

ELITE ELECTRONIC ENGINEERING INC.  
1516 CENTRE CIRCLE  
DOWNERS GROVE, ILLINOIS 60515-1082

ELITE PROJECT: 29798      DATES TESTED: April 25 through May 3, 2001

TEST PERSONNEL: Daniel E. Crowder

TEST SPECIFICATION: FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 for Frequency Hopping Spread Spectrum Intentional Radiators Operating within the 2400-2483.5MHz band

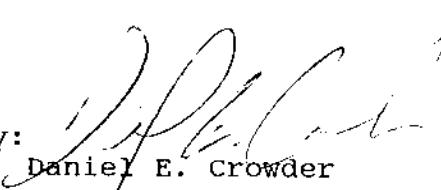
ENGINEERING TEST REPORT NO. 23679

MEASUREMENTS OF RF EMISSIONS

FROM THE MODEL REMOTE SPEAKER MICROPHONE TRANSMITTER

FOR: Motorola  
Rolling Meadows, Illinois

PURCHASE ORDER NO.: NP129920

Report By:   
Daniel E. Crowder

Approved By:   
Raymond J. Klouda  
Registered Professional  
Engineer of Illinois - 44894

ENGINEERING TEST REPORT NO. 23679

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

**DESCRIPTION OF TEST ITEM:** Frequency Hopping Spread Spectrum Transmitter

**MODEL NO. :** REMOTE SPEAKER MICROPHONE      **SERIAL NO.:** None Assigned

**FCC ID NO. :**

**MANUFACTURER:** Motorola

**APPLICABLE**

**SPECIFICATION:** FCC "Code of Federal Regulations", Title 47, Part 15, Subpart C, Sec. 15.247

**TEST PERFORMED BY:** ELITE ELECTRONIC ENGINEERING INC.  
Downers Grove, Illinois 60515

**DATES TESTED:** April 25 through May 3, 2001

**PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):**

**WITNESS:** No Motorola personnel were present during the testing.  
**ELITE ELECTRONIC:** Daniel E. Crowder

**ELITE JOB NO.:** 29798

**ABSTRACT:** The Remote Speaker Microphone Transmitter meets the requirements of the FCC "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 15.247 for frequency hopping spread spectrum transmitters. The carrier frequency separation, number of hopping frequencies, time of occupancy (dwell time), 20 dB bandwidth, peak output power, band-edge compliance, and spurious emissions were measured and found to comply with the requirements.

See the test results and data pages for more details.

---

ENGINEERING TEST REPORT NO. 23679

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION	1
1.1 Description of Test Item	1
1.2 Purpose	1
1.3 Deviations, Additions and Exclusions	1
1.4 Applicable Documents	1
1.5 Subcontractor Identification	1
2.0 TEST ITEM SETUP AND OPERATION	2
3.0 TEST SITE AND INSTRUMENTATION	2
3.1 Test Site	2
3.2 Test Instrumentation	2
4.0 REQUIREMENTS, PROCEDURES AND RESULTS	2
4.1 Power Line Conducted Emissions	2
4.2 Carrier Frequency Separation	2
4.3 Number of Hopping Frequencies	3
4.4 Time of Occupancy (Dwell Time)	4
4.5 20 dB Bandwidth	4
4.6 Peak Output Power	5
4.7 Band-edge Compliance	6
4.8 Spurious Emissions	6
5.0 CONCLUSION	8
6.0 CERTIFICATION	8
EQUIPMENT LIST	9

ENGINEERING TEST REPORT NO. 23679

MEASUREMENT OF RF EMISSIONS

FROM A REMOTE SPEAKER MICROPHONE TRANSMITTER

**1.0 INTRODUCTION:**

**1.1 DESCRIPTION OF TEST ITEM:** This report presents the results of the RF emissions measurements performed for the Remote Speaker Microphone spread spectrum transmitter, (hereinafter referred to as the test item). The tests were performed for Motorola located in Rolling Meadows, Illinois.

The test item is a frequency hopping spread spectrum transceiver used for bluetooth applications. It operates in the frequency band 2400 to 2483.5MHz.

**1.2 PURPOSE:** The test series was performed to determine if the test item meets the requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for intentional radiators.

**1.3 DEVIATIONS, ADDITIONS AND EXCLUSIONS:** There were no deviations from the test requirements.

**1.4 APPLICABLE DOCUMENTS:** The following documents of the exact issue designated form part of this document to the extent specified herein:

Federal Communications Commission (FCC) "Code of Federal Regulations", Title 47, Part 15, dated 1 October 2000

FCC Public Notice, DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", Released March 30, 2000

**1.5 SUBCONTRACTOR IDENTIFICATION:** This series of tests was performed by the Elite Electronic Engineering Inc., of Downers Grove, Illinois.

**2.0 TEST ITEM SETUP AND OPERATION:**

For all tests the test item was placed on a 0.8 meter high non-conductive table. The 4.5VDC was supplied to the test item from internal batteries. The test item is supplied with an internal antenna.

Motorola ear-piece was connected to the ear-piece port.

**3.0 TEST SITE AND INSTRUMENTATION:**

**3.1 TEST SITE:** All tests were performed at Elite's facility in Downers Grove, Illinois. All tests were performed in a hybrid anechoic/ferrite tile shielded enclosure.

**3.2 TEST INSTRUMENTATION:** A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

**4.0 REQUIREMENTS, PROCEDURES AND RESULTS:**

**4.1 POWER LINE CONDUCTED EMISSIONS:**

**4.1.1 REQUIREMENT:** This requirement does not apply since the test item is battery operated. There are no operation modes where the transmitter can be connected to the AC power public utilities, and therefore, the conducted emissions test are not required.

**4.2 CARRIER FREQUENCY SEPARATION:**

**4.2.1 REQUIREMENTS:** Per section 15.247 (a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

**4.2.2 PROCEDURES:** The test item was setup inside the chamber. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to  $\geq$  to 1% of the span. The peak detector and 'Max-Hold' function was engaged. The span was set wide enough to capture the peaks of at least two adjacent channels. When the trace had stabilized after multiple scans. The marker-delta function was used to determine the separation between the peaks of the adjacent channels. The analyzer's display was plotted using a 'screen dump' utility.

**4.2.3 RESULTS:** Data page 101 shows the carrier frequency separation. As can be seen from this plot, the separation is 1MHz which is the 20dB bandwidth.

**4.3 NUMBER OF HOPPING FREQUENCIES:**

**4.3.1 REQUIREMENTS:** Per section 15.247(a)(1)(ii), frequency hopping systems shall use at least 75 hopping frequencies.

**4.3.2 PROCEDURE:** The test item was setup inside the chamber. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to  $\geq$  to 1% of the span. The peak detector and 'Max-Hold' function was engaged. The span was set wide enough to capture the entire frequency band of operation.

When the trace had stabilized after multiple scans. The number of hopping frequencies was counted. The analyzer's display was plotted using a 'screen dump' utility.

**4.3.3 RESULTS:** Data page 102 shows the number of hopping frequencies. As can be seen from this plot, the number of frequencies is 79 which is greater than the minimum required of 75.

**4.4 TIME OF OCCUPANCY (DWELL TIME):**

**4.4.1 REQUIREMENTS:** Per section 15.247(a)(1)(ii), the

average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

**4.4.2 PROCEDURE:** The test item was setup inside the chamber. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to 1 MHz. The peak detector and 'Max-Hold' function was engaged. With the span was to 0Hz, the sweep time was adjusted to capture a single event in order to measure the dwell time per hop. Then, the sweep time was expanded to capture the average time between hops. When the trace had stabilized after multiple scans, the time between hops was measured. The analyzer's display was plotted using a 'screen dump' utility.

The dwell time in a 30 second period was then calculated from dwell time per hop divided by time between hops then multiplied by 30 seconds.

**4.4.3 RESULTS:** Data pages 103 and 104 show the plots for the time of occupancy (dwell time). As can be seen from the plots, the time of occupancy can be determined by a 424 usec burst every 100 msec in a 30 Second period. This calculated value is equal to 0.13 seconds which is less than the 0.4 seconds allowed.

#### **4.5 20 dB BANDWIDTH:**

**4.5.1 REQUIREMENTS:** Per section 15.247(a)(1)(ii), the maximum 20dB bandwidth of the hopping channel is 1MHz.

**4.5.2 PROCEDURE:** The test item was setup inside the chamber. With the hopping function disabled, the test item was allowed to transmit continuously. The frequency hopping channel was set separately to low, middle, and high hopping channels. The resolution

bandwidth (RBW) was set to  $\geq$  to 1% of the 20 dB BW.

The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

**4.5.3 RESULTS:** The plots on pages 105 through 107 show that the maximum 20 dB bandwidth was 0.95 MHz. The 20 dB bandwidth was less than the maximum requirement.

**4.6 PEAK OUTPUT POWER:**

**4.6.1 REQUIREMENTS:** This requirement applies only to the transmit mode of operation. Per section 15.247(b) the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**4.6.2 PROCEDURES:** Since the antenna was an integrated antenna the equivalent isotropic radiated power (EIRP) was computed from the radiated field strength measurements at 3 meters.

The spectrum analyzer bandwidth was set to 3 MHz which is greater than the 20dB bandwidth of the transmitter. A double ridged waveguide antenna was positioned 3 meters from the test item. The maximum meter reading was recorded for the vertical and horizontal receiver antenna polarity while rotating the test item through 360 degrees. The EIRP was calculated for the low, middle and high hopping frequencies.

**4.6.3 RESULTS:** The results are presented on data page 109. The maximum EIRP measured from the transmitter was 4.5 dBm. Therefore, the transmitter meets the De Facto 36 dBm limit. Only one type of

antenna is supplied with the test item.

**4.7 BAND-EDGE COMPLIANCE:**

**4.7.1 REQUIREMENTS:** Per section 15.247(c), the emissions at the band-edges must be at least 20dB below the highest level measured within the band. In addition, the radiated emissions which fall in the restricted band beginning at 2483.5 MHz, must meet the general limits of 15.209

**4.7.2 PROCEDURE:** The same data recorded for the low and high hopping frequencies from the 20 dB bandwidth measurements was used to demonstrate compliance with the 20 dB band-edge requirements.

For the radiated emissions which fall in the restricted band the "marker-delta" method described in Public Notice DA 00-705 was used. Initially radiated measurements were performed at the fundamentals of the highest hopping frequencies using 1 MHz bandwidth. For the measurements the "delta" required to meet the general limit was calculated.

Next, the band-edge emissions were plotted using peak detector and 100 kHz bandwidth. The "delta" limit was applied to this plot to determine compliance at the band-edge.

**4.7.3 RESULTS:** Data page 108 show the band-edge compliance results using the marker-delta method. As can be seen from this plot, the emissions at the band-edge in the restricted band are within the general limits.

**4.8 SPURIOUS EMISSIONS:**

**4.8.1 REQUIREMENTS:** Per section 15.247(c), the spurious emissions in any 100 kHz BW outside the frequency band must be at least 20dB below the highest 100 kHz BW level measured within the

band. In addition, the radiated emissions which fall in the restricted bands must meet the general limits of 15.209.

**4.8.2 PROCEDURES:** Since the test item was supplied with a permanently attached antenna, the spurious emissions compliance was evaluated against the radiated emissions levels for unrestricted bands as well as the restricted bands.

The radiated tests were performed in a 32ft. x 20ft. x 18ft. hybrid absorber lined semi-anechoic test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. The floor of the chamber is used as the ground plane. The chamber complies with ANSI 63.4 and CISPR 16 requirements for site attenuation.

Preliminary radiated measurements are performed to determine the frequencies where the significant emissions might be found. With the test item at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using peak detection with 100 kHz BW. This data was then automatically plotted up through 18 GHz. Frequency range 18 to 24 GHz was checked manually but not plotted.

Next, the harmonic or spurious emissions falling in the restricted bands were measured up through the 10th harmonic. For these measurements, the measurement bandwidths were set to 1 MHz RBW. The analyzer was set to **linear mode** with 10 Hz VBW in order to simulate an average detector. A preamplifier was used to increase the receiver sensitivity.

**4.8.3 RESULTS:** The preliminary emissions levels were plotted. These plots are presented on Data Pages 110 through 116. This

plot shows that the spurious emissions were at least 20 dB below the level of the fundamental.

The harmonics and any other emissions that fall in the restricted frequency bands were then remeasured manually. This data is shown in the tables on Data Pages 117 through 119. The field intensities levels for the harmonics in the restricted band were within the limit.

A block diagram of the test item orientation position is shown in Figure 1.

**5.0 CONCLUSION:**

The Motorola Remote Speaker Microphone, complies with the limits imposed by the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for frequency hopping spread spectrum transmitters.

**6.0 CERTIFICATION:**

Elite Electronic Engineering Inc. certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specification.

The data presented in this test report pertains to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

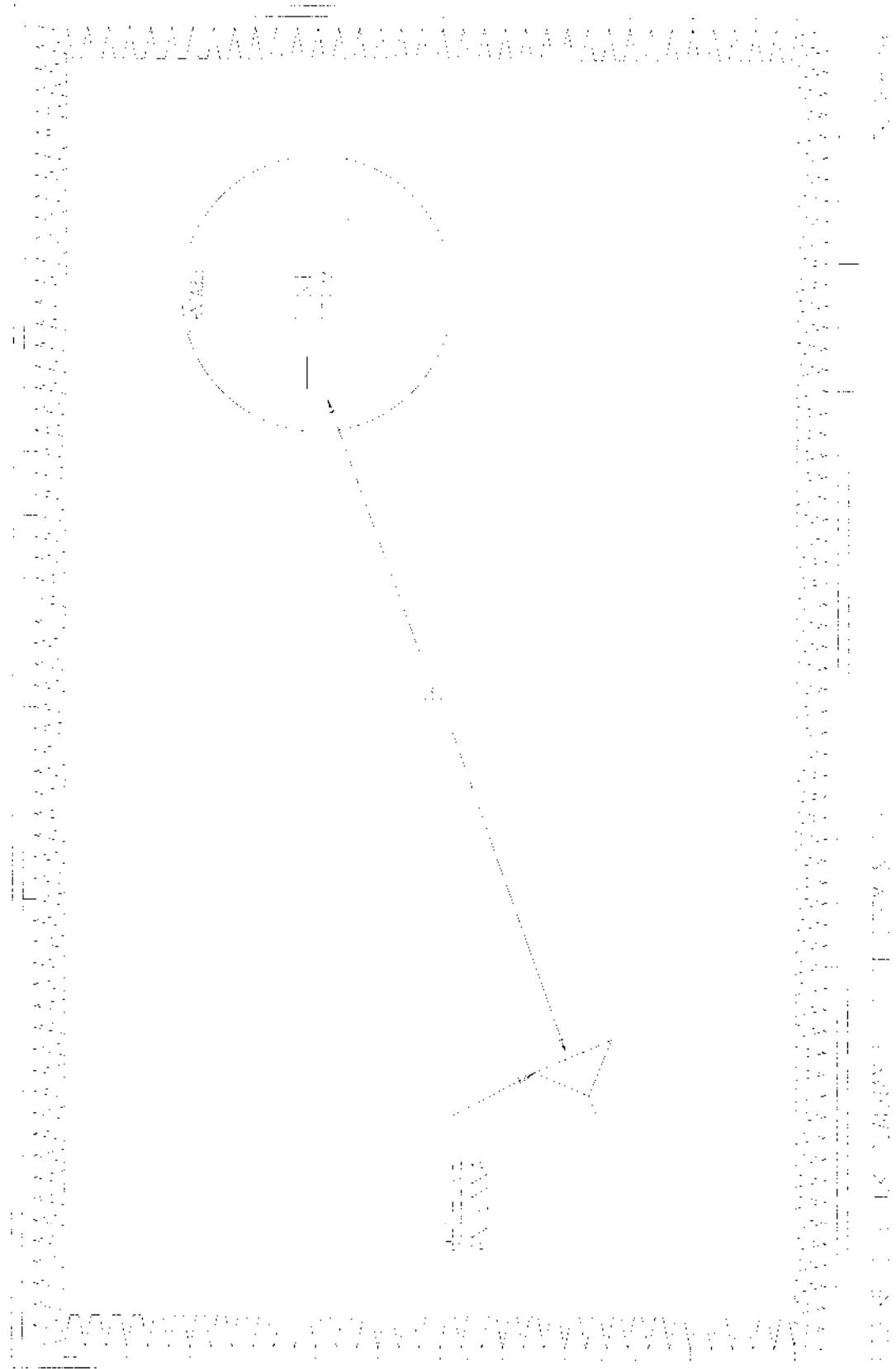
This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

## ENGINEERING TEST REPORT NO. 23679

TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.						Page: 1		
Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
<b>Equipment Type: ACCESSORIES, MISCELLANEOUS</b>								
XZ60	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---	01/31/00	N/A	
<b>Equipment Type: AMPLIFIERS</b>								
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	02/15/01	12	02/15/02
<b>Equipment Type: ANTENNAS</b>								
NTAO	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	05/09/00	12	05/09/01
NW10	RIDGED WAVE GUIDE	AEL	H1498	153	2-18GHZ	08/28/00	12	08/28/01
<b>Equipment Type: CONTROLLERS</b>								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
<b>Equipment Type: PRINTERS AND PLOTTERS</b>								
HRE2	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061201	---		N/A	
<b>Equipment Type: RECEIVERS</b>								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/16/01	12	01/16/02
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	05/10/00	12	05/10/01
RAF3	QUASipeak ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/17/01	12	01/17/02
<b>Equipment Type: TEST CHAMBERS (EMI)</b>								
RM17	3M ANECHOIC CHAMBER MEETS	EMC TEST SYSTEM	3M ANECHOIC		30MHZ-18GHZ	03/21/00	12	03/21/01

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable  
 Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.



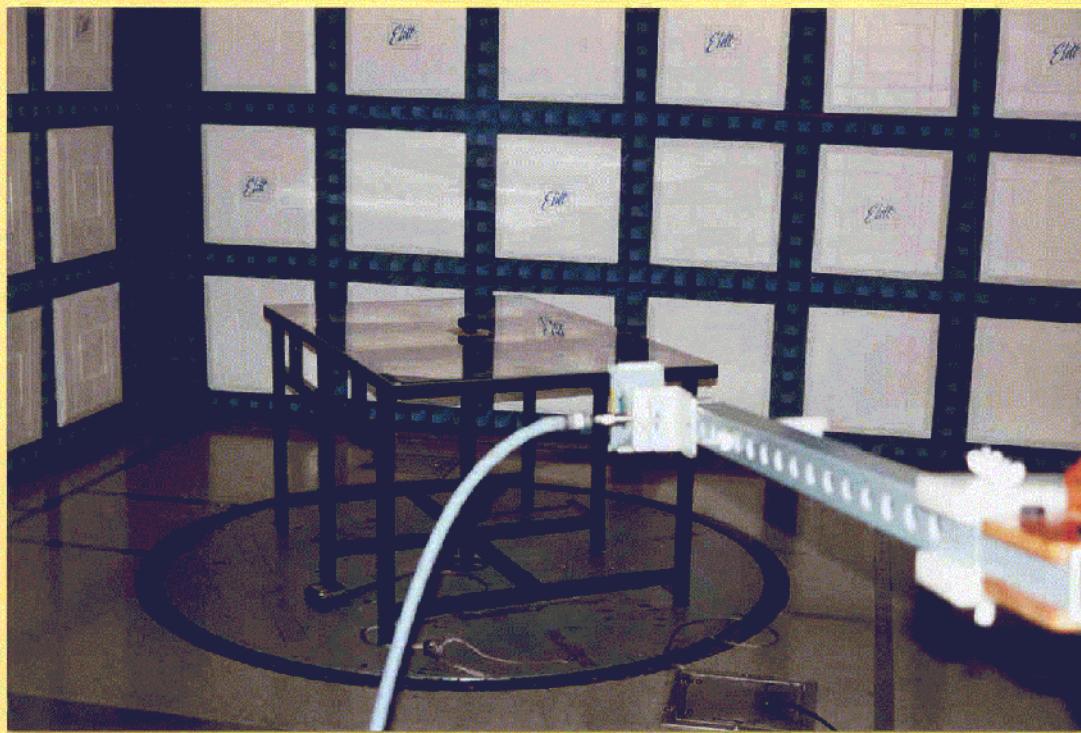


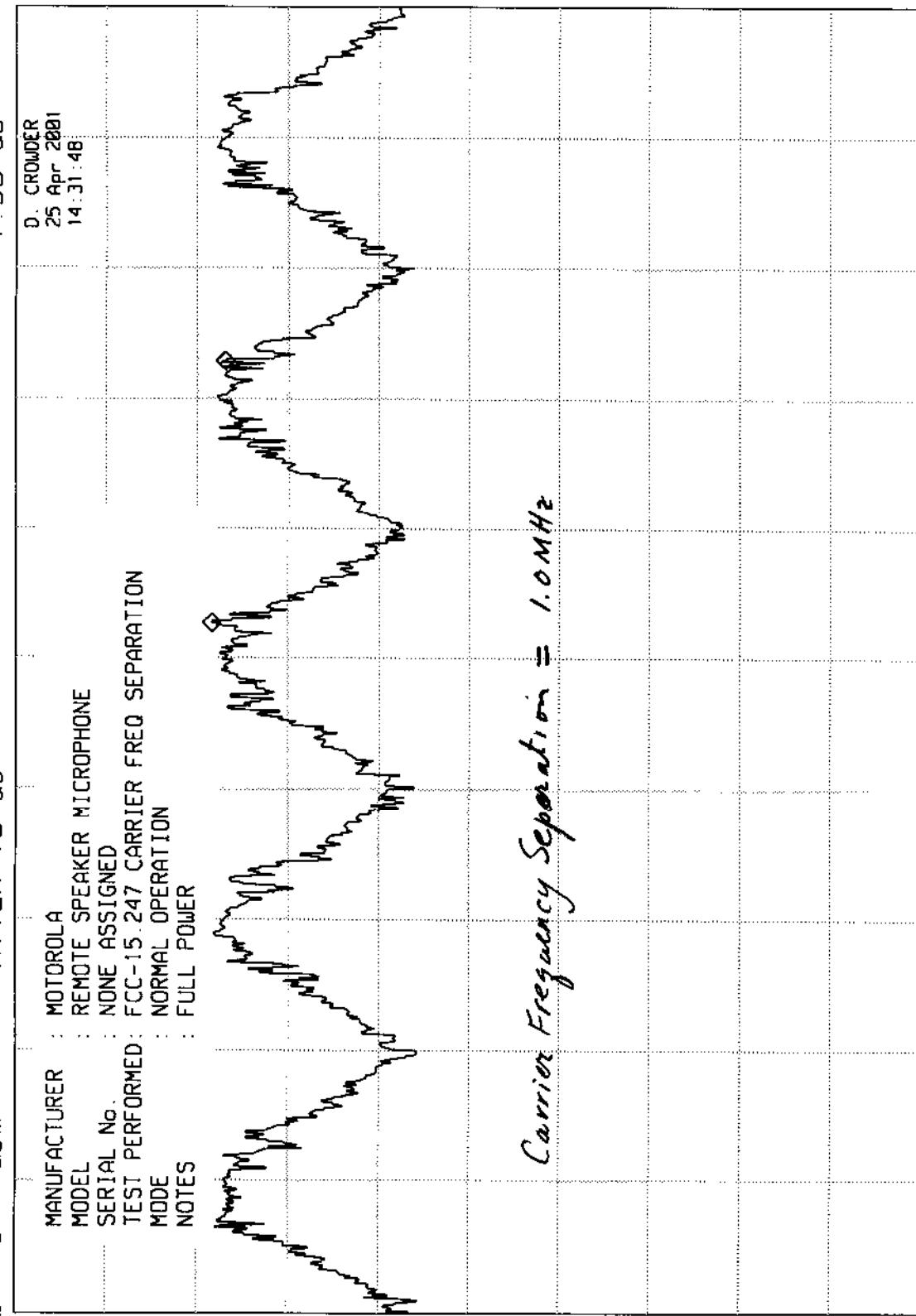
FIGURE 2A TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION



FIGURE 2B TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION

## ELITE ELECTRONIC ENGINEERING CO

hp REF -5.1 dBm ATTEN 10 dB



CENTER 2.441 00 GHz  
RES BW 100 kHz(i) UBU 1 MHz

SPAN 5.00 MHz  
SUP 20.0 msec

12 of 29

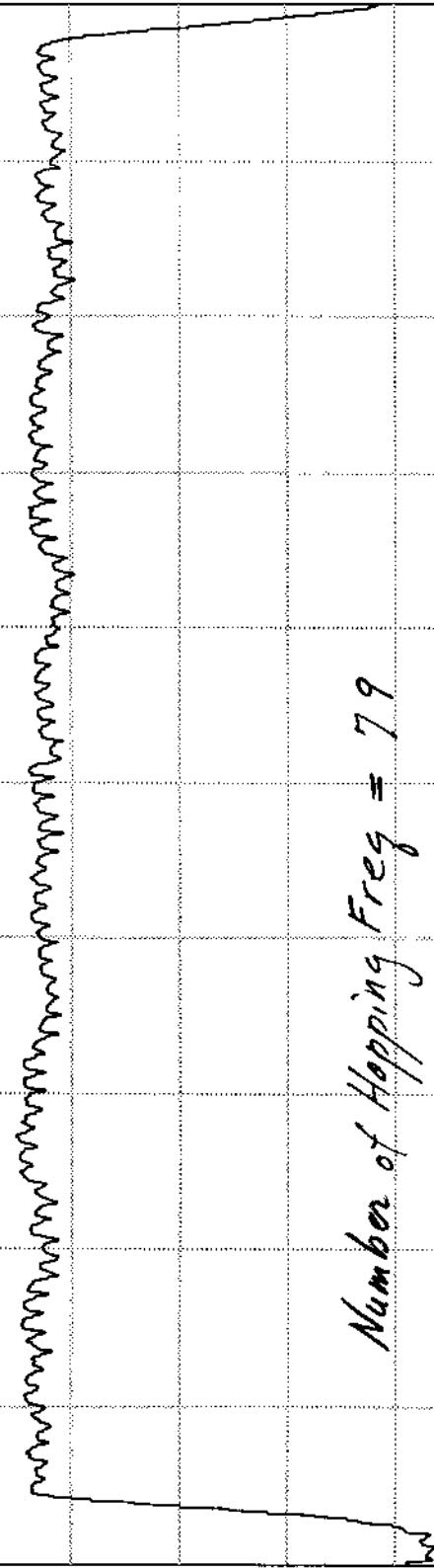
ETR 23674

## ELITE ELECTRONIC ENGINEERING CO

hp REF 5.4 dB<sub>m</sub> ATTEN 20 dB MKR ~ 13.61 MHz  
 10 dB/ 30.20 dB

MANUFACTURER	MOTOROLA	D. CROWDER
MODEL	REMOTE SPEAKER MICROPHONE	25 Apr 2001
SERIAL No.	NONE ASSIGNED	13:46:31
TEST PERFORMED	FCC-15.247 NUMBER OF HOPPING FREQS	
MODE	NORMAL OPERATION	
NOTES	FULL POWER	

DL -50.9 dB<sub>m</sub>



13 of 29

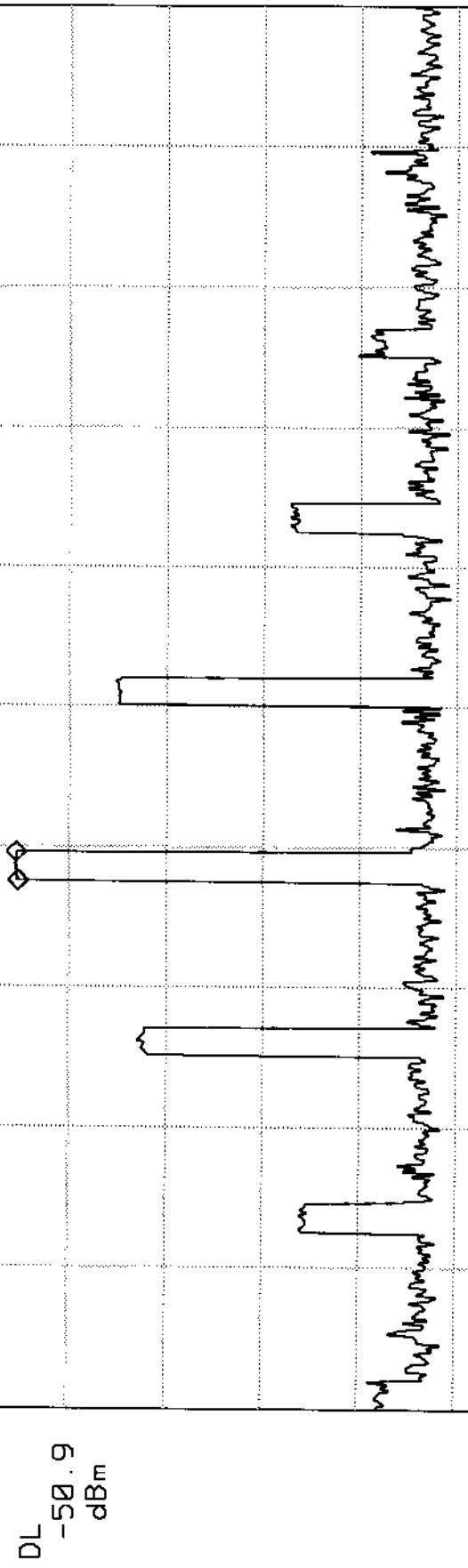
CENTER 2.440 4 GHz RES BW 1 MHz (i) UBW 3 MHz SPAN 85.1 MHz SUP 20.0 msec

ETR 23679

## ELITE ELECTRONIC ENGINEERING CO

hp REF -5.1 dBm ATEN 10 dB

MANUFACTURER	MOTOROLA
MODEL	REMOTE SPEAKER MICROPHONE
SERIAL No.	NONE ASSIGNED
TEST PERFORMED	FCC-15.247 DWELL TIME
MODE	NORMAL OPERATION
NOTES	FULL POWER



CENTER 2.441 000 000 GHz  
RES BW 1 MHz (i) UBU 3 MHz

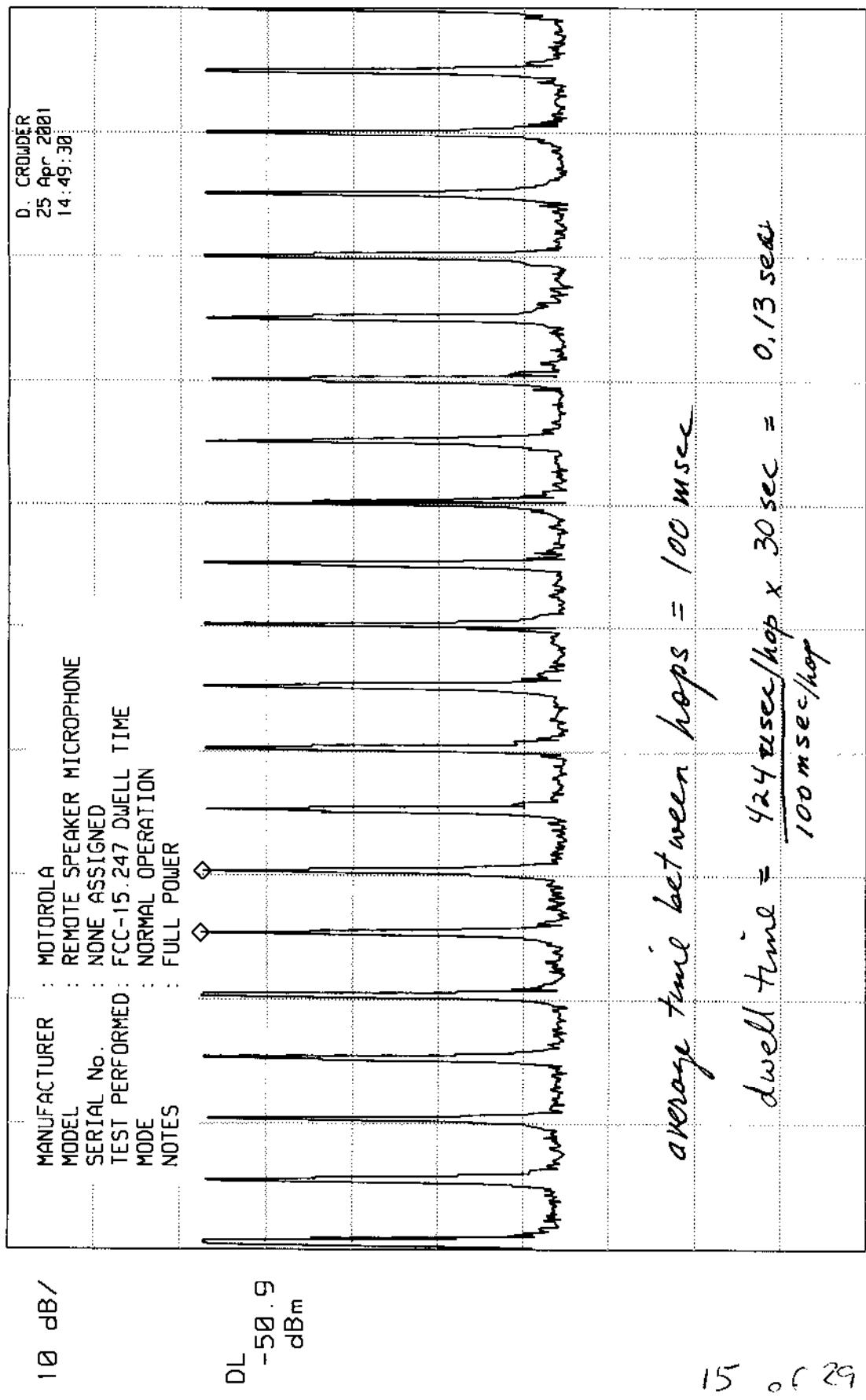
SPAN 0 Hz

SUP 20.2 msec

17.20

## ELITE ELECTRONIC ENGINEERING CO

hp REF -5.1 dBm ATTEN 10 dB



CENTER 2.441 000 000 GHz  
RES BW 1 MHz (i) UBU 3 MHz  
SPAN 0 Hz  
SUF 2.00 sec

15 25

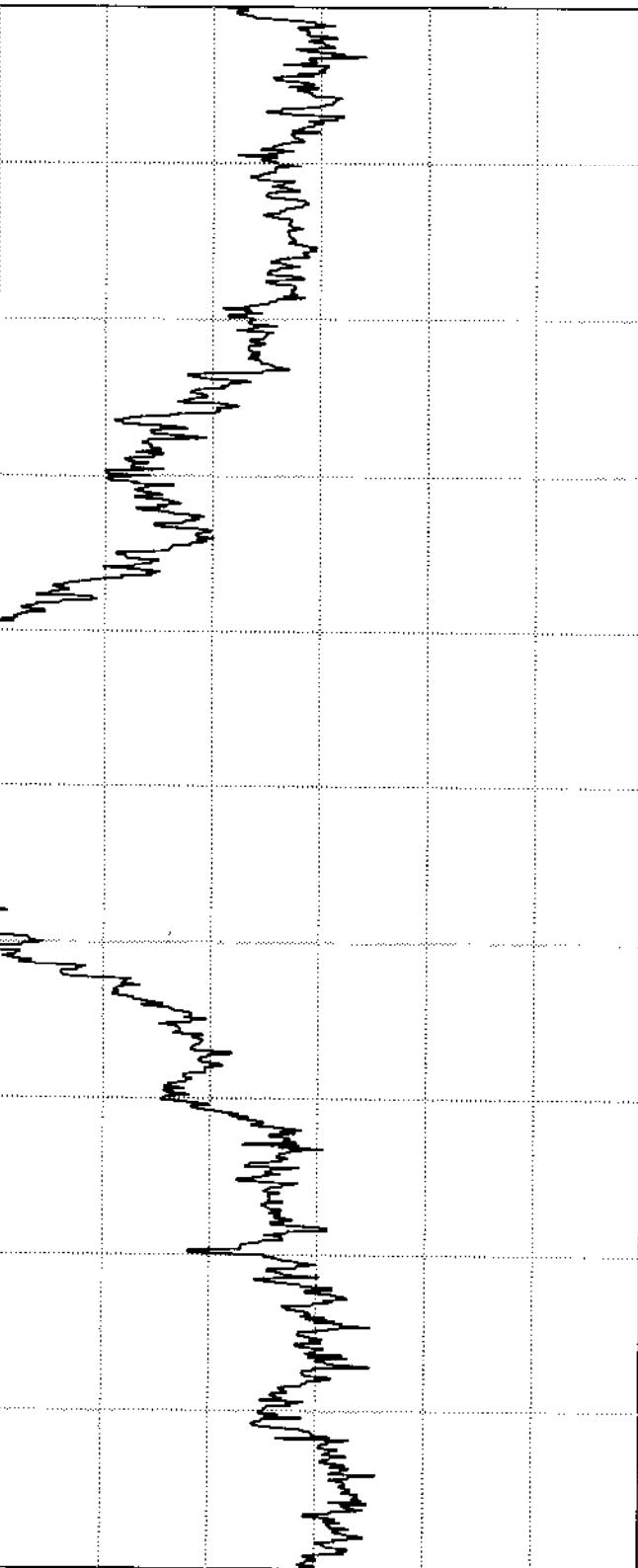
## ELITE ELECTRONIC ENGINEERING CO

hp REF -13.2 dBm ATTEM 10 dB MKR ~ 950 kHz  
 -1.30 dB

10 dB /	MANUFACTURER : MOTOROLA
	MODEL : REMOTE SPEAKER MICROPHONE
	SERIAL No. : NONE ASSIGNED
	TEST PERFORMED : FCC-15.247 20 dB BANDWIDTH
	MODE : Tx AT LOW CHANNEL
	NOTES : FULL POWER

DL -50.4 dBm

2400 kHz Band edge



16 of 29  
 CENTER 2.402 00 GHz  
 RES BW 10 kHz (1) UBU 100 kHz  
 SPAN 5.00 MHz SUP 375 msec

E7R 23679

## ELITE ELECTRONIC ENGINEERING CO

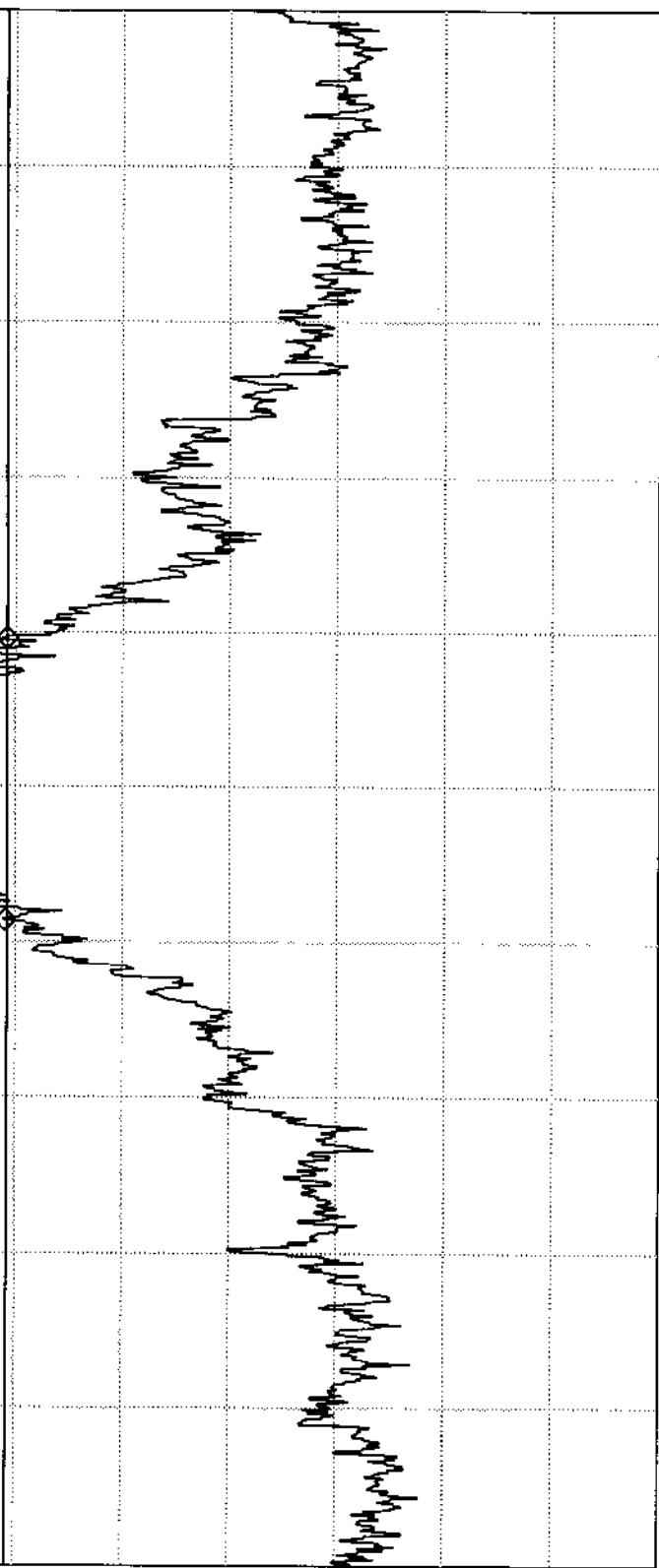
hP REF -13.2 dBm ATEN 10 dB

10 dB /

MANUFACTURER	MOTOROLA
MODEL	REMOTE SPEAKER MICROPHONE
SERIAL No.	NONE ASSIGNED
TEST PERFORMED	FCC-15.247 20 dB BANDWIDTH
MODE	Tx AT MID CHANNEL
NOTES	FULL POWER

DL -52.5 dBm

ETR 23679



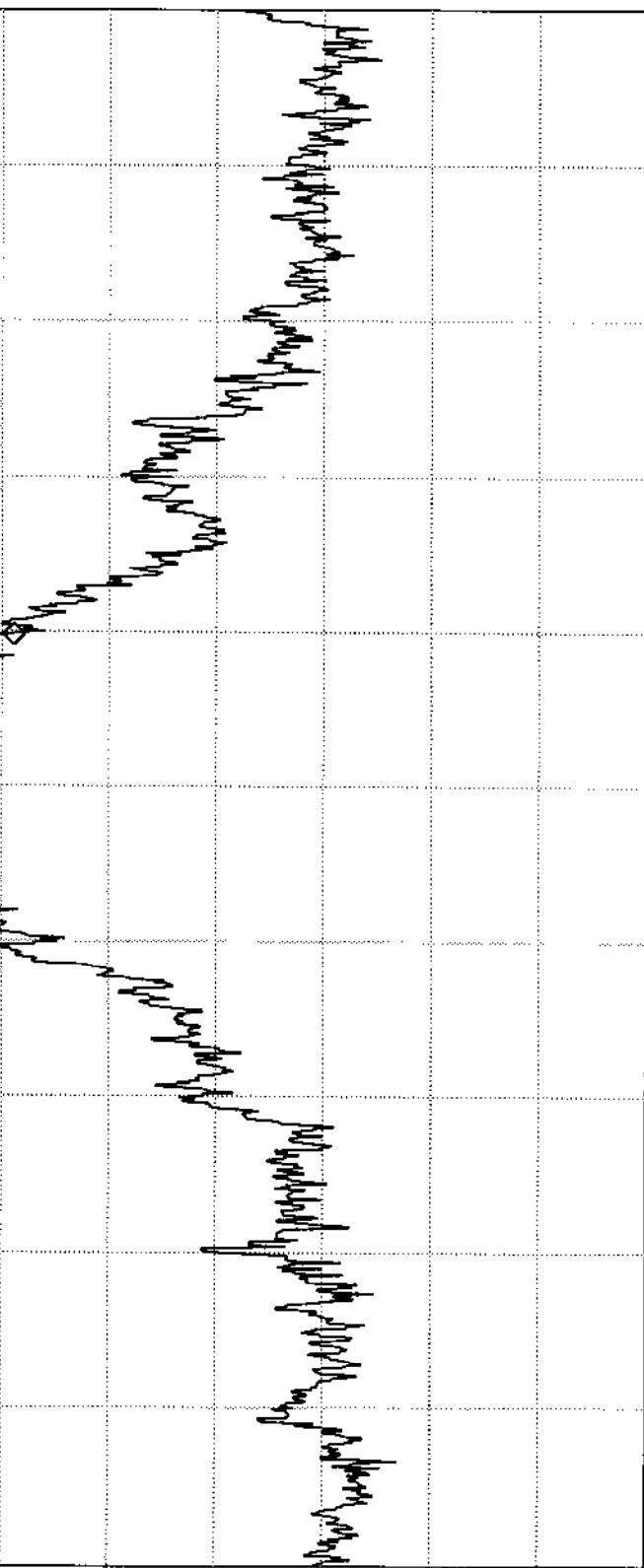
CENTER 2.441 00 GHz RES BW 10 kHz (i) UBU 100 kHz  
SPAN 5.00 MHz SUP 375 msec

## ELITE ELECTRONIC ENGINEERING CO

hp REF -13.2 dB<sub>m</sub> ATTEN 10 dB

10 dB <sub>v</sub>	MANUFACTURER : MOTOROLA
MODEL : REMOTE SPEAKER MICROPHONE	
SERIAL No. : NONE ASSIGNED	
TEST PERFORMED : FCC-15.247 20 dB BANDWIDTH	
MODE : Tx AT HIGH CHANNEL	
NOTES : FULL POWER	

DL -50.9 dB<sub>m</sub>



CENTER 2.480 00 GHz  
RES BW 10 kHz (i) UBW 100 kHz  
SPAN 5.00 MHz SUP 375 msec  
18.6.29



ETR No. 23679  
DATA SHEET

PEAK OUTPUT POWER

SPECIFICATION : FCC-15C (15.247)  
MANUFACTURER : MOTOROLA  
MODEL NO. : REMOTE SPEAKER MODULE  
SERIAL NO. : NONE ASSIGNED  
NOTES : TRANSMIT AT FULL POWER  
TEST DATE : 26 APRIL 2001  
TEST DISTANCE : 3m

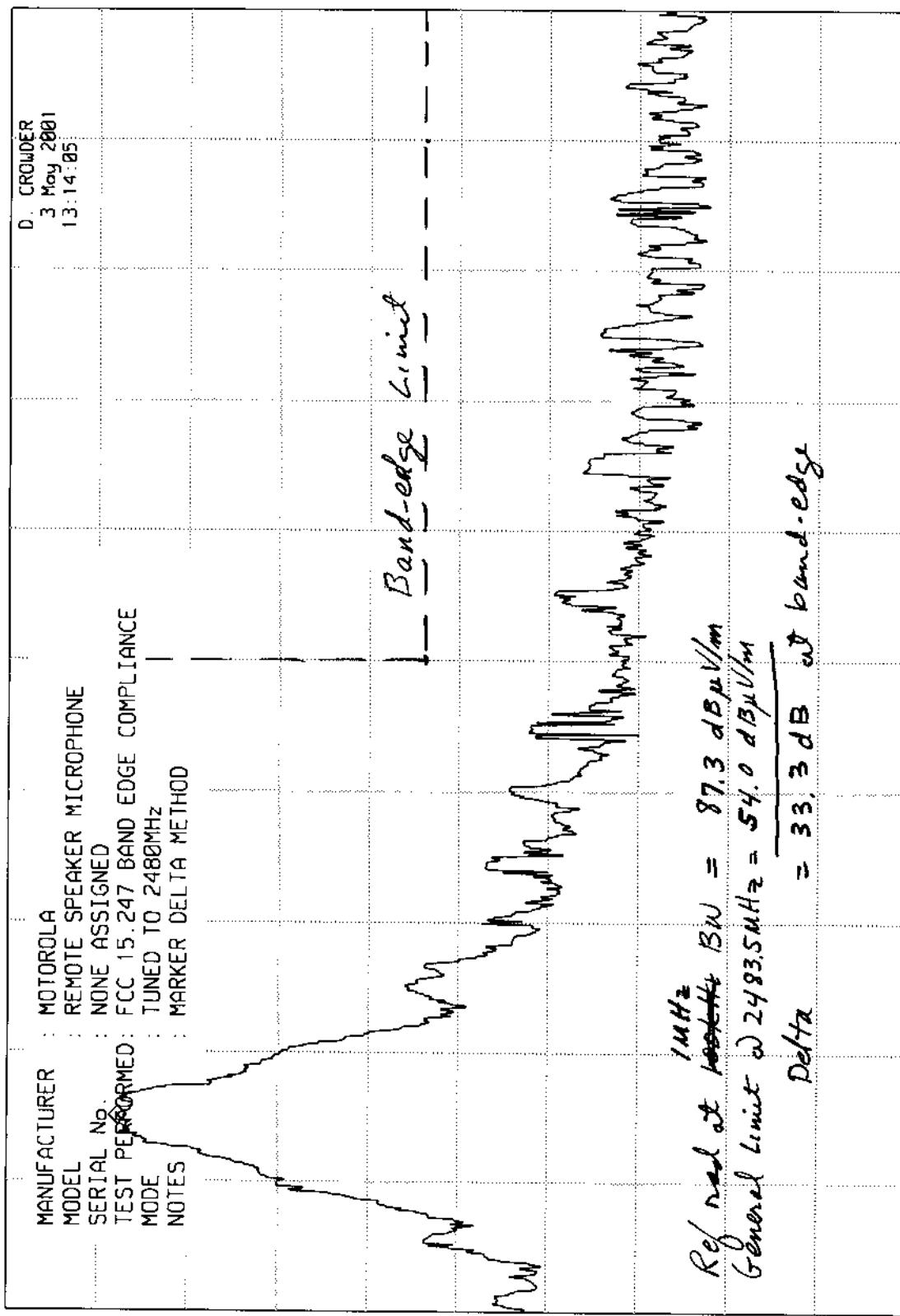
FREQ. (MHz)	ANT POL	F.I. (dBuV/m)	CONV. F.I. to EIRP	EIRP TOTAL dBm	EIRP TOTAL dBm
2402.0	H	99.0	95.0	4.0	36
	V	99.5	95.0	4.5	36
2441.0	H	98.5	95.0	3.5	36
	V	97.9	95.0	2.9	36
2480.0	H	97.8	95.0	2.8	36
	V	97.7	95.0	2.7	36

CHECKED BY: 

page 19 of 29

## ELITE ELECTRONIC ENGINEERING CO

hp REF 97.0 dB<sub>U</sub> ATTN 0 dB



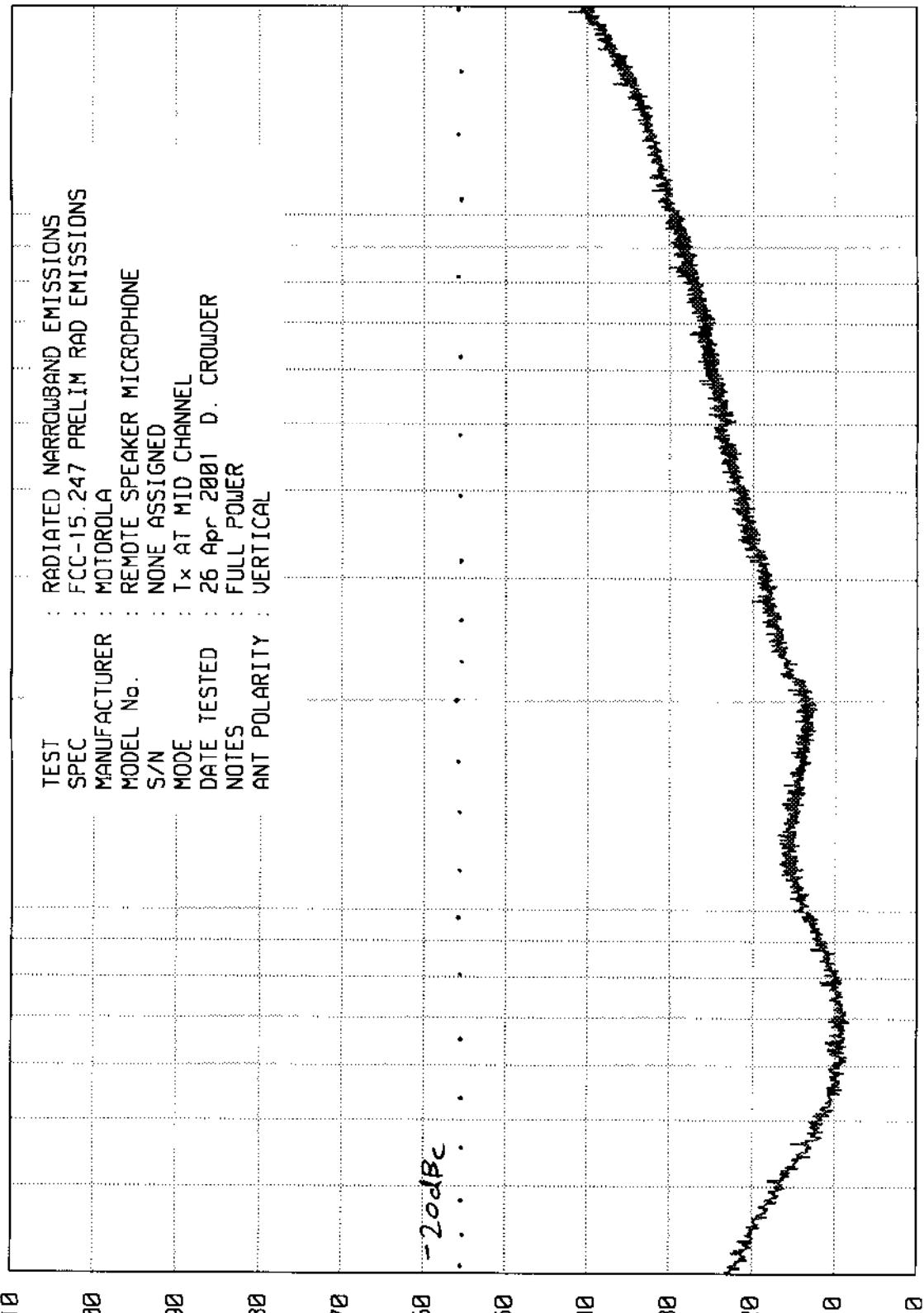
CENTER 2.483 5 GHz  
RES BW 100 kHz (i) UBU 1 MHz  
SPAN 10.0 MHz  
SWP 20.0 msec

*Eee* ELITE ELECTRONIC ENGINEERING Co.  
Dowmers Grove, Ill. 60515

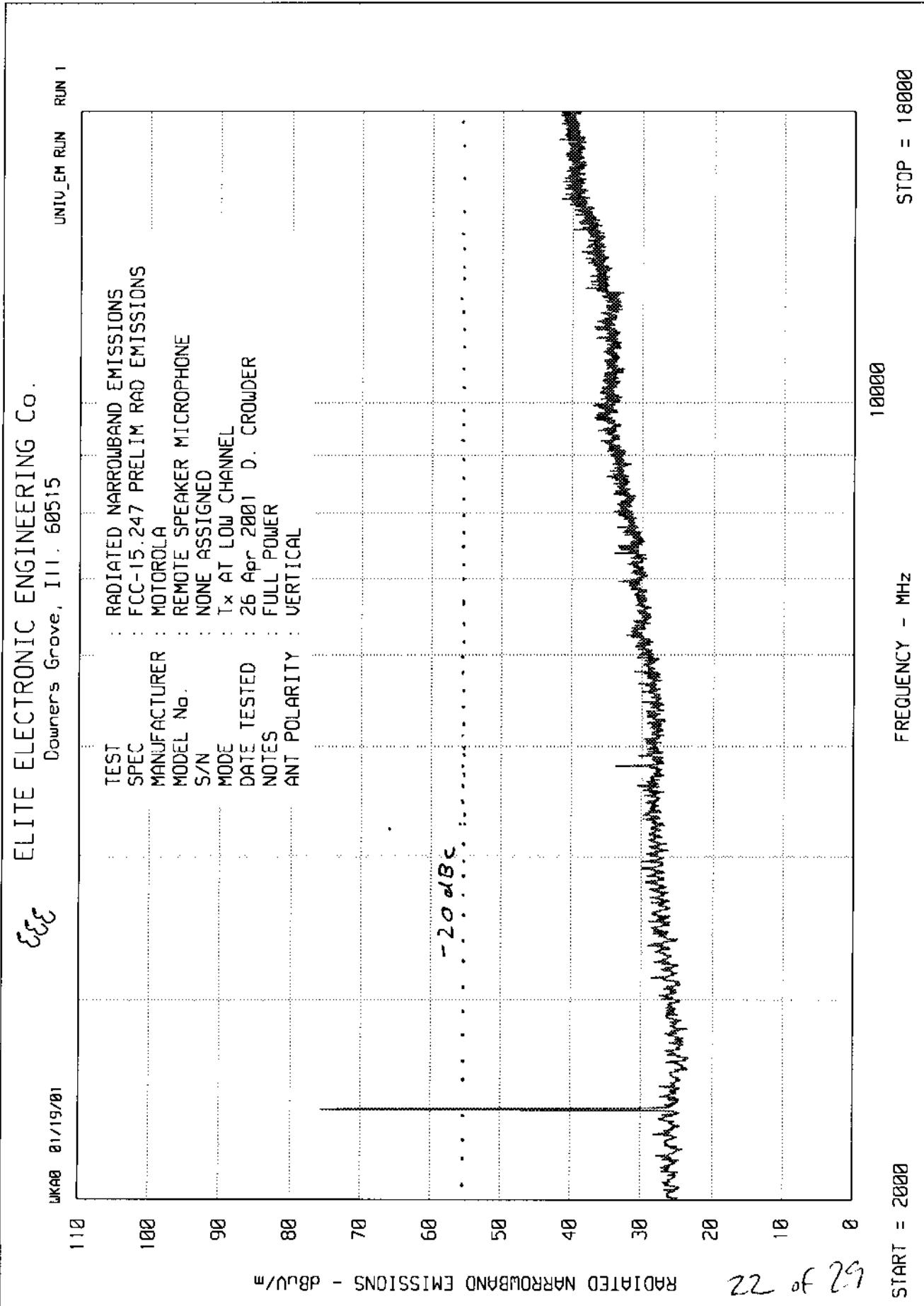
WKAQ 01/19/01

UNIV EM RUN RUN 1

TEST : RADIATED NARROWBAND EMISSIONS  
SPEC : FCC-15.247 PRELIM RAD EMISSIONS  
MANUFACTURER : MOTOROLA  
MODEL No. : REMOTE SPEAKER MICROPHONE  
S/N : NONE ASSIGNED  
MODE : Tx AT MID CHANNEL  
DATE TESTED : 26 Apr 2001 D. CROWDER  
NOTES : FULL POWER  
ANT POLARITY : VERTICAL



ETR 23679



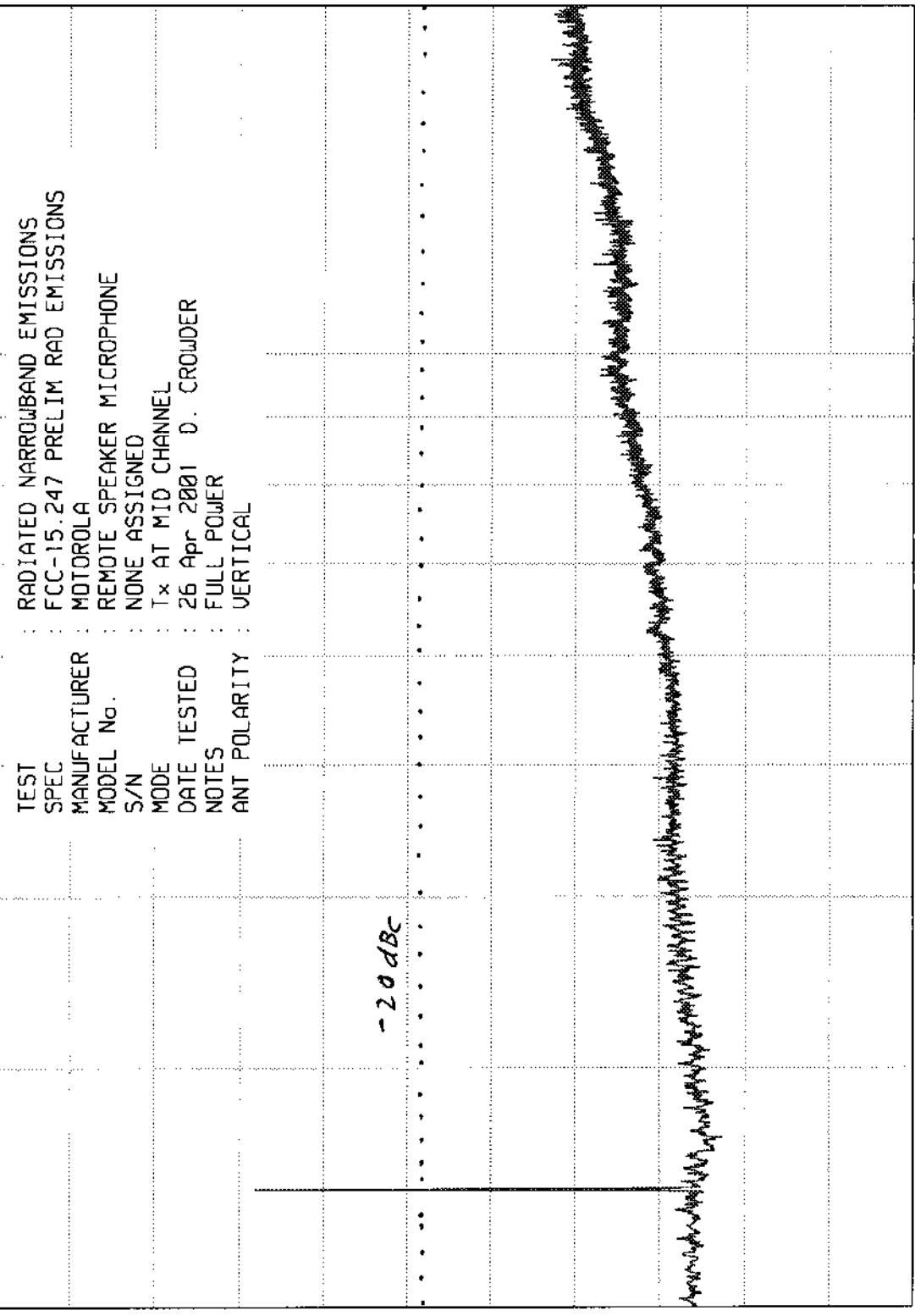
EEC

ELITE ELECTRONIC ENGINEERING Co.  
Dowlers Grove, III. 60515

WKA# 0119/01

110

UNIV\_EM RUN 1



RADIATED NARROWBAND EMISSIONS - dBu/ $\mu$

23 279

START = 2000

10000

FREQUENCY - MHz

STOP = 18000

ETR 23679

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UKAB 01/19/01

INITIAL RINSE 1

TEST SPEC: RADIATED NARROWBAND EMISSIONS  
MANUFACTURER: MOTOROLA  
MODEL No.: FCC-15.247 PRELIM RAD EMISSIONS  
S/N: 1  
MODE: Tx AT LOW CHANNEL  
DATE TESTED: 26 Apr 2001  
NOTES: D. CROWDER  
ANT POLARITY: VERTICAL

-20 dBc

START = 30

100

FREQUENCY = MHz

1000

STOP = 2000

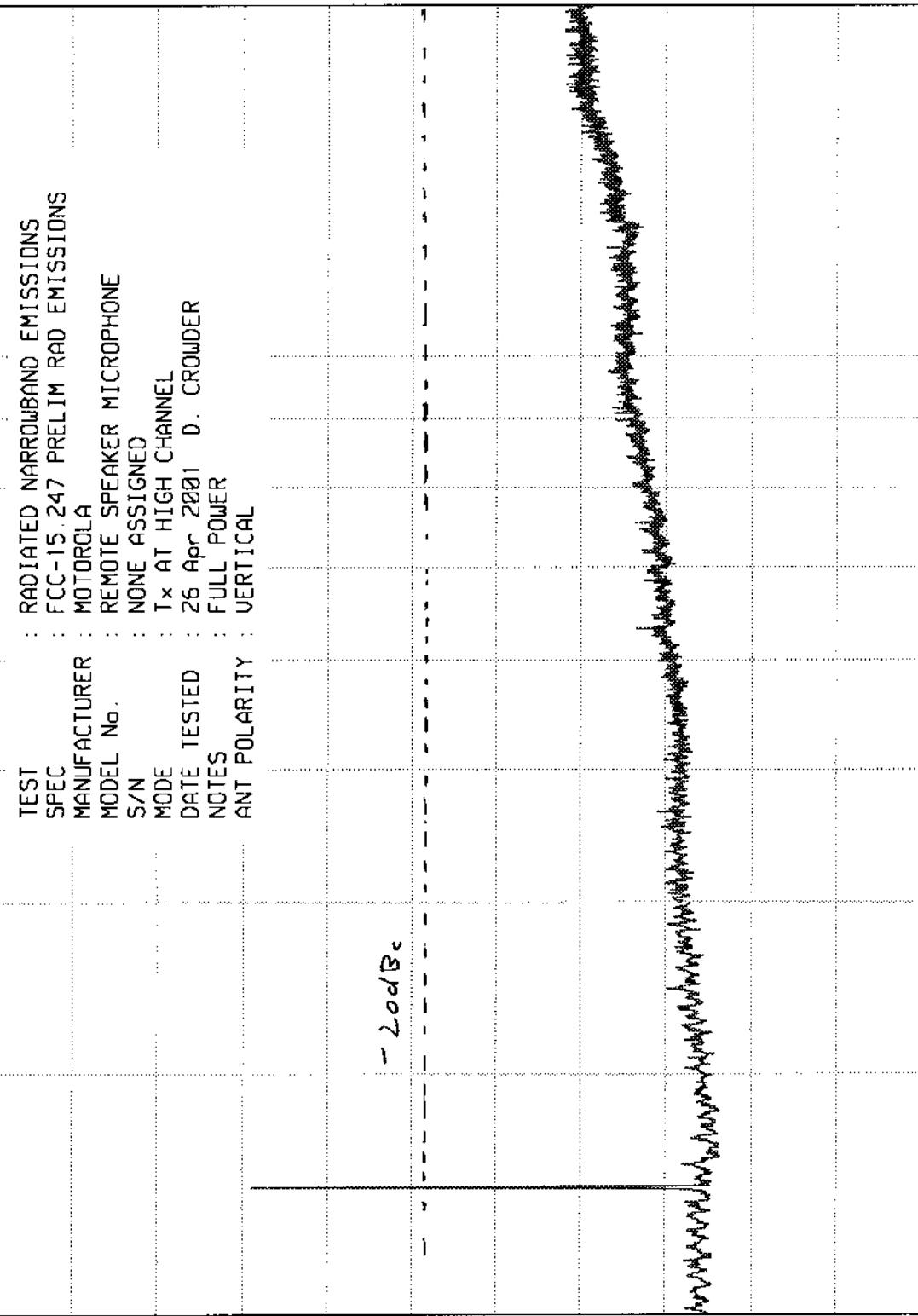
24 of 29

EEC ELITE ELECTRONIC ENGINEERING Co.  
Dowlers Grove, III. 60515

WKAQ 01/19/01

UNIV\_EM RUN 1

110



RADIATED NARROWBAND EMISSIONS - dBu/ $\mu$

25 of 29

START = 2000

FREQUENCY - MHz

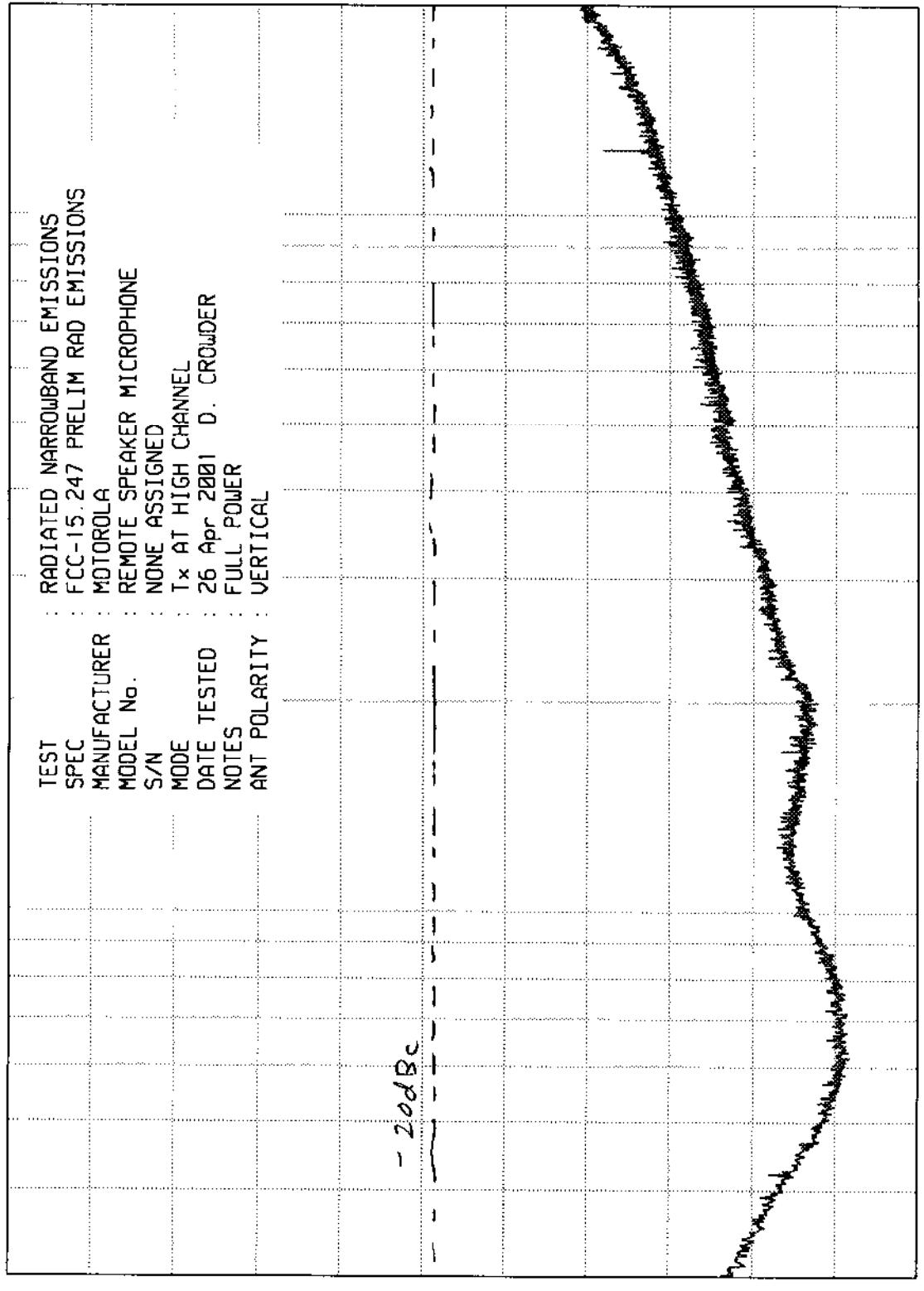
10000

STOP = 18000

EEC ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

LUKA# 01/19/01

UNIV\_EM RUN RUN 1



RADIATED NARROWBAND EMISSIONS - dBuV/m

26 of 27

START = 30

FREQUENCY - MHz

1000

STOP = 2000

100

0

ETR 23679



ETR No. 23679  
DATA SHEET

RADIATED EMISSION MEASUREMENTS IN A 3m ANECHOIC ROOM

SPECIFICATION : FCC-15C (15.247)  
MANUFACTURER : MOTOROLA  
MODEL NO. : REMOTE SPEAKER MODULE  
SERIAL NO. : NONE ASSIGNED  
NOTES : TRANSMIT AT MID CHANNEL  
TEST DATE : 26 APRIL 2001  
TEST DISTANCE : 3m

FREQ (MHz)	ANT POL	MTR RDG dBuV	ANT BW RES/VID	CBL FAC dB	PRE FAC dB	AMP dB	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV
2441.0	H	102.0	3M/3M	31.8	0.8	36.1	98.5	84139.5	500.0
	V	101.4	3M/3M	31.8	0.8	36.1	97.9	78523.6	
2441.0	H	90.9	1M/10	31.8	0.8	36.1	87.4	23442.3	500.0
	V	90.5	1M/10	31.8	0.8	36.1	87.0	22387.2	
4882.0	H	32.3	1M/10	35.2	1.3	35.2	33.6	47.9	500.0
	V	33.2	1M/10	35.2	1.3	35.2	34.5	53.1	
7323.0	H	29.4 AMB	1M/10	38.0	1.6	35.5	33.5	47.3	500.0
	V	29.1 AMB	1M/10	38.0	1.6	35.5	33.2	45.7	
12205.0	H	27.8 AMB	1M/10	41.4	2.0	34.8	36.4	66.1	500.0
	V	27.0 AMB	1M/10	41.4	2.0	34.8	35.6	60.3	
19528.0	H	12.7 AMB	1M/10	40.3			53.0	446.7	500.0
	V	12.7 AMB	1M/10	40.3			53.0	446.7	

\* - Peak level < 20dB above average in all cases.

\* - Modulation on but not hopping.

CHECKED BY: 

page 27 of 29



ETR No. 23679  
DATA SHEET

RADIATED EMISSION MEASUREMENTS IN A 3m ANECHOIC ROOM

SPECIFICATION : FCC-15C (15.247)  
MANUFACTURER : MOTOROLA  
MODEL NO. : REMOTE SPEAKER MODULE  
SERIAL NO. : NONE ASSIGNED  
NOTES : TRANSMIT AT LOW CHANNEL  
TEST DATE : 26 APRIL 2001  
TEST DISTANCE : 3m

FREQ (MHz)	ANT POL	MTR RDG dBuV	ANT BW RES/VID	CBL FAC dB	PRE FAC dB	AMP dB	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV
2402.0	H	102.5	3M/3M	31.8	0.8	36.1	99.0	89125.1	500.0
	V	103.0	3M/3M	31.8	0.8	36.1	99.5	94406.1	
2402.0	H	92.8	1M/10	31.8	0.8	36.1	89.3	29174.3	500.0
	V	91.9	1M/10	31.8	0.8	36.1	88.4	26302.7	
4804.0	H	30.7	1M/10	35.2	1.3	35.2	32.0	39.8	500.0
	V	34.6	1M/10	35.2	1.3	35.2	35.9	62.4	
12010.0	H	27.5 AMB	1M/10	41.4	2.0	34.8	36.1	63.8	500.0
	V	32.9 AMB	1M/10	41.4	2.0	34.8	41.5	118.9	
19216.0	H	12.7 AMB	1M/10	40.3			53.0	446.7	500.0
	V	12.7 AMB	1M/10	40.3			53.0	446.7	

\* - Peak level < 20dB above average in all cases.

\* - Modulation on but not hopping.

CHECKED BY: 

page 18 of 29



ETR No. 23679  
DATA SHEET

RADIATED EMISSION MEASUREMENTS IN A 3m ANECIOIC ROOM

SPECIFICATION : FCC-15C (15.247)  
MANUFACTURER : MOTOROLA  
MODEL NO. : REMOTE SPEAKER MODULE  
SERIAL NO. : NONE ASSIGNED  
NOTES : TRANSMIT AT HIGH CHANNEL  
TEST DATE : 26 APRIL 2001  
TEST DISTANCE : 3m

FREQ (MHz)	ANT POL	MTR RDG dBuV	ANT BW RES/VID	CBL FAC dB	PRE FAC dB	AMP dB	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV
2480.0	H	101.3	3M/3M	31.8	0.8	36.1	97.8	77624.7	
	V	101.2	3M/3M	31.8	0.8	36.1	97.7	76736.1	
2480.0	H	90.8	1M/10	31.8	0.8	36.1	87.3	23173.9	
	V	89.8	1M/10	31.8	0.8	36.1	86.3	20653.8	
4960.0	H	31.3	1M/10	35.2	1.3	35.2	32.6	42.7	500.0
	V	30.8	1M/10	35.2	1.3	35.2	32.1	40.3	500.0
7440.0	H	30.1 AMB	1M/10	38.0	1.6	35.5	34.2	51.3	500.0
	V	30.1 AMB	1M/10	38.0	1.6	35.5	34.2	51.3	500.0
12400.0	H	27.2 AMB	1M/10	41.4	2.0	34.8	35.8	61.7	500.0
	V	27.6 AMB	1M/10	41.4	2.0	34.8	36.2	64.6	500.0
19840.0	H	12.7 AMB	1M/10	40.3			53.0	446.7	500.0
	V	12.7 AMB	1M/10	40.3			53.0	446.7	500.0
22320.0	H	12.5 AMB	1M/10	40.4			52.9	441.6	500.0
	V	12.5 AMB	1M/10	40.4			52.9	441.6	500.0

\* - Peak level < 20dB above average in all cases.

\* - Modulation on but not hopping.

CHECKED BY:

*D. H.*

page 29 of 29