GTCO CalComp
PERIPHERALS

TEST REPORT TO FCC PART 15 SUBPART B AND EN55022 FOR:

USB CONVERSION BOX MODEL USB

[redacted]

PREPARED FOR:

GTCO CalComp
14555 North 82nd Street
Scottsdale, AZ 85260

PREPARED BY:

Kenneth B. Jacobson
Product Support Engineer
GTCO Calcomp
14555 North 82nd Street
Scottsdale, AZ 85260

DATE OF REPORT:

05/10/99

TABLE OF CONTENTS

I. OVERVIEW OF TEST REPORT

The procedures used for the conducted and radiated tests were derived from the American National Standard ANSI C63.4-1991 as stated in FCC CFR 47, Part 15, Paragraph 15.31. The test side attenuation and layout was done in accordance with ANSI C63.4-1991 and is on file with the FCC as required in FCC CFR 47, Part 2, Paragraph 2.948.

PRODUCT TESTED:	USB Conversion Box, Model USB
TRADE NAME:	None
APPLICANT:	GTCO CalComp 14555 North 82nd Street Scottsdale, AZ 85260
MANUFACTURER:	Same as Applicant
TEST FACILITY LOCATION:	Same as Applicant
TEST DATE:	05/5/99

The measurement data contained in this report reflects an accurate representation of the emission characteristics of the produce mentioned above.

REPORT PREPARED AND APPROVED BY: _____

Kenneth B. Jacobson
Product Support Engineer
GTCO CalComp

II. STATEMENT OF COMPLIANCE

Under the test configuration as described in this test report, the product tested has shown that it complies to the requirements of:

FCC RULES, PART 15, SUBPART B, CLASS B LIMITS

The product tested has shown that it also complies to the requirements of:

EC STANDARD EN55022/CISPR 22, CLASS B LIMITS

We, GTCO Calcomp, assume full responsibility to manufacture the product as shown in the enclosed photographs to uphold compliance to the FCC rules.

SIGNED: _____
Randy Crutchfield

TITLE: Manager of Engineering

DATE: 5/13/99

III. DESCRIPTION OF TEST SAMPLE

The USB Conversion Box, Model USB, is a small peripheral device that converts standard RS-232 data to the new Universal Serial Buss data (USB) and visa versa and can be attached to the I/O cable of standard GTCO CalComp digitizers and then connected to the host computer.

The Conversion Box consists of a single PCB with a 9-pin D-Sub connector and a pig tail cable with a USB connector attached to it. The conversion of data is handled by a microprocessor with a clock speed of 12MHz. The Conversion Box gets it power from the host computer.

IV. SUBASSEMBLIES OF TEST SAMPLE

The USB Conversion Box, Model USB consists of a single PCB board and has no subassemblies. See attached photographs.

V. TEST EQUIPMENT AND CALIBRATION

The following is a list of equipment and calibration dates that are used at GTCO CalComp's test site.

TEST EQUIPMENT	MODEL	CALIBRATION DATE	FREQUENCY
Com-Power Log Periodic Antenna	CPAL-100	06/08/98	1 Year
Com-Power Biconical Antenna	AB-100	05/28/98	1 Year
Com-Power Loop Antenna	AL-130	06/26/98	1 Year
EMCO LISN	3825/2	09/25/98	1.5 Year
EMCO LISN	3825/2	09/25/98	1.5 Year
HP Spectrum Analyzer with Quasi-Peak Adapter	8568B 85650A	11/10/98	1 Year
HP Signal Generator	HP8656B	09/15/98	1 Year
EMCO Turntable	1060	N/A	N/A
HP Plotter	HP7470	N/A	N/A
Cable	RG-59/U	05/13/98	1 Year

VI. CABLE LOSS AND ANTENNA FACTORS

Com-Power Corporation

(949) 587-9800

Antenna Calibration

Antenna Type:	Biconical
Model:	AB-100
Serial Number:	14069
Calibration Date:	5/28/98

Frequency MHz	Gain dBi	Factors dB/m
30	-14.6	14.4
40	-9.8	12.1
50	-8.0	12.2
60	-5.7	11.5
70	-3.3	10.4
80	0.8	7.5
90	3.0	6.3
100	4.1	6.1
125	-0.9	13.0
150	5.1	8.6
175	-1.8	16.9
200	-1.9	18.1
250	-2.0	20.2
300	-1.4	21.2

Trans. Antenna Height	2 meter
Receiving Antenna Height	1 to 4 meter
Calibration	3 meter
Spectrum Analyzer	
Resolution Bandwidth	100 kHz
Video Bandwidth	100 kHz
Signal Generator Output	120 dBuV

Com-Power Corporation

(949) 587-9800

Antenna Calibration

Antenna Type:	Biconical
Model:	AB-100
Serial Number:	14069
Calibration Date:	5/28/98

Frequency MHz	Gain dBi	Factors dB/m
30	-14.6	14.4
40	-9.8	12.1
50	-8.0	12.2
60	-5.7	11.5
70	-3.3	10.4
80	0.8	7.5
90	3.0	6.3
100	4.1	6.1
125	-0.9	13.0
150	5.1	8.6
175	-1.8	16.9
200	-1.9	18.1
250	-2.0	20.2
300	-1.4	21.2

Trans. Antenna Height	2 meter
Receiving Antenna Height	1 to 4 meter
Calibration	3 meter
Spectrum Analyzer	
Resolution Bandwidth	100 kHz
Video Bandwidth	100 kHz
Signal Generator Output	120 dBuV

Com-Power Corporation

(714) 587-9800

Antenna Calibration

Antenna Type:	Loop Antenna
Model:	AL-130
Serial Number:	17000
Calibration Date:	6/26/98

Frequency MHz	Magnetic (dB/m)	Electric dB/m
0.01	-41.3	10.2
0.02	-42.3	9.2
0.03	-40.6	10.9
0.04	-40.6	10.9
0.05	-41.8	9.7
0.06	-41.4	10.1
0.07	-41.5	10.0
0.08	-41.8	9.7
0.09	-41.9	9.6
0.1	-41.9	9.6
0.2	-44.0	7.5
0.3	-41.6	9.9
0.4	-41.6	9.9
0.5	-41.5	10.0
0.6	-41.3	10.2
0.7	-41.2	10.3
0.8	-41.2	10.3
0.9	-41.1	10.4
1	-40.4	11.1
2	-39.7	11.8
3	-40.3	11.2
4	-40.6	10.9
5	-40.2	11.3
6	-40.3	11.2
7	-40.7	10.8
8	-41.1	10.4
9	-40.3	11.2
10	-40.5	11.0
12	-41.1	10.4
14	-41.5	10.0
15	-41.7	9.8
16	-42.0	9.5
18	-42.0	9.5
20	-42.0	9.5
25	-43.4	8.1
30	-46.7	4.8

Trans. Antenna Height	2 meter
Receiving Antenna Height	2 meter

CERTIFICATE OF CALIBRATION CONFORMANCE

COM-POWER CORPORATION
20621 Pascal Way
Lake Forest, CA 92630
TEL: (949) 587-9800
FAX: (949) 587-9960

This antenna has been individually calibrated using ANSI C63.5, American National Standard for Calibration of Antennas used for radiated emission measurement in EMI control.

Certificate Number	1001
Client	Calcomp
Manufacturer	Com-Power
Model Number	AB-100
Serial Number	14069
Date of Calibration	05/28/98

Calibration Accuracy: ± 1 dB

Calibration Traceability:

All measurement instrumentation is traceable to the United States National Institute of Standards and Technology (NIST). Supporting Documentation relative to traceability is on file and is available for examination upon request.

Measurement procedure per Military Handbook-52A as guidance for Military Standard 45662A, ANSI/NCSL Z540-1-1994 and ISO Guide 25.

Notes:

Re-Certification Date: 1 Year from Calibration Date.

COM-POWER CORPORATION

Calibration Engineer

CERTIFICATE OF CALIBRATION CONFORMANCE

COM-POWER CORPORATION
20621 Pascal Way
Lake Forest, CA 92630
TEL: (949) 587-9800
FAX: (949) 587-9960

This antenna has been individually calibrated using ANSI C63.5, American National Standard for Calibration of Antennas used for radiated emission measurement in EMI control.

Certificate Number	1005
Client	CalComp Inc.
Manufacturer	Com-Power
Model Number	AL-130
Serial Number	17000
Date of Calibration	06/26/98

Calibration Traceability:

All measurement instrumentation is traceable to the United States National Institute of Standards and Technology (NIST). Supporting Documentation relative to traceability is on file and is available for examination upon request.

Measurement procedure per Military Handbook-52A as guidance for Military Standard 45662A, ANSI/NCSL Z540-1-1994 and ISO Guide 25.

Notes:

Re-Certification Date: 1 Year from Calibration Date.

COM-POWER CORPORATION

Calibration Engineer

RG 59/U 3 METER CABLE LOSS

MHZ	LOSS (db)	MHZ	LOSS (db)
		280	1.30
30	.47	290	1.37
35	.31	300	1.61
40	.64	310	1.28
45	.77	320	1.53
50	.70	330	1.71
55	.69	340	1.99
60	.76	350	1.84
65	.67	360	2.11
70	.48	370	2.06
75	.36	380	1.82
80	.23	390	2.29
85	.16	400	2.02
90	.12	410	2.18
95	.19	420	2.12
100	.24	430	2.31
105	.31	440	2.43
110	.48	450	2.57
115	.71	460	2.62
120	.45	470	3.03
125	.46	480	3.04
130	.50	490	3.18
135	.61	500	3.21
140	.61	525	2.94
145	.46	550	2.54
150	.58	575	2.85
155	.87	600	3.18
160	.95	625	3.15
165	.48	650	3.54
170	.48	675	3.71
175	.75	700	3.93
180	1.23	725	4.08
185	1.07	750	3.70
190	.43	775	3.65
195	.38	800	3.52
200	.58	825	4.41
210	.46	850	4.51
220	.58	875	4.33
230	.61	900	4.29
240	.90	925	4.78
250	.80	950	4.91
260	1.17	975	4.93
270	1.13	990	4.87

VII. DESCRIPTION OF EQUIPMENT/CABLES USED FOR TESTING

The test sample was connected and tested to the following equipment:

PERIPHERAL	MAKE/MODEL	SERIAL NO.	FCC ID
PC	COMPAQ XL566	6440HHP50232	CNT75MO16
Monitor	DELL VC5	33E2424	ARFKDM1466
Keyboard	COMPAQ VOCALYST	1HQ71B509673	CIGE03783
Printer	Epson FX-850	00C0042889	BKM9A8P82PA
Mouse	GENUIS PRO	97041240	FSUGMZFC
Digitizer	Calcomp 11050	N/A	ECP6093021

DESCRIPTION OF CABLE

All cabling is shielded. See attached photographs.

VIII. RADIATED TEST PROCEDURE

Testing in the field as specified in ANSI C63.4, Section 8, the Conversion Box was evaluated from the range of 30-1,000 MHz. The Conversion Box was placed on a wooden turntable .8 meter above the groundplane and at a distance of 3 meters from the search antenna.

Maximum emissions were obtained by rotating the turntable and raising and lowering the search antenna while manipulating the cables which are bundled as specified. Appendix D in ANSI C63.4 was used for a reference. Both horizontal and vertical polarizations of the antenna were scanned and the position is noted on the radiated data sheet. Worst case configuration is shown in Photographs 1 and 2.

All emission levels were measured with a spectrum analyzer and represent peak readings at 100kHz bandwidth resolution. Converting the spectrum analyzer readings of dbm to dbμv/m proceeds as follows:

A. Convert dbm to dbμv by adding 107db to the reading in dbm. This is derived from the voltage for a power level into a 50ohm load.

B. Finally, adding the antenna factor with any cable loss to the dbμv reading yields dbμv/m.

By formula: dbμv/m = dbm (reading) + 107db + AF + CL

Where: AF = Antenna Factor in db
CL = Cable Loss in db

NO emissions were noted at 3 meters since the Conversion Box does not buffer the crystal clock or divide it. It is directly connected to the Micro with very short traces. Since the clock signal is sinusoidal, no harmonics are emitted.

IX. RADIATED TEST DATA/PHOTOGRAPHS

COMPANY NAME: GTCO CalComp DATE: 05/5/99

TEST SAMPLE: USB Conversion Box, Model USB

SERIAL NUMBER: N/A

ANTENNA TYPE: DIPOLE _____ BICONICAL X LOG PER _____ LOOP _____

TEST DISTANCE: 3M PEN N/A CURSOR N/A

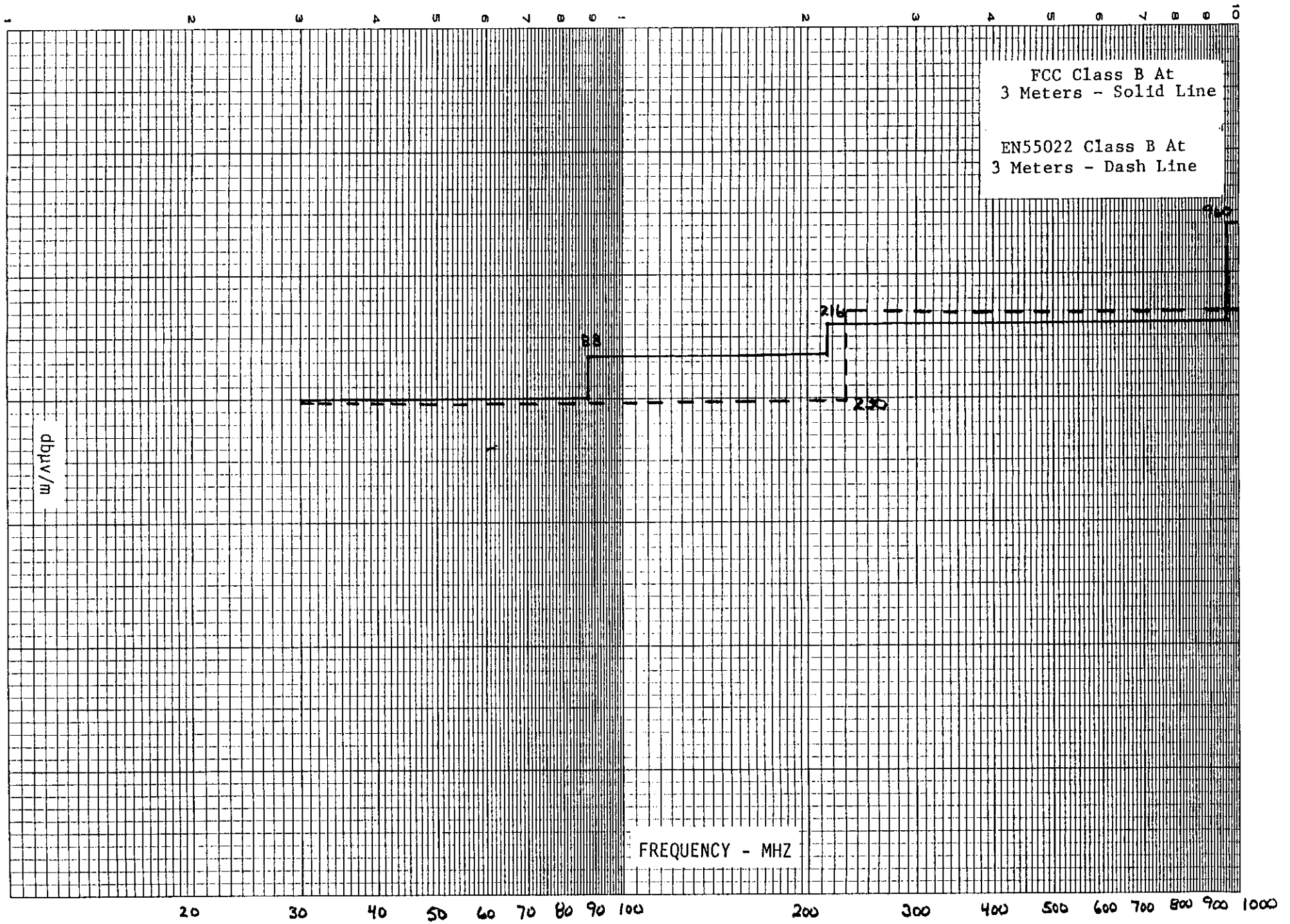
NOTES: As stated in Section VIII, Test Procedures, there were no emissions found at 3 meters.

(MHz) EMISSION FREQUENCY	ANT. POL.	ANT. HEIGHT (M)	AZIMUTH* DEGREES	METER READ dbuV	ANTENNA FACTOR & CABLE LOSS	FINAL READING dbuV/m	FCC LIMIT dbuV/m	MARGIN

* A 0-degree reading means the front of the EUT is facing the antenna. 180 degrees would mean the back of the EUT is facing the antenna. Rotation is clockwise from 0 degrees.

NO. 340R-L210 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
2 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



X. CONDUCTED TEST PROCEDURE

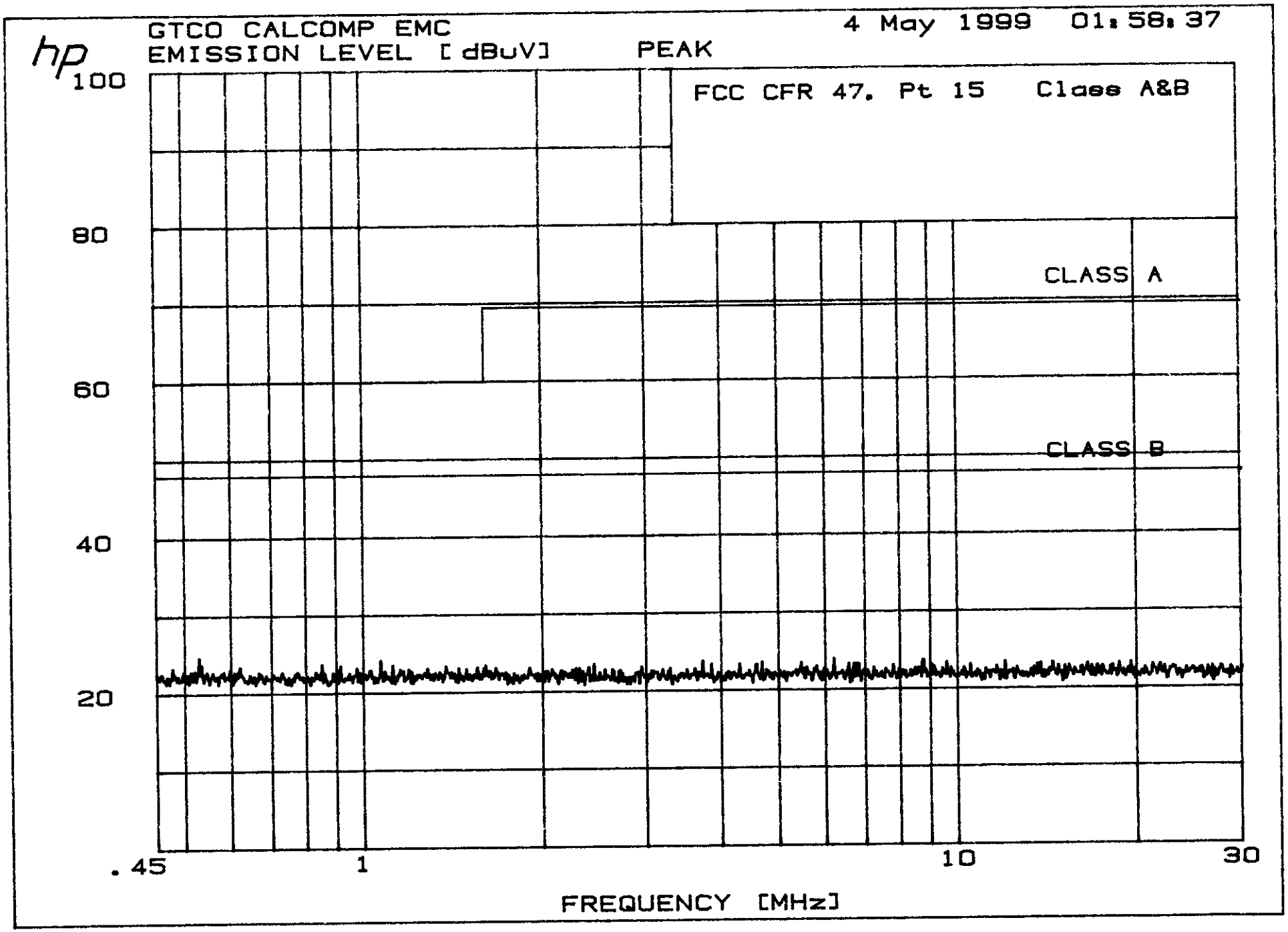
Since the Conversion Box gets it's power from the host as mentioned in the description, Section III, the computer and digitizer with the Conversion Box connected to it were attached to one LISN while the monitor and printer to a second LISN. The Conversion Box was set up over a horizontal ground plane measuring approximately 2.5 x 3 meters and beside a vertical ground plane measuring about 2 x 2 meters as outlined in ANSI C63.4, Paragraphs 5.2.1 and 5.2.2. Any excess power cord between the LISN and Conversion Box was folded back and forth to form a bundle not exceeding 40cm in length. All test procedures used ANSI C63.4, Paragraph 7.2.1 as a reference. Test configuration is shown in Photographs 3 and 4.

The following graphs show the resulting conducted tests and each graph shows the following:

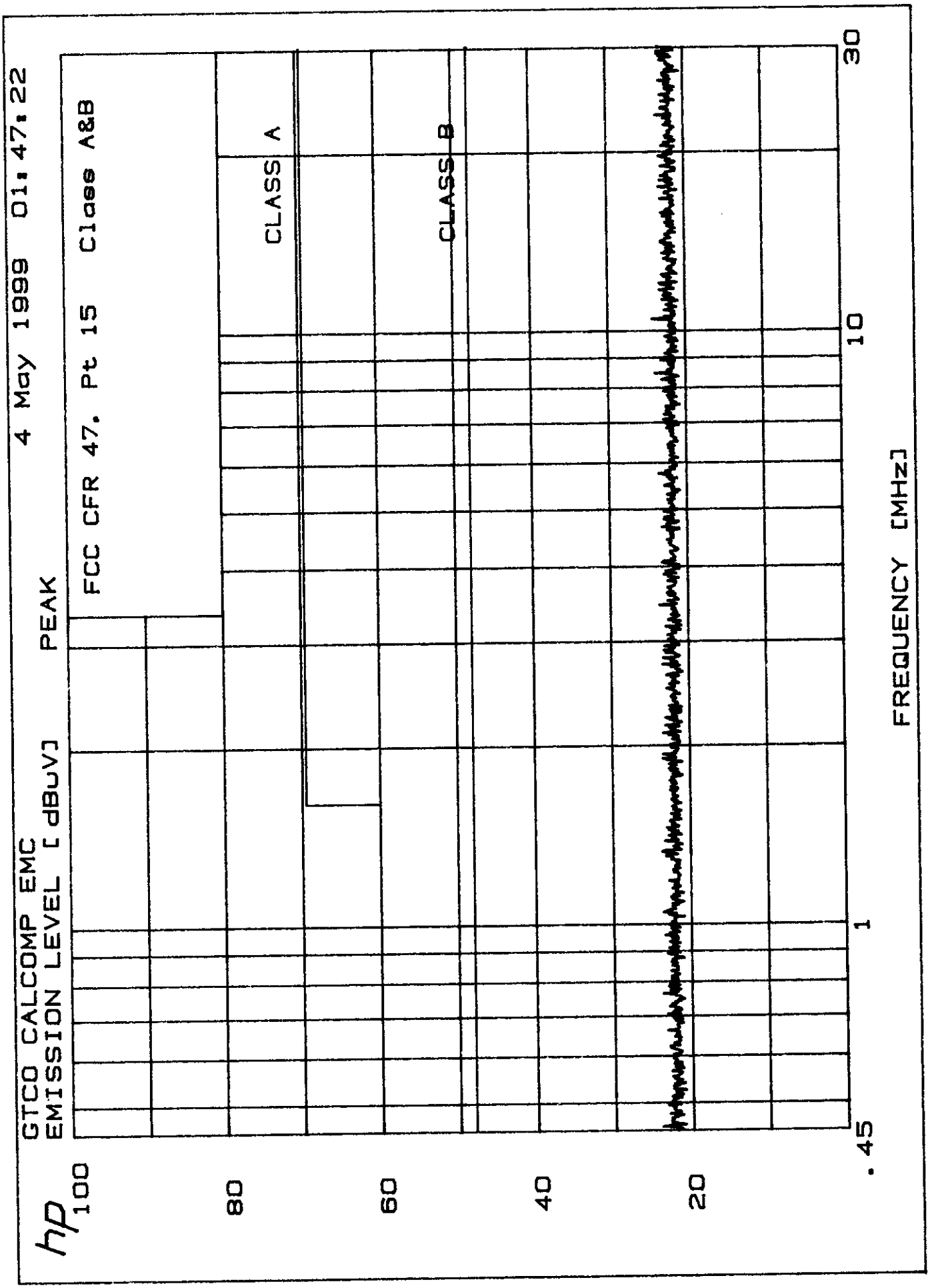
GRAPH NUMBER	FREQUENCY RANGE, MHZ	POWER LINE SIDE	GROUNDING
1	.45-30	Line	Ungrounded
2	.45-30	Neutral	Ungrounded
3	.45-1	Line	Ungrounded
4	.45-1	Neutral	Ungrounded
5	.15-30	Line	Ungrounded
6	.15-30	Neutral	Ungrounded

On all graphs, the red horizontal line is the maximum FCC Class B Reference Level or EN55022 Class B Level.

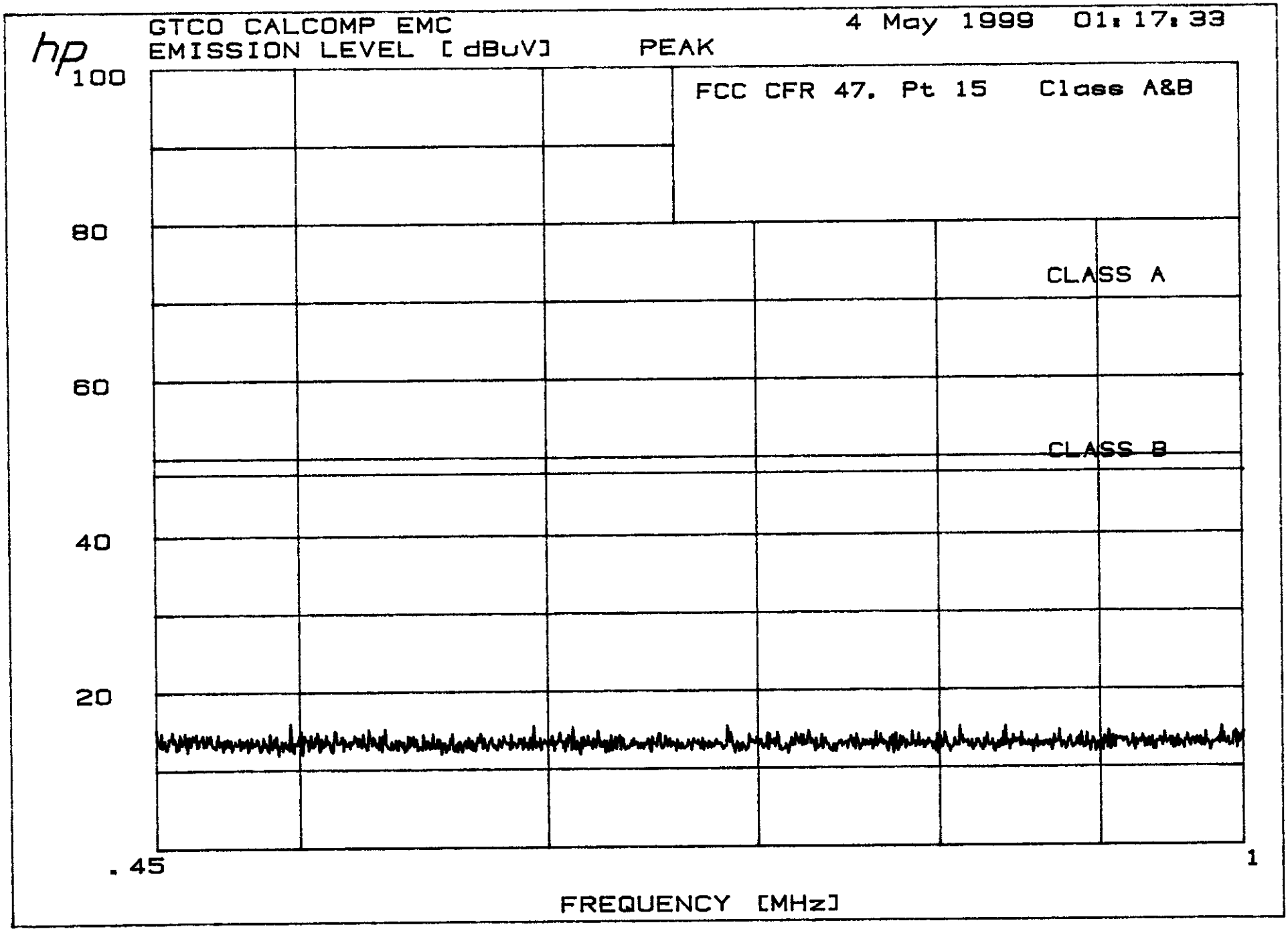
XI. CONDUCTED TEST DATA/PHOTOGRAPHS


GTCO CALCOMP EMC
EMISSION LEVEL [dBuV]
PEAK
4 May 1999 01:58:37
hp
100
80
60
40
20
FCC CFR 47, Pt 15 Class A&B
CLASS A
CLASS B
.45
1
10
30
FREQUENCY [MHz]

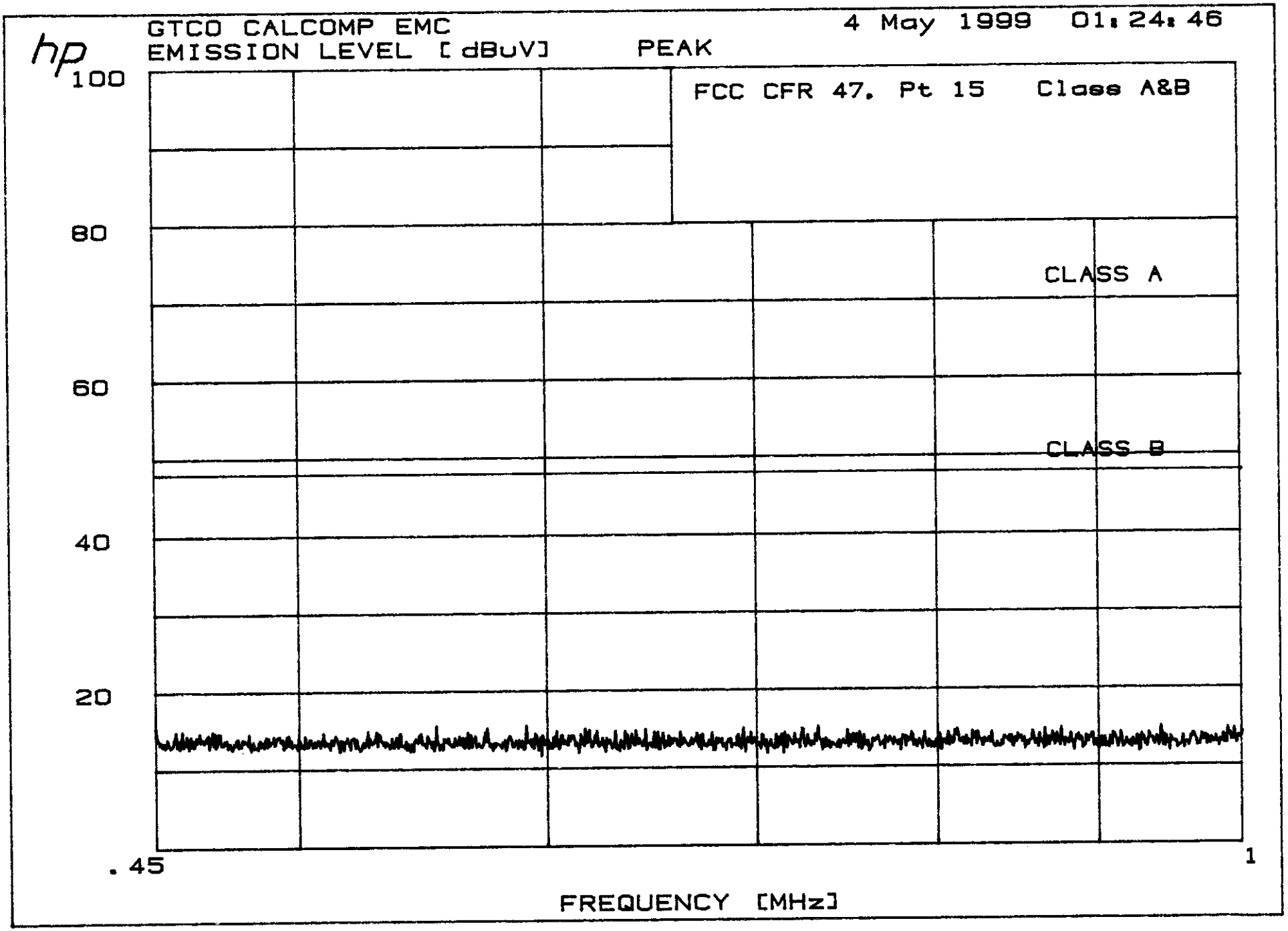
Graph 1
-21-


GTCO CALCOMP EMC
EMISSION LEVEL [dBuV]
PEAK
4 May 1999 01:47:22
FCC CFR 47. Pt 15 Class A&B
CLASS A
CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

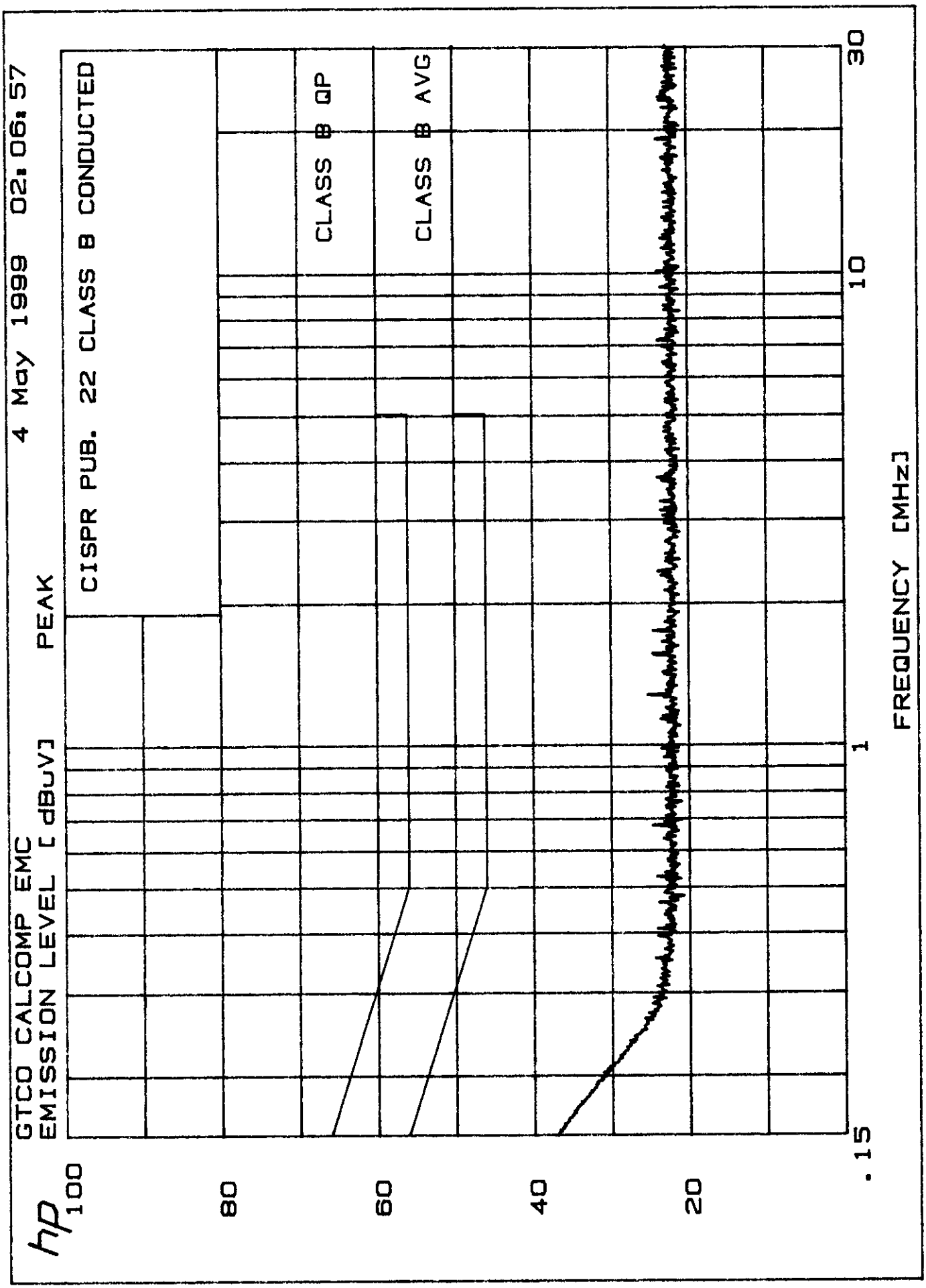
Graph 2


GTCO CALCOMP EMC
4 May 1999 01:17:33
EMISSION LEVEL [dBuV]
PEAK
100
FCC CFR 47, Pt 15 Class A&B
80
CLASS A
60
CLASS B
40
20
.45
1
FREQUENCY [MHz]

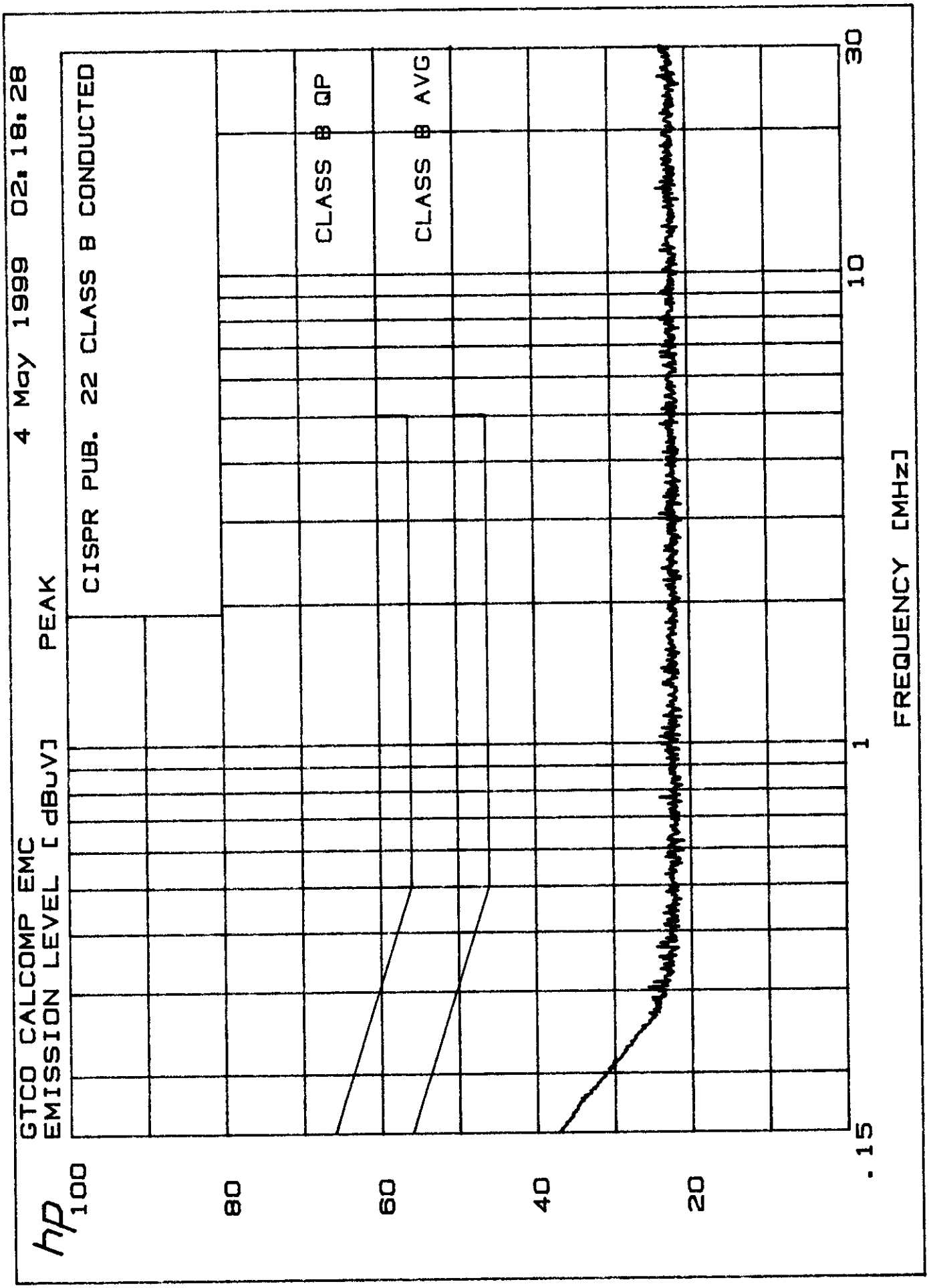
Graph 3
-23-


GTCO CALCOMP EMC
EMISSION LEVEL [dBuV]
PEAK
4 May 1999 01:24:46
hp
100
80
60
40
20
FCC CFR 47, Pt 15 Class A&B
CLASS A
CLASS B
.45
1
FREQUENCY [MHz]

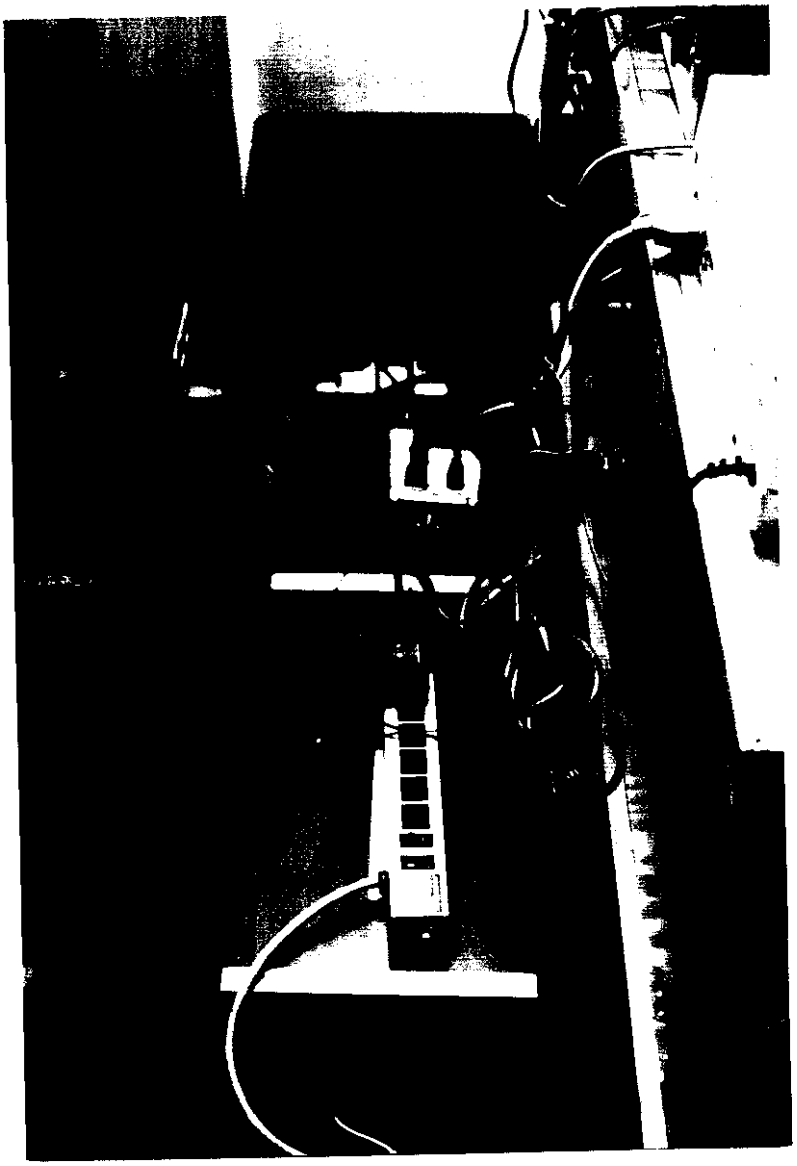
Graph 4
-24-


GTCO CALCOMP EMC
EMISSION LEVEL [dBuV]
PEAK
4 May 1999 02:06:57
CISPR PUB. 22 CLASS B CONDUCTED
CLASS B QP
CLASS B AVG
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

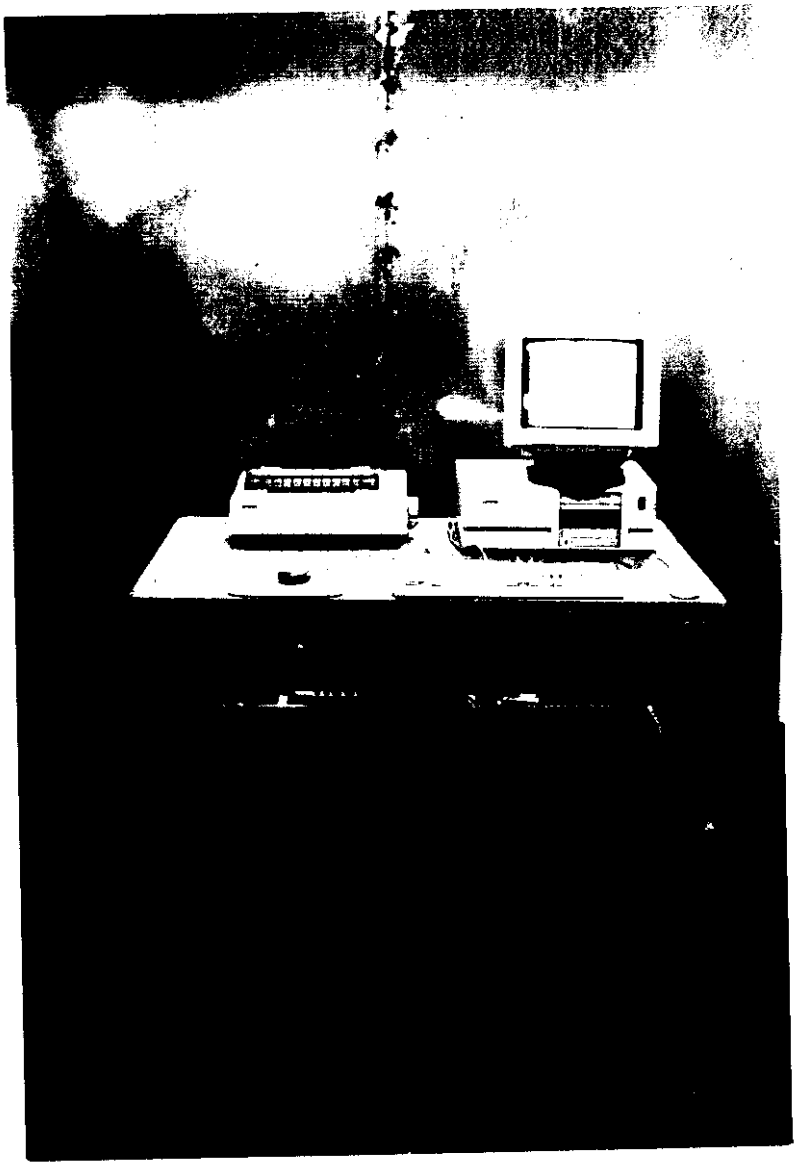
Graph 5


GTCO CALCOMP EMC
EMISSION LEVEL [dBuV]
4 May 1999 02:18:28
PEAK
CISPR PUB. 22 CLASS B CONDUCTED
CLASS B QP
CLASS B AVG
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

Graph 6



PHOTOGRAPH 3



PHOTOGRAPH 4

XII. SUMMARY OF RESULTS

The USB Conversion Box, Model USB, has shown that it passes both radiated and conducted test limits for FCC Class B as noted in FCC's CFR 47, Park 15, Paragraphs 15.107 and 15.109. No emissions were noted at 3 meters. This product has also shown that it passes the Class B limits as specified in CISPR 22/EN55022 standards as set in CISPR 22 Publication, Paragraphs 4 and 5.

The product tested had no specific modifications done to it to pass the above limits.