Measurement of RF Emissions from an In-Home Repeater, Model No. BDA 1900-1

For : TRL Technologies
Elgin, IL

P.O. No. : 780-0000001633
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THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.

Measurement of RF Emissions from a Model No. BDA 1900-1, In-Home Repeater

1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: During the period of January 12 through February 2, 2004, a series of radio interference measurements were performed on a model BDA 1900-1 In-Home Repeater Serial Number 1001, (hereinafter referred to as the test item). The tests were performed for TRL Technologies of Elgin, IL.

The test item is an In-Home Repeater that operates in the PCS bands, 1930 through 1990 and 1850 through 1910. The test item has a rated gain of 55dB for the PCS band.

The test item is designed to operate in the following frequency blocks in the PCS band:

Block	Downlink Frequency (MHz)	Uplink Frequency (MHz)
A	1930-1945	1850-1865
D	1945-1950	1865-1870
B	1950-1965	1870-1885
E	1965-1970	1885-1890
F	1970-1975	1890-1895
C	1975-1990	1895-1910

1.2 PURPOSE: The test series was performed to determine if the test item meets the technical requirements of the FCC Part 24 for broadband PCS.

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 24, dated 1 October 2002

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, 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"

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 21%.

2.0 TEST ITEM SETUP AND OPERATION:

2.1 POWER INPUT: The test item obtained 5VDC from an SMP Technology, Inc. AC Adaptor, M/N: SBU 205-SF5C, S/N: 305-000673, through two, 1.8 meter long unshielded leads.

2.2 GROUNDING: The test item was ungrounded during the tests.

2.3 PERIPHERAL EQUIPMENT: The following peripheral equipment was submitted with the test item:

ITEM	DESCRIPTION
HP Signal Generator	M/N E4432B, S/N VS39440973
Attenuator	HP 30dB Attenuator Assembly
HP Power Sensor	M/N 8481B
HP Power Meter	M/N 437B

The output of the signal generator was connected to the test item through a 1 meter long coaxial cable. The power meter was connected to the test item through a 1 meter long coaxial cable.

2.4 MODULATION: The test signal was modulated with three different representative types of modulations: (1) Digital I/Q modulation - TDMA 30kHz, (2) Digital I/Q modulation - CDMA 1.23 MHz, and (3) Digital modulation - GSM 300kHz. The input signals were supplied from an HP M/N E4432B Signal Generator.

The RF Power Output, the Occupied Bandwidth, the Spurious Emissions at Antenna Terminal, and the Field Strength of Spurious Emissions tests were performed with TDMA, CDMA, and GSM modulated input signals. The frequency stability tests were performed with unmodulated (CW) input signals.

2.5 FREQUENCY SELECTION: For the RF Power Output test, the Occupied Bandwidth test, and the Spurious Emissions at Antenna Terminal test, two test frequencies for both uplink and downlink, one at the

low edge of Block A and one at the high edge of Block C, were selected. The frequencies were one channel spacing from the low or high edge of the frequency range edge.

For the Field Strength of Spurious Emissions test, three test frequencies for both uplink and downlink, one near the middle of block A, one near the middle of block B, and one near the middle of block C, were selected.

For frequency stability test, one test frequency for both uplink and downlink, near the middle of block B, was selected.

The specified channel spacing used for each modulation type is shown below:

Modulation	Channel Spacing
TDMA	30kHz
CDMA	1.23MHz
GSM	300kHz

The specific test frequencies are designated as follows:

Modulation Type	Low Edge Frequency MHz	High Edge Frequency MHz	Low Frequency MHz	Middle Frequency MHz	High Frequency MHz
Downlink RF Power Output test, Occupied Bandwidth test, Spurious Emissions at Antenna Terminal test					
TDMA	1930.03	1989.97			
CDMA	1931.23	1988.77			
GSM	1930.3	1989.7			
Downlink, Field Strength of Spurious Emissions test					
TDMA			1935	1955	1985
CDMA			1935	1955	1985
GSM			1935	1955	1985
Downlink, Frequency Stability Test					
CW				1955	
Uplink RF Power Output test, Occupied Bandwidth test, Spurious Emissions at Antenna Terminal test					
TDMA	1850.03	1909.97			
CDMA	1851.23	1908.77			
GSM	1850.3	1909.7			
Uplink, Field Strength of Spurious Emissions test					
TDMA			1855	1875	1905
CDMA			1855	1875	1905
GSM			1855	1875	1905
Uplink, Frequency Stability Test					

CW				1875	

2.6 RF POWER OUTPUT: The input levels were adjusted to reach the rated output levels shown below:

Modulation	Rated Power dBm	Rated Power Watts
TDMA	20	0.1
CDMA	20	0.1
GSM	20	0.1

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 RF POWER OUTPUT MEASUREMENTS:

4.1.1 REQUIREMENTS: In accordance with paragraph 24.323, mobile/portable stations are limited to 2 Watts e.i.r.p. peak power and the equipment must employ means to limit the power of the minimum necessary for successful communications.

4.1.2 PROCEDURES: The test item was adjusted for the rated gain. The test item was configured to measure the output for the downlink path.

(a) The input signal was set to 1930.03MHz.

(b) The input signal was TDMA modulated.

(c) The HP 437B Power Meter was connected to the output of the test item and the output of the test item was monitored.

(d) The amplitude of the input signal was adjusted until the rated output level was achieved. The output power level was measured and recorded. The input signal level was also recorded.

(e) Steps (b) through (d) were repeated separately for each frequency and modulation listed in paragraph 2.5 above.

4.1.3 RESULTS: The output power measurements are presented on data pages 16 through 18. The power outputs achieved for the downlink path and the uplink path were 0.1 watts for all frequencies and modulations listed in paragraph 2.5 above. The remainder of the tests were performed at these power

levels. The power output complies with the FCC requirements.

The EIRP 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. Therefore, the EIRP requirement cannot be directly applied to the test item.

4.2 OCCUPIED BANDWIDTH MEASUREMENTS:

4.2.1 REQUIREMENTS: In accordance with Paragraph 24.238(a), on any frequency outside the authorized frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P)dB. For a rated power level of 0.1W, the emissions outside of the emission bandwidth shall be attenuated at least 33dB below the transmitter power.

In the 1MHz bands immediately outside and adjacent to the frequency range a resolution of at least one percent of the emission bandwidth shall be used. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency where the emissions are 26dB down.

4.2.2 PROCEDURES: The test was performed using each of the modulation types listed in paragraph 2.5 (TDMA, CDMA, GSM).

(a) The input signal was set separately to 1850.03MHz, 1909.97MHz, 1930.03MHz and 1989.97MHz. The input signal level was adjusted to provide the rated level at the test item output. The reference level was recorded.

(b) The input signal was TDMA modulated.

(c) A spectrum analyzer was connected to the output of the test item. With a bandwidth of the spectrum analyzer set to 300 Hz, the output of the test item was measured and recorded.

(d) The input signal from the signal generator was measured with the spectrum analyzer and recorded over the same frequency range.

(e) The modulation was changed to CDMA and steps (c) and (d) were repeated separately with the input signal set to 1851.23MHz, 1908.77MHz, 1931.23MHz, and 1988.77MHz. The bandwidth of the spectrum analyzer was set to 30kHz.

(f) The modulation was changed to GSM and steps (c) and (d) were repeated separately with the input signal set to 1850.3MHz, 1909.7MHz, 1930.3MHz, and 1989.7MHz. The bandwidth of the spectrum analyzer was set to 30kHz.

4.2.3 RESULTS: The plots of the occupied bandwidth measured with the TDMA modulation of the carrier are presented on data pages 19 through 30. The plots of the occupied bandwidth measured with the CDMA modulation of the carrier are presented on data pages 31 through 42.The plots of the occupied

bandwidth measured with the GSM modulation of the carrier are presented on data pages 43 through 54.

The limits, shown on the plots, are referenced to the power measured from the unmodulated carrier. As can be seen from the data, the test item output met the occupied bandwidth requirements with the TDMA, CDMA, and GSM modulations of the carrier. The sideband emissions measured at the test item output were similar to the sideband emissions measured from the input signals.

4.3 SPURIOUS EMISSIONS AT ANTENNA TERMINAL:

4.3.1 REQUIREMENTS: This test determines whether the test item produces excessive spurious emissions. In accordance with Paragraph FCC 24.238, the spurious emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P)dB. FCC requirements apply only to frequencies outside the authorized frequency block. For 0.1W, the spurious emissions shall be attenuated by a minimum of 33dB. 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 terminals. The test was performed using each of the modulation types listed in paragraph 2.4 (TDMA, CDMA, GSM).

(a) The input signal was set to 1850.03MHz. The input signal level was adjusted to provide the rated level at the test item output.

(b) The input signal was TDMA modulated.

(c) A spectrum analyzer was connected to the output of the test item. The frequency span was adjusted to cover 30 MHz up to 1 GHz. With a bandwidth of the spectrum analyzer set to 100 kHz, the output of the test item was measured and recorded.

(d) The frequency span was adjusted to cover 1 GHz up to 2 GHz. With a bandwidth of the spectrum analyzer set to 1 MHz, the output of the test item was measured and recorded.

(e) The frequency span was adjusted to cover 2 GHz up to 20 GHz. With a bandwidth of the spectrum analyzer set to 1 MHz, the output of the test item was measured and recorded. This range covers up through the 10th harmonic.

(f) Steps (c) through (e) were repeated on the input signal from the signal generator.

(g) Steps (c) through (f) were repeated with the input signal set to 1909.97MHz. The input signal was TDMA modulated and adjusted to provide the rated level at the test item output.

(h) Steps (c) through (f) were repeated with the input signal set to 1930.03MHz. The input signal was TDMA modulated and adjusted to provide the rated level at the test item output.

(i) Steps (c) through (f) were repeated with the input signal set to 1989.97MHz. The input signal was

adjusted to provide the rated level at the test item output.

(j) Steps (c) through (f) were repeated with the input signal set to 1851.23MHz. The input signal was CDMA modulated and adjusted to provide the rated level at the test item output.

(k) Steps (c) through (f) were repeated with the input signal set to 1908.77MHz. The input signal was CDMA modulated and adjusted to provide the rated level at the test item output.

(l) Steps (c) through (f) were repeated with the input signal set to 1931.23MHz. The input signal was CDMA modulated and adjusted to provide the rated level at the test item output.

(m) Steps (c) through (f) were repeated with the input signal set to 1988.77MHz. The input signal was CDMA modulated and adjusted to provide the rated level at the test item output.

(n) Steps (c) through (f) were repeated with the input signal set to 1850.3MHz. The input signal was GSM modulated and adjusted to provide the rated level at the test item output.

(o) Steps (c) through (f) were repeated with the input signal set to 1909.7MHz. The input signal was GSM modulated and adjusted to provide the rated level at the test item output.

(p) Steps (c) through (f) were repeated with the input signal set to 1930.3MHz. The input signal was GSM modulated and adjusted to provide the rated level at the test item output.

(q) Steps (c) through (f) were repeated with the input signal set to 1989,7MHz. The input signal was GSM modulated and adjusted to provide the rated level at the test item output.

4.3.3 RESULTS: The plots of the antenna conducted output measurements are presented on data pages 55 through 126. As can be seen from the data, the test item did not produce spurious emissions in excess of the -13 dBm limit.

4.4 FIELD STRENGTH OF SPURIOUS EMISSIONS:

4.4.1 PRELIMINARY RADIATED MEASUREMENTS:

4.4.1.1 REQUIREMENTS: Because emission levels in the open field may be masked by interference from sources other than the test item, preliminary radiated measurements are first performed in the low ambient environment of a shielded enclosure. The radiated emissions from the test item were first measured using peak detection. This data was then automatically plotted

4.4.1.2 PROCEDURES: All preliminary 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 2001 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 test was performed using each of the modulation types listed in paragraph 2.5.

(a) The preliminary measurements were performed with the test item operating separately with an input signal of 1855.0MHz, 1875.0MHz, 1905MHz, 1935MHz, 1955MHz, and 1985MHz with TDMA modulation. The broadband measuring antennas were positioned at a 3 meter distance from the test item. The frequency range from 30MHz to 18GHz was investigated. The readings were taken with a peak detector function and recorded.

(b) Step (a) was repeated with an input signal 1855.0MHz, 1875.0MHz, 1905MHz, 1935MHz, 1955MHz, and 1985MHz and with the modulation changed to CDMA.

(c) Step (a) was repeated with an input signal 1855.0MHz, 1875.0MHz, 1905MHz, 1935MHz, 1955MHz, and 1985MHz and with the modulation changed to GSM.

4.4.1.3 RESULTS: The preliminary plots are presented on data pages 127 through 162. Factors for the antennas and cables were added to the data before it was plotted.

This data is only presented for a reference, and is not used as official data. All significant radiated emissions were subsequently measured at an open field test site.

4.4.2 FINAL RADIATED EMISSIONS:

4.4.2.1 REQUIREMENTS: In accordance with paragraph 24.238, on any frequency twice or more than twice the fundamental frequency, the emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P)dB. This requirement translates to a minimum attenuation of 33dB. The peak power of the emissions shall be measured from 30MHz up to the 10th harmonic of the fundamental frequency.

4.4.2.2 PROCEDURES: Final open field measurements 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 2001 for site attenuation.

The final open field emission test procedure is as follows:

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 of the test item was terminated in 50 ohms for the tests.

c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.

d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization.

e) The maximum meter reading was recorded. Measurement BW was 1 MHz and Video of 3MHz. Peak readings were recorded. No averaging methods or corrections were applied.

f) Measurements were performed with the input signal modulated with TDMA, CDMA, and GSM.

g) Measurements were performed separately at each frequency used during the preliminary measurements.

The equivalent power into a dipole antenna was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power another tuned dipole antenna or double ridged waveguide antenna was set in place of the test item and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was corrected to compensate for cable loss, as required, and when the ridged waveguide antenna was used increased by the difference in gain between the dipole and the waveguide antenna.

4.4.2.3 RESULTS OF OPEN FIELD RADIATED TEST: The final open field radiated levels are presented on data pages 163 through 180. The radiated emissions were measured through the 10th harmonic. All emissions measured from the test item were within the specification limits.

4.5 FREQUENCY STABILITY:

4.5.1 REQUIREMENTS: In accordance with 24.235, frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.. The frequency stability shall be measured separately with variations in 1) the ambient temperature from -30°C to +50°C and in 2) the nominal supply voltage from 85% of nominal voltage to 115% of nominal voltage.

4.5.2 PROCEDURES:

4.5.2.1 FREQUENCY STABILITY VS. TEMPERATURE: The test item was placed inside of a temperature chamber and the test item was powered up.

(a) The uplink side of the test item was connected to a signal generator and the downlink side of the test item was connected to a frequency counter. The signal generator was set to 1875MHz with an unmodulated (CW) signal. The frequency on the frequency counter was recorded.

(b) The downlink side of the test item was connected to a signal generator and the uplink side of the test item was connected to a frequency counter. The signal generator was set to 1955MHz with an unmodulated (CW) signal. The frequency on the frequency counter was recorded.

(c) The temperature in the temperature chamber was lowered to -30°C and this temperature was maintained for 45 minutes. Steps (a) and (b) were repeated at -30°C.

(d) The temperature in the temperature chamber was raised to -20°C and this temperature was

maintained for 30 minutes. Steps (a) and (b) were repeated at -20°C.

(e) The temperature in the temperature chamber was raised to -10°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at -10°C.

(f) The temperature in the temperature chamber was raised to 0°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at 0°C.

(g) The temperature in the temperature chamber was raised to +10°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at +10°C.

(h) The temperature in the temperature chamber was raised to +20°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at +20°C.

(i) The temperature in the temperature chamber was raised to +30°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at +30°C.

(j) The temperature in the temperature chamber was raised to +40°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at +40°C.

(k) The temperature in the temperature chamber was raised to +50°C and this temperature was maintained for 30 minutes. Steps (a) and (b) were repeated at +50°C.

4.5.2.2 FREQUENCY STABILITY VS. INPUT VOLTAGE: The SMP Technology, Inc., AC Adaptor used to power the test item was powered up with 115V, 60Hz and operated in ambient temperature conditions.

(a) The uplink side of the test item was connected to a signal generator and the downlink side of the test item was connected to a frequency counter. The signal generator was set to 1875MHz with an unmodulated (CW) signal. The frequency on the frequency counter was recorded.

(b) The downlink side of the test item was connected to a signal generator and the uplink side of the test item was connected to a frequency counter. The signal generator was set to 1955MHz with an unmodulated (CW) signal. The frequency on the frequency counter was recorded.

(c) Steps (a) and (b) were repeated with the power to the SMP Technology, Inc. AC Adaptor reduced to 85% of nominal voltage (97.75VAC).

(d) Steps (a) and (b) were repeated with the power to the SMP Technology, Inc. AC Adaptor increased to 115% of nominal voltage (132.25VAC).

4.5.3 RESULTS: The frequency stability vs. temperature test results are presented on data page 181. The frequency stability vs. input voltage test results are presented on data page 182. As can be seen from the data, the fundamental emission stayed within the authorized frequency block for all frequency stability tests.

5.0 CONCLUSION:

It was found that the TRL Technologies model BDA 1900-1, Serial No. 1001, In-Home Repeater, complies with the RF Power Output, the Occupied Bandwidth, the Spurious Emissions at Antenna Terminal, the Field Strength of Spurious Emissions, and Frequency Stability requirements of the FCC Part 24.

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 TRL Technologies 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								
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---		N/A	
Equipment Type: AMPLIFIERS								
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
NWF2	RIDGED WAVE GUIDE	ELECTRO-METRICS	RGA 180	2521	1-12.4GHZ	09/05/03	12	09/05/04
NWH0	RIDGED WAVE GUIDE	TENSOR	4105	2081	1-12.4GHZ	09/05/03	12	09/05/04
NWI0	RIDGED WAVE GUIDE	AEL	H1498	153	2-18GHZ	09/05/03	12	09/05/04
NWI1	RIDGED WAVE GUIDE	AEL	H1498	154	2-18GHZ	09/05/03	12	09/05/04
Equipment Type: ATTENUATORS								
T2D1	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AV5814	DC-18GHZ	03/13/03	12	03/13/04
T2D5	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9244	DC-18GHZ	01/22/04	12	01/22/05
T2D9	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BH5445	DC-18HGZ	12/29/03	12	12/29/04
Equipment Type: METERS								
MFC0	MICROWAVE FREQ. COUNTER	HEWLETT PACKARD	5343A	2133A00591	10HZ-26GHZ	06/03/03	12	06/03/04
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
RAF3	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/29/03	12	01/29/04
Equipment Type: SIGNAL GENERATORS								
GBN5	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 02	DE13542	0.009-2008MHZ	04/02/03	12	04/02/04
GBX1	SYNTHESIZED SWEEPER	HEWLETT PACKARD	83630A	3420A00857	10MHZ-26.5GHZ		NOTE 1	

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.

Manufacturer : TRL Technology
Model No. : BDA 1900-1
Serial No. : 1001
Specification : FCC-24 RF Power Output
Date : January 12 and 13, 2004

Frequency MHz	Power Reading dBm	Watts
	UPLINK	
1850.03 TDMA	20.0	0.1
1907.97 TDMA	20.0	0.1
1855.00 TDMA	20.0	0.1
1875.00 TDMA	20.0	0.1
1905.00 TDMA	20.0	0.1
	DOWNLINK	
1930.03 TDMA	20.0	0.1
1989.97 TDMA	20.0	0.1
1935.00 TDMA	20.0	0.1
1955.00 TDMA	20.0	0.1
1985.00 TDMA	20.0	0.1

Checked By:_____
Mark E. Longinotti

Manufacturer : TRL Technology
Model No. : BDA 1900-1
Serial No. : 1001
Specification : FCC-24 RF Power Output
Date : January 12 and 13, 2004

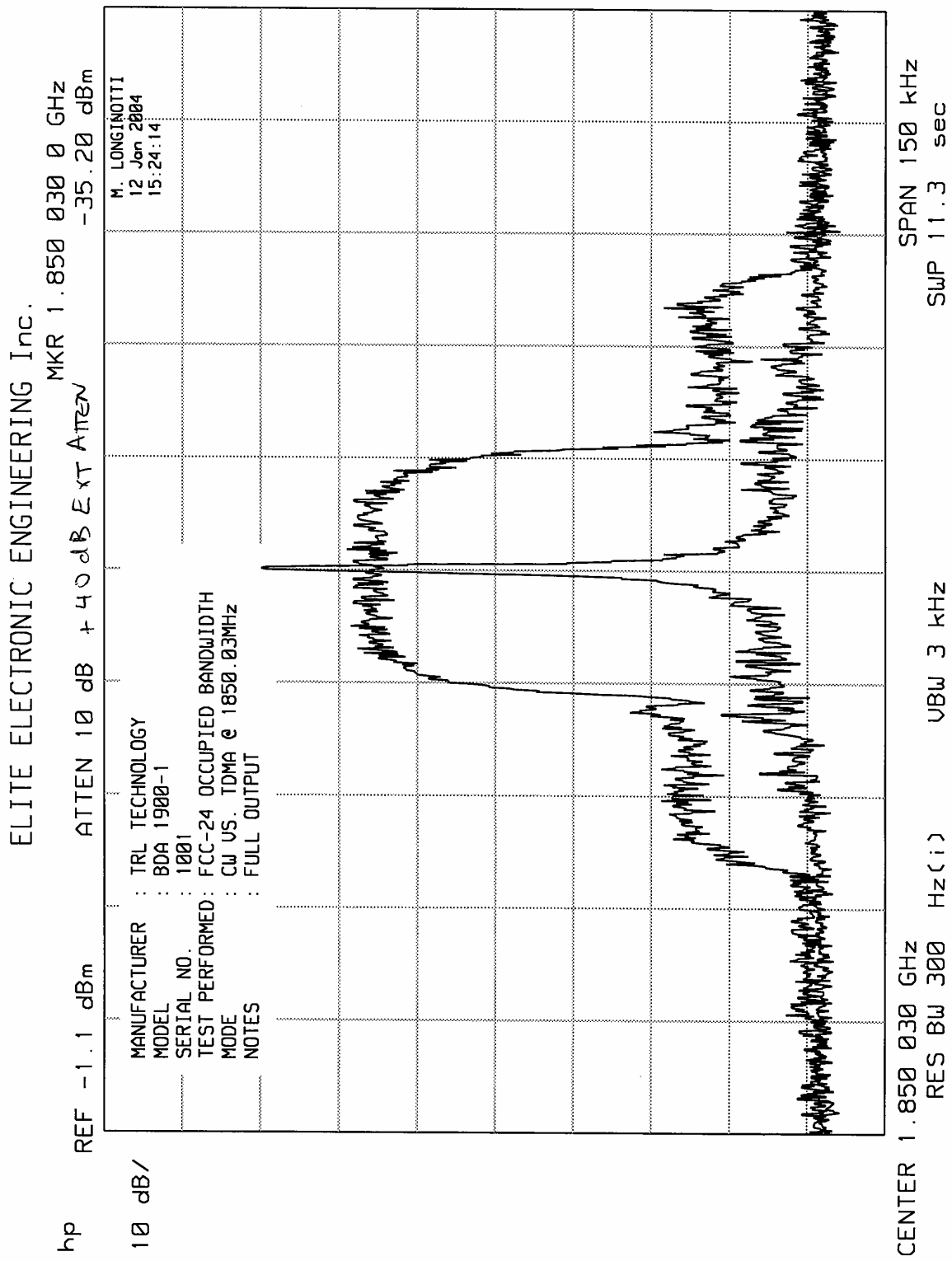
Frequency MHz	Power Reading dBm	Watts
	UPLINK	
1851.23 CDMA	20.0	0.1
1908.77 CDMA	20.0	0.1
1855.00 CDMA	20.0	0.1
1875.00 CDMA	20.0	0.1
1905.00 CDMA	20.0	0.1
	DOWNLINK	
1931.23 CDMA	20.0	0.1
1988.77 CDMA	20.0	0.1
1935.00 CDMA	20.0	0.1
1955.00 CDMA	20.0	0.1
1985.00 CDMA	20.0	0.1

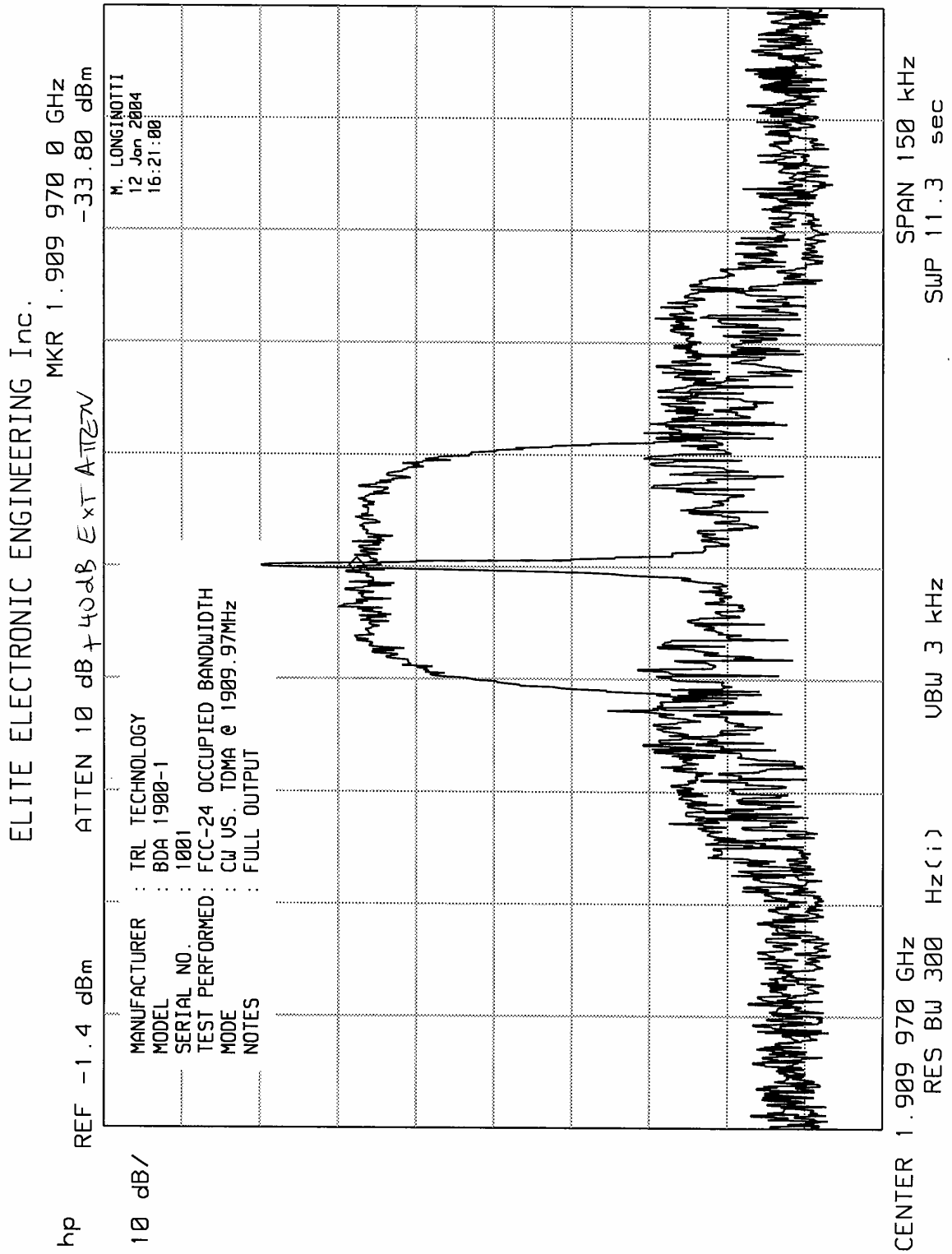
Checked By: _____
Mark E. Longinotti

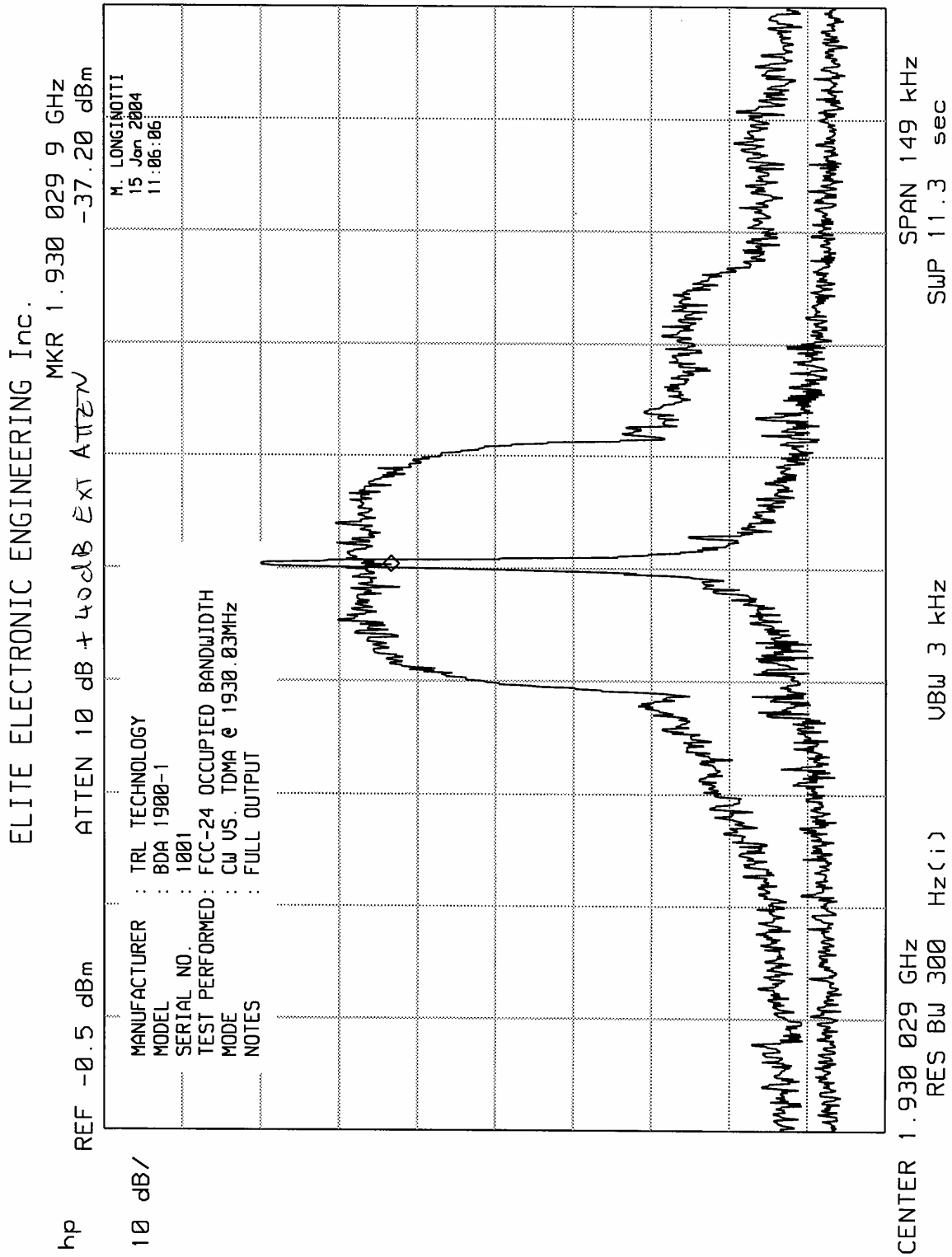
Manufacturer : TRL Technology
Model No. : BDA 1900-1
Serial No. : 1001
Specification : FCC-24 RF Power Output
Date : January 12 and 13, 2004

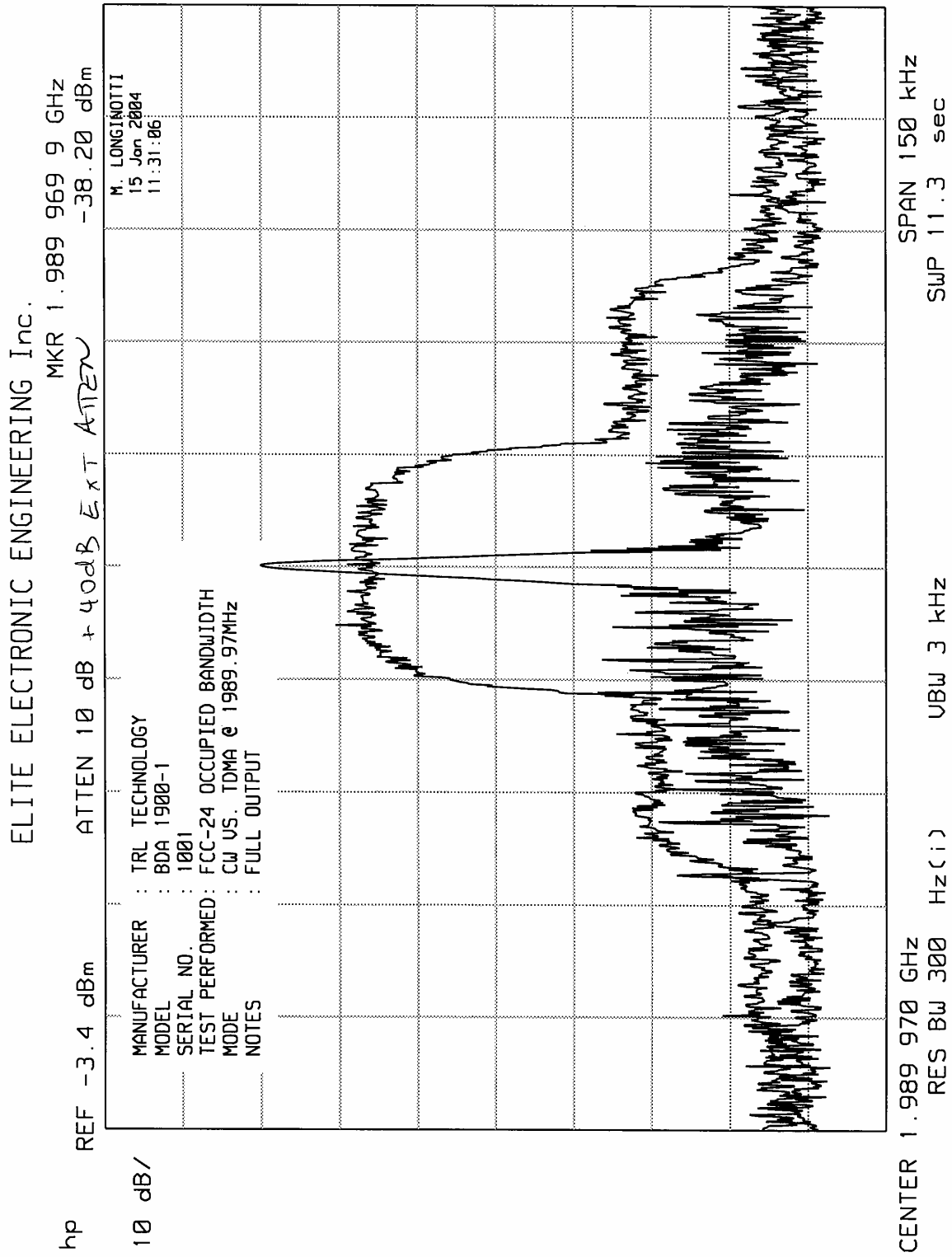
Frequency MHz	Power Reading dBm	Watts
	UPLINK	
1851.23 GSM	20.0	0.1
1908.77 GSM	20.0	0.1
1855.00 GSM	20.0	0.1
1875.00 GSM	20.0	0.1
1905.00 GSM	20.0	0.1
	DOWNLINK	
1931.23 GSM	20.0	0.1
1988.77 GSM	20.0	0.1
1935.00 GSM	20.0	0.1
1955.00 GSM	20.0	0.1
1985.00 GSM	20.0	0.1

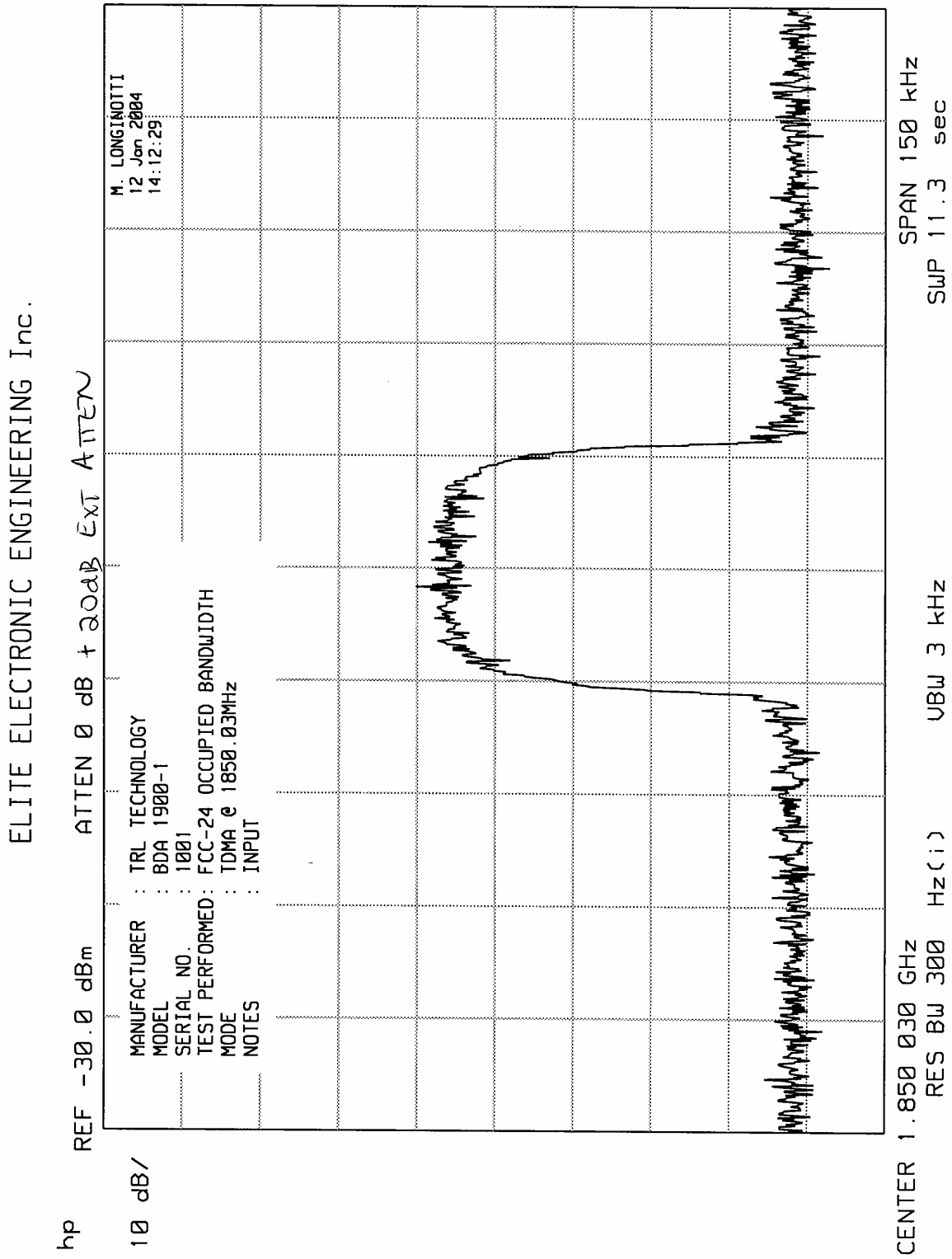
Checked By: _____
Mark E. Longinotti

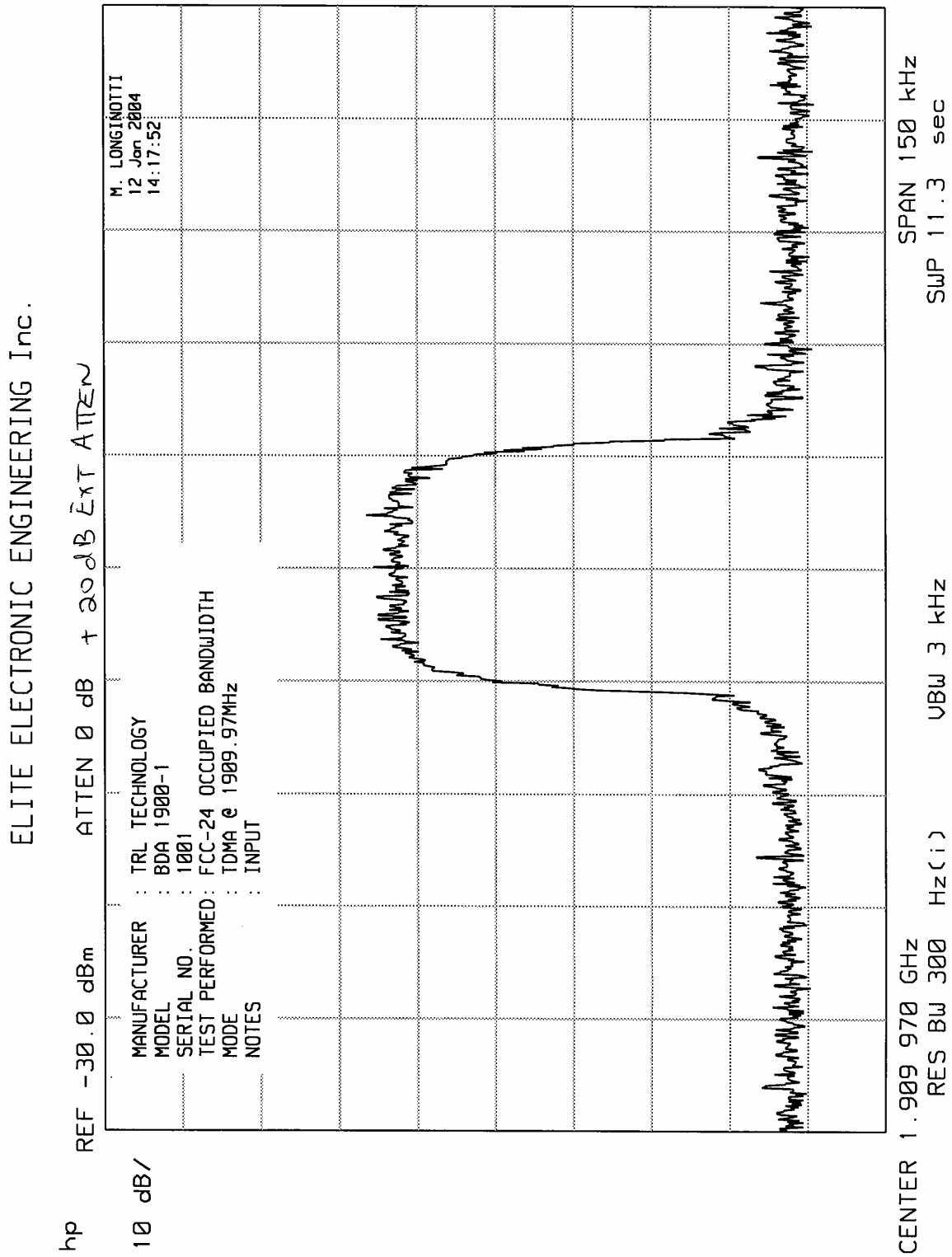

hp
10 dB/
REF -1.1 dBm
ATTEN 10 dB +40 dB EXT ATTEN
ELITE ELECTRONIC ENGINEERING Inc.
MKR 1.850 030 0 GHz
-35.20 dBm
M. LONGINOTTI
12 Jan 2004
15:24:14
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. TDMA @ 1850.03MHz
NOTES : FULL OUTPUT
CENTER 1.850 030 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 150 kHz
SWP 11.3 sec

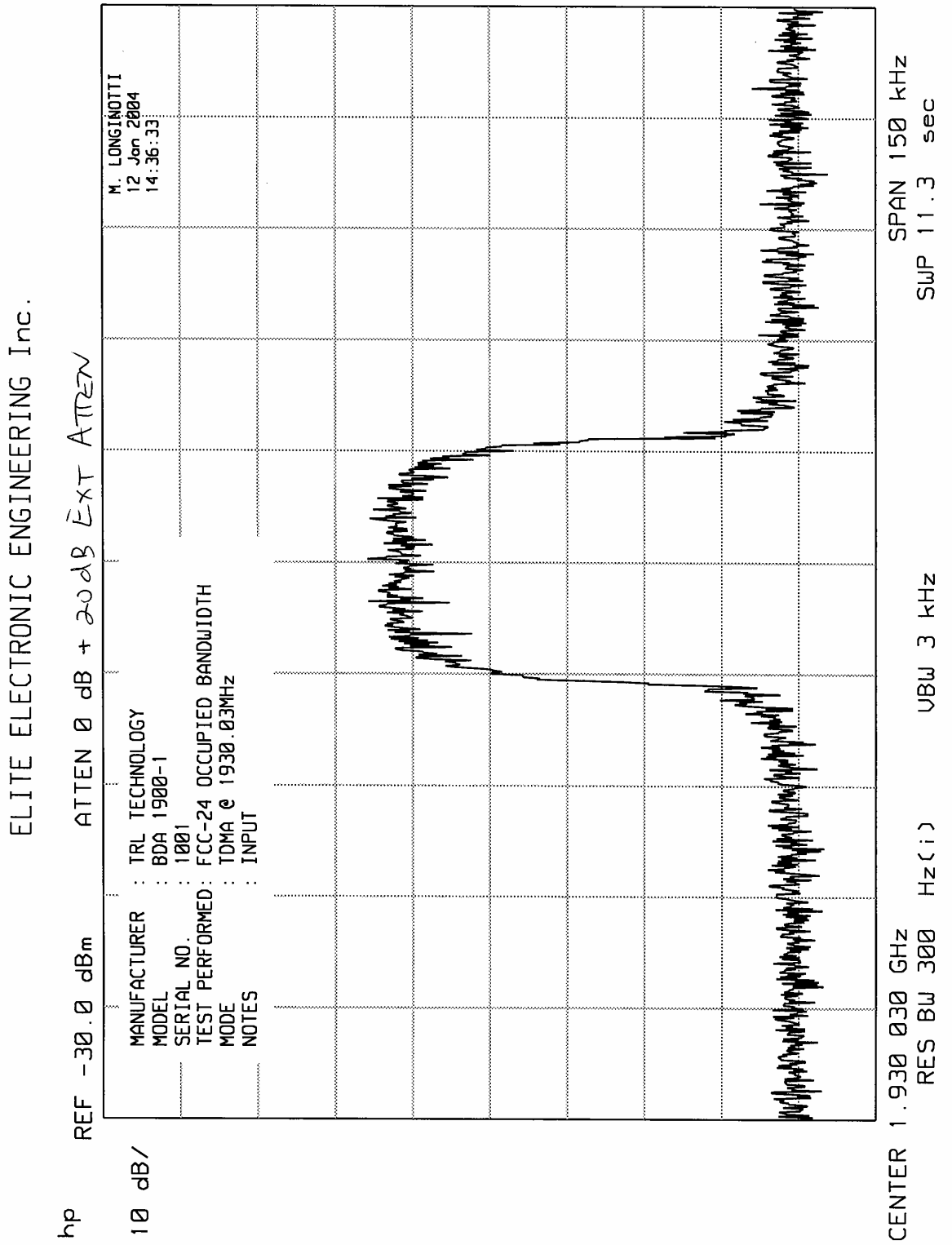

hp
10 dB/
REF -1.4 dBm
ATTEN 10 dB +40dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MKR 1.909 970 0 GHz
-33.80 dBm
M. LONGINOTTI
12 Jan 2004
16:21:00
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. TDMA @ 1909.97MHz
NOTES : FULL OUTPUT
CENTER 1.909 970 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 150 kHz
SWP 11.3 sec

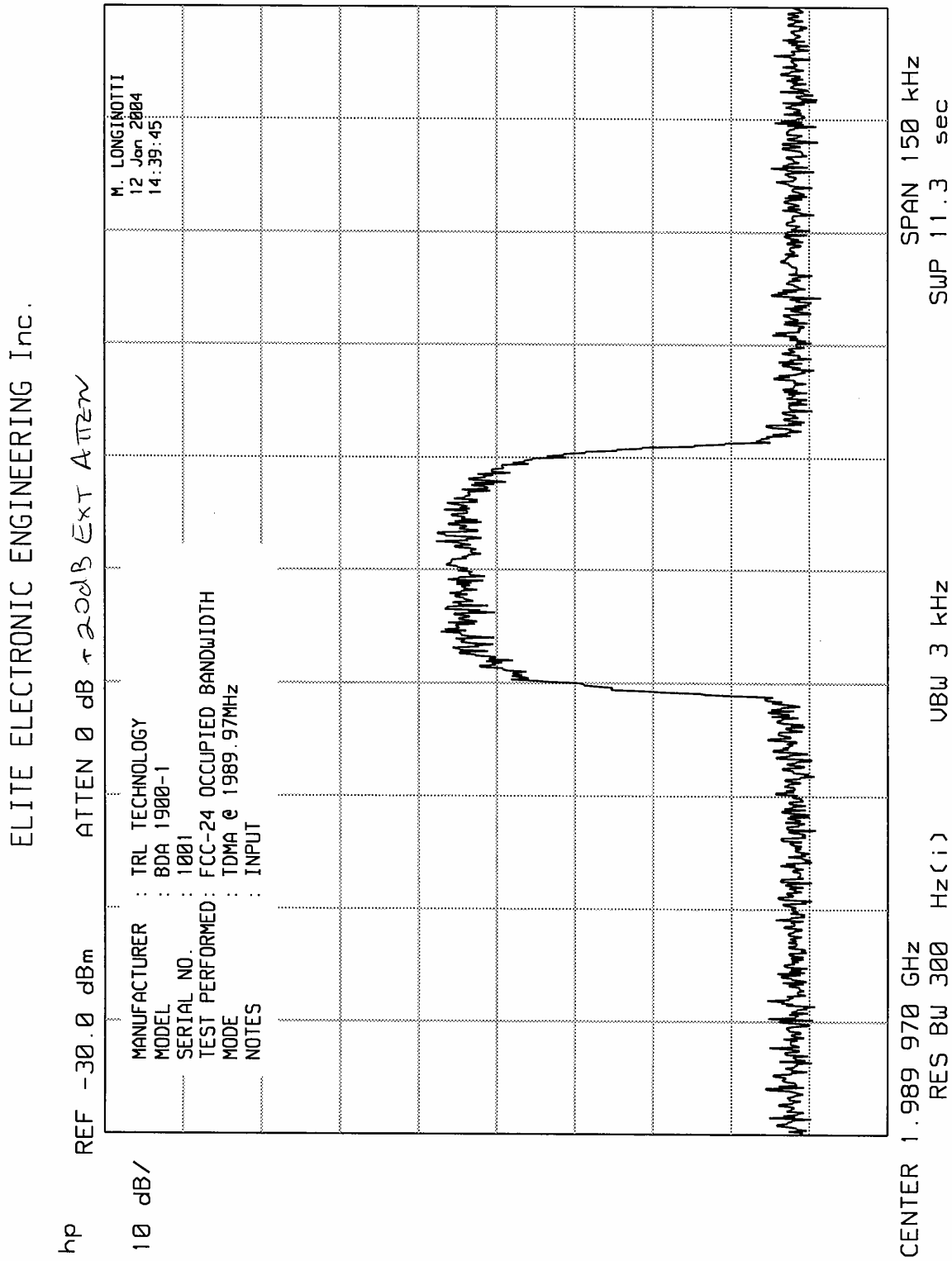

hp
10 dB/
REF -0.5 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB + 40dB Ext Atten
MKR 1.930 029 9 GHz
-37.20 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. TDMA @ 1930.03MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:06:06
CENTER 1.930 029 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 149 kHz
SWP 11.3 sec

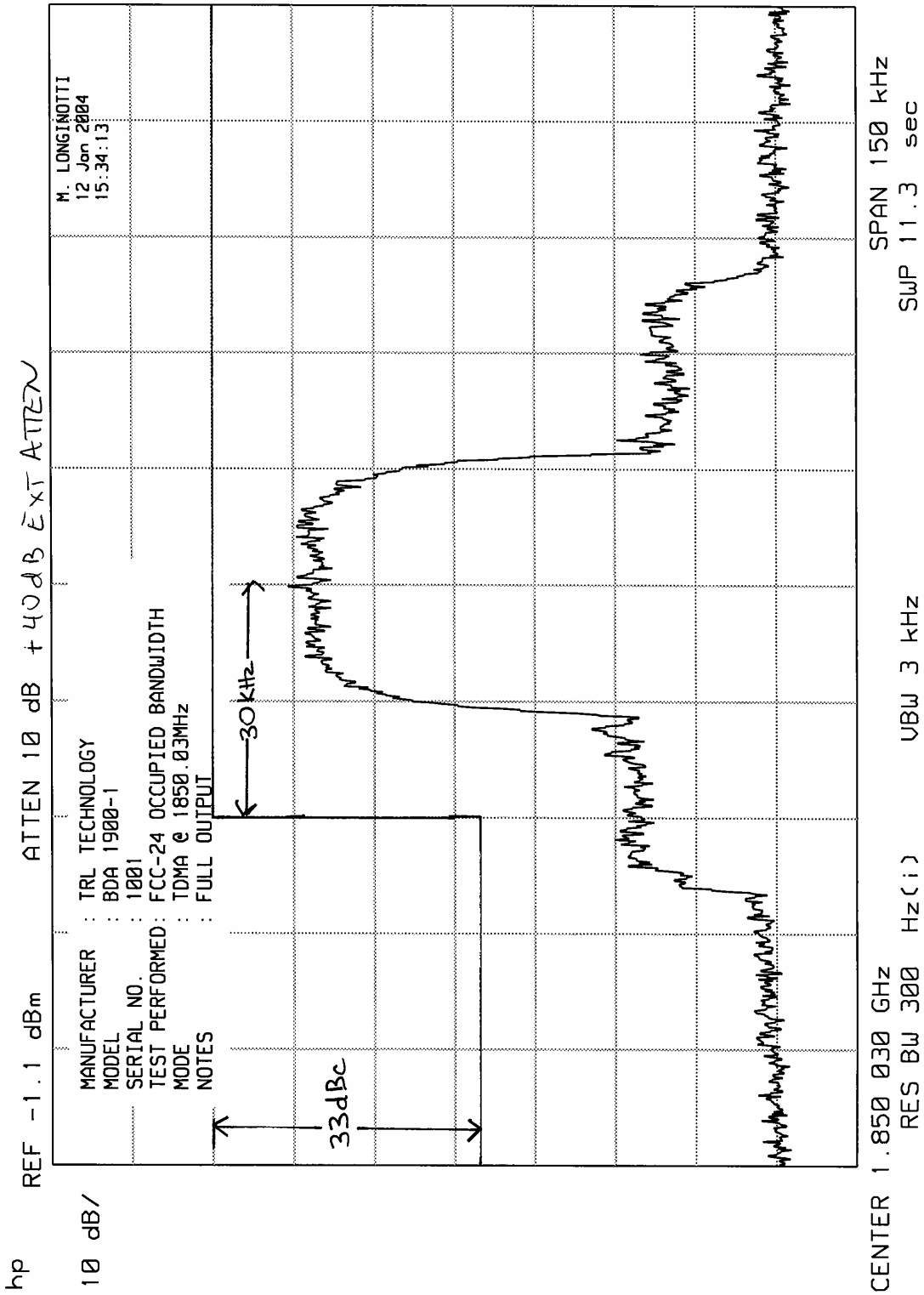

hp
10 dB/
REF -3.4 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB + 40dB Ext Atten
MKR 1.989 969 9 GHz
-38.20 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. TDMA @ 1989.97MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:31:06
CENTER 1.989 970 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SWP 11.3 sec
SPAN 150 kHz

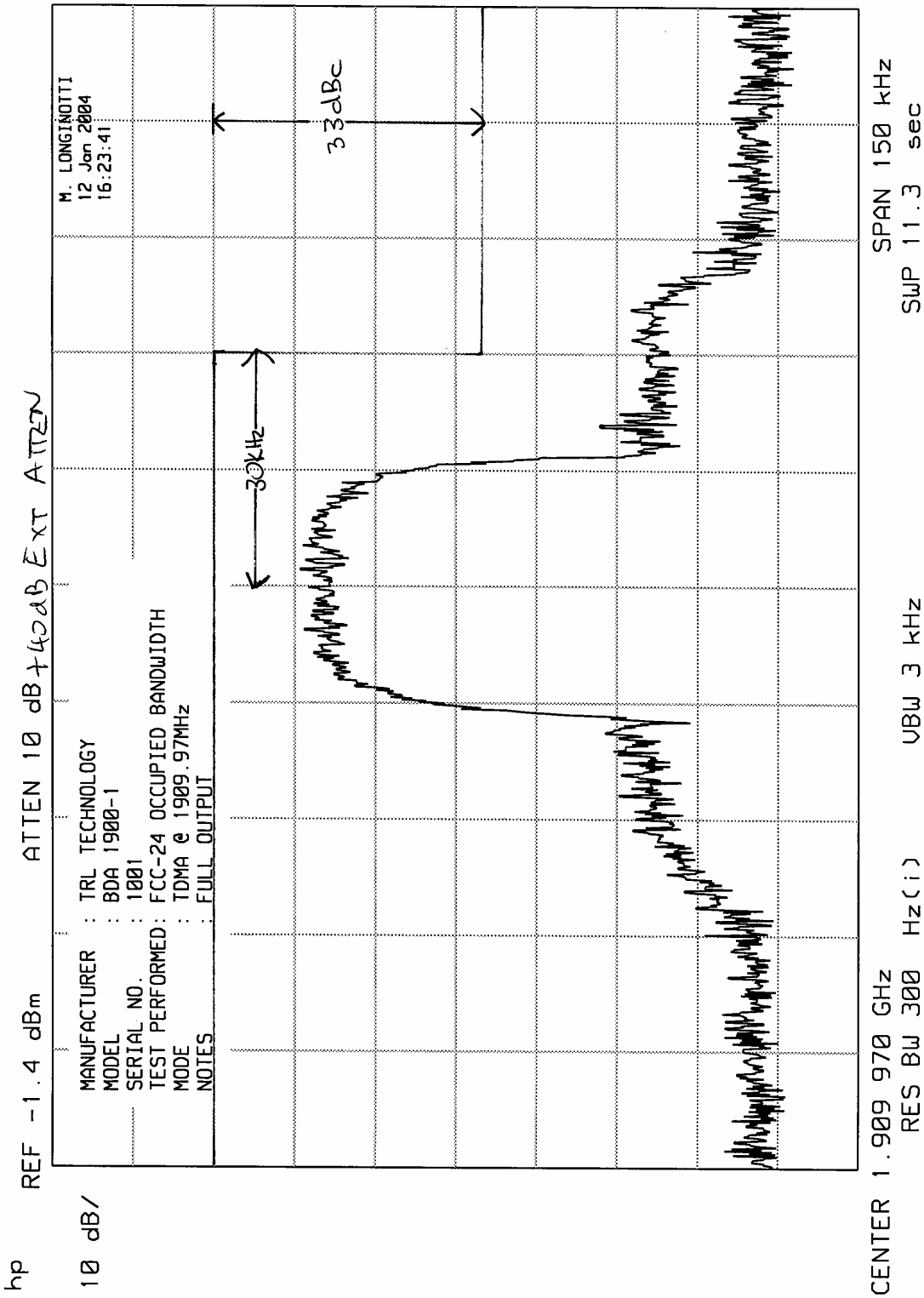

hp
REF -30.0 dBm
ATTEN 0 dB + 30dB Ext Atten
10 dB/
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1850.03MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:12:29
CENTER 1.850 030 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 150 kHz
SWP 11.3 sec

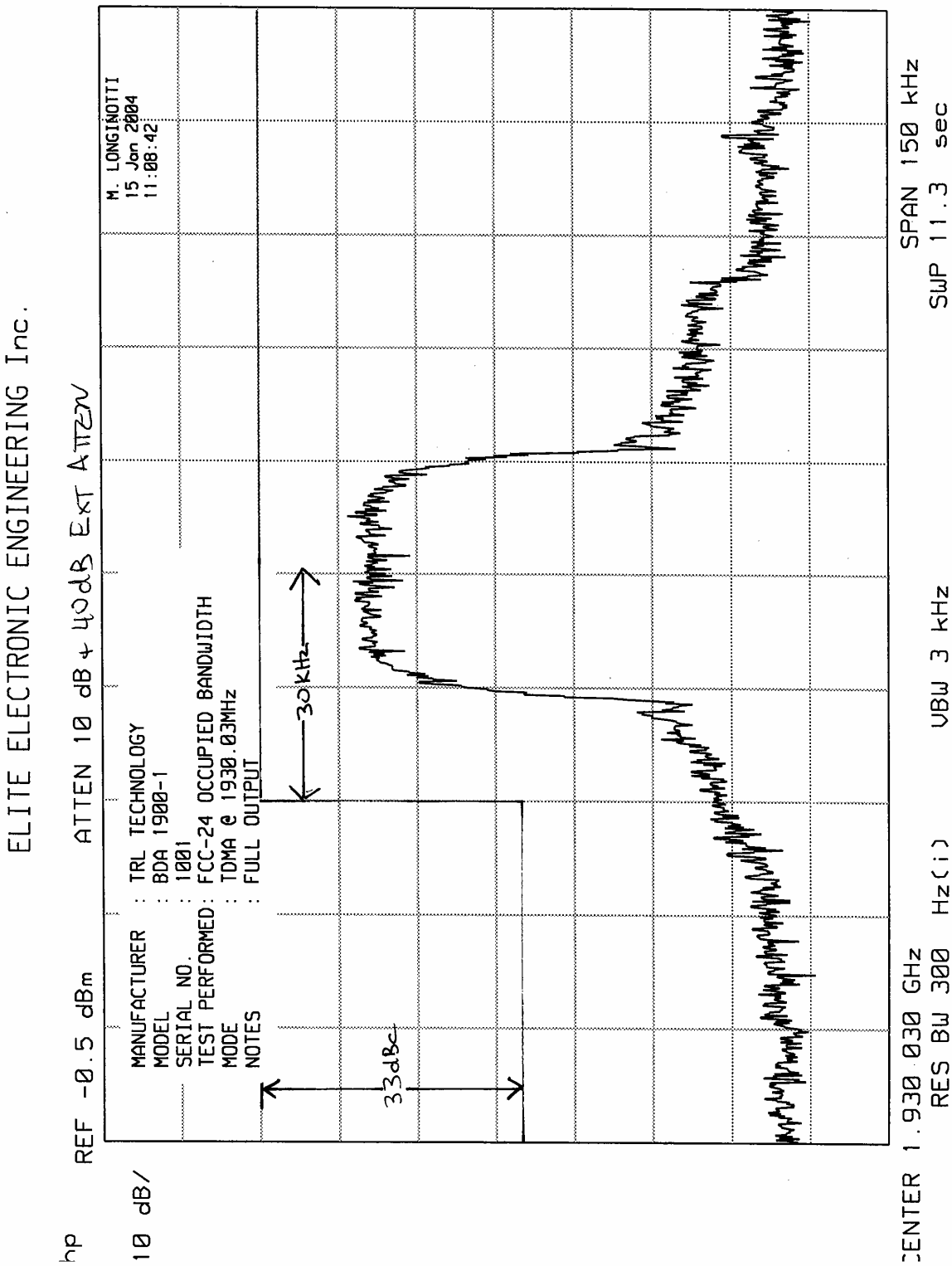

hp
10 dB/
REF -30.0 dBm
ATTEN 0 dB + 20dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED : FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1909.97MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:17:52
CENTER 1.909 970 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 150 kHz
SWP 11.3 sec

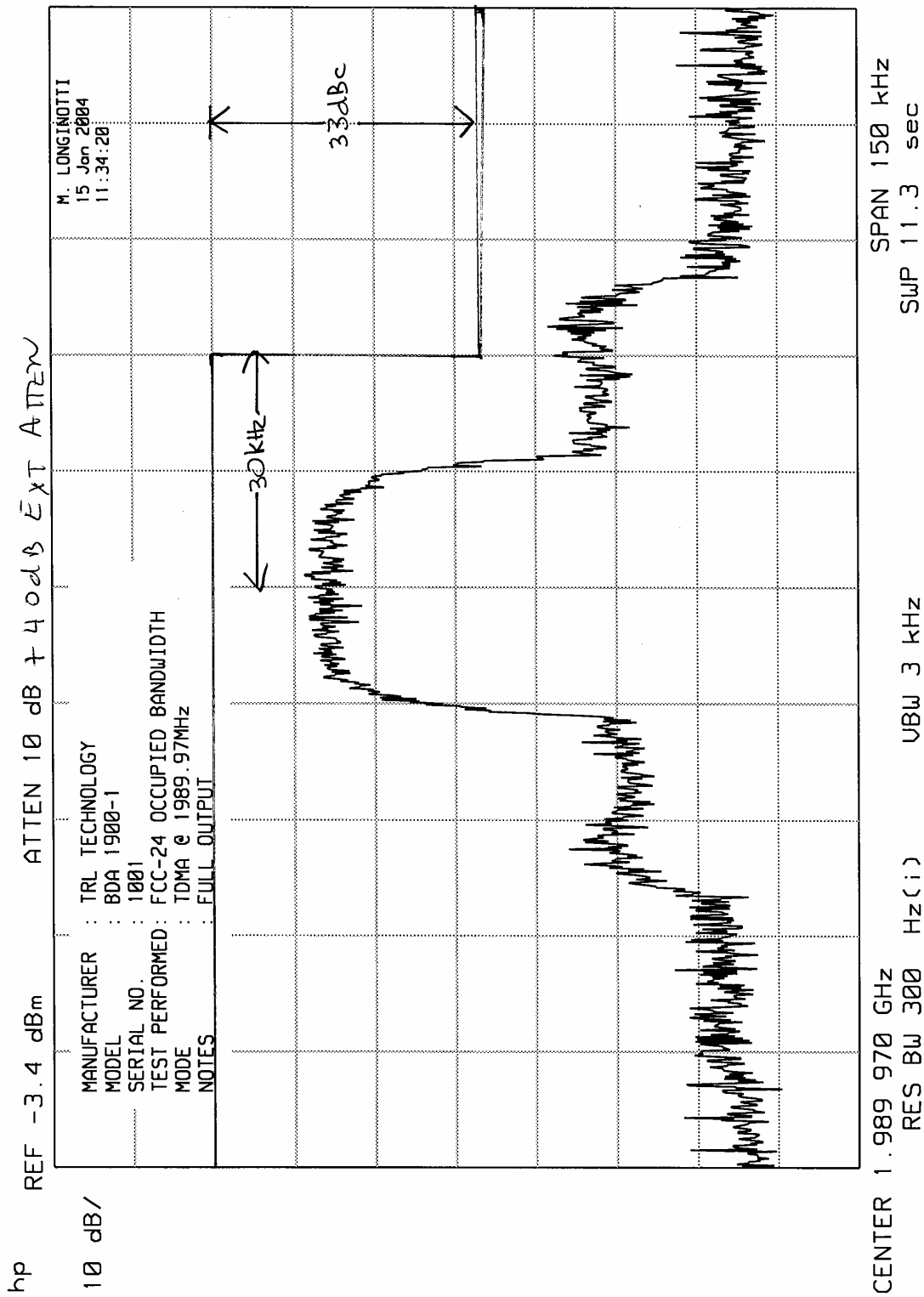

hp
10 dB/
REF -30.0 dBm
ATTEN 0 dB + 20dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1930.03MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:36:33
CENTER 1.930 030 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 150 kHz
SWP 11.3 sec

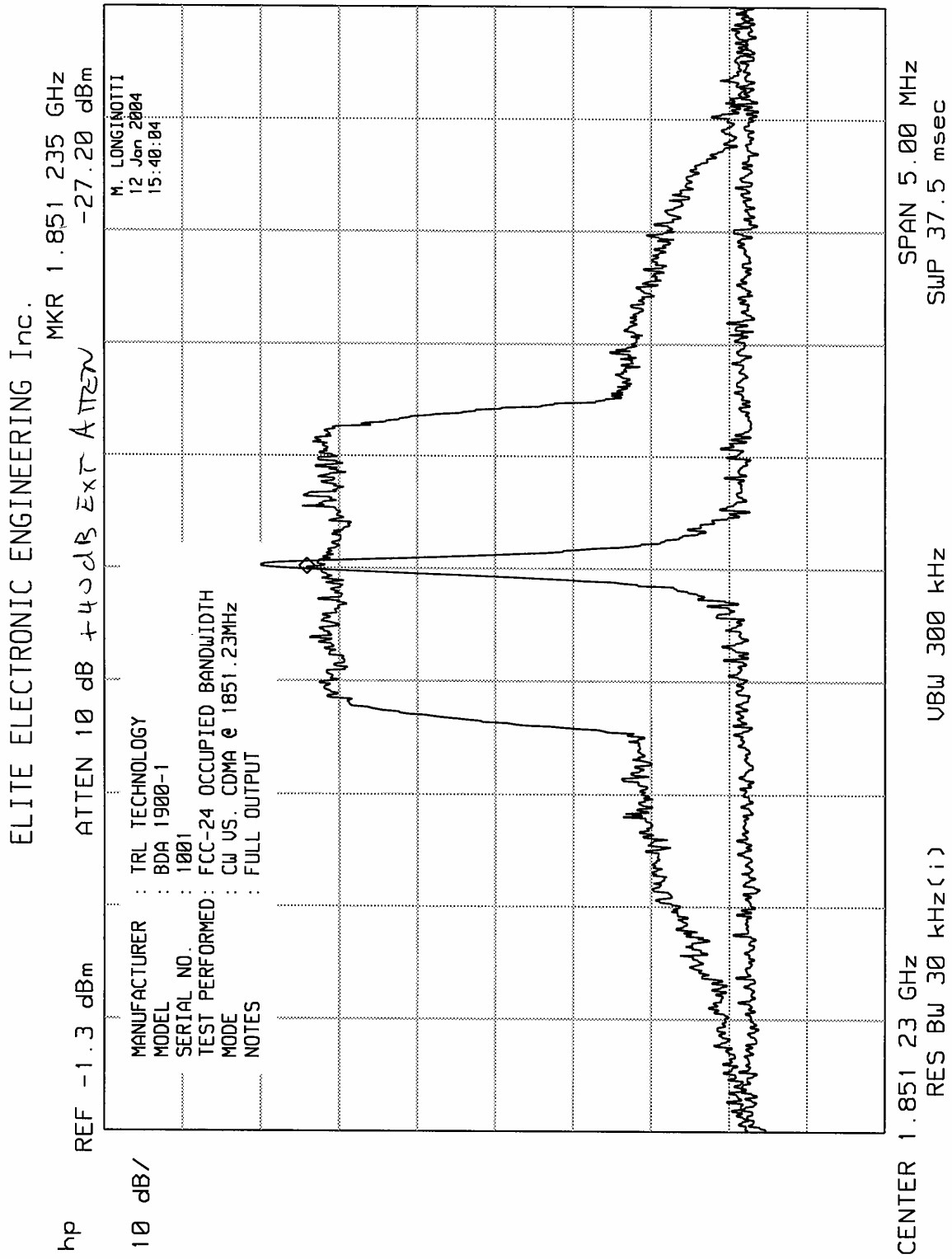

hp
10 dB/
REF -30.0 dBm
ATTEN 0 dB + 20dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1989.97MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:39:45
CENTER 1.989 970 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SPAN 150 kHz
SWP 11.3 sec

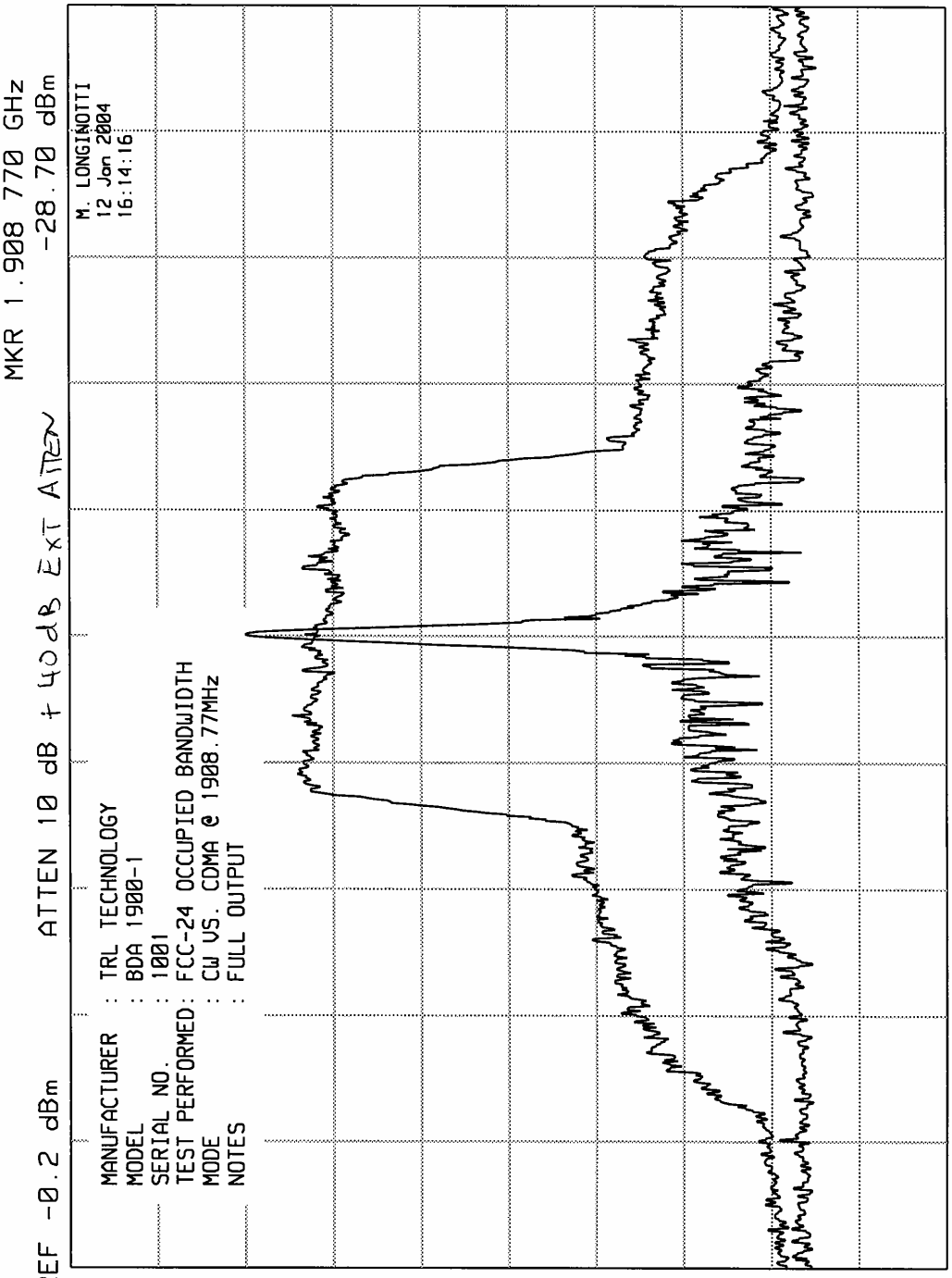

hp
10 dB/
REF -1.1 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB +40dB EXT ATTEN
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1850.03MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
12 Jan 2004
15:34:13
30kHz
33dBc
CENTER 1.850 030 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SWP 11.3 sec
SPAN 150 kHz

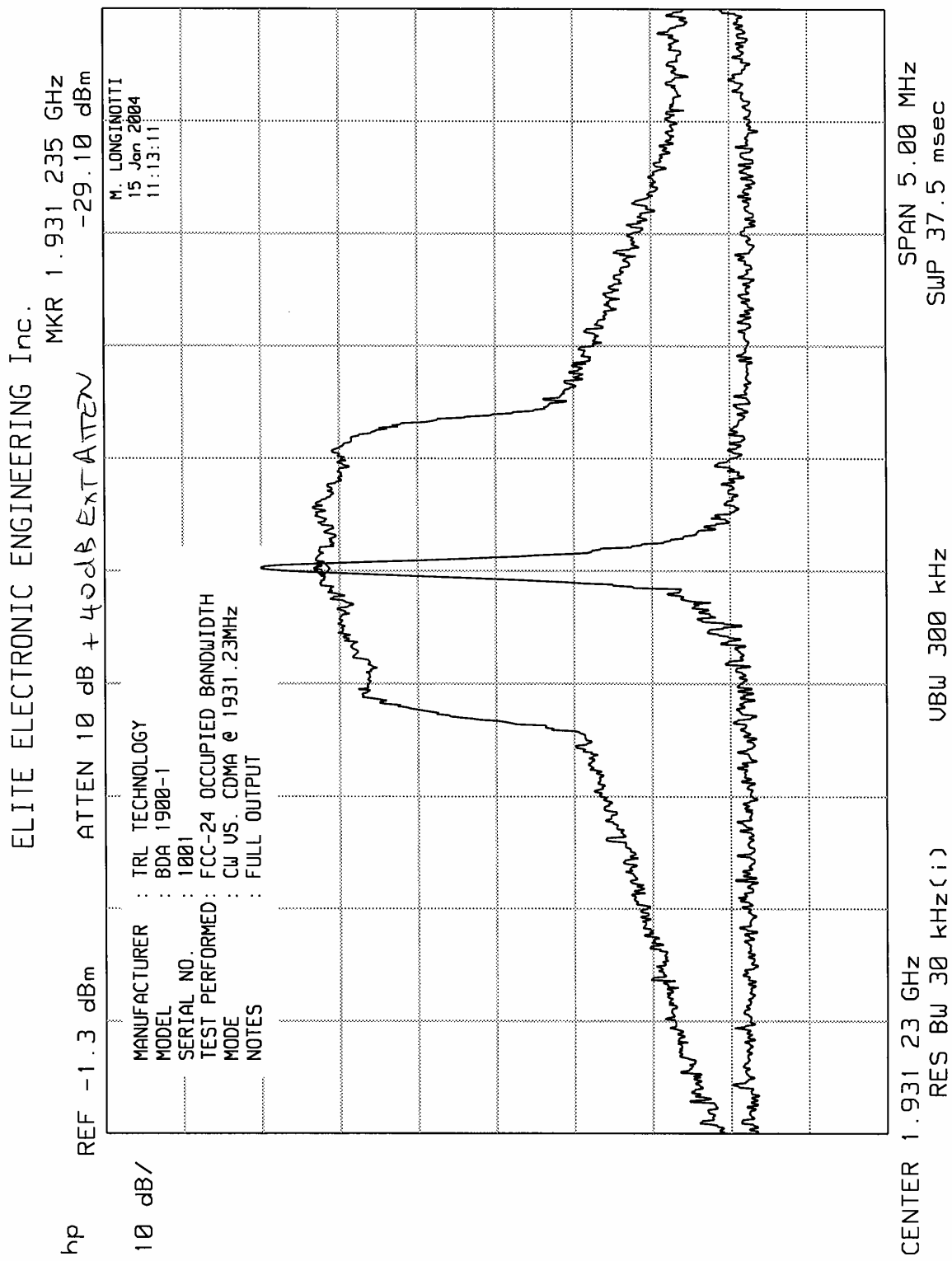

hp
10 dB/
REF -1.4 dBm
ATTEN 10 dB+40dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1909.97MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
12 Jan 2004
16:23:41
33dBc
30kHz
CENTER 1.909 970 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SWP 11.3 sec
SPAN 150 kHz

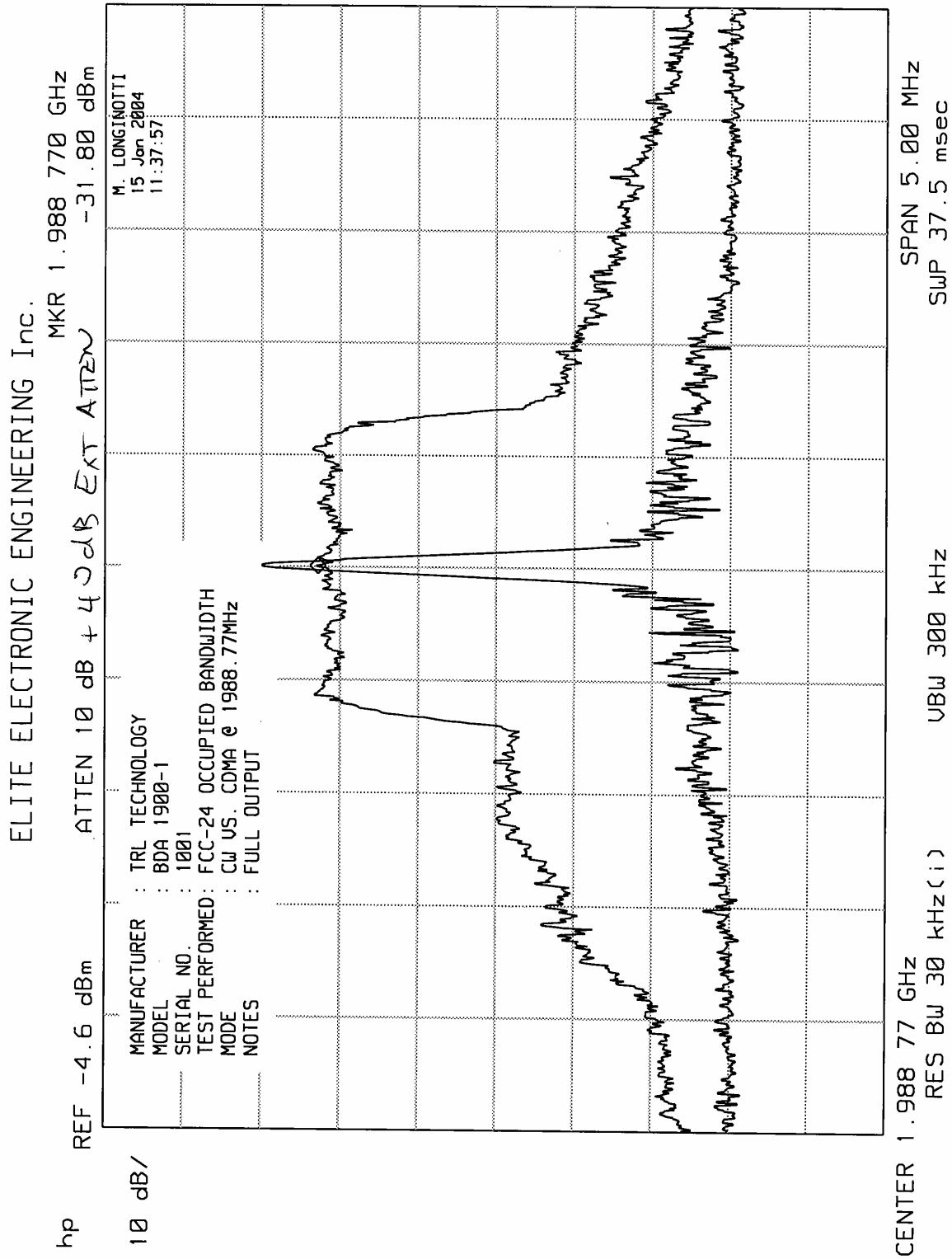

hp
10 dB/
REF -0.5 dBm
ATTEN 10 dB + 40dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED : FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1930.03MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:08:42
30kHz
33dBc
CENTER 1.930 030 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SWP 11.3 sec
SPAN 150 kHz

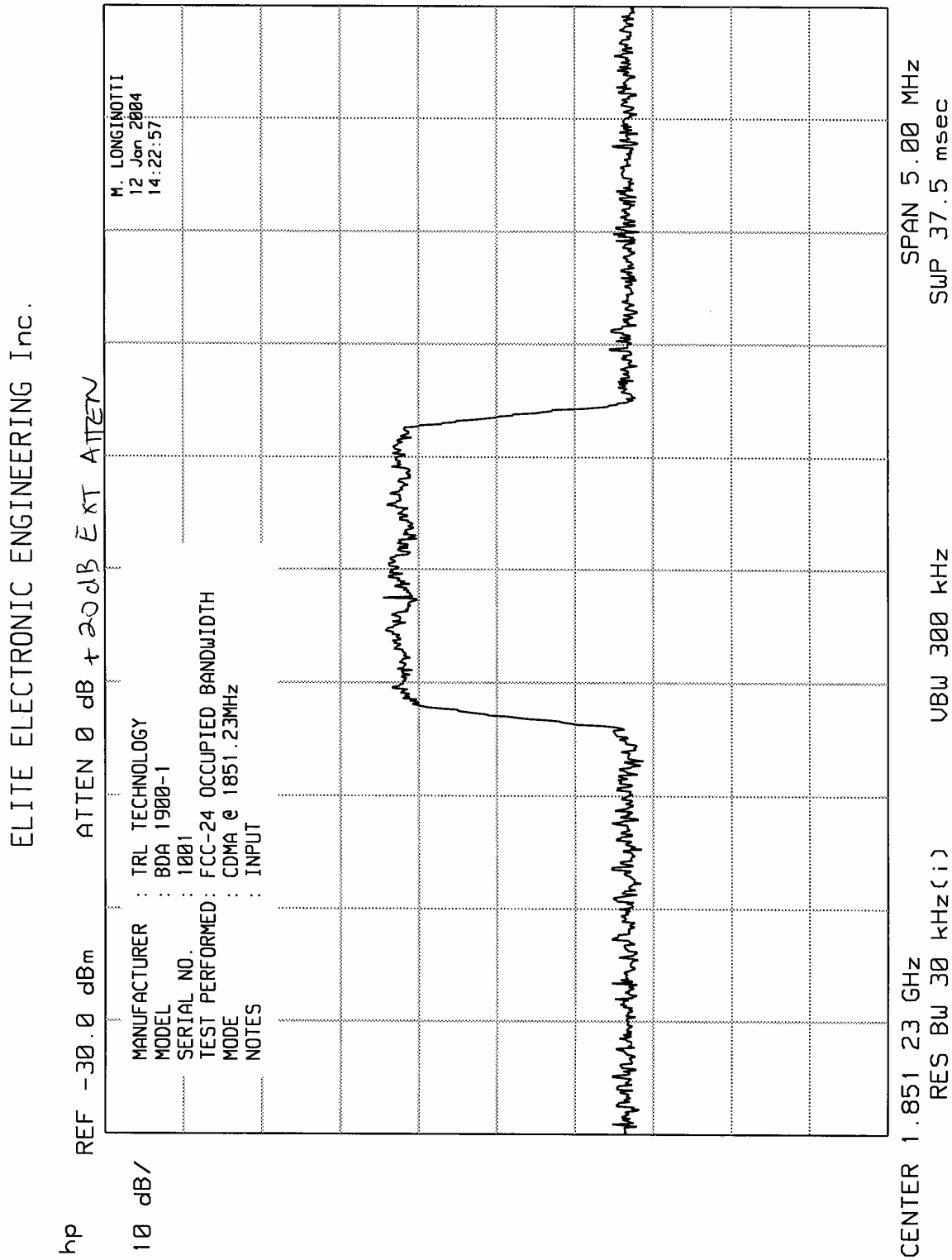

hp
10 dB/
REF -3.4 dBm
ATTEN 10 dB + 40dB EXT ATTEN
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : TDMA @ 1989.97MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:34:28
33dBc
30kHz
CENTER 1.989 970 GHz
RES BW 300 Hz(i)
VBW 3 kHz
SWP 11.3 sec
SPAN 150 kHz

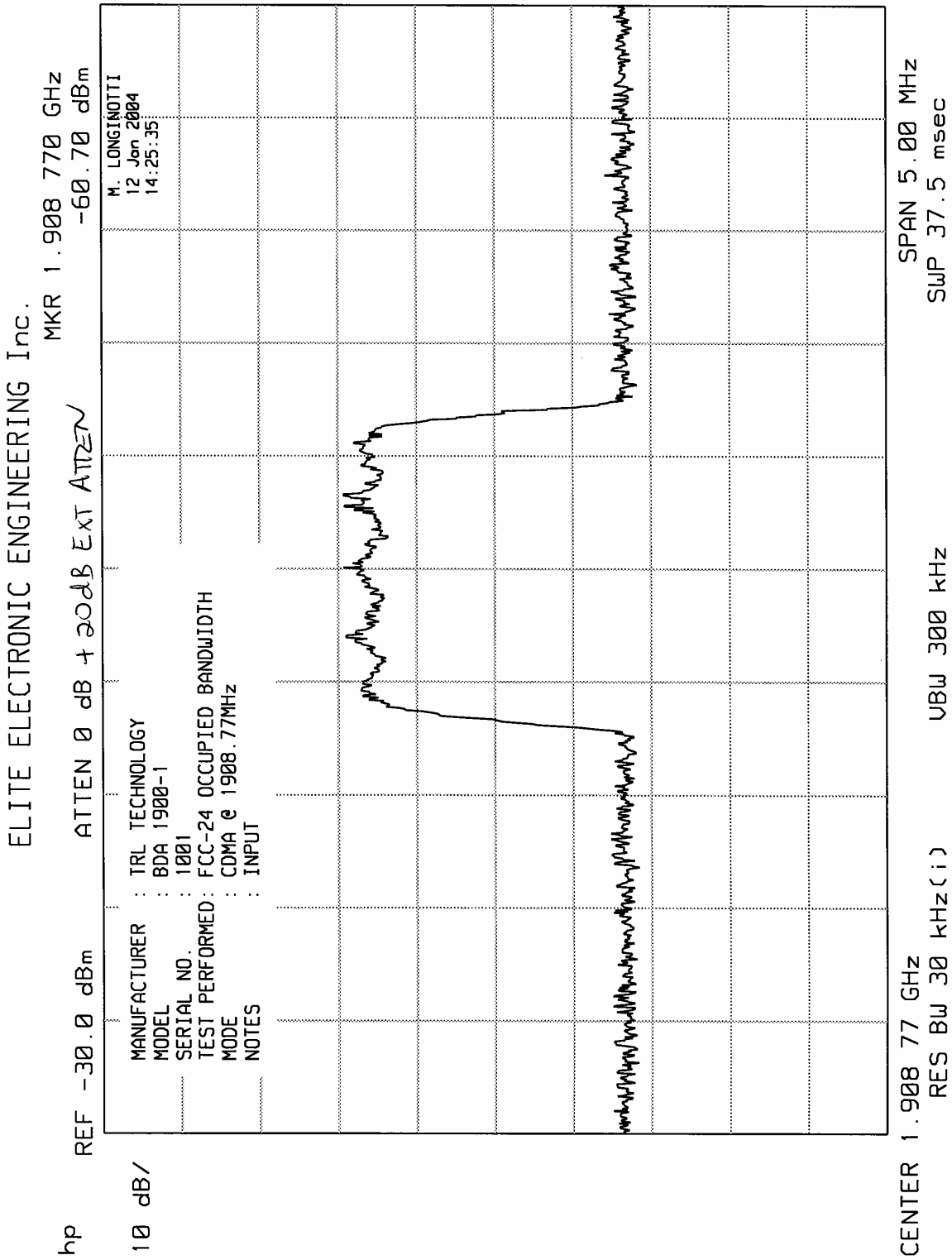

hp
10 dB/
REF -1.3 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB +40dB Ext Atten
MKR 1.851 235 GHz
-27.20 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. CDMA @ 1851.23MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
12 Jan 2004
15:40:04
CENTER 1.851 23 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

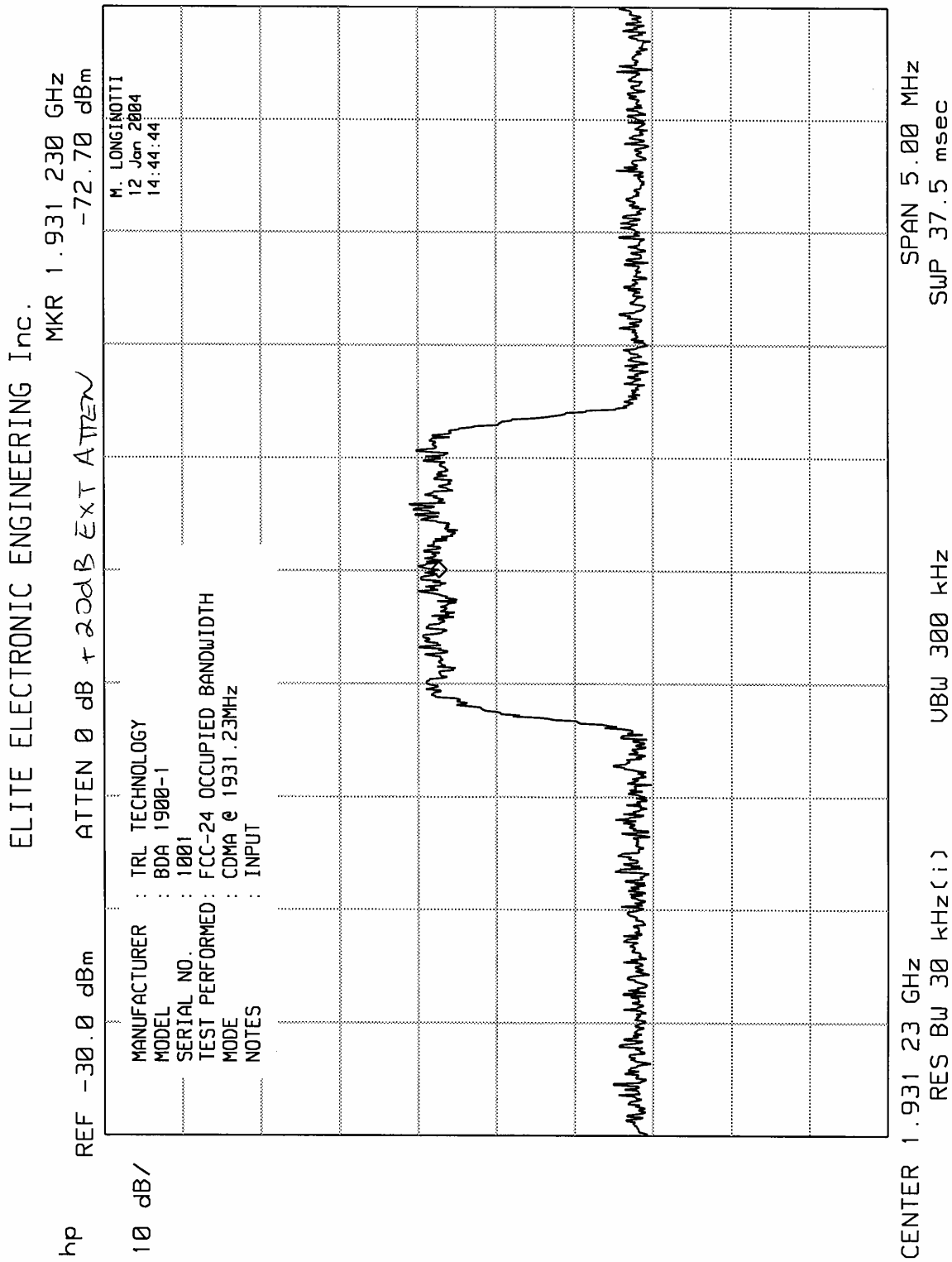

hp
10 dB/
REF -0.2 dBm
ATTEN 10 dB + 40dB Ext Atten
ELITE ELECTRONIC ENGINEERING Inc.
MKR 1.908 770 GHz
-28.70 dBm
M. LONGINOTTI
12 Jan 2004
16:14:16
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. CDMA @ 1908.77MHz
NOTES : FULL OUTPUT
CENTER 1.908 77 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

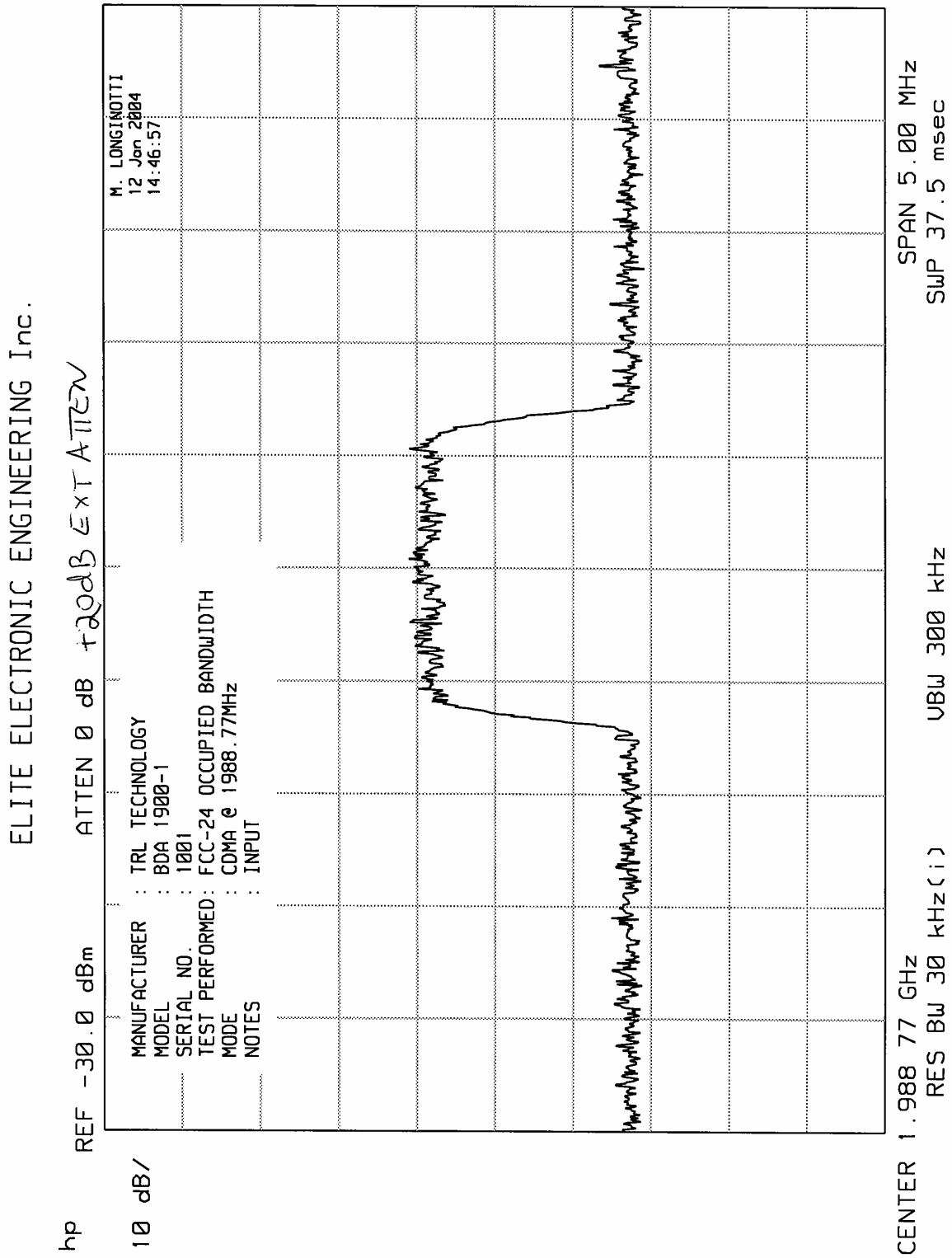

hp
10 dB/
REF -1.3 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB + 40dB EXT ATTEN
MKR 1.931 235 GHz
-29.10 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. CDMA @ 1931.23MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:13:11
CENTER 1.931 23 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

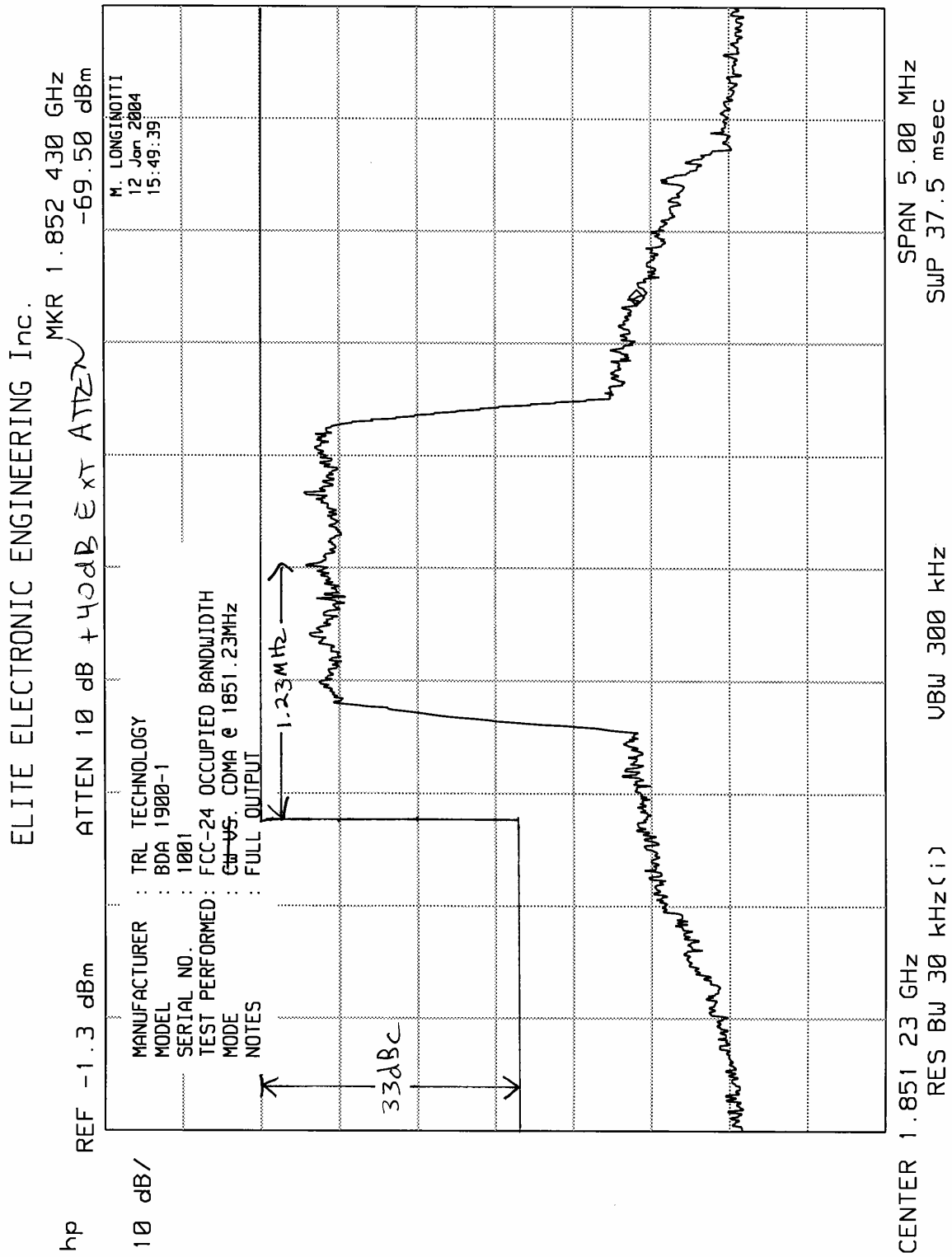

hp
10 dB/
REF -4.6 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB + 45dB Ext Atten
MKR 1.988 770 GHz
-31.80 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED : FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. CDMA @ 1988.77MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:37:57
CENTER 1.988 77 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

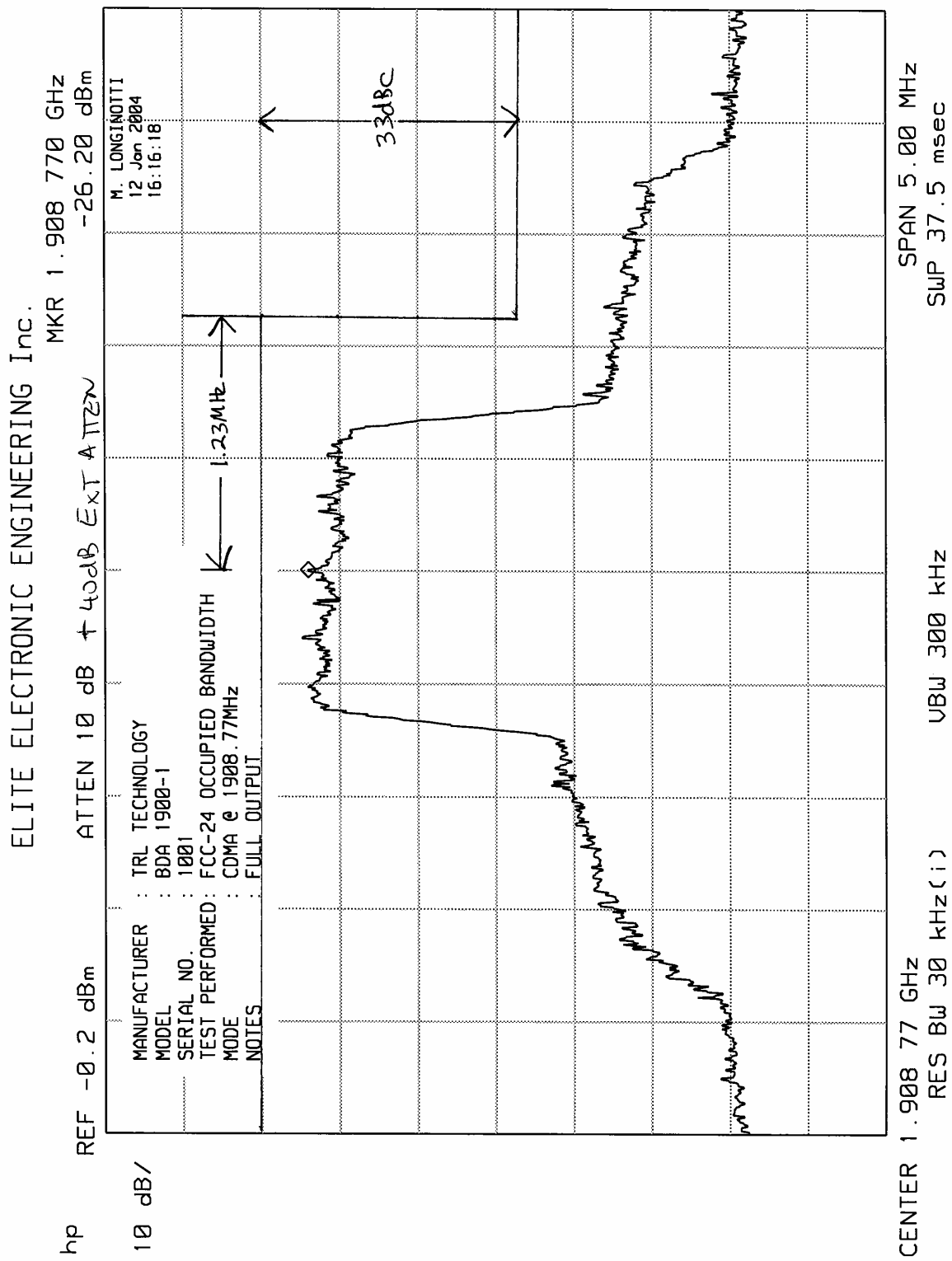

hp
10 dB/
REF -30.0 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 0 dB + 20dB EXT ATTEN
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1851.23MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:22:57
CENTER 1.851 23 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

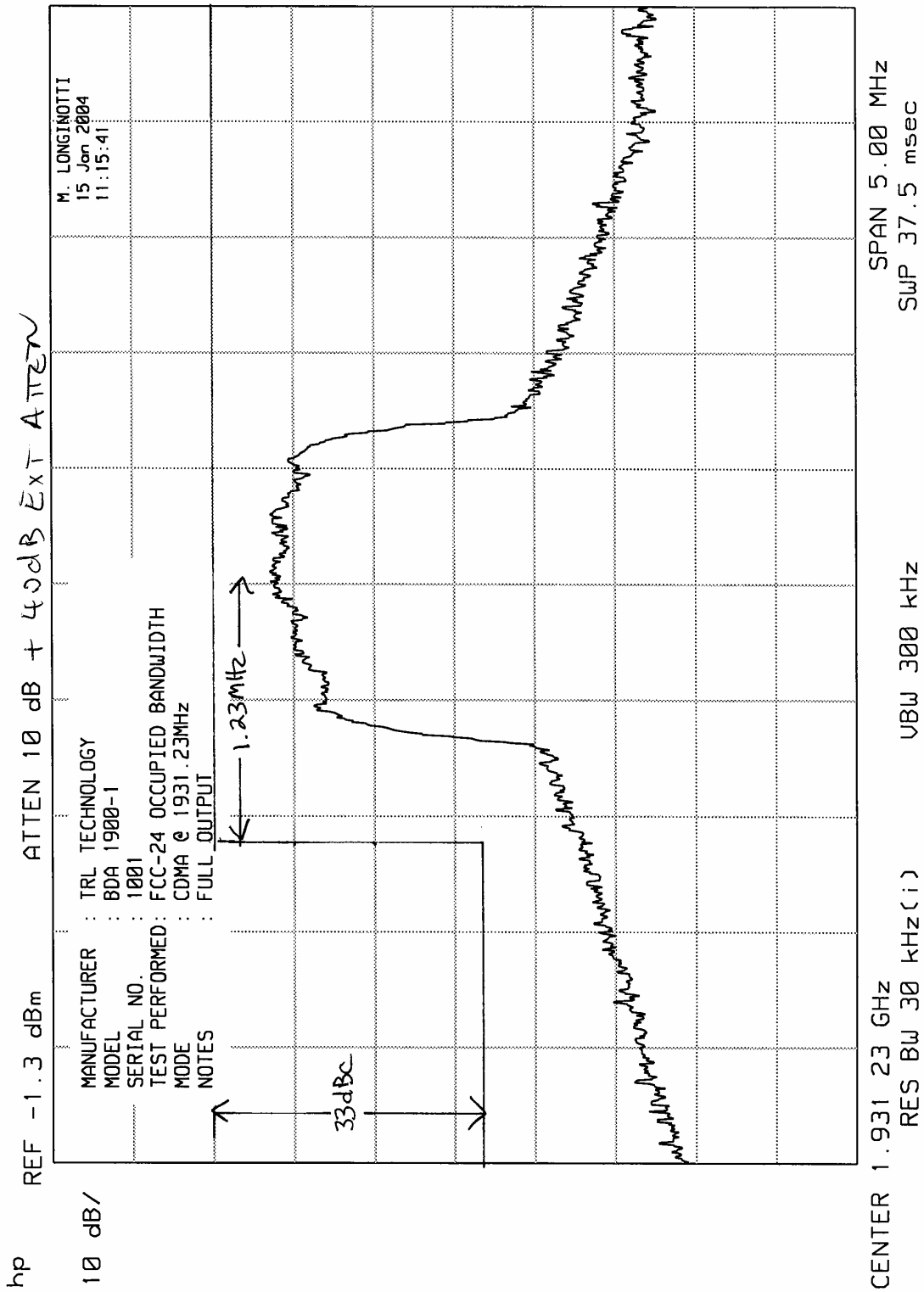

hp
10 dB/
REF -30.0 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 0 dB + 20dB EXT ATTEN
MKR 1.908 770 GHz
-60.70 dBm
M. LONGINOTTI
12 Jan 2004
14:25:35
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1908.77MHz
NOTES : INPUT
CENTER 1.908 77 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

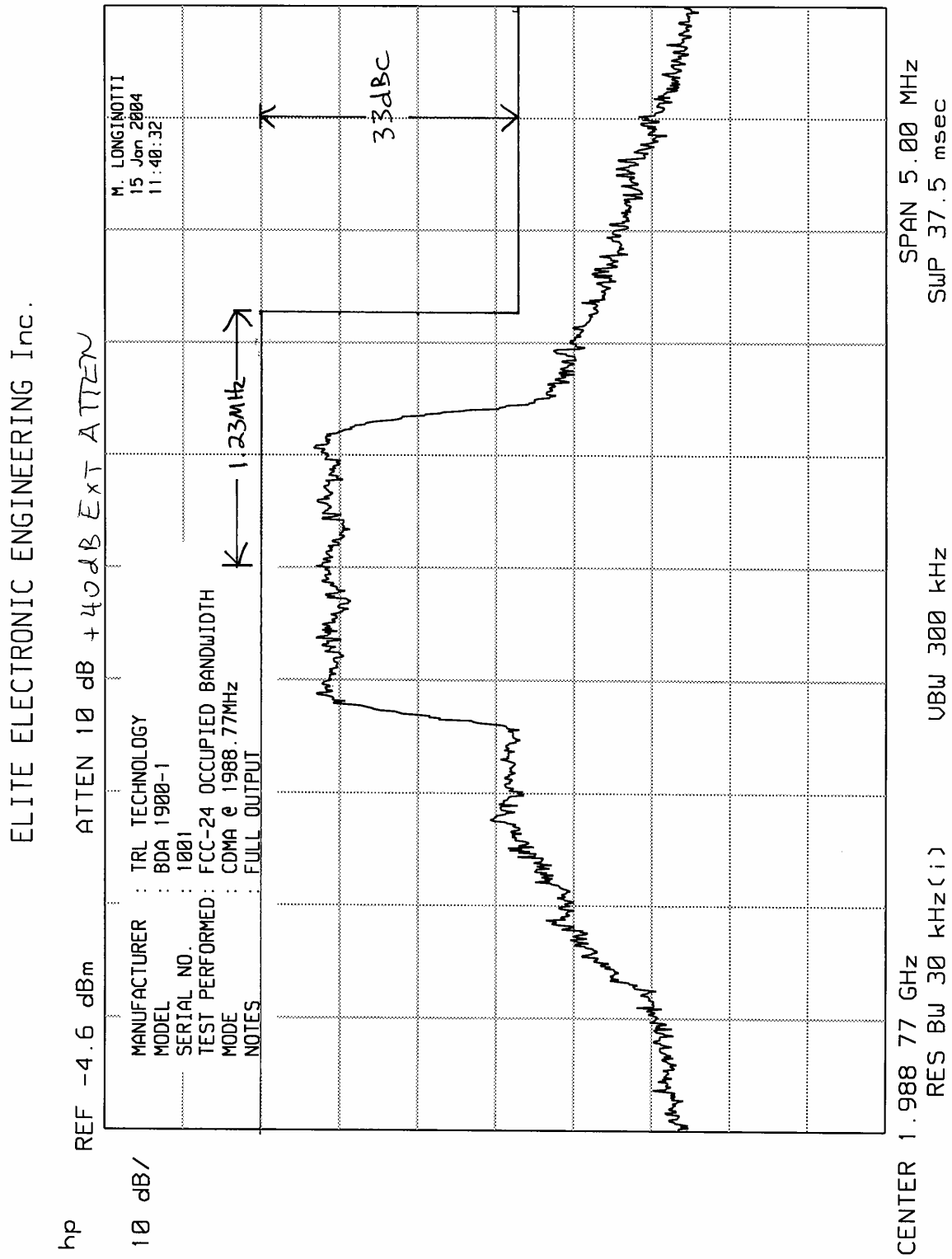

hp
10 dB/
REF -30.0 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 0 dB + 20dB EXT ATTEN
MKR 1.931 230 GHz
-72.70 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED : FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1931.23MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:44:44
CENTER 1.931 23 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

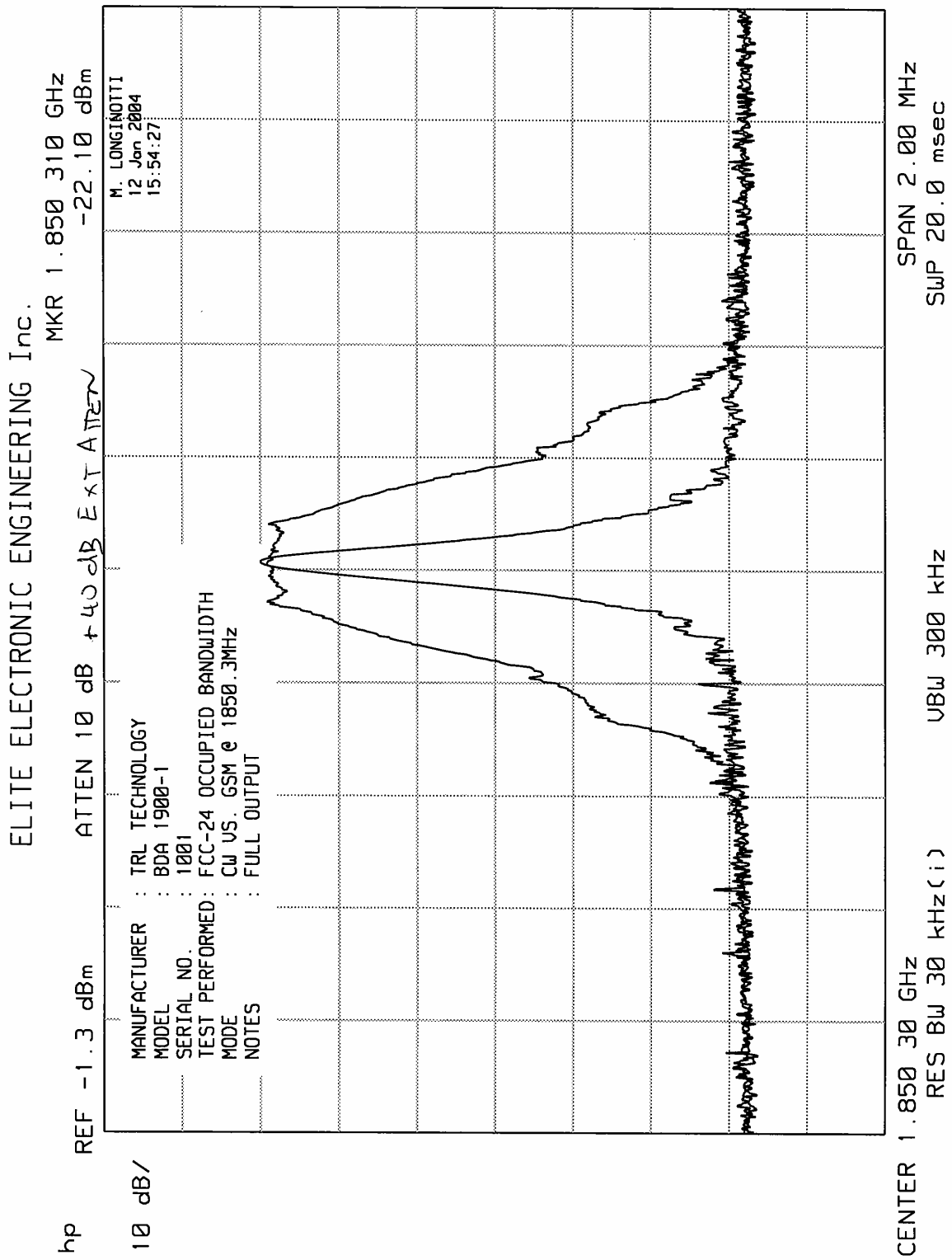

hp
10 dB/
REF -30.0 dBm
ATTEN 0 dB +20dB EXT ATTEN
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1988.77MHz
NOTES : INPUT
M. LONGINOTTI
12 Jan 2004
14:46:57
CENTER 1.988 77 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec

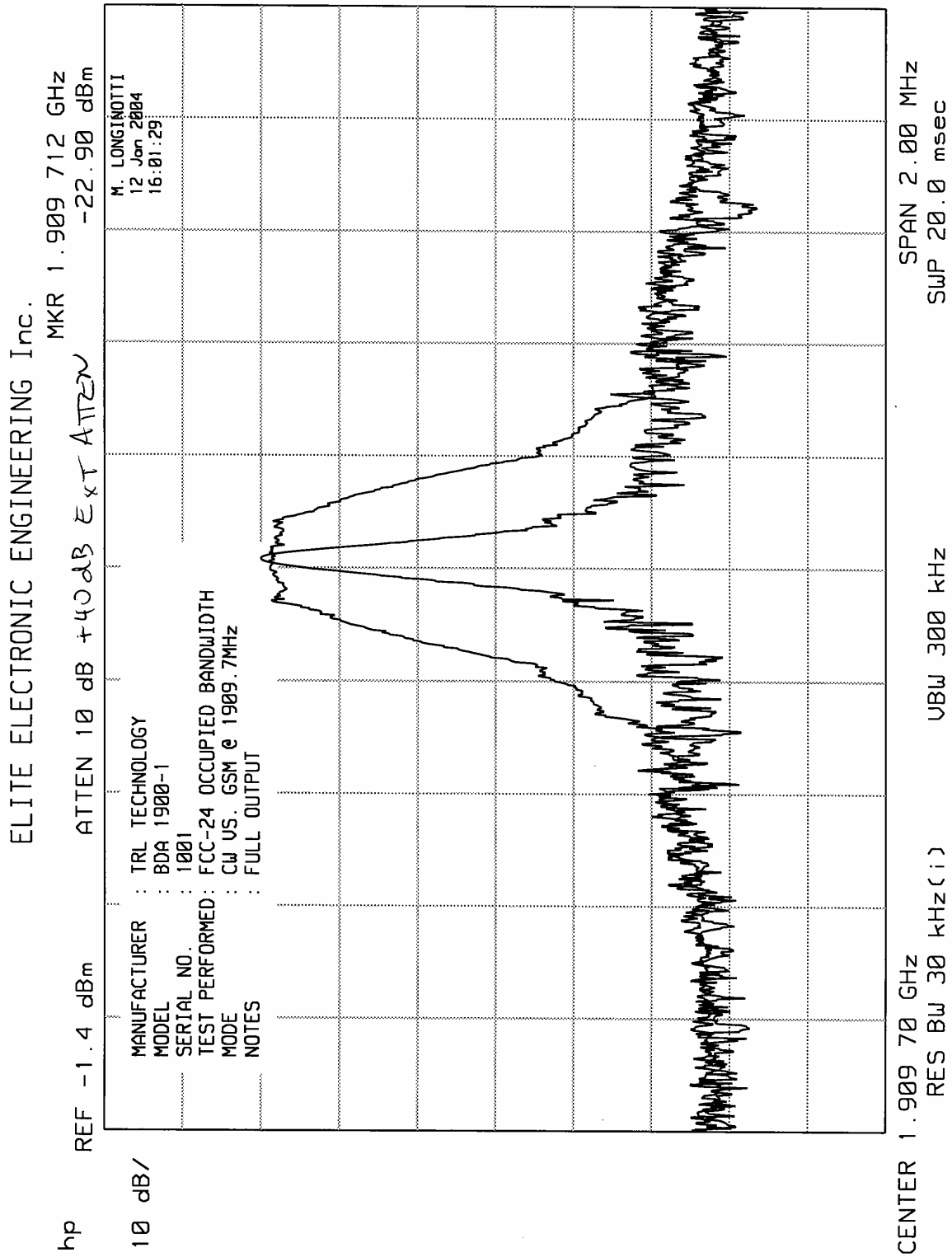

hp
10 dB/
REF -1.3 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB + 40dB Ext Atten
MKR 1.852 430 GHz
-69.50 dBm
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1851.23MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
12 Jan 2004
15:49:39
1.23MHz
33dBc
CENTER 1.851 23 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec


hp
10 dB/
REF -0.2 dBm
ATTEN 10 dB + 40dB EXT ATTEN
ELITE ELECTRONIC ENGINEERING Inc.
MKR 1.908 770 GHz
-26.20 dBm
M. LONGINOTTI
12 Jan 2004
16:16:18
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1908.77MHz
NOTES : FULL OUTPUT
1.23MHz
33dBc
CENTER 1.908 77 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec


hp
10 dB/
REF -1.3 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB + 40dB Ext Atten
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1931.23MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:15:41
1.23MHz
33dBc
CENTER 1.931 23 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec


hp
10 dB/
REF -4.6 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB +40dB Ext ATTEN
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CDMA @ 1988.77MHz
NOTES : FULL OUTPUT
M. LONGINOTTI
15 Jan 2004
11:40:32
1.23MHz
33dBc
CENTER 1.988 77 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 5.00 MHz
SWP 37.5 msec


hp
10 dB/
REF -1.3 dBm
ATTEN 10 dB +40 dB EXT ATTEN
ELITE ELECTRONIC ENGINEERING Inc.
MKR 1.850 310 GHz
-22.10 dBm
M. LONGINOTTI
12 Jan 2004
15:54:27
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. GSM @ 1850.3MHz
NOTES : FULL OUTPUT
CENTER 1.850 30 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 2.00 MHz
SWP 20.0 msec


hp
10 dB/
REF -1.4 dBm
ELITE ELECTRONIC ENGINEERING Inc.
ATTEN 10 dB +40dB Ext Atten
MKR 1.909 712 GHz
-22.90 dBm
M. LONGINOTTI
12 Jan 2004
16:01:29
MANUFACTURER : TRL TECHNOLOGY
MODEL : BDA 1900-1
SERIAL NO. : 1001
TEST PERFORMED: FCC-24 OCCUPIED BANDWIDTH
MODE : CW VS. GSM @ 1909.7MHz
NOTES : FULL OUTPUT
CENTER 1.909 70 GHz
RES BW 30 kHz(i)
VBW 300 kHz
SPAN 2.00 MHz
SWP 20.0 msec