PHOENIX TESTLAB

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TEST REPORT

Test Report Reference: F082825E01

Equipment under Test: MiCard Legic/Mifare

FCC ID: WG7MICARDLM01

IC: 7900A-MICARDLM01

Serial Number: BDFF5CC325C93935

Applicant: NT-ware Systemprogrammierung GmbH

Manufacturer: NT-ware Systemprogrammierung GmbH

Test Laboratory
(CAB)

accredited by DATech in der TGA GmbH
in compliance with DIN EN ISO/IEC 17025
under the Reg. No. DAT-P-105/99-21,

recognized by Bundesnetzagentur
under the Reg.-No. BNetzA-CAB-02/21-104/1,

CAB Designation Number DE0004,

listed by
FCC 31040/SIT1300F2
FCC Test site registration number 90877
Industry Canada Test site registration IC3469A-1

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1 IDENTIFICATION

1.1 APPLICANT

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1.2 MANUFACTURER

Name:	NT-ware Systemprogrammierung GmbH
Address:	Arkaden Strasse 5 49186 Bad Iburg
Country:	Germany
Name for contact purposes:	Mr. Holger Bauszus
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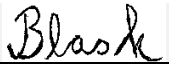
e-mail address:	hbauszus@nt-ware.com

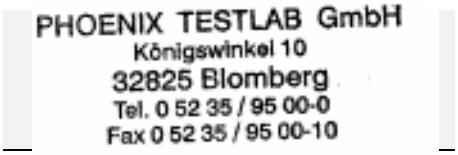
1.3 DATES

Date of receipt of test sample:	18 November 2008
Start of test:	18 November 2008
End of test:	01 December 2008

1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**
Königswinkel 10
D-32825 Blomberg **Phone:** **+49 (0) 52 35 / 95 00-0**
Germany **Fax:** **+49 (0) 52 35 / 95 00-10**

	Name	Signature	Date
Test engineer:	Raimund BLASK		02 December 2008
Test report checked:	Bernd STEINER		02 December 2008



1.5 RESERVATION

This test report is only valid in its original form.

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

1.6 NORMATIVE REFERENCES

[1] **ANSI C63.4:2003** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[2] **FCC 47 CFR Part 2** General Rules and Regulations

[3] **FCC 47 CFR Part 15** Radio Frequency Devices (Subpart C)

[4] **RSS-210 Issue 7 June 2007** Low power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

[5] **RSS-Gen Issue 2 June 2007** General Requirements and Information for the Certification of Radiocommunication Equipment

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

2 TECHNICAL DATA OF EQUIPMENT

2.1 DEVICE UNDER TEST

Type of equipment:	13.56 MHz USB RF-Cardreader
Type designation:	MiCard Legic/Mifare
FCC ID:	WG7MICARDLM01
IC:	7900A-MICARDLM01
Serial No.:	BDFF5CC325C93935
Lowest internal frequency:	2 MHz Processor-Clock)
Highest internal frequency:	96 MHz (internal USB-clock)
Antenna type:	Internal
Supply Voltage:	5 V DC (via USB-Connector)

The following external I/O cables were used:

Cable	Length	Shielding	Connector
Universal serial bus (USB)	-	yes	1.5 m

*: Length during the test

2.2 PERIPHERY DEVICES

The following equipment was used as control unit and ancillary equipment:

Computer Laptop, type “Fujitsu-Siemens LifeBook S Series, Prod.-No.: FPC04052B” with Windows XP and monitoring-software “MiCardConfigTool.exe”, delivered by the applicant.

2.3 SPECIAL EMC MEASURES

The following EMC measures were necessary to reach the documented results:

None.

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

During all tests the EUT was supplied with 5 V DC, which was provided via the USB-connection.

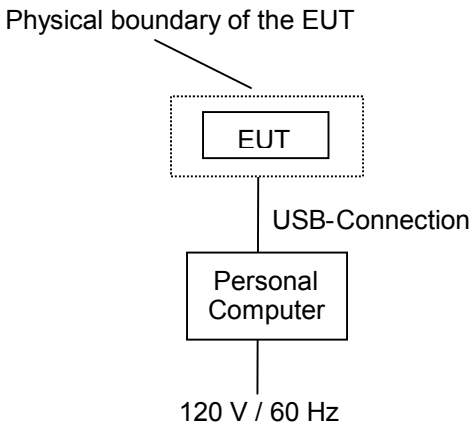
If a variation of the supply voltage was necessary, it was done in the range from 4.8 V DC to 5.2 V DC.
This range was declared by the applicant as extreme supply voltage range for USB.

If not otherwise stated, the tests were carried out with the EUT powered on in awaiting a transponder card. In this operation mode a pulsed 13.56 MHz signal was produced by the EUT.

During the measurement of occupied bandwidth a transponder card (MiCard) was presented in front of the EUT. This operation mode represents a normal operation mode.

For the whole frequency range a preliminary measurement in a fully anechoic chamber with a measuring distance of 3 m was carried out to determine the frequencies, which were radiated by the EUT.
The final measurements on the detected frequencies were carried out on an outdoor test site without ground plane (for the frequency range 9 kHz to 30 MHz) and on an open area test site with ground plane (for the frequency range 30 MHz to 1 GHz).

The physical boundaries of the Equipment Under Test are shown below.



4 APPLICATION OVERVIEW

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section	RSS 210, Issue 7 [4] or RSS-Gen, Issue 2 [5]	Status	Refer page
Radiated emissions	30 – 1,000	15.205 (a), 15.209 (a)	A2.6 (d) [4], 2.6 [5]	Passed	15 et seq.
Spectrum mask	13.110 to 14.010	15.225 (a) to (c)	A2.6 (a) to (d) [4]	Passed	21 et seq.
Occupied bandwidth	General	15.215 (c)	-	Passed	23 et seq.
Frequency tolerance	13.553 to 13.567	15.225 (e)	A2.6 [4]	Passed	25 et seq.
Conducted emissions on supply line	0.15 – 30	15.207 (a)	7.2.2 [5]	Passed	27 et seq.
99 % bandwidth	General	-	4.6.1 [5]	Passed	1 et seq. of Annex D of this test report

5 TEST RESULTS

5.1 RADIATED EMISSIONS

5.1.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into five stages.

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

All measurements will be carried out with the EUT working on the middle and upper and lower edge of the assigned frequency band. For this reason the hopping function of the EUT has to be disenabled.

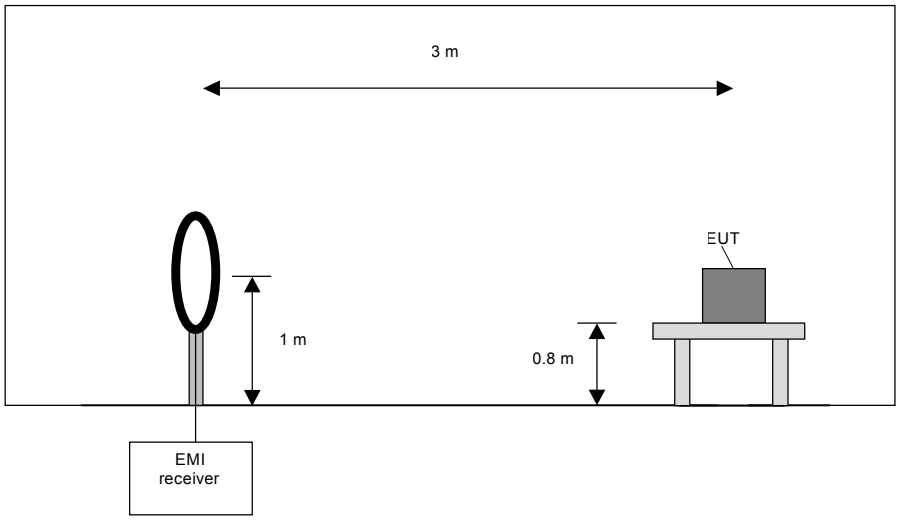
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to found the maximum emissions.

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

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



Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure will be used:

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

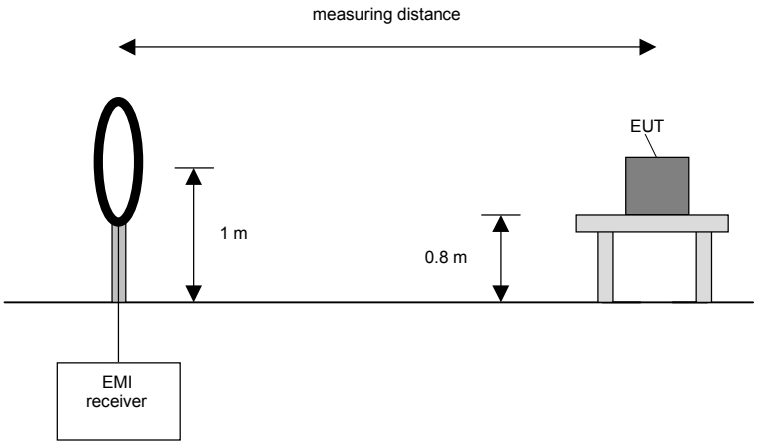
Final measurement (9 kHz to 30 MHz):

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required the results will be 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 a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

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

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

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



Final measurement procedure:

The following procedure will be used:

1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
3) Rotate the measuring antenna to find the maximum and note the value.
4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
5) Repeat steps 1) to 4) with the other orthogonal axes of the EUT (if the EUT is handheld equipment).

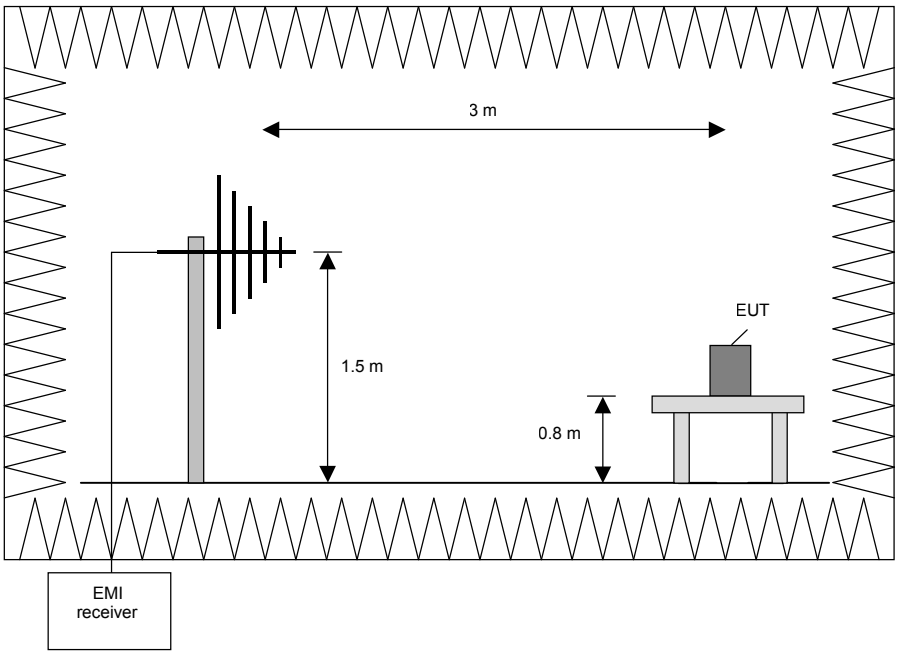
Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

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

Frequency range	Resolution bandwidth
30 MHz to 230 MHz	100 kHz
230 MHz to 1 GHz	100 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.
The following procedure will be used:

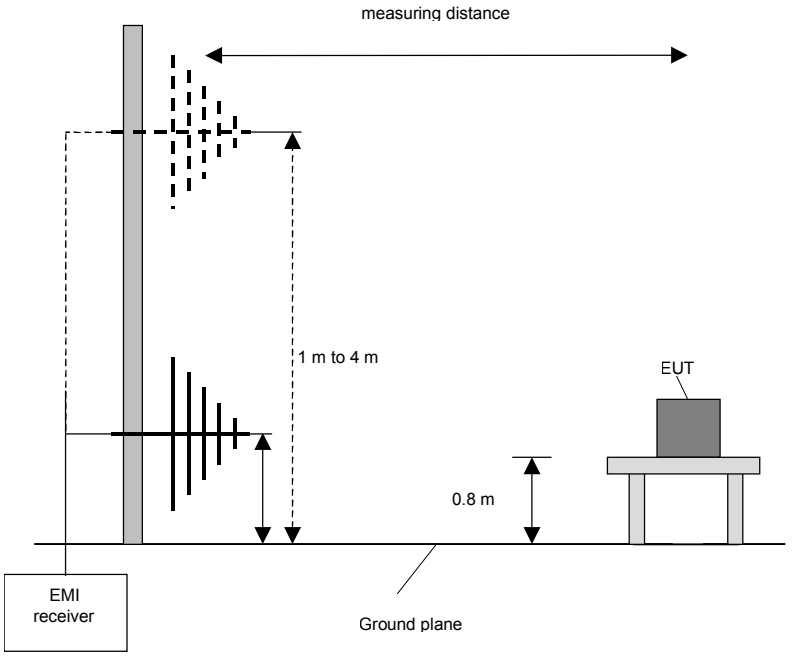
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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

Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of
0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

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

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
4) Repeat 1) to 3) for the other orthogonal antenna polarization.
5) Move the antenna and the turntable to the position where the maximum value is detected.
6) Measure while moving the antenna slowly +/- 1 m.
7) Set the antenna to the position where the maximum value is found.
8) Measure while moving the turntable +/- 45 °.
9) Set the turntable to the azimuth where the maximum value is found.
10) Measure with Final detector (QP and AV) and note the value.
11) Repeat 5) to 10) for each frequency.
12) Repeat 1) to 11) for each orthogonal axes of the EUT (if the EUT is handheld equipment).

Preliminary and final measurement (1 GHz to 25 GHz)

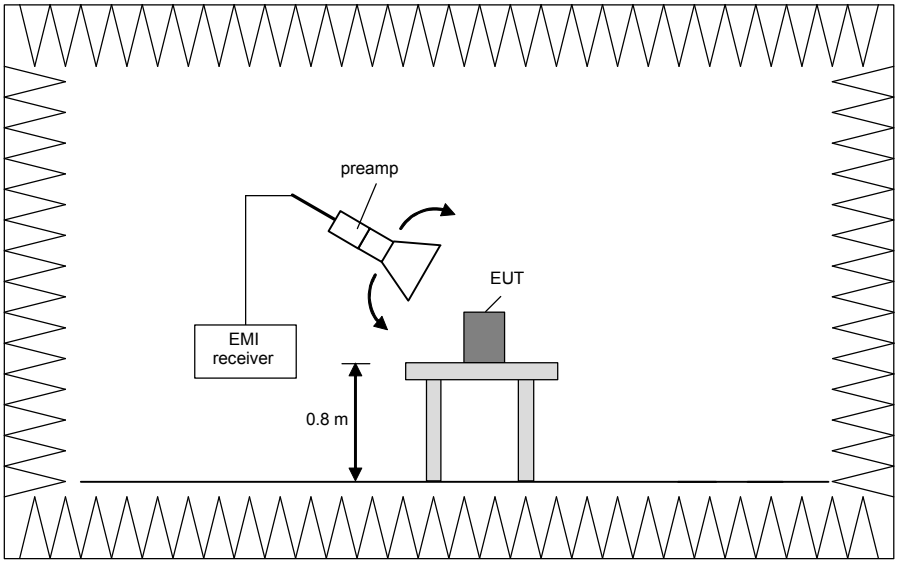
This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

Preliminary measurement (1 GHz to 25 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna, the antenna close to the EUT and while moving the antenna over all sides of the EUT. With the spectrum analyser in CLEAR / WRITE mode the cone of the emission should be found and than the measuring distance will be set to 3 m with the receiving antenna moving in this cone of emission. At this position the final measurement will be carried out.

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

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 25 GHz	100 kHz

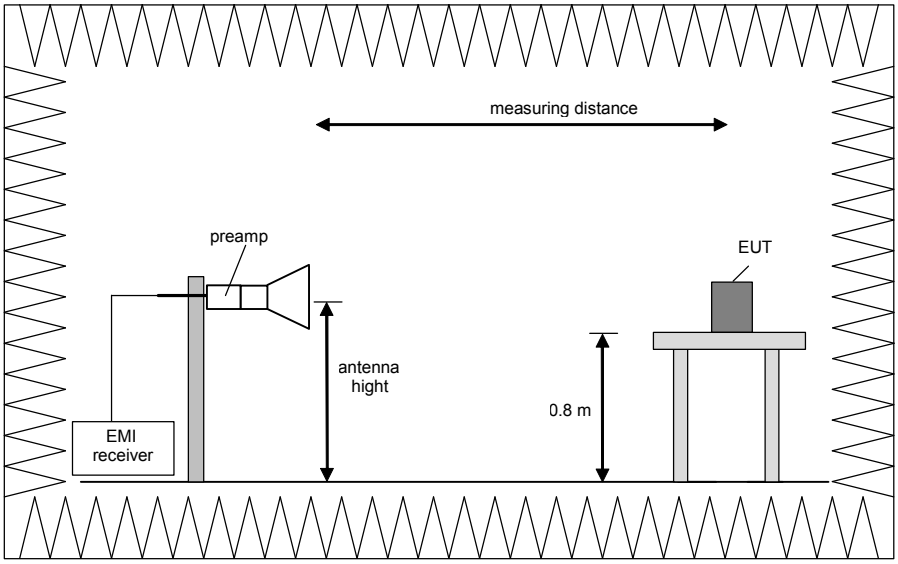


Final measurement (1 GHz to 25 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 ° in order to have the antenna inside the cone of radiation.

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

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	1 MHz
4 GHz to 12 GHz	1 MHz
12 GHz to 18 GHz	1 MHz
18 GHz to 25 GHz	1 MHz



Procedure of measurement:

The measurements were performed in the frequency range 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz and 18 GHz to 25 GHz.
The following procedure will be used:

1) Monitor the frequency range at horizontal polarisation and move the antenna over all sides of the EUT (if necessary move the EUT to another orthogonal axis).
2) Change the antenna polarisation and repeat 1) with vertical polarisation.
3) Make a hardcopy of the spectrum.
4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
5) Change the analyser mode to Clear / Write and found the cone of emission.
6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3 m and the antenna will be still inside the cone of emission.
7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarisation and azimuth and the peak and average detector, which causes the maximum emission.
8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

Step 1) to 6) are defined as preliminary measurement.

5.1.2 TEST RESULTS (RADIATED EMISSIONS)

5.1.2.1 PRELIMINARY MEASUREMENT (9 kHz to 2 GHz)

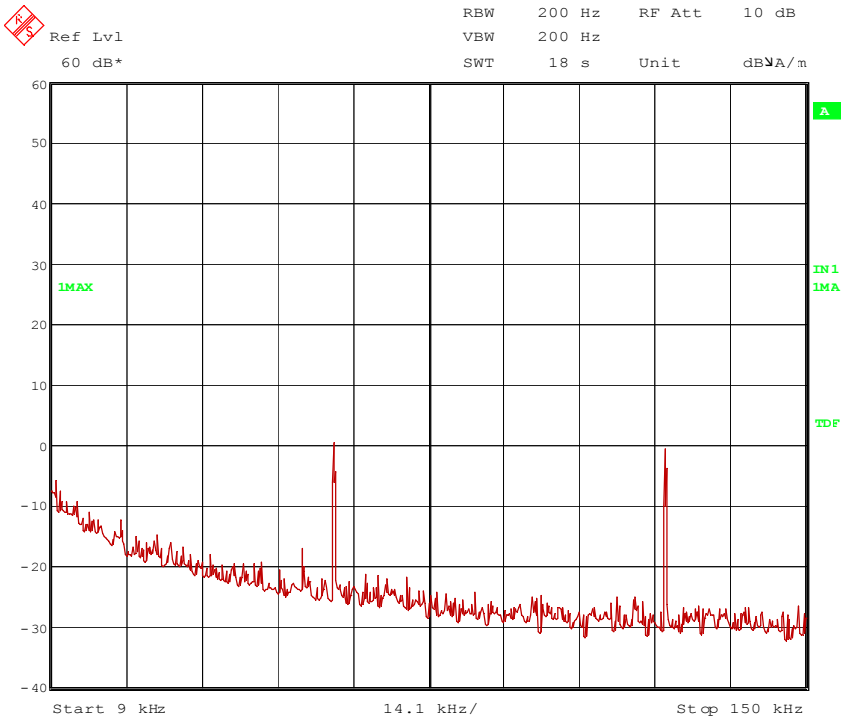
Ambient temperature:	20 °C	Relative humidity:	45 %

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

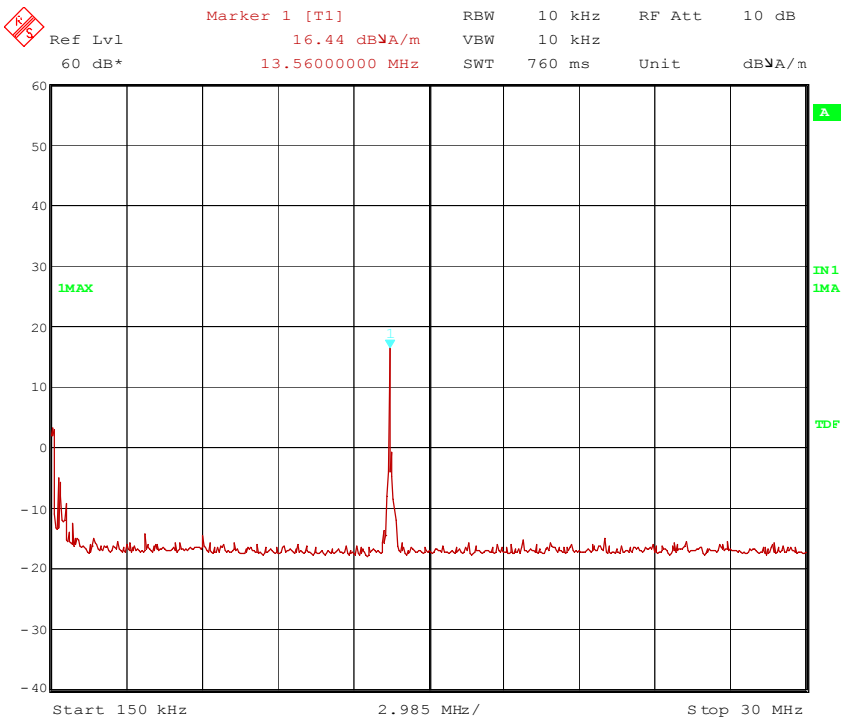
Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in normal operation mode of the EUT (without reading a TAG). All results are shown in the following.

Supply voltage: The EUT was supplied with 5 V DC via USB.



82825emi1.wmf: Spurious emissions from 9 kHz to 150 kHz:



82825emi2.wmf: Spurious emissions from 150 kHz to 30 MHz:

The following emissions were found according to FCC 47 CFR Part 15 section 15.209 (a).

61.840 kHz, 123.800 kHz, 185.500 kHz

The following frequency was found inside the 13.533 to 13.567 MHz band according to FCC 47 CFR Part 15 section 15.225 [2]:

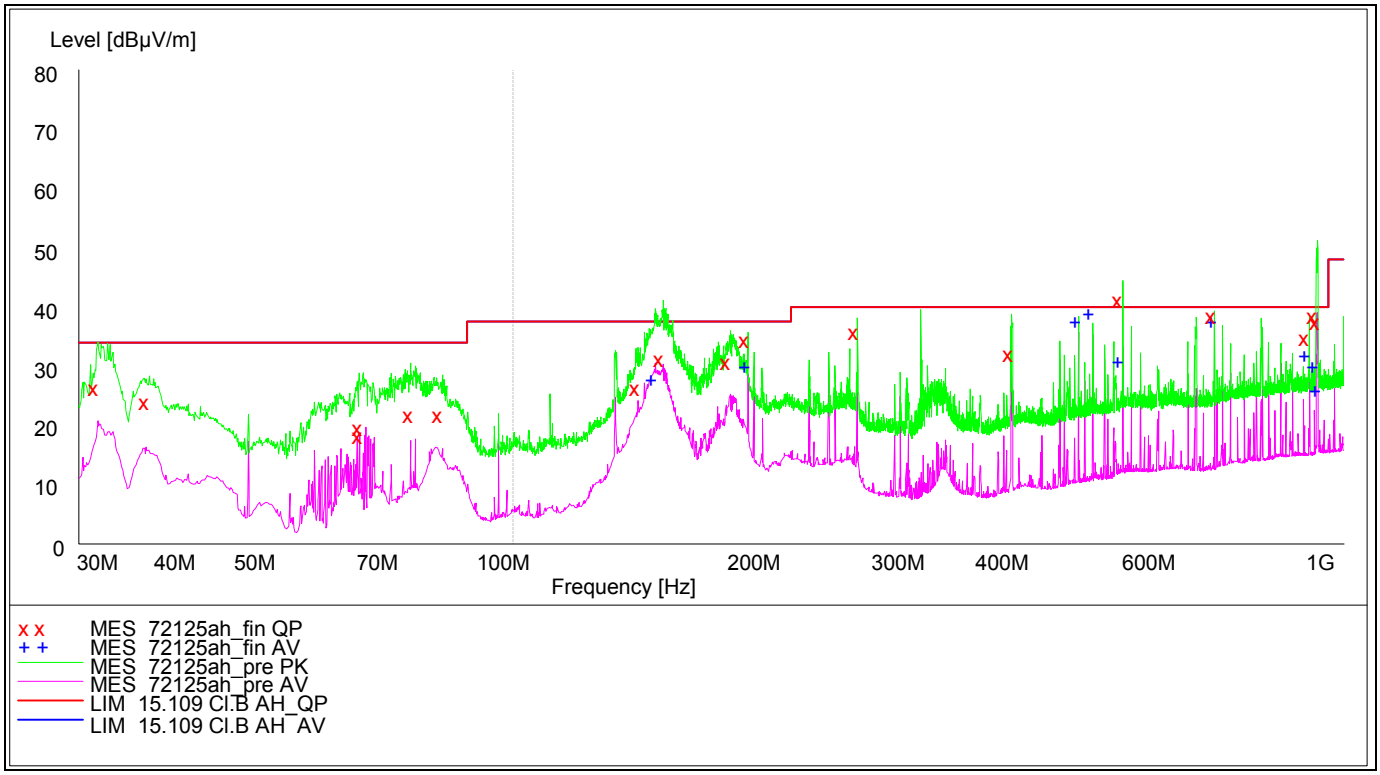
13.560 MHz.

These frequencies have to be measured on the outdoor test site. The result of this final measurement is shown in subclause 5.1.2.2 of this test report.

TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 35, 43, 54

Title:	Preliminary emission measurement according CFR 47 Part15.109
EUT:	13.56 MHz MiCard-Reader
Manufacturer:	NT-Ware
Operating Condition:	Normal operation
Test site:	fully anechoic chamber M20; PHOENIX TEST LAB GmbH
Operator:	R. Blask

The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with the EUT in various positions.
The top measured curve represents the peak measurement. The measured points marked with x are frequency points for which later measurements with a quasi-peak detector were carried out. These values are indicated in the following table. The bottom measured curve represents average values, which are only required for control purposes.



The following frequencies were found during the preliminary radiated emission test:

31.644 MHz, 192.012 MHz, 260.016 MHz, 480.036 MHz, 499.224 MHz, 542.400 MHz, 698.928 MHz, 930.972 MHz, 931.956 MHz

These frequencies have to be measured on the open area test site. The results of this final measurement are shown in subclause 5.1.2.3 of this test report.

5.1.2.2 FINAL RADIATED EMISSION TEST (9 kHz to 30 MHz)

Ambient temperature:	5 °C	Relative humidity:	78 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m, 10 m and 30 m.

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

Test record: The test was carried out in normal operation mode of the EUT (without reading a TAG). All results are shown in the following.

Supply voltage: The EUT was supplied with 5 V DC.

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

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

Results with measuring distance of 3 m						
Frequency	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m
61.840 kHz	53.5	111.8	58.3	QP	33.5	20.0
123.800 kHz	50.5	105.7	55.2	QP	30.5	20.0
185.500 kHz	55.5	102.2	46.7	QP	35.5	20.0
13.560 MHz	64.5	124.0	59.5	QP	44.5	20.0
Results with measuring distance of 10 m						
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m
61.840 kHz	Measured signal level below the noise level of the system.					
123.800 kHz						
185.500 kHz						
13.560 MHz						
Results with measuring distance of 30 m						
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Readings dBµV	Antenna factor * dB/m
61.840 kHz	Measured signal level below the noise level of the system.					
123.800 kHz						
185.500 kHz						
13.560 MHz						
Measurement uncertainty			+2.2 dB / -3.6 dB			

*: Cable loss included

Test result: Passed

TEST EQUIPMENT USED FOR THE TEST:
54 – 57

5.1.2.3 FINAL RADIATED EMISSION TEST (30 MHz to 1 GHz)

Ambient temperature:	5 °C	Relative humidity:	75 %

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

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

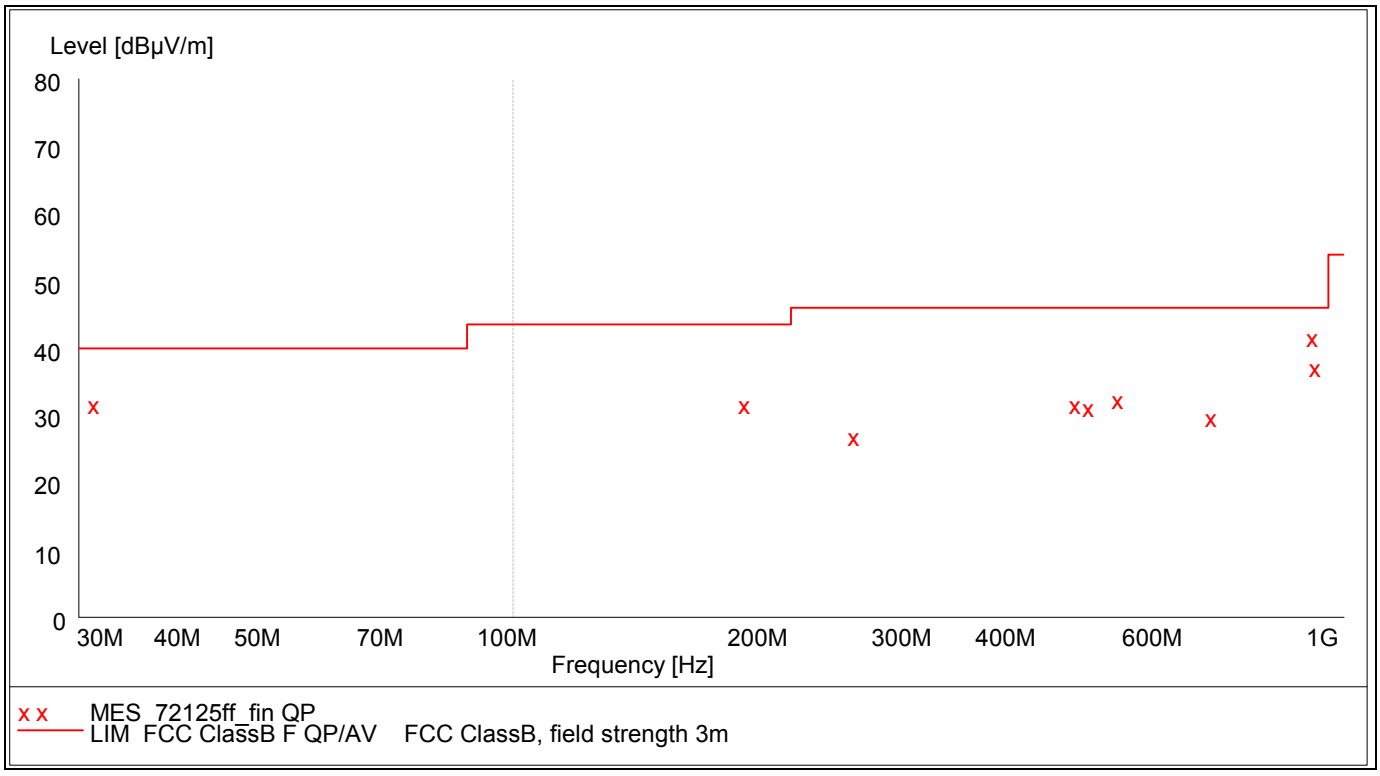
Test record: The test was carried out in normal operation mode of the EUT (without reading a TAG). All results are shown in the following.

Supply voltage: The EUT was supplied with 5 V DC.

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

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

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with x are the measured results of the standard final measurement on the open area test site.



Data record name: 72125ff

The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 3m measuring distance.

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

Result measured with the quasipeak detector:

(These values are marked in the above diagram by x)

Spurious emissions outside restricted bands									
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
31.644	32.1	40.0	7.9	12.6	18.9	0.6	113	48	Vertikal
192.012	32.0	43.5	11.5	21.5	9.0	1.5	112	264	Vertikal
480.036	32.1	46.0	13.9	12.7	17.0	2.4	175	359	Horizontal
499.224	31.5	46.0	14.5	11.6	17.4	2.5	225	45	Horizontal
542.400	32.9	46.0	13.1	11.4	18.8	2.7	237	314	Vertikal
698.928	30.1	46.0	15.9	7.1	20.0	3.0	177	89	Horizontal
930.972	42.1	46.0	3.9	15.2	23.5	3.4	125	354	Vertikal
931.956	37.5	46.0	8.5	10.5	23.6	3.4	131	324	Vertikal
Spurious emissions in restricted bands									
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
260.016	27.2	46.0	18.8	12.9	12.5	1.8	338	180	Horizontal
Measurement uncertainty				+2.2 dB / -3.6 dB					

The test results were calculated with the following formula:

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

Test result: Passed

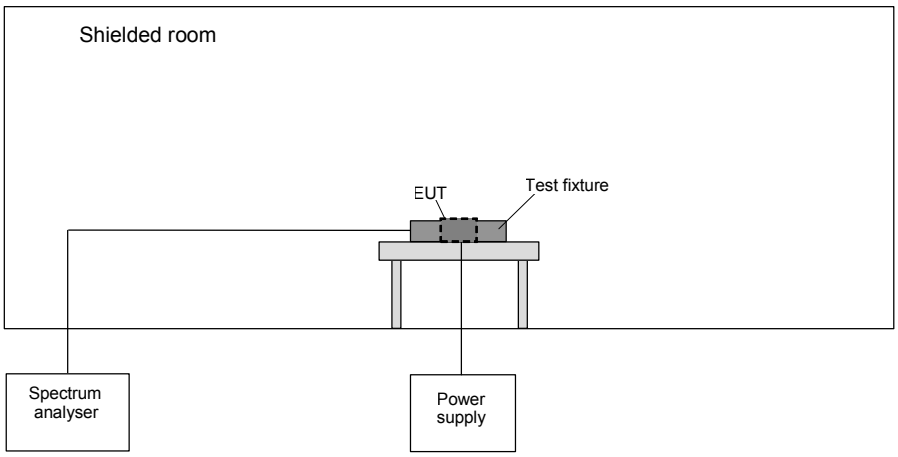
TEST EQUIPMENT USED FOR THE TEST:
14 – 20

5.2 SPECTRUM MASK

5.2.1 METHOD OF MEASUREMENT (SPECTRUM MASK)

The following procedure will be used for the spectrum mask measurement:

1) Place the EUT in the test fixture and switch it on.
2) Use the following spectrum analyser settings: RWB = VBW = 1 kHz, Span = wide enough to capture the whole 13 MHz band including the frequency ranges were the 15.209 limit applies, Trace mode = MaxHold, select the limit line 15225spc
3) After trace stabilisation, set the marker to the signal peak.
4) The Reference level will be calculated by the amount of the margin of the wanted signal to its 30 m emission limit plus the marker value.
5) The whole signal trace has to be below the limit line.



The following procedure will be used for the occupied bandwidth measurement:

1) Place the EUT in the test fixture and switch it on.
2) Use the following spectrum analyser settings: RWB = VBW = 10 kHz, Span = wide enough to capture app. 1.5 times the 20 dB bandwidth, Trace mode = MaxHold.
3) After trace stabilisation, set the first marker and the first display line to the signal peak. Set the second display line 20 dB below the first display line. The second marker and its delta marker shall be set to cross points of the spectrum line and the second display line and note these frequencies.
4) Alternatively the 20 dB down function of the analyser could be used, if this function will be applicable to the displayed spectrum.

5.2.2 TEST RESULTS (SPECTRUM MASK)

Ambient temperature:	20 °C	Relative humidity:	45 %

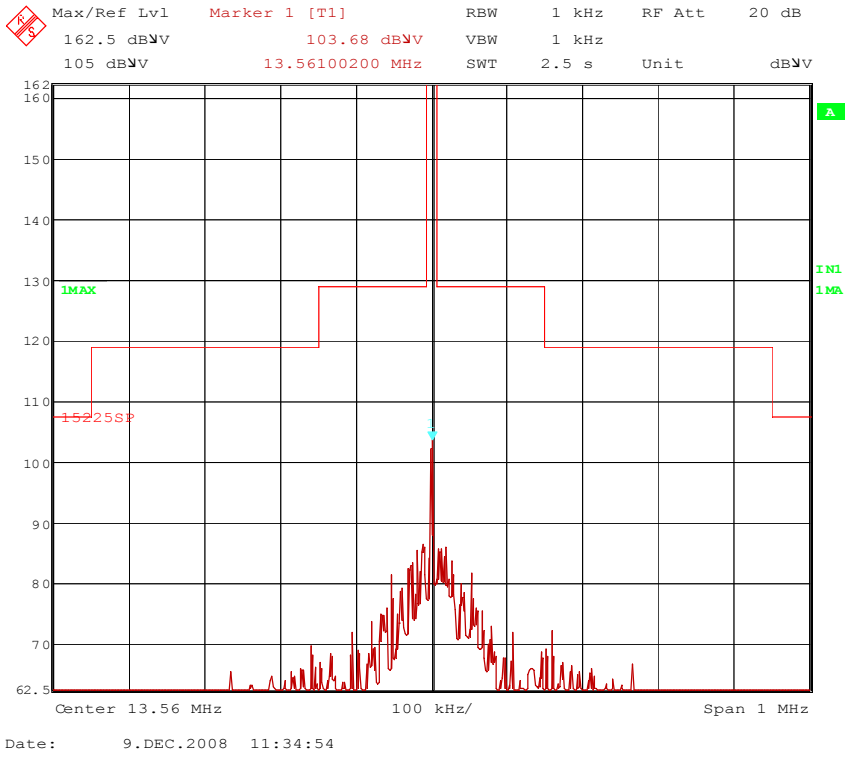
Supply voltage: The EUT was supplied with 5.0 V DC by USB.

Test record: The test was carried out while the EUT was reading a TAG.

The Reference level in the plot below was calculated with the following formula:

$$\text{Reflevel} = (\text{Limit}_{OATS} - \text{Level}_{OATS}) + \text{Marker value}$$

Where Limit_{OATS} = 84.0 dBµV/m, Level_{OATS} = 24.5 dBµV/m and Marker value = 103.0 dBµV.



82825bw.wmf: Spectrum mask at 13.560 MHz

Test result: Passed

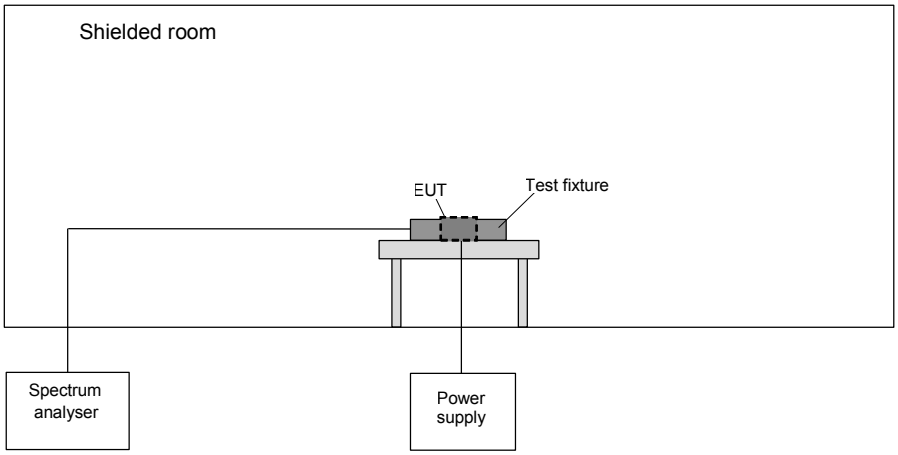
TEST EQUIPMENT USED THE TEST:
22, 54, 58, 59

5.3 OCCUPIED BANDWIDTH

5.3.1 METHOD OF MEASUREMENT (OCCUPIED BANDWIDTH)

The following procedure will be used for the occupied bandwidth measurement:

5) Place the EUT in the test fixture and switch it on.
6) Use the following spectrum analyser settings: RWB = VBW = 10 kHz, Span = wide enough to capture app. 1.5 times the 20 dB bandwidth, Trace mode = MaxHold.
7) After trace stabilisation, set the first marker and the first display line to the signal peak. Set the second display line 20 dB below the first display line. The second marker and its delta marker shall be set to cross points of the spectrum line and the second display line and note these frequencies.
8) Alternatively the 20 dB down function of the analyser could be used, if this function will be applicable to the displayed spectrum.



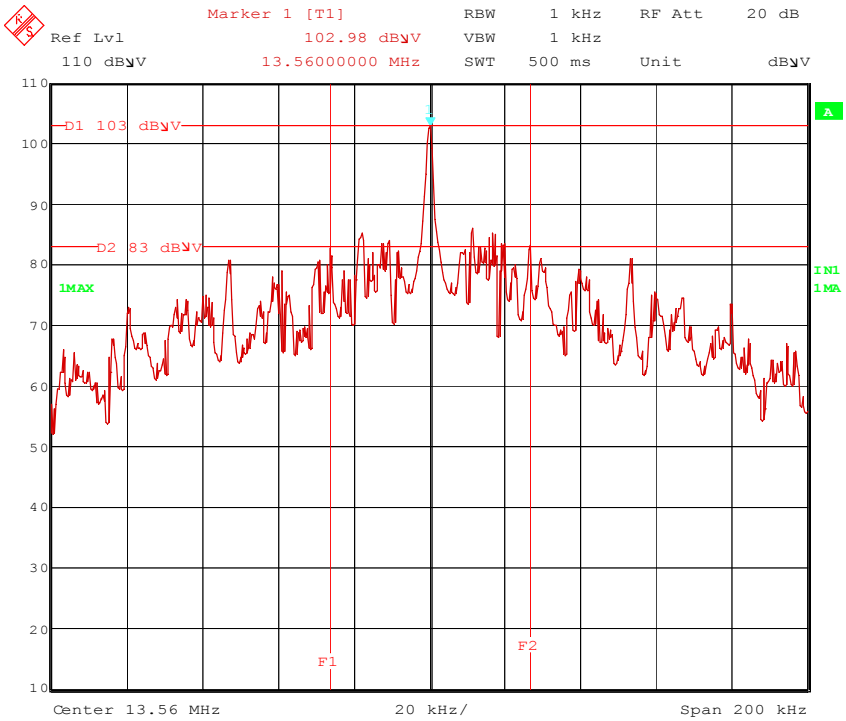
5.3.2 TEST RESULTS (OCCUPIED BANDWIDTH)

Ambient temperature:	20 °C

Relative humidity:	50 %

Supply voltage: The EUT was supplied with 5.0 V DC by USB.

Test record: The test was carried out while the EUT was reading a TAG.



82825obw.wmf: Occupied bandwidth at 13.560 MHz:

F_L	F_U	BW (F_U - F_L)
13.5335 MHz	13.5866 MHz	53.1 kHz
Measurement uncertainty		$< \pm 1*10^{-7}$

Test result: Passed

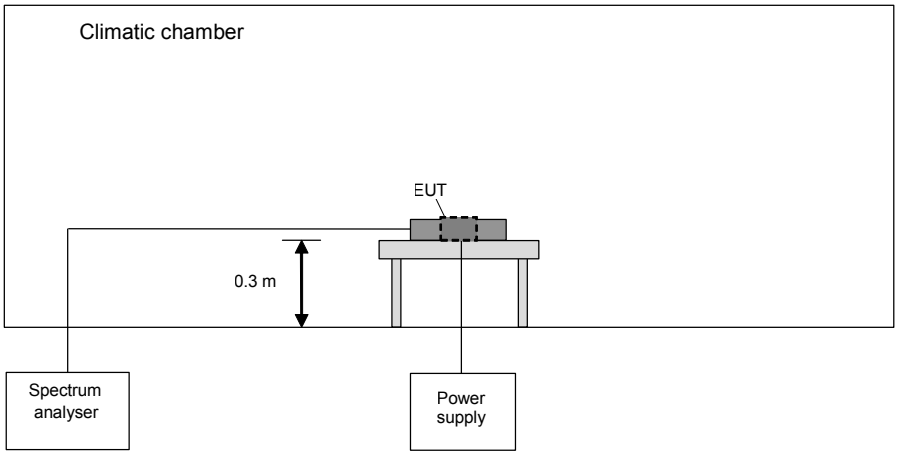
TEST EQUIPMENT USED THE TEST:
22, 54, 58, 59

5.4 FREQUENCY TOLERANCE

5.4.1 METHOD OF MEASUREMENT (FREQUENCY TOLERANCE)

The following procedure will be used:

1) Place the EUT in the climatic chamber.
2) Switch on the EUT and check the correct function and the settings of the spectrum analyser.
3) Switch off the EUT and tune the climatic chamber to a temperature of 50 °C. Wait until the thermal balance is obtained.
4) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
5) Repeat 4) with the minimum and the maximum of the supply voltage.
6) Switch off the EUT and tune the climatic chamber to a temperature range of 50 °C to –20 °C to in ten-degree steps. Wait until the thermal balance is obtained for every step.
7) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
8) Repeat 7) with the minimum and the maximum of the supply voltage at 20 °C.
9) Repeat 6) with the next temperature step until –20 °C were reached.



5.4.2 TEST RESULTS (FREQUENCY TOLERANCE)

Ambient temperature:	20 °C	Relative humidity:	50 %

Test set-up: For this test the EUT was fixed on a wooden table inside the climatic chamber.

Cable guide: For further information of the cable guide refer to the pictures in annex A of this test report.

Temperature	Supply voltage	Minutes after switch on	Frequency [MHz]	Allowed tolerance	Measured tolerance	Result
50 °C	5.0 V DC	0	13.560695	±1.356 kHz	+606 Hz	Passed
	5.0 V DC	2	13.560675	±1.356 kHz	+586 Hz	Passed
	5.0 V DC	5	13.560670	±1.356 kHz	+581 Hz	Passed
	5.0 V DC	10	13.560660	±1.356 kHz	+571 Hz	Passed
40 °C	5.0 V DC	0	13.560515	±1.356 kHz	+426 Hz	Passed
	5.0 V DC	2	13.560480	±1.356 kHz	+391 Hz	Passed
	5.0 V DC	5	13.560455	±1.356 kHz	+366 Hz	Passed
	5.0 V DC	10	13.560450	±1.356 kHz	+361 Hz	Passed
30 °C	5.0 V DC	0	13.560238	±1.356 kHz	+149 Hz	Passed
	5.0 V DC	2	13.560230	±1.356 kHz	+141 Hz	Passed
	5.0 V DC	5	13.560228	±1.356 kHz	+139 Hz	Passed
	5.0 V DC	10	13.560225	±1.356 kHz	+136 Hz	Passed
20 °C	4.8 V DC (U_{min})	0	13.560103	±1.356 kHz	+14 Hz	Passed
	5.0 VDC (U_{nom})		13.560098	±1.356 kHz	+9 Hz	Passed
	5.2 V DC (U_{max})		13.560098	±1.356 kHz	+9 Hz	Passed
	4.8 V DC (U_{min})	2	13.560097	±1.356 kHz	+8 Hz	Passed
	5.0 VDC (U_{nom})		13.560092	±1.356 kHz	+3 Hz	Passed
	5.2 V DC (U_{max})		13.560092	±1.356 kHz	+3 Hz	Passed
	4.8 V DC (U_{min})	5	13.560092	±1.356 kHz	+3 Hz	Passed
	5.0 VDC (U_{nom})		13.560089	±1.356 kHz	±0 Hz	Passed
	5.2 V DC (U_{max})		13.560089	±1.356 kHz	±0 Hz	Passed
	4.8 V DC (U_{min})	10	13.560090	±1.356 kHz	+1 Hz	Passed
	5.0 VDC (U_{nom})		13.560089	-	-	Reference
	5.2 V DC (U_{max})		13.560089	±1.356 kHz	±0 Hz	Passed
10 °C	5.0 V DC	0	13.559870	±1.356 kHz	-219 Hz	Passed
	5.0 V DC	2	13.559885	±1.356 kHz	-204 Hz	Passed
	5.0 V DC	5	13.559901	±1.356 kHz	-188 Hz	Passed
	5.0 V DC	10	13.559904	±1.356 kHz	-185 Hz	Passed
0 °C	5.0 V DC	0	13.559704	±1.356 kHz	-385 Hz	Passed
	5.0 V DC	2	13.559720	±1.356 kHz	-369 Hz	Passed
	5.0 V DC	5	13.559737	±1.356 kHz	-352 Hz	Passed
	5.0 V DC	10	13.559741	±1.356 kHz	-348 Hz	Passed
-10 °C	5.0 V DC	0	13.559531	±1.356 kHz	-558 Hz	Passed
	5.0 V DC	2	13.559585	±1.356 kHz	-504 Hz	Passed
	5.0 V DC	5	13.559603	±1.356 kHz	-486 Hz	Passed
	5.0 V DC	10	13.559613	±1.356 kHz	-476 Hz	Passed
- 20 °C	5.0 V DC	0	13.559384	±1.356 kHz	-705 Hz	Passed
	5.0 V DC	2	13.559432	±1.356 kHz	-657 Hz	Passed
	5.0 V DC	5	13.559441	±1.356 kHz	-648 Hz	Passed
	5.0 V DC	10	13.559450	±1.356 kHz	-639 Hz	Passed
Measurement uncertainty				$< \pm 1*10^{-7}$		

Test result: Passed

TEST EQUIPMENT USED FOR THE TEST:
22, 54, 58, 59, 61

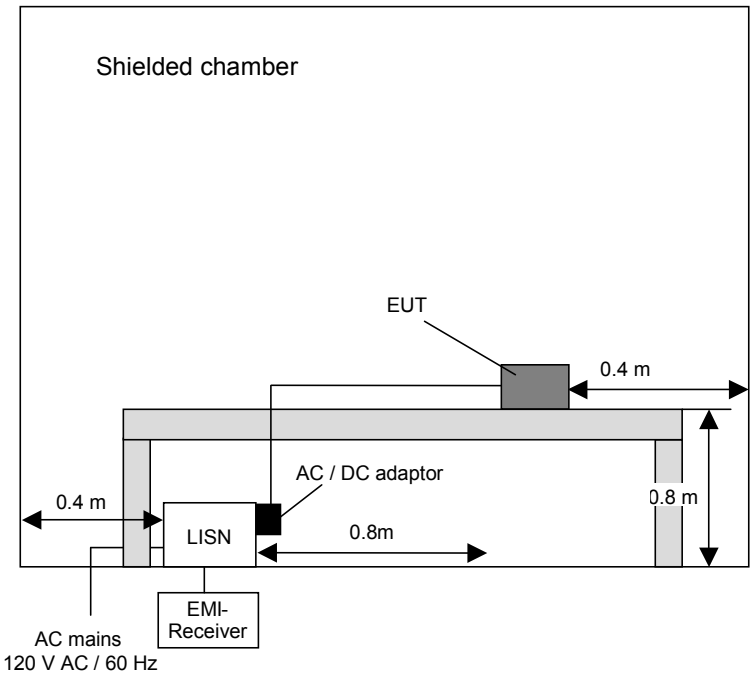
5.5 CONDUCTED EMISSION MEASUREMENT POWER SUPPLY LINES

5.5.1 METHOD OF MEASUREMENT (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to
ANSI C63.4-2003 [1].

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

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



5.5.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

Ambient temperature:	20 °C	Relative humidity:	45 %

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

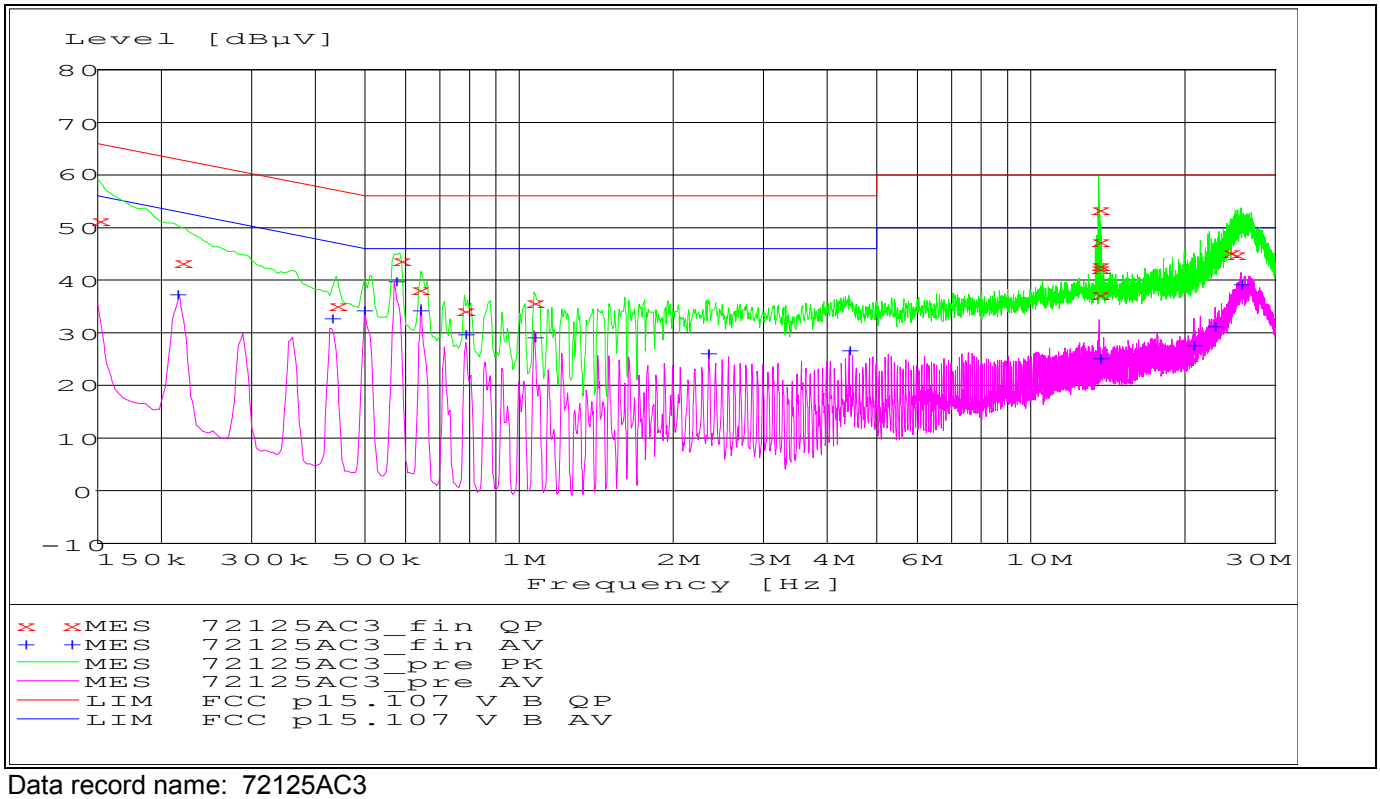
Cable guide: All cables of the EUT were fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out in normal operation mode of the EUT (without reading a TAG). All results are shown in the following.

Power supply: During this test the EUT was powered with 5 V DC.

Title: Mains terminal disturbance voltage measurement with protective ground conductor simulation
EUT: MiCard Legic/Mifare
Manufacturer: NTware
Operating Condition: Normal operation mode
Test site: PHOENIX TESTLAB Blomberg M4
Operator: R. Blask

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



Data record name: 72125AC3

Result measured with the quasipeak detector:

(These values are marked in the above diagram by x)

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.150540	51.80	2.1	66.0	14.2	L1	FLO
0.218940	43.70	1.0	62.9	19.2	L1	FLO
0.438540	35.20	0.9	57.1	21.9	L1	FLO
0.586680	44.10	0.8	56.0	11.9	L1	FLO
0.640500	38.30	0.8	56.0	17.7	N	FLO
0.781080	34.60	0.8	56.0	21.4	N	FLO
1.071870	36.10	0.8	56.0	19.9	L1	FLO
13.544070	47.30	1.8	60.0	12.7	L1	FLO
13.567560	53.60	1.9	60.0	6.4	L1	FLO
13.602570	42.40	1.9	60.0	17.6	N	FLO
13.613280	43.10	1.9	60.0	16.9	N	FLO
13.638390	37.60	1.9	60.0	22.4	N	FLO
24.535320	45.70	2.8	60.0	14.3	L1	FLO
25.162170	44.80	2.9	60.0	15.2	N	FLO

Data record name: 72125AC3_fin QP

Result measured with the average detector:

(These values are marked in the above diagram by +)

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.214890	37.60	1.0	53.0	15.4	L1	FLO
0.428370	32.60	0.9	47.3	14.6	L1	FLO
0.499560	34.10	0.8	46.0	11.9	L1	FLO
0.570300	40.20	0.8	46.0	5.8	N	FLO
0.642030	34.40	0.8	46.0	11.6	L1	FLO
0.783600	29.80	0.8	46.0	16.2	N	FLO
1.068540	29.30	0.8	46.0	16.7	L1	FLO
2.347530	26.20	0.7	46.0	19.8	N	FLO
4.408170	26.60	0.7	46.0	19.4	N	FLO
13.574400	25.20	1.9	50.0	24.8	N	FLO
20.832810	27.90	2.5	50.0	22.1	N	FLO
22.896060	31.60	2.7	50.0	18.4	L1	FLO
25.745910	39.60	2.9	50.0	10.4	L1	FLO

Data record name: 72125AC3_fin AV

Test result: Passed

TEST EQUIPMENT USED:
1 - 3, 5, 6

6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088	Weekly verification (system cal.)	
2	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026	02/27/2008	02/2010
3	LISN	NSLK8128	Schwarzbeck	8128155	480058	01/09/2008	01/2009
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097	Weekly verification (system cal.)	
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111	-	-
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	Measuring receiver	ESCS30	Rohde & Schwarz	828985/014	480270	02/27/2008	02/2010
16	Controller	HD100	Deisel	100/670	480139	-	-
17	Turntable	DS420HE	Deisel	420/620/80	480087	-	-
18	Antenna support	AS615P	Deisel	615/310	480086	-	-
19	Antenna	CBL6111 A	Chase	1643	480147	08/01/2007	08/2012
18	Antenna support	AS615P	Deisel	615/310	480086	-	-
19	Antenna	CBL6111 A	Chase	1643	480147	08/01/2007	08/2012
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	-
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification (system cal.)	
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	02/25/2008	02/2010
32	Controller	MCU	Maturo GmbH	MCU/043/971107	480832	-	
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	
34	Antenna support	AS615P	Deisel	615/310	480187	-	
35	Antenna	CBL6112 B	Chase	2688	480328	10/11/2005	10/2010
36	Antenna	3115 B	EMCO	9609-4918	480184	09/11/2008	09/2013
43	RF-cable No. 30	RTK 081	Rosenberger	-	410141	Weekly verification (system cal.)	
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142	Weekly verification (system cal.)	
49	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337	Six month verification (system cal.)	
54	Power supply	TOE 8752-32	Toellner	31566	480010	06/19/2007	06/2009
58	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	02/19/2008	02/2013
60	Signal generator	83650L	Agilent	3844A00554	480333	02/26/2008	02/2010
61	Precision Dipole	HZ 13	Rohde & Schwarz	831782/02	480062	Six month verification (system cal.)	
62	Horn Antenna	3115 A	EMCO	9609-4922	480183	Six month verification (system cal.)	
63	RF-cable No. 1	RTK 081	Rosenberger	-	410093	Weekly verification (system cal.)	
64	Climatic chamber	MK 240	BINDER	05-79022	480462	01/22/2008	07/2009
65	Power Meter	NRVD	Rohde & Schwarz	828110/026	480267	02/26/2008	02/2010
66	Thermal Power Sensor	NRV-Z51	Rohde & Schwarz	825489/004	480247	02/22/2008	02/2010
67	High Pass Filter	WHJS1000C11 /60EF	Wainwright Instruments GmbH	1	480413	-	-
68	Tuneable Notch Filter	TTR 375-3EE	TELONIC Berkeley	-	480330	-	-

7 LIST OF ANNEXES

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	Test set-up fully anechoic chamber (H-Field)	82825emi5.jpg
	Test set-up open area test site (E-Field)	82825emi8.jpg
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	Test set-up climatic chamber	82825clima2.jpg
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ANNEX B	**EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**3 pages**
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ANNEX D	**METHODS OF MEASUREMENT AND TEST RESULT 99%-BW**	**5 pages**