Actions Mesures

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EMC TEST REPORT

Nr 2701-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200304-2192

Date of test..... : April 14th & 15th , 2003

Location ..... : SMEE *Actions Mesures* Laboratory - 38 VOIRON

Performed by ..... : Jacques LORQUIN

Customer..... : **Gemplus**
Z.I. Athélia III - Voie Antiope
13705 LA CIOTAT Cedex 8
France

Product..... : **GemPC-SW (USB / serial)**
GemPC-SL (USB / serial)

Type of test ..... : **Radiated and Conducted Emission Test**

Applied standards or specification: EN55022 (1999) +/A1: (2000)
CISPR22 (1997) +/A1: (2000)

Level ..... : Class B

Test objective ..... : Qualification

Results ..... : Conducted emissions: Comply
Radiated emissions: Comply

Written by..... : Géraldine GUYENNOT

Approved by..... : Jacques LOROUIN

1. System test configuration

1.1. HARDWARE IDENTIFICATION:

Equipment under test (EUT):

- ① **GemPC USB-SW** **pn:HWP108919 A** **sn: none**
  - Frequency: crystal 4MHz
  - Size : 100x70x10mm
  - Input/output: USB cable with USB connector.

- ② **GemPC serial-SW** **pn: HWP108920** **sn: none**
  - Frequency: crystal 4MHz
  - Size : 100x70x10mm
  - Input/output: serial cable with DB9 and PS/2 (keyboard) connector.

- ③ **GemPC serial-SL** **pn: HWP108927** **sn: none**
  - Frequency: crystal 4MHz
  - Size : 100x70x10mm
  - Input/output: serial cable with DB9 and PS/2 (keyboard) connector.

- ④ **GemPC USB-SL** **pn :HWP108841 A** **sn: R03313**
  - Frequency: crystal 4MHz
  - Size : 100x70x10mm
  - Input/output: serial cable with DB9 and PS/2 (keyboard) connector.

1.2. Justification

For determined setup produce maximum emission (during pre-scan evaluation), GemPC USB-SW; GemPC serial-SW; GemPC serial-SL and GemPC USB-SL have been tested. The operating modes producing the largest emission are GemPC USB-SW and GemPC serial-SW. Consequently, all test results contained in this report are from the GemPC USB-SW and GemPC serial-SW.

The system was configured for testing in a typical fashion (as a customer would normally use it). A typical GemPC-SW and GemPC-SL are connected onto the USB port or Serial port of a personal computer. It has been tested with a HP PC VECTRA VLi8. Each ports of the Personal Computer were loaded with a typical peripheral device.

1.3. Auxiliaries

The FCC IDs for all equipment, plus description of all cables used in the tested system (including inserted cards, which have grants) are:

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
GemSAFE ™ Entreprise	None	Smart card	none
HEWLETT PACKARD Vectra VLi8 pn:D7963A (sn: FR9402053)	Doc. Of Conf.	Personal computer	All data cables are shielded Power cable unshielded
HEWLETT PACKARD pn: D2846 (sn: JP74001000)	Doc. Of Conf.	21" color monitor	Shielded video cable with ferrite at each end
HEWLETT PACKARD pn: C4736-60101 (sn: LZA693024031)	JNZ201213	Mouse	Shielded cable
HEWLETT PACKARD pn: C4734-60111 (sn: M971168931)	GYUR38SK	Keyboard	Shielded cable
HEWLETT PACKARD 895CXI pn: C6410A (sn: MY9761915S)	Doc. Of Conf.	Parallel printer	HP C2950A shielded parallel cable
HEWLETT PACKARD deskjet500 pn: C2106A (sn: 3110S58792)	B94C2106X	Serial printer	HP 24542G shielded serial cable
TELEX (sn: 700.373.000A)	None	Microphone	Shielded cable
LABTEC LT100 pn: D8387A (sn: none)	None	Headset	Shielded cable
HEWLETT PACKARD 48GX [1] (sn: 83802369)	None	Graphic Calculator	Unshielded cable with ferrite

[1] : Used only with GemPC USB-SW setup

1.4. EUT Exercise software

The EUT exercise program (Soft Apitest.exe V.2.0, running under Windows 98) used during radiated and conducted testing was designed to exercise the GemPC-SW or the GemPC-SL in a manner similar to a typical use:

- Make a comparison of the answer to the reset (ATR) between the GemPC-SW or the GemPC-SL and the PC.

1.5. I/O cables

- Lan cable cat 5 shielded, length: 5m.
- Video cable with ferrite at each end, length: 1.8m.
- Parallel cable shielded HP #C2950A, length: 2m.
- Serial cable shielded HP #24542G, length : 3m.
- Serial / graphic adapter cable with ferrite, HP # 8120-6736, length : 1.5m.
- 2x Power cord (PC and monitor), length : 2.5m.
- USB cable (auxiliary), length : 1m.

- USB cable (EUT), length : 2m.
- serial cable (EUT)shielded with keyboard connector, length : 1.4m + 0.5m (see figure 1)

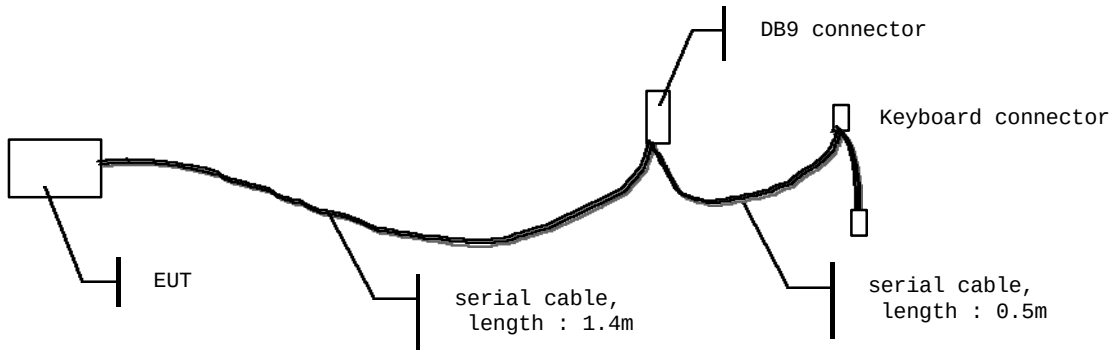


Figure 1

1.6. Equipment modifications

No equipment modification has been necessary during testing to achieve compliance to Class B levels. The units tested were representative to a production unit.

2. Radiated emission data

2.1. SET-UP (GemPC USB-SW)

Mains: 230V@50Hz
The EUT and auxiliaries are set on the no-conductive table of 80cm height.

Equipment configuration and running mode:

- The GemPC USB-SW is plug in the USB port of the PC;
- software running in loop;

The installation of EUT is identical for pre-characterization measures in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

2.2. SET-UP (GemPC serial-SW)

Mains: 230V@50Hz
The EUT and auxiliaries are set on the no-conductive table of 80cm height.

Equipment configuration and running mode:

- The GemPC serial-SW is plug in the serial and keyboard port of the PC;
- software running in loop;

The installation of EUT is identical for pre-characterization measures in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

2.3. TEST EQUIPMENT

Test Equipment from 30MHz to 1GHz on 10 meters open site:

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8568B	2732A04140
Quasi-Peak adapter	HP	85650A	2811A01136
RF Pre-selector	HP	85685A	2833A00773
Biconical Antenna	EMCO	3104C	9401-4636
Log Periodic Antenna	EMCO	3146	2178
Absorbing clamp	LÜTHI	MDS21	2826
Absorbing clamp	R&S	85024A	194.0100.50
Tube ferrite	LÜTHI	MDS101	4485
OATS			

Equipment	Company	Model	Serial

EMCO-1050, 6 meters height antenna mast & EMCO-1060, 3 meters diameter Turntable.
A 10 meters Open site located in SMEE *Actions Mesures* - Voiron (FRANCE).

Pre-scan, test Equipment from 30MHz to 1GHz:

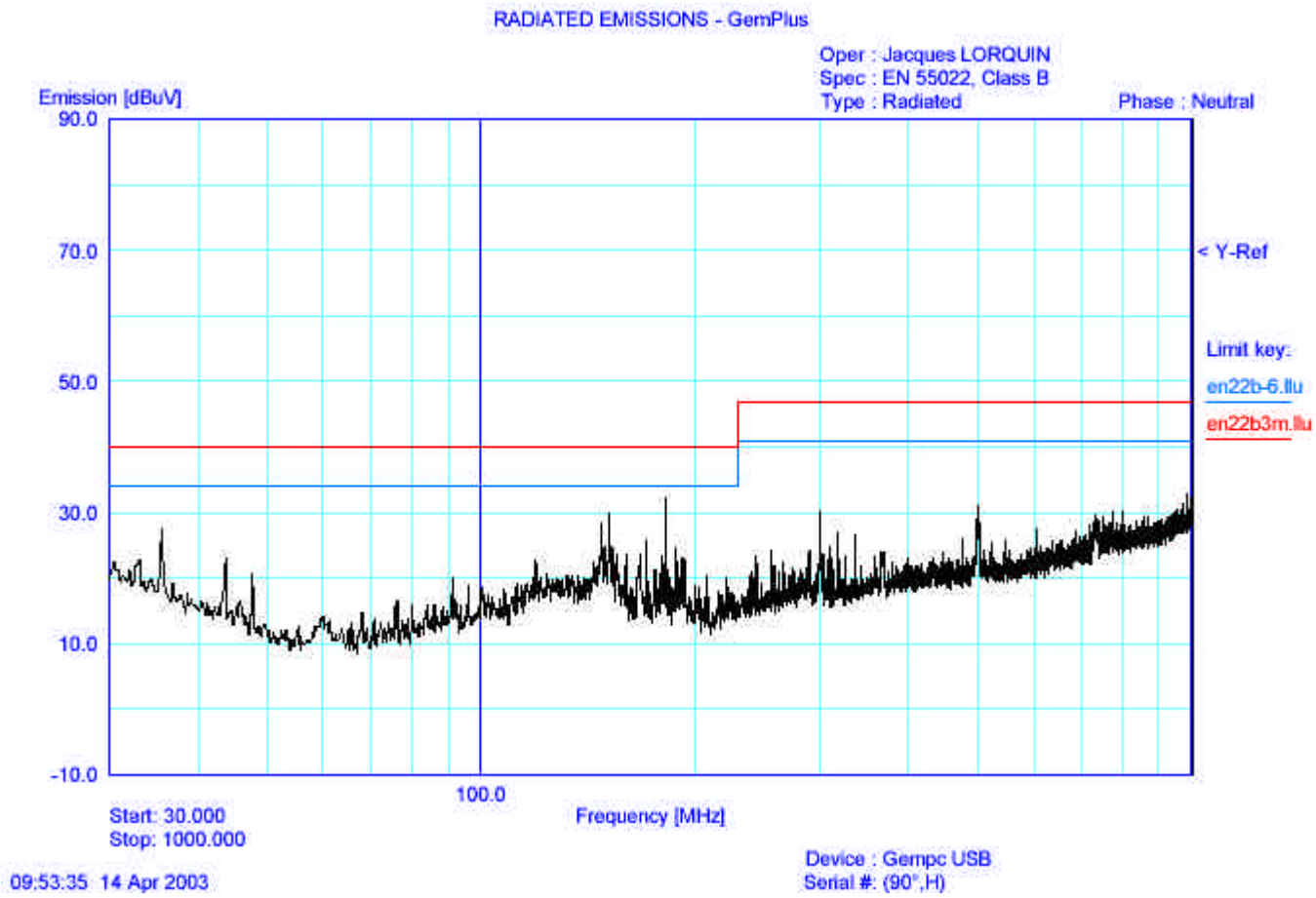
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628
Absorbing clamp	LÜTHI	MDS21	2826
Absorbing clamp	R&S	85024A	194.0100.50
Tube ferrite	LÜTHI	MDS101	4485

2.4. TEST SEQUENCE AND RESULTS for GemPC USB-SW

2.4.1.Pre-characterization at 3 meters

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.
The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for a graph example:

RBW: 120kHz - VBW: 300kHz



2.4.2.Characterization on 10 meters open site from 30MHz to 1GHz

The product has been tested according to ANSI C63.4-(1992), CISPR22-1997/A1:2000 and EN55022:1998/A1:2000. Radiated Emission were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested with 230V@50Hz power line voltage, at a distance of 10 meters from the antenna and compared to the CISPR 22 Class B limits. Measurement bandwidth was 120kHz from 30MHz to 1GHz.

Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.1.

Frequency list has been created with anechoic chamber pre-scan results.

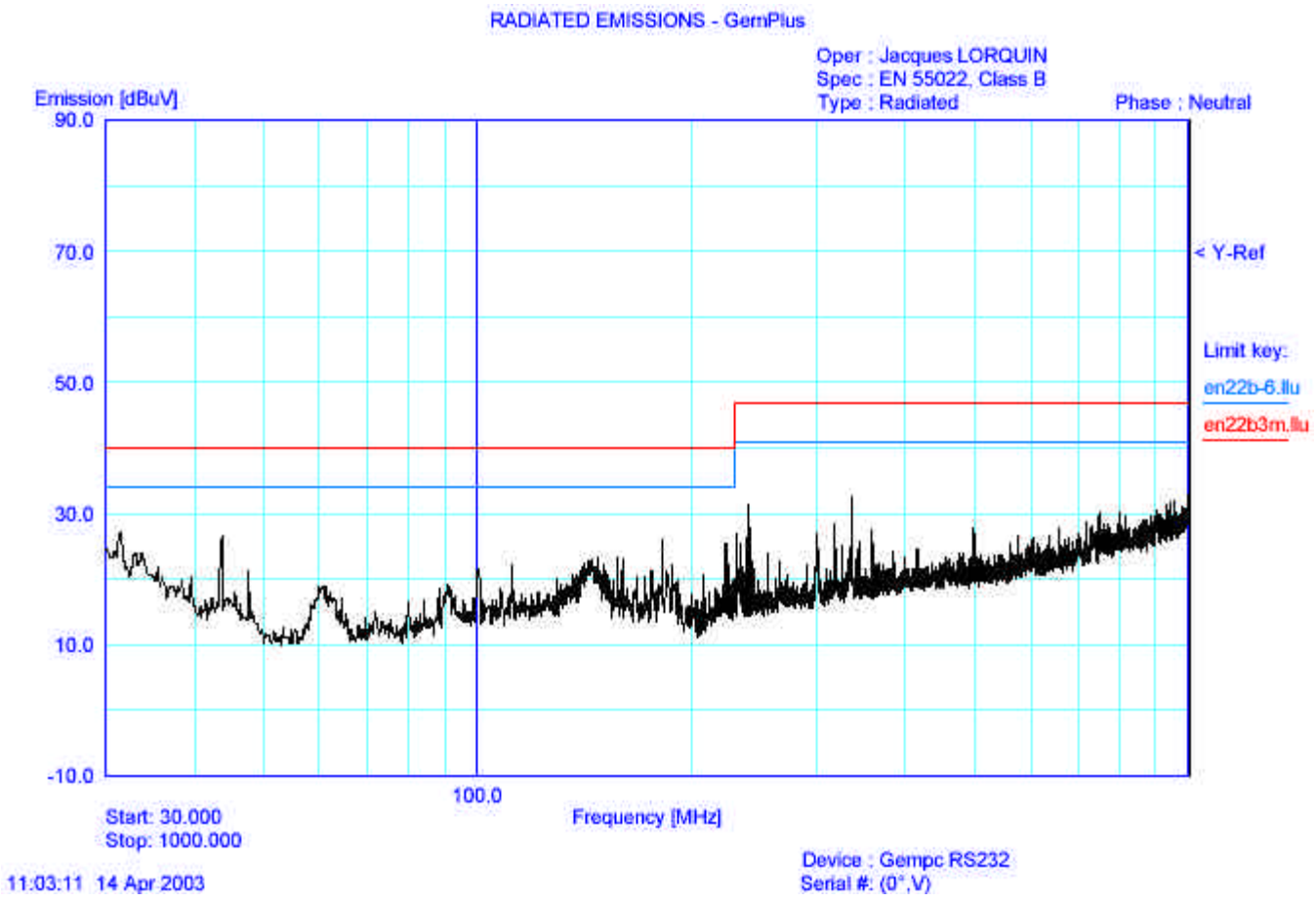
No	Frequencies (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Corr Factor (dB)	Comments
1	36.015	30.0	23.8	**-6.2**	158	V	128	11.7	
2	44.026	30.0	20.0	**-10**	21	V	197	11.8	
3	47.450	30.0	18.5	**-11.5**	341	H	394	11.9	
4	152.034	30.0	16.5	**-13.5**	179	V	145	15.7	
5	182.117	30.0	22.0	**-8**	91	H	339	18.7	
6	255.604	37.0	31.8	**-5.2**	10	V	103	15.3	

2.5. TEST SEQUENCE AND RESULTS for GemPC serial-SW

2.5.1.Pre-characterization at 3 meters

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.
The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for a graph example:

RBW: 120kHz - VBW: 300kHz



2.5.2.Characterization on 10 meters open site from 30MHz to 1GHz

The product has been tested according to ANSI C63.4-(1992), CISPR22-1997/A1:2000 and EN55022:1998/A1:2000. Radiated Emission were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested with 230V@50Hz power line voltage, at a distance of 10 meters from the antenna and compared to the CISPR 22 Class B limits. Measurement bandwidth was 120kHz from 30MHz to 1GHz.

Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.2.

Frequency list has been created with anechoic chamber pre-scan results.

No	Frequencies (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Corr Factor (dB)	Comments
1	31.990	30.0	22.4	**-7.6**	34	V	103	13.0	
2	44.006	30.0	20.9	**-9.1**	142	V	260	11.8	
3	112.010	30.0	24.2	**-5.8**	105	H	395	16.2	
4	182.120	30.0	23.9	**-6.1**	284	H	341	18.7	
5	191.985	30.0	27.2	**-2.8**	149	H	393	19.4	
6	207.411	30.0	19.1	**-10.9**	166	H	287	15.6	
7	240.013	37.0	29.4	**-7.6**	2	H	329	15.5	
8	336.079	37.0	24.2	**-12.8**	207	V	101	18.3	

2.6. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow :

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.

FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m

The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

3. Conducted emission data

The product has been tested according to ANSI C63.4-(1992), CISPR22-1997/A1:2000 and EN55022:1998/A1:2000.

The product has been tested with 110V@60Hz power line voltage and compared to the CISPR22 Class B limits. Measurement bandwidth was 9kHz from 150kHz to 30MHz.

Measurement was initially made with an HP-8591EM Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the Rohde & Schwarz ESH3 receiver for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.

The Peak data are shown on the following plots. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

3.1. SET-UP GemPC USB-SW

Mains: 110V/60Hz

The EST and auxiliaries are set on the no-conductive table of 80 cm height.

3.2. SET-UP GemPC serial-SW

Mains: 110V/60Hz

The EST and auxiliaries are set on the no-conductive table of 80 cm height.

3.3. TEST EQUIPMENT

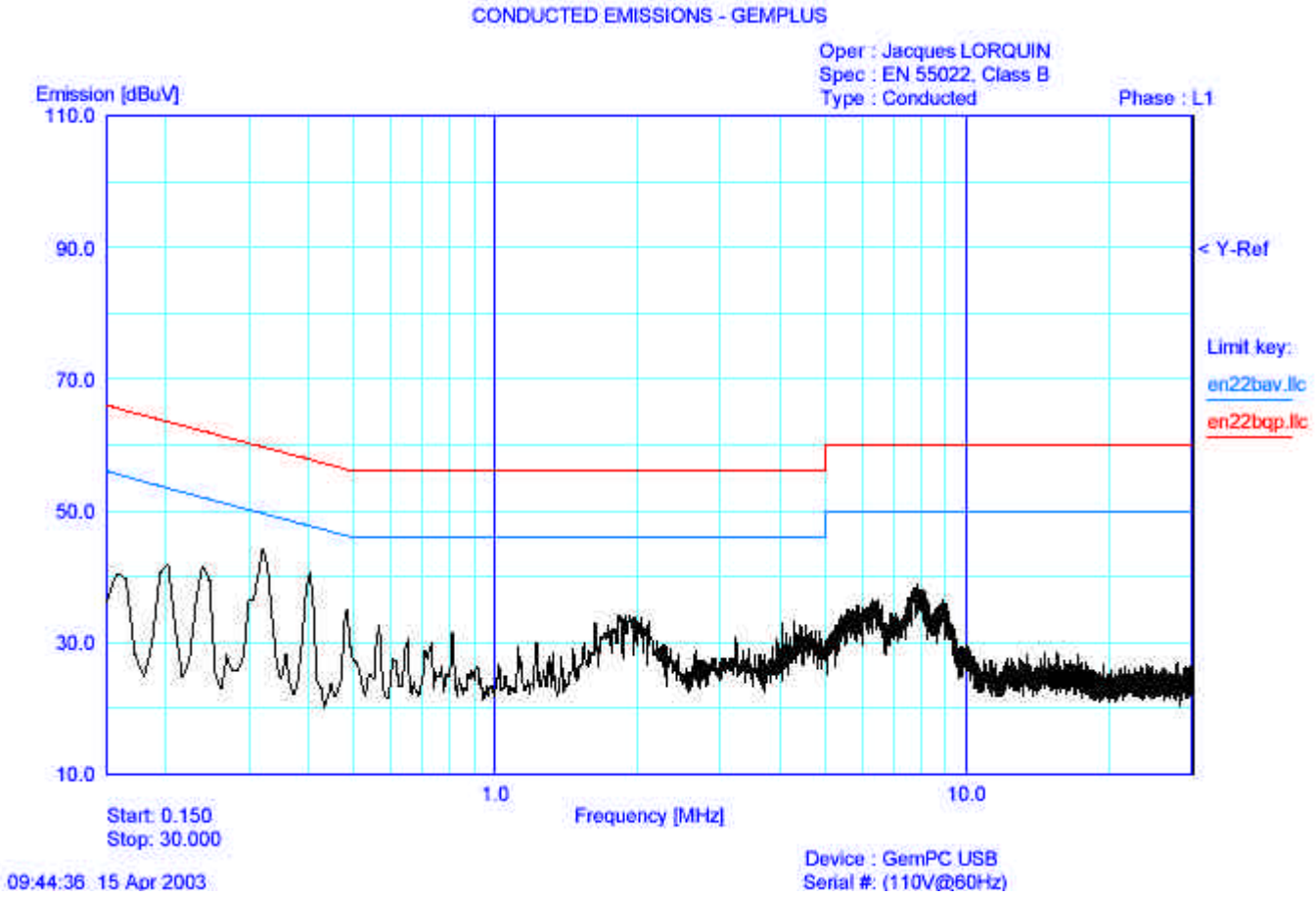
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628
LISN(measure) (50Ω/50microhenry)	Telemeter Electronis	TGmbH NNB 2/16	0001300
Faraday room	Rayproof		4854

3.4. TEST SEQUENCE AND RESULTS for GemPC USB-SW

Measures are performed on line 1 and line 2 of the power supply of the PC

3.4.1.Line conducted emission data (110V@60Hz)

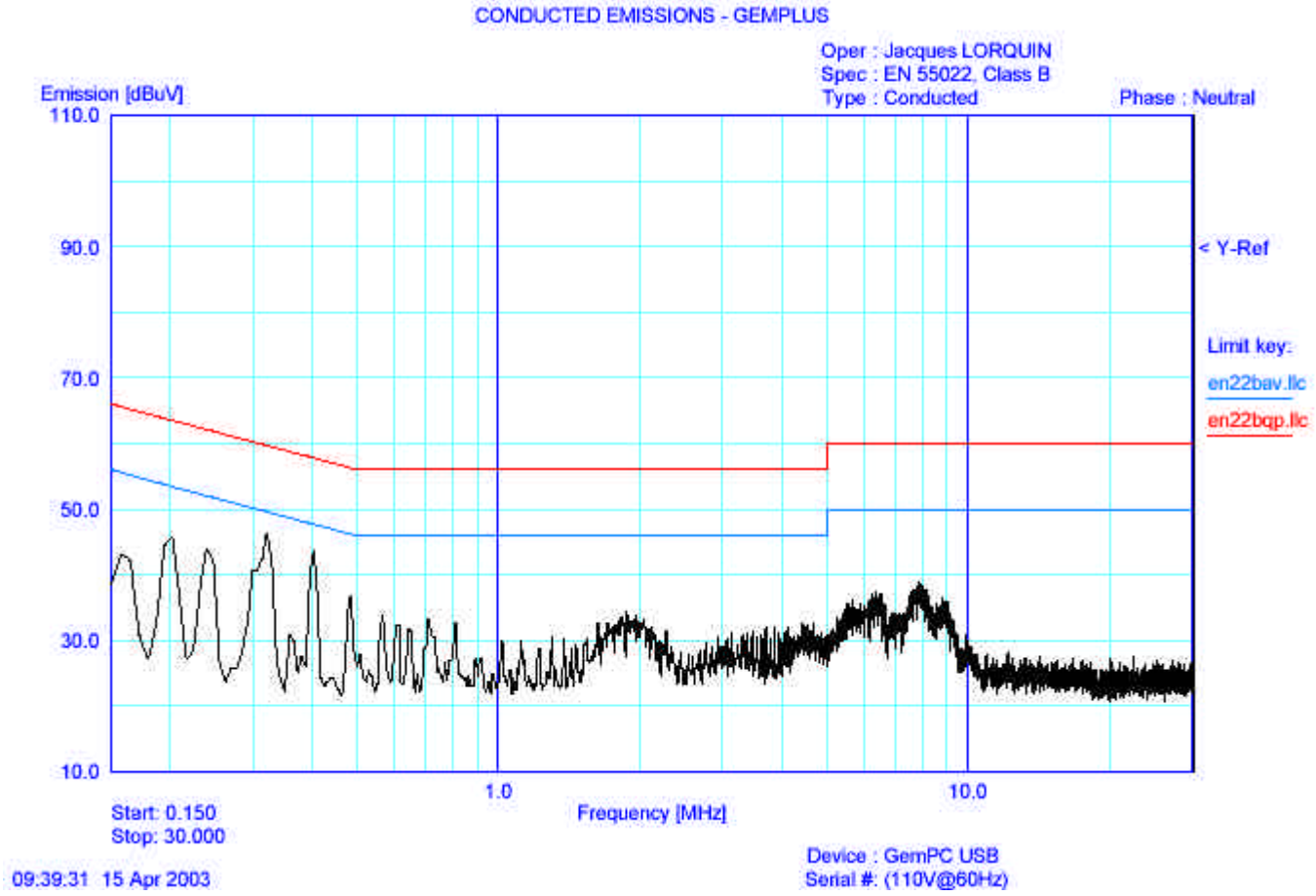
RBW: 9kHz - VBW: 30kHz



Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	**[dBµV]**	[dBµV]	[dBµV]	**[dBµV]**
1	0.16	42.22	39.72	64.0	**-24.28**	39.17	54.0	**-14.83**
2	0.20	42.54	41.29	62.0	**-20.71**	40.89	52.0	**-11.11**
3	0.24	42.36	41.53	62.0	**-20.47**	41.09	52.0	**-10.91**
4	0.32	45.34	44.09	58.0	**-13.91**	43.14	48.0	**-4.86**
5	0.40	41.15	39.71	56.0	**-16.29**	37.32	46.0	**-8.68**
6	7.93	38.83	37.62	60.0	**-22.38**	36.94	50.0	**-13.06**

3.4.2.Neutral conducted emission data (110V@60Hz)

RBW: 9kHz - VBW: 30kHz



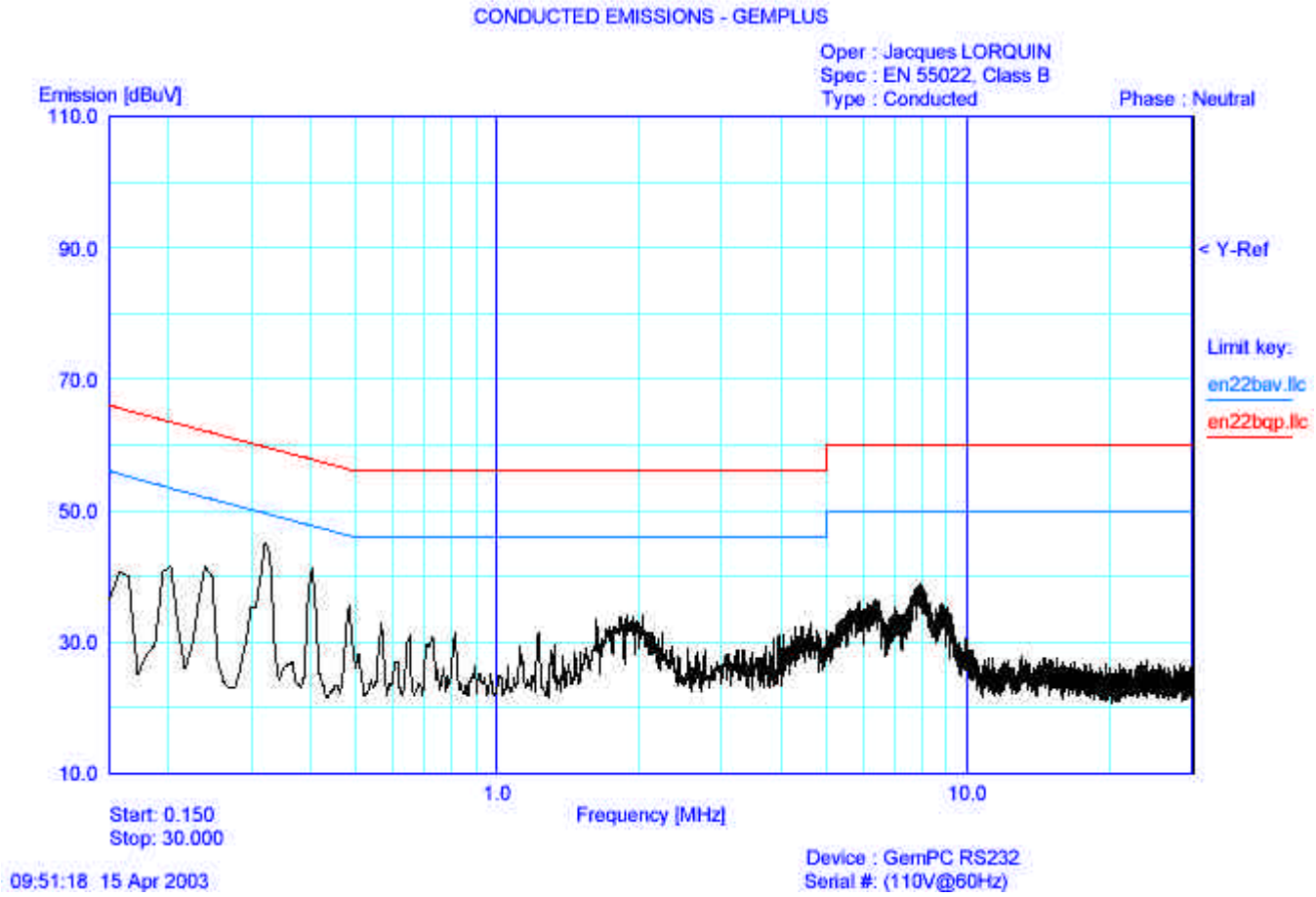
Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	**[dBµV]**	[dBµV]	[dBµV]	**[dBµV]**
1	0.16	44.43	43.16	64.0	**-20.84**	42.63	54.0	**-11.37**
2	0.20	46.28	45.57	62.0	**-16.43**	45.11	52.0	**-6.89**
3	0.24	44.57	43.77	62.0	**-18.23**	43.23	52.0	**-8.77**
4	0.32	47.04	46.19	58.0	**-11.81**	45.24	48.0	**-2.76**
5	0.40	44.68	43.07	56.0	**-12.93**	39.49	46.0	**-6.51**
6	7.95	38.54	37.19	60.0	**-22.81**	35.66	50.0	**-14.34**

3.5. TEST SEQUENCE AND RESULTS for GemPC serial-SW

Measures are performed on line 1 and line 2 of the power supply of the PC

3.5.1.Line conducted emission data (110V@60Hz)

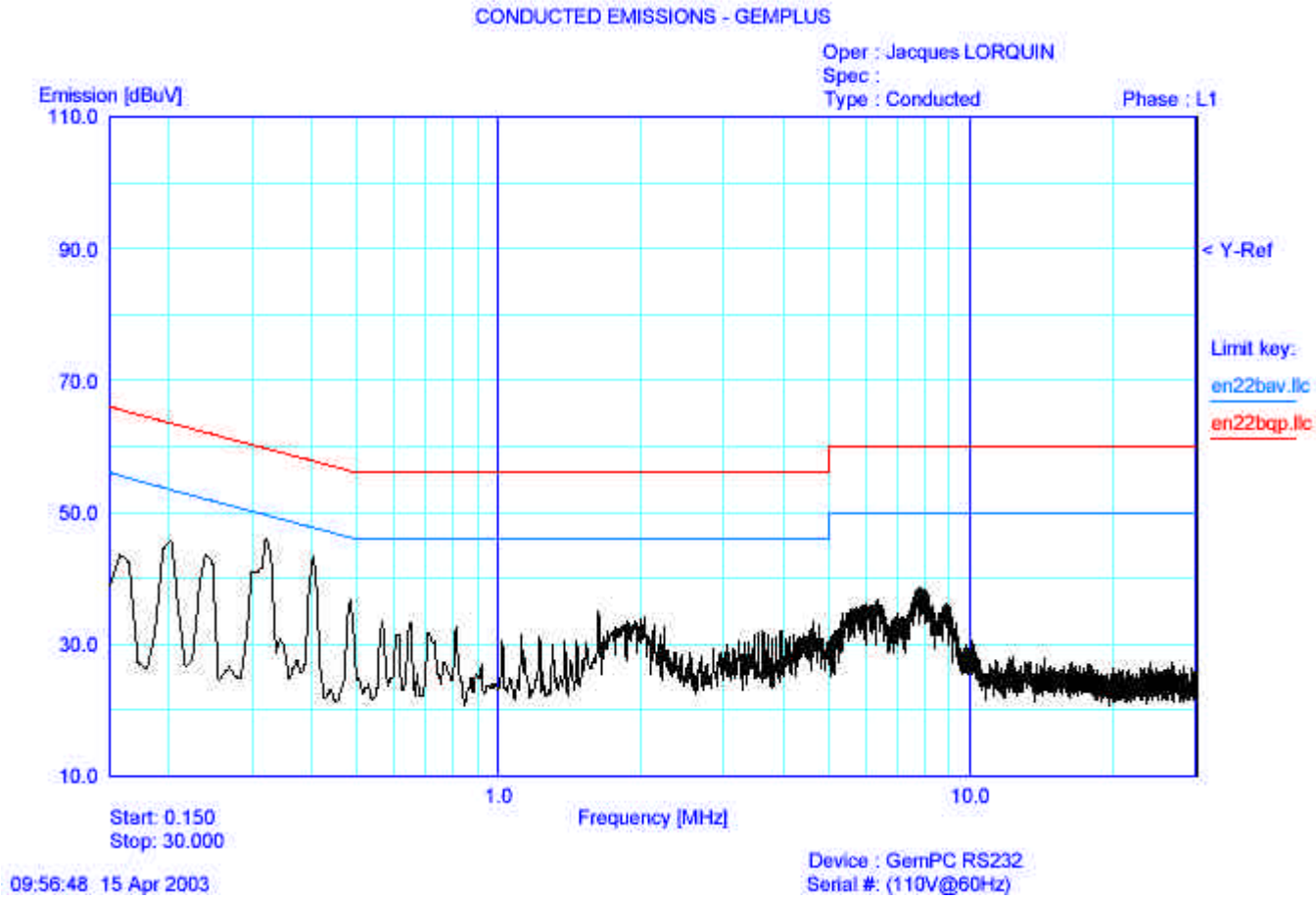
RBW: 9kHz - VBW: 30kHz



Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	**[dBµV]**	[dBµV]	[dBµV]	**[dBµV]**
1	0.16	48.92	40.85	64.0	**-23.15**	40.15	54.0	**-13.85**
2	0.20	46.70	45.52	62.0	**-16.48**	45.09	52.0	**-6.91**
3	0.24	47.34	42.38	62.0	**-19.62**	41.79	52.0	**-10.21**
4	0.32	47.37	46.02	58.0	**-11.98**	45.09	48.0	**-2.91**
5	0.41	44.49	43.02	56.0	**-12.98**	39.32	46.0	**-6.68**
6	7.85	38.98	37.72	60.0	**-22.28**	37.10	50.0	**-12.90**

3.5.2.Neutral conducted emission data (110V@60Hz)

RBW: 9kHz - VBW: 30kHz



Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	**[dBµV]**	[dBµV]	[dBµV]	**[dBµV]**
1	0.16	41.86	40.02	64.0	**-23.98**	39.51	54.0	**-14.49**
2	0.20	44.07	41.64	62.0	**-20.36**	41.22	52.0	**-10.78**
3	0.24	42.62	41.47	62.0	**-20.53**	41.00	52.0	**-11.00**
4	0.32	45.31	44.41	58.0	**-13.59**	73.56	48.0	**-25.56**
5	0.40	41.96	40.31	56.0	**-15.59**	37.85	46.0	**-8.15**
6	7.87	39.34	37.33	60.0	**-22.67**	36.12	50.0	**-13.88**

End of Tests