D.L.S. ELECTRONIC SYSTEMS, INC.
1250 PETERSON DRIVE
WHEELING, ILLINOIS 60090

REPORT NO. 8933

FCC "Rules and Regulations" / Unintentional Radiators

Class B Digital Devices

Part 15, Subpart B, Sections 15.107a & 15.109a

THE FOLLOWING **"MEETS"** THE ABOVE TEST SPECIFICATION

Formal Name:	Motorola Whisp
Kind of Equipment:	5 GHz Fixed Wireless Access
FCC ID NUMBER:	NA
Test Configuration:	Terminated Ethernet Interface
Model Number:	X5
Serial Number:	000176
Date of Tests:	April 5 & 12, 2001
Test Conducted For:	Motorola 50 East Commerce Drive Schaumburg, Illinois 60173

D.L.S. ELECTRONIC SYSTEMS, INC.
1250 PETERSON DRIVE
WHEELING, ILLINOIS 60090

REPORT NO. 8933

SIGNATURE PAGE

Report Written By:

Arnom C. Rowe
Test Engineer
EMC-001375-NE

Report Reviewed by:

For: Jack Prawica
Lab Manager

Report Approved by:

Brian J. Mattson
General Manager

Company Official:

RICHARD J. KENIUK
Motorola

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

D.L.S. ELECTRONIC SYSTEMS, INC.
WHEELING, IL

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. Accreditation is awarded for specific services, listed on the Scope of Accreditation for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

September 30, 2001
Effective through

David F. Alderman
For the National Institute of Standards and Technology

NVLAP Lab Code: 100276-0

National Institute of Standards and Technology

NVLAP®

National Voluntary Laboratory Accreditation Program

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Scope of Accreditation

Revised Scope 02/22/2001

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.
1250 Peterson Drive
Wheeling, IL 60090-6454
Mr. Brian J. Mattson
Phone: 847-537-6400 Fax: 847-537-6488
E-Mail: bmattson@dlsemc.com
URL: http://www.dlsemc.com

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993) with Ammendments A1 (1997) & A2 (1999)
12/CIS14b	AS/NZS 1044 (1995)
12/CIS14c	CNS 13783-1
12/CIS22	IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1:1995, and Amendment 2:1996.

September 30, 2001

Effective through

David F. Alderman

For the National Institute of Standards and Technology

National Institute of Standards and Technology

NVLAP®

National Voluntary Laboratory Accreditation Program

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Scope of Accreditation

Revised Scope 02/22/2001

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.

NVLAP Code	*Designation / Description*
12/CIS22b	CNS 13438:1997: Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/F01	FCC Method - 47 CFR Part 15 - Digital Devices
12/F01a	Conducted Emissions, Power Lines, 450 KHz to 30 MHz
12/F01b	Radiated Emissions
12/T51	AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

Immunity Test Methods:

12/I01	IEC 61000-4-2 (1995) and Amendment 1 (1998): Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3 (1995) and Amendment 1 (1998): Radiated, Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4 (1995): Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5 (1995): Surge Immunity Test
12/I05	IEC 61000-4-6 (1996): Immunity to Conducted Disturbances, Induced Radio-Frequency Fields

September 30, 2001

Effective through

David F. Alderman

For the National Institute of Standards and Technology

National Institute of Standards and Technology

NVLAP®

National Voluntary Laboratory Accreditation Program

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Scope of Accreditation

Revised Scope 02/22/2001

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.

NVLAP Code	*Designation / Description*
12/I06	IEC 61000-4-8 (1993): Power Frequency Magnetic Field Immunity Test
12/I07	IEC 61000-4-11 (1994): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

September 30, 2001

Effective through

David F. Alderman

For the National Institute of Standards and Technology

D.L.S. ELECTRONIC SYSTEMS, INC.
REPORT NO. 8933

TABLE OF CONTENTS

D.L.S. ELECTRONIC SYSTEMS, INC.
REPORT NO. 8933

Kind of Equipment: 5 GHz Fixed Wireless Access

S/N: 000176

1.0 SUMMARY OF TEST REPORT

It was found that the Motorola Whisp, S/N: 000176 **"meets" the radio interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart B, Sections 15.107a & 15.109a for Unintentional Radiators, Class B digital devices. It should be noted that the amount of margin was only 4.88 dB at 500 MHz, radiated. The normal tolerance of the test equipment is + or - 3 dB. Due to this tolerance and the variation in normal production, a margin of at least 6 dB is recommended.**

2.0 INTRODUCTION

On April 5 & 12, 2001, a series of radio frequency interference measurements were performed on 5 GHz Fixed Wireless Access, S/N: 000176. For Class B digital devices the tests were performed according to the procedures of the FCC as stated in the "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" found in the American National Standards Institute, ANSI C63.4-1992 (Revision of ANSI C63.4-1988). These test procedures were performed by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency emission requirements of the FCC "Rules and Regulations", Part 15, Subpart B, Sections 15.107a & 15.109a for Unintentional Radiators, Class B digital devices.

4.0 TEST SET-UP

All conducted emission tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the American National Standards Institute, ANSI C63.4-1992, Section 7, (Figures 9a and 9b). The conducted tests were performed with the test item placed on a non-conductive table (table top equipment), located in the Test Room. Equipment normally operated on the floor, was tested by placing it on the metal ground plane. The ground plane has an electrical isolation layer over its surface. The power line supplied was connected to a dual line impedance stabilization network located on the floor (a ground plane). The networks were constructed per the requirements of the American National Standards Institute, ANSI C63.4-1992, Section 4, (Figure 2). The only ground supplied to the unit was through the third wire of the standard power cord when supplied.

Radiated emissions tests were performed with the test item placed on a rotating non-conductive table, located in the Test Room. Equipment normally operated on the floor was placed on top of the rotating platform, less than 30 centimeters above the floor. The equipment under test was set up according to ANSI C63.4-1992, Section 8, (Figures 9c and 9d).

When testing a monitor or a device that includes a monitor as part of the test, a repeating "H" pattern is used with white letters on a black background. When the software does not allow the "H" pattern, the screen is filled with ASCII characters or a display we determine to be a normal worst case condition.

5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the HP Spectrum Analyzer or EMC-25 Tuned Receiver. The data was taken using Peak or Quasi-Peak Detector Functions as required. This information was then used to determine the frequencies of maximum emissions. Above 1000 MHz, final data was taken using the Peak Detector.

Below 1000 MHz, final data was taken using the HP Spectrum Analyzer and or the EMC-25 fixed tuned receiver. These plots were made using the Peak or Quasi-Peak Detector functions, with manual measurements performed on the questionable frequencies using the Quasi-Peak Detector Function of the Analyzer or EMC-25 Receiver. Above 1000 MHz, final data was taken using the Peak Detector on the Spectrum Analyzer.

The bandwidths used are specified by the FCC as stated in the American National Standards Institute, ANSI C63.4-1992, Section 4.2. From 450 kHz to 30 MHz a bandwidth of 9 or 10 kHz was used. From 30 MHz to 1000 MHz a bandwidth of 120 kHz and above 1000 MHz, a bandwidth of 1 MHz was used.

A list of the equipment used can be found in Table 1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

6.0 CONDUCTED EMISSION MEASUREMENTS

Conducted emissions were measured over the frequency range from 0.45 MHz to 30 MHz in accordance with the power line measurements as specified in the American National Standards Institute, ANSI C63.4-1992 (Revision of ANSI C63.4-1991), Section 7. The 115 Vac 60 Hz power leads, high (hot) and low (neutral) sides, were measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. During the test, the cables were placed and items moved (when appropriate) to maximize emissions. All signals were then recorded. The allowed levels for Class B digital devices are 250 uV (47.96 dBuV) from 450 kHz to 30 MHz as stated in Section 15.107a.

NOTE:

All test measurements were made at a screen room temperature of **70° F** at **40%** humidity.

7.0 RADIATED EMISSION MEASUREMENTS

The allowed radiated emissions for Class B digital devices (Unintentional Radiators) shall not exceed the following field strength limits at a distance of three meters. The allowed levels are 100 uV/m (40 dBuV/m) from 30 to 88 MHz, 150 uV/m (43.52 dBuV/m) from 88 to 216 MHz and 200 uV/m (46.02 dBuV/m) from 216 to 960 MHz. Above 960 MHz the limit is 500 uV/m (53.98 dBuV/m).

Preliminary radiation measurements were performed at a 3 meter test distance. The frequency range from 30 MHz to over 960 MHz as stated in Section 15.33b, was automatically scanned and plotted at various angles.

NOTE:

As stated in Section 15.33b for Unintentional Radiators, the Motorola Whisp measurements were made up to 1000 MHz, since the fundamental frequency is 80 MHz.

All radiated emissions measurements were made at a test room temperature of **70° F** at **40%** humidity.

At those frequencies where significant signals were detected, measurements were made at a 3 meter open field test site, located at Genoa City, Wisconsin, FCC file number 31040/SIT, to determine the actual radiation levels. When required, levels were extrapolated from 3 meters to 10 meters using a linear extrapolation.

All signals in the frequency range of 30 to 200 MHz were measured with a Biconical Antenna or Tuned Dipoles as the pickup device. From 200 MHz to 1000 MHz, a Log Periodic or Tuned Dipoles were used and above 1000 MHz a Double Ridge Horn Antenna was used.

During the test for frequencies below 1000 MHz, the equipment was rotated and the antenna was raised and lowered from 1 meter to 4 meters to find the maximum level of emissions. For frequencies greater than 1000 MHz the Double Ridge Horn Antenna was set at 1 meter from the EUT with the antenna set at a fixed height of 1 meter off the ground plane. The EUT was rotated with the equipment moved and the cables (if any) placed within the range of positions likely to find their maximum emissions. Tests were made in both the horizontal and vertical planes of polarization.

8.0 PHOTO INFORMATION AND TEST SET-UP

The test set-up can be seen on the accompanying photo page.

Item 0 Motorola Whisp
FCC ID#: NA SN: 000176

Item 1 Non-shielded Ethernet Cat 5 Cable with Plastic Shells.
(1 @ 4m)

Item 2

Item 3

Item 4

Item 5

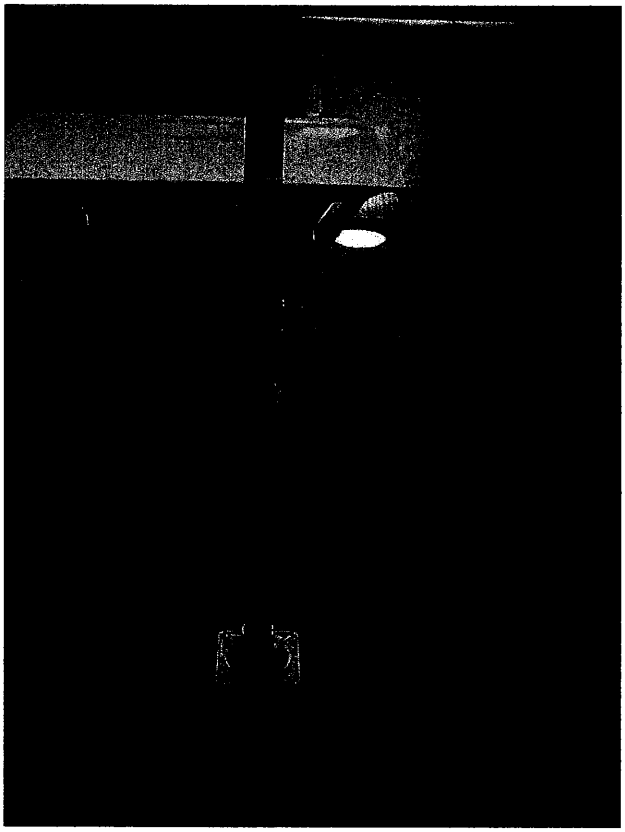
Item 6

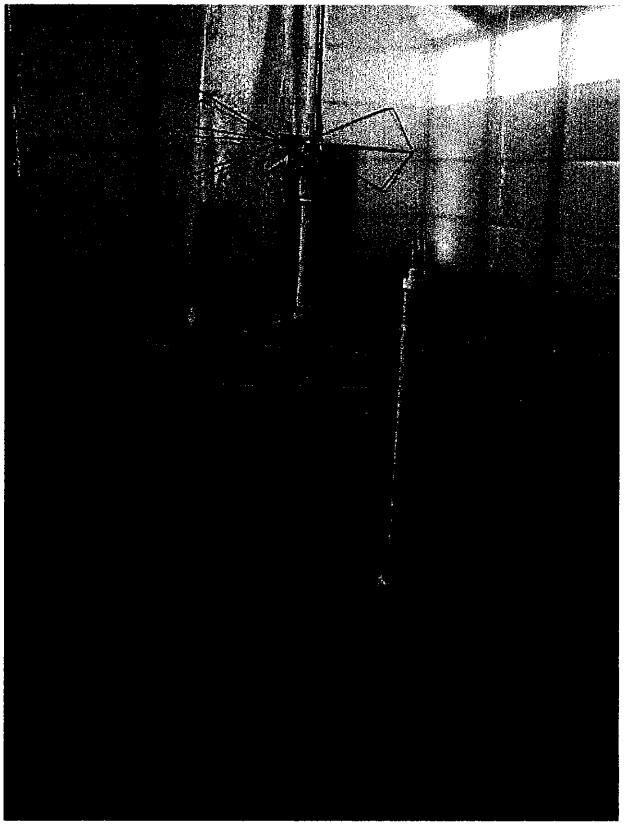
Item 7

Item 8

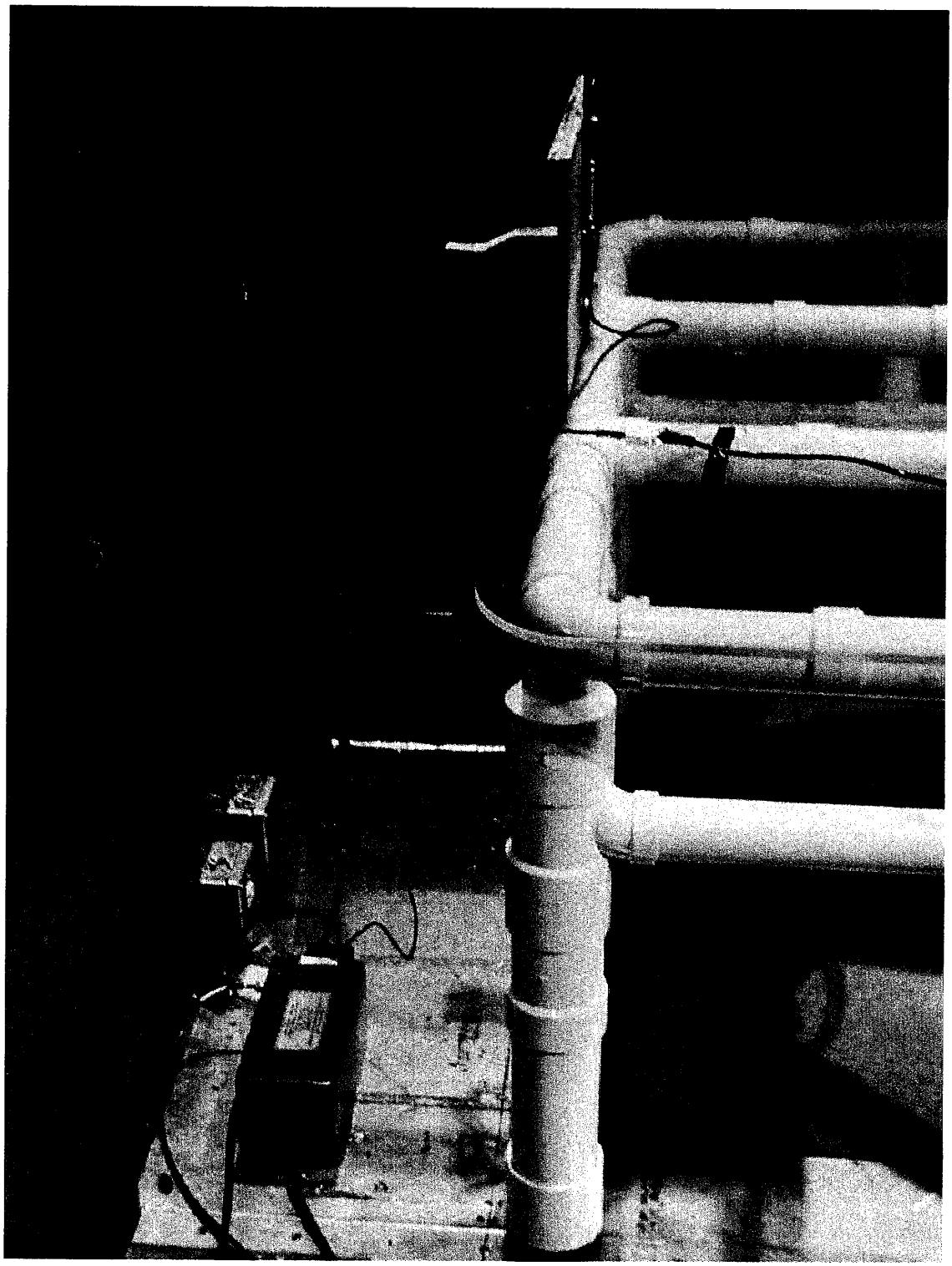
Item 9

9.0 RADIATED PHOTOS TAKEN DURING TESTING





9.0 CONDUCTED PHOTOS TAKEN DURING TESTING



10.0 CHANGE INFORMATION

The following changes were implemented during the testing and must be incorporated into the production units to insure compliance.

Change 1. There were no changes made at D.L.S. Electronic Systems.

Change 2.

Change 3.

Change 4.

Change 5.

The responsibility of implementing the changes listed in this report is accepted or I certify that no changes were made

by Richard J. Kenneth — Signature

PRINCIPAL STAFF ENG — Title

for MOTOROLA — Company Name

20 AUG 2001 — Date

11.0 RESULTS OF TESTS

The conducted and radiated emission results can be seen on pages at the end of this report. Data sheets indicating the conducted and radiated measurements can also be found with this report. On the conducted and radiated charts the PINK horizontal line indicates the Class B limit. Those points on the radiated charts shown with a yellow mark are background frequencies which were verified during the test.

SAMPLE CONDUCTED CALCULATIONS:

Meter Reading in (dBuV)	+	Cable Losses (dB) or Meter Factors (dB)	=	Total in (dBuV)

Limit (dBuV)	-	Total (dBuV)	=	Margin (dB)

SAMPLE RADIATED CALCULATIONS:

Meter Reading in (dBuV)	+	Cable Losses (dB) or Meter Factors (dB)	+	Antenna (dBuV)	=	Total (dBuV/m)

Limit (dBuV)	-	Total (dBuV)	=	Margin (dB)

12.0 CONCLUSION

It was found that the 5 GHz Fixed Wireless Access, Model NO: X5, S/N: 000176 **"meets" the radio interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart B for Class B equipment. It should be noted that the amount of margin was only 4.88 dB at 500 MHz, radiated. The normal tolerance of the test equipment is + or - 3 dB. Due to this tolerance and the variation in normal production, a margin of at least 6 dB is recommended.**

This test report relates only to the items tested and contains the following number of pages.

Text:	21 pages
Data Summary:	4 pages
Charts:	12 pages

D.L.S. ELECTRONIC SYSTEMS, INC.
REPORT NO. 8933

TABLE 1 - EQUIPMENT LIST

Test Equipment	Manufacturer/ Description	Model Number	Serial Number	Frequency Range	Cal Due Date
*Spectrum Analyzer	Hewlett/ Packard	8566B	2240A 02041	100 Hz-22 GHz	10/01
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A 00121	10 kHz - 1GHz	10/01
**Spectrum Analyzer	Hewlett/ Packard	8566B	2421A 00452	100 Hz-22 GHz	2/02
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A 00248	10 kHz-1 GHz	2/02
***Spectrum Analyzer	Hewlett/ Packard	8591A	3009A 00700	9 kHz-1.8 GHz	3/02
Receiver	Electrometrics	EMC-25 Mark-III	772	.01-1000 MHz	10/01
Meter Module	Electrometrics	CRM-25	162	.01-1000 MHz	10/01
Receiver	Electrometrics	EMC-25 Mark-III	804	.01-1000 MHz	10/01
Meter Module	Electrometrics	CRM-25	138	.01-1000 MHz	10/01
Receiver	Electrometrics	EMC-30	44168	.01-1000 MHz	9/01

*Firmware Version 29.9.86 Software Version 85864C Rev A
**Firmware Version 14.1.85 Software Version 85864C Rev A
***Firmware Version 5.1.3 Software Version 82301-12029 Rev C

TABLE 1 - EQUIPMENT LIST

Test Equipment	Manufacturer/ Description	Model Number	Serial Number	Frequency Range	Cal Due Date
Antenna	Electrometrics	BIA-25	2453	20-200 MHz	5/01
Antenna	Electrometrics	LPA-25	1114	200-1000 MHz	4/01
Antenna	Electrometrics	BIA-25	2614	20-200 MHz	5/01
Antenna	Electrometrics	LPA-25	1205	200-1000 MHz	4/01
Antenna	Rohde & Schwarz	Dipoles	829381 -001	20-1000 MHz	3/02
Antenna	Rohde & Schwarz	Dipoles	829381 -005	20-1000 MHz	8/01
Antenna	Electro- Mechanics Co	3115	2479	1 - 18 GHz	8/01
Antenna	Electro- Mechanics Co	3115	9903- 5731	1 - 18 GHz	4/01
LISN	Solar	Dual	927106	10 - 30 MHz	6/01
LISN	Solar	Dual	971612	10 - 30 MHz	10/01
LISN	Solar	Dual	961019	10 - 30 MHz	12/01

D.L.S. ELECTRONIC SYSTEMS, INC.
REPORT NO. 8933

APPENDIX A

DATA SUMMARY

D.L.S. ELECTRONIC SYSTEMS INC. REPORT NO. 8933

SUMMARY DATA SHEET OF **CONDUCTED** EMISSIONS

TEST DATE:--------April 5, 2001
MANUFACTURER:-----Motorola
MODEL NO:---------X5
S/N:--------------000176
CONFIGURATION:----**NA**

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15, SUBPART B / SECTION 15.107a / CLASS B

TEST EQUIPMENT: Spectrum Analyzer ----- HP 8566B
Quasi Peak Adapter ----- HP 85650A

TYPE OF TEST: CONDUCTED **HIGH** LINE

THE FOLLOWING ARE SIGNIFICANT CONDUCTED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	CABLE LOSSES dB	TOTAL dBuV	LIMIT dBuV	MARGIN dB
.4519	41.05	.05	41.10	47.96	6.86
1.0414	37.94	.36	38.30	47.96	9.66
12.1723	40.76	.64	41.40	47.96	6.56
23.1287	38.38	1.12	39.50	47.96	8.46
29.2542	38.93	1.47	40.40	47.96	7.56

D.L.S. ELECTRONIC SYSTEMS INC. REPORT NO. 8933

SUMMARY DATA SHEET OF **CONDUCTED** EMISSIONS

TEST DATE:--------April 5, 2001
MANUFACTURER:-----Motorola
MODEL NO:---------X5
S/N:--------------000176
CONFIGURATION:----**NA**

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15, SUBPART B / SECTION 15.107a / CLASS B

TEST EQUIPMENT: Spectrum Analyzer ----- HP 8566B
Quasi Peak Adapter ----- HP 85650A

TYPE OF TEST: CONDUCTED **LOW** LINE

THE FOLLOWING ARE SIGNIFICANT CONDUCTED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	CABLE LOSSES dB	TOTAL dBuV	LIMIT dBuV	MARGIN dB
.4519	40.35	.05	40.40	47.96	7.56
.7414	38.25	.05	38.30	47.96	9.66
2.0208	37.33	.17	37.50	47.96	10.46
8.5569	36.70	.50	37.20	47.96	10.76
16.7437	36.48	.82	37.30	47.96	10.66
27.1263	36.04	1.36	37.40	47.96	10.56

D.L.S. ELECTRONIC SYSTEMS INC. REPORT NO. 8933

SUMMARY DATA SHEET OF **RADIATED** EMISSIONS **<1000 MHz**

TEST DATE:--------April 12, 2001
MANUFACTURER:-----Motorola
MODEL NO:---------X5
S/N:--------------000176
CONFIGURATION:----**NA**

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15, SUBPART B, CLASS B EQUIPMENT / SECTION 15.109a

TEST EQUIPMENT: Receiver --- EMC-30 -- SN 44168

Antennas --- BIA-25 -- SN 4785
LPA-25 -- SN 4895

TYPE OF TEST: RADIATED **VERTICAL** MEASURED **AT 3 METERS**

THE FOLLOWING ARE SIGNIFICANT RADIATED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	METER CORR. dBuV	ANTENNA FACTOR dB	TOTAL dBuV/m	LIMIT dBuV/m	MARGIN dB
38.00	19.00	3.00	11.07	33.07	40.00	6.93
39.50	19.00	3.00	11.39	33.39	40.00	6.61
50.00	18.00	3.00	11.19	32.19	40.00	7.81
81.00	25.00	1.00	6.96	32.96	40.00	7.04
82.00	25.00	1.00	7.24	33.24	40.00	6.76
103.00	24.00	2.00	11.91	37.91	43.52	5.61
108.00	21.00	2.00	12.42	35.42	43.52	8.10
143.00	21.00	2.00	11.87	34.87	43.52	8.65
500.00	19.00	4.00	18.14	41.14	46.02	4.88
540.00	18.00	3.00	18.61	39.61	46.02	6.41
600.00	16.00	3.00	19.03	38.03	46.02	7.99

D.L.S. ELECTRONIC SYSTEMS INC. REPORT NO. 8933

SUMMARY DATA SHEET OF **RADIATED** EMISSIONS **<1000 MHz**

TEST DATE:--------April 12, 2001
MANUFACTURER:-----Motorola
MODEL NO:---------X5
S/N:--------------000176
CONFIGURATION:----**NA**

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15, SUBPART B, CLASS B EQUIPMENT / SECTION 15.109b

TEST EQUIPMENT: Receiver --- EMC-30 -- SN 44168

Antennas --- BIA-25 -- SN 4785
LPA-25 -- SN 4895

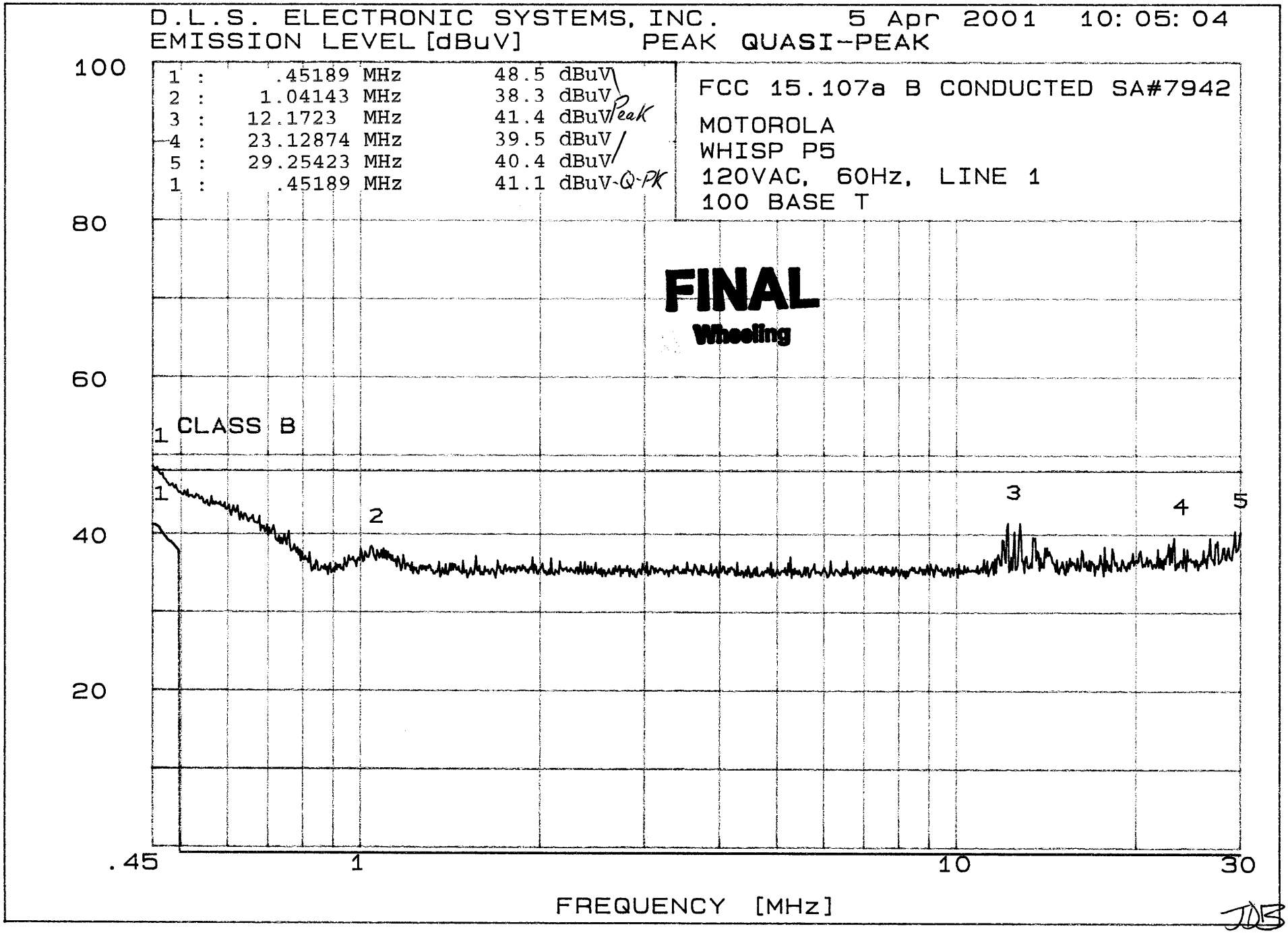
TYPE OF TEST: RADIATED **HORIZONTAL** MEASURED **AT 3 METERS**

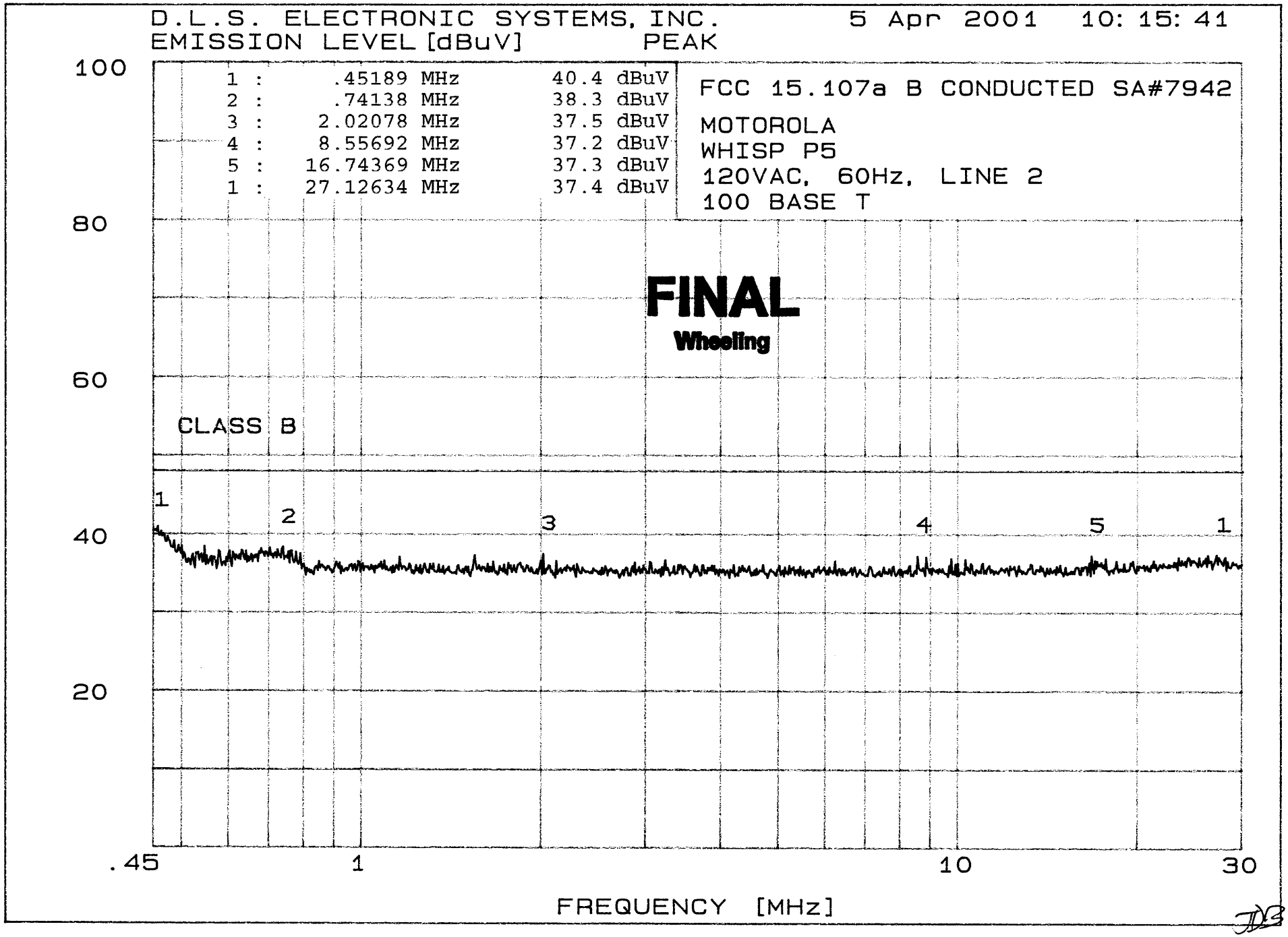
THE FOLLOWING ARE SIGNIFICANT RADIATED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	METER CORR. dBuV	ANTENNA FACTOR dB	TOTAL dBuV/m	LIMIT dBuV/m	MARGIN dB
ALL						>15dB

APPENDIX B

CHARTS TAKEN DURING TESTING


D.L.S. ELECTRONIC SYSTEMS, INC.
5 Apr 2001 10: 05: 04
EMISSION LEVEL [dBuV]
PEAK QUASI-PEAK
1 : .45189 MHz 48.5 dBuV
2 : 1.04143 MHz 38.3 dBuV
3 : 12.1723 MHz 41.4 dBuV
4 : 23.12874 MHz 39.5 dBuV
5 : 29.25423 MHz 40.4 dBuV
1 : .45189 MHz 41.1 dBuV-Q-PK
Peak
FCC 15.107a B CONDUCTED SA#7942
MOTOROLA
WHISP P5
120VAC, 60Hz, LINE 1
100 BASE T
FINAL
Wheeling
1 CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]
JDB


D.L.S. ELECTRONIC SYSTEMS, INC.
5 Apr 2001 10: 15: 41
EMISSION LEVEL [dBuV]
PEAK
1 : .45189 MHz 40.4 dBuV
2 : .74138 MHz 38.3 dBuV
3 : 2.02078 MHz 37.5 dBuV
4 : 8.55692 MHz 37.2 dBuV
5 : 16.74369 MHz 37.3 dBuV
1 : 27.12634 MHz 37.4 dBuV
FCC 15.107a B CONDUCTED SA#7942
MOTOROLA
WHISP P5
120VAC, 60Hz, LINE 2
100 BASE T
FINAL
Wheeling
CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

HOW TO READ EMC-30 RADIATED CHARTS

1. The EMC-30 Attenuation (receiver) is written at the top of each chart.

2. The total attenuation (B) is the receiver attenuation plus any correction due to the pre-amps.

3. The total attenuation is then used to determine the limit on the chart.
Example: Say we are testing a computer to meet FCC "B" Limit.

Step 1: Look at the top of the page for the total attenuation (B)
Let's say the total attenuation is 20. See sample chart.

Step 2: Look for the bold horizontal line with the number 20 written inside the parenthesis (20). This is the number above or below the bold line without a + or – sign associated with it. "B" limit numbers are written in parenthesis, while "A" limit numbers are written outside parenthesis. See limit above Rev No near bottom left of page.

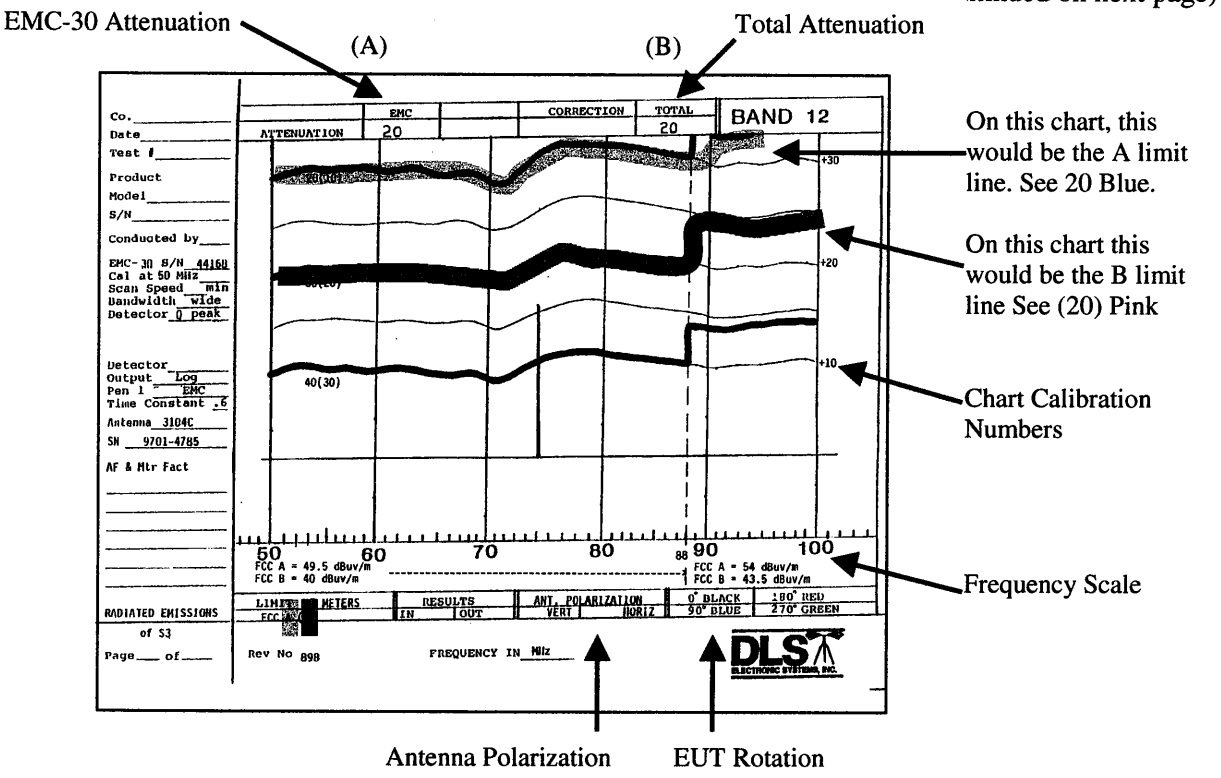
Step 3: The bold line marked (20) would be the FCC "B" limit line and should be marked with a pink highlighter marker. See sample chart.

Step 4: The proximity of the signals to the limit can now be determined. Each bold, horizontal line represents 10 dB, while the narrow line indicates 5 dB. The sample signal is 4/5 of a small division below the pink line. The signal is therefore below the FCC B limit by 4 dB. The frequency of the signals can be determined from the numbers on the x-axis of the chart.

Step 5: The plot may be run in several different colors which represent the angle of the EUT with respect to the antenna. To determine what color corresponds to what angle, see the boxes in the lower right-hand corner of the chart.

Step 6: The polarization of the antenna at the time of the test, either vertical or horizontal, can be seen in the lower center portion of the chart.

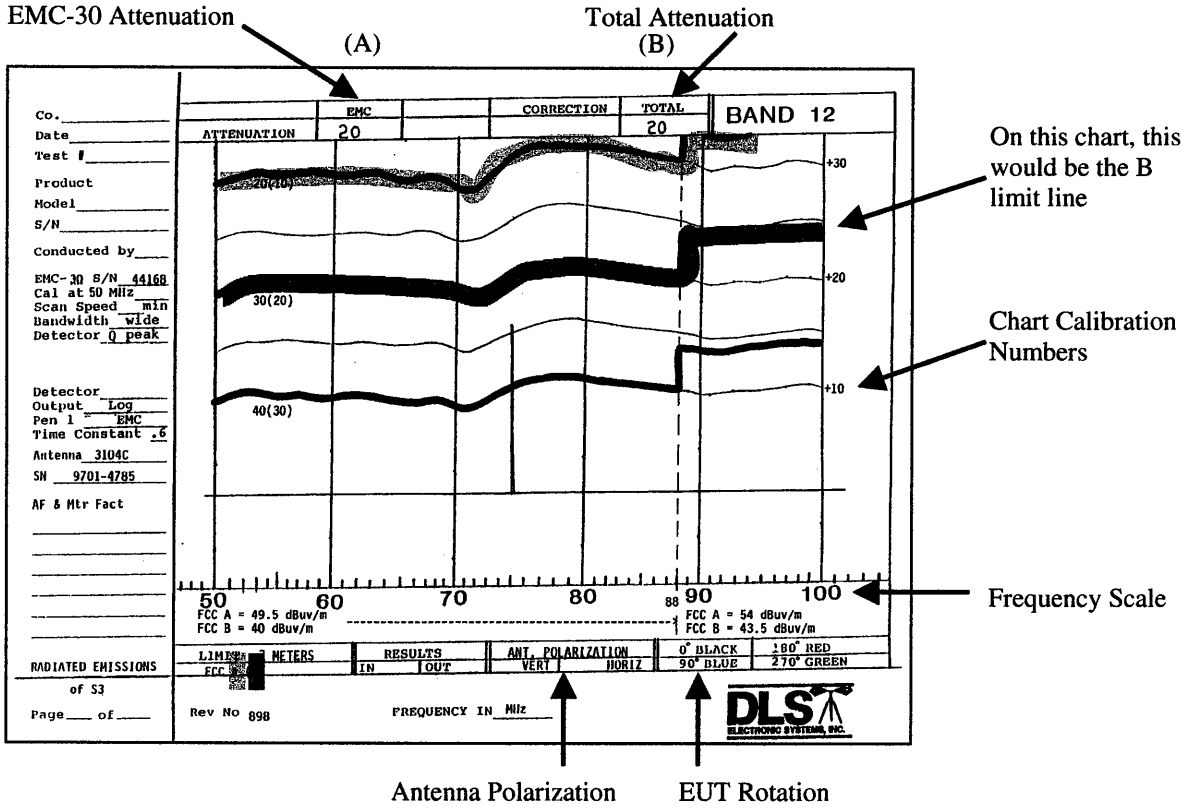
(continued on next page)



HOW TO READ EMC-30 RADIATED CHARTS (continued)

Step 7: If yellow or blue tags are present: Yellow tags are broad band antenna measurements which contain the frequency, meter reading, antenna height, and the EUT rotation with respect to the antenna. Blue tags are dipole readings which contain the same information. When dipoles are used, the margin cannot be approximated graphically but must be calculated.

Step 8: To determine the approximate signal strength of a frequency, first determine the total attenuation from the chart (B). Second, find the chart calibration number on the right vertical axis of the chart which is nearest to the level of signal strength you are trying to determine. Adding this number to the total attenuation gives you the level of this line in dBuv/m. Example: A total attenuation of 20 added to the +20 line (chart calibration number) makes this line 40 dBuv/m. Let's call this the amplitude line. Next, determine the approximate height of the signal with respect to the amplitude line remembering that each horizontal division is 5 dB. The amount above or below the amplitude line determines the approximate signal strength. The signal on the sample chart at 75 MHz would be below the "B" limit by approximately 4 dB or 36 dBuv/m.



Note: All backgrounds are indicated with yellow markers and each is verified before being marked.

Co. Motorola
Date 4-12-01
Test # 1A

Product
Model WHiSP
~~S/N~~ 5200

Conducted by TL

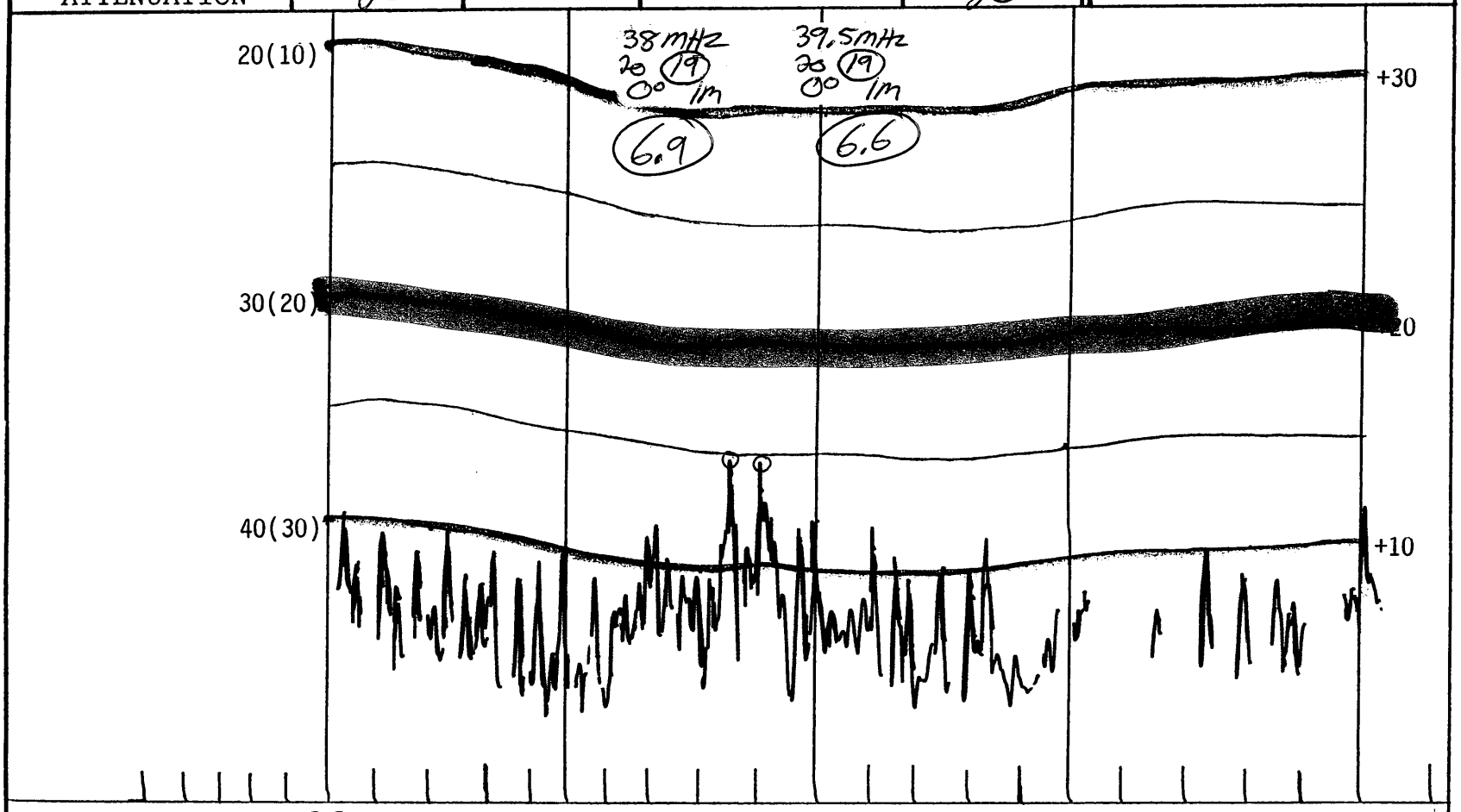
EMC- 30 S/N 44168
Cal at 30 MHz ✓
Scan Speed 30 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3104C
SN 9701-4785

AF & Mtr Fact

ATTENUATION	EMC 20		CORRECTION	TOTAL 20

BAND 11



FCC A = 49.5 dBuv/m
FCC B = 40 dBuv/m ---------->

LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	(VERT)	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS
S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1A

Product
Model
S/N

Conducted by JL

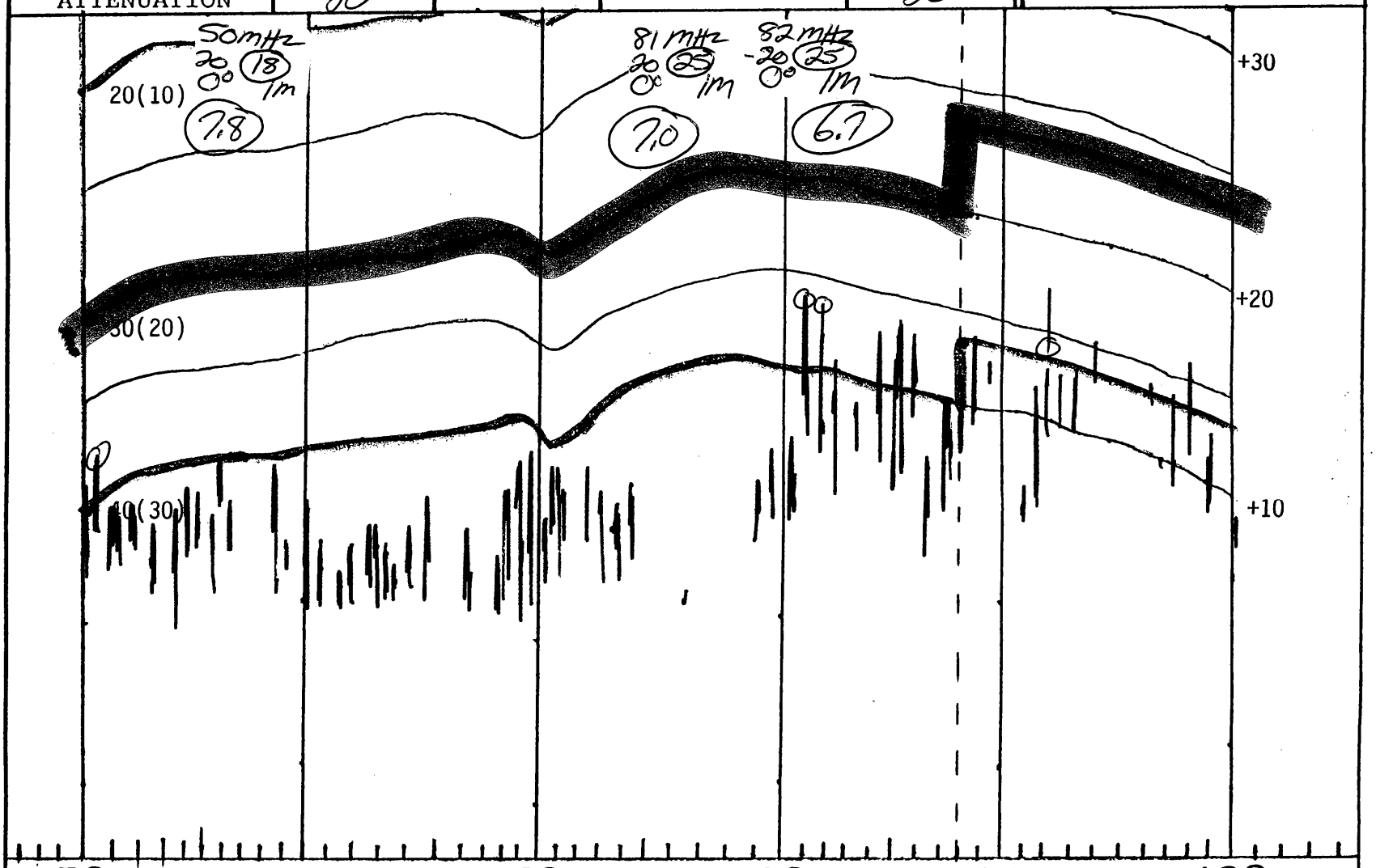
EMC-30 S/N 44168
Cal at 50 MHz ✓
Scan Speed 20 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3104C
SN 9701-4785

AF & Mtr Fact

	EMC		CORRECTION	TOTAL
ATTENUATION	20			20

BAND 12



LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	VERT	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1A

Product
Model
S/N

Conducted by TL

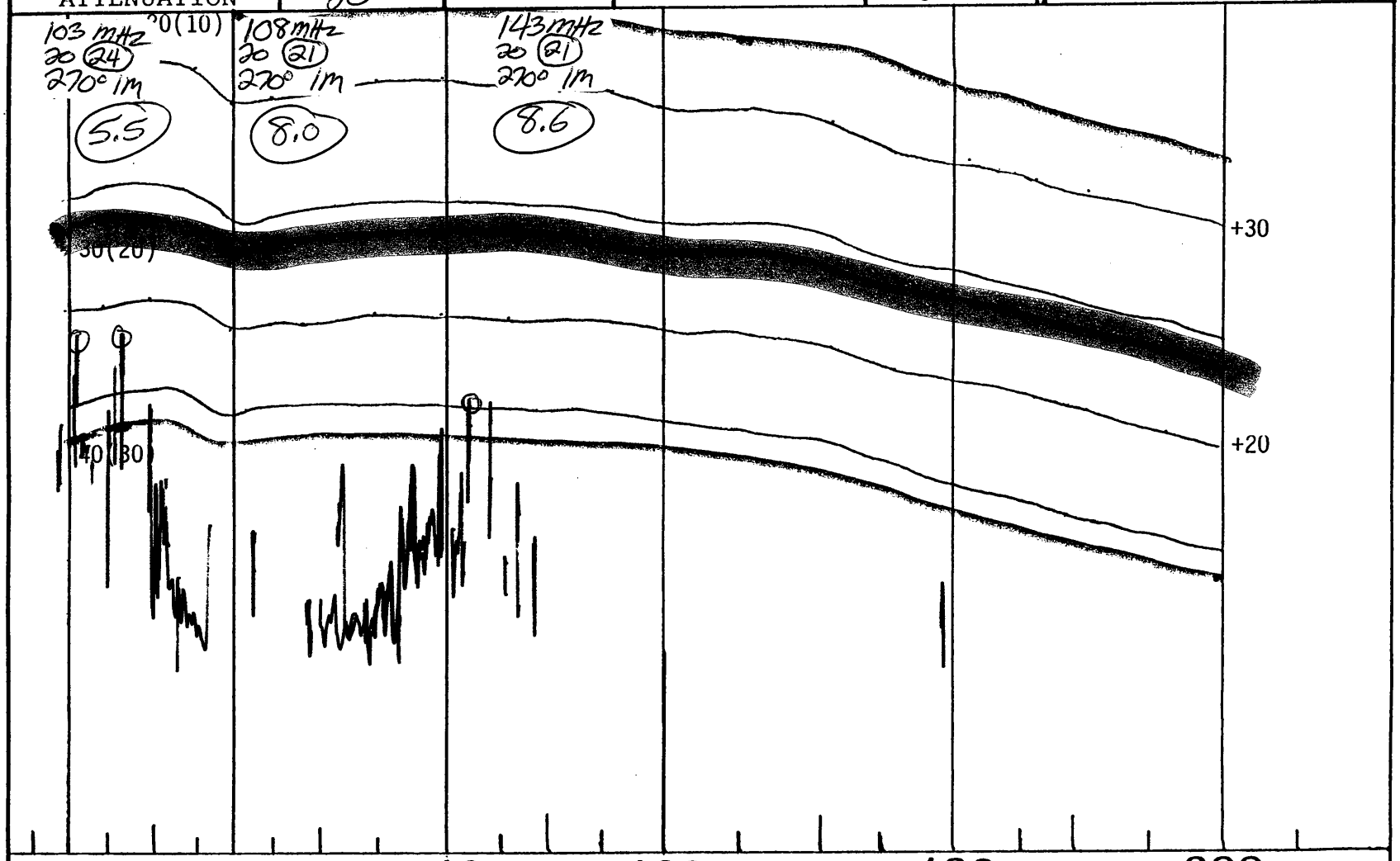
EMC- 30 S/N 44168
Cal at 100 MHz ✓
Scan Speed 20 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3104C
SN 9701-4785

AF & Mtr Fact

ATTENUATION	EMC		CORRECTION	TOTAL
	20			20

BAND 13



FCC A = 54 dBuv/m
FCC B = 43.5 dBuv/m ---------->

LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	(VERT)	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1c

Product
Model
S/N

Conducted by TL

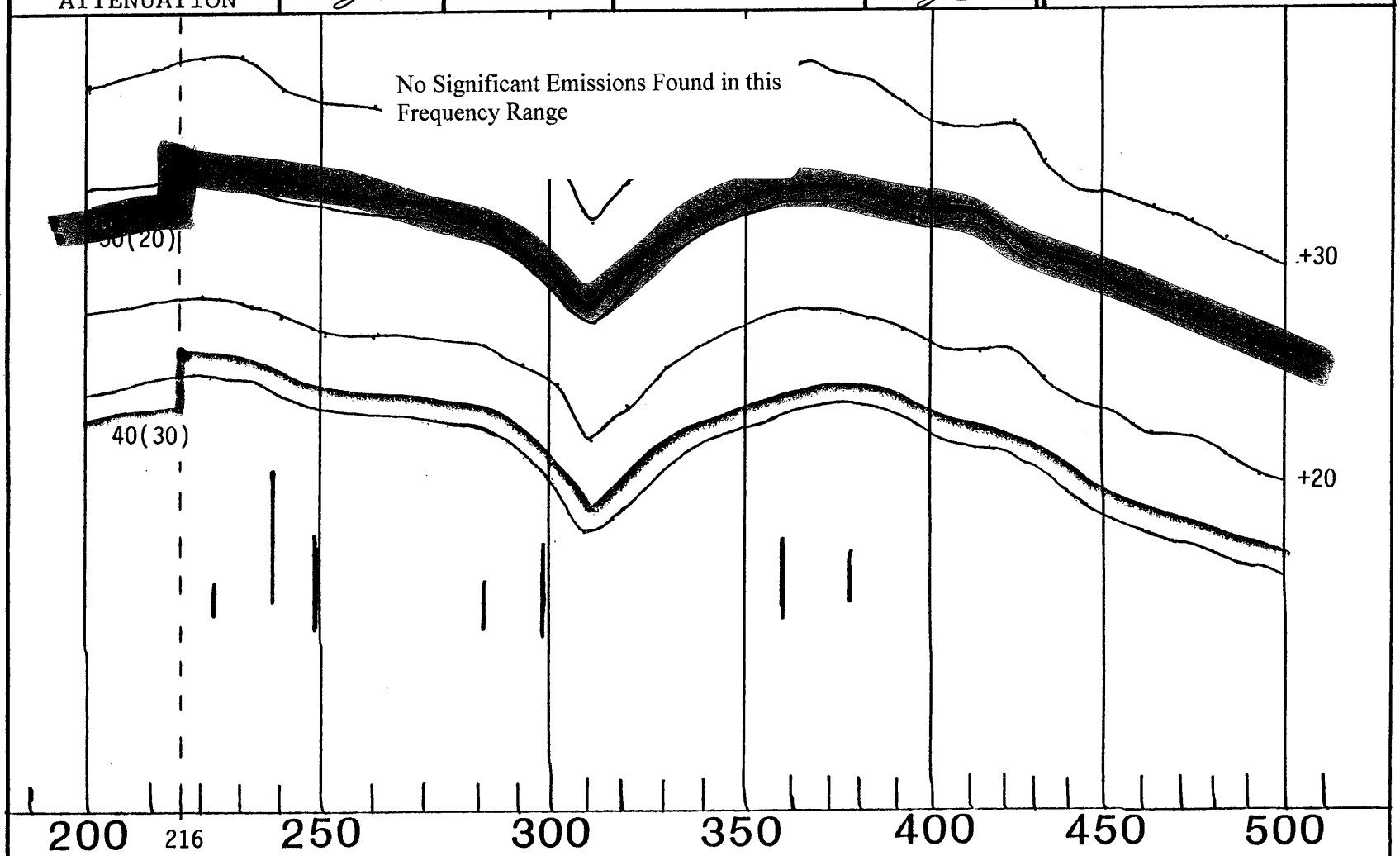
EMC- 30 S/N 44168
Cal at 200 MHz ✓
Scan Speed 30 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3146
SN 9702-4895

AF & Mtr Fact

	EMC		CORRECTION	TOTAL
ATTENUATION	20			20

BAND 14



FCC A = 54 dBuv/m
FCC B = 43.5 dBuv/m
->
FCC A = 57 dBuv/m
FCC B = 46 dBuv/m
---------->

LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	(VERT)	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1c

Product
Model
S/N

Conducted by TL

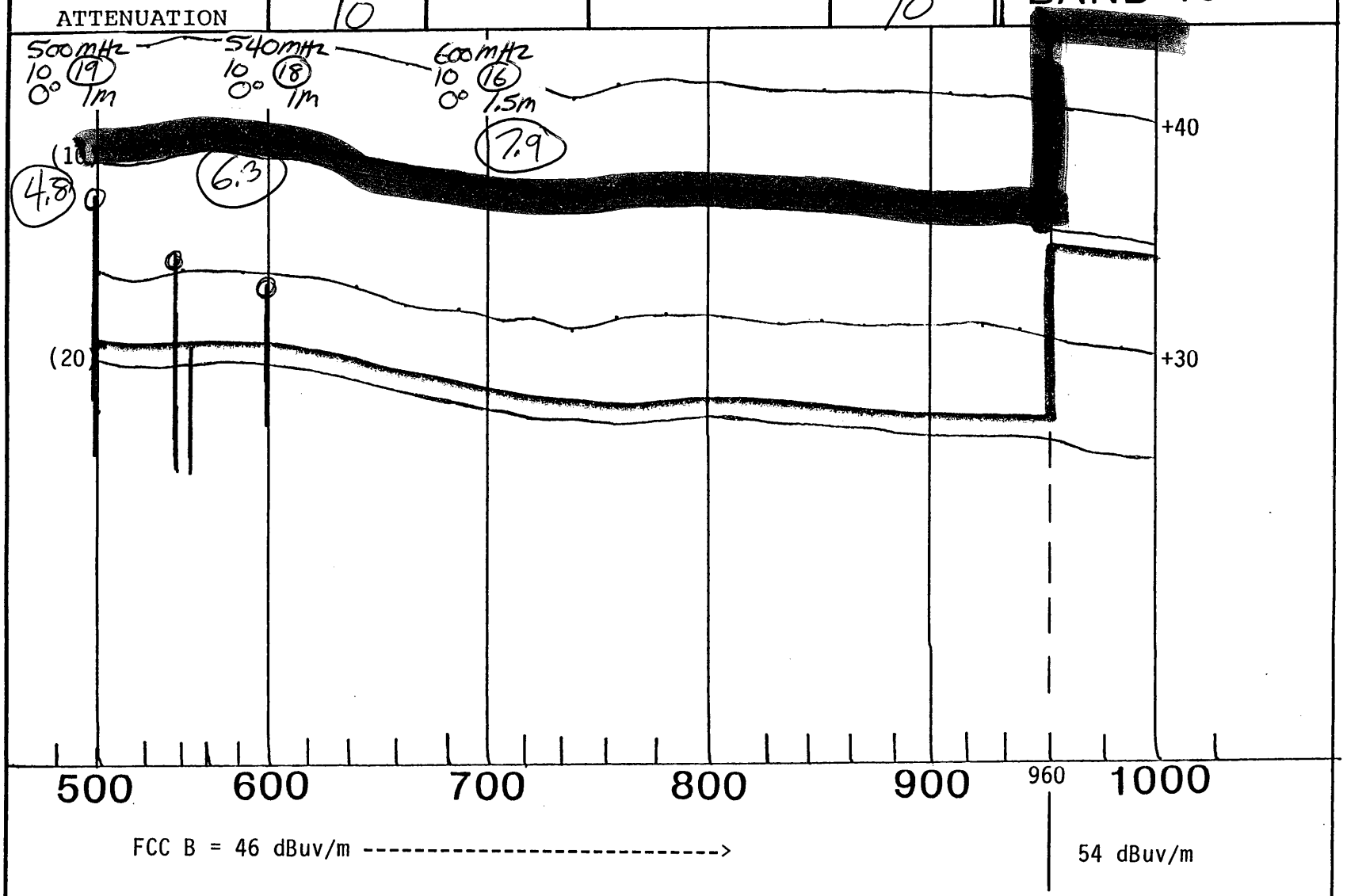
EMC- 30 S/N 44168
Cal at 500 MHz ✓
Scan Speed 20 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3146
SN 9702-4895

AF & Mtr Fact

	EMC		CORRECTION	TOTAL
ATTENUATION	10			10

BAND 15



LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC (B)	IN	OUT	(VERT)	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1A

Product
Model
S/N
Conducted by TL

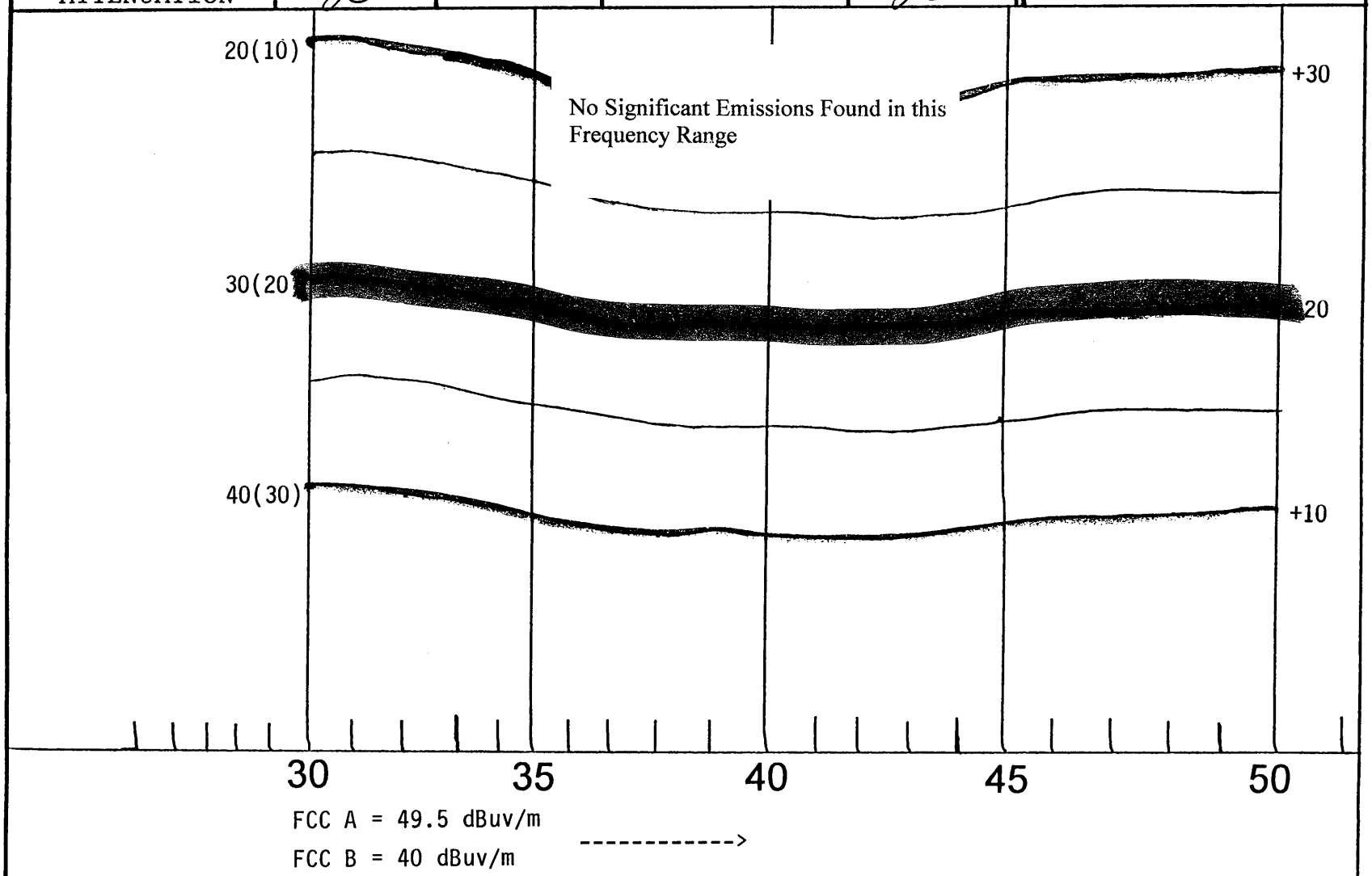
EMC- 30 S/N 44168
Cal at 30 MHz ✓
Scan Speed 20 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3104C
SN 9701-4785

AF & Mtr Fact

ATTENUATION	EMC		CORRECTION	TOTAL
	20			20

BAND 11



LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	VERT	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1B

Product
Model
S/N

Conducted by TL

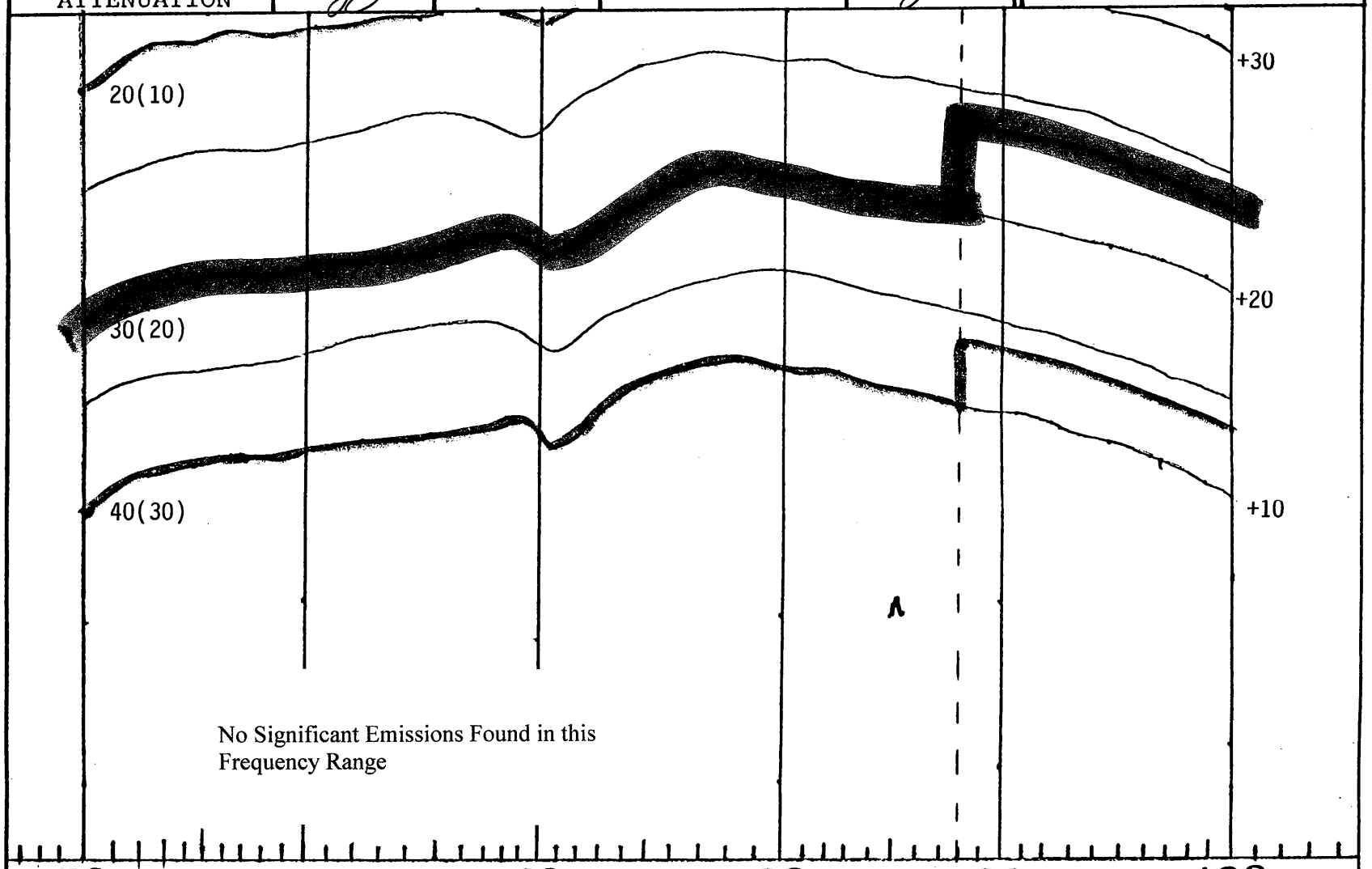
EMC-30 S/N 44168
Cal at 50 MHz ✓
Scan Speed 30 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3104C
SN 9701-4785

AF & Mtr Fact

ATTENUATION	EMC 20		CORRECTION	TOTAL 20

BAND 12



LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	VERT	(HORIZ)	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1B

Product
Model
S/N

Conducted by TL

EMC- 30 S/N 44168
Cal at 100 MHz ✓
Scan Speed 20 min
Bandwidth wide
Detector Q peak

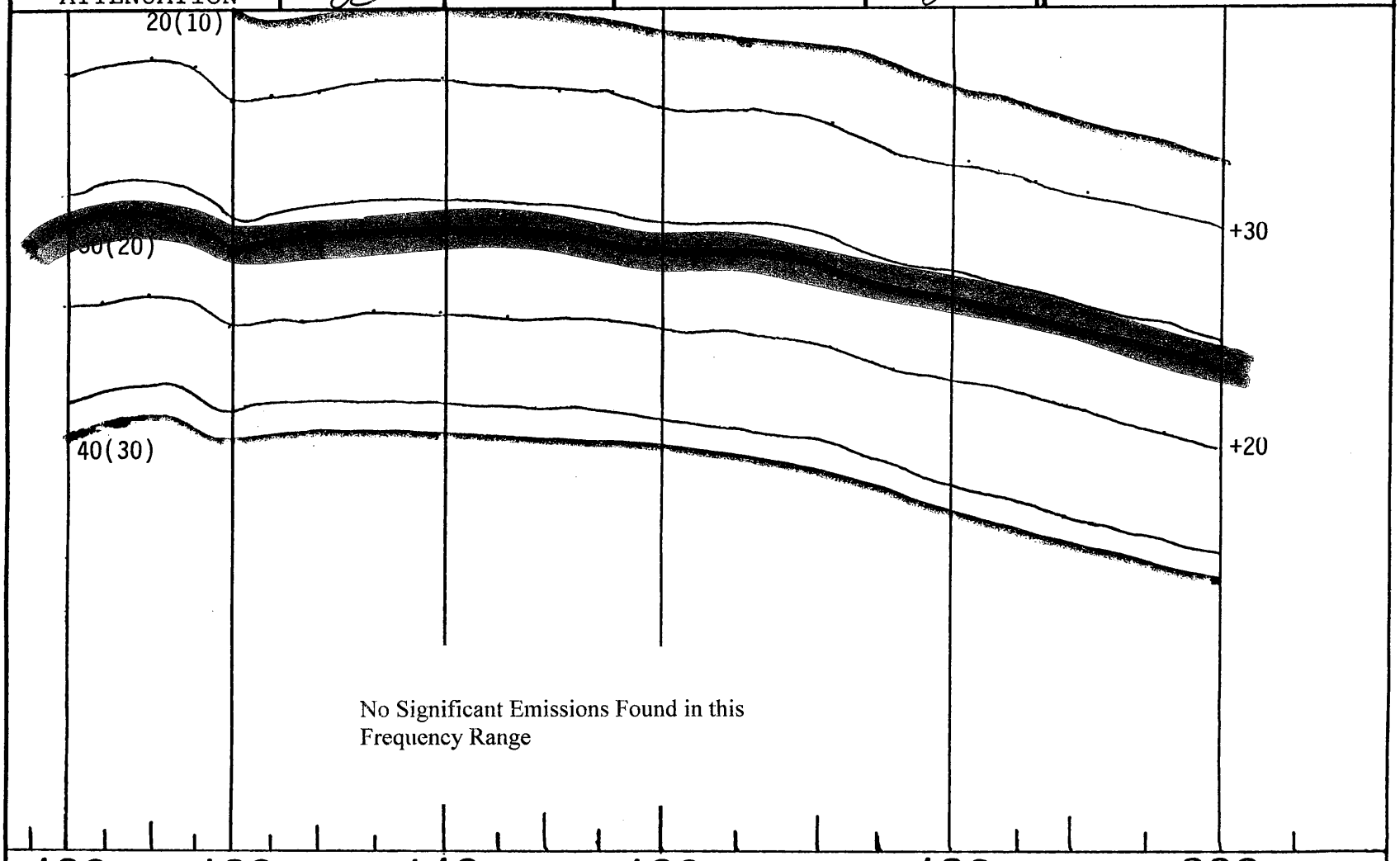
Output Log
Pen 1 EMC
Time Constant .6

Antenna 3104C
SN 9701-4785

AF & Mtr Fact

ATTENUATION	EMC 20		CORRECTION	TOTAL 20

BAND 13



LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	VERT	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # ID

Product
Model
S/N

Conducted by TL

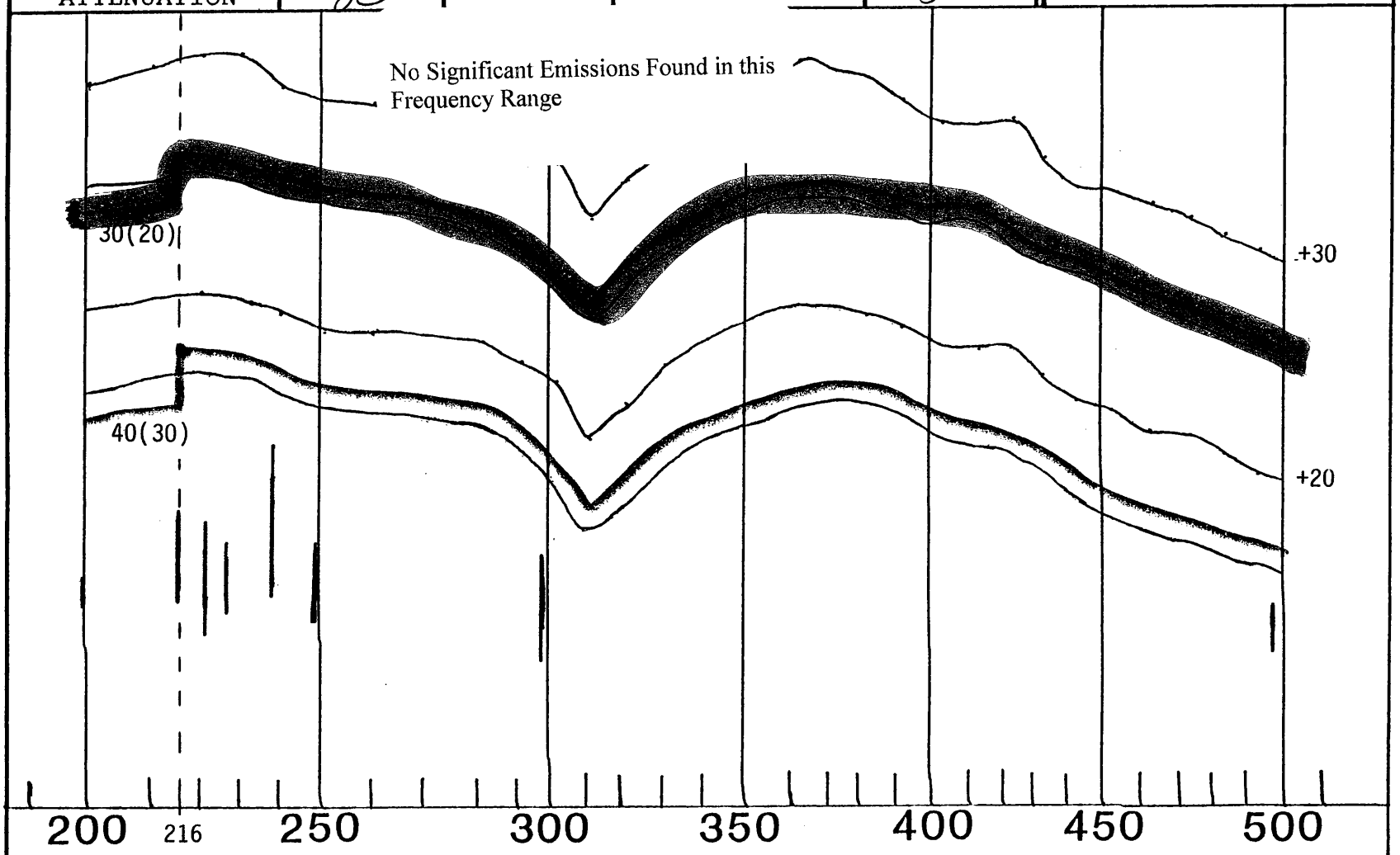
EMC- 30 S/N 44168
Cal at 200 MHz ✓
Scan Speed 30 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3146
SN 9702-4895

AF & Mtr Fact

ATTENUATION	EMC	CORRECTION	TOTAL
	20		20

BAND 14



FCC A = 54 dBuv/m
FCC B = 43.5 dBuv/m
->
FCC A = 57 dBuv/m
FCC B = 46 dBuv/m
---------->

LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC A (B)	IN	OUT	VERT	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.

Co. Motorola
Date 4-12-01
Test # 1D

Product
Model
S/N

Conducted by TL

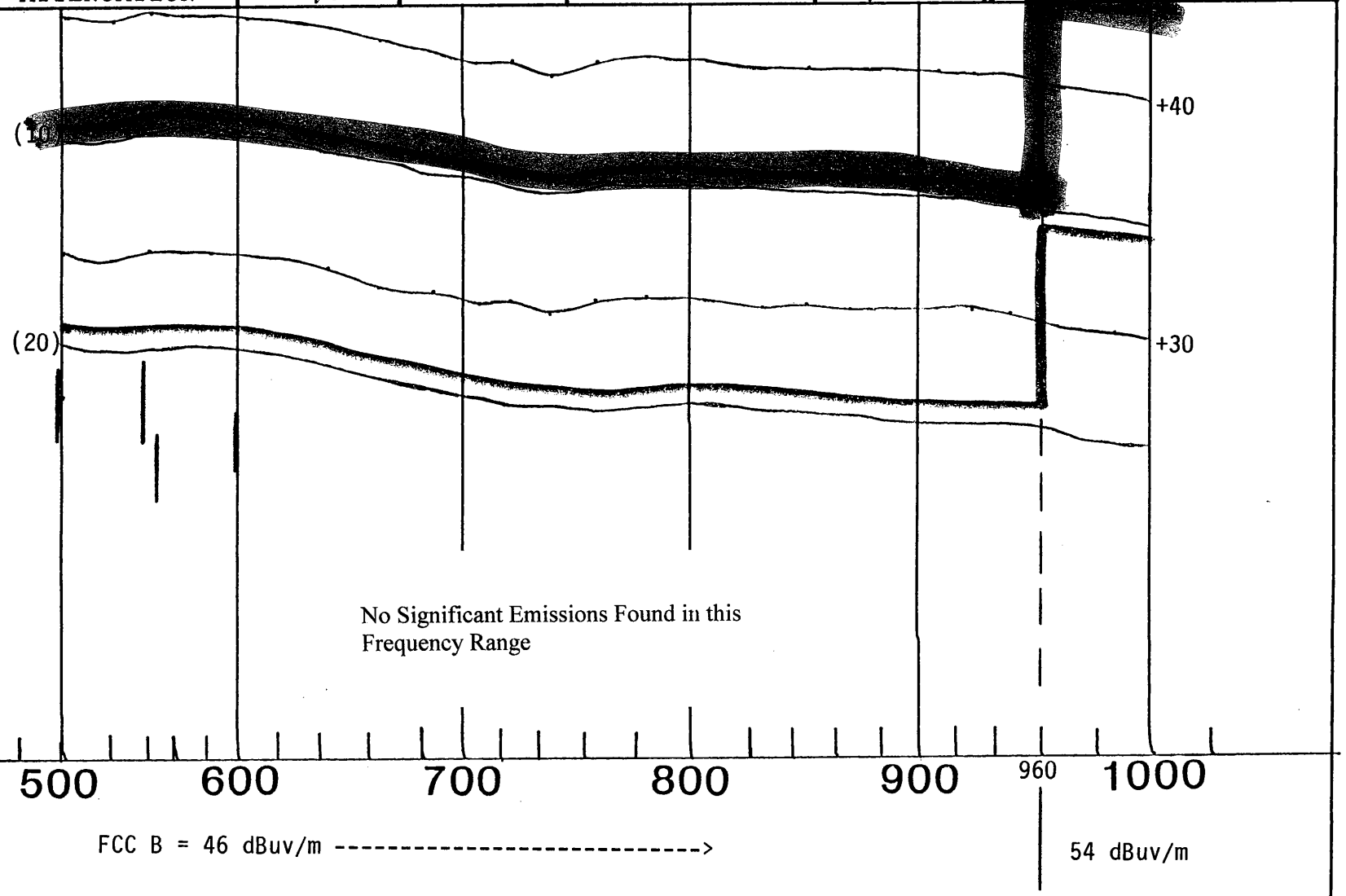
EMC- 30 S/N 44168
Cal at 500 MHz ✓
Scan Speed 20 min
Bandwidth wide
Detector Q peak

Output Log
Pen 1 EMC
Time Constant .6
Antenna 3146
SN 9702-4895

AF & Mtr Fact

ATTENUATION	EMC		CORRECTION	TOTAL
	10			10

BAND 15



LIMIT 3 Meters	RESULTS		ANT. POLARIZATION		0° BLACK	180° RED
FCC (B)	IN	OUT	VERT	HORIZ	90° BLUE	270° GREEN

RADIATED EMISSIONS

S3

Page ___ of ___

Rev No 0900

FREQUENCY IN MHz

DLS ELECTRONIC SYSTEMS, INC.