Measurement of RF Interference from a Model CA9000 PIR Sensor Transceiver

For : Intermatic
7777 Winn Road
Spring Grove, IL 60081

P.O. No. :
Date Received : April 12, 2007
Date Tested : April 12, 2007
Test Personnel : Mark E. Longinotti
Specification : FCC "Code of Federal Regulations" Title 47
: Part 15, Subpart B, for receivers and Subpart C,
: Section 15.249 for Intentional Radiators
: Operating within the 902MHz to 928MHz band
: Industry Canada RSS-210
: Industry Canada RSS-GEN

Test Report By : MARK E. LONGINOTTI
Mark E. Longinotti

Witnessed By :
Mike Kass
Intermatic

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

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REVISION HISTORY

Revision	Date	Description
—	April 13, 2007	Initial release

Measurement of RF Emissions from a CA9000 PIR Sensor Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a PIR Sensor, Part No. CA9000, Serial No. None Assigned transceiver, (hereinafter referred to as the test item). The test item was designed to transmit at approximately 908.42MHz and receive at approximately 908.2MHz using an internal antenna. The test item was manufactured and submitted for testing by Intermatic located in Spring Grove, IL.

1.2 Purpose

The test series was performed to determine if the test item meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109, and Subpart C, Sections 15.207 and 15.249 for Intentional Radiators Operating within the 902MHz -928MHz band. Testing was performed in accordance with ANSI C63.4-2003.

1.3 Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4 EMC Laboratory 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.

1.5 Laboratory Conditions

The temperature at the time of the test was 22°C and the relative humidity was 23%.

2 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 B for Receivers, dated 1 October 2005
- ANSI C63.4-2003, "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"
- Industry Canada RSS-210, Issue 6, September 2005, “Spectrum Management and

  Telecommunications Radio Standards Specification, Low-power License-exempt radio communication devices (All Frequency Bands): Category I Equipment”
- Industry Canada RSS-GEN, Issue 1, September 2005, “Spectrum Management and Telecommunications Radio Standards Specification, General Requirements and Information for the Certification of radio communication equipment”

3 TEST ITEM SETUP AND OPERATION

3.1 General Description

The test item is a PIR Sensor, Part No. CA9000. A block diagram of the test item setup is shown as Figure 1. Photographs of the test item are shown as Figure 2.

3.1.1 Power Input

The test item could be powered by 9VDC from an external power supply, M/N: U090050D or by 4.5VDC from 3 “AA” internal batteries. The power supply was connected to the test item via a 2 meter long, 2 wire unshielded power cable. The power supply was powered with 115V, 60Hz. Each primary lead was connected through a line impedance stabilization network (LISN) which was located on the ground plane. The network complies with the requirements of Paragraph 4.1.2 of ANSI C63.4-2003.

3.1.2 Peripheral Equipment

The test item was submitted for testing with no peripheral equipment.

3.1.3 Interconnect Cables

The test item was submitted for testing with no interconnect cables.

3.1.4 Grounding

The test item was ungrounded during the test.

3.2 Operational Mode

For all tests, the test item was placed on an 80cm high non-conductive stand. The test item was energized. One of the units submitted for testing was set up so that upon power up it would receive continuously at 908.2MHz. The second unit submitted for testing was set up so that upon power up it would transmit continuously at 908.4MHz.

3.3 Test Item Modifications

No modifications were required for compliance to the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109, and Subpart C, Sections 15.207 and 15.249 requirements.

4 TEST FACILITY AND TEST INSTRUMENTATION

4.1 Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. 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 C63.4-2003 for site attenuation.

4.2 Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

Conducted emission tests were performed with a spectrum analyzer in conjunction with a quasi-peak adapter.

Radiated emissions were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths specified by the FCC and with the quasi-peak detector function.

4.3 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).

4.4 Measurement Uncertainty

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

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

The measurement uncertainty for these tests is presented below:

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

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

5 TEST PROCEDURES

5.1 Powerline Conducted Emissions

5.1.1 Receiver

5.1.1.1 Requirements

Per 15.107(a), all radio frequency voltages on the power lines of a receiver shall be below the values shown below when using a quasi-peak detector:

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* - Decreases with the logarithm of the frequency
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.

5.1.1.2 Procedures

The interference on each power lead 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 150 kHz 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.

5.1.1.3 Results

As can be seen from the data, all emissions measured from the test item were within the specification limits. The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 18 and 19. The conducted limit for intentional radiators is shown as a reference. The final quasi-peak results are presented on pages 20 and 21.

The emissions level closest to the limit (worst case) occurred at 381 kHz. The emissions level at this frequency was 12.1dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.1.2 Transmitter

5.1.2.1 Requirements

Per 15.207(a), all radio frequency voltages on the power lines of a transmitter shall be below the values shown below when using a quasi-peak detector:

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 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.

5.1.2.2 Procedures

The interference on each power lead 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 150 kHz 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.

5.1.2.3 Results

As can be seen from the data, all emissions measured from the test item were within the specification limits. The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 22 and 23. The

conducted limit for intentional radiators is shown as a reference. The final quasi-peak results are presented on pages 24 and 25.

The emissions level closest to the limit (worst case) occurred at 353 kHz. The emissions level at this frequency was 12.1dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.2 Radiated Measurements

5.2.1 Receiver

5.2.1.1 Requirements

All emanations from a receiver shall be below the levels shown on the following table:

Frequency MHz	Distance between Test Item And Antenna in Meters	Field Strength uV/m	Field Strength dBuV/m
30-88	3	100	40
88-216	3	150	43.5
216-960	3	200	46
Above 960	3	500	54

Note: The tighter limit shall apply at the edge between the two frequency bands.

5.2.1.2 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 2003 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.

Since quasi-peak and average measurements require long integration times, it is not practical to automatically sweep through the quasi-peak or average levels. Therefore, radiated emissions from the test item were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak or average detector.

For preliminary radiated emissions sweeps from 30MHz to 5GHz, 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 below 1GHz and the double-ridged waveguide antenna above 1GHz. The maximum levels were plotted.

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

1) Measurements below 1GHz were made using a quasi-peak detector and a bilog antenna. Measurements above 1GHz were made using an average detector and a double ridged waveguide antenna.

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

a. The test item was rotated so that all of its sides were exposed to the receiving antenna.

b. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

c. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

5.2.1.3 Results

The preliminary plots, with the test item AC Powered, are presented on pages 26 and 27. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on page 28. As can be seen from the data, all emissions measured from the test item were within the specification limits for receivers. The emissions level closet to the limit (worst case) occurred at 1816.4MHz. The emissions level at this frequency was 21.3dB within the limit. Photographs of the test configuration are shown on Figure 4.

The preliminary plots, with the test item DC Powered, are presented on pages 29 and 30. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on page 31. As can be seen from the data, all emissions measured from the test item were within the specification limits for receivers. The emissions level closet to the limit (worst case) occurred at 1816.4MHz. The emissions level at this frequency was 16.4dB within the limit. Photographs of the test configuration are shown on Figure 4.

5.2.2 Transmitter

5.2.2.1 Requirements

The test item must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.205 et seq. Paragraph 15.249(a) has the following radiated emission limits:

Fundamental Frequency MHz	Field Intensity mV/m @ 3 meter	Field Strength of Harmonics and Spurious uV/m @ 3 meter
902 to 928	50	500

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

5.2.2.2 Procedures

All measurements were 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 floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2003 for site attenuation.

A preliminary radiated emissions test was performed to determine the emission characteristics of the test item. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the test item. The entire frequency range from 30MHz to 9.1GHz was investigated using a peak detector function. The data was then processed by the computer to calculate equivalent field intensity.

The final emission tests were then manually performed over the frequency range of 30MHz to 9.1GHz. Between 30MHz and 1000MHz, a tuned dipole antenna was used as the pick-up device. A broadband double ridged waveguide antenna was used as the pick-up device for all frequencies above 1GHz. All significant broadband and narrowband signals were measured and recorded.

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

1) The test item was rotated so that all of its sides were exposed to the receiving antenna.

2) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

3) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

5.2.2.3 Results

The preliminary plots, with the test item transmitting at 908.4MHz and AC Powered, are presented on data pages 32 and 33. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels, with the test item transmitting at 908.4MHz and AC Powered, are presented on data page 34. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closet to the limit (worst case) occurred at 908.4MHz. The emissions level at this frequency was 12.1dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 5.

The preliminary plots, with the test item transmitting at 908.4MHz and DC Powered, are presented on data pages 35 and 36. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels, with the test item transmitting at 908.4MHz and DC Powered, are presented on data page 37. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closet to the limit (worst case) occurred at 908.4MHz. The emissions level at this frequency was 13.7dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 5.

5.3 Occupied Bandwidth Measurements

5.3.1 Requirements

In accordance with paragraph 15.249(d), all emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuate by at least 50dB below the level of the fundamental or to the general radiated emissions limits in 15.209, which ever is the lesser attenuation.

5.3.2 Procedure

The test item was placed on an 80cm high non-conductive stand. The unit was set to transmit continuously. With an antenna positioned nearby, occupied bandwidth emissions were displayed on the spectrum analyzer. The resolution bandwidth was set to 100 kHz and span was set to 30 MHz. The frequency spectrum near the fundamental was plotted.

5.3.3 Results

The plots of the emissions near the fundamental frequency are presented on data pages 38and 39. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

The 99% bandwidth was measured to be 130 kHz.

6 OTHER TEST CONDITIONS

6.1 Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated. The test series was witnessed by Intermatic personnel.

6.2 Disposition of the Test Item

The test item and all associated equipment were returned to Intermatic upon completion of the tests.

7 CONCLUSIONS

It was determined that the Intermatic PIR Sensor, Part No. CA9000, Serial No. None Assigned, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109 for receivers, and Subpart C, Sections 15.207 and 15.249 for Intentional Radiators Operating within the 902MHz -928MHz band, when tested per ANSI C63.4-2003.

8 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 *as operated by Intermatic 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.

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

9 EQUIPMENT LIST

Table 9-1 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								
XPQ3	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T	4	1.8GHZ-10GHZ		12	
XZG4	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2223A01683	---		N/A	
Equipment Type: AMPLIFIERS								
APK4	PREAMPLIFIER OPT H02	HEWLETT PACKARD	8449B	3008A00329	1-26.5GHZ	03/12/07	12	03/12/08
Equipment Type: ANTENNAS								
NDQ1	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	313	400-1000MHZ	03/28/07	12	03/28/08
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	08/21/06	12	08/21/07
NWF0	RIDGED WAVE GUIDE	EMCO	3105	2035	1-12.4GHZ	10/09/06	12	10/09/07
Equipment Type: ATTENUATORS								
T1EA	10DB, 25W ATTENUATOR	WEINSCHEL	46-10-34	BN2316	DC-18GHZ	03/22/07	12	03/22/08
Equipment Type: CONTROLLERS								
CDS2	COMPUTER	GATEWAY	MFATXPNT NMZ	0028483108	1.8GHZ		N/A	
Equipment Type: PROBES; CLAMP-ON & LISNS								
PLL9	50UH LISN 462D	ELITE	462D/70A	010	0.01-400MHZ	03/08/07	12	03/08/08
PLLA	50UH LISN 462D	ELITE	462D/70A	011	0.01-400MHZ	03/08/07	12	03/08/08
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061052	---		N/A	
Equipment Type: RECEIVERS								
RACA	RF PRESELECTOR	HEWLETT PACKARD	85685A	2926A00980	20HZ-2GHZ	02/16/07	12	02/16/08
RAEC	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	3014A06690	100HZ-22GHZ	02/16/07	12	02/16/08
RAF5	QUASIPEAK ADAPTOR W/ RECEI	HEWLETT PACKARD	85650A	2043A00151	0.01-1000MHZ	02/16/07	12	02/16/08

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.

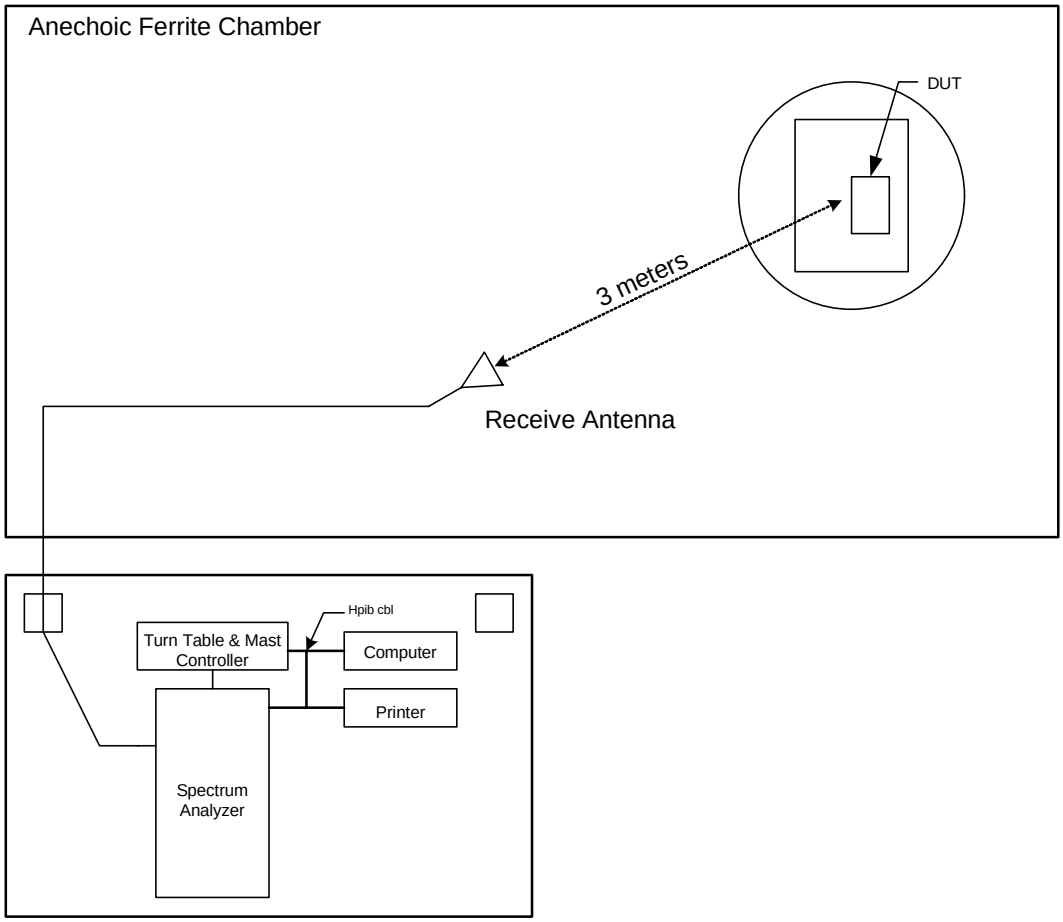


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

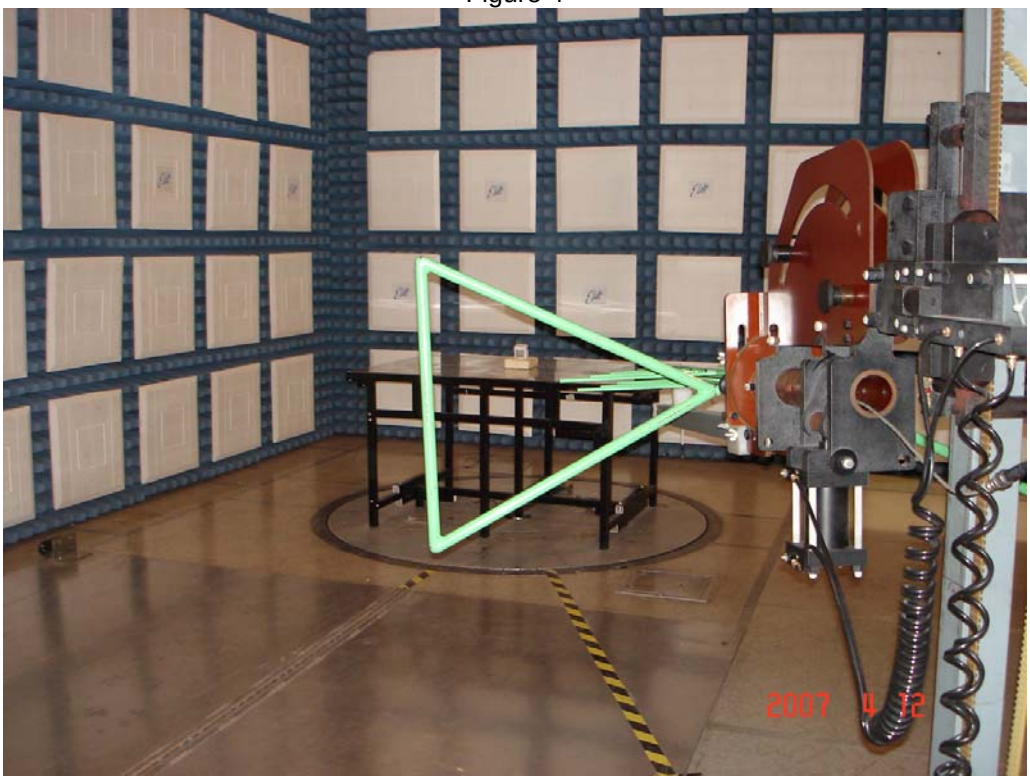
Test Setup – AC Powered

Test Setup – DC Powered

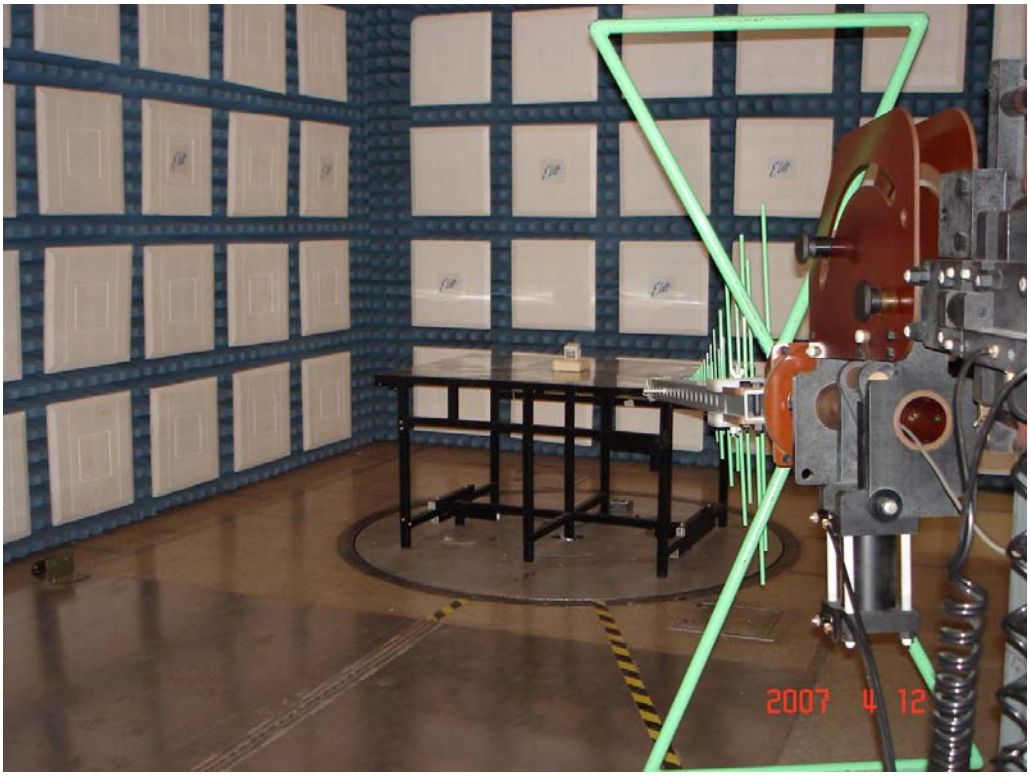
Figure 3

Test Setup for Conducted Emissions

Figure 4

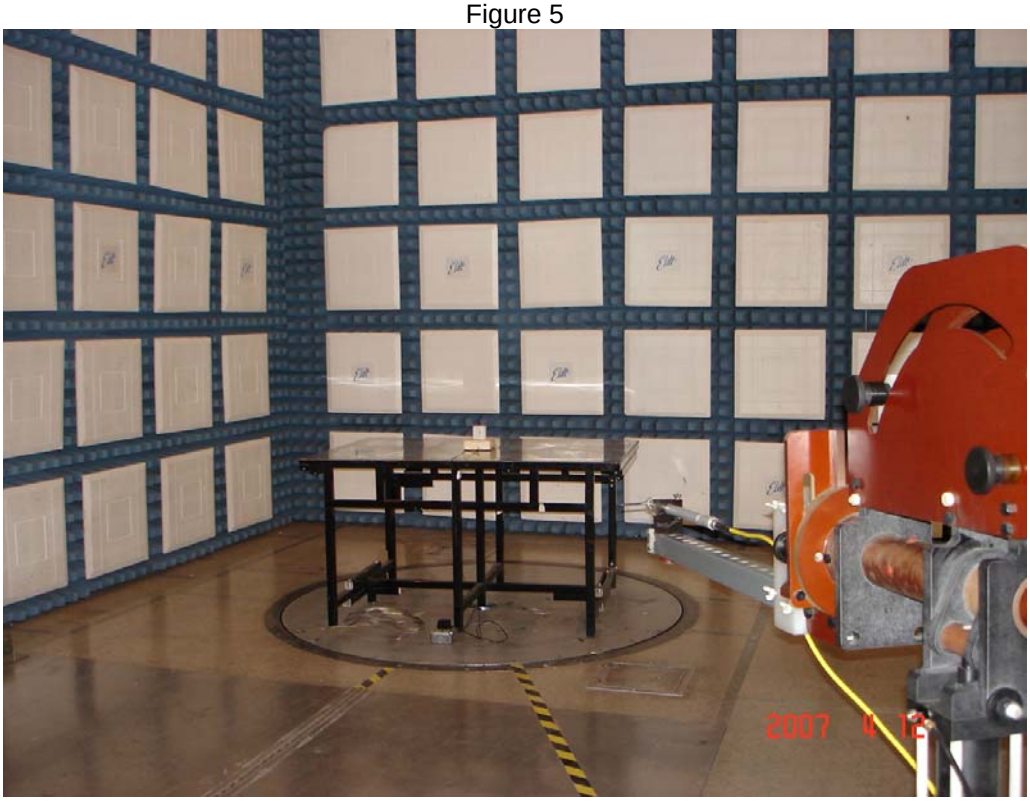


Test Setup for Radiated Emissions – 30MHz to 1GHz – Horizontal Polarization - Receiver



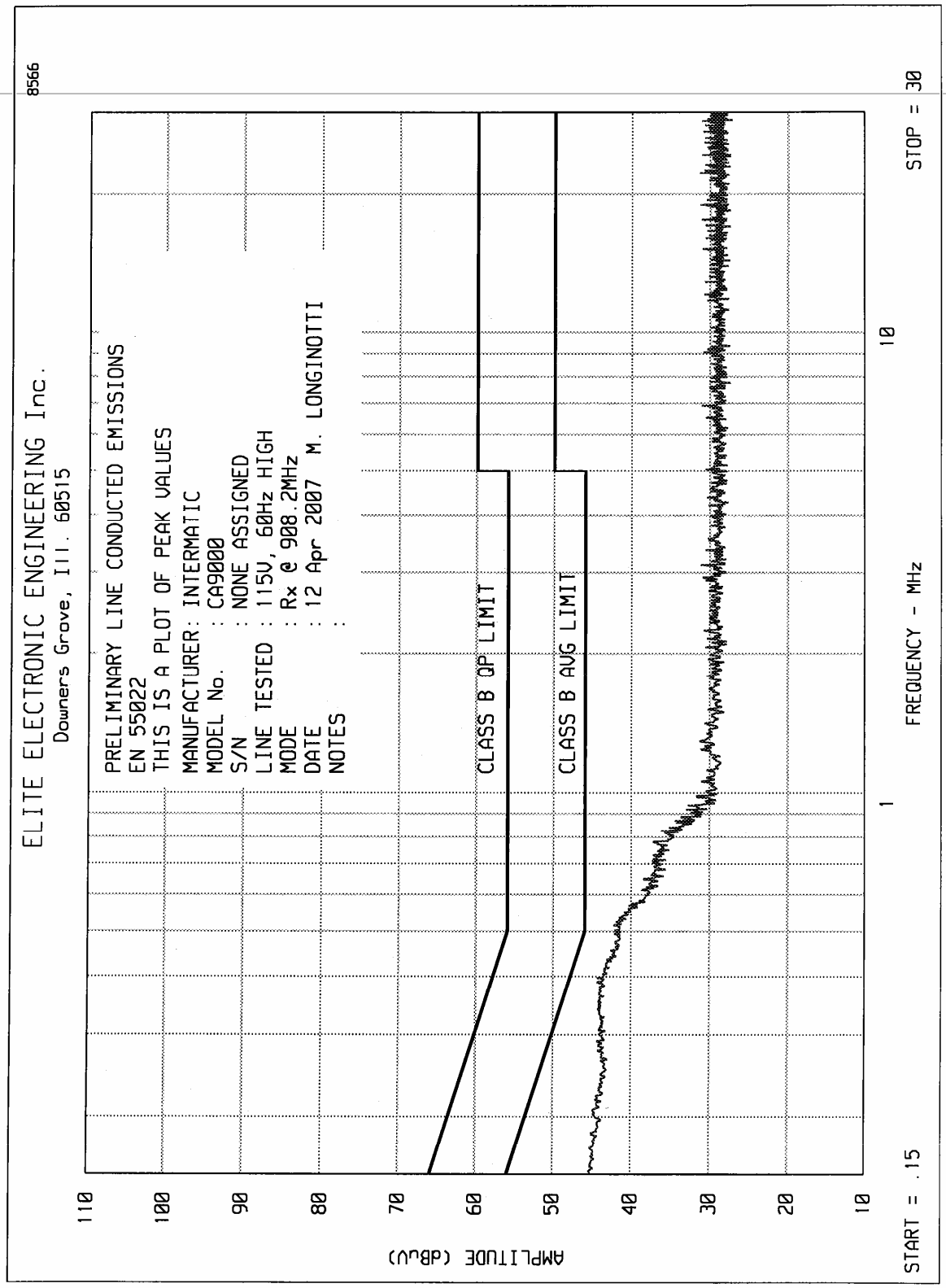
Test Setup for Radiated Emissions – 30MHz to 1GHz - Vertical Polarization - Receiver

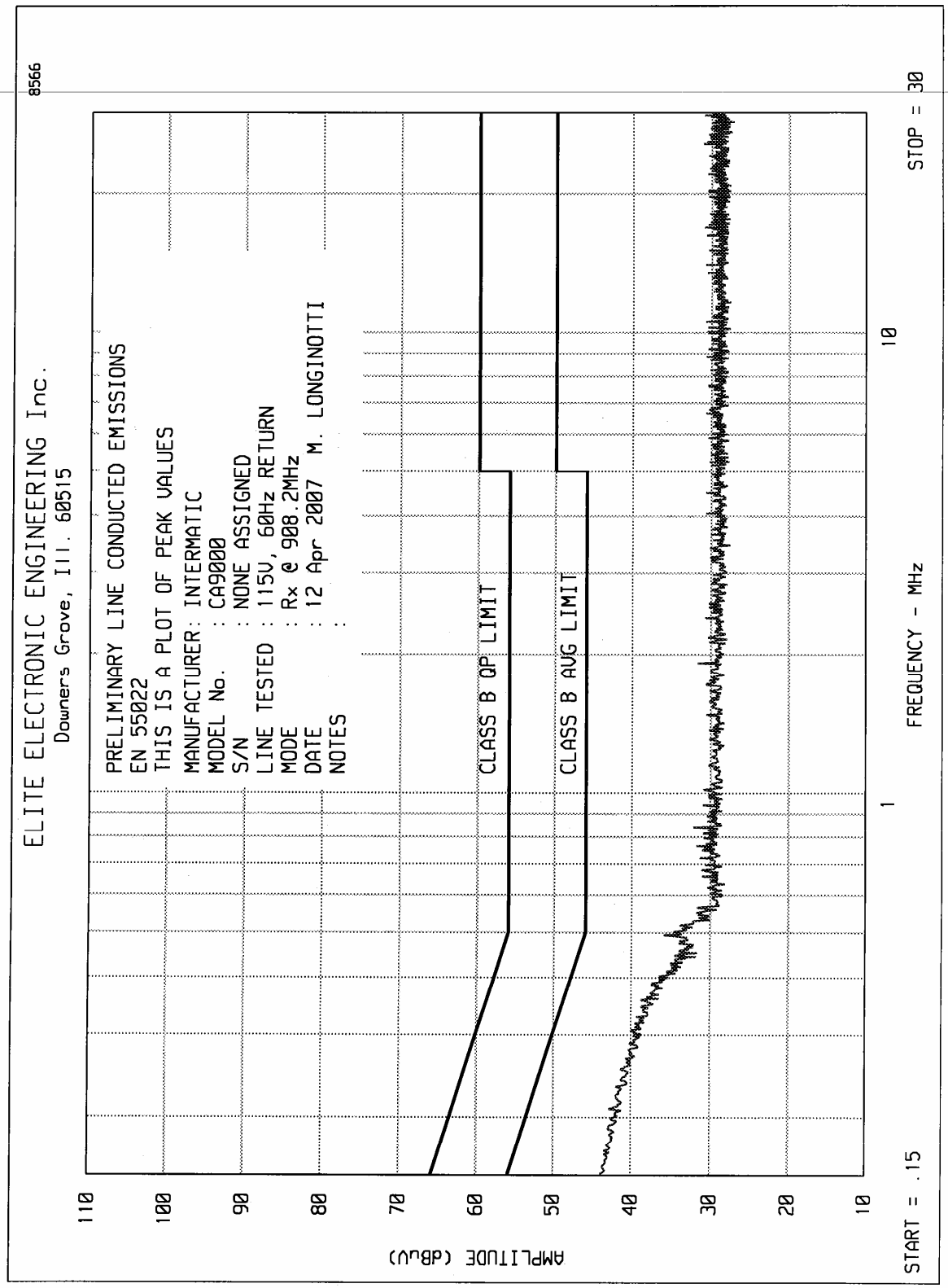
Figure 5



Test Setup for Radiated Emissions – 908MHz - Horizontal Polarization - Transmitter

Test Setup for Radiated Emissions – 908MHz – Vertical Polarization - Transmitter


8566
ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
LINE TESTED : 115V, 60Hz HIGH
MODE : Rx @ 908.2MHz
DATE : 12 Apr 2007 M. LONGINOTTI
NOTES :
CLASS B QP LIMIT
CLASS B AVG LIMIT
AMPLITUDE (dBuV)
110
100
90
80
70
60
50
40
30
20
10
START = .15
1
10
STOP = 30
FREQUENCY - MHz


8566
ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
LINE TESTED : 115V, 60Hz RETURN
MODE : Rx @ 908.2MHz
DATE : 12 Apr 2007 M. LONGINOTTI
NOTES :
CLASS B QP LIMIT
CLASS B AVG LIMIT
AMPLITUDE (dBuV)
110
100
90
80
70
60
50
40
30
20
10
START = .15
1
10
STOP = 30
FREQUENCY - MHz

ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : INTERMATIC
MODEL : CA9000
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz HIGH
MODE : Rx @ 908.2MHz
DATE : 12 Apr 2007
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	38.0	66.0		56.0	
.283	36.3	60.7		50.7	
.381	36.2	58.3		48.3	
.446	34.8	57.0		47.0	
.637	29.6	56.0		46.0	
.779	27.9	56.0		46.0	
.821	27.7	56.0		46.0	
1.662	26.8	56.0		46.0	
2.915	26.6	56.0		46.0	
5.033	26.3	60.0		50.0	
6.862	26.4	60.0		50.0	
9.075	26.4	60.0		50.0	
12.143	26.3	60.0		50.0	
15.123	26.3	60.0		50.0	
18.333	26.3	60.0		50.0	
21.338	26.1	60.0		50.0	
24.223	26.3	60.0		50.0	
27.227	26.3	60.0		50.0	

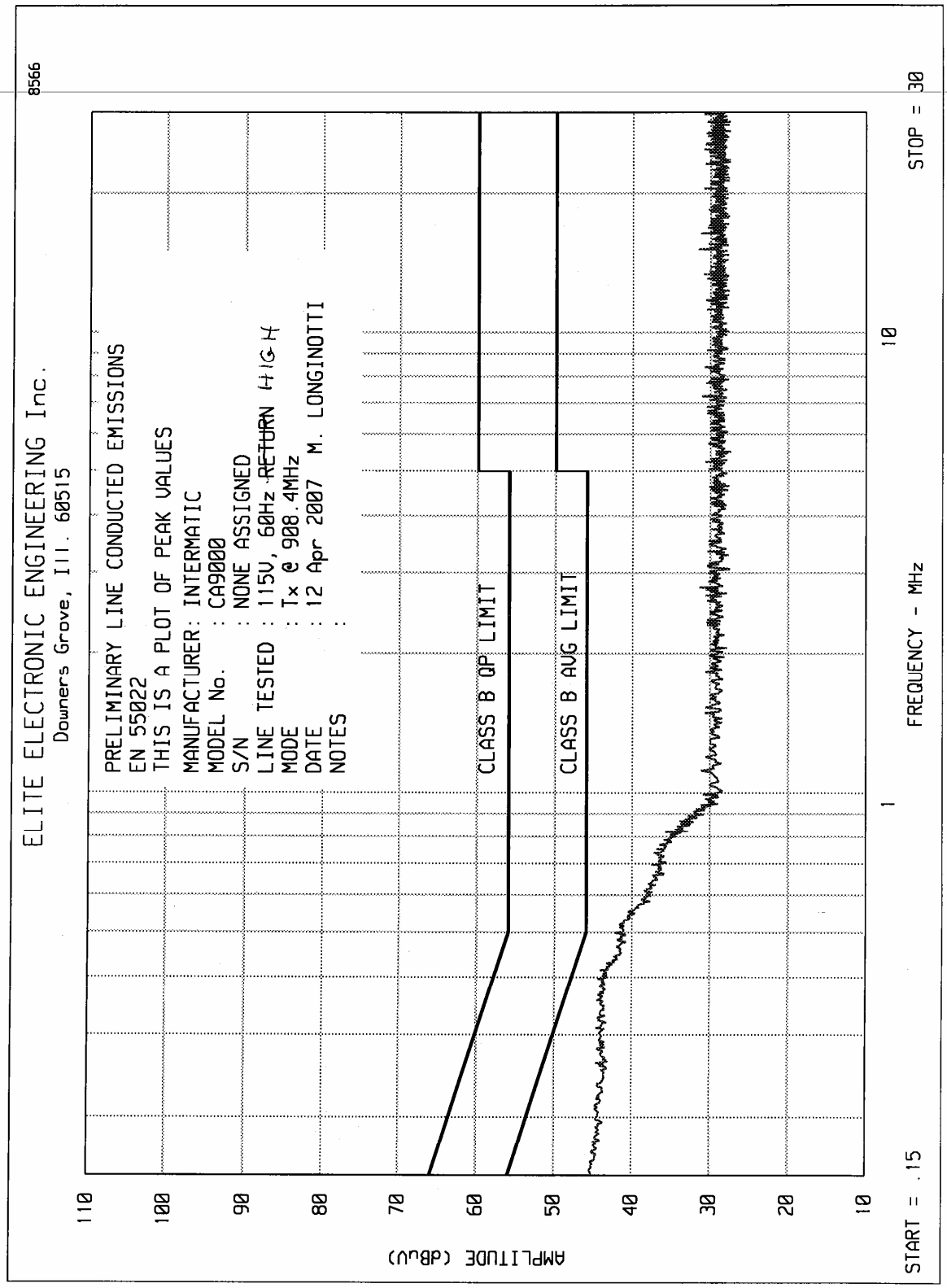
CHECKED BY: Mark E Longinotti
M. LONGINOTTI

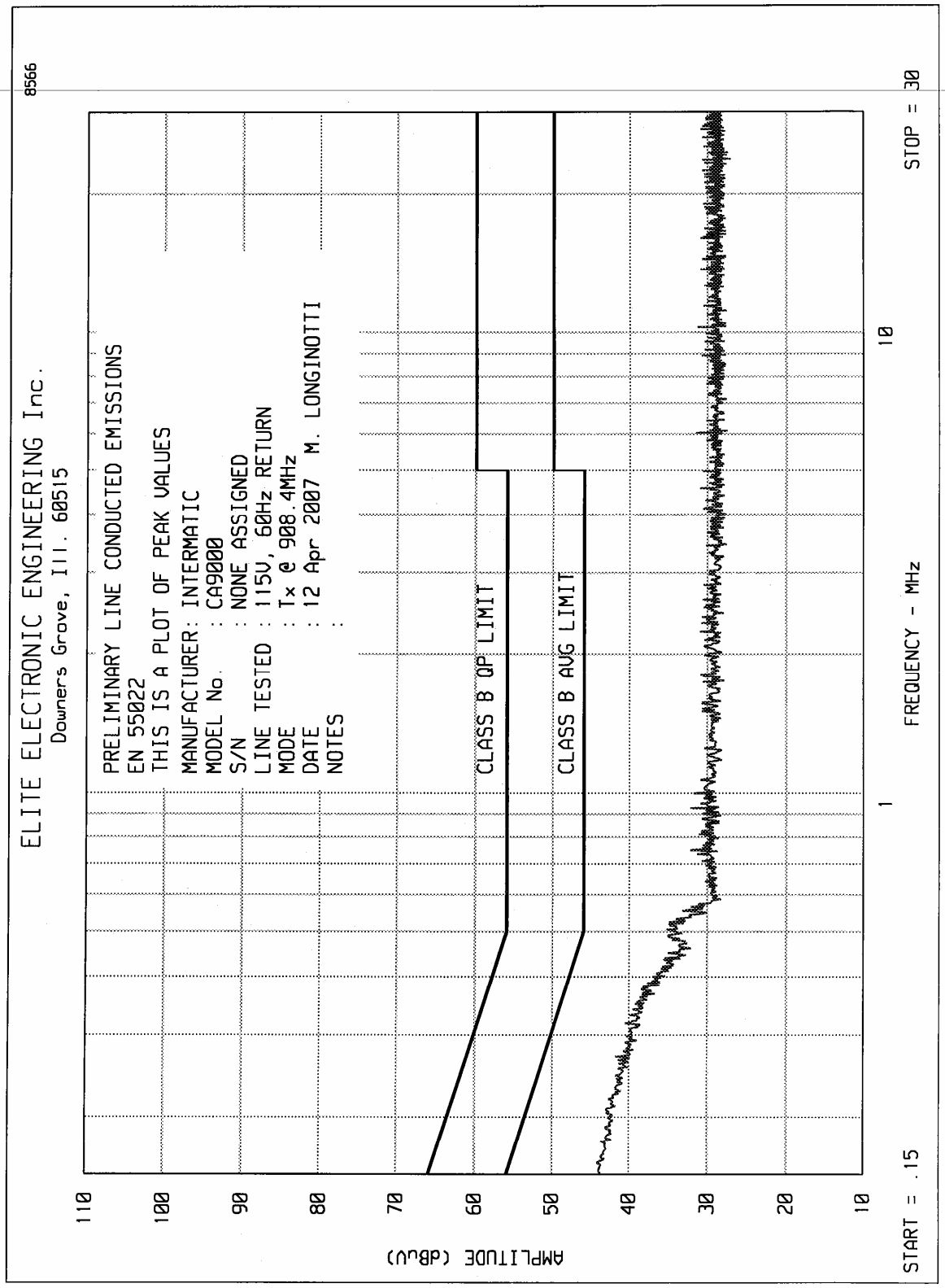
ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : INTERMATIC
MODEL : CA9000
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz RETURN
MODE : Rx @ 908.2MHz
DATE : 12 Apr 2007
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	36.3	66.0		56.0	
.244	33.5	62.0		52.0	
.331	31.0	59.4		49.4	
.350	29.9	59.0		49.0	
.493	27.5	56.1		46.1	
.505	27.4	56.0		46.0	
.912	26.9	56.0		46.0	
1.911	26.8	56.0		46.0	
3.198	26.8	56.0		46.0	
4.929	26.8	56.0		46.0	
7.314	26.5	60.0		50.0	
9.927	26.3	60.0		50.0	
12.748	26.3	60.0		50.0	
15.065	26.3	60.0		50.0	
19.487	26.3	60.0		50.0	
21.743	26.3	60.0		50.0	
24.523	26.3	60.0		50.0	
26.808	26.3	60.0		50.0	

CHECKED BY: Mark E Longinotti
M. LONGINOTTI


8566
ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
LINE TESTED : 115V, 60Hz RETURN HIGH
MODE : Tx @ 908.4MHz
DATE : 12 Apr 2007 M. LONGINOTTI
NOTES :
CLASS B QP LIMIT
CLASS B AVG LIMIT
AMPLITUDE (dBuV)
110
100
90
80
70
60
50
40
30
20
10
START = .15
1
10
STOP = 30
FREQUENCY - MHz


8566
ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
LINE TESTED : 115V, 60Hz RETURN
MODE : Tx @ 908.4MHz
DATE : 12 Apr 2007 M. LONGINOTTI
NOTES :
CLASS B QP LIMIT
CLASS B AVG LIMIT
AMPLITUDE (dBuV)
110
100
90
80
70
60
50
40
30
20
10
START = .15
1
10
STOP = 30
FREQUENCY - MHz

ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : INTERMATIC
MODEL : CA9000
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz ~~RETURN~~ HIGH
MODE : Tx @ 908.4MHz
DATE : 12 Apr 2007
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	37.9	66.0		56.0	
.253	35.9	61.6		51.6	
.353	36.3	58.9		48.9	
.505	33.5	56.0		46.0	
.624	29.6	56.0		46.0	
.811	27.5	56.0		46.0	
.841	27.4	56.0		46.0	
1.814	26.7	56.0		46.0	
3.132	26.8	56.0		46.0	
5.225	26.3	60.0		50.0	
7.237	26.4	60.0		50.0	
9.337	26.4	60.0		50.0	
12.353	26.3	60.0		50.0	
15.088	26.3	60.0		50.0	
18.303	26.3	60.0		50.0	
21.797	26.3	60.0		50.0	
24.843	26.3	60.0		50.0	
27.184	26.3	60.0		50.0	

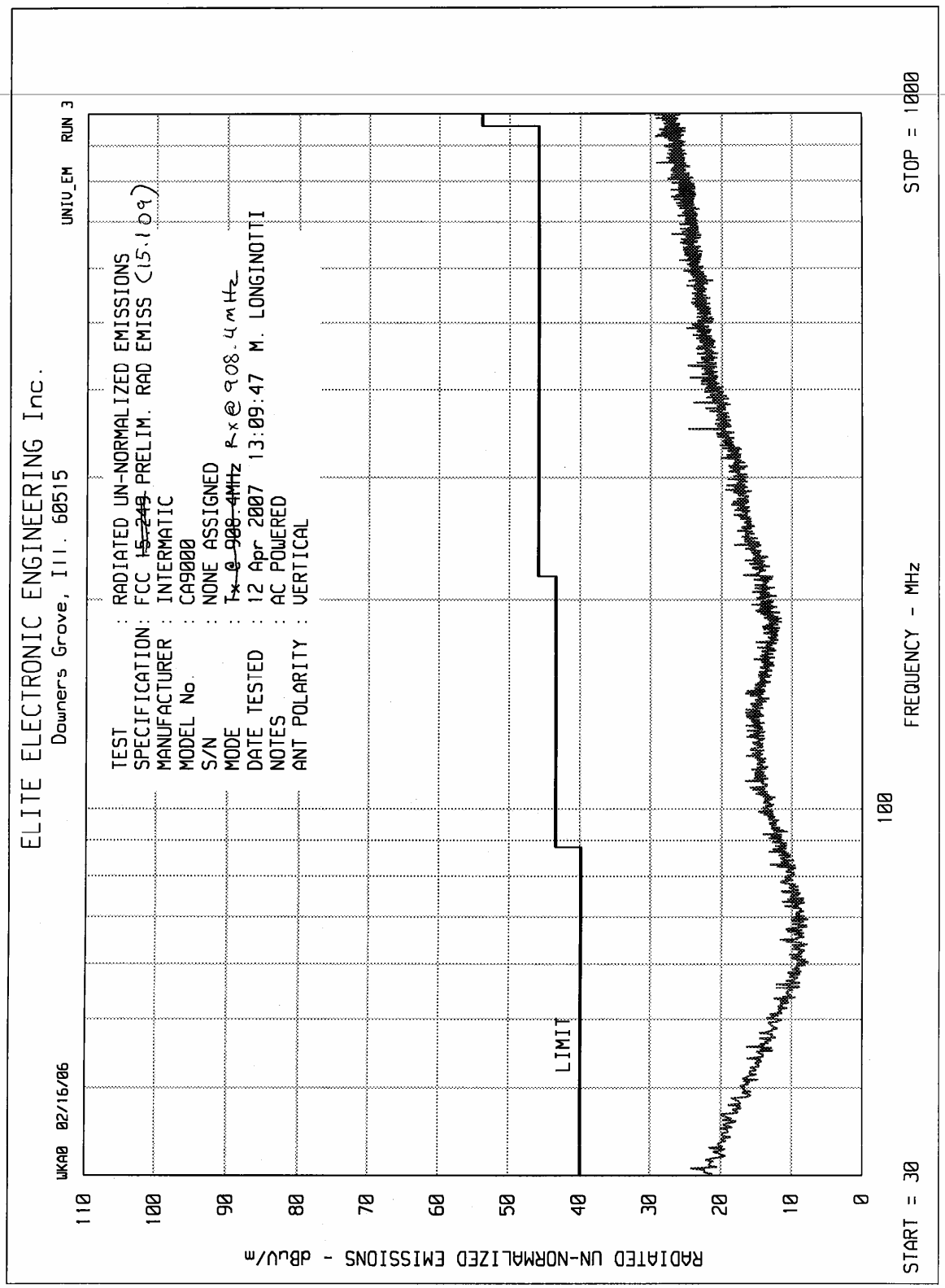
CHECKED BY: Mark E Longinotti
M. LONGINOTTI

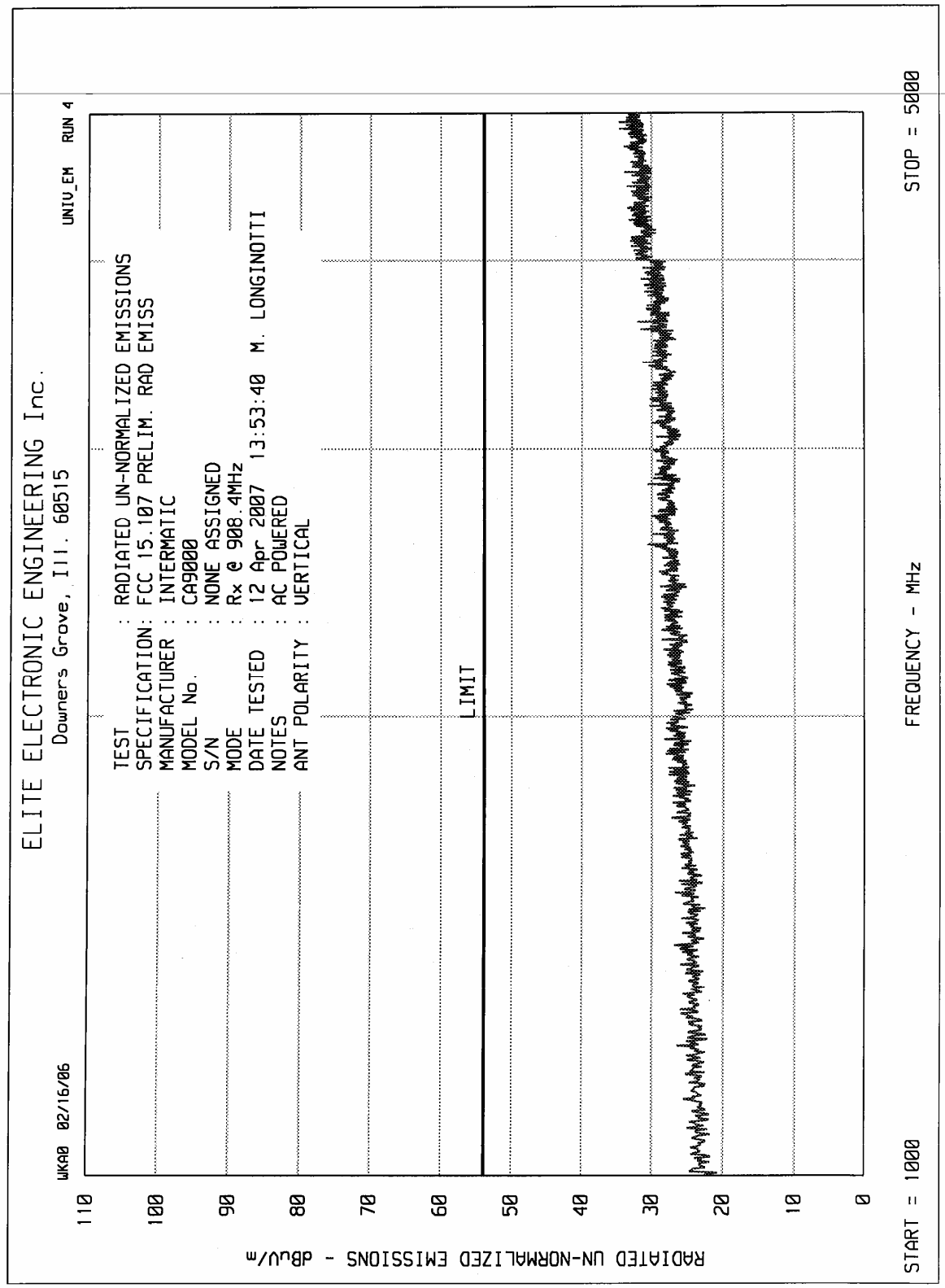
ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : INTERMATIC
MODEL : CA9000
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz RETURN
MODE : Tx @ 908.4MHz
DATE : 12 Apr 2007
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	36.4	66.0		56.0	
.265	32.7	61.3		51.3	
.296	31.6	60.4		50.4	
.346	30.6	59.1		49.1	
.499	27.6	56.0		46.0	
.654	26.9	56.0		46.0	
.923	26.8	56.0		46.0	
2.222	26.7	56.0		46.0	
3.398	26.7	56.0		46.0	
5.442	26.3	60.0		50.0	
6.083	26.3	60.0		50.0	
8.886	26.3	60.0		50.0	
12.463	26.3	60.0		50.0	
15.037	26.4	60.0		50.0	
18.782	26.3	60.0		50.0	
21.233	26.3	60.0		50.0	
23.607	26.3	60.0		50.0	
27.492	26.3	60.0		50.0	

CHECKED BY: Mark E Longinotti
M. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 3
WKA0 02/16/06
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.249 PRELIM. RAD EMISS (15.109)
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Tx @ 908.4MHz Rx @ 908.4MHz
DATE TESTED : 12 Apr 2007 13:09:47 M. LONGINOTTI
NOTES : AC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 30
100
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 4
WKA0 02/16/06
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.107 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Rx @ 908.4MHz
DATE TESTED : 12 Apr 2007 13:53:40 M. LONGINOTTI
NOTES : AC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 5000

MANUFACTURER : Intermatic
TEST ITEM : Transceiver
MODEL NO. : CA9000
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 908.2MHz, AC Powered
TEST DATE : April 12, 2007
TEST DISTANCE : 3 meters

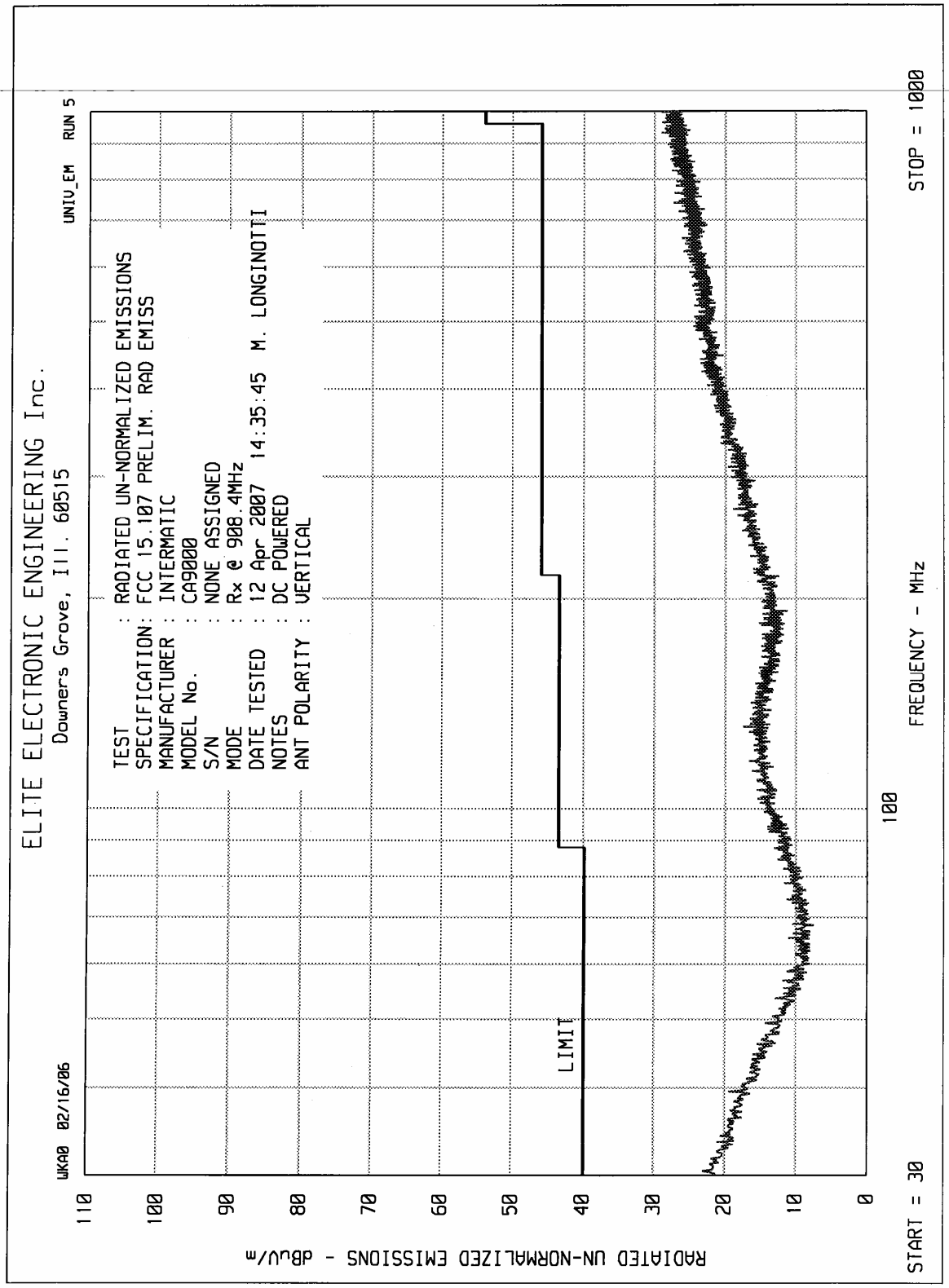
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.2	H	4.5	Ambient	1.9	22.3	0.0	28.7	27.4	200.0
908.2	V	4.3	Ambient	1.9	22.3	0.0	28.5	26.8	200.0
1816.4	H	35.5		2.9	28.1	-33.8	32.7	43.0	500.0
1816.4	V	30.1	Ambient	2.9	28.1	-33.8	27.3	23.1	500.0
2724.6	H	27.7	Ambient	3.8	31.4	-33.4	29.4	29.6	500.0
2724.6	V	27.7	Ambient	3.8	31.4	-33.4	29.4	29.6	500.0
3632.8	H	26.6	Ambient	4.4	32.5	-33.6	29.9	31.4	500.0
3632.8	V	26.5	Ambient	4.4	32.5	-33.6	29.8	31.0	500.0
4541.0	H	26.5	Ambient	4.8	32.9	-32.2	32.0	39.8	500.0
4541.0	V	26.6	Ambient	4.8	32.9	-32.2	32.1	40.3	500.0

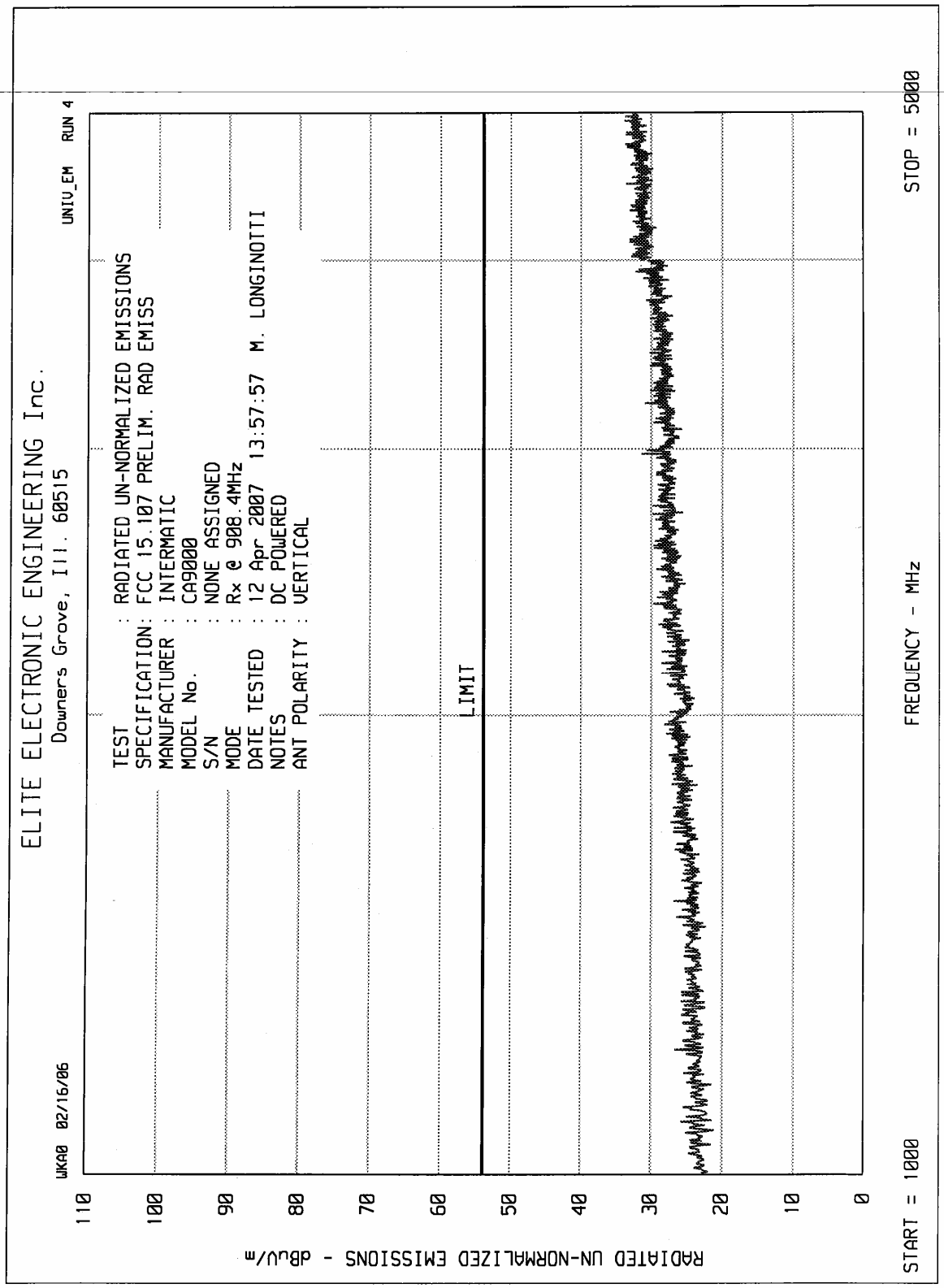
H – Horizontal
V = Vertical

Quasi-Peak detector used for all measurements below 1GHz.
Average detector used for all measurements above 1GHz.

Total = Meter Reading + Cable Loss + Antenna Factor + Preamp Gain

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 5
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.107 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Rx @ 908.4MHz
DATE TESTED : 12 Apr 2007 14:35:45 M. LONGINOTTI
NOTES : DC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 30
100
FREQUENCY - MHz
STOP = 1000
WKA0 02/16/06


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 4
WKA0 02/16/06
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.107 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Rx @ 908.4MHz
DATE TESTED : 12 Apr 2007 13:57:57 M. LONGINOTTI
NOTES : DC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 5000

MANUFACTURER : Intermatic
TEST ITEM : Transceiver
MODEL NO. : CA9000
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 908.2MHz, DC Powered
TEST DATE : April 12, 2007
TEST DISTANCE : 3 meters

Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.2	H	3.3	Ambient	1.9	22.3	0.0	27.5	23.8	200.0
908.2	V	4.8	Ambient	1.9	22.3	0.0	29.0	28.3	200.0
1816.4	H	31.1	Ambient	2.9	28.1	-33.8	28.3	25.9	500.0
1816.4	V	40.4		2.9	28.1	-33.8	37.6	75.6	500.0
2724.6	H	27.8	Ambient	3.8	31.4	-33.4	29.5	30.0	500.0
2724.6	V	27.7	Ambient	3.8	31.4	-33.4	29.4	29.6	500.0
3632.8	H	26.7	Ambient	4.4	32.5	-33.6	30.0	31.8	500.0
3632.8	V	26.7	Ambient	4.4	32.5	-33.6	30.0	31.8	500.0
4541.0	H	26.8	Ambient	4.8	32.9	-32.2	32.3	41.2	500.0
4541.0	V	26.9	Ambient	4.8	32.9	-32.2	32.4	41.7	500.0

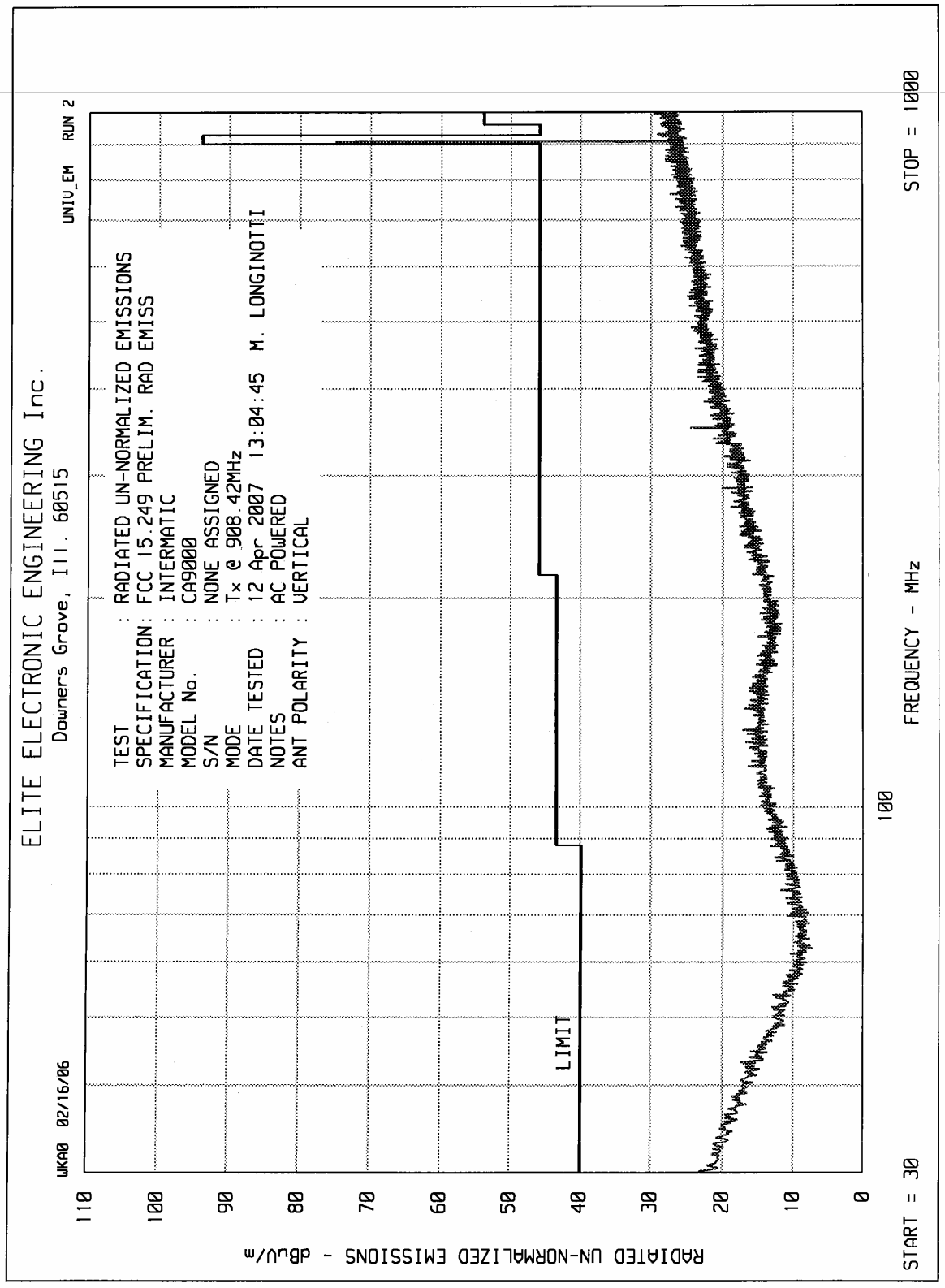
H – Horizontal
V = Vertical

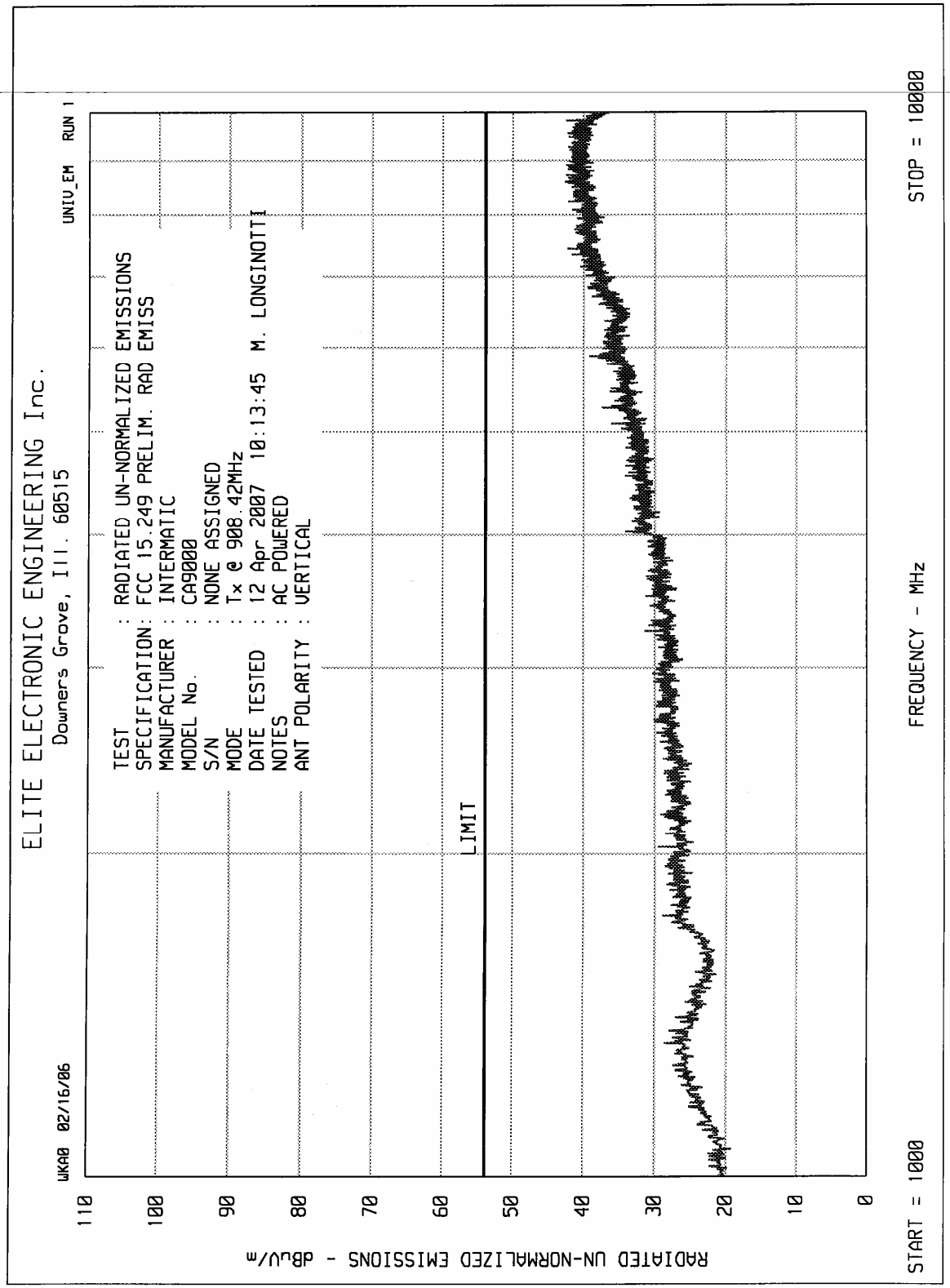
Quasi-Peak detector used for all measurements below 1GHz.

Average detector used for all measurements above 1GHz.

Total = Meter Reading + Cable Loss + Antenna Factor + Preamp Gain

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 2
WKA0 02/16/06
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.249 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Tx @ 908.42MHz
DATE TESTED : 12 Apr 2007 13:04:45 M. LONGINOTTI
NOTES : AC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 30
100
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 1
WKA0 02/16/06
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.249 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Tx @ 908.42MHz
DATE TESTED : 12 Apr 2007 10:13:45 M. LONGINOTTI
NOTES : AC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 10000

MANUFACTURER : Intermatic
TEST ITEM : Transceiver
MODEL NO. : CA9000
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 908.4MHz, AC Powered
TEST DATE : April 12, 2007
TEST DISTANCE : 3 meters

Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.4	H	52.2		1.9	27.7	0.0	81.9	12375.9	50000.0
908.4	V	51.5		1.9	27.7	0.0	81.2	11417.6	50000.0
1816.8	H	31.9	Ambient	2.9	28.1	-33.8	29.1	28.4	500.0
1816.8	V	31.9	Ambient	2.9	28.1	-33.8	29.1	28.4	500.0
2725.3	H	32.4	Ambient	3.8	31.4	-33.4	34.1	50.9	500.0
2725.3	V	30.3	Ambient	3.8	31.4	-33.4	32.0	40.0	500.0
3633.7	H	32.0	Ambient	4.4	32.5	-33.6	35.3	58.5	500.0
3633.7	V	28.6	Ambient	4.4	32.5	-33.6	31.9	39.5	500.0
4542.1	H	27.7	Ambient	4.8	32.9	-32.2	33.2	45.8	500.0
4542.1	V	27.6	Ambient	4.8	32.9	-32.2	33.1	45.2	500.0
5450.5	H	25.2	Ambient	5.2	35.3	-31.9	33.9	49.6	500.0
5450.5	V	25.1	Ambient	5.2	35.3	-31.9	33.8	49.0	500.0
6358.9	H	27.6	Ambient	5.9	36.1	-31.6	38.0	79.8	500.0
6358.9	V	27.6	Ambient	5.9	36.1	-31.6	38.0	79.8	500.0
7267.4	H	27.9	Ambient	6.6	37.7	-31.4	40.8	109.1	500.0
7267.4	V	28.0	Ambient	6.6	37.7	-31.4	40.9	110.3	500.0
8175.8	H	27.9	Ambient	7.1	37.7	-31.7	41.0	111.7	500.0
8175.8	V	27.9	Ambient	7.1	37.7	-31.7	41.0	111.7	500.0
9084.2	H	28.3	Ambient	7.5	38.0	-31.8	42.0	125.3	500.0
9084.2	V	28.1	Ambient	7.5	38.0	-31.8	41.8	122.4	500.0

H – Horizontal

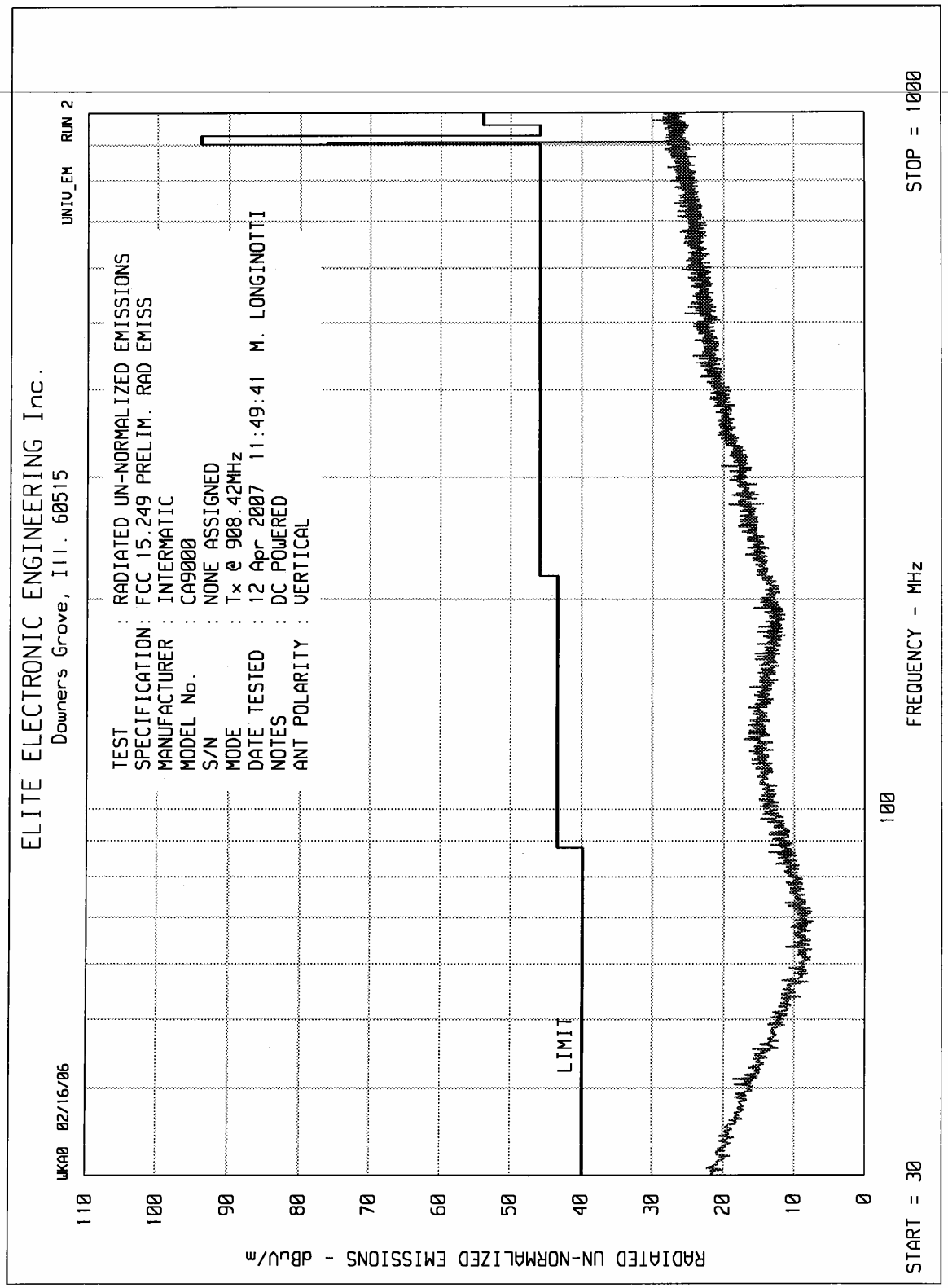
V = Vertical

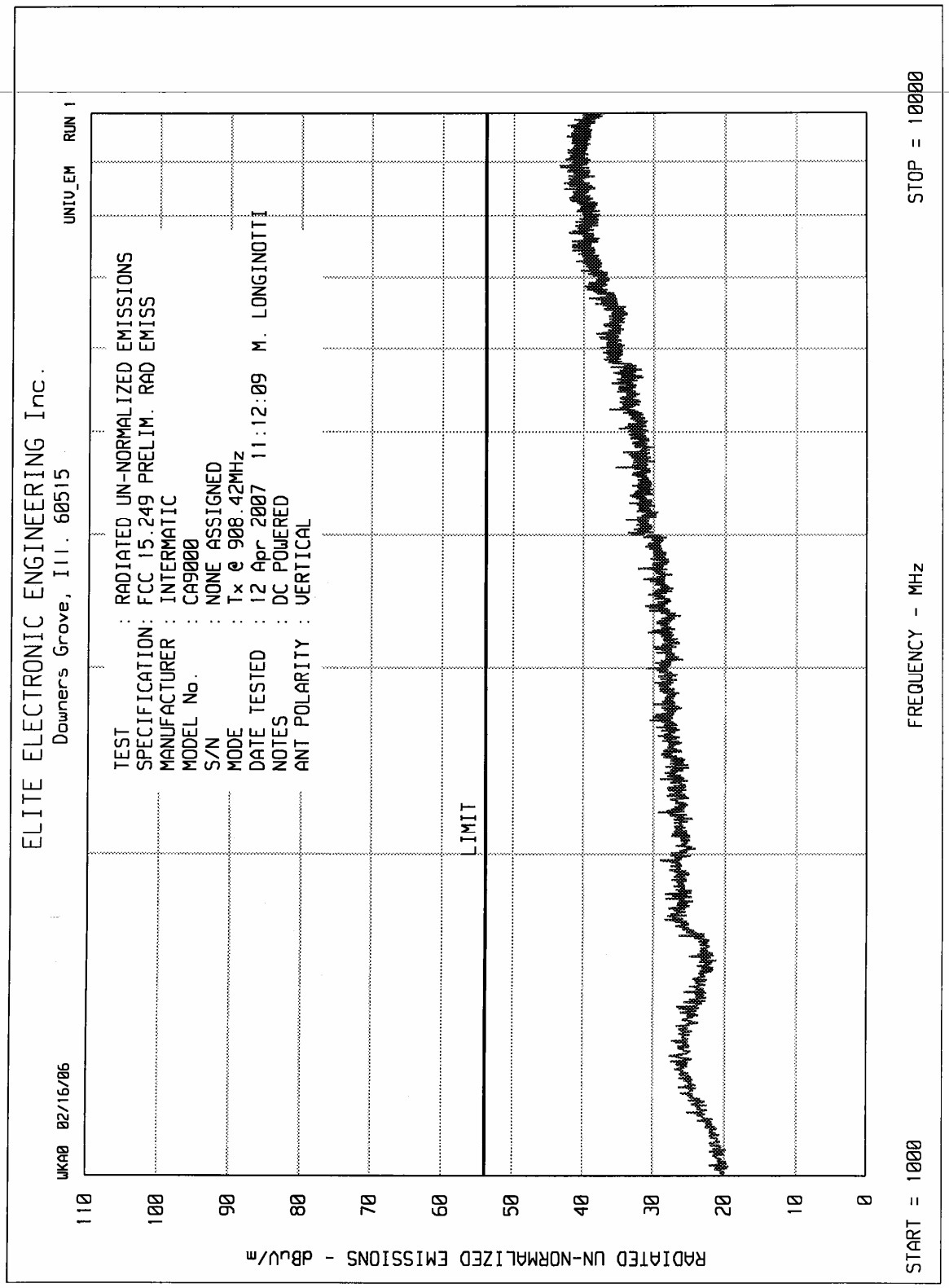
Quasi-Peak detector used for all measurements below 1GHz.

Average detector used for all measurements above 1GHz.

Total = Meter Reading + Cable Loss + Antenna Factor + Preamp Gain

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 2
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.249 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Tx @ 908.42MHz
DATE TESTED : 12 Apr 2007 11:49:41 M. LONGINOTTI
NOTES : DC POWERED
ANT POLARITY : VERTICAL
LIMIT
WKA0 02/16/06
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 30
100
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 1
WKA0 02/16/06
TEST : RADIATED UN-NORMALIZED EMISSIONS
SPECIFICATION: FCC 15.249 PRELIM. RAD EMISS
MANUFACTURER : INTERMATIC
MODEL No. : CA9000
S/N : NONE ASSIGNED
MODE : Tx @ 908.42MHz
DATE TESTED : 12 Apr 2007 11:12:09 M. LONGINOTTI
NOTES : DC POWERED
ANT POLARITY : VERTICAL
LIMIT
RADIATED UN-NORMALIZED EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 10000

MANUFACTURER : Intermatic
TEST ITEM : Transceiver
MODEL NO. : CA9000
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 908.4MHz, DC Powered
TEST DATE : April 12, 2007
TEST DISTANCE : 3 meters

Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.4	H	41.4		1.9	27.7	0.0	71.1	3569.2	50000.0
908.4	V	50.6		1.9	27.7	0.0	80.3	10293.8	50000.0
1816.8	H	34.7		2.9	28.1	-33.8	31.9	39.2	500.0
1816.8	V	35.9		2.9	28.1	-33.8	33.1	45.0	500.0
2725.3	H	31.8	Ambient	3.8	31.4	-33.4	33.5	47.5	500.0
2725.3	V	27.3	Ambient	3.8	31.4	-33.4	29.0	28.3	500.0
3633.7	H	26.3	Ambient	4.4	32.5	-33.6	29.6	30.3	500.0
3633.7	V	26.7	Ambient	4.4	32.5	-33.6	30.0	31.8	500.0
4542.1	H	27.3	Ambient	4.8	32.9	-32.2	32.8	43.7	500.0
4542.1	V	27.3	Ambient	4.8	32.9	-32.2	32.8	43.7	500.0
5450.5	H	24.5	Ambient	5.2	35.3	-31.9	33.2	45.7	500.0
5450.5	V	24.6	Ambient	5.2	35.3	-31.9	33.3	46.3	500.0
6358.9	H	27.5	Ambient	5.9	36.1	-31.6	37.9	78.9	500.0
6358.9	V	27.6	Ambient	5.9	36.1	-31.6	38.0	79.8	500.0
7267.4	H	27.8	Ambient	6.6	37.7	-31.4	40.7	107.8	500.0
7267.4	V	27.8	Ambient	6.6	37.7	-31.4	40.7	107.8	500.0
8175.8	H	27.7	Ambient	7.1	37.7	-31.7	40.8	109.2	500.0
8175.8	V	27.7	Ambient	7.1	37.7	-31.7	40.8	109.2	500.0
9084.2	H	28.1	Ambient	7.5	38.0	-31.8	41.8	122.4	500.0
9084.2	V	28.1	Ambient	7.5	38.0	-31.8	41.8	122.4	500.0

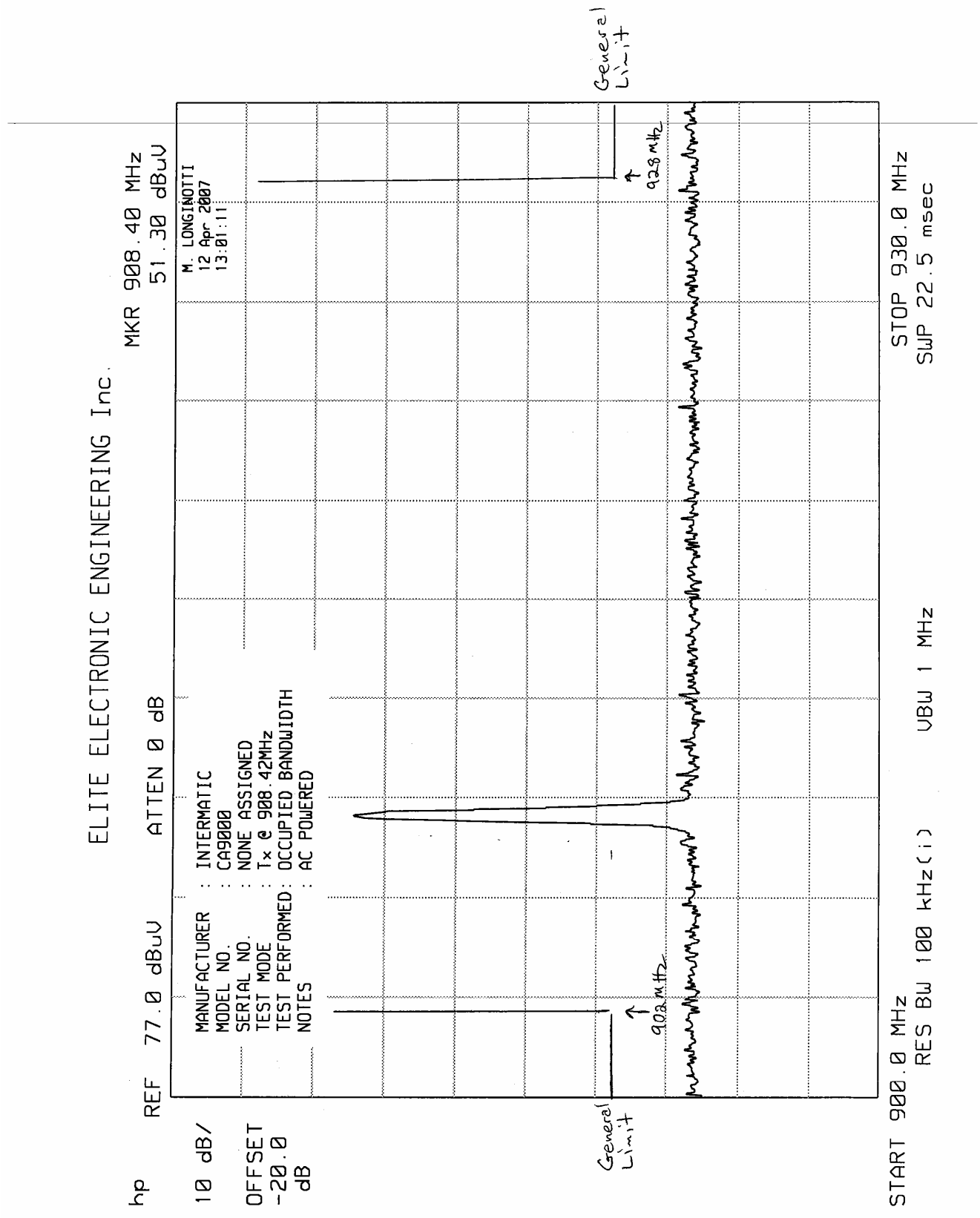
H – Horizontal
V = Vertical

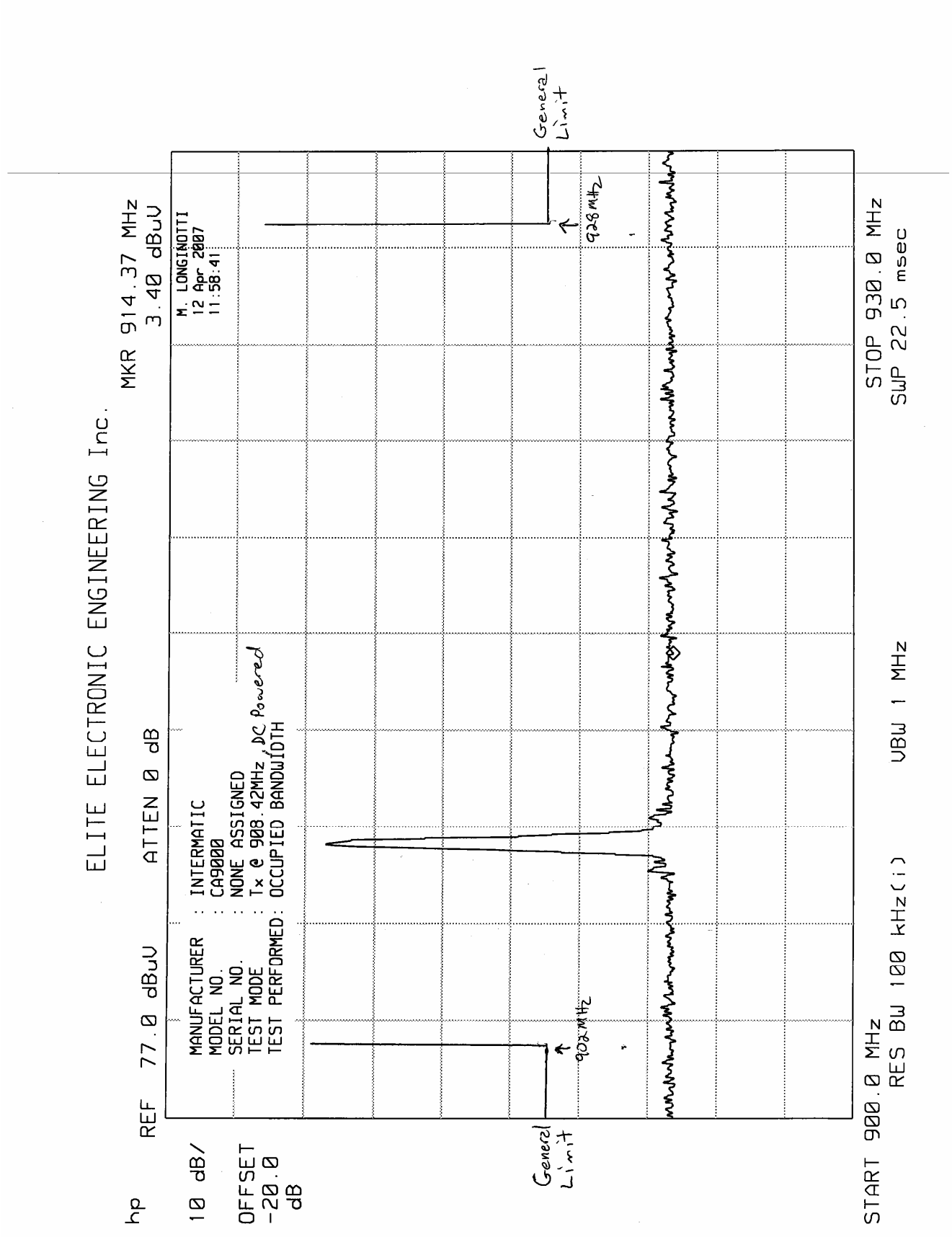
Quasi-Peak detector used for all measurements below 1GHz.

Average detector used for all measurements above 1GHz.

Total = Meter Reading + Cable Loss + Antenna Factor + Preamp Gain

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
MKR 908.40 MHz
51.30 dBuV
M. LONGINOTTI
12 Apr 2007
13:01:11
hp
REF 77.0 dBuV
ATTEN 0 dB
10 dB/
OFFSET
-20.0
dB
MANUFACTURER : INTERMATIC
MODEL NO. : CA9000
SERIAL NO. : NONE ASSIGNED
TEST MODE : Tx @ 908.42MHz
TEST PERFORMED: OCCUPIED BANDWIDTH
NOTES : AC POWERED
General Limit
903 mHz
928 mHz
General Limit
START 900.0 MHz
RES BW 100 kHz(i)
VBW 1 MHz
STOP 930.0 MHz
SWP 22.5 msec


ELITE ELECTRONIC ENGINEERING Inc.
hp
REF 77.0 dBuV
ATTEN 0 dB
MKR 914.37 MHz
3.40 dBuV
10 dB/
OFFSET
-20.0
dB
MANUFACTURER : INTERMATIC
MODEL NO. : CA9000
SERIAL NO. : NONE ASSIGNED
TEST MODE : Tx @ 908.42MHz, DC Powered
TEST PERFORMED: OCCUPIED BANDWIDTH
M. LONGINOTTI
12 Apr 2007
11:58:41
General Limit
928 MHz
908 MHz
General Limit
START 900.0 MHz
RES BW 100 kHz(i)
VBW 1 MHz
STOP 930.0 MHz
SWP 22.5 msec