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REPORT NO.: 43957-o 1
WYLE JOB NO.: 43957
CLIENT P.O. NO.: 00-0247
CONTRACT: N / A
TOTAL PAGES (INCLUDING COVER): 2 2
DATE: March 6, 2000

TEST REPORT

FCC CERTIFICATION TESTING ON MICRO SYSTEMS' RAPID SCORING SYSTEM

For
Micro Systems, Inc.
35 Hill Avenue
Fort Walton Beach, FL 32548
Attn: Adam Taylor

STATE OF ALABAMA
COUNTY OF MADISON }

James R. Dearman, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted testing and is to the best of his knowledge true and correct in all respects.

SUBSCRIBED and sworn to before me this 7 day of March 20 00

Notary Public in and for the State of Alabama at Large SEAL

My Commission expires April 6, 2002

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

TEST BY: 3/7/00
Mike Moranha, Sr. Test Specialist Date

(dsc)

1.0 INTRODUCTION

1.1 Scope

This report documents conformance with the FCC Rules, Part 15, Class A, as listed below, and details the results of the testing performed on Micro Systems' Rapid Scoring System (RSS) on February 28 and 29, 2000, at Wyle Laboratories' Huntsville, Alabama, Test Facility. The specimen was received in good condition on February 28, 2000.

1.2 Product Description

The Rapid Scoring System (RSS) provides schools with a simple system to conduct standardized testing, The student enters their multiple-choice answers into a small hand-held device rather than using a paper answer sheet. The RSS consists of 30 small hand-held devices (remote units), used by the students, and a base unit connected to a PC. The remote units use radio frequencies (RF) to communicate with the base unit. The base unit connects to the PC via an RS-232 connection and receives its power from a plug-in wall transformer. Each remote unit is powered by a rechargeable battery pack. The base unit polls each remote unit periodically to transfer information required for standardized testing.

1.3 Details for Tested System

The identifiers for the test specimen, support devices, and cables used in the tested system are:

- **Test Specimen**

Item	Part No.	Serial No.	Quantity
Base Unit	RSS	Wyle 001	1
Remote Unit	RSS	Wyle 001	1

- **Support Equipment**

  There was no support equipment used during the FCC Part 15 testing.

1.4 Test Methodology

All emissions testing was performed according to the procedures in ANSI C63.4-1992. The EUT is subject to the radiated emission limits for a Class A Digital Device per Subpart B, Paragraphs 15.107(b), 15.109(b), 15.209 at an antenna-to-EUT distance of ten meters. Subpart C (Intentional Radiators), Paragraph 15.249 of the FCC Rules and Regulations testing was conducted at an antenna-to-EUT distance of three meters.

1.0 INTRODUCTION (Continued)

1.5 Test Facility

The Open-Area Test Site facility used to collect the data in this report is located on the grounds of Wyle Laboratories' Huntsville, Alabama Test Facility. This site has been fully described in reports provided to the FCC Reference 3 1040/SIDDS300B3. This test site was tested and meets the requirements of ANSI C63.4-1992.

1.6 References

- Micro Systems' purchase Order No. 00-0247
- Wyle Laboratories' Request for Quotation No. 545/002671-C1/DB
- ANSI C63.4-1992, "Methods of Measurement of Radio Noise From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- Code of Federal Regulations (CFR) Title 47, "Telecommunications," October 1, 1998
- Wyle Laboratories' Quality Assurance Program Manual, Revision 1
- ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- IS0 10012- 1, "Quality Assurance Requirements for Measuring Equipment"
- MIL-STD-45662A, *Calibration System Requirements"

1.7 Quality Assurance

1.7.1 Quality Assurance Program

All work performed on this test program was completed in accordance with Wyle Laboratories' Quality Assurance Program.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a Division of Canadian Standards Association (CSA).

1.0 INTRODUCTION (Continued)

1.7 Quality Assurance (Continued)

1.7.2 Test Equipment and Instrumentation

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the requirements of ANSI/NCSL Z540-1, IS0 10012-1, and Military Specification MIL-STD-45662A. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

Appendix C contains a list of the instrumentation, measuring, and test equipment that was used to perform the tests.

2.0 PRODUCT LABELING

FCC ID XXXXXXX
THE DEVICE COMPLIES WITH PART 15 OF THE FCC RULES
OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS
(1) THE DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE AND
(2) THE DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION

Figure 2.1 – FCC ID Label

3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

The equipment was configured for testing in a typical fashion (as a customer would normally use it).

3.0 SYSTEM TEST CONFIGURATION (Continued)

3.2 Test Specimen Configuration

The equipment was configured for testing in a typical fashion (as a customer would normally use it). Refer to Figure 2.1. Photographs of the equipment arrangement for the Radiated Emissions Test are presented in Attachment A.

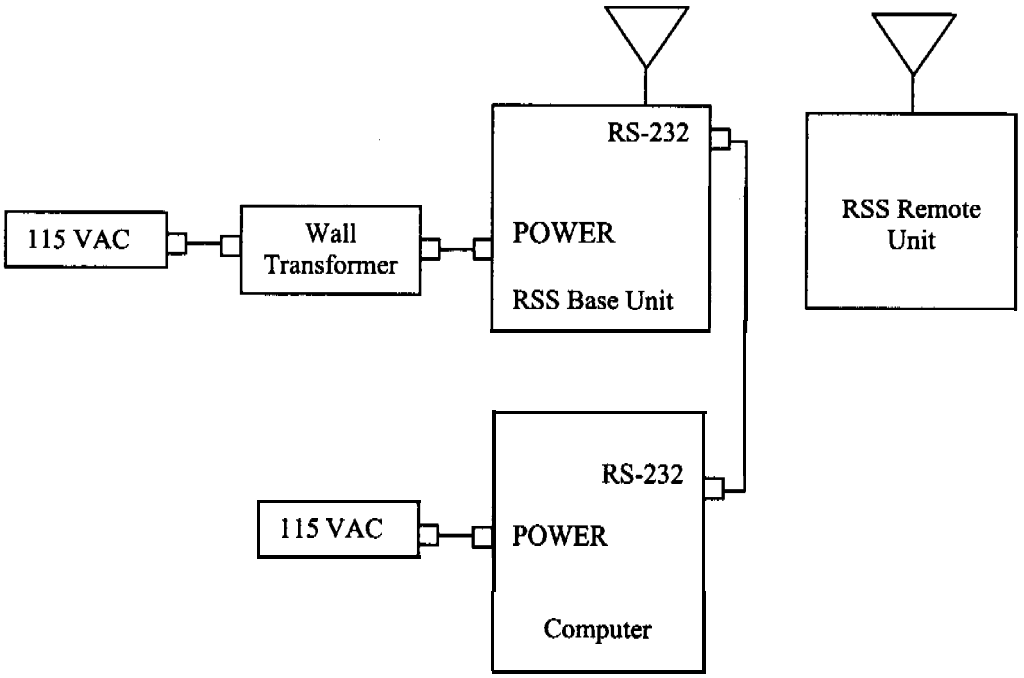


Figure 2.1 - Test Specimen Configuration

3.3 Special Accessories

There are no special accessories.

4.0 RADIATED EMISSIONS

4.1 Field Strength Calculations

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

4.0 RADIATED EMISSIONS (Continued)

4.1 Field Strength Calculations (Continued)

$$FS = RA + AF + CF - AG + DC$$

where: FS = Field Strength
RA = Received Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
DC = Distance Correction

For example: assume a receiver input reading of 52.5 dBμV is obtained. The Antenna Factor, 7.4 dB, and Cable Factor, 1.1 dB, are added and the amplifier gain, 29 dB, is subtracted.

$$FS = 52.5 + 7.4 + 1.1 - 29$$

$$FS = 32.0\ \text{dB}\mu\text{V/m}$$

Correction for measurement distance from 3 meters to 30 meters (if necessary) would add the distance correction factor of -20.0 dB to the value of FS.

FS (3 meters) = 32.0 dBμV/m -20.0

FS (30 meters) = 12.0 dBμV/m

When the measured amplitude of the signal plus the ambient noise is less than 10 dB greater than the measured amplitude of the ambient noise, the actual signal level must be determined by applying a correction factor. The deviation of this correction factor is as follows:

$$10 \log (S+N)/N = 10 \log [(S+N)/N] - 10 \log [10^{\log (S+N)/N-1}]$$

where the quantity (S +N)/N is the measured amplitude of the signal plus the ambient noise divided by the measured amplitude of the ambient noise.

The correction factor, 10 log (S+N)/N, is subtracted from the measured amplitude of the signal plus the ambient noise, to determine the true signal amplitude.

For example: assume the measured digital plus ambient noise is 19.5 dBμV and the measured ambient noise amplitude is 18 dBμV. From the equation, the correction factor would be 5.3dB.

4.0 RADIATED EMISSIONS (Continued)

4.1 Field Strength Calculations (Continued)

The true signal amplitude would be:

Measured value of signal plus ambient noise	19.5 dBμV
Correction factor, 10 log (S+N)/N	(-) 5.3 dB
True signal amplitude	14.2 dBμV

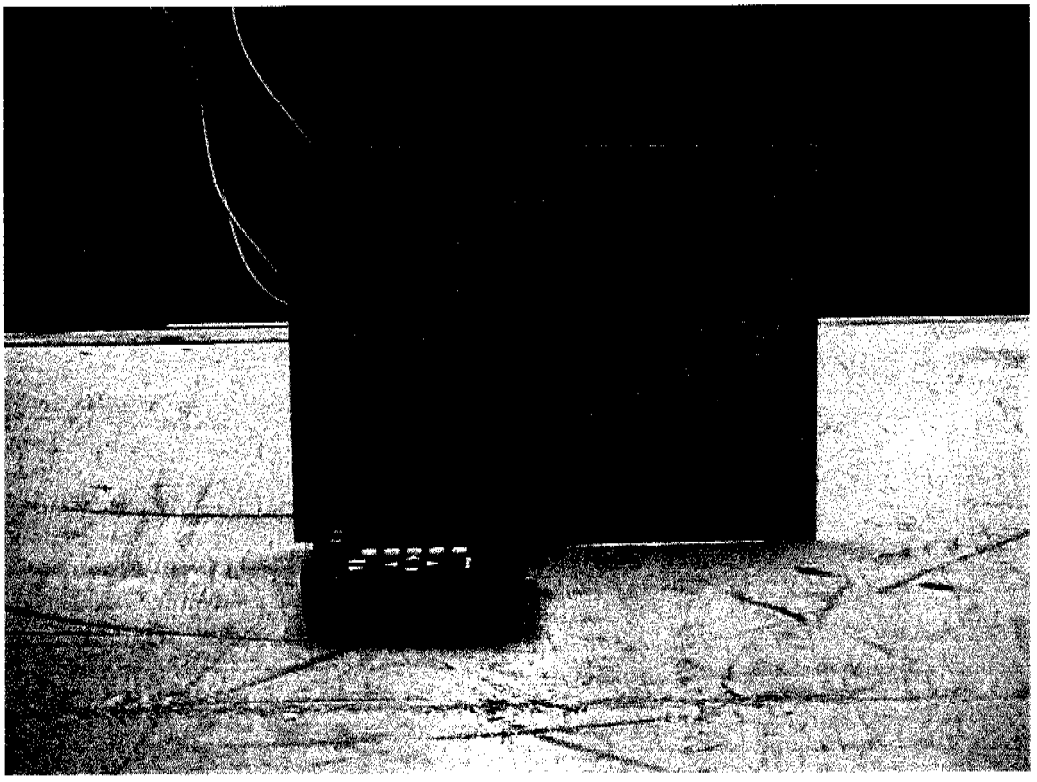
The correction subtracted from the signal plus the ambient noise amplitude gives a true signal amplitude of 14.2 dBμV.

Correction for measurement distance from 3 meters to 10 meters (if necessary) would add the distance correction factor of -10.46 dB to the value of FS.

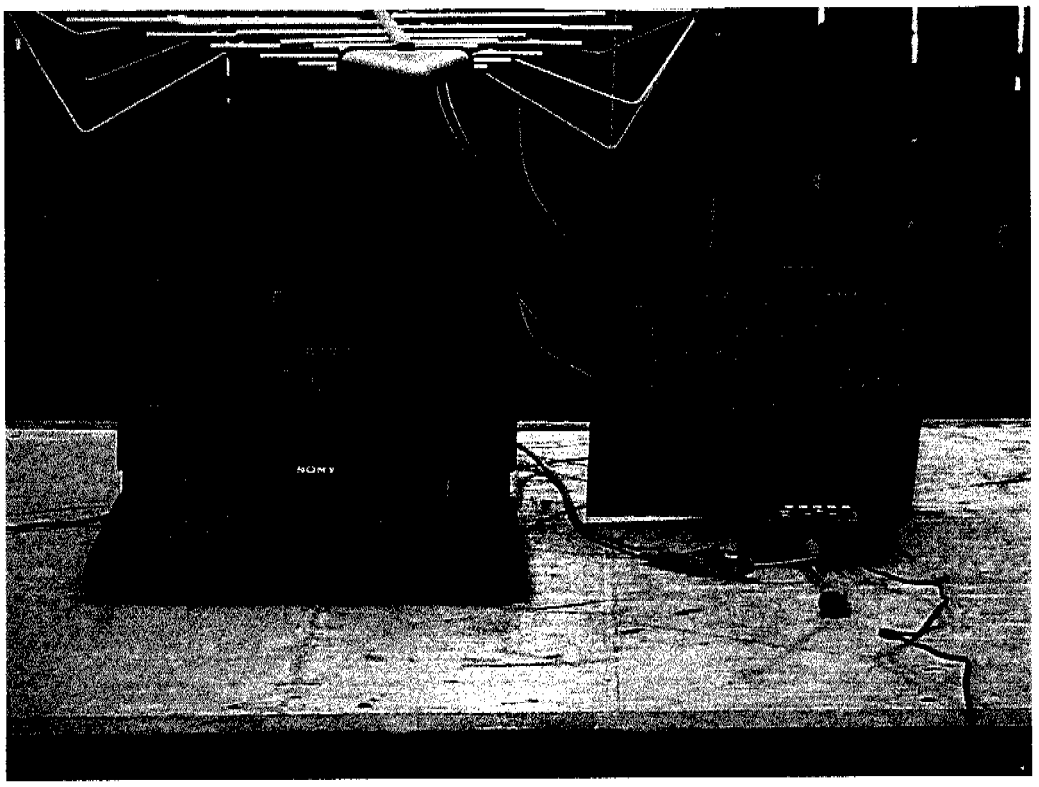
FS (10 meters) = 32.0 dBμV/m – 10.46
FS (10 meters) = 21.54 dBμV/m

5.0 TEST RESULTS

The radiated emissions from the RSS complied with FCC Part 15, Class A, limits. No anomalies were noted. The test data is presented in Attachment B.



Photograph A-l
CFR 47, Part 15, Class A
Radiated Emissions Test Setup
for the RSS Remote Unit



Photograph A-2
CFR 47, Part 15, Class A
Radiated Emissions Test Setup
for the RSS Base Unit

wyle

EMISSIONS DATA SHEET

Customer: MICRO SYSTEM, INC Date: 2/28/00

Model Number: RSS (BASE UNIT) Job Number: 43957

Specimen Nomenclature: RAPID SCANNING SYSTEM Freq. Range of Test: 30-1000 MHz

Serial Number: PROTOTYPE #1 Mode of Operation: ACTIVE (TRANSMITTING)

Measurement Point: MAXIMUM Measurement Technique:

Type of Measurement: Radiated [X] Conducted [ ]

Standard: FCC Part 15 [X] EN55022/11 [ ] GR-1 089-Core [ ] ICES-005 [ ]

Class: A [X] B [ ]

Quasi-Peak [X] Peak [ ] Average [ ] [ ] Slideback [ ]

Test Frequency (MHz)	ivleter Indication dBuV	Correction Factors (dB) A	B	C	D	Corrected Reading dBuV	Limit dBuV	Remarks
32.14	12.29	11.95	1.38			25.54	39.8	VERTICAL
75.82	19.78	6.99	1.60			28.37	39.8	VERTICAL
129.87	12.68	7.85	2.29			21.94	43.5	VERTICAL
199.23	23.33	10.18	2.78			36.21	43.5	HORIZONTAL
226.98	12.30	10.52	3.81			25.83	46.8	HORIZONTAL
324.23	12.31	13.61	3.74			29.66	46.8	HORIZONTAL

A= Antenna Factor B= Cable Loss C= _____ D= _____

Tested By: [signature] Date: 2/28/00

Notice of Anomaly: NONE Reviewed By: [signature] Date: 3/3/00

Sheet No. 1 of 2

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EMISSIONS DATA SHEET

Customer: MICRO SYSTEMS, INC. Date: 2/28/00

Model Number: RSS (REMOTE UNIT) Job Number: 43957

Specimen Nomenclature: RAPID SCORING SYSTEM Freq. Range of Test: 30 - 1000 MHz

Serial Number: PROTOTYPE #2 Mode of Operation: ACTIVE (RECEIVE)

Measurement Point: MAXIMUM Measurement Technique:

Type of Measurement:		Standard:		Class:			
Radiated	☒	FCC Part 15	☒	A	☒	Quasi-Peak	☒
Conducted	☐	EN55022/11	☐	B	☐	Peak	☐
		GR-1089-Core	☐			Average	☐
		ICES-005	☐			RMS	☐
						Slideback	☐

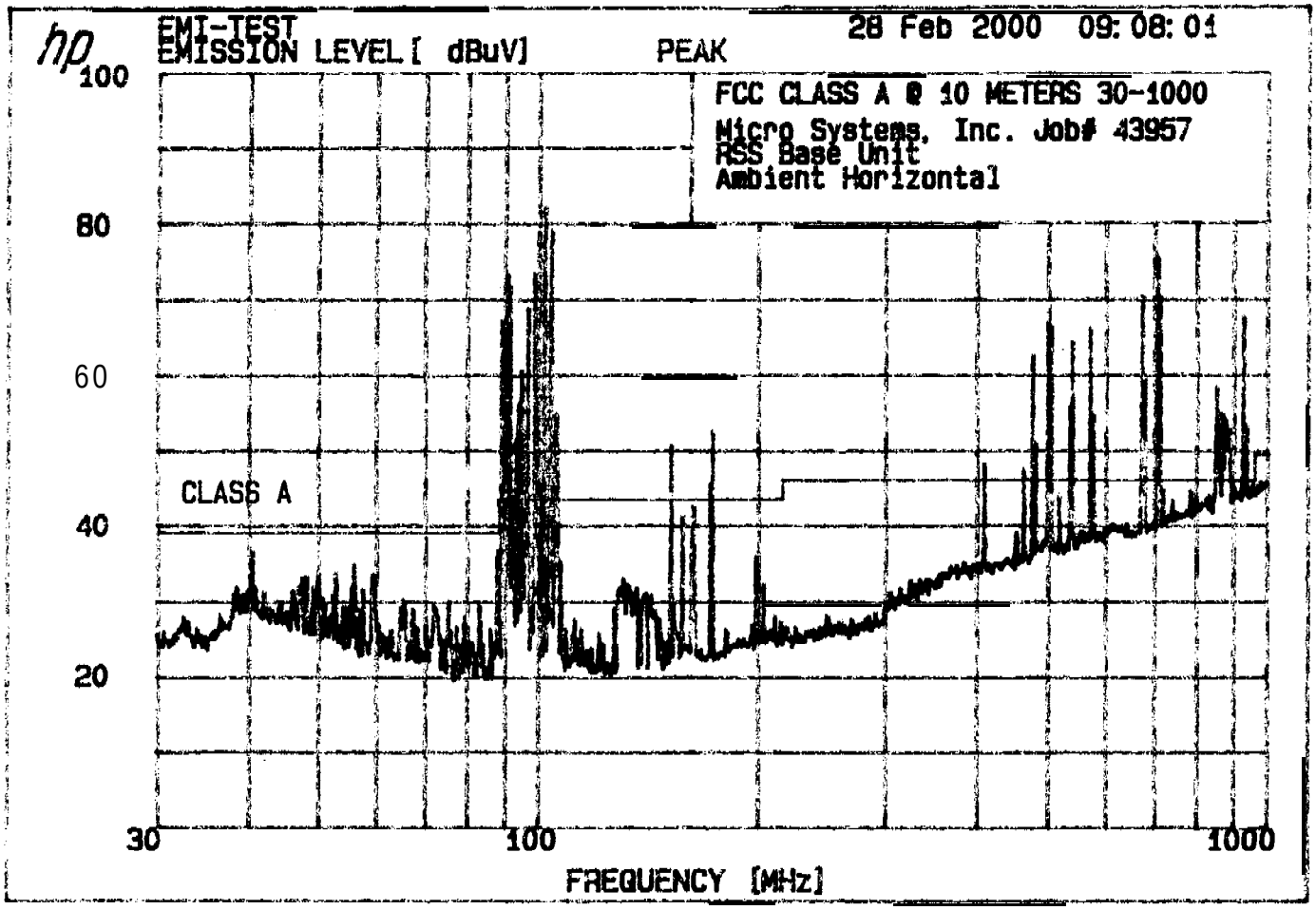
Test Frequency (MHz)	Meter Indication dBuV	Correction Factors (dB) A	B	C	D	Corrected Reading dBuV	Limit dBuV	Remarks
32.14	11.43	11.95	1.38			24.68	39.8	VERTICAL
75.82	17.68	6.99	1.68			26.19	39.8	VERTICAL
129.87	11.92	7.85	2.29			21.26	43.5	VERTICAL
178.18	28.95	8.55	2.61			32.11	43.5	VERTICAL
221.20	11.26	10.46	2.95			24.67	46.0	HORIZONTAL
225.91	11.57	10.52	3.81			25.10	46.8	HORIZONTAL

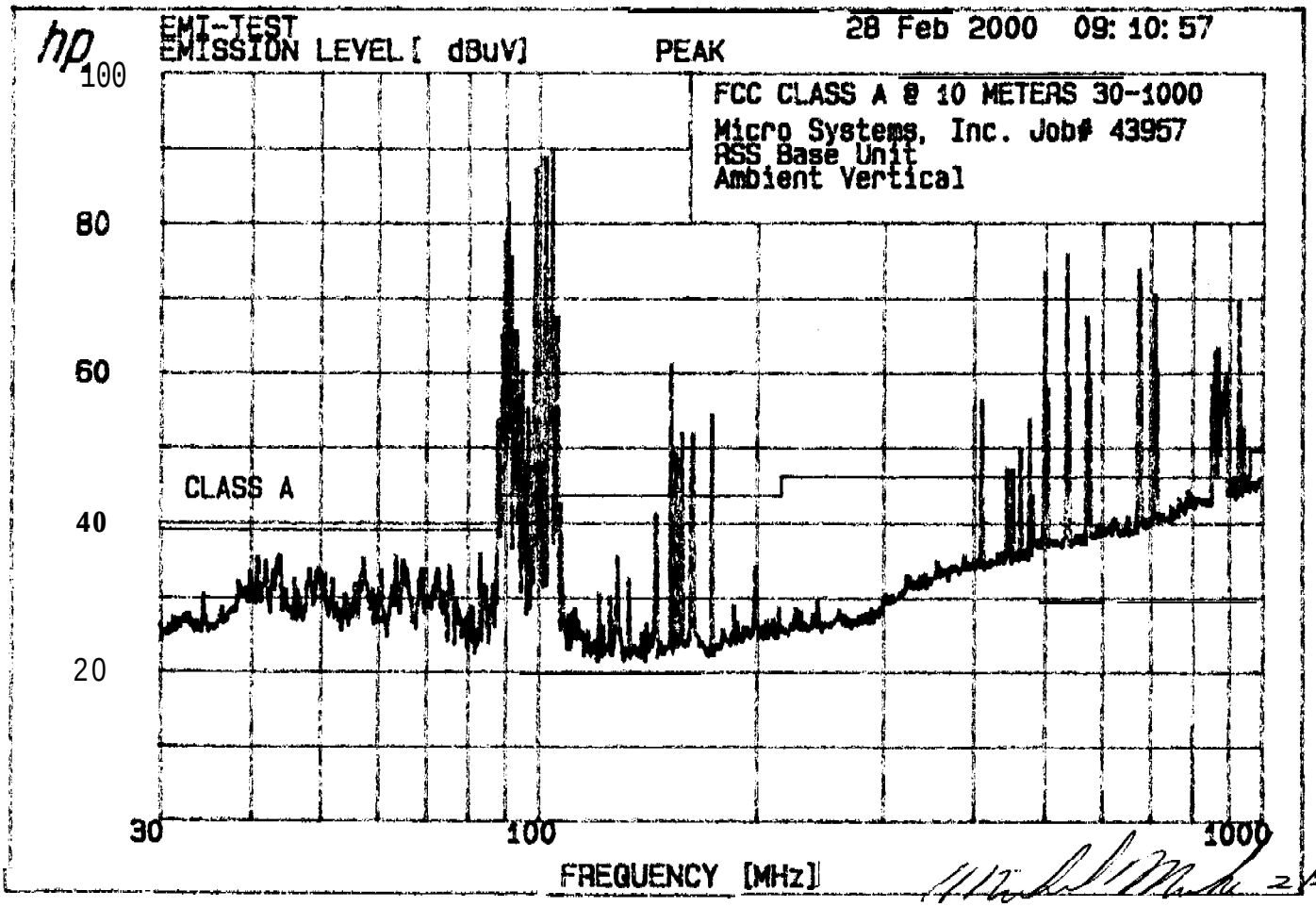
A= Antenna Factor B= Cable Loss C= _____ D= _____

Tested By: [signature] Date: 2/28/00

Notice of Anomaly: NONE Reviewed By: [signature] Date: 3/3/00

Sheet No. 2 of 2


EMI-TEST
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 09: 08: 01
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Base Unit
Ambient Horizontal
100
80
60
40
20
CLASS A
30
100
1000
FREQUENCY [MHz]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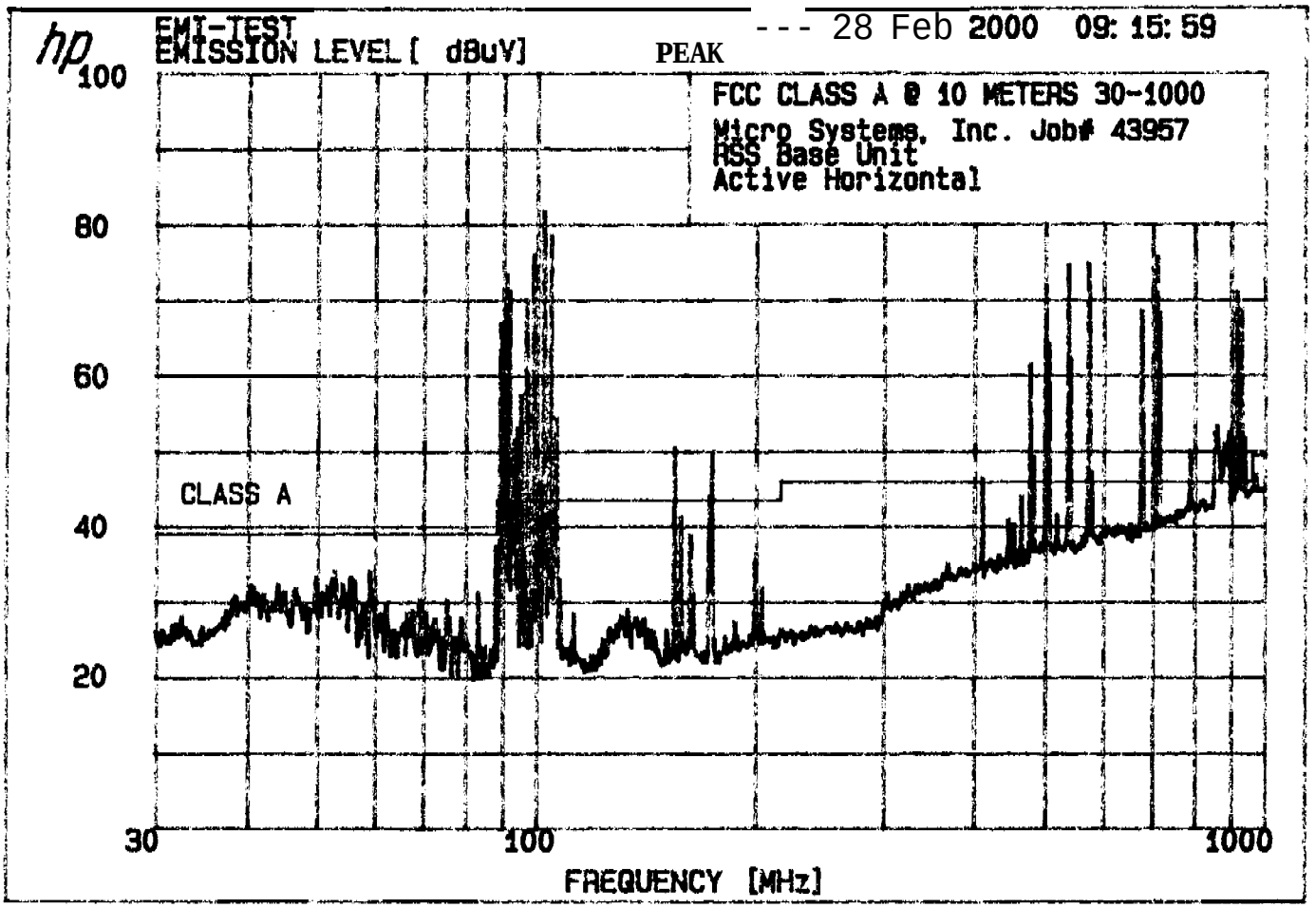
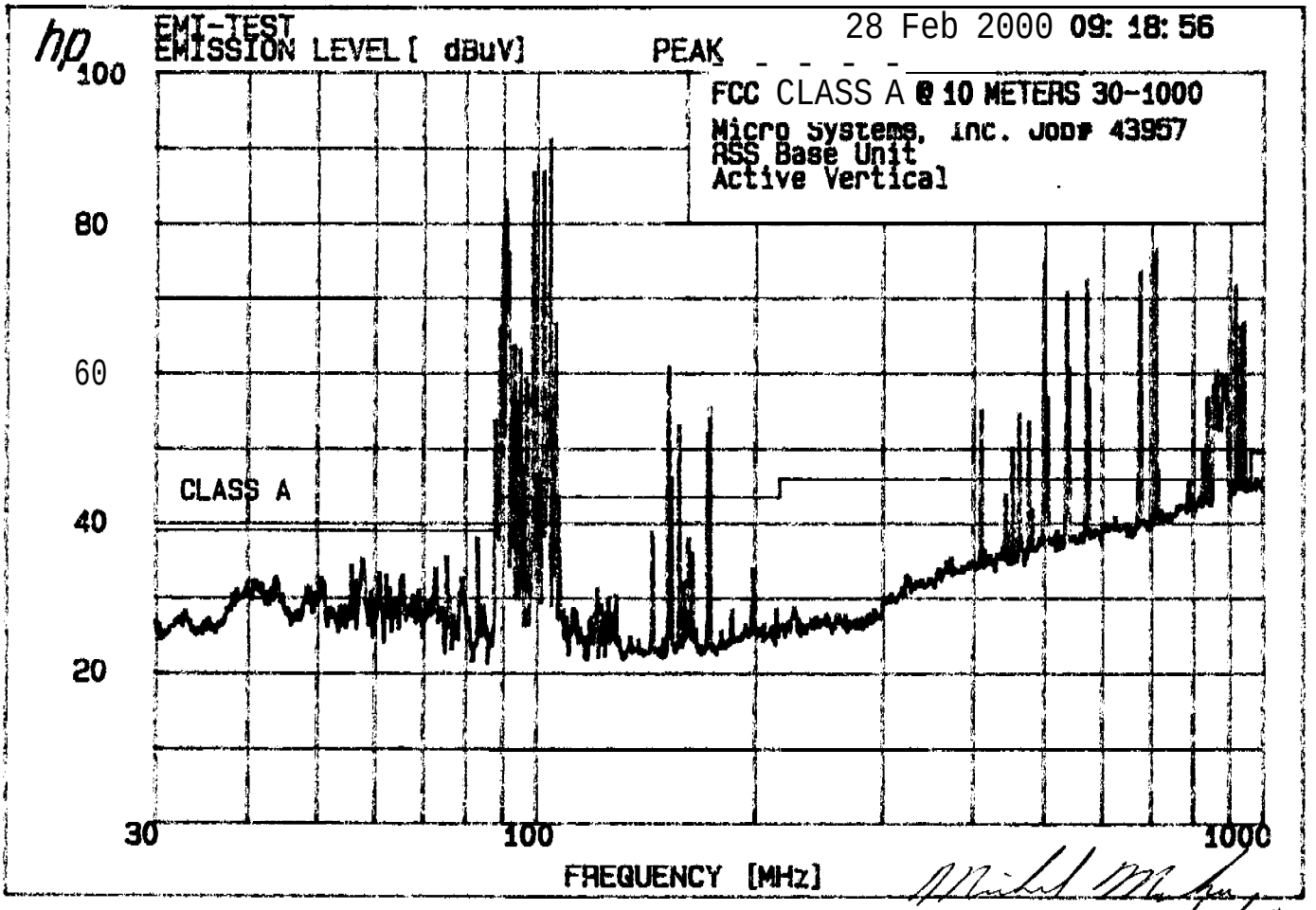
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 09: 10: 57
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Base Unit
Ambient Vertical
100
80
60
40
20
CLASS A
30
100
1000
FREQUENCY [MHz]


hp
EMI-TEST
EMISSION LEVEL [dBuV]
PEAK
--- 28 Feb 2000 09: 15: 59
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Base Unit
Active Horizontal
100
80
60
40
20
CLASS A
30
100
1000
FREQUENCY [MHz]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EMISSION LEVEL [dBuV]
PEAK
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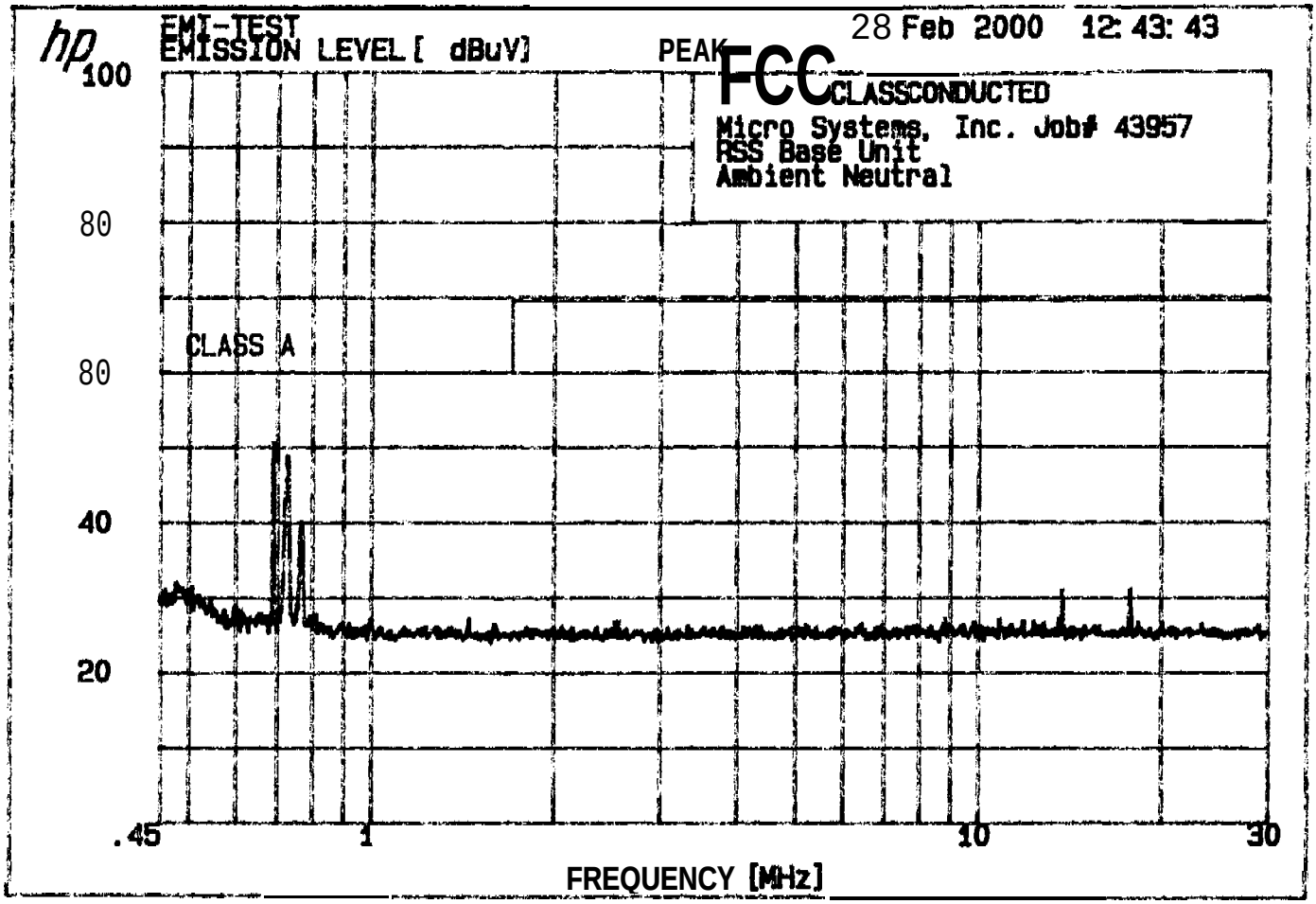
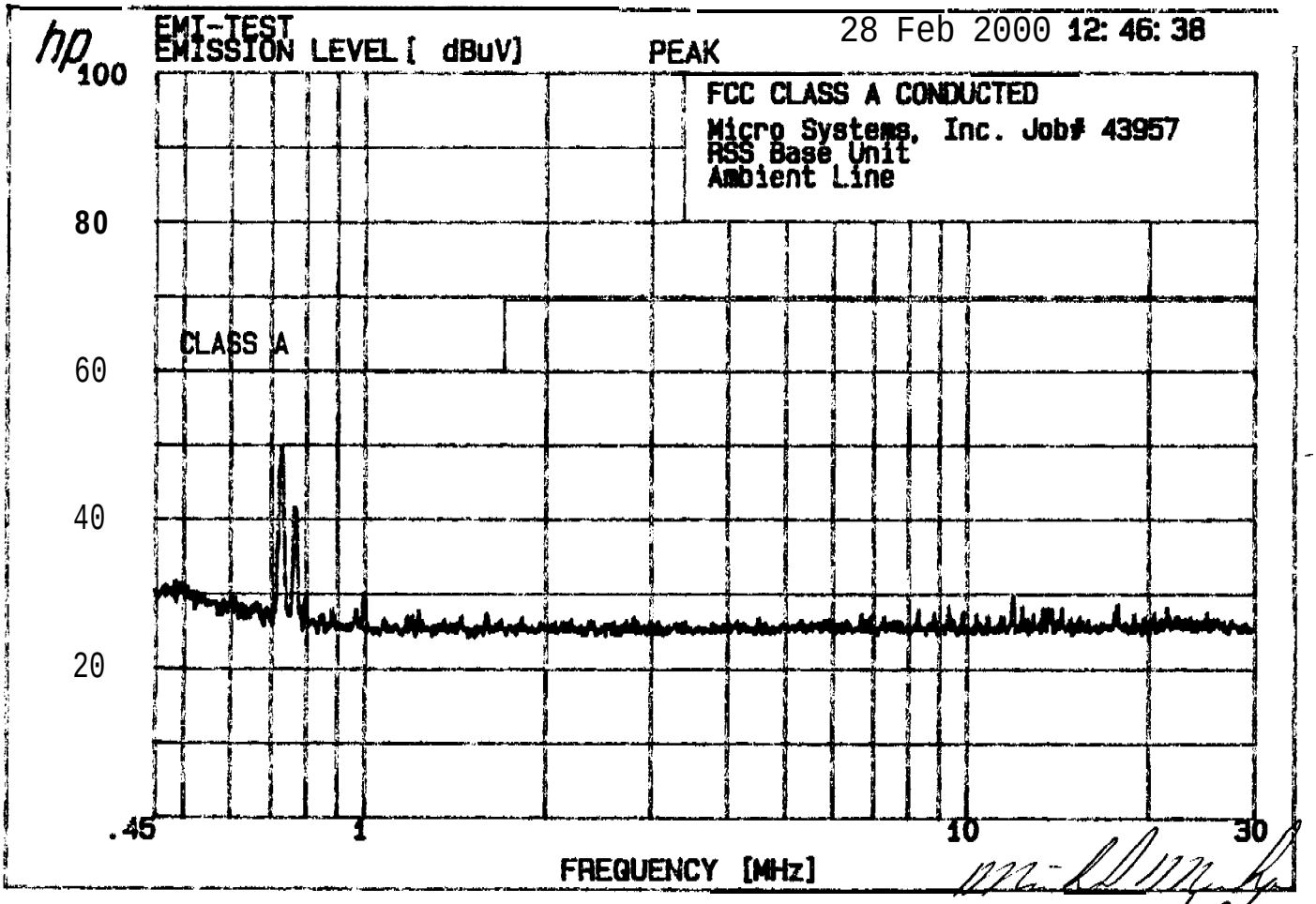
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Base Unit
Active Vertical
100
80
60
40
20
CLASS A
30
100
1000
FREQUENCY [MHz]

2/28/00


hp
EMI-TEST
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 12: 43: 43
FCC CLASSCONDUCTED
Micro Systems, Inc. Job# 43957
RSS Base Unit
Ambient Neutral
100
80
CLASS A
80
40
20
.45
1
10
30
FREQUENCY [MHz]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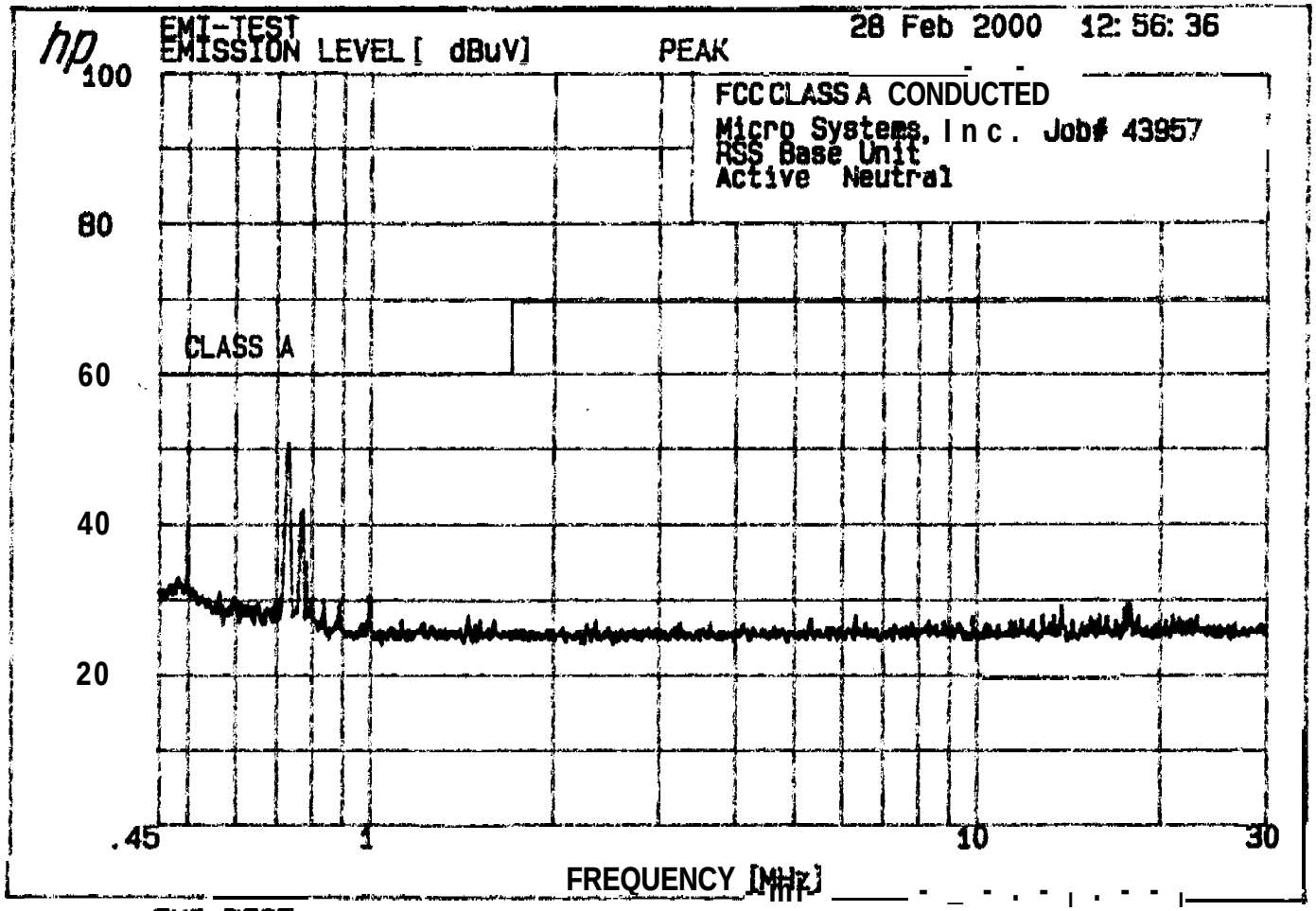
EMI-TEST
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 12: 46: 38
FCC CLASS A CONDUCTED
Micro Systems, Inc. Job# 43957
RSS Base Unit
Ambient Line
100
80
CLASS A
60
40
20
.45
1
10
30
FREQUENCY [MHz]

2/28/00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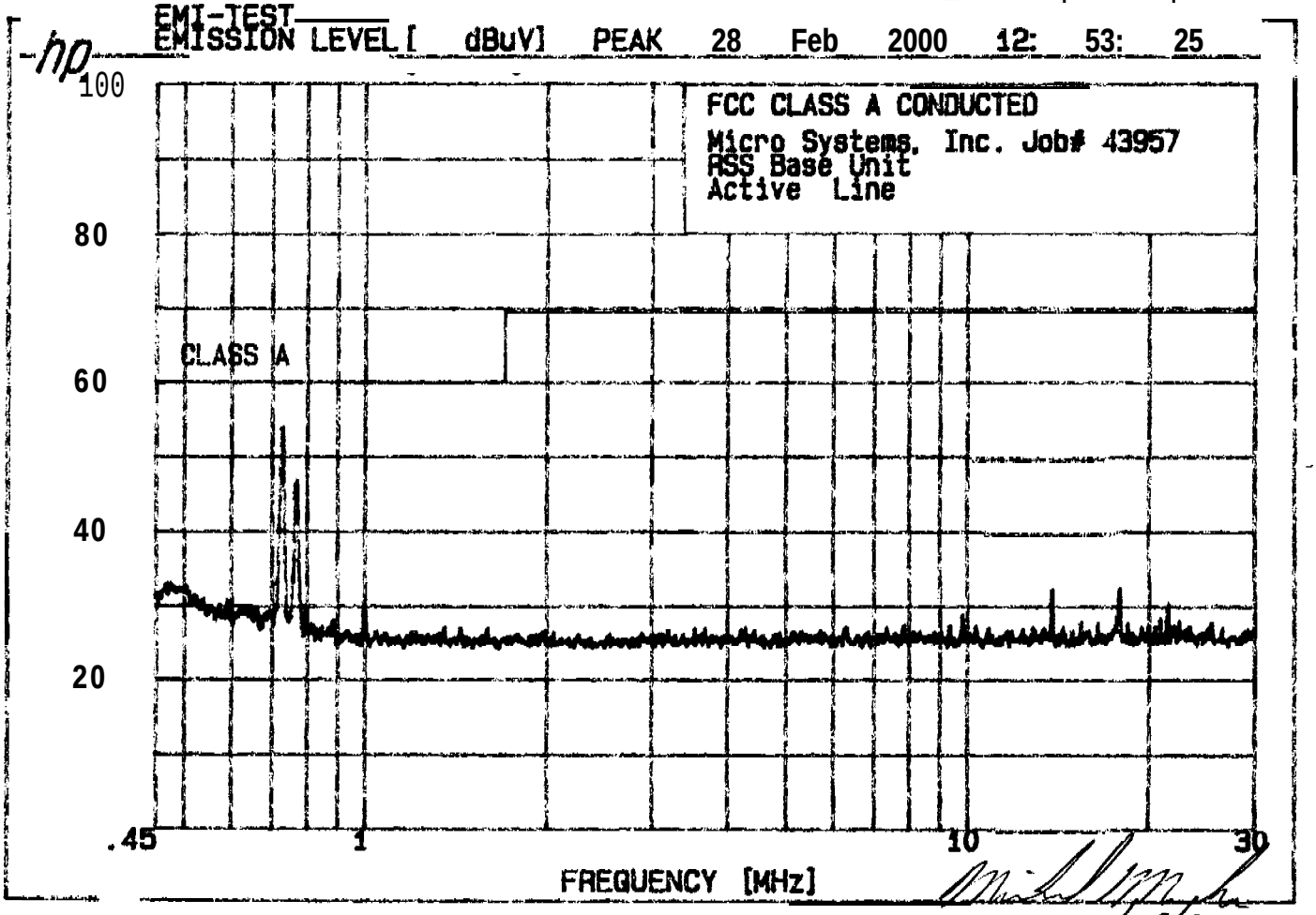
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 12: 56: 36
FCC CLASS A CONDUCTED
Micro Systems, Inc. Job# 43957
RSS Base Unit
Active Neutral
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]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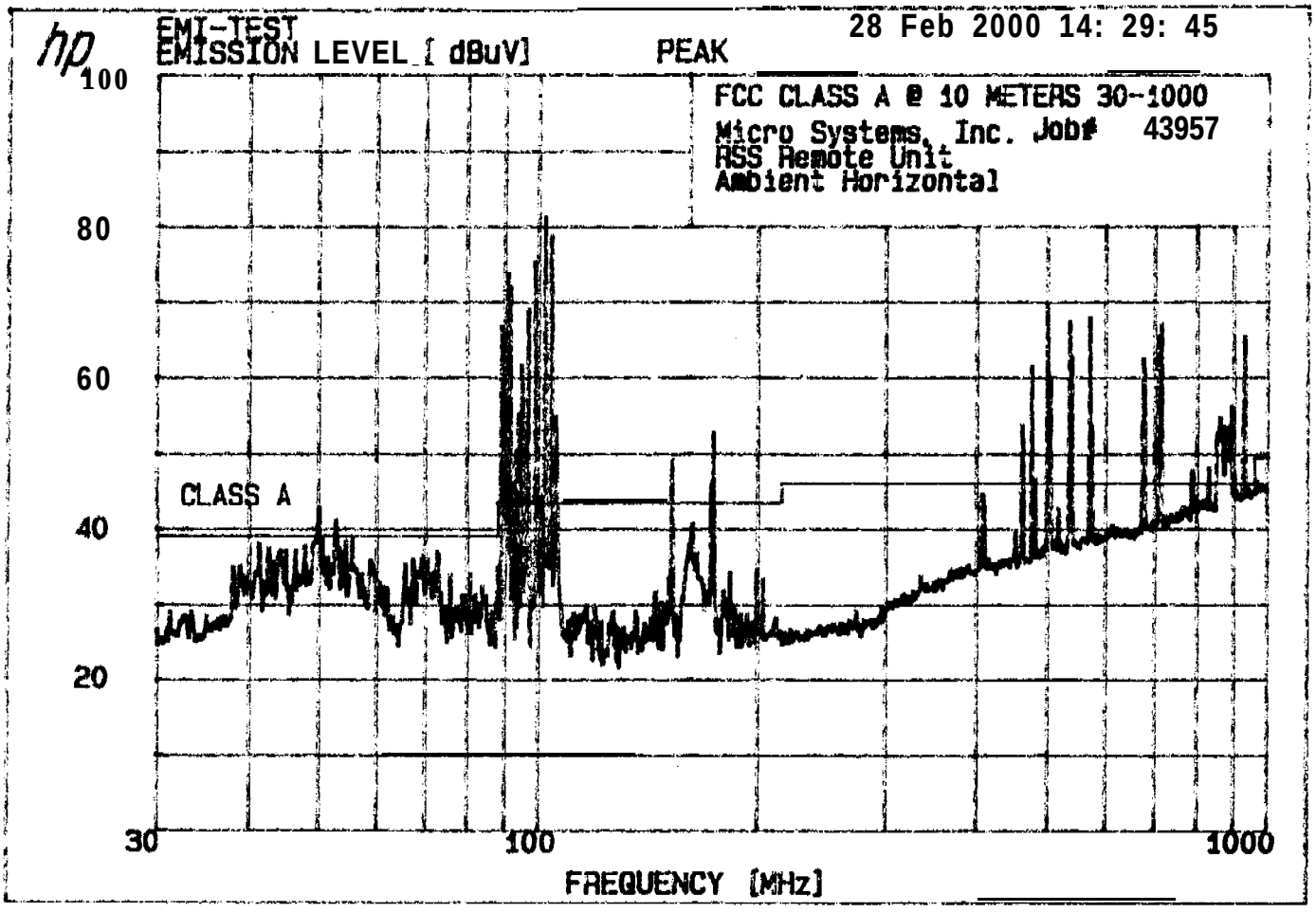
EMISSION LEVEL [dBuV] PEAK 28 Feb 2000 12: 53: 25
FCC CLASS A CONDUCTED
Micro Systems, Inc. Job# 43957
RSS Base Unit
Active Line
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

2/28/00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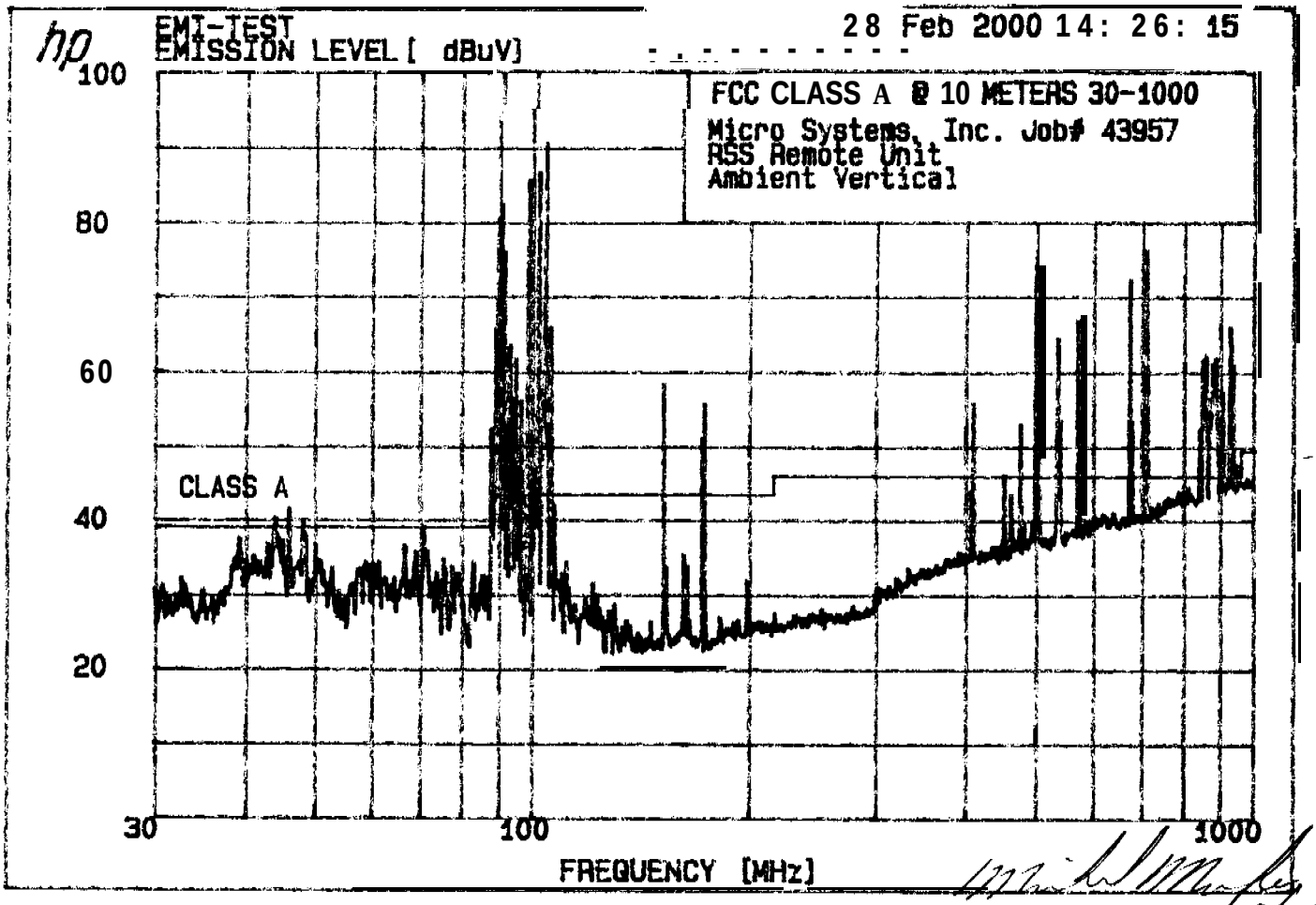
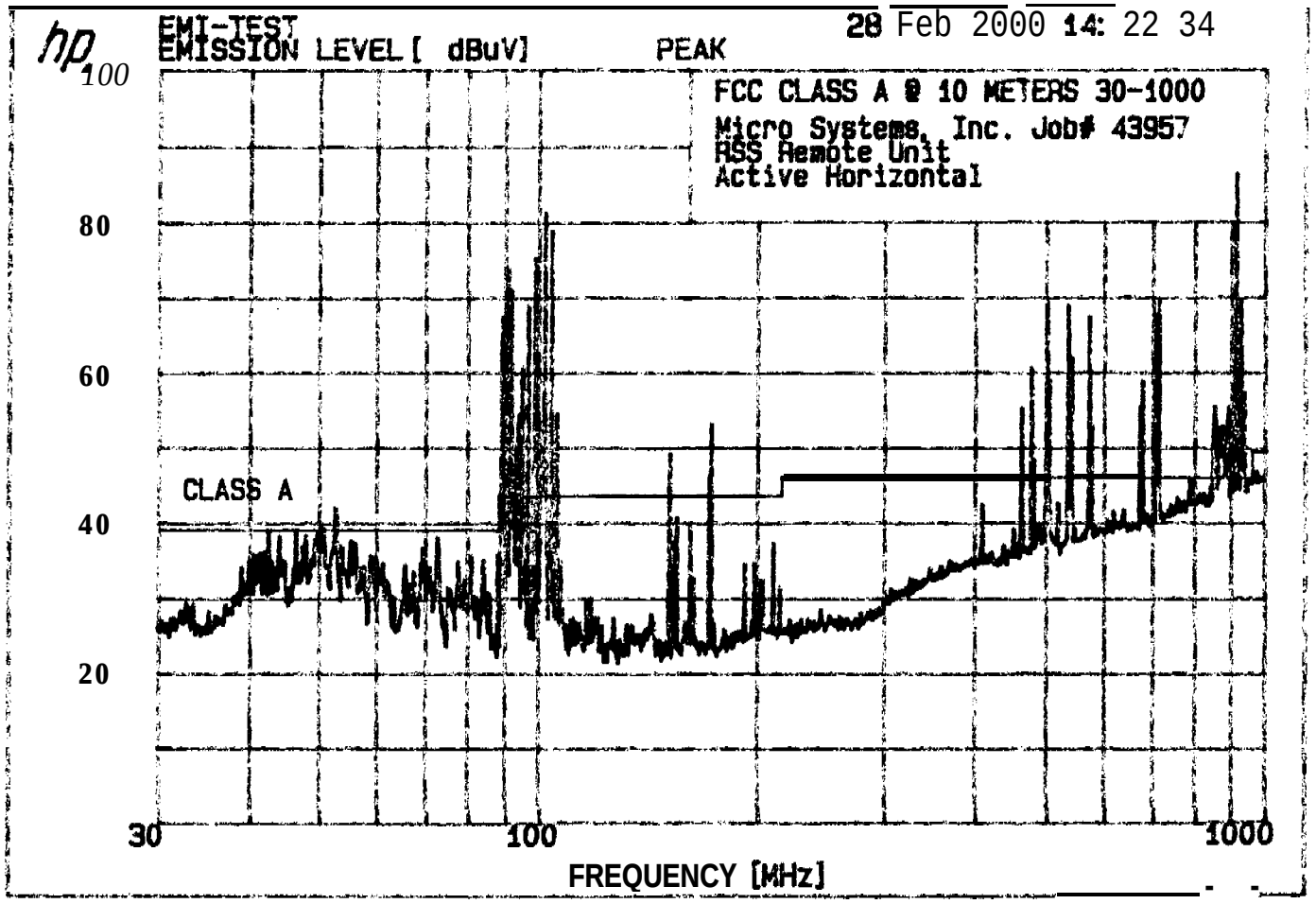
28 Feb 2000 14: 29: 45
EMISSION LEVEL [dBuV]
PEAK
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Remote Unit
Ambient Horizontal
100
80
60
40
20
CLASS A
30
100
1000
FREQUENCY [MHz]


hp
EMI-TEST
28 Feb 2000 14: 26: 15
EMISSION LEVEL [dBuV]
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Remote Unit
Ambient Vertical
100
80
60
40
20
CLASS A
30
100
1000
FREQUENCY [MHz]

2/28/00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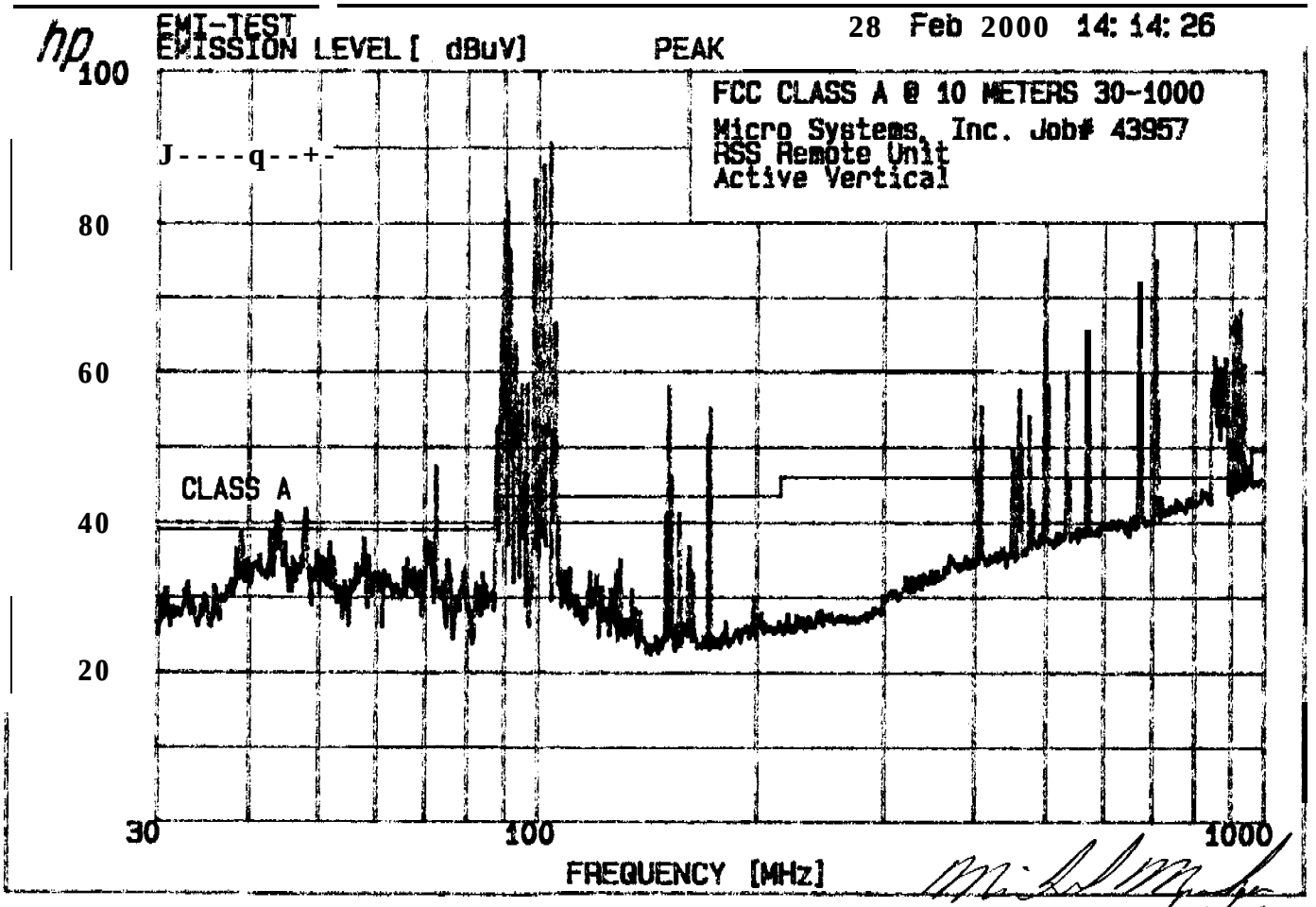
EMI-TEST
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 14: 22 34
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Remote Unit
Active Horizontal
80
60
CLASS A
40
20
30
100
1000
FREQUENCY [MHz]


hp 100
EMI-TEST
EMISSION LEVEL [dBuV]
PEAK
28 Feb 2000 14: 14: 26
FCC CLASS A @ 10 METERS 30-1000
Micro Systems, Inc. Job# 43957
RSS Remote Unit
Active Vertical
J----q--+-
80
60
CLASS A
40
20
30
100
1000
FREQUENCY [MHz]

2/28/00

wyle

EMISSIONS DATA SHEET

Customer: MICRO SYSTEM, INC Date: 2-29-00

Model Number: RSS (BASE UNIT) Job Number: 43957

Specimen Nomenclature: RAPID SCORING SYSTEM Freq. Range of Test: 30-10000 MHz

Serial Number: PROTO TYPE #1 Mode of Operation: ACTIVE (TX)

Measurement Point: MAXIMUM EMISSION

Type of Measurement: Radiated ☐ Conducted ☐

Standard: INTENTIONAL RADIATOR Class: FCC Part 15 C ☒ A ☐ B ☐

EN55022/11 ☐ GR-1089-Core ☐ ICES-005 ☐

Technique: Quasi-Peak ☒ Peak ☒ Average ☒ Slideback ☐

Test Frequency (MHz)	Meter Indication dBuV	Correction Factors (dB) A	B	C	D	Corrected Reading dBuV	Limit dBuV	Remarks
916.53	41	21.83	5.94			68.77	94	QUASI PEAK HORIZONTAL
1833.06	50.22	26.5	-28			48.72	54	AVERAGE HORIZONTAL
2749.59	45.75	29.25	-27.8			47.20	54	PEAK HORIZONTAL
1833.06	68.93	26.5	-28			67.43	54 (1)	PEAK HORIZONTAL

(1) 15.244(b)

Note: (1) Cannot exceed the Limit by more than 20 dbuV.

A= Antenna Factor B= Cable Loss C= _____ D= _____

Tested By: [signature] Date: 2/29/00

Notice of Anomaly: NONE Reviewed By: [signature] Date: 3/3/00

Sheet No. 1 of 2

wyle Laboratories

EMISSIONS DATA SHEET

Customer: MICRO SYSTEM, INC Date: 2-29-00

Model Number: RSS (REMOTE UNIT) Job Number: 43957

Specimen Nomenclature: RAPID SCORING SYSTEM Freq. Range of Test: 30-10000 MHz

Serial Number: PROTOTYPE #2 Mode of Operation: ACTIVE (TX)

Measurement Point: MAXIMUM EMISSION Measurement Technique:

Type of Measurement:
- Radiated [X]
- Conducted [ ]

Standard: INTENTIONAL RADIATOR
- FCC Part 15 C [ ]
- EN55022/11 [ ]
- GR-1 089-Core [ ]
- ICES-005 [ ]

Class:
- A [ ]
- B [ ]

Quasi-Peak [X]
Peak [X]
Average [X]
RMS [ ]
Slideback [ ]

Test Frequency (MHz)	Meter Indication (dBuV)	Correction Factors (dB) A	B	C	D	Corrected Reading (dBuV)	Limit (dBuV)	Remarks
916.53	37.12	21.83	5.94			64.89	94	QUASI-PEAK HORIZONTAL
1833.06	47.61	26.50	-28			46.11	54	AVERAGE HORIZONTAL
2749.59	45.24	29.35	-27.8			46.69	54	PEAK HORIZONTAL
1833.06	63.79	26.50	-28			62.29	54 (1)	PEAK HORIZONTAL

See 15.249(d)

Note (1) cannot exceed the limit by more than 20 dbuv.

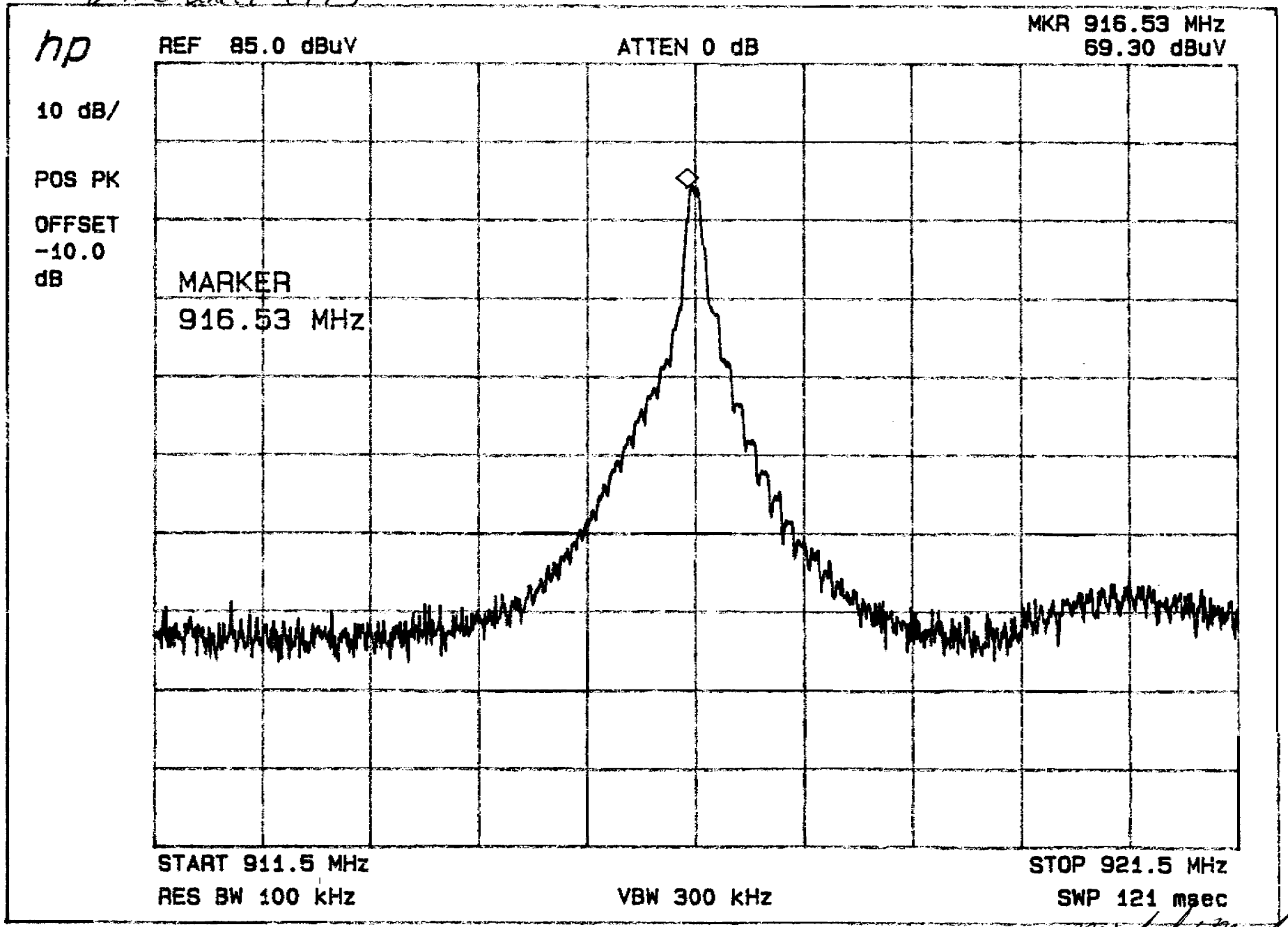
A= Antenna Factor B= Cable Loss + Amp C= _____ D= _____

Tested By: Michael Montalvo Date: 2/29/00

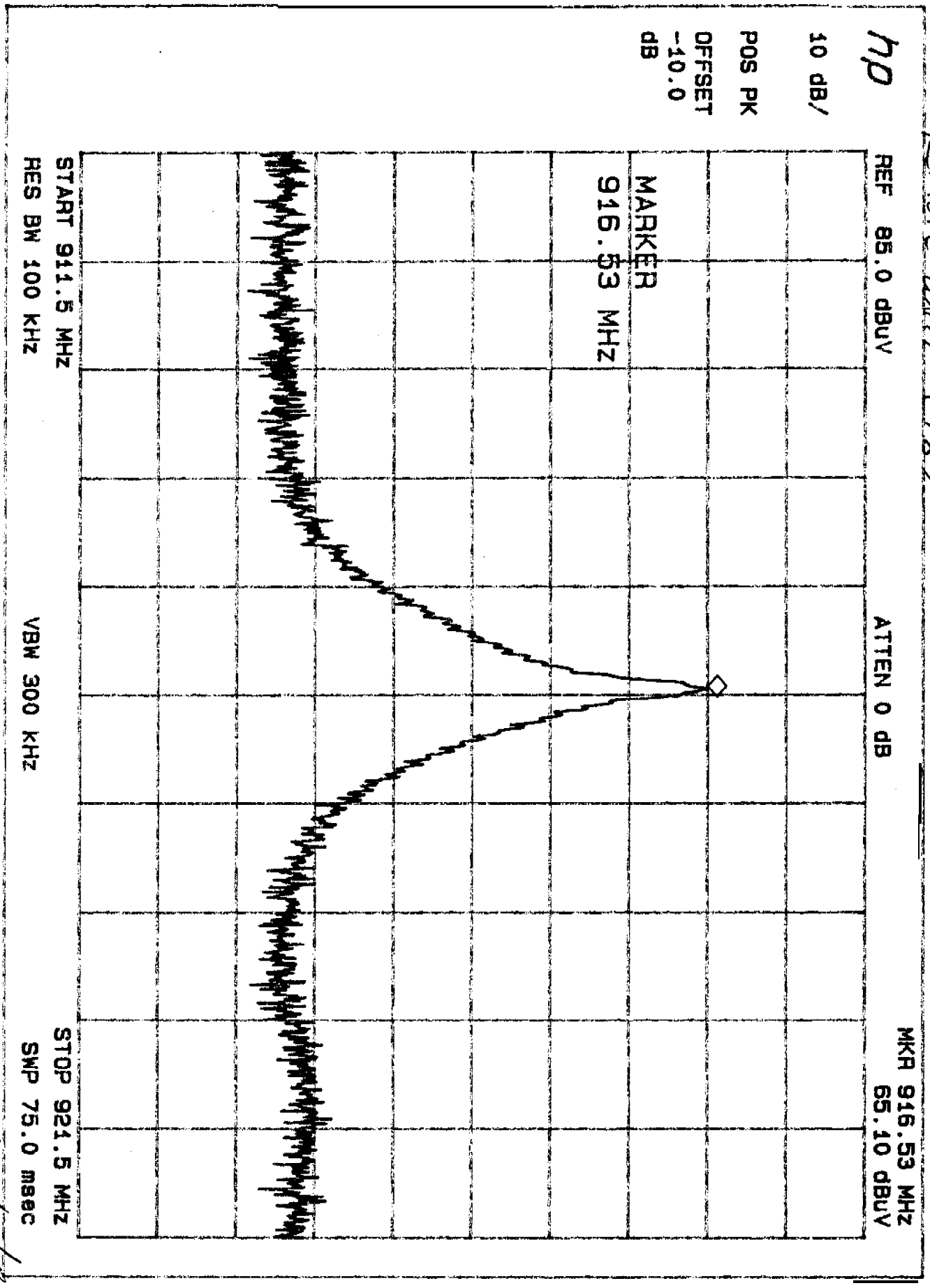
Notice of Anomaly: N/A Reviewed By: Ram Tao Date: 3/3/00

Sheet No. 2 of 2

BASE UNIT (TX)


hp
REF 85.0 dBuV
ATTEN 0 dB
MKR 916.53 MHz
69.30 dBuV
10 dB/
POS PK
OFFSET
-10.0
dB
MARKER
916.53 MHz
START 911.5 MHz
RES BW 100 kHz
VBW 300 kHz
STOP 921.5 MHz
SWP 121 msec

REMOTE UNIT (TX)



2/9/00

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE 2/28/00 JOB NUMBER: 43957 TEST AREA: FCC (OATS)
TECHNICIAN: M. MORANHA **CUSTOMER:** MICRO SYSTEMS INC TYPE TEST: FCC

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
	Q-PEAK ADAPTER	HP	85650A	2811A01189	112109	BY PASS M O D	.3db	5/24/99	5/23/00
2	DISPLAY SECTION	HP	85662A	2648A13534	108392	MFG	CERT	4/15/99	4/14/00
3	SPEC ANAL	HP	85660	2637A03696	108391	10MHZ	CERT	4/15/99	4/14/00
4	RF PRESELECTOR	HP	85685A	3107A01286	109934	20 - 2GHZ	2db	9/15/99	9/14/00
5	ANTENNA	EMCO	EM-6917A	124116	114415	30MHZ - 3GHZ	CERT	3/ 4/99	3/ 4/00
6	LISN	SOLAR	8028-50-TS-24-B	974622	113973	IOK-IOOMHZ	CERT	9/15/99	9/14/00
	LISN	SOLAR	8028-50-TS-24-B	974623	113974	10K-100MHZ	CERT	9/15/99	9/14/00
8	ANTENNA	EMCO	3115	3289	10971 1	1-18GHZ	CERT	5/11/99	5/11/00
9	PRE-AMP	HP	84498	3008A00159	112595	2-22GHZ	3.8db	5/ 5/99	5/ 4/00

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION 2/29/00 CHECKED &RECEIVED BY 2/29/00

Q.A. 2/29/00

WH-1029A, REV. APR '99