FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

FOR

UNICAL ENTERPRISES, INC.

16960 Gale Avenue
City of Industry, CA 91745

FCC ID: LZX39231

March 29, 2000

This Report Concerns:	**Equipment Type:**
☒ Original Report	900 MHz Cordless Phone – Household Appliances

Test Engineer:	Thomas Huang
Test Date:	March 24, 2000
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The UNICAL ENTERPRISES, INC.'s 39231 or the "EUT" as referred to in this report is a 900 MHz cordless telephone. The EUT was composed of two parts, one is a Handset which measured 7.5" L x 2.25" W x 1.5"H, and the other is a Base which measures 8.00"L x 4.25"W x 1.75"H.

1.2 Purpose

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the 900 MHz Cordless Phone, Model is 39231. The EMI measurements were performed according to the measurement procedure described in ANSI C63.6: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, 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. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test sites at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-674 and R-657. The test sites has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices,

IEC/CISPR 22: 1993, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Data
HP	Spectrum Analyzer	8566B	2610A02165	12/6/2000
HP	Spectrum Analyzer	8593B	2919A00242	12/20/2000
HP	Amplifier	8349B	2644A02662	12/20/2000
HP	Quasi-Peak Adapter	85650A	917059	12/6/2000
HP	Amplifier	8447E	1937A01046	12/6/2000
A.H. System	Horn Antenna	SAS0200/571	261	12/27/2000
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/2000
Com-Power	Biconical Antenna	AB-100	14012	11/2/2000
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/2000
Com-Power	LISN	LI-200	12208	12/20/2000
Com-Power	LISN	LI-200	12005	12/20/2000
BACL	Data Entry Software	DES1	0001	12/20/2000

1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
Unical Enterprises, Inc.	Cordless Phone	39231	None	LZX39231

1.8 Local Support Equipment (for Base only)

Manufacturer	Description	Model	Serial Number	FCC ID
Teltone	Telephone Line Simulator	TLS-3B-01	80071	None

1.9 Remote Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
None	None	None	None	None

1.10 External I/O Cabling for the EUT Base Unit

Cable Description	Length (M)	Port/From	To
Phone Line	1.8	RJ11 port / EUT	RJ11 port / line simulator

1.11 External I/O Cabling for the EUT Handset Unit

Cable Description	Length (M)	Port/From	To
None	None	None	None

2 - SYSTEM TEST CONFIGURATION

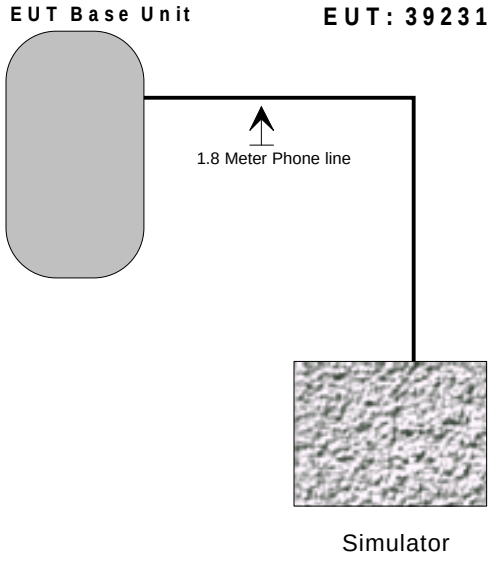
2.1 Description of Test Configuration

The EUT was configured for testing in a typical fashion (as normally used by a typical user).

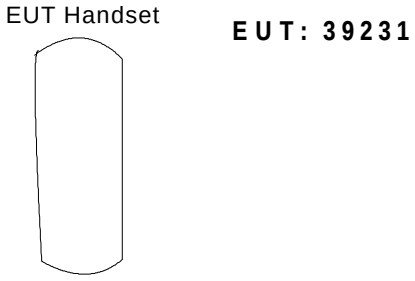
Handset Being tested: The 900 MHz Analog Cordless Phone – Handset, Model 39231 (EUT) was placed on the wooden table and tested in three orthogonal axis. The handset was connected to the headset via its headset port. The Low, middle, and high channels were tested. The handset was transmitting to and receiving from the Base unit. The EUT was investigated for emissions while off hook. The radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.5.

Base being tested: The 900 MHz Analog Cordless Phone – Base, Model 39231 (EUT) was placed on the wooden table. The Low, middle, and high channels were tested. The base was connected to the line simulator and an AC adapter via its Tel Line and power ports, respectively. The base was transmitting and receiving from the 900 MHz Analog Cordless Phone – Handset. The conducted as well as radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.4.

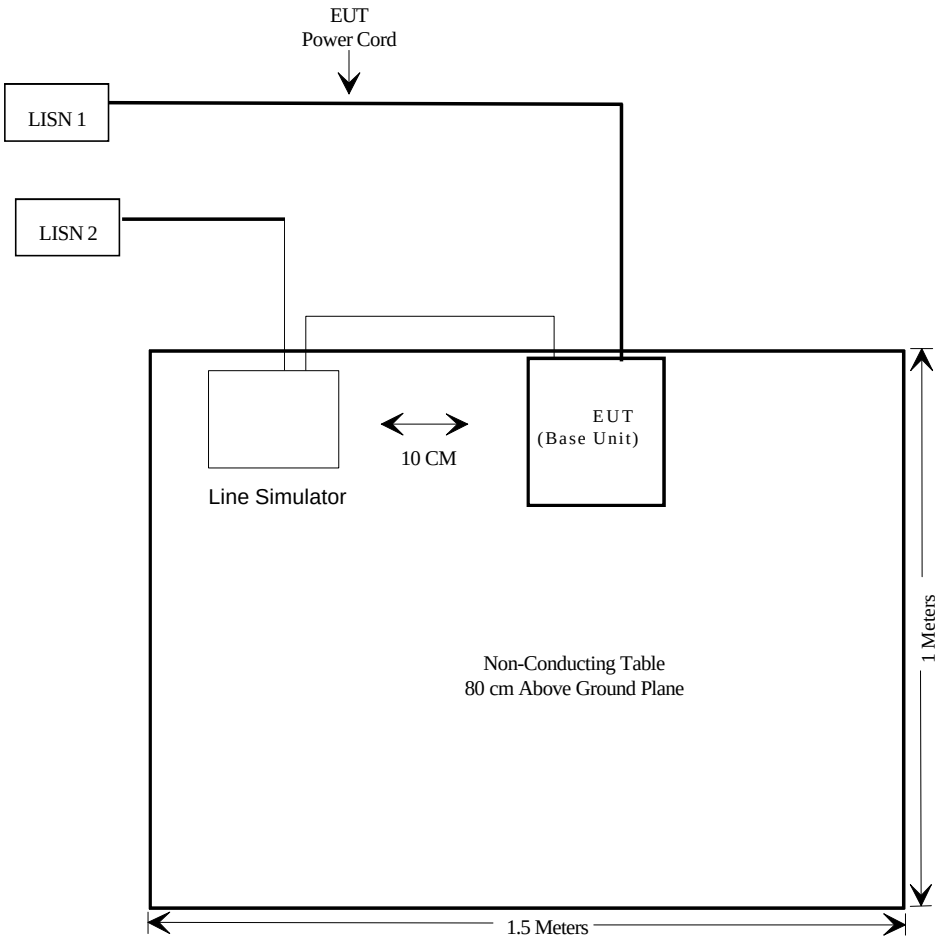
2.2 Configuration of Test System (Base Unit)



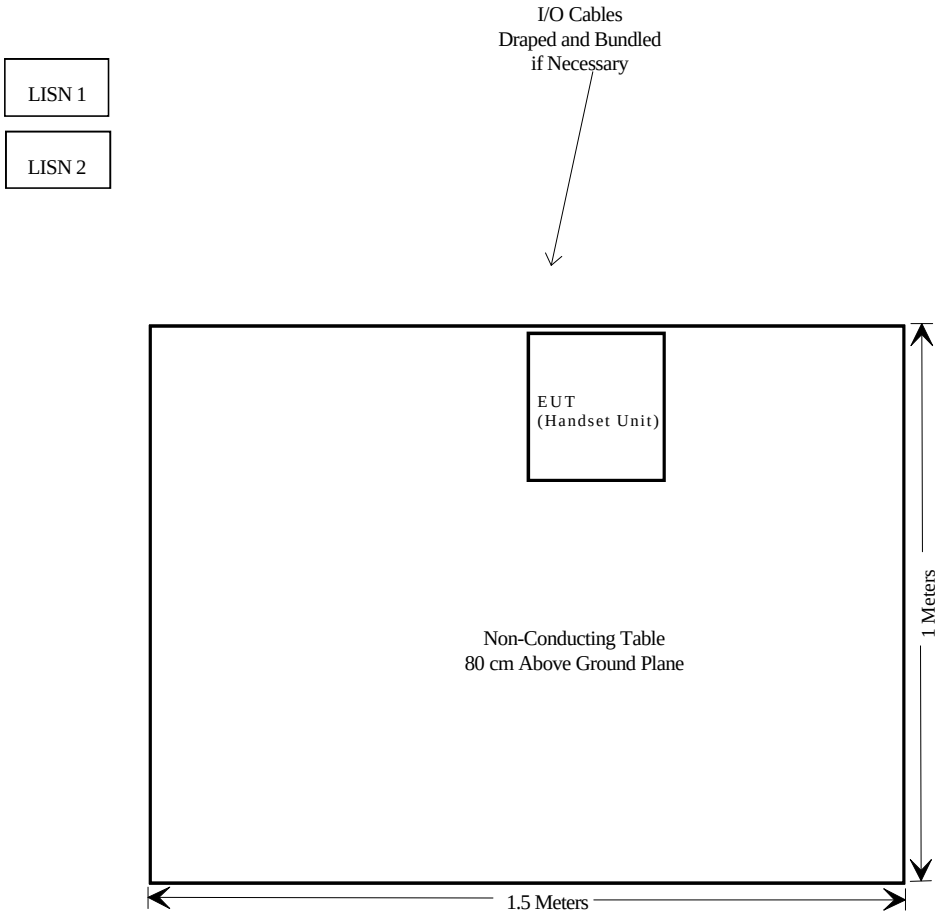
2.3 Configuration of Test System (Handset Unit)



2.4 Test Setup Block Diagram (Base Unit)



2.5Test Setup Block Diagram (Handset Unit)



2.6 Equipment Modifications

There were no modification(s) to the EUT were made to comply with the applicable limits.

3 - CONDUCTED EMISSIONS TEST DATA

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is $\pm$2.4 dB.

3.2 EUT Setup

The measurement was performed at the **O**pen **A**rea **T**est **S**ite, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the FCC Class B limits.

The Base of EUT was connected to a 110 VAC / 60 Hz power source and it was placed center and the back edge of the test table. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped over edge of the test table and bundle when necessary.

3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conducted emission test:

Start Frequency	450 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth	100 kHz
Video Bandwidth	100 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

3.4 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first LISN with all support equipment power cords connected to the second.

The EUT was tested with the *BELL PHONESS* (*U120020D*) power supply to represent worst case results for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 3.6 of this report.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (less than -4 dBμV). Quasi-peak readings are distinguished with a "**Qp**".

3.5 Summary of Test Results

According to the data in section 3.6, the EUT complied with the FCC Conducted margin for a Class B device and these test results is deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, with the *worst* margin reading of:

- 5.7 dBμV at **0.630 MHz** in the ***Line*** mode for the ***BELL PHONESS***, ***U120020D*** power supply

3.6 Conducted Emissions Test Data

3.6.1 Test Data for *Bell Phoness*, model *U120020D*, 0.45 - 30 MHz.

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBμV	Qp/Ave/Peak	Line/Neutral	dBμV	dB
0.630	42.3	QP	Line	48	-5.7
0.630	40.7	QP	Neutral	48	-7.3
0.780	35.5	QP	Line	48	-12.5
1.160	34.8	QP	Neutral	48	-13.2
9.480	34.3	QP	Neutral	48	-13.7
2.110	30.3	QP	Line	48	-17.7

3.7 Plot of Conducted Emissions Test Data

Plot of Conducted Emissions test data for the *Bell Phoness Power Adapter*, model *U120020D* is presented in Appendix B of this report as reference.

4 - RADIATED EMISSION DATA

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3 meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the FCC 15 Subpart C limits.

The EUT was connected to a 110 VAC / 60 Hz power source and it was placed center and the back edge of the test table. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped over edge of the test table and bundle when necessary.

4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), since the clock was 900 MHz, the system was tested to 10000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	10000 MHz
Sweep Speed	Auto
IF Bandwidth	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

4.4 Test Procedure

For the radiated emissions test, both the EUT and all support equipment power cords was connected to the AC floor outlet since the power supply (*U120020D*) used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (less than -4 dBμV), and are distinguished with a "**Qp**" in the data table.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249, and had the worst margin of:

For Base:

- 8.2 dBμV at **131.06 MHz** in the **Vertical** polarization at Low Channel, 30 to 10000MHz, 3 meters.

- 7.4 dBμV at **131.06 MHz** in the **Vertical** polarization at Middle Channel, 30 to 10000MHz, 3 meters.

- 8.4 dBμV at **131.06 MHz** in the **Vertical** polarization at High Channel, 30 to 10000MHz, 3 meters.

For Handset:

- 2.3 dBμV at **925.10 MHz** in the **Vertical** polarization at Low Channel, 30 to 10000MHz, 3 meters.

- 4.1 dBμV at **926.28 MHz** in the **Vertical** polarization at Middle Channel, 30 to 10000MHz, 3 meters.

- 3.8 dBμV at **927.47 MHz** in the **Vertical** polarization at High Channel, 30 to 10000MHz, 3 meters.

4.7 Radiated Emissions Test Result Data

4.7.1 Final Test Data, Base Unit, Low Channel, 30 to 10000MHz, 3 meters.

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15 Subpart C	
Frequency MHz	Ampl. dBµV/m	Mode	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
131.06	42.2	Peak	45	1.1	V	12.6	2.0	21.5	35.3	43.5	-8.2
193.24	37.1	Peak	300	1.1	V	14.4	2.7	22.5	31.7	43.5	-11.8
131.06	38.4	Peak	0	2.1	H	12.6	2.0	21.5	31.5	43.5	-12.0
902.60	73.9	Average	180	1.1	H	24.8	3.0	19.8	81.9	94.0	-12.1
902.60	71.4	Average	90	1.1	V	24.8	3.0	19.8	79.4	94.0	-14.6
216.04	32.3	Peak	135	2.3	H	12.5	4.7	22.4	27.1	46.0	-18.9
1805.00	39.6	Peak	90	1.4	H	25.3	2.6	22.0	45.5	74.0	-28.5
1805.00	35.8	Peak	270	3.1	V	25.3	2.6	22.0	41.7	74.0	-32.3

4.7.2 Final Test Data, Base Unit, Middle Channel, 30 to 10000MHz, 3 meters.

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15 Subpart C	
Freqency MHz	Ampl. dBµV/m	Mode	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
131.06	43.0	Peak	45	1.1	V	12.6	2.0	21.5	36.1	43.5	-7.4
903.72	74.0	Average	180	1.1	H	24.8	3.0	19.8	82.0	94.0	-12.0
193.24	36.5	Peak	300	1.1	V	14.4	2.7	22.5	31.1	43.5	-12.4
131.06	37.0	Peak	0	2.1	H	12.6	2.0	21.5	30.1	43.5	-13.4
903.72	72.3	Average	90	1.1	V	24.8	3.0	19.8	80.3	94.0	-13.7
216.04	33.0	Peak	135	2.3	H	12.5	4.7	22.4	27.8	46.0	-18.2
1807.44	40.0	Peak	115	1.4	H	25.3	2.6	22.0	45.9	74.0	-28.1
1807.44	36.0	Peak	270	3.1	V	25.3	2.6	22.0	41.9	74.0	-32.1

4.7.3 Final Test Data, Base Unit, High Channel, 30 to 10000MHz, 3 meters.

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15 Subpart C	
Freqency MHz	Ampl. dBµV/m	Mode	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
131.06	42.0	Peak	45	1.1	V	12.6	2.0	21.5	35.1	43.5	-8.4
193.24	37.0	Peak	300	1.1	V	14.4	2.7	22.5	31.6	43.5	-11.9
131.06	37.0	Peak	0	2.1	H	12.6	2.0	21.5	30.1	43.5	-13.4
904.92	72.0	Average	180	1.1	H	24.8	3.0	19.8	80.0	94.0	-14.0
904.92	71.9	Average	90	1.1	V	24.8	3.0	19.8	79.9	94.0	-14.1
216.04	32.0	Peak	135	2.3	H	12.5	4.7	22.4	26.8	46.0	-19.2
1809.94	42.0	Peak	115	1.4	H	25.3	2.6	22.0	47.9	74.0	-26.1
1809.94	37.0	Peak	270	3.1	V	25.3	2.6	22.0	42.9	74.0	-31.1

4.7.4 Final Test Data, Handset Unit, Low Channel, 30 to 10000MHz, 3 meters.

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15 Subpart C	
Freqency MHz	Ampl. dBµV/m	Mode	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
925.10	82.8	Average	90	1.1	V	24.7	4.4	20.2	91.7	94.0	-2.3
925.10	80.7	Average	135	1.3	H	24.7	4.4	20.2	89.6	94.0	-4.4
1850.20	53.5	Peak	270	1.5	V	25.3	2.6	22.0	59.4	74.0	-14.6
211.24	33.7	Peak	0	1.3	V	12.5	4.7	22.4	28.5	43.5	-15.0
193.24	32.5	Peak	180	1.3	V	14.4	2.7	22.5	27.1	43.5	-16.4
211.24	32.1	Peak	180	2.1	H	12.5	4.7	22.4	26.9	43.5	-16.6
193.25	30.6	Peak	180	1.8	H	14.4	2.7	22.5	25.2	43.5	-18.3
1850.20	49.8	Peak	270	1.6	H	25.3	2.6	22.0	55.7	74.0	-18.3

4.7.5 Final Test Data, Handset Unit, Middle Channel, 30 to 10000MHz, 3 meters.

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15 Subpart C	
Frequency MHz	Ampl. dBµV/m	Mode	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
926.28	81.0	Average	90	1.1	V3	24.7	4.4	20.2	89.9	94.0	-4.1
926.28	81.0	Average	135	1.3	H3	24.7	4.4	20.2	89.9	94.0	-4.1
211.24	33.0	Peak	180	2.1	H3	12.5	4.7	22.4	27.8	43.5	-15.7
1852.56	52.0	Peak	270	1.5	V3	25.3	2.6	22.0	57.9	74.0	-16.1
211.24	32.0	Peak	0	1.3	V3	12.5	4.7	22.4	26.8	43.5	-16.7
193.25	32.0	Peak	180	1.8	H3	14.4	2.7	22.5	26.6	43.5	-16.9
193.24	31.0	Peak	180	1.3	V3	14.4	2.7	22.5	25.6	43.5	-17.9
1852.56	50.0	Peak	270	1.6	H3	25.3	2.6	22.0	55.9	74.0	-18.1

4.7.6 Final Test Data, Handset Unit, High Channel, 30 to 10000MHz, 3 meters.

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15 Subpart C	
Freqency MHz	Ampl. dBµV/m	Mode	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
927.47	81.3	Average	90	1.1	V	24.7	4.4	20.2	90.2	94.0	-3.8
927.47	81.2	Average	135	1.3	H	24.7	4.4	20.2	90.1	94.0	-3.9
1854.96	55.0	Peak	270	1.5	V	25.3	2.6	22.0	60.9	74.0	-13.1
211.24	35.0	Peak	0	1.3	V	12.5	4.7	22.4	29.8	43.5	-13.7
211.24	35.0	Peak	180	2.1	H	12.5	4.7	22.4	29.8	43.5	-13.7
193.25	33.5	Peak	180	1.8	H	14.4	2.7	22.5	28.1	43.5	-15.4
193.24	33.0	Peak	180	1.3	V	14.4	2.7	22.5	27.6	43.5	-15.9
1854.96	51.0	Peak	270	1.6	H	25.3	2.6	22.0	56.9	74.0	-17.1

5.0 Band Edges Testing

Requirements : FCC 15.249 (c), the emission power at the START and STOP frequencies shall be at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209, whichever is the lesser attenuation.

5.1 Test Procedure

The antenna was removed and SMA connector was connected to the transmitter output. The transmitter output was connected to a calibrated coaxial attenuator (50 Ohm), the other end of which was connected to a spectrum analyzer with the START and STOP frequencies set to the operation band. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter was determined by adding the value of the attenuator to the spectrum analyzer reading.

The test was performed for handset and the base respectively.

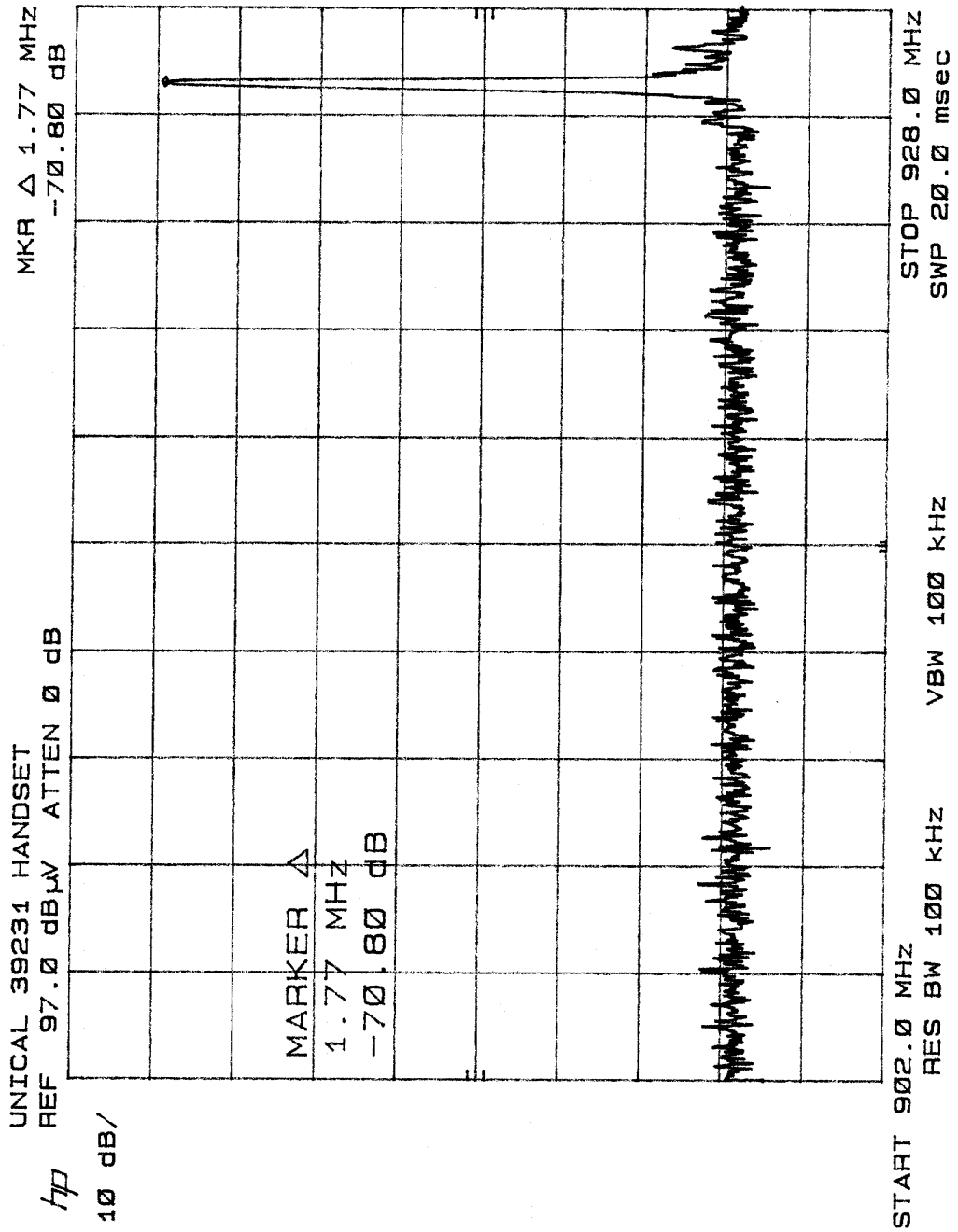
5.2 Test Equipment

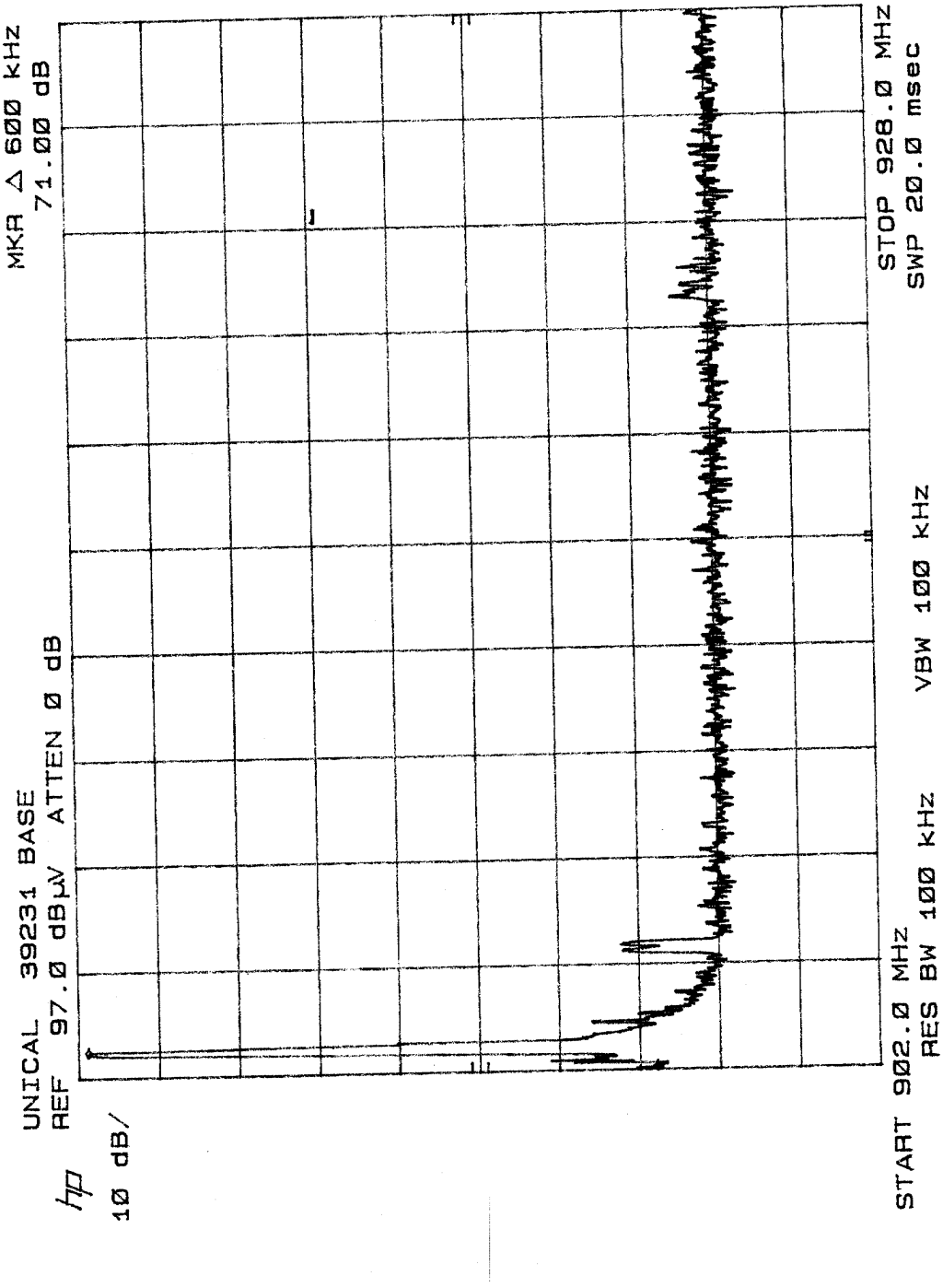
HP 8566B Spectrum Analyzer
HP 7470A Plotter

5.3 Test Results

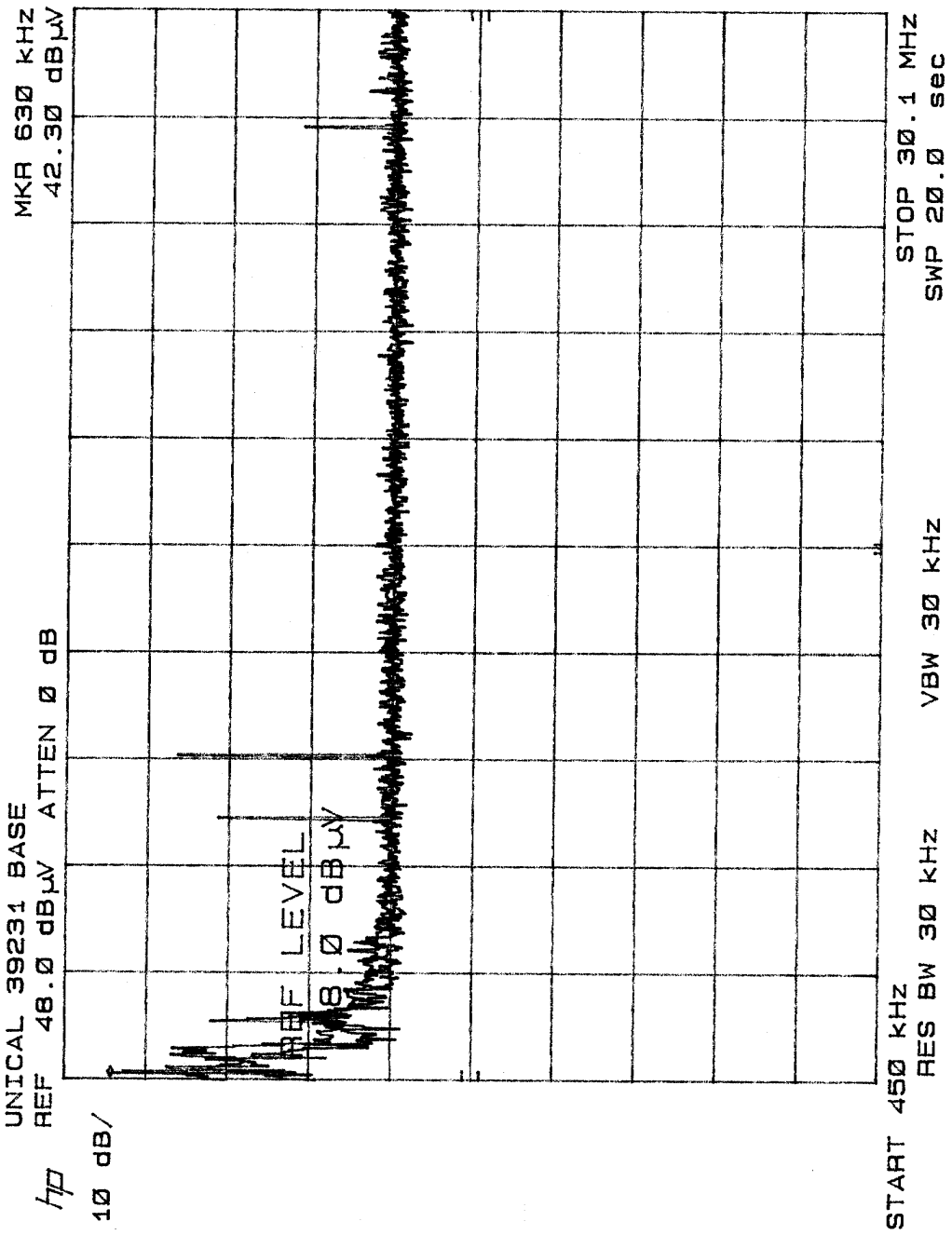
Refer to the attached plots.

Band Edge	
Base	Page 21
Handset	Page 20


MKR Δ 1.77 MHz
-70.80 dB
UNICAL 39231 HANDSET
REF 97.0 dBμV ATTEN 0 dB
10 dB/
MARKER Δ
1.77 MHz
-70.80 dB
START 902.0 MHz
RES BW 100 kHz
VBW 100 kHz
STOP 928.0 MHz
SWP 20.0 msec


MKR Δ 600 kHz
71.00 dB
UNICAL 39231 BASE
REF 97.0 dBμV ATTEN 0 dB
10 dB/
STOP 928.0 MHz
SWP 20.0 msec
VBW 100 kHz
START 902.0 MHz
RES BW 100 kHz

Appendix A – PLOT OF CONDUCTED EMISSION TEST DATA


MKR 630 kHz
42.30 dBµV
UNICAL 39231 BASE
REF 48.0 dBµV ATTEN 0 dB
10 dB/
REF LEVEL
48.0 dBµV
START 450 kHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.1 MHz
SWP 20.0 sec

Appendix B – AGENT AUTHORIZATION LETTER

NORTHWESTERN BELL PHONES
Distributed Exclusively Worldwide by
UNICAL ENTERPRISES, INC.

16960 Gale Avenue, City of Industry, CA 91745 (626) 965-5588 Fax: (626) 965-6998

March 23, 2000

Federal Communications Commission
7435 Oakland Mills Road
Columbia, Maryland, 21046

Sir/Madam,

Reg: FCC grant for 39231 Cordless Telephone

This letter is an authorization to accept Bay Area Compliance Lab. Corporation as an agent for Unical Enterprises, Inc., to sign applications before the Commission on our behalf, to make representations to you on our behalf, and to receive and exchange data between our company and the commission in connection with certification of the following Northwestern Bell Phones product:

900 MHz Cordless Telephone 39231

Under FCC docket number 20780 and general docket number 80-284 pursuant to part 15, FCC rules and regulations.

Sincerely,

Andy Chung,
Assistant to the President