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 2626-FCC

This test report applies only on equipment described hereafter.

Proposal number : 200212-2112

Date of test..... : December 17th , 2002

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

Performed by ..... : Jacques LORQUIN

Customer ..... : **DIGIGRAM**
430 rue Aristide BERGES
Voie Antiope
38330 MONTBONNOT St MARTIN –France

Product ..... : **VX442**

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

Applied standards or specification: EN55022 (1999) +/A1: (2000)
CISPR22 (1997) +/A1: (2000)
ANSI C63-4 (1992)

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 VX442 card was connected into 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):

- **VX442 audio card** **sn: 0000051** **FCCID:IGTVX442**
  - Frequency: crystal 22.576MHz & 22.5792MHz
    Sampling frequency 96kHz, no frequencies above 108MHz
  - Size : PCI card
  - Input/output:
    - 15-pin HD SUB-D for digital I/O
    - 25-pin SUB-D for analog I/O

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
HEWLETT PACKARD Brio7174 pn:D6769A (sn: FR83332107)	Doc. Of Conf	Personal computer	Power cord unshielded All data cable are shielded
HEWLETT PACKARD P1100 pn: D2846 (sn: JP74001000)	Doc. Of Conf	21" color monitor	Shielded video cable with ferrite at each end
HEWLETT PACKARD pn:C4734-60111 (sn: M971168931)	GYUR38SK	Keyboard	Shielded cable
HEWLETT PACKARD pn: C4736-60101 (sn: LZA93024031)	JNZ201213	Mouse	Shielded cable
HEWLETT PACKARD 895CXI pn: C6410A (sn: MY9761915S)	Doc. Of Conf	Parallel printer	HP#C2950A shielded parallel cable
HEWLETT PACKARD 48GX (sn: ID83802369)	None	Graphic calculator	HP#8120-6736 shielded cable
INTEL YC76 pn: 680942-002 (sn:0045143)	EDUYC76	Web Cam	shielded cable
TELEX (sn: 700.373.000A)	None	Microphone	Shielded cable
LABTEC LT100 pn: D8387A (sn: none)	None	Headset	Shielded cable
DIGIGRAM (sn: none)	None	I/O Load box	Standard power cable

1.4. 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.

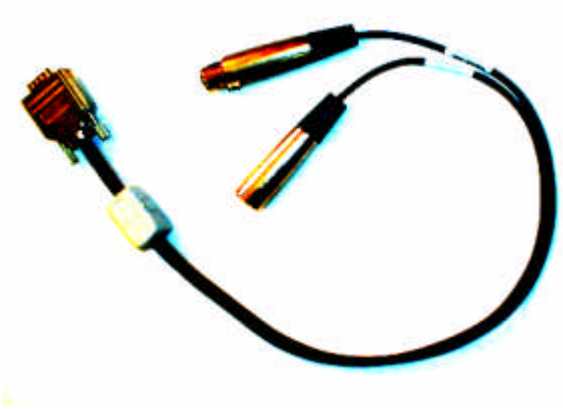
1.5. EUT Exercise software

The EUT exercise program (coolEdit.exe, running under Windows 98) used during radiated and conducted testing was designed to exercise the audio card VX442 in a manner similar to a typical use :

- Playing a sound file (.wav) in loop

1.6. Special accessories

The "digital cable" (15-pin HD SUBD) which is connected to the VX442 card, is a shielded cable with a ferrite Wurth N° 742 7111 located close to the 15-pin HD SUBD connector.



1.7. I/O cables

- "Digital cable" shielded (15-pin/XLR adapter), length : 0.6m
  - 1x AES/EBU input loaded by 100Ω
  - 1x AES/EBU output loaded by 100Ω
- "Analog cable" shielded (25-pin/XLR adapter), length : 0.6m
  - 4x balanced analog input loaded by 47Ω
  - 4x balanced analog output loaded by 13kΩ
- RS232 cable shielded, length : 1.5m
- Video cable with ferrite at each end, length : 1.8m.
- Parallel cable HP #C2950A, length : 2m.
- 2x Power cord (Monitor and PC), length: 1.8m
- 10x XLR cables shielded, length: 3m

1.8. 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 VX442 I/O is connected on load box;
- 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	Calibration Due
Spectrum Analyzer	HP	8568B	2732A04140	March 22nd ,2003
Quasi-Peak adapter	HP	85650A	2811A01136	March 22nd ,2003
RF Pre-selector	HP	85685A	2833A00773	March 22nd ,2003
Biconical Antenna	EMCO	3104C	9401-4636	April 4th ,2003
Log Periodic Antenna	EMCO	3146	2178	April 4th ,2003
Absorbing clamp	LÜTHI	MDS21	2826	September 25th ,2003
Absorbing clamp	R&S	85024A	194.0100.50	September 25th ,2003
Tube ferrite	LÜTHI	MDS101	4485	September 25th ,2003
OATS				April 9th ,2003

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).

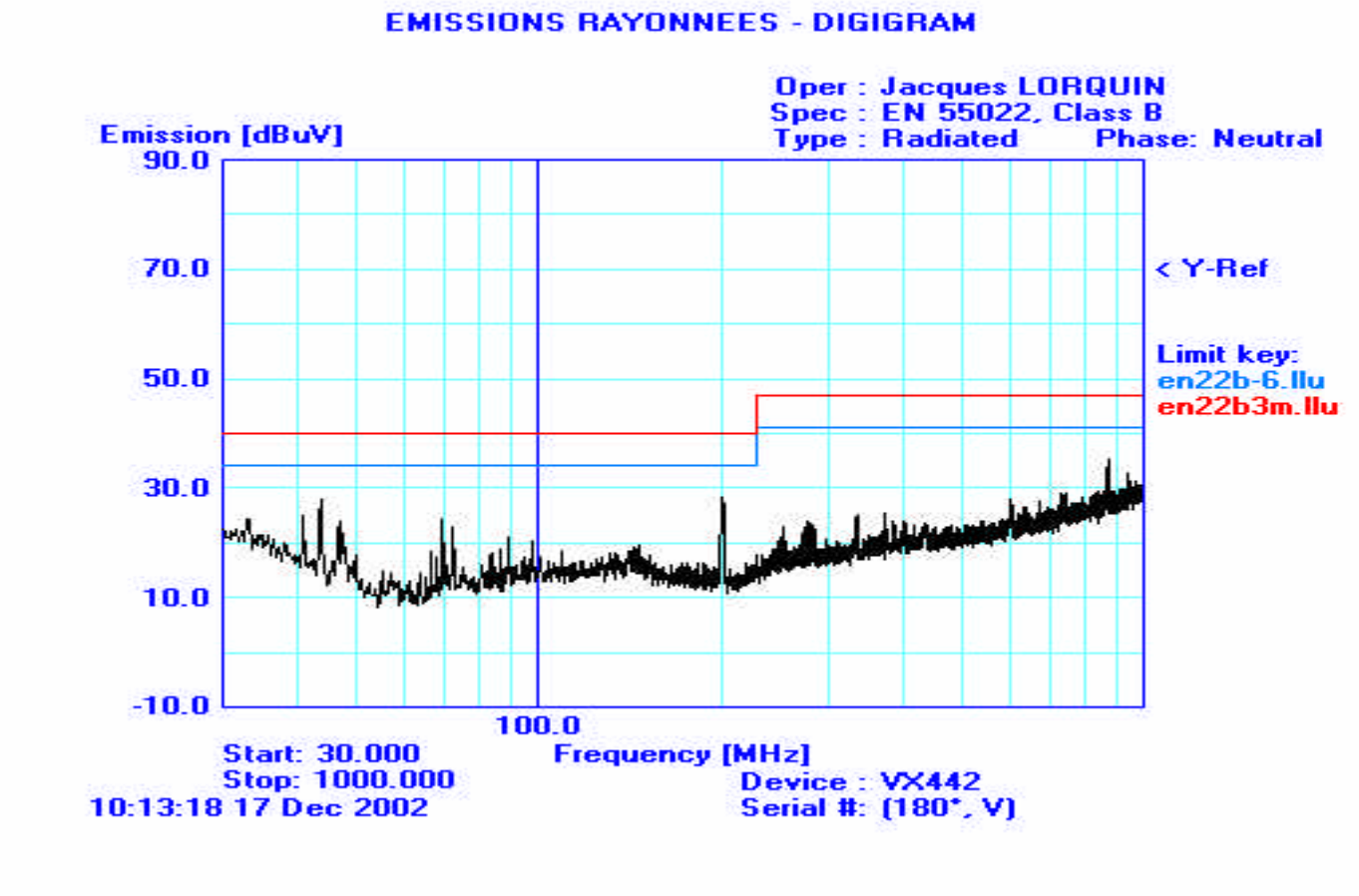
Pre-scan, test Equipment from 30MHz to 1GHz:

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29th ,2003
Amplifier	HP	8447F H64	3113A06394	March 28th ,2003
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628	March 29th ,2003
Absorbing clamp	LÜTHI	MDS21	2826	September 25th ,2003
Absorbing clamp	R&S	85024A	194.0100.50	September 25th ,2003
Tube ferrite	LÜTHI	MDS101	4485	September 25th ,2003

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-(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.

Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
43.741	30.0	20.5	-9.5	236	V	102	11.8	
66.353	30.0	23.5	-6.5	282	V	102	10.1	
69.167	30.0	28.7	-1.3	252	V	102	9.8	
71.978	30.0	22.2	-7.8	285	V	130	9.5	
108.648	30.0	16.3	-13.8	202	V	120	15.8	
201.183	30.0	24.1	-5.9	266	H	388	15.6	
871.645	37.0	32.4	-4.6	221	H	237	27.5	

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-(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

Mains: 110V/60Hz & 230V/50Hz

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

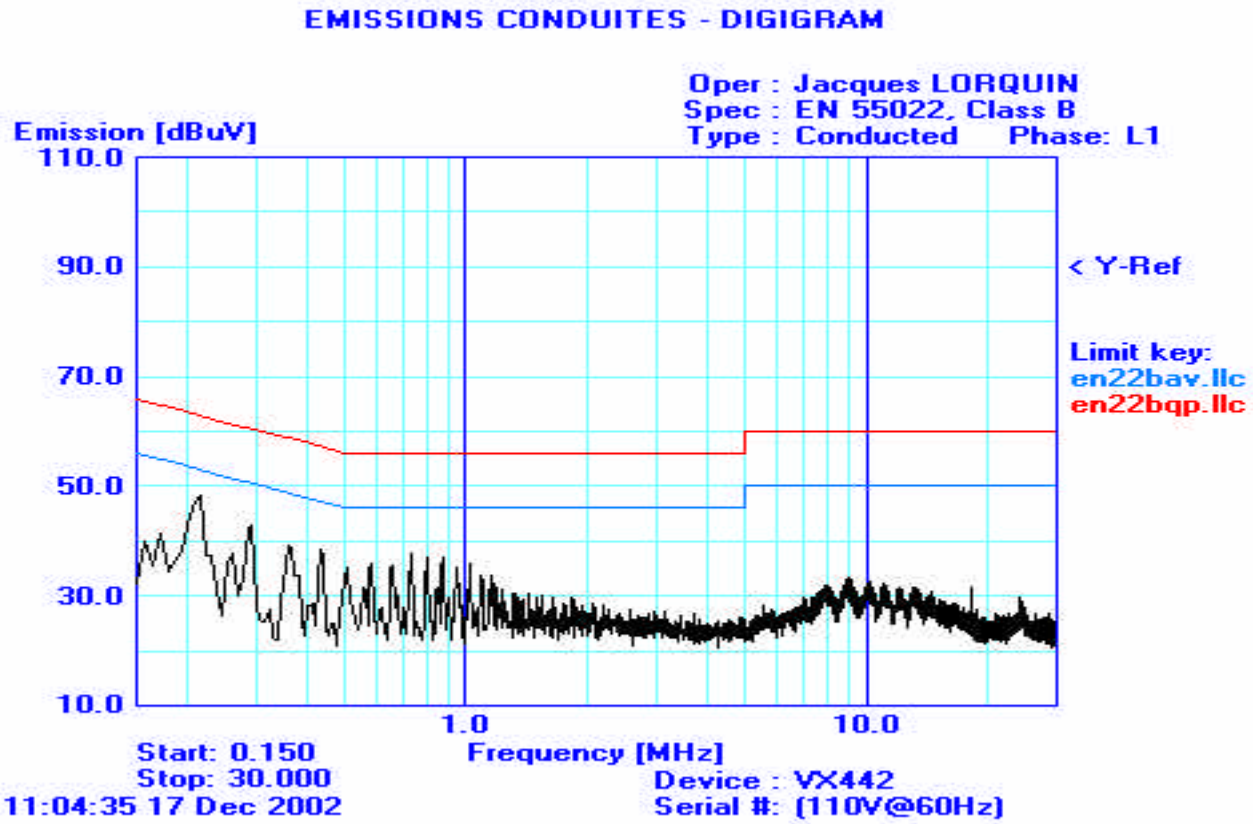
3.2. TEST EQUIPMENT

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29th ,2003
test receiver	Rohde&Schwarz	ESH3	872079/117	March 21st ,2003
Transient Limiter	HP	11947A	3107A01596	March 28th ,2003
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628	December 12th ,2003
LISN(measure)	Telemeter Electronis	TGmbH NNB 2/16	9511-11821628	September 13th ,2003
Faraday room	Rayproof		4854	none

3.3. TEST SEQUENCE AND RESULTS

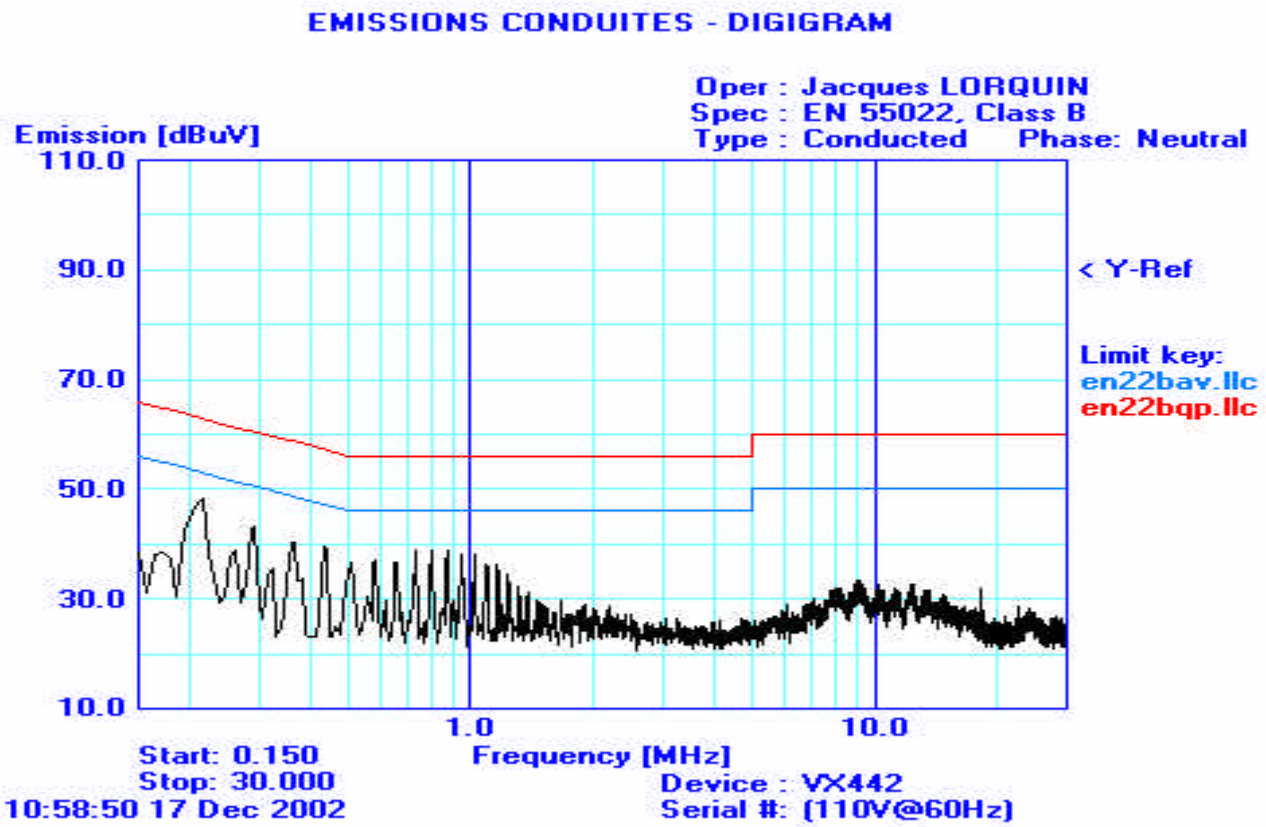
Measures are performed on line 1 and line 2 of the power supply of the PC,

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



Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]
1	0.17	46.06	39.18	64.96	-25.78	26.66	54.96	-28.30
2	0.22	49.68	48.57	62.82	-14.25	48.34	52.82	-4.48
3	0.26	40.45	37.53	61.43	-23.90	32.09	51.43	-19.34
4	0.29	44.19	42.5	60.52	-18.02	41.48	50.52	-9.04
5	0.36	40.23	38.6	58.73	-20.13	38.11	48.73	-10.62
6	0.43	39.27	37.42	57.25	-19.83	35.34	47.25	-11.91
7	0.73	39.54	37.14	56.00	-18.86	34.81	46.00	-11.19
8	0.8	37.66	35.92	56.00	-20.08	35.28	46.00	-10.72
9	0.88	37.93	36.08	56.00	-19.92	35.13	46.00	-10.87

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



Num.	Freq.	Peak	Q-Peak	QP limit	QP delta	Average	AVG Limit	AVG Delta
	[MHz]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]	[dBµV]
1	0.15	55.59	51.94	66.00	-14.06	48.89	56.00	-7.11
2	0.2	45.72	43.23	63.61	-20.38	41.79	53.61	-11.82
3	0.22	49.57	48.64	62.82	-14.18	48.44	52.82	-4.38
4	0.29	44.48	43	60.52	-17.52	42.37	50.52	-8.15
5	0.36	40.76	39.79	58.73	-18.94	39.42	48.73	-9.31
6	0.44	41.14	39.04	57.06	-18.02	37.58	47.06	-9.48
7	0.73	39.74	37.91	56.00	-18.09	36.29	46.00	-9.71
8	0.8	39.35	38.09	56.00	-17.91	37.63	46.00	-8.37
9	0.87	39.96	38.59	56.00	-17.41	38.13	46.00	-7.87
10	0.95	39.09	37.7	56.00	-18.30	37.23	46.00	-8.77

End of Tests