



CISPR 22 Class B - MEASUREMENT / TECHNICAL REPORT
HEWLETT PACKARD VECTRA XA 6/233DT VECTRA XA 6/266DT
VECTRA XA 6/300DT VECTRA XA 6/333DT

FCC ID: B94VECTRAXA6DT

Mai 11, 1998

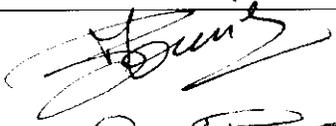
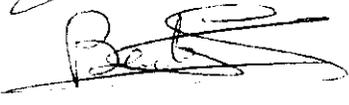
This report concerns (check one): Original grant _____ Class II change <input checked="" type="checkbox"/>	
*Class B verification _____ *Class A verification _____ *Class I change _____	
Equipment type: <u>Personal Computer</u> (ex.: computer, printer, modem, etc.)	
Request issue of grant: <input checked="" type="checkbox"/> Immediately upon completion of review. <input type="checkbox"/> Defer grant per 47 CFR 0.457(d)(1)(ii) until _____ date _____ Hewlett Packard Company 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: <input type="checkbox"/> Applicant requests the existence of this grant to be kept confidential until _____ The announcement of this product before this date via freedom of information would be detrimental to Hewlett-Packard, 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: CISPR 22 <input checked="" type="checkbox"/> Part 15 _____	
Measurement procedure used is ANSI C63.4-1992 unless another is specified.	
Other test procedure: _____	
Report prepared by: Martine BOUVIER	Signature: 
Report approved by: Yves BARDET Hewlett Packard France 5 Avenue Raymond Chanas - EYBENS 38053 GRENOBLE CEDEX 9 FRANCE	Signature: 
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1 GENERAL INFORMATION

1.1 Product Description

The Vectra compatible desk top personal computers described in this report are all using the same printed board and differ only from processor type used. Three mass storage shelves are provided on the front panel plus internal shelves for internal Hard Disc Drives, along with two ISA slots, three PCI slots, one ISA/PCI combo slot, one on board AGP Ultra VGA video port with 1600 x 1200 @ 85Hz non-interlaced maximum available resolution, one serial port, one parallel port, one USB (Universal Serial Bus) port, audio functionality (stereo out, stereo in and microphone ports plus a 120 Watts power supply. This submittal report is dedicated to a Class II change covering introduction of two new alternate power supply models, one model from DELTA and another model from ASTEC. All other parts of the machine remain unchanged.

Vectra models covered with processor are:

Vectra model	Processor type and speed	Processor input frequency
Vectra XA 6/233DT	Pentium II, 233MHz	66.666 MHz
Vectra XA 6/266DT	Pentium II, 266MHz	66.666 MHz
Vectra XA 6/300DT	Pentium II, 300MHz	66.666 MHz
Vectra XA 6/333DT	Pentium II, 333MHz	66.666 MHz

1.2 Related Submittal(s) / Grant(s)

All host peripherals used to collect data for this submittal possess grants as listed in the FCC PAL data base or are using the FCC self-authorization process based on manufacturer's declaration of compliance per 47CFR Parts 0, 2 and 15 [ET Docket No. 95-19; FCC 96-208].

1.3 Tested System Details

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

Model & Serial No	FCC ID	Description	Cable Description
Vectra XA 6/300DT (1) FR73263701	B94VECTRAXA6DT	Personal Computer	Unshielded power cord
D2845A (2) JP63600324	ACJ93312126	Ultra VGA Color monitor	Video ferrite removed before test
C4732 M97042358	GYUR41SK	Keyboard	Shielded keyboard cable
C2164A SG63G1P030	B942164X	Printer, Centronics I/F	HP24542D shielded Centronics cable
HP 48GX 3621508954		Graphic calculator RS232 I/F	Shielded RS232 cable
C3751B LZA55100088	DZL211029	Mouse	Shielded cable (3)
5182-8847 LTC73300009	N/A (D.O.C)	USB Scanner	USB shielded cable
Audio kit: loudspeakers, microphone, headphones	N/A		Shielded audio cables
HP 5183-0798 (1) FR75002342	B94SCLAN	Wide SCSI/100BT Lan interface card	Shielded SCSI cable Unshielded LAN cable
C1520G GB00091909	B94TC152XX	SureStore Tape 2000	Shielded SCSI interface cable

(1) EUT submitted for grant

(2) Monitor's attached video cable includes grantee supplied Ferrite ? Yes _____ No X

(3) Mouse cable permanently attached to mouse

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 EN 5022:1994/A1:1995 . Radiated testing was performed at an antenna to EUT distance of 10 meters.

1.5 Test Facility

The test facility used to collect the conducted and radiated 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 / CISPR 22 norms for 89/336/EEC European EMC Directive application. All pertinent data for this test facility remains unchanged.

2 SYSTEM CONFIGURATION

2.1 Justification

In order to show the performance of the product for all possible configurations, each processor speed and processor type has been tested during pre-test scans evaluation. The Vectra XA 6/300DT with Pentium II 300MHz processor, has been identified as the worst case product during these pre-test scans. Consequently, all tests results contained in this report are from the Vectra XA 6/300DT. The system was configured for testing in a typical fashion (as a customer would normally use it). The Vectra XA 6/300DT is running at the maximum speed compatible with the processor selected. Since the high speed selection was found to be the worst case, this mode was used to collect the included data. The system was pretested in all supported video resolution modes. The 1600 x 1200 at 85Hz refresh rate (non-interlaced) has been identified as the most severe condition with an equivalent dot clock of 208MHz. Since this graphic mode was found to be the worst case, this mode was used to collect the included data. In this extremely severe condition, the Vectra XA 6/300DT was still in compliance with CISPR 22 Class B requirements. According to FCC Part 15, Subpart A, paragraph 15.33, the upper frequency measurement range has been extended to 2GHz because the video equivalent dot clock was 208MHz during EMI tests. No significant emission has been found upon 1000MHz.

The system was equipped with an optional FCC Class B certified SCSI/100BT LAN card. The 100 Base-T I/O connector was connected to a 100 Base-T LAN cable, 2.5m long and connected to a 100 Base-T termination. LAN activity was emulated by sending continuous data flow on 100 Base-T LAN cable, which is more severe than the normal use. During normal operation on a customer site, LAN data activity is not continuous (data activity represents a very small percentage of the LAN capability)

The USB port was loaded with a real device (USB secondary mouse) during compliance testing.

The rear audio ports were loaded with loudspeakers.

The front panel audio port was loaded with headphones and microphone (microphone connected to front panel was identified as worst case compared to microphone connected to rear during pre-test scan).

During pre-test scans, a Class B certified ultra VGA video card was tested in one of the PCI slots (Matrox Millennium card), but the worst case was observed with the on-board AGP ultra VGA video. Therefore, the final qualification was completed with on-board video.

2.2 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 software, contained on a CD-ROM, was inserted into the CD drive and is auto-starting on power up. Once loaded, the program sequentially exercises each system component in turn. The sequence is: (1) an H line is printed on the monitor, (2) speaker beep, (3) mass storage devices exercised, (4) H is sent to the RS 232 port, (5) printer prints an H, LAN is activated. The complete cycle takes about 2 seconds and is repeated continuously. As the keyboard and the mouse are strictly input devices, no data is transmitted to them during test. They are, however, continuously scanned for data input activity.

2.3 Special Accessories

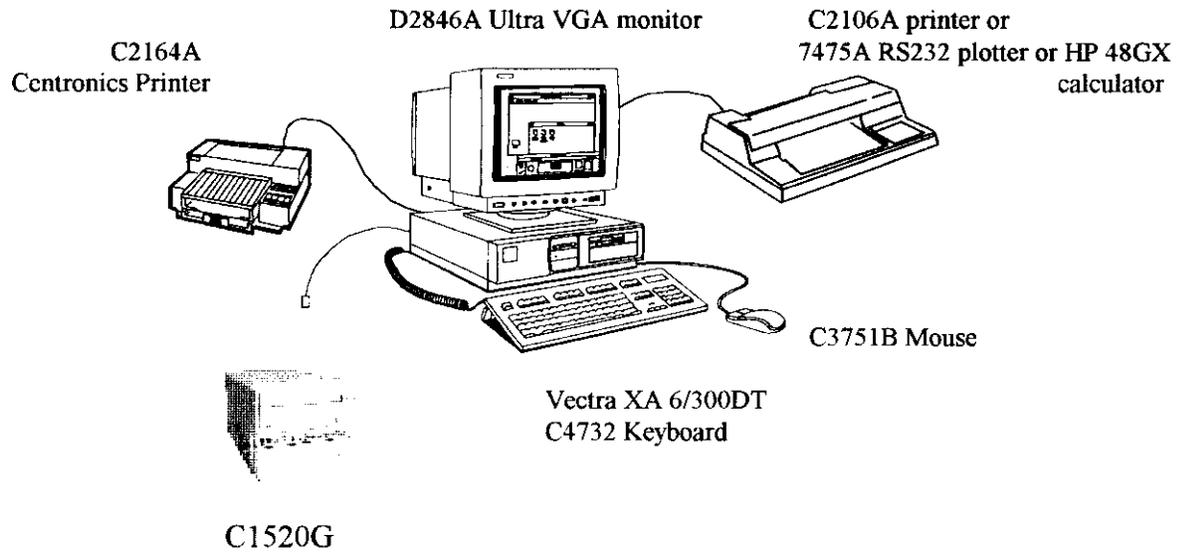
As shown in Figure 3.1, all interface cables used for compliance testing are shielded as normally supplied by Hewlett Packard Company. These cable model and part numbers are marketed with Hewlett Packard peripherals to the end user, and appear on our related product price list supplied to our customers. All cable connectors feature integral metal hoods for shielding.

2.4 Equipment Modifications

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

2.5 Configuration of Tested System

Figure 3.1 Configuration of Tested System



- HP24542G = 2m long RS232 cable
- HP24542D = 2m long Centronics cable
- Keyboard cable: Shielded, 2m long, Part Number 5062-6225
- Mouse cable: 2.5m long, permanently attached to mouse

4 CONDUCTED EMISSION DATA

The product has been tested according to the following standards:

- ♦ ANSI C63.4-1992
- ♦ CISPR 22:1993/A1:1995
- ♦ EN 55022:1994/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.

A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

Test Equipment:

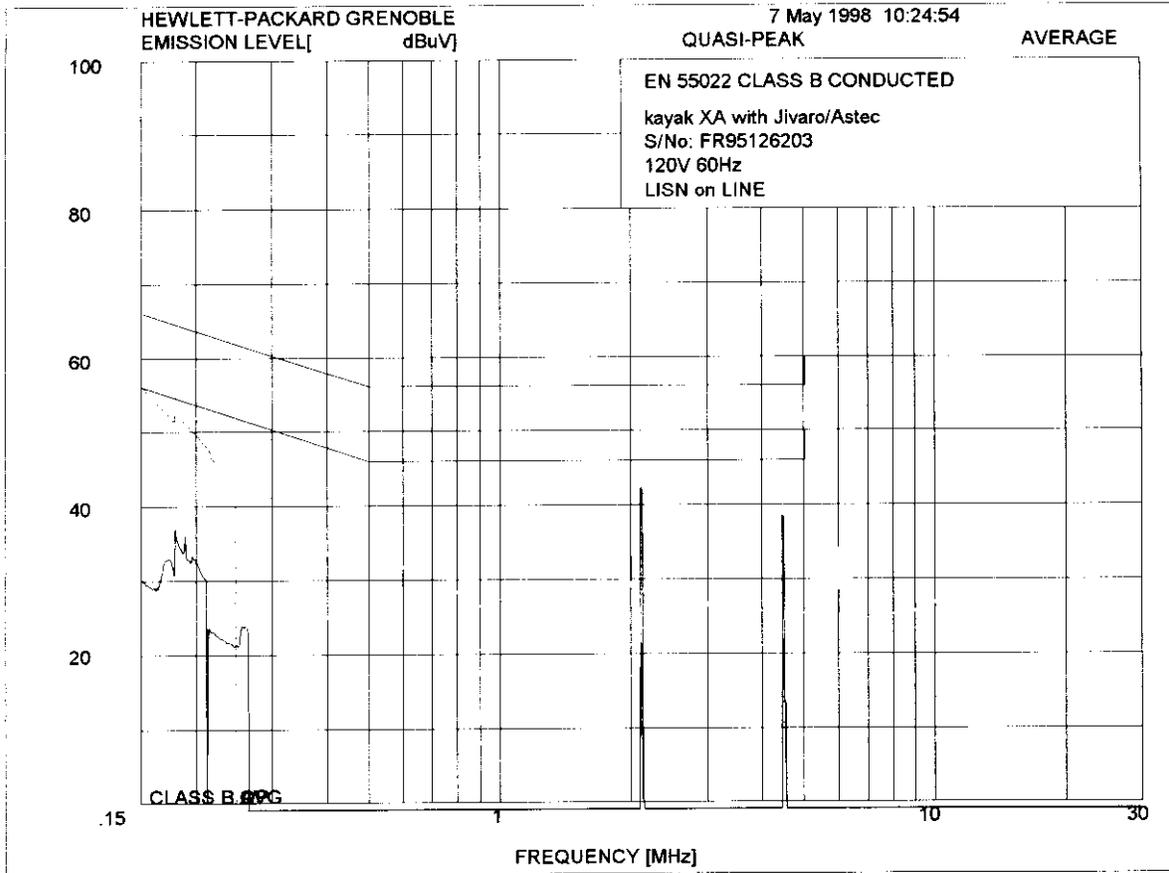
HP-8568B Analyzer

HP-85650A Quasi-Peak adapter.

Rhode & Schwarz ESH2-Z5, LISN No 1

Rhode & Schwarz ESH2-Z5, LISN No 2

4.1 Astec Power Supply - Line Conducted Emission Data



- Quasi peak:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	2.105	42.3	-13.7
2	4.462	38.7	-17.3

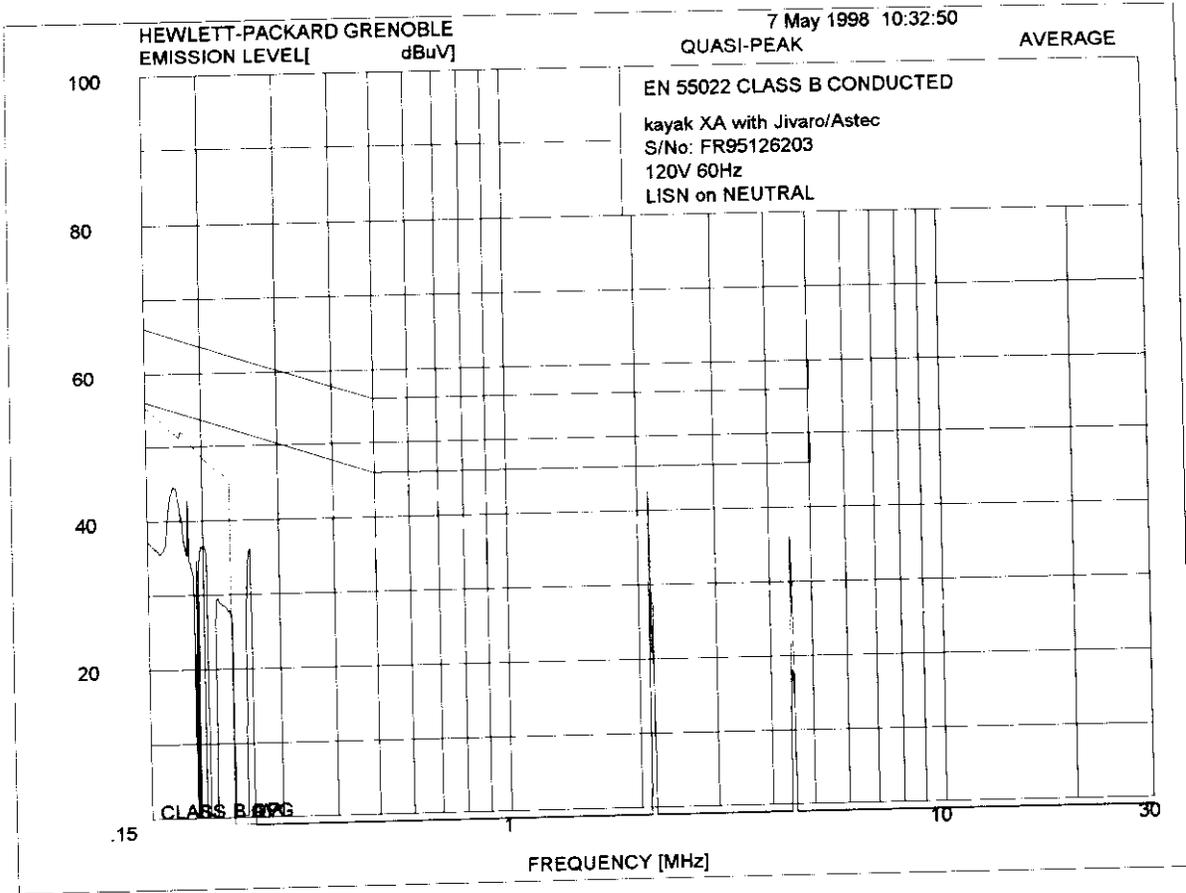
- Average:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.1796	37.1	-17.4
2	4.462	22.1	-23.9
3	2.105	21.5	-24.5
4	.256	23.9	-27.6

4.2 Astec Power Supply - Neutral Conducted Emission Data



- Quasi peak:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	2.116	42.6	-13.4
2	4.462	36.2	-19.8

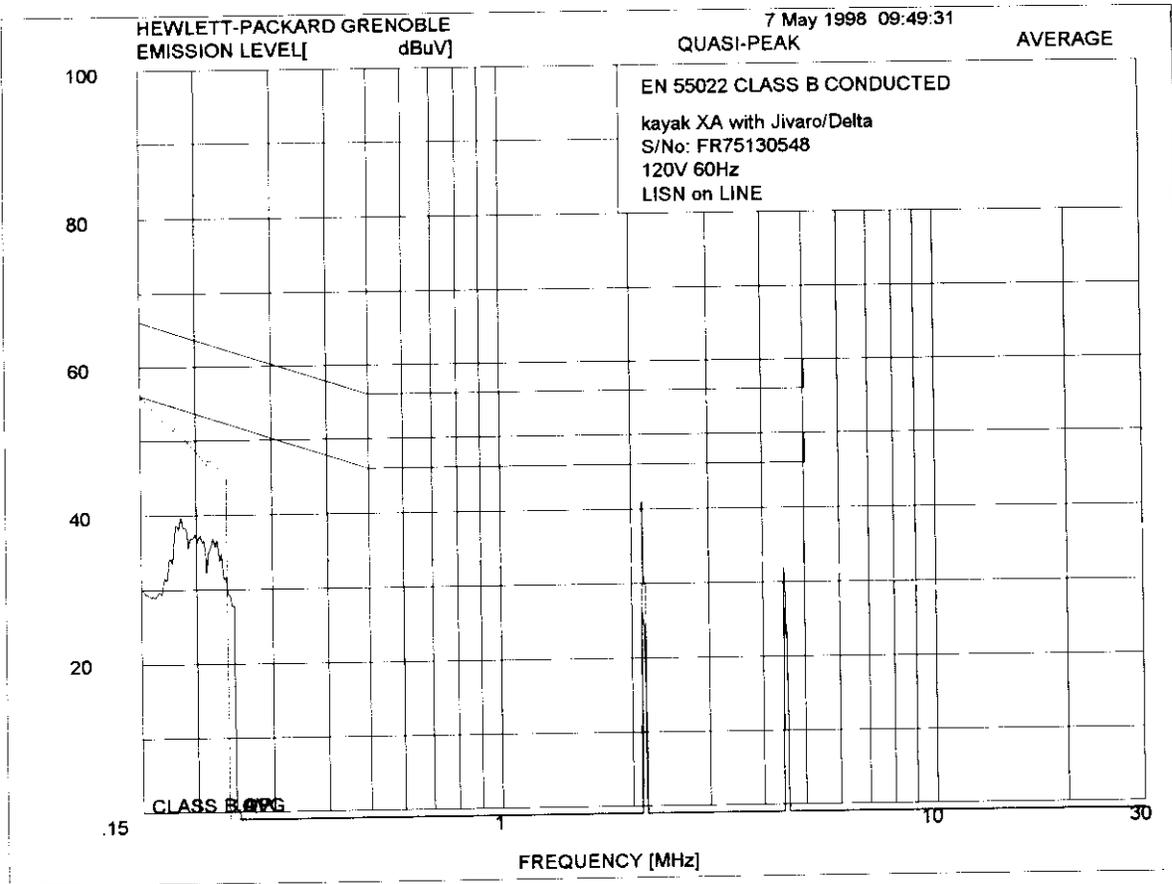
- Average:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.1721	44.7	-10.1
2	.1854	42.9	-11.3
3	.2574	36.2	-15.3
4	2.116	29.3	-16.7
5	.2018	36.7	-16.8
6	.1934	34.7	-19.1
7	.2161	29.5	-23.4
8	4.462	18.1	-27.9

4.3 Delta Power Supply - Line Conducted Emission Data



- Quasi peak:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	2.116	41.1	-14.9
2	4.462	32	-24.0

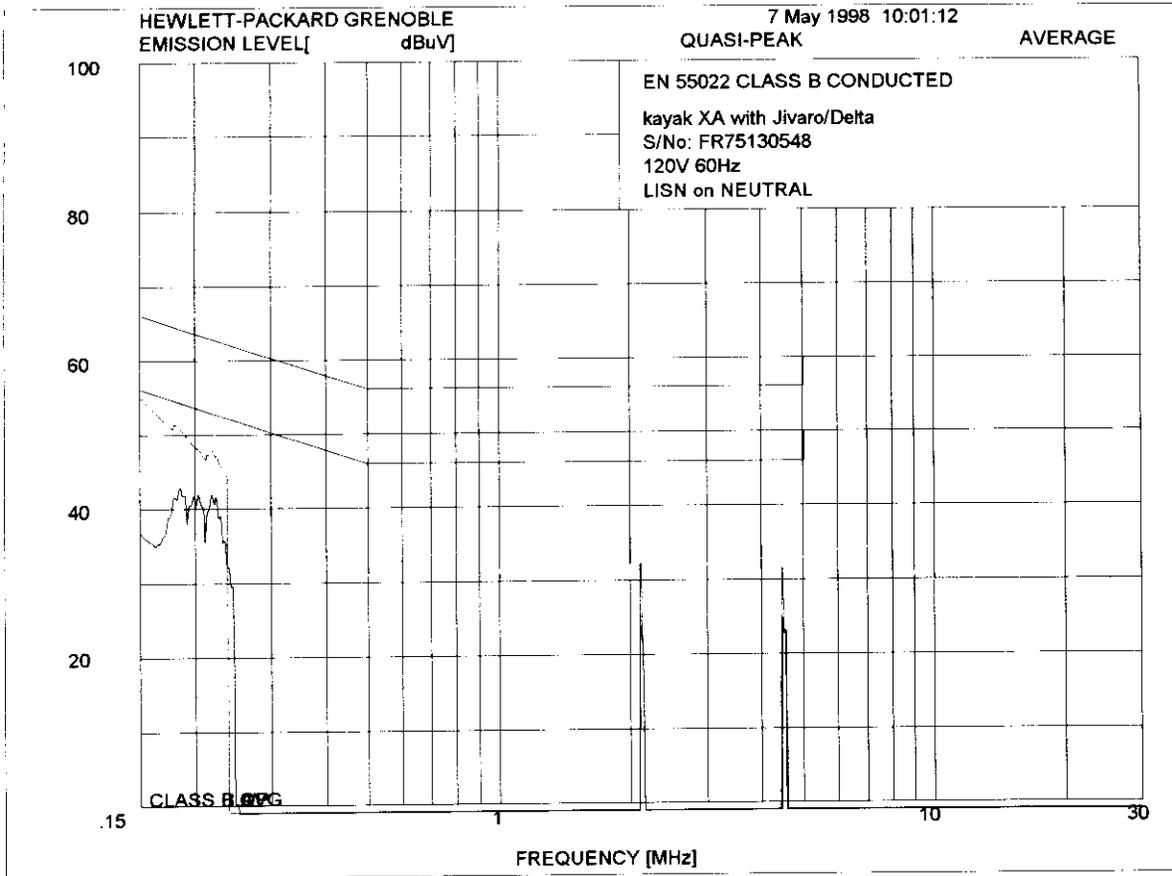
- Average:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.1844	39.6	-14.6
2	2.105	26.4	-19.6
3	4.462	26.4	-19.6

4.4 Delta Power Supply - Neutral Conducted Emission Data



- Quasi peak:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	2.105	32.3	-23.7
2	4.462	31.7	-24.3

- Average:

=====

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

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.2196	41.9	-10.9
2	.1854	42.9	-11.3
3	4.462	24.9	-21.1
4	2.105	23.9	-22.1

5 RADIATED EMISSION DATA

The product has been tested according to the following standards:

- ANSI C63.4-1992
- CISPR 22:1993/A1:1995
- EN 55022:1994/A1:1995.

Both 120V/60Hz and 230V/50Hz have been tested during prescan. The product has been tested with 230V / 50Hz power line voltage (worst case) , 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 and 1 MHz upon 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.

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 System
(HP-85462A, 9KHz to 6.5GHz Receiver + HP-85460A RF Filter Section)
EMCO 3110 Biconical Antenna S/No 1245 & EMCO 3146 Log Periodic Antenna S/No 1151
5 meters diameter Turntable (Deisel model DS450.11), two antenna masts (Deisel model MA242)
EMCO 3147, 200MHz - 5GHz Log Periodic Antenna
EMCO 3147, 200MHz - 5GHz Log Periodic Antenna
EMCO 3110, 30MHz - 300MHz Biconical Antenna
EMCO 3104, 30MHz - 200MHz Biconical Antenna
CHASE CBL6111, 30MHz - 1GHz Bilog Antenna
EMCO 3115, 1GHz - 18GHz Double-Ridged Horn
EMCO 3115, 1GHz - 18GHz Double-Ridged Horn

5.1 Astec Power Supply - Radiated Emission Data

RADIATED EMISSIONS REPORT : 30 MHz ---> 2000MHz.

Date : 5/5/98 2:41 PM

Product : JIVARO ASTEC power supply set in Kayak XA 6/300 DT

Config : 1600*1200@85Hz

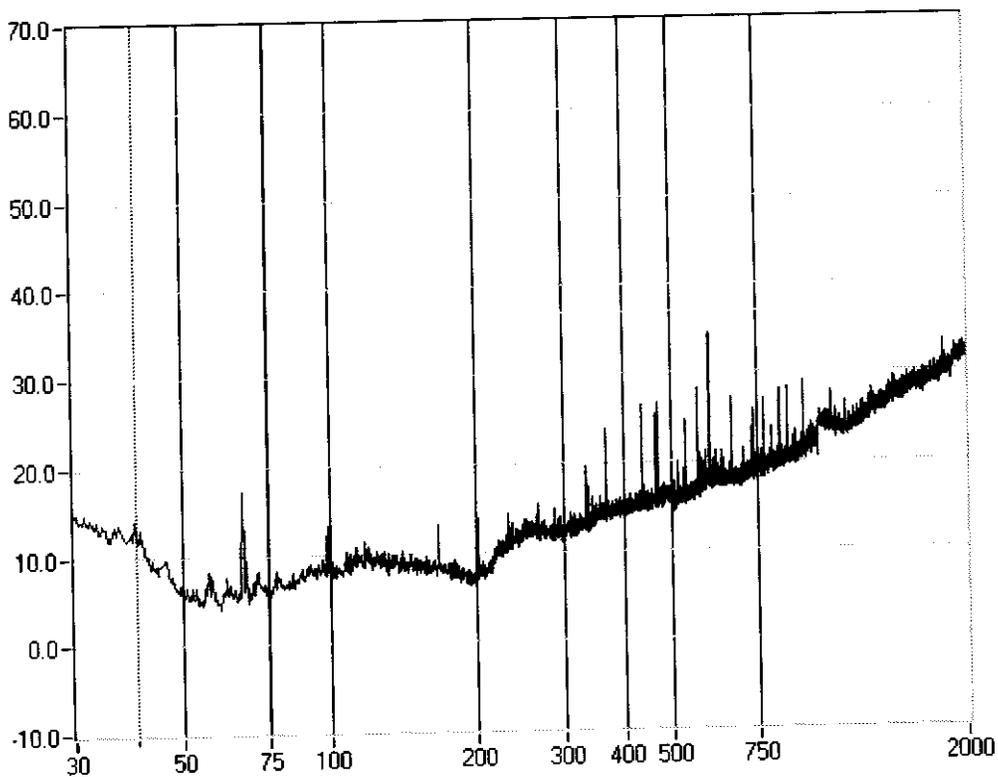
S/N : FR75126203

Operator : N.DOMPNIER

Limit used : EN_FCC_B

S0 Anecoic chamber. 10 meters measurement.

Prescan:



Final result:

Frequency (MHz)	QPeak Lmt (dBuV/m)	QPeak (dBuV/m)	Peak (dBuV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)
200	30	23.93	24.5	-6.07	332	H	360	11.03
333.35	37	29.69	30.86	-7.31	23	H	302	15.9
600.01	37	32.06	33.13	-4.94	147	H	173	21.28
666.67	37	35.32	36.01	-1.68	134	V	358	21.16
733.34	37	33.44	34.14	-3.56	336	H	100	21.66
866.69	37	34.61	35.44	-2.39	334	V	188	23.16

5.2 Delta Power Supply - Radiated Emission Data

RADIATED EMISSIONS REPORT : 30 MHz ---> 2000MHz.

Date : 5/5/98 5:26 PM

Product : JIVARO DELTA power supply set in Kayak XA 6/300DT

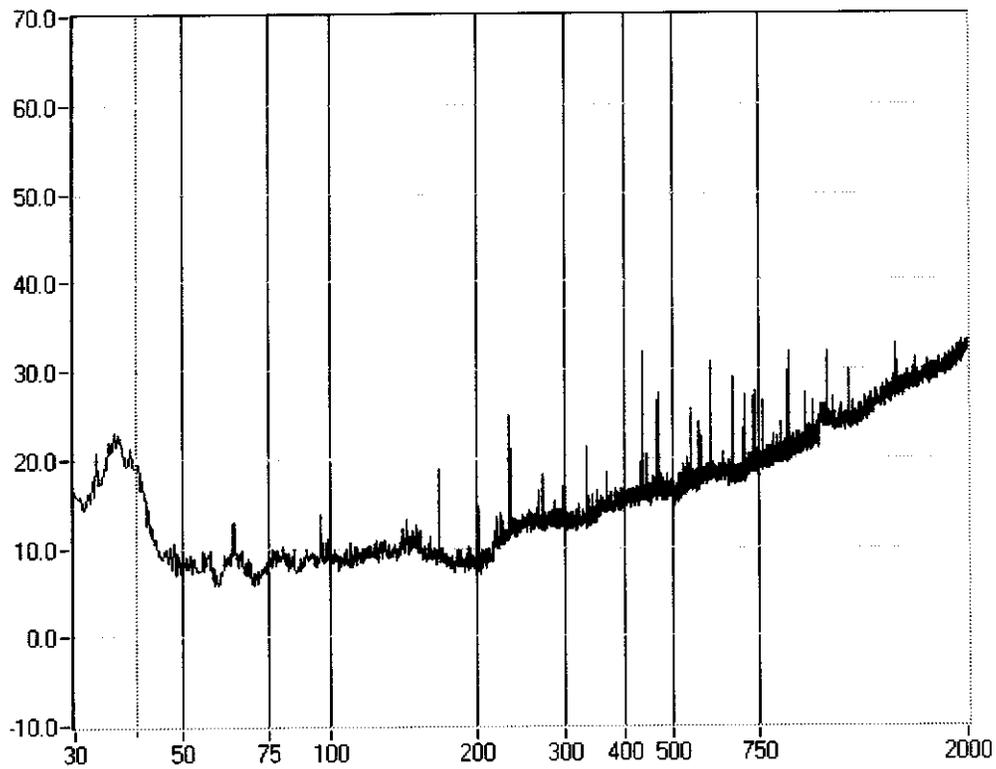
Config : 1600*1200@85Hz

S/N : FR75130548

Operator : N.DOMPNIER

Limit used : EN_FCC_B

Prescan:



Final result:

Frequency (MHz)	QPeak Lmt (dBuV/m)	QPeak (dBuV/m)	Peak (dBuV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)
36.45	30	23.91	26.7	-6.09	157	V	100	15.04
433.33	37	31.55	33.01	-5.45	59	H	202	18.1
600	37	32.91	33.51	-4.09	302	H	213	21.28
666.69	37	34.15	35.41	-2.85	318	H	150	21.16
859.09	37	29.65	31.38	-7.35	52	H	103	23.11
866.68	37	35	35.99	-2	358	V	178	23.16

5.3 Field Strength Calculation

The Field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\text{Corr Factor (dB)} = \text{AF} + \text{CL} - \text{AG}$$

$$\text{ABS (dBuV/m)} = \text{RA} + \text{Corr Factor}$$

where ABS = Absolute Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CL = Cable Loss

AG = Amplifier gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Loss of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m. The 32 dBuV/m value can be mathematically converted to its corresponding level in uV/m.

$$\text{ABS} = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{common Antilogarithm} [(32 \text{ dBuV/m})/20] = 39.8 \text{ uV/m}$$

6 PHOTOS OF TESTED EUT

The following photos are attached:

- ◆ DELTA Power Supply, External view
- ◆ DELTA Power Supply PC Board, Component Side
- ◆ DELTA Power Supply PC Board, Foil Side
- ◆ ASTEC Power Supply PC Board, Component Side
- ◆ ASTEC Power Supply PC Board, Foil Side