Registration No. DAT-P-207/05

**FCC ID:NI4TMLF8-14**

# EMI -- T E S T  R E P O R T

**- FCC Part 15.209 -**

| **Test Report No. :** **T33118-00-00KG** | 27. November 2008<br>Date of issue |
|---|---|

**Type / Model Name** : TMLF8-14

**Product Description** : Smart LF Oscillator

**Applicant** : Toyota Motor Corporation

Address : 1, Toyota-Cho
Toyota, Aichi, 471-8572 Japan

**Manufacturer** : Toyota Motor Corporation

Address : 1, Toyota-Cho
Toyota, Aichi, 471-8572 Japan

**Licence holder** : Toyota Motor Corporation

Address : 1, Toyota-Cho
Toyota, Aichi, 471-8572 Japan

| **Test Result** according to the standards listed in clause 1 test standards: | **POSITIVE** |
|---|---|

DAT-P-207/05-00





mikes-testingpartners gmbh
Ohmstrasse 2-4 · 94342 STRASSKIRCHEN · GERMANY
Tel.:+49(0)9424-94810 · Fax:+49(0)9424-9481240

# Contents

# 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart C- Intentional Radiators (July 10, 2008)

| | |
|---|---|
| Part 15, Subpart C, Section 15.209 | Radiated emissions, general requirements |

# 2 SUMMARY

## GENERAL REMARKS:

None

## FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : November 25, 2008

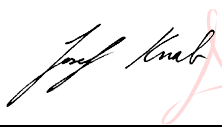
Testing concluded on : November 27, 2008

Checked by:

Thomas Weise
Ich bestätige die Richtigkeit und Integrität dieses Dokuments
2008.12.05 11:21:36 +01'00'

Thomas Weise
Dipl.-Ing.(FH)
Laboratory Manager

Tested by:

i.A. 

Josef Knab
Ich bestätige die Richtigkeit und Integrität dieses Dokuments
2008.12.05 11:17:20 +01'00'

Klaus Gegenfurtner
Dipl.-Ing.(FH)

# 3 EQUIPMENT UNDER TEST

## 3.1 Power supply system utilised

Power supply voltage : 12 V / DC

## 3.2 Short description of the Equipment under Test (EuT)

The Smart LF Oscillator Model TMLF8-14 is a transmitter installed in a motor vehicle and is used as part of Smart System. In the System, the Smart LF Oscillator has mainly following functions:

- Smart Door Unlocking
  Door antennas transmit a low frequency at 134.2 kHz intermittently. An electronic key, carried by the driver, will transmit a high radio wave when recognized the signal.
- Smart Trunk Unlocking
  The trunk antenna provides the signal for the electronic key to open the trunk.
- Detection of Electronic Key inside Trunk.
  If the driver tries to close the trunk, the inside trunk antenna transmit a radio wave of 134.2 KHz. The key left inside the trunk will recognize the signal and transmits a high radio frequency back to alarm the driver.
- Smart Engine Start
  When the driver is inside the car the inside Room Antenna transmits a radio wave of 134.2 kHz. If the electronic key recognize the signal it transmits a high radio frequency back to trigger the engine start mechanism.

The tests were performed on three antenna types in conjunction with Computer Assy (ECU):

1. Door antenna
2. Room antenna / Luggage antenna
3. Trunk antenna

Number of tested samples: 1

## EuT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- Transmit mode CW (unmodulated)

- Transmit mode modulated

## EuT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

**The following peripheral devices and interface cables were connected during the measurements:**

| | | | |
|---|---|---|---|
| - | Test box | Model : | Supplied by the manufacturer |
| - | Door antenna | Model : | 8DF / 8DG |
| - | Room antenna | Model : | 8RA / 8RB |
| - | Trunk antenna | Model : | 8TA |
| - | | Model : | |

# 4 TEST ENVIRONMENT

## 4.1 Address of the test laboratory

**mikes-testingpartners gmbh**
**Ohmstrasse 2-4**
**94342 STRASSKIRCHEN**
**GERMANY**

## 4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 15-35 ° C |
| Humidity: | 30-60 % |
| Atmospheric pressure: | 86-106 kPa |

## 4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

## 4.4 Measurement Protocol for FCC, VCCI and AUSTEL

### 4.4.1 GENERAL INFORMATION

#### 4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.
The test methods used comply with CISPR Publication 22, EN 55022 - " Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 Limits.

4.4.1.2 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

## 4.5 Determination of worst case measurement conditions

The tests were performed on two variants of the Door Antenna (8DF and 8DG) and of the Room/Luggage antenna (8RA and 8RB). The differences of the two types are the design of the external shape and the different resin type. Technically are the two types identical. The tests results of the two types were nearly identical.
So in the report only the worst case test results of Door antenna type (8DF) and Room/Luggage antenna type (8RB) are described.

# 5 TEST CONDITIONS AND RESULTS

## 5.1 Conducted emissions

For test instruments and accessories used see section 6 Part **A 4**.

### 5.1.1 Description of the test location

Test location: None

### 5.1.2 Photo documentation of the test set-up

### 5.1.3 Description of Measurement

The final level, expressed in dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit.

To convert between dBμV and μV, the following conversions apply:
dBμV = 20(log μV)
μV = Inverse log(dBμV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EuT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

### 5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin

**Remarks:** The test is not applicable because the EuT is battery powered.

## 5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part **CPR 1**.

### 5.2.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

### 5.2.2 Photo documentation of the test set-up

### 5.2.3 Description of Measurement

The magnetic field strength from the EuT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.
The resolution bandwidth during the measurement is as follows:
9 kHz – 150 kHz: ResBW: 200 Hz
150 kHz – 30 MHz: ResBW: 9 kHz

Example:

| Frequency (MHz) | Level (dBµV) | + | Factor (dB) | = | Level (dBµV/m) | Limit (dBµV/m) | = | Delta (dB) |
|---|---|---|---|---|---|---|---|---|
| 1.705 | 5 | + | 20 | = | 25 | 30 | = | 5 |

### 5.2.4 Test result

**a) Door antenna**

**Measurement distance: 3m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | 75.7 | 75.7 | 75.6 | 20.0 | 95.7 | 95.7 | 95.6 | 105.0 | -9.3 |

**Calculated value at distance: 30m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | 35.7 | 35.7 | 35.6 | 20.0 | 55.7 | 55.7 | 55.6 | 65.0 | -9.3 |

**Calculated value at distance: 300m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | -4.3 | -4.3 | -4.4 | 20.0 | 15.7 | 15.7 | 15.6 | 25.0 | -9.3 |

**b) Room antenna**

**Measurement distance: 3m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | 76.5 | 76.5 | 76.4 | 20.0 | 96.5 | 96.5 | 96.4 | 105.0 | -8.5 |

**Calculated value at distance: 30m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | 36.5 | 36.5 | 36.4 | 20.0 | 56.5 | 56.5 | 56.4 | 65.0 | -8.5 |

**Calculated value at distance: 300m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | -3.5 | -3.5 | -3.6 | 20.0 | 16.5 | 16.5 | 16.4 | 25.0 | -8.5 |

**c) Trunk antenna**

**Measurement distance: 3m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | 76.6 | 76.6 | 76.4 | 20.0 | 96.6 | 96.6 | 96.4 | 105.0 | -8.4 |

**Calculated value at distance: 30m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | 36.6 | 36.6 | 36.4 | 20.0 | 56.6 | 56.6 | 56.4 | 65.0 | -8.4 |

**Calculated value at distance: 300m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 134.2 | -3.4 | -3.4 | -3.6 | 20.0 | 16.6 | 16.6 | 16.4 | 25.0 | -8.4 |

Limit according to FCC Part 15 Subpart 15.209(a)

| Frequency (MHz) | Field strength of fundamental wave | | Measurement distance (meters) |
|---|---|---|---|
| | (µV/m) | dB (µV/m) | |
| **0.009-0.490** | **2400/F(kHz)** | **--** | **300** |
| 0.490-1.705 | 24000/F (kHz) | -- | 30 |
| 1.705-30.0 | 30 | 29.5 | 30 |

The requirements are **FULFILLED.**

**Remarks:** _____

## 5.3 Spurious emissions (Magnectic field) 9 kHz – 30 MHz

For test instruments and accessories used see section 6 Part **SER 1**.

### 5.3.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

### 5.3.2 Photo documentation of the test set-up

### 5.3.3 Description of Measurement

The spurious emissions from the EuT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.
The resolution bandwidth during the measurement is as follows:
9 kHz – 150 kHz: ResBW: 200 Hz
150 kHz – 30 MHz: ResBW: 9 kHz

Example:

| Frequency (MHz) | Level (dBµV) | + | Factor (dB) | = | Level (dBµV/m) | Limit (dBµV/m) | = | Delta (dB) |
|---|---|---|---|---|---|---|---|---|
| 1.705 | 5 | + | 20 | = | 25 | 30 | = | 5 |

### 5.3.4 Test result

**a) Door antenna**

**Measurement distance: 3m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 402.6 | 50.7 | 50.3 | 50.0 | 20.0 | 70.7 | 70.3 | 70.0 | 95.5 | -25.2 |
| 671.0 | 42.0 | 40.7 | 40.8 | 20.0 | 62.0 | 60.7 | 60.8 | 71.1 | -10.3 |
| 939.4 | 37.0 | 35.5 | 35.9 | 20.0 | 57.0 | 55.5 | 55.9 | 68.1 | -12.2 |
| 1207.8 | 32.2 | 29.3 | 29.8 | 20.0 | 52.2 | 49.3 | 49.8 | 66.0 | -16.2 |

**Calculated value at distance: 30m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 671.0 | 2.0 | 0.7 | 0.8 | 20.0 | 22.0 | 20.7 | 20.8 | 31.1 | -10.3 |
| 939.4 | -3.0 | -4.5 | -4.1 | 20.0 | 17.0 | 15.5 | 15.9 | 28.1 | -12.2 |
| 1207.8 | -7.8 | -10.7 | -10.2 | 20.0 | 12.2 | 9.3 | 9.8 | 26.0 | -16.2 |

**Calculated value at distance: 300m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 402.6 | -29.3 | -29.7 | -30.0 | 20.0 | -9.3 | -9.7 | -10.0 | 15.5 | -25.2 |

**b) Room antenna**

**Measurement distance: 3m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 402.6 | 46.9 | 46.2 | 46.0 | 20.0 | 66.9 | 66.2 | 66.0 | 95.5 | -29.3 |
| 671.0 | 36.5 | 35.7 | 36.0 | 20.0 | 56.5 | 55.7 | 56.0 | 71.1 | -15.1 |
| 939.4 | 30.6 | 28.6 | 30.0 | 20.0 | 50.6 | 48.6 | 50.0 | 68.1 | -18.1 |
| 1207.8 | 25.0 | 23.1 | 24.0 | 20.0 | 45.0 | 43.1 | 44.0 | 66.0 | -22.0 |

**Calculated value at distance: 30m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 671.0 | -3.5 | -4.3 | -4.0 | 20.0 | 16.5 | 15.7 | 16.0 | 31.1 | -15.1 |
| 939.4 | -9.4 | -11.4 | -10.0 | 20.0 | 10.6 | 8.6 | 10.0 | 28.1 | -18.1 |
| 1207.8 | -15.0 | -16.9 | -16.0 | 20.0 | 5.0 | 3.1 | 4.0 | 26.0 | -22.0 |

**Calculated value at distance: 300m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 402.6 | -33.1 | -33.8 | -34.0 | 20.0 | -13.1 | -13.8 | -14.0 | 15.5 | -29.3 |

**c) Trunk antenna**

**Measurement distance: 3m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 402.6 | 53.4 | 53.1 | 52.9 | 20.0 | 73.4 | 73.1 | 72.9 | 95.5 | -22.4 |
| 671.0 | 45.1 | 43.2 | 43.2 | 20.0 | 65.1 | 63.2 | 63.2 | 71.1 | -7.9 |
| 939.4 | 38.8 | 36.5 | 37.2 | 20.0 | 58.8 | 56.5 | 57.2 | 68.1 | -10.9 |
| 1207.8 | 33.6 | 31.2 | 32.1 | 20.0 | 53.6 | 51.2 | 52.1 | 66.0 | -13.9 |

**Calculated value at distance: 30m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 671.0 | 5.1 | 3.2 | 3.2 | 20.0 | 25.1 | 23.2 | 23.2 | 31.1 | -7.9 |
| 939.4 | -1.2 | -3.5 | -2.8 | 20.0 | 18.8 | 16.5 | 17.2 | 28.1 | -10.9 |
| 1207.8 | -6.4 | -8.8 | -7.9 | 20.0 | 13.6 | 11.2 | 12.1 | 26.0 | -13.9 |

**Calculated value at distance: 300m**

| Frequency [kHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 402.6 | -26.6 | -26.9 | -27.1 | 20.0 | -6.6 | -6.9 | -7.1 | 15.5 | -22.4 |

Limit according to FCC Part 15 Subpart 15.209(a)

| Frequency (MHz) | Field strength of spurious emissions | | Measurement distance (meters) |
|---|---|---|---|
| | (µV/m) | dB (µV/m) | |
| 0.009-0.490 | 2400/F(kHz) | -- | 300 |
| 0.490-1.705 | 24000/F (kHz) | -- | 30 |
| 1.705-30.0 | 30 | 29.5 | 30 |

The requirements are **FULFILLED.**

**Remarks:** All other unwanted emissions are below 10 dBµV/m (at 30m).

## 5.4 Radiated emissions (electric field) 30 MHz – 1 GHz

For test instruments and accessories used see section 6 Part **SER 2**.

### 5.4.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

### 5.4.2 Photo documentation of the test set-up

### 5.4.3 Description of Measurement

Spurious emissions from the EuT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003. The Interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarization`s and the EuT are rotated 360 degrees.

The final level, expressed in dBµV/m, is arrived by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page.

The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: ResBW: 120 kHz

Example:

| Frequency (MHz) | Level (dBµV) | + | Factor (dB) | = | Level (dBµV/m) | Limit (dBµV/m) | = | Delta (dB) |
|---|---|---|---|---|---|---|---|---|
| 719 | 75 | + | 32.6 | = | 107.6 | 110 | = | -2.4 |

### 5.4.4 Test result

**Door antenna, Room antenna, Trunk antenna**

| Frequency [MHz] | L: PK [dBµV] | L: AV [dBµV] | L: QP [dBµV] | Correct. [dB] | L: PK [dBµV/m] | L: AV [dBµV/m] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 30-1000 | No unwanted emissions detected | | | | | | | | |

Limit according to FCC Part 15 Subpart 15.209(a)

| Frequency (MHz) | Field strength of spurious emissions | | Measurement distance (meters) |
|---|---|---|---|
| | (µV/m) | dB (µV/m) | |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

The requirements are **FULFILLED.**

**Remarks:** _____

_____

_____

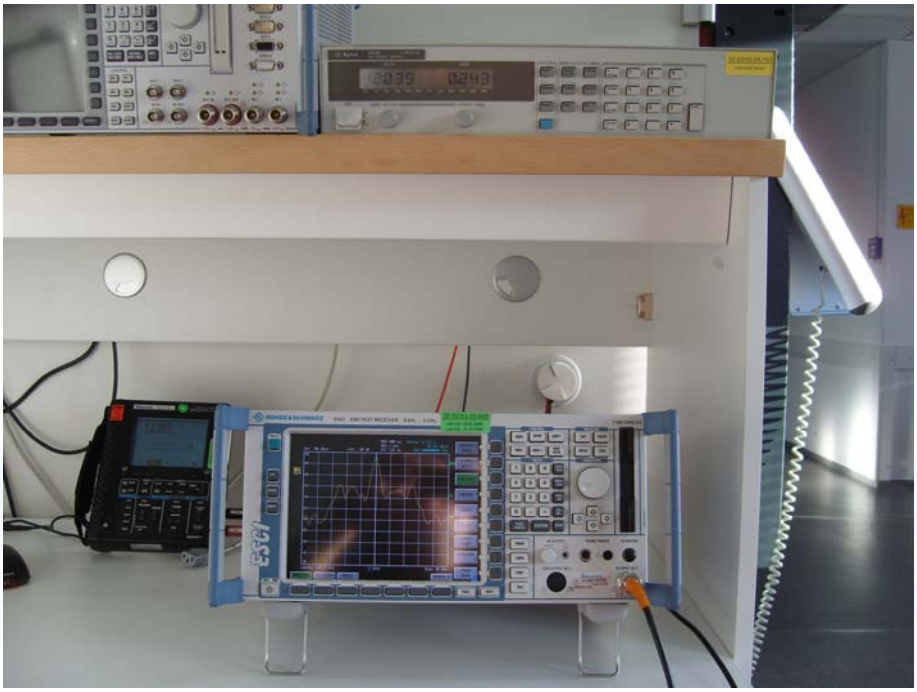
## 5.5 Emission Bandwidth

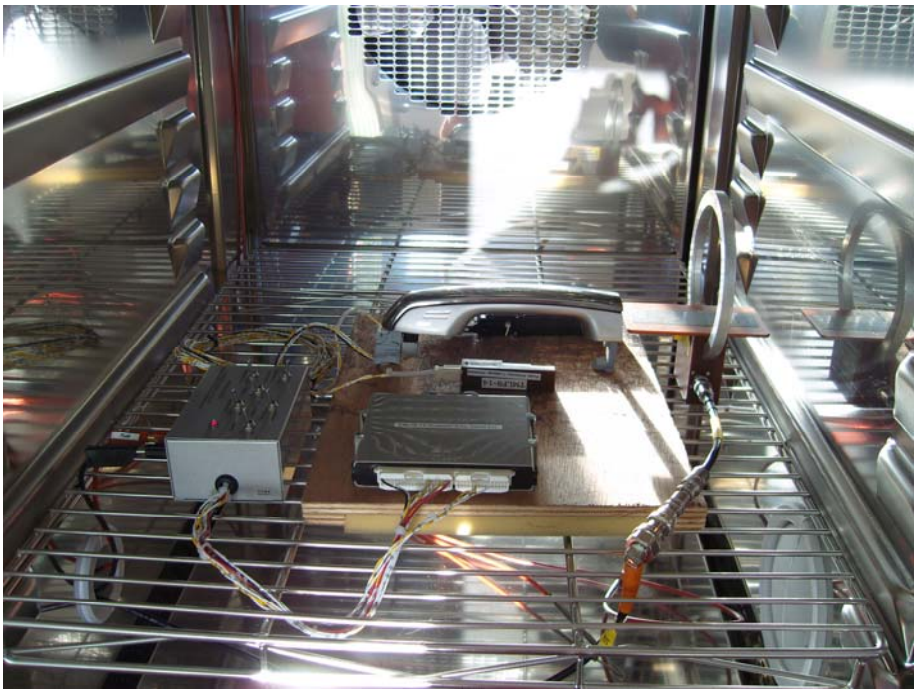
For test instruments and accessories used see section 6 Part **MB**.

### 5.5.1 Description of the test location

Test location: AREA4

### 5.5.2 Photo documentation of the test set-up

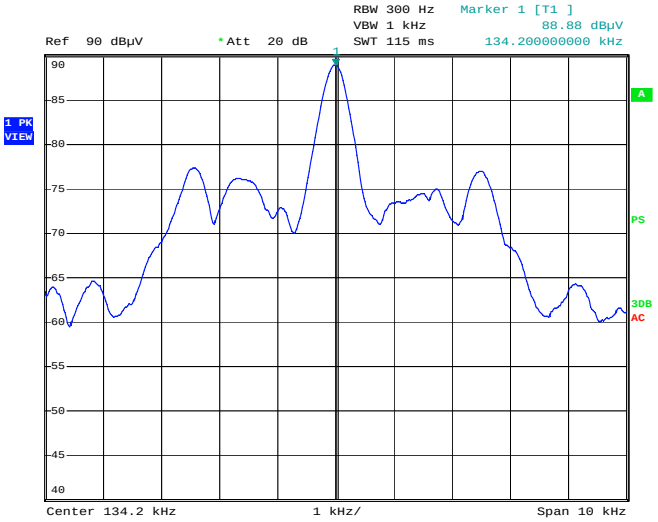




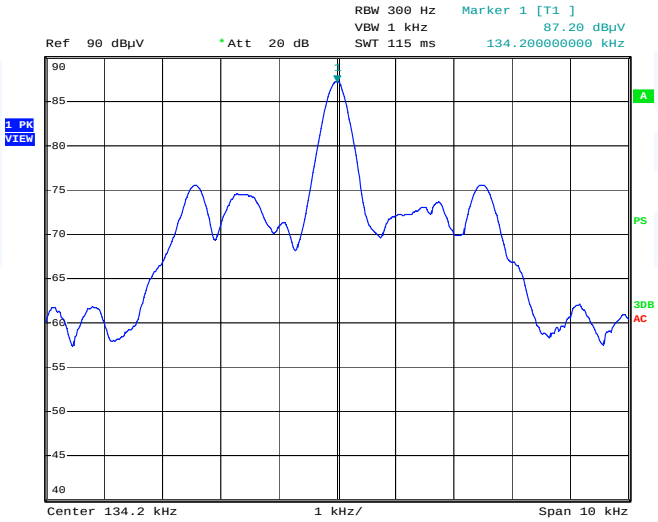
### 5.5.3 Test protocol

**Emission Bandwidth plots**

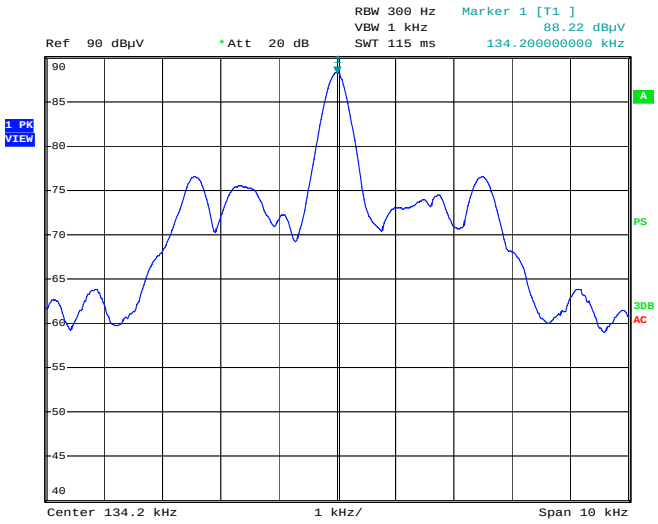
Door antenna




Room antenna




Trunk antenna



# 6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

The calibration intervals and the calibration history will be given out on request.

| Test ID | Model / Type | Kind of Equipment | Manufacturer | Equipment No. |
|---|---|---|---|---|
| CPR 1 | FMZB 1516 | Magnetic Field Antenna | Schwarzbeck Mess-Elektron | 01-02/24-01-018 |
| | ESCI | EMI Test Receiver | Rohde & Schwarz München | 02-02/03-05-005 |
| MB | ESCI | EMI Test Receiver | Rohde & Schwarz München | 02-02/03-05-005 |
| | HZ-10 | Magnetic Field Antenna | Rohde & Schwarz München | 02-02/24-05-012 |
| | WK-340/40 | Climatic Chamber | Weiss Umwelttechnik GmbH | 02-02/45-05-001 |
| | 6454A | Power Supply | HP Hewelett Packard | 02-02/50-07-157 |
| | THS730A | Handheld Scope | Tektronix GmbH | 02-02/13-05-001 |
| SER 1 | FMZB 1516 | Magnetic Field Antenna | Schwarzbeck Mess-Elektron | 01-02/24-01-018 |
| | ESCI | EMI Test Receiver | Rohde & Schwarz München | 02-02/03-05-005 |
| SER 2 | ESVS 30 | EMI Test Receiver | Rohde & Schwarz München | 02-02/03-05-006 |
| | VULB 9168 | Trilog-Broadband Anten | Schwarzbeck Mess-Elektron | 02-02/24-05-005 |
| | S10162-B | RF Cable 33m | Huber + Suhner | 02-02/50-05-031 |
| | KK-EF393-21N-16 | RF Cable 20m | Huber + Suhner | 02-02/50-05-033 |
| | NW-2000-NB | RF Cable | Huber + Suhner | 02-02/50-05-113 |

| Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---|---|---|---|---|
| 01-02/24-01-018 | | | 02/20/2009 | 02/20/2008 |
| 02-02/03-05-005 | 01/24/2009 | 01/24/2008 | | |
| 02-02/03-05-005 | 01/24/2009 | 01/24/2008 | | |
| 02-02/24-05-012 | | | | |
| 02-02/45-05-001 | 09/01/2010 | 09/01/2005 | 12/17/2009 | 12/17/2008 |
| 02-02/50-07-157 | | | | |
| 02-02/13-05-001 | 09/10/2009 | 09/10/2008 | | |
| 01-02/24-01-018 | | | 02/20/2009 | 02/20/2008 |
| 02-02/03-05-005 | 01/24/2009 | 01/24/2008 | | |
| 02-02/03-05-006 | 07/30/2009 | 07/30/2008 | | |
| 02-02/24-05-005 | 06/05/2011 | 05/06/2008 | 02/28/2009 | 02/28/2008 |
| 02-02/50-05-031 | | | | |
| 02-02/50-05-033 | | | | |
| 02-02/50-05-113 | | | | |