



Prüfbericht / Test report

Test-Firm-Registration-Number: 90870

FCC
(Federal Communications Commission)



**TESTED
IN GERMANY**

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Prüfbericht Nr./
Test report no.: **10/03-0008**

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Note:

The test equipments used at pkm are calibrated by an external DKD-calibration laboratory. Calibration documents are available upon request.

1. CLIENT INFORMATION:

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2. EQUIPMENT UNDER TEST:

2.1 Identification of the EUT

Equipment: Single Board Computer für NEC Public Displays
Model: SBC ATOM N270 1,6 GHZ, 8GB SSD, 1GB RAM
Brand name: -/-
Serial no.: -/-
Manufacturer: see above
Country of origin: Germany
Rating: powered by Display

2.2 Additional information about the EUT: tested with NEC Display MultiSync P401

3. TEST SITE

3.1. Shielded room for conducted emission

Measurement of conducted emission from EUT was made in the shielded chamber (Siemens DC-10GHz) that has been found in compliance with Federal Communications Commissions (FCC) requirements of clause 2.948 according to ANSI C63.4-2003 on March 04, 2009.

3.2. Semi-anechoic chamber/OATS for radiated emission

Measurement of radiated emissions from EUT was made in the semi-anechoic chamber that has been found in compliance with Federal Communications Commissions (FCC) requirements of clause 2.948 according to ANSI C63.4-2003 on March 04, 2009.

3.3 Cable input conducted emission

Measurement of cable input conducted emission from EUT was made in the semi-anechoic chamber that has been found in compliance with Federal Communications Commissions (FCC) requirements of clause 2.948 according to ANSI C63.4-2003 on March 04, 2009.

4. CALIBRATIONS OF MEASURING INSTRUMENTS

All measurements were made with instruments calibrated according to the requests of EN/IEC 17025 according to which the test site is accredited. Measurement of radiated emissions was made with instruments conforming to American National Standard Specification, ANSI C63.4-2003. The calibration of measuring instrument, including any accessories that may affect test results, was performed according to the requests of EN/IEC 17025.

5. DESCRIPTION OF THE TEST CONDITIONS

5.1 Conducted emission measurements

5.1.1 Test site

Measurements were made in shielded chamber as described at 3.1 in this report.

5.1.2 Detector function selection and bandwidth

In conducted emissions measurement CISPR quasi-peak- and average-detector were used. The bandwidth of the detector of instrument is 10 kHz over the frequency range of 150 kHz to 30 MHz, Conducted emission is detected in CCIR quasi-peak- and average-mode.

5.1.3 Unit of measurement

Test results of conducted emission measurement are reported in dBμV.

5.1.4 Frequency range to be scanned

For conducted emission measurements, the spectrum in the range of 150 kHz to 30 MHz was investigated.

5.1.5 Test conditions and configuration of EUT

The EUT was configured and operated in all modes of operation so as to find the maximum conducted emission generated from EUT.

The power was furnished with rated (normal) power, as specified in the owner's manual of EUT. The EUT was placed on a 80 cm high non metallic table.

Each type of accessory provided by manufacturer or typically used and support equipment were connected to the EUT during measurements as for the typical usage and applicable as nearly as practicable.

5.1.6 Measurement uncertainty

Conducted emission measurements: $\pm 1.8\text{dB}$

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurements uncertainty was calculated in accordance with NAMAS NIS 81: "The treatment of uncertainty in EMC measurement" and "Guide to the Expression of Uncertainty in Measurement (GUM)".

The measurement uncertainty was given with a confidence of 95%.

5.2 Radiated emissions measurements

5.2.1 Test site

Measurements were made in semi-anechoic chamber as described at 3.2 in this report.

5.2.2 Detector function selection and bandwidth

In radiated emissions measurement, field strength meters that have CISPR quasi-peak and average were used. The bandwidth of the detector of instrument is 120 KHz over frequency range of 30 to 1000 MHz, emissions to be measured are detected in CCIR quasi peak mode.

The bandwidth of the detector of instrument is 1000 KHz for frequencies above 1000 MHz, emissions to be measured are detected in average mode.

5.2.3 Unit of measurement

Test results of radiated emissions measurement are reported in dB(microvolts per meter) at the specific distance. Using the unit of dBμV on the test instrument, the indication unit can be converted to field strength unit of μV/m as following method for frequencies 30 MHz – 1000 MHz;

$$F/S = 10^{[(R + CF)/20]}$$

here,

F/S: Field strength in μV/m

R: Meter reading in dB (μV)

CF: Correction factor (includes cable loss, antenna factor, field deviation)

5.2.4 Antennas

Measurements were made using a calibrated bilog antenna in the range of 30 to 1000 MHz and a calibrated horn antenna above 1000MHz to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization.

The horizontal distance between the receiving antenna and the closest periphery of the EUT is 3 meters.

5.2.5 Frequency range to be scanned

For radiated emissions measurements, the spectrum in the range of 30 to 1000 MHz was investigated and above 1000MHz up to the 5th harmonic of the highest frequency or 40GHZ, whichever is lower.

5.2.6 Test conditions and configuration of EUT

The EUT was configured and operated in all modes of operation so as to find the maximum RF energy generated from EUT.

The power was furnished with rated (normal) Power, as specified in the owner's manual of EUT. The EUT was placed on a 80 cm high non metallic 1m diameter table. The turntable containing the system was rotated and the antenna height was varied 1m to 4 m to find the maximum RF energy generated from EUT.

Each type of accessory provided by manufacturer or typically used and support equipment were connected to the EUT during measurements to the typical usage and applicable as nearly as practicable.

5.2.7 Measurement uncertainty

Radiated emissions measurements, bilog antenna: ± 2.7 dB, horn antenna ± 2.9 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurements uncertainty was calculated in accordance with NAMAS NIS 81: "The treatment of uncertainty in EMC measurement" and "Guide to the Expression of Uncertainty in Measurement (GUM)".

The measurement uncertainty was given with a confidence of 95 %.

5.3 Cable input conducted emission measurements

5.3.1 Test site

Measurements were made in shielded chamber as described at 3.3 in this report.

5.3.2 Detector function selection and bandwidth

In conducted cable input emissions measurement CISPR quasi-peak were used.

The bandwidth of the detector of instrument is 120 KHz over frequency range of 30 MHz to 1000 MHz, Conducted cable input emission is detected in CCIR quasi peak mode.

5.3.3 Unit of measurement

Test results of conducted emission measurement are reported in dBμV. Using the unit of dBμV on the test instrument, indication unit was converted to voltage unit of μV as following method for frequencies 30 MHz – 1000 MHz;

$$U = 10^{[R/20]}$$

here,

U: Voltage of conducted emission in μV

R: Meter reading in dB(μV)

5.3.4 Frequency range to be scanned

For conducted cable input emission measurements, the spectrum in the range of 54 MHz to 804 MHz was investigated.

5.3.5 Test conditions and configuration of EUT

The EUT was configured and operated in all modes of operation so as to find the maximum conducted emission generated from EUT.

The power was furnished with rated (normal) Power, as specified in the owner's manual of EUT. The EUT was placed on a 1 m high non metallic table.

Each type of accessory provided by manufacturer or typically used and support equipment were connected to the EUT during measurements to the typical usage and applicable as nearly as practicable.

5.3.6 Measurement uncertainty

Conducted cable input emission measurements: ± 1.3 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurements uncertainty was calculated in accordance with NAMAS NIS 81: "The treatment of uncertainty in EMC measurement" and "Guide to the Expression of Uncertainty in Measurement (GUM)".

The measurement uncertainty was given with a confidence of 95 %.

6. MEASURING INSTRUMENTS AND SET-UP

6.1 Conducted emission

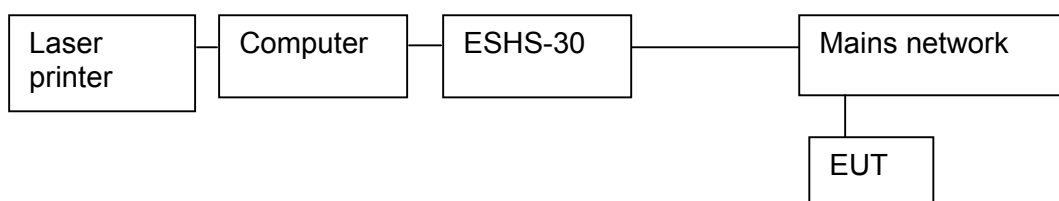
6.1.1 Test receiver

Rohde & Schwarz, model ESHS-30 (9 kHz – 30 MHz)
 Detector function: quasi peak
 IF bandwidth: 10 kHz

6.1.2 Mains network

Rohde & Schwarz, model ESH2-Z5 (9 kHz – 30 MHz)

6.1.3 Measurement setup



6.2 Radiated emission

6.2.1 Test receiver

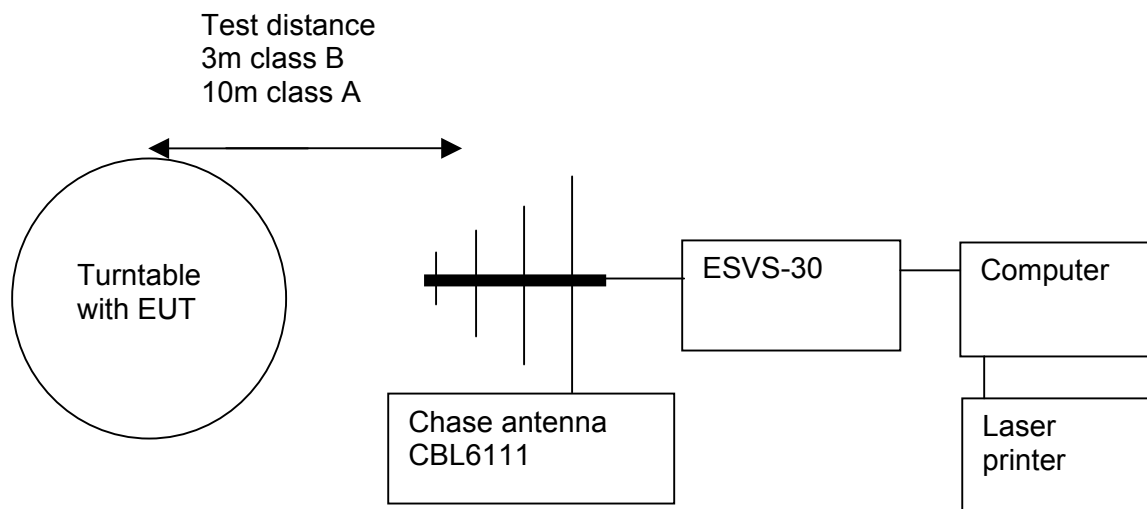
Rohde & Schwarz, model ESVS-30 (20 MHz – 1000 MHz)
 Detector function: quasi peak
 IF bandwidth: 120kHz
 Rohde & Schwarz, model FSMS26 (above 1000MHz)
 Schwarzbeck, Preamplifier model BBV 9718 1GHz - 18GHz
 Detector function: average
 IF bandwidth: 1000kHz

6.2.2 Receiving antenna

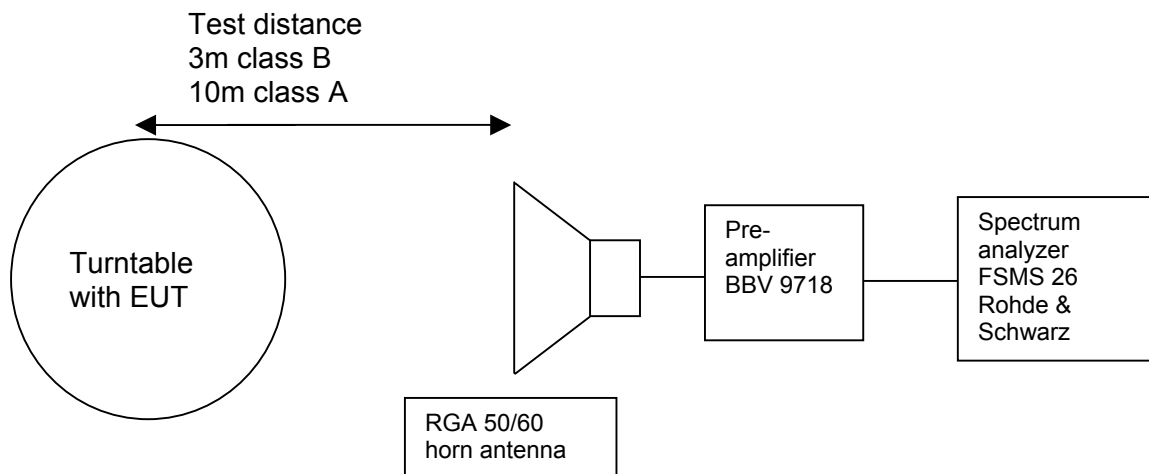
Chase, model CBL6111: bilog antenna (30 MHz – 1000 MHz)
 Electro Metric RGA 50/60 horn antenna (above 1000MHz)

6.2.3 Measurement setup

30MHz - 1000MHz



above 1000MHz



6.3 Cable input conducted emission

6.3.1 Test receiver

Rohde & Schwarz, model ESVS-30 (20 MHz – 1000 MHz)
Detector function: quasi peak
IF bandwidth: 120 kHz

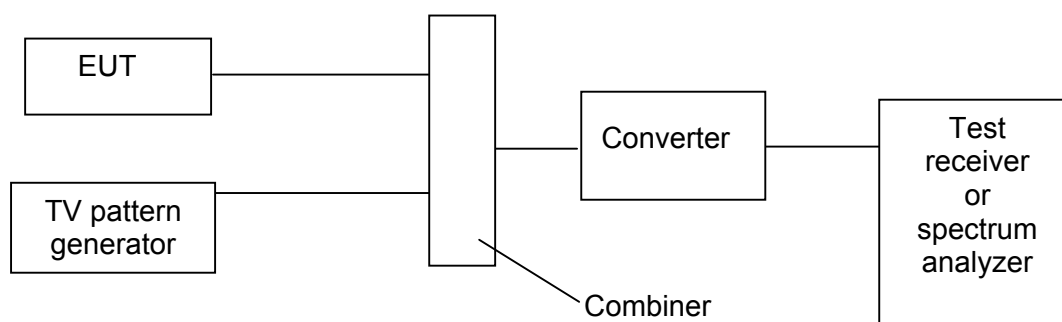
6.3.2 Power divider

Model 50 Ohm-6 dB, Suhner
DC- 2000 MHz

6.3.3 Converter (matching network) 50/75 Ohm

Model ZM57, Texscan

6.3.4 Measurement setup



7. MEASUREMENTS AND RESULTS

7.1 Conducted emission

During test the power was furnished with rated (normal) Power, as specified in the owner's manual of EUT. Measurements on neutral- and live wire had been performed. The EUT complied with the requirements of section 15.107 (a) class B.

7.2 Radiated emission

During tests the power was furnished with rated (normal) Power, as specified in the owner's manual of EUT. As the highest frequency generated is 1.6 GHz, frequencies up to 8 GHz have been investigated. The EUT complied with the requirements of section 15.109 (a) class B.

7.3 Cable input conducted emission

As the EUT has no connection facility to an external antenna or cable network, no cable input conducted emission can be measured.

8. TEST DATA

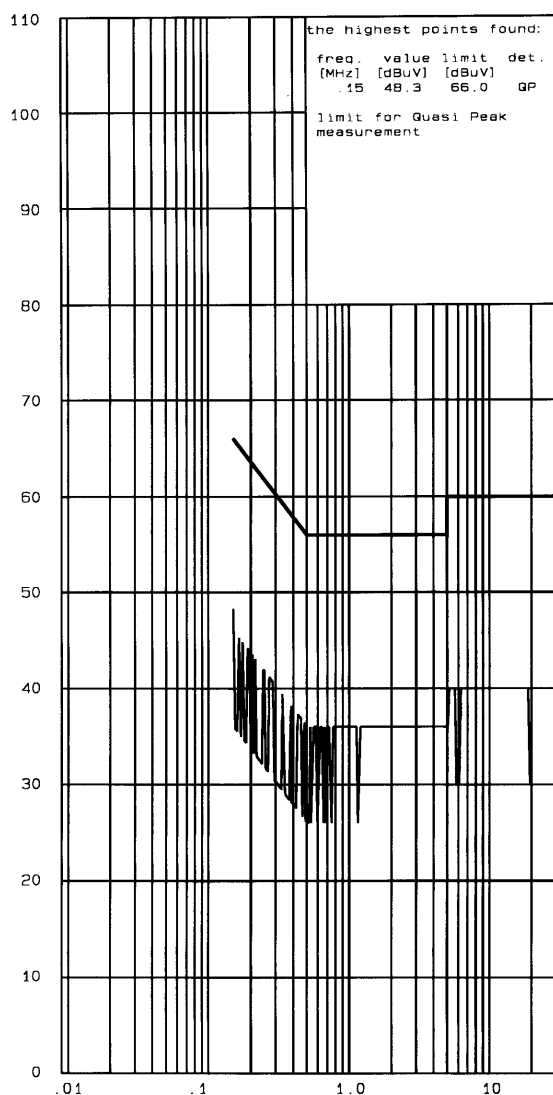
8.1 Conducted emission (section 15.107)

IT 1/2

Interference Voltage 150 KHz - 30 MHz

acc. FCC PART 15.107 (a) Class B

Cabin 1



Ref.-No.: 10/03-0008

Product: Computer

Sample: 01

Date: 18 Mar 2010

Operator: B1

Test equipment:

Rohde & Schwarz ESHS 30

Rohde & Schwarz ESH 2-Z5

Connected sets:

Input Voltage 120V/AC

Operating mode:

Screen filled with H-Pattern

Resolution: 1920x1080 Pixel

Arial 10/Screen ref.: 60Hz

Tested on L1

RFI suppression parts:

* two dB safety margin for
type approval recommended

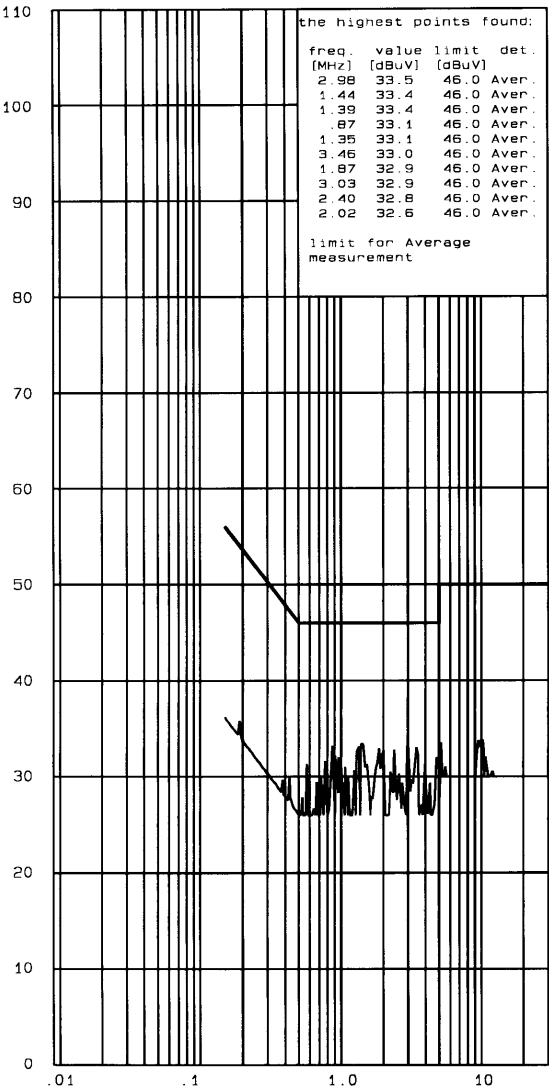
Result: pass ☒ fail ☐



electronic GmbH
Frontenhausen

IT 1 / 2

Interference Voltage 150 KHz - 30 MHz
acc. FCC PART 15.107(a) Class B
Cabin 1



Ref.-No.: 10/03-0008

Product: Computer

Sample: 01

Date: 18 Mar 2010

Operator: B1

Test equipment:

Rohde & Schwarz ESHS 30

Rohde & Schwarz ESH 2-Z5

Connected sets:

Input Voltage 120V/AC

Operating mode:

Screen filled with H-Pattern

Resolution: 1920x1080 Pixel

Arial 10/Screen ref.r.: 60Hz

Tested on L1

RFI suppression parts:

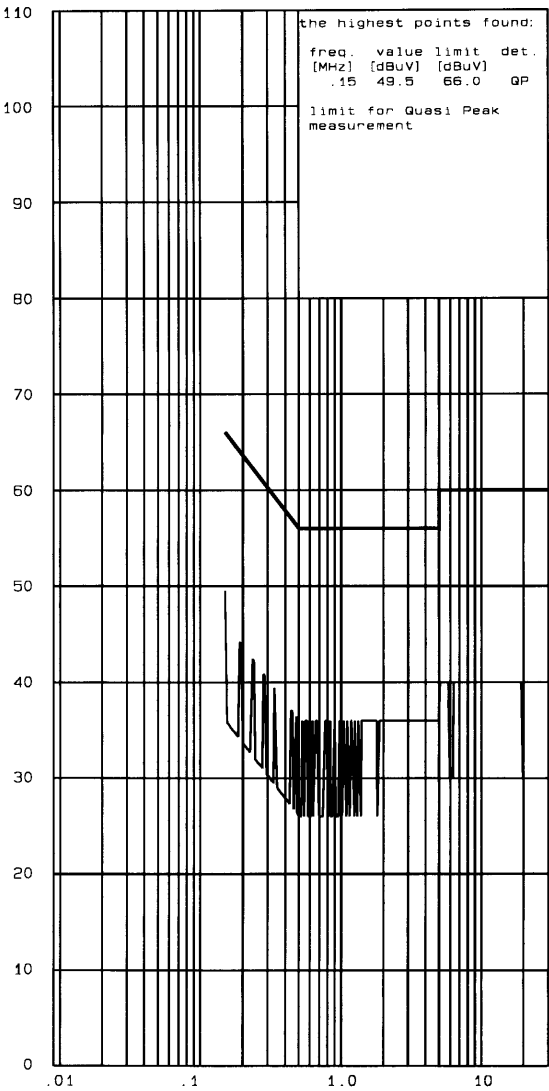
* two dB safety margin for
type approval recommended

Result: pass [X] fail []

 electronic GmbH
Frontenhausen

IT 1 / 2

Interference Voltage 150 KHz - 30 MHz
acc. FCC PART 15.107 (a) Class B
Cabin 1



Ref.-No.: 10/03-0008

Product: Computer

Sample: 01

Date: 18 Mar 2010

Operator: B1

Test equipment:

Rohde & Schwarz ESHS 30

Rohde & Schwarz ESH 2-Z5

Connected sets:

Input Voltage 120V/AC

Operating mode:

Screen filled with H-Pattern

Resolution: 1920x1080 Pixel

Arial 10/Screen ref.c.: 60Hz

Tested on N

RFI suppression parts:

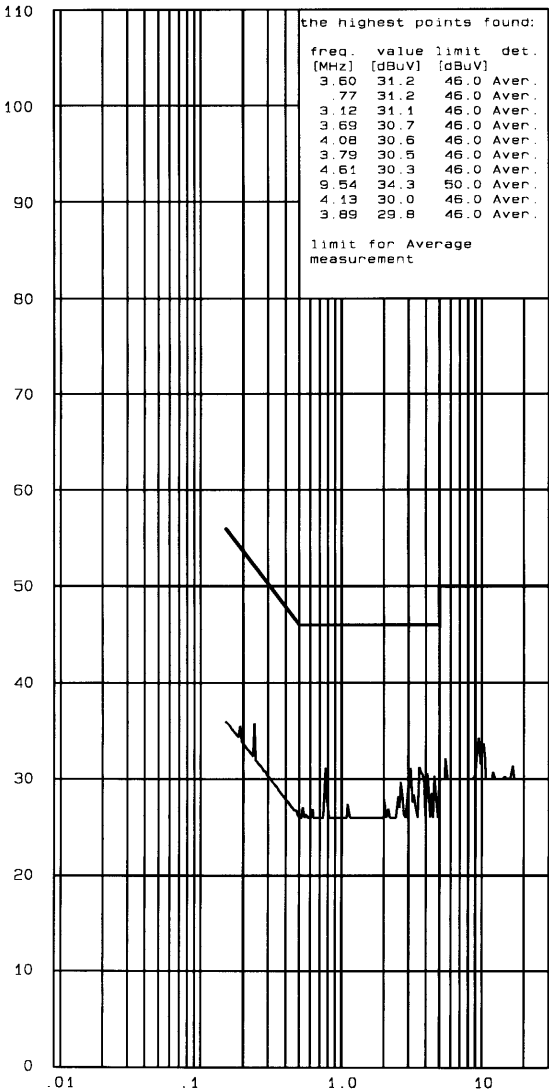
* two dB safety margin for
type approval recommended

Result: pass [X] fail []

PKM electronic GmbH
Frontenhausen

IT 1 / 2

Interference Voltage 150 KHz - 30 MHz
acc. FCC PART 15.107 (a) Class B
Cabin 1



Ref.-No.: 10/03-0008

Product: Computer

Sample: 01

Date: 18 Mar 2010

Operator: B1

Test equipment:

Rohde & Schwarz ESHS 30

Rohde & Schwarz ESH 2-Z5

Connected sets:

Input Voltage 120V/AC

Operating mode:

Screen filled with H-Pattern
Resolution: 1920x1080 Pixel
Ant 10/Screen ref.c.: 60Hz
Tested on N

RFI suppression parts:

* two dB safety margin for
type approval recommended

Result: pass [☒] fail []

 electronic GmbH
Frontenhausen



electronic GmbH
Frontenhausen

Ref.-No.: 10/03-0008
Product : COMPUTER
Sample : 01
Date : 18 Mar 2010
Operator: BL

OPERATION MODE:
SCREEN FILLED WITH H-PATTERN
RESOLUTION: 1920x1080 PIXEL
SCREEN REFRESH RATE: 60Hz
ARIAL 10

27 HOR. FRQ.: 48 MHz	LEV.: 34.7 dBuV/m	Lim.: 40 dBuV/m
48 HOR. FRQ.: 69.28 MHz	LEV.: 30.3 dBuV/m	Lim.: 40 dBuV/m
51 HOR. FRQ.: 73.08 MHz	LEV.: 32.7 dBuV/m	Lim.: 40 dBuV/m
52 HOR. FRQ.: 74.24 MHz	LEV.: 34.5 dBuV/m	Lim.: 40 dBuV/m
53 HOR. FRQ.: 75.48 MHz	LEV.: 33.9 dBuV/m	Lim.: 40 dBuV/m
54 HOR. FRQ.: 76.96 MHz	LEV.: 32.1 dBuV/m	Lim.: 40 dBuV/m
55 HOR. FRQ.: 77.48 MHz	LEV.: 33.8 dBuV/m	Lim.: 40 dBuV/m
57 HOR. FRQ.: 81.36 MHz	LEV.: 36.5 dBuV/m	Lim.: 40 dBuV/m
58 HOR. FRQ.: 81.64 MHz	LEV.: 36.1 dBuV/m	Lim.: 40 dBuV/m
59 HOR. FRQ.: 83.32 MHz	LEV.: 30.3 dBuV/m	Lim.: 40 dBuV/m
190 HOR. FRQ.: 831.04 MHz	LEV.: 38.2 dBuV/m	Lim.: 46 dBuV/m
25 VER. FRQ.: 46.4 MHz	LEV.: 33.7 dBuV/m	Lim.: 40 dBuV/m
26 VER. FRQ.: 47.12 MHz	LEV.: 33.8 dBuV/m	Lim.: 40 dBuV/m
27 VER. FRQ.: 48 MHz	LEV.: 38.2 dBuV/m	Lim.: 40 dBuV/m
28 VER. FRQ.: 48.28 MHz	LEV.: 33.4 dBuV/m	Lim.: 40 dBuV/m
29 VER. FRQ.: 49.16 MHz	LEV.: 36.4 dBuV/m	Lim.: 40 dBuV/m
30 VER. FRQ.: 50.04 MHz	LEV.: 31.9 dBuV/m	Lim.: 40 dBuV/m
31 VER. FRQ.: 50.92 MHz	LEV.: 31.4 dBuV/m	Lim.: 40 dBuV/m
32 VER. FRQ.: 51.72 MHz	LEV.: 30.6 dBuV/m	Lim.: 40 dBuV/m
33 VER. FRQ.: 53.04 MHz	LEV.: 31.1 dBuV/m	Lim.: 40 dBuV/m
34 VER. FRQ.: 53.88 MHz	LEV.: 33.4 dBuV/m	Lim.: 40 dBuV/m
35 VER. FRQ.: 55.4 MHz	LEV.: 32.9 dBuV/m	Lim.: 40 dBuV/m
36 VER. FRQ.: 56.16 MHz	LEV.: 32.7 dBuV/m	Lim.: 40 dBuV/m
37 VER. FRQ.: 57.04 MHz	LEV.: 31.6 dBuV/m	Lim.: 40 dBuV/m
38 VER. FRQ.: 57.52 MHz	LEV.: 30.2 dBuV/m	Lim.: 40 dBuV/m
51 VER. FRQ.: 73.08 MHz	LEV.: 33.8 dBuV/m	Lim.: 40 dBuV/m
52 VER. FRQ.: 73.48 MHz	LEV.: 31.9 dBuV/m	Lim.: 40 dBuV/m
53 VER. FRQ.: 75.48 MHz	LEV.: 34.5 dBuV/m	Lim.: 40 dBuV/m
54 VER. FRQ.: 77.32 MHz	LEV.: 34.6 dBuV/m	Lim.: 40 dBuV/m
55 VER. FRQ.: 77.64 MHz	LEV.: 34.7 dBuV/m	Lim.: 40 dBuV/m
56 VER. FRQ.: 78.76 MHz	LEV.: 30.8 dBuV/m	Lim.: 40 dBuV/m
57 VER. FRQ.: 81.36 MHz	LEV.: 33.5 dBuV/m	Lim.: 40 dBuV/m
58 VER. FRQ.: 81.8 MHz	LEV.: 33.4 dBuV/m	Lim.: 40 dBuV/m
59 VER. FRQ.: 83.36 MHz	LEV.: 31.8 dBuV/m	Lim.: 40 dBuV/m
60 VER. FRQ.: 84.64 MHz	LEV.: 32.1 dBuV/m	Lim.: 40 dBuV/m
61 VER. FRQ.: 87.2 MHz	LEV.: 30.4 dBuV/m	Lim.: 40 dBuV/m
62 VER. FRQ.: 87.72 MHz	LEV.: 30.3 dBuV/m	Lim.: 40 dBuV/m
67 VER. FRQ.: 96 MHz	LEV.: 35.2 dBuV/m	Lim.: 43.5 dBuV/m
99 VER. FRQ.: 169.28 MHz	LEV.: 34.9 dBuV/m	Lim.: 43.5 dBuV/m
192 VER. FRQ.: 863.08 MHz	LEV.: 36.9 dBuV/m	Lim.: 46 dBuV/m
193 VER. FRQ.: 877.28 MHz	LEV.: 36.24 dBuV/m	Lim.: 46 dBuV/m
194 VER. FRQ.: 887.84 MHz	LEV.: 36.5 dBuV/m	Lim.: 46 dBuV/m
195 VER. FRQ.: 907.84 MHz	LEV.: 36.74 dBuV/m	Lim.: 46 dBuV/m
196 VER. FRQ.: 924.4 MHz	LEV.: 36.97 dBuV/m	Lim.: 46 dBuV/m
197 VER. FRQ.: 934.04 MHz	LEV.: 36.13 dBuV/m	Lim.: 46 dBuV/m
198 VER. FRQ.: 957.44 MHz	LEV.: 37.07 dBuV/m	Lim.: 46 dBuV/m



electronic GmbH

IT 5/6 (Interference radiation)
FCC Part 15
(>1GHz)

Reference No.:	10/03-0008		
Product:	Computer		
Sample:	01		
Date :	18.03.2010		
Operator :	BI		
Remarks :			
Operating Mode:	PC-Mode		
Result:	☒ pass	☐ fail	

Test Equipment:
Analyzer FSMS 26
Antenna: RGA 50/60
Preamplifier BBV 9718

Remark: Screen filled with H-Paatern; Resolution:1920x1080 Pixel; Arial 10
Screen refresh rate:60Hz; All cables connected; Input Voltage 120V/AC

[illegible]

No further emission found.

CONCLUSIONS:

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the relevant clauses of Federal Communications Commission Rules for unintentional radiators (part 15 subpart B)

Zuständiger Laborleiter:
 Responsible head of laboratory:

23.03.2010

(Datum/Date)

G. Raithe! Dipl.-Ing. (FH)

(Name/Name)



pkM electronic GmbH

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(Unterschrift/Signature)

9. LIST OF INSTRUMENT USED

Test place	Kind of equipment	Type	Manufacturer	pkm-ident no.
Conducted emissions cabin 1 9kHz - 30MHz	EMI test receiver	ESHS-30	Rohde&Schwarz	10571
	Line impedance stabilisation network	ESH2-Z5	Rohde&Schwarz	10139
	Shielded room	1 GHz Typ B83102	Siemens	10111
Radiated emissions 30MHz - 1000MHz	EMI test receiver	ESVS-30	Rohde&Schwarz	10572
	EMI test antenna	CBL6111	Chase	10022
	Antenna mast system	AM9104	Schwarzbeck	10099
	RF cable	K4	Suhner	20707
	AC-linefilter	FV2-10-D	Timonta	10755
	Turntable	DT 310	Deisel	10774
Cable input conducted emissions	TV-test transmitter	VTG700SAT	Grundig	10531
	Spectrum analyzer	HP8566A	Hewlett Packard	10206
	EMI test receiver	ESVS-30	Rohde&Schwarz	10572
	50/75 Ohm converter	ZM57	Texscan	10305
	Power divider	50 Ohm-6dB	Suhner	10421
Interference radiation 1000MHz – 18GHz	Spectrum analyzer (100Hz – 26.5GHz)	FSMS 26	Rohde & Schwarz	10965
	Horn antenna (1GHz – 18GHz)	RGA-50/60	Electro Metrics	10018
	Broadband-Preamplifier 1-18 GHz	BBV 9718	Schwarzbeck	11230
	Antenna mast system	AM9104	Schwarzbeck	10099
	RF cable	K4	Suhner	20707
	AC-linefilter	FV2-10-D	Timonta	10755
Frequency measurements	Turntable	DT 310	Deisel	10774
	Spectrum analyzer (100Hz – 26.5GHz)	FSMS 26	Rohde & Schwarz	10965
	Antenna mast system	AM9104	Schwarzbeck	10099
	RF cable	K4	Suhner	20707
	AC linefilter	FV2-10-D	Timonta	10755
	Turntable	DT 310	Deisel	10774

The test equipments used at pkm are calibrated by an external DKD-calibration laboratory. Calibration documents are available upon request.

10. PHOTOS





End of test report