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

ELITE PROJECT: 29108

DATES TESTED: September 11 through October 6, 2000

TEST PERSONNEL: Daniel E. Crowder

TEST SPECIFICATION: Federal Communication Commission (FCC) Part 90

ENGINEERING TEST REPORT NO. 23083

MEASUREMENT OF RF INTERFERENCE FROM

A PORTABLE INTERROGATOR

MODEL BADGER P.I.

FOR: Granite Communications
Amherst, New Hampshire

PURCHASE ORDER NO: 16562

Report By:
Daniel E. Crowder
NARTE ATL-0152-E

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

ENGINEERING TEST REPORT NO. 23083

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Portable Interrogator

MODEL NO: Badger P.I.

SERIAL NO: 0002

FCC ID: GIFPI04

MANUFACTURER: Granite Communications

APPLICABLE SPECIFICATIONS: FCC Parts 2 and 90

QUANTITY OF ITEMS TESTED: One (1)

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

DATES TESTED: September 11 through October 6, 2000

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):
CUSTOMER: No Granite Communications personnel were present.
ELITE ELECTRONIC: Daniel E. Crowder

ELITE JOB NO.: 29108

ABSTRACT: The Model Badger P.I. Portable Interrogator complies with the technical requirements in FCC Part 90. See test results and data pages for more details.

ENGINEERING TEST REPORT NO. 23083

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MODEL BADGER P.I.

1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: This report presents the results of the radio interference measurements were performed on a Portable Interrogator, Model Badger P.I., Serial Number 0002, (hereinafter referred to as the test item). The tests were performed for Granite Communications of Amherst, New Hampshire.

The Portable Interrogator is a handheld transmitter used for reading of remote utility meters.

The test item is designed to transmit at 451.35MHz using an external antenna.

The test item has a maximum rated output power of 2 Watts.

1.2 PURPOSE: The test series was performed to determine if the test item meets the technical requirements of the FCC Part 90.

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 90, dated 1 October 1999
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, 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 the Elite Electronic Engineering, Inc., radio interference consultants of Downers Grove, Illinois.

2.0 TEST ITEM SETUP AND OPERATION:

2.1 SETUP: The test item was powered with an 8VDC internal battery. Since the test item was battery powered, it was ungrounded during the test series.

2.2 RF OUTPUT: The test item was operated at its maximum output power level.

3.0 TEST EQUIPMENT:

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 OUTPUT MEASUREMENTS:

4.1.1 REQUIREMENTS:

The maximum allowable effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area.

4.1.2 PROCEDURES:

(a) The test item was set to transmit at 451.35MHz.

(b) A power meter was connected to the output of the test item.

(c) The output power level was measured and recorded.

4.1.3 RESULTS: The output power measurements are presented on data page 101.

The ERP limit does not apply to the power output alone, but the combination of the power output and the antenna. Compliance to the power output will be based on the system configuration and service area. Therefore, the ERP requirement cannot be applied to the test item.

4.2 OCCUPIED BANDWIDTH MEASUREMENTS:

4.2.1 REQUIREMENTS: In accordance with Paragraph 90.209(b)(5), the maximum authorized bandwidth shall be 20kHz for operations in the bands of 421MHz to 512MHz.

In accordance with paragraph 90.210, Mask C was selected since it represents equipment without audio low pass filter. For Mask C, the peak power of any emission shall be attenuated below the unmodulated carrier power (P) in accordance with the following schedule:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 5.0 kHz, but no more than 10.0 kHz: At least 83 log (f/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 10.0 kHz, but no more than 250 percent of the authorized bandwidth: At least 29 log (f^2/11) dB, or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

4.2.2 PROCEDURES:

(a) With the spectrum analyzer bandwidth set to 100 Hz and the span set to 100 kHz. The output signal was measured and plotted.

4.2.3 RESULTS: The plots of the occupied bandwidth are presented on data pages 102 and 103.

The limits, shown on the plots, are referenced to the power

measured from the unmodulated carrier.

The 99% bandwidth was measured to be 13.5kHz.

As can be seen from the data, the test item output met the occupied bandwidth requirements.

4.3 SPURIOUS EMISSIONS AT ANTENNA TERMINAL:

4.3.1 REQUIREMENTS: This test determines whether the test item produces excessive spurious emissions at the antenna port.

In accordance with paragraph FCC 90.210, the spurious emissions shall be attenuated below the unmodulated carrier power (P) by at least 43 + 10 log(P)dB. For output at 2 watts, the spurious emissions shall be attenuated by a minimum of 46 dB. This requirement translates to a limit of -13dBm. The peak power of the emissions shall be measured at the antenna terminal from 30MHz up to the 10th harmonic of the fundamental frequency.

4.3.2 PROCEDURES:

In general, this test will measure spurious emissions at the antenna terminal.

(a) The test item was connected to the spectrum analyzer.

(b) The analyzer bandwidth was set to 100kHz. The out-of-band signal levels were measured and plotted over the frequency range from 30MHz to 1GHz.

(c) The analyzer bandwidth was increased to 1MHz. The emissions were measured over the frequency range from 1GHz to 5GHz.

4.3.3 RESULTS: The plots of the antenna conducted output measurements are presented on data pages 104 through 106. The limit lines have been adjusted to include the cable loss factors. As can be seen from the data, the test item did not produce spurious emissions

in excess of the -13 dBm (attenuated 46 dB below unmodulated carrier level).

4.4 FIELD STRENGTH OF SPURIOUS EMISSIONS:

4.4.1 REQUIREMENTS: In accordance with Paragraph FCC 90.210(b), the spurious on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth, the emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P)dB. This requirement translates to a limit of -13dBm. The emissions shall be measured from 30MHz up to the 10th harmonic of the fundamental frequency.

4.4.2 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.

The broadband measuring antenna was positioned at a 3 meter distance from the test item. The frequency range from 30MHz to 5GHz was investigated using a peak detector function with the bilog antenna from 30MHz to 2GHz and a double ridged waveguide antenna above 2GHz.

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 broadband bi-log of waveguide antenna.

2) To ensure that maximum, or worst case, emission levels were measured, the following steps were taken:

(a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
(b) The antenna output was terminated in 50 ohms.
(c) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded.
(d) Measurement BW was 100kHz below 1000 MHz and 1MHz above 1000 MHz. Peak reading were recorded. No averaging methods or corrections were applied.
(e) The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$Pg = E^2 4\pi d^2/120\pi = E^2 d^2/30$$

where P = power in watts
g = arithmetic gain of transmitting antenna over isotropic radiator.
E = maximum field strength in volts/meter
d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3 meters, this equation reduces to:

$$P(dBm) = E(dBuV/m) - 97.2dB$$

4.4.3 RESULTS: The preliminary plots are presented on data pages 107 and 108. The plots are presented for a reference only, and are not used to determine compliance.

The final open area radiated levels are presented on data page 109. The radiated emissions were measured through the 10th harmonic. Ambient level were recorded if the harmonic signals were not detected above the ambient. All emissions were within the specification limits.

4.5 FREQUENCY STABILITY:

4.5.1 REQUIREMENTS: In accordance with Paragraph 90.213, the frequency stability shall within +/- 5 parts per million (0.0005%) for mobile stations 2 Watts or less.

4.5.2 PROCEDURES: Two separate procedures were performed for each of the two tests which are as follows:

(a) Frequency Stability vs. Temperature

(1) The test item was placed in a Thermotron temperature chamber. The test item was powered up.

(2) The measurement equipment was connected to the test item's antenna port.

(3) The ambient room temperature was recorded and a reference frequency was recorded.

(4) The temperature was varied from -30 to +50 degrees centigrade in 10 degree increments. The test item was allowed to soak from 30 to 45 minutes at each temperature. After this time period the unit was set to transmit and the frequency recorded.

(b) Frequency Stability vs. Voltage:

(1) The measurement equipment was connected to the test item's antenna port.

(2) The nominal voltage was reduced to reach the battery operating endpoint.

4.5.3 RESULTS OF TESTS: The results of the frequency stability vs. temperature tests can be found on data page 110. As can be seen from the data, the frequency stability of the test item is within +/- 5.0 ppm.

The results of the frequency stability vs. voltage variation tests con be found on data page 110. As can be seen from the data, the test item stopped transmitting at 6.8 VDC.

4.6 TRANSIENT FREQUENCY BEHAVIOR:

4.6.1 REQUIREMENTS: In accordance with Paragraph 90.214, transmitters designed to operate with a 25 kHz bandwidth in the 421MHz to 512MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum Frequency Difference (kHz)	Frequency Ranges (MHz) All Equipment 421-512MHz
t_1	+/-25	10.0ms
t_2	+/-12.5	25.0ms
t_3	+/-25	10.0ms

4.6.2 PROCEDURES: Transient frequency behavior is a measure of the difference, as a function in time, of the actual transmitter frequency to the assigned transmitter frequency when the transmitted RF output power is switched on or off.

(a) Connect the receiver's Demodulator Output Port (DOP) to the vertical input channel of the storage oscilloscope. Connect the output of the directional coupler to the external trigger on the storage oscilloscope. Connect the output of the RF combiner to the RF power meter.

(b) Set the receiver to measure FM deviation with the audio bandwidth set at <50Hz to >15,000Hz and tune the RF frequency to the transmitter assigned frequency.

(c) Set the signal generator to the assigned transmitter frequency and modulate it with a 1kHz tone at +/-25kHz deviation and set its output level to -100dBm.

(d) Turn the transmitter on.

(e) Supply sufficient attenuation via the RF attenuator to provide an input level to the receiver which is approximately 40dB below the receiver's maximum allowed input power when the transmitter is operating at its rated power level. Note this level on the RF power meter.

(f) Turn the transmitter off.

(g) Adjust the RF level of the signal generator to provide RF power into the RF power meter 20dB below the level noted in step (e). this signal generator RF level shall be maintained throughout the rest of the measurement.

(h) Disconnect the RF power meter and connect the output of the Rf combiner network to the input of the receiver.

(i) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1000Hz tone from the DOP. Adjust the vertical amplitude control of the oscilloscope to display the 1000Hz at +/-4 divisions vertically centered on the display.

(j) Adjust the oscilloscope so it will trigger on an increasing magnitude from the RF peak detector at 1 division from the left side of the display, when the transmitter is turned on.

(k) Reduce the attenuation of the RF attenuator so the input to the RF peak detector and the Rf combiner is increased by 30dB when the transmitter is turned on.

(l) Turn on the transmitter and observe the stored display. The output at the DOP, due to the change in the ration of power between the signal generator input power and transmitter output power will, because of the capture effect of the test receiver, produce a change in display: for the first part of the sweep it will show the 1kHz test signal. Then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. the instant when the 1kHz test signal is completely suppressed (including any capture time due to phasing) is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t_1 and t_2.

(m) During the time form the end of t_2 to the beginning of t_3 the frequency difference should not exceed the limits set by FCC in Part 90.214 (as above). The allowed limit is equal to the transmitter frequency times its FCC tolerance times +/-4 display divisions divided by 25kHz.

(n) Turn on the transmitter and observe the stored display. The trace should be maintained within the allowed divisions after the end of t_2 and remain within it until the end of the trace.

(o) To test the transient frequency behavior during the period t_3, the transmitter shall be switched on.

(p) Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the RF peak detector, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1kHz

test signal starts to rise is considered to provide t_{off}.

(q) The transmitter shall be switched off.

(r) Observe the display. The trace should remain within the allowed divisions during period t_3.

4.6.3 RESULTS OF TESTS: The results of the transient frequency behavior tests can be found on data pages 111 and 112. As can be seen from the data, the transient frequency behavior of the test item is within the specified limits for time period t_1, t_2, and t_3. Since the modulation of the test item could not be turned off, the period between t_2 and t_3 was evaluated by examining the average signal level and with the frequency stability test.

4.7 ADDITIONAL LIMITATIONS: Applications form part 90 certification of transmitters designed to operate on frequencies in the 421MHz to 512MHz bands, received on or after February 14, 1997, must be capable of supporting a minimum data rate of 4800 bits per second per 6.25kHz of channel bandwidth. The plot of the spectrum efficiency of the test item is shown on data page 113. As can be seen from the data, the test item meets the spectrum efficiency requirements.

5.0 CONCLUSION:

The Portable Interrogator, Model Badger P.I., complies with the RF output, the occupied bandwidth, the spurious emissions at antenna terminal, and the field strength of spurious emissions, the frequency stability, and the transient frequency behavior requirements of the FCC Part 90 and 2.

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.

TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XDM1	50DB, 1500W BIDIR. COUPLER	AMPLIFIER RESEA	DC6000	14749	400-1000MHZ	06/14/00	12	06/14/01
XLJE	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	15	DC-2GHZ	06/07/00	12	06/07/01
XYF3	POWER SPLITTER	HEWLETT PACKARD	11667A	11052	DC-18GHZ	07/19/00	12	07/19/01
Equipment Type: ANTENNAS								
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	05/09/00	12	05/09/01
NWH0	RIDGED WAVE GUIDE	TENSOR	4105	2081	1-12.4GHZ	08/01/00	12	08/01/01
Equipment Type: ATTENUATORS								
T2D1	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AV5814	DC-18GHZ	03/01/00	12	03/01/01
T2D5	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9244	DC-18GHZ	12/28/99	12	12/28/00
T2D9	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BH5445	DC-18NGZ	11/27/00	12	11/27/01
Equipment Type: CONTROLLERS								
CEA1	HANDHELD PERSONAL COMPUTER	SHARP ELECTRONI	ZAURUS 5700	---	---		N/A	
Equipment Type: METERS								
MFC0	MICROWAVE FREQ. COUNTER	HEWLETT PACKARD	5343A	2133A00591	10HZ-26GHZ	06/02/00	12	06/02/01
MSN0	DIGITAL OSCILLOSCOPE	LECROY CORP.	LEC/9354AL	2537	DC-500MHZ	04/01/00	12	04/01/01
Equipment Type: PROBES; CLAMP-ON & LISNS								
PSN7	10X OSCILLOSCOPE PROBE	LECROY	PP002	---	DC-350MHZ		NOTE 1	
Equipment Type: PRINTERS AND PLOTTERS								
HRF0	DESKJET 540 PRINTER	HEWLETT PACKARD	C2162A	US4CN1H1HW	---		N/A	
Equipment Type: RECEIVERS								
RAC2	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3638A08770	100HZ-22GHZ	11/13/00	12	11/13/01
RACD	RF PRESELECTOR	HEWLETT PACKARD	85685A	3010A01205	20HZ-2GHZ	03/01/00	12	03/01/01
RAF4	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	2043A00320	0.01-1000MHZ	11/13/00	12	11/13/01
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	9KHZ-6.5GHZ	01/24/00	12	01/24/01
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	01/24/00	12	01/24/01
Equipment Type: SIGNAL GENERATORS								
GBN2	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 02	DE14046	9KHZ-2.080GHZ	04/28/00	12	04/28/01
GBQ0	SIGNAL GENERATOR WITH I/Q	ROHDE & SCHWARZ	SMHU-58	843558/039	1KHZ-4320MHZ	07/14/00	12	07/14/01

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.

ETR 23083
DATA SHEET

MANUFACTURER	: GRANITE COMMUNICATIONS
MODEL	: BADGER P.I.
S/N	: 0002
SPECIFICATION	: RF POWER OUTPUT
DATE	: SEPTEMBER 12, 2000
NOTES	:

RF OUTPUT DIRECTLY OUT OF THE ANTENNA PORT

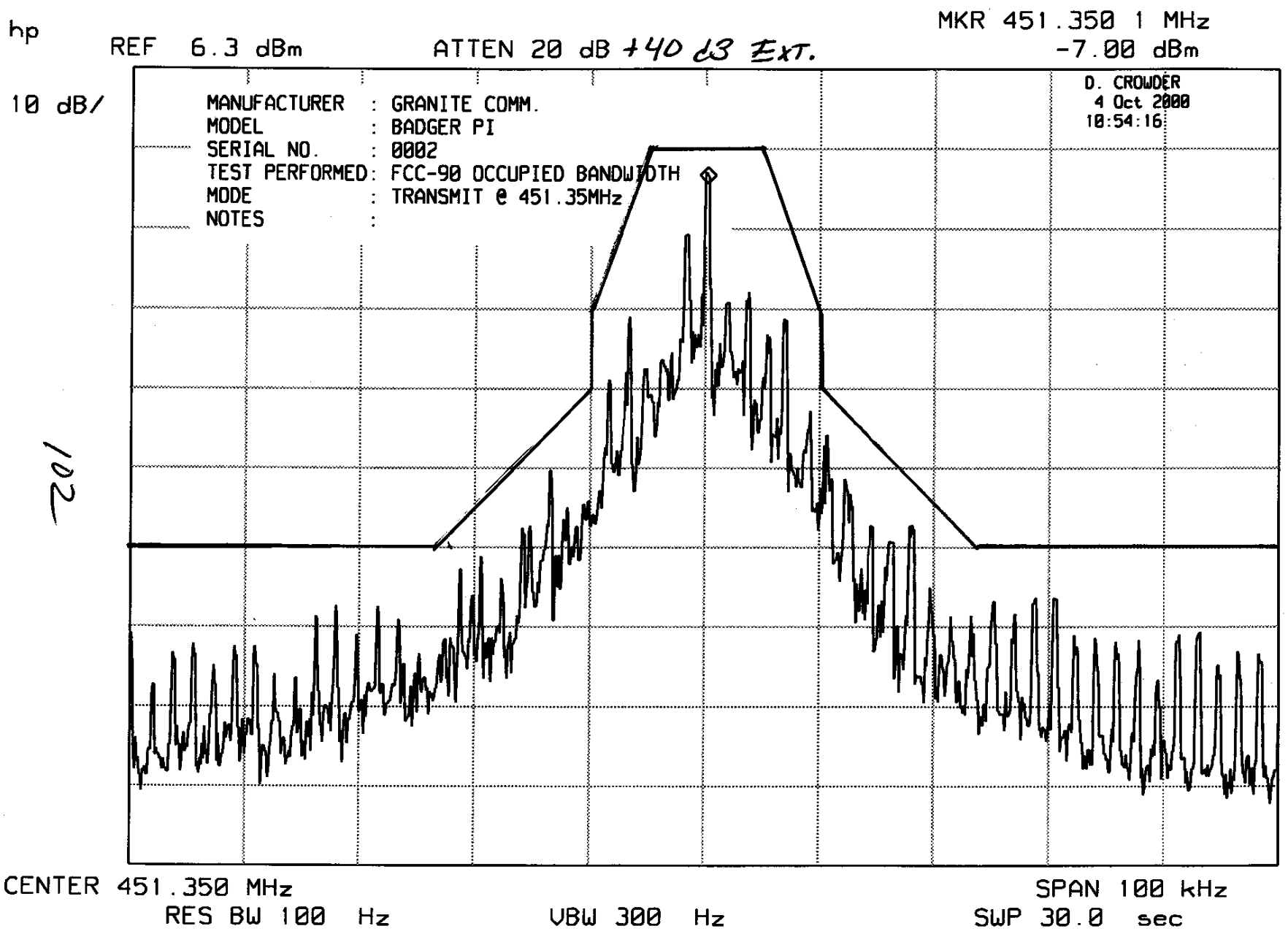
FREQ. (MHz)	MTR RDG(dBm)	PADS (dB)	TOTAL (dBm)	TOTAL (Watts)
451.35	-6.9	40.2	33.3	2.14

RF OUTPUT (ERP) AT 3 METERS WITH SUPPLIED ANTENNA

FREQ. (MHz)	ANT POL	MTR RDG (dBuV)	ANT FAC dB	CABLE FAC dB	CONV. F.I. to dBm(dipole)	TOTAL ERP dBm	TOTAL ERP Watts
451.35	H	102.5	17.1	2.2	97.2	24.6	0.29
	V	104.4	17.1	2.2	97.2	26.5	0.45

CHECKED BY: DW

ELITE ELECTRONIC ENGINEERING CO



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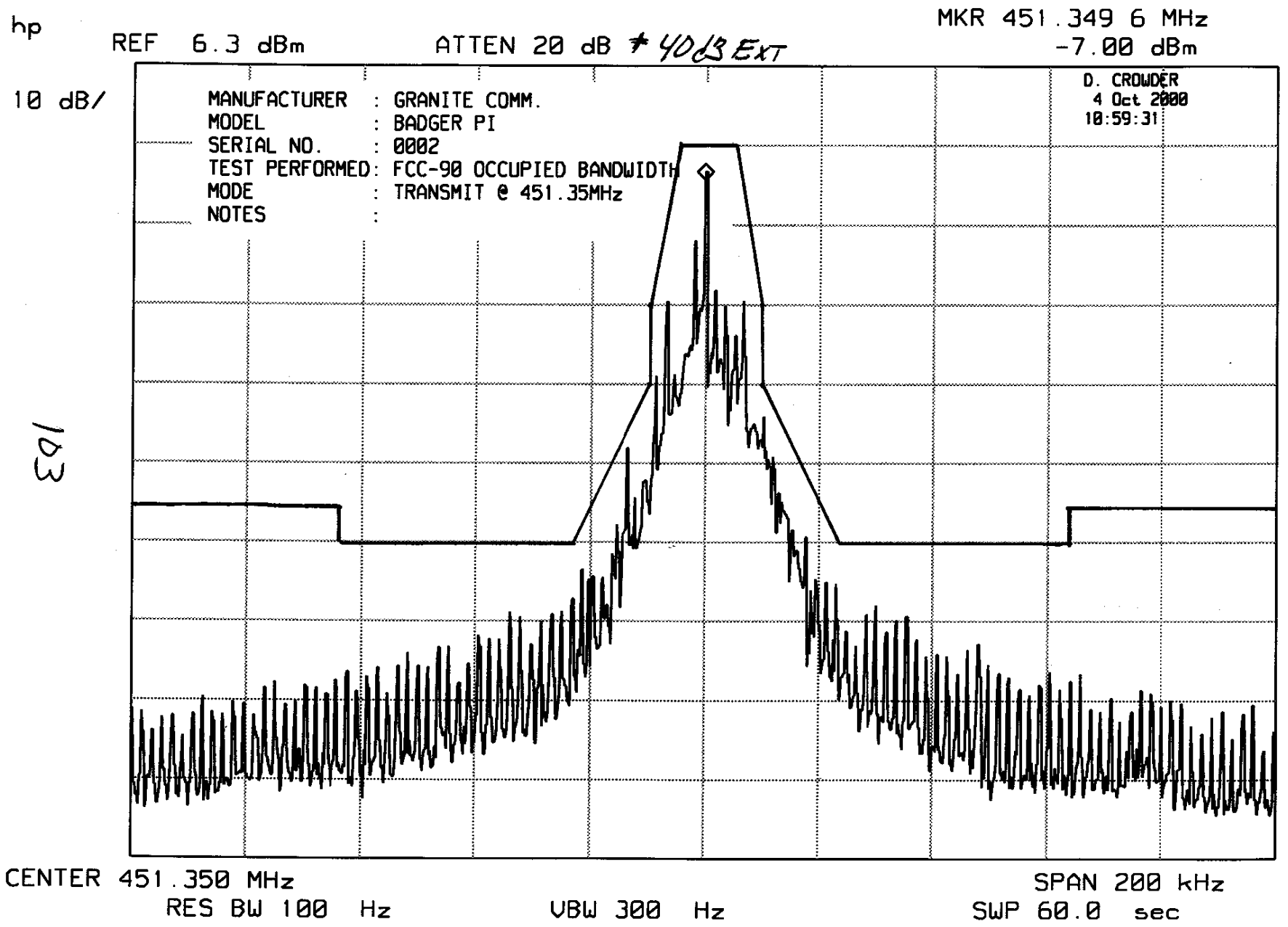
ETL 2308

ELITE ELECTRONIC ENGINEERING CO



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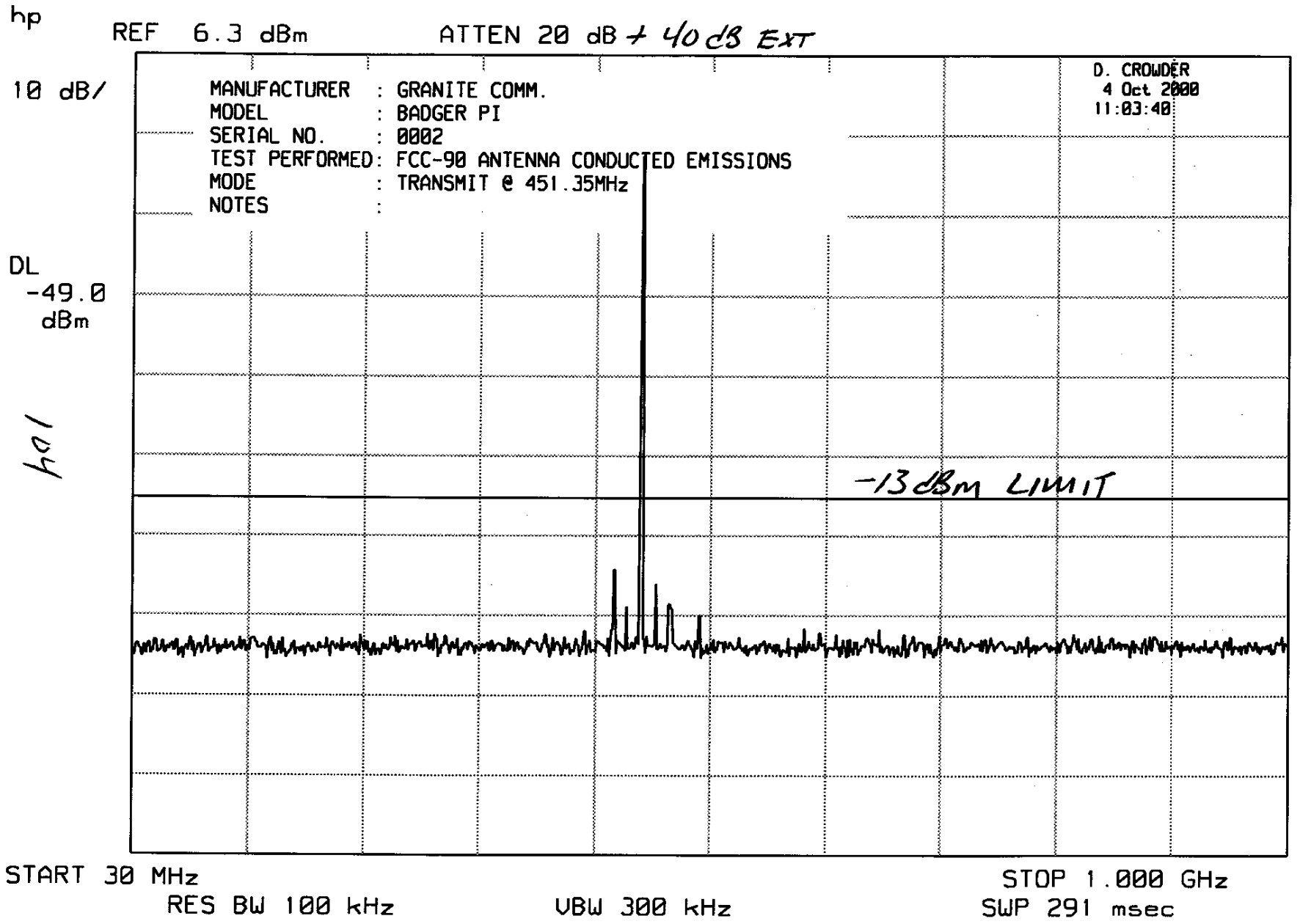
ETR 2383

ELITE ELECTRONIC ENGINEERING CO



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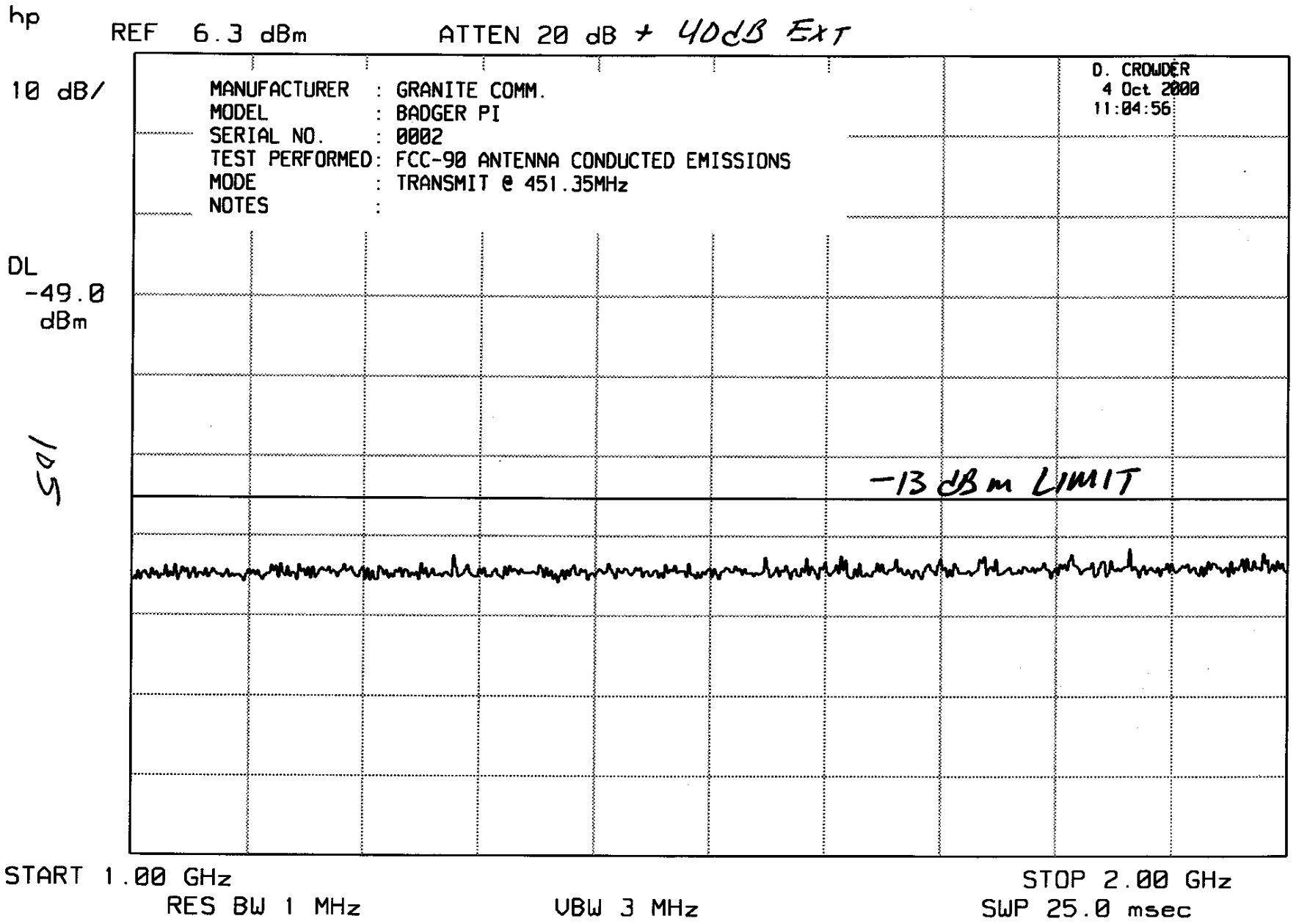
ETR 23083

ELITE ELECTRONIC ENGINEERING CO



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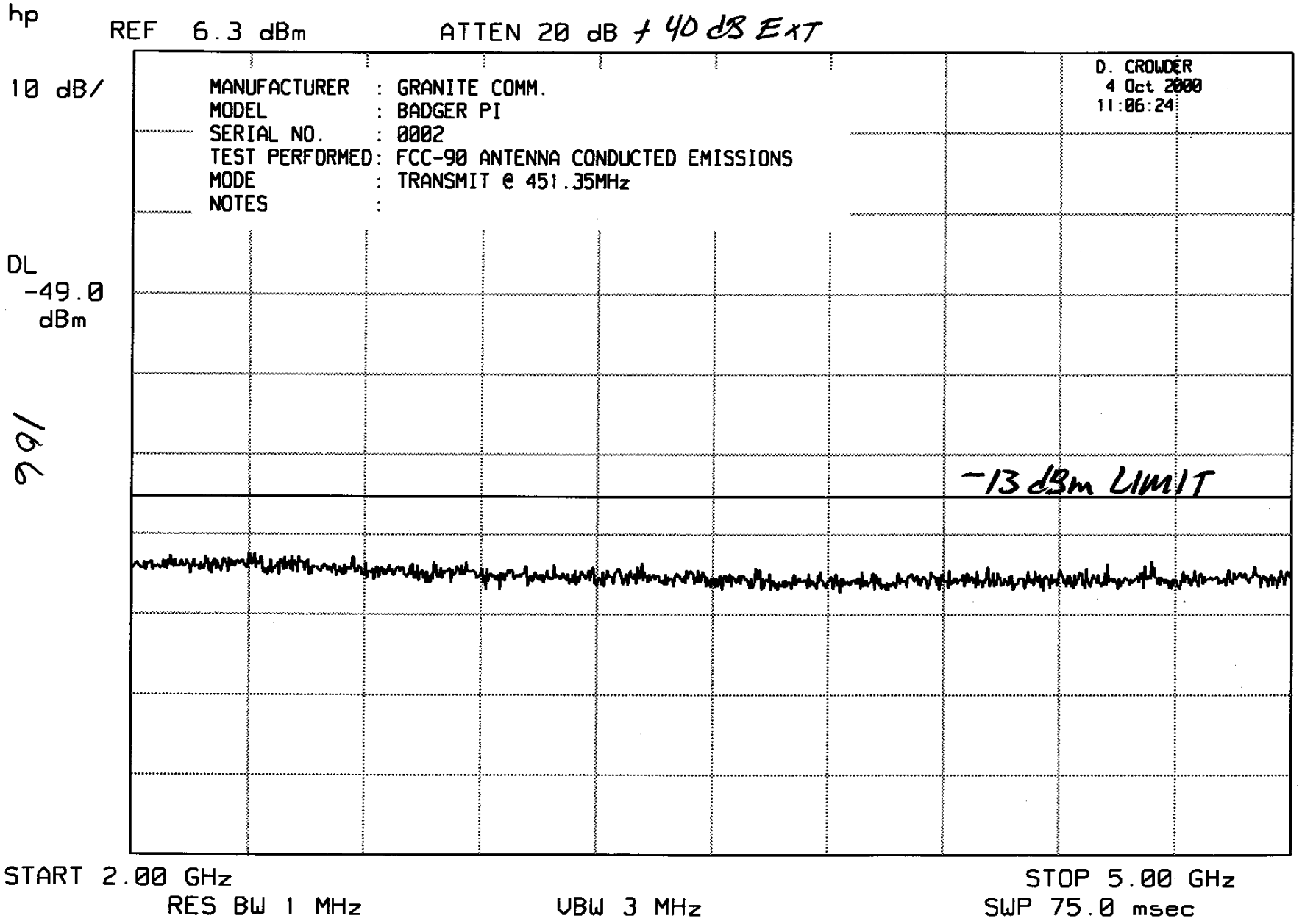
ELITE ELECTRONIC ENGINEERING CO



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STR 23083

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EEE

ELITE ELECTRONIC ENGINEERING Co.

Downers Grove, Ill. 60515

WKA0 09/13/99

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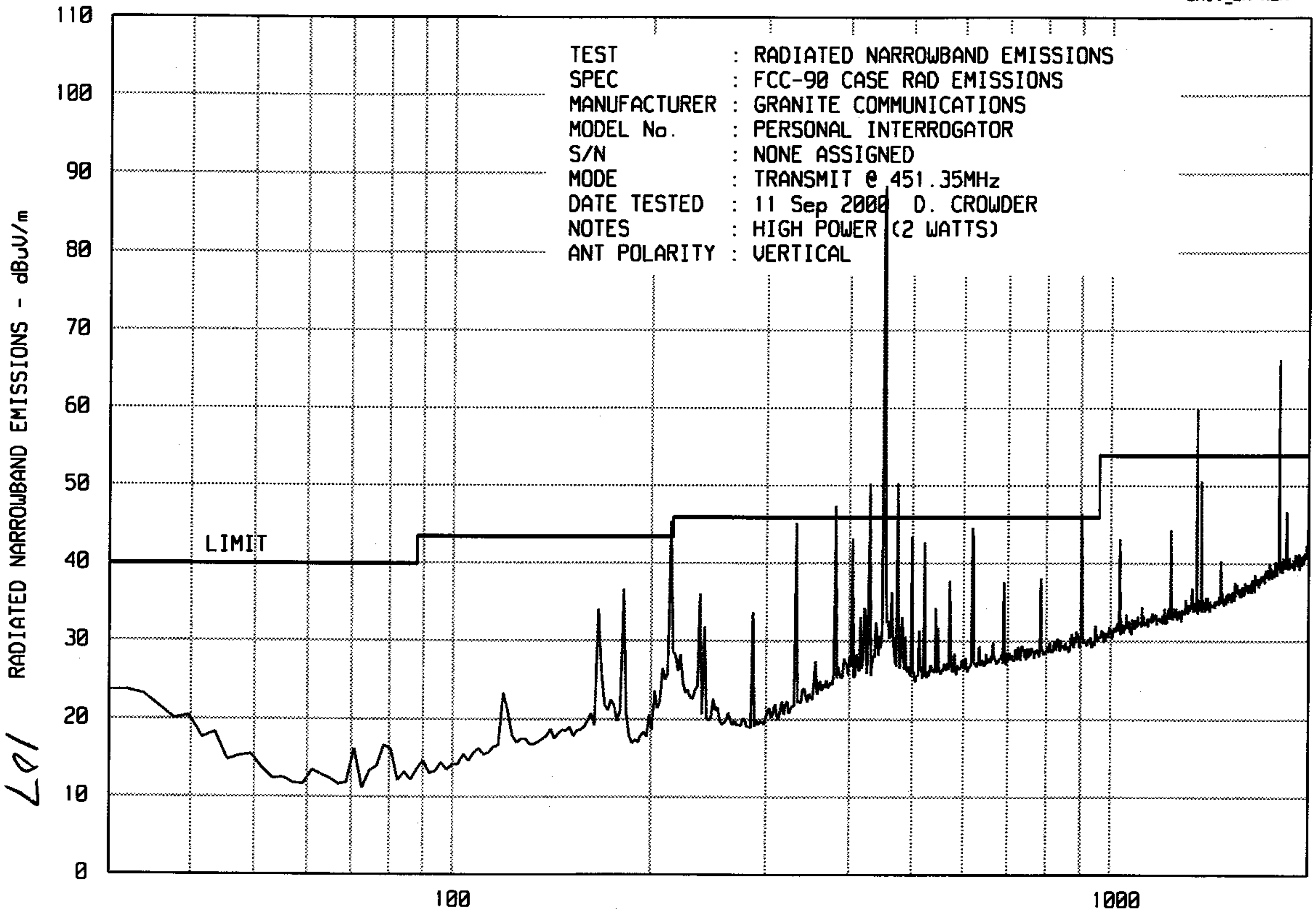

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ELITE ELECTRONIC ENGINEERING Co.

Downers Grove, Ill. 60515

WKA0 09/13/99

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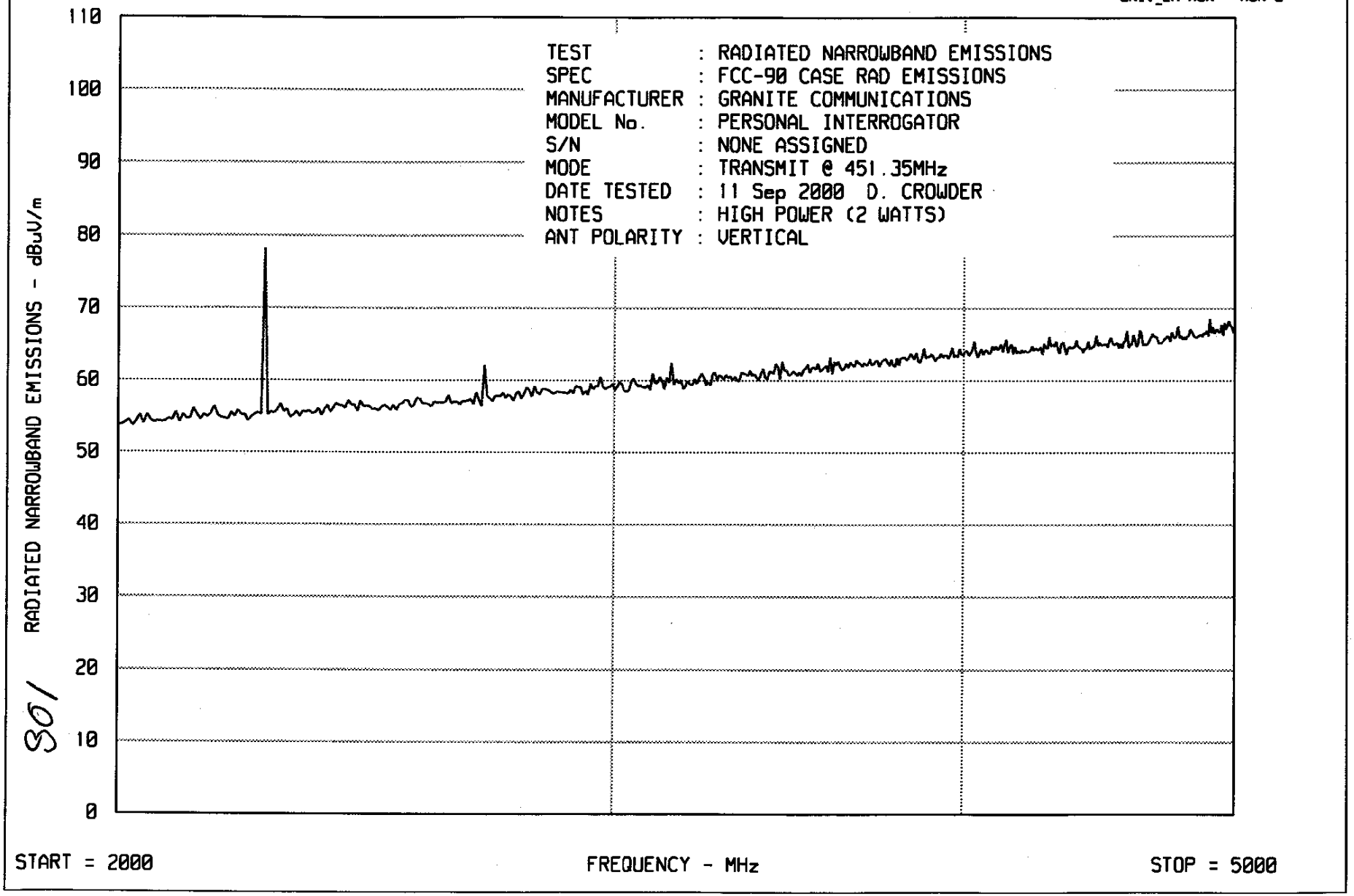

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ETR 23083

ETR 23083
DATA SHEET

MANUFACTURER : GRANITE COMMUNICATIONS
MODEL : BADGER P.I.
S/N : 0002
SPECIFICATION : FCC-90 OPEN FIELD SPURIOUS RADIATED EMISSIONS
DATE : SEPTEMBER 12, 2000
NOTES : TRANSMIT AT 451.35MHz INTO 50 OHMS
: TEST DISTANCE IS 3 METERS

FREQ. (MHz)	ANT POL	MTR RDG (dBuV)	ANT FAC dB	CABLE FAC dB	CONV. F.I. to dBm(dipole)	TOTAL dBm	LIMIT dBm
902.7	H	40.8	21.9	3.1	97.2	-31.4	-13
	V	44.7	21.9	3.1	97.2	-27.5	-13
1354.1	H	48.3	24.8	4.4	97.2	-19.7	-13
	V	45.7	24.8	4.4	97.2	-22.3	-13
1805.4	H	39.5	26.3	4.8	97.2	-26.6	-13
	V	34.6	26.3	4.8	97.2	-31.5	-13
2256.8	H	36.3	28.1	6.0	97.2	-26.8	-13
	V	37.8	28.1	6.0	97.2	-25.3	-13
2708.1	H	31.7	29.9	7.0	97.2	-28.6	-13
	V	31.1	29.9	7.0	97.2	-29.2	-13
3159.5	H	31.0	30.9	7.9	97.2	-27.4	-13
	V	30.3	30.9	7.9	97.2	-28.1	-13
3610.8	H	30.0	32.3	8.8	97.2	-26.1	-13
	V	31.7	32.3	8.8	97.2	-24.4	-13
4062.2	H	30.7	33.4	9.7	97.2	-23.4	-13
	V	30.2	33.4	9.7	97.2	-23.9	-13
4513.5	H	30.7	33.0	11.0	97.2	-22.5	-13
	V	30.4	33.0	11.0	97.2	-22.8	-13

CHECKED BY: DM

ETR 23083
DATA SHEET

MANUFACTURER : GRANITE COMMUNICATIONS
MODEL : BADGER P.I.
S/N : 0002
SPECIFICATION : FCC-90 FEQUENCY STABILITY
DATE : OCTOBER 5, 2000
NOTES : TRANSMIT AT 451350054Hz

TEMP C°	FREQ (Hz)	DEVIATION (PPM)	LIMIT (PPM)
-30	DNO	-----	5.0
-20	451350674	1.37	5.0
-10	451350047	-0.02	5.0
0	451350593	1.19	5.0
10	451350565	1.13	5.0
20	451350377	0.72	5.0
30	451350034	-0.04	5.0
40	451349730	-0.72	5.0
50	451349516	-1.19	5.0

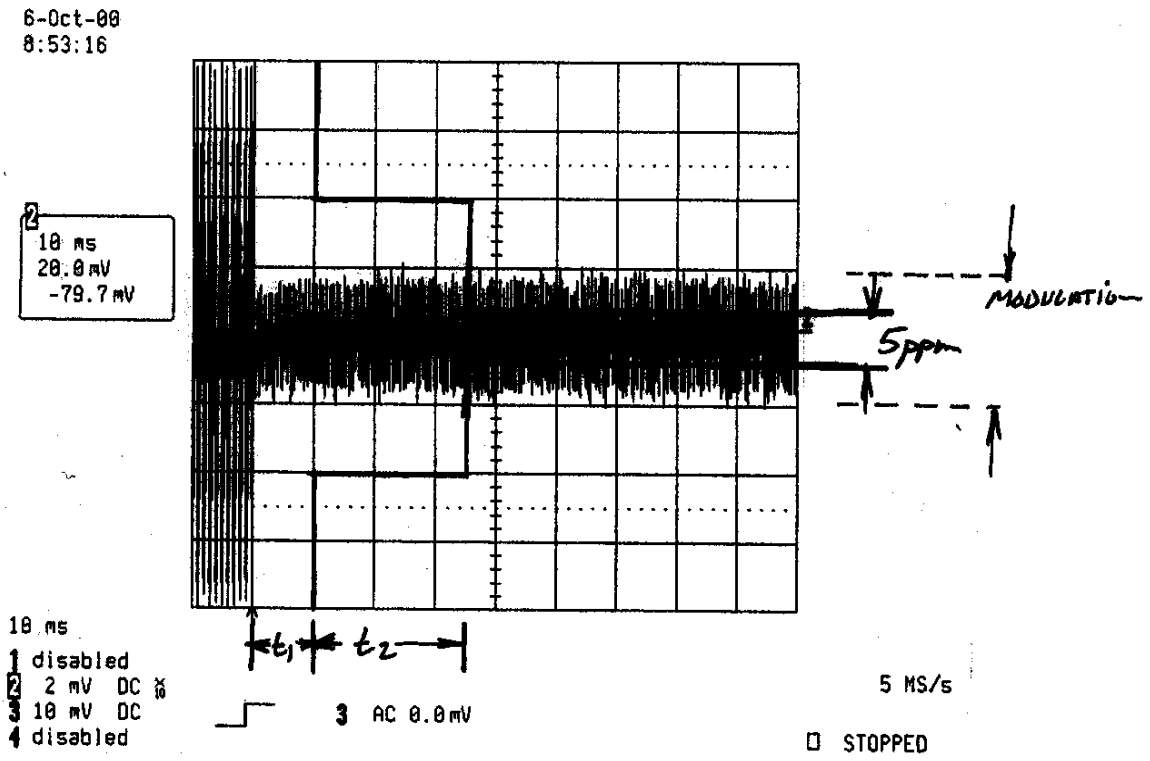
DNO – DID NOT OPERATE

VOLTAGE (VDC)	FREQ (Hz)	DEVIATION (PPM)	LIMIT (PPM)
8.0	451350041	-----	5.0
6.8	451350050	0.02	5.0

BELOW 6.8VDC THE TEST ITEM DID NOT OPERATE

CHECKED BY:

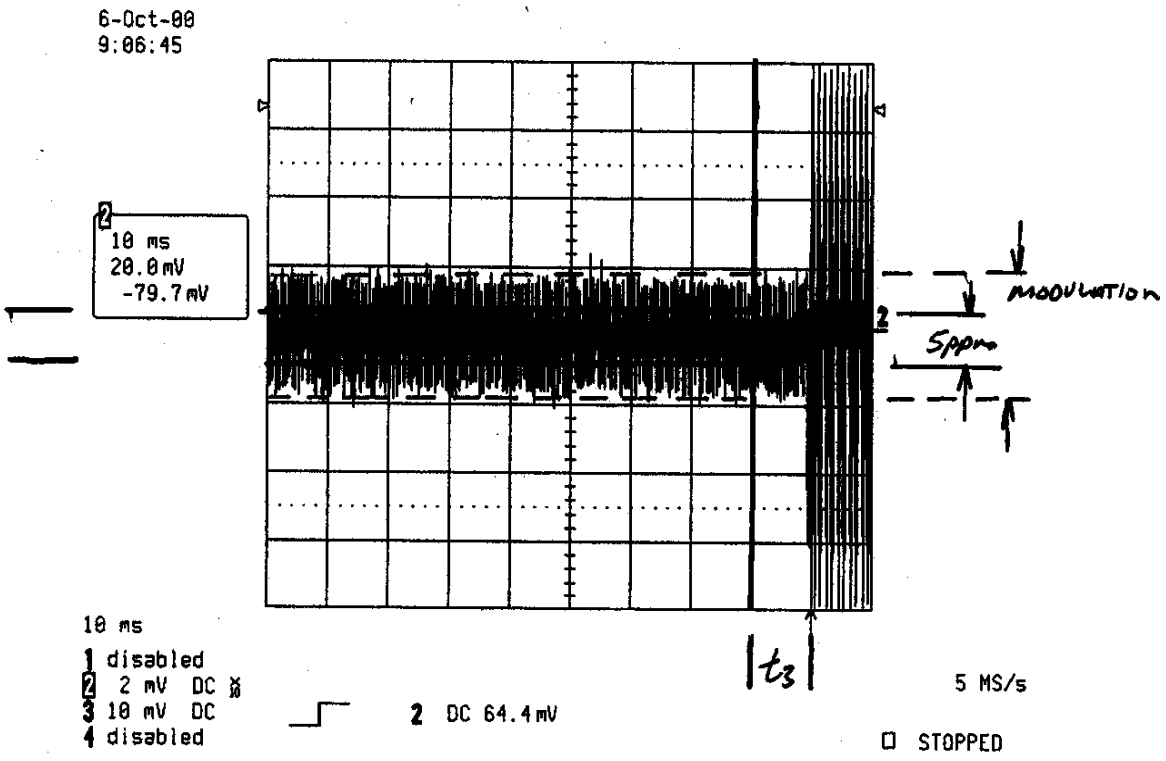
ETR 23083



ELITE ELECTRONIC ENGINEERING INC.
ENGINEERING TEST REPORT NO.

MANUFACTURER : GRANITE COMM.
MODEL NO. : BADGER P.I.
SERIAL NO. : 0002
TEST DESCRIPT.: FCC-90 TRANSIENT FREQUENCY BEHAVIOR
TEST MODE : TRANSMIT @ 451.35MHz

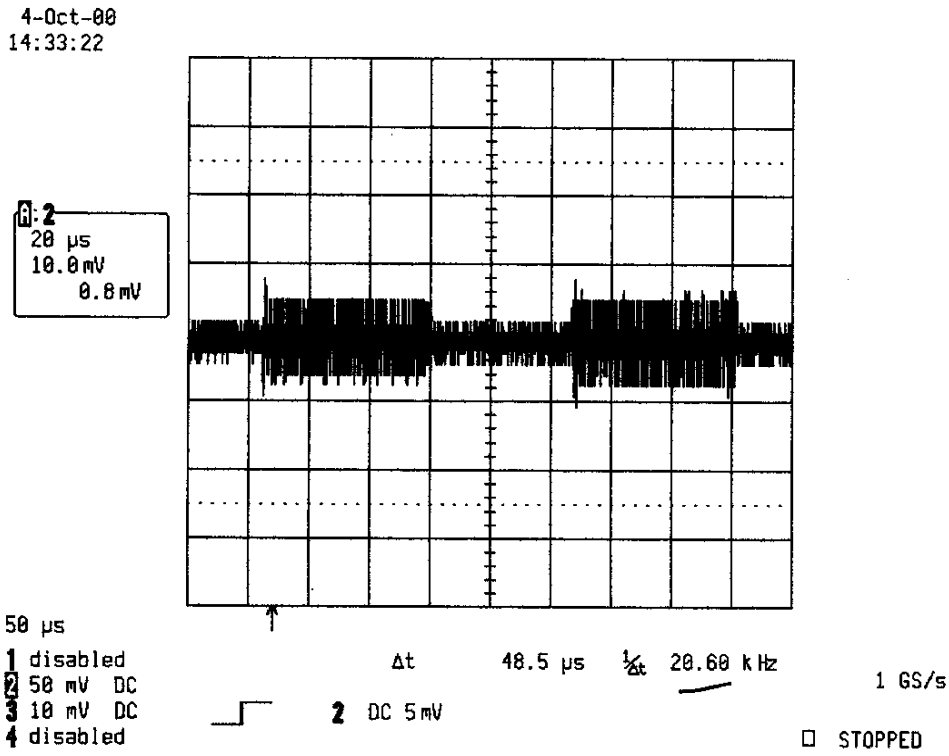
ETR 23083



ELITE ELECTRONIC ENGINEERING INC.
ENGINEERING TEST REPORT NO.

MANUFACTURER : GRANITE COMM.
MODEL NO. : BADGER P.I.
SERIAL NO. : 0002
TEST DESCRIPT.: FCC-90 TRANSIENT FREQUENCY BEHAVIOR
TEST MODE : TRANSMIT @ 451.35MHz

ETR 23083



ELITE ELECTRONIC ENGINEERING INC.
ENGINEERING TEST REPORT NO.

MANUFACTURER : GRANITE COMM.
MODEL NO. : BADGER P.I.
SERIAL NO. : 0002
TEST DESCRIPT.: FCC-90 SPECTRUM EFFICIENCY
TEST MODE : TRANSMIT @ 451.35MHz