



Measurement of RF Interference from a Model Motorola Canopy Transciever with a Pacific Wireless PAWDA58-29 Parabolic Antenna

For : FDDI Systems
Tulsa, OK

P.O. No. : CANCONVFCCCTEST

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Specification : FCC "Code of Federal Regulations" Title 47
Part 15.247, Subpart C

Test Report By

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**Measurement of RF Emissions from a Motorola Canopy Transceiver with
a Pacific Wireless PAWDA58-29 Parabolic Antenna**

1.0 INTRODUCTION:

1.1 Description of Test Item - This document presents the results of tests performed to determine if the Motorola Canopy Transceiver (ISM Band) would meet the FCC requirements when using a Pacific Wireless Model PAWDA58-29 Parabolic Antenna. The test item was designed to transmit in the 5735MHz to 5840MHz band. The tests were performed for FDDI Systems of Tulsa, Oklahoma.

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, Sections for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2001.

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 2002
- ANSI C63.4-2001, "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"
- Federal Communications Commission, FCC 97-114, Guidance on Measurements for Direct Sequence Spread Spectrum Systems

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 21°C and the relative humidity was 22%.

2.0 TEST ITEM SETUP AND OPERATION:

The test item is a Motorola Canopy Transceiver with a Pacific Wireless PAWDA58-29 Parabolic Antenna. All tests, with the test item operating in the 20Mb/sec rate, were performed on the Motorola Canopy Transceiver, P/N: 5700BH20, S/N: 606CDW5350. Radiated emissions tests, antenna conducted emissions tests, bandwidth tests, and power spectral density tests with the test item operating in the 10Mb/sec rate, were performed on the Motorola Canopy Transceiver, P/N: 5700BH, S/N: 606CDL5073. All other tests, with the test item operating in the 10Mb/sec rate, were performed on the Motorola Canopy Transceiver, P/N: 5700BH20, S/N: 606CDW5350. A block diagram of the test item setup is shown as Figure 1.

2.1 Power Input - The test item received 24VDC from a Motorola P/N: ACPS110, model SADB-1129 power supply via a Category 5 cable.

2.2 Grounding - Since the test item was powered with two wires, it was ungrounded during the tests.

2.3 Peripheral Equipment - A Sony laptop computer, M/N: PCG-GRX500P, was used to set the test item to transmit at the desired frequency.

2.4 Interconnect Cables - The test item was connected to the laptop via a 45 foot long CAT 5 cable.

2.5 Operational Mode - For all tests the test item was placed on an 80cm high non-conductive stand.

RF antenna conducted tests, radiated emissions tests, power spectral density tests, bandwidth tests, and power output tests were performed separately with the test item operating in the following modes:

- Transmit Frequency: 5745MHz, Bit Rate: 10Mb/sec
- Transmit Frequency: 5745MHz, Bit Rate: 20Mb/sec
- Transmit Frequency: 5790MHz, Bit Rate: 10Mb/sec
- Transmit Frequency: 5790MHz, Bit Rate: 20Mb/sec
- Transmit Frequency: 5800MHz, Bit Rate: 10Mb/sec
- Transmit Frequency: 5800MHz, Bit Rate: 20Mb/sec

Bandedge compliance tests were performed separately with the test item operating in the following modes:

- Transmit Frequency 5735MHz, Bit Rate: 10Mb/sec
- Transmit Frequency 5735MHz, Bit Rate: 20Mb/sec
- Transmit Frequency 5840MHz, Bit Rate: 10Mb/sec

- Transmit Frequency 5840MHz, Bit Rate: 20Mb/sec

Conducted emissions tests on the AC power lines of the Motorola P/N: ACPS110, model SADB-1129 power supply were performed with the test item operating in the following mode:

-Transmit Frequency 5790MHz, Bit Rate: 10Mb/sec

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.

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).

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 Powerline Conducted Emissions

4.1.1 Requirements – Per 15.207, all radio frequency voltages on the power lines of a Subpart C intentional radiator shall be below the values shown below when using the appropriate detector:

CONDUCTED LIMITS FOR CLASS B DEVICE

Frequency MHz	RFI Voltage dBuV(QP)	RFI Voltage dBuV(Average)
0.15-0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5-5	56	46
5-30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the test item is considered to have met both requirements and measurements do not need to be performed using the Average detector.

A photograph of the test item setup is presented as Figure 2.

4.1.2 Procedures - The interference on each power lead of the Motorola P/N: ACPS110, model SADB-1129 power supply was measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. The meter terminal of the LISN not under test was terminated

with 50 ohms. Measurements were first made over the entire frequency range from 150kHz through 30MHz with a peak detector and the results were automatically plotted. The data thus obtained was then searched by the computer for the highest levels. Quasi-peak measurements were automatically performed at the frequencies selected from the highest peak measurements, and the results printed.

4.1.3 Results - The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 14 and 15. The conducted limits for Subpart C intentional radiators are shown as a reference. The final quasi-peak results are presented on pages 16 and 17. As can be seen by the data, the test item did meet the powerline conducted emissions limits of 15.207.

4.2 Antenna Conducted Emissions and Band Edge Compliance Measurements

4.2.1 Requirements – Per section 15.247(c), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated emissions measurement. Attenuation below the general limits specified in §15.209(a) is not required.

In addition, at the edges of the band in which the intentional radiator is allowed to operate (5725MHz and 5850MHz) , the radio frequency power that is produced by the intentional radiator at the antenna port must be 20dB below the highest level of the desired power.

4.2.2 Procedures – The antenna port of the transmitter was connected to a spectrum analyzer through two 20dB attenuators. The resolution bandwidth was set to 100kHz with a video bandwidth of 1MHz.

For antenna conducted emissions, the maximum meter reading was recorded for the harmonics starting with the 2nd harmonic up to the 6th harmonic. The peak emissions in a 100kHz bandwidth were measured for each of the modes of operation listed in paragraph 2.5.

For band edge compliance, separate plots were made of the radio frequency power that is produced at the antenna port with the test item operating in the modes listed in paragraph 2.5. The 20dB down point at the band edge is shown on each plot.

4.2.3 Results: The antenna conducted emissions for the modes of operation listed in paragraph 2.5 are shown on data pages 18 and 19. As can be seen by the data the test item did meet the antenna conducted emissions limits of 15.247(c).

The band edge compliance plots are shown on data pages 20 through 23. As can be seen

by the data, the test item did meet the band edge compliance limits of 15.247(c).

4.3 Radiated Measurements

4.3.1 Requirements - Per section 15.247(c), radiated emissions which fall in the restricted bands, as defined in 15.205(a), must comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

Paragraph 15.209(a) has the following radiated emission limits:

Frequency MHz	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30.0-88.0	100	3
88.0-216.0	150	3
216.0-960.0	200	3
Above 960	500	3

4.3.2 Procedures - Radiated measurements were manually performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. 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 radiated emission tests were performed for the 2nd and 4th harmonics which fall in restricted bands. To ensure that maximum emission levels were measured, the following steps were taken:

- 1) Measurements were made using an average detector and a standard gain horn 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 for each antenna polarization to maximize the readings.

Radiated emissions measurements of the 2nd harmonic were taken at a distance of 1 meter. The reading was converted to an equivalent field intensity at 3 meters using linear extrapolation. A -9.5dB (-9.5 = 20 * log (1m/3m)) distance correction factor was applied to all data.

Radiated emissions measurements of the 4th harmonic were taken at a distance of 0.3 meters. The

reading was converted to an equivalent field intensity at 3 meters using linear extrapolation. A -20dB ($-20 = 20 * \log(0.3\text{m}/3\text{m})$) distance correction factor was applied to all data.

In addition, preliminary sweeps were made from 30MHz to 2GHz to ensure that no radiated emissions in the restricted bands exceeded the limits of 15.209(a).

Photographs of the test item setup are presented as Figure 3.

4.3.3 Results - The preliminary radiated emissions plots from 30MHz to 2GHz are presented on data pages 24 through 35. The final radiated emissions data from 30MHz to 2GHz are presented on data page 36. Initially, radiated emissions at 400MHz exceeded the limits of 15.209(a). However, by placing a piece of copper tape over the circuit board of the Canopy transceiver and connecting the ends of the copper tape to the ground of the circuit board, all emissions in the restricted band were below the limits of 15.209(a).

Radiated emissions data of the 2nd and 4th harmonics are presented on data pages 37 and 38. As can be seen by the data the test item did meet the emissions limits of 15.247(c).

4.4 Power Spectral Density

4.4.1 Requirements – Per section 15.247(d), for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

4.4.2 Procedures – The antenna port of the transmitter was connected to a spectrum analyzer through two 20dB attenuators. Per FCC 97-114, an emission peak was located in the passband. The resolution bandwidth was set to 3kHz with a video bandwidth of 30kHz and the span was set to 2MHz. The sweep time was set to 667 seconds ($\text{SPAN}/3\text{kHz} = 2 \times 10^6 / 3 \times 10^3 = 667$ seconds). A power spectral density plot was made for each of the modes of operation listed in paragraph 2.5

4.4.3 Results: Power spectral density plots for each of the modes of operation listed in paragraph 2.5 are shown on data pages 39 through 44. The display line on each plot shows the 8dBm limit (8dBm - 40dBm external attenuation = -32dBm).

As can be seen by the data the test item did meet the power spectral density limits of 15.247(d).

4.5 Bandwidth

4.5.1 Requirements – Per section 15.247(a)(2), for digitally modulated systems, the minimum 6dB bandwidth shall be at least 500kHz.

4.5.2 Procedures – The antenna port of the transmitter was connected to a spectrum

analyzer through two 20dB attenuators. The resolution bandwidth was set to 100kHz with a video bandwidth of 1MHz and the span was set to 100MHz. A bandwidth plot was made for each of the modes of operation listed in paragraph 2.5. The markers on the plots represent the 6dB down points from the transmit frequency.

4.5.3 Results: Bandwidth plots for each of the modes of operation listed in paragraph 2.5 are shown on data pages 45 through 50. As can be seen by the data the test item did meet the minimum 6dB bandwidth requirements.

4.6 Power Output

4.6.1 Requirements – Per section 15.247(b)(3), for digitally modulated systems, the maximum peak output power shall not exceed 1 watt (30dBm).

4.6.2 Procedures – The antenna port of the transmitter was connected to a spectrum analyzer through two 20dB attenuators. The resolution bandwidth was set to 1MHz with a video bandwidth of 3MHz. The peak power was calculated by applying a bandwidth correction factor of $10 \cdot \log(B/1\text{MHz})$ to the peak reading at the antenna port of the transmitter. (B is the 26dB bandwidth of the signal).

4.6.3 Results: Power output data for each of the modes of operation listed in paragraph 2.5 are shown on data page 51. As can be seen by the data the test item did meet the maximum peak output power requirements of 15.247(b)(3).

5.0 CONCLUSIONS:

It was determined that the FDDI Systems, Motorola Canopy Transciever, did fully meet the emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15.247, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-2001.

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 specifications.

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.

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								
XOA1	WAVE-TO-COAX ADAPTER	HEWLETT PACKARD	R281A	02119	26.5-65GHZ		NOTE 1	
XOB1	ADAPTER	HEWLETT PACKARD	K281C	10422	18-26.5GHZ		NOTE 1	
XOD1	2.4-3.5MM ADAPTER	HEWLETT PACKARD	11901A	---	DC-26.5GHZ		NOTE 1	
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---		N/A	
Equipment Type: AMPLIFIERS								
APH0	POWER AMPLIFIER	HEWLETT PACKARD	11975A	2304A00322	2-8GHZ		NOTE 1	
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	02/19/03	12	02/19/04
Equipment Type: ANTENNAS								
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	07/03/03	12	07/03/04
NWN0	DOUBLE RIDGED GUIDE ANTENN	ETS-LINDGREN	3116	00026778	18 TO 40 GHZ	08/15/03	12	08/15/04
Equipment Type: ATTENUATORS								
T1E4	10DB, 25W ATTENUATOR	WEINSCHEL	46-10-43	AV5805	DC-18GHZ	02/10/03	12	02/10/04
T2D5	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9244	DC-18GHZ	01/22/03	12	01/22/04
T2DA	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BH5446	DC-18GHZ	12/02/03	12	12/02/04
TVC0	VARIABLE ATTENUATOR	HEWLETT PACKARD	R382A	1281	26.5-40GHZ	08/13/03	12	08/13/04
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		N/A	
Equipment Type: METERS								
MPA0	POWER METER	HEWLETT PACKARD	432A	1141A08696	0.01-40GHZ	07/01/03	12	07/01/04
MPAD	THERMISTOR MOUNT	HEWLETT PACKARD	R486A	3322	26.5-40GHZ	09/30/03	12	09/30/04
Equipment Type: PROBES; CLAMP-ON & LISNS								
PLL9	50UH LISN 462D	ELITE	462D/70A	010	0.01-400MHZ	03/04/03	12	03/04/04
PLLA	50UH LISN 462D	ELITE	462D/70A	011	0.01-400MHZ	03/04/03	12	03/04/04
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061052	---		N/A	
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/29/03	12	01/29/04
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	01/29/03	12	01/29/04
RAE1	SPECTRUM ANALYZER (DCC-CEM	HEWLETT PACKARD	85660A	2209A01336	100HZ-22GHZ	02/06/03	12	02/06/04
RAF3	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/29/03	12	01/29/04
RAH0	FREQUENCY MIXER	HEWLETT PACKARD	11970K	2332A00270	18-26GHZ		N/A	
RAI0	FREQUENCY MIXER	HEWLETT PACKARD	11970A	2332A00292	26-40GHZ	06/02/03	N/A	
RB1A	EMI TEST RECEIVER	RHODE & SCHWARZ	ESIB26	100146	20HZ-26.5GHZ	03/13/03	12	03/13/04
Equipment Type: SIGNAL GENERATORS								
GBX1	SYNTHESIZED SWEEPER	HEWLETT PACKARD	83630A	3420A00857	10MHZ-26.5GHZ		NOTE 1	
GSB1	SWEEP OSCILLATOR	HEWLETT PACKARD	8350A	2749A09916	0.01-40GHZ	06/06/03	12	06/06/04
GSBC	TUNING HEAD	HEWLETT PACKARD	83572B	2429A00203	26.5-40GHZ	06/09/03	12	06/09/04

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.

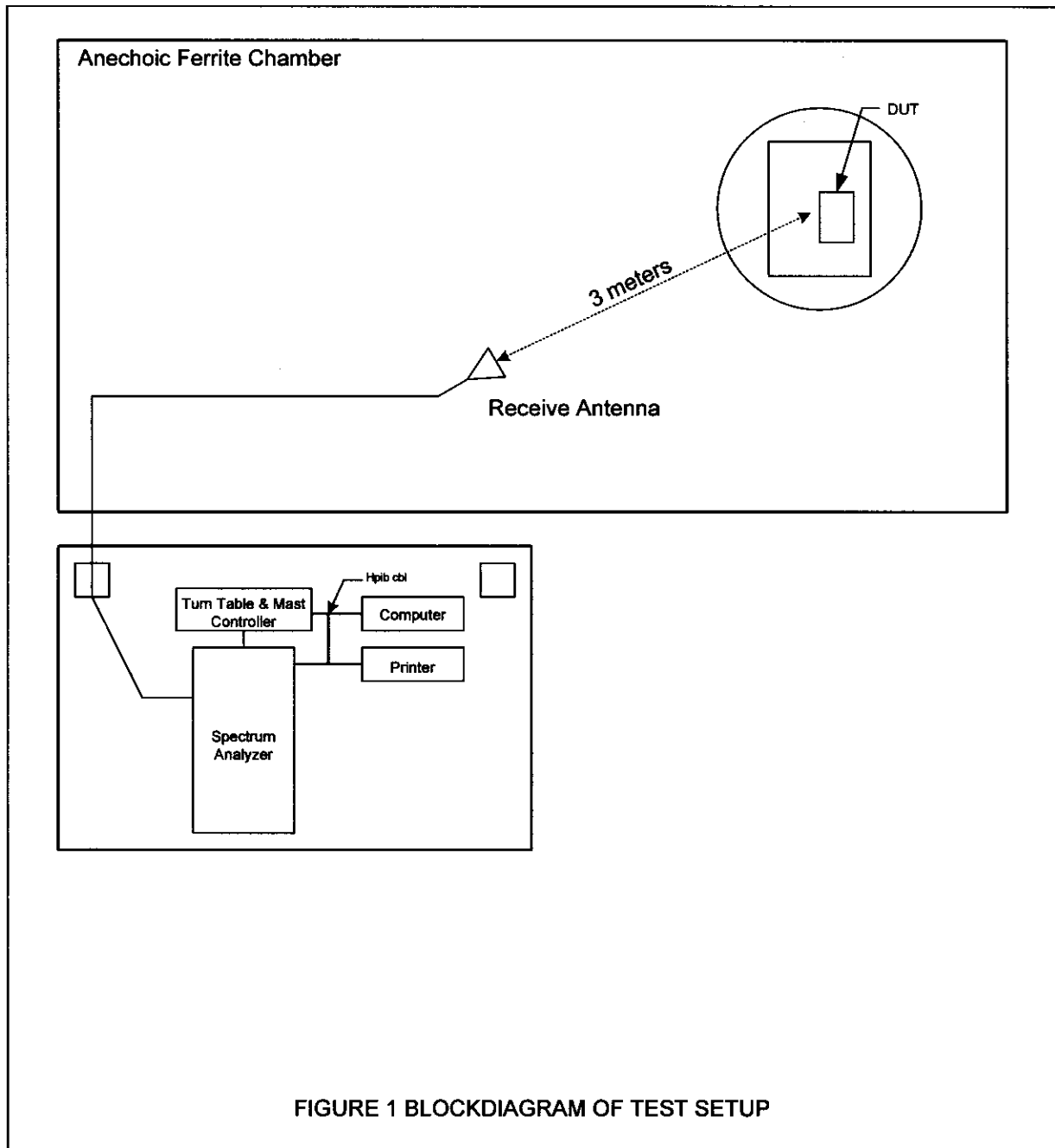
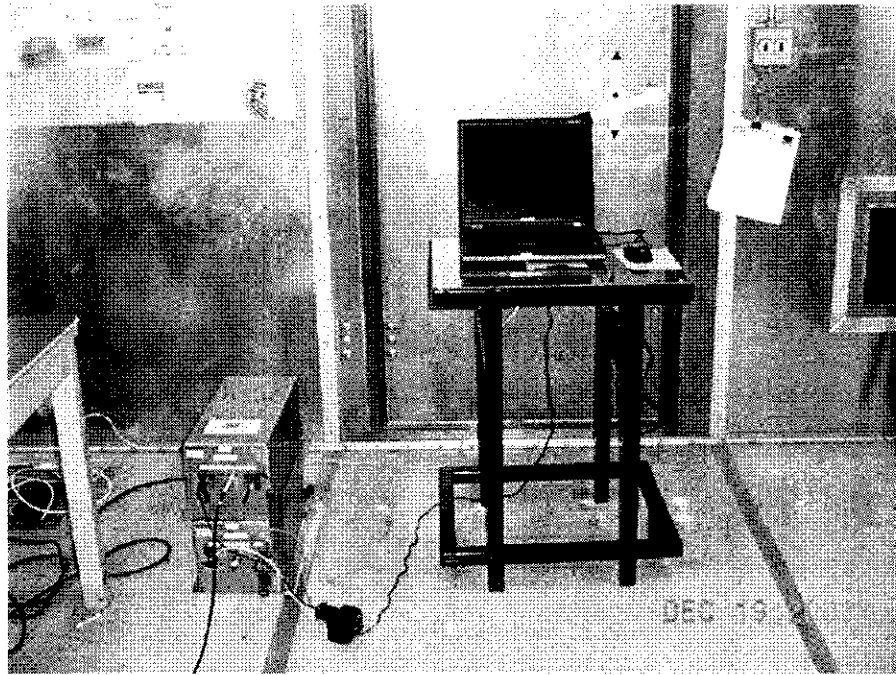
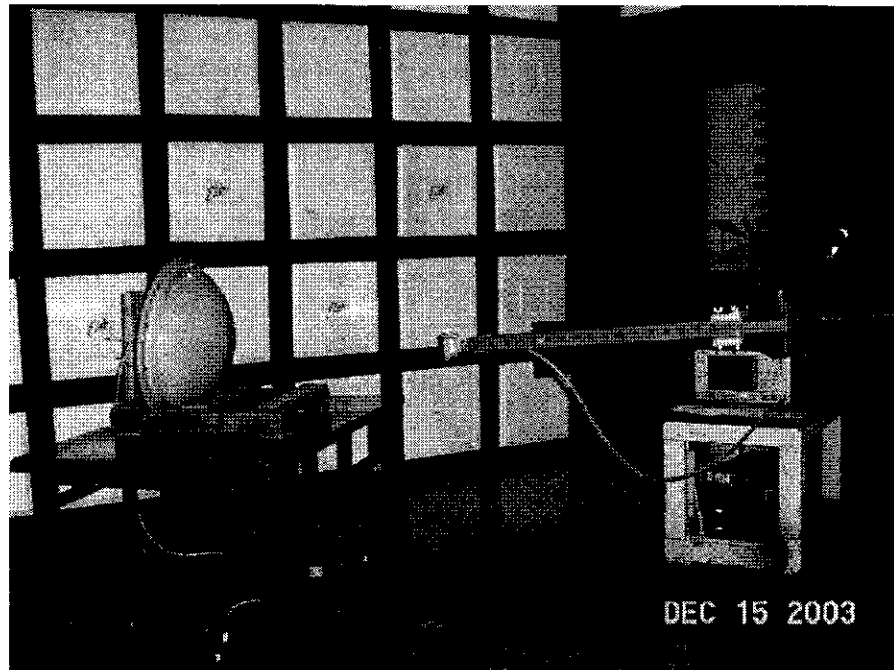


Figure 2

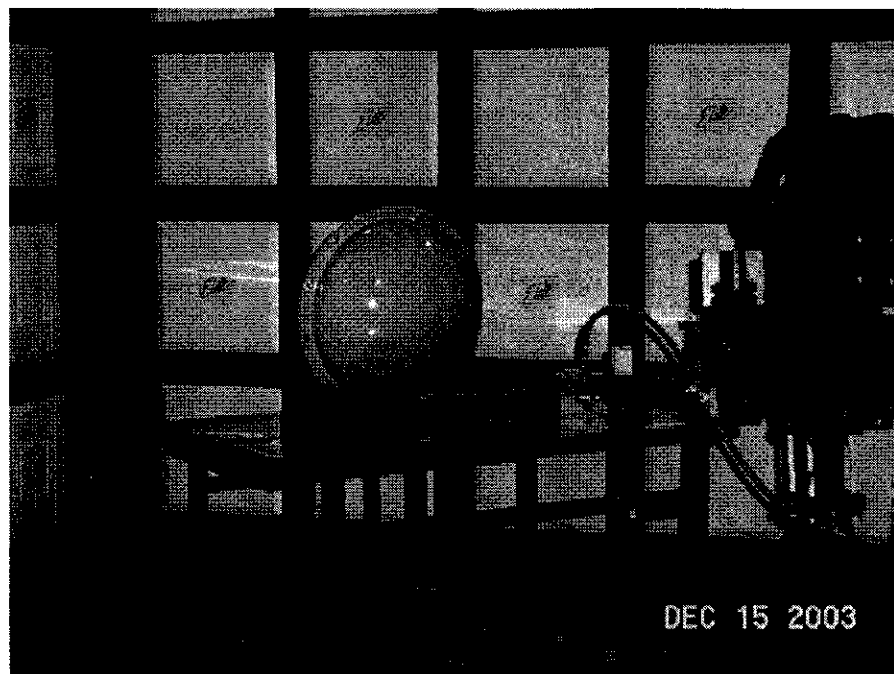


TEST SETUP FOR MEASUREMENT OF POWERLINE CONDUCTED EMISSIONS

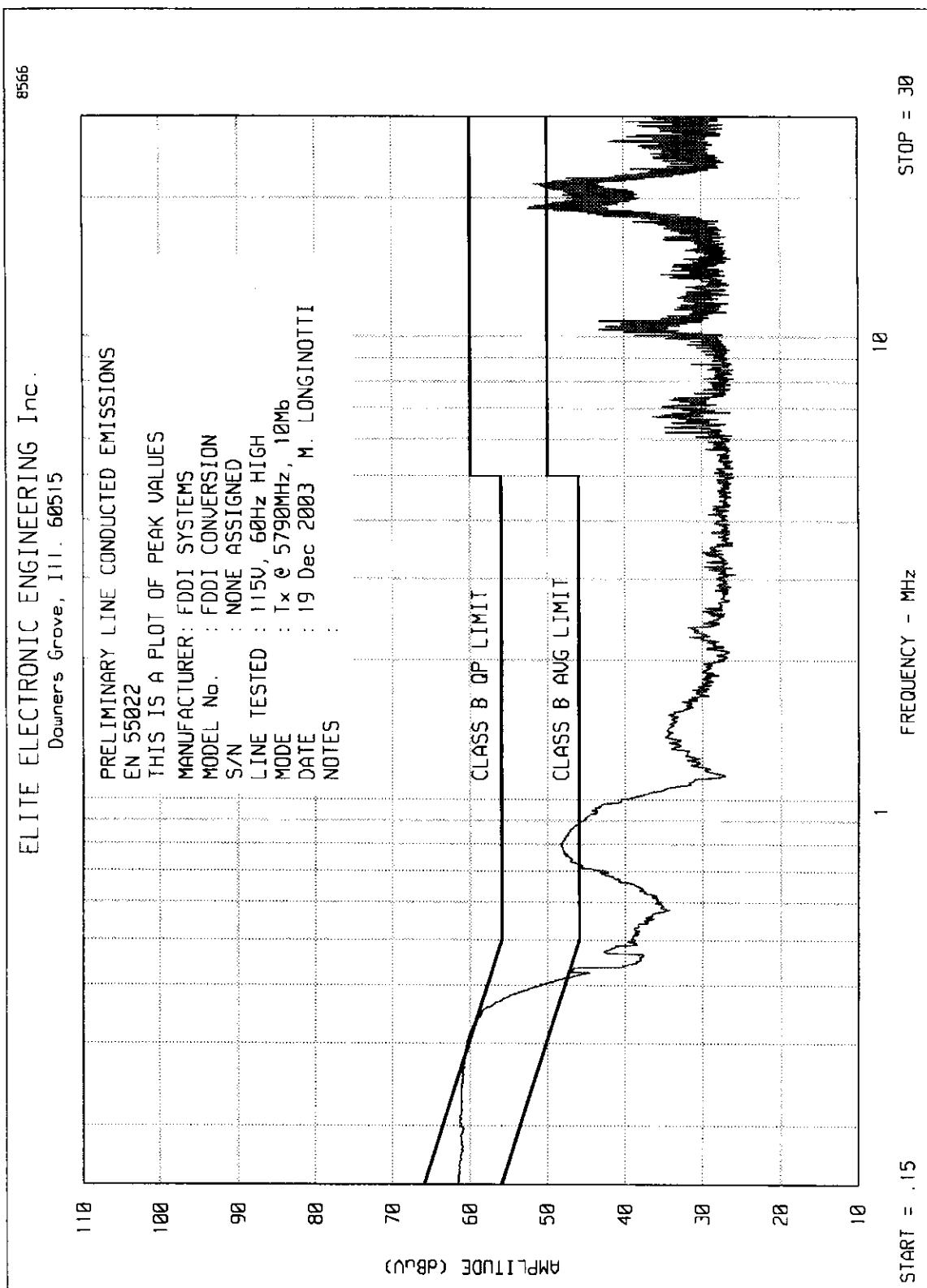
Figure 3



TEST SETUP FOR MEASUREMENT OF RADIATED EMISSIONS HORIZONTAL
POLARIZATION

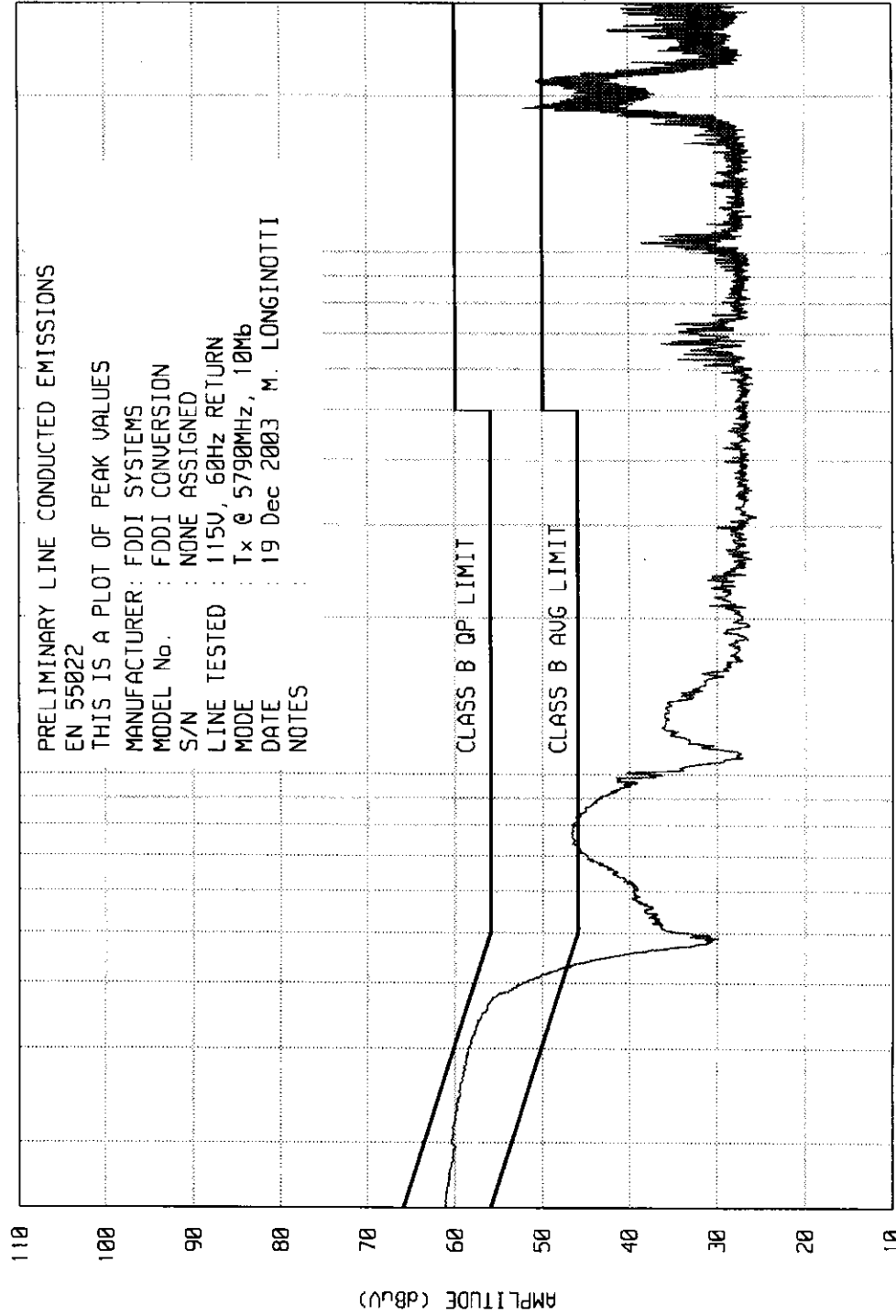


TEST SETUP FOR MEASUREMENT OF RADIATED EMISSIONS VERTICAL
POLARIZATION



8566

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515



START = .15

FREQUENCY - MHz

STOP = 30



ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz HIGH
MODE : Tx @ 5790MHz, 10Mb
DATE : 19 Dec 2003
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.150	52.9	66.0		56.0	
.240	51.5	62.1		52.1	
.297	49.6	60.3		50.3	
.343	48.1	59.1		49.1	
.468	30.1	56.6		46.6	
.727	36.3	56.0		46.0	
.782	38.0	56.0		46.0	
.825	37.3	56.0		46.0	
.998	27.4	56.0		46.0	
2.346	25.8	56.0		46.0	
4.088	25.8	56.0		46.0	
6.703	33.8	60.0		50.0	
9.938	30.0	60.0		50.0	
10.337	38.3	60.0		50.0	
10.794	37.3	60.0		50.0	
12.138	30.3	60.0		50.0	
16.230	33.2	60.0		50.0	
18.244	40.9	60.0		50.0	
18.896	48.9	60.0		50.0	
21.398	48.8	60.0		50.0	
21.696	45.6	60.0		50.0	
23.129	37.2	60.0		50.0	
24.899	32.5	60.0		50.0	
26.487	38.6	60.0		50.0	
26.549	37.9	60.0		50.0	
27.159	37.2	60.0		50.0	
29.236	39.2	60.0		50.0	

CHECKED BY:

M. LONGINOTTI



ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz RETURN
MODE : Tx @ 5790MHz, 10Mb
DATE : 19 Dec 2003
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.150	52.8	66.0		56.0	
.242	50.8	62.0		52.0	
.304	48.3	60.1		50.1	
.344	46.8	59.1		49.1	
.460	31.1	56.7		46.7	
.714	35.4	56.0		46.0	
.766	36.3	56.0		46.0	
.820	35.5	56.0		46.0	
.998	29.0	56.0		46.0	
2.204	25.7	56.0		46.0	
4.007	25.9	56.0		46.0	
5.933	25.1	60.0		50.0	
7.375	30.0	60.0		50.0	
10.396	34.6	60.0		50.0	
13.418	27.0	60.0		50.0	
16.840	28.3	60.0		50.0	
18.244	38.5	60.0		50.0	
18.916	44.3	60.0		50.0	
19.222	37.3	60.0		50.0	
21.112	37.2	60.0		50.0	
21.295	37.9	60.0		50.0	
21.724	39.6	60.0		50.0	
26.610	39.4	60.0		50.0	
27.160	37.8	60.0		50.0	
29.236	40.3	60.0		50.0	

CHECKED BY: M. Longinotti
M. LONGINOTTI



MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION (MOTOROLA CANOPY TRANSCEIVER)
S/N : NONE ASSIGNED
SPECIFICATION : FCC-15C ANTENNA CONDUCTED EMISSIONS
DATE : DECEMBER 16, 2003 THROUGH DECEMBER 18, 2003
NOTES : 10Mb/second RATE

Low Channel

FREQ MHz	MTR RDG dBm	AMBIENT	RBW/VBW	ATTENUATION	TOTAL dBm	LIMIT dBm
5745	-18.6		100kHz/1MHz	40	21.4	
11490	-87.9	AMBIENT	100kHz/1MHz	40	-47.9	1.4
17235	-87.2	AMBIENT	100kHz/1MHz	40	-47.2	1.4
22980	-74.0	AMBIENT	100kHz/1MHz		-74.0	1.4
28725	-69.7	AMBIENT	100kHz/1MHz		-69.7	1.4
34470	-70.9	AMBIENT	100kHz/1MHz		-70.9	1.4

Middle Channel

FREQ MHz	MTR RDG dBm	AMBIENT	RBW/VBW	ATTENUATION	TOTAL dBm	LIMIT dBm
5790	-19.7		100kHz/1MHz	40	20.3	
11580	-87.2	AMBIENT	100kHz/1MHz	40	-47.2	0.3
17370	-86.1	AMBIENT	100kHz/1MHz	40	-46.1	0.3
23160	-68.5	AMBIENT	100kHz/1MHz		-68.5	0.3
28950	-69.3	AMBIENT	100kHz/1MHz		-69.3	0.3
34740	-70.8	AMBIENT	100kHz/1MHz		-70.8	0.3

High Channel

FREQ MHz	MTR RDG dBm	AMBIENT	RBW/VBW	ATTENUATION	TOTAL dBm	LIMIT dBm
5800	-19.7		100kHz/1MHz	40	20.3	
11600	-86.2	AMBIENT	100kHz/1MHz	40	-46.2	0.3
17400	-86.8	AMBIENT	100kHz/1MHz	40	-46.8	0.3
23200	-72.0	AMBIENT	100kHz/1MHz		-72.0	0.3
29000	-70.7	AMBIENT	100kHz/1MHz		-70.7	0.3
34800	-70.3	AMBIENT	100kHz/1MHz		-70.3	0.3

Checked By: Mark E. Longinotti
Mark E. Longinotti



MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION (MOTOROLA CANOPY TRANSCEIVER)
S/N : NONE ASSIGNED
SPECIFICATION : FCC-15C ANTENNA CONDUCTED EMISSIONS
DATE : DECEMBER 18, 2003
NOTES : 20Mb/second RATE

Low Channel

FREQ MHz	MTR RDG dBm	AMBIENT	RBW/VBW	ATTENUATION	TOTAL dBm	LIMIT dBm
5745	-19.8		100kHz/1MHz	40	20.2	
11490	-84.4	AMBIENT	100kHz/1MHz	40	-44.2	0.2
17235	-86.6	AMBIENT	100kHz/1MHz	40	-46.6	0.2
22980	-55.6		100kHz/1MHz		-55.6	0.2
28725	-71.0	AMBIENT	100kHz/1MHz		-71.0	0.2
34470	-72.4	AMBIENT	100kHz/1MHz		-72.4	0.2

Middle Channel

FREQ MHz	MTR RDG dBm	AMBIENT	RBW/VBW	ATTENUATION	TOTAL dBm	LIMIT dBm
5790	-20.5		100kHz/1MHz	40	19.5	
11580	-86.3	AMBIENT	100kHz/1MHz	40	-46.3	-0.5
17370	-86.8	AMBIENT	100kHz/1MHz	40	-46.8	-0.5
23160	-56.0		100kHz/1MHz		-56.0	-0.5
28950	-69.9	AMBIENT	100kHz/1MHz		-69.9	-0.5
34740	-71.6	AMBIENT	100kHz/1MHz		-71.6	-0.5

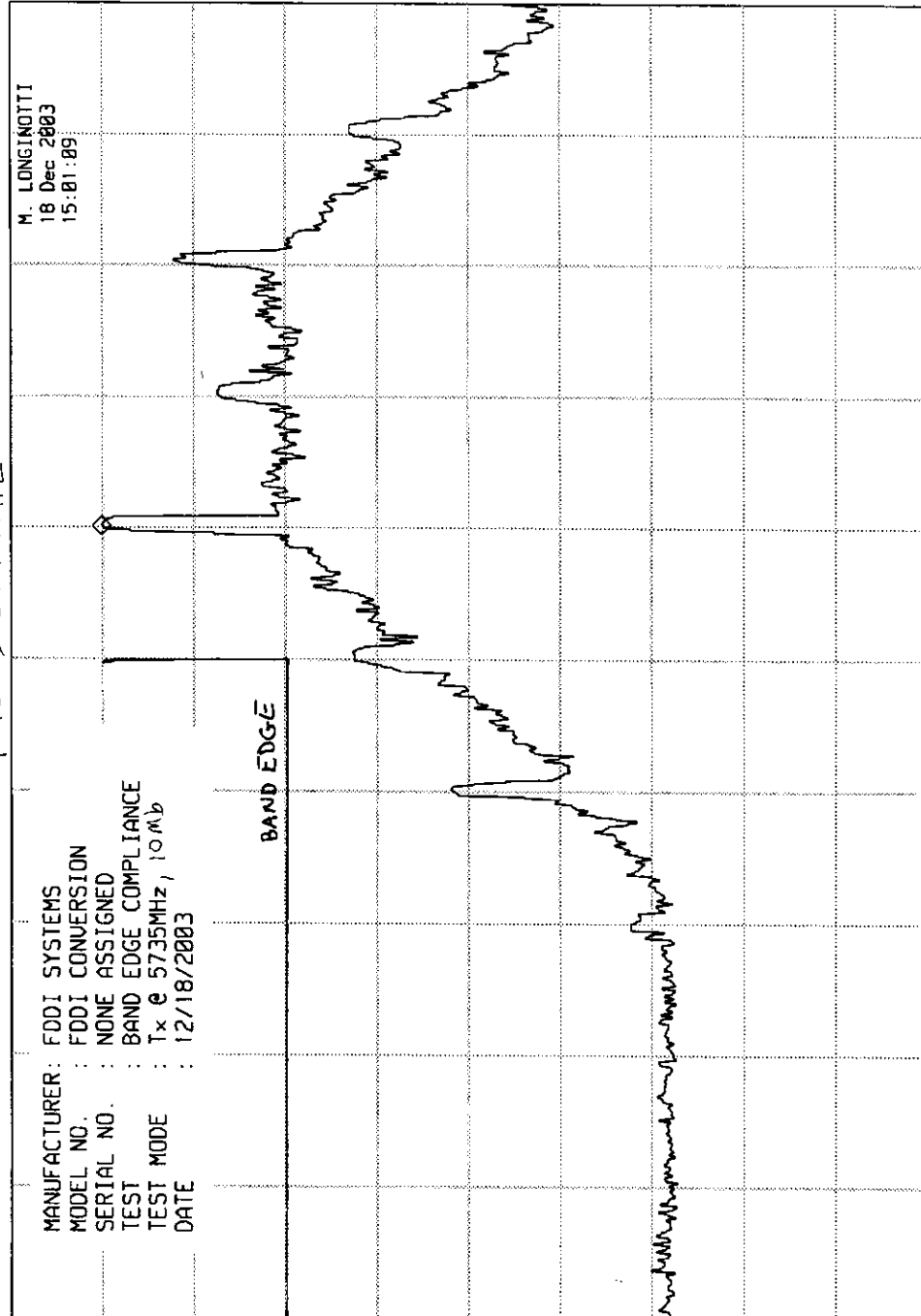
High Channel

FREQ MHz	MTR RDG dBm	AMBIENT	RBW/VBW	ATTENUATION	TOTAL dBm	LIMIT dBm
5800	-20.8		100kHz/1MHz	40	19.2	
11600	-86.1	AMBIENT	100kHz/1MHz	40	-46.1	-0.8
17400	-85.8	AMBIENT	100kHz/1MHz	40	-45.8	-0.8
23200	-57.9		100kHz/1MHz		-57.9	-0.8
29000	-71.0	AMBIENT	100kHz/1MHz		-71.0	-0.8
34800	-71.7	AMBIENT	100kHz/1MHz		-71.7	-0.8

Checked By: Mark E. Longinotti
Mark E. Longinotti

ELITE ELECTRONIC ENGINEERING INC.

hp 10 dB/ MKR 5.730 00 GHz -24.40 dBm
 REF -14.5 dBm ATTN 0 dB +40dB EXT ATTN



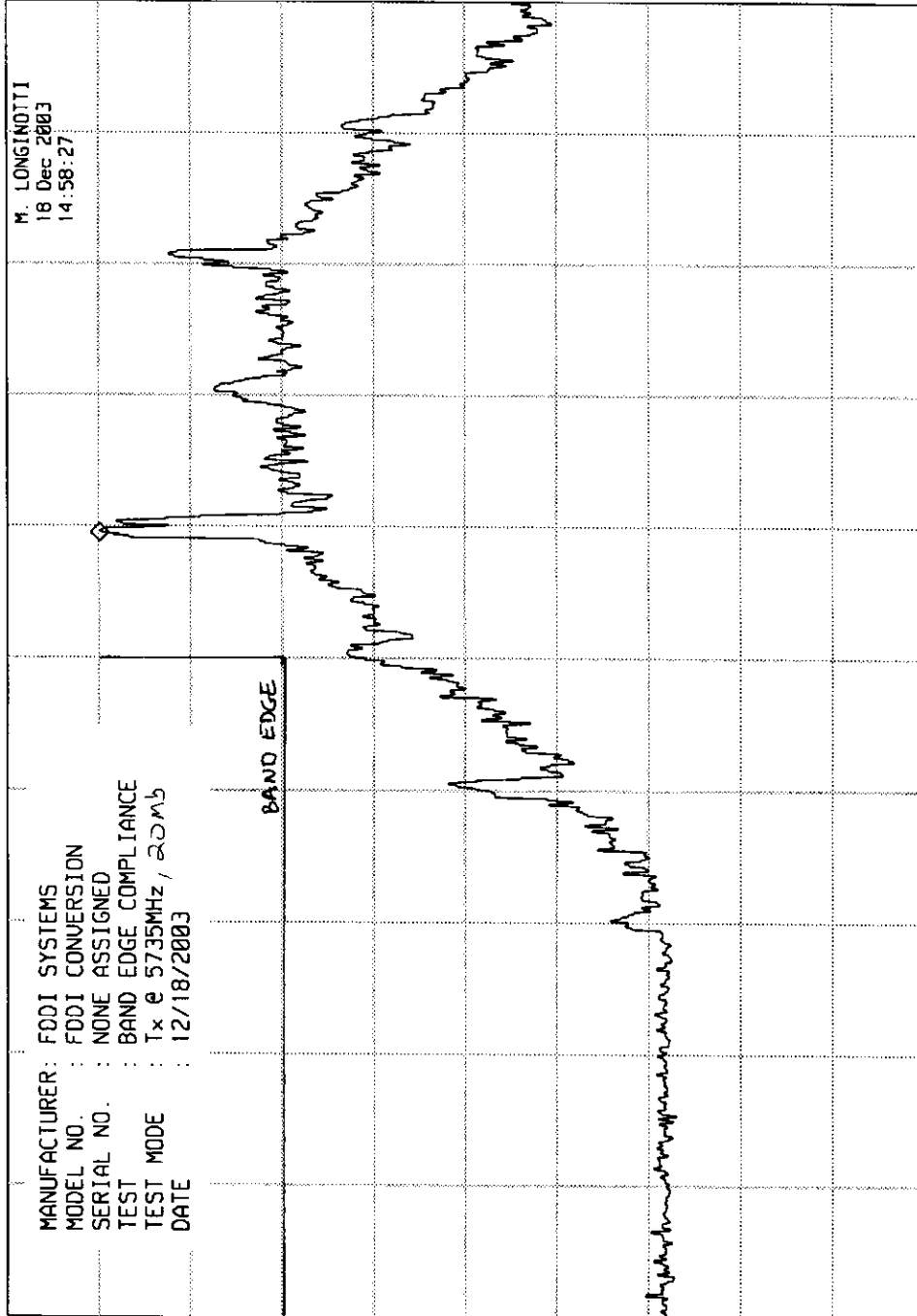
START 5.700 0 GHz STOP 5.750 0 GHz
 RES BW 100 kHz (i) UBLW 1 MHz
 SWP 37.5 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp 10 dB/ MKR 5.729 70 GHz -24.60 dBm

REF -14.5 dBm

ATTEN 0 dB + 40dB EXT ATTEN



START 5.700 0 GHz RES BW 100 kHz(i) STOP 5.750 0 GHz
 UBW 1 MHz SWP 37.5 msec

ELITE ELECTRONIC ENGINEERING INC.

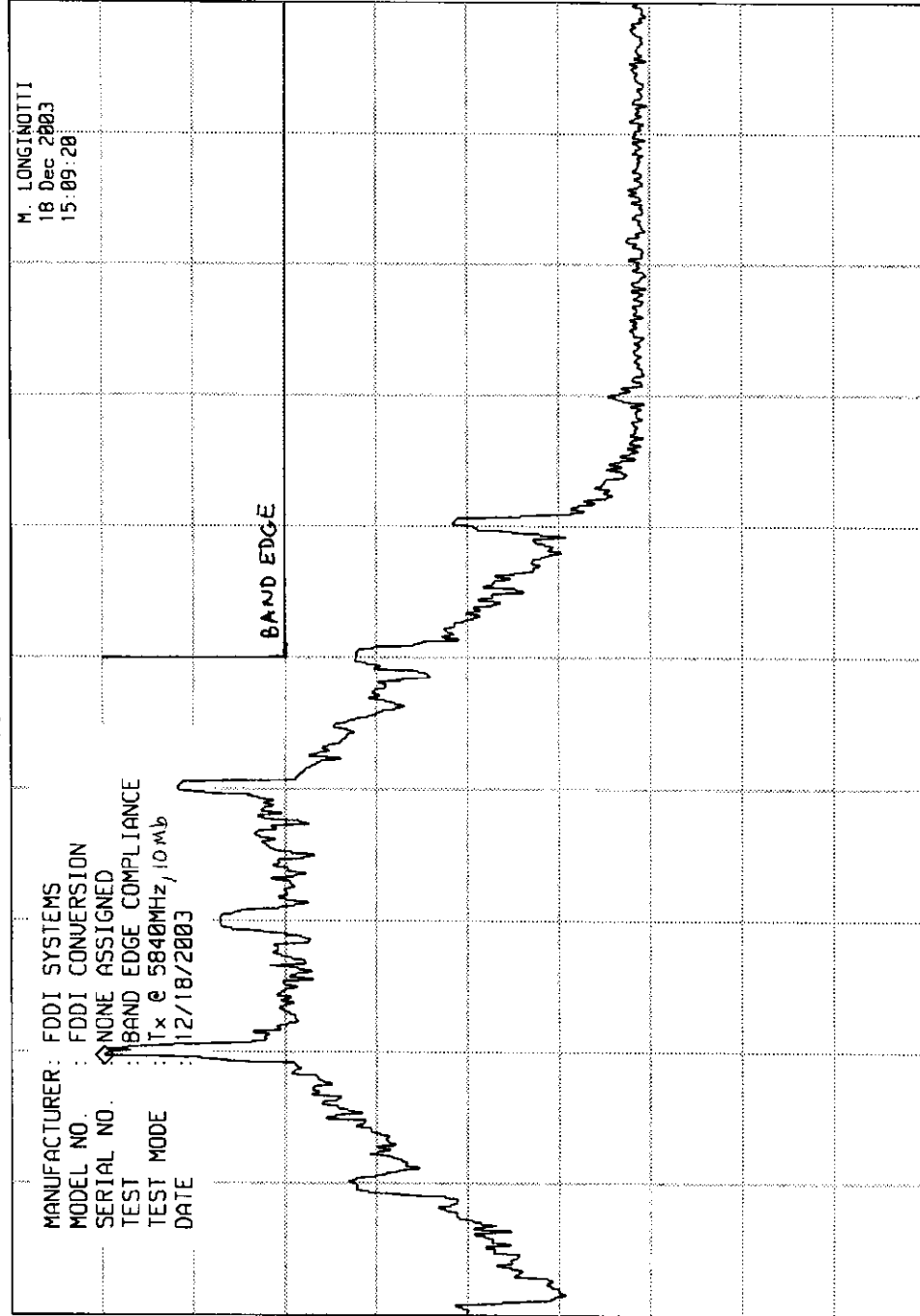
MR 5.834 80 GHz
-24.20 dBm

REF -14.0 dBm

ATTEN 0 dB + 40dB EXT ATTEN

hp

10 dB/



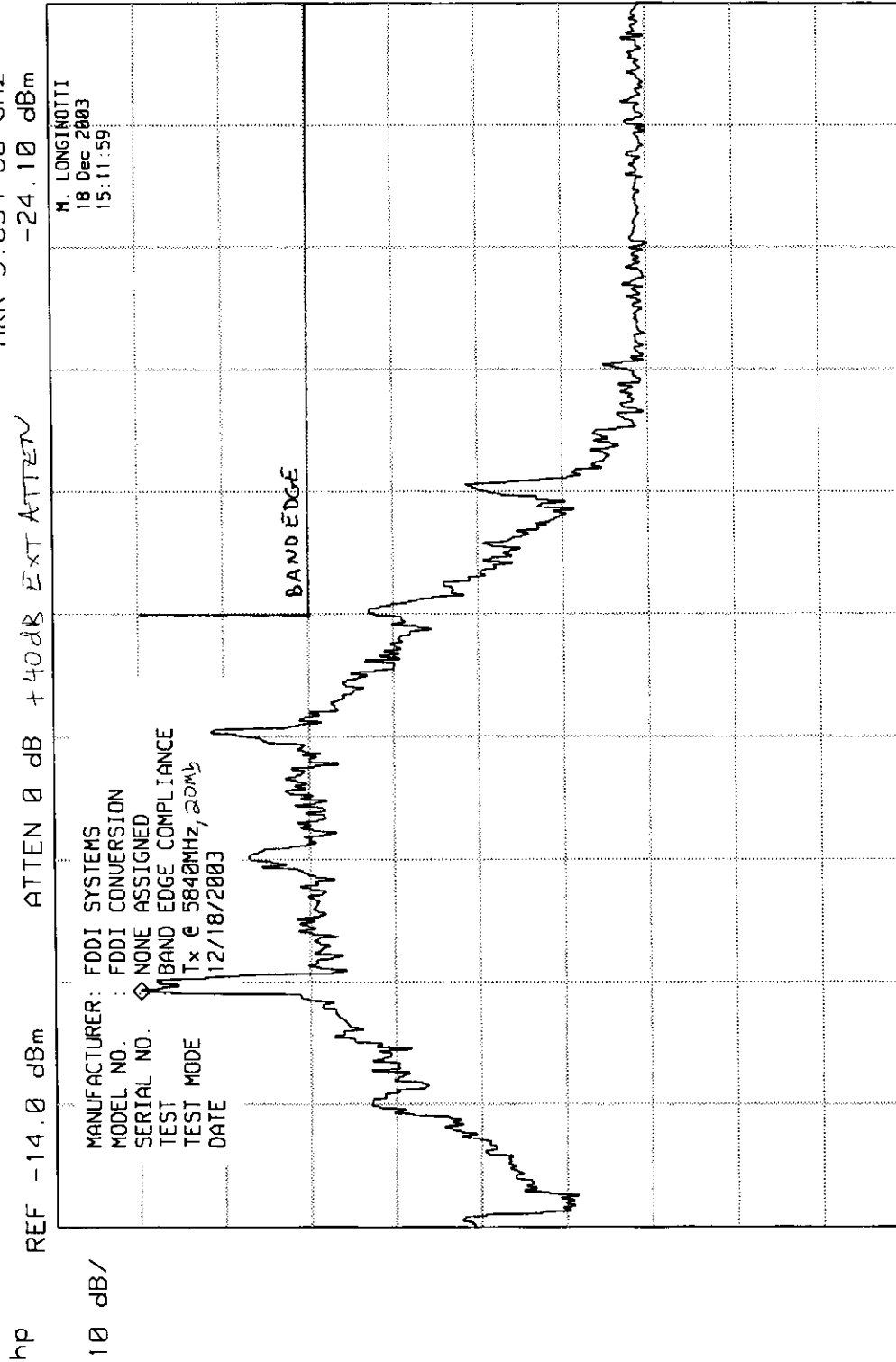
STOP 5.875 0 GHz
SUP 37.5 msec

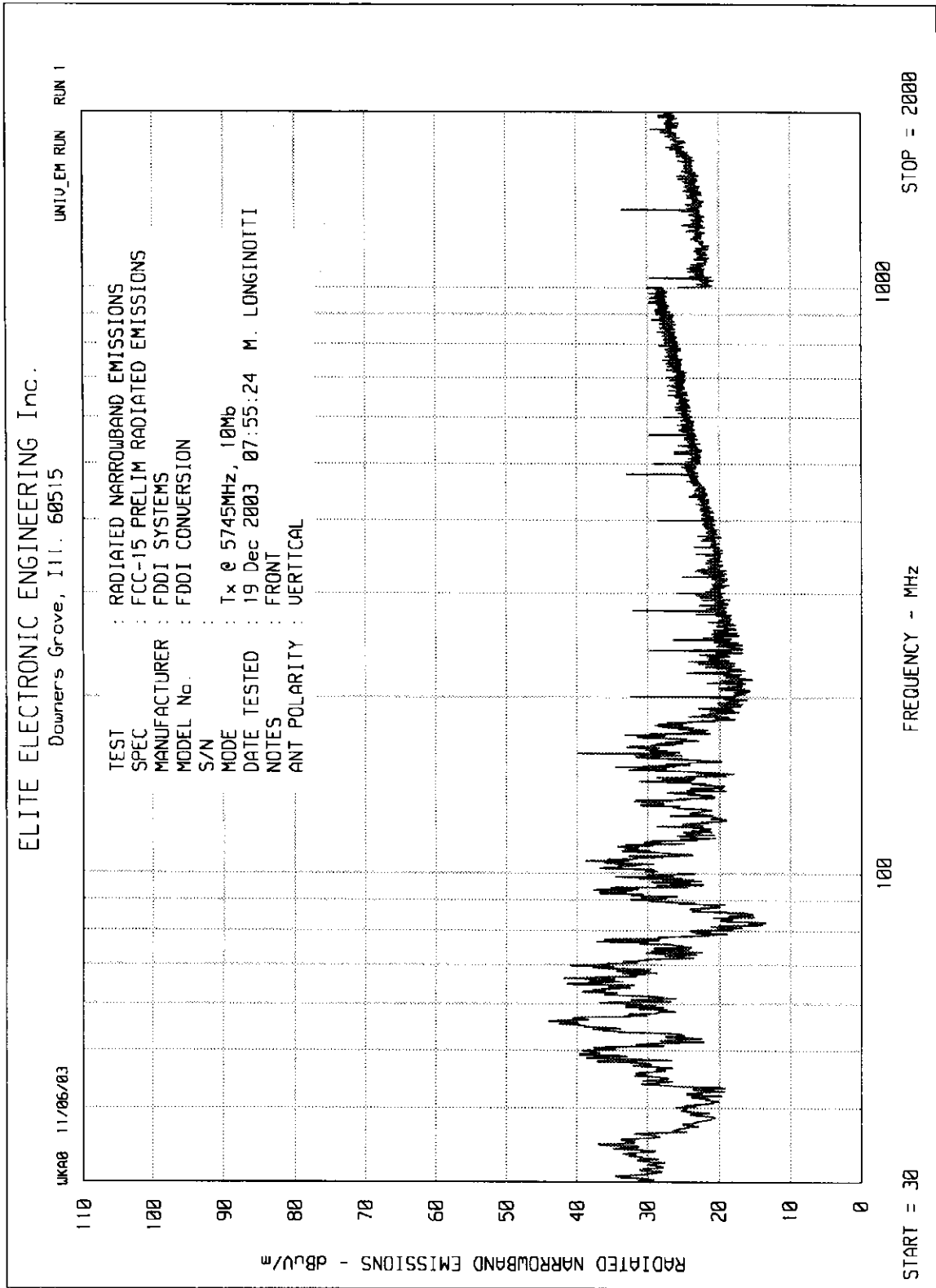
UBW 1 MHz

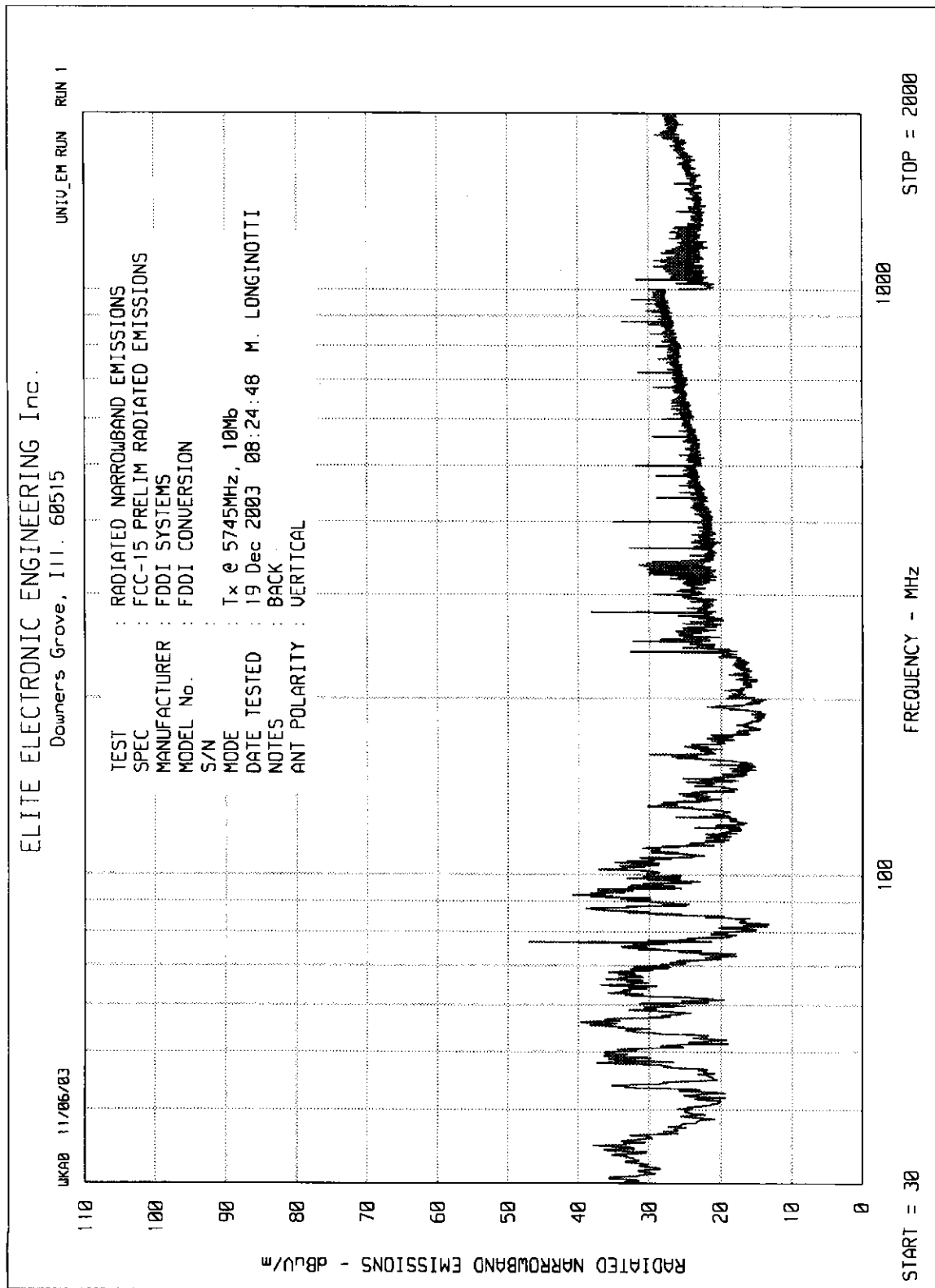
START 5.825 0 GHz
RES BW 100 kHz (i)

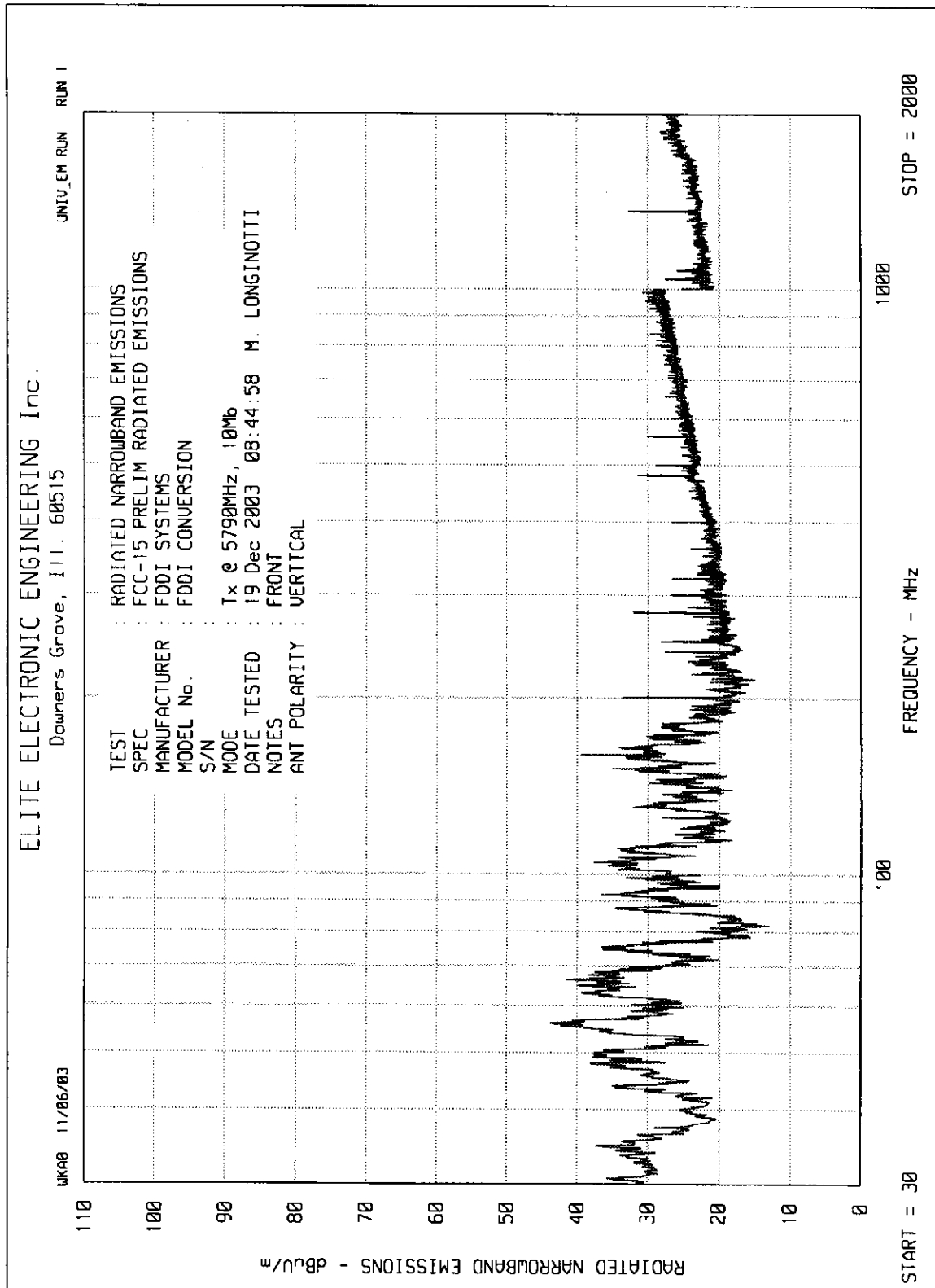
ELITE ELECTRONIC ENGINEERING Inc.

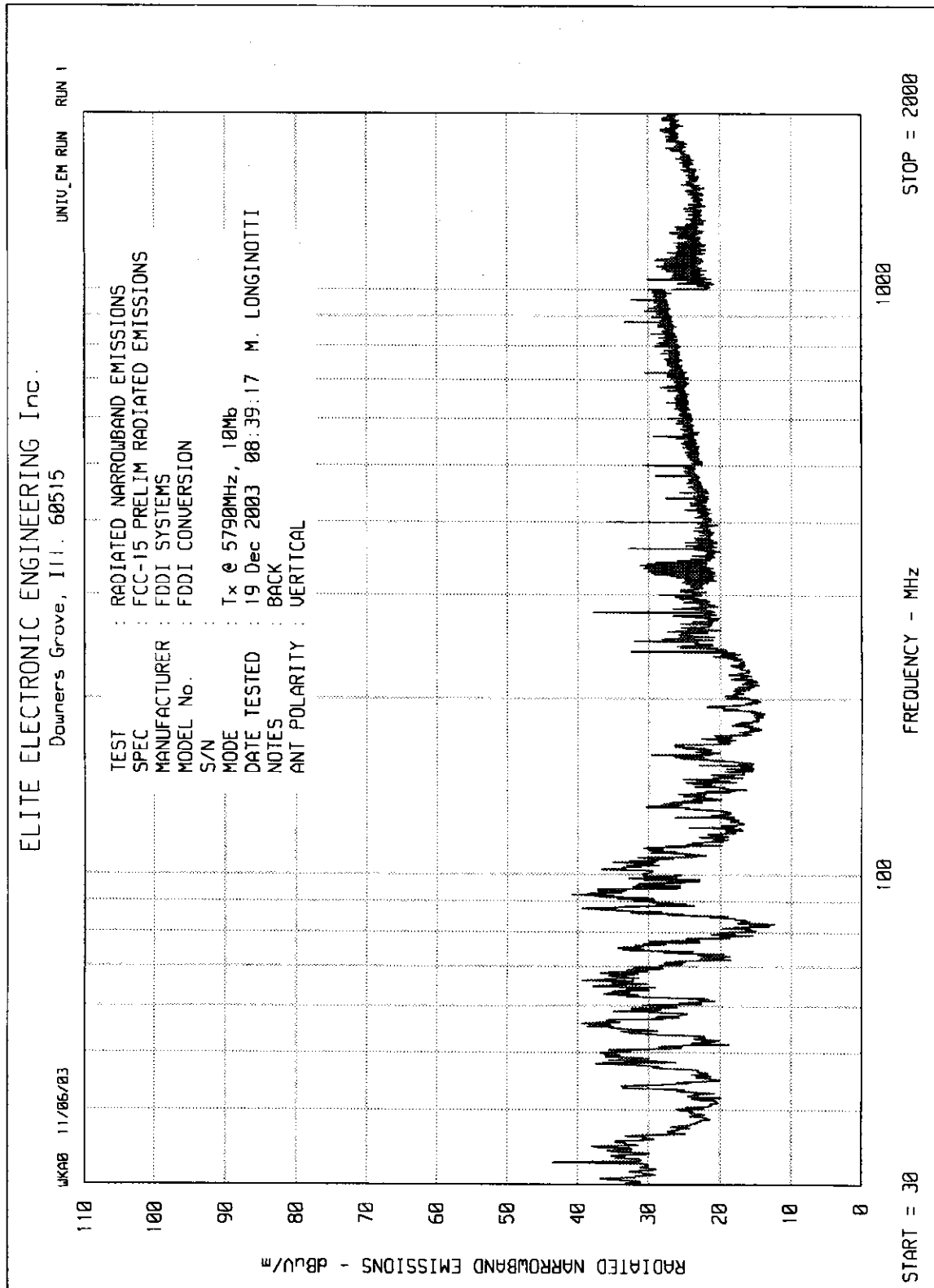
MR 5.834 60 GHz
-24.10 dBm



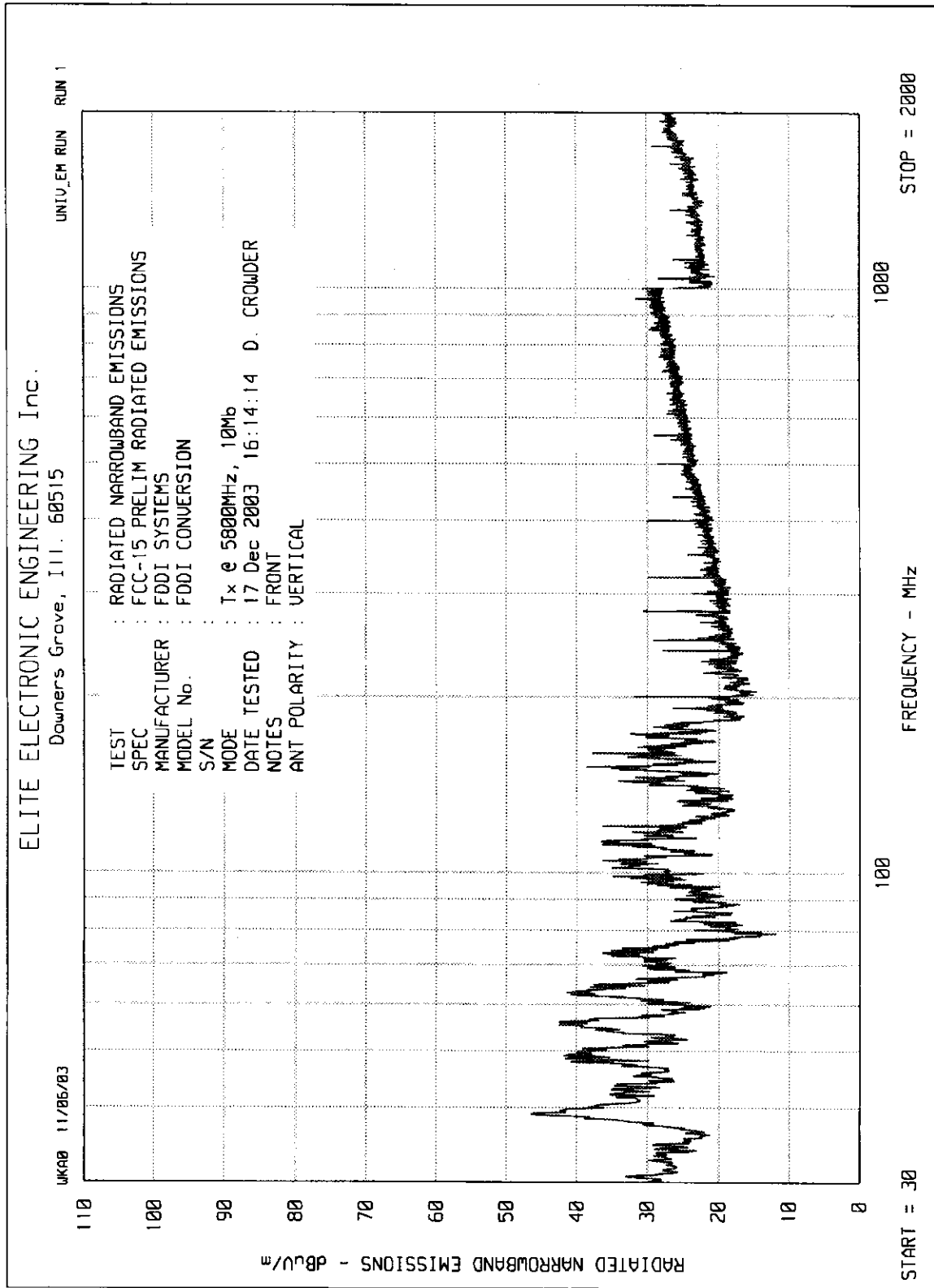






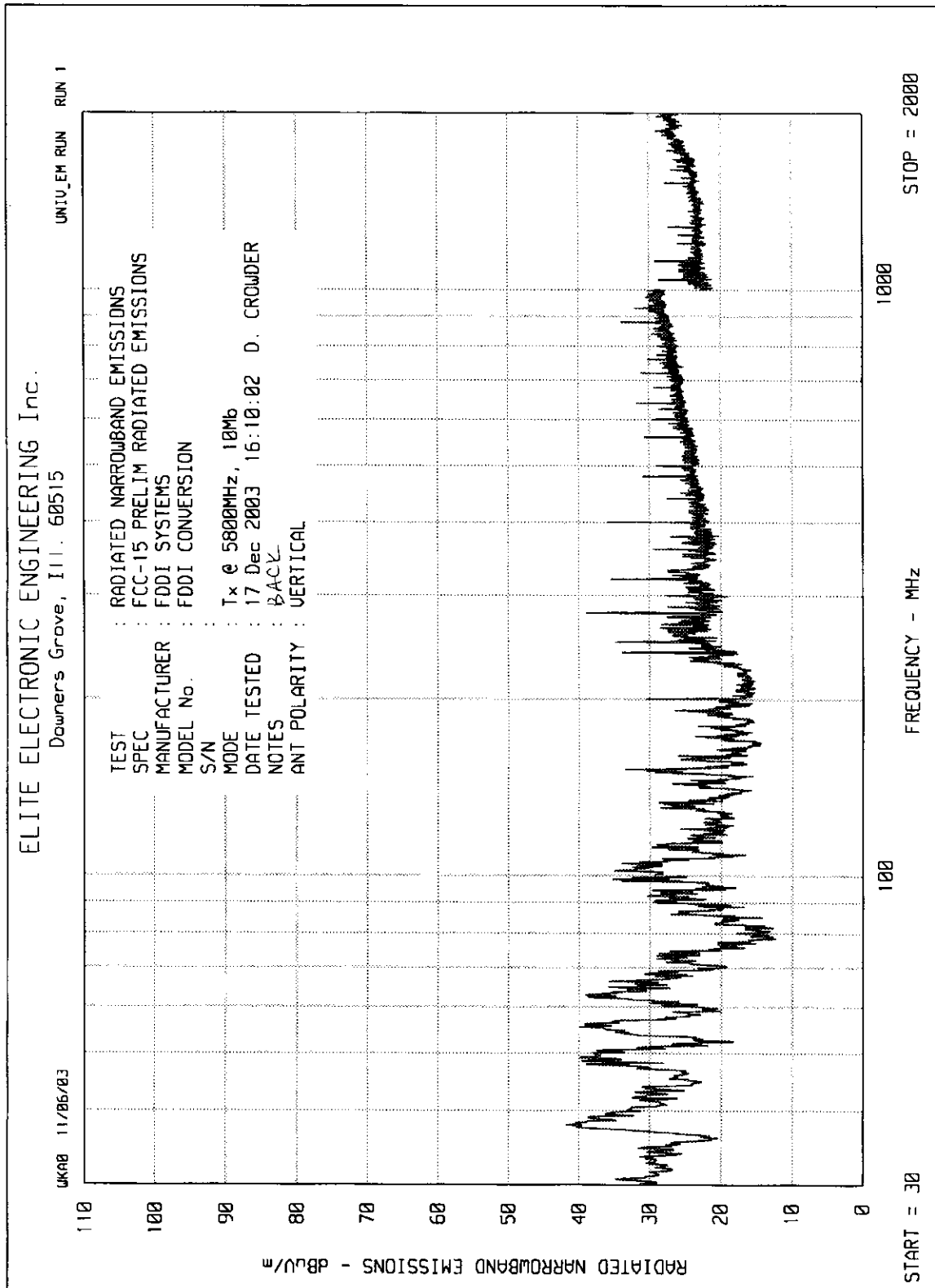


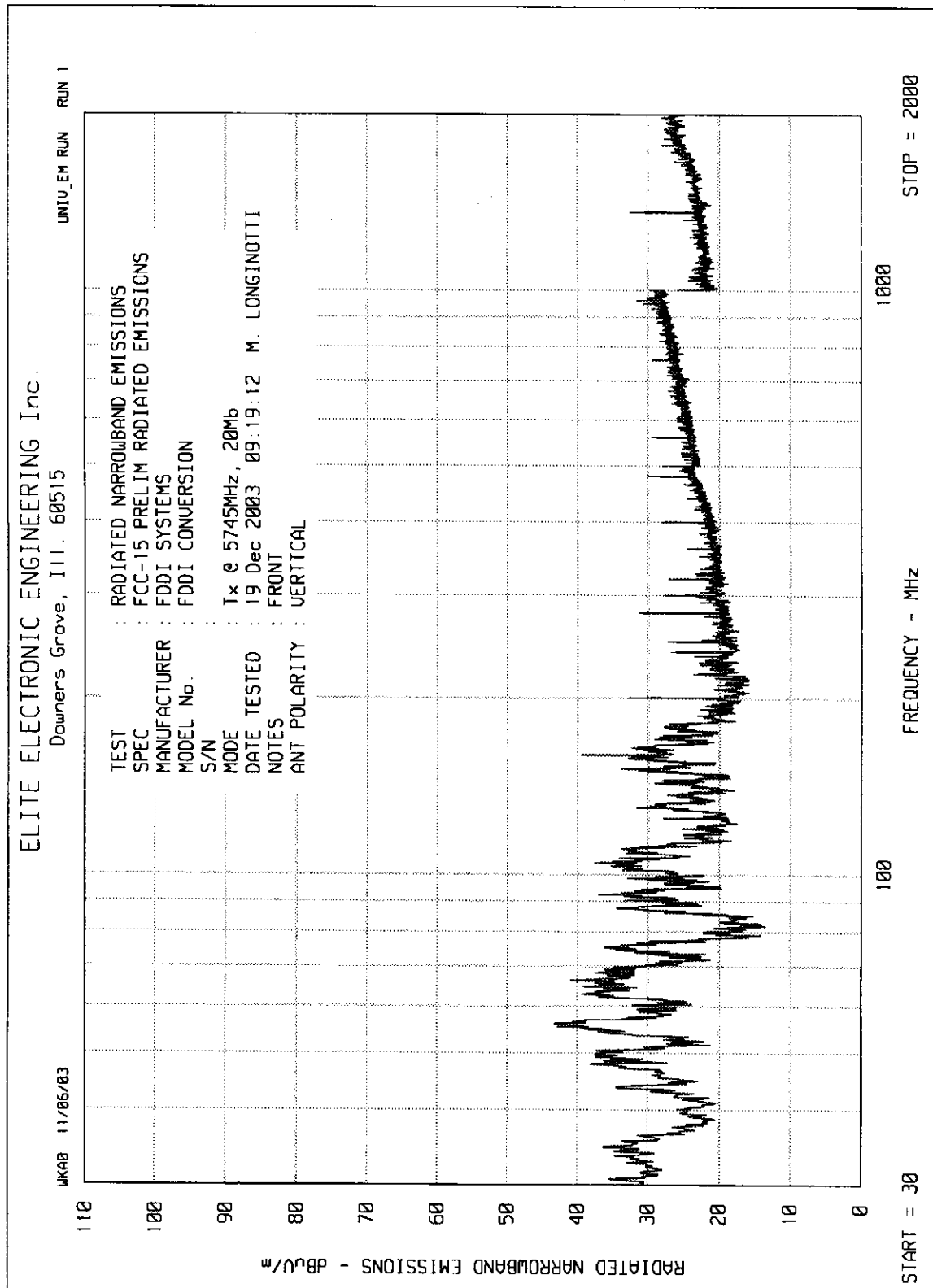
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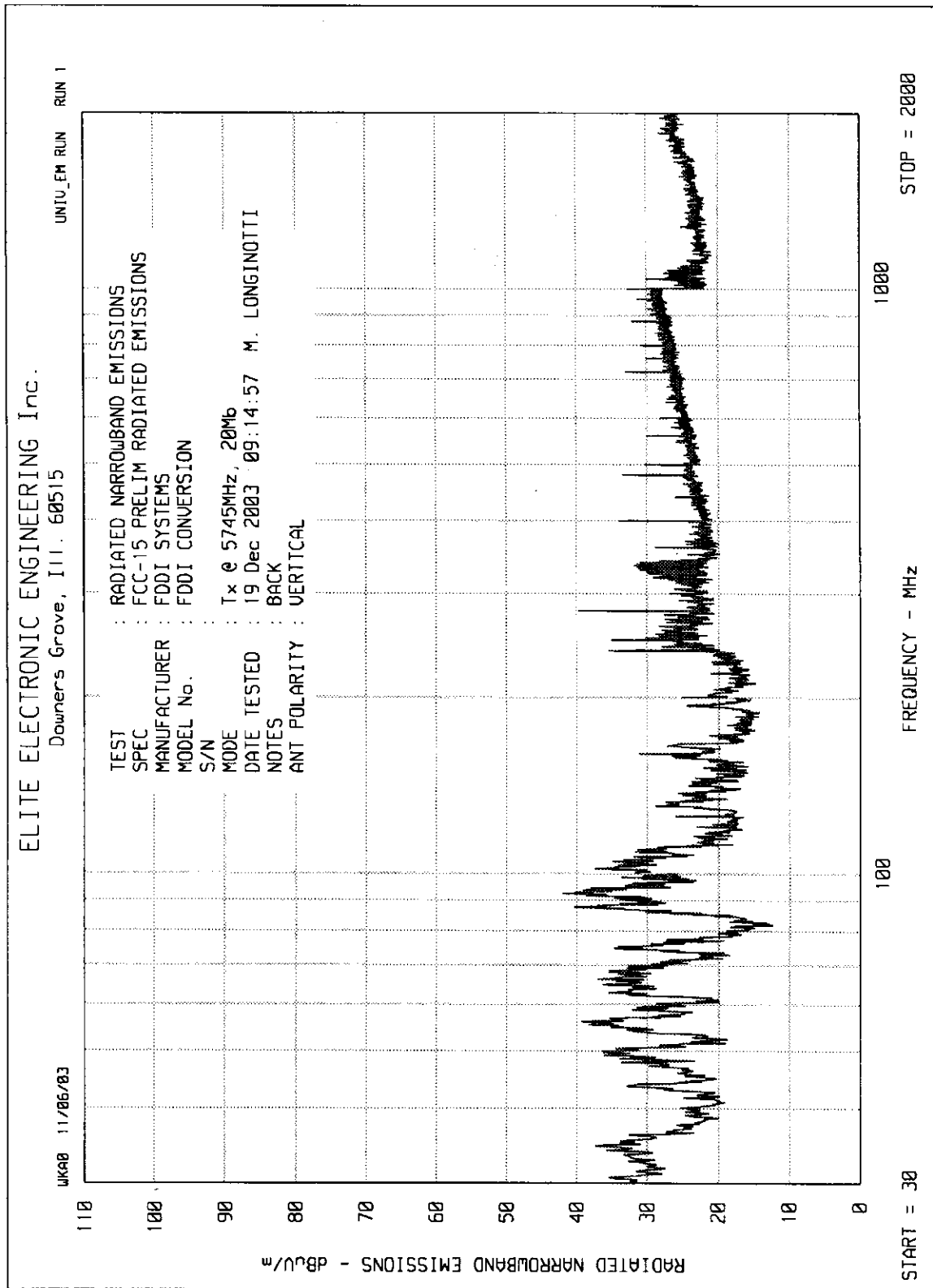


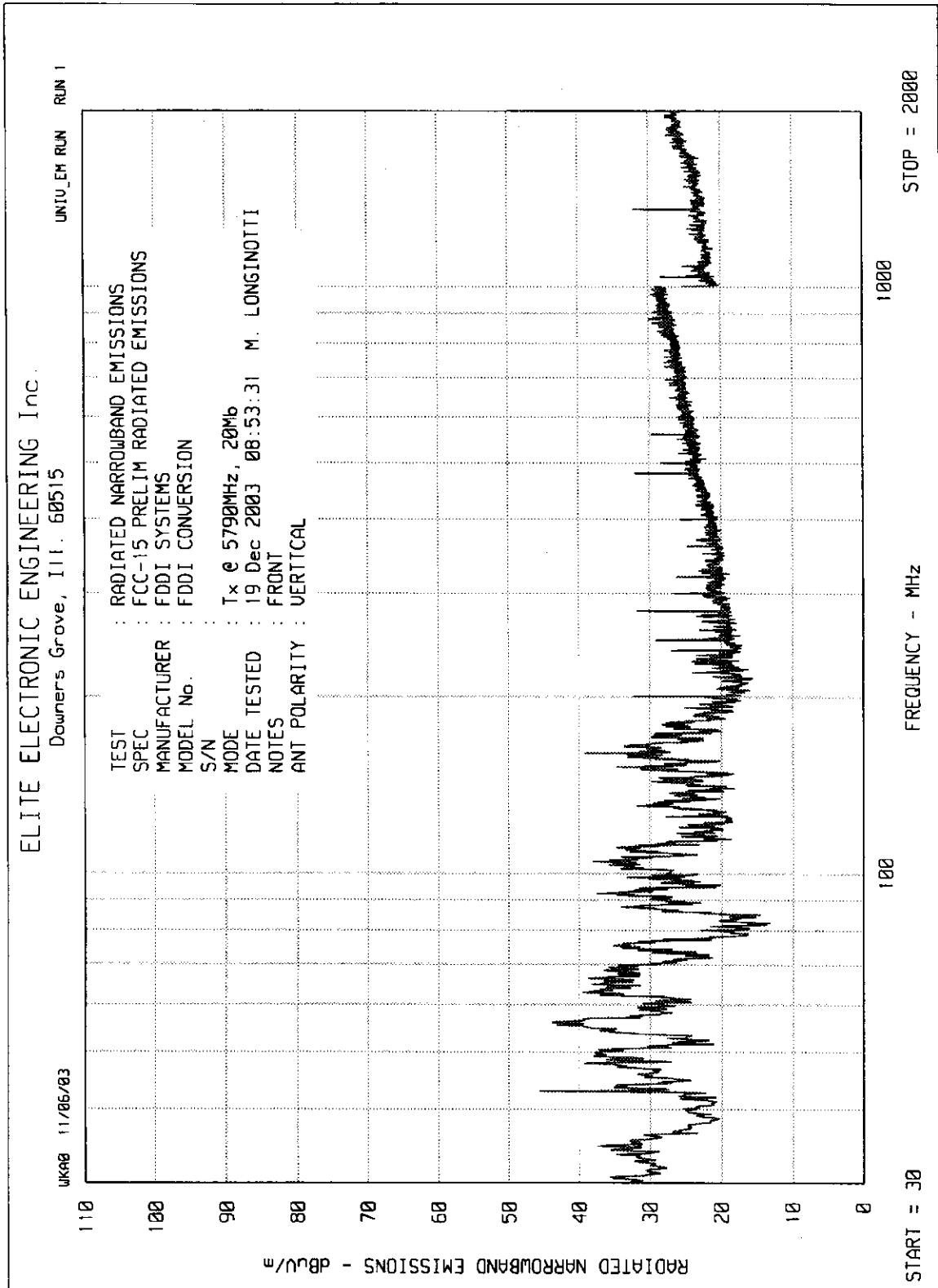


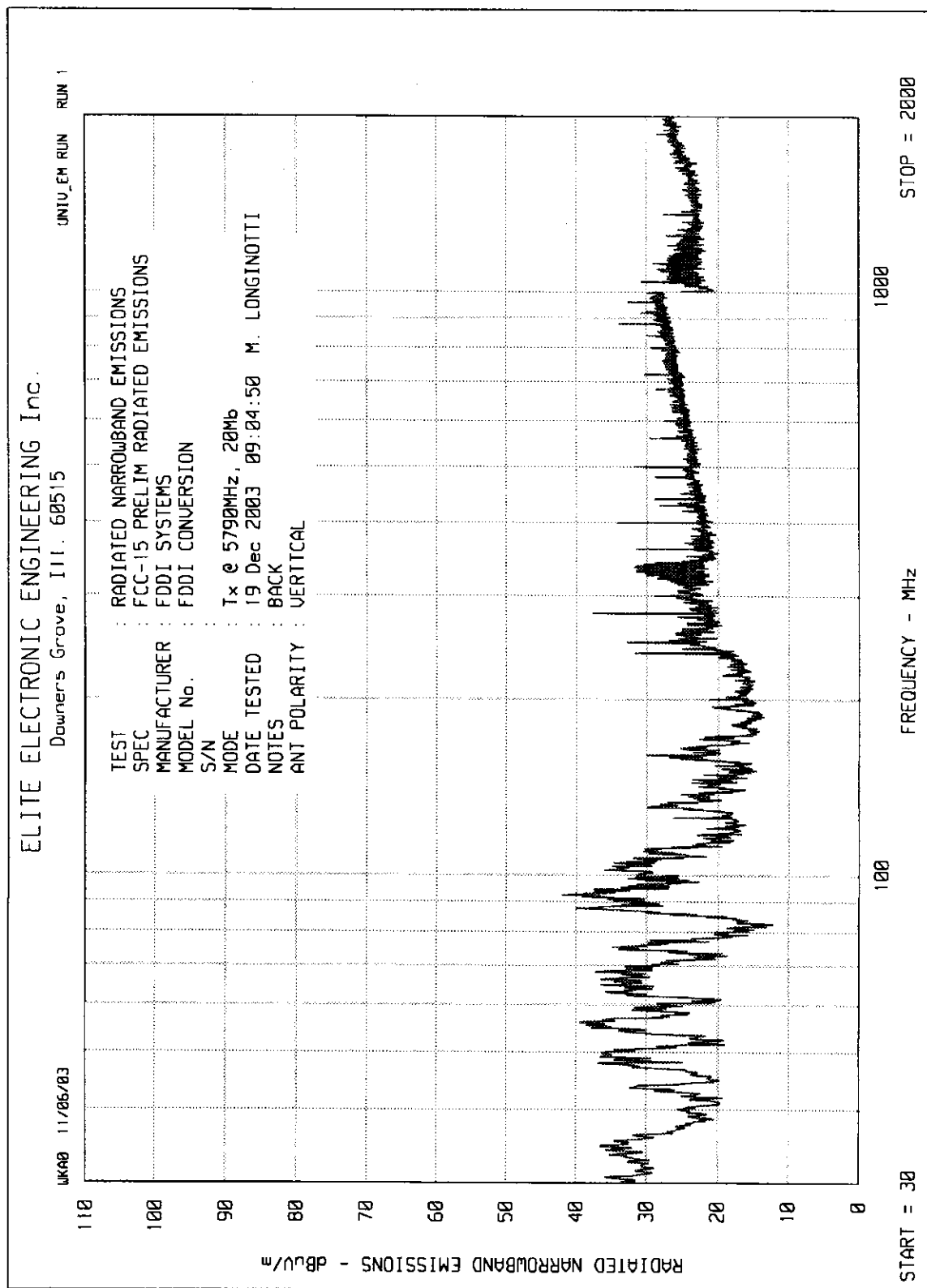
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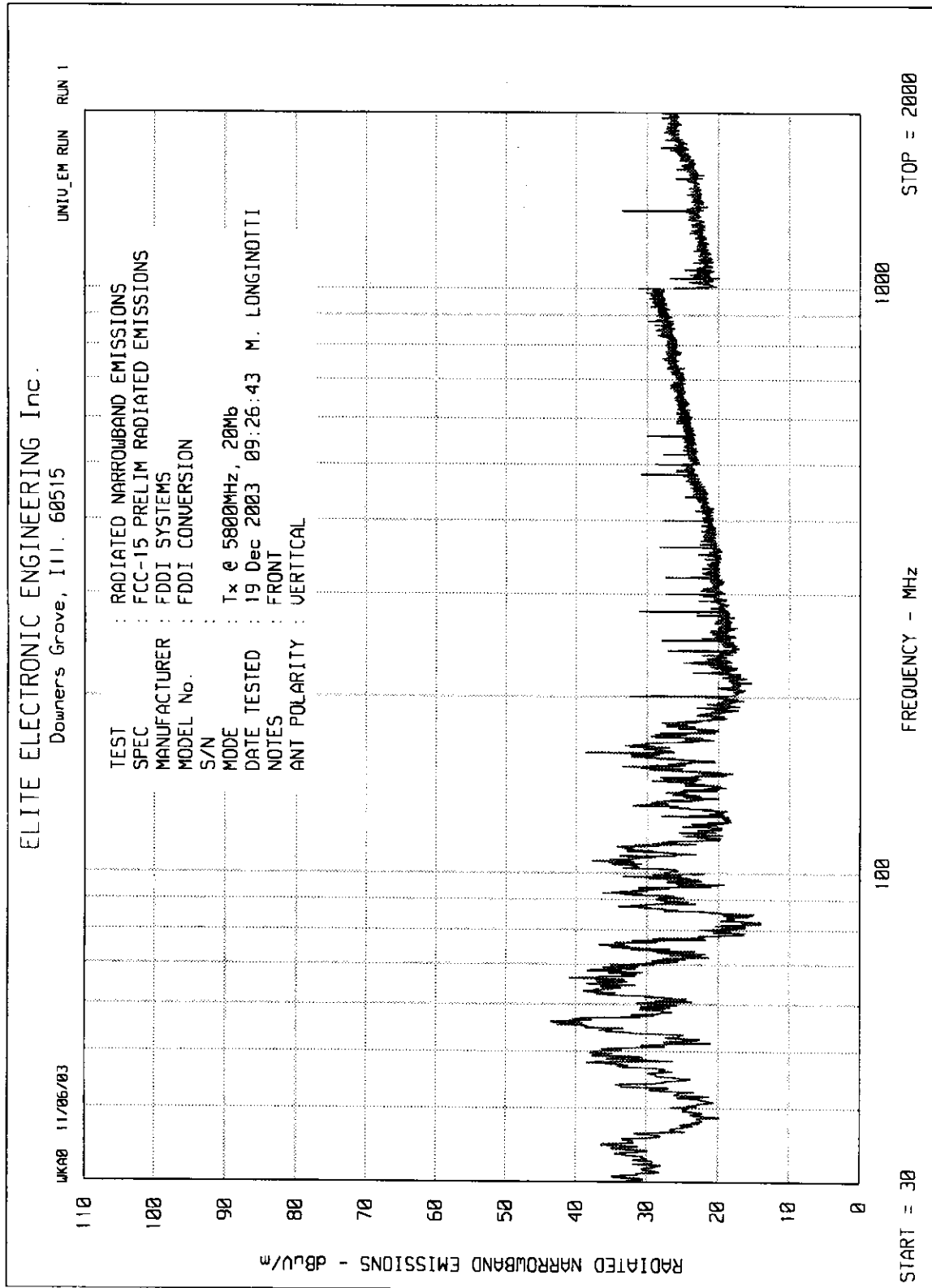


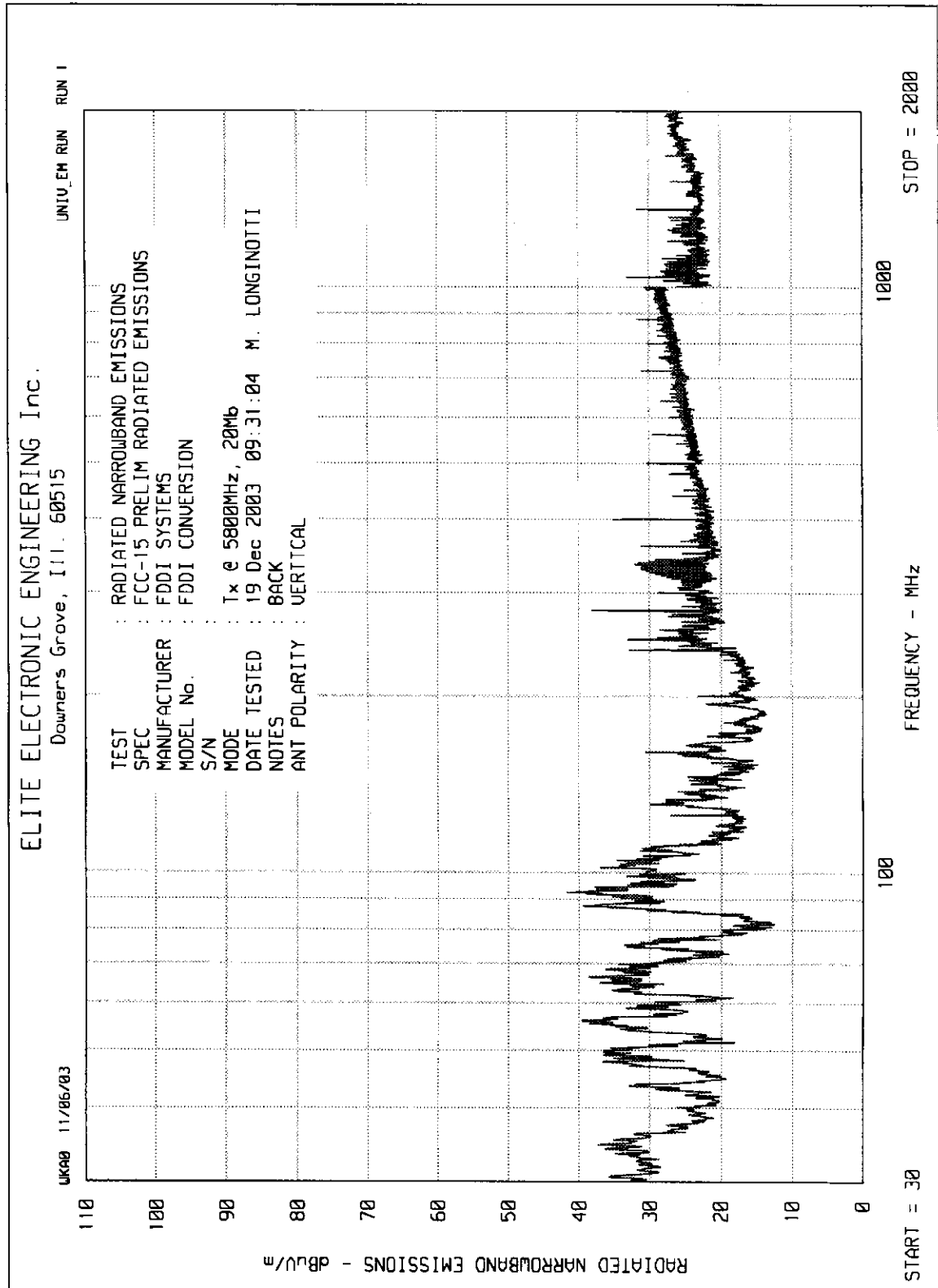














MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION (MOTOROLA CANOPY TRANSCEIVER)
S/N : NONE ASSIGNED
SPECIFICATION : FCC-15C RADIATED EMISSIONS
DATE : DECEMBER 19, 2003
NOTES : TEST DISTANCE WAS 3 METERS

FREQUENCY MHz	ANTENNA POLARITY	METER READING dBuV	ANTENNA FACTOR dB	CABLE FACTOR dB	TOTAL dB	LIMIT dBuV/m
Tx @ 5800MHz, 10Mb/second Rate Tested With Pacific Wireless PAWDA58-29 Parabolic Antenna A piece of copper tape was placed over the circuit board of the Canopy transceiver and the ends of the copper tape were grounded to the ground of the circuit board						
400.0	HORIZONTAL	14.5	20.4	1.5	36.4	46.0

Checked By: Mark E. Longinotti
Mark E. Longinotti



MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION (MOTOROLA CANOPY TRANSCEIVER)
S/N : NONE ASSIGNED
SPECIFICATION : FCC-15C RADIATED EMISSIONS
DATE : DECEMBER 16, 2003
NOTES : 10Mb/second RATE, TESTED WITH PACIFIC WIRELESS
PAWDA58-29 PARABOLIC ANTENNA

Low Channel (Transmit @ 5745MHz)

FREQ MHz	ANT POL	AVG MTR RDG dBuV	AMB	RBW/VBW	ANT FAC dB	CBL FAC dB	DIST CORR FAC dB	TOTAL dBuV/m	LIMIT dBm
11490	V	13.8	AMB	1MHz/10Hz	40.9	1.4	-10.5*	45.6	54.0
	H	13.7	AMB	1MHz/10Hz	40.9	1.4	-10.5*	45.5	54.0
22980	V	14.4	AMB	1MHz/10Hz	46.3	1.3	-20.0#	42.0	54.0
	H	14.5	AMB	1MHz/10Hz	46.3	1.3	-20.0#	42.1	54.0

Middle Channel (Transmit @ 5790MHz)

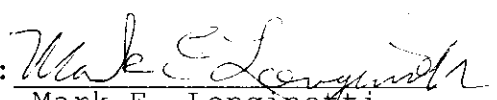
FREQ MHz	ANT POL	AVG MTR RDG dBuV	AMB	RBW/VBW	ANT FAC dB	CBL FAC dB	DIST CORR FAC dB	TOTAL dBuV/m	LIMIT dBm
11580	V	14.2	AMB	1MHz/10Hz	40.8	1.4	-10.5*	45.9	54.0
	H	14.3	AMB	1MHz/10Hz	40.8	1.4	-10.5*	46.0	54.0
23160	V	15.9	AMB	1MHz/10Hz	46.2	1.8	-20.0#	43.9	54.0
	H	15.8	AMB	1MHz/10Hz	46.2	1.8	-20.0#	43.8	54.0

High Channel (Transmit @ 5800MHz)

FREQ MHz	ANT POL	AVG MTR RDG dBuV	AMB	RBW/VBW	ANT FAC dB	CBL FAC dB	DIST CORR FAC dB	TOTAL dBuV/m	LIMIT dBm
11600	V	14.5	AMB	1MHz/10Hz	40.7	1.4	-10.5*	46.1	54.0
	H	14.4	AMB	1MHz/10Hz	40.7	1.4	-10.5*	45.6	54.0
23200	V	15.4	AMB	1MHz/10Hz	46.1	1.7	-20.0#	43.2	54.0
	H	15.3	AMB	1MHz/10Hz	46.1	1.7	-20.0#	43.1	54.0

* - Measurement was taken at a 1 meter distance

- Measurement was taken at a 0.3 meter distance

Checked By: 
Mark E. Longinotti



MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION (MOTOROLA CANOPY TRANSCEIVER)
S/N : NONE ASSIGNED
SPECIFICATION : FCC-15C RADIATED EMISSIONS
DATE : DECEMBER 19, 2003
NOTES : 20Mb/second RATE, TESTED WITH PACIFIC WIRELESS
PAWDA58-29 PARABOLIC ANTENNA

Low Channel (Transmit @ 5745MHz)

FREQ MHz	ANT POL	AVG MTR RDG dBuV	AMB	RBW/VBW	ANT FAC dB	CBL FAC dB	DIST CORR FAC dB	TOTAL dBuV/m	LIMIT dBm
11490	V	14.0	AMB	1MHz/10Hz	40.9	1.4	-10.5*	45.8	54.0
	H	14.3	AMB	1MHz/10Hz	40.9	1.4	-10.5*	46.1	54.0
22980	V	14.7	AMB	1MHz/10Hz	46.3	1.3	-20.0#	42.3	54.0
	H	14.6	AMB	1MHz/10Hz	46.3	1.3	-20.0#	42.2	54.0

Middle Channel (Transmit @ 5790MHz)

FREQ MHz	ANT POL	AVG MTR RDG dBuV	AMB	RBW/VBW	ANT FAC dB	CBL FAC dB	DIST CORR FAC dB	TOTAL dBuV/m	LIMIT dBm
11580	V	14.4	AMB	1MHz/10Hz	40.8	1.4	-10.5*	46.1	54.0
	H	14.8	AMB	1MHz/10Hz	40.8	1.4	-10.5*	46.5	54.0
23160	V	16.1	AMB	1MHz/10Hz	46.2	1.8	-20.0#	44.1	54.0
	H	16.1	AMB	1MHz/10Hz	46.2	1.8	-20.0#	44.1	54.0

High Channel (Transmit @ 5800MHz)

FREQ MHz	ANT POL	AVG MTR RDG dBuV	AMB	RBW/VBW	ANT FAC dB	CBL FAC dB	DIST CORR FAC dB	TOTAL dBuV/m	LIMIT dBm
11600	V	14.7	AMB	1MHz/10Hz	40.7	1.4	-10.5*	46.3	54.0
	H	15.1	AMB	1MHz/10Hz	40.7	1.4	-10.5*	46.7	54.0
23200	V	15.4	AMB	1MHz/10Hz	46.1	1.7	-20.0#	43.2	54.0
	H	15.4	AMB	1MHz/10Hz	46.1	1.7	-20.0#	43.2	54.0

* - Measurement was taken at a 1 meter distance

- Measurement was taken at a 0.3 meter distance

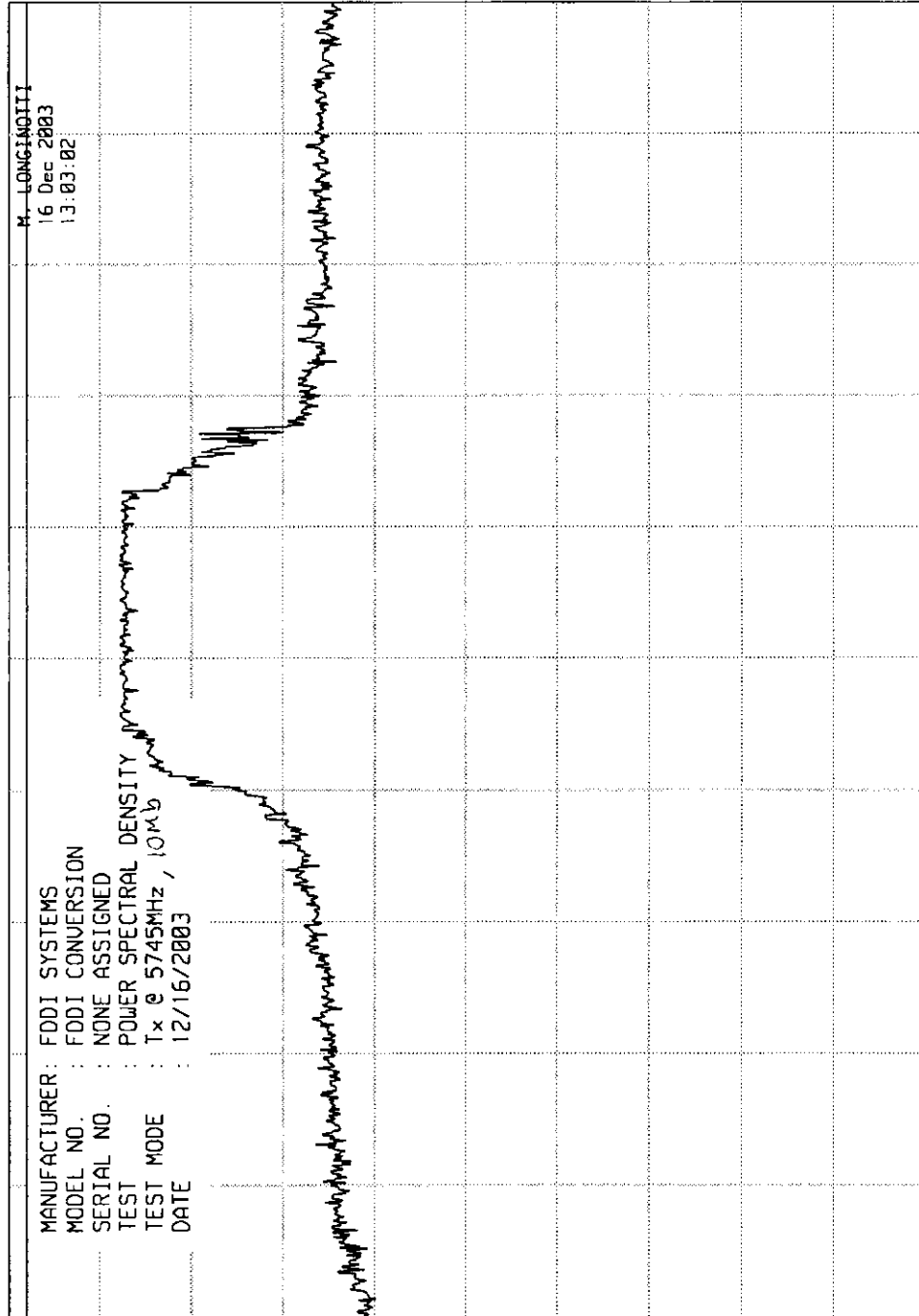
Checked By: Mark E. Longinotti
Mark E. Longinotti



ELITE ELECTRONIC ENGINEERING INC.

MKR 5.739 655 GHz
-76.40 dBm

hp REF -30.0 dBm ATTN 0 dB + 40dB EXT ATTEN



10 dB/

DL -32.0 dBm

CENTER 5.739 65 GHz
RES BW 3 kHz(i)
SPAN 2.00 MHz
SWP 667 sec
UBW 30 kHz



ELITE ELECTRONIC ENGINEERING Inc.

MKR 5.784 721 GHz
-51.10 dBm

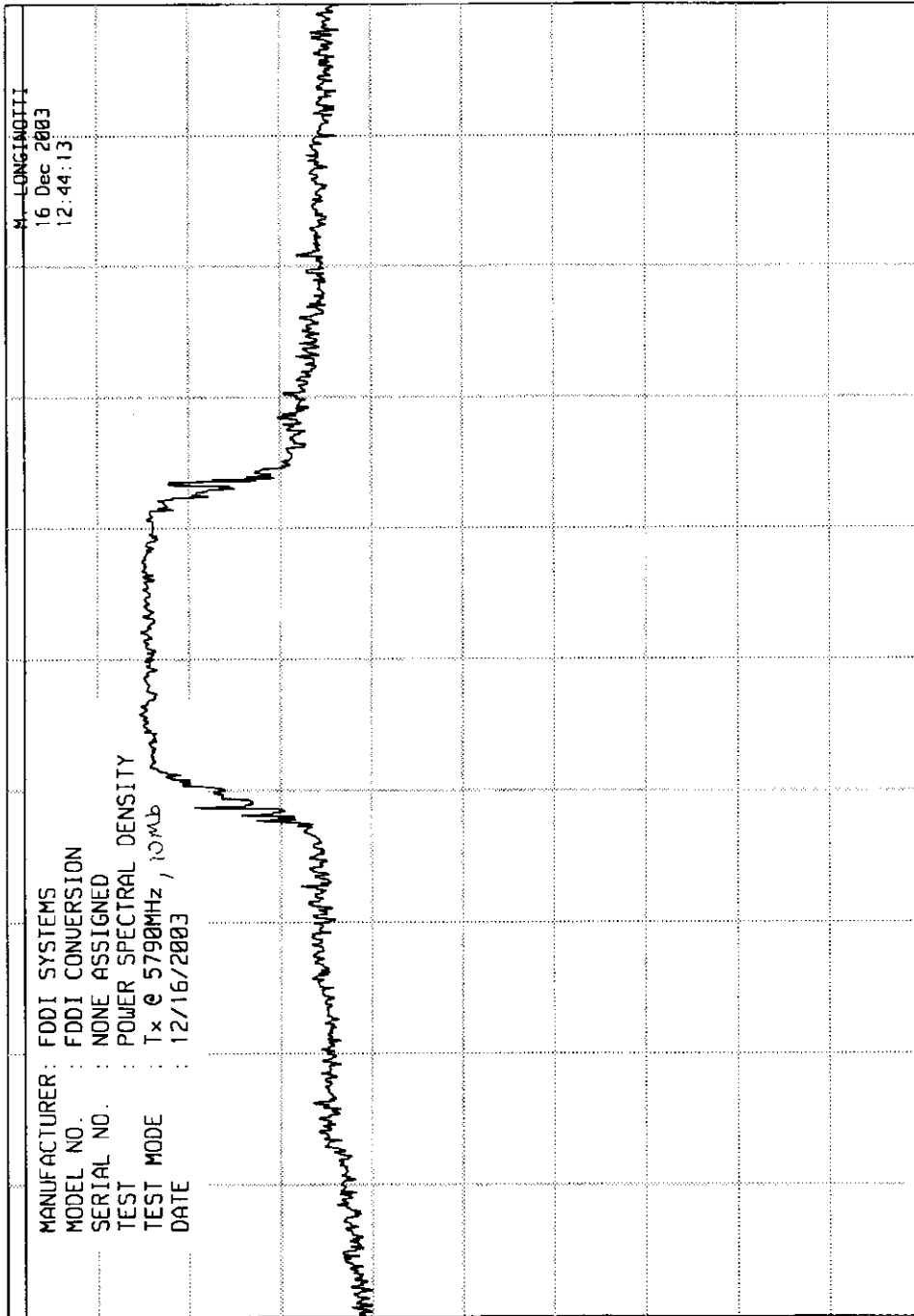
hp

REF -30.0 dBm

ATTEN 0 dB +40dB EXT ATTEN

10 dB/

MANUFACTURER: FDDI SYSTEMS
MODEL NO.: FDDI CONVERSION
SERIAL NO.: NONE ASSIGNED
TEST: POWER SPECTRAL DENSITY
TEST MODE: Tx @ 5790MHz, 10mb
DATE: 12/16/2003



DL
-32.0
dBm

CENTER 5.784 72 GHz
RES BW 3 kHz(i)

VBW 30 kHz

SPAN 2.00 MHz
SWP 667 sec



ELITE ELECTRONIC ENGINEERING Inc.

MR 5.794 788 GHz
-49.50 dBm

hp

REF -30.0 dBm

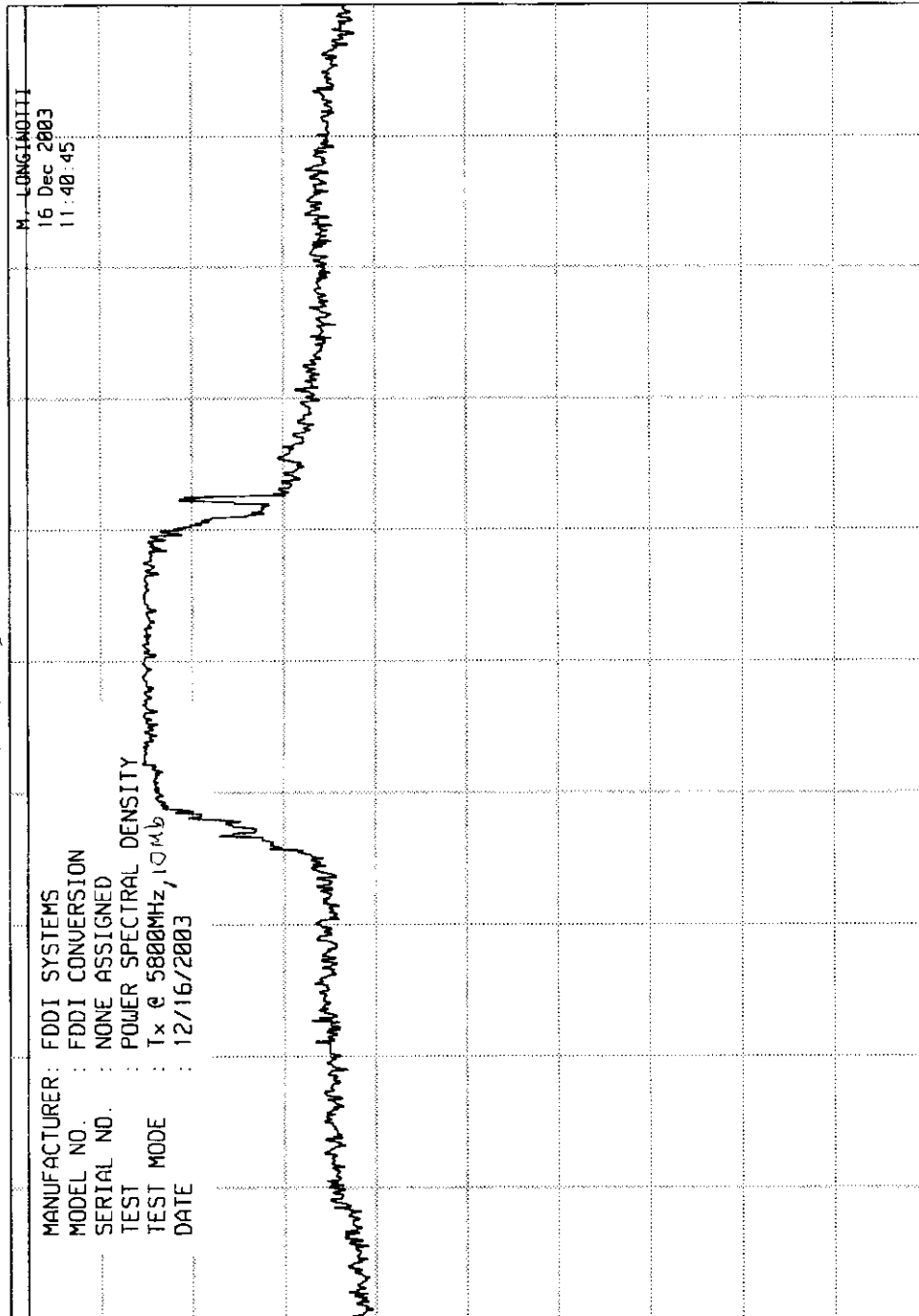
ATTEN 0 dB + 40dB EXT ATTN

10 dB/

M-LONGING011
16 Dec 2003
11:40:45

MANUFACTURER: FDDI SYSTEMS
MODEL NO.: FDDI CONVERSION
SERIAL NO.: NONE ASSIGNED
TEST: POWER SPECTRAL DENSITY
TEST MODE: Tx @ 5800MHz, 10MB
DATE: 12/16/2003

DL
-32.0
dBm



CENTER 5.794 78 GHz
RES BW 3 kHz (i)

VBW 30 kHz

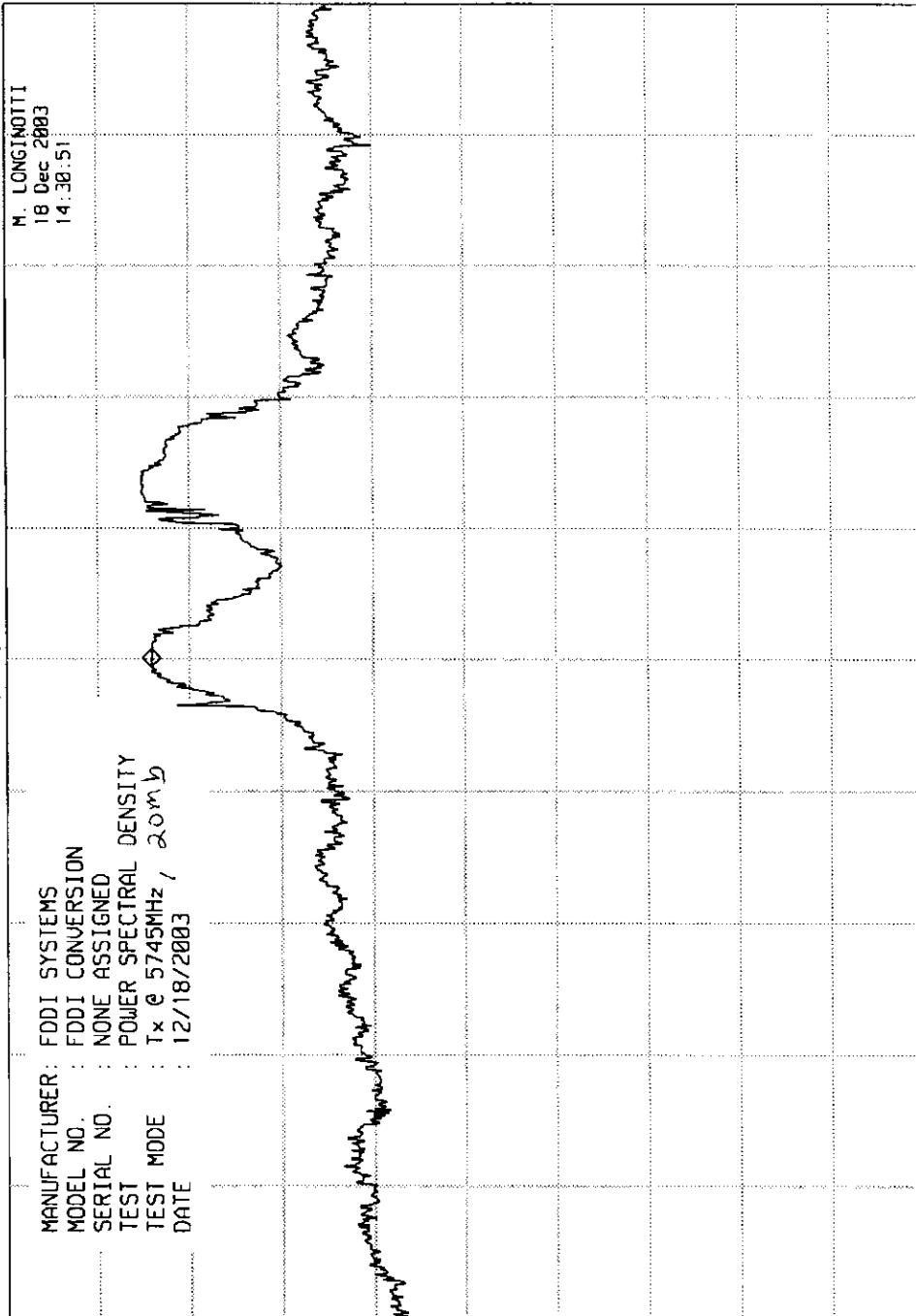
SPAN 2.00 MHz
SWP 667 sec



ELITE ELECTRONIC ENGINEERING Inc.

MKR 5.739 695 GHz
-45.80 dBm

REF -30.0 dBm
ATTEN 0 dB +40dB EXT ATTEN



SPAN 2.00 MHz
SWP 667 sec

UBW 30 kHz

CENTER 5.739 69 GHz
RES BW 3 kHz(i)



ELITE ELECTRONIC ENGINEERING Inc.

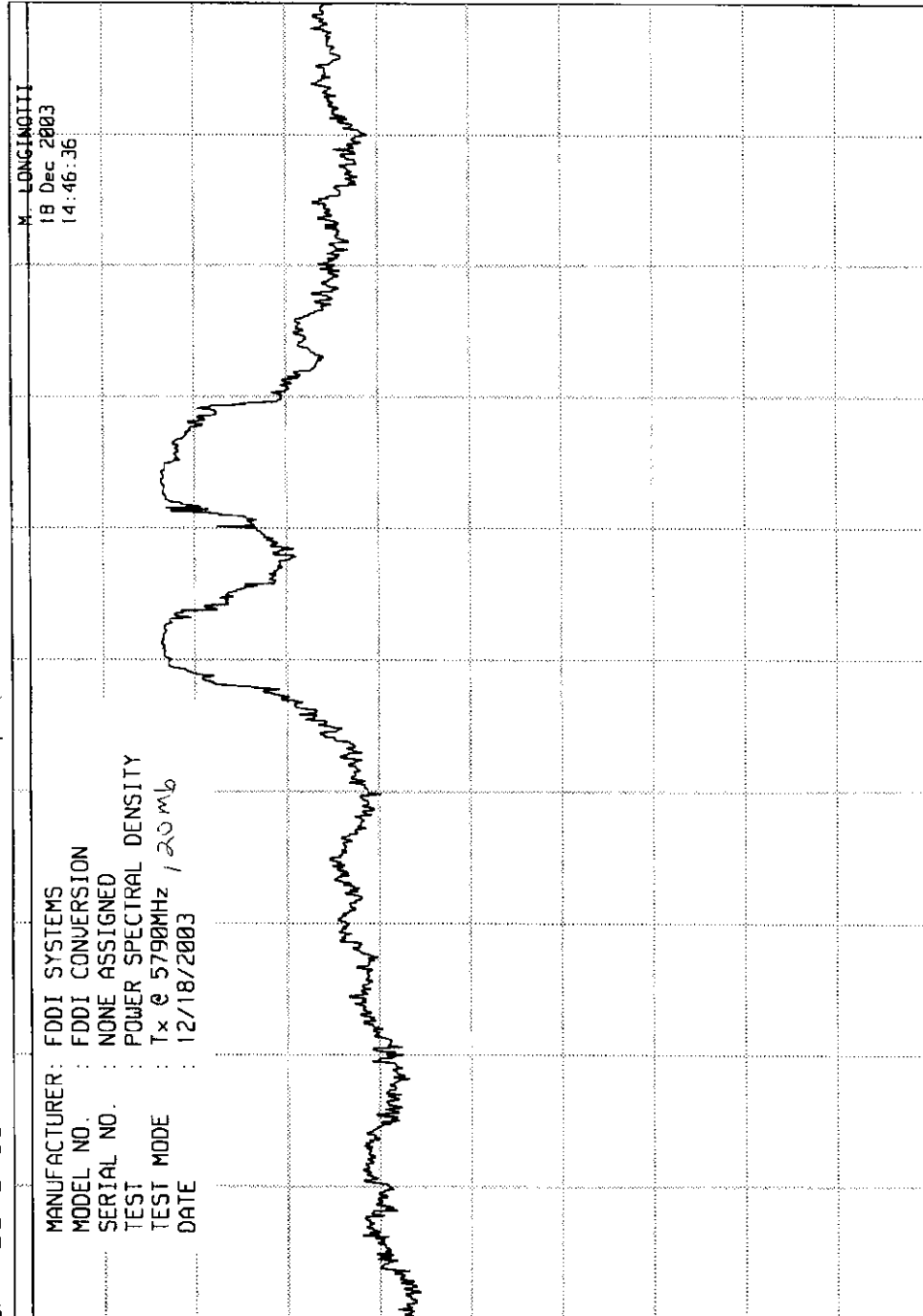
MKR 5.784 710 GHz
-47.30 dBm

REF -30.0 dBm ATTN 0 dB + 40 dB EXT ATTEN

hp

10 dB/

DL
-32.0
dBm

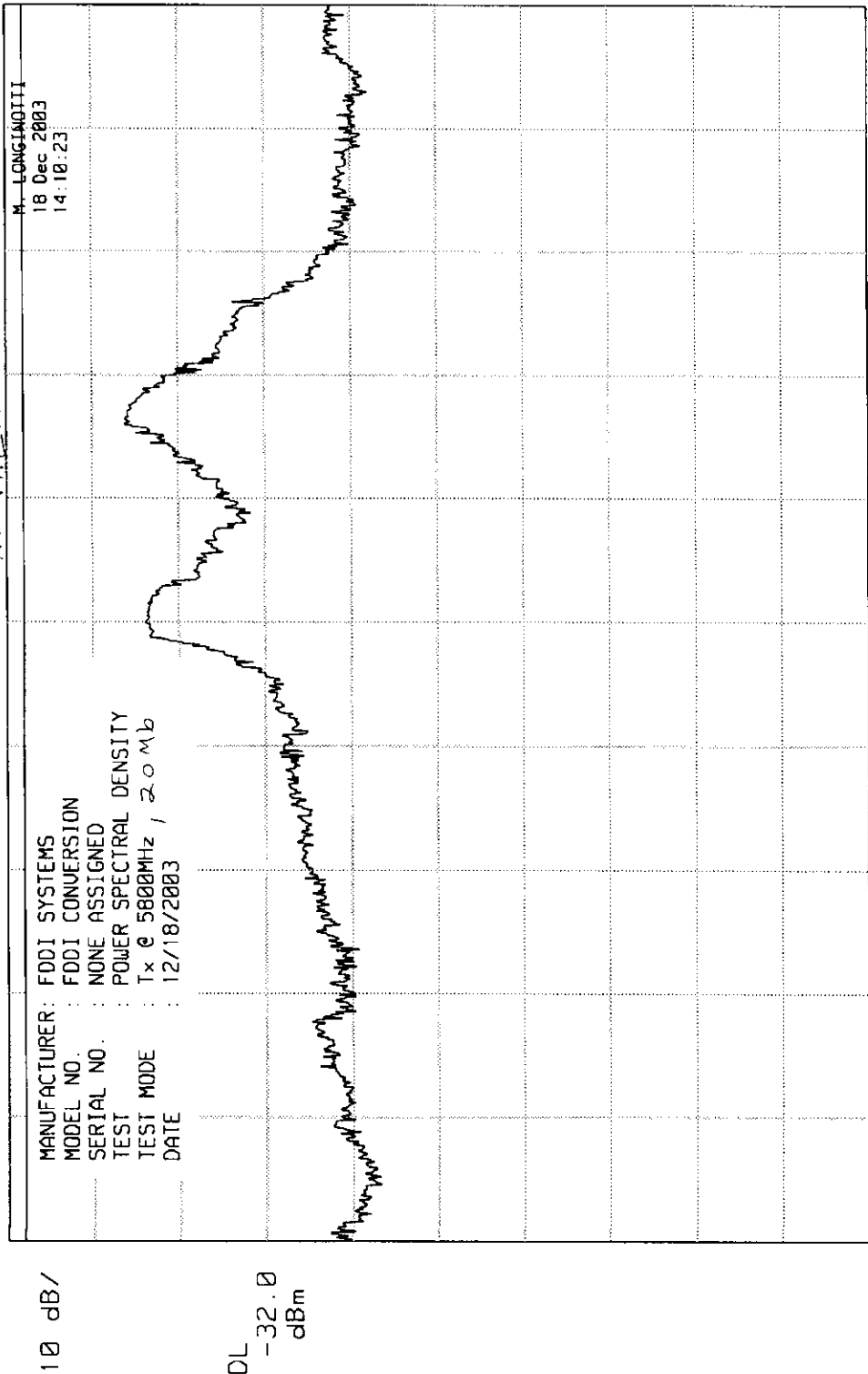




ELITE ELECTRONIC ENGINEERING Inc.

MR 5.794 564 GHz
-46.70 dBm

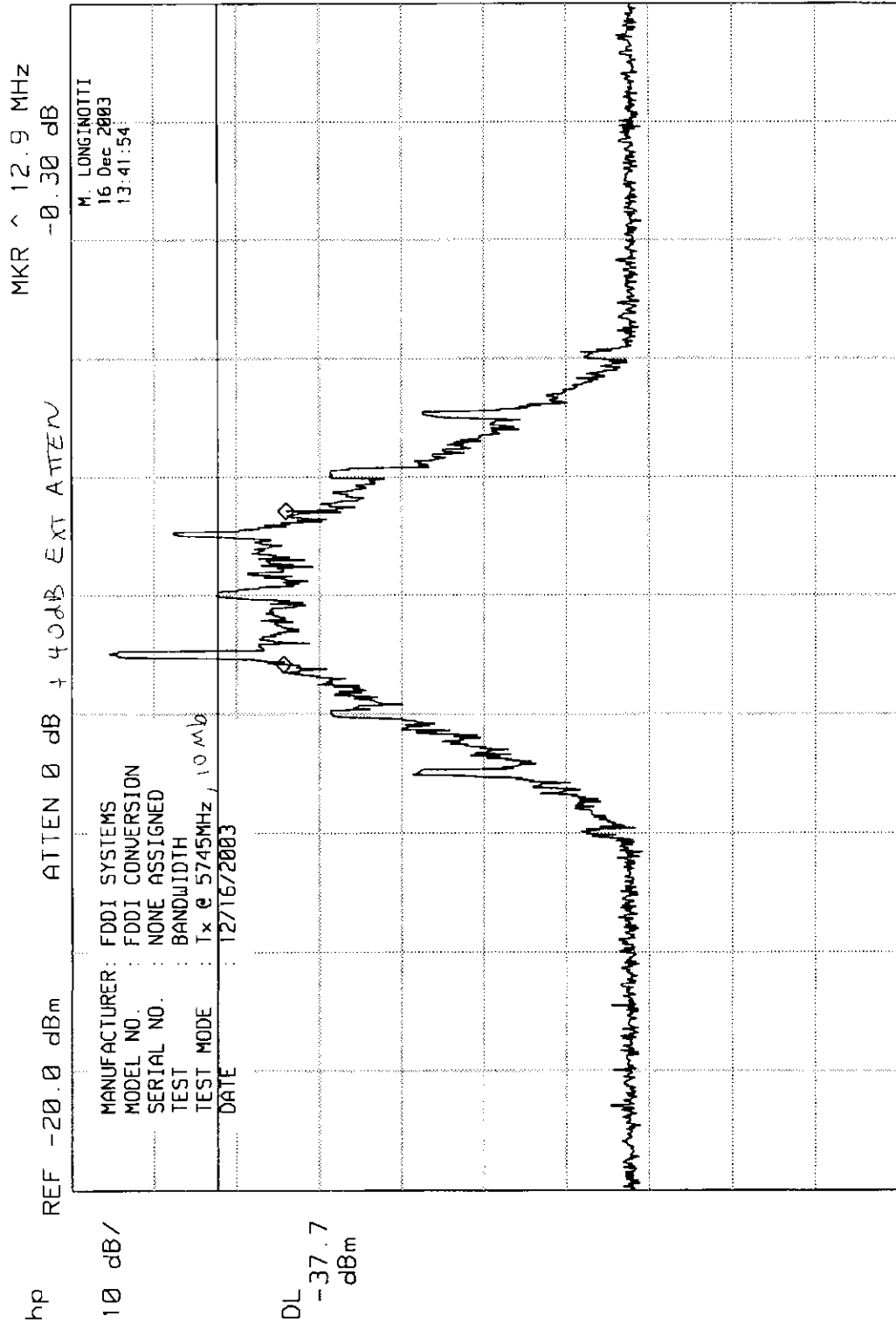
hp REF -30.0 dBm ATTN 0 dB + 40dB EXT ATTN



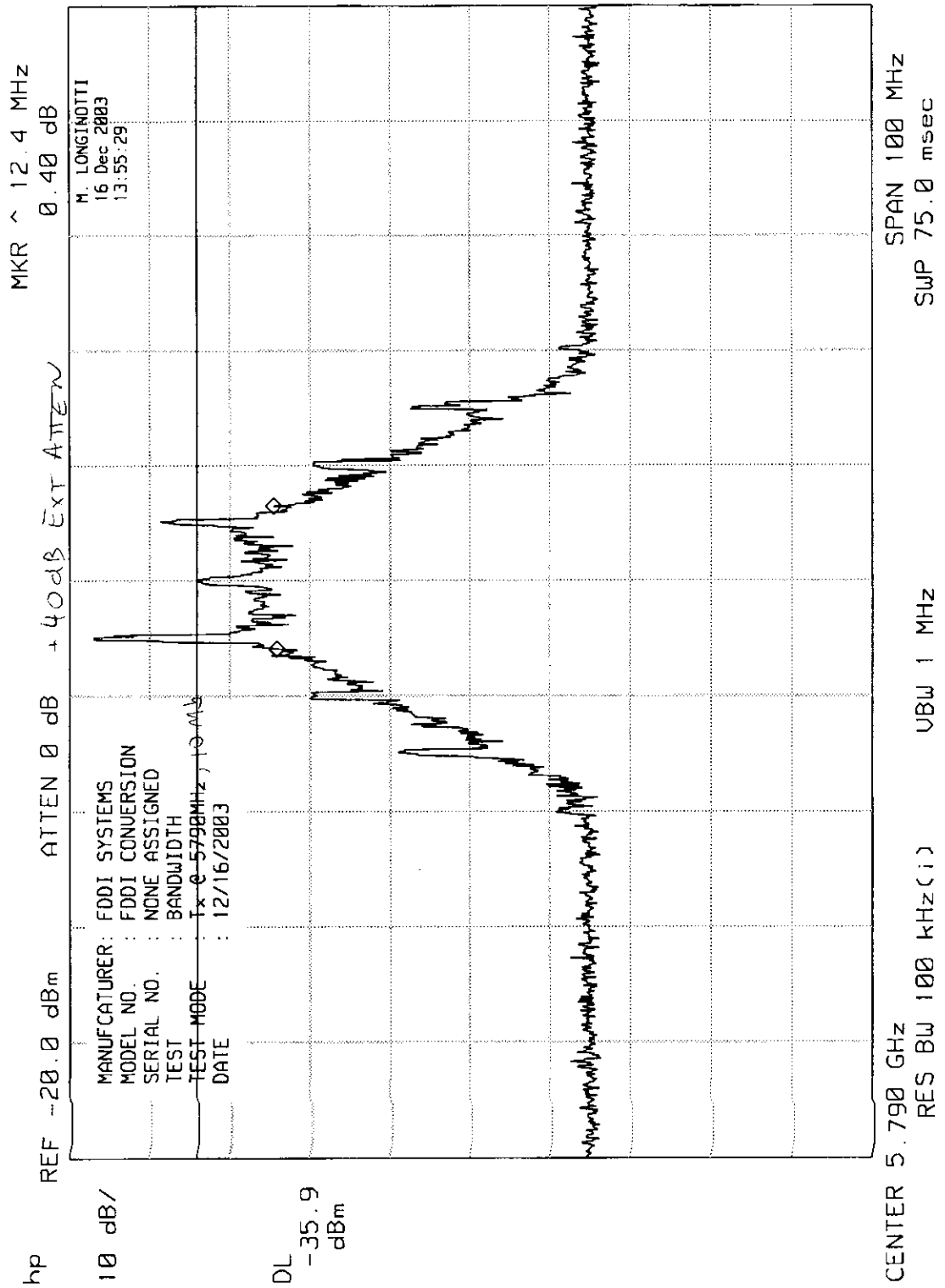
CENTER 5.794 57 GHz
RES BW 3 kHz(i)
SPAN 2.00 MHz
SWP 667 sec
VBW 30 kHz



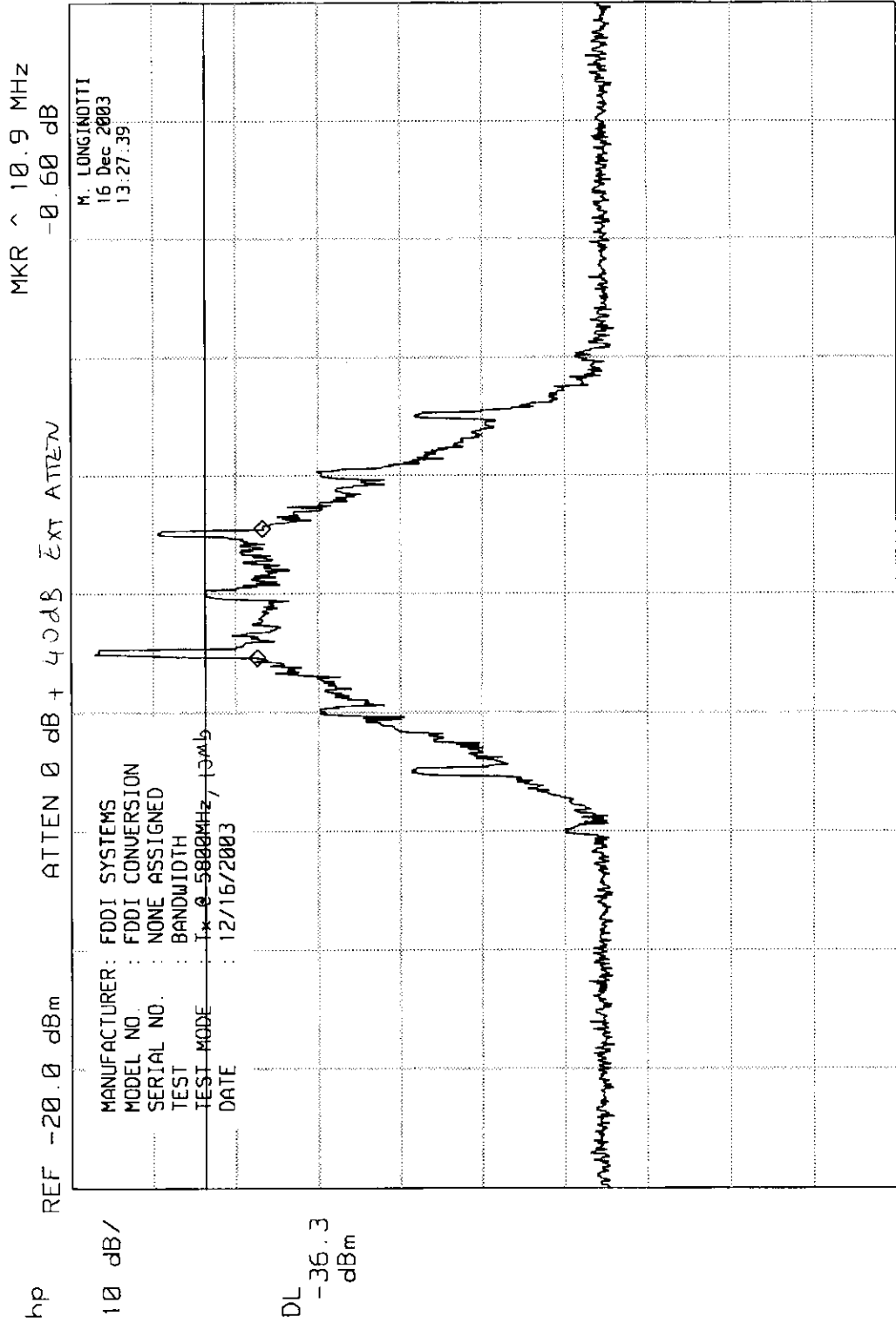
ELITE ELECTRONIC ENGINEERING Inc.



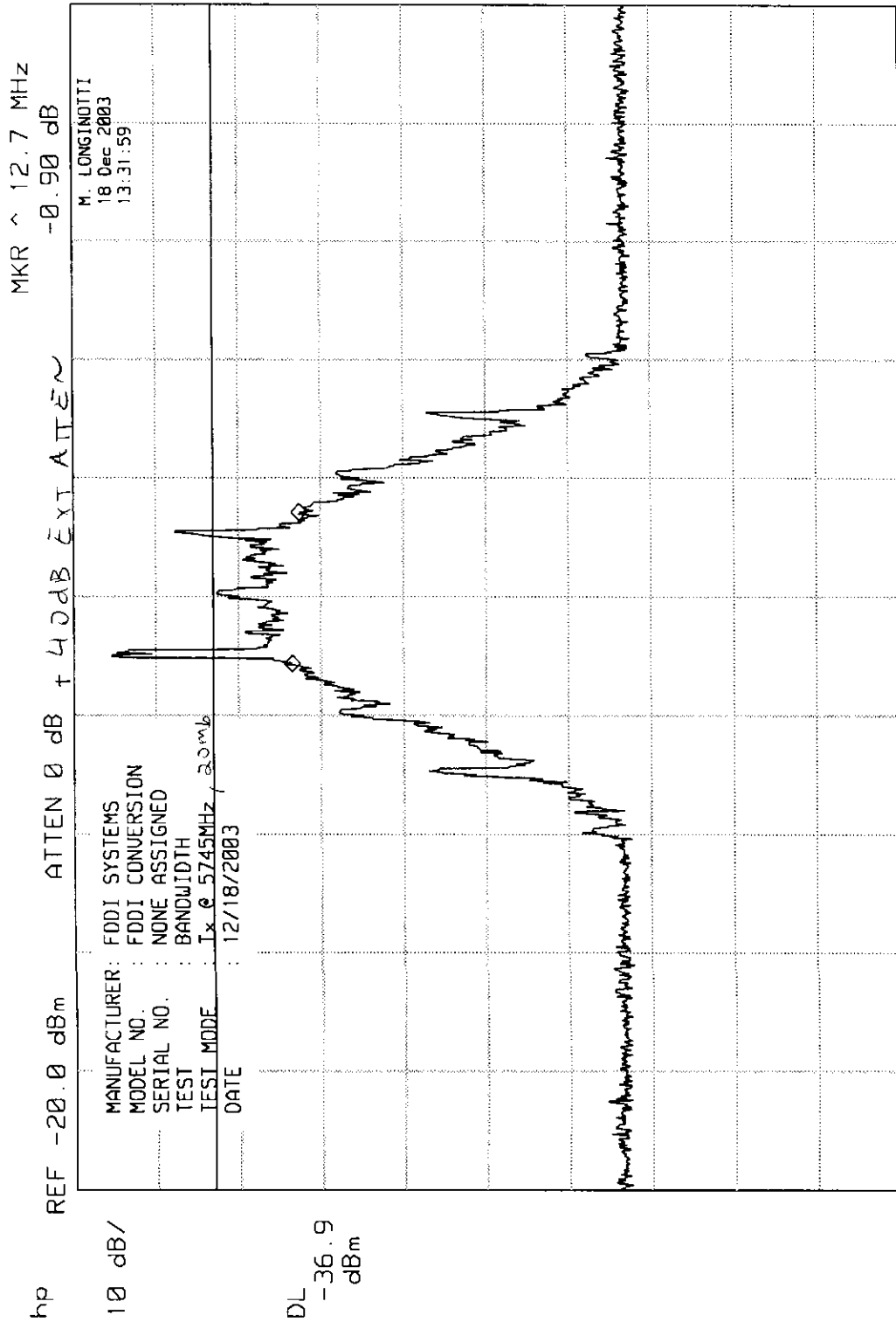
ELITE ELECTRONIC ENGINEERING Inc.



ELITE ELECTRONIC ENGINEERING Inc.

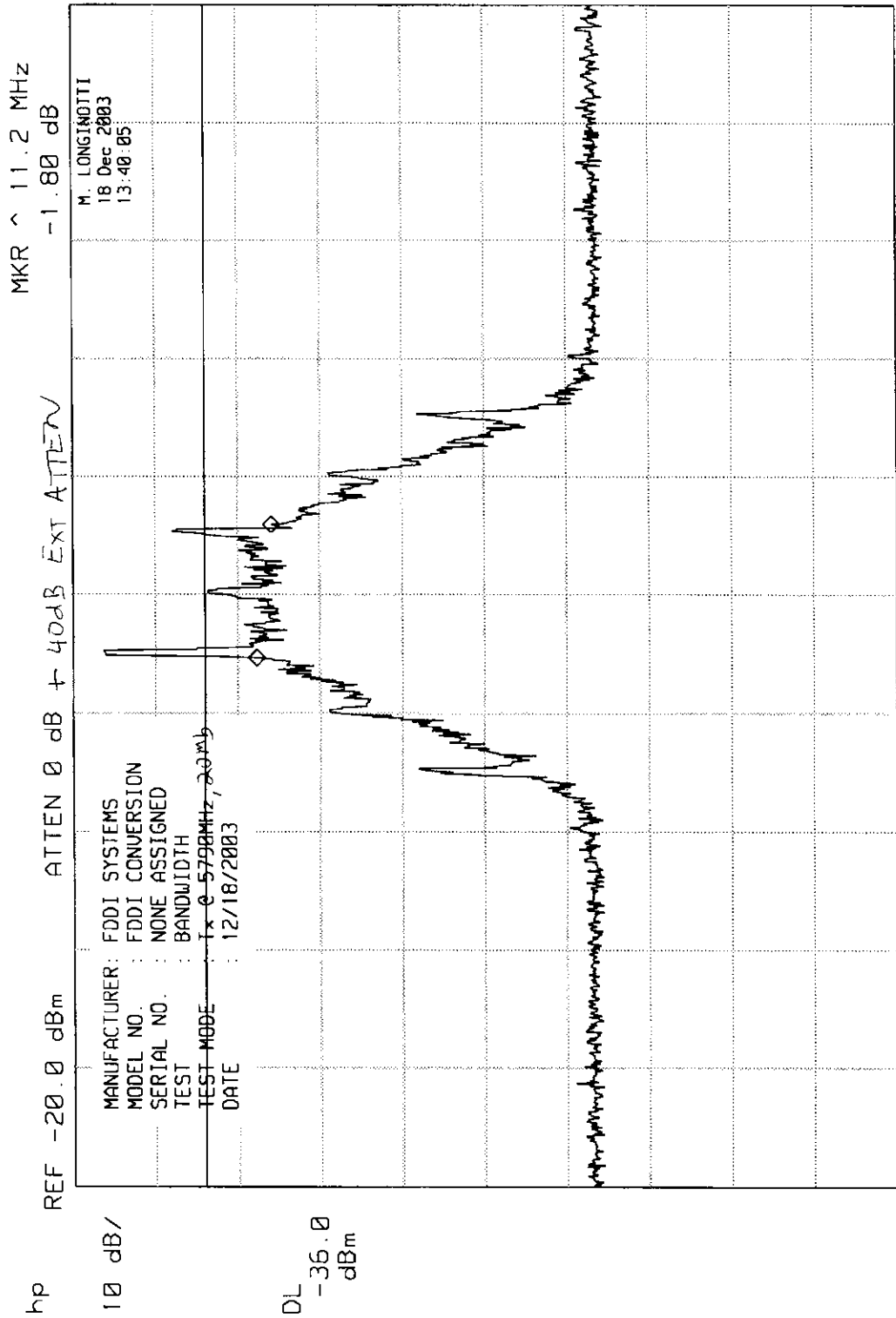


ELITE ELECTRONIC ENGINEERING Inc.



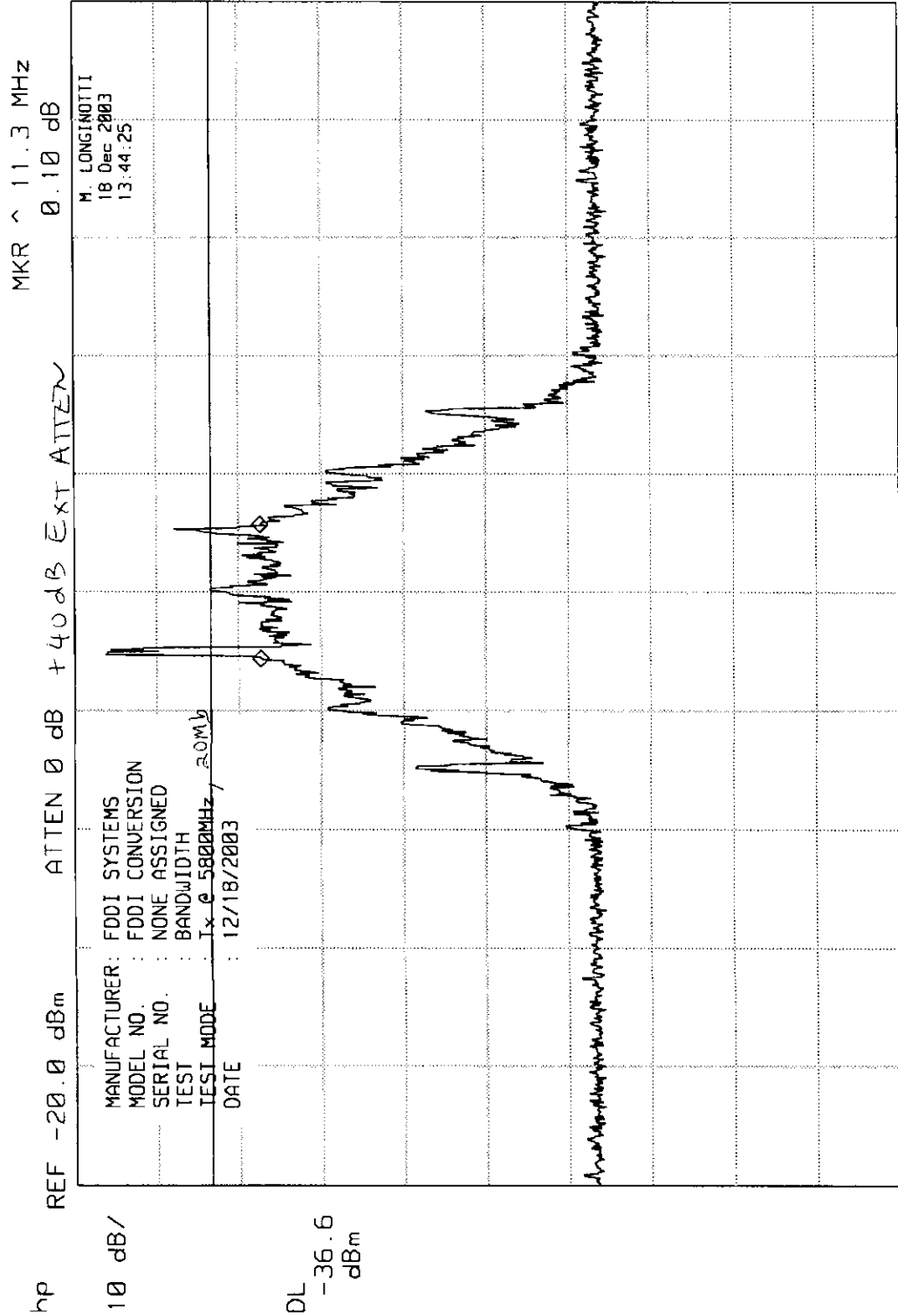


ELITE ELECTRONIC ENGINEERING Inc.





ELITE ELECTRONIC ENGINEERING Inc.





MANUFACTURER : FDDI SYSTEMS
MODEL : FDDI CONVERSION (MOTOROLA CANOPY TRANSCEIVER)
S/N : NONE ASSIGNED
SPECIFICATION : FCC-15C PEAK POWER
DATE : DECEMBER 19, 2003
NOTES :

FREQUENCY MHz	BIT RATE	26dB BANDWIDTH (B) MHz	METER READING dBm	BANDWIDTH CORRECTION FACTOR* dB	ATTEN dB	PEAK POWER dBm	LIMIT dBm
5745	10Mb/sec	25.25	-29.9	14.2	40	24.3	30.0
	20Mb/sec	26.55	-31.2	14.2	40	23.0	30.0
5790	10Mb/sec	26.1	-30.0	14.2	40	24.1	30.0
	20Mb/sec	26.5	-30.9	14.2	40	23.3	30.0
5800	10Mb/sec	26.1	-30.3	14.2	40	23.9	30.0
	20Mb/sec	26.5	-31.1	14.2	40	23.1	30.0

Bandwidth Correction Factor = $10 \cdot \log(B/1\text{MHz})$

Peak Power = Meter Reading + Bandwidth Correction Factor + Atten.

Checked By: Mark E. Longinotti
Mark E. Longinotti