



EMC TEST REPORT

Nr 2915-FCC

This test report applies only on equipment described hereafter.

Proposal number : 200312-2323

Date of test..... : December 12th, 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..... : **Gem e-Seal**

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

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

Level : CISPR Class B

Test objective : Qualification

Results : Conducted emissions: Comply
Radiated emissions: Comply

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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 Gem e-Seal was connected onto the USB port of a personal computer. It has been tested with a HP Personal computer. Each ports of the Personal Computer were loaded with a typical peripheral device.

1.2. HARDWARE IDENTIFICATION:

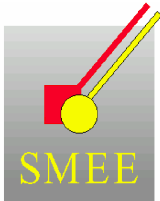
Equipment under test (EUT):

- **Gem e-Seal** **PCB: 016-808A66.00** **sn: proto**
 - Frequency: crystal 4 MHz
 - Size :64x16x8mm
 - Input/output: USB connector.

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
Gem e-Seal* PCB: 016-808A66.00 (sn: proto)	MES1	Smart card reader	none
HEWLETT PACKARD Vectra VLi8 pn:D7963A (sn: FR94020533)	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
Microsoft pn: 58264 (sn: 03932025)	C3KAZB1	Mouse	Shielded cable
HEWLETT PACKARD pn: C4734-60111 (sn: M971168931)	GYUR385K	Keyboard	Shielded cable
HEWLETT PACKARD 895CXI pn: C6410A (sn: MY9761915S)	Doc. Of Conf.	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	Unshielded cable with ferrite



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 Gem e-Seal in a manner similar to a typical use :

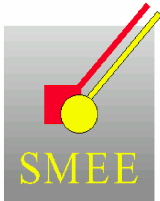
- Make a comparison of the answer to the reset (ATR) between the Gem e-Seal and the PC.

1.5. I/O cables

- Video cable 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

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 Gem e-Seal is plug in the USB port of the PC;
- software running in loop;

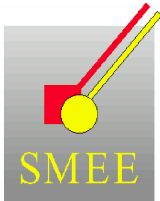
The installation of EUT is identical for pre-characterization measures in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

2.2. 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

EMCO-1050, 6 meters height antenna mast & EMC0-1060, 3 meters diameter Turntable.
A 10 meters Open site located in SMEE *Actions Mesures* - Voiron (FRANCE).



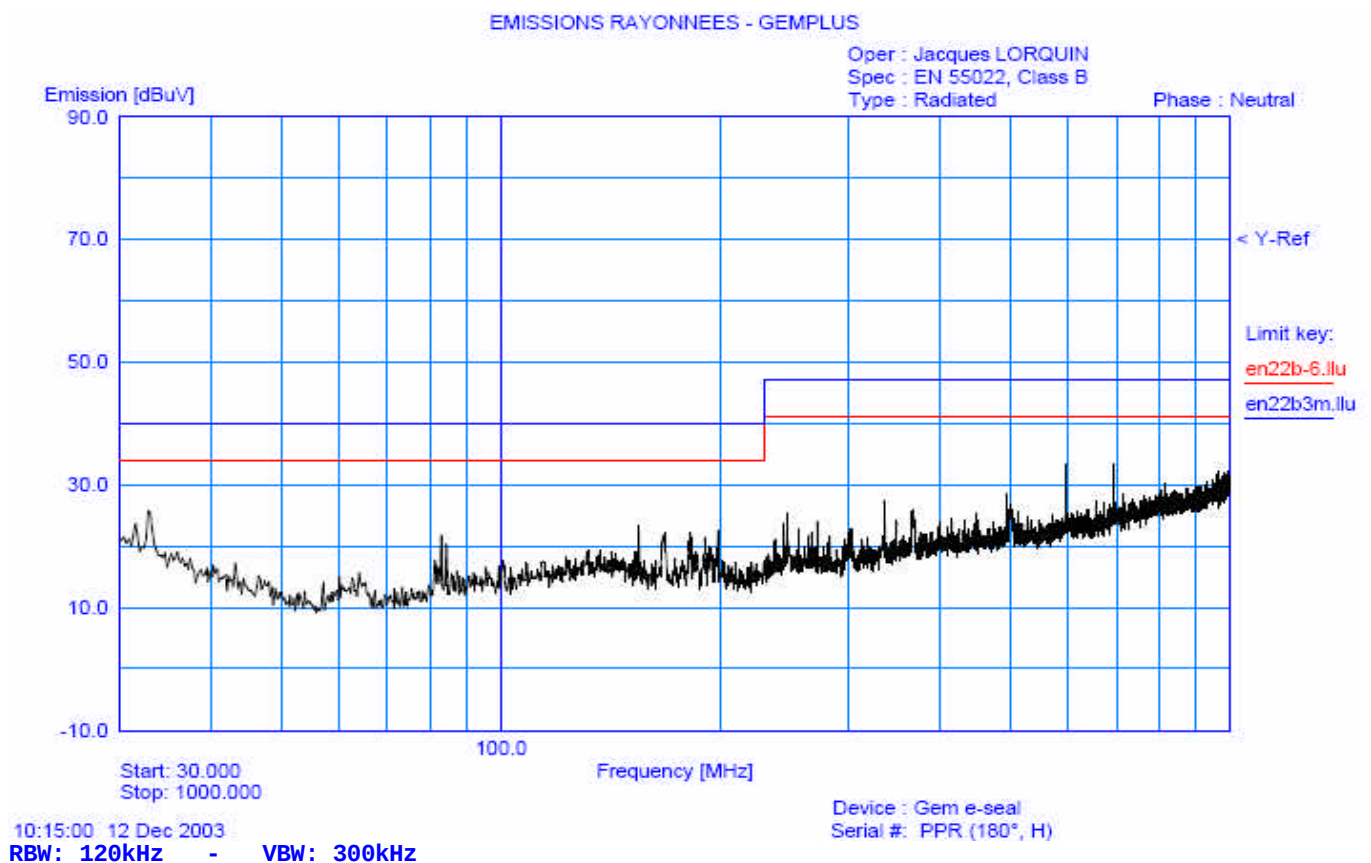
Pre-scan, test Equipment from 30MHz to 1GHz:

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

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:





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 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	33.318	30.0	22.8	-7.2	176	H	283	12.2	
2	166.892	30.0	21.1	-8.9	296	V	103	17.6	
3	198.030	30.0	29.7	-0.3	21	H	388	19.3	
4	205.904	30.0	21.4	-8.6	23	H	368	14.4	
5	255.572	37.0	32.4	-4.6	1	V	101	14.3	
6	594.046	37.0	33.3	-3.7	239	H	155	22.5	
7	693.052	37.0	31.3	-5.7	45	V	216	25	

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:

$$FS = RA + AF + CF - AG$$

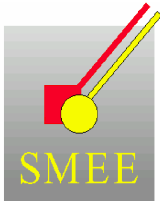
Where
 FS = Field Strength
 RA = Receiver Amplitude
 AF = Antenna Factor
 CF = Cable Factor
 AG = Amplifier Gain

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.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dBμV/m}$$

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

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$



3. Conducted emission data

The product has been tested according to ANSI C63.4-(2000), 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.

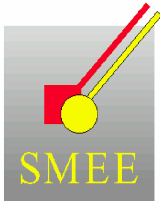
Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

3.1. SET-UP

Mains: 110V/60Hz

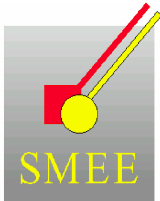


The EST and auxiliaries are set on the no-conductive table of 80 cm height.



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 2/16	NNB 0001300
Faraday room	Rayproof		4854

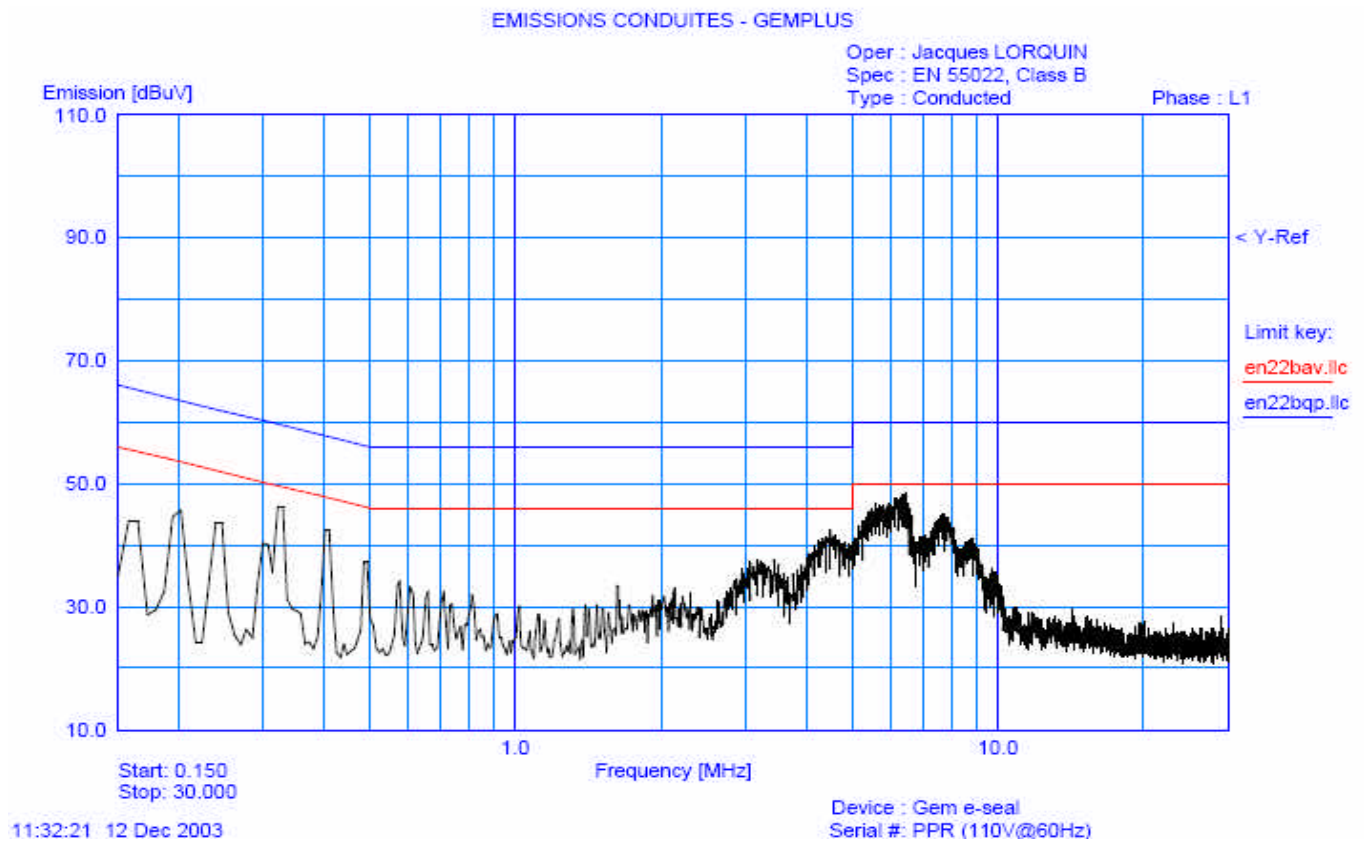


3.3. TEST SEQUENCE AND RESULTS

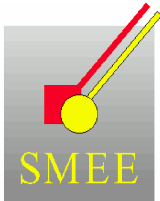
Measures are performed on line 1 and line 2 of the power supply of the PC,

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	0.160	43.92	43.02	64.0	- 20.98	42.48	54.0	- 11.52
2	0.200	46.14	45.48	62.0	- 16.52	45.02	52.0	- 6.98
3	0.240	44.74	43.78	62.0	- 18.22	43.23	52.0	- 8.77
4	0.300	41.32	40.34	60.0	- 19.66	39.48	50.0	- 10.52
5	0.320	47.28	46.35	58.0	- 11.65	45.34	48.0	- 2.66
6	0.410	43.80	42.25	56.0	- 13.75	38.89	46.0	- 7.11
7	6.360	48.31	45.90	60.0	- 14.10	42.68	50.0	- 7.32



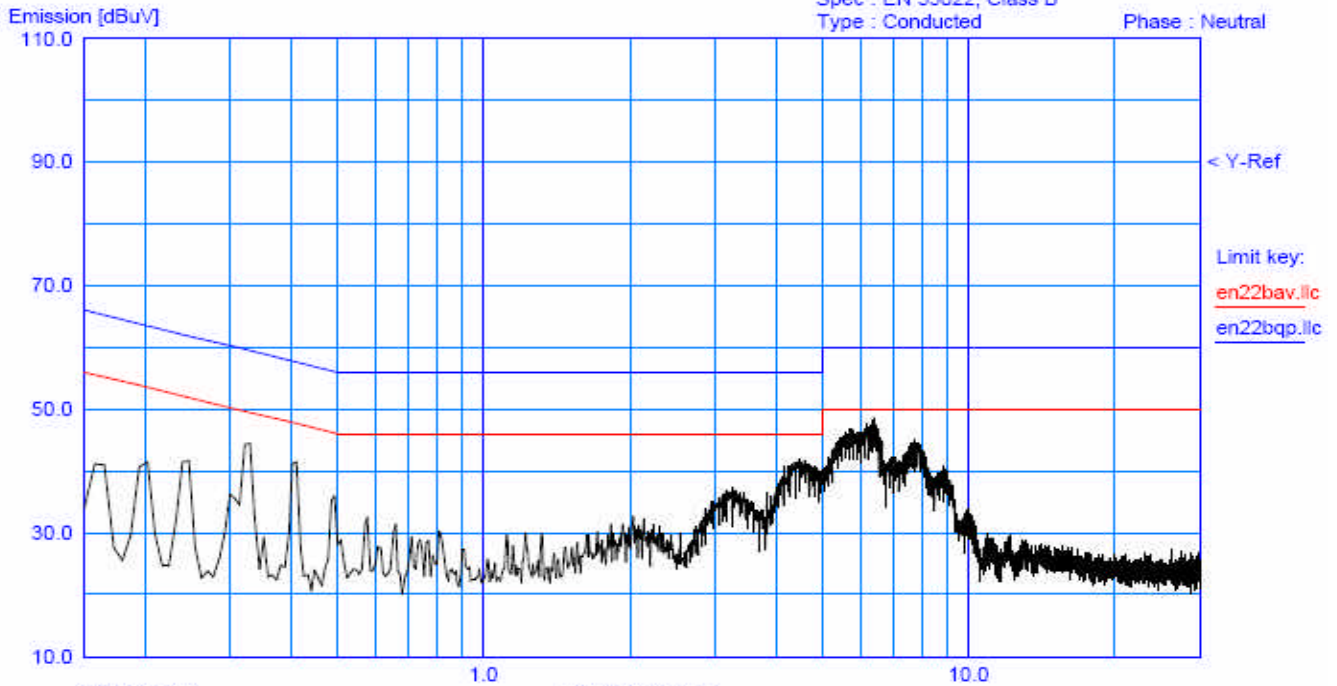
3.3.2. Neutral conducted emission data (110V@60Hz)

RBW: 9kHz - VBW: 30kHz

EMISSIONS CONDUITES - GEMPLUS

Oper : Jacques LORQUIN
Spec : EN 55022, Class B
Type : Conducted

Phase : Neutral



11:37:11 12 Dec 2003

Device : Gem e-seal
Serial #: PPR (110V@60Hz)

Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
1	0.160	42.33	40.26	64.0	- 23.74	39.80	54.0	- 14.20
2	0.200	41.97	40.91	62.0	- 21.09	40.49	52.0	- 11.51
3	0.240	42.79	41.61	60.0	- 18.39	41.14	50.0	- 8.86
4	0.310	37.38	35.52	60.0	- 24.48	33.87	50.0	- 16.13
5	0.330	45.45	44.67	58.0	- 13.33	43.66	48.0	- 4.34
6	0.410	41.82	40.64	56.0	- 15.36	37.47	46.0	- 8.53
7	6.380	49.06	47.98	60.0	- 12.02	46.78	50.0	- 3.22

End of Tests