Actions Mesures

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EMC TEST REPORT

Nr 2605-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200209-2029

Date..... :	September 27th , 2002
Location ..... :	*Actions Mesures* Laboratory - 38 VOIRON
Performed by ..... :	Jacques LORQUIN
Customer **..... :**	**DIGIGRAM (M. ARCHAMBAULT)** 430 rue Aristide BERGES 38330 MONTBONNOT SAINT MARTIN FRANCE

Product..... :	**PCX924-MIC / PCX924 / VX222-Mic / VX222 / PCX22 Cards**
Type of test ..... :	**Radiated and Conducted Emission Test**

Applied standards ..... :	EN55022 : 1998 +/A1 (2000) CISPR22 : 1997 +/A1 (2000) ANSI C63-4 (1992)
Level..... :	Class B

Result of tests..... :	**Radiated Emission : Comply (test performed on the PCX924-Mic)** **Conducted Emission : Comply (test performed on the PCX924-Mic)**

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Written by ..... : Laurent CHAPUS 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). It has been tested in a HEWLLET PACKARD Brio Personnel Computer. Each In/Out audio ports of the Professional Audio Card were connected on a “Digigram load box” simulating a typical user environment. It has been decided that it will be the PCX924-Mic which will be tested, as it is the most complete configuration. Consequently, all test results contained in this report are from the PCX924-Mic.

1.2. HARDWARE IDENTIFICATION:

*** Equipment under test (EUT): PCX924-Mix PCI bus card sn: 00094 & 00097**

- Input/output: 1x SUBD9 High density 15pts
  1x jack for headset
  1x SUBD15
- Size : 123x113x15mm
- Frequency: crystal 28.224MHz (no frequencies used in the EUT above 108MHz)

1.3. Auxiliaries

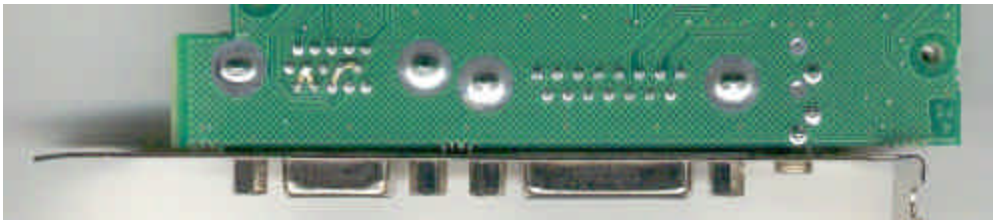
The FCC IDs for all equipment, plus description of all cables used in the tested system are :

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
PCX924-Mic*① (sn: 00094)	IGTPCX924	Audio type PCI card	All I/O cables are shielded
PCX924-Mic*② (sn: 00097)	IGTPCX924	Audio type PCI card	All I/O cables are shielded
HEWLETT PACKARD pn:D6769A (sn: FR83332107)	D. of C.	Personnel Computer	All data cables are shielded Power cable unshielded
HEWLETT PACKARD pn:D2846 (sn JP74001000)	D. of C.	21" color monitor	Shielded video cable with ferrite at each end Power cable unshielded
HEWLETT PACKARD pn:C4732-60111 (sn: M971168931)	GYUR38SK	Keyboard	Shielded cable
HEWLETT PACKARD pn:C3751B (sn: LZA62831261)	DZL211029	Mouse	Shielded cable
HEWLETT PACKARD pn:C6410A Deskjet 895Cxi (sn: MY9761915T)	D. of C.	Parallel printer	Shielded cable
HEWLETT PACKARD 48GX (sn: ID83802369)	None	Serial graphic calculator	Shielded cable
TELEX (sn: none)	None	Microphone	Shielded cable
INTEL YC76 (sn: 0045143)	EDUYC76	USB WebCam	Shielded cable
LABTEC LT100 pn:D8387A (sn: none)	None	Headphone	Shielded cable
SENNHEISER HD435 MANHATTANN (sn: none)	none	Headphone	Shielded cable
Digigram (sn: none)	None	Load box	Power cable unshielded

*Equipment Under Test / (1): Equipment used for radiated emission test
(2): Equipment used for conducted emission test

1.4. Equipment modifications

Capacitors of 10pF are set between the pins 10,11,12,13 and the GND of the SUBD9 HD connector. The connector SUBD9 HD and SUBD15 of cables are in metallic case.
The unit tested was representative to a production unit.



1.5. EUT Exercise software

The EUT exercise program used during radiated and conducted testing, was designed to exercise the PCX924-Mic in a manner similar to a typical use (data are transmitted on audio inputs and outputs). Software is running on PC under DOS, is called VXTEST.EXE, and Audio test is selected.

1.6. Special accessories

All interfaces cables used for compliance testing are shielded as normally supplied. All these cables are normally recommended to be used with the product.

1.7. I/O cables

- 2x Standard power cord Length:1.8m
- 1x special shielded cable (DB9 HD/XLR adapter)
  - LTCIN
  - UER OUT
  - UER IN2
  - UER IN1
  - DB9 connector
- 1x special shielded cable (DB15/XLR adapter)
  - MIC IN
  - R OUT
  - L IN
  - R IN
  - L OUT
- 8x XLR extension cord of 3m (shielded)
- 1x RCA cable (length : 3m)
- 1x video cable with 2 integrated ferrite (shielded cable, length: 1.8m)
- 1x Parallel cable HP #C2950A (shielded cable, length: 2m)
- 1x adapter RS232/graphic calculator HP #8120-6736 (shielded cable, length : 1.5m)

2. Radiated emission data

2.1. SET-UP

The EUT is placed on a non-conducting table of 80cm height. Each In/Out ports of the audio card was connected to a "Digigram load box" simulating a typical user environment.

Equipment configuration and running mode:

- The graphic calculator is connected on serial port of the PC;
- The headset Sennheiser is connected on the jack of the EUT;
- All other device is connected at each relevant ports of the PC
- PC and EUT are ON;
- software is running;

Cables configuration:

- URout: connected to 100Ω load.
- URin1: connected to 100Ω load.
- URin2: connected to 47Ω load
- Micro ana in: connected to 47Ω load
- Rin: connected to 47Ω load — Lin: connected to 47Ω load
- Rout: connected to13kΩ load — Lout: connected to 13kΩ load
- RCA: connected to 63Ω load

The installation of EUT is identical for pre-characterization measurement 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	Rohdes& Schwarz	85024A	194.0100.50	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).

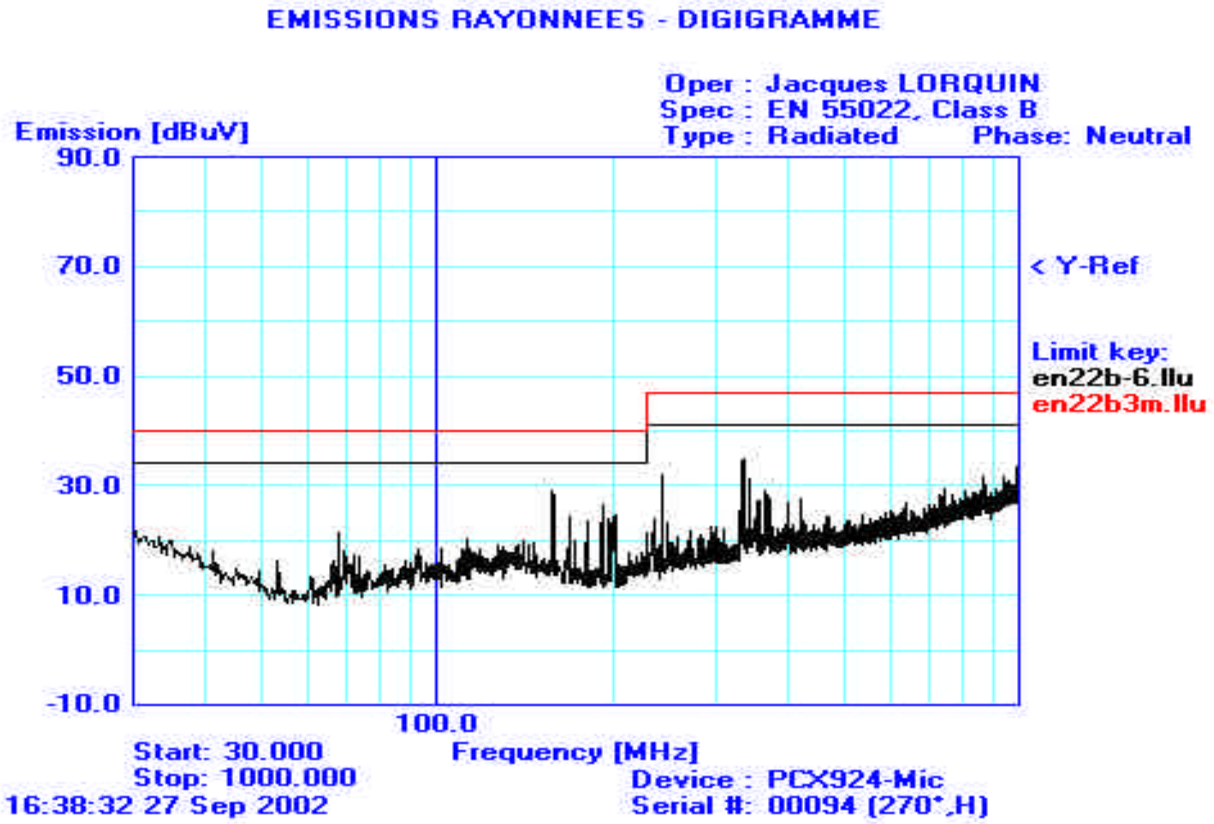
Pre-scan, test Equipment from 30MHz to 1GHz:

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	Rohdes& Schwarz	85024A	194.0100.50	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 120 kHz from 30 MHz to 1 GHz.
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 (MHz)	QPeak Lmt (dBuV/m)	QPeak (dBuV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)
158.031	30.0	22.8	-7.2	218	V	167	17.1
180.650	30.0	26.9	-3.1	355	V	173	18.5
191.955	30.0	28.7	-1.3	85	V	157	19.4
243.428	37.0	25.4	-11.6	234	H	305	15.5
335.133	37.0	33.8	-3.2	293	H	223	18.3
366.924	37.0	28.9	-8.1	313	H	220	18.7
395.135	37.0	25.7	-11.3	344	V	334	19.1
864.999	37.0	34.3	-2.7	12	V	308	27.4
891.003	37.0	33.0	-4.0	43	V	199	27.7
912.139	37.0	36.3	-0.7	345	V	288	28.1
987.813	37.0	34.8	-2.2	124	H	327	29.9

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 120V / 60Hz power line voltage and compared to the CISPR22 Class B limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

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

The EUT is placed on a non-conducting table of 80cm height. The cable of the power supply has been shorted to 1meter length. The EUT is powered trough the LISN. Each In/Out ports of the audio card was connected on a “Digigram load box” simulating a typical user environment.

Equipment configuration and running mode:

- The graphic calculator is connected on serial port of the PC;
- The headset Sennheiser is connected on the jack of the EUT;
- All other device is connected at each relevant ports of the PC
- PC and EUT are ON;
- software is running;

Cables configuration:

- URout: connected to 100Ω load.
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- Rout: connected to13kΩ load Lout: connected to 13kΩ load
- RCA: connected to 63Ω load

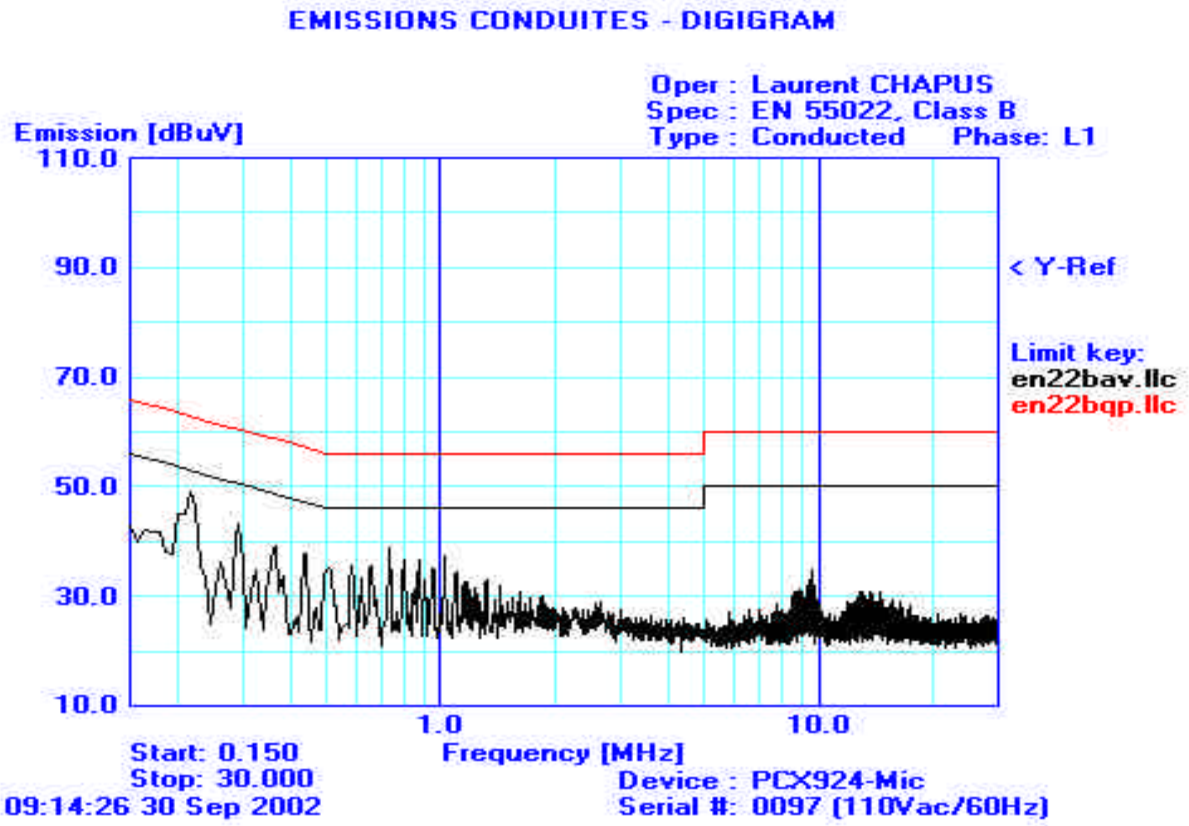
3.2. TEST EQUIPMENT

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

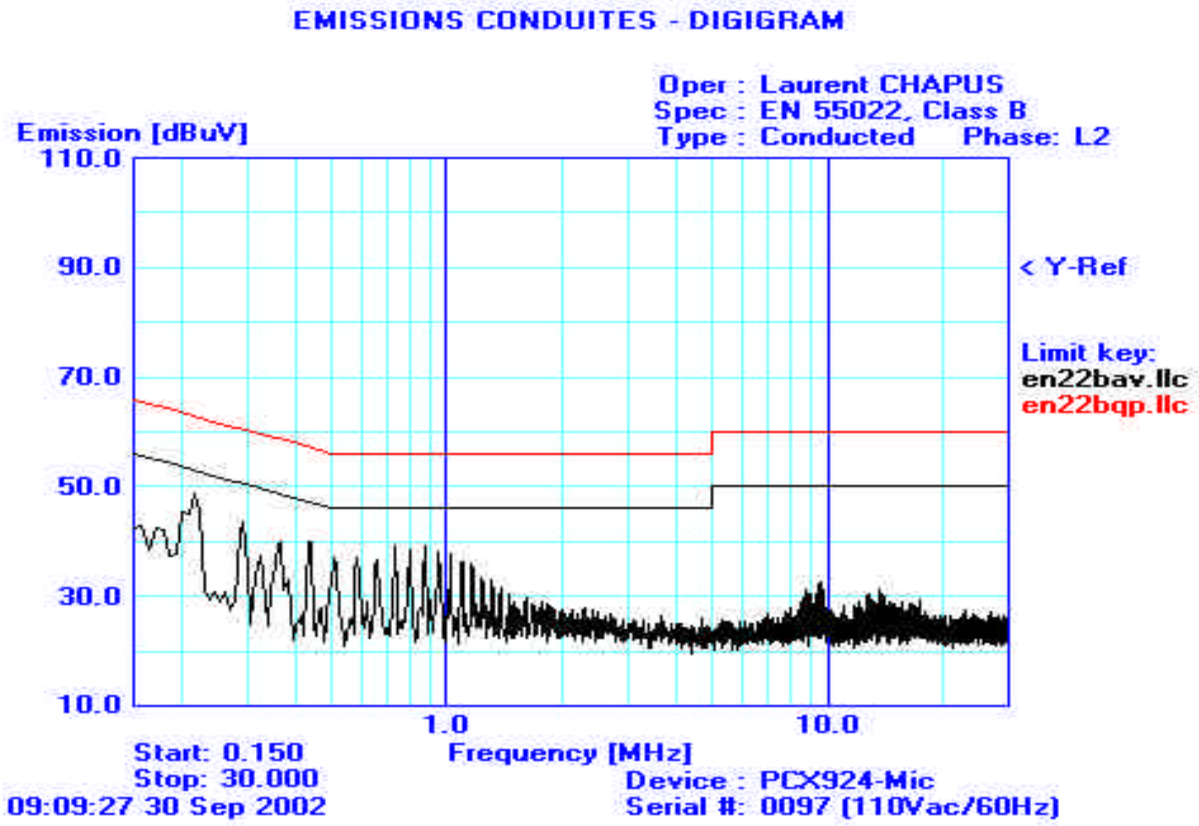
Measures are performed on line 1 and line 2 of the power supply of the PC,

3.3.1.Line conducted emission data on PC HP Brio with PCX924-Mic



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]
1	0.220	49.76	48.66	62.82	**-14.16**	48.40	52.82	**-4.42**
2	0.290	43.61	42.20	60.52	**-18.32**	41.30	50.52	**-9.22**
3	0.370	40.12	38.88	58.50	**-19.62**	38.47	48.50	**-10.03**
4	0.730	39.51	38.01	56.00	**-17-99**	35.68	46.00	**-10.32**
5	0.880	37.86	36.01	56.00	**-19.99**	35.21	46.00	**-10.79**
6	1.020	38.06	36.19	56.00	**-19.81**	32.65	46.00	**-13.35**

3.3.2.Neutral conducted emission data on PC HP Brio with PCX924-Mic



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]
1	0.220	48.94	48.25	62.82	**-14.57**	48.05	52.82	**-4.77**
2	0.290	44.57	43.27	60.52	**-17.25**	42.36	50.52	**-8.16**
3	0.360	40.65	39.69	58.73	**-19.04**	39.31	48.73	**-9.42**
4	0.440	40.67	39.53	57.06	**-17.53**	37.61	47.06	**-9.45**
5	0.720	39.82	38.48	56.00	**-17.52**	37.32	46.00	**-8.68**
6	0.880	40.24	38.82	56.00	**-17.18**	38.04	46.00	**-7.96**
7	1.020	38.03	36.54	56.00	**-19.46**	35.66	46.00	**-10.34**

End of Tests