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

Testing For FCC Submissions/Verifications

Approved Test Facility

TEST REPORT			
REPORT DATE:	May 13, 1998		REPORT NO: 98164D
CONTENTS:	See Table of Contents		
SUBMITTOR:	THOMSON CONSUMER ELECTRONICS, INC. Audio & Communications Product Dev. 101 West 103rd Street Indianapolis, IN 46290-1102 USA		
SUBJECT:	Model No:	2-9750(XXXX)	
	FCC ID:	G9H2-9750	
TEST SPECIFICATION	FCC CFR 47 15.233 AND 2.989 Sections: 15.35, 15.107, 15.109, 15.207 and 15.209 NOTE: Tests Conducted Are "Type" Tests.		
DATE SAMPLE RECEIVED:	May 1, 1998	DATE TESTED:	April 30 to May 6,1998
RESULTS:	Equipment tested complies with referenced specification.		
ALTERATIONS	The following alterations required for compliance with referenced specification: Base Unit: 1) R57 resistor changed to 2.2Kohm; 2) R53 resistor changed to 10Kohm; 3) Power Supply of IC2 to +9VDC.		
Tested by:	Original signed by: Jim Sims	Approved and Certified by:	Robert Marshall
	Hiran De Silva		Robert G. Marshall, P. Eng.
Reviewed by:	Ed Chang	Date:	June 8/98

TECHNICAL REPORT - FCC 2.1033(b)

Applicant

Thomson Consumer Electronics, Inc.
Audio & Communications Product Dev.
101 West 103rd Street
Indianapolis, IN
46290-1102 USA

FCC Identifier

G9H2-9750

Manufacturer

Dongguan CCT Telecommunications Products Co. Ltd.
Dongguan, Guangdong Province
The PRC

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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:	Thomson Consumer Electronics, Inc. Audio & Communications Product Dev. 101 West 103rd Street Indianapolis, IN 46290-1102 USA
MANUFACTURER:	Dongguan CCT Telecommunications Products Co. Ltd. Dongguan, Guangdong Province The PRC
FCC IDENTIFIER:	G9H2-9750
TRADE NAME:	GE
MODEL NUMBER:	2-9750(XXXX)
SERIAL NO.:	N/M

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

TECHNICIANS:
Jim Sims - Com-Serve Corp.
Hiran De Silva - Marstech Limited

Robert G. Marshall, P. Eng.

Date: June 8/98

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

Hewlett-Packard spectrum analyzer # 8554 RF & 141T video.
Anritsu 2601 A spectrum analyzer.
Advantest R3261A Spectrum Analyzer
Hewlett-Packard RF generator # 8640 B with an 002 doubler
Hewlett-Packard attenuator 30 dB # 11708A.
Narda 20 watt (20 dB) attenuator
Compliance Design P950 Preamp (16 dB)..... 25 MHZ -1.0 GHZ
A.H. Systems biconical antenna; ....20 MHZ - 330 MHZ
A.H. Systems log periodic antenna; .....300 MHZ - 1.8 GHZ
Eaton dipole antennas; T1, T2, T3 .....25 MHZ - 1.0 GHZ
CDI Roberts dipole antennas; T1, T2, T3 & T4.....25 MHZ - 1.0 GHZ

NOTE:

The Anritsu 2601 A spectrum analyzer, the Hewlett-Packard 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 meter 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
MULTIMETER -	FLUKE 75
POWER SUPPLY -	IN HOUSE
OVEN -	IN HOUSE
FREEZER -	IN HOUSE

SUMMARY OF RESULTS

	COMPLIANCE (yes)	(no)
FIELD STRENGTH OF THE CARRIER FREQUENCIES		
Handset: 48 MHz and 49 MHz bands	(x)	( )
Base Station: 43/44 MHz and 46 MHz bands	(x)	( )
OCCUPIED BANDWIDTH		
Handset: 48 MHz and 49 MHz bands	(x)	( )
Base Station: 43/44 MHz and 46 MHz bands	(x)	( )
SPURIOUS RADIATED EMISSIONS		
Handset: 48 MHz and 49 MHz bands	(x)	( )
Base Station: 43/44 MHz and 46 MHz bands	(x)	( )
LINE CONDUCTED SPURIOUS EMISSIONS		
Base Station: Telephone Mode: 43/44 MHz and 46 MHz bands	(x)	( )
TRANSMITTER ENVIRONMENTAL TESTS		
Handset:	(x)	( )
Base Station:	(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 FREQUENCY FIELD STRENGTH

RESULTS

Handset: **Maximum field strength of 2,860 μV/M: Channel # 01**
Handset: **Maximum field strength of 2,573 μV/M: Channel # 25**

Base Station:
Modes:
Telephone: **Maximum field strength of 9,956 μV/M: Channel # 01**
Telephone: **Maximum field strength of 6,800 μV/M: Channel # 25**

TEST CONDITIONS

Equipment Positioning:
Handset: vertical or upright
Base Station: standing vertically with the antenna extended in the vertical plane.

Antenna Polarization:
Handset: vertical
Base Station: vertical

Antenna Type: T.1; tuned half wave dipole

Measurement Bandwidth: 100 KHz (IF)

Supply Voltages:
Handset: 3.6 VDC from an internal battery.
Base Station: 120 VAC/60 Hz to 09 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 handset 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 unmodulated carrier 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 RESULTS

RESULTS

The highest level emission resulting from the modulation process exceeding the specified frequency range of ± 10 KHz (20 KHz) over the carrier frequency was:

Handset:
Unmodulated carrier level: **-34 dB** (30 dB external pad) **Channel # 01**
Unmodulated carrier level: **-36 dB** (30 dB external pad) **Channel # 25**

a) At the maximum frequency deviation at 2,500 Hz: Channel # 01
-74 dB at +12.5 KHz.
b) At the maximum frequency deviation at 2,500 Hz: Channel # 25
-78 dB at +12.5 KHz.

Base Station:
Unmodulated carrier level: **-52 dB** (30 dB external pad) **Channel # 01**
Unmodulated carrier level: **-53 dB** (30 dB external pad) **Channel # 25**

Telephone:
a) At the maximum frequency deviation at 2,500 Hz: Channel # 01
-103 dB at -12.5 KHz.
b) At the maximum frequency deviation at 2,500 Hz: Channel # 25
-103 dB at -12.5 KHz.

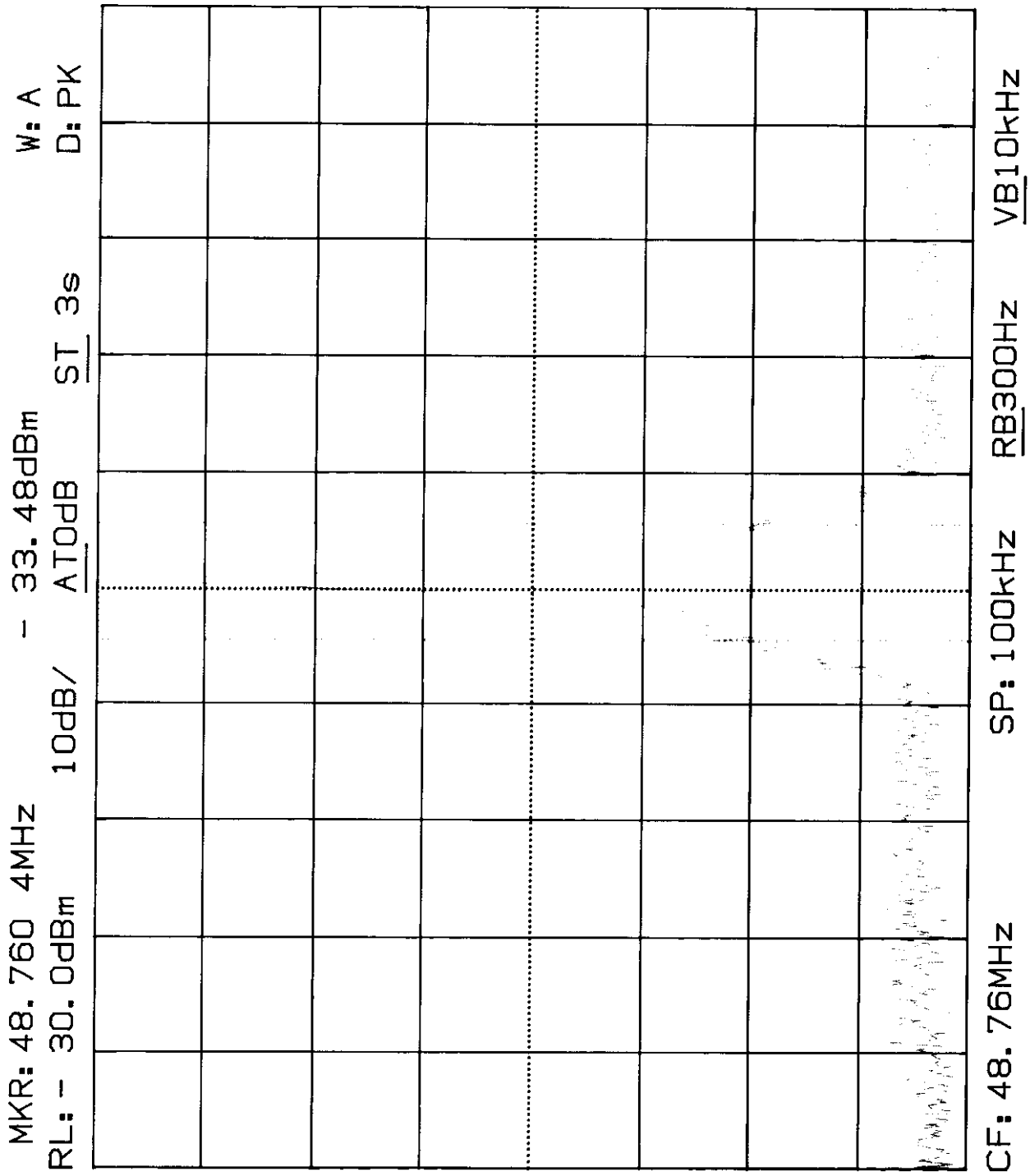
METHODS OF MEASUREMENT

Each transmitter was operated in turn under the standard test conditions specified, and at the maximum output power. An external 2,500 Hz audio signal was coupled to the standard input port and adjusted to a level which produced 85% of the measured "Maximum Frequency Deviation". In this case, the base station and handset, modulation in-band emissions meet the requirements at maximum frequency deviation. Levels for compliance have therefore been evaluated at these levels. Any internal modulation source that normally operates on a continuous basis was disabled.

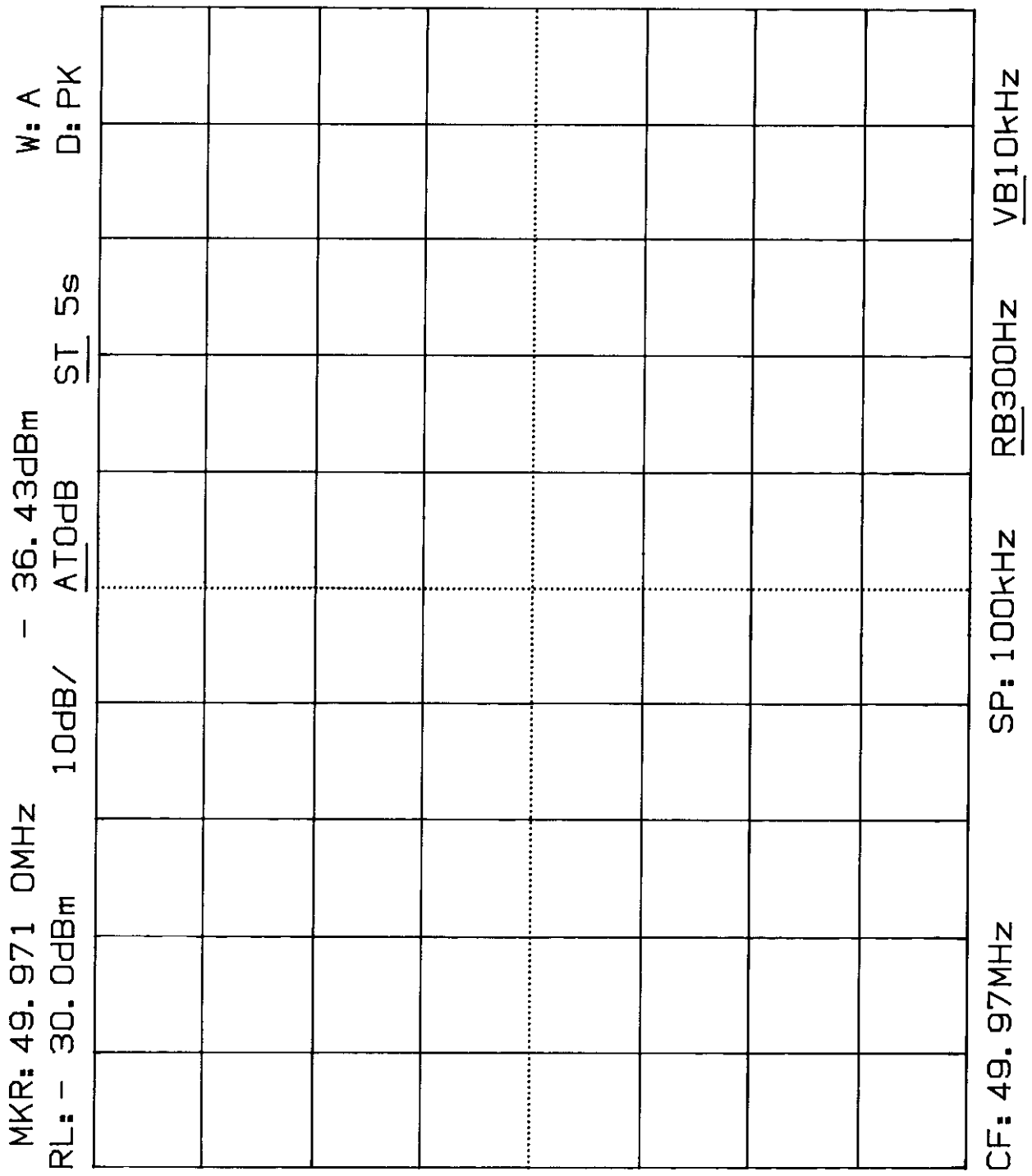
A portion of the radio frequency power delivered by the transmitter into the standard output termination was coupled to a spectrum analyzer.

If the cordless telephone contained an internal modulation source that normally operates continuously or for more than three (3) seconds, then the above test was also repeated with the external 2,500 Hz disconnected.
Please refer to the attached results.

HANDSET; UNMODULATED CARRIER LEVEL
MODEL 2-9750(XXXX); 48 MHz

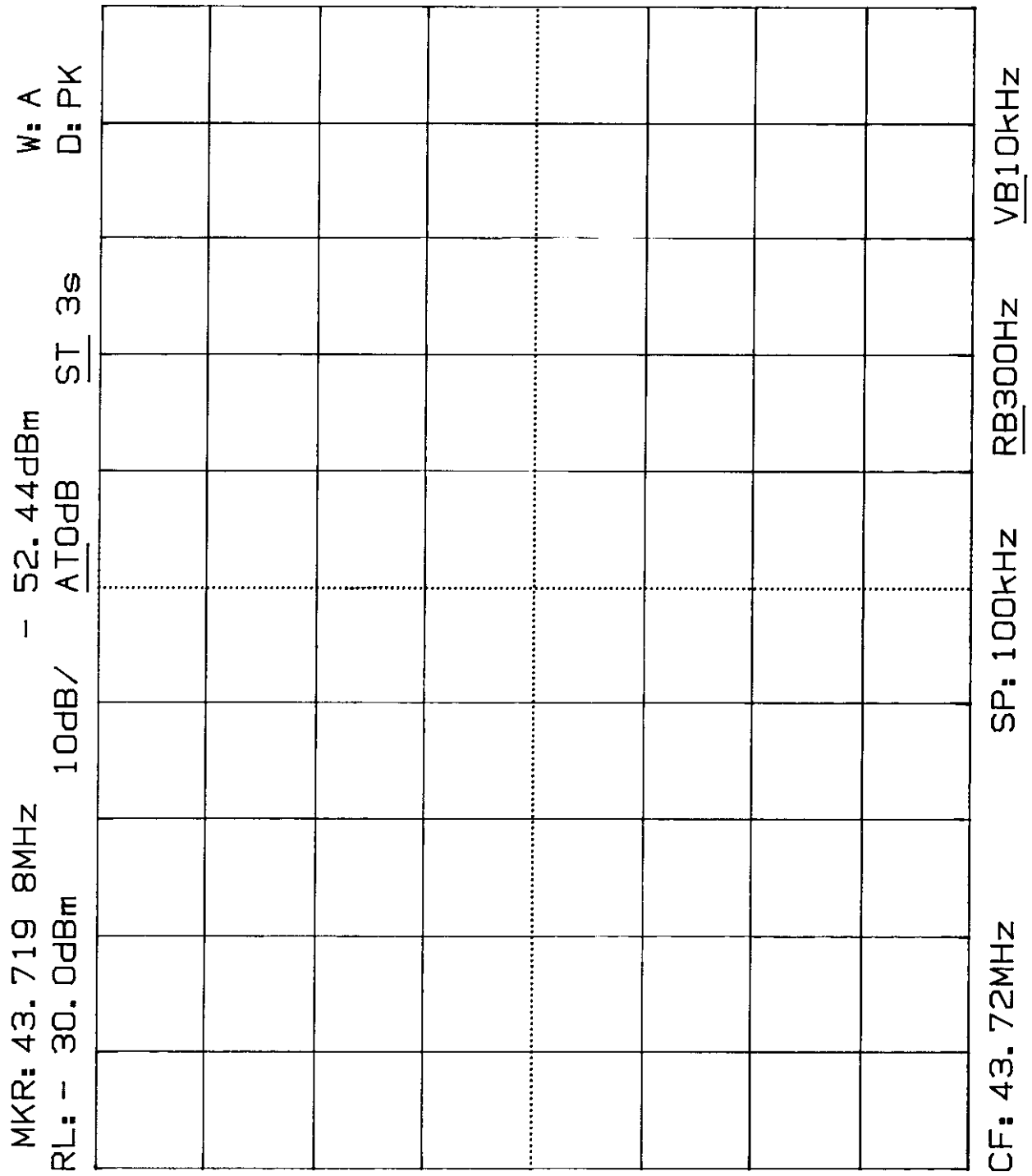


HANDSET; UNMODULATED CARRIER LEVEL
MODEL 2-9750(XXXX); 49 MHz



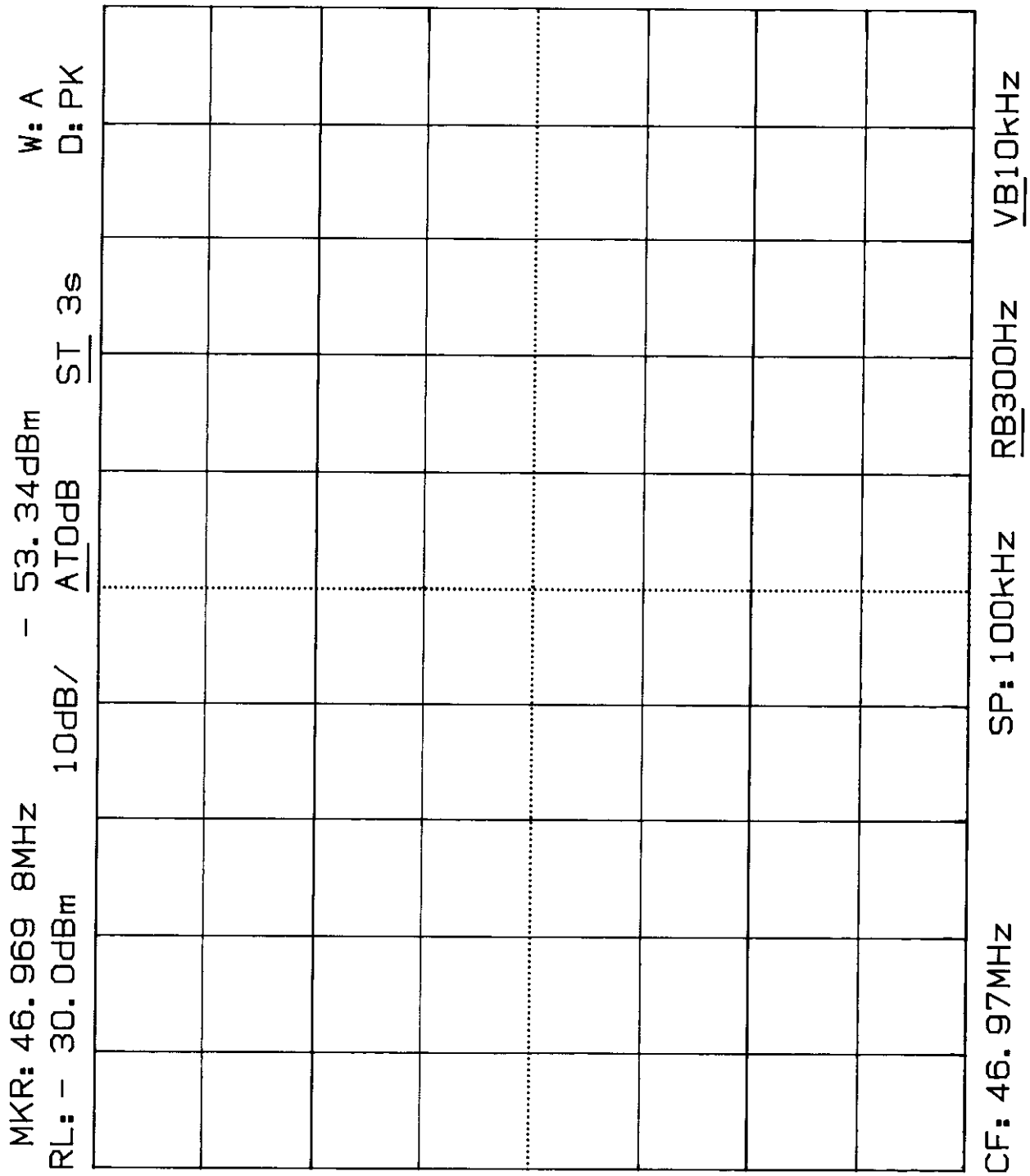
FCC ID: G9H2-9750
EXHIBIT D(3)-5
Marstech Report No. 98164D

BASE STATION; UNMODULATED CARRIER LEVEL
MODEL 2-9750(XXXX); 43/44 MHz

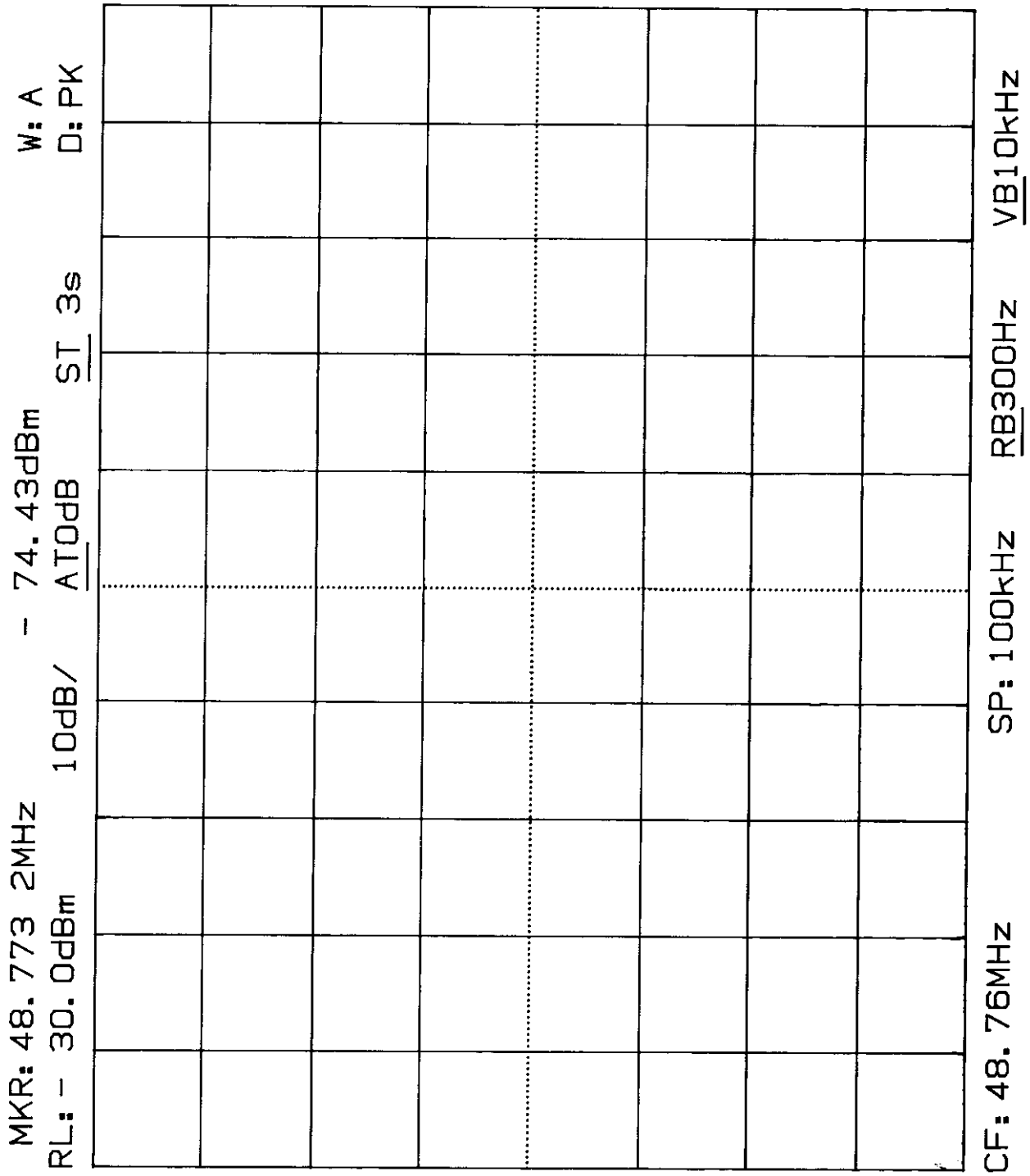


FCC ID: G9H2-9750
EXHIBIT D(3)-6
Marstech Report No. 98164D

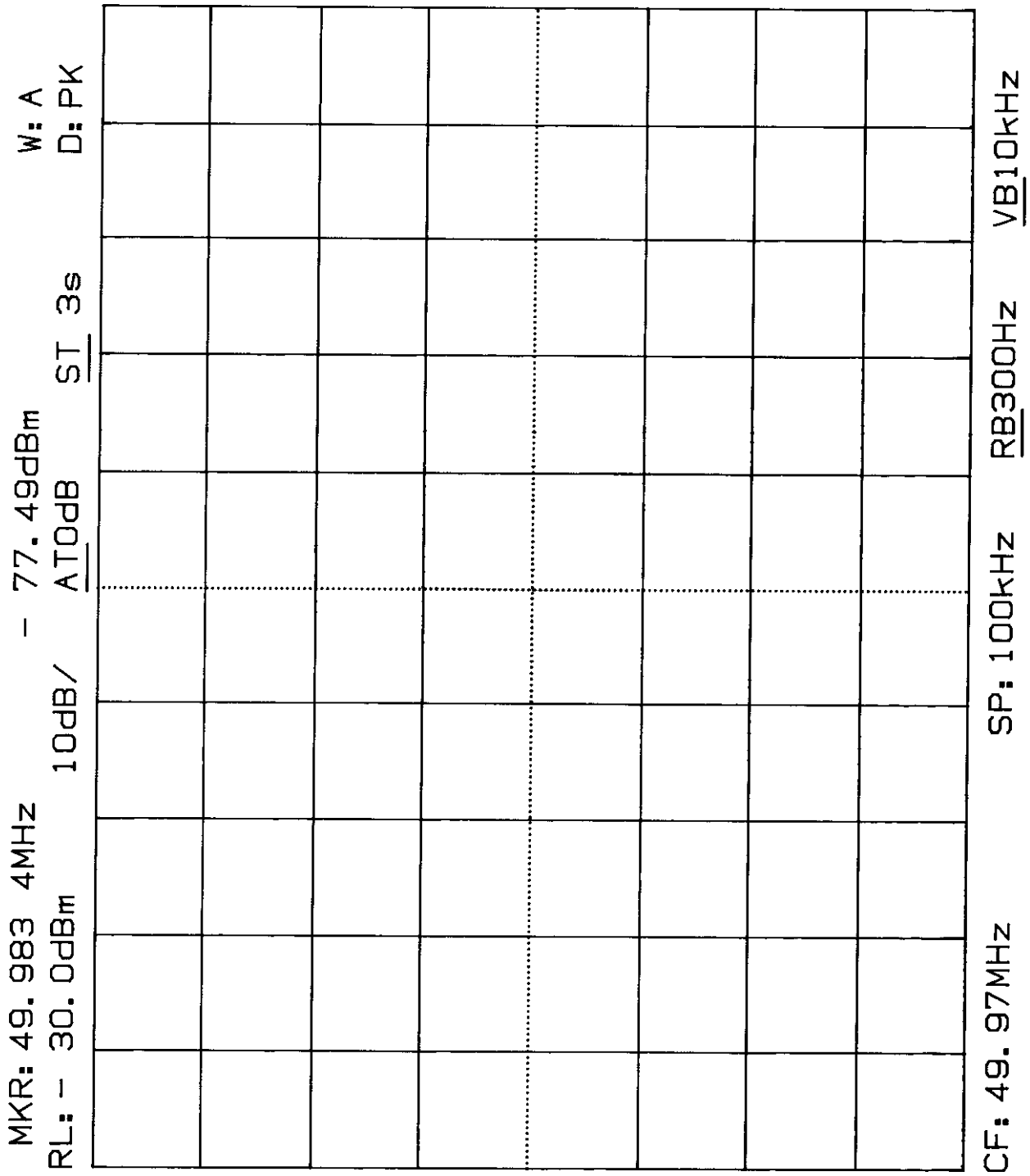
BASE STATION; UNMODULATED CARRIER LEVEL
MODEL 2-9750(XXXX); 46 MHz



OUT-OF-BAND HANDSET; 48 MHz
2.00 VOLTS AT MFD; MODEL 2-9750(XXXX)

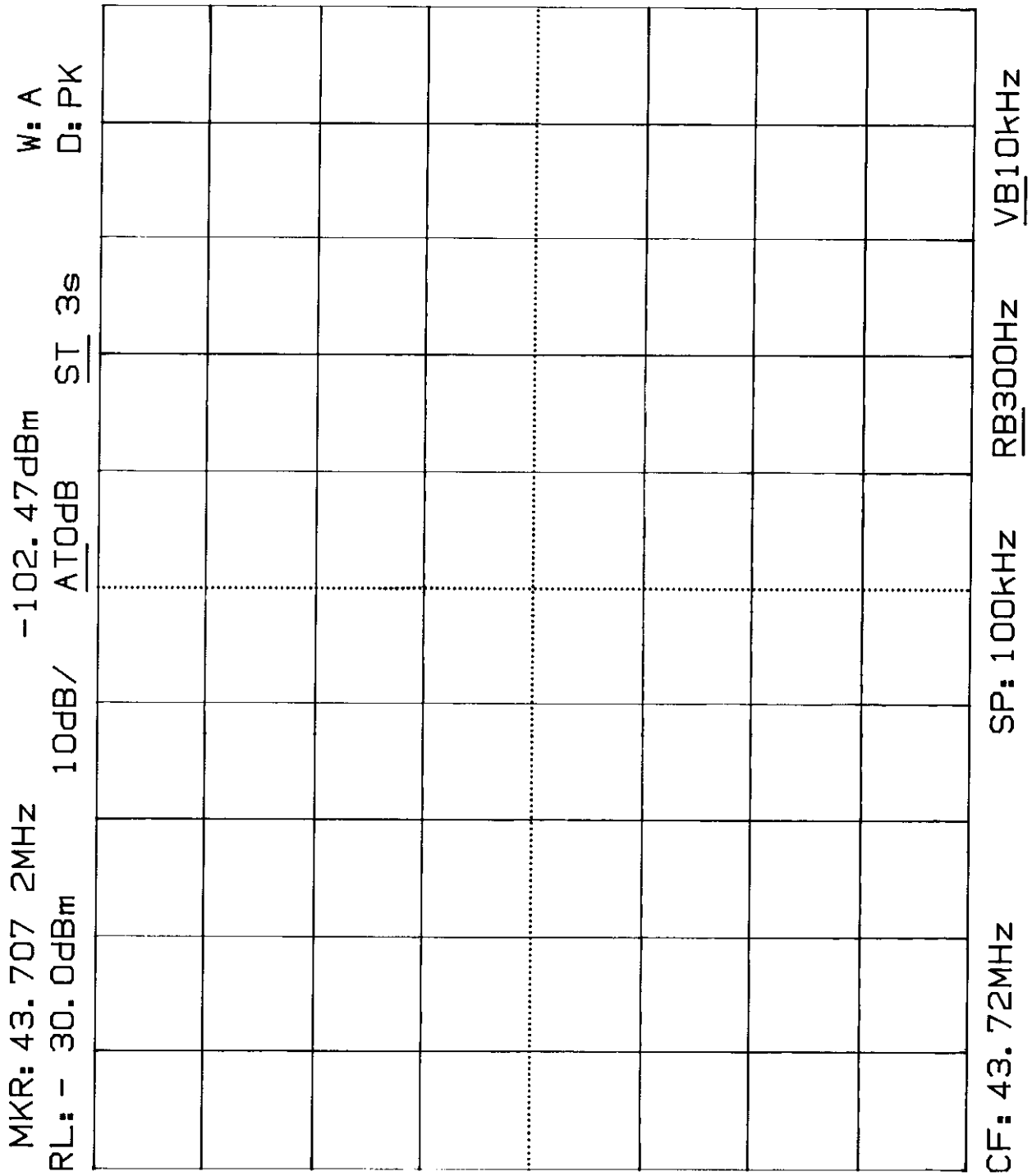


OUT-OF-BAND HANDSET; 49 MHz
2.75 VOLTS AT MFD; MODEL 2-9750(XXXX)

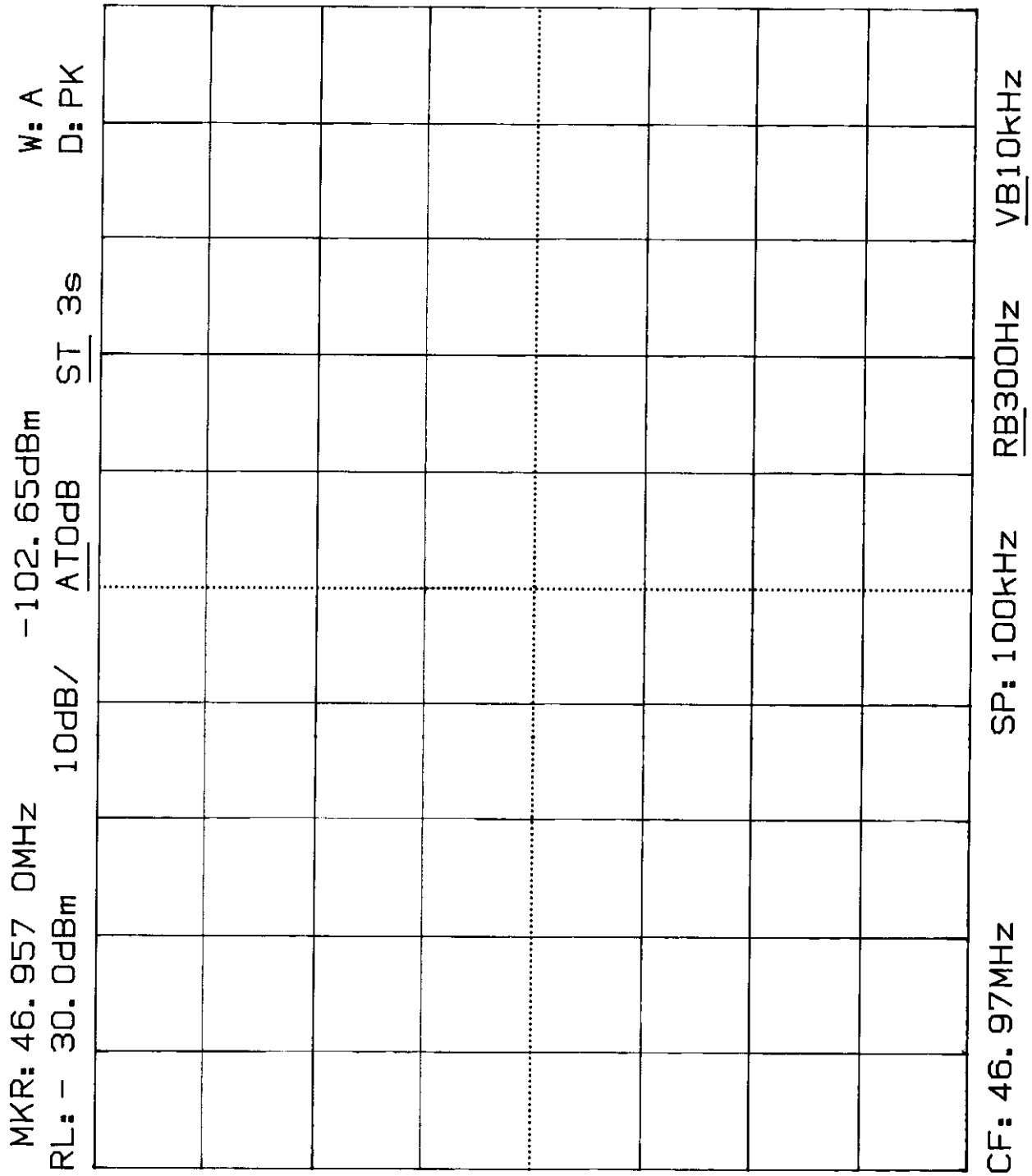


FCC ID: G9H2-9750
EXHIBIT D(3)-9
Marstech Report No. 98164D

OUT-OF-BAND BASE STATION; 43/44 MHz
2.45 VOLTS AT MFD; MODEL 2-9750(XXXX)

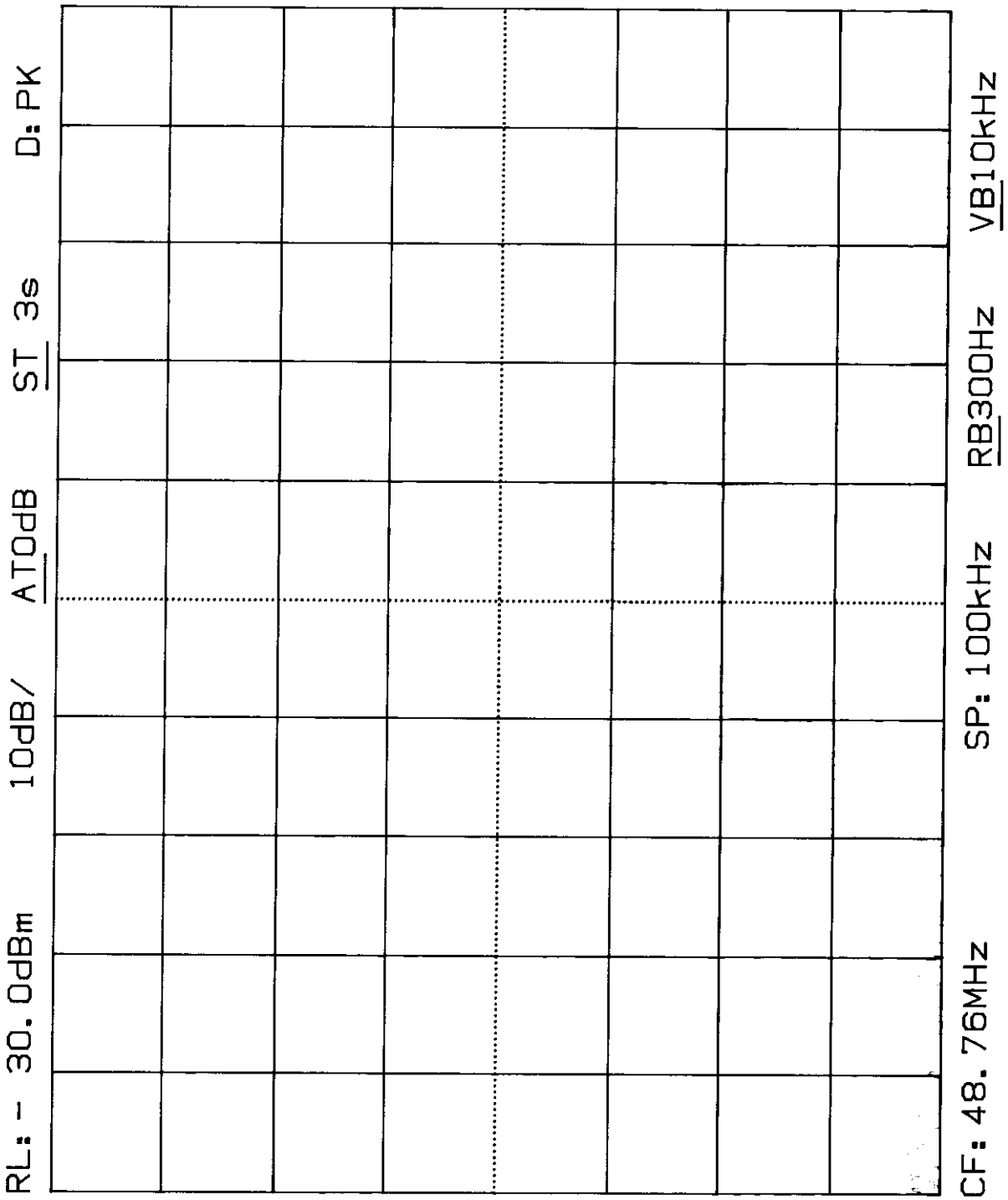


OUT-OF-BAND BASE STATION; 46 MHz
3.30 VOLTS AT MFD; MODEL 2-9750(XXXX)

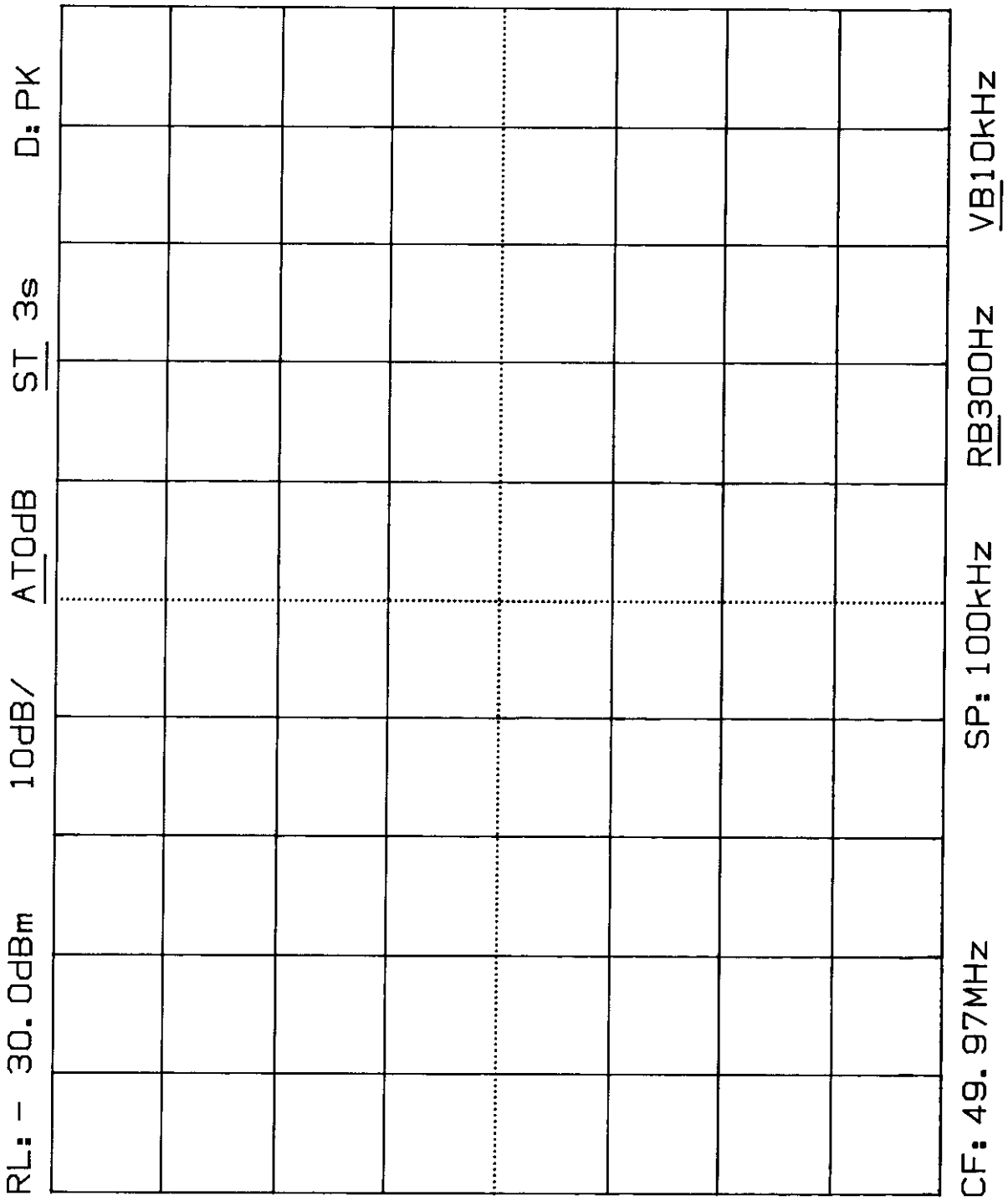


FCC ID: G9H2-9750
EXHIBIT D(3)-11
Marstech Report No. 98164D

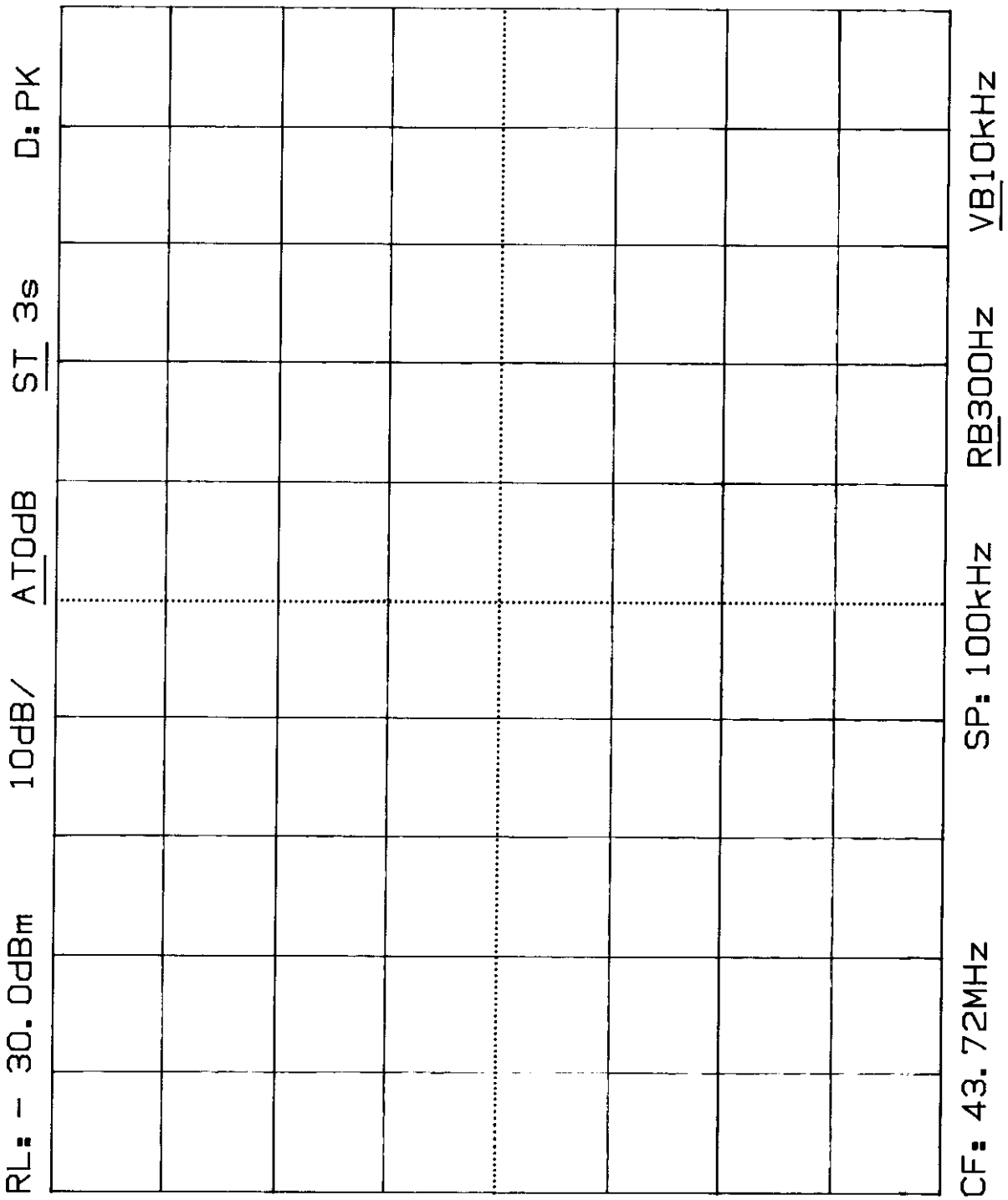
MAXIMUM FREQUENCY DEVIATION; 48 MHz
HANDSET; 2.00 VOLTS MODEL 2-9750(XXXX)



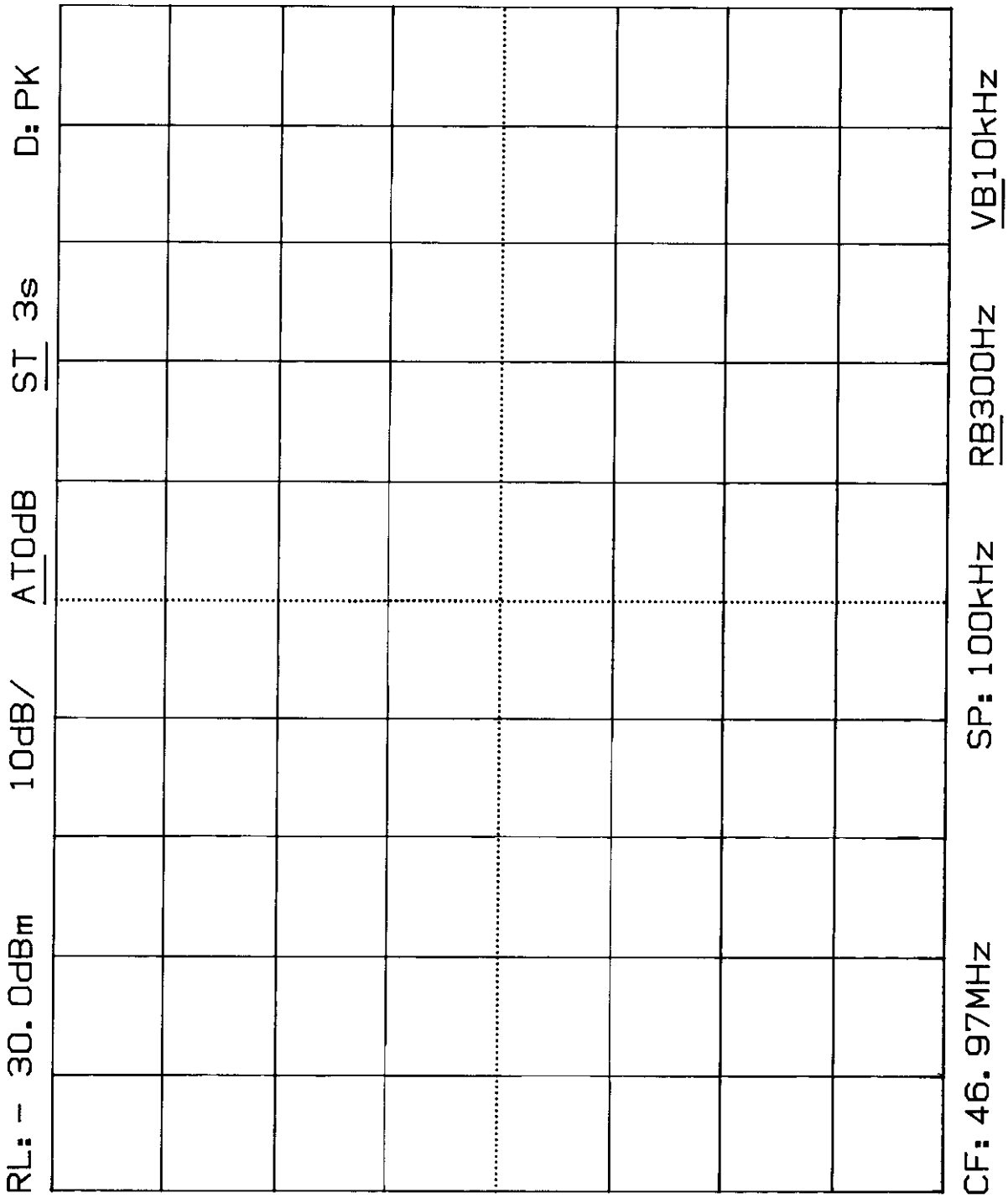
MAXIMUM FREQUENCY DEVIATION; 49 MHz
HANDSET; 2.75 VOLTS MODEL 2-9750(XXXX)



MAXIMUM FREQUENCY DEVIATION; 43/44 MHz
BASE STATION; 2.45 VOLTS MODEL 2-9750(XXXX)



MAXIMUM FREQUENCY DEVIATION; 46 MHz
BASE STATION; 3.30 VOLTS MODEL 2-9750(XXXX)



SPURIOUS RADIATED EMISSIONS

RESULTS

The maximum field strength of any spurious emission, with respect to the applicable limit, to 1,000 MHz, while transmitting or receiving was:

Handset: **Maximum field strength of 109.5 μV/M at 633.87 MHz; Channel 01**
Maximum field strength of 155.7 μV/M at 599.63 MHz; Channel 25

Base Station:
Maximum field strength of 88.2 μV/M at 174.88 MHz; Channel 01
Maximum field strength of 94.7 μV/M at 187.86 MHz; Channel 25
Maximum field strength of: NONE FOUND at 000.00 MHz; RECEIVE

TEST CONDITIONS

Equipment Positioning:

Handset:	laying on its back.
Base Station:	standing on its back with the antenna extended in the vertical plane.

Antenna Polarization:

Handset:	horizontal
Base Station:	horizontal
Base Station: Receive	vertical and horizontal

Measurement Bandwidth: 100 KHz/120 KHz Q.P. (IF)

Supply Voltages:

Handset:	3.6 VDC from an internal battery.
Base Station:	120 VAC/60 Hz to 09 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 handset 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: 100/120 KHz
Span: 5 to 50 MHz

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	43.720	7,600.0	RT.1 V	1.31	9956.0	10,000	-0.04
01 TX	131.15	08.6	B/C H	5.6	48.2	150	-9.87
02 TX	174.88	11.6	B/C H	7.6	88.2	150	-4.62
03 TX	218.58	09.2	B/C H	7.3	67.2	200	-9.48
04 TX	262.32	06.5	B/C H	13.6	88.4	200	-7.09
CARRIER	46.970	5,000.0	RT.1 V	1.36	6800.0	10,000	-3.35
05 TX	187.86	12.8	B/C H	7.4	94.7	150	-3.99
06 TX	234.85	08.1	B/C H	9.3	75.3	200	-8.48
07 TX	281.82	06.5	B/C H	16.2	105.3	200	-5.57
08 TX	328.78	07.7	L/P H	14.5	111.7	200	-5.06
09 TX	657.57	06.3	L/P H	15.7	98.9	200	-6.12

RADIATED EMISSION RESULTS

BW: 100/120 KHz
Span: 5 to 50 MHz

HANDSET

TEST # MODE	FREQ MHz BAND	LEVEL μV	ANT. TYPE (PZ)	ANT. FACT.	F.S. μV/M	LIMIT μV/M	DIFF. TO LIMIT; dB
CARRIER	48.760	2,000.0	RT.1 V	1.43	2860.0	10,000	-10.87
01 TX	585.10	08.0	L/P H	13.6	108.8	200	-5.29
02 TX	633.87	07.5	L/P H	14.6	109.5	200	-5.23
CARRIER	49.970	1,750.0	RT.1 V	1.47	2572.5	10,000	-11.79
03 TX	99.94	12.3	B/C V	4.1	50.4	150	-9.47
04 TX	599.63	11.2	L/P H	13.9	155.7	200	-2.18
05 TX	649.60	06.0	L/P H	15.0	90.0	200	-6.94
06 TX	849.49	05.2	L/P H	25.4	132.1	200	-3.60
07 TX	999.40	03.0	L/P H	37.0	111.0	500	-13.07

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 **10.08 μV (20.07 dBμV) at 4.14 MHz** from the base station while transmitting and/or receiving. (B 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.

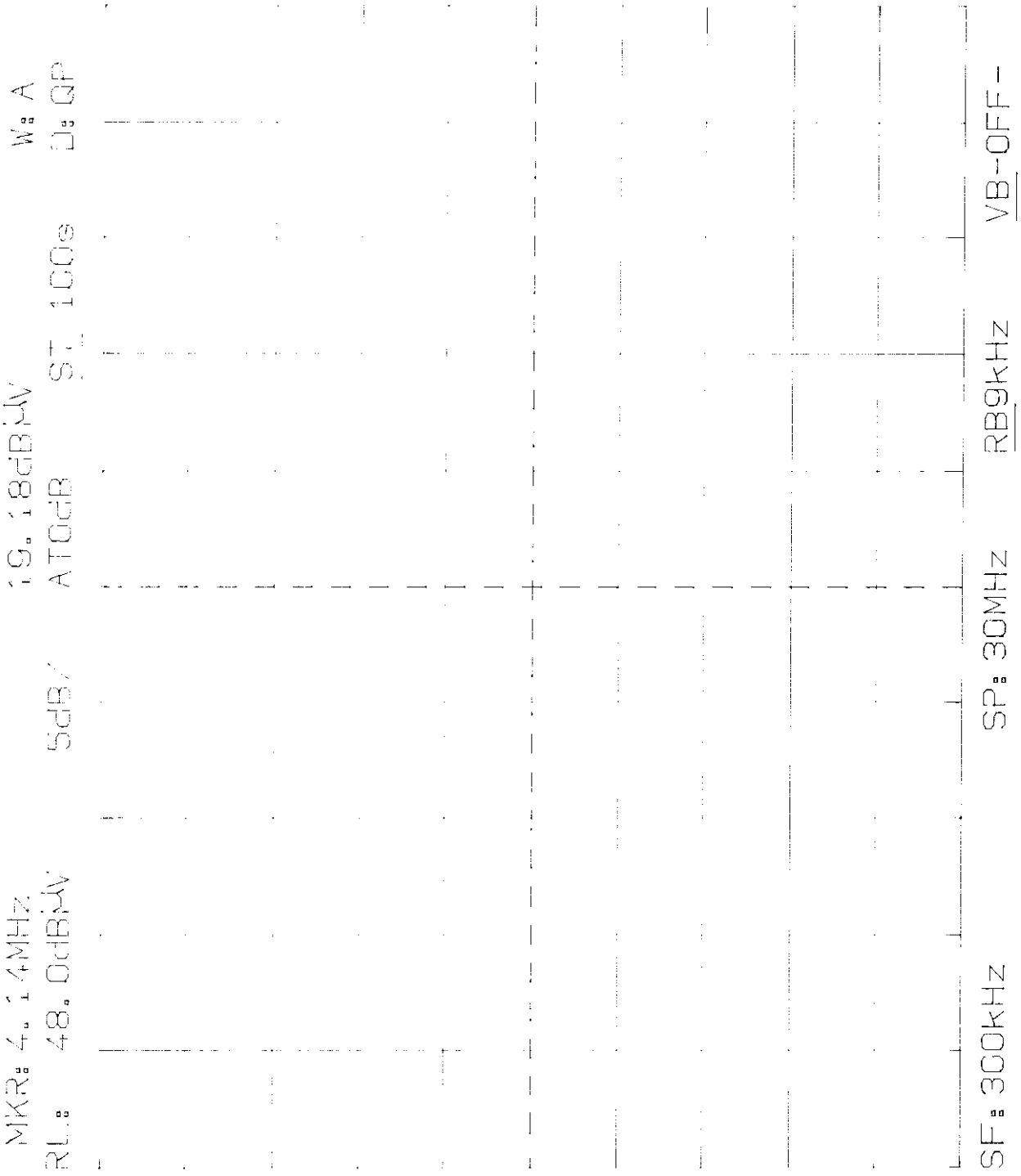
The base station was connected to a simulated 9,000 foot phone line and 48 VDC was applied. The 9,000 foot phone line network was grounded to the nearest AC outlet with a test lead.

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.

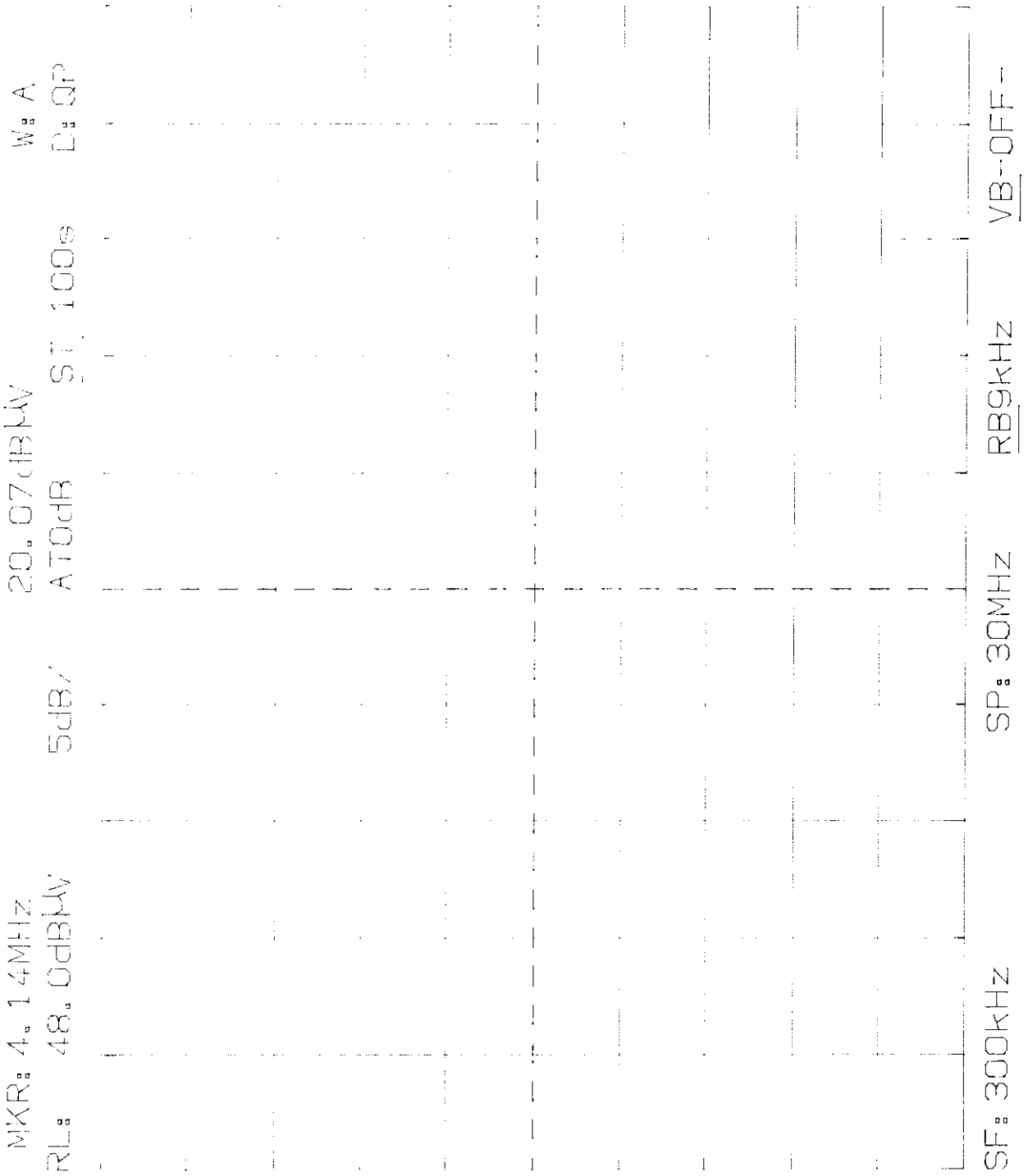
The base station was tested in all modes of operation which were applicable to the specific equipment under test. This included operating modes such as "calling/paging", quiescent or receive mode and standard telephone/transmit operation in both the 43/44 MHz and the 46 MHz bands.

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 2-9750(XXXX)
SIDE: A - OFF HOOK



POWER LINE CONDUCTED EMISSIONS
MODEL 2-9750(XXXX)
SIDE: B - OFF HOOK



TRANSMITTER ENVIRONMENTAL TESTS

FREQUENCY TOLERANCE OF CARRIER

MINIMUM PERFORMANCE STANDARD: The stability of the carrier frequency shall be maintained within +0.01 percent over a range of:

a) Temperature from -20 to +50 degrees Celsius at normal supply voltage;
b) Voltages that vary from 85 percent to 115 percent of the rated supply voltage at a temperature of +20 degrees Celsius.

TEST RESULTS:

Channel 1:

Handset: The largest deviation from the authorized carrier frequency of 48,760,000 Hz was +1790 Hz ±10Hz at -20 degrees Celsius and 3.6VDC. The test limit is ±4876 Hz.

Base Station: The largest deviation from the authorized carrier frequency of 43,720,000 Hz was -1054 Hz ±10Hz at -20 degrees Celsius and 120 VAC. This was within the ±4372 Hz limit.

Channel 25:

Handset: The largest deviation from the authorized carrier frequency of 49,970,000 Hz was +1818 Hz ±10Hz at -20 degrees Celsius and 3.6VDC. The test limit is ±4997 Hz.

Base Station: The largest deviation from the authorized carrier frequency of 46,970,000 Hz was +1295 Hz ±10Hz at +50 degrees Celsius and 120VAC. This was within the ±4697 Hz limit.

TEST CONDITIONS:

Supply Voltages:	85%, 100% and 115% of 120VAC, ±2% and 3.6VDC
Stabilization Time:	60 minutes
Temperature:	-20, -10, 0, +10, +20, +30, +40 and +50, ±3 degrees Celsius
Modulation:	Both transmitters were unmodulated.

METHOD OF MEASUREMENT:

Both the base and handset components were placed individually in a thermal chamber. The frequency was monitored by a spectrum analyzer and recorded at 1 minute intervals.

The base station was powered from a variable AC transformer. The internal battery was used for handset power. The antennae of both transmitters were replaced with short lengths of miniature 50Ω cable fitted with BNC connectors, for shielded connections to the frequency counter.

At +20 degrees Celsius, after the chamber had stabilized for at least 60 minutes and the samples had been turned off for 15 minutes, the transmitters were operated continuously for 5 minutes at each voltage condition. At the temperature extremes, each transmitter was operated for 5 minutes following stabilization. The frequencies were recorded at 1 minute intervals. The temperature was monitored by a thermocouple on the enclosure.

ENVIRONMENTAL TEST RESULTS FCC 15

CHANNEL 1

	BASE		HANDSET
+50°C	120V		3.6V
	43720596		48759896
	43720628		48759839
	43720682		49759807
	43720715		49759717
	43720745		49759656
+40°C	120V		3.6V
	43720356		48760168
	43720404		48760130
	43720438		48760051
	43720502		48760004
	43720532		48759931
+30°C	120V		3.6V
	43720140		48760506
	43720187		48760387
	43720261		48760340
	43720288		48760258
	43720339		48760224

+20°C	102V	120V	138V	3.6V
	43720033	43720044	43720044	48760632
	43720036	43720045	43720046	48760631
	43720034	43720044	43720045	48760639
	43720037	43720047	43720042	48760634
	43720035	43720047	43720046	48760644

+10°C	120V		3.6V
	43719789		48760828
	43719697		48760897
	43719653		48760999
	43719602		48761031
	43719552		48761128

0°C	120V	3.6V
	43719487	48761198
	43719455	48761267
	43719435	48761275
	43719427	48761318
	43719386	48761351

-10°C	120V	3.6V
	43719383	48761389
	43719363	48761401
	43719354	48761428
	43719338	48761444
	43719328	48761480

-20°C	120V	3.6V
	43718992	48761758
	43718988	48761763
	43718966	48761777
	43718959	48761781
	43718946	48761790

MODEL NO.:	2-9750(XXXX)
DATE:	May 1, 1998
BASE FREQ:	**43,720,000 Hz**
HANDSET FREQ:	**48,760,000 Hz**

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CHANNEL 25

	BASE		HANDSET
+50°C	120V		3.6V
	46971097		49969532
	46971184		49969508
	46971214		49969490
	46971270		49969484
	46971295		49969456
+40°C	120V		3.6V
	46970504		49970030
	46970548		49969948
	46970611		49969923
	46970659		49969840
	46970753		49969788
+30°C	120V		3.6V
	46970177		49970436
	46970284		49970313
	46970324		49970220
	46970395		49970165
	46970434		46970081

+20°C	102V	120V	138V	3.6V
	46970032	46970011	46970030	49970674
	46970034	46970012	46970032	49970664
	46970032	46970018	46970035	49970656
	46970036	46970020	46970036	49970646
	46970036	46970018	46970036	49970639

+10°C	120V		3.6V
	46969669		49970936
	46969640		49971026
	46969580		49971080
	46969568		49971119
	46969525		49971158

0°C	120V	3.6V
	46969514	49971197
	46969474	49971243
	46969441	49971322
	46969420	49971350
	46969391	49971372

-10°C	120V	3.6V
	46969298	49971487
	46969250	49971506
	46969223	49971529
	46969188	49971543
	46969152	49971588

-20°C	120V	3.6V
	46968949	49971745
	46968941	49971762
	46968911	49971773
	46968891	49971806
	46968867	49971818

MODEL NO.:	2-9750(XXXX)
DATE:	May 1, 1998
BASE FREQ:	**46,970,000 Hz**
HANDSET FREQ:	**49,970,000 Hz**

CLEAR CHANNEL DETECTION

Test Procedure

Setup the equipment as per figure 1.

Verification of Base Unit Detector

1. Connect the base unit to an AC source and place the handset in the off hook mode and select channel 12.

2. Using the spectrum analyzer verify the base and handset frequencies are on channel 12 using the RX antenna.

3. Put the handset on hook.

4. Set the signal generator to channel 12 modulated at 1KHz dev., approx. 20KHz, to produce approximately -30dBM to -40dBM on the analyzer from the RX antenna when feeding this signal to the TX antenna for several seconds.

5. Turn the handset on and go off hook.

6. Re-measure the base and handset frequencies. They must be other than the initial ones.

7. Busy the resulting frequency and repeat the above steps.

Verification of Handset Unit Detector

1. Connect the base unit to an AC source and place the handset in the off hook mode and select channel 12.

2. Using the spectrum analyzer verify the base and handset frequencies are on channel 12 using the RX antenna.

3. Put the handset on hook.

4. Set the signal generator to channel 12 modulated at 1KHz dev., approx. 20KHz, to produce approximately -30dBM to -40dBM on the analyzer from the RX antenna when feeding this signal to the TX antenna for several seconds.

5. Place the handset off hook.

6. Re-measure the base and handset frequencies. They must be other than the initial ones.

7. Busy the resulting frequency and repeat the above steps.

TESTS RESULTS

Model: 2-9750(XXXX) Date: April 30, 1998

Base Unit Detector

Step 2 - Check initial channel frequencies

44,360,035 Hz Channel 12
Base

Step 6 - Recheck channel frequencies

44,400,038 Hz Channel 13
Base

Step 7 - Recheck channel frequencies

44,460,041 Hz Channel 14
Base

Step 7 - Recheck channel frequencies

44,480,037 Hz Channel 15
Base

Step 7 - Recheck channel frequencies

46,610,041 Hz Channel 16
Base

Results: Satisfactory

Handset Unit Detector

Step 2 - Check initial channel frequencies

49,360,440 Hz Channel 12
Handset

Step 6 - Recheck channel frequencies

49,400,323 Hz Channel 13
Handset

Step 7 - Recheck channel frequencies

49,460,320 Hz Channel 14
Handset

Step 7 - Recheck channel frequencies

49,500,444 Hz Channel 15
Handset

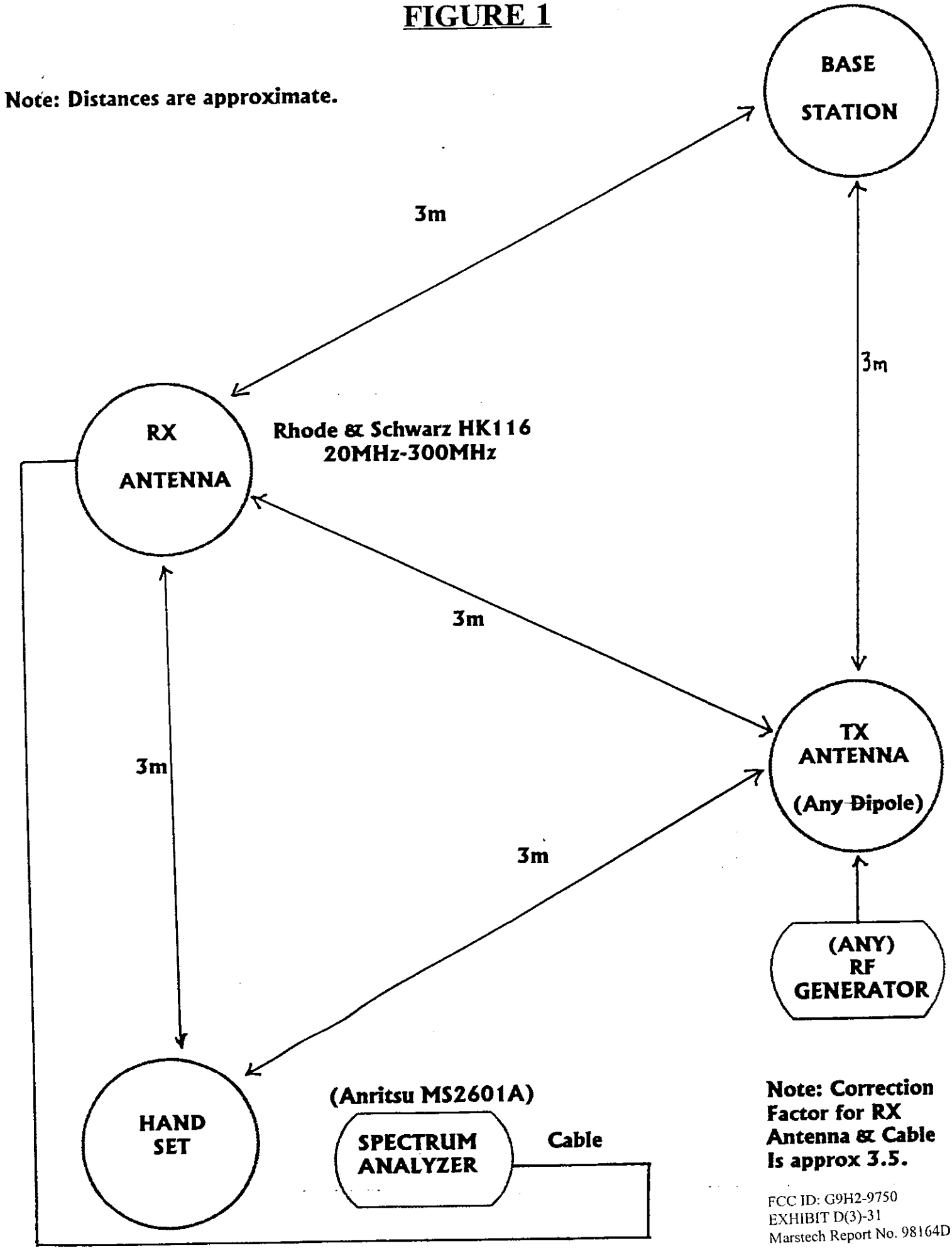
Step 7 - Recheck channel frequencies

49,670,359 Hz Channel 16
Handset

Results: Satisfactory

Technician: Hiran De Silva

FIGURE 1



FCC ID: G9H2-9750
EXHIBIT D(3)-31
Marstech Report No. 98164D

Data and Voice Channels Definition

The communication between handset and base units is defined and handled by two channels. They are data channel and voice channel. There is a chance both voice and data channel using the same channel.

All command codes communicates are through data channel during the data handshake process. This channel generates from security code, that is, different security code has different data channel number. Since the security code changes in a random manner whenever the handset puts onto cradle, the data channel is always random. As soon as the handshake process is completed in the data channel, the system will switched to voice channel. Once the voice channel is established, both base and handset are in talk mode.

Channel Scanning Sequence

During base stand-by mode or channel changing mode, it follows a programmed sequence to search an unoccupied channel.

1→5→9→13→17→21→25→2→6→10→14→18→22→3→7→11→15→19→2
3→4→8→12→16→20→24

Channel Scanning at Stand-by Mode

When base is first time power up, the voice channel is set to CH1. The signal strength detection circuit is designed in base unit such that the MCU scan every channel in order to search for idle channel for voice communication and then store each channel information to separate register. To make sure the data code receive more frequently at stand-by mode, the idle channel and data code scan will be alternated as following sequence:

CH1→Data CH→CH5→Data CH→CH9→.....→CH20→Data CH→CH24.....

Since each channel uses 150ms to identify the occupation, the total time to take one cycle is equal to 7.5sec.

Whenever the base unit power up all channel register is set to 4. If a channel find that no carrier exist, then it will add minus one to it own register. The minimum value of a register is equal to zero. If a channel is occupied, then it will plus one to it own register. The maximum value of a register is equal to eight.

The threshold value of channel register is 4. The definition is that if it is equal to or less than 4 then this channel is classified as no jamming. If it is greater than 4, then this channel is being jammed.

As a result, the maximum time to make a channel from jammed to not jam is 30 sec. when channel register is 8. The minimum time to make a channel to become jammed is 37.5sec when channel register is 0.

During Handset Talk On Request Period

After handset and base handshake all information at data channel including ID code, ring command or talk on request command. base MCU will make a decision about which channel for voice communication (i.e. voice channel). At that moment, base MCU will firstly look for the value inside last voice channel register. If it is classified as not jammed channel, base then send an acknowledge code to handset and both side will be linked at that voice channel. Even though this voice channel may really be jammed by other signal because the channel register is still less than or equal to 4.

If voice channel is classified as jammed channel (even this voice channel haven't any jamming signal because the channel register is still greater than 4), it will look for current channel plus 4 (e.g. current channel = 7, then next channel is 11). If it is classified as non-jamming channel, then it becomes the voice channel, otherwise, it look for next channel (i.e. CH15 according to above example) and so on. Until all channels are jammed, it will be enforced last channel as voice channel.

Change Channel During Handset Talk Mode

Handset sends "channel change" command code to base with information of next channel number. (e.g. current channel is 7, next channel is 11) Base receives the "channel change" command code and then change to that specified channel. After the handshaking of the "channel change" command is completed, the handset will switch to that next channel. So, both base and handset are locking to the same next channel.

Then the handset sends an "ACK" command to base. If the handshaking of this command is completed, the handset and base will stay in this new channel. If not completed, the handset will return to the previous channel.

If the next channel is not ready, the handset will poll another next channel as the sequence defined on above. For example, it will poll in a sequence from 7, 11, 15 ....., If all channel are blocked, then both handset and base will stay back on current channel.

End

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