

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

ELITE PROJECT: 29382

DATE TESTED: December 15, 2000

TEST PERSONNEL: Daniel E. Crowder

TEST SPECIFICATION: FCC "Code of Federal Regulations" Title 47  
Part 15, Subpart C, Section 15.205

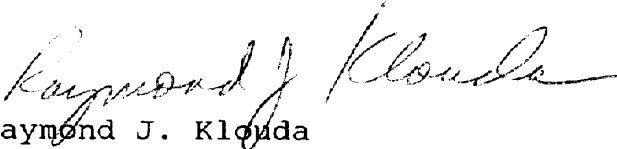
ENGINEERING TEST REPORT NO. 23304  
MEASUREMENT OF RF INTERFERENCE FROM  
A MODEL TC1 TRANSMITTER

FOR: Chamberlain Group  
Elmhurst, Illinois

PURCHASE ORDER NO.: 412207

Report By:   
Daniel E. Crowder

Witnessed By:  
Eric Robb  
Chamberlain Group

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

ENGINEERING TEST REPORT NO. 23304  
ADMINISTRATIVE DATA AND SUMMARY OF TESTS

**DESCRIPTION OF TEST ITEM:** Transmitter

**MODEL NO:** TC1

**SERIAL NO:** 697

**MANUFACTURER:** Chamberlain Group

**APPLICABLE SPECIFICATIONS:** FCC "Code of Federal Regulations"  
Title 47, Part 15, Subpart C

**QUANTITY OF ITEMS TESTED:** One (1)

**TEST PERFORMED BY:** ELITE ELECTRONIC ENGINEERING INCORPORATED  
Radio Interference Consultants  
Downers Grove, Illinois 60515

**DATE RECEIVED:** December 15, 2000

**DATE TESTED:** December 15, 2000

**PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):**  
**CUSTOMER:** Eric Robb of Chamberlain Group was present.  
**ELITE ELECTRONIC:** Daniel E. Crowder

**ELITE JOB NO.:** 29382

**ABSTRACT:** The model TC1 transmitter, does meet the radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-1992.

The radiated emissions level closest to the limit (worst case) occurred at 1800MHz. The emissions level at this frequency was 0.3dB within the limit. See data page 21 for more details.

THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE  
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TOTAL NUMBER OF PAGES IN THIS DOCUMENT,  
(INCLUDING DATA SHEETS): 24

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ENGINEERING TEST REPORT NO. 23304  
MEASUREMENT OF RF INTERFERENCE FROM  
A MODEL TC1 TRANSMITTER

**1.0 INTRODUCTION:**

**1.1 DESCRIPTION OF TEST ITEM:** This document presents the results of a series of radio interference measurements performed on a model TC1 Transmitter, serial number 697, (hereinafter referred to as the test item). The test item was designed to transmit at either 300MHz or 310MHz using an internal antenna. The test item is a generic replacement for a variety of garage door openers. The frequency selection is based on the position of an internal switch. The tests were performed for Chamberlain Group of Elmhurst, Illinois.

**1.2 PURPOSE:** The test series was performed to determine if the test item meets the radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-1992.

**1.3 DEVIATIONS, ADDITIONS AND EXCLUSIONS:** There were no deviations, additions to, or exclusions from the test specification during this test series.

**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 "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 1999
- 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"

**1.5 SUBCONTRACTOR IDENTIFICATION:** This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

**1.6 LABORATORY CONDITIONS:** The temperature at the time of the test was 22°C and the relative humidity was 22%.

**2.0 TEST ITEM SETUP AND OPERATION:**

A block diagram of the test item setup is included as Figure 1.

**2.1 POWER INPUT:** The test item received 9VDC power from an internal battery.

**2.2 GROUNDING:** Since the test item was powered with a 9VDC battery, it was ungrounded during the tests.

**2.3 PERIPHERAL EQUIPMENT:** There was no peripheral equipment submitted with the test item.

**2.4 INTERCONNECT CABLES:** There were no interconnect cables submitted with the test item.

**2.5 OPERATIONAL MODE:** For all tests, the test item was energized and placed on a 80cm high non-conductive stand.

For all tests, the test item's transmit button was held down thereby setting the unit to transmit continuously. The transmitting mechanism automatically deactivated when released. The battery voltage was periodically checked to ensure proper operation at maximum level. The tests were performed separately with the test item operating at 300MHz and 310MHz.

**3.0 TEST EQUIPMENT:**

**3.1 TEST EQUIPMENT LIST:** 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.

The fundamental, harmonics and spurious emissions were measured with a spectrum analyzer. The spectrum analyzer peak detected readings were converted to average readings using a duty cycle factor. All measurements were taken with the resolution and video bandwidth of the measuring instrument adjusted to 100kHz below 1GHz and 1MHz above 1GHz.

**3.2 CALIBRATION TRACEABILITY:** Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

**3.3 MEASUREMENT UNCERTAINTY:** All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

The measurement uncertainty budgets were based on guidelines in "ISO Guide to the Expression of Uncertainty in Measurements" and NAMAS NIS81 "The Treatment of Uncertainty in EMC Measurements".

The measurement uncertainty for these tests is presented below:

**Conducted Emission Measurements:**

Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

**Radiated Emission Measurements:**

Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

**4.0 REQUIREMENTS, PROCEDURES AND RESULTS:**

**4.1 POWERLINE CONDUCTED EMISSIONS:**

**4.1.1 REQUIREMENTS:** All radio frequency voltages on the power lines of an intentional radiator shall be below 250uV (quasi-peak) over the frequency range from 0.45MHz to 30MHz. It is also to be noted that if emitted levels in the peak detector function do not exceed the above limits, the test item does meet the intent of these requirements.

Since the test item was powered by internal batteries, no conducted emissions tests were performed.

**4.2 DUTY CYCLE FACTOR MEASUREMENTS:**

**4.2.2 PROCEDURES:** The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal.

With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width with 5msec/div. The amplitude setting are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at beginning and end of a word period. If the word period exceeds 100 msec the word period is set to 100 msec. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the  $(\text{On-time} / \text{word period})$  where the word period =  $(\text{On-time} + \text{Off-time})$ .

**4.2.3 RESULTS:** Representative plots of the duty cycle at each transmit frequency are shown on data pages 15 and 16. With the

test items transmitting at 300MHz and 310MHz, the worst case duty cycle would be a 15.684 millisecond Word ON time during a 39.41 millisecond period. The duty cycle factor is  $20 \cdot \log(15.684/39.41) = -8.0\text{dB}$ .

**4.3 RADIATED MEASUREMENTS:**

**4.3.1 REQUIREMENTS:** The test item must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.205 et seq.

Paragraph 15.231(b) has the following radiated emission limits:

Fundamental Frequency MHz	Field Intensity uV/m @ 3 meters	Field Strength Harmonics and Spurious @ 3 meters
260 to 470	3,750 to 12,500*	375 to 1,250*

\* - Linear Interpolation

For 300MHz, the limit at the fundamental is 5416.7uV/m @ 3m and the limit on the harmonics is 541.7uV/m @ 3m.

For 310MHz, the limit at the fundamental is 5833.3uV/m @ 3m and the limit on the harmonics is 583.3uV/m @ 3m.

In addition, emissions appearing in the Restricted Bands of Operation listed in paragraph 15.205(a) shall not exceed the general requirements shown in paragraph 15.209.

**4.3.2 PROCEDURES:** All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation.

The shielded enclosure prevents emissions from other sources,



such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions measurements were first performed using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured.

With the broadband measuring antennas positioned at a 3 meter distance from the test item, the frequency range from 30MHz to 4GHz was investigated using a peak detector function with the antennas set for vertical polarization.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

- 1) Measurements were made using a peak detector and a dipole or double ridged waveguide antenna.
- 2) To ensure that maximum, or worst case, emission levels were measured, the following steps were taken:
  - (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
  - (b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
  - (c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
  - (d) The fundamental through the 10th harmonic of the transmit frequency were measured.

**4.3.3 RESULTS:** The preliminary plots, with the test item transmitting at 300MHz, are presented on data pages 17 and 18. The preliminary plots, with the test item transmitting at 310MHz, are presented on data pages 19 and 20. The plots are presented for a

reference only, and are not used to determine compliance.

The final open area radiated levels, with the test item transmitting at 300MHz, is presented on data page 21. The final open area radiated levels, with the test item transmitting at 310MHz, is presented on data page 22. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closet to the limit (worst case) occurred at 1800MHz. The emissions level at this frequency was 0.3dB within the limit. See data pages 21 and 22 for details. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figure 2.

#### **4.4 OCCUPIED BANDWIDTH MEASUREMENTS:**

**4.4.1 REQUIREMENTS:** In accordance with paragraph 15.231(c), all emissions within 20dB of the peak amplitude level of the center frequency are required to be within a band less than 0.25% of the center frequency wide.

**4.4.2 PROCEDURES:** The test item was placed on an 80cm high non-conductive stand. The unit was set to transmit continuously. With an antenna positioned nearby, occupied bandwidth emissions were displayed on the spectrum analyzer. The resolution bandwidth was set to 30 kHz and span was set to 2 MHz. The frequency spectrum near the fundamental was plotted.

**4.4.3 RESULTS:** The plot of the emissions near the 300MHz fundamental frequency are presented on data page 23. The plot of the emissions near the 310MHz fundamental frequency are presented on data page 24. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

**5.0 CONCLUSION:**

It was found that the Chamberlain Group model TC1 Transmitter, serial number 697, does meet the radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-1992.

**6.0 CERTIFICATION:**

Elite Electronic Engineering Incorporated 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 only to the test item at the test date as operated by Chamberlain Group personnel. 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.

**7.0 ENDORSEMENT DISCLAIMER:**

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

TABLE I: TEST EQUIPMENT LIST

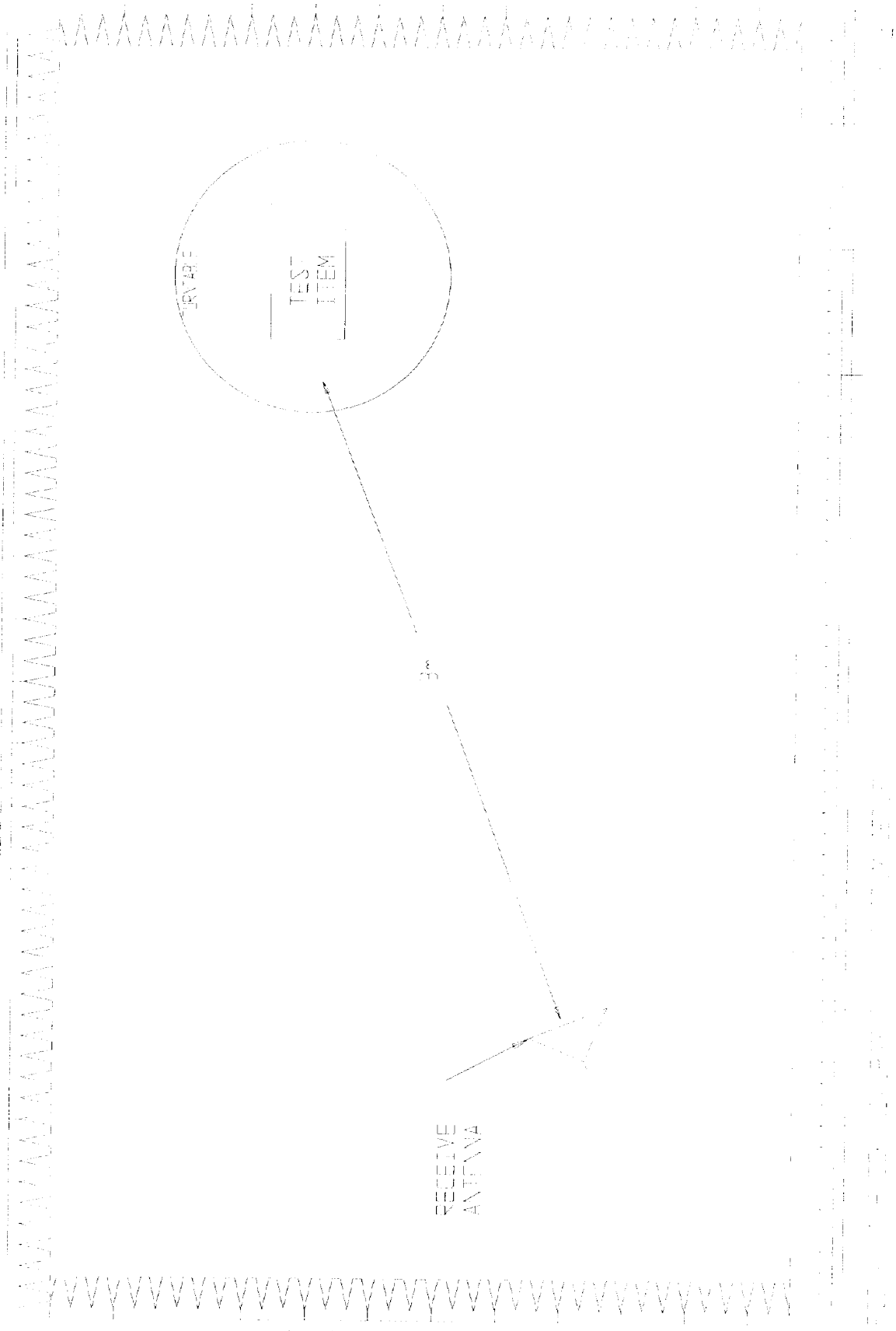
ELITE ELECTRONIC ENG. INC.

Page: 1

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XZG1	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---	02/28/00	12	02/28/01
Equipment Type: AMPLIFIERS								
APK1	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A01243	1-26.5GHZ	02/28/00	12	02/28/01
Equipment Type: ANTENNAS								
NDP0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB3	311	140-400MHZ	11/29/00	12	11/29/01
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	11/29/00	12	11/29/01
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	05/09/00	12	05/09/01
NWFO	RIDGED WAVE GUIDE	EMCO	3105	2035	1-12.4GHZ	08/28/00	12	08/28/01
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
Equipment Type: PRINTERS AND PLOTTERS								
HRE2	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061201	---		N/A	
Equipment Type: RECEIVERS								
RACC	RF PRESELECTOR	HEWLETT PACKARD	85685A	2648A00507	20HZ-2GHZ	01/10/00	12	01/10/01
RAE5	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	2532A02136	100HZ-22GHZ	05/31/00	12	05/31/01
Equipment Type: TEST CHAMBERS (EMI)								
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.



SERVIZIO

TEST  
ITEM

35

RECEIVE  
ANTIPIVA

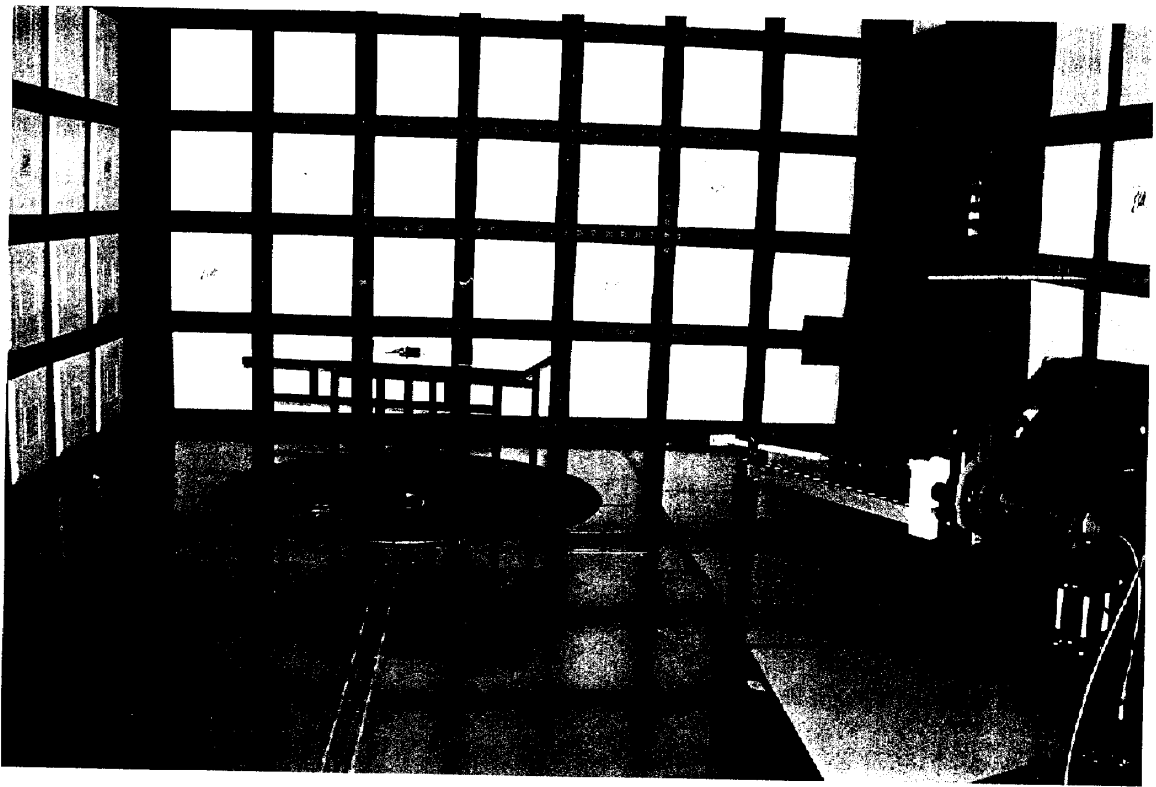


FIGURE 2A TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION

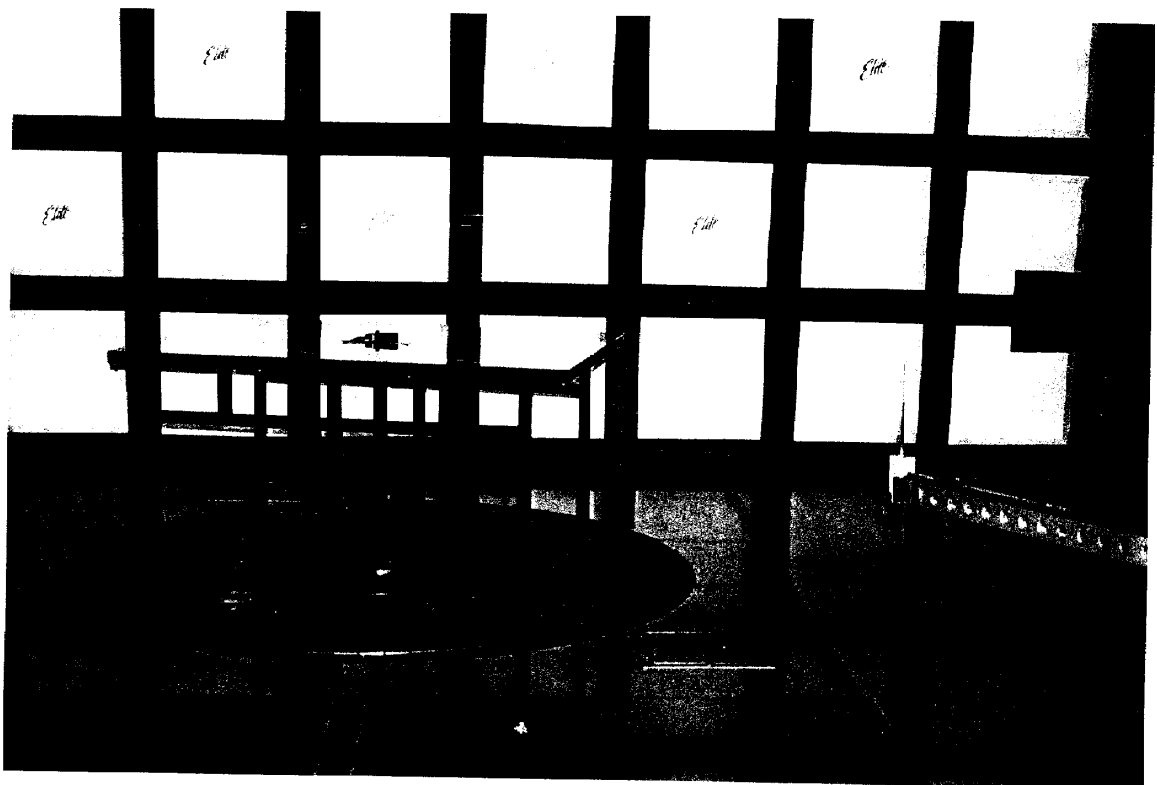
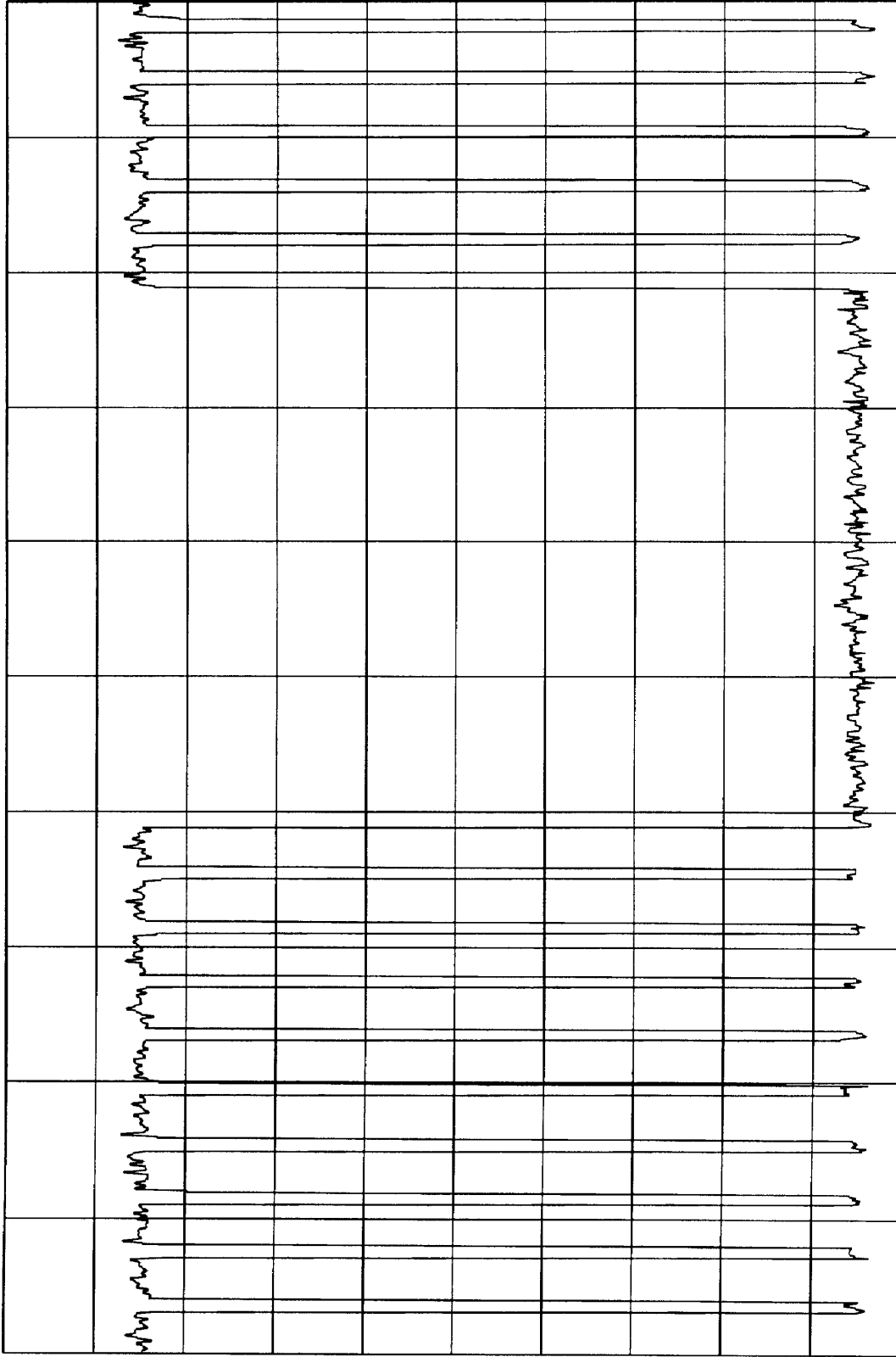


FIGURE 2B TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION

ETC 23804

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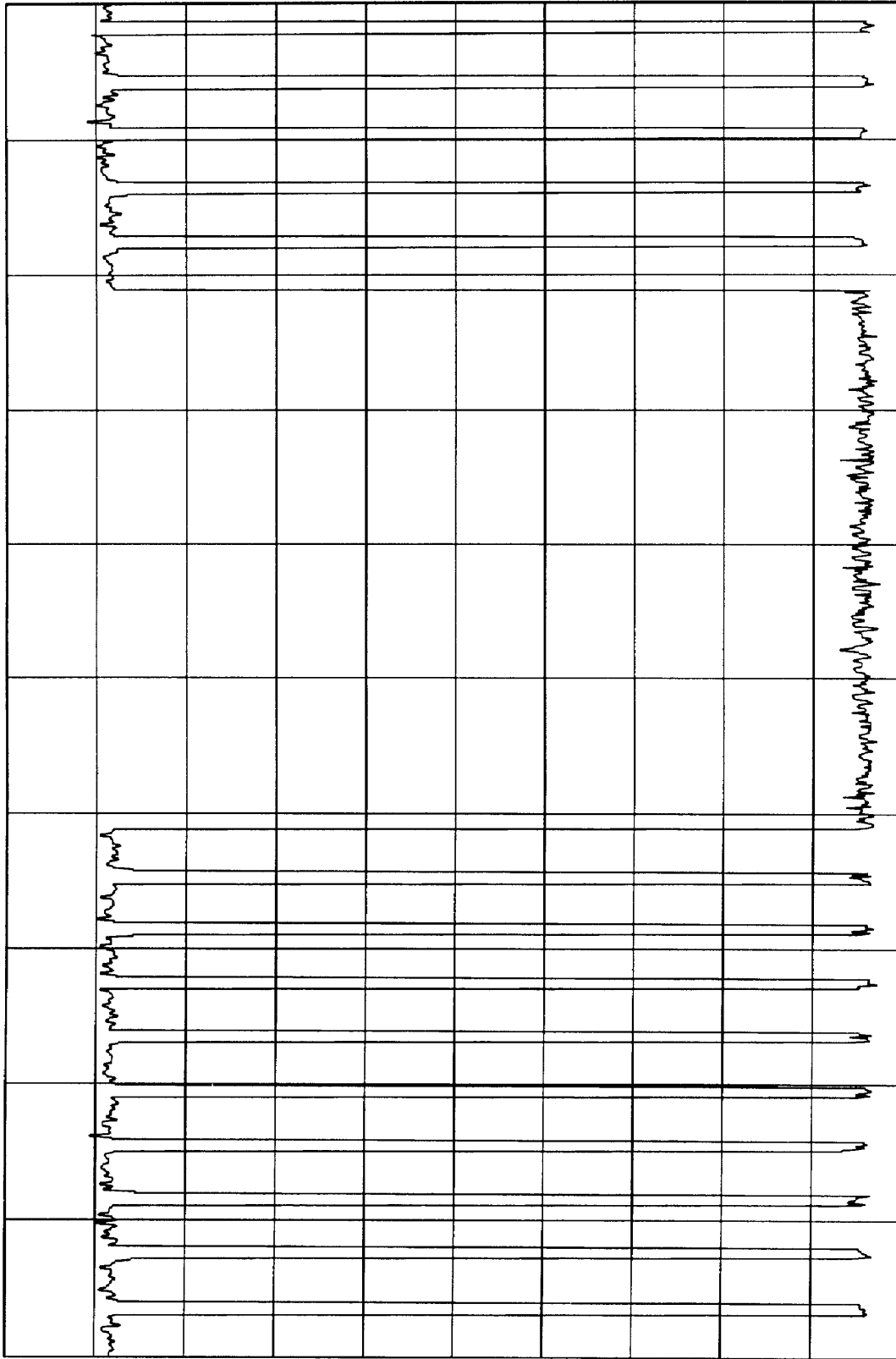


5 mSEC/DIV

TRANSMITTER DUTY CYCLE  
 FREQUENCY : 299.5892 MHz  
 ON TIME : 15.684 mSEC  
 OFF TIME : 23.726 mSEC  
 DUTY CYCLE = .4 or -7.96 dB  
 COMPUTED OVER 1 DATA WORD

MANUFACTURER : CHAMBERLAIN GROUP  
 MODEL : TC1  
 S/N : 697  
 TEST DATE : 15 Dec 2000  
 NOTES :

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, IL 60515



5 mSEC/DIV

TRANSMITTER DUTY CYCLE  
 FREQUENCY : 310.3407 MHz  
 ON TIME : 15.734 mSEC  
 OFF TIME : 23.676 mSEC  
 DUTY CYCLE = 4 or -7.96 dB  
 COMPUTED OVER 1 DATA WORD

MANUFACTURER : CHAMBERLAIN GROUP  
 MODEL : TCI  
 S/N : 697  
 TEST DATE : 15 Dec 2000  
 NOTES :

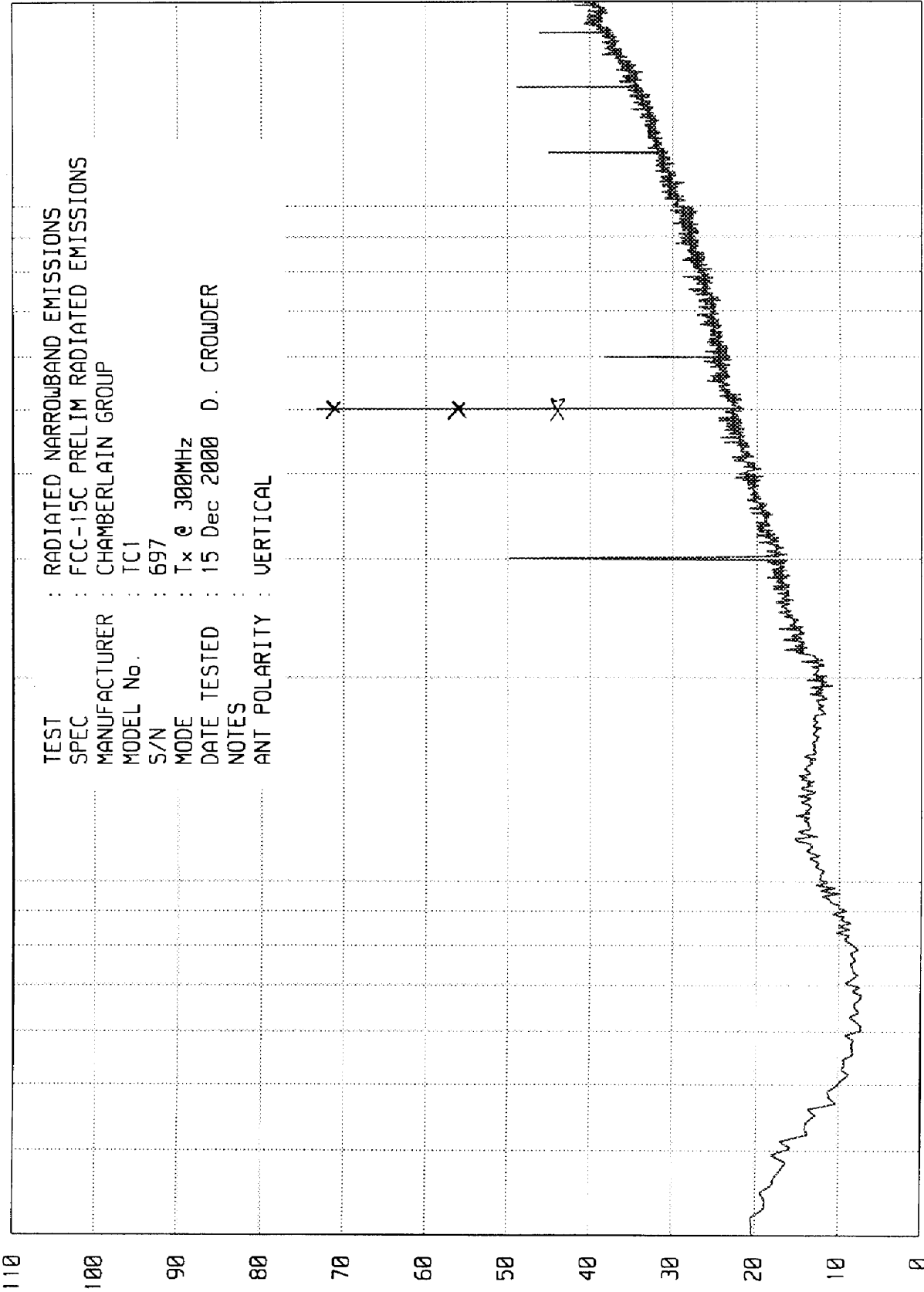


ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UNIU\_EM RUN RUN 1

WKA00 11/28/00

TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15C PRELIM RADIATED EMISSIONS  
 MANUFACTURER : CHAMBERLAIN GROUP  
 MODEL No. : TC1  
 S/N : 697  
 MODE : Tx @ 300MHz  
 DATE TESTED : 15 Dec 2000 D. CROWDER  
 NOTES :  
 ANT POLARITY : VERTICAL



RADIATED NARROWBAND EMISSIONS - dBu/m³

42 of 24

START = 30      FREQUENCY - MHz      STOP = 2000

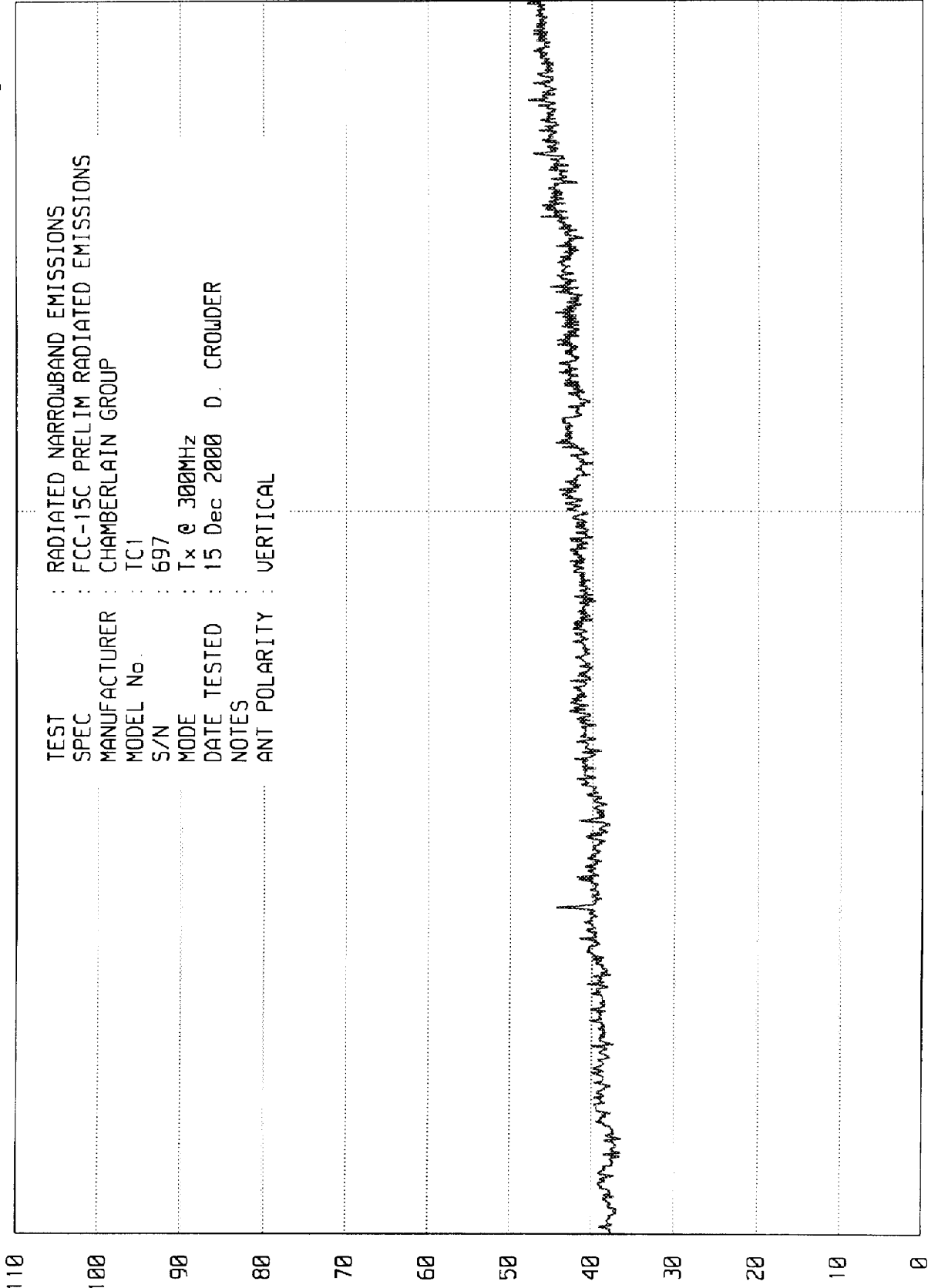
ETK 23304

ELITE ELECTRONIC ENGINEERING Co.

Downers Grove, Ill. 60515

WKAB 11/28/00

UNTU\_EM RUN RUN 2



TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15C PRELIM RADIATED EMISSIONS  
 MANUFACTURER : CHAMBERLAIN GROUP  
 MODEL No. : TCI  
 S/N : 697  
 MODE : Tx @ 300MHz  
 DATE TESTED : 15 Dec 2000 D. CROWDER  
 NOTES :  
 ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dBu/m

h2 f 81

START = 2000

FREQUENCY - MHz

STOP = 4000

ETR 23304

# ELITE ELECTRONIC ENGINEERING Co.

Downers Grove, Ill. 60515

UNITU\_EM RUN RUN 1

UKAB 11/28/00

110

TEST

SPEC

MANUFACTURER

MODEL No.

S/N

MODE

DATE TESTED

NOTES

ANT POLARITY

RADIATED NARROWBAND EMISSIONS

FCC-15C PRELIM RADIATED EMISSIONS

CHAMBERLAIN GROUP

TCI

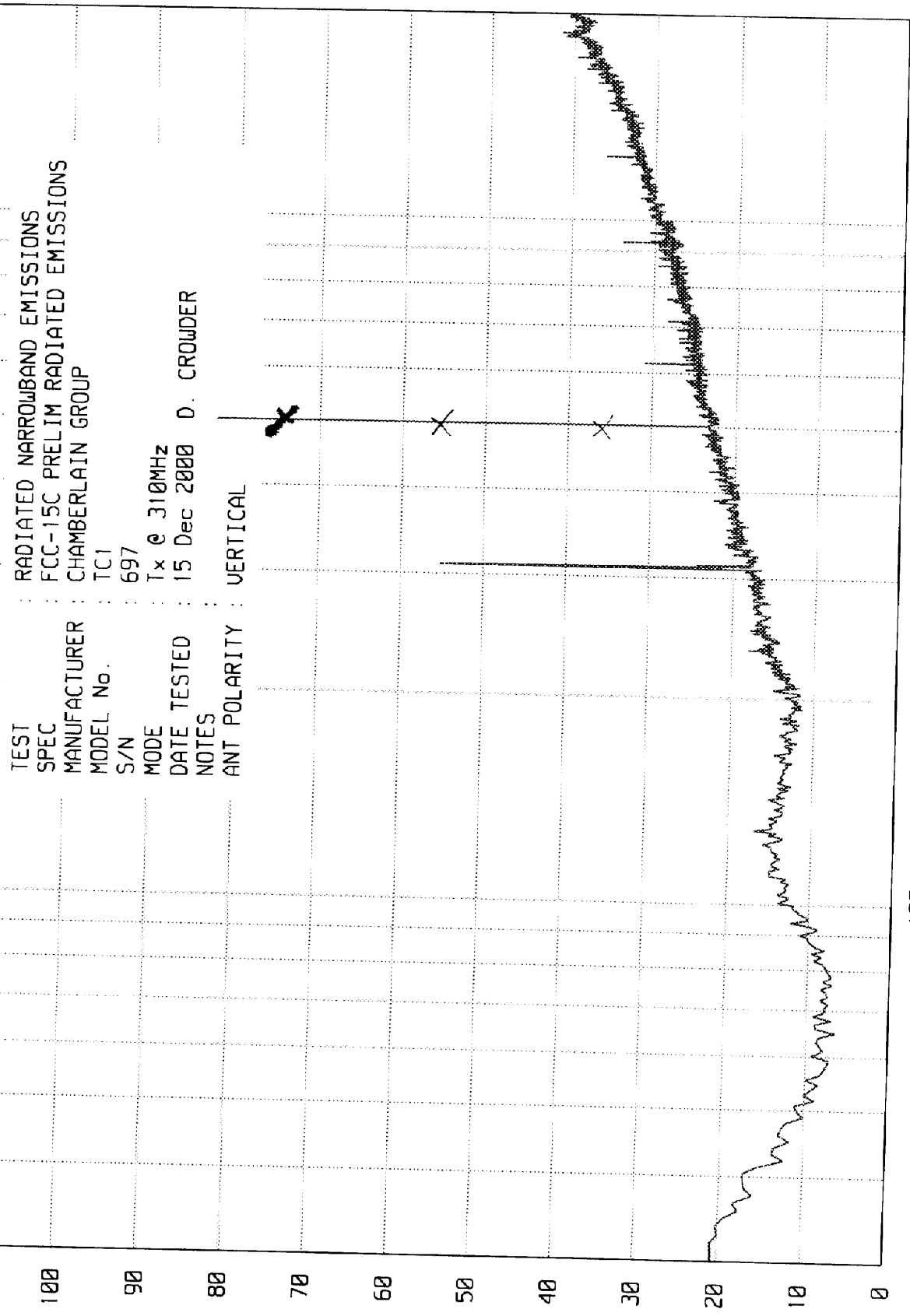
697

Tx @ 310MHz

15 Dec 2000

D. CROWDER

VERTICAL



RADIATED NARROWBAND EMISSIONS - dBu/m

17 of 24

START = 30

FREQUENCY - MHz

100

1000

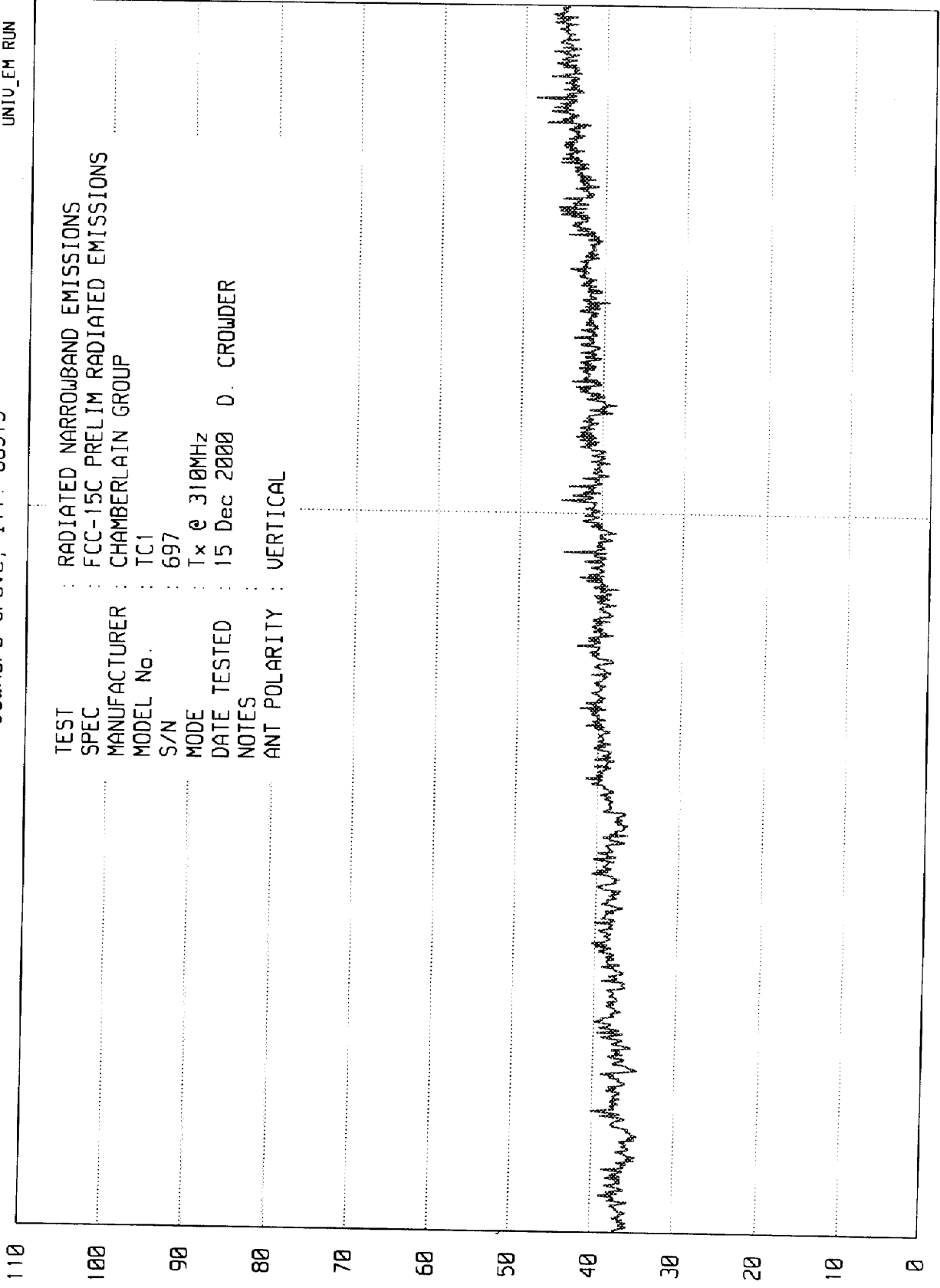
STOP = 2000

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UNTU\_EM RUN RUN 2

WKA00 11/28/00

TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15C PRELIM RADIATED EMISSIONS  
 MANUFACTURER : CHAMBERLAIN GROUP  
 MODEL No. : TC1  
 S/N : 697  
 MODE : Tx @ 310MHz  
 DATE TESTED : 15 Dec 2000 D. CROWDER  
 NOTES :  
 ANT POLARITY : VERTICAL



12 of 24

START = 2000

FREQUENCY - MHz

STOP = 4000



ETR No. 23304  
DATA PAGE

SPECIFICATION : FCC PART 15C (REV OCT 1, 94) TRANSMITTER OPEN FIELD DATA  
 MANUFACTURER : CHAMBERLAIN GROUP  
 MODEL : TC1  
 S/N : 697  
 TEST DATE : 15 Dec 2000  
 NOTES :  
 TEST ANTENNA : ROBERTS DIPOLE & DRWG ANTENNAS

FREQUENCY MHz	ANT POL	MTR RDG dBuV	CBL FAC dB	ANT FAC dB	DUTY CYCLE dB	TOTAL dBuV/m @3m	TOTAL uV/m @3m	LIMIT uV/m @3m	NOTES
310.00	H	57.8	1.8	18.6	-8.0	70.2	3237.4	5833.3	
310.00	V	44.7	1.8	18.6	-8.0	57.1	716.5	5833.3	
620.00	H	25.8	2.7	24.6	-8.0	45.0	178.7	583.3	
620.00	V	18.7	2.7	24.6	-8.0	37.9	78.9	583.3	
930.00	H	18.5	3.4	28.2	-8.0	42.1	127.2	583.3	
930.00	V	18.7	3.4	28.2	-8.0	42.3	130.1	583.3	
1240.00	H	31.7	4.0	24.8	-8.0	52.6	426.1	500.0	*
1240.00	V	22.8	4.0	24.8	-8.0	43.7	152.9	500.0	*
1550.00	H	25.0	4.7	25.7	-8.0	47.5	236.3	500.0	*
1550.00	V	21.4	4.7	25.7	-8.0	43.9	156.1	500.0	*
1860.00	H	23.3	5.4	27.1	-8.0	47.8	245.0	583.3	
1860.00	V	16.6	5.4	27.1	-8.0	41.1	113.3	583.3	
2170.00	H	13.4	6.0	28.1	-8.0	39.5	94.3	583.3	
2170.00	V	13.9	6.0	28.1	-8.0	40.0	99.9	583.3	
2480.00	H	16.9	6.6	28.9	-8.0	44.3	164.4	583.3	
2480.00	V	10.5	6.6	28.9	-8.0	37.9	78.7	583.3	
2790.00	H	10.6	7.1	29.8	-8.0	39.5	94.6	500.0	*
2790.00	V	10.3	7.1	29.8	-8.0	39.2	91.3	500.0	*
3100.00	H	6.5	7.7	30.7	-8.0	36.9	69.8	583.3	
3100.00	V	6.1	7.7	30.7	-8.0	36.5	66.7	583.3	

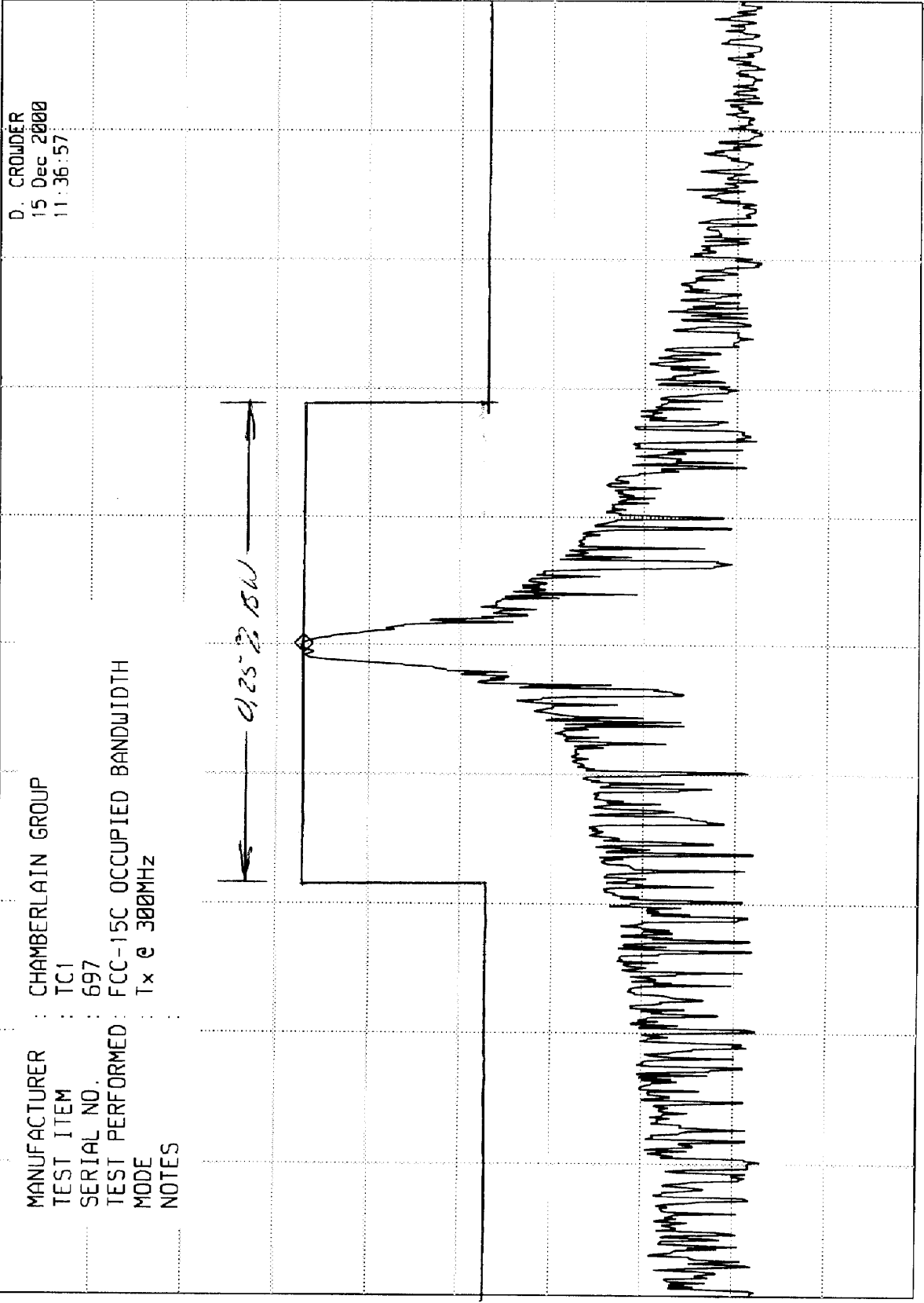
\* DENOTES A FREQUENCY CONFLICT WITH RESTRICTED BANDS

checked by: *D.C.*  
D. CROWDER

ELITE ELECTRONIC ENGINEERING CO

MKR 299.556 MHz  
-53.00 dBm

REF -20.0 dBm  
ATTEN 0 dB



D. CROWDER  
15 Dec 2000  
11:36:57

MANUFACTURER : CHAMBERLAIN GROUP  
TEST ITEM : TC1  
SERIAL NO. : 697  
TEST PERFORMED : FCC-15C OCCUPIED BANDWIDTH  
MODE : Tx @ 300MHz  
NOTES :

hp  
10 dB/  
OFFSET  
-10.0  
dB

CENTER 299.55 MHz  
RES BW 30 kHz(i)  
VBW 300 kHz  
SPAN 2.00 MHz  
SWP 20.0 msec

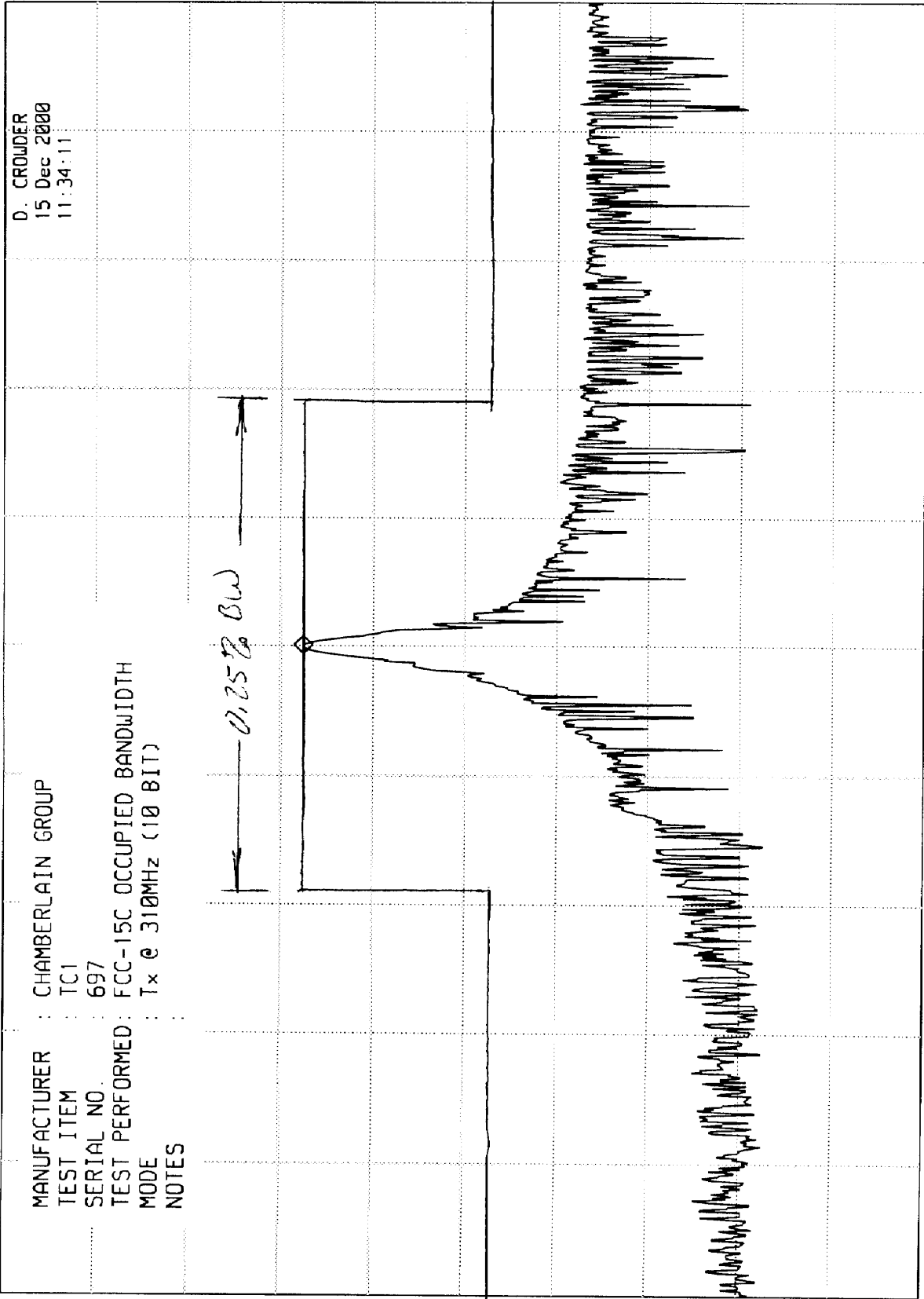
ETR 23304

ELITE ELECTRONIC ENGINEERING CO

MKR 310.366 MHz  
-52.50 dBm

hp REF -20.0 dBm

ATTEN 0 dB



D. CROWDER  
15 Dec 2000  
11:34:11

MANUFACTURER : CHAMBERLAIN GROUP

TEST ITEM : TCI

SERIAL NO. : 697

TEST PERFORMED : FCC-15C OCCUPIED BANDWIDTH

MODE : Tx @ 310MHz (10 BIT)

NOTES :

10 dB/

OFFSET

-10.0

dB

24 of 24

CENTER 310.36 MHz

RES BW 30 kHz (1)

VBW 300 kHz

SPAN 2.00 MHz

SWP 20.0 msec