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Test Report

Report Number:

F113544 E2

Applicant:

NT-ware Systemprogrammierung GmbH

Manufacturer:

NT-ware Systemprogrammierung GmbH

Equipment under Test (EUT):

microMind USB to Ethernet Bridge

microMIND V2

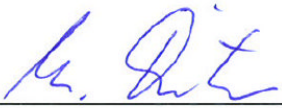

Laboratory accredited by
DGA Deutsche Gesellschaft für Akkreditierung mbH
in compliance with DIN EN ISO/IEC 17025

REFERENCES

- [1] **ANSI C63.4:2009** 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 B)
- [4] **ICES-003 Issue 4** Spectrum Management and Telecommunications Policy. Interference-Causing Equipment Standard. Digital Apparatus

TEST RESULT

The requirements of the tests performed as shown in the overview (chapter 4 of this test report) were fulfilled by the equipment under test.
The complete test results are presented in the following.

Test engineer:	Michael DINTER		5 March 2012
	_____ Name	_____ Signature	_____ Date
Authorized reviewer:	Bernd STEINER		5 March 2012
	_____ Name	_____ Signature	_____ Date

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1 IDENTIFICATION

1.1 APPLICANT

Name:	NT-ware Systemprogrammierung GmbH
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Country:	Germany
Name for contact purposes:	Mr. Klaus SUNTROP
Phone:	+49-(0)5403-7243-231
Fax:	+49-(0)5403-780103
eMail Address:	ksuntrop@nt-ware.com
Applicant represented during the test by the following person:	-

1.2 MANUFACTURER

Name:	NT-ware Systemprogrammierung GmbH
Address:	Niedersachsenstraße 6 49186 Bad Iburg
Country:	Germany
Name for contact purposes:	Mr. Klaus SUNTROP
Phone:	+49-(0)5403-7243-231
Fax:	+49-(0)5403-780103
eMail Address:	ksuntrop@nt-ware.com
Manufacturer represented during the test by the following person:	-

1.3 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

accredited by DGA Deutsche Gesellschaft für Akkreditierung mbH in compliance with
DIN EN ISO/IEC 17025 under Reg. No. DGA-PL-105/99-22
Industry Canada Test site registration 3469A-1 recognized by Bundesnetzagentur under the
Reg.-No. BNetzA-CAB-02/21-104/3, CAB Designation Number DE0004,
listed by FCC 31040/SIT1300F2 FCC Test site registration number 90877

1.4 EUT (EQUIPMENT UNDER TEST)

Test object:	USB to Ethernet Bridge
Type:	microMIND V2
Order number:	microMIND V2 == miM_v2-1_1
Serial number:	100953
PCB identifier:	3402_microMIND; 3002_Poe_MM; 3702_μM_IO
Hardware version:	2
Software version:	EMC Testsoftware

1.5 TECHNICAL DATA OF EQUIPMENT

Power supply:	AC Mains AC Adapter
Supply voltage:	Unom = 230 V, 50 / 60 Hz
	Umin = 100 V, 50 / 60 Hz
	Umax = 240 V, 50 / 60 Hz
highest internal frequency *:	384 MHz internal

* as declared by the applicant

EXTERNAL I/O:

Identification	Connector		Length during test
	EUT	Ancillary	
Ethernet 1 Port	RJ45	RJ45	2 m
Ethernet 2 Port	RJ45	RJ45	2 m
USB port	USB A	USB B	Approx. 1.8 m
IO-port	D-Sub 25 Pin	Customized left open	Approx. 1.2 m
AC-Adapter	DC-Plug	AC-plug	Approx. 2.90 m

1.6 DATES

Date of receipt of test sample:	14 December 2011
Start of test:	14 December 2011
End of test:	20 December 2011

2 OPERATIONAL STATES

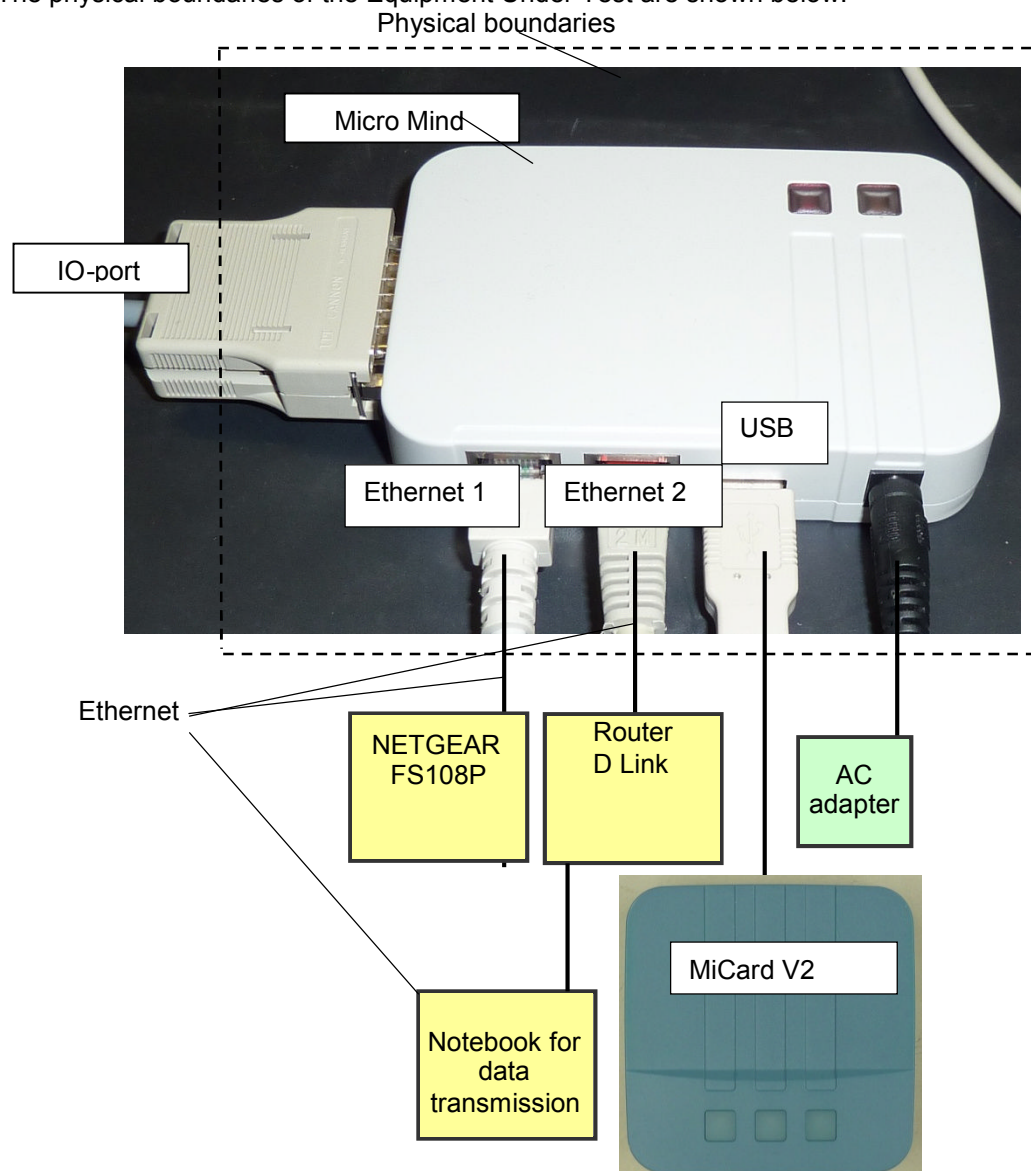
The operation mode of the microMIND V2 (USB to Ethernet Bridge) during the emission tests was defined by the customer as follows:

During the tests the EUT was powered either by an external power supply or by the Netgear FS108P router via Power over Ethernet (PoE), depending whether the EUT was tested as PoE version or not. In addition, the EUT was connected to an USB RF Card Reader (MiCard V2 Multi), a D-LINK router and a test adapter. In order to make sure the EUT worked as expected and rests responsive, a permanent ping was established between a notebook and the microMIND V2 (PoE) via the D-Link router and furthermore a DSub-25 plug was connected to the newly added IO-board within the microMIND. The relay itself was triggered by a test program running inside the microMIND.

In this case the EUT was powered via AC-adapter.

The setup is shown in the following diagram.

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



3 ADDITIONAL INFORMATION

Ancillary (necessary for testing):

- I.T.E. Power supply
Model: SA07-24US12R
Input: 100-240 V_{AC}; 50/60 Hz; 0.8 A
Output: 12V_{DC}; 2.0 A (24 W max)
- D-Link
- Netgear ProSafe 8 Port 10/100 Switch with 4 Port PoE
- NTware MiCard V2 Multi USB RF Card Reader
- Laptop Panasonic Model : CF-48

Special EMC measures:

- none

Remarks:

The EUT was labelled with the FCC ID:WG7-MICROMIND1

The radiated tests were done with another AC adapter FP Switch power supply Model SAW12-12-1000.

The AC adapter has a changeable plug and in this chase a European plug was used for the measurements instead of the American plug which is normally used for.

Changes:

The difference between the USB to Ethernet Bridge mircoMIND and microMIND V2 is the added IO PCB.

4 OVERVIEW

Conducted emissions FCC 47 CFR Part 15 section 15.107 (b) [3] / ICES-003 Issue 4 section 7.1 [4]					
Application	Frequency range	Limits	Reference standard	Remark	Status
AC supply line	0.15 to 0.5 MHz	66 to 56 dBμV (QP)* 56 to 46 dBμV (AV)*	ANSI C63.4 (2009)	class B	Passed
	0.5 to 5 MHz	56 dBμV (QP) 46 dBμV (AV)	CISPR 22		
	5 to 30 MHz	60 dBμV (QP) 50 dBμV (AV)			
*: Decreases with the logarithm of the frequency					
Radiated emissions FCC 47 CFR Part 15 section 15.109 (b) [3] / ICES-003 Issue 4 section 7.1 [4]					
Application	Frequency range	Limits	Reference standard	Remark	Status
Radiated Emission	30 to 88 MHz	40.0 dBμV/m QP at 3 m	ANSI C63.4 (2009);	class B	Passed
	88 to 216 MHz	43.5 dBμV/m QP at 3 m			
	216 to 960 MHz	46.0 dBμV/m QP at 3 m			
	960 to 1000 MHz	54.0 dBμV/m QP at 3 m			
	above 1000 MHz	54.0 dBμV/m AV at 3 m			
Radiated Emission	30 to 230 MHz	40 dBμV/m QP at 3 m	CISPR 22	class B	Passed
	230 to 1000 MHz	47 dBμV/m QP at 3 m			
	1 to 3 GHz	50/70 dBμV/m AV/PK at 3 m			
	3 to 6 GHz	54/74 dBμV/m AV/PK at 3 m			

Remark: The highest internal frequency of the EUT was 384 MHz as declared by the applicant. Therefore the radiated emission test was carried out up to 2 GHz.

5 RESULTS

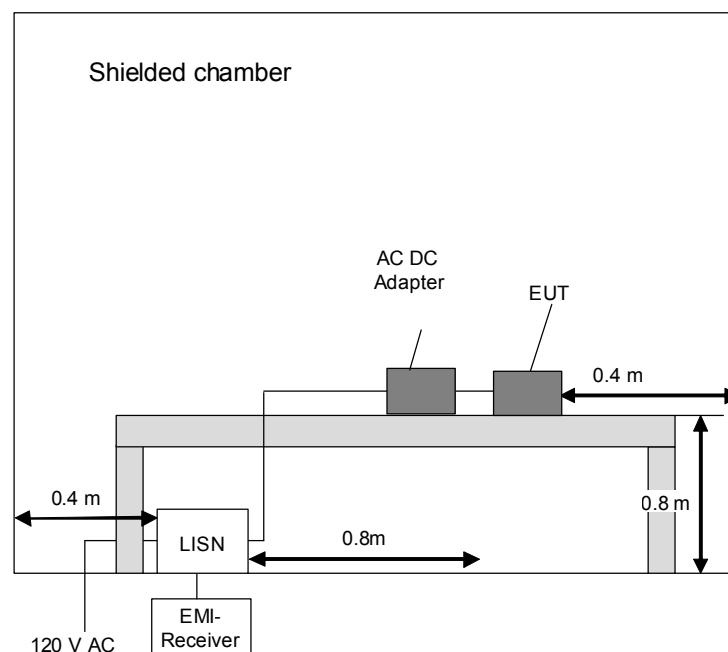
5.1 CONDUCTED EMISSIONS ON POWER SUPPLY LINES

5.1.1 TESTMETHOD

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 setup of the Equipment under test will be in accordance to ANSI C63.4-2009 [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



5.1.2 RESULTS CONDUCTED EMISSION MEASUREMENT ON AC MAINS

Ambient temperature:	20 °C	Relative humidity:	36 %
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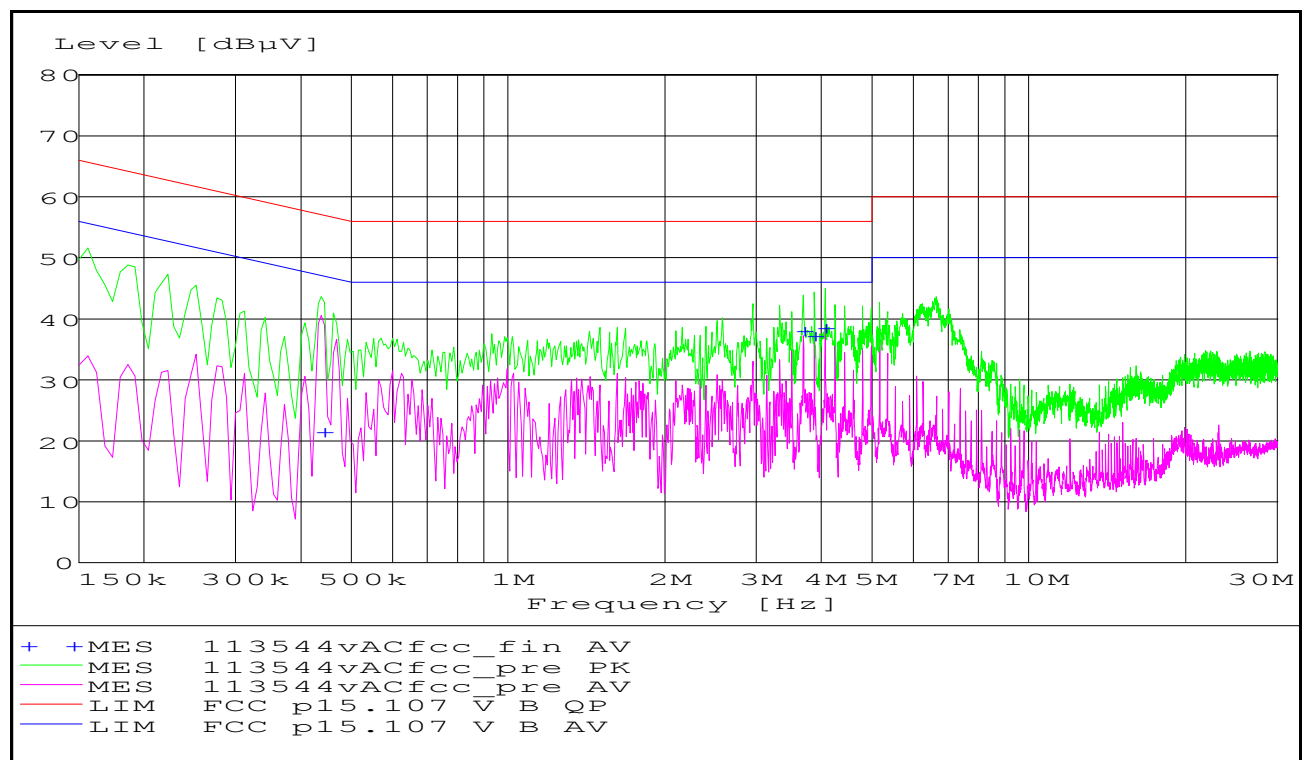
Position of EUT: The EUT was set-up on a wooden table of a height of 0.8 m.

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

Power supply: During the measurement the EUT was supplied with 120 V_{AC} 60 Hz via a AC adapter.

Operation states: As described in chapter 2.

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: 113544vACfcc

Result measured with the average detector (marked by +):

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.440700	21.60	0.7	47.0	25.5	L1	FLO
3.692400	38.30	0.6	46.0	7.7	L1	GND
3.876900	37.50	0.6	46.0	8.5	L1	FLO
4.061400	38.50	0.7	46.0	7.5	L1	GND

Test: Passed

TEST EQUIPMENT USED:

1-3, 5, 6

5.2 RADIATED EMISSIONS

5.2.1 TESTMETHOD

The radiated emission measurement is subdivided into four stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an open area test site with reflecting ground plane and various antenna heights in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 12.75 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 12.75 GHz.

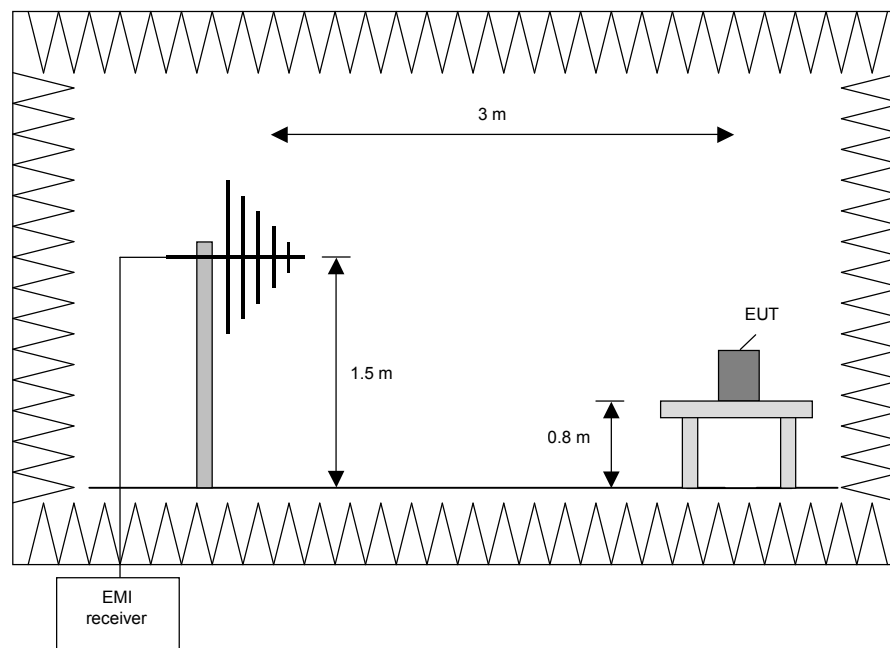
Preliminary measurement (30 MHz to 1 GHz)

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 C63.4-2009 [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 120 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 1 GHz	120 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 1 GHz.

The following procedure will be used:

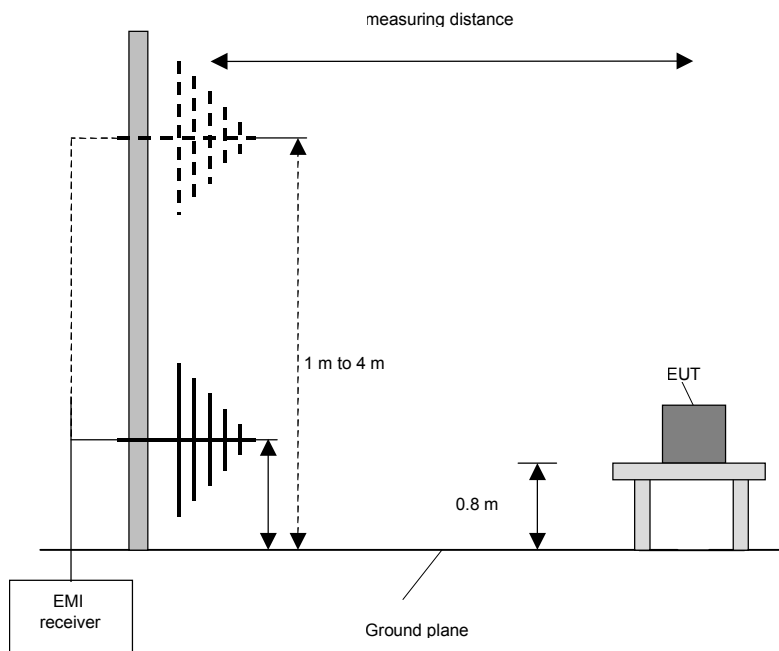
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the 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 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 handheld equipment.

Preliminary and final measurement (1 GHz to 12.75 GHz)

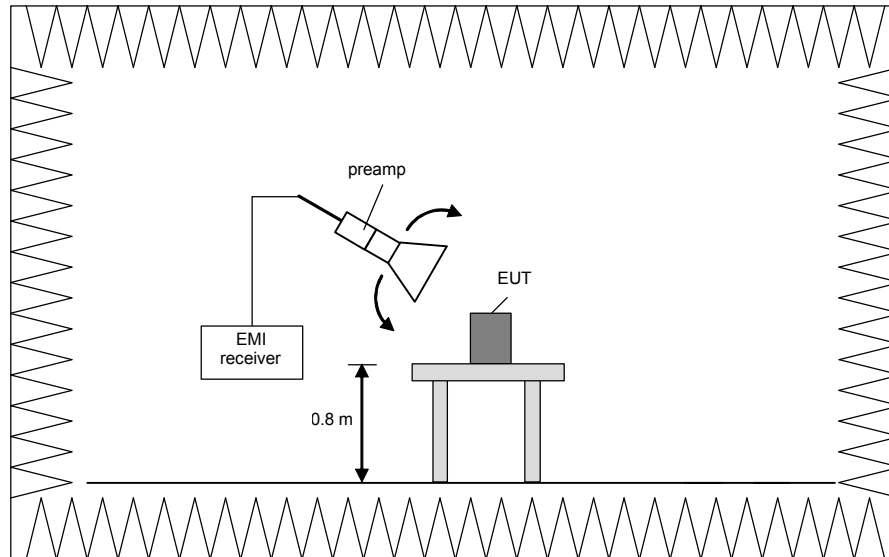
This measurement will be performed in a fully anechoic chamber. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2009 [1].

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

Frequency range	Resolution bandwidth (preliminary)	Resolution bandwidth (final)
1 GHz to 12.75 GHz	100 kHz	1 MHz

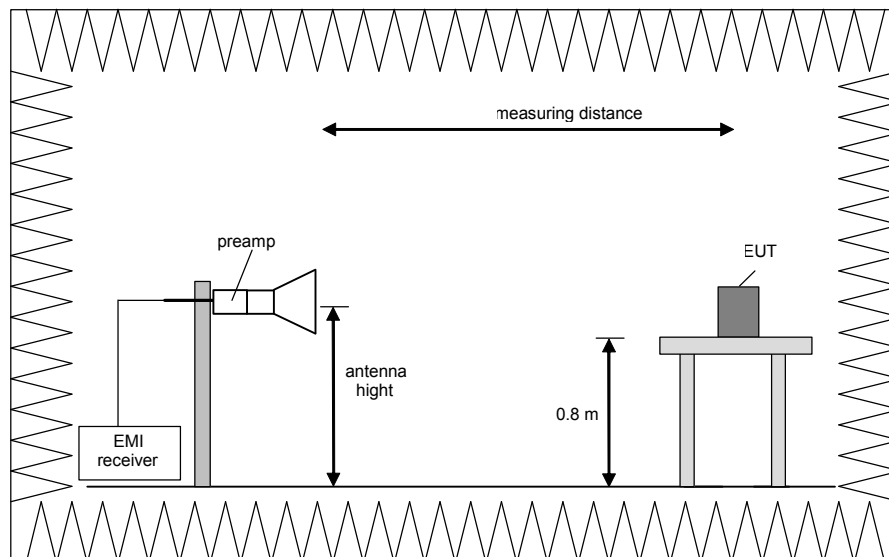
Preliminary measurement (1 GHz to 12.75 GHz)

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.



Final measurement (1 GHz to 12.75 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.



Procedure of measurement:

The measurements were performed in the frequency range 1 to 12.75 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 beam width.

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

5.2.2 RESULT PRELIMINARY MEASUREMENT

Ambient temperature	20 °C	Relative humidity	36 %
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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.

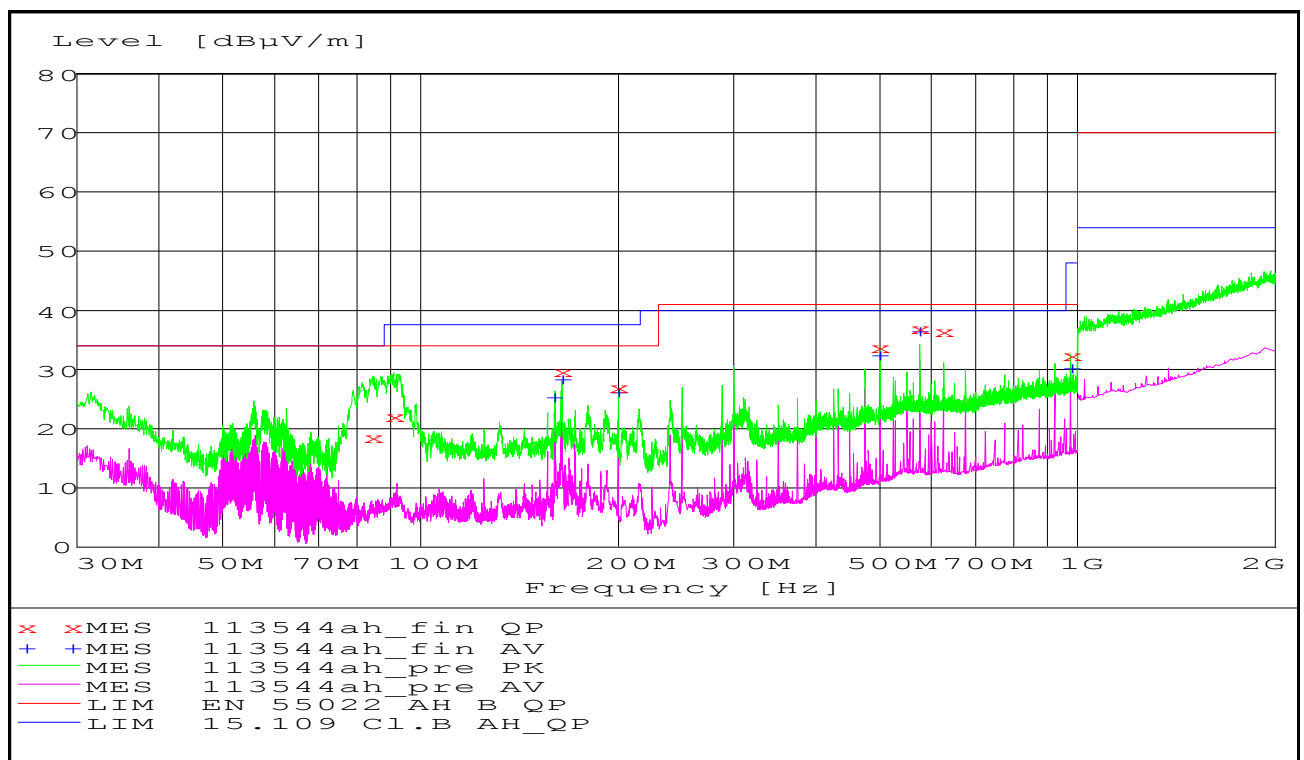
Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex C of this test report.

Power supply: During the measurement the EUT was supplied with 120 V_{AC} 60 Hz via a AC adapter.

Operation states: As described in chapter 2.

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 an 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.



Data record name: 113544ah

The following frequencies were found during the preliminary emission test:

Frequency MHz
84.480000
159.996000
163.884000
199.992000
250.000000
300.000000
475.000000
499.996000
525.000000
574.996000
625.000000
974.980000

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

30 - 35

5.2.3 RESULTS FINAL MEASUREMENT

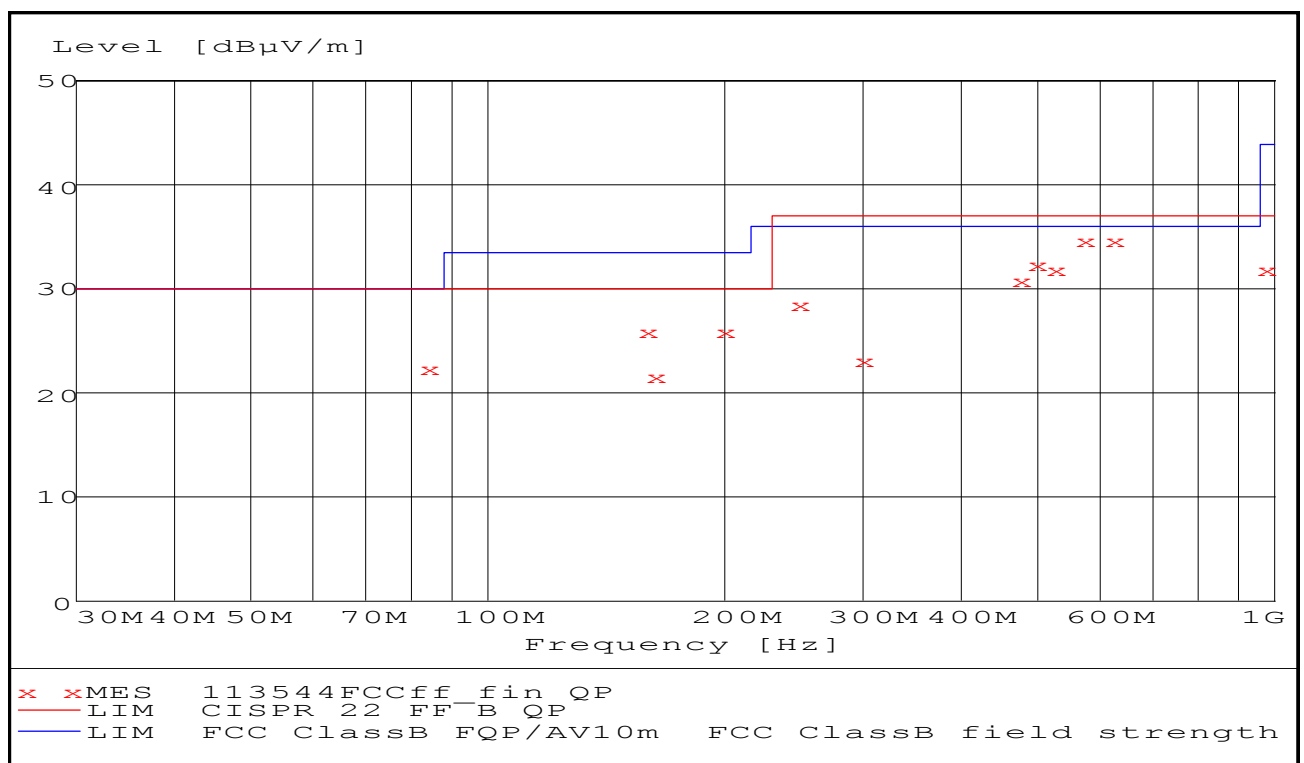
Ambient temperature:	20 °C	Relative humidity:	39 %
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Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 10 m.

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 C of this test report.

Power supply: During the measurement the EUT was supplied with 120 V_{AC} 60 Hz via a AC adapter.

Operation states: As described in chapter 2.



Data record name: 113544FCCff

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 10 m measuring distance.

Result measured with the quasipeak detector according to FCC 47 CFR Part 15 class B:
(These values are marked in the above diagram by x)

Frequency MHz	Level dBµV/m	Transducer dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
84.480000	22.50	10.2	30.0	7.5	398.0	227.00	HORIZONTAL
159.996000	26.10	12.9	33.5	7.4	124.0	90.00	VERTICAL
163.884000	21.70	13.0	33.5	11.8	100.0	80.00	VERTICAL
199.992000	26.10	11.8	33.5	7.4	100.0	295.00	VERTICAL
250.000000	28.50	16.2	36.0	7.5	100.0	119.00	VERTICAL
300.000000	23.20	17.1	36.0	12.8	300.0	106.00	HORIZONTAL
475.000000	30.80	21.9	36.0	5.2	139.0	223.00	HORIZONTAL
499.996000	32.40	22.5	36.0	3.6	167.0	242.00	HORIZONTAL
525.000000	31.80	22.8	36.0	4.2	214.0	59.00	HORIZONTAL
574.996000	34.70	24.4	36.0	1.3	157.0	290.00	HORIZONTAL
625.000000	34.80	24.8	36.0	1.2	137.0	210.00	HORIZONTAL
974.980000	31.80	29.5	43.9	12.1	103.0	208.00	HORIZONTAL

Result measured with the quasipeak detector according to ICES-003 Issue 4 class B:
(These values are marked in the above diagram by x)

Frequency MHz	Level dBµV/m	Transducer dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
84.480000	22.50	10.2	30.0	7.5	398.0	227.00	HORIZONTAL
159.996000	26.10	12.9	30.0	3.9	124.0	90.00	VERTICAL
163.884000	21.70	13.0	30.0	8.3	100.0	80.00	VERTICAL
199.992000	26.10	11.8	30.0	3.9	100.0	295.00	VERTICAL
250.000000	28.50	16.2	37.0	8.5	100.0	119.00	VERTICAL
300.000000	23.20	17.1	37.0	13.8	300.0	106.00	HORIZONTAL
475.000000	30.80	21.9	37.0	6.2	139.0	223.00	HORIZONTAL
499.996000	32.40	22.5	37.0	4.6	167.0	242.00	HORIZONTAL
525.000000	31.80	22.8	37.0	5.2	214.0	59.00	HORIZONTAL
574.996000	34.70	24.4	37.0	2.3	157.0	290.00	HORIZONTAL
625.000000	34.80	24.8	37.0	2.2	137.0	210.00	HORIZONTAL
974.980000	31.80	29.5	37.0	5.2	103.0	208.00	HORIZONTAL

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 - 20

6 REPORT HISTORY

Report Number	Date	Comment
F113544E2	05 March 2012	Document created

7 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	ESIB 26	Rohde & Schwarz	100292	481182	08/02/2010	02/2012
3	LISN	NSLK8128	Schwarzbeck	8128155	480058	12/2011	12/2012
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097		
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111	-	
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	Measuring receiver	ESIB 7	Rohde & Schwarz	100304	480521	15/03/2010	03/2012
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 D	Chase	25761	480894	28/09/2011	09/2014
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	
30	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification (system cal.)	
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	17/03/2010	03/2012
32	Controller	HD100	Deisel	100/670	480326	-	
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	
34	Antenna support	AS615P	Deisel	615/310	480187	-	
35	Antenna	CBL6112B	Chase	2917	480447	28/09/2010	09/2012
36	Antenna	3115 A	EMCO	9609-4918	480183	09/11/2011	11/2014
37	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337	Six month verification (system cal.)	
40	Fully anechoic chamber M5	-	Siemens	B83177-S1-X156	480073	Weekly verification (system cal.)	
42	Measuring receiver	ESIB 7	Rohde & Schwarz	100304	480521	15/03/2010	03/2012
43	Controller	MCU	Maturo	MCU/040/971107	480924	-	-
44	Antenna support	MA240	Deisel	228/314	480069	-	-
45	Turntable	DS412	Deisel	412/317	480070	-	-
46	Antenna	CBL6112B	Chase	2917	480447	28/09/2010	09/2012
47	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	

8 LIST OF ANNEXES

Annex A	External Photographs of the EUT (outside):	3 pages
	EUT 3D front-view	113544eut1
	EUT 3D rear-view	113544eut2
	EUT AC adapter	113544eut7
Annex B	Internal Photographs of the EUT (inside):	4 pages
	EUT inside view	113544eut3
	EUT inside view	113544eut4
	EUT inside view	113544eut5
	EUT inside view	113544eut6
Annex C	Photographs of the test set-ups:	4 pages
	Test set-up fully anechoic chamber	113544emi1.JPG
	Test set-up fully anechoic chamber	113544emi2.JPG
	Test set-up open area test side	113544emiff1.JPG
	Test set-up conducted emissions	113544emic1.JPG