# MEASUREMENT/TECHNICAL REPORT

## DIGIGRAM - PCX20V2

## FCC ID: IGTPCX20V2

**April 28, 1998**

This report concerns : Original grant___X___ Class II change _____

*Class B verification_____ *Class A verification_____ *Class I change _____

Equipment type: Audio PC Board

Request issue of grant :

_ X __Immediately upon completion of review.

_____ Defer grant per 47 CFR 0.457(d)(1)(ii) until _____date____. Company Name agrees to notify the Commission by ____date____ of the intended date of announcement of the product so that the grant can be issued on that date.

Confidentiality of grant:

_____Applicant requests the existence of this grant to be kept confidential until ___date__. The announcement of this product before this date via freedom of information would be detrimental to Company Name, and therefore must be considered a business secret. Public announcement of this product will not be made prior to this date. *(Max. 60 days after grant issued).*

Limits used: *(check one)*

CISPR 22 _____X_____ Part 15_____

Measurement procedure used is ANSI C63.4-1992 unless another is specified.

Other test procedure: _____


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**Not to be filed with Equipment Authorization Branch of FCC unless requested.*

Report format prepared by the Information Technology Industry Council (ITI) ESC-5 and reviewed by FCC staff in 1994.

# Table of Contents

# 1 GENERAL INFORMATION

## 1.1 Product Description

PCX20V2 is an ISA bus PC-Card intended for professional sound processing and editing application on a personal computer.
The PCX20V2 provides one stereo or two mono output channels and one headphone output.
Analog audio outputs are unbalanced.
It provides processing and playback functionality.
The main processing functions are :
.....- Real-time MPEG audio decompression on two channels
.....- Playback in PCM mode.
.....- Real time mixing of several PCM or MPEG audio files.

See Attachment A for further description and technical features of the submitted product.

## 1.2 Related Submittal(s)/Grant(s)

All host equipment used in the test configuration are FCC granted, when relevant.

## 1.3 Tested System Details

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

| Model Number (Serial Number) | FCC ID | Description | Cable Description |
|---|---|---|---|
| PCX20V2 card (1) (975203686) | IGTPCX20V2 | Audio PC board | Shielded signal cable. |
| VECTRA VL Series 3 5/75 FR53352782 | K4UVECTRAVL5 | Personal Computer | Unshielded power cord. |
| HP D2846 (JP74001005) | N/A - Déclaration of Conformity | 21" Video monitor | Shielded video cable |
| HP C3751B LCA52435792 | DZL210582 | Mouse | Shielded cable |
| HP C3757A (F62008) | CIGE03614 | Keyboard | Shielded cable |
| HP C2145A (US5301105F) | B94C2145X | Printer, Parrallel I/F Deskjet 850C | HP24542D - Shielded cable |
| HP7475A (2807L77281) | BSD4TE7475A | Serial plotter | HP24542G - Shielded cable |
| SENNHEISER HD330 | Not applicable | Headphone | Shielded signal cable |

(1) EUT submitted for grant.
N/A = Not Applicable

## 1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4-1992, CISPR 22-1993/A1:1995 and EN55022:1994/A1:1995.
Radiated testing was performed at an antenna to EUT distance of 10 meters. During testing, all equipments and cables were moved relative to each other in order to identify the worst case set up.

## 1.5 Test Facility

The test facility used to collect the radiated and conducted data is the Hewlett Packard Quality Engineering Test Center B10 EMI facility located 5 Avenue Raymond Chanas - EYBENS, 38053 GRENOBLE, FRANCE. This test facility has been fully described in a report and accepted by the FCC as compliant with the radiated and AC line conducted test site criteria in ANSI C63.4-1992 in a letter dated August 19, 1996 (31040/SIT, 1300F2). This test facility has also been accredited by COFRAC (french accreditation authority for european union test lab accreditation organization), accreditation number 1-0199 as compliant with test site criteria and competence in EN 55022 / CISPR22 norms for 89/336/EEC European EMC Directive application. All pertinent data for this test facility remains unchanged.

# 2 PRODUCT LABELING

Figure 2.1 FCC ID Label

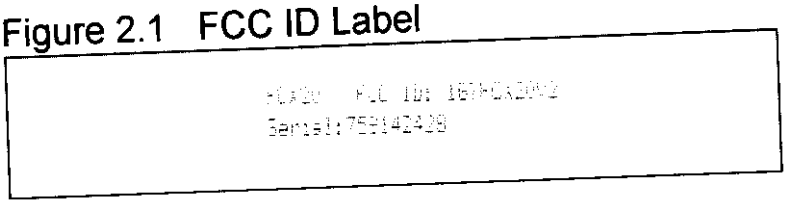


Figure 2.2 Location of Label on EUT

Label is sticked on the board, foil side. (See photo of board in this file).

# 3 SYSTEM TEST CONFIGURATION

## 3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). It has been tested with a Vectra VL Series 3 5/75 Personal Computer. Each audio output is connected on a "load box" simulating a user environment. Speed selection at 8 Mhz has been performed, but the highest emission was found for the high speed selection. Exercise software running under Windows 95 system, the screen definition used was 640 x 480 pixels.

## 3.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software has been designed in order to exercise each part of the PC involved in a typical use. Data are transmitted on each output.

## 3.3 Special Accessories

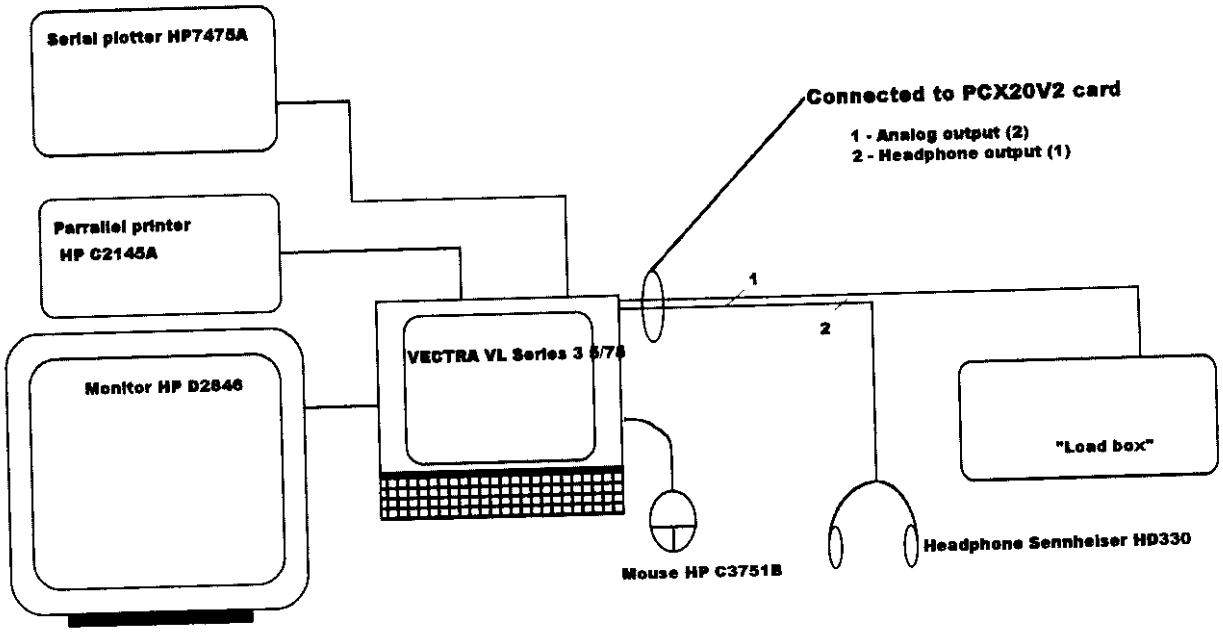
As shown in Figure 3.1, all interface cables used for compliance testing are shielded as normally supplied. All these cable are normally recommended to be used with the product.

## 3.4 Equipment Modifications

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

## 3.5 Configuration of Tested System

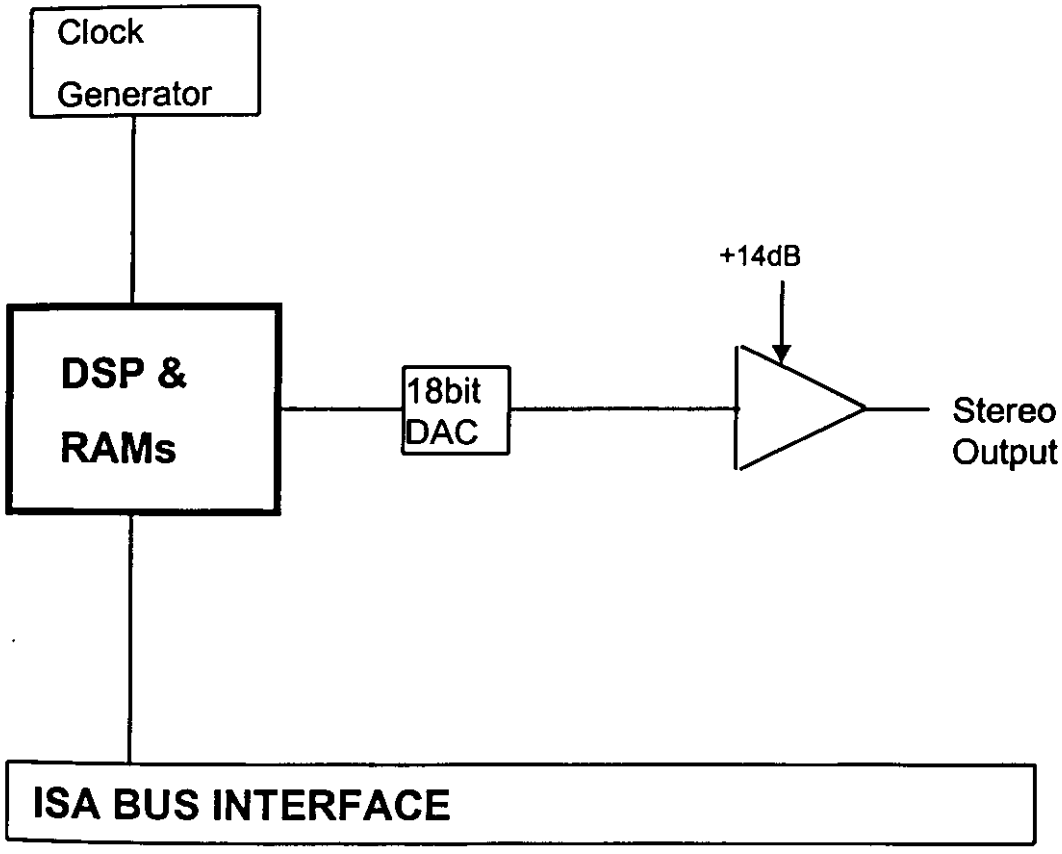
Figure 3.1 Configuration of Tested System



# 4 BLOCK DIAGRAM(S) OF EQUIPMENT

## 4.1 Clock schematics of PCX20V2 board

Crystal and oscillators :.....66 Mhz (DSP 56000)
.....24.576 Mhz (Sampling frequency)
.....22.5792 Mhz (Sampling frequency)



# 6 CONDUCTED EMISSION DATA

## 6.1 Test Procedure

The product has been tested according to ANSI C63.4-1992, CISPR 22-1993/A1:1995 and EN55022:1994/A1:1995.

The product has been tested with 120V / 60Hz power line voltage and compared to the CISPR 22 Class B limits. Measurement bandwidth was 9 KHz from 150 KHz to 30 MHz.

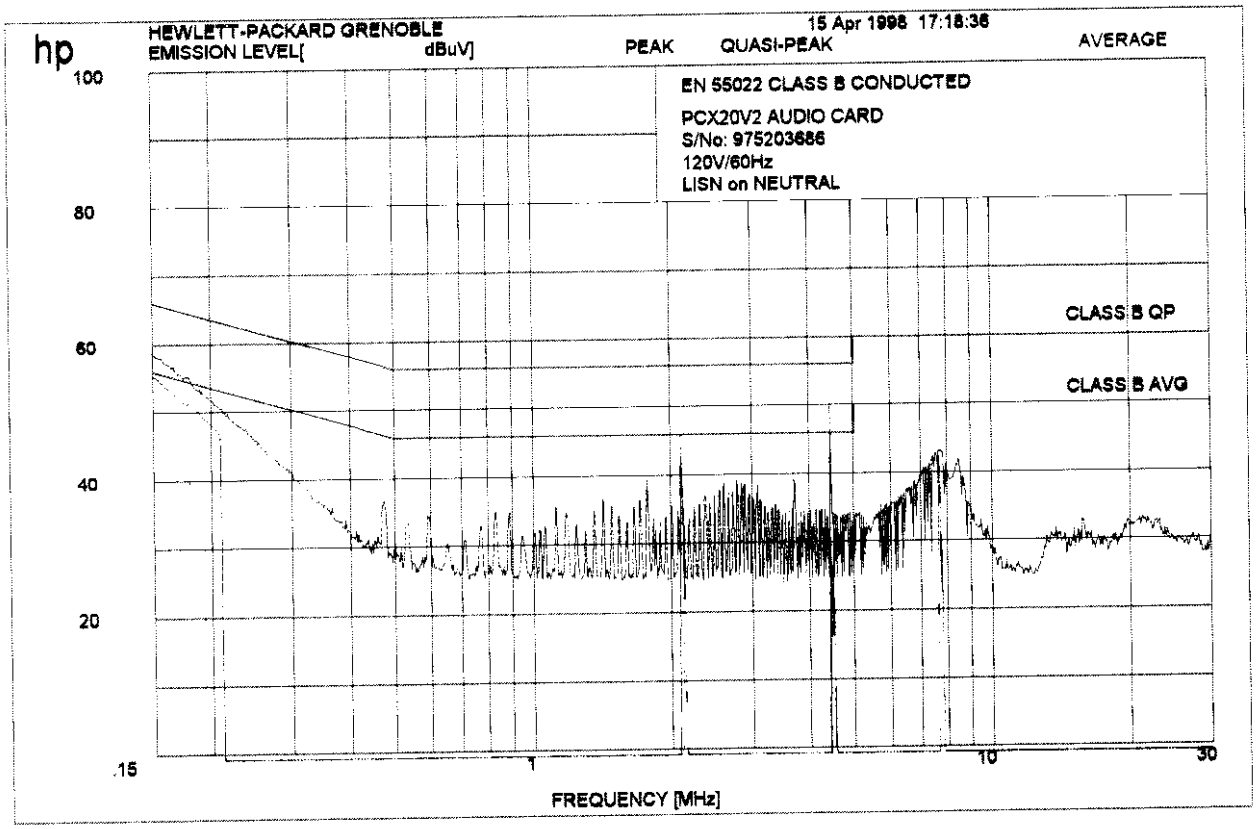
Measurement was initially made with an HP-8568B Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the HP-85650A Quasi-Peak Adapter on the analyzer for any strong signal. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.

Both the Peak and Quasi-Peak data are shown on the following plots. Where a Quasi-Peak measurement has been performed, a Quasi-Peak trace has been added under the Peak trace in order to show the QP level. Area where Quasi-Peak measurement were performed and other points of interest 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.

Test equipment :
HP 8568B Analyzer
HP 85650A Quasi Peak adapter
Rhode & Schwarz ESH2-Z5, LISN N° 1
Rhode & Schwarz ESH2-Z5, LISN N° 2

## 6.2 Neutral conducted emission data




**- Quasi peak:**

HEWLETT-PACKARD GRENOBLE 15 Apr 1998 17:18:36

1. CONDUCTED
   1.2 EN55022/CISPR 22 CLASS B S2 JAN97

Quasi-Peaks above -30 dB of Limit Line #1
peak criteria = 6 dB

| PEAK# | FREQ (MHz) | (dBuV) | DELTA |
|---|---|---|---|
| 1 | 4.462 | 45.2 | -10.8 |
| 2 | 2.116 | 41.6 | -14.4 |
| 3 | 7.697 | 42.3 | -17.7 |
| 4 | 7.779 | 31.1 | -28.9 |

**- Average:**

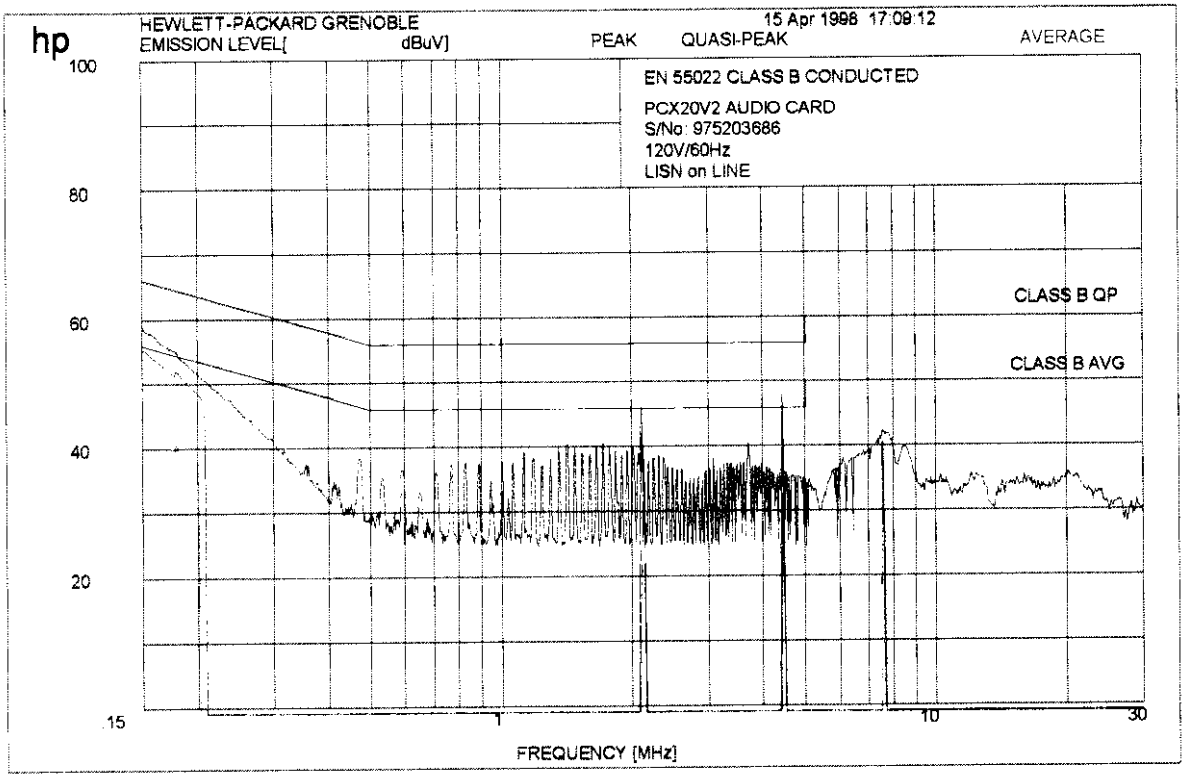
HEWLETT-PACKARD GRENOBLE 15 Apr 1998 17:18:36

1. CONDUCTED
   1.2 EN55022/CISPR 22 CLASS B S2 JAN97

Avg Peaks above -30 dB of Limit Line #2
peak criteria = 6 dB

| PEAK# | FREQ (MHz) | (dBuV) | DELTA |
|---|---|---|---|
| 1 | 7.697 | 39.9 | -10.1 |
| 2 | .1796 | 39.9 | -14.6 |
| 3 | 4.51 | 31.2 | -14.8 |
| 4 | 4.462 | 30.1 | -15.9 |
| 5 | 2.138 | 29.7 | -16.3 |
| 6 | 7.779 | 31.1 | -18.9 |

## 6.3 Line conducted emission data




**- Quasi peak:**

```
=============================================================
HEWLETT-PACKARD GRENOBLE          15 Apr 1998  17:09:12
=============================================================
 1. CONDUCTED
    1.2  EN55022/CISPR 22 CLASS B S2 JAN97
=============================================================
Quasi-Peaks above -30 dB of Limit Line #1
  peak criteria = 6 dB
PEAK#     FREQ (MHz)        (dBuV)          DELTA
  1         4.462            45.5          -10.5
  2         2.116            41.9          -14.1
  3         7.576            40.7          -19.3
```

**- Average:**

```
=============================================================
HEWLETT-PACKARD GRENOBLE          15 Apr 1998  17:09:12
=============================================================
 1. CONDUCTED
    1.2  EN55022/CISPR 22 CLASS B S2 JAN97
=============================================================
Avg Peaks above -30 dB of Limit Line #2
  peak criteria = 6 dB
PEAK#     FREQ (MHz)        (dBuV)          DELTA
  1         2.127            35.7          -10.3
  2         7.536            37.8          -12.2
  3         4.439            32.7          -13.3
  4          .1796           40.7          -13.8
```

# 7 RADIATED EMISSION DATA

## 7.1 Test Procedure

The product has been tested according to ANSI C63.4-1992, CISPR 22-1993/A1:1995 and EN55022:1994/A1:1995.

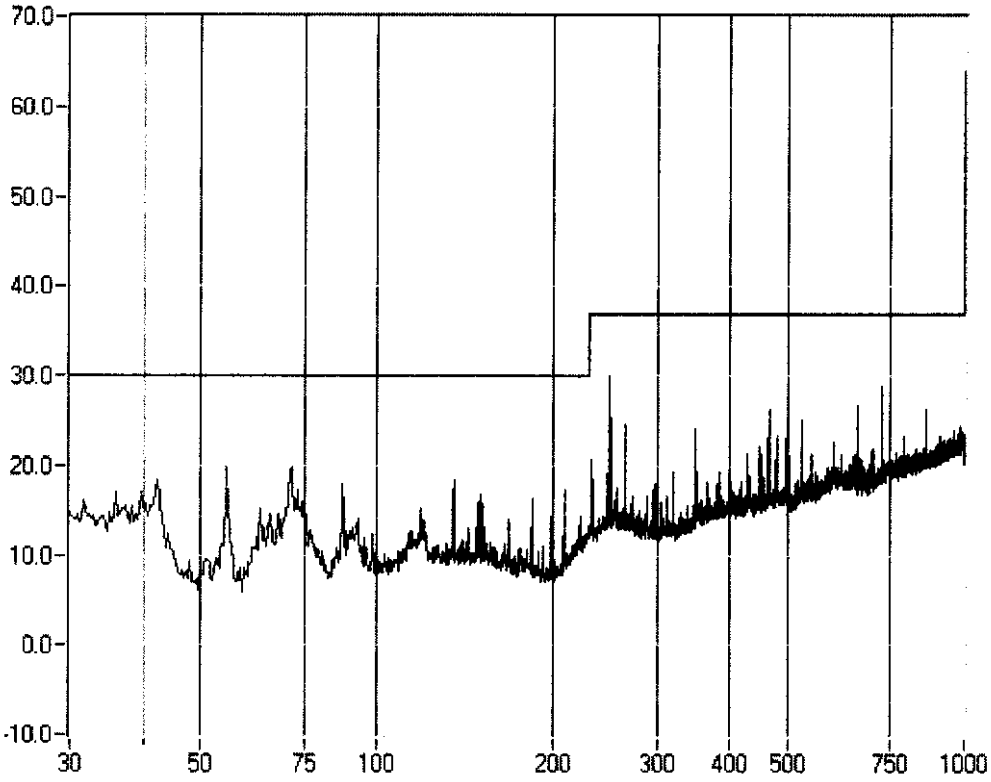
The product has been tested with 230V / 50Hz power line voltage, at a distance of 10 meters from the antenna and compared to the CISPR 22 Class B limits. Measurement bandwidth was 120 KHz from 30 MHz to 1 GHz.

Antenna height search was performed from 0.9m 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 the following page.

**Test Equipment:**
HP 8546A E.M.I Receiver
HP 85460A RF Filter section
CHASE Bilog Antenna CBL 6112 / 26-2000 MHz

## 7.2 Radiated Emission data




**Final result:**

| Frequency (MHz) | QPeak Lmt (dBµV/m) | QPeak (dBµV/m) | Peak (dBµV/m) | QPeak-Lmt (dB) | Angle (deg) | Pol | Hgt (cm) | Tot Corr (dB) |
|---|---|---|---|---|---|---|---|---|
| 56.07 | 30.00 | 25.18 | 27.82 | -4.82 | 278 | V | 281 | 6.36 |
| 72.10 | 30.00 | 21.27 | 24.41 | -8.73 | 160 | V | 104 | 6.80 |
| 250.14 | 37.00 | 33.20 | 34.06 | -3.80 | 35 | V | 147 | 15.38 |
| 660.00 | 37.00 | 31.00 | 32.32 | -6.00 | 10 | H | 140 | 21.17 |
| 725.99 | 37.00 | 29.22 | 30.75 | -7.78 | 312 | V | 242 | 21.54 |
| 857.99 | 37.00 | 26.66 | 28.60 | -10.34 | 1 | V | 219 | 23.11 |

## 7.3 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 follows:

FS = RA + AF + CF - AG

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/m

The 32 dBuV/m value can be mathematically converted to its corresponding level in uV/m.

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20]= 39.8 uV/m

# 8 PHOTOS OF TESTED EUT

The following photos are attached:

**Attachment A. Product Data Sheet**
(2 pages)

Digigram
Products

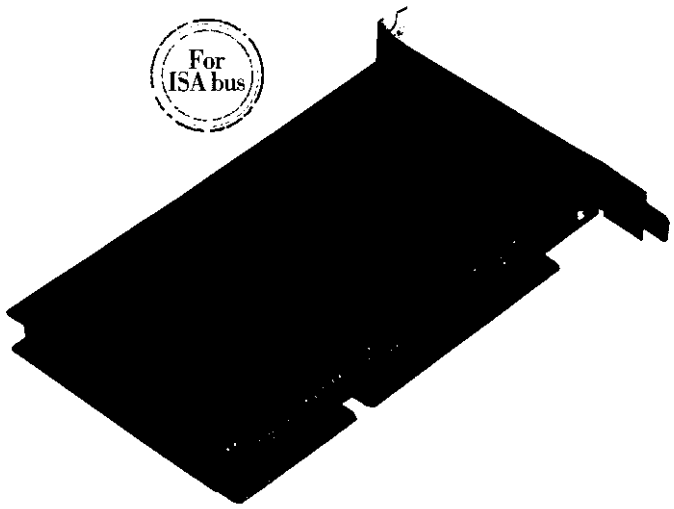
# PCX20 v2
## A low cost PCX board for playback only

**Specially designed for broadcast applications, the PCX20 v2 is an ISA bus half-length board with two unbalanced analog mono audio outputs.**

The PCX20 v2 improves on its predecessor, the PCX20, incorporating a faster DSP (66 MHz instead of 40 MHz) and more RAM to yield greater processing power. Yet, the PCX20 v2 remains fully compatible with the applications built on the PCX20 board.

A high level of processing power allows the PCX20 v2 to handle both MPEG Audio (compressed mode) and PCM (linear mode) data. Real-time processing operations such as simultaneous coding/decoding or mixing of several tracks may be carried out in both modes.

PCX20 v2 is available with a complete set of development tools, Xtrack multitrack editor and a wide range of applications developed by Digigram's OEMs.



FCC ID: IGTPCX20V2

# PCX20 v2
# Technical features

**Principal features**
- Two-channel playback-only PC sound card for ISA bus
- Processing and playback of professional-quality sound
- For multi-channel applications, the system can be extended to several non-synchronized PCX20 boards
- Unbalanced analog audio outputs

**Processing power**
- Motorola-56002 DSP
- DSP Clock frequency: 66 MHz
- RAM: 128 kwords

**Audio specifications**
- Two-channel analog outputs (18 bit D/A conversion)
- Programmable sampling frequency among the following values: 48, 44.1, 32, 24, 22.05, 16, 11.025, 8 kHz
- Frequency response at 48 kHz: 20 Hz - 20 kHz: ± 0.2 dB
- Signal/noise ratio: > 88 dB
- Distortion + noise at 1 kHz: < -84 dB
- Phase difference between channels: 20 Hz - 20 kHz: 0.1° / 1°
- Unbalanced line outputs and headphone output (600 Ω)
- Maximum output levels: +14 dBu
- Programmable digital gain

**Processing functions***
- Real-time MPEG Audio decompression (two channels), professional audio quality. This format reduces disk storage requirements in a programmable ratio of 1:4 to 1:48. At 128 kbps (1:6 compression at 48 kHz), 1 minute of mono sound (or 30 seconds of stereo sound) takes up only 960 Kbytes. PCX20 v2 supports Layers I and II of the ISO/MPEG Audio standard (ISO 11172-3) and the low sampling frequencies of the MPEG2 Audio standard (ISO 13818-3)
- Playback in PCM mode (no compression)
- Real-time mixing of several PCM or MPEG Audio files: up to 8 stereo MPEG Audio Layer II tracks at 256 kbps or up to 2 stereo PCM tracks
- A wide range of software functions:
  - Time-stretching (in real time and offline)
  - Pitch-shifting
  - Scrubbing
  - Panning
  - Format conversion
  - Sampling frequency conversion

** Optimum performance of the card achieved with the np driver. Performance in PCM depends on the PC used.*

**Limitations**
- 8-bit exchange between the PC and the board (vs 16-bit on the PCX9 and PCX11+ boards), which permits mixing of fewer number of tracks in linear mode
- No interboard synchronization
- IRQ not shared with other boards
- No SMPTE input
- No digital option

**Physical format and connections**
- ISA bus board, 1 slot, half-length format (160 mm x 85 mm)
- Connections:
  - two CINCH connectors for analog outputs
  - stereo headphone mini jack (3.5 mm)

**Driver**
PCX20 v2 is managed by both the PCX and np drivers.

**Available on request**
- PCXtools — development tools
- WAVE driver

**Options**
- PCX Designer Kit (Windows)
- Application software