Actions Mesures

Z.I. des Blanchisseries – 38500 VOIRON – France – Tél. +33 (0)4 76 65 76 50 – Fax +33 (0)4 76 66 18 30

EMC TEST REPORT

Nr 3021-FCC

This test report applies only on equipment described hereafter.

Proposal number : 200403-2380

Date of test..... : March 19th & 29th , 2004

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 Card**

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

Applied standards or specification: EN55022 (1999) +/A1: (2000) +/A2: (2003)
CISPR22 (1997) +/A1: (2000) +/A2: (2002)

Level ..... : CISPR Class B

Test objective ..... : Qualification

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

Written by.....: Jacques LORQUIN

Approved by.....: Jacques LORQUIN

1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). A typical Smart card was introduced in the GemPC card reader, which was itself set in place in a PC card slot (PCMCIA) of a laptop. It has been tested with a Thosiba laptop. Each ports of the laptop were loaded with a typical peripheral device.

1.2. HARDWARE IDENTIFICATION:

Equipment under test (EUT):

- **Gempc Card** **sn: J043001460**
  - Frequencies: crystal 16 MHz, clock 4MHz (no frequency higher than 108MHz)
  - Size :85x54x5mm
  - Input/output: PC card slot.

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
Gempc Card* (sn: J043001460)	**MESCARD**	**Smart card reader**	**none**
Thoshiba TECRA PT900E-03SFH-FR ① (sn: Y1080996G ST900-0)	None	Laptop	All data cables are shielded Power cable unshielded
Thoshiba TECRA PAT800U ② (sn: 29435523A-3)	DOC	Laptop	All data cables are shielded
Thoshiba PA3083U-IACA ② (sn: 0108A0001580G)	DOC	Power supply of laptop	Power cable unshielded
HEWLETT PACKARD pn: D2846 (sn: JP74001000)	DOC	21" color monitor	Shielded video cable with ferrite at each end
HEWLETT PACKARD pn: C4736-60101 (sn: LZA93024031)	JNZ201213	Mouse	Shielded cable
HEWLETT PACKARD 895CXI pn: C6410A (sn: MY9761915S)	DOC	Parallel printer	HP C2950A shielded parallel cable
TELEX (sn: 700.373.000A)	None	Microphone	Shielded cable
LABTEC LT100 pn: D8387A (sn: none)	None	Headset	Shielded cable
HEWLETT PACKARD 48GX (sn: 83802369)	None	Graphic Calculator	Shielded cable with ferrite
Intel YC76 (sn: 0045143)	EDUYC76	Web Cam	Shielded cable
Gemplus GEM-230 (sn: 000020001d02280)	None	Smart Card	

*** : Equipment under test**

① : Auxiliaries used for radiated test only

② : Auxiliaries used for conducted test only

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 Card in a manner similar to a typical use:

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

1.5. I/O cables

- Video cable shielded with ferrite at each end, length : 1.8m;
- Parallel cable shielded HP #C2950A, length : 2m;
- Serial / graphic adapter cable with ferrite, HP # 8120-6736, length : 1m;
- Power cord (PC and monitor), length : 1.8m;
- LAN cable CAT5 FTP, shielded, length : 2m;
- USB cable, shielded, length: 2.5m. ②

② : cable used for radiated test only.

1.6. Equipment modifications

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

2. Radiated emission data

2.1. SET-UP

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

Equipment configuration and running mode:

- The Gempc card is plug in the PC card slot;
- The web Cam is connected on the USB port;
- Parallel printer is connected on the parallel port;
- Graphic calculator is connected on serial port;
- The headphone is connected on the audio output port, and the microphone is connected on the audio input port;
- 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. 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

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:

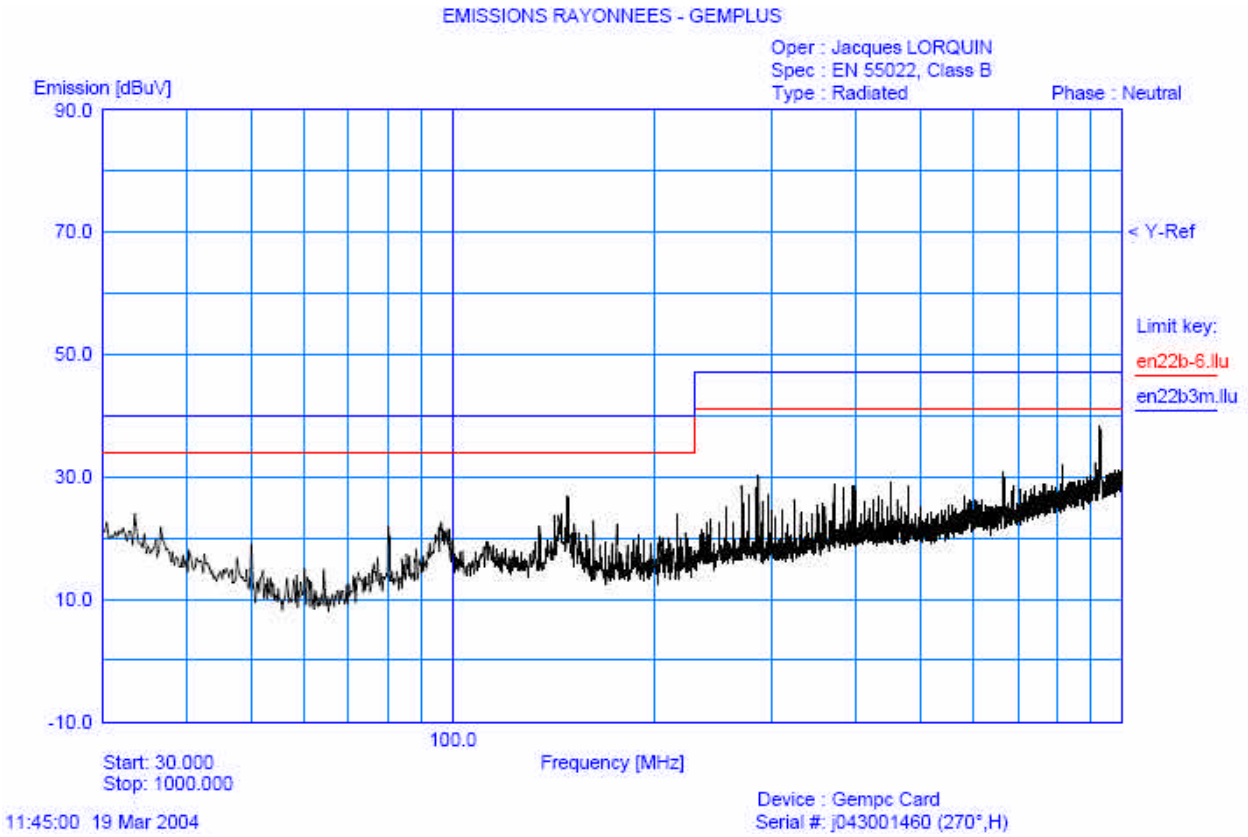
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628
Absorbing clamp	LÜTHI	MDS21	2826

2.3. TEST SEQUENCE AND RESULTS

2.3.1.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



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

The product has been tested according to ANSI C63.4-(2000), CISPR22-1997 +/A1:2000 +/A2:2002 and EN55022:1998+/A1:2000+/A2:2003. 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	79.981	30.0	26.9	**-3.1**	103	V	189	8.8	
2	143.173	30.0	18.5	**-11.5**	175	V	120	14.6	
3	148.524	30.0	22.5	**-7.5**	5	V	103	14.7	
4	270.004	37.0	21.7	**-15.3**	219	H	287	15.0	
5	286.381	37.0	21.6	**-15.4**	50	V	102	15.9	
6	400.009	37.0	31.4	**-5.6**	317	V	344	18.8	
7	531.245	37.0	25.5	**-11.6**	170	V	292	21.8	
8	624.109	37.0	30.3	**-6.7**	1	V	277	23.2	
9	638.973	37.0	28.6	**-8.4**	352	V	241	23.6	
10	662.816	37.0	32.8	**-4.2**	354	V	291	24.2	
11	927.772	37.0	35.7	**-1.3**	153	V	259	27.8	

2.4. 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 is 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-(2000), CISPR22-1997 +/A1:2000 +/A2:2002 and EN55022:1998+/A1:2000+/A2:2003.

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

Mains: 110V/60Hz

The EST and auxiliaries are set on the no-conductive table of 80 cm height. The AC-DC power supply is set on the floor.

3.2. TEST EQUIPMENT

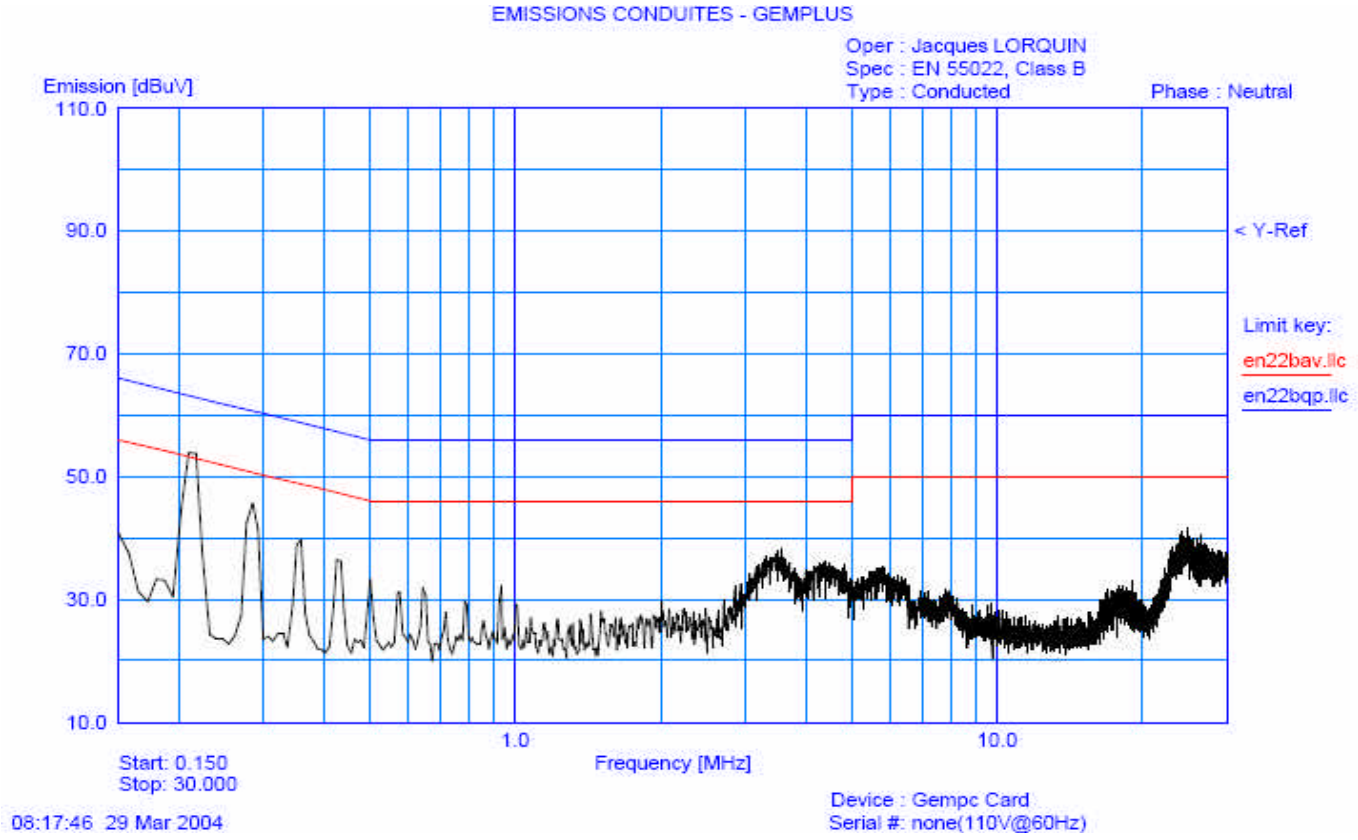
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliaries)	EMCO	3810/2SH	9511-11821628
LISN(measure) (50Ω/50microhenry)	Telemeter Electronis	TGmbH NNB 2/16	0001300
Faraday room	Rayproof		4854

3.3. TEST SEQUENCE AND RESULTS

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

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

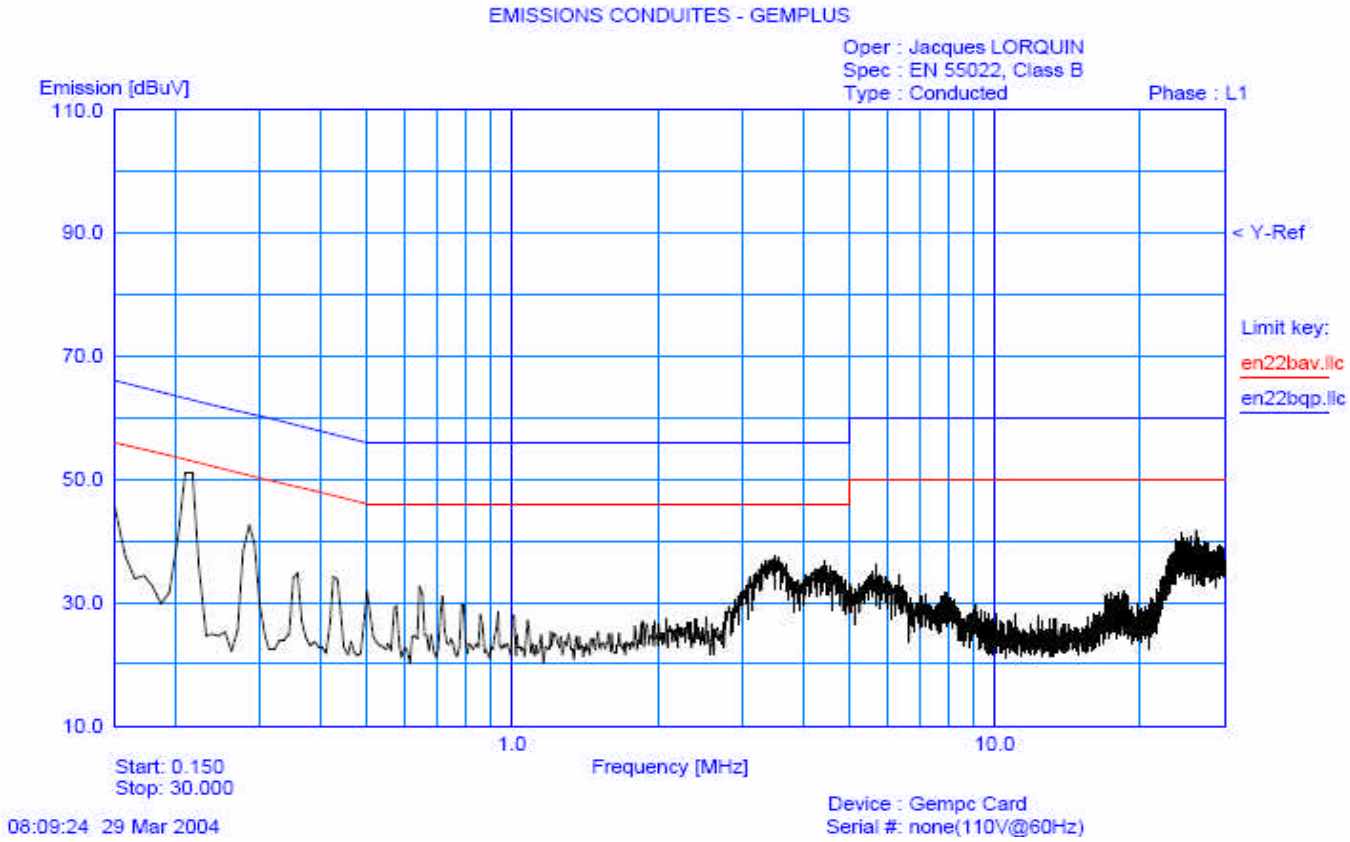
RBW: 9kHz - VBW: 30kHz



Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]
1	0.150	44.0	43.4	**66.0**	**- 22.60**	31.7	56.0	**- 24.30**
2	0.215	54.4	52.6	**63.1**	**- 10.50**	45.8	53.1	**- 7.30**
3	0.280	46.3	45.2	**60.8**	**- 15.60**	34.2	50.8	**- 16.60**
4	0.360	41.4	39.6	**58.7**	**- 19.10**	32.0	48.7	**- 16.70**
5	3.560	38.4	35.3	**56.0**	**- 20.70**	33.7	46.0	**- 12.30**
6	24.47	40.2	34.2	**60.0**	**- 25.80**	25.7	50.0	**- 24.30**

3.3.2.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	0.150	45.0	44.1	66.0	- 21.90	31.7	56.0	- 24.30
2	0.215	51.3	49.9	63.1	- 13.20	41.6	53.1	- 11.50
3	0.280	43.2	41.3	60.8	- 19.50	32.5	50.8	- 18.30
4	0.350	39.1	36.6	58.9	- 22.30	30.0	48.9	- 18.90
5	3.500	37.7	33.3	56.0	- 22.70	30.9	46.0	- 15.10
6	26.00	39.4	33.0	60.0	- 27.00	24.2	50.0	- 25.80

End of Tests