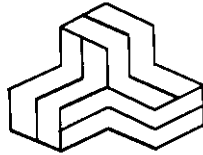


# ENGINEERING TEST REPORT



**MDS 2710D DATA TRANSCEIVER  
MODEL NO.: MDS 2710D**

**FCC ID: E5MDS2710D**

**FCC PART 2 & PART 90, SUBPART I  
RADIO SERVICES FOR COMMERCIAL/INDUSTRIAL USES  
OPERATING FREQUENCY BAND 220-222 MHz, MASK F**

**UltraTech's FILE NO.: MIC-012FCCTX**

**Tested for:**

**MICROWAVE DATA SYSTEMS**

175 Science Parkway  
Rochester, New York  
USA, 14620-4261

**Tested by:**

**UltraTech - Group of Labs**

4181 Sladeview Crescent, Unit 33  
Mississauga, Ontario  
Canada L5L 5R2

**Report Prepared by: Mr. Tri M. Luu, P.Eng.**

**DATE: Feb. 05, 1999**

## UltraTech

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33-4181 Sladeview Crescent, Mississauga, Ontario, Canada, L5L 5R2  
Telephone (905) 569-2550 Facsimile (905) 569-2490  
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### ULTRATECH GROUP OF LABS

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File #: MIC-012FCCTX  
Feb. 05, 1999

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- Recognized/Listed by FCC (USA), Industry Canada (Canada)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

EXHIBIT 1 - SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
90.205 & 2.985	RF Power Output	Yes
90.213 & 2.995	Frequency Stability	Yes
90.242(b)(8) & 2.987(a)	Audio Frequency Response	Not applicable for FM Data Modulated Transmitter
90.210 & 2.987(b)	Modulation Limiting	Yes
90.210 & 2.989	Emission Masks	Yes
90.210, 2.997 & 2.991	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
90.210, 2.997 & 2.993	Emission Limits - Field Strength of Spurious Emissions	Yes

MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D, by MICROWAVE DATA SYSTEMS has also been tested and found to comply with FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.

**ULTRATECH GROUP OF LABS**

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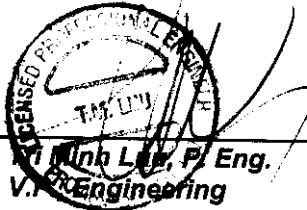
- Accredited by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Recognized/Listed by FCC (USA), Industry Canada (Canada)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

## TESTIMONIAL AND STATEMENT OF CERTIFICATION

*THIS IS TO CERTIFY:*

- 1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*
- 2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*
- 3) *THAT the data was obtained on representative production units, representative.*
- 4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

**Certified by:**



Minh Lee, P. Eng.  
V.I. Engineering

DATE: Feb. 05, 1999

### **ULTRATECH GROUP OF LABS**

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## 1. EXHIBIT 2 - GENERAL INFORMATION

### 1.1. APPLICANT

MICROWAVE DATA SYSTEMS  
175 Science Parkway  
Rochester, New York  
USA, 14620-4261

Applicant's Representative: Mr. Jacob Z. Schanker, P.Eng., CPEng., Director of Agency Compliance

### 1.2. MANUFACTURER

MICROWAVE DATA SYSTEMS  
175 Science Parkway  
Rochester, New York  
USA, 14620-4261

### 1.3. DESCRIPTION OF EQUIPMENT UNDER TESTS

PRODUCT NAME: MDS 2710D DATA TRANSCEIVER  
MODEL NO.: MDS 2710D  
SERIAL NUMBER: preproduction  
TYPE OF EQUIPMENT: Radio Services Transmitters  
SERVICES AREAS: Commercial/Industrial  
OPERATING FREQ.: 220 - 222 MHz  
CHANNEL SPACINGS 5 kHz  
POWER RATING: 5 Watts  
OUTPUT IMPEDANCE: 50 Ohms  
DUTY CYCLE: Continuous  
99% BANDWIDTH: 2.67 kHz  
BAUD RATES: 3200 b/s  
EMISSION DESIGNATION: 2K8F1D

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#### ULTRATECH GROUP OF LABS

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Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vhk.ultratech@sympatico.ca](mailto:vhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

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**OSC. FREQUENCY(IES):** 302.20 - 304.2 MHz (1st L.O.), 82.2 MHz (IF), 81.745 (2nd L.O.)

**CPU SPEED:** 16 MHz

**INPUT SUPPLY:** 13.6 Vdc battery

**ASSOCIATED DEVICES:** N/A

**FCC ID:** E5MDS2710D

**INTERFACE PORTS:** (1) RS-232 Interface (RS-11) for factory uses only  
(2) Data Interface (DB25)  
(3) RF IN/OUT

---

**ULTRATECH GROUP OF LABS**

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File #: MIC-012FCCTX  
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- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

#### 1.4. RELATED SUBMITTALS)/GRANT

Not applicable

#### 1.5. TEST METHODOLOGY

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations, Parts 2 & 90, Subpart I, Radio Services Operating in the Frequency Bands 220 - 222 MHz.

Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

#### 1.6. TEST FACILITY

AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: July 16, 1997.

The above test site is also filed with Interference Technology International Ltd (ITI - An EC Directive on EMC).

#### 1.7. UNITS OF MEASUREMENTS

Measurements of conducted emissions are reported in units of dB referenced to one microvolt [dB(uV)].

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(uV)/m] at the distance specified in the report, wherever it is applicable.

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#### ULTRATECH GROUP OF LABS

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File #: MIC-012FCCTX  
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## **List of Exhibits**

**Exhibit A: Technical Report (this document)**

**Exhibit B: Test Report to FCC Part 90 - Includes Product Photographs**

**Exhibit C: Installation and Operation Manual - MDS 2710D**



PH199-FOO4

## Description of Changes

The 15" SVGA color monitor

Model No. : 15B2322Q  
FCC ID : A3KM078

was granted by FCC on Feb. 12,1998, file no.: 31010/EQU 4-3-5 as attached grant of equipment authorization.

This monitor also named as below for IBM Brand:

- Model No. : 6546-0AN A  
- Brand : IBM  
- FCC ID : A3KM078

For quality improvement and customer request, the following change items were made:

- New cabinets style.
- Main chassis was relayout.
- Video IC was changed from TDA4885 to TDA4886 and PCB layout was changed.

- DECREASE MAX RESOLUTION FROM 1280x1024 TO 1024x768, NI  
The changes will be made only in these units produced after the change is authorized.



Ronnie Yang -- Manager, Safety/Dev  
NVLAP Signatory

**Exhibit 5**

MAR 25 1999

**Test Data of Original**

## 2.7. Line Conducted RF Voltage Measurement Results

The frequency range from 450KHz to 30 MHz was investigated.

All emissions not report below are too low against the prescribed limits.

Date of Test : Dec. 04, 1997 Temperature : 19 °C

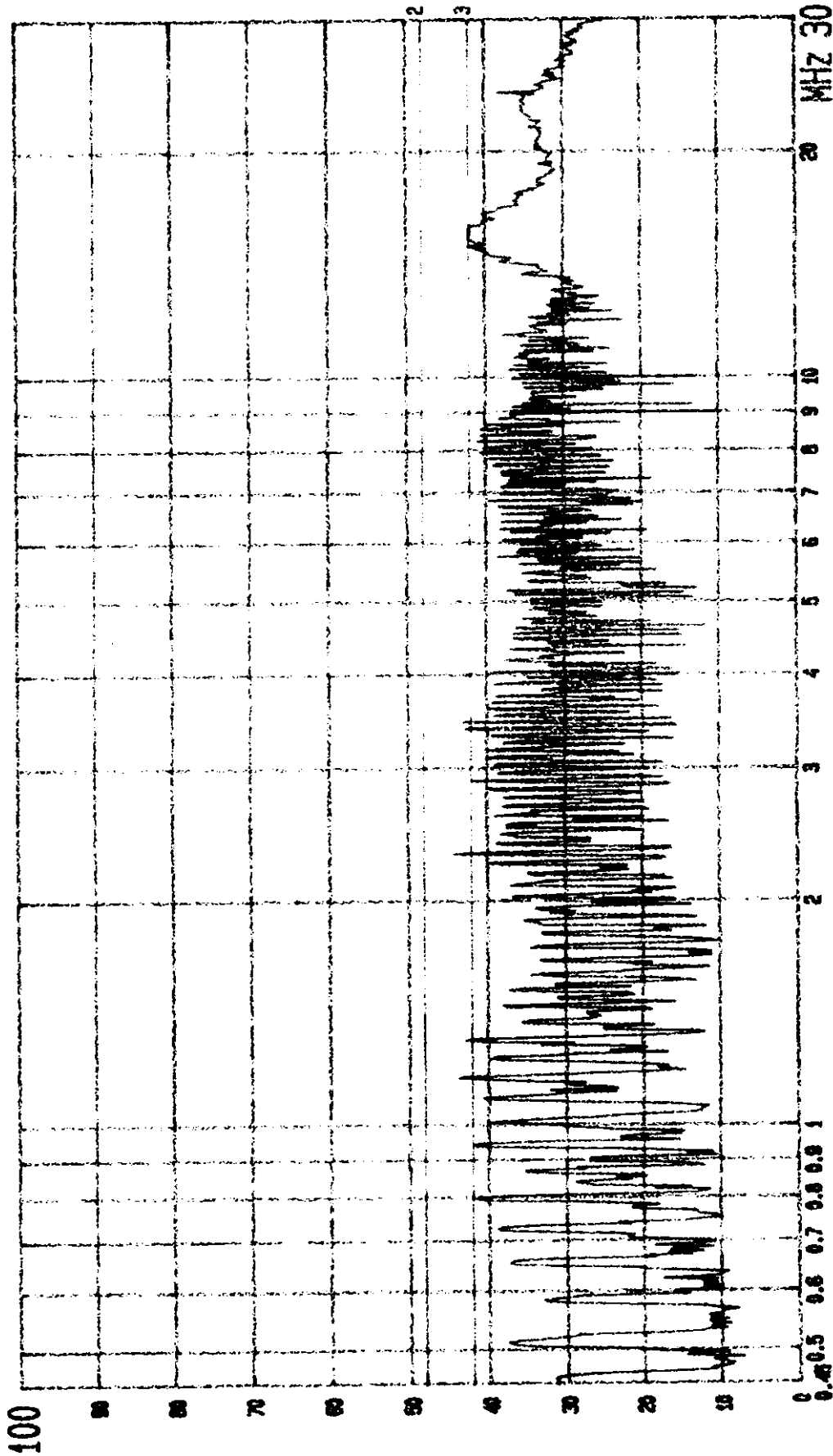
EUT : 15" Display Color Monitor Humidity : 62 %

Test Mode : 64KHz/1280\*1024, 60Hz

Frequency (MHz)	Factor dB	Measurement (dBuV)		Reading (dBuV)		Limits (dBuV)	Margin (dBuV)	
		VA	VB	VA	VB		VA	VB
0.7208	0.2	*	37.1	*	37.3	48.0	*	10.7
0.7922	0.2	39.6	*	39.8	*	48.0	8.2	*
0.9374	0.2	*	39.2	*	39.4	48.0	*	8.6
1.1520	0.2	39.6	*	39.8	*	48.0	8.2	*
<b>2.3038</b>	<b>0.2</b>	<b>41.3</b>	39.7	<b>41.5</b>	39.9	<b>48.0</b>	<b>6.5</b>	8.1
3.3170	0.2	*	40.0	*	40.2	48.0	*	7.8
3.3846	0.2	39.7	*	39.9	*	48.0	8.1	*
8.2103	0.3	37.2	38.2	37.5	38.5	48.0	10.5	9.5
15.7721	0.8	40.1	39.5	40.9	40.3	48.0	7.1	7.7

- Remark :
1. All reading are Quasi-Peak values.
  2. Factor = Insertion Loss + Cable Loss
  3. The worst emission was detected at 2.3038MHz with corrected signal level of 41.5dBuV (limit was 48dBuV) when the VA side of the EUT was connected to L.I.S.N.

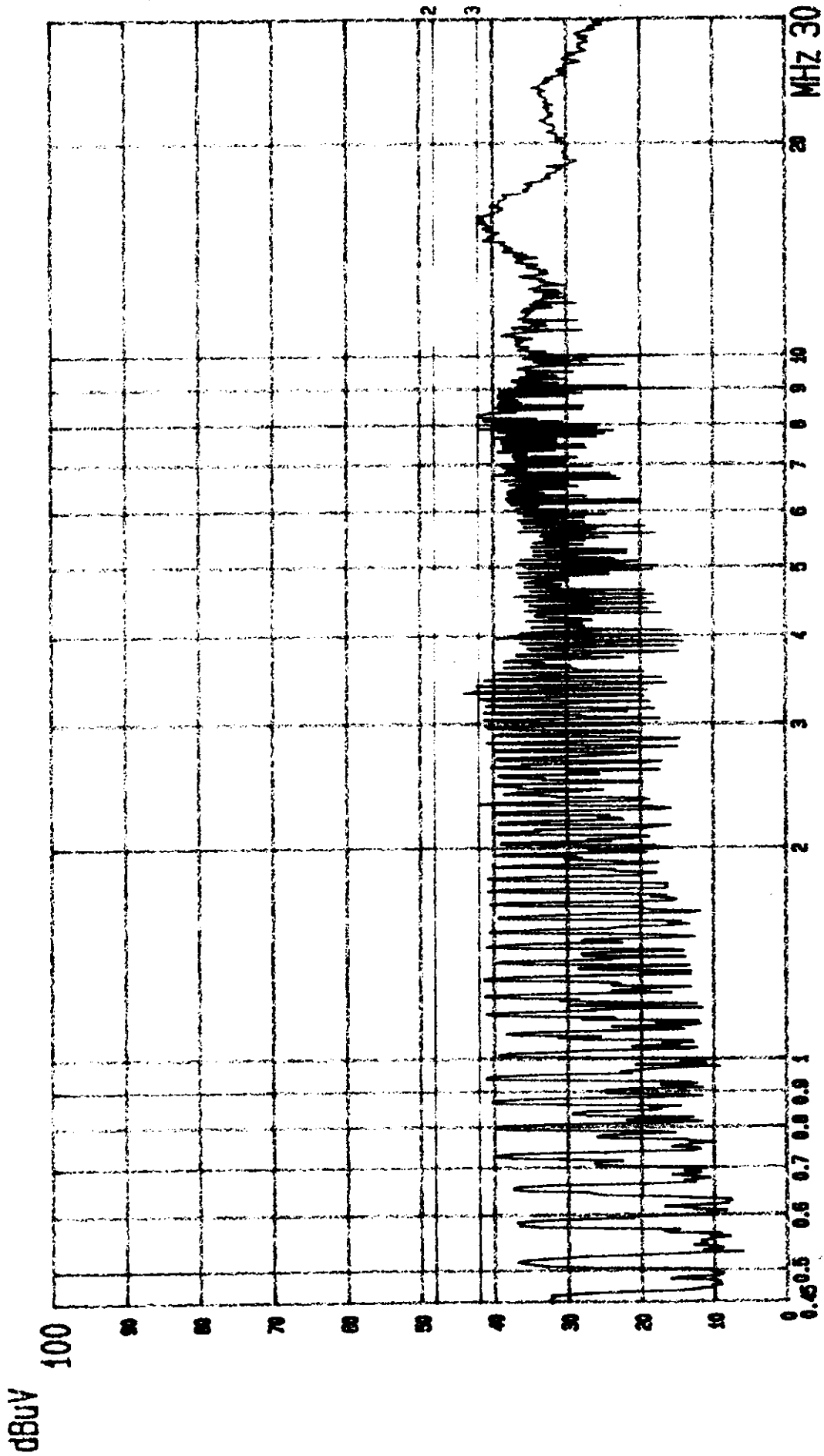
dBuV



--- Date 04 DEC '97 Time 19:37:18  
PHILIPS EUT: 15" DISPLAY COLOR MONITOR  
LINE: VA. MEMO: 64KHZ (1280X1024/60HZ)

M/N: 15B2322Q  
(PEAK VALUE)

TAIWAN TOKIN EMC.ENG.CORP.  
PAGE:002.

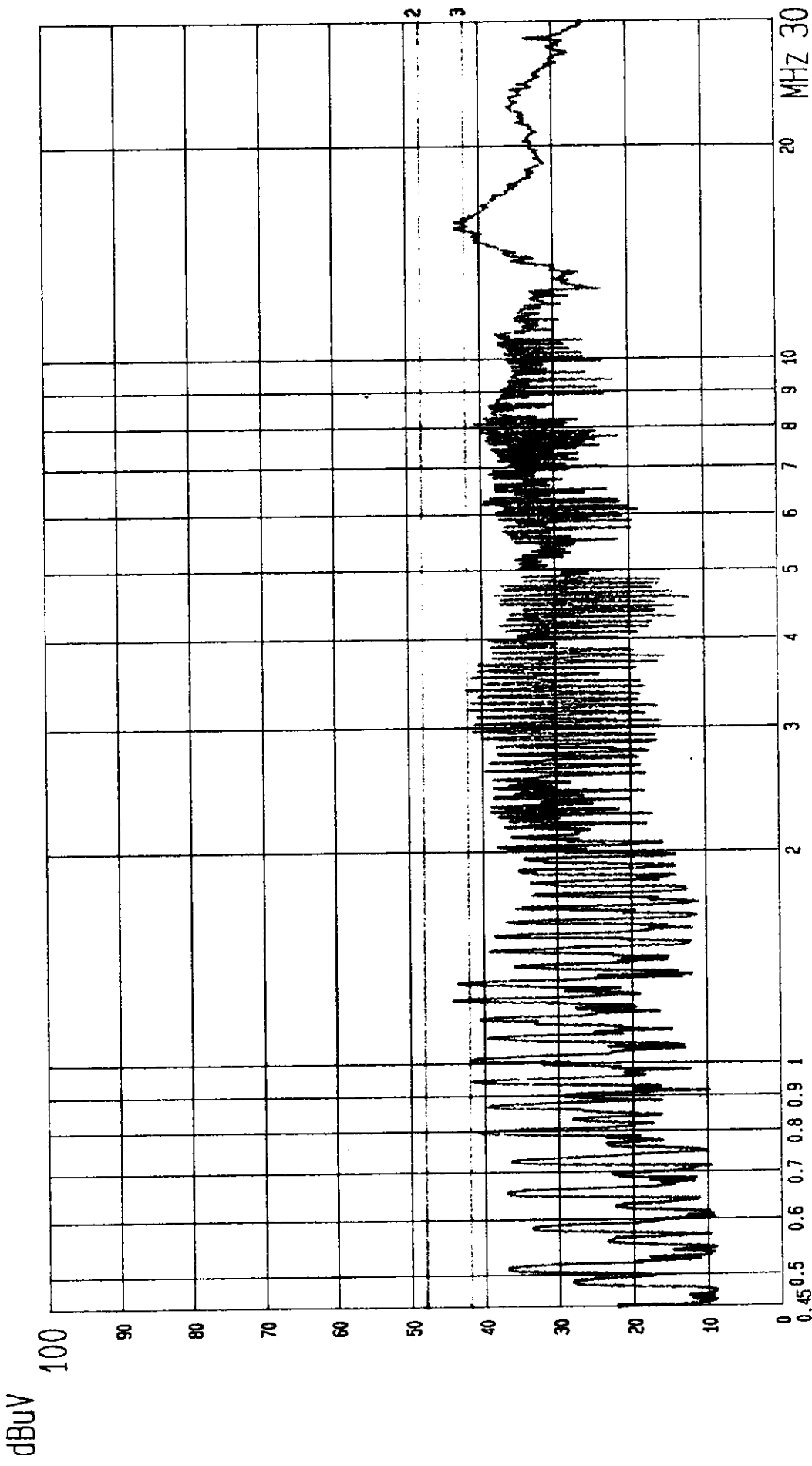


--- Date 04 DEC '97 Time 19:33:02  
 PHILIPS EUT: 15 DISPLAY COLOR MONITOR  
 LINE: VB. MEMO: 64KHZ (1280x1024/60HZ)  
 M/N: 15823220 (PEAK VALUE) TAIWAN TOKIN EMC.ENG.CORP. PAGE: 001.

Date of Test : Dec. 04, 1997 Temperature : 19 °C  
 EUT : 15" Display Color Monitor Humidity : 62 %  
 Test Mode : 69KHz/1024\*768, 85Hz

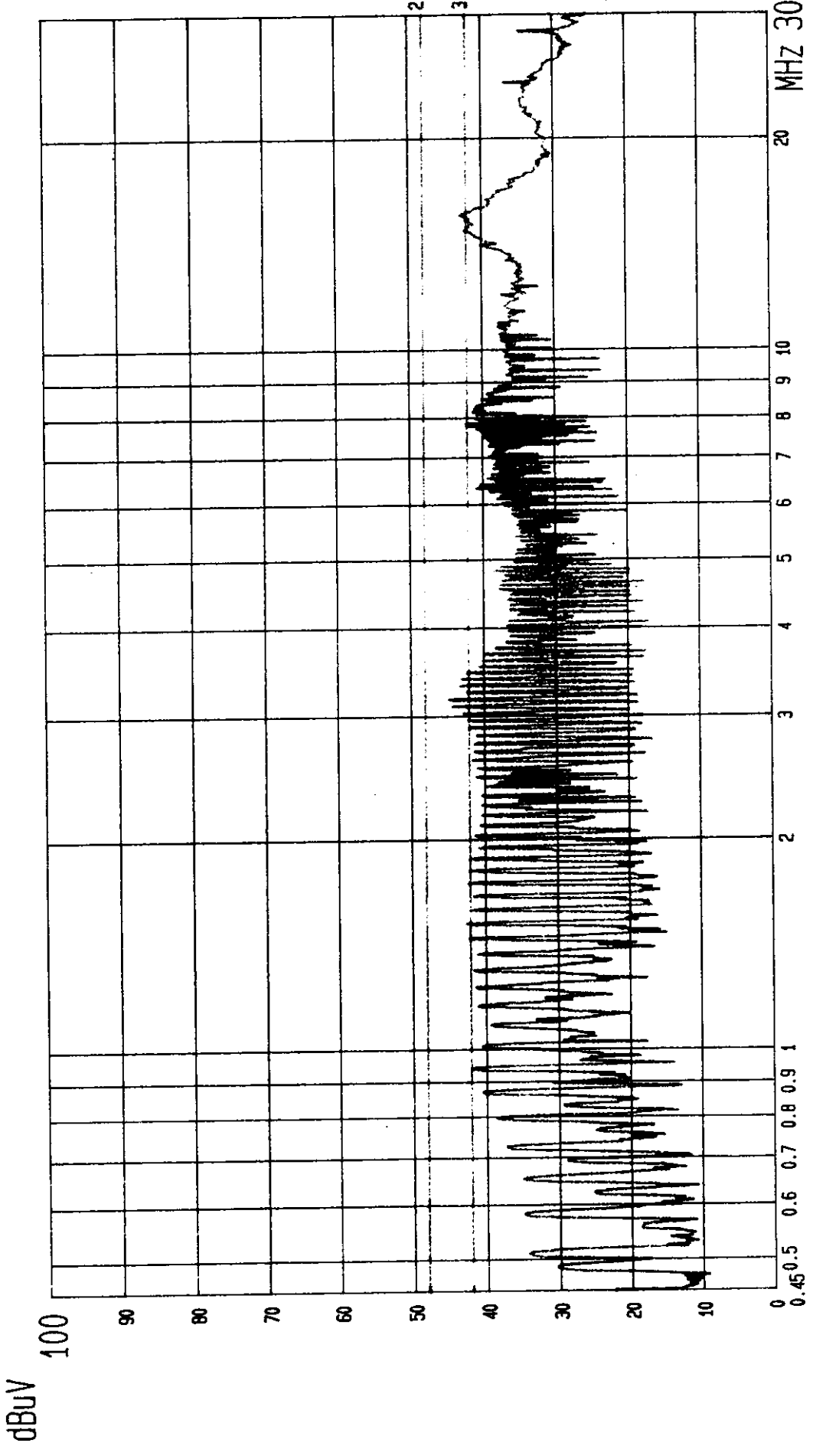
Frequency (MHz)	Factor dB	Measurement (dBuV)		Reading (dBuV)		Limits (dBuV)	Margin (dBuV)	
		VA	VB	VA	VB		VA	VB
0.9339	0.2	*	39.6	*	39.8	48.0	*	8.2
1.0065	0.2	39.8	*	40.0	*	48.0	8.0	*
1.2223	0.2	41.8	*	42.0	*	48.0	6.0	*
1.5094	0.2	*	40.1	*	40.3	48.0	*	7.7
<b>3.1619</b>	<b>0.2</b>	*	<b>42.1</b>	*	<b>42.3</b>	<b>48.0</b>	*	<b>5.7</b>
3.3810	0.2	39.8	*	40.0	*	48.0	8.0	*
6.1863	0.3	37.1	*	37.4	*	48.0	10.6	*
6.3242	0.3	*	38.0	*	38.3	48.0	*	9.7
7.8360	0.3	*	38.8	*	39.1	48.0	*	8.9
8.0549	0.3	37.4	*	37.7	*	48.0	10.3	*
15.2496	0.8	40.4	*	41.2	*	48.0	6.8	*
15.5993	0.8	*	39.7	*	40.5	48.0	*	7.5

- Remark :
1. All reading are Quasi-Peak values.
  2. Factor = Insertion Loss + Cable Loss
  3. The worst emission was detected at 3.1619MHz with corrected signal level of 42.3dBuV (limit was 48dBuV) when the VB side of the EUT was connected to L.I.S.N.



Date 04.DEC.'97 Time 19:47:46  
 PHILIPS EUT: 15" DISPLAY COLOR MONITOR  
 LINE: VA. MEMO: 69KHZ (1024x768/85HZ)

M/N: 15823220  
 (PEAK VALUE) TAIWAN TOKIN EMC.ENG.CORP.



--- Date 04 DEC '97 Time 19:56:18  
 PHILIPS EUT: 15" DISPLAY COLOR MONITOR  
 LINE: VB. MEMO: 69KHZ (1024X768/85HZ)

M/N: 15B2322Q  
 (PEAK VALUE) TAIWAN TOKIN EMC.ENG.CORP.

PAGE: 004.



### 3. RADIATED EMISSION TEST

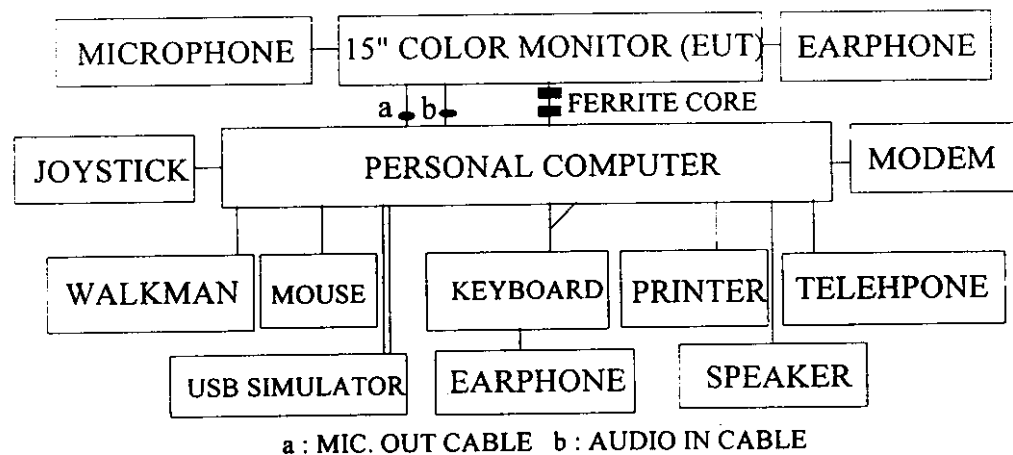
#### 3.1. Test Equipment

The following test equipments were used during the radiated emission tests :

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Anritsu	R3361A	91730122	Jun. 07, 97'	1 Year
2.	Test Receiver	Rohde&Schwarz	ESVS10	845165/018	Feb. 19, 97'	1 Year
3.	Amplifier	HP	8447D	2727A05737	Dec. 20, 96'	1 Year
4.	Biconical Antenna	Chase	VBA6106A	1223	Nov. 97'	1 Year
5.	Log Periodic Antenna	Chase	UPA6109	1020	Nov. 97	1 Year

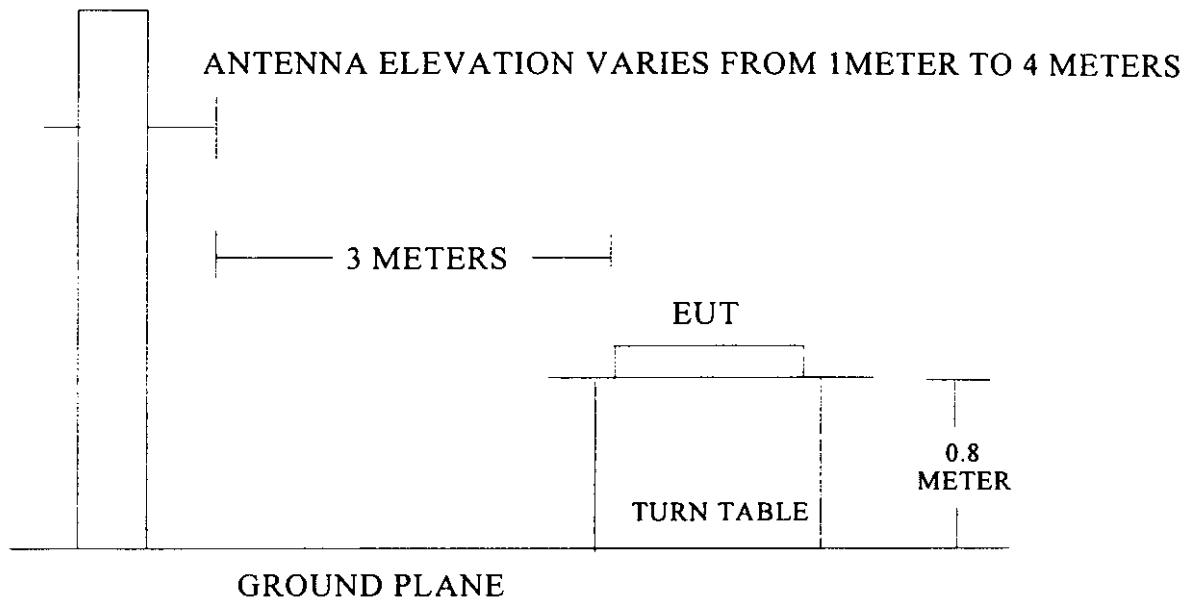
#### 3.2. Block Diagram of Test Setup

##### 3.2.1. Block Diagram of connection between EUT and simulators



### 3.2.2. Open Field Test Site Setup Diagram

#### ANTENNA TOWER



### 3.3. Radiation Limit (CLASS B)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		uV/M	dBuV/M
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0

- Remark :
- (1) Emission level (dBuV/M) = 20 log Emission level (uV/M)
  - (2) The tighter limit applies at the edge between two frequency bands.
  - (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

### 3.4. EUT Configuration on Measurement

The configuration of EUT and its simulators were same as those used in conducted measurement. Please refer to 2.4.

### 3.5. Operating Condition of EUT

Same as conducted measurement which was listed in 2.5.

### 3.6. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated biconical and log periodical antenna) and dipole antenna were used as receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4-1992 on radiated measurement.

The bandwidth setting on the field strength meter (R&S TEST RECEIVER ESVS10) was 120KHz.

The frequency range from 30MHz to 1000MHz was checked.

The following test modes were done on radiated test and all the test results are listed in section 3.7

- (1) 64KHz / 1280\*1024, 60Hz
- (2) 69KHz / 1024\*768, 85Hz

### 3.7. Radiated Emission Noise Measurement Results

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All the emissions not report below are too low against the FCC CLASS B limit..

Date of Test : Dec. 03, 1997 Temperature : 22 °C  
 EUT : 15" Display Color Monitor Humidity : 68 %  
 Test Mode : 64KHz/1280\*1024, 60Hz

Frequency MHz	Antenna Cable		Meter Reading		Emission Level	
	Factor dB/m	Loss dB	Horizontal dBuV	Horizontal dBuV/m	Limits dBuV/m	Margin dBuV/m
36.049	21.27	1.62	3.47	26.36	40.00	13.64
38.000	20.54	1.62	4.77	26.93	40.00	13.07
48.049	16.34	1.83	5.01	23.18	40.00	16.82
61.500	12.07	1.98	7.96	22.01	40.00	17.99
64.305	11.53	2.00	9.14	22.67	40.00	17.33
108.049	17.57	2.38	14.16	34.11	43.50	9.39
144.049	20.09	2.70	5.78	28.57	43.50	14.93
168.049	21.52	2.86	8.15	32.53	43.50	10.97
180.049	21.84	2.96	3.82	28.62	43.50	14.88
216.049	21.75	3.21	1.74	26.70	46.00	19.30
300.097	26.46	3.71	-8.58	21.59	46.00	24.41
312.097	13.93	3.81	6.14	23.88	46.00	22.12
324.097	14.28	3.88	10.72	28.88	46.00	17.12
336.097	15.02	3.94	3.99	22.95	46.00	23.05
348.097	15.75	4.02	1.83	21.60	46.00	24.40
408.097	16.25	4.32	2.28	22.85	46.00	23.15
420.097	16.32	4.37	0.38	21.07	46.00	24.93

Remark : All readings are Quasi-Peak values.

Date of Test : Dec. 03, 1997 Temperature : 22 °C  
 EUT : 15" Display Color Monitor Humidity : 68 %  
 Test Mode : 64KHz/1280\*1024, 60Hz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Emission Level		Margin dBuV/m
			Vertical dBuV	Vertical dBuV/m	Limits dBuV/m		
32.200	22.68	1.53	2.31	26.52	40.00	13.48	
36.000	21.00	1.62	13.18	35.80	40.00	4.20	
37.000	20.34	1.61	9.05	31.00	40.00	9.00	
60.000	13.57	1.95	19.44	34.96	40.00	5.04	
61.204	13.60	1.98	17.87	33.45	40.00	6.55	
120.049	18.47	2.51	4.48	25.46	43.50	18.04	
144.049	20.50	2.70	5.15	28.35	43.50	15.15	
168.049	19.25	2.86	1.84	23.95	43.50	19.55	
192.049	22.36	3.06	2.50	27.92	43.50	15.58	
204.087	22.33	3.13	0.45	25.91	43.50	17.59	
216.087	22.79	3.21	3.94	29.94	46.00	16.06	
228.084	22.43	3.28	2.61	28.32	46.00	17.68	
300.084	26.25	3.71	- 5.96	24.00	46.00	22.00	
312.084	14.35	3.81	7.60	25.76	46.00	20.24	
324.084	14.65	3.88	18.45	36.98	46.00	9.02	
336.097	15.20	3.94	7.44	26.58	46.00	19.42	
360.097	15.34	4.05	8.50	27.89	46.00	18.11	
372.097	15.29	4.11	4.60	24.00	46.00	22.00	
408.097	16.06	4.32	2.00	22.38	46.00	23.62	

Remark : All readings are Quasi-Peak values.

Date of Test : Dec. 02, 1997 Temperature : 23 °C  
 EUT : 15" Display Color Monitor Humidity : 67 %  
 Test Mode : 69KHz/1024\*768, 85Hz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Limits dBuV/m	Margin dBuV/m
			Horizontal dBuV	Horizontal dBuV/m		
66.210	11.62	2.00	19.35	32.97	40.00	7.03
75.683	12.89	2.12	16.22	31.23	40.00	8.77
75.713	12.89	2.12	17.75	32.76	40.00	7.24
85.126	15.20	2.19	11.68	29.07	40.00	10.93
94.599	16.60	2.26	15.66	34.52	43.50	8.98
132.426	20.16	2.57	9.96	32.69	43.50	10.81
151.372	20.12	2.74	10.43	33.29	43.50	10.21
* 160.845	21.17	2.80	13.52	37.49	43.50	6.01
208.089	20.80	3.14	9.50	33.44	43.50	10.06
255.454	24.00	3.47	9.66	37.13	46.00	8.87
264.927	24.11	3.53	10.53	38.17	46.00	7.83
312.137	13.93	3.81	11.37	29.11	46.00	16.89
331.043	14.54	3.87	12.46	30.87	46.00	15.13
368.998	16.09	4.10	9.95	30.14	46.00	15.86
501.371	17.83	4.81	11.03	33.67	46.00	12.33
539.252	18.72	5.02	10.23	33.97	46.00	12.03
595.917	19.28	5.29	10.70	35.27	46.00	10.73
614.854	19.49	5.36	10.44	35.29	46.00	10.71
690.562	20.58	5.77	12.21	38.56	46.00	7.44

- Remark :
1. All reading were Quasi-Peak values.
  2. The worst emission was detected at 160.845MHz with corrected signal level of 37.49dBuV/m (limit was 43.5dBuV/m) when the antenna was at horizontal polarization and was at 1.8m high and the turn table was at 145 ° .
  3. 0 ° is the table front facing the antenna. Degree was calculated from 0 ° clockwise facing the antenna.

Date of Test : Dec. 02, 1997 Temperature : 23 °C  
 EUT : 15" Display Color Monitor Humidity : 67 %  
 Test Mode : 69KHz/1024\*768, 85Hz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Emission Level	
			Vertical dBuV	Vertical dBuV/m	Limits dBuV/m	Margin dBuV/m
37.000	20.34	1.61	12.46	34.41	40.00	5.59
40.000	19.36	1.67	13.87	34.90	40.00	5.10
66.199	12.92	2.00	21.19	36.11	40.00	3.89
71.396	13.02	2.06	17.98	33.06	40.00	6.94
* 75.668	13.76	2.12	20.27	36.15	40.00	3.85
94.614	16.36	2.26	16.14	34.76	43.50	8.74
160.817	19.88	2.80	9.83	32.51	43.50	10.99
170.286	19.17	2.88	9.59	31.64	43.50	11.86
208.115	22.47	3.14	10.10	35.71	43.50	7.79
227.017	22.45	3.28	10.27	36.00	46.00	10.00
236.489	22.93	3.35	8.98	35.26	46.00	10.74
255.435	24.80	3.47	11.20	39.47	46.00	6.53
312.196	14.36	3.82	9.89	28.07	46.00	17.93
331.126	15.05	3.87	11.46	30.38	46.00	15.62
387.887	15.70	4.18	10.31	30.19	46.00	15.81
482.479	17.66	4.72	12.56	34.94	46.00	11.06
501.337	18.12	4.81	11.69	34.62	46.00	11.38
529.756	18.21	4.96	12.63	35.80	46.00	10.20
690.562	20.22	5.77	10.88	36.87	46.00	9.13

- Remark :
1. All reading were Quasi-Peak values.
  2. The worst emission was detected at 75.668MHz with corrected signal level of 36.15dBuV/m (limit was 40dBuV/m) when the antenna was at vertical polarization and was at 1m high and the turn table was at 135 ° .
  3. 0 ° is the table front facing the antenna. Degree was calculated from 0 ° clockwise facing the antenna.

## STATEMENT OF DATA MEASURED

### 1. General Information of EUT

The EUT, 15" super VGA color monitor :

Model No. : 6546-0AN A  
 FCC ID : A3KM078  
 Brand : IBM

The monitor automatically scans horizontal frequencies between 30KHz and 70KHz, and vertical frequencies between 50Hz and 120Hz. This color monitor displays sharp and brilliant images of text and graphics with a maximum resolution up to 1024X768 pixels. With microprocessor based digital controlled circuit and software control, the monitor can automatically adjust itself to the video card's scanning frequency and displays an image with the precise parameters you desire.

The monitor has 10 factory-preset modes as indicated in the following table:

	Resolution	H-Frequency	V-Frequency	Remark
M01	720 X 400	31.5KHz	70Hz	Non-interlaced
M02	640 X 480	31.5KHz	60Hz	Non-interlaced
M03	640 X 480	37.5KHz	75Hz	Non-interlaced
M04	640 X 480	43.3KHz	85Hz	Non-interlaced
M05	800 X 600	46.9KHz	75Hz	Non-interlaced
M06	800 X 600	53.7KHz	85Hz	Non-interlaced
M07	1024 X 768	60.0KHz	75Hz	Non-interlaced
M08	1024 X 768	68.7KHz	85Hz	Non-interlaced
M09	MFI 2@		85Hz	Non-interlaced
M10	720 X 400	37.9KHz	85Hz	Non-interlaced

### 2. Test Equipment and Procedure

Test was performed by:

**PHILIPS ELECTRONICS INDUSTRIES (TAIWAN) LTD.**  
**CONSUMER ELECTRONICS DIVISION**  
**EMI - LAB**

5, Tze Chiang 1 Road, Chungli Industrial Park  
 P.O. Box 123, Chungli, Taoyuan, Taiwan  
 R. O. C.

Tel : 886-3-4549862      Fax : 886-3-4549887  
 Internet: ronnie.yang@cli.ce.philips.com



All data in this report are "PEAK" value within 15dB margin unless otherwise noted. The radiated (open site) data has included antenna and cable factors, sample calculation:

Final Value (dB $\mu$ v/m) = Reading (dB $\mu$ v) + Antenna Factor (dB) + Cable Loss (dB)

The measured data of radiated RF interference at open site and line conducted interference as attached.

**The subject device is in compliance with the limits for a class B digital device, pursuant to part 15, subpart B of the FCC rules.**



---

Ronnie Yang - Manager, Safety/Dev. PEI-CED  
NVLAP Signatory

FCC TEST REPORT

FCC ID : A3KM078  
REPORT NO.: EMI99-009  
TEST DATE : MAR/07/1999  
TEST ENGI.: C.C.Wu

TEST PERFORMED BY  
PHILIPS ELECTRONICS INDUSTRIES (TAIWAN) LTD.  
CONSUMER ELECTRONICS DIVISION (PEI-CED)  
EMI-LAB  
P.O.BOX 123  
CHUNGLI, TAOYUAN, TAIWAN, R.O.C.  
TEL: 886-3-4549862 FAX: 886-3-4549887

MANUFACTURER : PHILIPS  
TESTED SYSTEM:

1. EUT : IBM 6546-0AN A COLOR MONITOR S/N.: TY9904009  
FCC ID. : A3KM078
2. COMPUTER: IBM 6588-120 S/N.: 556N59M  
FCC ID. : AN02161V
3. PRINTER : HP 2225C S/N.: 3145S02419  
FCC ID. : DS16XU2225
4. MODEM : USRobotics 268 S/N.: 0002680559278575  
FCC ID. : CJE-0318
5. MOUSE : IBM M-S34 S/N.: 23-146196  
FCC ID. : DZL211029
6. KEYBOARD: IBM KB-9826 S/N.: K071940  
FCC ID. : E8HKB-5323
7. VIDEO CARD : BUILT-IN S/N.: --  
FCC ID. : --

NOTE: TEST WAS PERFORMED IN ACCORDANCE WITH FCC MEASUREMENT PROCEDURE ANSI C63.4-1992 'AMERICAN NATIONAL STANDARD FOR MEASUREMENT OF RADIO-NOISE EMISSION FROM LOW-VOLTAGE ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9KHz TO 406Hz'

MONITOR WAS CONNECTED TO FLOOR MOUNTED AC OUTLET.  
68.7KHz MODE(1024X768/85Hz) WAS TESTED.  
INTERFACE CABLE WITH THREE FERRITE CORES(ONE INSIDE) WAS TESTED.  
UNSHIELDED MAINS CORD WAS USED DURING TEST.

THE TEST EQUIPMENT PLEASE REFER TO EQUIPMENT LIST AS ATTACHED.

DEVIATION: NONE

RADIATED RF LEVEL - PEAK VALUE

FREQUENCY (MHz)	HORIZONTAL (dBuv/m)	VERTICAL (dBuv/m)	FCC CLASS B LIMIT (dBuv/m)
47.43	29.38	33.98	40
57	28.75	32.17	40

66.4	31.18	31.68	40
75.89	31.38	31.68	40
85.38	25.45	27.55	40
123.32	28.59	30.19	43.5
142.28	28.42	AMBIENT	43.5
161.26	30.53	29.73	43.5
170.75	30.73	28.13	43.5
237.16	34.85	32.75	46
256.11	34.4	34.4	46
265.62	36.44	35.24	46
303.56	31.216	30.716	46
313.05	29.752	32.852	46
332.02	31.668	29.568	46
360.48	30.7	30.8	46
379.44	32.944	31.544	46
426.87	32.448	32.248	46
682.98	38.192	38.492	46
758.87	38.344	38.944	46

# ABOVE READINGS ARE PEAK READINGS WITH CABLE AND ANTENNA FACTORS INCLUDED.  
 SPECTRUM ANALYZER SETTINGS:

RBW : 100KHz  
 VBW : 100KHz

# QUASI-PEAK READINGS ARE TAKEN WITH ROHDE & SCHWARZ EMI TEST RECEIVER  
 20 - 1000MHz ESVS 30 :

RADIATED RF LEVEL - QUASI-PEAK VALUE

FREQUENCY (MHz)	HORIZONTAL (dBuv/m)	VERTICAL (dBuv/m)	FCC CLASS B LIMIT (dBuv/m)
37.2	26.92	35.32	40
208.69	33.2	AMBIENT	43.5
218.19	32.04	31.14	46

THE SPECTRUM WAS SCANNED FROM 30 TO 1000 MHz AND THE SIGNIFICANT EMISSIONS ARE RECORDED.

TEST DISTANCE BETWEEN DEVICE UNDER TEST AND RECEIVING ANTENNA WAS 3-METER.

# SAMPLE CALCULATION :

FINAL VALUE (dBuv/m) = ANTENNA FACTOR (dB) + CABLE (dB) + READING (dBuv/m)

# THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY

# THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT ENDORSEMENT BY NVLAP OR ANY AGENCY OF THE U.S. GOVERNMENT

THE TEST RESULT WAS PASS FCC CLASS B LIMIT.

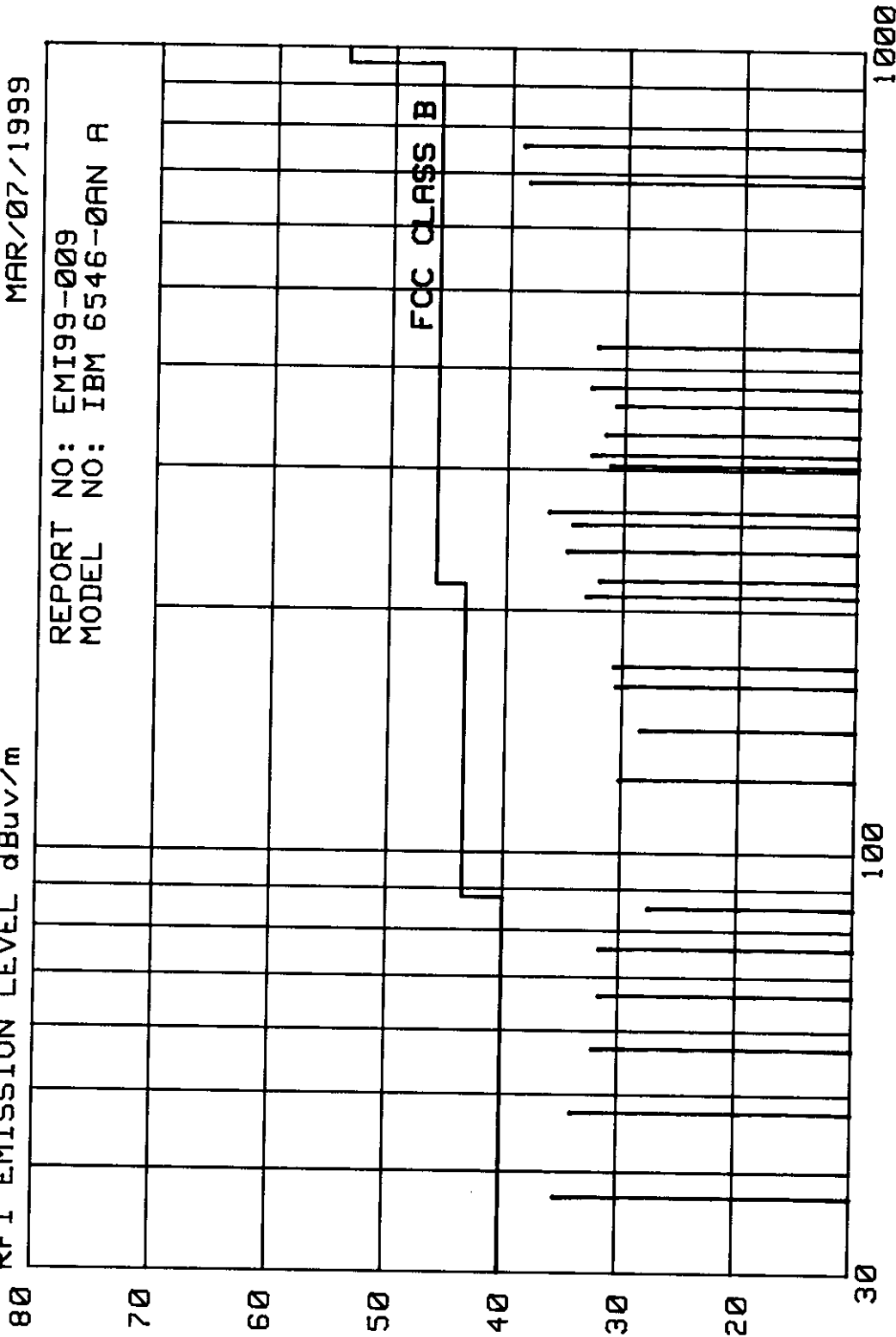
RFI EMISSION LEVEL dBuV/m

MAR/07/1999

REPORT NO: EMI99-009  
MODEL NO: IBM 6546-08AN A

FCC CLASS B

FREQUENCY MHz

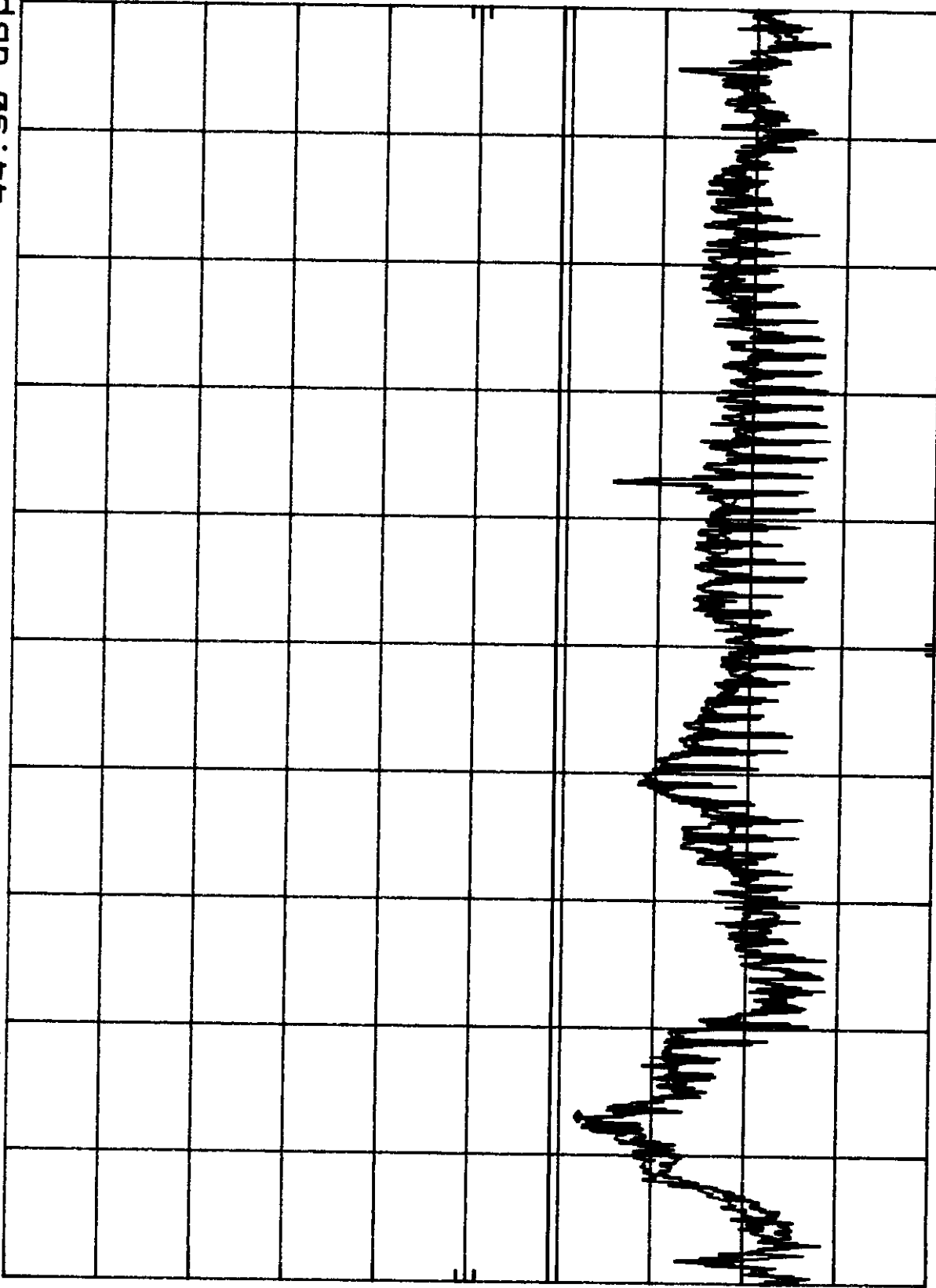


A3KM078 RUN 1024X768/85HZ 68.7KHZ MODE AC110V MKR 4.26 MHZ  
REF 107.0 dBμV ATTEN 10 dB 44.90 dBμV

hp

10 dB/

DL  
48.0  
dBμV



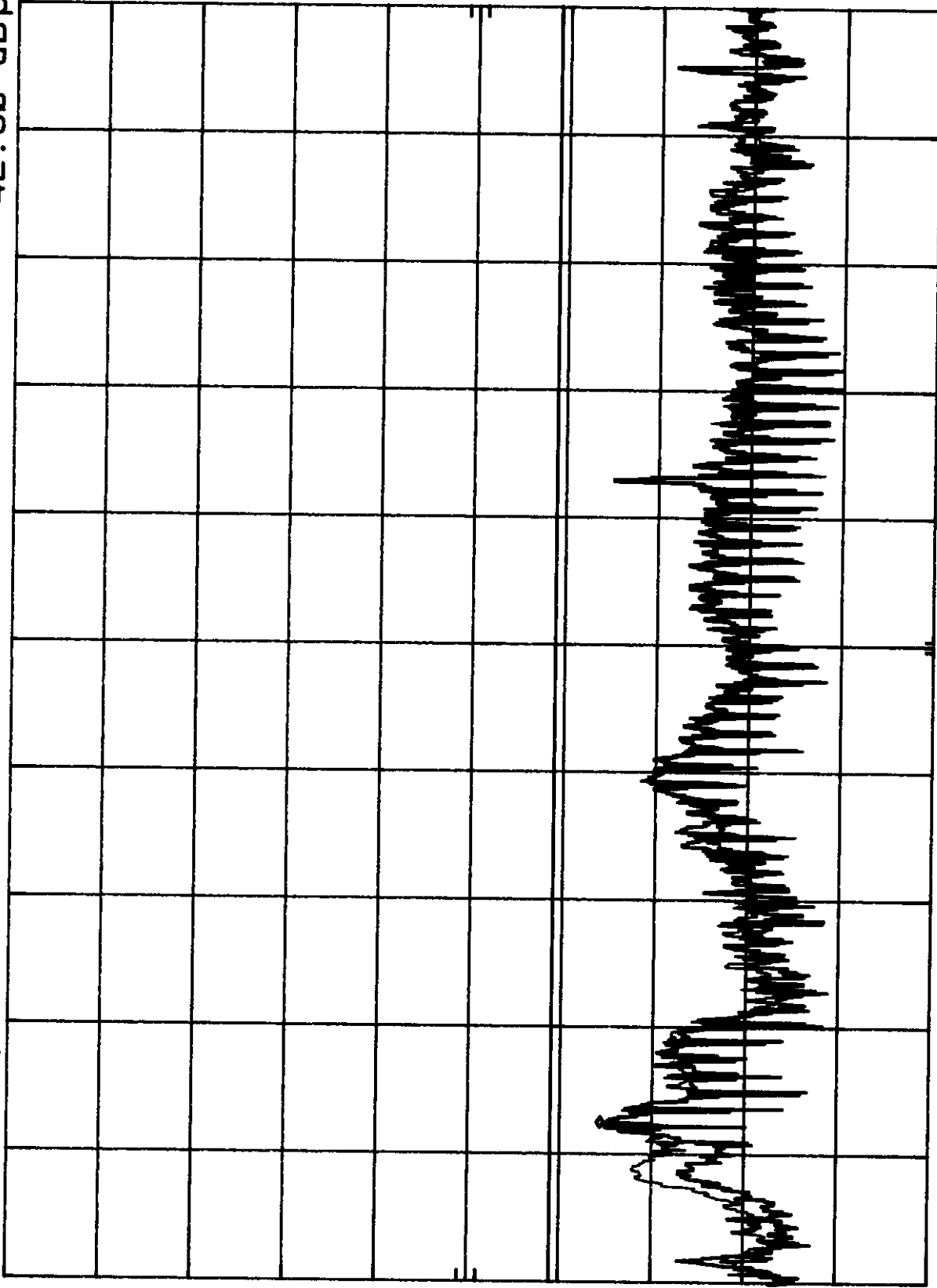
START 450 KHZ RES BW 10 KHZ VBW 10 KHZ STOP 30.00 MHZ  
SWP 750 msec

A3KM078 RUN 1024X768/85HZ 68.7KHZ MODE AC220V MKR 4.11 MHZ  
REF 107.0 dBμV ATTEN 10 dB 42.60 dBμV

HP

10 dB/

DL  
48.0  
dBμV



START 450 KHZ

RES BW 10 KHZ

VBW 10 KHZ

STOP 30.00 MHZ

SWP 750 msec

FCC TEST REPORT

FCC ID : A3KM078  
 REPORT NO.: EMI99-009A  
 TEST DATE : MAR/08/1999  
 TEST ENGI.: C.C.Wu

TEST PERFORMED BY  
 PHILIPS ELECTRONICS INDUSTRIES (TAIWAN) LTD.  
 CONSUMER ELECTRONICS DIVISION (PEI-CED)  
 EMI-LAB  
 P.O.BOX 123  
 CHUNGLI, TAOYUAN, TAIWAN, R.O.C.  
 TEL: 886-3-4549862 FAX: 886-3-4549887

MANUFACTURER : PHILIPS  
 TESTED SYSTEM:

1. EUT : IBM 5546-0AN A COLOR MONITOR S/N.: TY9904009  
 FCC ID. : A3KM078
2. COMPUTER: IBM 6588-120 S/N.: 556N59M  
 FCC ID. : AN021B1V
3. PRINTER : HP 2225C S/N.: 3145S02419  
 FCC ID. : DSI6XU2225
4. MODEM : USRobotics 268 S/N.: 0002680559278575  
 FCC ID. : CJE-0318
5. MOUSE : IBM M-534 S/N.: 23-146196  
 FCC ID. : DZL211029
6. KEYBOARD: IBM KB-9826 S/N.: K071940  
 FCC ID. : E8HKB-5323
7. VIDEO CARD : BUILT-IN S/N.: --  
 FCC ID. : --

NOTE: TEST WAS PERFORMED IN ACCORDANCE WITH FCC MEASUREMENT PROCEDURE ANSI C63.4-1992 'AMERICAN NATIONAL STANDARD FOR MEASUREMENT OF RADIO-NOISE EMISSION FROM LOW-VOLTAGE ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9KHz TO 40GHz'

MONITOR WAS CONNECTED TO FLOOR MOUNTED AC OUTLET.  
 60.0KHz MODE(1024X768/75Hz) WAS TESTED.  
 INTERFACE CABLE WITH THREE FERRITE CORES(ONE INSIDE) WAS TESTED.  
 UNSHIELDED MAINS CORD WAS USED DURING TEST.

THE TEST EQUIPMENT PLEASE REFER TO EQUIPMENT LIST AS ATTACHED.

DEVIATION: NONE

RADIATED RF LEVEL - PEAK VALUE

FREQUENCY (MHz)	HORIZONTAL (dBuv/m)	VERTICAL (dBuv/m)	FCC CLASS B LIMIT (dBuv/m)
86.64	25.25	28.55	40
118.14	26.18	30.68	43.5
126.02	28.28	28.18	43.5
133.9	27.04	28.24	43.5

141.73	28.22	28.72	43.5
157.52	29.3	30	43.5
173.27	31.79	AMBIENT	43.5
181.15	30.89	29.09	43.5
212.63	33.24	AMBIENT	43.5
236.27	35.1	33.7	46
252.06	34.9	33.9	46
259.89	35.9	34.5	46
267.77	34.62	34.42	46
275.63	36.34	35.04	46
315	30.66	30.56	46
338.62	30.136	29.936	46
354.38	32	31.3	46
393.76	31.284	AMBIENT	46
417.4	31.304	31.204	46
488.26	32.816	33.116	46

# ABOVE READINGS ARE PEAK READINGS WITH CABLE AND ANTENNA FACTORS INCLUDED.  
 SPECTRUM ANALYZER SETTINGS:  
 RBW : 100KHz  
 VBW : 100KHz

# QUASI-PEAK READINGS ARE TAKEN WITH ROHDE & SCHWARZ EMI TEST RECEIVER  
 20 - 1000MHz ESVS 30 :

RADIATED RF LEVEL - QUASI-PEAK VALUE

FREQUENCY (MHz)	HORIZONTAL (dBuv/m)	VERTICAL (dBuv/m)	FCC CLASS B LIMIT (dBuv/m)
39.01	29.64	32.84	40
47.24	27.08	34.08	40
55.12	29.35	34.65	40
63	25.89	34.09	40
220.51	32.52	31.22	46

THE SPECTRUM WAS SCANNED FROM 30 TO 1000 MHz AND THE SIGNIFICANT EMISSIONS ARE RECORDED.

TEST DISTANCE BETWEEN DEVICE UNDER TEST AND RECEIVING ANTENNA WAS 3-METER.

# SAMPLE CALCULATION :

$$\text{FINAL VALUE (dBuv/m)} = \text{ANTENNA FACTOR (dB)} + \text{CABLE (dB)} + \text{READING (dBuv/m)}$$

# THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY

# THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT ENDORSEMENT BY NULAP OR ANY AGENCY OF THE U.S. GOVERNMENT

THE TEST RESULT WAS PASS FCC CLASS B LIMIT.

CHECKED BY: K. J. Hsu

K.J.HSU, NULAP SIGNATORY

TESTED BY: C.C. Wu

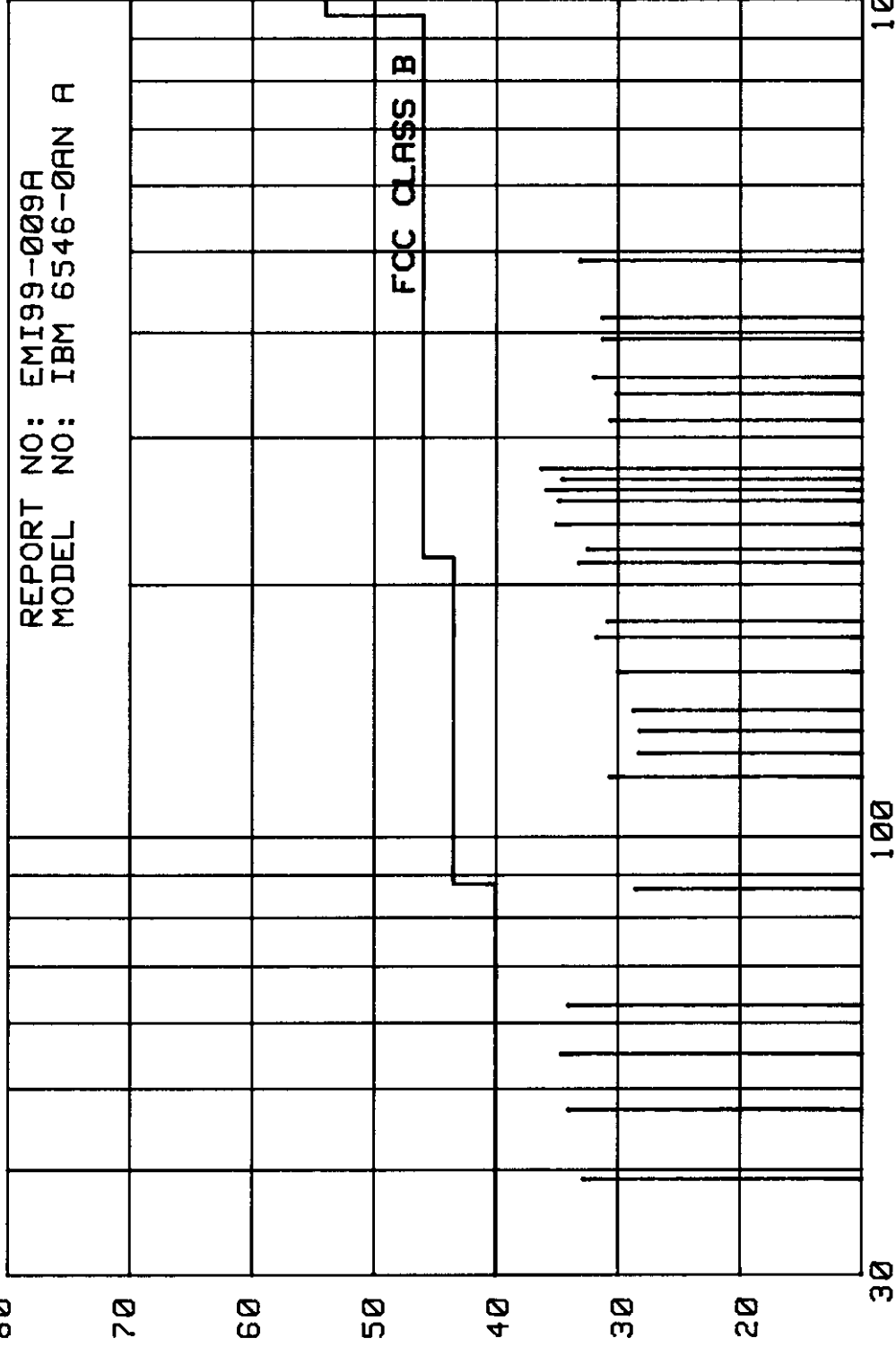
C.C. Wu



MAR/08/1999

REPORT NO: EMI99-009A  
MODEL NO: IBM 6546-0AN A

RFI EMISSION LEVEL dBuV/m



FCC CLASS B

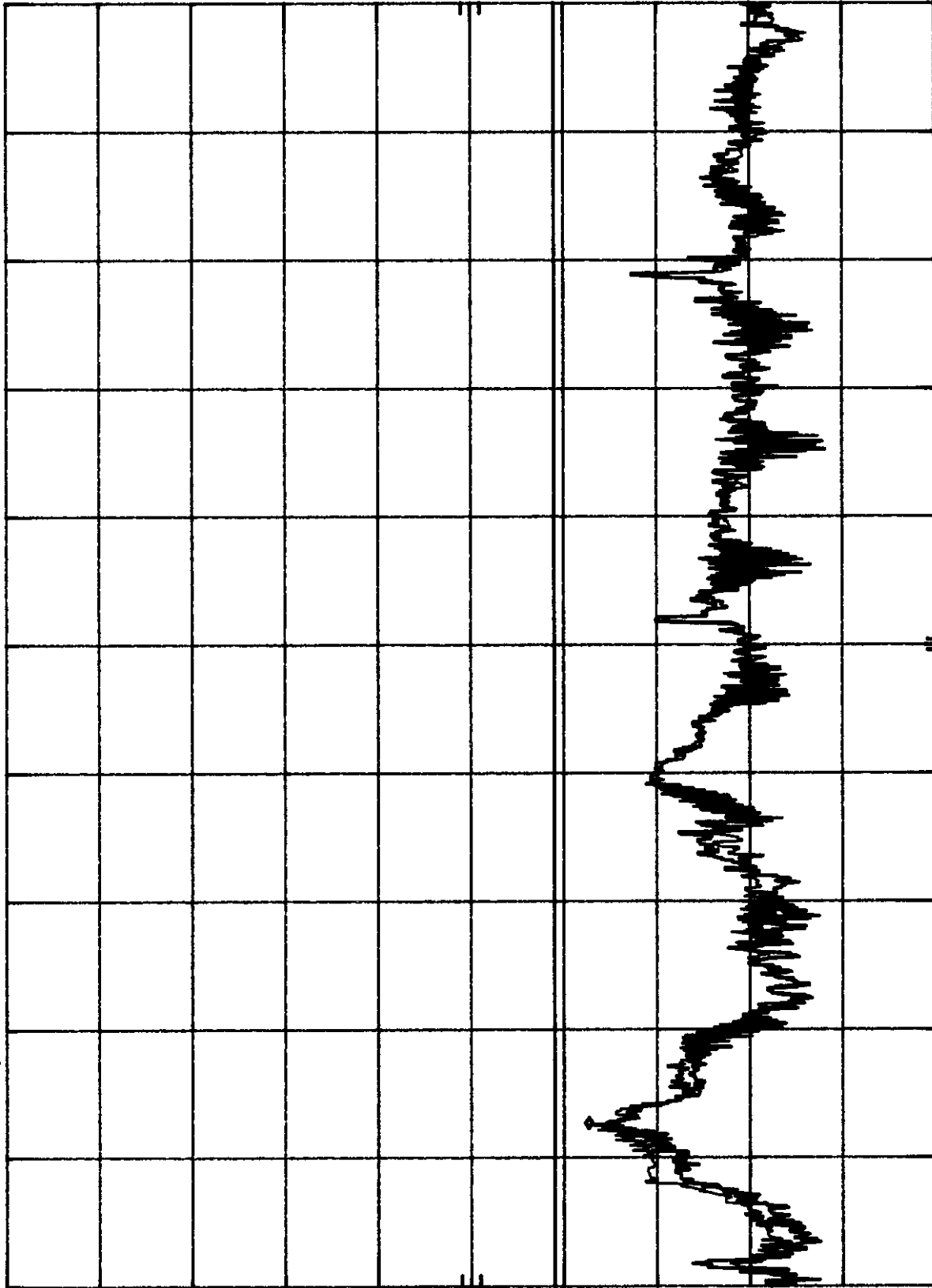
FREQUENCY MHZ

A3KM078 RUN 1024X768/75HZ 60KHZ MODE AC110V MKR 4.17 MHZ  
REF 107.0 dBμV ATTEN 10 dB 44.30 dBμV

hp

10 dB/

DL  
48.0  
dBμV



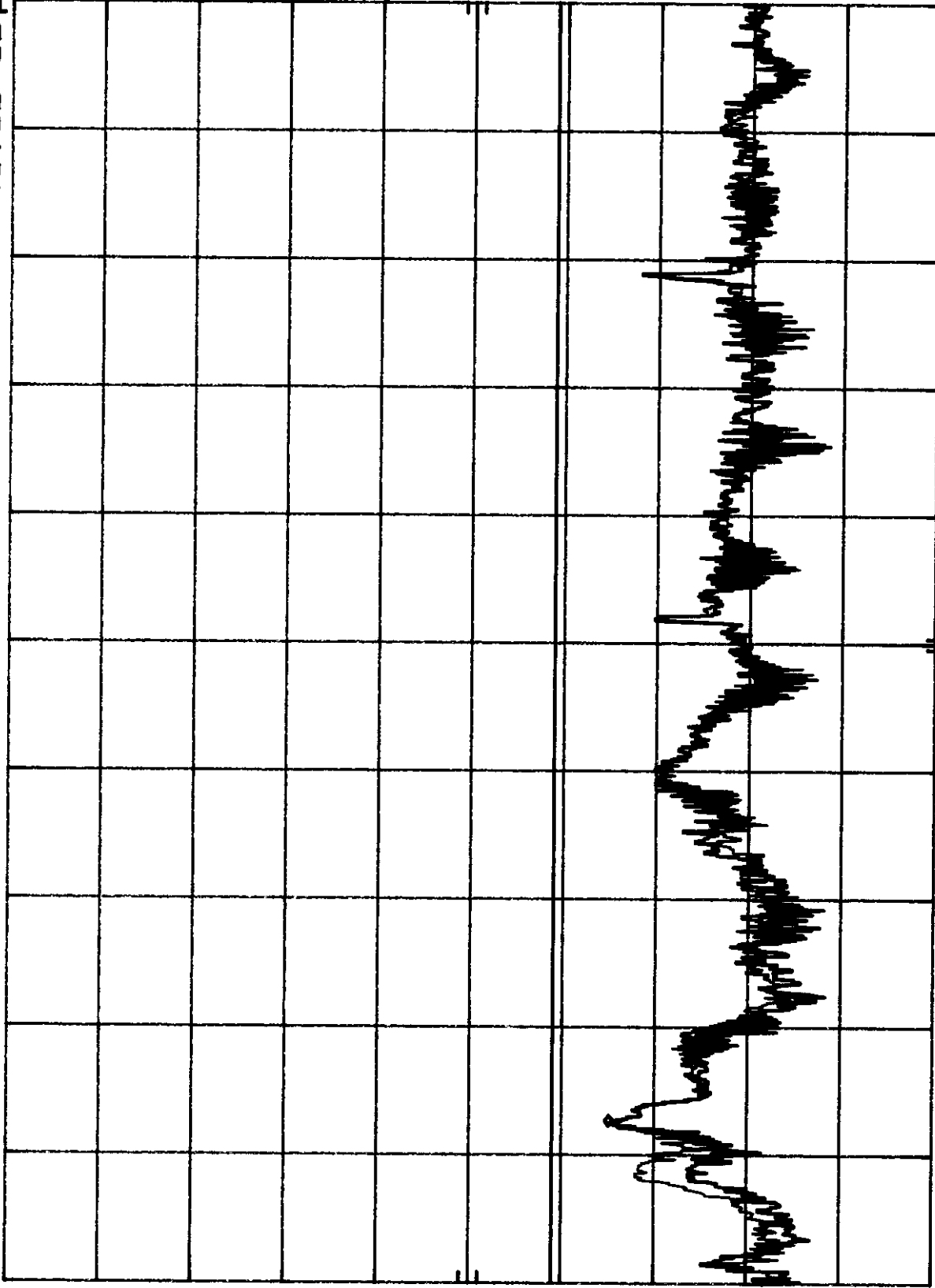
START 450 KHZ RES BW 10 KHZ VBW 10 KHZ STOP 30.00 MHZ  
SWP 750 msec

A3KM078 RUN 1024X768/75HZ 60KHZ MODE AC220V MKR 4.17 MHZ  
REF 107.0 dBμV ATTEN 10 dB 41.90 dBμV

hp

10 dB/

DL  
48.0  
dBμV



START 450 KHZ RES BW 10 KHZ VBW 10 KHZ STOP 30.00 MHZ  
SWP 750 msec

## **Exhibit 7**

# **Photographs**

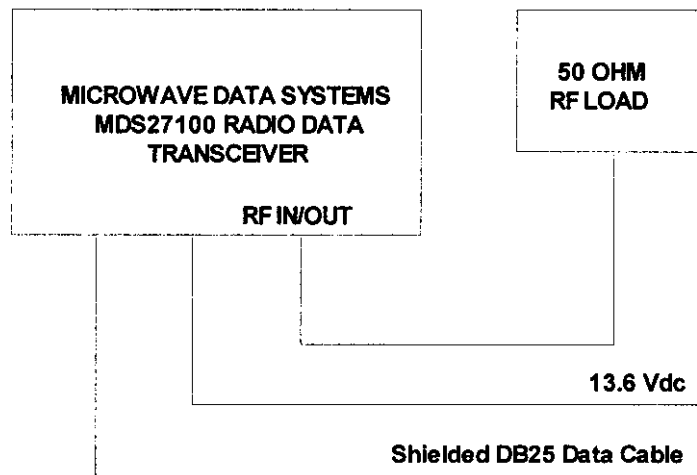
## 1. EXHIBIT 3 - SYSTEM TEST CONFIGURATION

### 1.1. TEST SYSTEM DETAILS

The following peripherals, FCC identifiers and types interconnecting cables were used with the EUT for testing:

- (1) **EUT:** MICROWAVE DATA SYSTEMS, MDS 2710D DATA TRANSCEIVER, Model : MDS 2710D, S/N: preproduction, OSC. FREQ: 302.20 - 304.2 MHz (1st L.O.), 82.2 MHz (IF), 81.745 (2nd L.O.).  
I/O Cable: All I/O cables were shielded  
Power Supply Cable: Non-shielded

### 1.2. BLOCK DIAGRAM FOR EUT'S TEST ARRANGEMENT



#### ULTRATECH GROUP OF LABS

4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vhk.ultratech@sympatico.ca](mailto:vhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

File #: MIC-012FCCTX  
Feb. 05, 1999

- Accredited by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Recognized/Listed by FCC (USA), Industry Canada (Canada)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

#### 1.4. JUSTIFICATION

No deviation, in both configuration and operation manners, different from normal operation were required.

#### 1.5. EUT OPERATING CONDITION

Transmit at centre frequency of the band.

#### 1.6. SPECIAL ACCESSORIES

No special accessories were required.

#### 1.7. EQUIPMENT MODIFICATIONS

Not required.

---

#### ULTRATECH GROUP OF LABS

4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vhk.ultratech@sympatico.ca](mailto:vhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

File #: MIC-012FCCTX  
Feb. 05, 1999

- Accredited by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Recognized/Listed by FCC (USA), Industry Canada (Canada)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

## 2. EXHIBIT 4 - TEST DATA

### 2.1. POWER AND ANTENNA HEIGHT @ FCC 90.205

**PRODUCT NAME:** MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D

**FCC REQUIREMENTS:**

FCC Part 90, Para. 90.205:- Please refer to FCC CFR 47, Part 80 to End, Para. 90.205 for specification details.

**CLIMATE CONDITION:**

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

**POWER INPUT:**

13.6 Vdc battery.

**TEST EQUIPMENT:**

- HP EMC Analyzer, Model HP8593EM, 9 kHz-26.5 GHz, S/N: 3412A00103
- Bird Attenuator, 50 Ohm IN/OUT

**METHOD OF MEASUREMENTS:**

Refer to FCC @ 2.985

- (a) For transmitter other than single sideband, independent sideband and controlled carrier radiotelephone, power rf output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of the current and voltage on the circuit elements specified in 2.983(d)(5). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

**TEST ARRANGEMENT**



**TEST RESULTS:** Conforms.

**TESTED PERSONNEL:** Mr. Hung Trinh, EMI/RFI Technician

**DATE:** Feb. 02, 1999

**ULTRATECH GROUP OF LABS**

4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vhk.ultratech@sympatico.ca](mailto:vhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

File #: MIC-012FCCTX  
Feb. 05, 1999

- Accredited by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Recognized/Listed by FCC (USA), Industry Canada (Canada)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

**MEASUREMENT DATA**

**PEAK POWER MEASUREMENT AT THE ANTENNA TERMINAL**

**TEST CONFIGURATION**

- *The transmitter terminal was coupled to the Spectrum Analyzer through a 30 dB attenuator*
- *Power of the transmitter channel near the lowest, middle and highest of each frequency block/band were measured using the power meter, and the reading was corrected by added the calibrated attenuator's attenuation value and cable loss.*
- *The RF Output was turned on with no modulation.*

<b>TRANSMITTER CHANNEL OUTPUT</b>	<b>FUNDAMENTAL FREQUENCY (MHz)</b>	<b>MEASURED PEAK POWER (Watts)</b>	<b>PEAK POWER RATING (Watts)</b>
Middle	221	5.0	5.0

**ERP Measurements:** -Appropriate antenna type, and adjustment of power output for effective radiated power (ERP) to meet FCC limits will be performed by the manufacturer at location of installation.

**ULTRATECH GROUP OF LABS**

4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [yhk.ultratech@sympatico.ca](mailto:yhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

File #: MIC-012FCCTX  
Feb. 05, 1999

- Accredited by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Recognized/Listed by FCC (USA), Industry Canada (Canada)
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## 2.2. FREQUENCY STABILITY @ FCC 90.213

**PRODUCT NAME:** MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D

### FCC REQUIREMENTS:

FCC Part 90, Sub. I, Para. 90.213

The carrier frequency of each transmitter shall be maintained within the following tolerances from the assigned frequencies.

FREQUENCY RANGE (MHz)	FIXED & BASE STATIONS (ppm)	MOBILE STATIONS (ppm)	
		≤ 2 W	≤ 2 W
220 – 220	0.1	1.5	1.5

### CLIMATE CONDITION:

Standard Temperature and Humidity: Please refer to Measurement Data

### POWER INPUT:

13.6 Vdc battery.

### TEST EQUIPMENT:

- HP EMC Analyzer, Model HP8593EM, 9 kHz-26.5 GHz, S/N: 3412A00103
- Tenney Temp. & Humidity Chamber, Model T5, S/N: 9723B
- Bird Attenuator, 50 Ohm IN/OUT

### METHOD OF MEASUREMENTS:

Refer to FCC @ 2.995

- (a) The frequency stability shall be measured with variation of ambient temperature as follows:
- From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.
- (b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.
- (d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

### **ULTRATECH GROUP OF LABS**

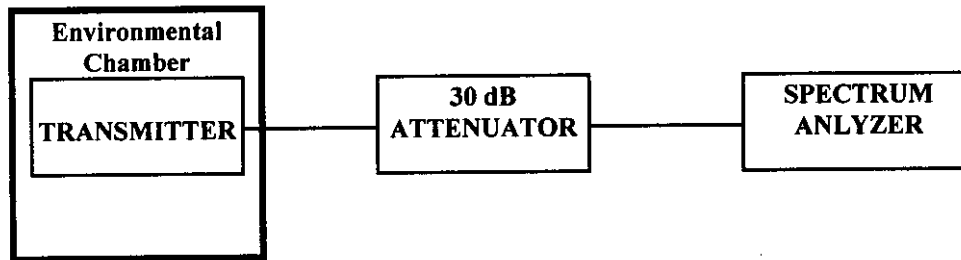
4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vtk.ultratech@sympatico.ca](mailto:vtk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

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- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
  - (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
  - (3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.
- (e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

### TEST ARRANGEMENT



**TEST RESULTS:** Conforms.

**TESTED PERSONNEL:** This tests are performed by Microwave Data Systems.

### MEASUREMENT DATA

Please kindly refer to the measurement data performed by Microwave Data Systems.

---

### **ULTRATECH GROUP OF LABS**

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Michael A. Rudy  
March 3, 1999

### 2710 Frequency Stability, and Emission Mask Test Data

The following data was taken with a 2710D ser#802111 radio for FCC verification of the emission mask and frequency stability. The radio was calibrated at 221MHz.

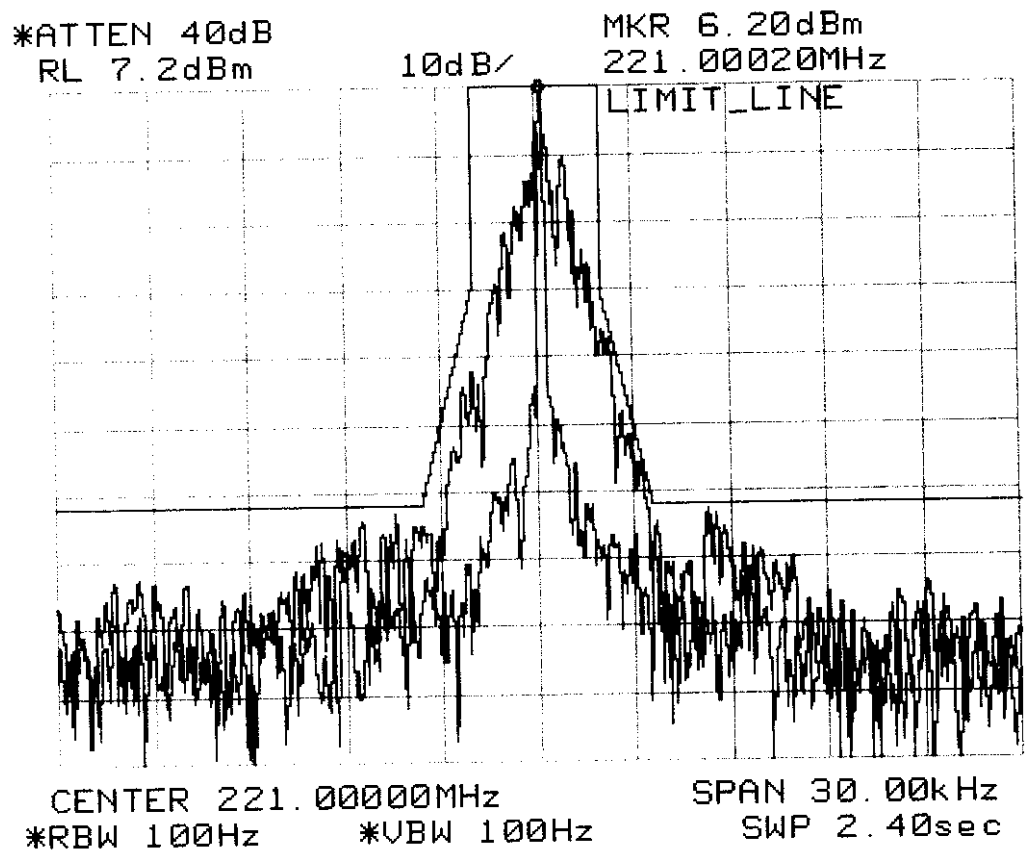
Temp( °C)	Frequency(MHz)	$\Delta$ from calibrated Frequency
-30	221.000217	+217Hz
-20	221.000179	+179Hz
-10	221.000119	+119Hz
0	221.000114	+114Hz
+10	220.999994	-6Hz
+25	221.000000	0Hz
+30	220.999977	-23Hz
+40	220.999930	-70Hz
+50	220.999884	-116Hz
+60	220.999870	-130Hz

The mask data is attached.

The mask and frequency stability were then measured at 85% rated supply voltage and 115% rated supply voltage at +25°C. The frequency for the two supply voltages was 220.999988. The mask data is attached.

3-2-11

P14-2



FCC MASK, MODULATED AND UNMODULATED CARRIER.

Temp = -30°C

3-2-99

p14-3

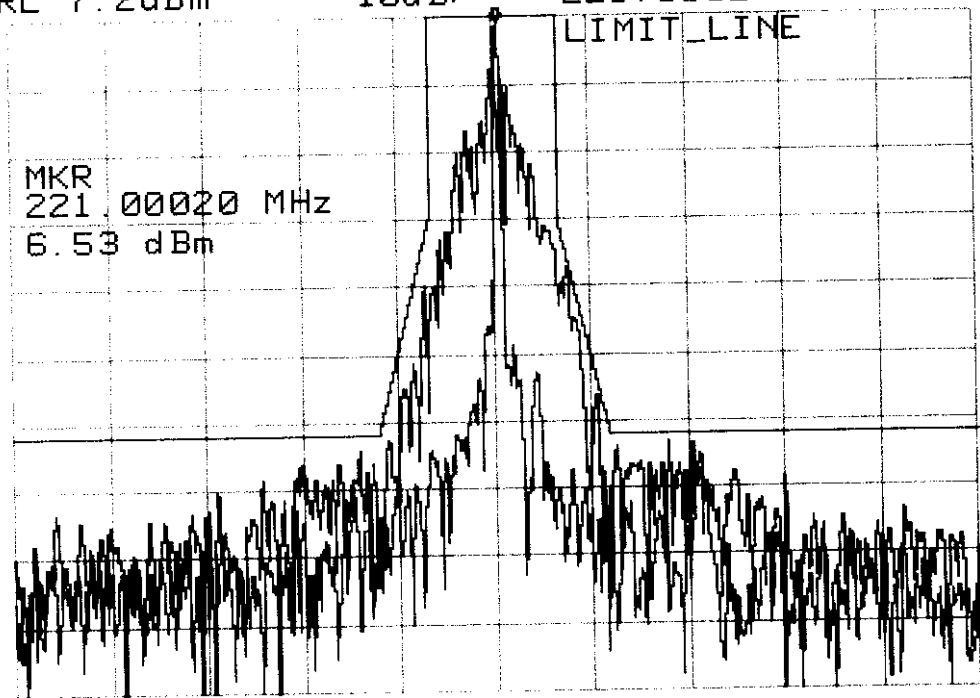
\*ATTEN 40dB  
RL 7.2dBm

MKR 6.53dBm  
221.00020MHz

10dB/

LIMIT\_LINE

MKR  
221.00020 MHz  
6.53 dBm



CENTER 221.00000MHz SPAN 30.00kHz  
\*RBW 100Hz \*VBW 100Hz SWP 2.40sec

- FCC MASK, modulated and modulated carrier
- TEMP = -20°C

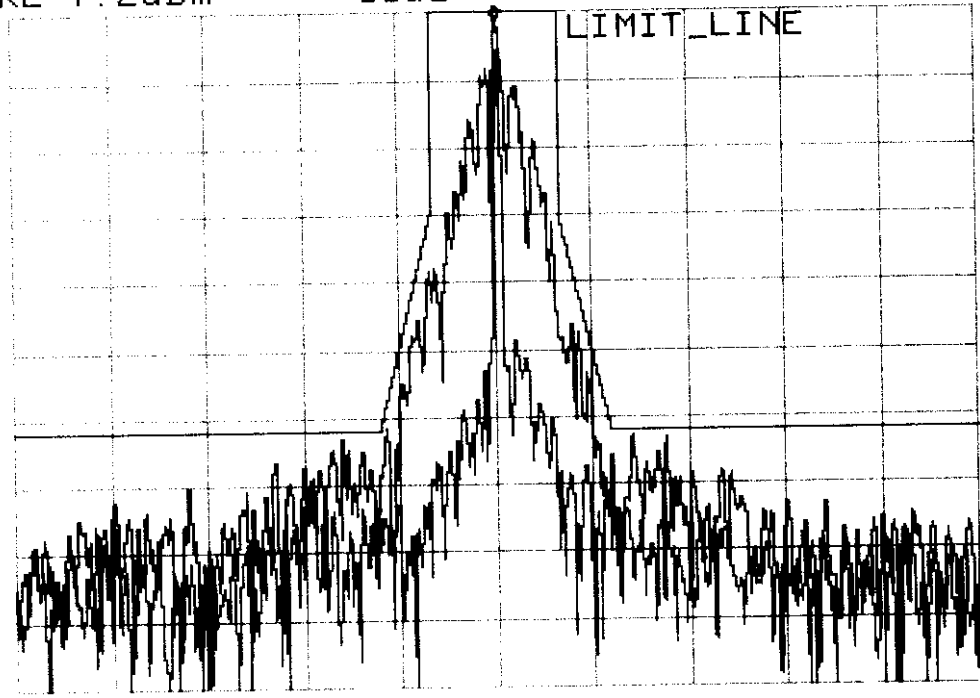
3-2-99

P14-4

\*ATTEN 40dB  
RL 7.2dBm

MKR 6.20dBm  
221.00010MHz  
LIMIT\_LINE

10dB/



CENTER 221.00000MHz  
\*RBW 100Hz \*VBW 100Hz

SPAN 30.00kHz  
SWP 2.40sec

- FCC MASK, modulated and UNMODULATED CARRIER  
- Temp = -10°C

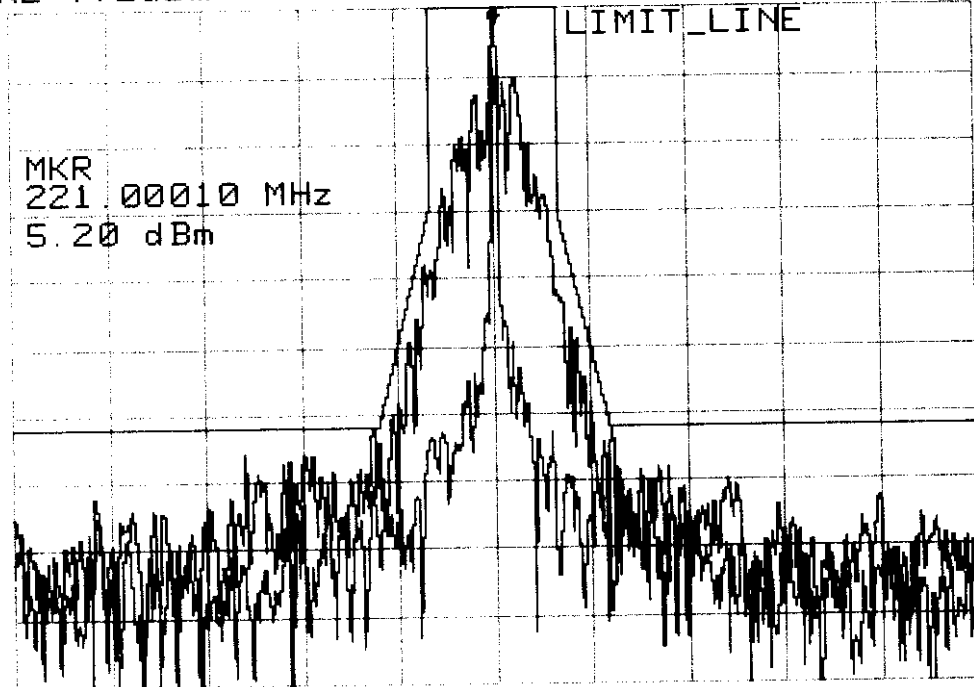
\*ATTEN 40dB  
RL 7.2dBm

10dB/

MKR 5.20dBm  
221.00010MHz

LIMIT\_LINE

MKR  
221.00010 MHz  
5.20 dBm



CENTER 221.00000MHz  
\*RBW 100Hz \*VBW 100Hz

SPAN 30.00kHz  
SWP 2.40sec

FCC MASK, modulated and unmodulated carrier  
Temp = 0°C

3-2-99

p14-6

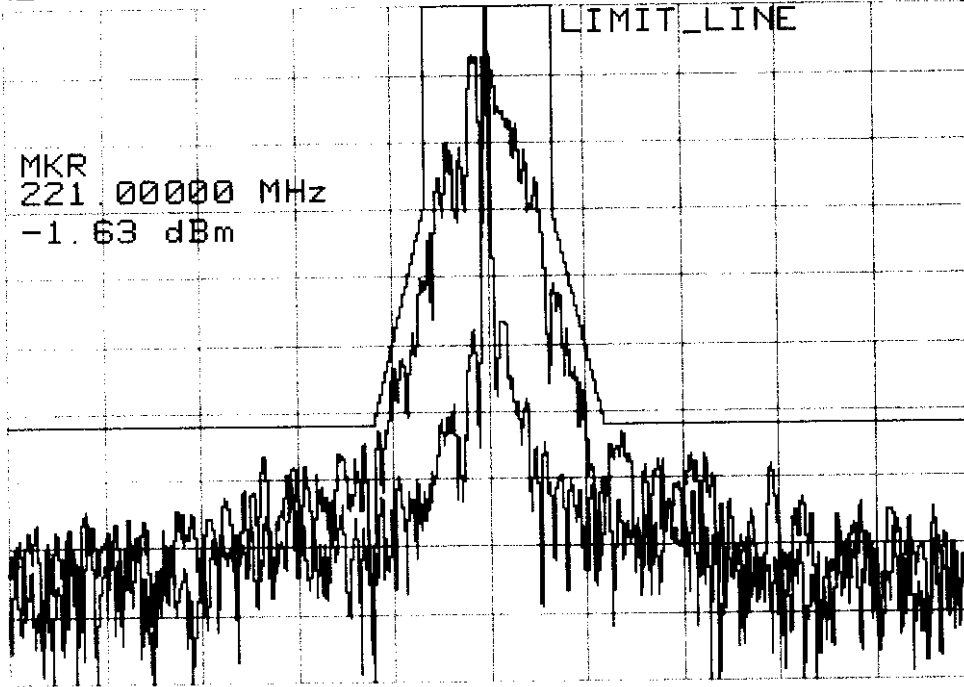
\*ATTEN 40dB  
RL 7.2dBm

10dB/

MKR -1.63dBm  
221.00000MHz

LIMIT\_LINE

MKR  
221.00000 MHz  
-1.63 dBm



CENTER 221.00000MHz SPAN 30.00kHz  
\*RBW 100Hz \*VBW 100Hz SWP 2.40sec

- FCC MASK, modulated and unmodulated carrier  
- Temp = +10°C



3-2-99

P14-7

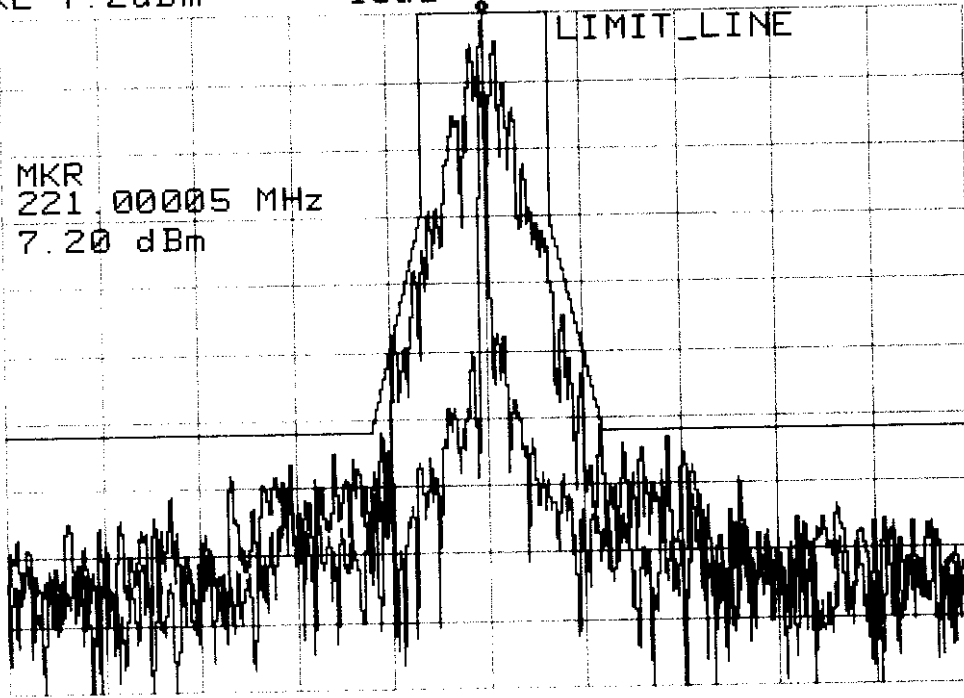
\*ATTEN 40dB  
RL 7.2dBm

10dB/

MKR 7.20dBm  
221.00005MHz

LIMIT\_LINE

MKR  
221.00005 MHz  
7.20 dBm

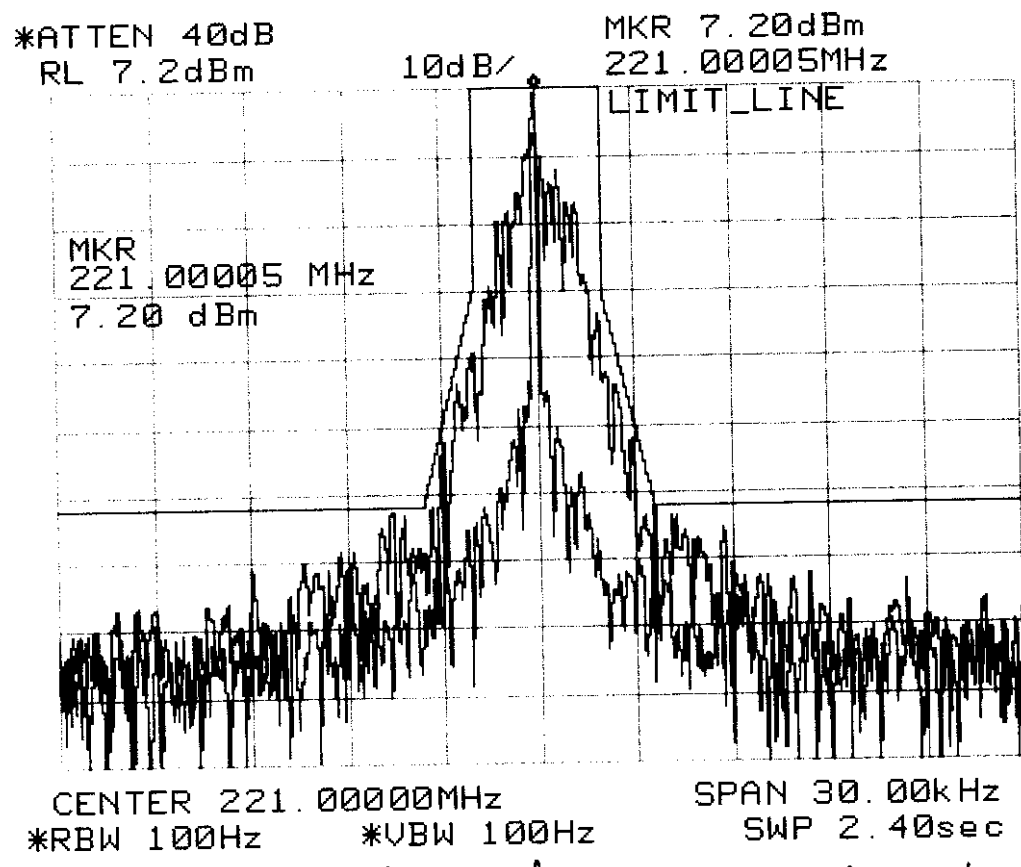


CENTER 221.00000MHz SPAN 30.00kHz  
\*RBW 100Hz \*VBW 100Hz SWP 2.40sec

- FCC MASK, modulated and unmodulated carrier  
- Temp = +25°C

3-2-99

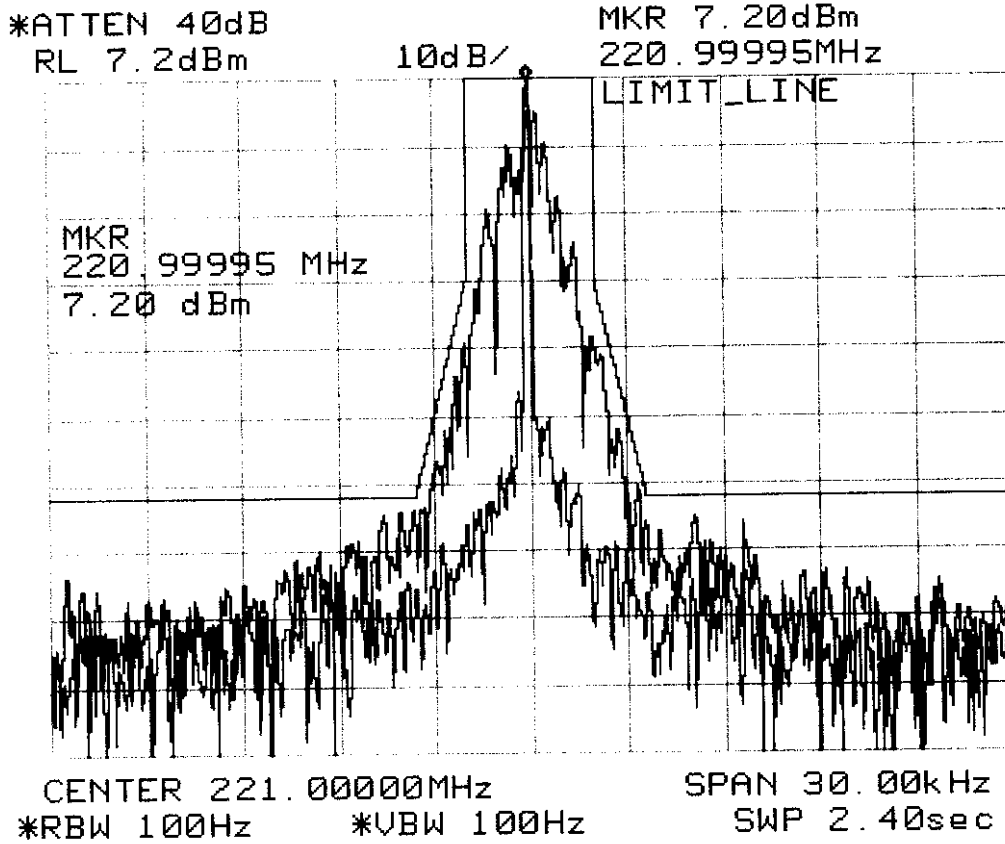
p14-8



- FCC MASK, modulated and unmodulated carrier  
- Temp = +30°C

3-2-99

p14-9



FCC MASK, modulated and unmodulated carrier.  
Temp = +40°C

3-2-99

p14-10

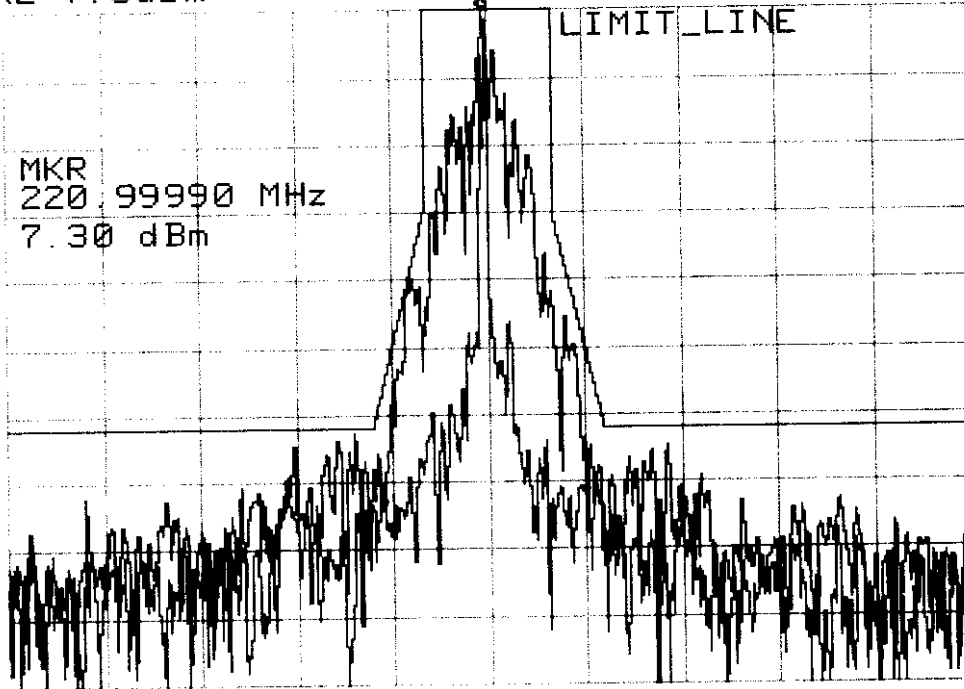
\*ATTEN 40dB  
RL 7.3dBm

10dB/

MKR 7.30dBm  
220.99990MHz

LIMIT LINE

MKR  
220.99990 MHz  
7.30 dBm



CENTER 221.00000MHz  
\*RBW 100Hz \*VBW 100Hz

SPAN 30.00kHz  
SWP 2.40sec

- FCC MASK, modulated and unmodulated carrier  
- Temp + 50°C

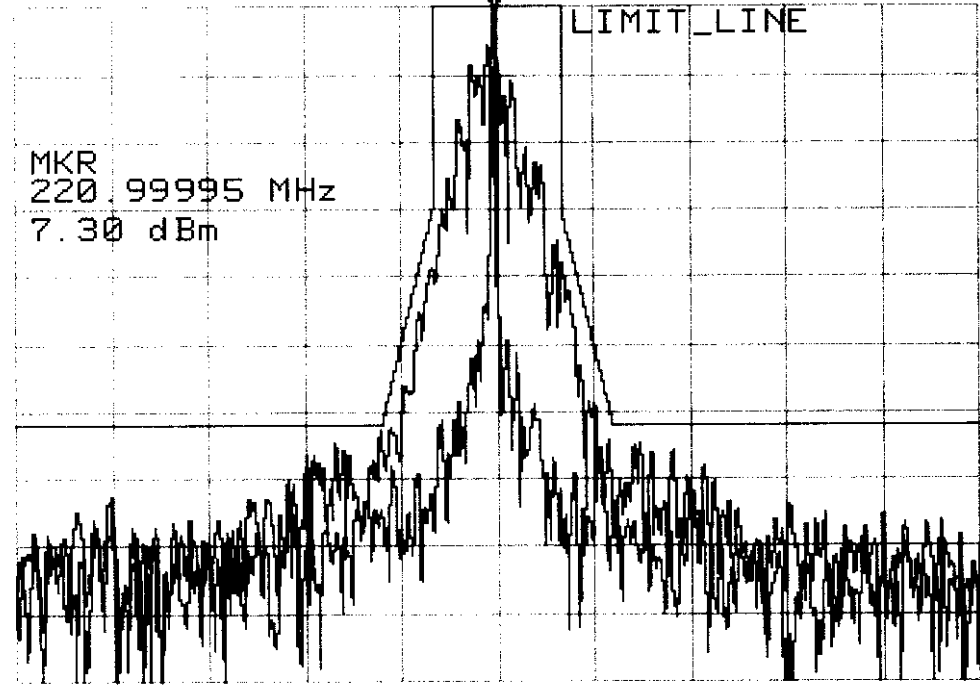
3-2-99

P14-11

\*ATTEN 40dB  
RL 7.3dBm

MKR 7.30dBm  
220.99995MHz

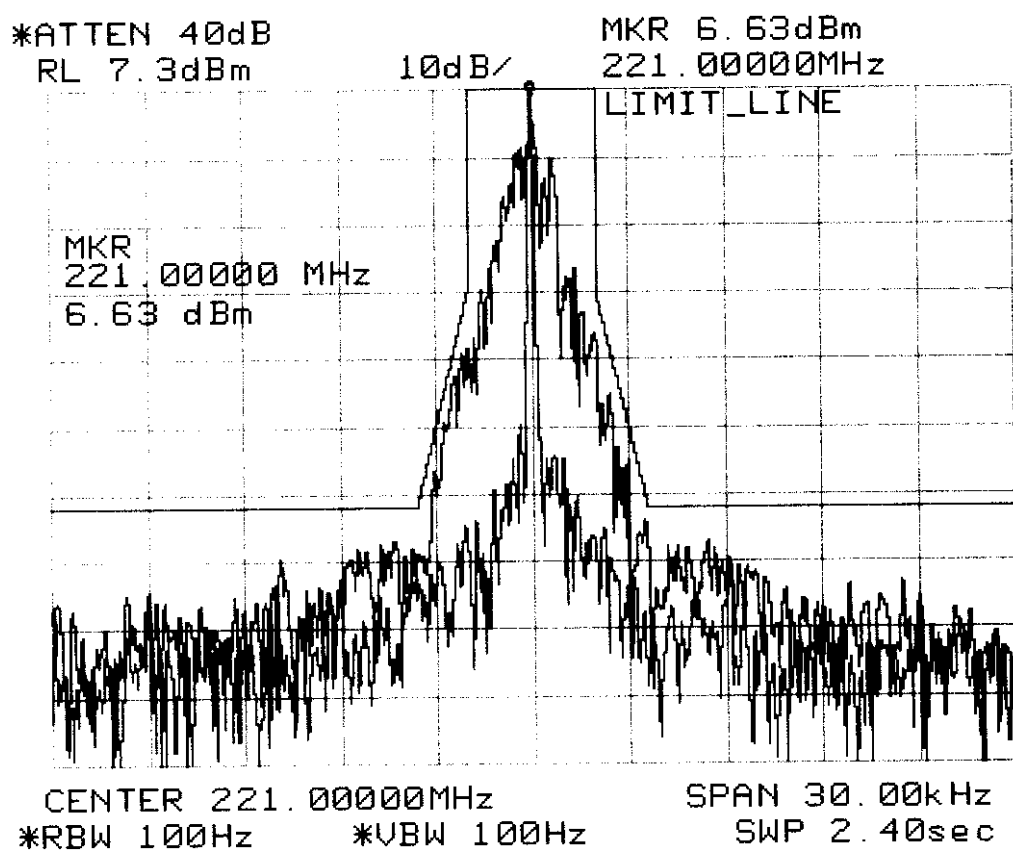
10dB/



MKR  
220.99995 MHz  
7.30 dBm

CENTER 221.00000MHz SPAN 30.00kHz  
\*RBW 100Hz \*VBW 100Hz SWP 2.40sec

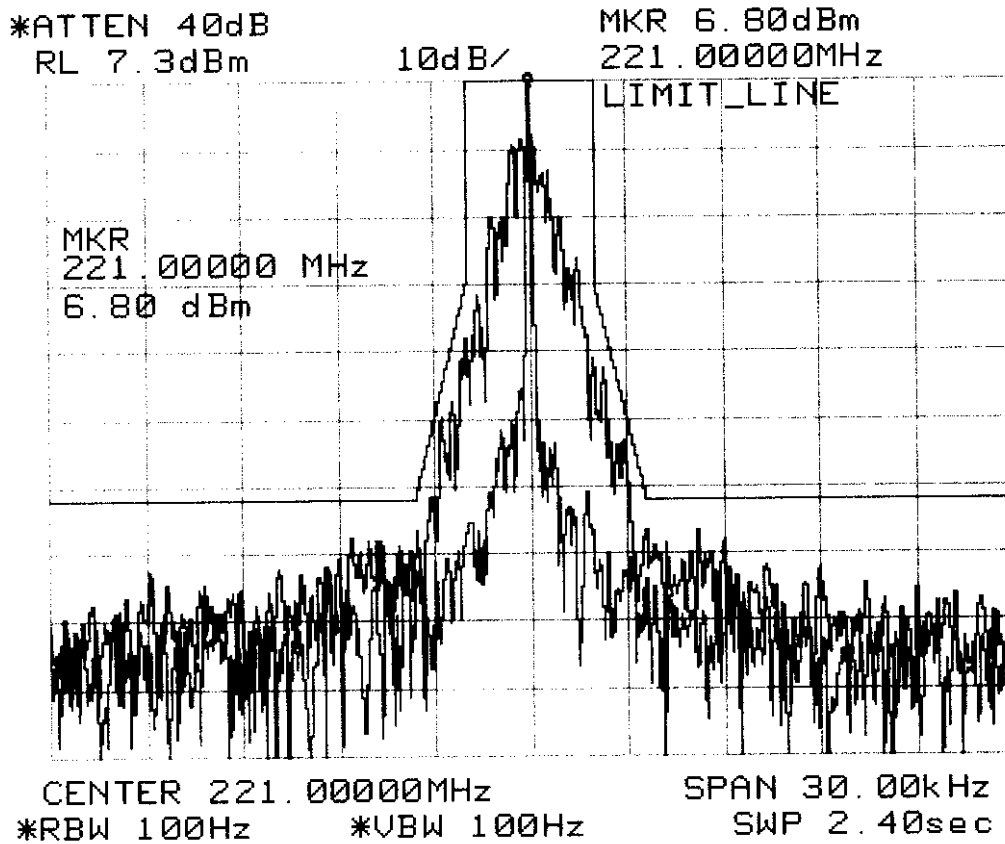
- FCC MASK, modulated and unmodulated carrier  
- Temp = +60°C



- FCC MASK MODULATED AND UNMODULATED CARRIER  
- Temp = +25°C @ 85% rate supply voltage

3-3-99

p14-13



- FCC MASK modulated and UNMODULATED CARRIER.  
Temp = +25°C @ 115% rated supply voltage

### 2.3. MODULATION LIMITING @ FCC 90.210

**PRODUCT NAME:** MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D

**FCC REQUIREMENTS:**

FCC Part 2, Sub. J, Para. 2.987(b) & FCC Part 90, Subpart I, Para. 90.210

Not required, however, tests will be attempted to be conducted for calculation of the necessary bandwidth

**CLIMATE CONDITION:**

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

**POWER INPUT:**

13.6 Vdc battery.

**TEST EQUIPMENT:**

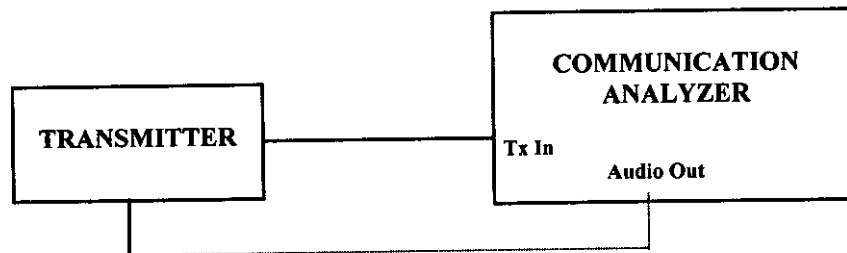
- Communication Analyzer, Rohde & Schawrz, Model SMFO2, S/N: 879988/057, 0.4 - 1000 MHz including AF & RF Signal Generators, SINAD, DISTORTION, DEVIATION meters and etc...

**METHOD OF MEASUREMENTS:**

**For Audio Transmitter:-** The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

**For Data Transmitter with Maximum Frequency Deviation set by Factory:-** The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

**TEST ARRANGEMENT**



**ULTRATECH GROUP OF LABS**

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Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [yhk.ultratech@sympatico.ca](mailto:yhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

File #: MIC-012FCCTX  
Feb. 05, 1999

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**TEST RESULTS:** Conforms.

**TESTED PERSONNEL:** Mr. Hung Trinh, EMI/RFI Technician

**DATE:** Feb. 02, 1999

**MEASUREMENT DATA**

**MODULATION LIMITING FOR DATA TRANSMITTER**

**Modulation:** FM modulation with random data and Modulation Limiter set at a Maximum Frequency Deviation (Factory Setting).

DATA RATE (b/s)	PEAK DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
3200	0.9	N/A

**ULTRATECH GROUP OF LABS**

4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vhk.ultratech@sympatico.ca](mailto:vhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

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## 2.4. EMISSION MASKS @ FCC 90.210

**PRODUCT NAME:** MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D

### FCC REQUIREMENTS:

FCC Part 90, Sub. I, Para. 90.210

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FREQUENCY RANGE (MHz)	Recommended OBW (KHz)	CHANNEL SPACING (KHz)	Recommended FREQ. DEVIATION (KHz)	FCC APPLICABLE MASK
220 – 220	4	5	1 kHz	90.210(f): Mask F – Voice & Data

FCC RULES	FREQUENCY RANGE	ATTENUATION LIMIT (dBc)
90.210(f): Mask F – Voice & Data	Fc+2 kHz-Fc+3.75 kHz	30+20(fd-2) dB or 55 + 10log(P) dB or 65 dB whichever is lesser attenuation

### CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

### POWER INPUT:

13.6 Vdc battery.

### TEST EQUIPMENT:

- HP EMC Analyzer, Model HP8593EM, 9 kHz-26.5 GHz, S/N: 3412A00103
- Bird Attenuator, 50 Ohm IN/OUT
- Audio Oscillator, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.

### ULTRATECH GROUP OF LABS

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Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [vhk.ultratech@sympatico.ca](mailto:vhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

File #: MIC-012FCCTX  
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**METHOD OF MEASUREMENTS:**

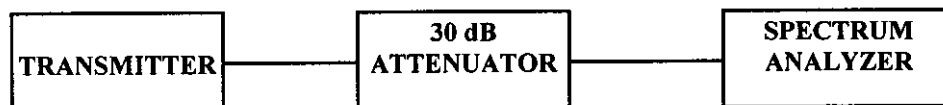
**FCC CFR 47, Para. 2.989 - Out-of-Band Emissions:**

The Emission Masks was measured with the Spectrum Analyzer controls set as shown on the test results (RBW  $\geq$  300 Hz, VBW  $\geq$  300 Hz and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

**Voice or Digital Modulation Through a Voice Input Port @ 2.989(c)(1):**- The transmitter was modulated by a xxx kHz tone signal at an input level 16 dB greater than that required to produce 50% modulation (e.g.:  $\pm$ xxx kHz peak deviation at 1 KHz modulating frequency). The input level was established at the frequency of maximum response of the audio modulating circuit.

**Digital Modulation Through a Data Input Port @ 2.989(h):**- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the descretion of the user.

**TEST ARRANGEMENT**



**TEST RESULTS:** Conforms.

**TESTED PERSONNEL:** Performed by Microwave Data Systems.

**MEASUREMENT DATA**

*Please see attached plots for detailèd measurements.*

**ULTRATECH GROUP OF LABS**

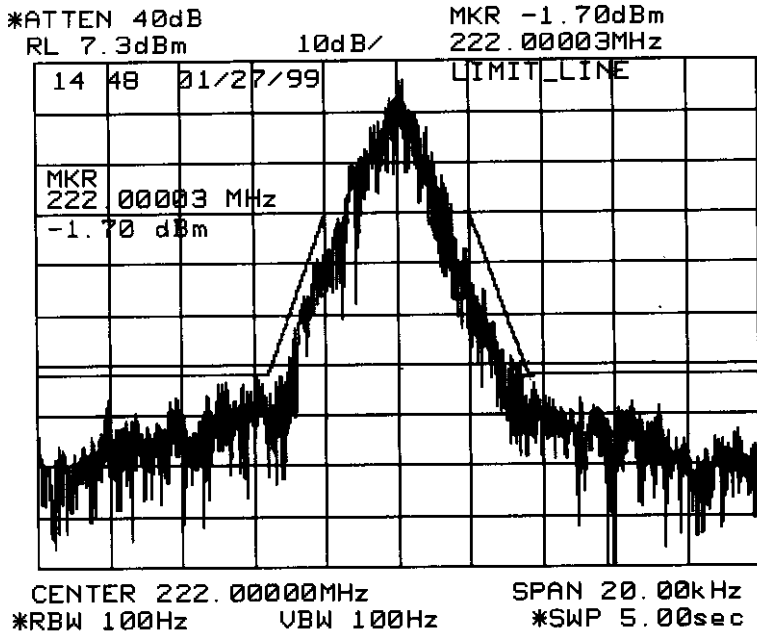
4181 Stadeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [yhk.ultratech@sympatico.ca](mailto:yhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

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2710 Ser# 802111

p18-1

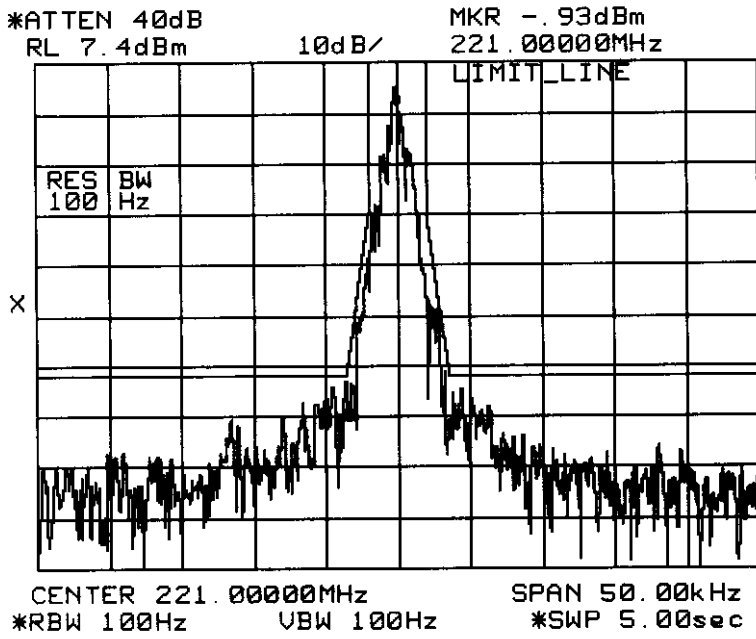


- MEASUREMENT MADE WITH  
HP 8563E Spectrum Analyzer

2710 Ser# 802111

- measurement made with  
HP 8563E Spectrum Analyzer

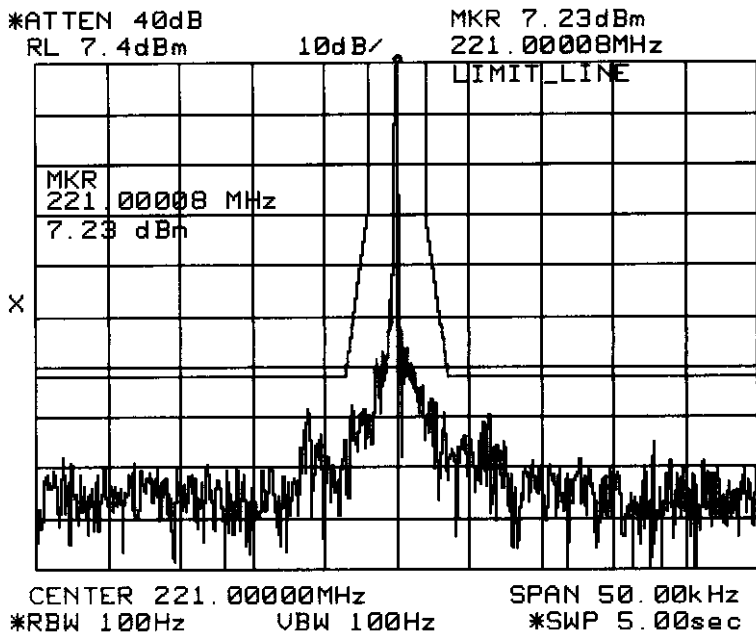
p18-2



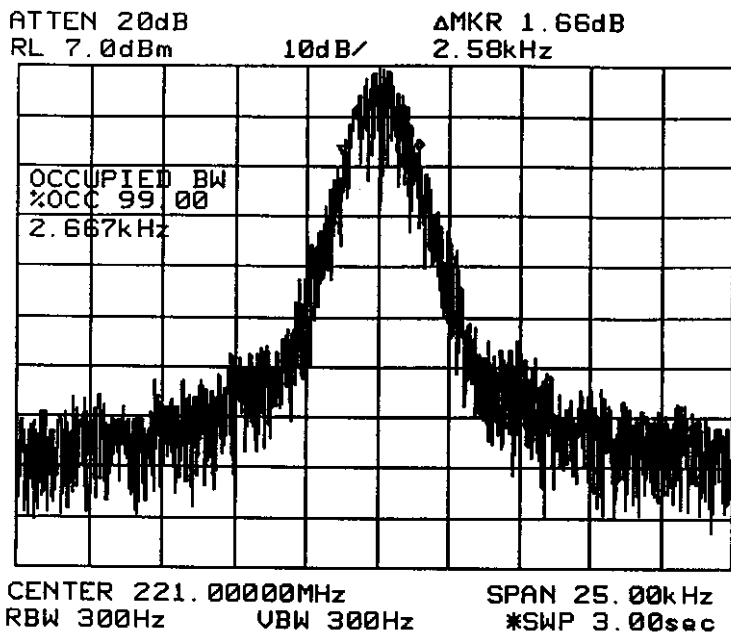
2710 Ser# 802111

- MEASUREMENT MADE WITH  
HP 8563E Spectrum Analyzer

p18-3



OCCUPIED BANDWIDTH



P18-4

3/22/99

Z710D ser # 00820303

SREV 2.4.7 16 Mar 1999

Pl. Deviation = 840 Hz

## 2.5. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 90.210

**PRODUCT NAME:** MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D

### FCC REQUIREMENTS:

FCC Part 90, Sub. I, Para. 90.210

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FREQUENCY RANGE (MHz)	Recommended OBW (KHz)	CHANNEL SPACING (KHz)	Recommended FREQ. DEVIATION (KHz)	FCC APPLICABLE MASK
220 – 220	4	5	1 kHz	90.210(f): Mask F – Voice & Data

FCC RULES	FREQUENCY RANGE	ATTENUATION LIMIT (dBc)
90.210(f): Mask F – Voice & Data	Fc+2 kHz-Fc+3.75 kHz	30+20(fd-2) dB or 55 + 10log(P) dB or 65 dB whichever is lesser attenuation

### CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

### POWER INPUT:

13.6 Vdc battery.

### TEST EQUIPMENT:

- HP EMC Analyzer, Model HP8593EM, 9 kHz-26.5 GHz, S/N: 3412A00103
- Bird Attenuator, 50 Ohm IN/OUT
- Hihpass Filter, Microphase, P/N: CR220HIB, S/N: IIT11000AB, cut-off freq.: 600 MHz.
- Audio Oscillator, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.

### METHOD OF MEASUREMENTS:

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.989, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the Spectrum Analyzer controls set as RBW = 100 kHz, VBW = 100 kHz and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

### ULTRATECH GROUP OF LABS

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Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [yhk.ultratech@sympatico.ca](mailto:yhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

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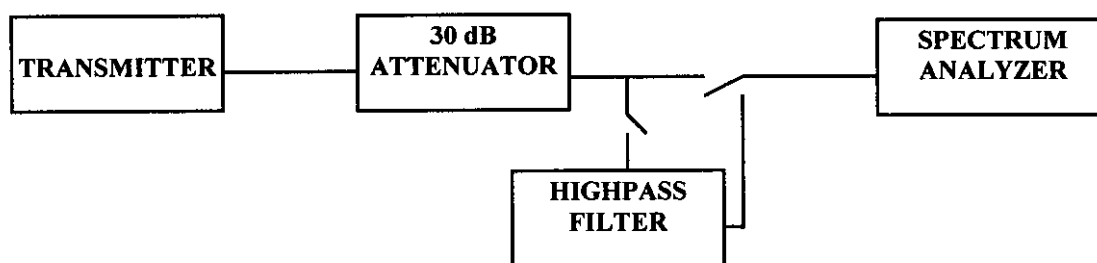
- Accredited by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia)
- Recognized/Listed by FCC (USA), Industry Canada (Canada)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)



**FCC CFR 47, Para. 2.997 - Frequency spectrum to be investigated:-** The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10<sup>th</sup> harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

**FCC CFR 47, Para. 2.991 - Spurious Emissions at Antenna Terminal:-** The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.989 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

**TEST ARRANGEMENT**



**TEST RESULTS:** Conforms.

**TESTED PERSONNEL:** Mr. Hung Trinh, EMI/RFI Technician

**DATE:** Feb. 02, 1999

**ULTRATECH GROUP OF LABS**

4181 Sladeview Cres., Unit 33, Mississauga, Ontario, Canada L5L 5R2  
Tel. #: 905-569-2550, Fax. #: 905-569-2480, Email: [yhk.ultratech@sympatico.ca](mailto:yhk.ultratech@sympatico.ca), Website: <http://www.ultratech-labs.com>

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**MEASUREMENT DATA**

**SPURIOUS & HARMONIC EMISSIONS  
AT THE TRANSMITTER ANTENNA TERMINAL**

**TEST CONFIGURATION**

- The transmitter was coupled to the Spectrum Analyzer through a 30 dB attenuator.
- The insertion loss between the transmitter output terminal and the spectrum analyzer was measured to be 30 dB
- The channel frequencies (Low, Middle and High) was established on the extreme edges of the operating band, both upper and lower at its full rated output power. The emissions was investigated up to the tenth harmonic of the fundamental emissions in each case.

Fundamental Frequency: 221 MHz					
RF Output Power: 5 Watts					
Modulation: FM modulation with 3200 b/s random data (internal source)					
FREQUENCY (MHz)	RF LEVEL (dBm)	DETECTOR USED (PEAK/QP)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
442.00	-24.9	PEAK	-25.0	0.1	Note (1)
The emissions were scanned from 10 MHz to 2.21 GHz and all emissions less 10 dB below the limits were recorded.					

Note (1): This emission was found to be 0.1 above the FCC limit of -25 dBm. However, the it's radiated emissions in Sec. 2.6 of this report shows that it is at least 14.4 dB below the FCC limit. The results are satisfactory.

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Feb. 05, 1999

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**MICROWAVE  
DATA  
SYSTEMS**

FCC ID: E5MDS2710D page 21-1

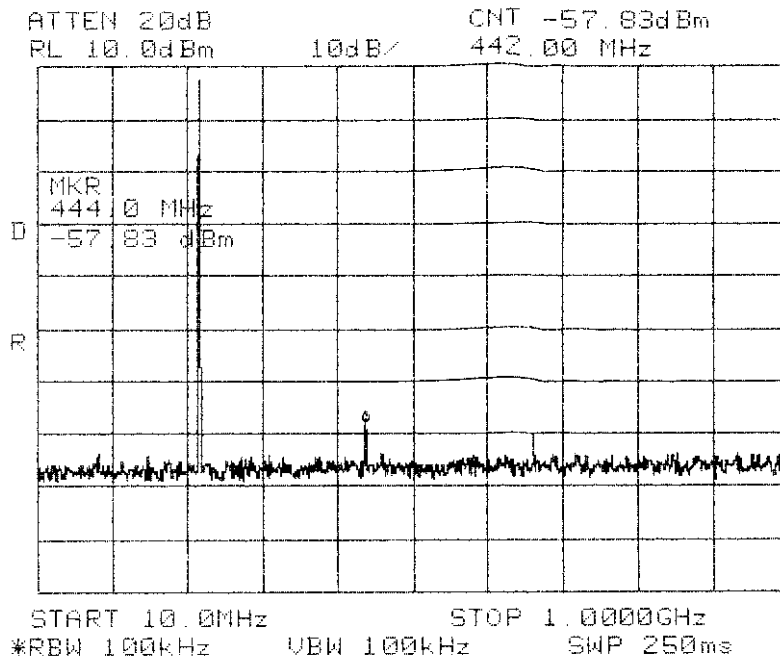
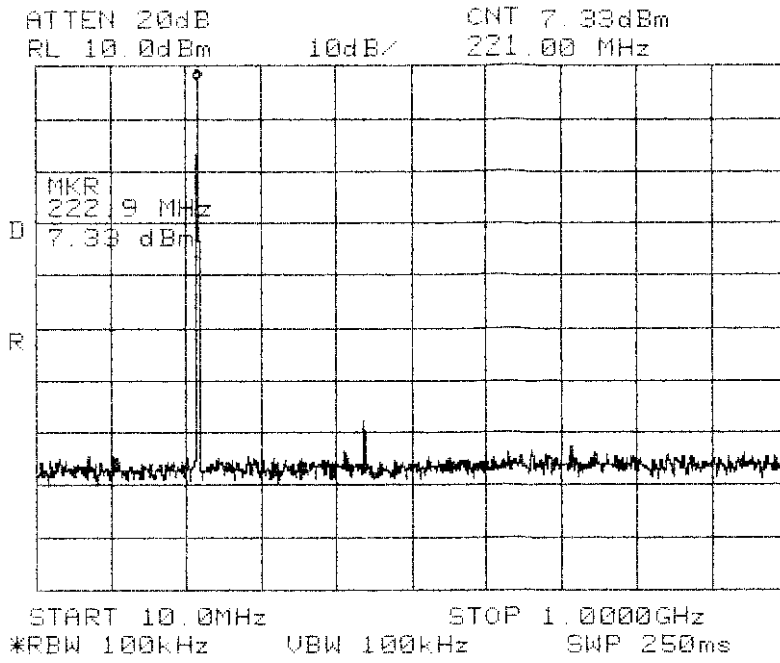
Subsequent to the measurements of Spurious & Harmonics performed by UltraTech, and shown on the immediately preceding pages, Microwave Data Systems performed the same measurements at our facility.

The block diagram of the test setup is the same as already shown, including a 30 dB attenuator in-line. The spectrum analyzer was an HP Model 8563E. Peak detection mode was used.

Our results, shown on the following page 21-2, found a measured level of second harmonic at 442 MHz of -27.83 dBm. (-57.83 dBm + 30 dB atten.). This is 2.83 dB below the limit of -25 dBm. We conclude that we meet the conducted requirements.

A handwritten signature in cursive script, appearing to read "J. Schanker".

(Jacob Z. Schanker, P.E.)



## 2.6. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 90.210

**PRODUCT NAME:** MDS 2710D DATA TRANSCEIVER, Model No.: MDS 2710D

### FCC REQUIREMENTS:

FCC Part 90, Sub. I, Para. 90.210

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FREQUENCY RANGE (MHz)	Recommended OBW (KHz)	CHANNEL SPACING (KHz)	Recommended FREQ. DEVIATION (KHz)	FCC SPECIFICATION LIMITS (Para. No.)
220 - 222	4	5	—	90.210(f): Mask F – Audio & Voice

FCC RULES	FREQUENCY RANGE	ATTENUATION LIMIT (dBc)
90.210(f): Mask F - Voice & Data	Lowest frequency generated from the transmitter circuit to 10 <sup>th</sup> harmonic of the fundamental frequency	30+20(fd-2) dB or 55 + 10log(P) dB or 65 dB whichever is lesser attenuation

### CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

### POWER INPUT:

13.6 Vdc battery.

### TEST EQUIPMENT:

1. EMI Receiver System/Spectrum Analyzer, Hewlett Packard, Model 8546A, Input +25dBm max., 9KHz-5.6GHz, 50 Ohms, built-in Peak, Quasi-Peak & Average Detectors, Pre-Amplifier and Tracking Signal Generator. This System includes: (1) HP 85460A RF Filter Section, S/N: 3448A00236 and (2) HP 85462A Receiver RF Section/Display, S/N: 3520A00248.
2. HP EMC Analyzer, Model HP8593EM, 9 kHz-26.5 GHz, S/N: 3412A00103
3. Microwave Amplifier, HP, Model 83017A, Frequency Range 1 to 22GHz, 30dB gain nominal, low noise floor type.
4. Active Loop Antenna, Emco, Model 6502, SN 9104-2611, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms.
5. BiconiLog Antenna, Emco, Model 3142, SN 10005, 30-2000 MHz @ 50 Ohms.
6. Log Periodic Antenna, AH System, Model SAS-200/518, SN: 343, Frequency Range: 1GHz-18GHz.
7. FCC Listed Open Field Test Site.
8. Audio Oscillator, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.

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9. **METHOD OF MEASUREMENTS:**

Refer to ANSI 63.4, Para. 8 for detailed radiated emissions measurement procedures.

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.989, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the Spectrum Analyzer controls set as RBW = 100 kHz, VBW = 100 kHz and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

**FCC CFR 47, Para. 2.997 - Frequency spectrum to be investigated**

The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10<sup>th</sup> harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

**FCC CFR 47, Para. 2.993 - Field Strength Spurious Emissions**

- (a) Measurements was made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.989(c) as appropriate. For equipment operating on frequencies below 1 GHz, an Open Field Test is normally required, with the measuring instrument antenna located in the far field at all test frequencies. In event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.
- (b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:
- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
  - (2) All equipment operating on frequencies higher than 25 MHz
  - (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
  - (4) Other types of equipment as required, when deemed necessary by the Commission.

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**METHOD OF CALCULATION FOR TRANSMITTED POWER (P) FROM THE MEASURED FIELD STRENGTH LEVEL (E):**

According to IEC 801-3, the power density can be calculated as follows:

$$S = P / (4 \times \text{PI} \times D^2)$$

Where: S: Power density in watts per square feet  
P: Transmitted power in watts  
PI: 13.1415  
D: Distance in meters

The power density S (W/m<sup>2</sup>) and electric field E (V/m) is related by:

$$S = E^2 / (120 \times \text{PI})$$

Accordingly, the field intensity of isotropic radiator in free space can be expressed as follows:

$$E = (30 \times P)^{1/2} / D = 5.5 \times (P)^{1/2} / D$$

For Halfwave dipole antenna or other antennas correlated to dipole in direction of maximum radiation:

$$S = (1.64 \times P) / (4 \times \text{PI} \times D^2)$$
$$E = (49.2 \times P)^{1/2} \times D = 7.01 \times (P)^{1/2} / D$$

$$P = (E \times D / 7.01)^2$$

Calculation of transmitted power P (dBm) given a measured field intensity E (dBuV/m):

$$P(W) = [E(V/m) \times D / 7.01]^2$$
$$P(mW) = P(W) \times 1000$$

=>  $P(\text{dBm}) = 10 \log P(mW)$

$$= 20 \log E(V/m) + 20 \log(D) - 20 \log(7.01) + 10 \log 1000$$
$$= E(\text{dBV/m}) + 20 \log D + 13$$
$$= E(\text{dBuV/m}) - 120 + 20 \log(D) + 13$$
$$= E(\text{dBuV/m}) + 20 \log(D) - 107$$

The Transmitted Power @ D = 3 Meters

$$P(\text{dBm}) = E(\text{dBuV/m}) - 97.5$$

**TEST RESULTS:** Conforms.

**TESTED PERSONNEL:** Mr. Hung Trinh, EMI/RFI Technician

**DATE:** Feb. 02, 1999

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**MEASUREMENT DATA**

**RADIATED EMISSIONS MEASUREMENTS @ 3 METERS**

**TEST CONFIGURATION**

- The channel frequencies (Low, Middle and High) was established at its full rated output power. The emissions was investigated up to the tenth harmonic of the fundamental emissions in each case. the measured level of the carrier was recorded and compared to the level of the emissions as required in Part 90.238(a). The absolute level of each emission shall not be greater than -20 dBm.
- For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 kHz RBW, 100 KHz VBW, SWEEP TIME: AUTO, PEAK DETECTOR.
- For measuring radiated emissions at frequencies above 1 GHz, the Spectrum Analyzer was set as 1 MHz RBW, 1 MHz VBW, SWEEP TIME: AUTO, PEAK DETECTOR.
- All rf emissions from the lowest frequency generated by the transmitter (...) upto the 10<sup>th</sup> harmonic of fundamental were scanned, and only emissions less than 20 dB below the limits (-20 dBm) were recorded.

Fundamental Frequency: 221 MHz							
RF Output Power: 5 Watts							
Modulation: FM modulation with 3200b/s random data							
FREQUENCY (MHz)	RF LEVEL (dBuV/m)	RF LEVEL (dBm)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
442.00	54.9	-42.6	PEAK	V	-25.0	-17.6	PASS
442.00	58.1	-39.4	PEAK	H	-25.0	-14.4	PASS
663.00	49.0	-48.5	PEAK	V	-25.0	-23.5	PASS
663.00	53.7	-43.8	PEAK	H	-25.0	-18.8	PASS
884.00	50.3	-47.2	PEAK	V	-25.0	-22.2	PASS
884.00	49.8	-47.7	PEAK	H	-25.0	-22.7	PASS
1105.00	63.2	-34.3	PEAK	V	-25.0	-9.3	PASS
1105.00	61.8	-35.7	PEAK	H	-25.0	-10.7	PASS
1326.00	56.1	-41.4	PEAK	V	-25.0	-16.4	PASS
1326.00	56.7	-40.8	PEAK	H	-25.0	-15.8	PASS
1547.00	67.3	-30.2	PEAK	V	-25.0	-5.2	PASS
1547.00	65.5	-32.0	PEAK	H	-25.0	-7.0	PASS
1768.00	40.3	-57.2	PEAK	V	-25.0	-32.2	PASS
1768.00	50.8	-46.7	PEAK	H	-25.0	-21.7	PASS
1989.00	64.7	-32.8	PEAK	V	-25.0	-7.8	PASS
1989.00	62.0	-35.5	PEAK	H	-25.0	-10.5	PASS
2210.00	49.2	-48.3	PEAK	V	-25.0	-23.3	PASS
2210.00	47.1	-50.4	PEAK	H	-25.0	-25.4	PASS

The RF emissions were scanned form 10 MHz to 2210 MHz, and all rf levels less than 30 dB below the FCC Limits were recorded.

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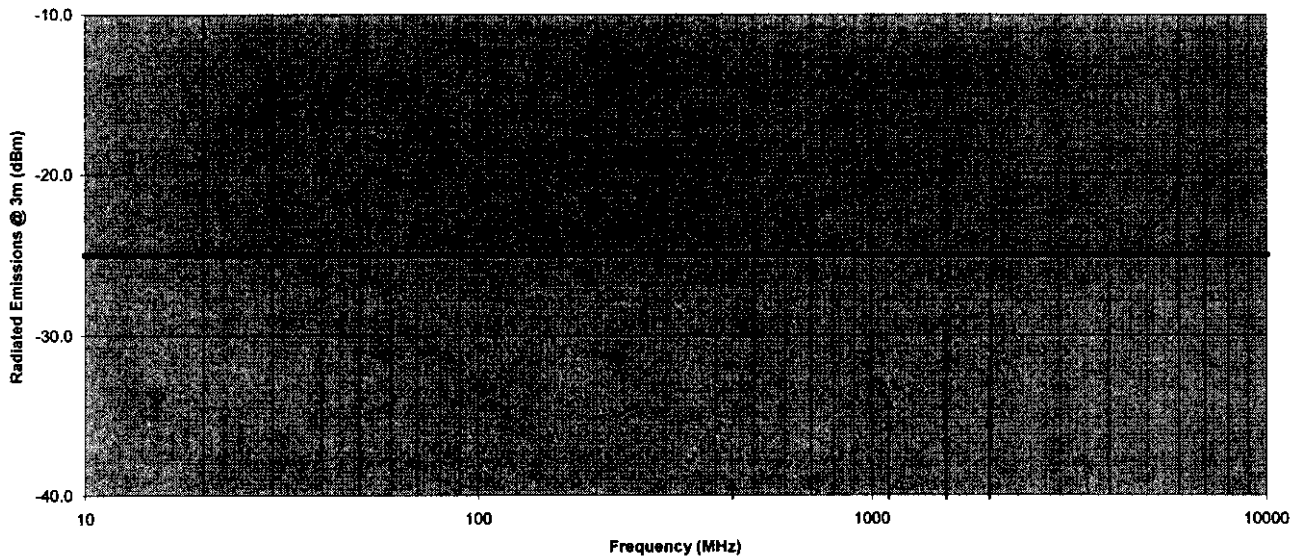
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Transmitter Emissions Measurements at 3 Meter OFTS  
Microwave Data Systems  
MDS 2710D RADIO DATA TRANSCEIVER  
Tx Freq.: 221 MHz



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### 3. EXHIBIT 5 - GENERAL TEST PROCEDURES

#### 3.1. ELECTRICAL FIELD RADIATED EMISSIONS MEASUREMENTS - GENERAL TEST METHOD

- The radiated emission measurements were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC.
- Radiated emissions measurements were made using the following test instruments:
  1. Calibrated EMCO biconilog antenna in the frequency range from 30 MHz to 2000 MHz.
  2. Calibrated A.H. Systems log periodic antenna in the frequency range above 1000 MHz (1GHz - 18 GHz).
  3. Calibrated EMI receiver or spectrum analyzer and pre-selector. In general, the spectrum analyzer would be used as follows:
    - The rf electric field levels were measured with the spectrum analyzer set to PEAK detector (100 KHz RBW and 100 KHz VBW).
    - If any rf emission was observed to be a broadBand noise, the spectrum analyzer's CISPR QUASI-PEAK detector (120 KHz RBW and 1MHz VBW) was then set to measure the signal level.
    - If the signal being measured was narrowband and the ambient field was broadBand, the bandwidth of the spectrum analyzer was reduced.
- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- During this process, cables and peripheral devices were manipulated within the range of likely configuration.
- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement (each variable within bounds specified elsewhere) were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more,

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go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.

- Step4: Move the antenna over its full allowed range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.
- Step5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.
- Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.
- Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

#### Calculation of Field Strength:

The field strength is calculated by adding the calibrated 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/Analyzer Reading
	AF	=	Antenna Factor
	CF	=	Cable Attenuation Factor
	AG	=	Amplifier Gain

**Example:** If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:

$$\text{Field Level} = 60 + 7.0 + 1.0 - 30 = 38.0 \text{ dBuV/m.}$$

$$\text{Field Level} = 10^{(38/20)} = 79.43 \text{ uV/m.}$$

**Notes:** The frequency and amplitude of at least six highest conducted emissions relative to the limit are recorded unless such emissions are more than 20 dB below the limit. If less than six emissions are within 20dB of the limit, the background or receiver noise level shall be reported at representative frequencies.

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## 4. EXHIBIT 6 - INFORMATION RELATED TO EQUIPMENT UNDER TESTS

### 4.1. FCC ID LABELLING AND SKETCH OF FCC LABEL LOCATION

Refer to the attached sheets

### 4.2. PHOTOGRAPHS OF EQUIPMENT UNDER TEST

Refer to the attached photographs

### 4.3. SYSTEM BLOCK DIAGRAM(S)

Refer to the attached sheets

### 4.4. SCHEMATIC DIAGRAMS

Refer to the attached sheets

### 4.5. USER'S MANUAL WITH "FCC INFORMATION TO USER STATEMENTS"

Refer to the attached Users' manual

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UltraTech  
Engineering Labs Inc.

h/p

MICROWAVE DATA SYSTEMS, MDS 2710D RADIO TRANSCIEVER  
TRANSMITTER ANTENNA POWER CONDUCTED EMISSIONS  
Tx Frequency: 221 MHz, Power Output : 5 Watts , Channel Spacing: 4 kHz  
Modulation: FM modulation with 3200 b/s random data

Date: Feb. 02, 1999  
Tested by: Hung Trinh

START  
10.0 MHz

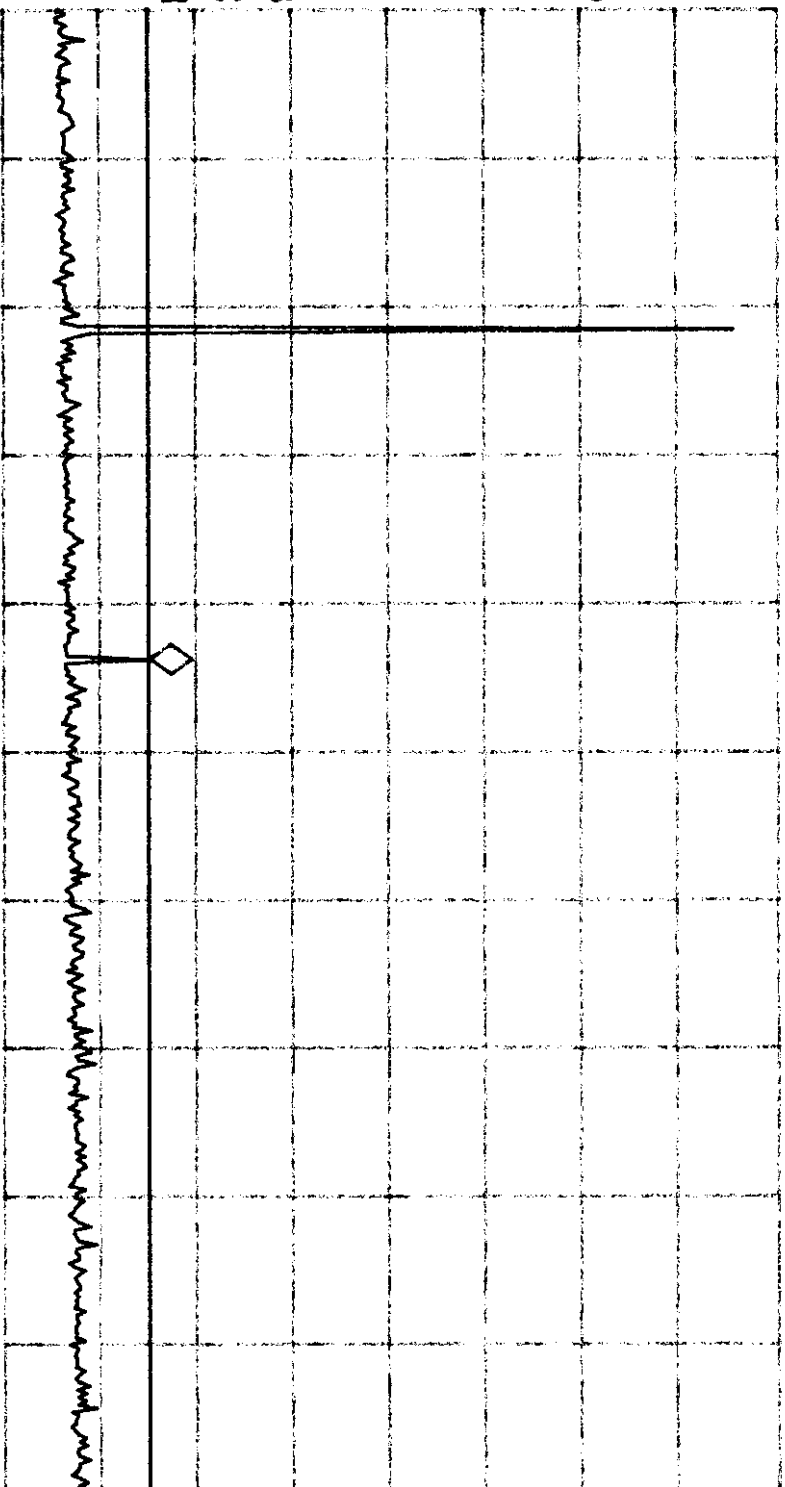
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 443.1 MHz

No user  
Menu

-24.88 dBm

REF OFFST 30.0 dB  
LOG REF 40.0 dBm

10  
dB/  
ATN  
20 dB



V A S B  
S C F C  
C O R R

START 10.0 MHz  
IF BW 120 kHz  
AVG BW 3000 kHz  
STOP 1.0000 GHz  
SWP 206 msec



**UltraTech**  
Engineering Labs Inc.

hp

**MICROWAVE DATA SYSTEMS, MDS 2710D RADIO TRANSCEIVER**  
TRANSMITTER ANTENNA POWER CONDUCTED EMISSIONS  
Tx Frequency: 221 MHz, Power Output : 5 Watts , Channel Spacing: 4 kHz  
Modulation: FM modulation with 3200 b/s random data

Date: Feb. 28, 1999  
Tested by: Hung Trinh

STOP  
2.500 GHz

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.076 GHz

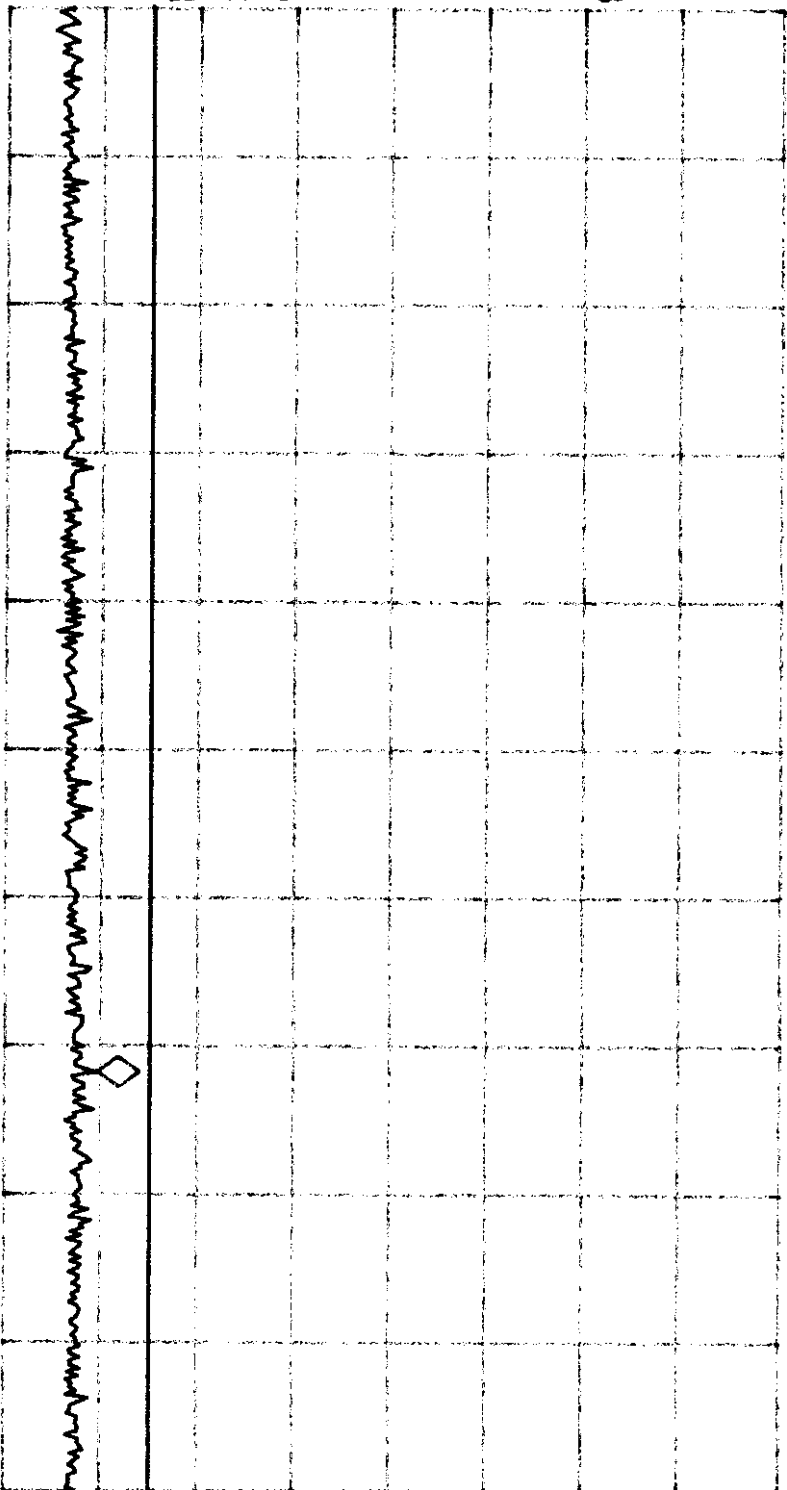
NO USER  
MENU

-30.46 dBm

REF OFFST 30.0 dB  
LOG REF 40.0 dBm

10 dB/  
ATN  
20 dB

V A S B  
S C F C  
C O R R



START 1.000 GHz  
IF BW 120 kHz

AVG BW 300 kHz

STOP 2.500 GHz  
SWP 313 msec

The test was performed in accordance with ANSI C63.4-1992, "AMERICAN NATIONAL STANDARD FOR MEASUREMENT OF RADIO-NOISE EMISSION FROM LOW-VOLTAGE ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9KHz TO 40GHz"

Test equipment used for line Conducted and Radiated emissions as following. All equipment were calibrated according to ANSI C63.4-1992 and ISO-9000 requirement unless otherwise specified.

Test Equipment	Model No.	Serial No.	Calibrated Date
Spectrum	HP8568B	2848A17738	11/17/1998
RF Preselector	HP85685A	2620A00338	11/17/1998
QP Adapter	HP85650A	2811A03124	11/17/1998
EMI Receiver	HP85460A	3441A00199	8/27/1998
RFI Filter Section	HP85460A	3330A00177	8/27/1998
EMI Receiver	R & S ESVS30	8419977/066	8/21/1998
Biconical Antenna	EMCO 3110B	3222	12/17/1998
Biconical Antenna	EMCO 3110B	3224	12/30/1998
Log-Periodic Antenna	EMCO 3146A	1424	12/29/1998
Log-Periodic Antenna	EMCO 3146A	1425	12/29/1998
LISN	EMCO 3825/2	9311-2153	9/23/1998
LISN	EMCO 3825/2	9311-2154	9/23/1998
Turn Table	EMCO 1060	1068	4/16/1998
Antenna Tower	EMCO 1050	1113	4/16/1998
RF Cable	M17/75-RG214-NE	N/A	4/16/1998
Computer	HP9000/300	2614A78610	N/A
Printer	HP2225A	2728S02586	N/A
Plotter	HP7440A	2539A40856	N/A

Traceability to R.O.C. and international standards is assured by using calibrated all equipment.

For system measurement, the EUT "6546-0AN A" was connected to:

Item	Model No.	Serial No.	FCC ID
1. Computer	IBM 6588-120	556N59M	AN02161V
2. Keyboard	IBM KB-9826	K071940	E8HKB-5323
3. Mouse	IBM M-S34	23-457249	DZL211029
4. Printer	HP 2225C	3123S97227	DSI6XU2225
5. Modem	USRrobotics 268	0002680559278575	CJE-0318
6. Vide Card	Built in		
7. CD-ROM	Sony CDU31A	--	KGACDU31A2

The system was configured for testing in a typical fashion ( as a customer would normally use it ) according to ANSI C63.4-1992, please see the photographs for detail.

Both conducted and radiated testing were performed according to the procedure in ANSI C63.4-1992. Conducted testing was performed in screen room and radiated testing was performed in open site at an antenna to EUT distance of 3-meter on horizontal and vertical polarization.

First, pre-scan all modes in screen room then select 2 higher modes (worst case) were tested and reported.

The line conductive interference was tested with 110VAC and 220VAC receptively. Unshielded power cord was used during test.

Tested and reported modes as following:

Report No.	Resolution	Frequencies
EMI99-009	1024X768	68.7KHz/85Hz
EMC98-090A	1024X768	60.0KHz/75Hz

### 3. Test Program and Test Results

Set up the EUT and all peripherals as chapter 6 of ANSI C63.4-1992 for AC power line conducted emissions testing and radiated emissions testing.

Turn on the power of EUT and all peripherals, select an appropriate displaying mode using the "setup" software. Then run an EMI test program "HTEST.EMI" as a basic software to execute the EUT operating under test.

- Step 1 : Run the "HTEST.EMI" on personal computer then sends "H" character to monitor continuously until full screen.
- Step 2 : Personal computer sends a complete line of continuously repeating "H" to HP 2225C printer.
- Step 3 : Personal computer sends a file of "H" pattern to floppy disk then read a file of "H" pattern from floppy disk.
- Step 4 : Personal computer sends a file of "H" pattern to hard disk then read a file of "H" pattern from hard disk.
- Step 5 : Personal computer sends a file of "H" patter to USRobotics 268 modem.
- Step 6 : Return to step 1

All data in this report are "PEAK" value within 15dB margin unless otherwise noted.