Initial release | 2017-02-08 |

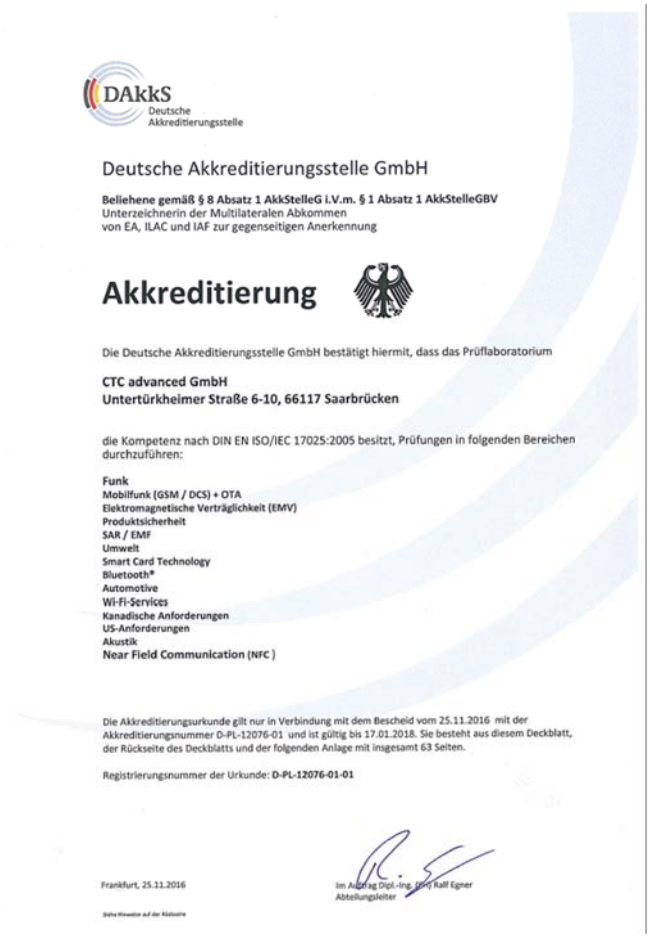
## Annex B Further information

**Glossary**

| | | |
|---|---|---|
| AVG | - | Average |
| DUT | - | Device under test |
| EMC | - | Electromagnetic Compatibility |
| EN | - | European Standard |
| EUT | - | Equipment under test |
| ETSI | - | European Telecommunications Standard Institute |
| FCC | - | Federal Communication Commission |
| FCC ID | - | Company Identifier at FCC |
| HW | - | Hardware |
| IC | - | Industry Canada |
| Inv. No. | - | Inventory number |
| N/A | - | Not applicable |
| PP | - | Positive peak |
| QP | - | Quasi peak |
| S/N | - | Serial number |
| SW | - | Software |
| PMN | - | Product marketing name |
| HMN | - | Host marketing name |
| HVIN | - | Hardware version identification number |
| FVIN | - | Firmware version identification number |
| OBW | | Occupied Bandwidth |
| OC | | Operating Channel |
| OCW | | Operating Channel Bandwidth |
| OOB | | Out Of Band |

## Annex C Accreditation Certificate

first page



DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

**Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV**
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

**Akkreditierung**

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

**CTC advanced GmbH**
**Untertürkheimer Straße 6-10, 66117 Saarbrücken**

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

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**Produktsicherheit**
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**Umwelt**
**Smart Card Technology**
**Bluetooth®**
**Automotive**
**Wi-Fi-Services**
**Kanadische Anforderungen**
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Frankfurt, 25.11.2016

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

last page

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