Marstech Limited

11 Kelfield Street, Etobicoke, Ontario, Canada, M9W 5A1
Telephone (416) 246-1116, Fax (416) 246-1020

Authorized by: Professional Engineers Ontario

Engineering & Administrative

CERTIFICATED UL AGENCY

Testing For FCC Submissions/Verifications

Approved Test Facility

Qualified Facility

TEST REPORT

REPORT DATE:	6 July 1998		REPORT NO: 98257D
CONTENTS:	See Table of Contents		
SUBMITTOR:	HELLO DIRECT, INC. 5893 Rue Ferrari San Jose, CA 95138-1858 USA		
SUBJECT:	Model No:	Cordless XLT	
	FCC ID:	LKKXLT	
TEST SPECIFICATION:	FCC CFR 47, Part 15.249, 15.35, 15.109 and 15.209 NOTE: Tests Conducted Are "Type" Tests.		
TESTED WITH:	GE 2-9169A Standard Desk Set Telephone		
DATE SAMPLE RECEIVED:	June 11, 1998	DATE TESTED:	24 & 26 June 24, 6 July 1998
RESULTS:	Equipment tested complies with referenced specification.		
ALTERATIONS:	None		
Tested by:	Original signed by: Jim Sims	Approved by:	Robert G. Marshall
	Ed. Chang		Robert G. Marshall, P. Eng.
	Edward Chang	Date:	Oct 27/98

REGISTERED PROFESSIONAL ENGINEER R. G. MARSHALL

TECHNICAL REPORT - FCC 2.1033(b)

Applicant

Hello Direct, Inc.
5893 Rue Ferrari
San Jose, CA
95138-1858 USA

FCC Identifier

LKKXLT

Manufacturer

Transtech Electronics, PTE., Ltd.
7 International Business Park, Jurong East
SINGAPORE 609919

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EXHIBIT D

(FCC Ref. 2.1033(b)(6))

"Report of Measurements"

EXHIBIT D(1)

DEVICE MEASURED

(FCC Ref. 2.1033(b)(6))

APPLICANT:	Hello Direct, Inc. 5893 Rue Ferrari San Jose, CA 95138-1858 USA
MANUFACTURER:	Transtech Electronics, PTE., Ltd. 7 International Business Park, Jurong East SINGAPORE 609919
FCC IDENTIFIER:	LKKXLT
MODEL NUMBER:	Cordless XLT
SERIAL NO.:	Not Marked

Marstech Limited
11 Kelfield Street
Etobicoke, Ontario
M9W 5A1 CANADA

TECHNICIANS:
Jim Sims - Com-Serve Corp.
Edward Chang - Marstech

Robert G. Marshall, P. Eng.

Date: Oct 27/98

EXHIBIT D(2)

TEST FACILITY AND EQUIPMENT LIST

FACILITIES

Radiated — ANSI C63.4 (FCC OET/55) open field 3 meter test range. This test range is protected from the cold and moisture by a non-conductive enclosure.

Conducted — 2.5m Anechoic Chamber

EQUIPMENT

Anritsu 2601 A spectrum analyzer.
Hewlett-Packard RF generator # 8640 B with an 002 doubler
Hewlett-Packard 8449B Preamp. (30 dB) .. 1.0 MHz to 26.5 GHz
A.H. Systems biconical antenna; ..... 20 MHz to 330 MHz
A.H. Systems log periodic antenna; ..... 300 MHz to 1.8 GHz
A.H. Systems log periodic antenna; ..... 1.0 GHz to 12.4 GHz
Eaton dipole antennas; T1, T2, T3 ..... 25 MHz to 1.0 GHz
Roberts dipole antennas; T1, T2, T3 & T4.... 25 MHz to 1.0 GHz
Compliance Design P950 Preamp (16 dB) .... 25 MHz to 1.0 GHz
Notch Filter; Model FIL01605001 ..... 30 dB at 920 MHz
M/A-COM High Frequency Cable Assembly; No. 2026-0600

NOTE:

The Anritsu 2601 A spectrum analyzer and the Advantest R3261A spectrum analyzer are calibrated annually, and that calibration is directly traceable to the National Research Council of Canada. (NRC) This equipment is only used by qualified technicians and only for the purpose of EMI measurements. The three metre test range has been carefully evaluated to the ANSI document C63.4 and will be remeasured for reflections and losses every three years.

FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-725-1585 (ext-218)
Facsimile: 301-344-2050

September 23, 1997

IN REPLY REFER TO
31040/SIT
1300F2

Electrohome Electronics Ltd
809 Wellington Street, North
Kitchener, Ontario N2G 4J6, Canada

Attention: Gerry Gallagher

Re: Measurement facility located at Roseville
(3 meter site)

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is published periodically and is also available on the Laboratory's Public Access Link as described in the enclosed Public Notice.

Sincerely,

Thomas W. Phillips
Electronics Engineer
Customer Service Branch

EXHIBIT D(2)

SPECTRUM ANALYZER -	ANRITSU MS2601A S/N MT64544 - NEXT CALIBRATION APRIL 1999

SUMMARY OF RESULTS

	COMPLIANCE (yes)	(no)
FIELD STRENGTH OF THE CARRIER FREQUENCIES		
Headset, Low Channel:	(x)	( )
Headset, High Channel:	(x)	( )
Base Station, Low Channel:	(x)	( )
Base Station, High Channel:	(x)	( )
OCCUPIED BANDWIDTH		
Headset:	(x)	( )
Base Station:	(x)	( )
SPURIOUS RADIATED EMISSIONS (15.109)		
Headset:	(x)	( )
Base Station:	(x)	( )
SPURIOUS RADIATED EMISSIONS (15.209/15.249)		
Headset, Low Channel:	(x)	( )
Headset, High Channel:	(x)	( )
Base Station, Low Channel:	(x)	( )
Base Station, High Channel:	(x)	( )
LINE CONDUCTED SPURIOUS EMISSIONS		
Base Station: Telephone mode:	(x)	( )
EQUIPMENT REQUIREMENTS AND IDENTIFICATION		
a) Manufacturers or applicants name:	(x)	( )
b) FCC ID:	(x)	( )
c) Serial number:	(N/M)	( )
d) Antenna:	(x)	( )
e) Operator controls:	(x)	( )
f) Security Coding:	(x)	( )
g) Equipment/Packaging Marking	(x)	( )

CARRIER FIELD STRENGTH

RESULTS

Headset:
Low Channel: **Maximum field strength of 36,720 μV/M; at 902.238 MHz.**
High Channel: **Maximum field strength of 27,734 μV/M; at 905.278 MHz.**

Base Station:
Low Channel: **Maximum field strength of 35,760 μV/M; at 924.720 MHz.**
High Channel: **Maximum field strength of 29,860 μV/M; at 927.760 MHz.**

Notes: All other channels were checked for carrier frequency field strength levels. The Cordless XLT base station was attached to the GE standard desk set telephone during carrier field strength tests.

TEST CONDITIONS

Equipment Positioning:	
Headset:	vertical or upright (head mounted)
Base Station:	standing on its back with the antenna extended in the vertical plane.
Antenna Polarization:	
Headset:	vertical
Base Station:	vertical
Antenna Type:	T.4; tuned half wave dipole
Measurement Bandwidth:	100 KHz
Supply Voltages:	
Headset:	3.6 VDC from an internal battery.
Base Station:	120 VAC/60 Hz to 12 VDC (adapter)

METHODS OF MEASUREMENT

The cordless phone components were placed in turn on a one metre high, non-metallic turntable and set at maximum output level. Measurements were made in a minimum of 3 positions for the Headset and 2 for the base station. If adjustable, the whip antennas were fully extended.

For each of the above conditions the turntable was rotated through 360 degrees while the receiving antenna, at three (3) metres from the EUT, was varied in height from 1 to 4 metres and set in both planes of polarization to find the maximum signal strength. The level was measured using a spectrum analyzer and a substitution signal from an RF generator. The measured level was converted to a field strength using the antenna correction factors and cable losses.

All base station measurements were made with the equipment under test connected to an artificial telephone line network, with 48 VDC applied.

OCCUPIED BANDWIDTH (47 CFR Part 2.989)

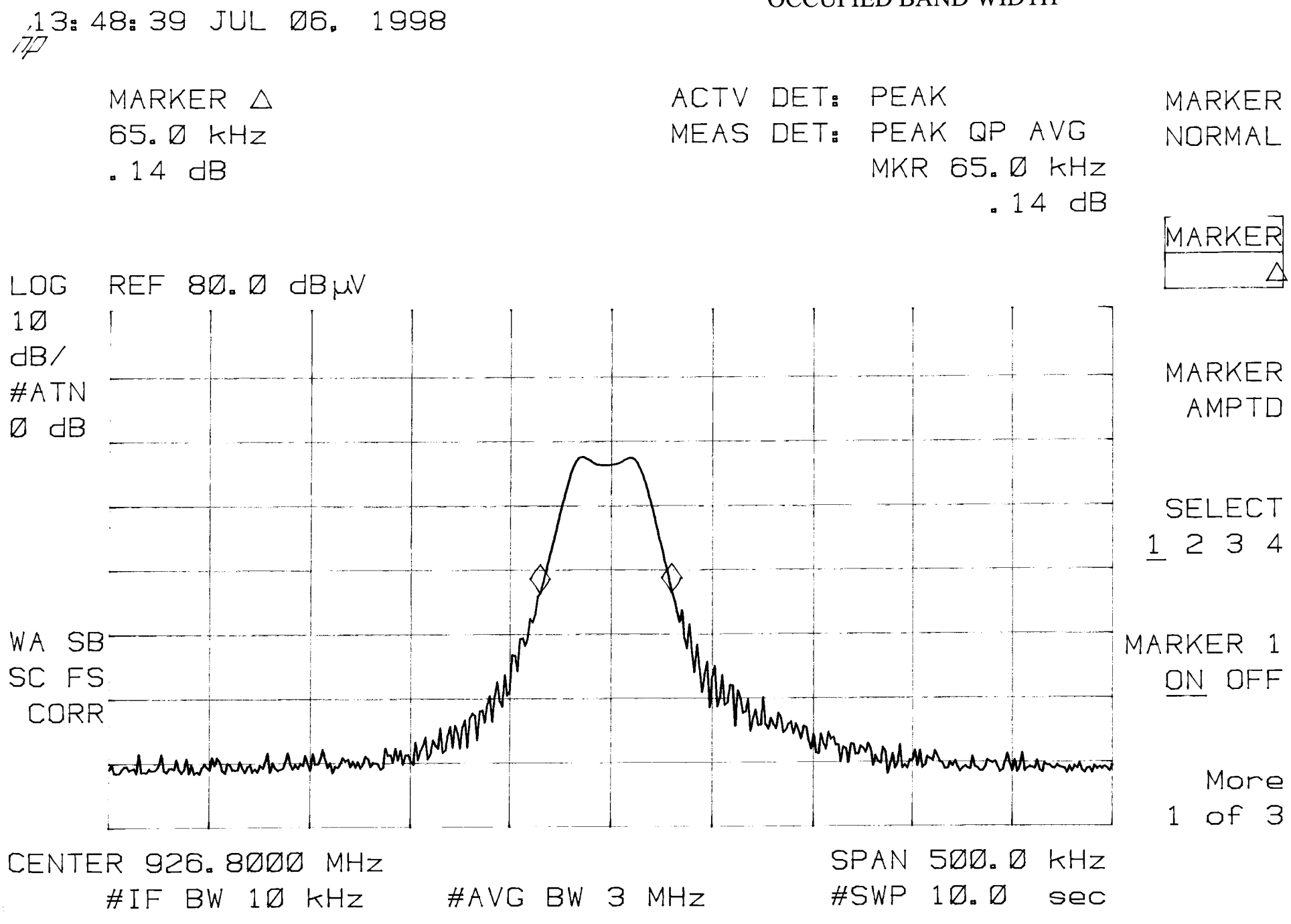
RESULTS

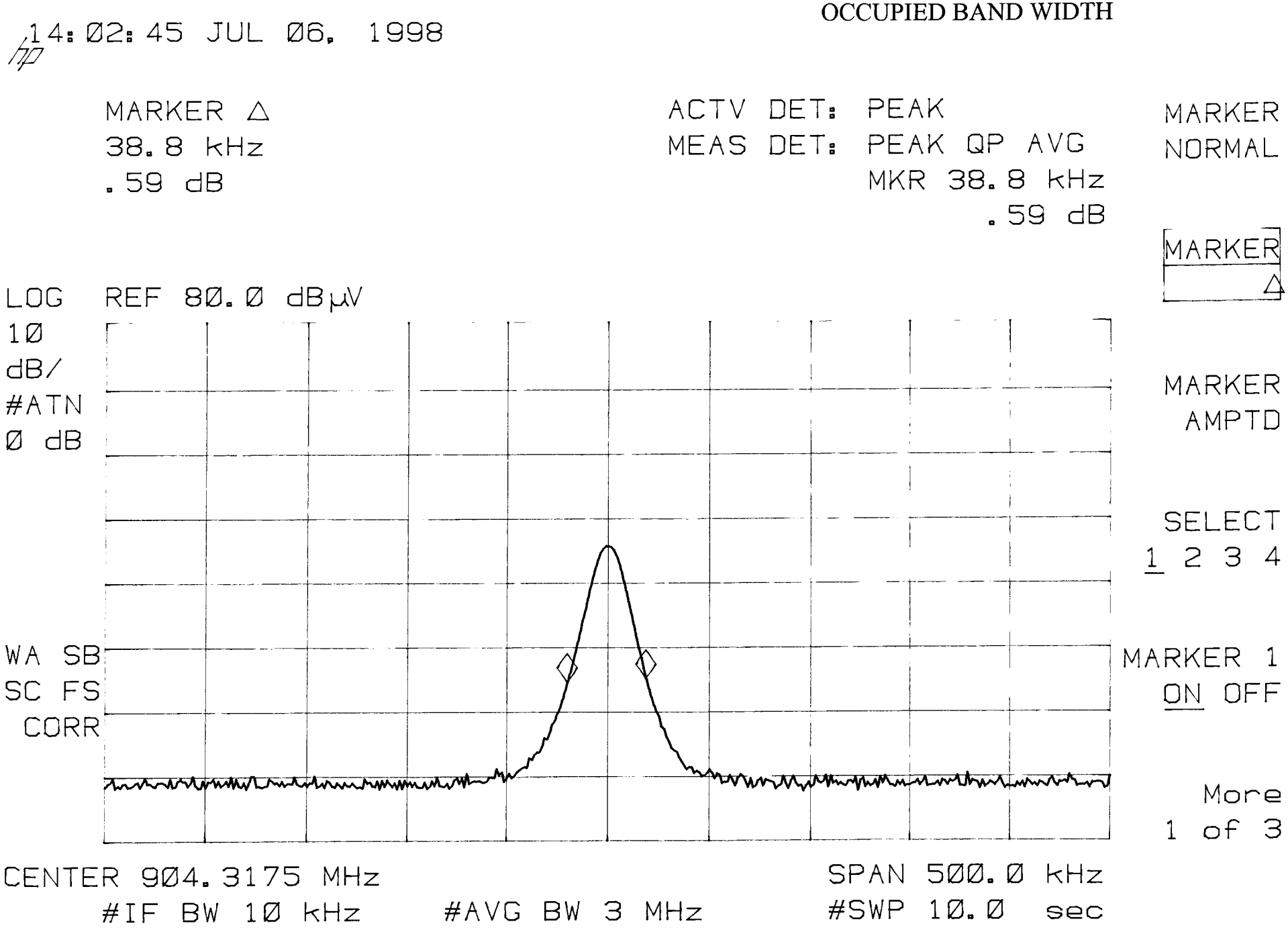
The bandwidth was as follows:

Headset: 38.8 KHz

Base Unit: 65 KHz

OCCUPIED BAND WIDTH




14: Ø2: 45 JUL Ø6, 1998
MARKER Δ
38.8 kHz
.59 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 38.8 kHz
.59 dB
MARKER
NORMAL
MARKER
LOG REF 8Ø.Ø dBμV
1Ø
dB/
#ATN
Ø dB
MARKER
AMPTD
SELECT
1 2 3 4
WA SB
SC FS
CORR
MARKER 1
ON OFF
More
1 of 3
CENTER 9Ø4.3175 MHz
SPAN 5ØØ.Ø kHz
#IF BW 1Ø kHz
#AVG BW 3 MHz
#SWP 1Ø.Ø sec

SPURIOUS RADIATED EMISSIONS

RESULTS

The maximum field strength of any harmonic or spurious emission with respect to the applicable limit, while transmitting or receiving was:

Headset: **Maximum field strength of: 158.6 μV/M at 877.16 MHz**
Maximum field strength of: NONE FOUND over 1000 MHz

Base Station:
Maximum field strength of: 23.3 μV/M at 36.90 MHz
Maximum field strength of: NONE FOUND over 1000 MHz

Note: The Cordless XLT base station was attached to the GE standard desk set telephone during spurious emission tests.

TEST CONDITIONS

Equipment Positioning:	
Headset:	standing vertically (head mounted)
Base Station:	standing on its back with the antenna extended in the vertical plane.
Antenna Polarization:	
Headset:	horizontal
Base Station:	vertical
Base Station, Receive:	vertical
Measurement Bandwidth:	100/120 KHz(IF) & 1 MHz(IF) for frequencies above 1.0 GHz.
Supply Voltages:	
Headset:	3.6 VDC from an internal battery.
Base Station:	120 VAC/60 Hz to 12 VDC (adapter)

METHODS OF MEASUREMENT

The cordless phone components were placed in turn on a one metre high, non-metallic turntable. Measurements were made in a minimum of 3 positions for the Headset and 2 for the base station. If adjustable, the whip antennas were fully extended.

For each of the above conditions the turntable was rotated through 360 degrees while the receiving antenna, at three (3) metres from the EUT, was varied in height from 1 to 4 metres and set in both planes of polarization to find the maximum signal strength. The level was measured using a spectrum analyzer and a substitution signal from an RF generator. The measured level was converted to a field strength using the antenna correction factors and cable losses.

All base station measurements were made with the equipment under test connected to an artificial telephone line network, with 48 VDC applied.

RADIATED EMISSION RESULTS

BW: 100 KHz
Span: 5 to 50 MHz

HEADSET

TEST # MODE	FREQ MHz BAND	LEVEL μV	ANT. TYPE (PZ)	ANT. FACT.	F.S. μV/M	LIMIT μV/M	DIFF. TO LIMIT; dB
CARRIER	902.238	850.0	RT.4 V	43.2	36720.0	50,000	-2.68
CARRIER	905.278	642.0	RT.4 V	43.2	27734.4	50,000	-5.12
01 TX	877.16	05.1	L/P H	31.1	158.6	200	-2.01

BASE STATION

TEST # MODE	FREQ MHz BAND	LEVEL μV	ANT. TYPE (PZ)	ANT. FACT.	F.S. μV/M	LIMIT μV/M	DIFF. TO LIMIT; dB
CARRIER	924.720	800.00	RT.4 V	44.7	35760.0	50,000	-2.91
CARRIER	927.760	668.00	RT.4 V	44.7	29859.6	50,000	-4.48
01 RX	36.90	06.3	B/C V	3.7	23.3	100	-12.65

POWER LINE CONDUCTED EMISSIONS

RESULTS

The largest RF voltages on the AC power lines, over the frequency range of 450 KHz to 30 MHz, was **71.94 μV (37.14 dBμV) at 0.448 MHz** from the base station while transmitting and/or receiving. (A side of the line in the telephone mode). Refer to the attached results.

TEST CONDITIONS

Measurement Bandwidth: 9 KHz Q.P. (IF)
AC Test Voltage: 120 VAC (filtered and stabilized)
Mode of Operation: Telephone

METHODS OF MEASUREMENT

The base station portion of the cordless phone was placed on a wooden table directly above a 50 ohm line impedance stabilization network.(LISN) If adjustable, the whip antenna was fully extended vertically and the AC power attachment cord went directly down to the LISN. The LISN is grounded directly to the floor of the test facility. Excess AC cord was coiled in a figure eight pattern before connecting directly to the 50 micro-henry LISN.

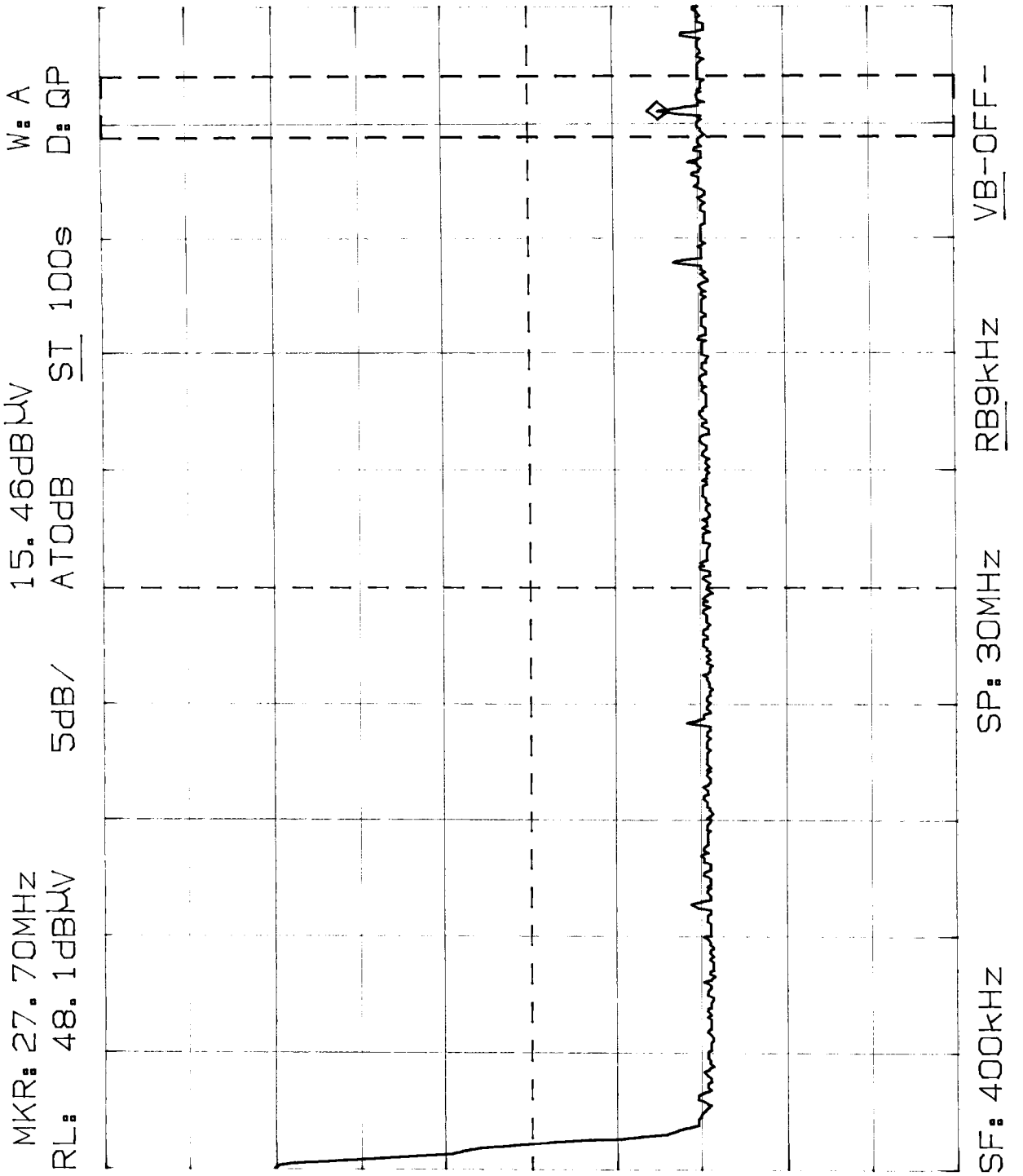
The base station was connected to a simulated 9,000 foot phone line and 48 VDC was applied. The 9,000 foot phone line network was grounded to the nearest AC outlet with a test lead.

A length of low loss RF foam cable was used to couple the RF voltages from the LISN to the spectrum analyzer. The base station transmitter was keyed on by the handset transmitting nearby. All of the RF voltages were recorded and are attached.

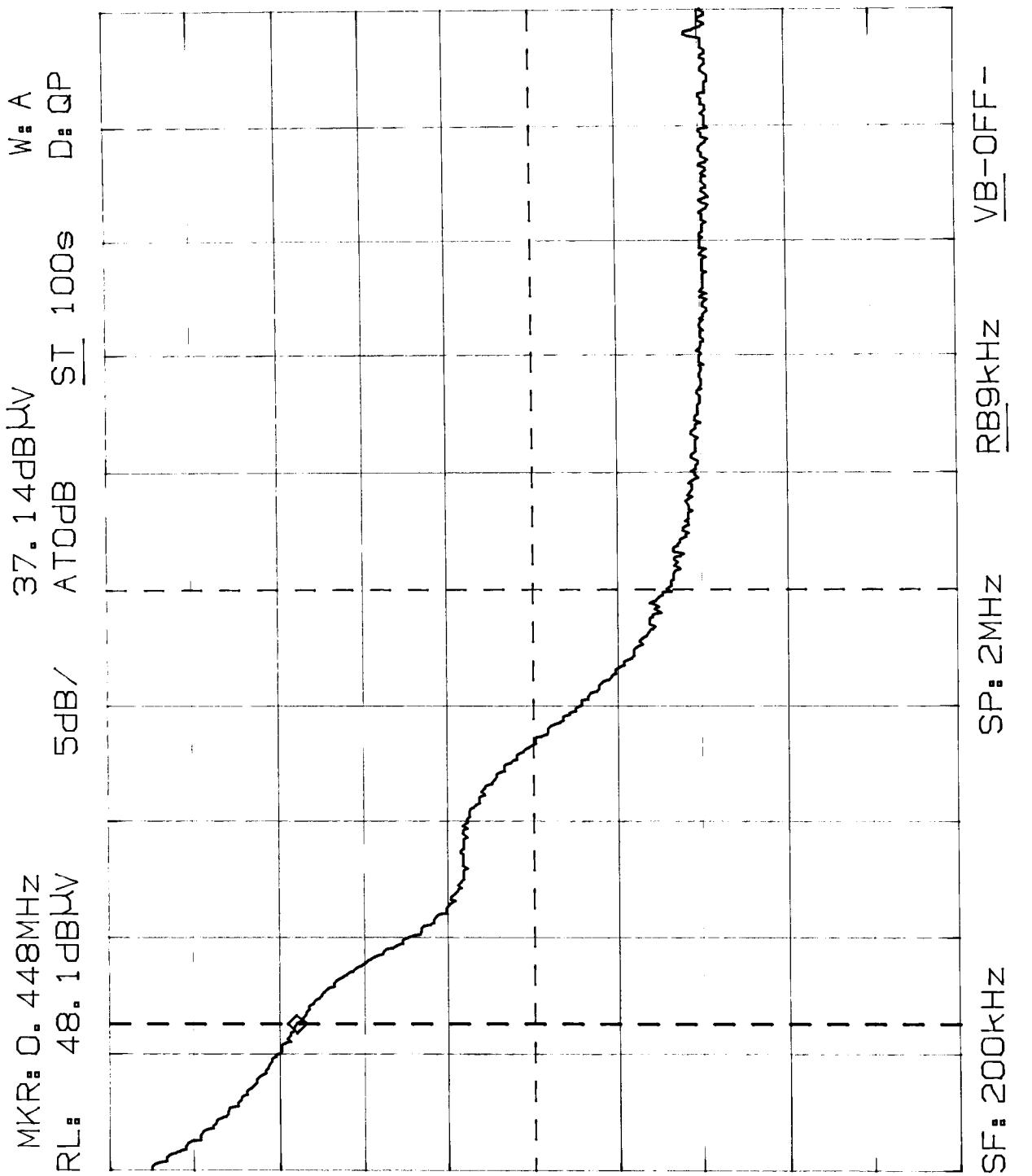
The base station was tested in all modes of operation which were applicable to the specific equipment under test. This included operating modes such as "calling/paging", quiescent or receive mode and standard telephone/transmit operation in both the 43/44 MHz and the 46 MHz bands.

If the cordless phone contained an intercom mode of operation, then this test was repeated in that mode. The attached results represent the **worst case results** in each test condition and frequency band.

POWER LINE CONDUCTED EMISSIONS
MODEL CORDLESS XLT
SIDE: A

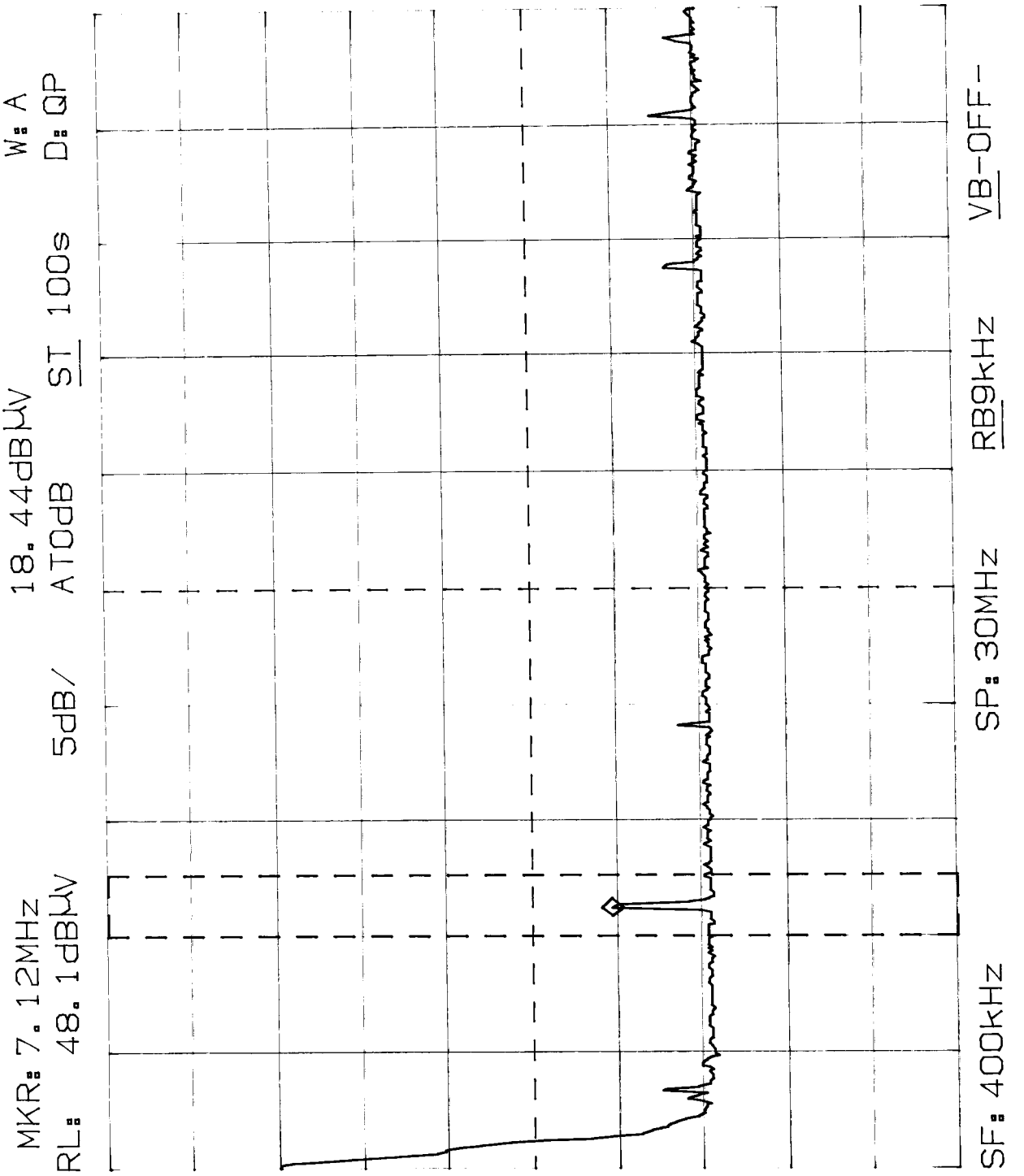


POWER LINE CONDUCTED EMISSIONS
MODEL CORDLESS XLT
SIDE: A



FCC ID: LKKXLT
Marstech Report No. 98257D
EXHIBIT D(3)-10

POWER LINE CONDUCTED EMISSIONS
MODEL CORDLESS XLT
SIDE: B



FCC ID: LKKXLT
Marstech Report No. 98257D
EXHIBIT D(3)-11

POWER LINE CONDUCTED EMISSIONS
MODEL CORDLESS XLT
SIDE: B