

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: D6X402421

December 23, 2000

This Report Concerns: ☒ Original Report	Equipment Type: Multiple - Handset Cordless Phone – Household Appliances
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

TECOM CO., LTD. FCC ID:D6X402421 or the "EUT" as referred to in this report is a 2.4 GHz 4-Line Cordless Phone. The EUT was composed of two parts, one is a Handset which measured 8" L x 2.25" W x 1.5"H, and the other is a Base which measures 8.5"L x 6.5"W x 1.75"H.

The system provides many features such as:

1. CO LINES/PBX: 4 CO LINES, 12 STATIONS
2. LCD with 2 x 16 ALPHA-NUMERIC & 2 ROWS ICONS
3. TONE/PULSE DIALING SELECABLE
4. SPEED DIAL: 20(EACH 30 DGT AND 16 CHAR NAME MAX)
5. MEMORY: 01-20
6. CID MEMORY: 50
7. HANDSET SPEAKERPHONE
8. PAGE
9. ROOM MONITOR
10. CALL TIMER
11. TYPE & II CALLER ID
12. VISUAL MESSAGE WAITING
13. INTERCOM
14. LAST NUMBER REDIAL
15. CALL HOLD FOR EXTERNAL CALL
16. 3-WAY CONFERENCE
17. CALL TRANSFER OF EXTERNAL CALL
18. TRANSFER RECALL
19. HOLD REMINDER
20. DO-NOT-DISTURB(DND)
21. FLASH
22. PAUSE(2 SECONDS)
23. MUTE/UNMUTE TOGGLE CONTROL
24. HEADSET COMPATIBILITY
25. RINGER TONES SELECTION AND VOL ADJUSTABLE
26. HANDSET/HEADSET/SPEAKERPHONE VOL ADJUSTABLE
27. CO LINE RINGING ENABLE/DISABLE
28. PROGRAMMABLE FLASH(0.6 SECONDS DEFAULT) RANGE 0.1SEC-0.9SEC
29. STORE REDIAL INTO SPEED DIAL MEMORY
30. ERASE SPEED DIAL MEMORY
31. PROGRAM SYSTEM SECURITY CODE
32. PROGRAM CID AREA CODES
33. HOME AREA CODES: 1
34. LOCAL AREA CODES: 5
35. MASTER RESET
36. HOLD TIME REMINDER TIME (30 SECONDS DEFAULT)
15 SECONDS-60SECONDS WITH OFF SETTING
37. LINE IN USE DETECT ENABLE/DISABLE
38. RINGING INDICATORS
39. CONFERENCE TWO OUTSIDE LINES
40. CONFERENCE ONE OUTSIDE AND TWO HANDSET
41. HANDSET IDENTIFICATION(01-12)
42. BATTERY LOW INDICATION
43. OUT OF RANGE INDICATION AND WARNING TONE
44. REVIEWING A CALL
45. AUTO-DIAL FROM CALLER ID LOG
46. STORE CID INTO SPEED DIAL

- 47. ERASE CIS CALL
- 48. ERASE ALL CALLS
- 49. DISPLAY TOTAL CALLS/TOTAL NEW CALLS
- 50. ANY KEY ANSWER
- 51. DIGITAL KEYS AND LINE KEYS
- 52. DIRECTLY ANSWER ANY RINGING LINE BY PRESSING THE ASSOCIATED LINE
BUTTON
- 53. AUX DATA PROT(CONNECTED TO LINE 2)
- 54. KEYPAD BACKLIGHT
- 55. LCD BACKLIGHT
- 56. US STANDARD WALL MOUNT BRACKET
- 57. AUTO RELEASE WHEN THE HANDSET IS RETRUNTED TO CRADLE

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	12/6/01
HP	Spectrum Analyzer	8593B	2919A00242	12/20/01
HP	Amplifier	8349B	2644A02662	12/20/01
HP	Quasi-Peak Adapter	85650A	917059	12/6/01
HP	Amplifier	8447E	1937A01046	12/6/01
A.H. System	Horn Antenna	SAS0200/571	261	12/27/01
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/01
Com-Power	Biconical Antenna	AB-100	14012	11/2/01
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/01
Com-Power	LISN	LI-200	12208	12/20/01
Com-Power	LISN	LI-200	12005	12/20/01
BACL	Data Entry Software	DES1	0001	12/20/01
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	7/10/02
Rohde & Schwarz	I/Q Modulation Generator	AMIQ	1110.2003.02	8/10/02

1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
TECOM CO., LTD.	2.4GHz Multiple-Handset Cordless Telephone System	40-2421	None	D6X402421

1.8 Support Equipment List and Details (N/A)

Manufacturer	Description	Model	Serial Number	FCC ID
Phone Line				
Cheng Uei Precision Industry Co., Ltd.	Power Adapter for Charger	DBT120950D	586-351202	DOC
Leader Electronics, Inc.	Power Adapter for Base	480910003CO	586-301202	DOC

1.9 External I/O Cabling

Cable Description	Length (M)	Port/From	To
Unshielded RJ11 Cable x 1	10	RJ-11 Port/Base	Phone Line
Unshielded Cable x 1	2	DC Power Port/Base	Power Adapter

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).

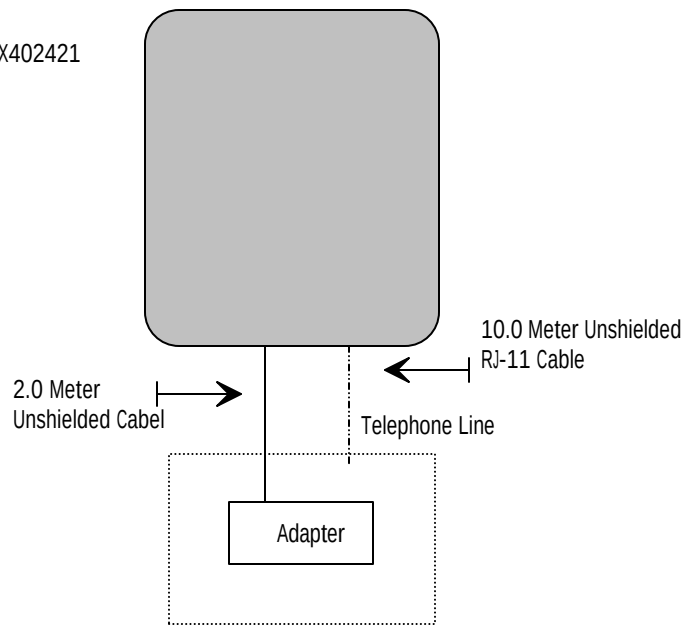
Handset Being tested: The Multiple -Handset Cordless Phone – Handset, Model 40-2421 (EUT) was placed on the wooden table and tested in three orthogonal axis. The handset was connected to the headset via its headset port. The Low, middle, and high channels were tested. The handset was transmitting to 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 40-2421 (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

For Base Unit

EUT: FCC ID: D6X402421
Base Unit



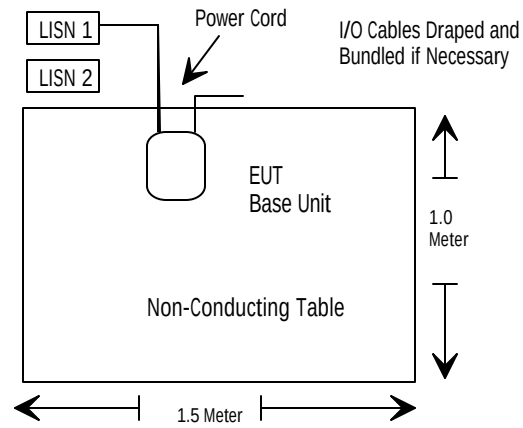
For Handset Unit

EUT: FCC ID: D6X402421
Handset Unit

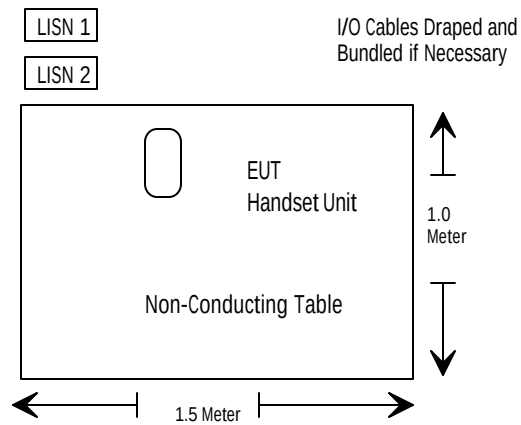


2.3 Test Setup Block Diagram

For Base Unit



For Handset Unit



2.4 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

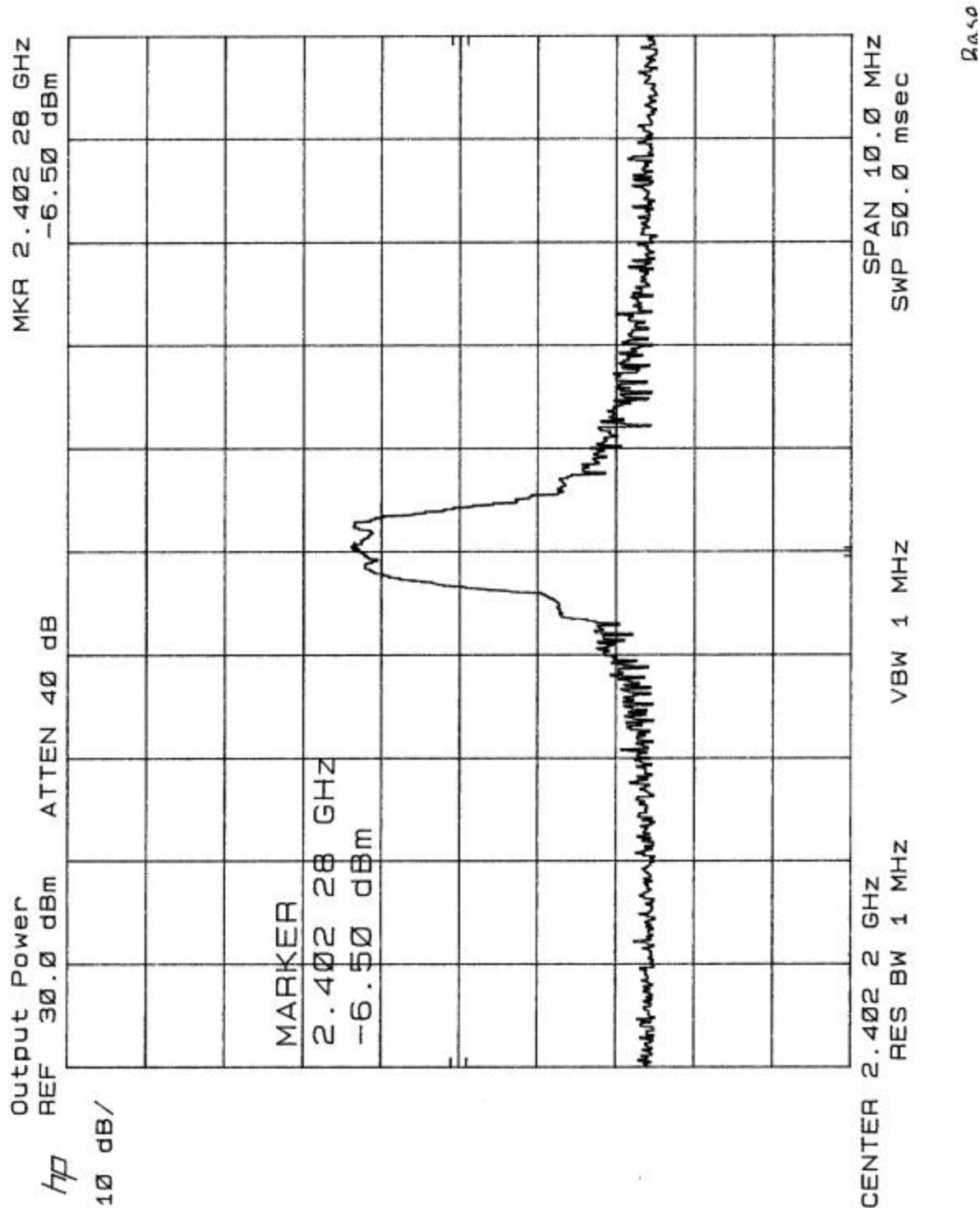
Refer to the attached to the following plots:

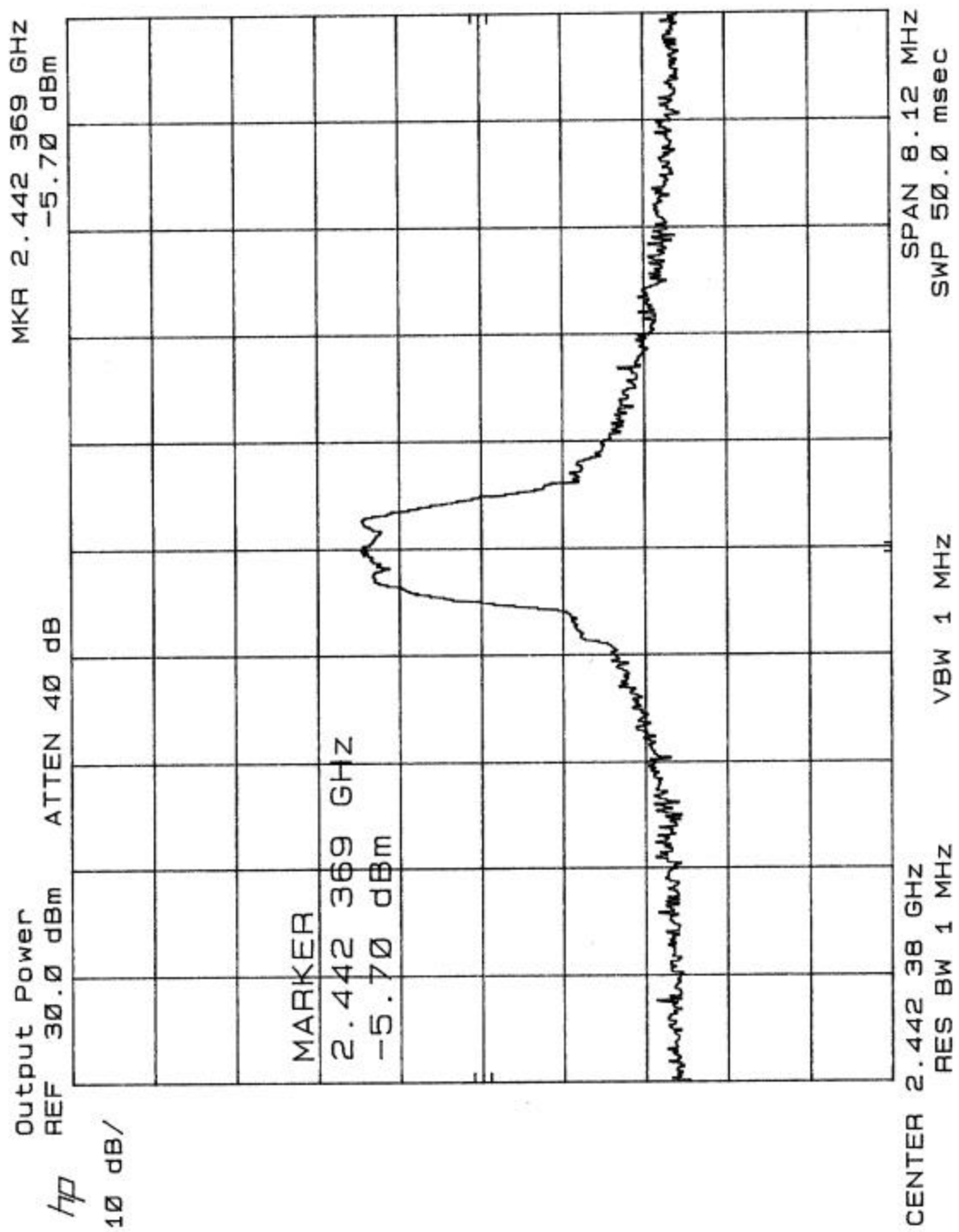
BASE

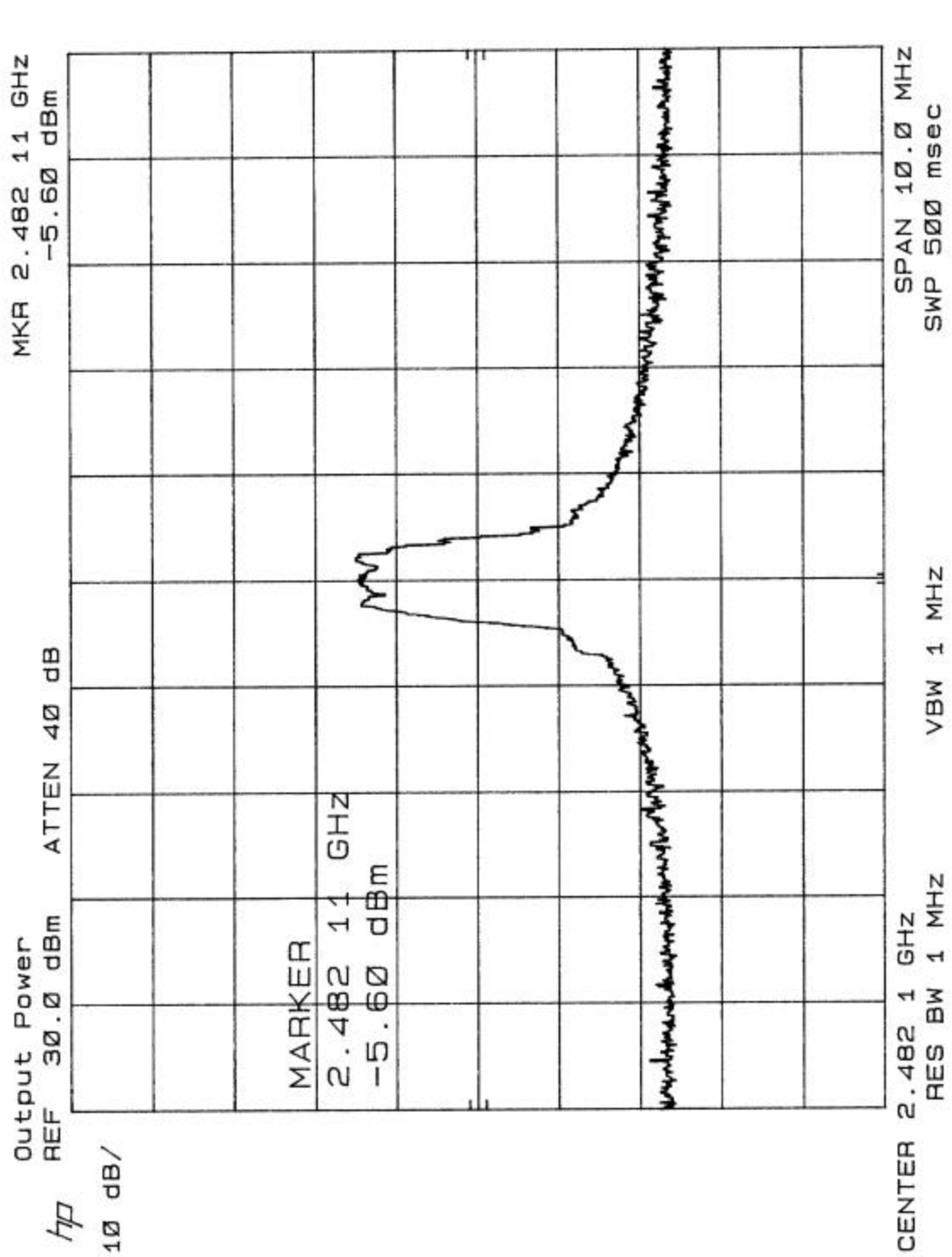
Peak Output Power	
Low Channel	Page 15
Middle Channel	Page 16
High Channel	Page 17

HANDSET

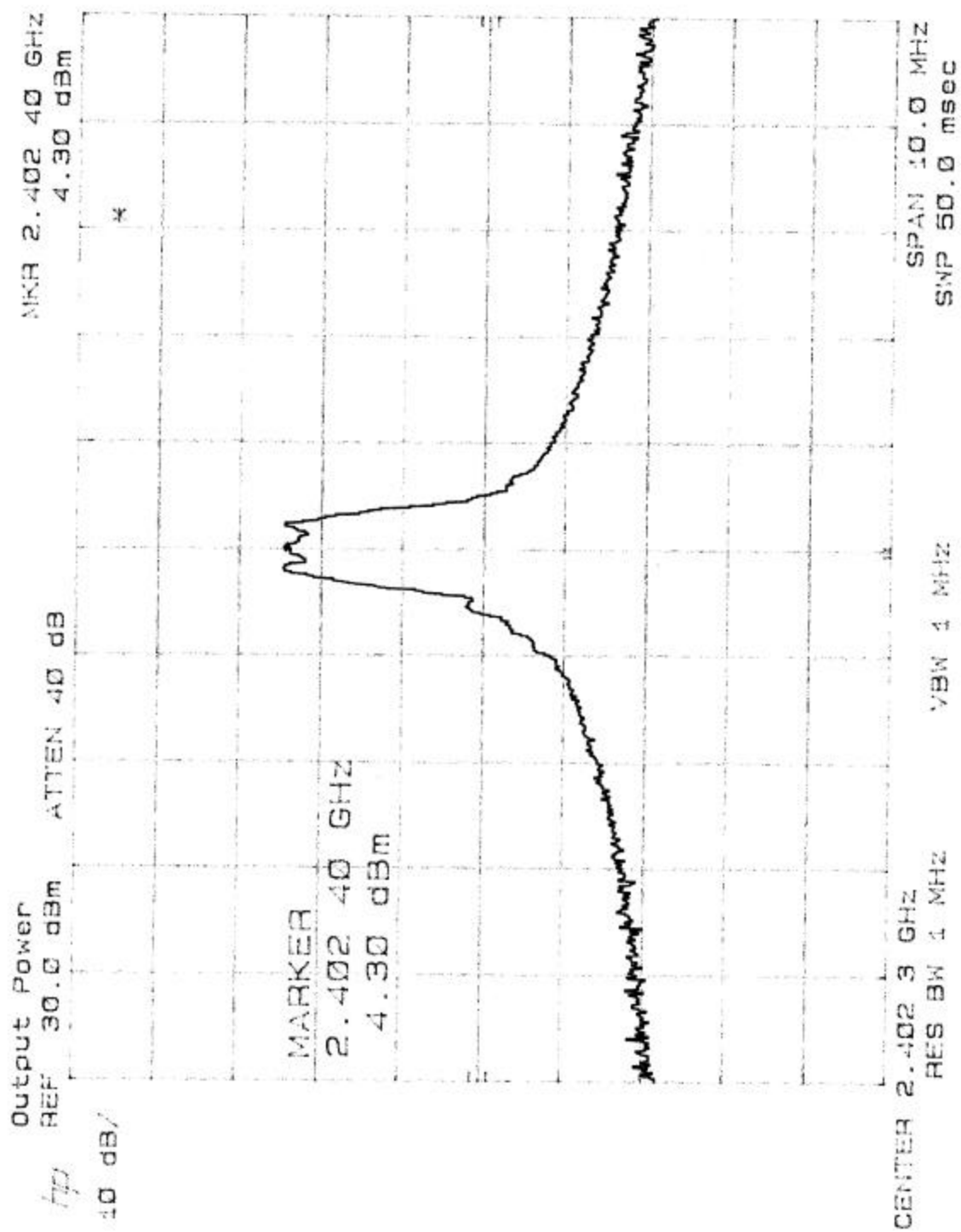
Peak Output Power	
Low Channel	Page 18
Middle Channel	Page 19
High Channel	Page 20

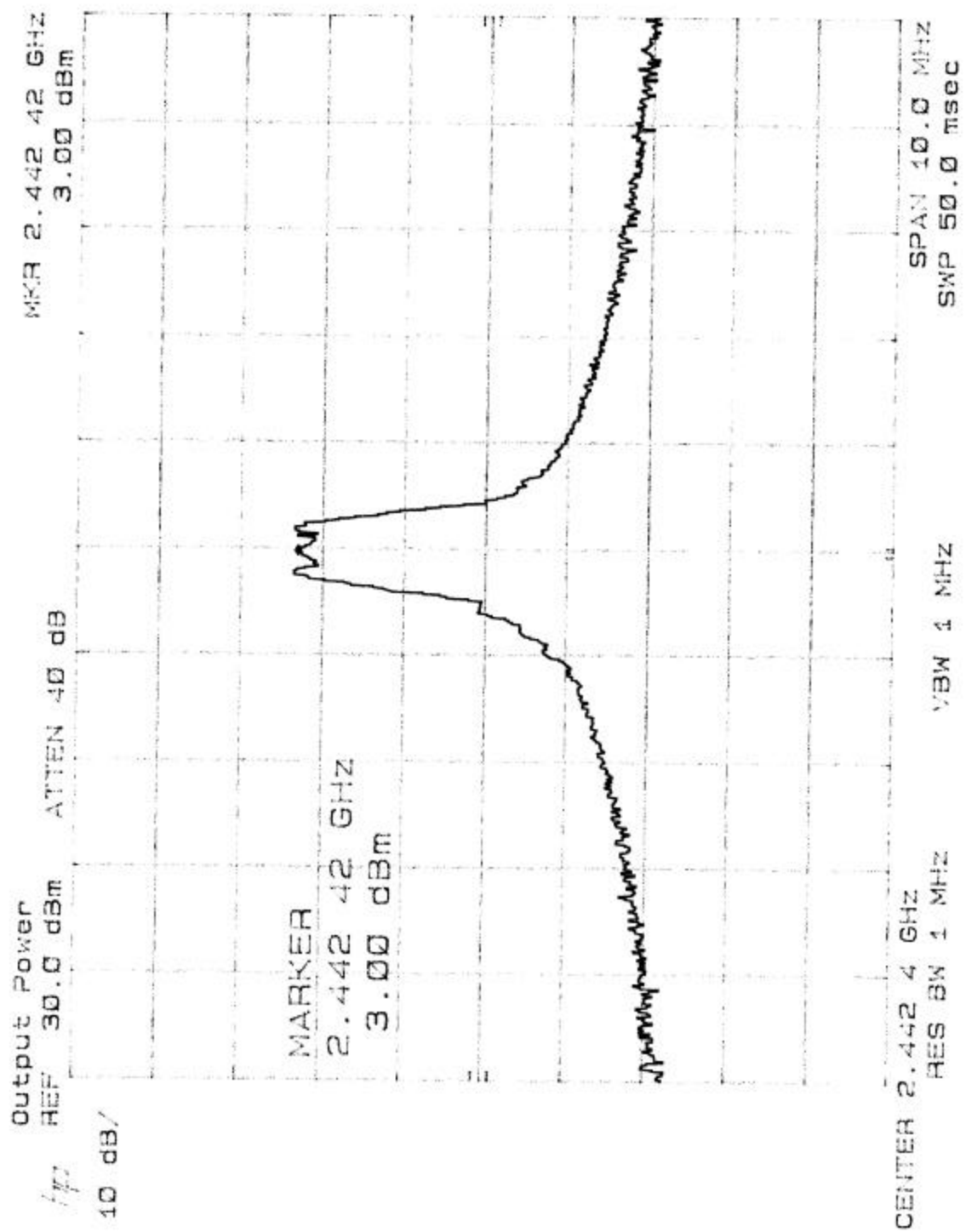


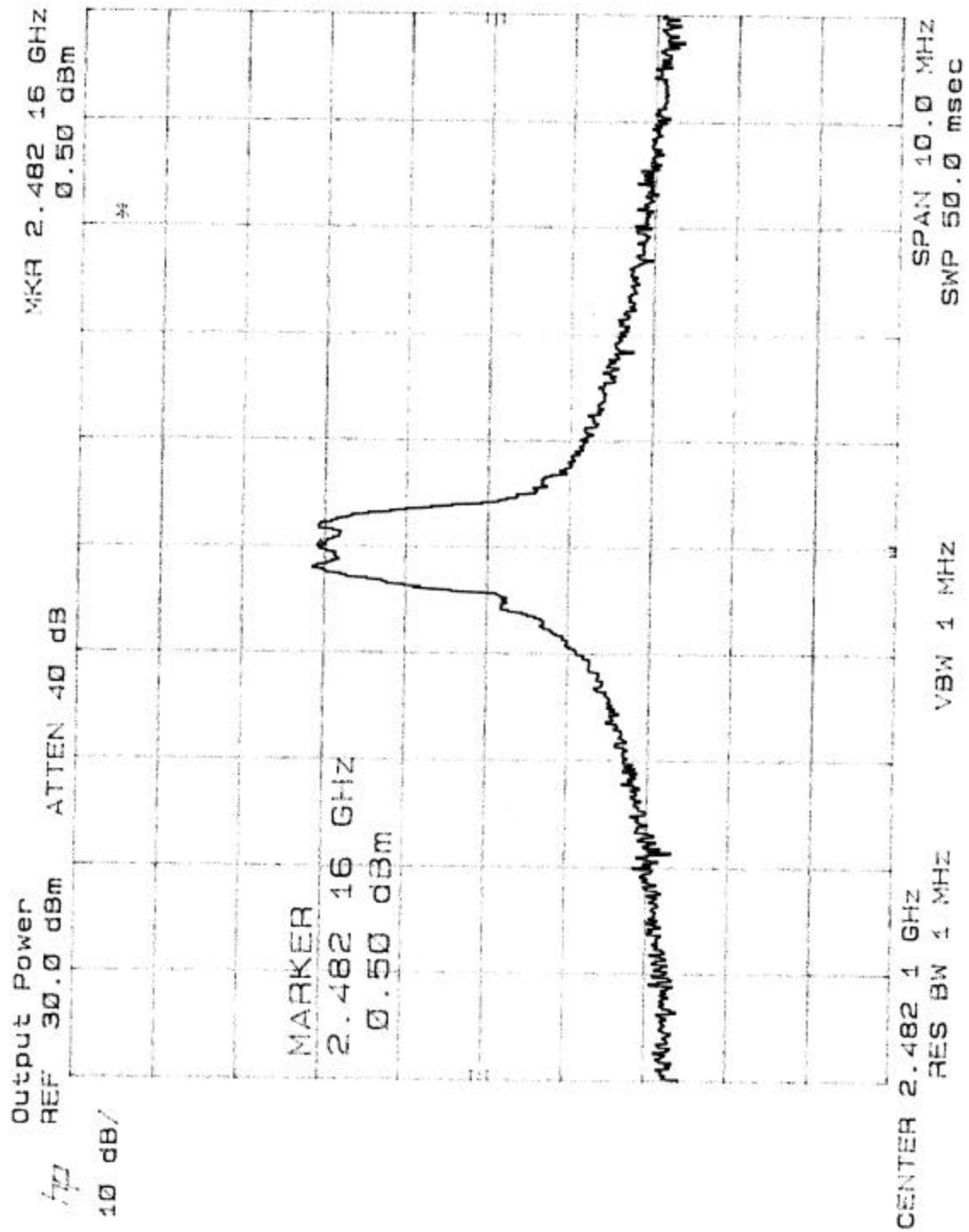




Pico







5 - CHANNEL BANDWIDTH

5.1 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 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 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 22
Middle Channel	Page 23
High Channel	Page 24

HANDSET

Hopping Channel Bandwidth	
Low Channel	Page 25
Middle Channel	Page 26
High Channel	Page 27

