# FCC PART 15 Subpart C

# EMI MEASUREMENT AND TEST REPORT

FOR

# TECOM CO., LTD.

No. 23, R & D Rd. 2, Science-Based Industrial Park,
Hsin-Chu, Taiwan, R. O. C.

**FCC ID: D6XMA1660**

July 25, 2000

| **This Report Concerns:** | **Equipment Type:** |
|---|---|
| ☒ Original Report | Multiple -Handset Cordless Phone – Household Appliances |

| | |
|---|---|
| **Test Engineer:** | Edward Yan |
| **Test Date:** | July 18, 2000 |
| **Reviewed By:** | John Y. Chan – Engineering Manager |
| **Prepared By:** | Bay Area Compliance Laboratory Corporation<br>230 Commercial Street, Suite 2<br>Sunnyvale, CA 94086<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

## TABLE OF CONTENTS

# 1 - GENERAL INFORMATION

## 1.1 Product Description for Equipment Under Test (EUT)

Tecom Co., Ltd. model *MA1660* or the "EUT" as referred to in this report is a 2.4 GHz Multiple - Handset Cordless Phone. The EUT was composed of two parts, one is a Handset which measured 7.0” L x 2.0” W x 1.25”H, and the other is a Base which measures 3.5”L x 3.0”W x 2.0”H.

The system provides many features such as:

1. 2 CO line Capacity (MHS-5 only with 1CO line capacity)
2. 12*2 LCD with icons
3. Directory (80 Numbers and name)
4. Intercom calling
5. Conference
6. Call Transfer
7. Do Not Disturb (DND)
8. Headset Compatibility
9. Etc.

## 1.2 Objective

This type approval report is prepared on behalf of *TECOM CO., LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Output Power, Antenna Requirement, Hopping Channel Separation, Number of Hopping Frequency Used, Channel Bandwidth, Dwell Time on Each Channel, Band Edge, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emission, and Conducted and Radiated Emission.

## 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 | 12/6/00 |
| HP | Spectrum Analyzer | 8593B | 2919A00242 | 12/20/00 |
| HP | Amplifier | 8349B | 2644A02662 | 12/20/00 |
| HP | Quasi-Peak Adapter | 85650A | 917059 | 12/6/00 |
| HP | Amplifier | 8447E | 1937A01046 | 12/6/00 |
| A.H. System | Horn Antenna | SAS0200/571 | 261 | 12/27/00 |
| Com-Power | Log Periodic Antenna | AL-100 | 16005 | 11/2/00 |
| Com-Power | Biconical Antenna | AB-100 | 14012 | 11/2/00 |
| Solar Electronics | LISN | 8012-50-R-24-BNC | 968447 | 12/28/00 |
| Com-Power | LISN | LI-200 | 12208 | 12/20/00 |
| Com-Power | LISN | LI-200 | 12005 | 12/20/00 |
| BACL | Data Entry Software | DES1 | 0001 | 12/20/00 |
| Rohde & Schwarz | Signal Generator | SMIQ03B | 1125.5555.03 | 7/10/2002 |
| Rohde & Schwarz | I/Q Modulation Generator | AMIQ | 1110.2003.02 | 8/10/2002 |

## 1.7 Equipment Under Test (EUT)

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| TECOM CO., LTD. | 2.4GHz Cordless Phone Base | MA1660 | None | D6XMA1660 |

## 1.8 Support Equipment (for Base Only)

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| TELTONE | Line Simulator | TLS-3B-01 | 80071 | N/A |
| STARPLUS | Phone | SP7314-71 | TJ904106 | N/A |

## 1.9 External I/O Cabling

For Base:

| Cable Description | Length (M) | Port/From | To |
|---|---|---|---|
| Unshielded RJ11 Cable x 1 | 3 | EUT | Simulator |
| Unshielded RJ11 Cable x 1 | 3 | simulator | Phone |

# 2 - SYSTEM TEST CONFIGURATION

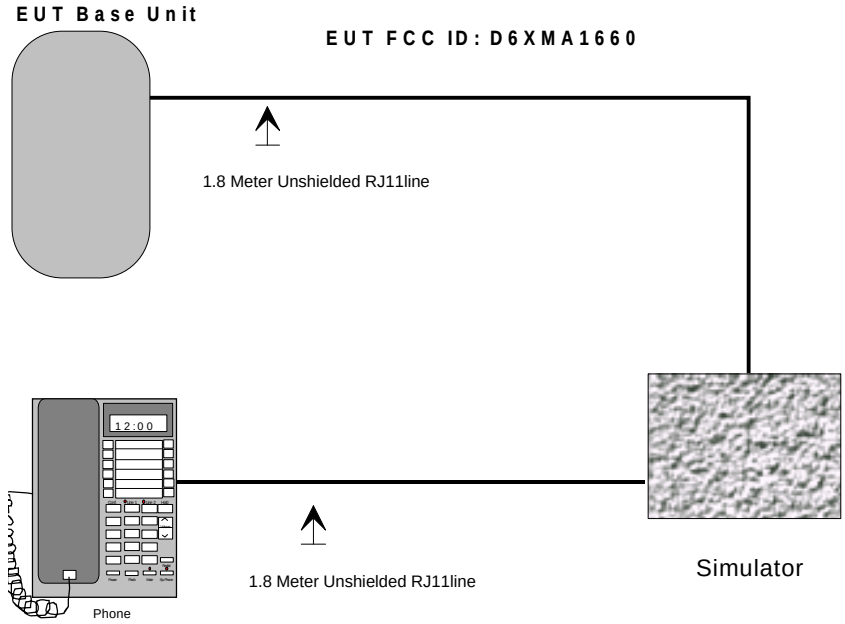
## 2.1 Description of Test Configuration

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

Handset Being tested: The Multiple -Handset Cordless Phone – Handset, Model MA1660 (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.

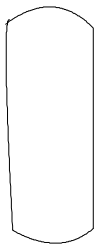
Base being tested: The Multiple -Handset Cordless Phone – Base, Model MA1660 (EUT) was placed on the wooden table. The Low, middle, and high channels were tested. The base was connected to the line simulator and an AC adapter via its Tel Line and power ports, respectively. The base was transmitting and receiving from the 2.4 GHz 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)



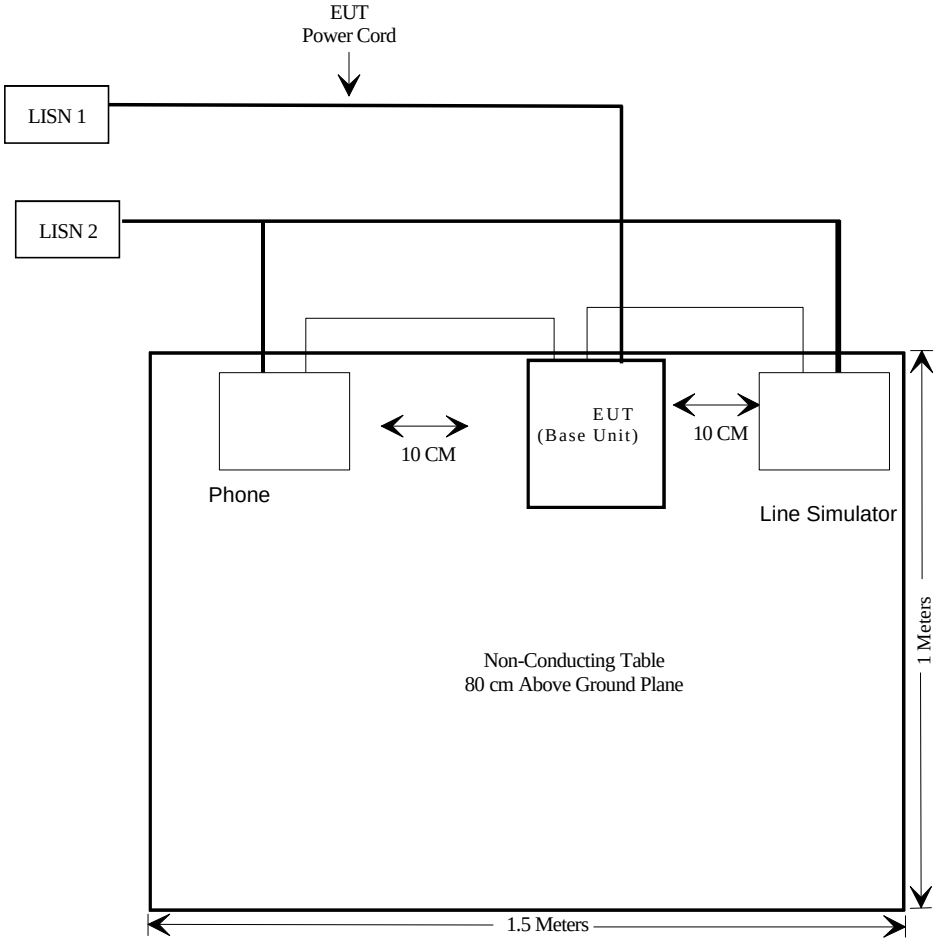
## 2.3 Configuration of Test System (Handset Unit)

EUT Handset

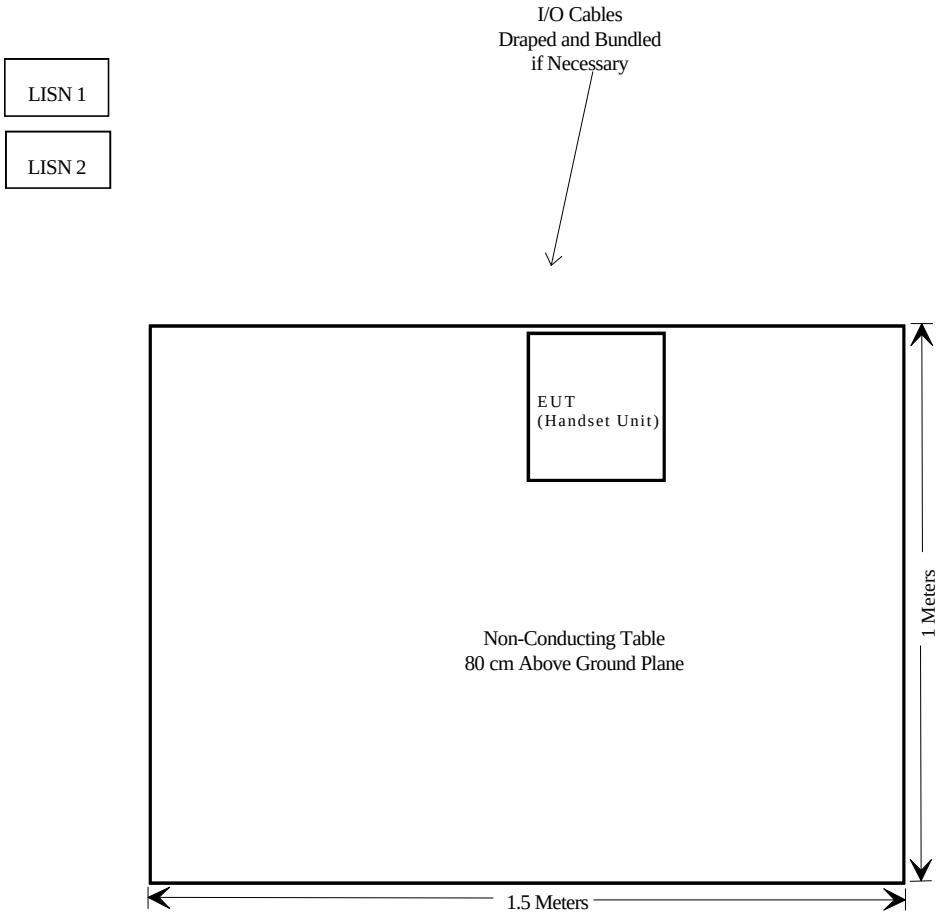


**EUT: D6XMA1660**

## 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 - SUMMARY OF TEST RESULTS

| FCC RULE | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| §15.107 (a) | Conducted Emission | Pass |
| §15.109 (a) | Radiated Emission | Pass |
| §15.203 | Antenna Requirement | Pass |
| §15.247 (a) (1) | Hopping Channel Separation | Pass |
| §15.247 (a) (1) (ii) | Number of Hopping Frequencies Used | Pass |
| §15.247 (a) (1) (ii) | Hopping Channel Bandwidth | Pass |
| §15.247 (a) (1) (ii) | Dwell Time of Each Frequency within a 30 Second Period | Pass |
| §15.247 (b) | Output Power | Pass |
| § 15.247 © | 100 kHz Bandwidth of Frequency Band Edges | Pass |
| § 2.1091 | RF Safety Requirements | Don't need |

# 4 - OUTPUT POWER MEASUREMENT

## 4.1 Standard Applicable

For direct sequence system, according to §15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in 613 that the directional gain of the antenna exceeds 6dBi.

For direct sequence system, according to §15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in 613 that the directional gain of the antenna exceeds 6dBi.

## 4.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via 8 low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
4. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.
5. Repeat above procedures until all frequencies measured were complete.

### 4.3 Measurement Result

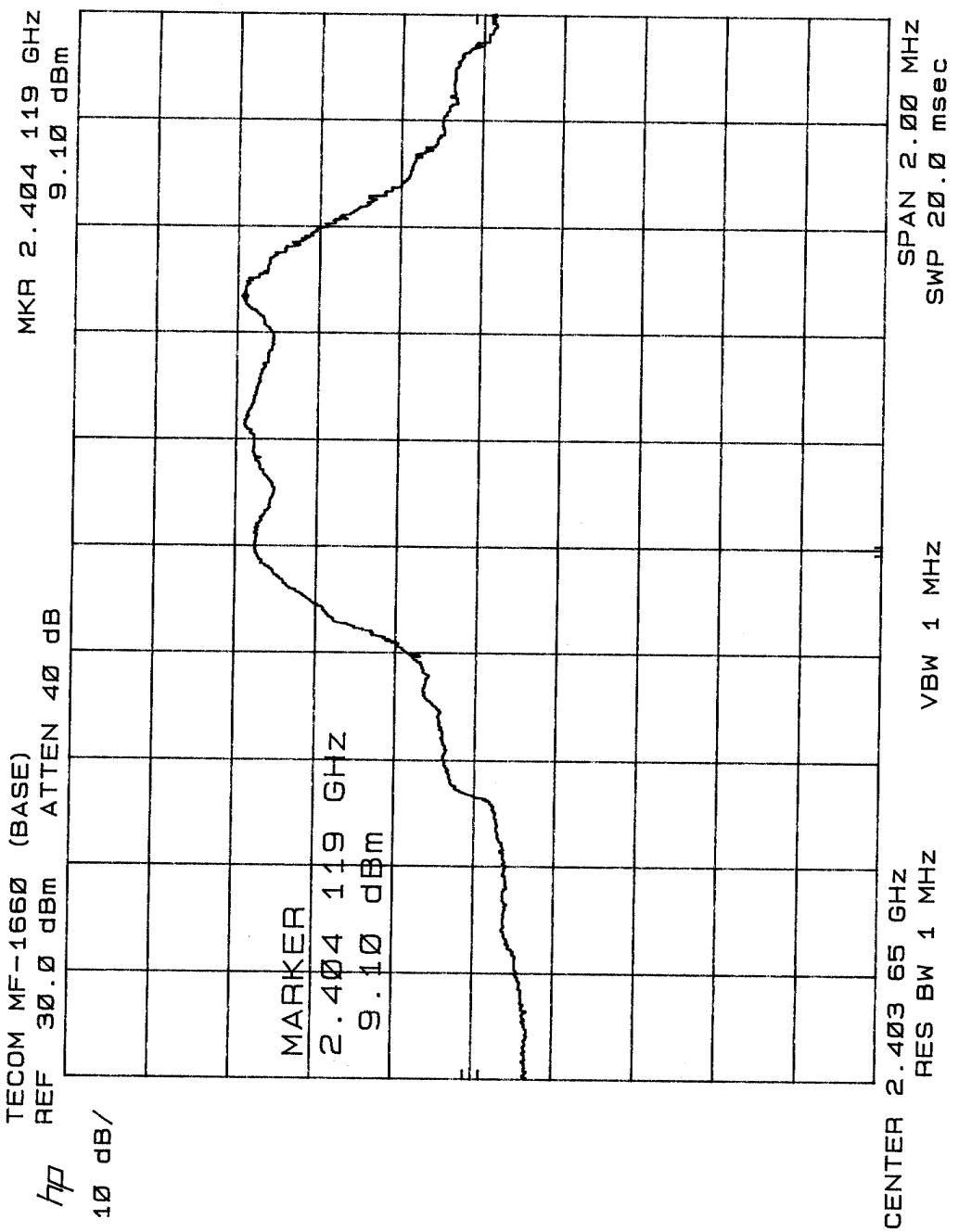
Refer to the attached to the following plots:

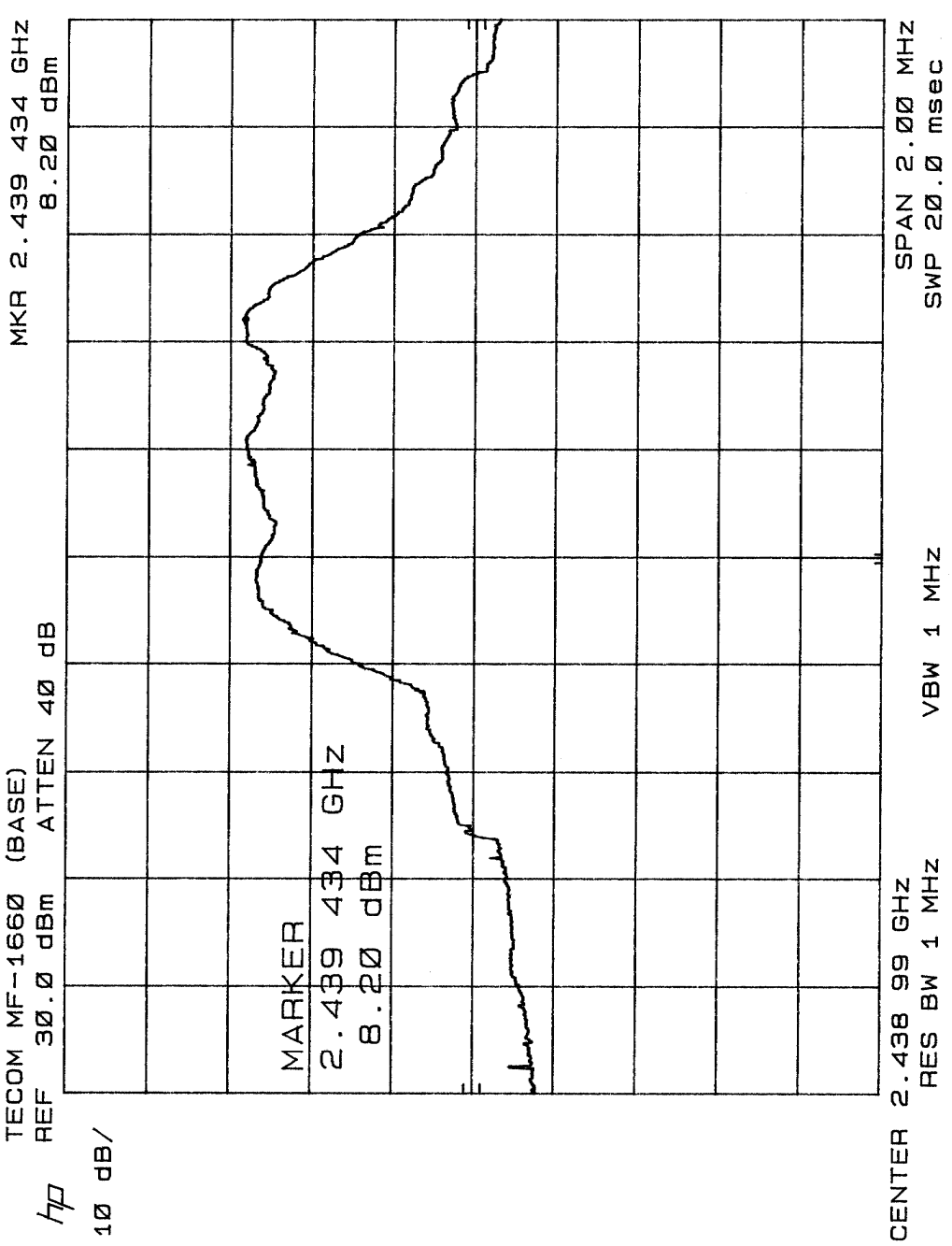
**BASE**

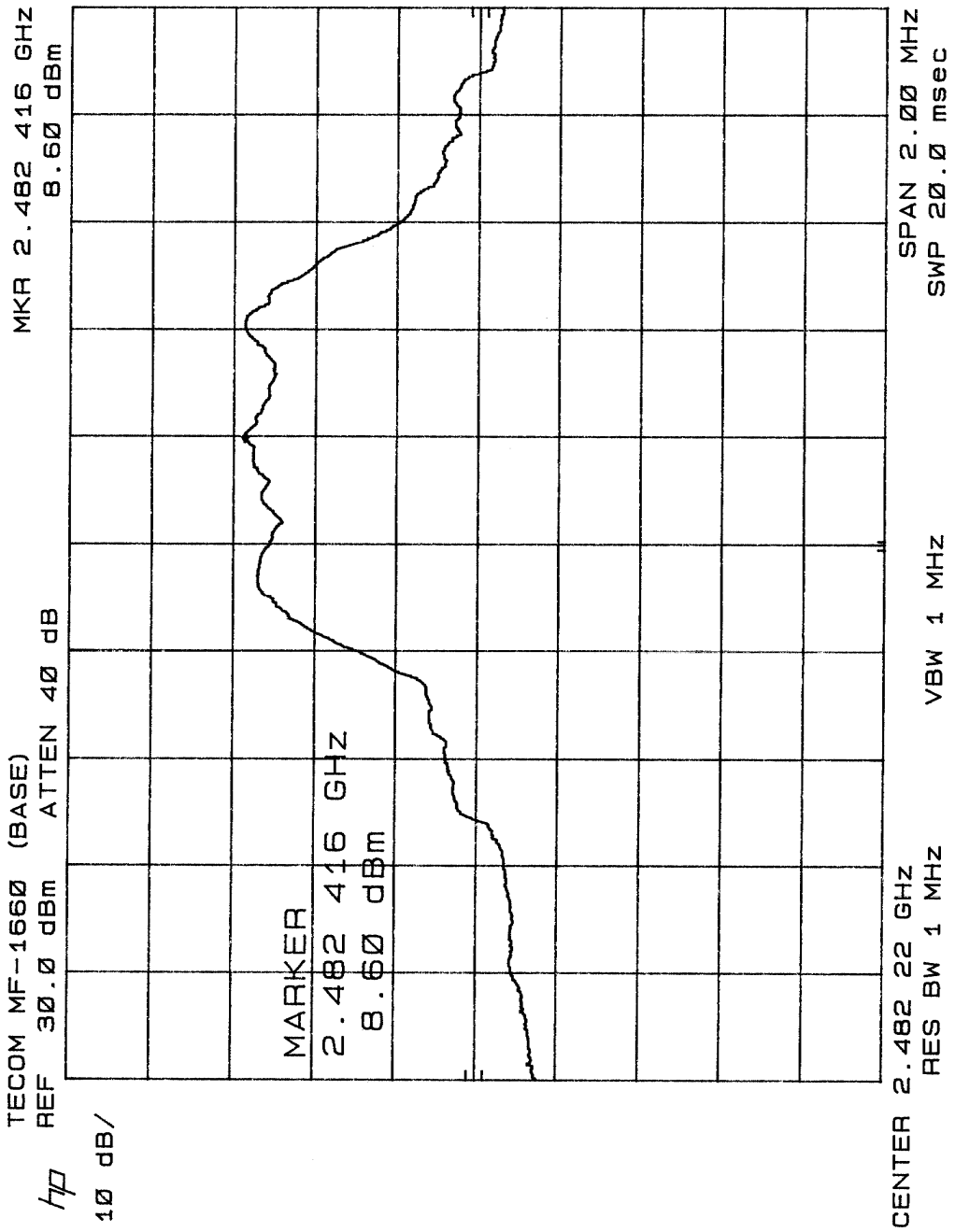
| Peak Output Power | |
|---|---|
| **Low Channel** | Page 16 |
| **Middle Channel** | Page 17 |
| **High Channel** | Page 18 |

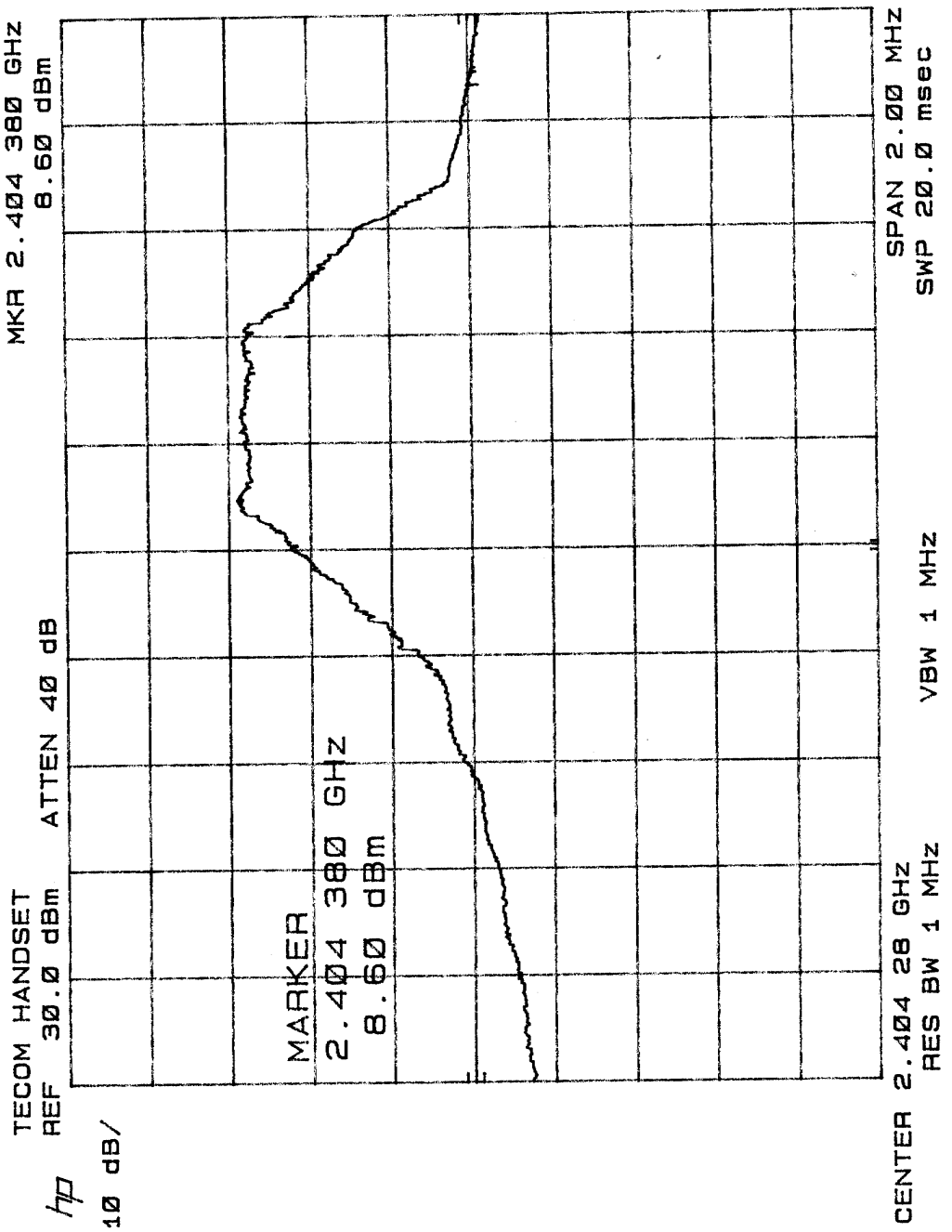
**HANDSET**

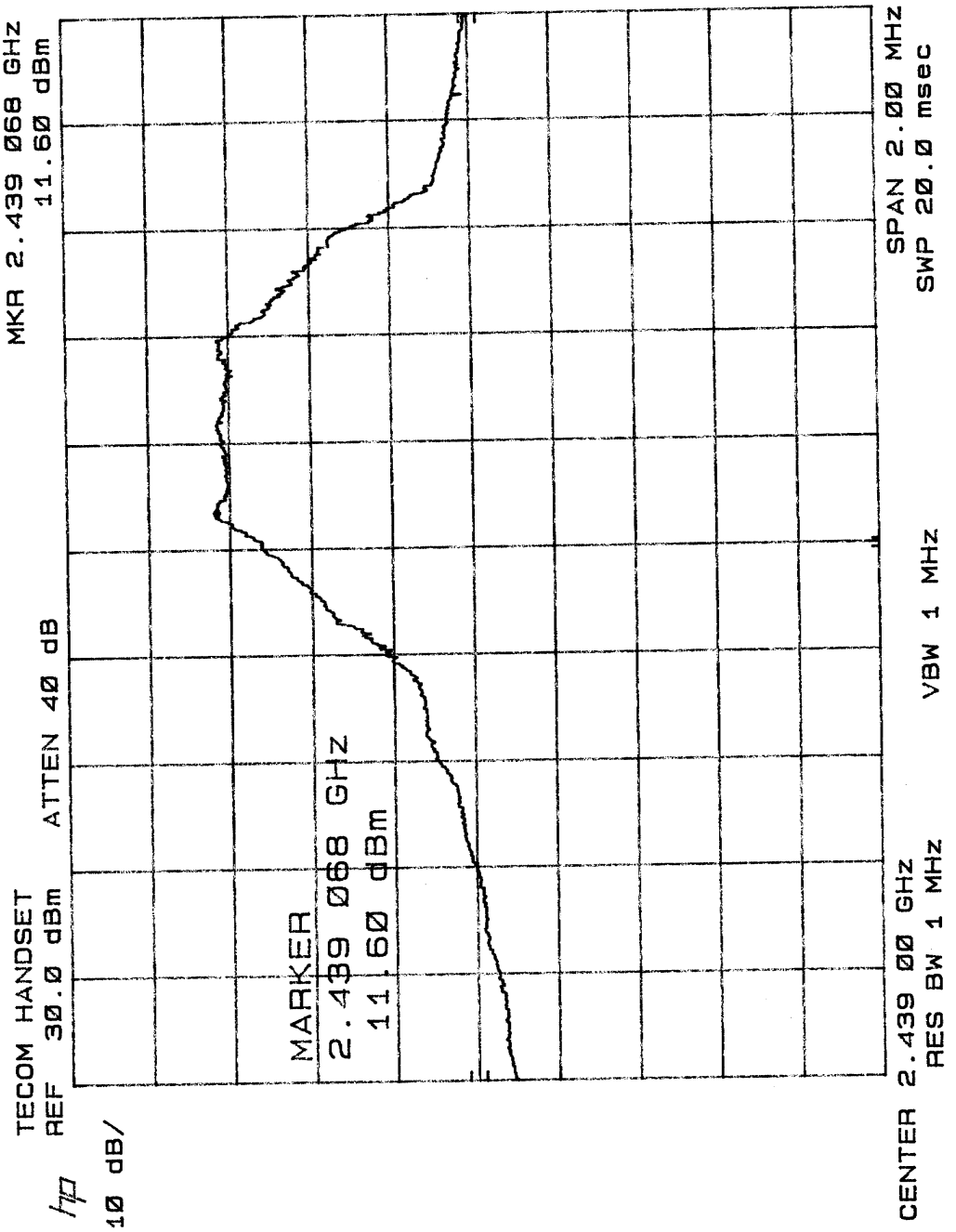
| Peak Output Power | |
|---|---|
| **Low Channel** | Page 19 |
| **Middle Channel** | Page 20 |
| **High Channel** | Page 21 |

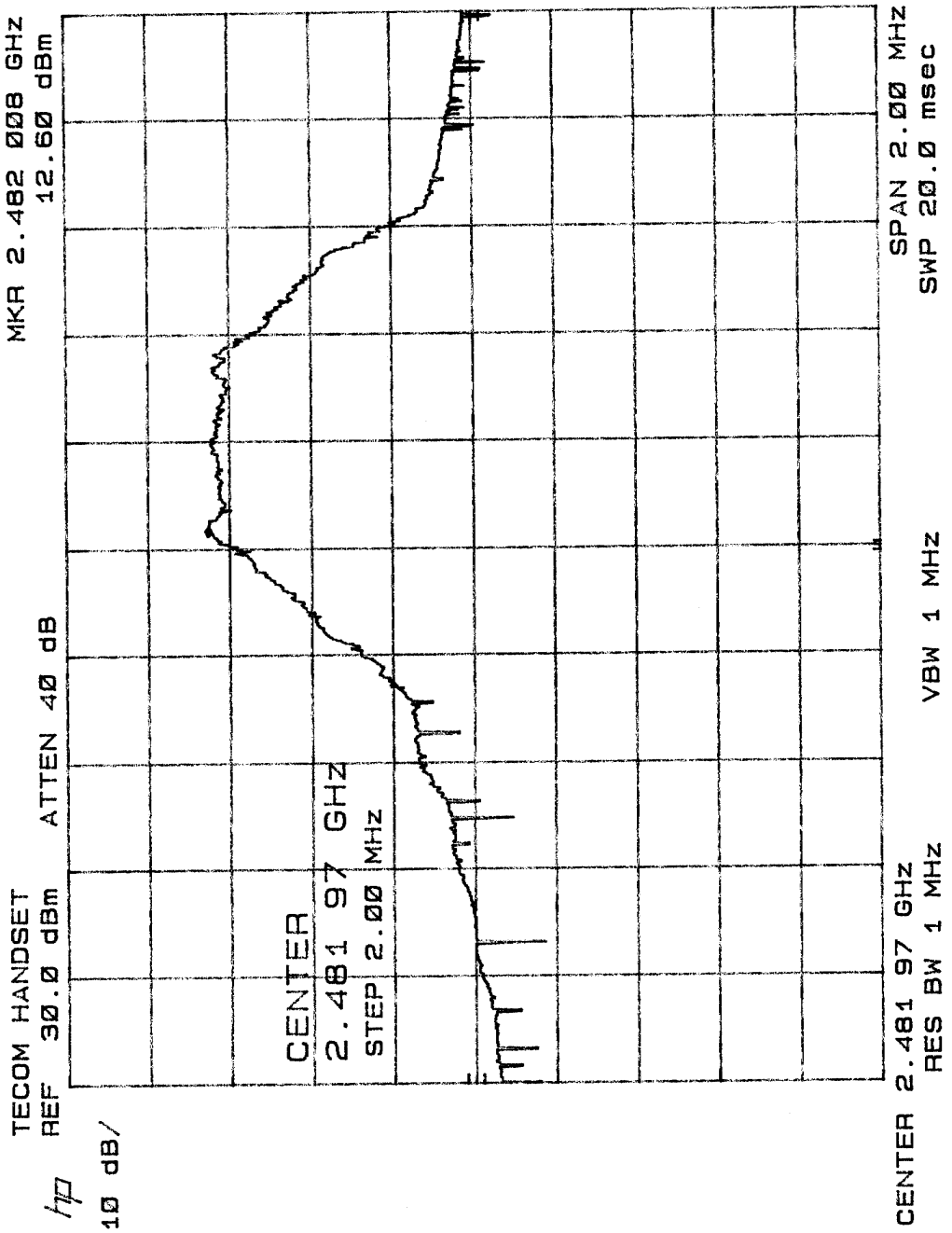

TECOM MF-1660 (BASE)
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MKR 2.404 119 GHz
9.10 dBm
MARKER
2.404 119 GHz
9.10 dBm
CENTER 2.403 65 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


TECOM MF-1660 (BASE)
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MKR 2.439 434 GHz
8.20 dBm
MARKER
2.439 434 GHz
8.20 dBm
CENTER 2.438 99 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


MKR 2.482 416 GHz
8.60 dBm
TECOM MF-1660 (BASE)
REF 30.0 dBm ATTEN 40 dB
10 dB/
MARKER
2.482 416 GHz
8.60 dBm
CENTER 2.482 22 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


TECOM HANDSET
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MKR 2.404 380 GHz
8.60 dBm
MARKER
2.404 380 GHz
8.60 dBm
CENTER 2.404 28 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


MKR 2.439 068 GHz
11.60 dBm
TECOM HANDSET
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
2.439 068 GHz
11.60 dBm
SPAN 2.00 MHz
SWP 20.0 msec
VBW 1 MHz
CENTER 2.439 00 GHz
RES BW 1 MHz


MKR 2.482 008 GHz
12.60 dBm
TECOM HANDSET
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
2.481 97 GHz
STEP 2.00 MHz
SPAN 2.00 MHz
SWP 20.0 msec
VBW 1 MHz
CENTER 2.481 97 GHz
RES BW 1 MHz

# 5 - CHANNEL BANDWIDTH

## 5.1 Standard Applicable

According to §15.247(a)(l )(ii), for frequency hopping system operating in the 2400-2483.5 MHz and *5725-5850* MHz bands, the maximum 20dB bandwidth of the hopping channel is 1MHz.

## 5.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

## 5.3 Measurement Data

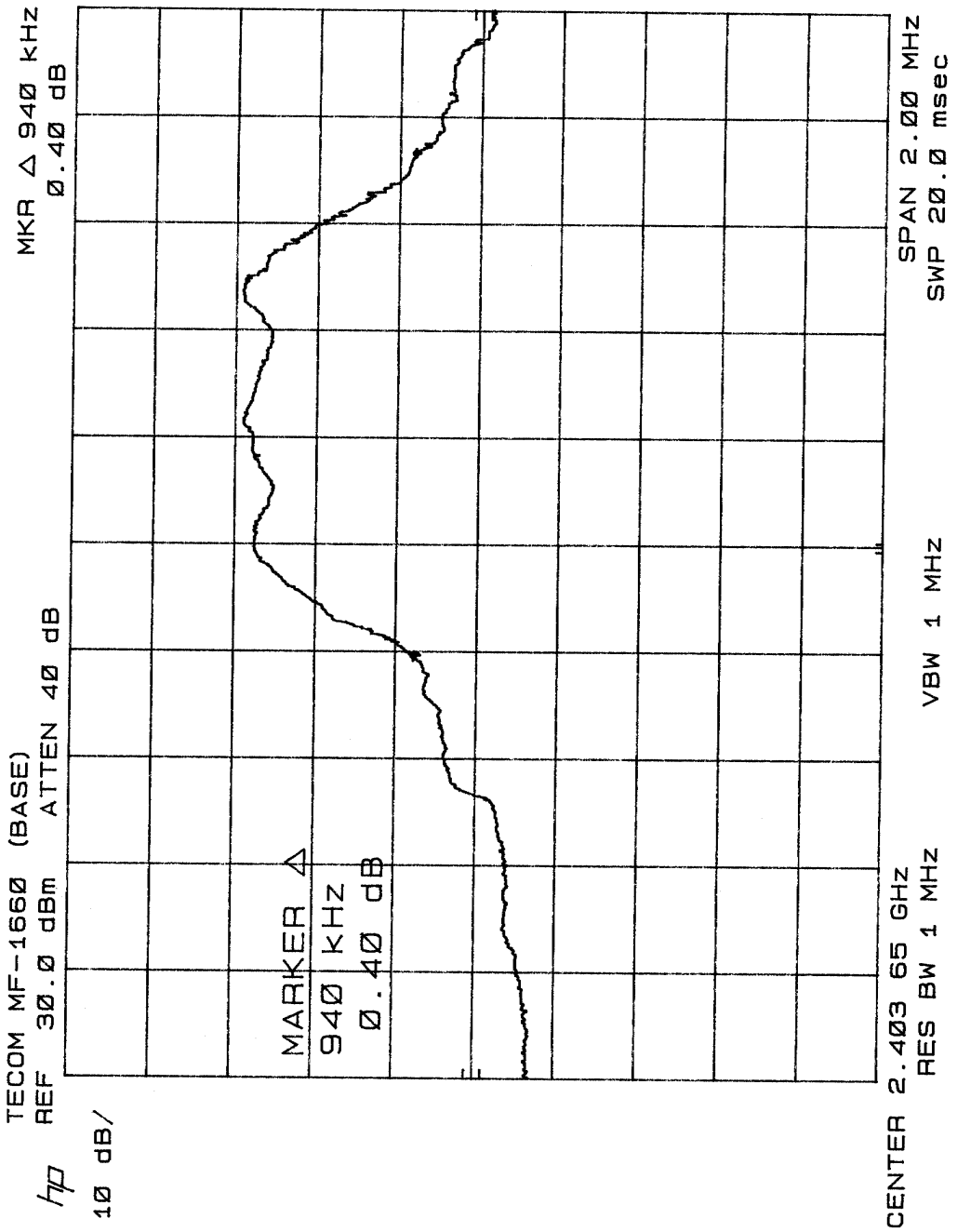
Included are plots of Hopping Channel Bandwidth for low, middle and high channel.

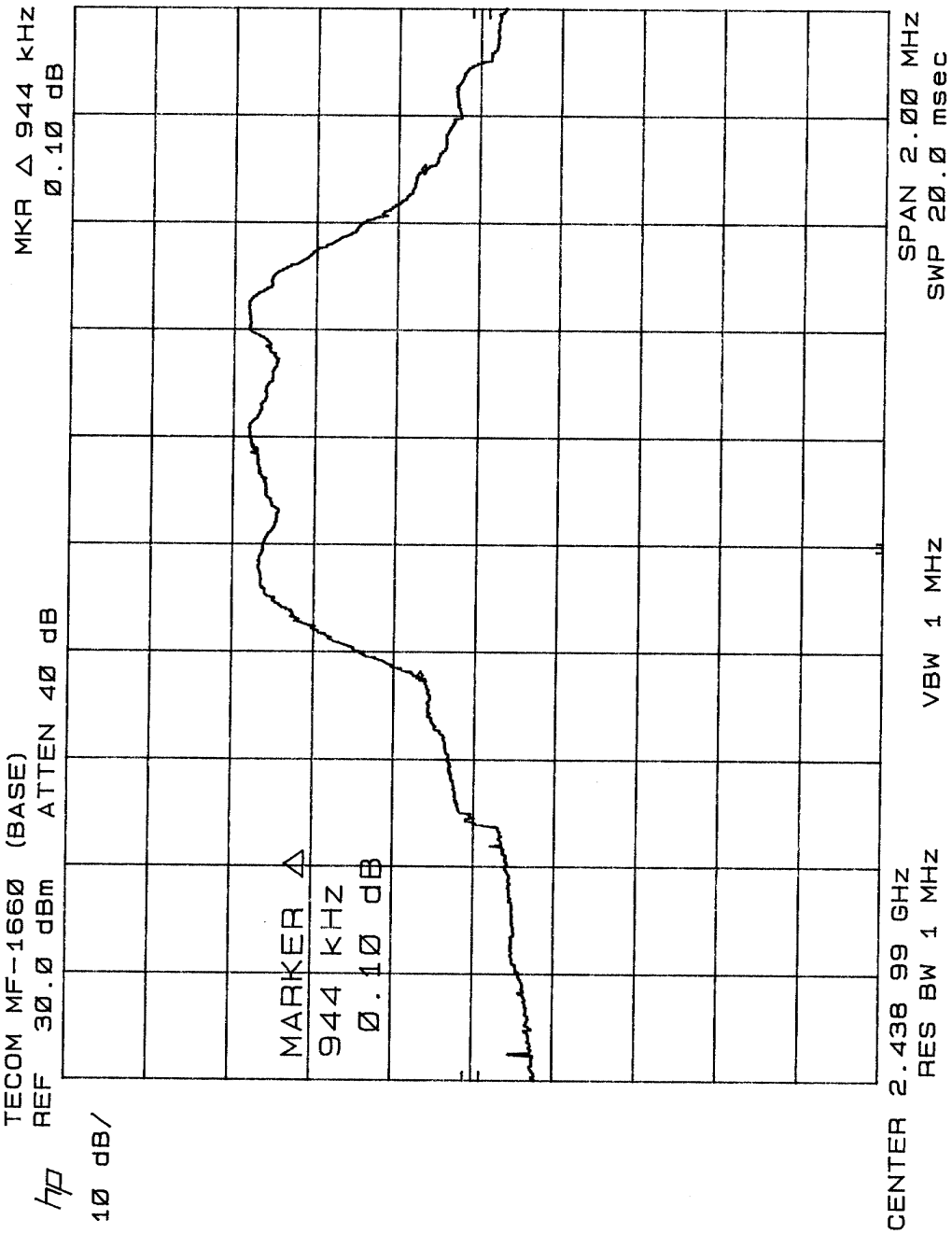
**BASE**

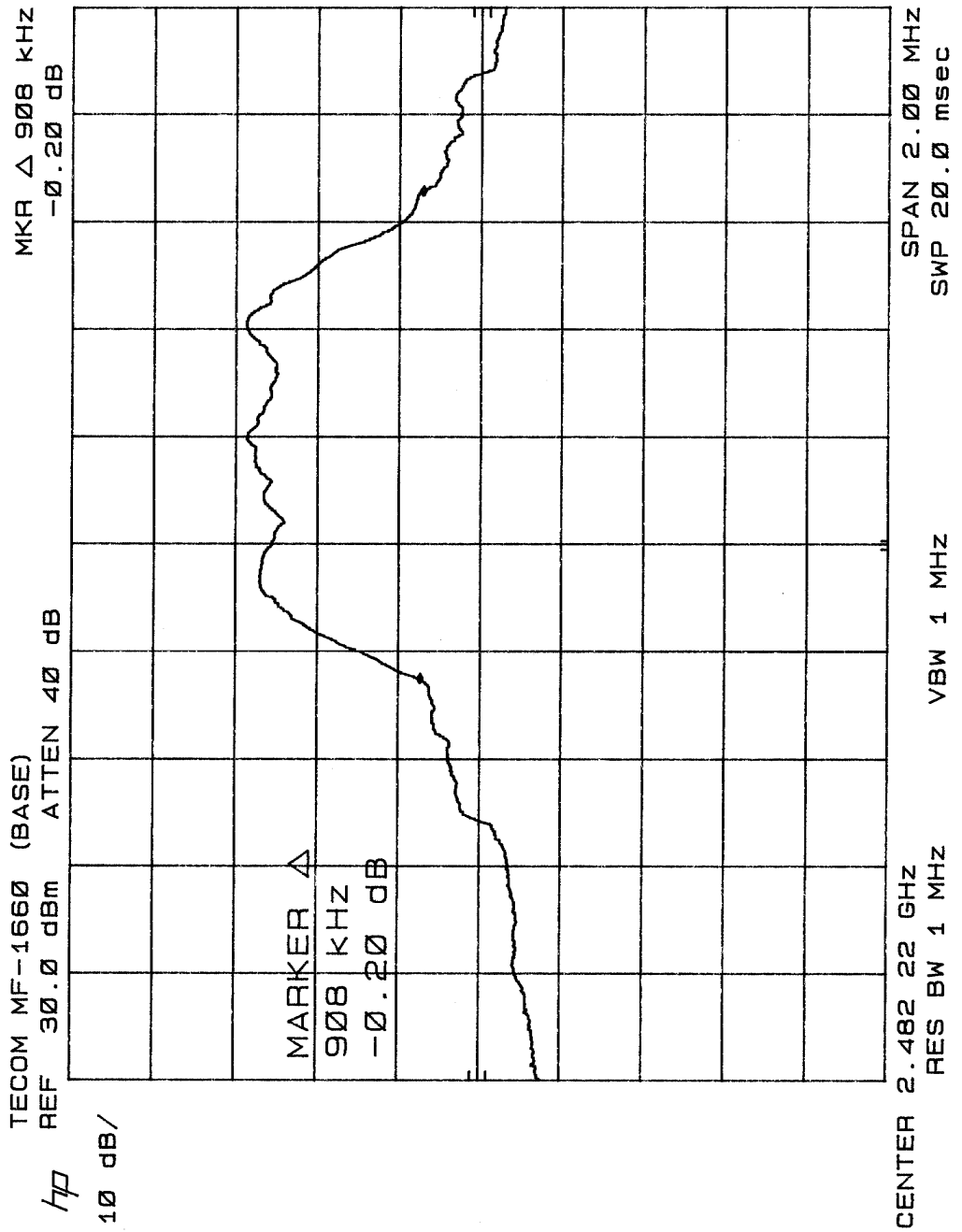
| **Hopping Channel Bandwidth** | |
|---|---|
| **Low Channel** | Page 23 |
| **Middle Channel** | Page 24 |
| **High Channel** | Page 25 |

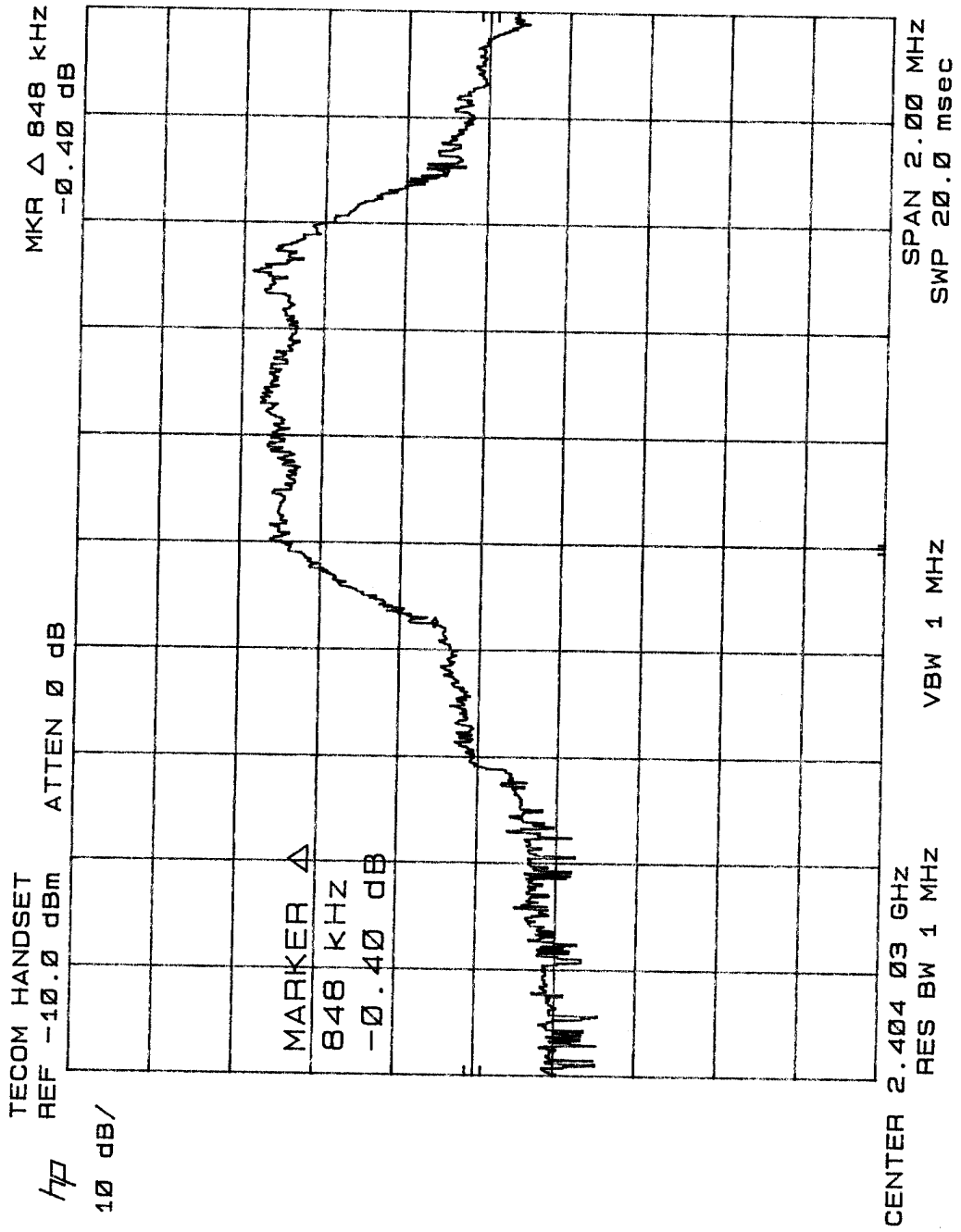
**HANDSET**

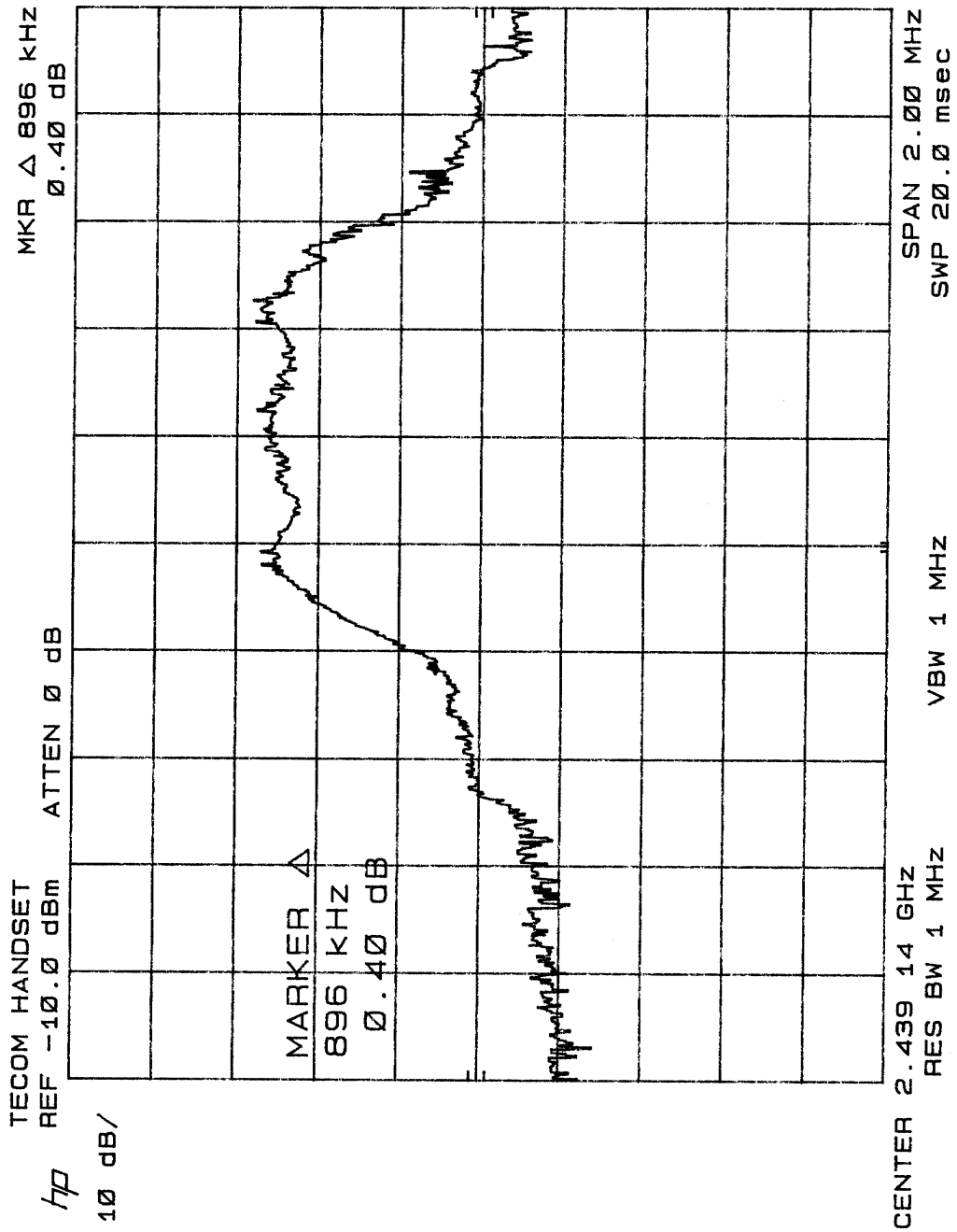
| **Hopping Channel Bandwidth** | |
|---|---|
| **Low Channel** | Page 26 |
| **Middle Channel** | Page 27 |
| **High Channel** | Page 28 |

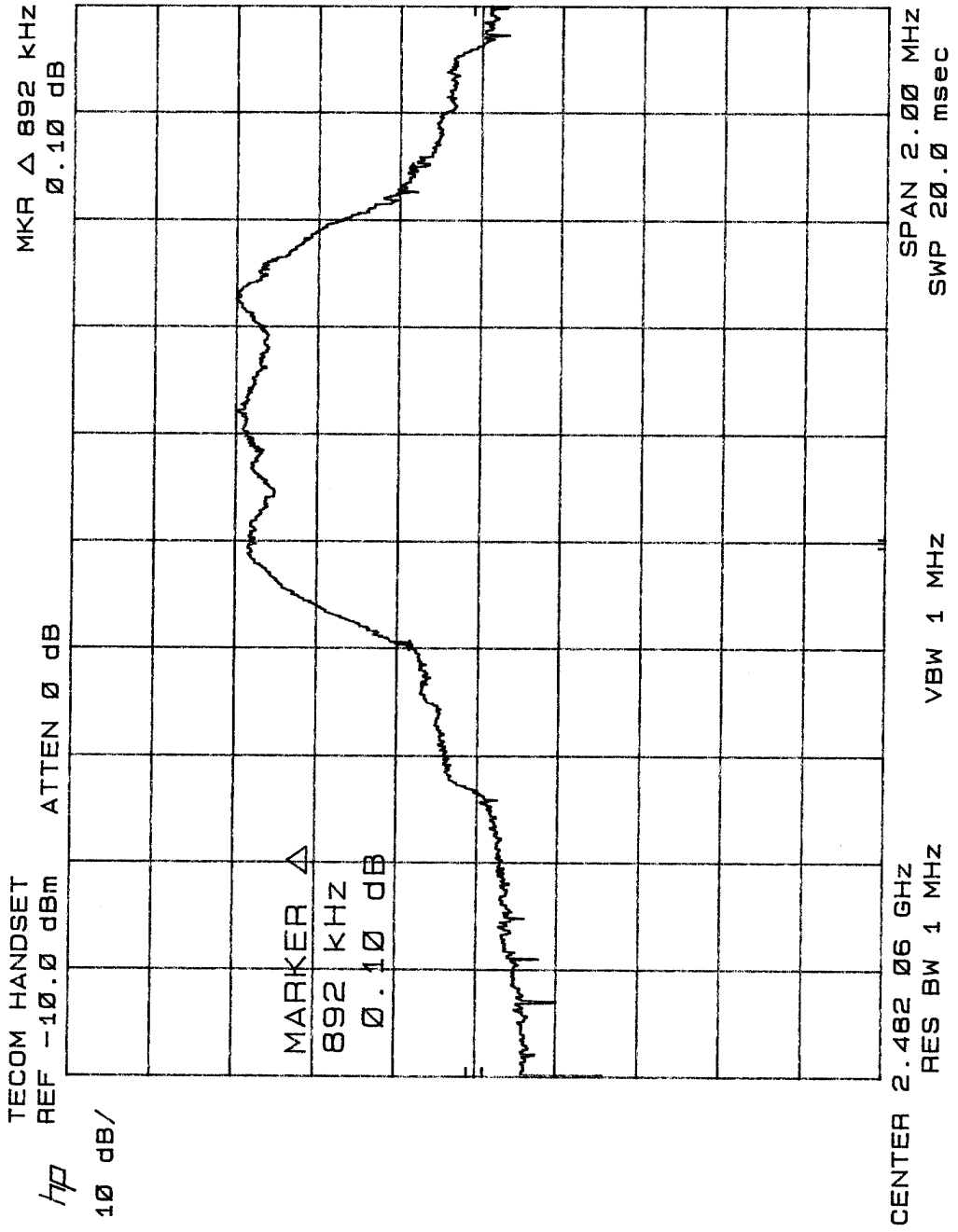

MKR Δ 940 kHz
Ø.40 dB
TECOM MF-1660 (BASE)
REF 30.Ø dBm ATTEN 40 dB
10 dB/
MARKER Δ
940 kHz
Ø.40 dB
SPAN 2.ØØ MHz
SWP 20.Ø msec
VBW 1 MHz
CENTER 2.403 65 GHz
RES BW 1 MHz


TECOM MF-1660 (BASE)
REF 30.0 dBm ATTEN 40 dB
10 dB/
MKR Δ 944 kHz
0.10 dB
MARKER Δ
944 kHz
0.10 dB
CENTER 2.438 99 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


MKR Δ 908 kHz
-0.20 dB
TECOM MF-1660 (BASE)
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER Δ
908 kHz
-0.20 dB
SPAN 2.00 MHz
SWP 20.0 msec
VBW 1 MHz
CENTER 2.482 22 GHz
RES BW 1 MHz


TECOM HANDSET
REF -10.0 dBm
ATTEN 0 dB
10 dB/
MKR Δ 848 kHz
-0.40 dB
MARKER Δ
848 kHz
-0.40 dB
CENTER 2.404 03 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


TECOM HANDSET
REF -10.0 dBm
ATTEN 0 dB
10 dB/
MKR Δ 896 kHz
0.40 dB
MARKER Δ
896 kHz
0.40 dB
CENTER 2.439 14 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec


TECOM HANDSET
REF -10.0 dBm
ATTEN 0 dB
10 dB/
MKR Δ 892 kHz
0.10 dB
MARKER Δ
892 kHz
0.10 dB
CENTER 2.482 06 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 2.00 MHz
SWP 20.0 msec

# 6 - NUMBER OF HOPPING FREQUENCY USED

## 6.1 Standard Applicable

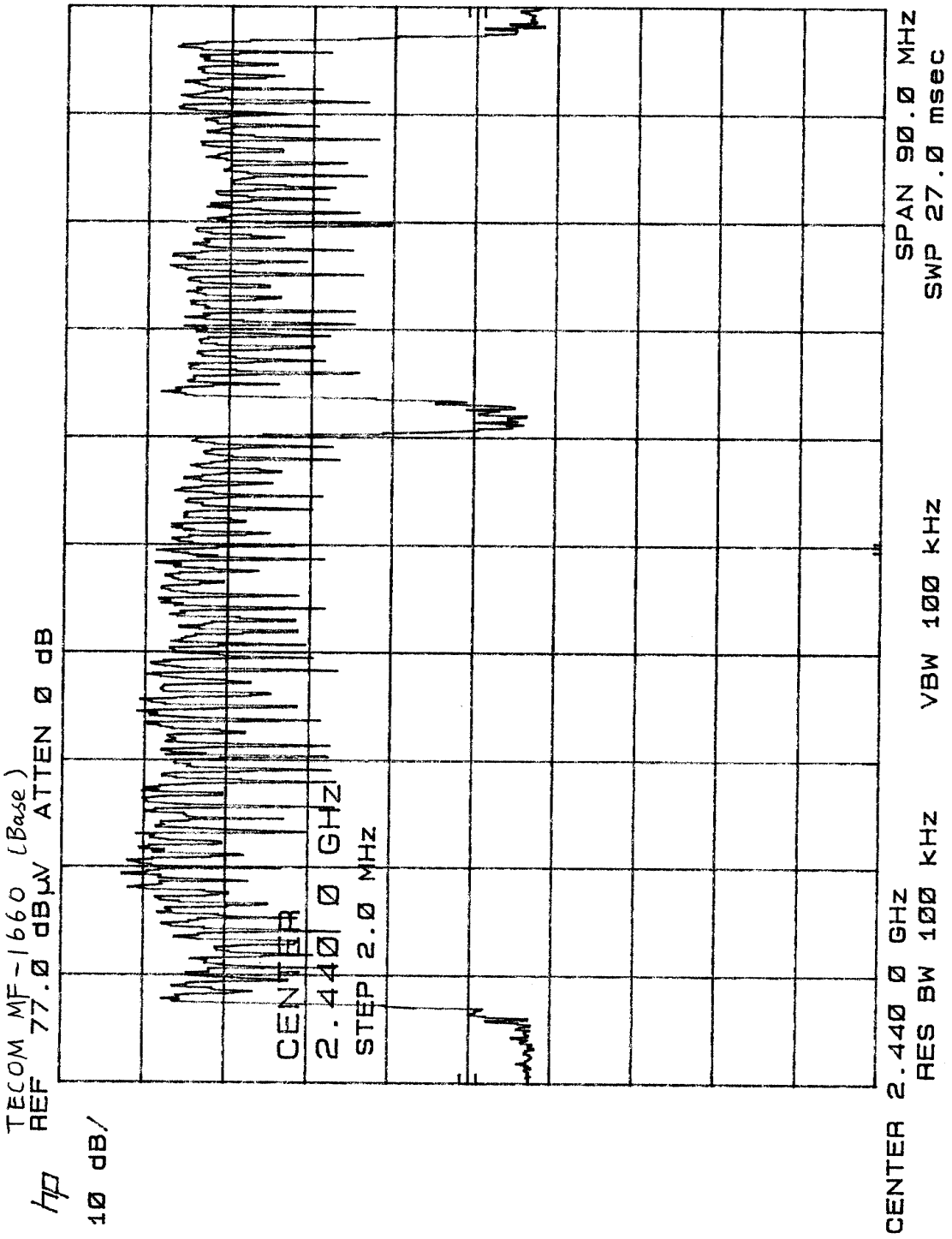
According to §15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and *5725-5850* MHz bands shall use at least 75 hopping frequencies.

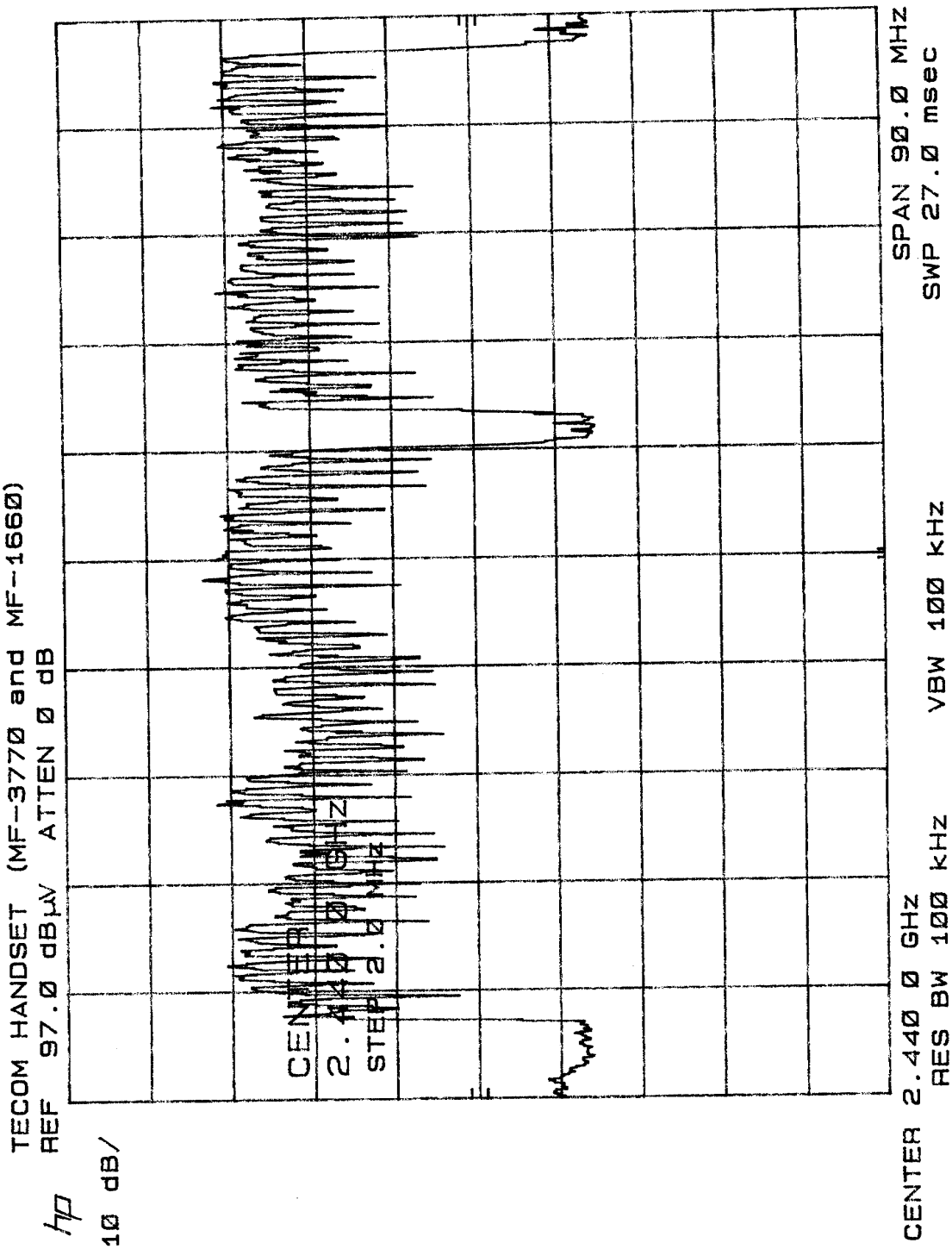
## 6.2 Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

## 6.3 Measurement Procedure

There were 75 hopping frequencies in a hopping sequence.


TECOM MF-1660 (Base)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
CENTER 2.440 0 GHz
STEP 2.0 MHz
CENTER 2.440 0 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 90.0 MHz
SWP 27.0 msec


TECOM HANDSET (MF-3770 and MF-1660)
REF 97.0 dBµV ATTEN 0 dB
10 dB/
CENTER 2.440 0 GHz
STEP 2.0 MHz
SPAN 90.0 MHz
SWP 27.0 msec
VBW 100 kHz
RES BW 100 kHz

# 7 - HOPPING CHANNEL SEPARATION

## 7.1 Standard Applicable

According to §15.247(a)(1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

## 7.2 Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the Max-Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function, and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.

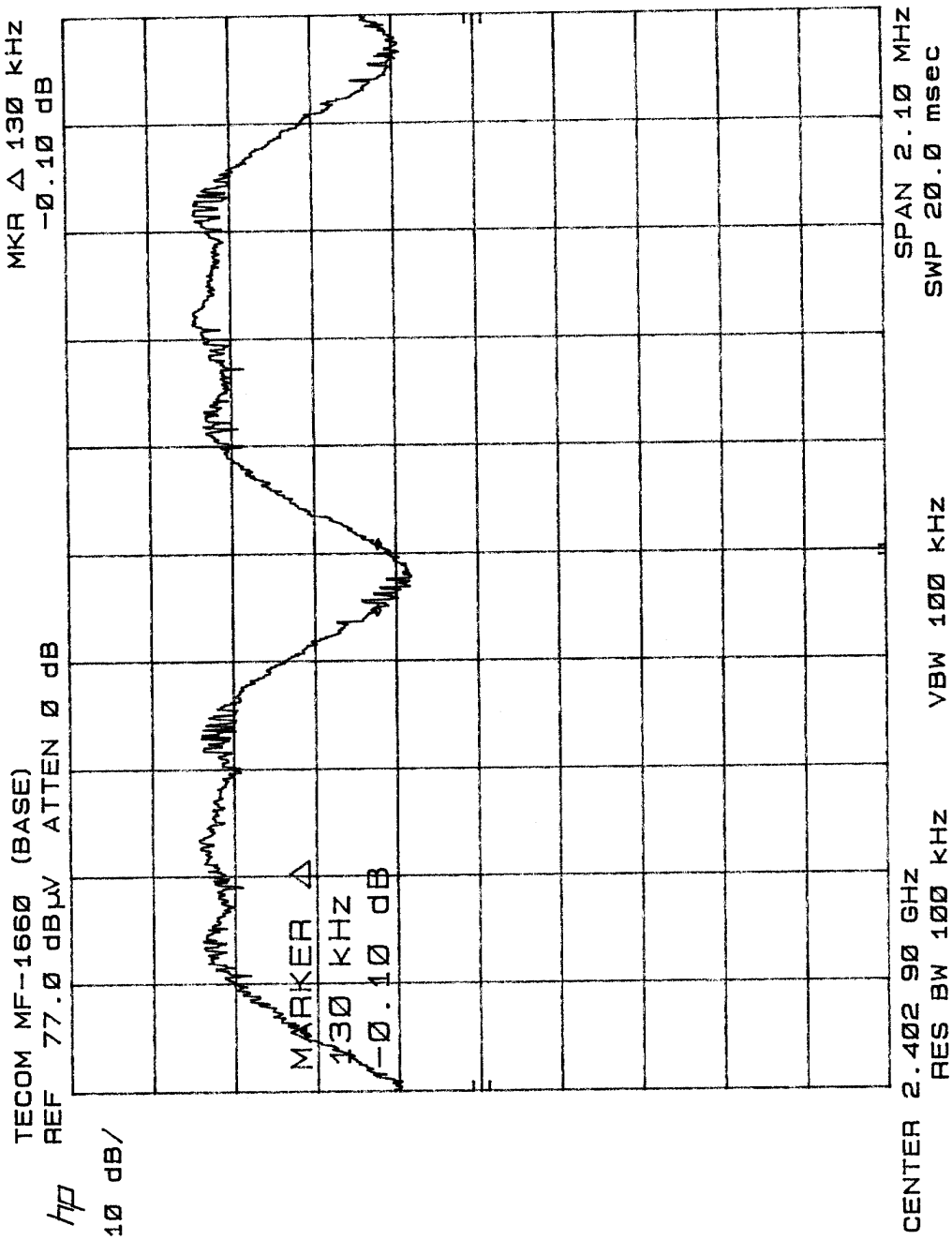
## 7.3 Test Results

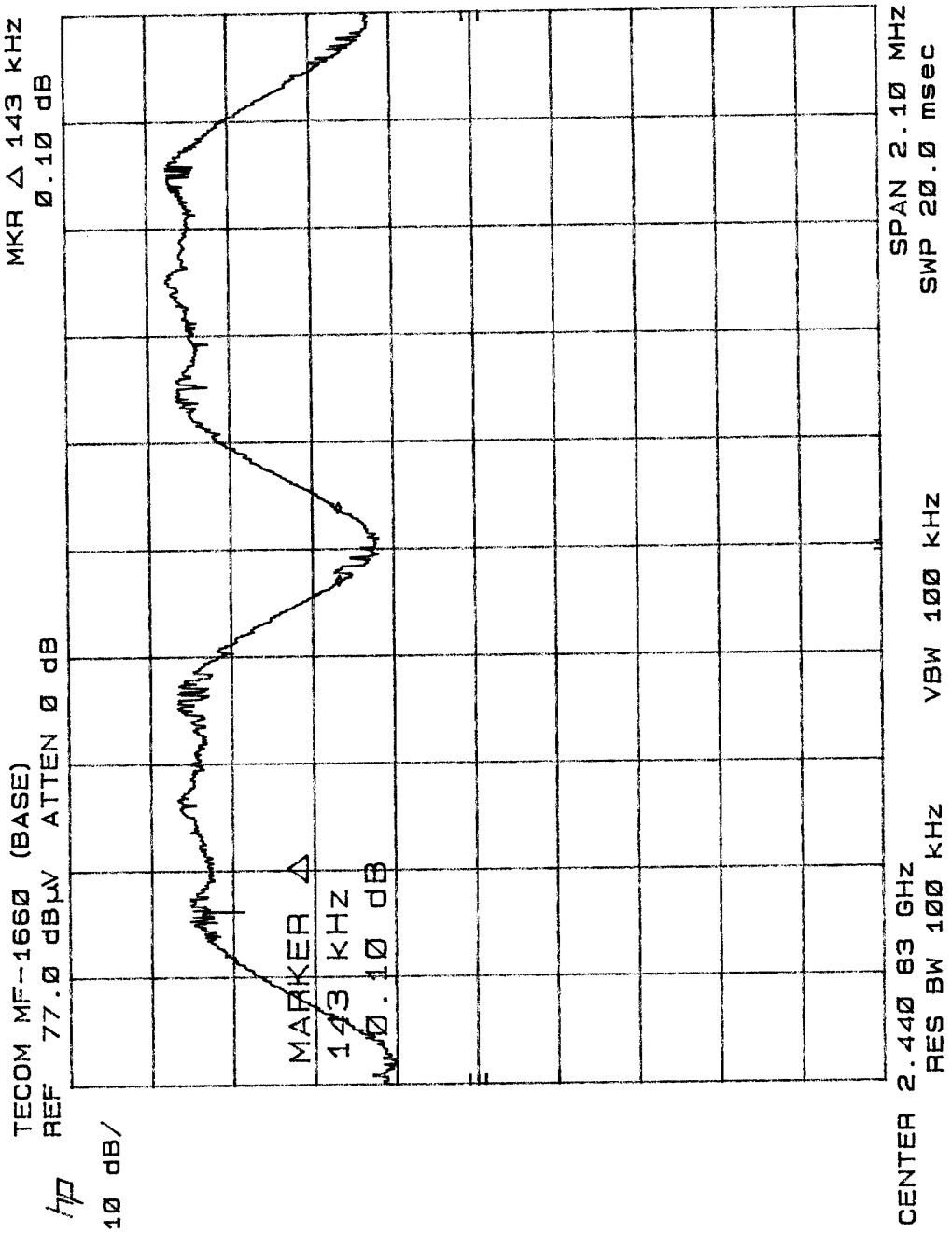
Refer to the attached Plots

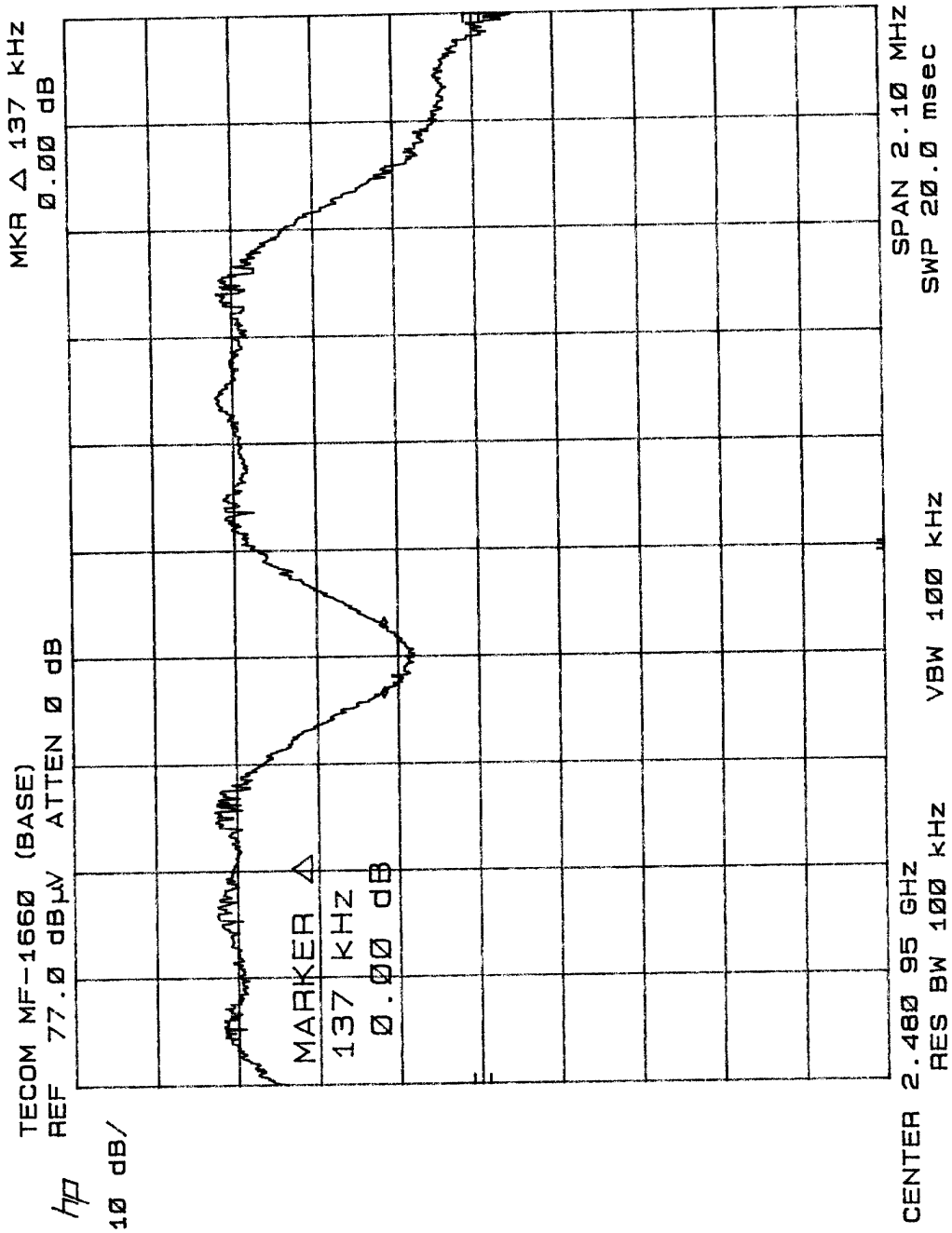
**BASE**

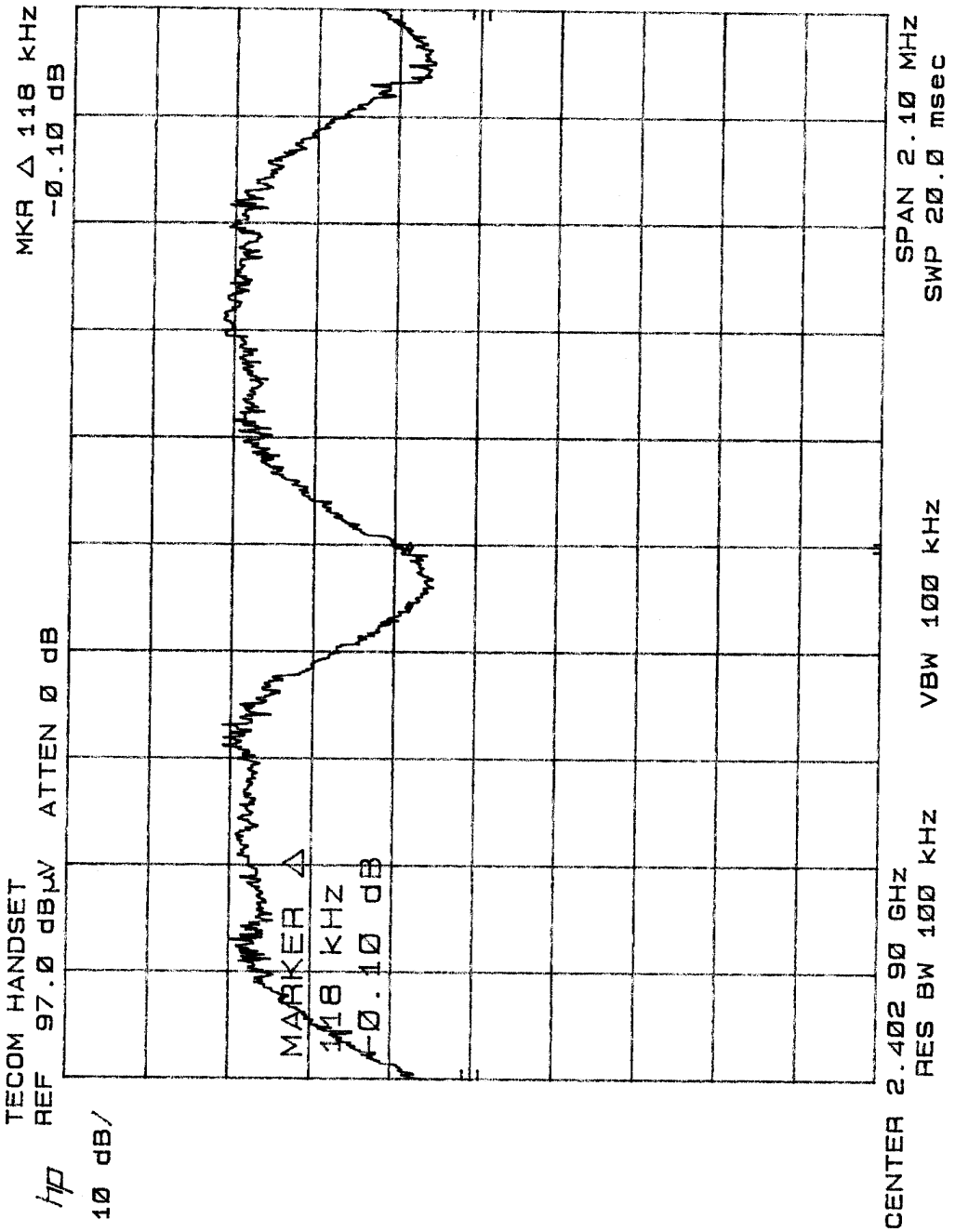


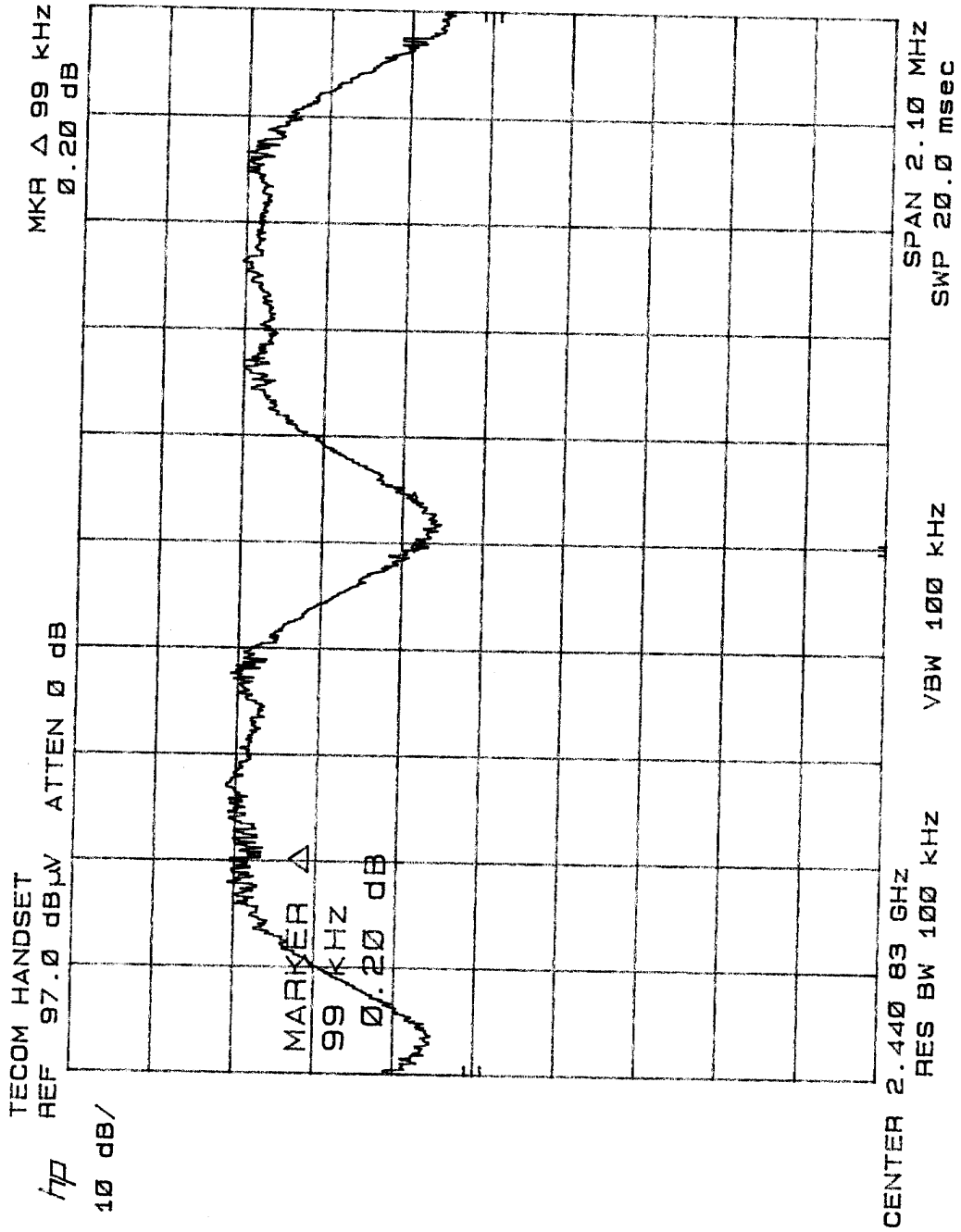
**HANDSET**

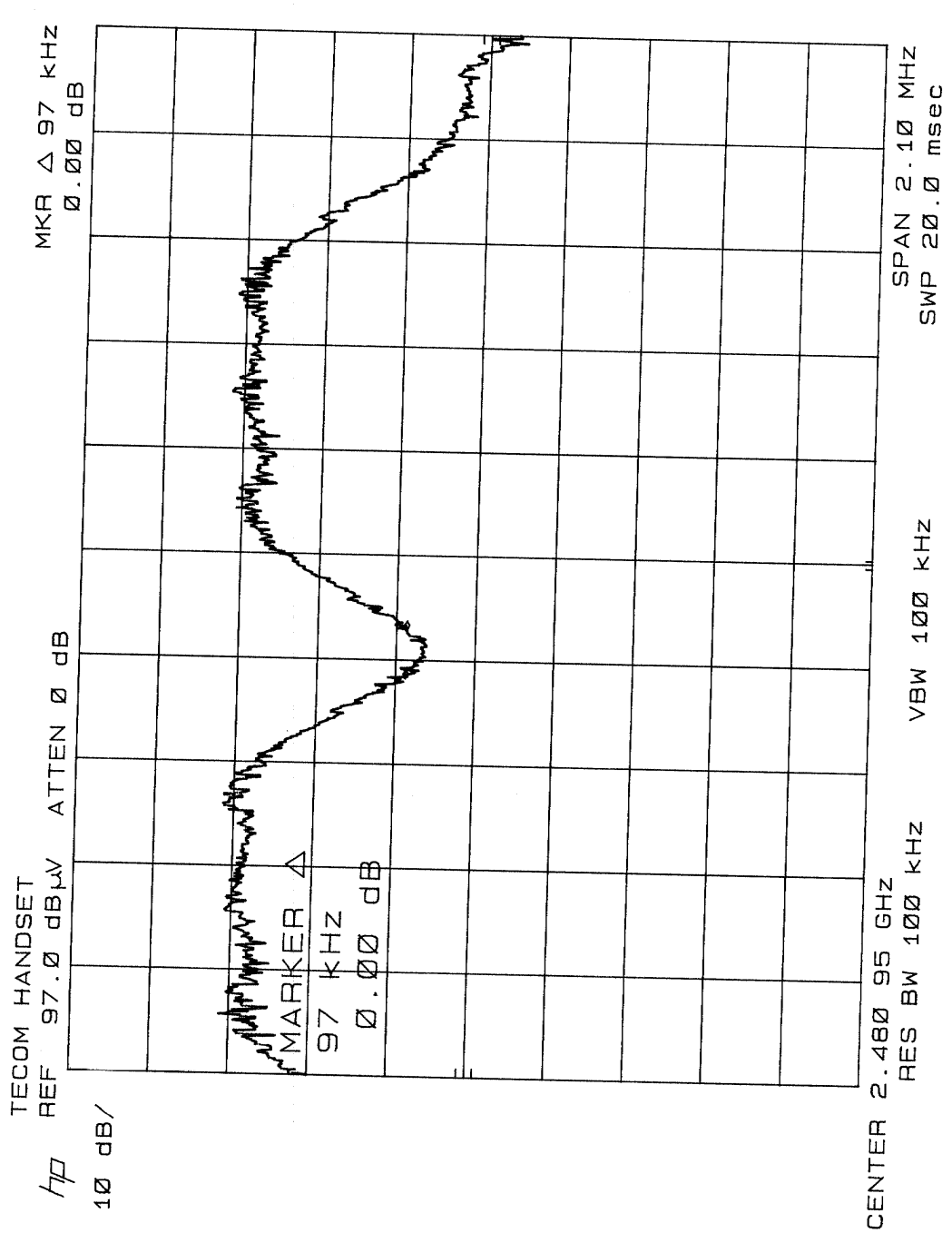

MKR Δ 130 kHz
-0.10 dB
TECOM MF-1660 (BASE)
REF 77.0 dBμV ATTEN 0 dB
10 dB/
MARKER Δ
130 kHz
-0.10 dB
SPAN 2.10 MHz
SWP 20.0 msec
CENTER 2.402 90 GHz
RES BW 100 kHz
VBW 100 kHz


MKR Δ 143 kHz
0.10 dB
TECOM MF-1660 (BASE)
REF 77.0 dBμV ATTEN 0 dB
10 dB/
MARKER Δ
143 kHz
0.10 dB
SPAN 2.10 MHz
SWP 20.0 msec
VBW 100 kHz
CENTER 2.440 83 GHz
RES BW 100 kHz


MKR Δ 137 kHz
0.00 dB
TECOM MF-1660 (BASE)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
MARKER Δ
137 kHz
0.00 dB
SPAN 2.10 MHz
SWP 20.0 msec
VBW 100 kHz
CENTER 2.480 95 GHz
RES BW 100 kHz


TECOM HANDSET
REF 97.0 dBµV
ATTEN 0 dB
10 dB/
MKR Δ 118 kHz
-0.10 dB
MARKER Δ
118 kHz
-0.10 dB
CENTER 2.402 90 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 2.10 MHz
SWP 20.0 msec


TECOM HANDSET
REF 97.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 99 kHz
0.20 dB
MARKER Δ
99 kHz
0.20 dB
CENTER 2.440 83 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 2.10 MHz
SWP 20.0 msec


TECOM HANDSET
REF 97.0 dBµV
ATTEN 0 dB
10 dB/
MKR Δ 97 kHz
0.00 dB
MARKER Δ
97 kHz
0.00 dB
CENTER 2.480 95 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 2.10 MHz
SWP 20.0 msec

# 8 - 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

## 8.1 Standard Applicable

According to §15.247(c), if *any* 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

## 8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## 8.3 Test Results

a) Lower Band Edge: All emissions in this 100kHz bandwidth are attenuated more than *20* dB from the carrier.

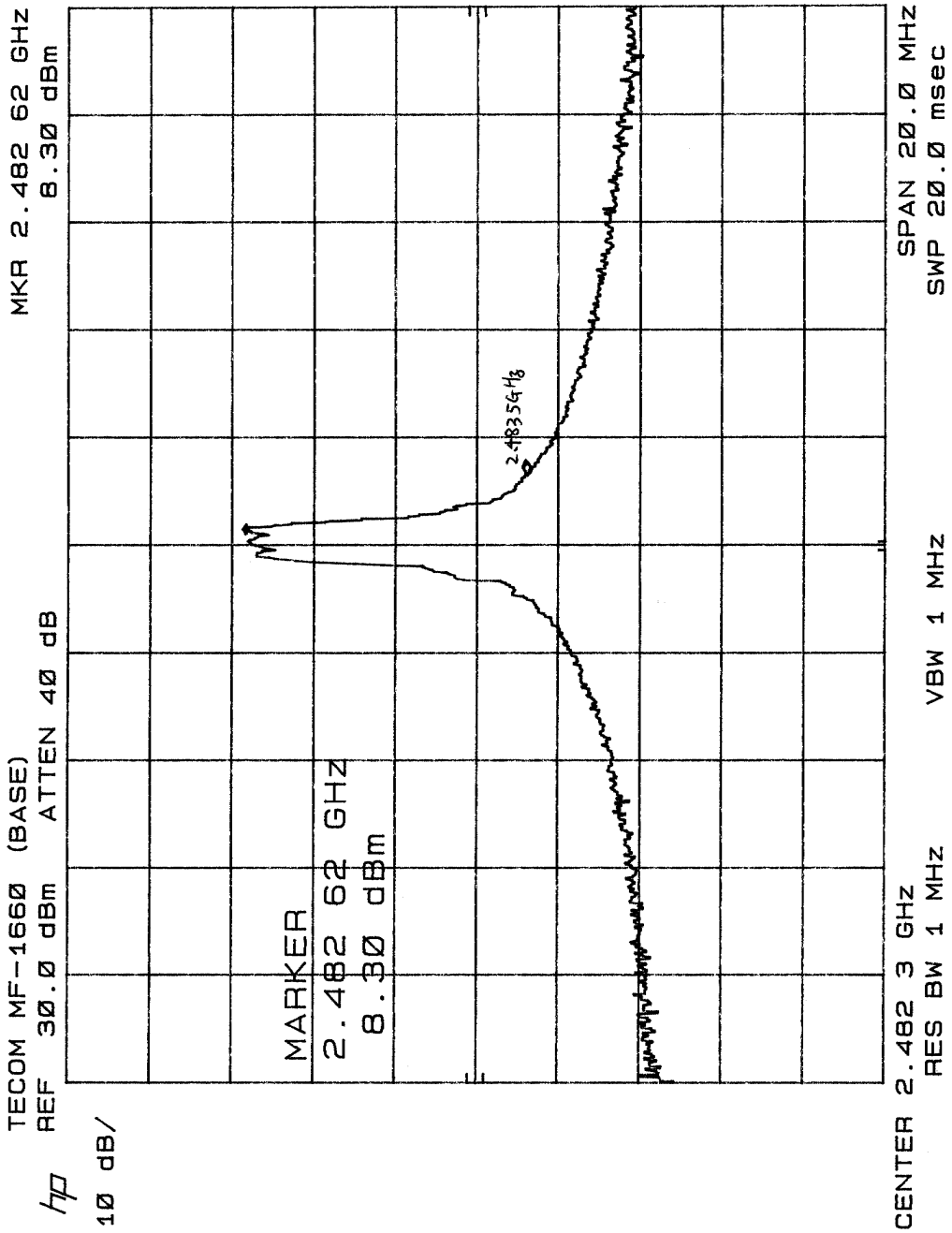
b) Upper Band Edge: All emissions in this 100kHz bandwidth are attenuated more than 20 dB from the carrier.

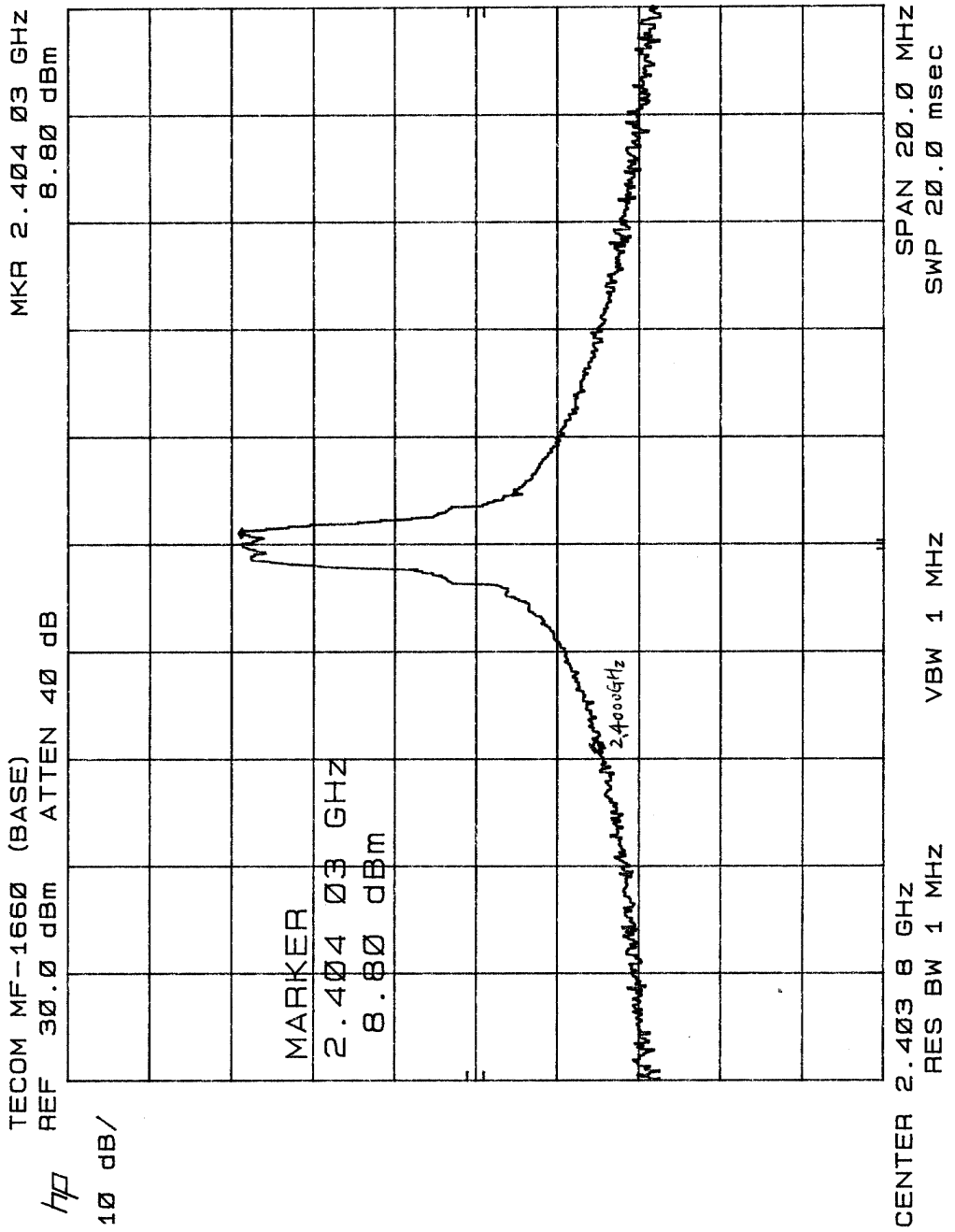
**BASE**

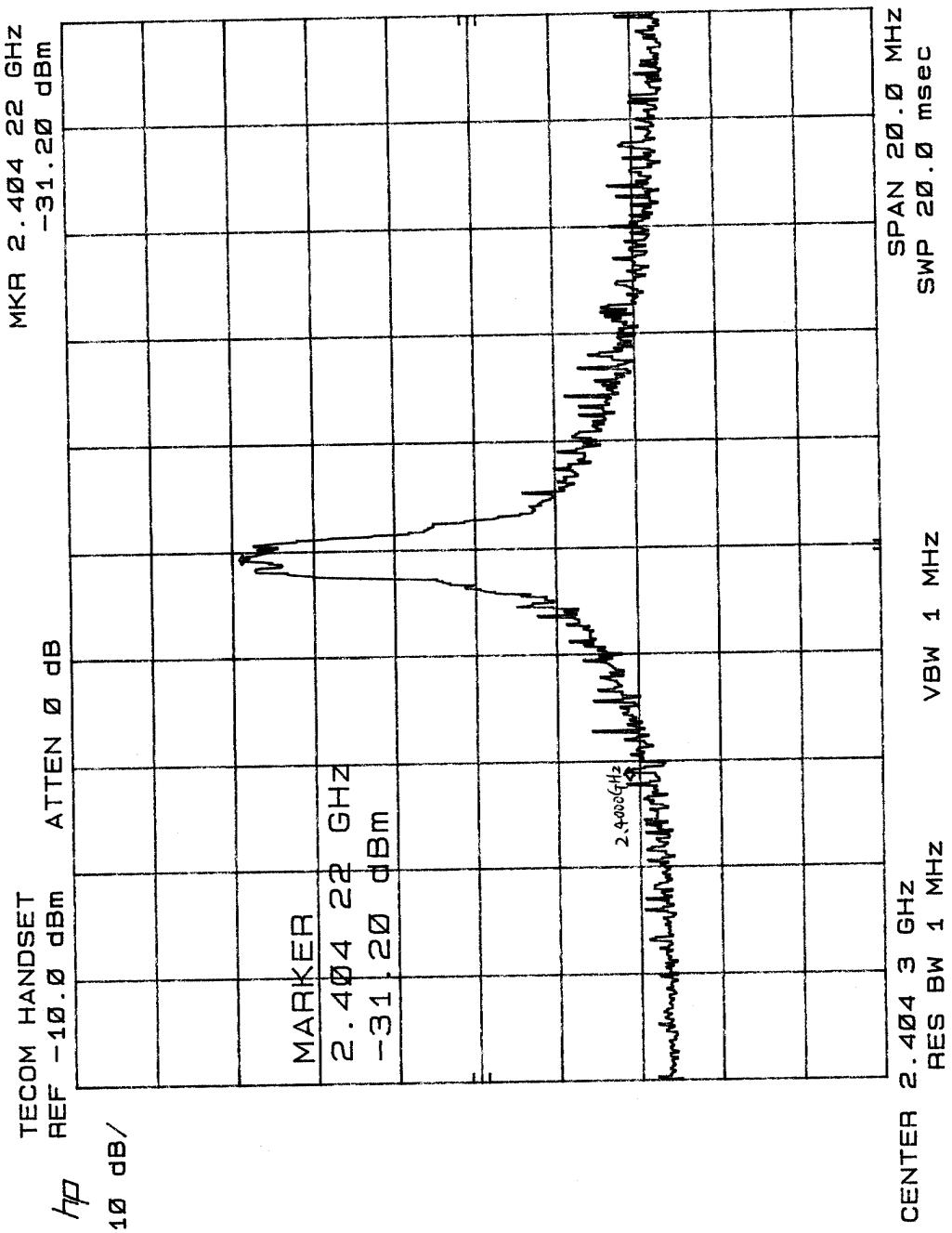
| Band Edge | |
|---|---|
| **Low Channel** | Page 42 |
| **High Channel** | Page 41 |

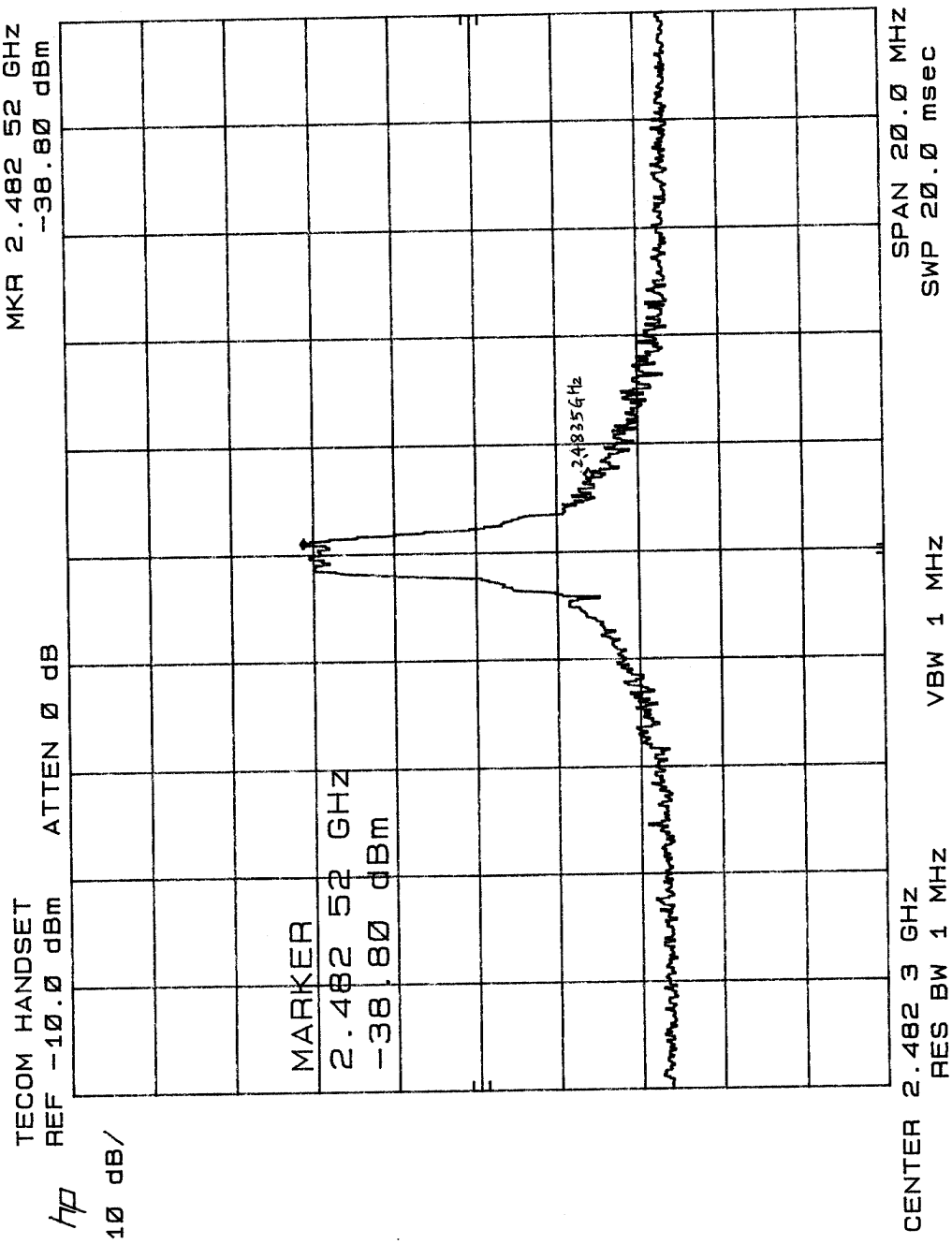
**HANDSET**

| Band Edge | |
|---|---|
| **Low Channel** | Page 43 |
| **High Channel** | Page 44 |


TECOM MF-1660 (BASE)
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MKR 2.482 62 GHz
8.30 dBm
MARKER
2.482 62 GHz
8.30 dBm
2.483 54 GHz
CENTER 2.482 3 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 20.0 MHz
SWP 20.0 msec


TECOM MF-1660 (BASE)
REF 30.0 dBm ATTEN 40 dB
10 dB/
MKR 2.404 03 GHz
8.80 dBm
MARKER
2.404 03 GHz
8.80 dBm
2.400GHz
CENTER 2.403 8 GHz
RES BW 1 MHz
VBW 1 MHz
SPAN 20.0 MHz
SWP 20.0 msec


MKR 2.404 22 GHz
-31.20 dBm
TECOM HANDSET
REF -10.0 dBm
ATTEN 0 dB
10 dB/
MARKER
2.404 22 GHz
-31.20 dBm
2.4000GHz
SPAN 20.0 MHz
SWP 20.0 msec
VBW 1 MHz
CENTER 2.404 3 GHz
RES BW 1 MHz


MKR 2.482 52 GHz
-38.80 dBm
TECOM HANDSET
REF -10.0 dBm
ATTEN 0 dB
10 dB/
MARKER
2.482 52 GHz
-38.80 dBm
2.483546Hz
SPAN 20.0 MHz
SWP 20.0 msec
VBW 1 MHz
CENTER 2.482 3 GHz
RES BW 1 MHz

# 9 - DWELL TIME ON EACH CHANNEL

## 9.1 Standard Applicable

According to §15.247 (a)(1)(ii), for frequency hopping system operating in the 2400-2483.5 MHz and 5725 – 5850 MHz bands, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 30-second period.

## 9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

.

## 9.3 Test Results

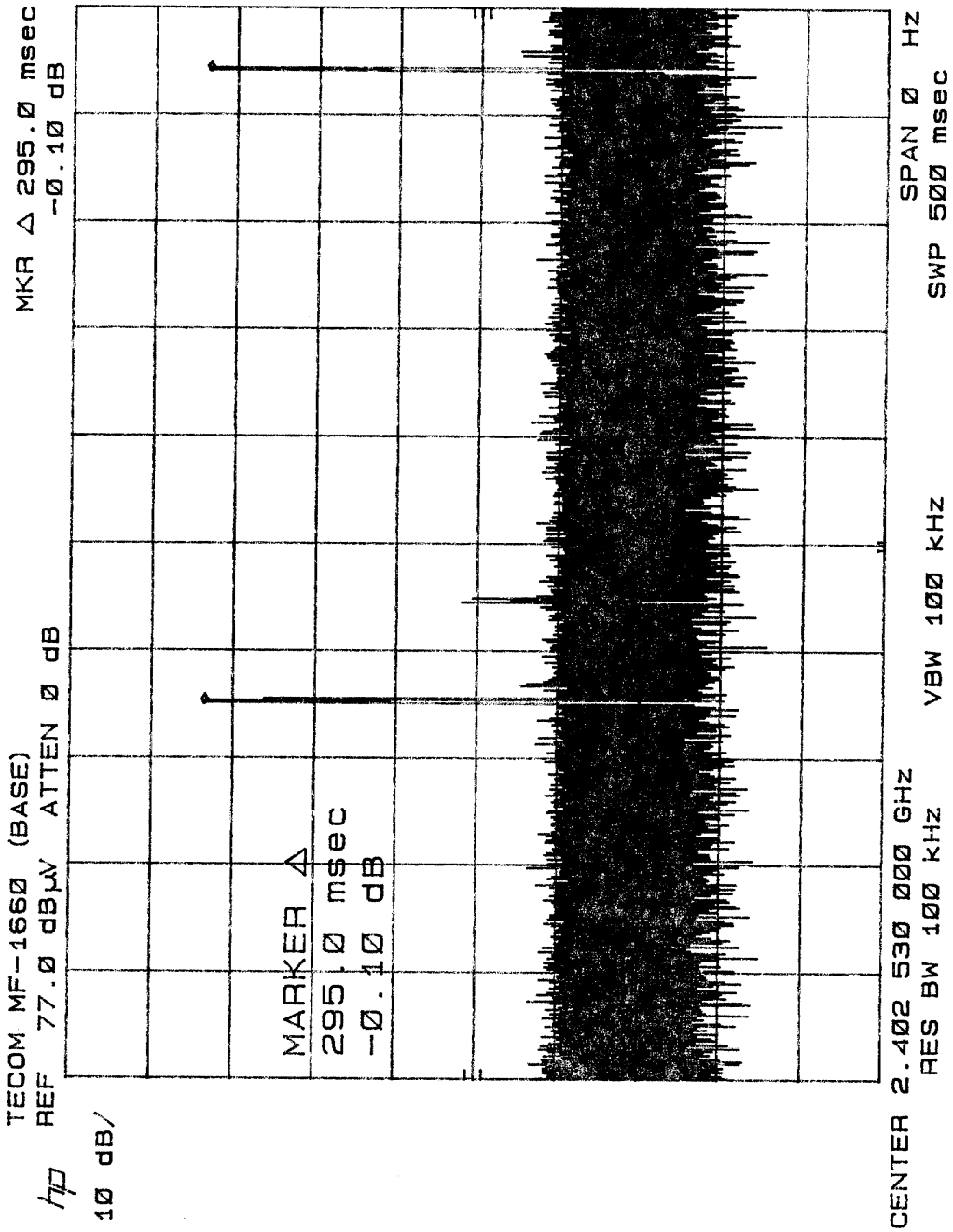
In normal operation, there is 2 transmission per 500mS, and the duration is 1.68 ms per transmission. Therefore, the dwell time is 1.68 x 120 = 201.6 ms.

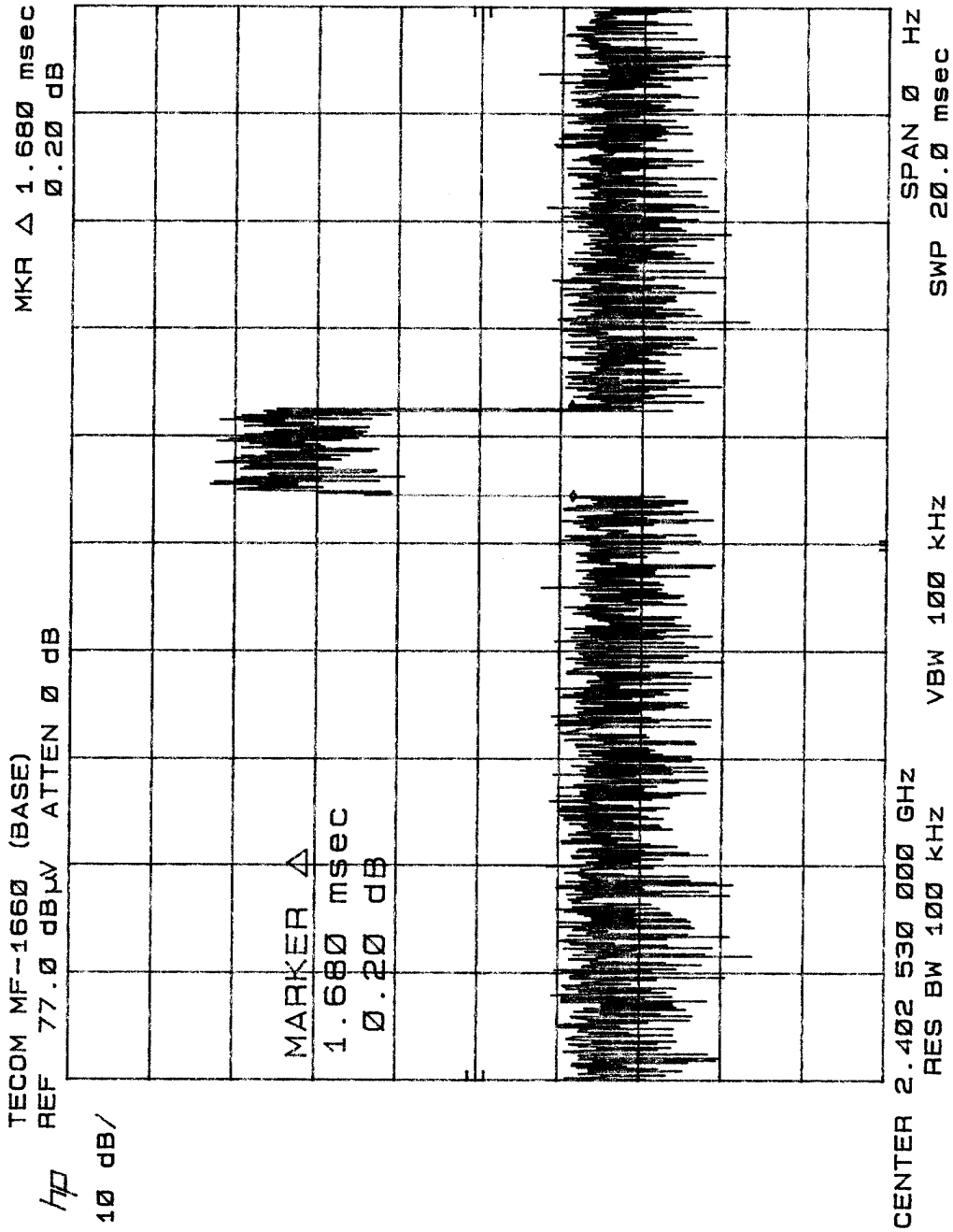
**BASE**

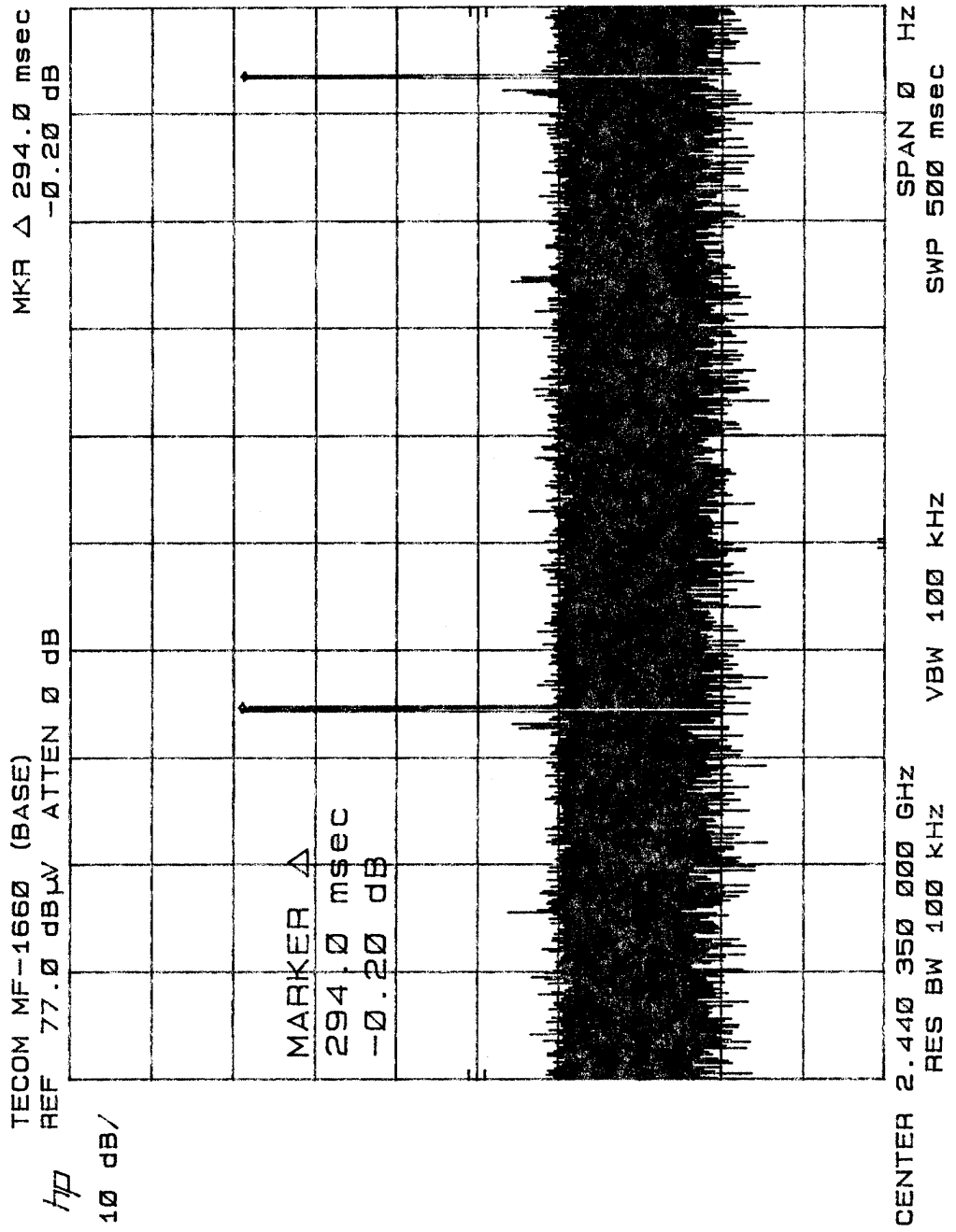
| Spurious Emission | |
|---|---|
| **Low Channel** | Page 47, 48 |
| **Middle Channel** | Page 49, 50 |
| **High Channel** | Page 51, 52 |

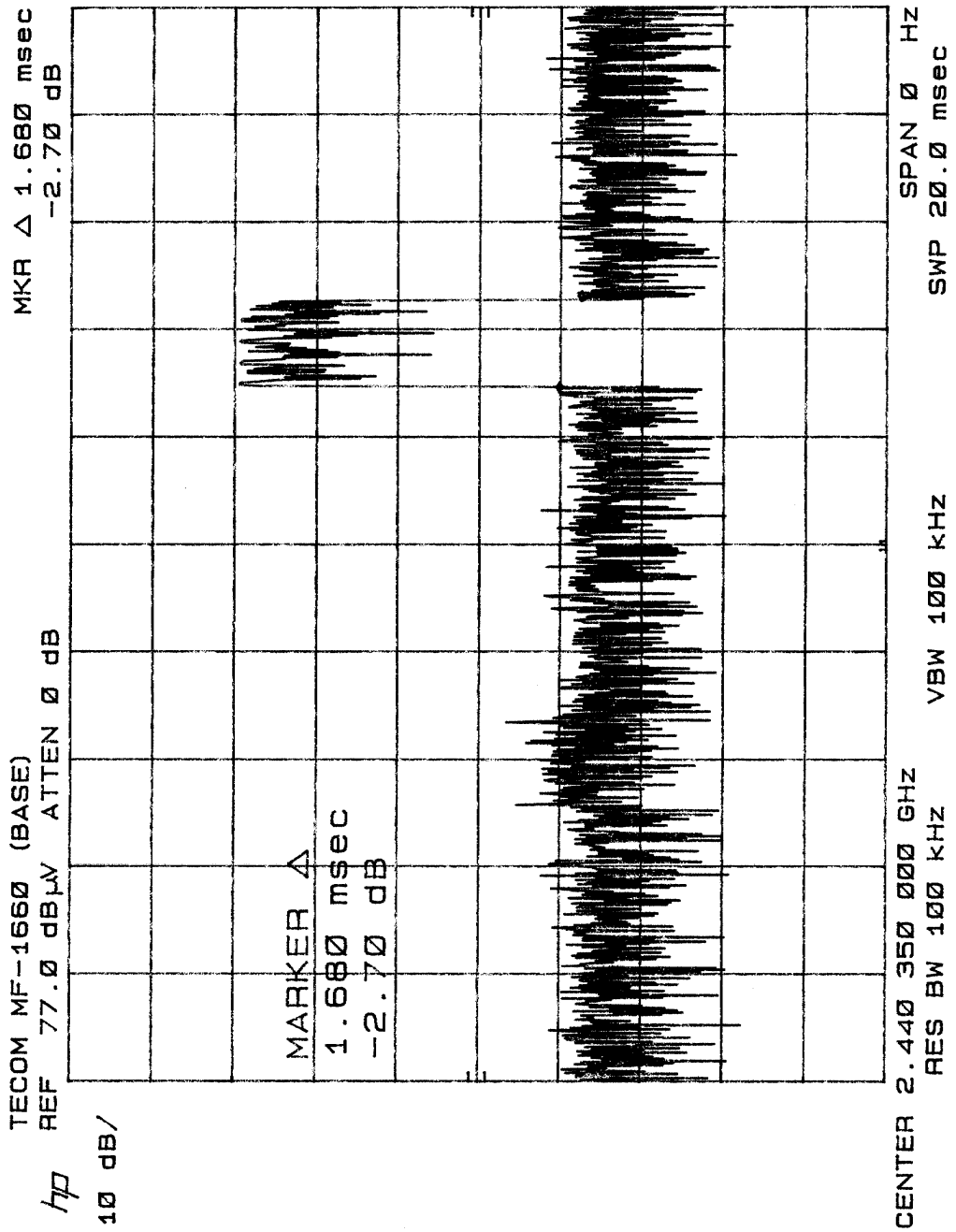
**HANDSET**

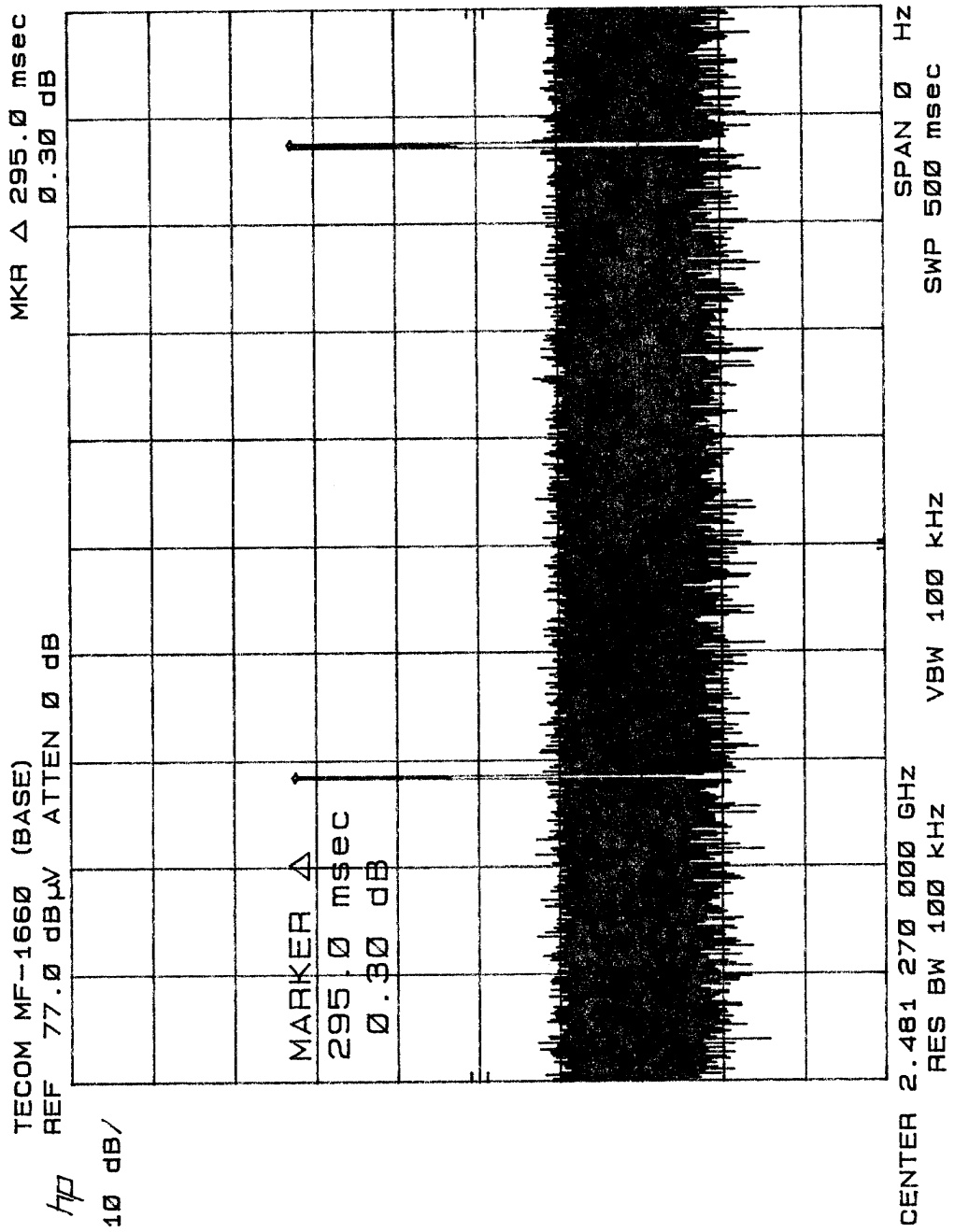
| Spurious Emission | |
|---|---|
| **Low Channel** | Page 53, 54 |
| **Middle Channel** | Page 55, 56 |
| **High Channel** | Page 57, 58 |

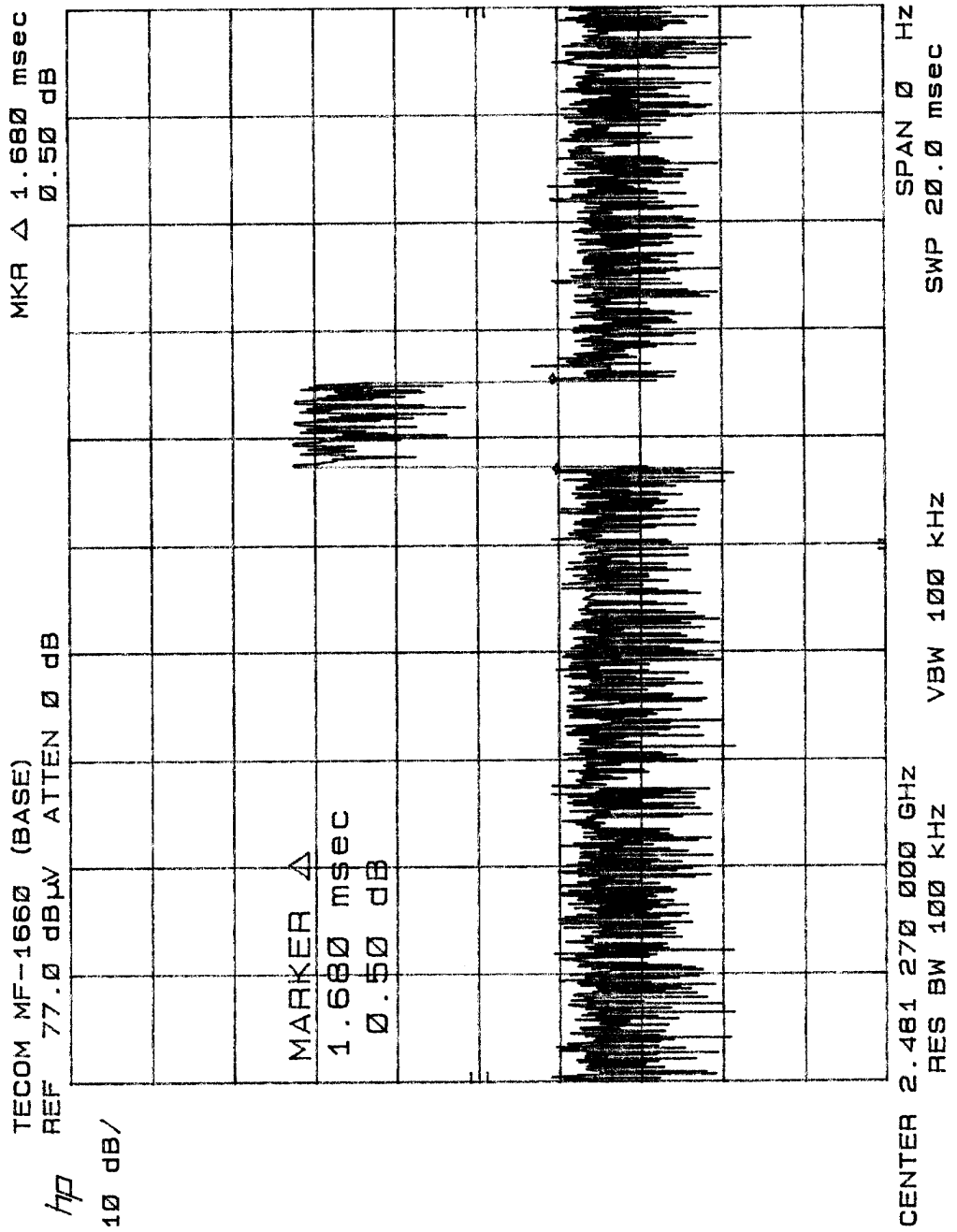

TECOM MF-1660 (BASE)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 295.0 msec
-0.10 dB
MARKER Δ
295.0 msec
-0.10 dB
CENTER 2.402 530 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 500 msec

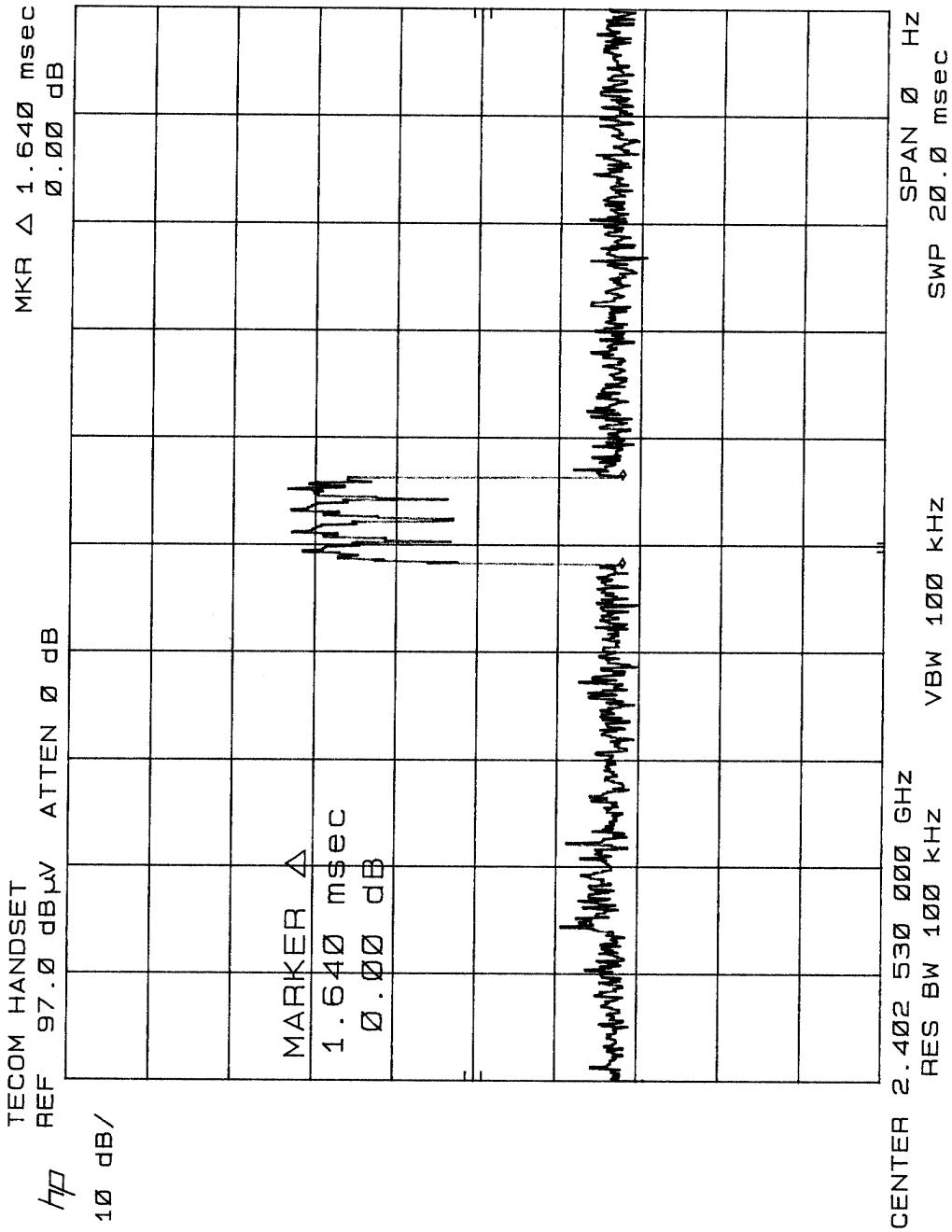

TECOM MF-1660 (BASE)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 1.680 msec
0.20 dB
MARKER Δ
1.680 msec
0.20 dB
CENTER 2.402 530 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 20.0 msec

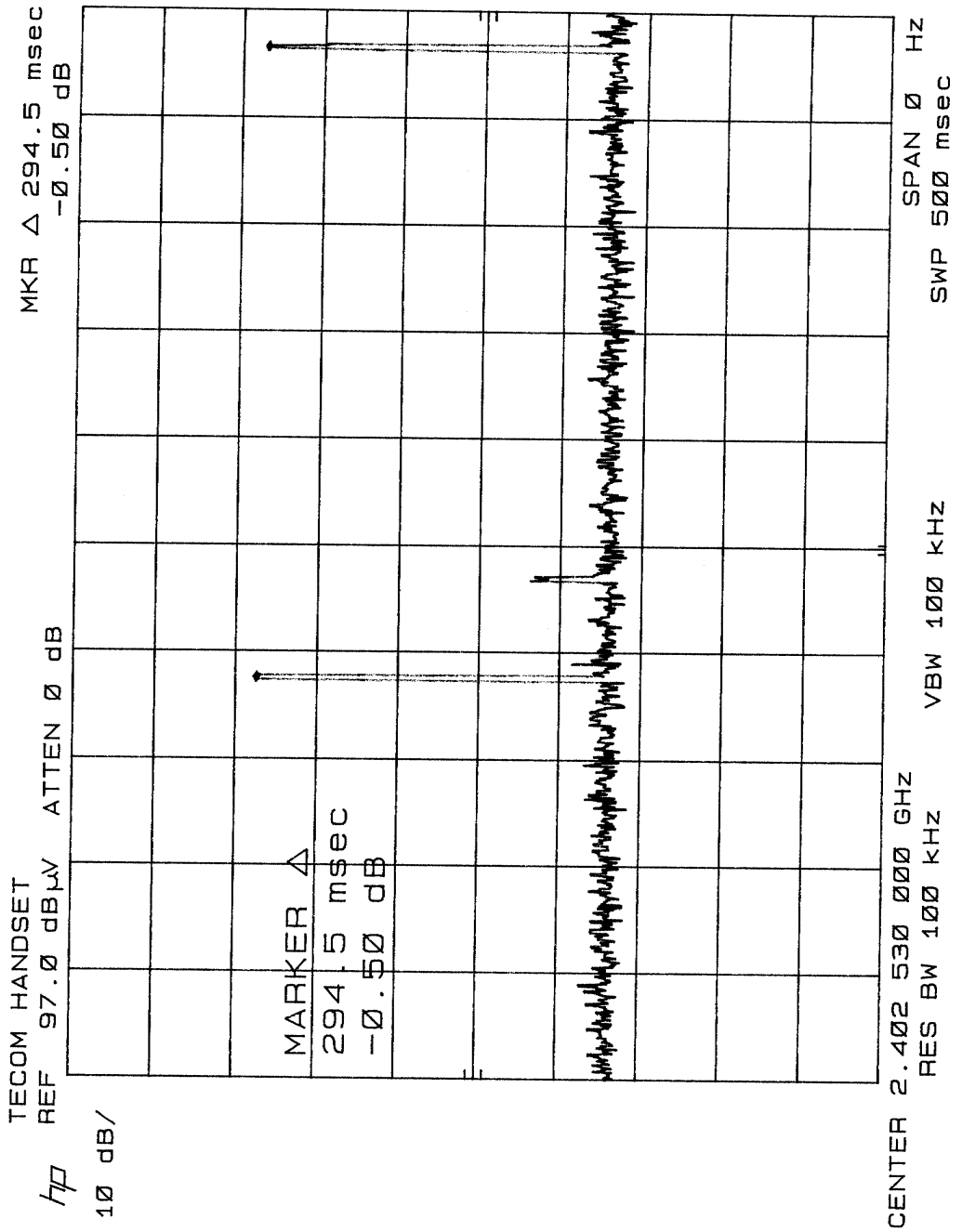

TECOM MF-1660 (BASE)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 294.0 msec
-0.20 dB
MARKER Δ
294.0 msec
-0.20 dB
CENTER 2.440 350 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 500 msec

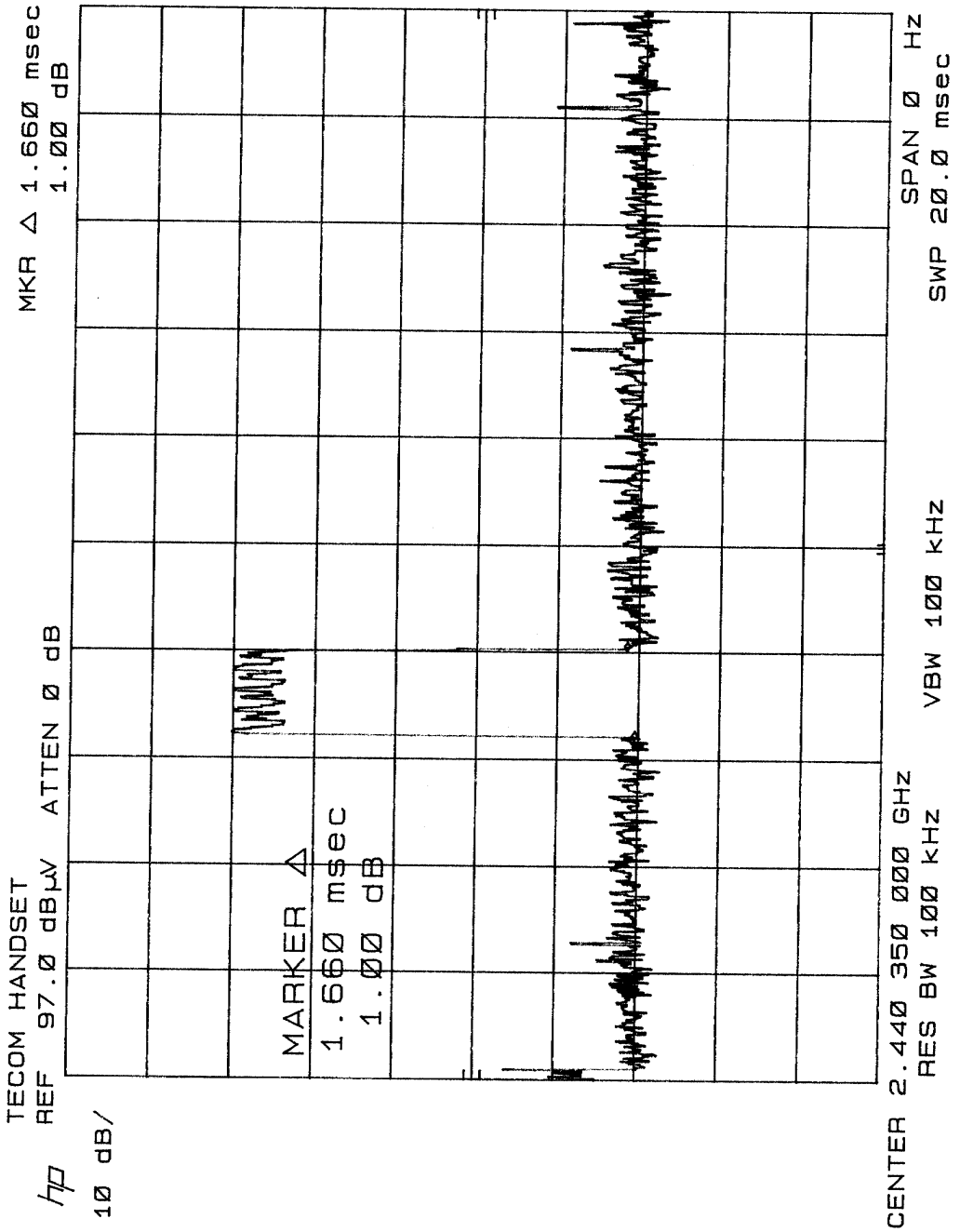

TECOM MF-1660 (BASE)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 1.680 msec
-2.70 dB
MARKER Δ
1.680 msec
-2.70 dB
CENTER 2.440 350 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 20.0 msec

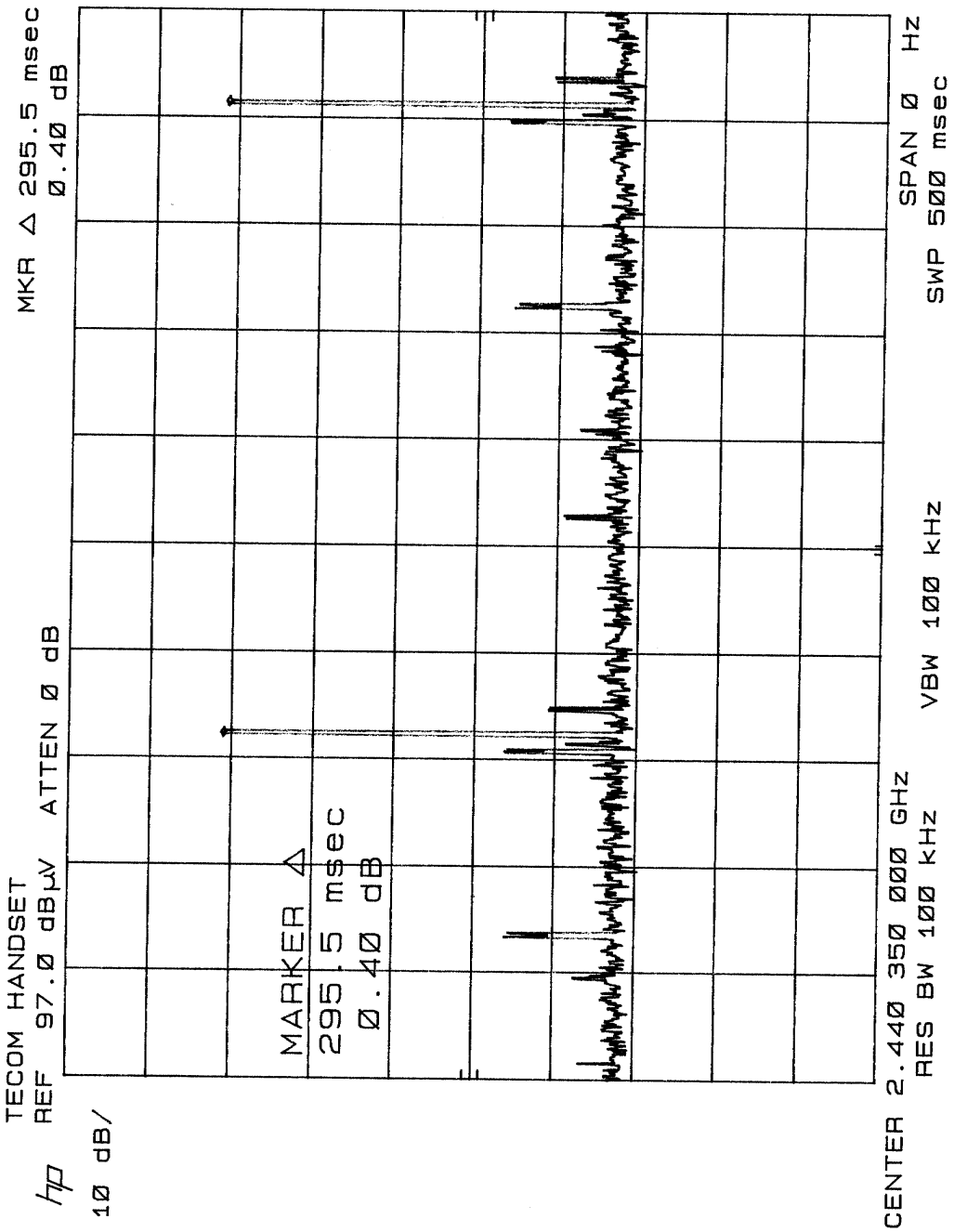

TECOM MF-1660 (BASE)
REF 77.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 295.0 msec
0.30 dB
MARKER Δ
295.0 msec
0.30 dB
CENTER 2.481 270 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 500 msec

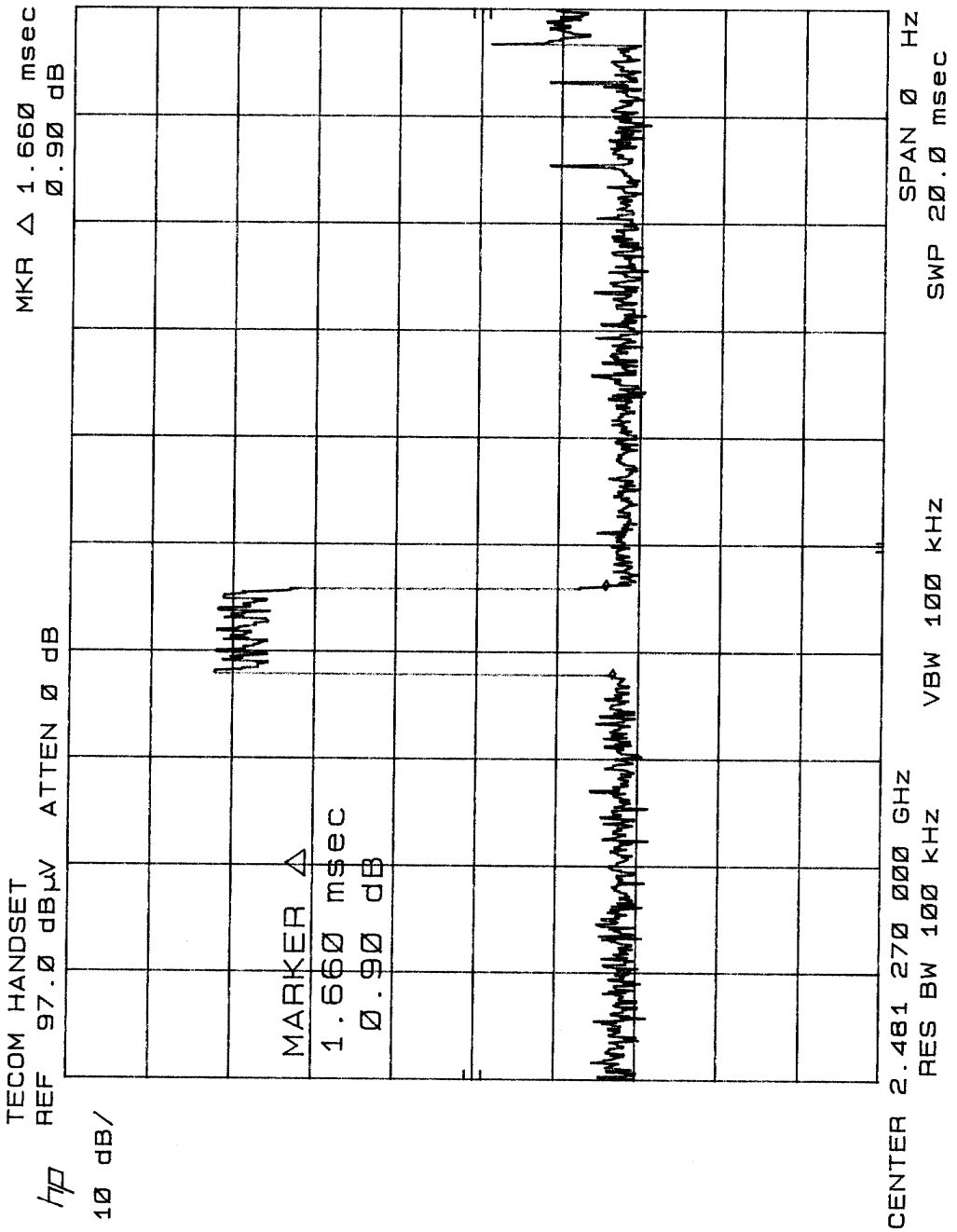

MKR Δ 1.680 msec
0.50 dB
TECOM MF-1660 (BASE)
REF 77.0 dBμV ATTEN 0 dB
10 dB/
MARKER Δ
1.680 msec
0.50 dB
CENTER 2.481 270 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 20.0 msec

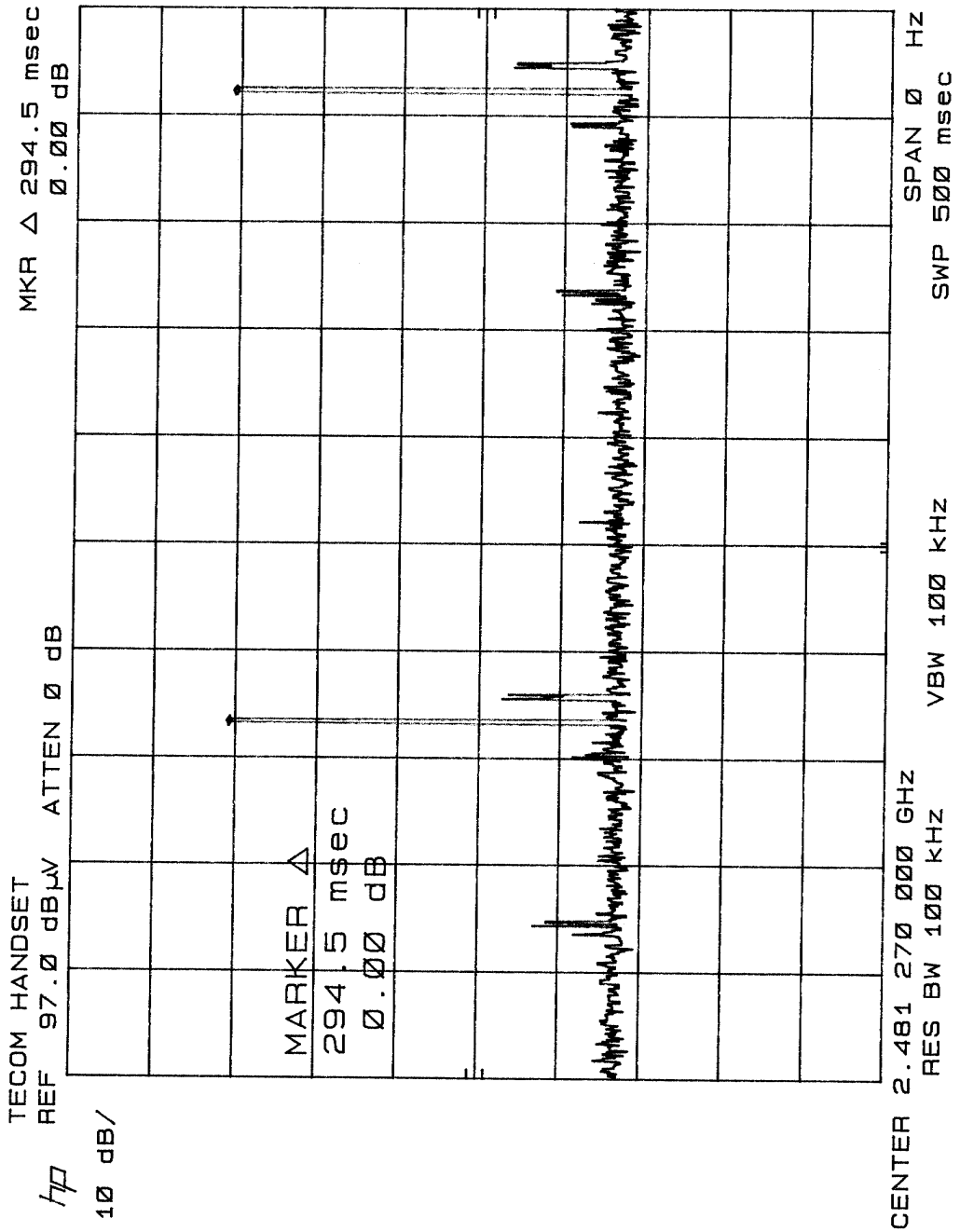

TECOM HANDSET
REF 97.Ø dBµV ATTEN Ø dB
10 dB/
MKR Δ 1.64Ø msec
Ø.ØØ dB
MARKER Δ
1.64Ø msec
Ø.ØØ dB
CENTER 2.4Ø2 53Ø ØØØ GHz
RES BW 1ØØ kHz
VBW 1ØØ kHz
SPAN Ø Hz
SWP 2Ø.Ø msec


TECOM HANDSET
REF 97.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 294.5 msec
-0.50 dB
MARKER Δ
294.5 msec
-0.50 dB
CENTER 2.402 530 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 500 msec


TECOM HANDSET
REF 97.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 1.660 msec
1.00 dB
MARKER Δ
1.660 msec
1.00 dB
CENTER 2.440 350 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 20.0 msec


TECOM HANDSET
REF 97.0 dBµV ATTEN 0 dB
10 dB/
MKR Δ 295.5 msec
0.40 dB
MARKER Δ
295.5 msec
0.40 dB
CENTER 2.440 350 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 500 msec


MKR Δ 1.660 msec
0.90 dB
TECOM HANDSET
REF 97.0 dBµV ATTEN 0 dB
10 dB/
MARKER Δ
1.660 msec
0.90 dB
CENTER 2.481 270 000 GHz
RES BW 100 kHz
VBW 100 kHz
SPAN 0 Hz
SWP 20.0 msec


TECOM HANDSET
REF 97.Ø dBµV ATTEN Ø dB
10 dB/
MKR Δ 294.5 msec
Ø.ØØ dB
MARKER Δ
294.5 msec
Ø.ØØ dB
CENTER 2.481 27Ø ØØØ GHz
RES BW 1ØØ kHz
VBW 1ØØ kHz
SPAN Ø Hz
SWP 5ØØ msec

# 10 - ANTENNA REQUIREMENT

## 10.1 Standard Applicable

For intentional device, according to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to § 15.247 (1)), if transmitting antennas of directional gain greater than 6 dBi are used$_1$ the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 10.2 Antenna Connected Construction

The directional gain of antenna used for transmitting is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

# 11 – RF SAFETY REQUIREMENTS TO 2.1091

According to section 3 of Supplement C to OET Bulleting 65, Part 15 Transmitters are categorically excluded from Routine Environmental Evaluation by measurement or precise computations unless otherwise required by the Commissions.

The unit under evaluation has an external antenna of 0 dBi gain with a measured output power of 0.018 Watts at the antenna terminals.

Due to the low power of the EUT, environmental evaluation should be deemed unnecessary since the EUT's operational frequency range is 2.4-2.4835 GHz and the ERP is considerably less than 3 Watts.

# 12 – SPURIOUS RADIATED EMISSION DATA

## 12.1 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.

## 12.2 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.

## 12.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), since the clock was 2.4 GHz, the system was tested to 24000 MHz.

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

| | |
|---|---|
| Start Frequency | 30 MHz |
| Stop Frequency | 24000 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 |

## 12.4 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.

## 12.5 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

## 12.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.247, and had the worst margin of:

***For Base:***

**- 6.1 dBμV** at **38.00 MHz** in the **Vertical** polarization at Low Channel, 30 to 24000MHz, 3 meters.

**- 7.1 dBμV** at **38.00 MHz** in the **Vertical** polarization at Middle Channel, 30 to 24000MHz, 3 meters.

**- 6.0 dBμV** at **38.00 MHz** in the **Vertical** polarization at Middle Channel, 30 to 24000MHz, 3 meters.

***For Handset:***

**- 4.8 dBμV** at **38.00 MHz** in the **Vertical** polarization at Low Channel, 30 to 24000MHz, 3 meters.

**- 5.8 dBμV** at **38.00 MHz** in the **Vertical** polarization at Middle Channel, 30 to 24000MHz, 3 meters.

**- 5.1 dBμV** at **38.00 MHz** in the **Vertical** polarization at High Channel, 30 to 24000MHz, 3 meters.

**12.7.3.a Final Scan, Base, High Channel.**

| 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 |
| 2482.52 | 107.1 | | 315 | 1.0 | v | 28.1 | 3.4 | 22.0 | 116.6 | | |
| 2482.33 | 105.3 | | 0 | 1.1 | h | 28.1 | 3.4 | 22.0 | 114.8 | | |
| 38.00 | 40.1 | | 225 | 1.0 | v | 13.3 | 0.5 | 19.9 | 34.0 | 40.0 | -6.0 |
| 4965.04 | 32.0 | Ave | 45 | 2.4 | h | 32.5 | 4.9 | 22.0 | 47.4 | 54.0 | -6.6 |
| 4964.19 | 31.0 | Ave | 315 | 1.1 | v | 32.5 | 4.9 | 22.0 | 46.4 | 54.0 | -7.6 |
| 266.00 | 43.0 | | 180 | 1.2 | v | 13.3 | 4.9 | 22.8 | 38.4 | 46.0 | -7.6 |
| 7447.56 | 26.3 | Ave | 45 | 2.3 | h | 35.1 | 5.6 | 22.0 | 45.0 | 54.0 | -9.0 |
| 7447.56 | 26.0 | Ave | 315 | 1.1 | v | 35.1 | 5.6 | 22.0 | 44.7 | 54.0 | -9.3 |
| 112.00 | 41.3 | | 180 | 1.0 | v | 11.7 | 1.3 | 20.8 | 33.5 | 43.5 | -10.0 |
| 168.00 | 38.5 | | 100 | 1.1 | v | 13.3 | 2.1 | 21.8 | 32.1 | 43.5 | -11.4 |
| 4965.04 | 47.0 | peak | 45 | 2.4 | h | 32.5 | 4.9 | 22.0 | 62.4 | 74.0 | -11.6 |
| 164.00 | 38.0 | | 225 | 1.2 | v | 13.2 | 1.6 | 21.0 | 31.8 | 43.5 | -11.7 |
| 4964.19 | 46.0 | peak | 315 | 1.1 | v | 32.5 | 4.9 | 22.0 | 61.4 | 74.0 | -12.6 |
| 7447.56 | 37.0 | peak | 315 | 1.1 | v | 35.1 | 5.6 | 22.0 | 55.7 | 74.0 | -18.3 |
| 7447.56 | 36.0 | peak | 45 | 2.3 | h | 35.1 | 5.6 | 22.0 | 54.7 | 74.0 | -19.3 |

**12.7.3.b Final Scan, Base, Middle Channel.**

| 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 |
| 2439.33 | 105.9 | | 315 | 1.2 | h | 28.1 | 3.4 | 22.0 | 115.4 | | |
| 2439.32 | 109.2 | | 315 | 1.1 | v | 28.1 | 3.4 | 22.0 | 118.7 | | |
| 38.00 | 39.0 | | 225 | 1.0 | v | 13.3 | 0.5 | 19.9 | 32.9 | 40.0 | -7.1 |
| 266.00 | 43.5 | | 180 | 1.2 | v | 13.3 | 4.9 | 22.8 | 38.9 | 46.0 | -7.1 |
| 4879.06 | 31.2 | Ave | 180 | 1.2 | h | 32.5 | 4.9 | 22.0 | 46.6 | 54.0 | -7.4 |
| 4879.02 | 31.0 | Ave | 315 | 1.2 | v | 32.5 | 4.9 | 22.0 | 46.4 | 54.0 | -7.6 |
| 7318.59 | 26.5 | Ave | 315 | 1.1 | v | 35.1 | 5.6 | 22.0 | 45.2 | 54.0 | -8.8 |
| 7318.58 | 26.1 | Ave | 270 | 1.2 | h | 35.1 | 5.6 | 22.0 | 44.8 | 54.0 | -9.2 |
| 112.00 | 40.3 | | 180 | 1.0 | v | 11.7 | 1.3 | 20.8 | 32.5 | 43.5 | -11.0 |
| 168.00 | 38.5 | | 100 | 1.1 | v | 13.3 | 2.1 | 21.8 | 32.1 | 43.5 | -11.4 |
| 164.00 | 38.0 | | 225 | 1.2 | v | 13.2 | 1.6 | 21.0 | 31.8 | 43.5 | -11.7 |
| 4879.02 | 46.5 | peak | 315 | 1.2 | v | 32.5 | 4.9 | 22.0 | 61.9 | 74.0 | -12.1 |
| 4879.06 | 45.8 | peak | 180 | 1.2 | h | 32.5 | 4.9 | 22.0 | 61.2 | 74.0 | -12.8 |
| 7318.59 | 35.3 | peak | 315 | 1.1 | v | 35.1 | 5.6 | 22.0 | 54.0 | 74.0 | -20.0 |
| 7318.58 | 34.1 | peak | 270 | 1.2 | h | 35.1 | 5.6 | 22.0 | 52.8 | 74.0 | -21.2 |

**12.7.3.c Final Scan, Base, Low Channel.**

| 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 |
| 2404.57 | 105.0 | | 45 | 2.5 | h | 28.1 | 3.4 | 22.0 | 114.5 | | |
| 2404.55 | 108.0 | | 315 | 1.2 | v | 28.1 | 3.4 | 22.0 | 117.5 | | |
| 38.00 | 40.0 | | 225 | 1.0 | v | 13.3 | 0.5 | 19.9 | 33.9 | 40.0 | -6.1 |
| 4809.09 | 32.1 | Ave | 315 | 1.1 | v | 32.5 | 4.9 | 22.0 | 47.5 | 54.0 | -6.5 |
| 4809.13 | 31.2 | Ave | 315 | 2.5 | h | 32.5 | 4.9 | 22.0 | 46.6 | 54.0 | -7.4 |
| 266.00 | 43.1 | | 180 | 1.2 | v | 13.3 | 4.9 | 22.8 | 38.5 | 46.0 | -7.5 |
| 7214.17 | 27.0 | Ave | 180 | 1.7 | h | 35.1 | 5.6 | 22.0 | 45.7 | 54.0 | -8.3 |
| 7213.67 | 26.9 | Ave | 0 | 1.1 | v | 35.1 | 5.6 | 22.0 | 45.6 | 54.0 | -8.4 |
| 4809.09 | 48.0 | peak | 315 | 1.1 | v | 32.5 | 4.9 | 22.0 | 63.4 | 74.0 | -10.6 |
| 112.00 | 40.2 | | 180 | 1.0 | v | 11.7 | 1.3 | 20.8 | 32.4 | 43.5 | -11.1 |
| 4809.13 | 47.3 | peak | 315 | 2.5 | h | 32.5 | 4.9 | 22.0 | 62.7 | 74.0 | -11.3 |
| 164.00 | 38.0 | | 225 | 1.2 | v | 13.2 | 1.6 | 21.0 | 31.8 | 43.5 | -11.7 |
| 168.00 | 37.8 | | 100 | 1.1 | v | 13.3 | 2.1 | 21.8 | 31.4 | 43.5 | -12.1 |
| 7213.67 | 38.0 | peak | 0 | 1.1 | v | 35.1 | 5.6 | 22.0 | 56.7 | 74.0 | -17.3 |
| 7214.17 | 36.5 | peak | 180 | 1.7 | h | 35.1 | 5.6 | 22.0 | 55.2 | 74.0 | -18.8 |

### 12.7.3. d Final Scan, Handset, High Channel.

| 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 |
| 2482.19 | 106.1 | | 0 | 1.5 | H | 28.1 | 3.4 | 22.0 | 115.6 | | |
| 2482.19 | 107.1 | | 0 | 1.4 | V | 28.1 | 3.4 | 22.0 | 116.6 | | |
| 38.00 | 41.0 | | 225 | 1.0 | v | 13.3 | 0.5 | 19.9 | 34.9 | 40.0 | -5.1 |
| 4963.98 | 52.0 | Peak | 0 | 1.6 | V | 32.5 | 4.9 | 22.0 | 67.4 | 74.0 | -6.6 |
| 4963.98 | 32.0 | Ave | 0 | 1.6 | V | 32.5 | 4.9 | 22.0 | 47.4 | 54.0 | -6.6 |
| 266.00 | 43.6 | | 180 | 1.2 | v | 13.3 | 4.9 | 22.8 | 39.0 | 46.0 | -7.0 |
| 4964.76 | 51.3 | Peak | 0 | 1.5 | H | 32.5 | 4.9 | 22.0 | 66.7 | 74.0 | -7.3 |
| 4964.76 | 30.5 | Ave | 0 | 1.5 | H | 32.5 | 4.9 | 22.0 | 45.9 | 54.0 | -8.1 |
| 7445.94 | 27.0 | Ave | 225 | 1.3 | H | 35.1 | 5.6 | 22.0 | 45.7 | 54.0 | -8.3 |
| 7445.98 | 26.8 | Ave | 0 | 1.4 | V | 35.1 | 5.6 | 22.0 | 45.5 | 54.0 | -8.5 |
| 112.00 | 42.3 | | 180 | 1.0 | v | 11.7 | 1.3 | 20.8 | 34.5 | 43.5 | -9.0 |
| 168.00 | 39.0 | | 100 | 1.1 | v | 13.3 | 2.1 | 21.8 | 32.6 | 43.5 | -10.9 |
| 164.00 | 36.4 | | 225 | 1.2 | v | 13.2 | 1.6 | 21.0 | 30.2 | 43.5 | -13.3 |
| 7445.98 | 41.8 | Peak | 0 | 1.4 | V | 35.1 | 5.6 | 22.0 | 60.5 | 74.0 | -13.5 |
| 7445.94 | 37.2 | Peak | 225 | 1.3 | H | 35.1 | 5.6 | 22.0 | 55.9 | 74.0 | -18.1 |

**12.7.3.e Final Scan, Handset, Middle Channel.**

| 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 |
| 2439.12 | 102.8 | | 0 | 1.8 | V | 28.1 | 3.4 | 22.0 | 112.3 | | |
| 2439.44 | 108.6 | | 0 | 1.5 | H | 28.1 | 3.4 | 22.0 | 118.1 | | |
| 38.00 | 40.3 | | 225 | 1.0 | v | 13.3 | 0.5 | 19.9 | 34.2 | 40.0 | -5.8 |
| 266.00 | 44.0 | | 180 | 1.2 | v | 13.3 | 4.9 | 22.8 | 39.4 | 46.0 | -6.6 |
| 4877.85 | 51.3 | Peak | 0 | 1.4 | H | 32.5 | 4.9 | 22.0 | 66.7 | 74.0 | -7.3 |
| 4877.85 | 31.2 | Ave | 0 | 1.4 | H | 32.5 | 4.9 | 22.0 | 46.6 | 54.0 | -7.4 |
| 4877.85 | 31.0 | Ave | 0 | 1.5 | V | 32.5 | 4.9 | 22.0 | 46.4 | 54.0 | -7.6 |
| 4877.85 | 50.9 | Peak | 0 | 1.5 | V | 32.5 | 4.9 | 22.0 | 66.3 | 74.0 | -7.7 |
| 7318.04 | 26.5 | Ave | 0 | 1.5 | V | 35.1 | 5.6 | 22.0 | 45.2 | 54.0 | -8.8 |
| 7316.82 | 26.0 | Ave | 0 | 1.4 | H | 35.1 | 5.6 | 22.0 | 44.7 | 54.0 | -9.3 |
| 168.00 | 40.6 | | 100 | 1.1 | v | 13.3 | 2.1 | 21.8 | 34.2 | 43.5 | -9.3 |
| 112.00 | 41.0 | | 180 | 1.0 | v | 11.7 | 1.3 | 20.8 | 33.2 | 43.5 | -10.3 |
| 164.00 | 36.5 | | 225 | 1.2 | v | 13.2 | 1.6 | 21.0 | 30.3 | 43.5 | -13.2 |
| 7316.82 | 40.3 | Peak | 0 | 1.4 | H | 35.1 | 5.6 | 22.0 | 59.0 | 74.0 | -15.0 |
| 7318.04 | 38.0 | Peak | 0 | 1.5 | V | 35.1 | 5.6 | 22.0 | 56.7 | 74.0 | -17.3 |

### 12.7.3.f Final Scan, Handset, Low Channel.

| 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 |
| 2404.34 | 108.8 | | 0 | 1.5 | V | 28.1 | 3.4 | 22.0 | 118.3 | | |
| 2404.40 | 107.8 | | 0 | 1.5 | H | 28.1 | 3.4 | 22.0 | 117.3 | | |
| 38.00 | 41.3 | | 225 | 1.0 | v | 13.3 | 0.5 | 19.9 | 35.2 | 40.0 | -4.8 |
| 4809.29 | 31.9 | Ave | 0 | 1.4 | H | 32.5 | 4.9 | 22.0 | 47.3 | 54.0 | -6.7 |
| 4809.26 | 31.5 | Ave | 0 | 1.5 | V | 32.5 | 4.9 | 22.0 | 46.9 | 54.0 | -7.1 |
| 4809.29 | 51.2 | Peak | 0 | 1.4 | H | 32.5 | 4.9 | 22.0 | 66.6 | 74.0 | -7.4 |
| 4809.26 | 50.6 | Peak | 0 | 1.5 | V | 32.5 | 4.9 | 22.0 | 66.0 | 74.0 | -8.0 |
| 7213.22 | 27.0 | Ave | 0 | 1.5 | H | 35.1 | 5.6 | 22.0 | 45.7 | 54.0 | -8.3 |
| 7212.59 | 26.3 | Ave | 45 | 1.7 | V | 35.1 | 5.6 | 22.0 | 45.0 | 54.0 | -9.0 |
| 112.00 | 42.0 | | 180 | 1.0 | v | 11.7 | 1.3 | 20.8 | 34.2 | 43.5 | -9.3 |
| 266.00 | 40.6 | | 180 | 1.2 | v | 13.3 | 4.9 | 22.8 | 36.0 | 46.0 | -10.0 |
| 168.00 | 38.0 | | 100 | 1.1 | v | 13.3 | 2.1 | 21.8 | 31.6 | 43.5 | -11.9 |
| 164.00 | 35.6 | | 225 | 1.2 | v | 13.2 | 1.6 | 21.0 | 29.4 | 43.5 | -14.1 |
| 7213.22 | 40.1 | Peak | 0 | 1.5 | H | 35.1 | 5.6 | 22.0 | 58.8 | 74.0 | -15.2 |
| 7212.59 | 39.0 | Peak | 45 | 1.7 | V | 35.1 | 5.6 | 22.0 | 57.7 | 74.0 | -16.3 |

# 13 - CONDUCTED EMISSIONS TEST DATA

## 13.1 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.

## 13.2 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. The specification used was with FCC Class B limits.

## 13.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction 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 |

## 13.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with 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**".

## 13.5 Summary of Test Results

According to the data in section 12.6, 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:

**-3.0 dBμV** at **0.630 MHz** in the **Neutral** mode.

## 13.6 Conducted Emissions Test Data

### 12.6.1 Test Data, 0.45 - 30 MHz.

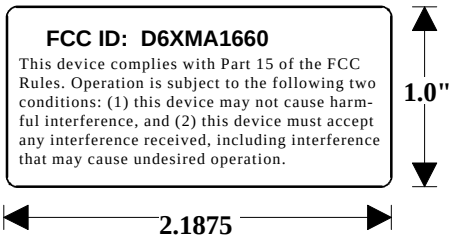
| LINE CONDUCTED EMISSIONS | | | | FCC CLASS B | |
|---|---|---|---|---|---|
| Frequency | Amplitude | Detector | Phase | Limit | Margin |
| MHz | dBμV | Qp/Ave/Peak | Line/Neutral | dBμV | dB |
| 0.630 | 45.0 | QP | Neutral | 48 | -3.0 |
| 0.630 | 40.4 | QP | Line | 48 | -7.6 |
| 9.520 | 36.9 | QP | Neutral | 48 | -11.1 |
| 17.800 | 31.9 | QP | Line | 48 | -16.1 |
| 21.370 | 28.4 | QP | Neutral | 48 | -19.6 |
| 21.370 | 26.9 | QP | Line | 48 | -21.1 |

## 13.7 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented in the following Appendix of this report as reference.

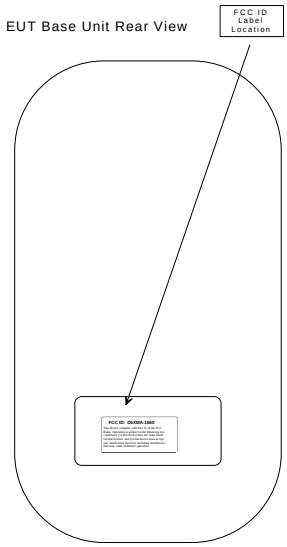
# 14 – FCC PRODUCT LABELING AND WARNING STATEMENT

## 14.1 FCC ID Label




Specifications: Text is black or white in color and is left justified. Labels are silk-screened and shall be "permanently affixed" at a conspicuous location on the EUT.

## 14.2 Proposed Label Location on EUT




## 14.3 FCC Warning Statement

The users manual or instruction manual for an intentional or unintentional radiator shall caution the use that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

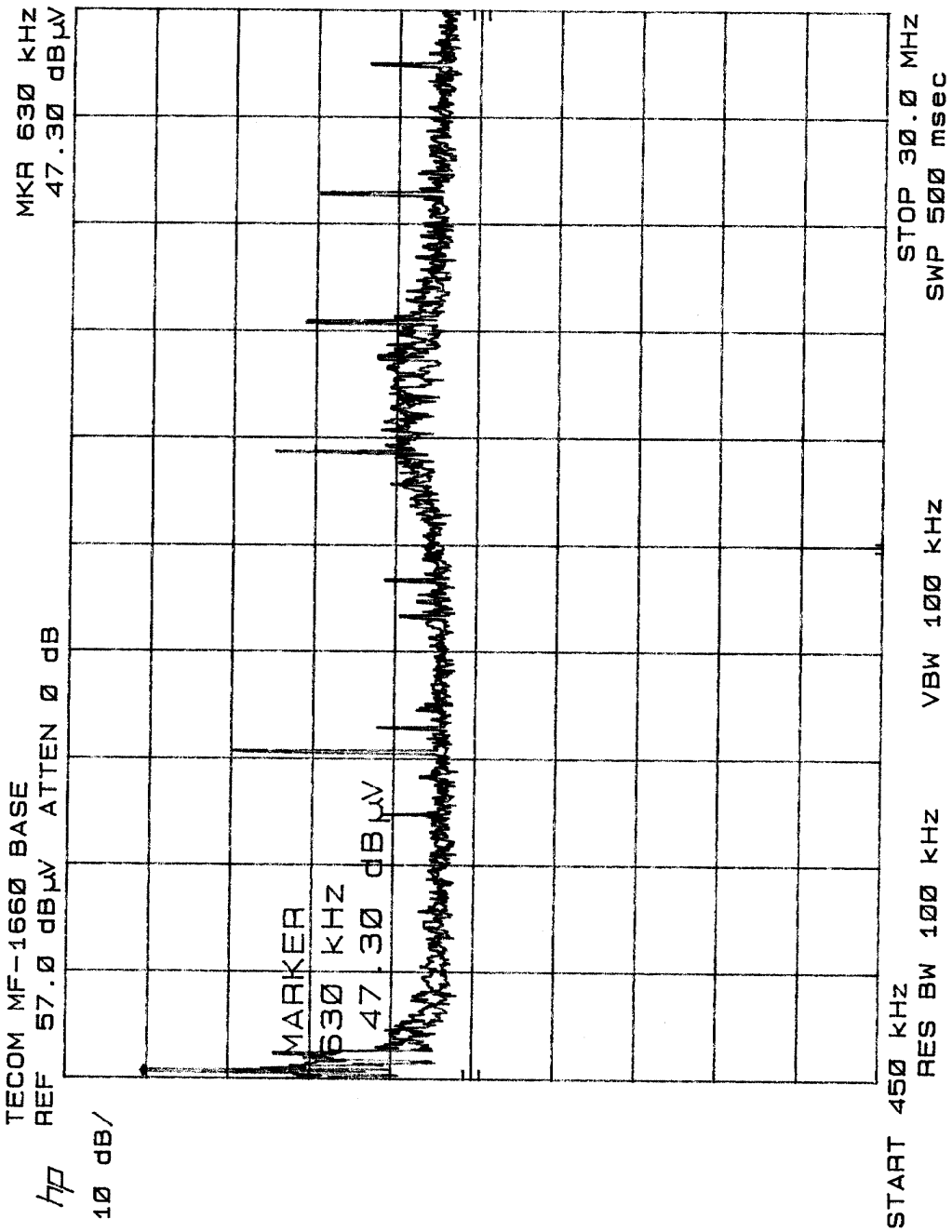
-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio / TV technician for help

# Appendix A – PLOT OF CONDUCTED EMISSION TEST DATA


MKR 630 kHz
47.30 dBµV
TECOM MF-1660 BASE
REF 57.0 dBµV ATTEN 0 dB
10 dB/
MARKER
630 kHz
47.30 dBµV
STOP 30.0 MHz
SWP 500 msec
VBW 100 kHz
START 450 kHz
RES BW 100 kHz

# Appendix B – AGENT AUTHORIZATION LETTER

P. 01

TECOM

TECOM CO.,LTD.
23, R & D ROAD 2
SCIENCE-BASED INDUSTRIAL PARK
HSIN-CHU TAIWAN R.O.C.
TELEPHONE: 886-35-775141
FAX: 886-35-776855

18 Jul 2000

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

Sir/Madam.

Reg: FCC grand for MA-1660

This letter is an authorization to accept Bay Area Compliance Lab. Corporation as an agent for (TECOM CO.,LTD. 23,R&D Road 2 Science-Based Industrial Park Hsin-Chu Taiwan ), 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 (CASIO COMMUNICATIONS, INC.) product:

Multiple-Handset Cordless Telephone, Model No.: MA-1660

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

Sincerely,

Sheng Yih Lin
Safety Engineer

# Appendix C – EUT SECURITY CODE

TECOM CO., LTD.
23, R & D ROAD 2
SCIENCE-BASED INDUSTRIAL PARK
HSIN-CHU TAIWAN R.O.C.
TELEPHONE 886-35-775141
FAX: 886-35-778855

FCC ID: D6XMA1660

DIGITAL SECURITY CODE:

The model MA-1660 has the circuitry for digital security code to provide protection against unintentional access. For each model, one of 7529536 kinds of digital security code is randomly selected and fixed in each telephone as it is manufactured.

Sincerely

Sheng Yih Lin
Safety Engineer