Measurement of RF Interference from a Transceiver Model CA 5100 AC Power Light Switch

For : Intermatic
Spring Grove, IL

P.O. No. : 912940
Date Received : August 30, 2006
Date Tested : August 30, 2006 through September 8, 2006
Test Personnel : Mark E. Longinotti, Brandon Lugo
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

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Raymond J. Klouda
Registered Professional Engineer of Illinois - 44894

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TABLE OF CONTENTS

Measurement of RF Emissions from a Transceiver,
Model No. CA 5100 AC Power Light Switch

1.0 INTRODUCTION:

1.1 Description of Test Item - This document presents the results of the series of radio interference measurements performed on a Transceiver, Model No. CA 5100 AC Power Light Switch (hereinafter referred to as the test item). Two (2) separate units were submitted for testing. One unit was set to continuously transmit and one unit was set to continuously receive. The test item was designed to transmit and receive at approximately 908MHz using an internal antenna. The test item was 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 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, 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"

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 23^{o}C and the relative humidity was 44%.

2.0 TEST ITEM SET-UP AND OPERATION:

The test item is a Transceiver, Model No. CA 5100 AC Power Light Switch. A block diagram of the test item set-up is shown as Figure 1.

2.1 Power Input - The test item is equipped with three 15cm long wires. The three leads were extended to a total length of 1 meter. For conducted emissions tests, each AC power lead to the test item 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.

2.2 Grounding - The test item was grounded only through the third wire of its input power cord.

2.3 Peripheral Equipment - Not applicable.

2.4 Interconnect Cables - Not applicable.

2.5 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 908.3MHz. The other unit submitted for testing was set up so that upon power up it would transmit continuously at 908.4MHz.

2.6 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.

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).

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

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

The measurement uncertainty for these tests is presented below:

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

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

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 Powerline Conducted Emissions

4.1.1 Receiver

4.1.1.1 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:

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.

4.1.1.2 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 ohm. 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.

4.1.1.3 Results - The plots of the peak preliminary conducted voltage levels on each power line with the test item operated in the continuous receive at 908.3MHz mode are presented on pages 15 and 16. The conducted limit for receivers is shown as a reference. The final quasi-peak results are presented on pages 17 and 18. As can be seen from the data, all conducted emission levels met the requirements for receivers. The emissions level closest to the limit (worst case) occurred at

152kHz. The emissions level at this frequency was 16.9dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 2.

4.1.2 Transmitter

4.1.2.1 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:

CONDUCTED EMISSION LIMIT

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.

4.1.2.2 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 ohm. 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.

4.1.2.3 Results - The plots of the peak preliminary conducted voltage levels on each power line with the test item operated in the continuous transmit at 908.4MHz mode are presented on pages 19 and 20. The conducted limit for receivers is shown as a reference. The final quasi-peak results are presented on pages 21 and 22. As can be seen from the data, all conducted emission levels met the requirements for transmitters. The emissions level closest to the limit (worst case) occurred at 152kHz. The emissions level at this frequency was 5.7dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 2.

4.2 Radiated Measurements

4.2.1 Receiver

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

RADIATION LIMITS FOR RECEIVER

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.

4.2.1.2 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 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.

4.2.1.3 Results - The preliminary plots are presented on pages 23 and 24. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on pages 25. 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 908.3MHz. The emissions level at this frequency was 8.4dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 3.

4.2.2 Transmitters -

4.2.2.1 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 meters	Field Strength Harmonics uV/m @ 3 meters
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.

4.2.2.2 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.

4.2.2.3 Results - The preliminary plots, with the test item transmitting at 908.4MHz, are presented on data pages 26 and 27. 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, are presented on data page 28. 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 4542.1MHz. The emissions level at this frequency was 0.9dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 3.

4.3 Occupied Bandwidth Measurements

4.3.1 Requirement - 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.

4.3.2 Procedures - The test item was placed on an 80cm high non-conductive stand. The

unit was set to transmit continuously. With an antenna positioned nearby, occupied bandwidth emissions were displayed on the spectrum analyzer. The resolution bandwidth was set to 100 kHz and span was set to 30 MHz. The frequency spectrum near the fundamental was plotted.

4.3.3 Results - The plot of the emissions near the fundamental frequency is presented on data page 29. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

The 99% bandwidth was measured to be 186kHz.

5.0 CONCLUSIONS:

It was determined that the Intermatic Transceiver, Model No. CA 5100 AC Power Light Switch, (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.

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								
XZG4	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2223A01683	---		N/A	
Equipment Type: AMPLIFIERS								
APK4	PREAMPLIFIER OPT H02	HEWLETT PACKARD	8449B	3008A00329	1-26.5GHZ	01/31/06	12	01/31/07
Equipment Type: ANTENNAS								
NDQ1	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	313	400-1000MHZ	03/10/06	12	03/10/07
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	10/01/05	12	10/01/06
Equipment Type: ATTENUATORS								
T1E6	10DB, 25W ATTENUATOR	WEINSCHEL	46-10-34	BG3488	DC-18GHZ	03/13/06	12	03/13/07
Equipment Type: CONTROLLERS								
CDS2	COMPUTER	GATEWAY	MFATXPNT NMZ	0028483108	1.8GHZ		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
Equipment Type: PROBES; CLAMP-ON & LISNS								
PLL9	50UH LISN 462D	ELITE	462D/70A	010	0.01-400MHZ	03/06/06	12	03/06/07
PLLA	50UH LISN 462D	ELITE	462D/70A	011	0.01-400MHZ	03/06/06	12	03/06/07
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	02/11/06	12	02/11/07
RAEC	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	3014A06690	100HZ-22GHZ	02/10/06	12	02/10/07
RAF5	QUASIPEAK ADAPTOR W/ RECEI	HEWLETT PACKARD	85650A	2043A00151	0.01-1000MHZ	02/11/06	12	02/11/07
RBA0	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100145	20HZ-26.5GHZ	08/31/06	12	08/31/07

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.

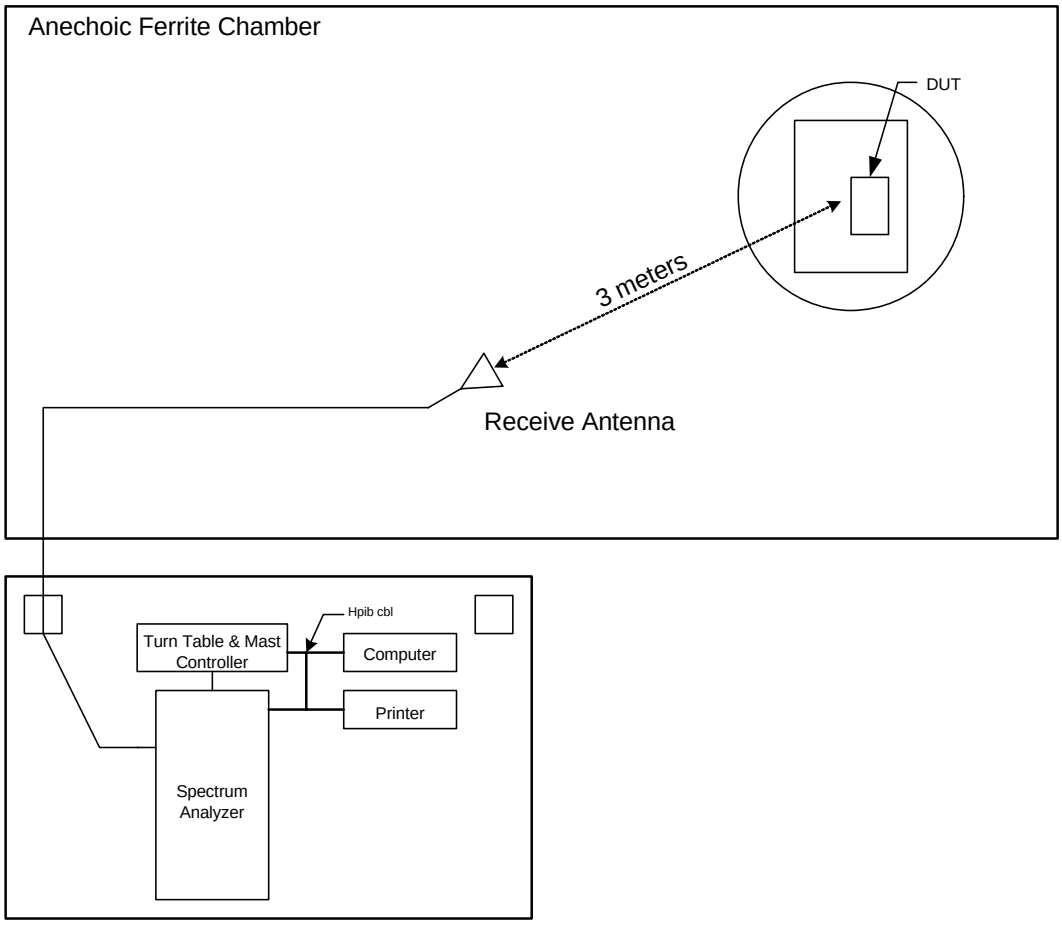
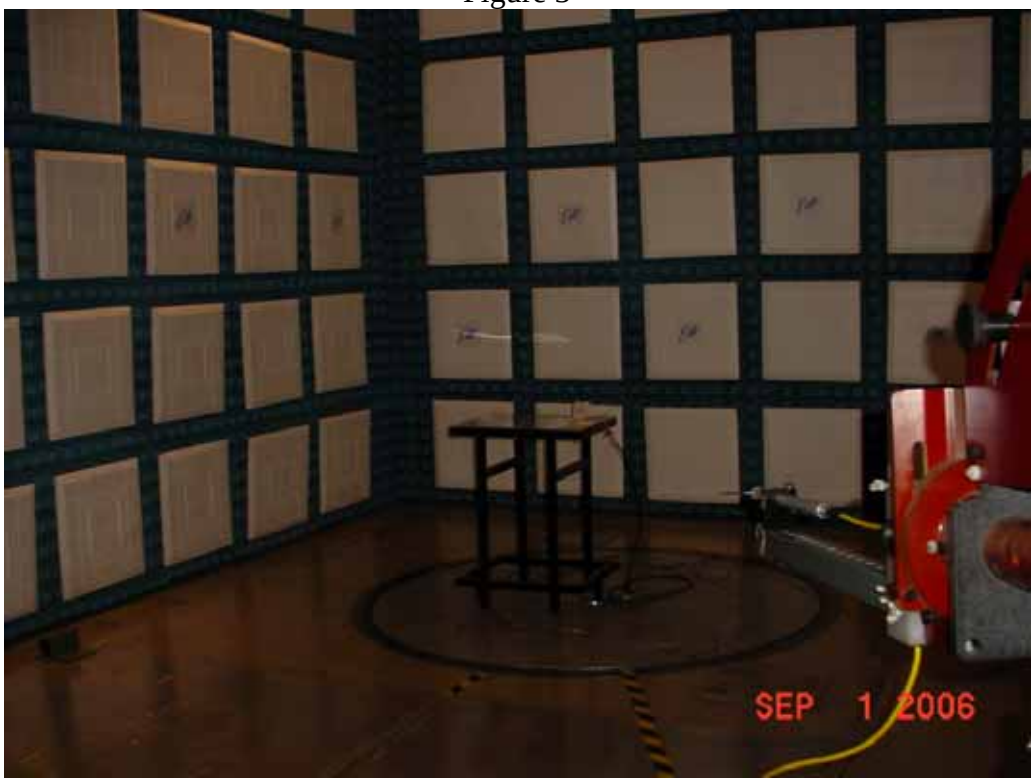


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

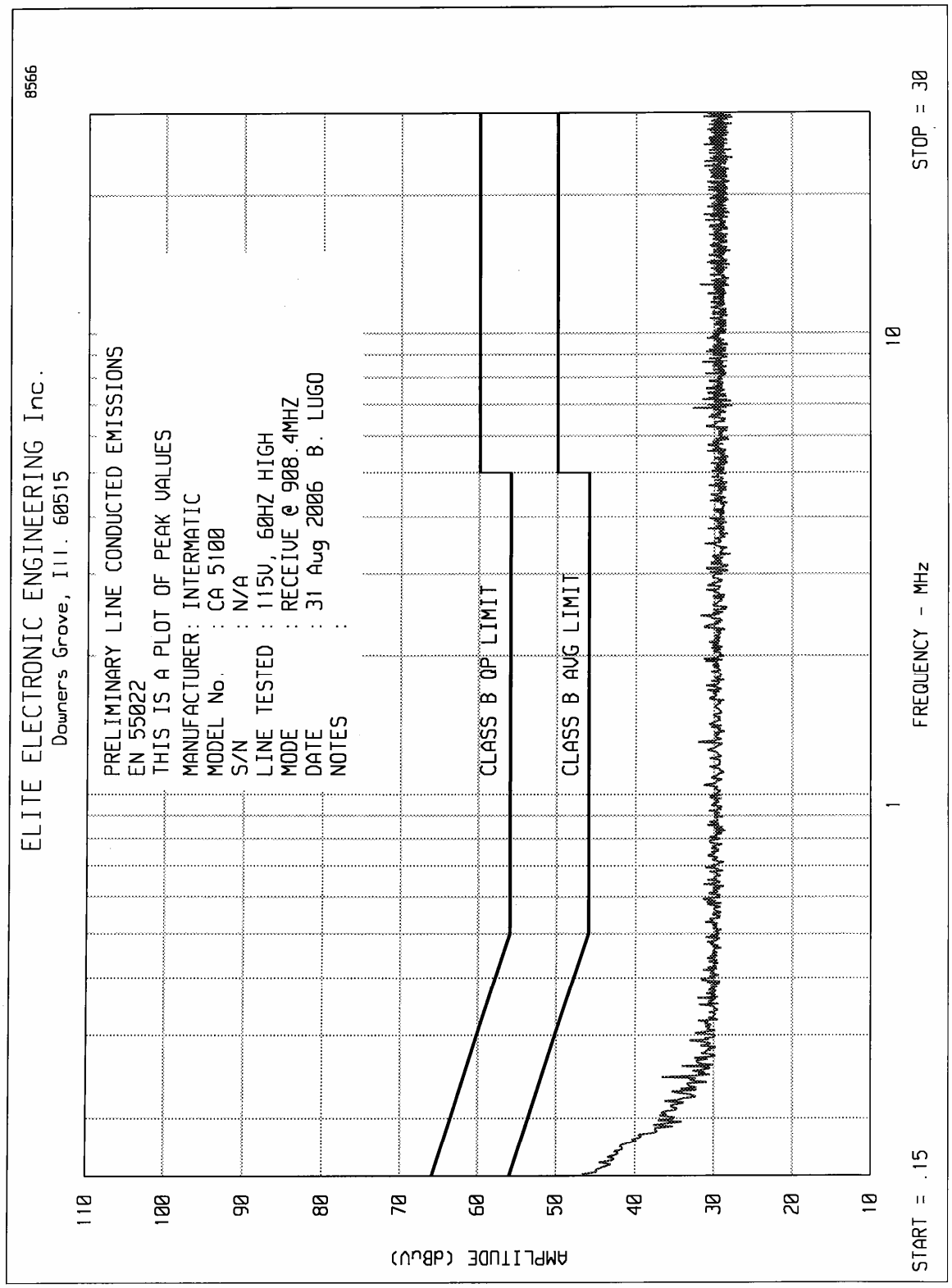
Test Setup for Conducted Emissions

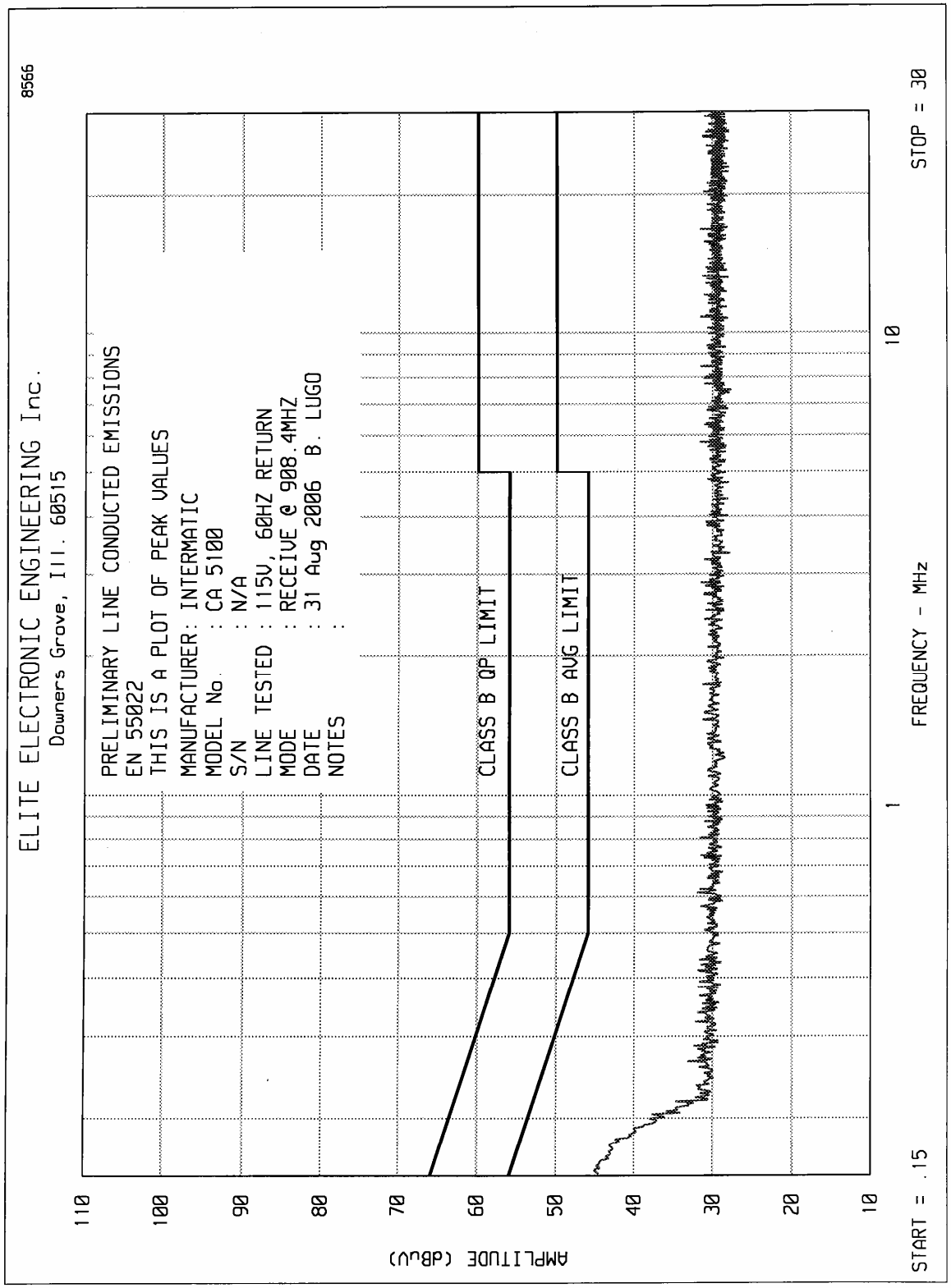
Figure 3



Test Setup for Radiated Emissions, 908MHz – Horizontal Polarization

Test Setup for Radiated Emissions, 908MHz – Vertical Polarization


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. : CA 5100
S/N : N/A
LINE TESTED : 115V, 60HZ HIGH
MODE : RECEIVE @ 908.4MHZ
DATE : 31 Aug 2006 B. LUGO
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. : CA 5100
S/N : N/A
LINE TESTED : 115V, 60HZ RETURN
MODE : RECEIVE @ 908.4MHZ
DATE : 31 Aug 2006 B. LUGO
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 : CA 5100
S/N : N/A
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60HZ HIGH
MODE : RECEIVE @ 908.4MHZ
DATE : 31 Aug 2006
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	35.4	66.0		56.0	
.547	27.5	56.0		46.0	
.852	27.4	56.0		46.0	
1.920	27.4	56.0		46.0	
3.322	27.3	56.0		46.0	
5.453	26.9	60.0		50.0	
7.293	26.9	60.0		50.0	
9.909	27.0	60.0		50.0	
12.694	27.0	60.0		50.0	
15.054	26.9	60.0		50.0	
18.208	26.9	60.0		50.0	
21.228	26.9	60.0		50.0	
23.993	26.9	60.0		50.0	
27.520	26.9	60.0		50.0	

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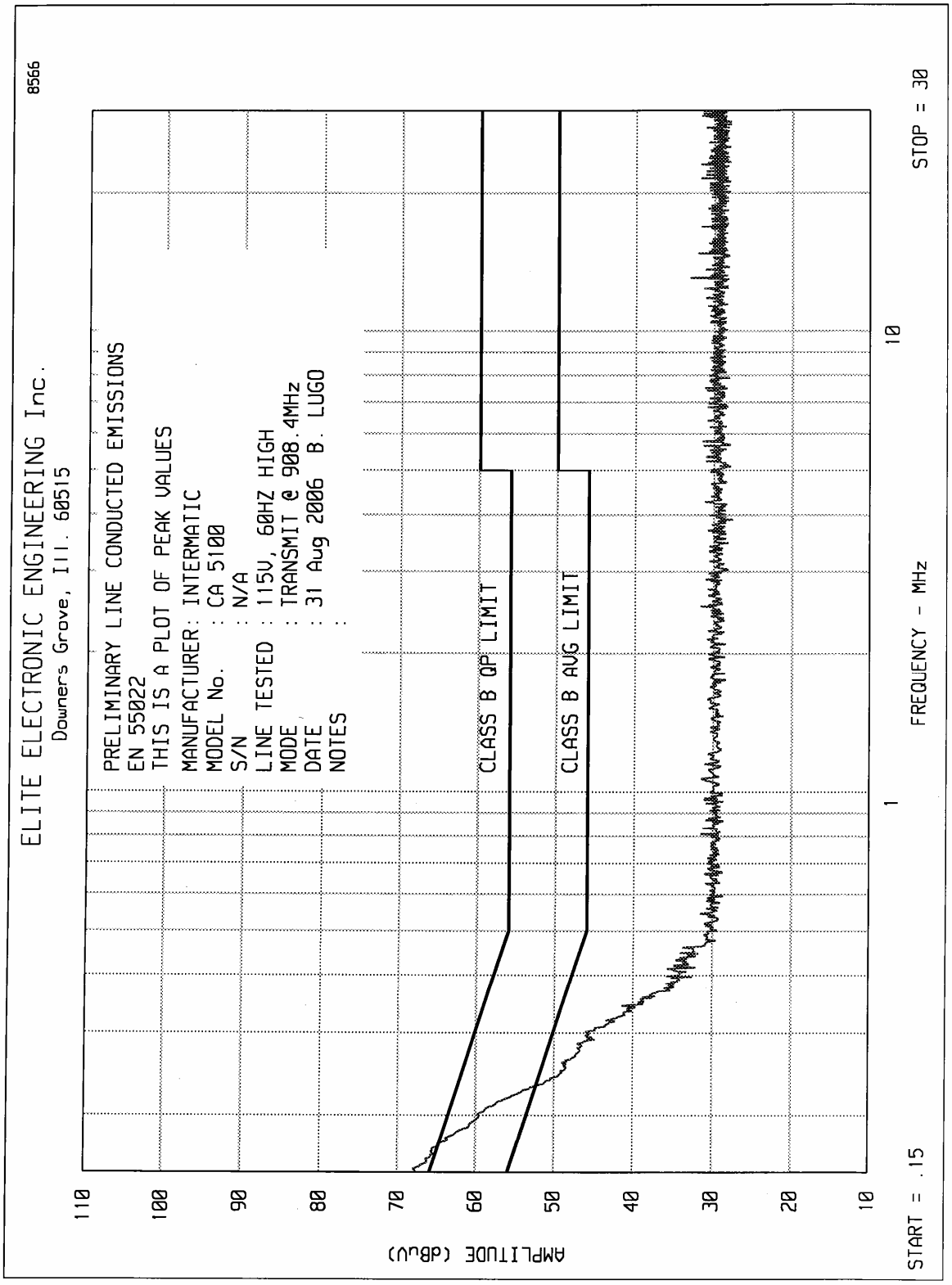
B. LUGO

ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : INTERMATIC
MODEL : CA 5100
S/N : N/A
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60HZ RETURN
MODE : RECEIVE @ 908.4MHZ
DATE : 31 Aug 2006
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
.152	39.0	65.9		55.9	
.371	27.6	58.5		48.5	
.651	27.4	56.0		46.0	
.870	27.4	56.0		46.0	
1.860	27.3	56.0		46.0	
3.185	27.3	56.0		46.0	
5.240	27.0	60.0		50.0	
6.274	26.9	60.0		50.0	
9.343	26.9	60.0		50.0	
12.499	26.9	60.0		50.0	
15.658	26.9	60.0		50.0	
18.405	26.9	60.0		50.0	
20.250	26.9	60.0		50.0	
24.381	26.9	60.0		50.0	
27.123	26.9	60.0		50.0	

CHECKED BY: Mark E Longwitt for
B. LUGO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ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
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MANUFACTURER: INTERMATIC
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S/N : N/A
LINE TESTED : 115V, 60HZ HIGH
MODE : TRANSMIT @ 908.4MHz
DATE : 31 Aug 2006 B. LUGO
NOTES :
CLASS B QP LIMIT
CLASS B AVG LIMIT
AMPLITUDE (dBuV)
110
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90
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70
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START = .15
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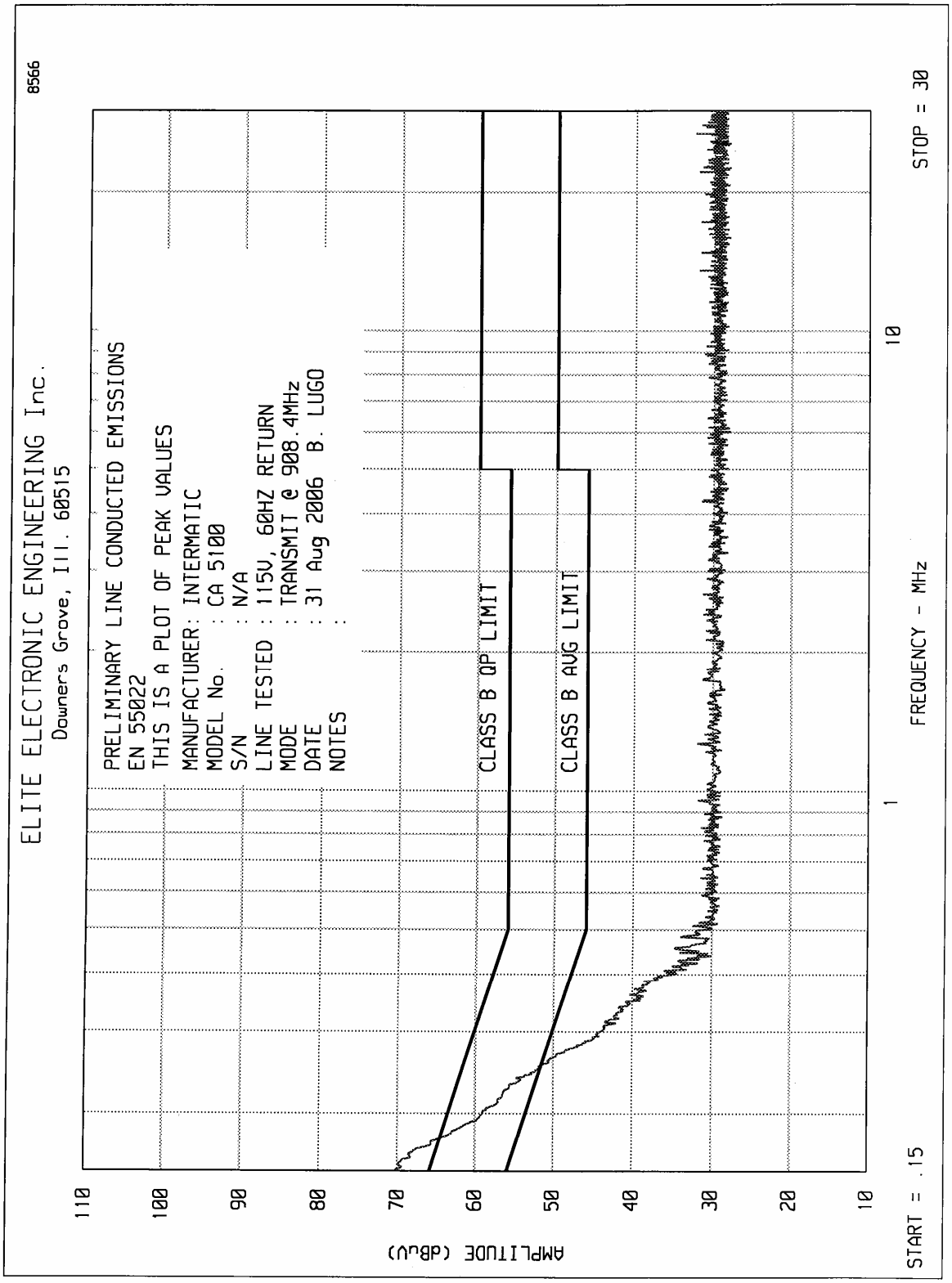
FREQUENCY - MHz


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. : CA 5100
S/N : N/A
LINE TESTED : 115V, 60HZ RETURN
MODE : TRANSMIT @ 908.4MHz
DATE : 31 Aug 2006 B. LUGO
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 : CA 5100
S/N : N/A
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60HZ HIGH
MODE : TRANSMIT @ 908.4MHz
DATE : 31 Aug 2006
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
.152	60.2	65.9	24.5	55.9	*
.163	56.5	65.3	22.6	55.3	*
.251	41.6	61.7		51.7	
.347	30.7	59.0		49.0	
.450	27.7	56.9		46.9	
.799	27.5	56.0		46.0	
1.917	27.4	56.0		46.0	
2.518	27.3	56.0		46.0	
4.226	27.3	56.0		46.0	
6.346	26.9	60.0		50.0	
8.713	26.9	60.0		50.0	
11.299	26.9	60.0		50.0	
15.491	26.9	60.0		50.0	
17.508	26.9	60.0		50.0	
21.436	26.9	60.0		50.0	
23.648	26.9	60.0		50.0	
27.507	26.9	60.0		50.0	

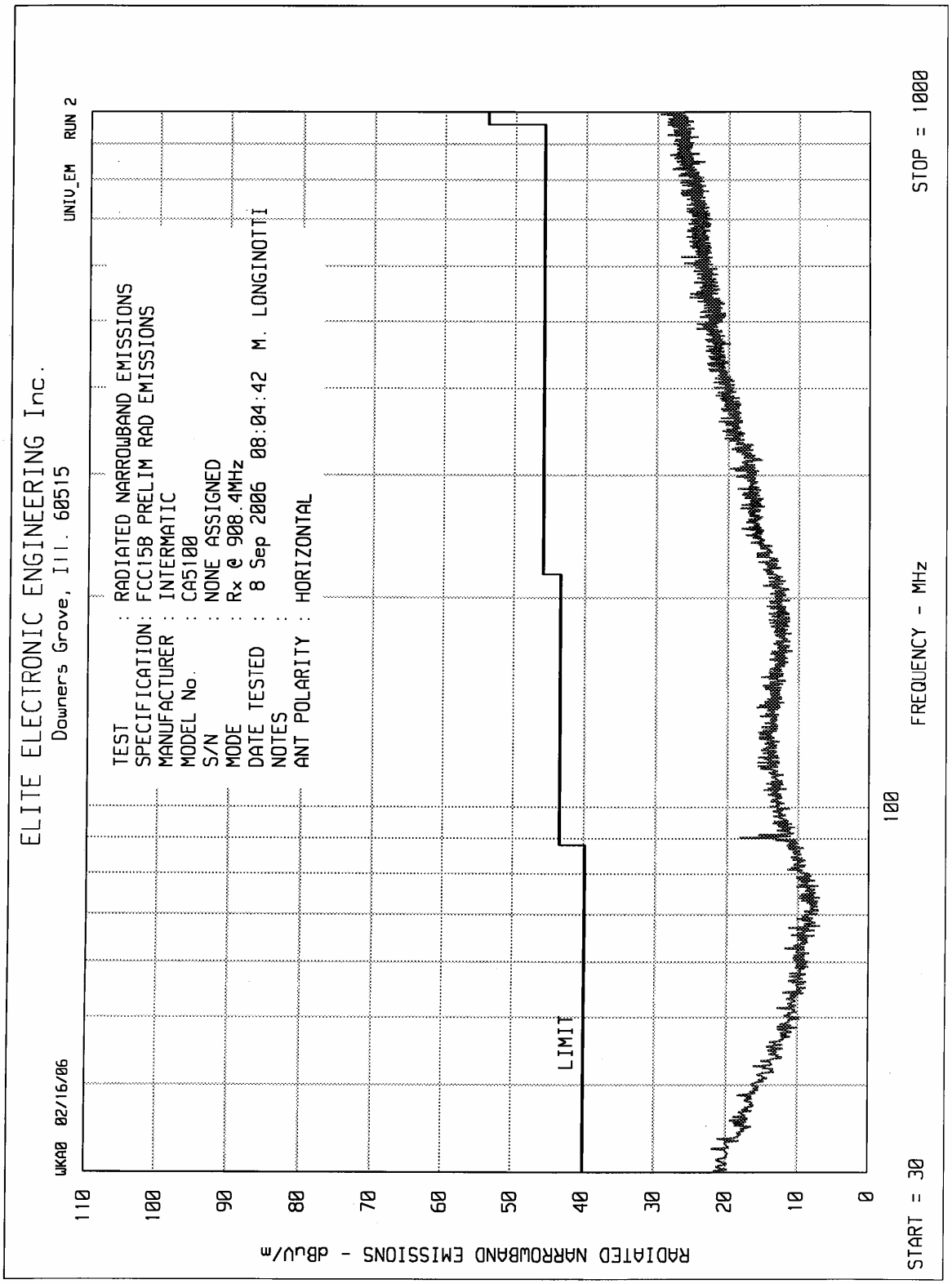
* QP EXCEEDS AVG LIMIT, SEE DATA CHECKED BY: Mark E Longworth for B. LUGO

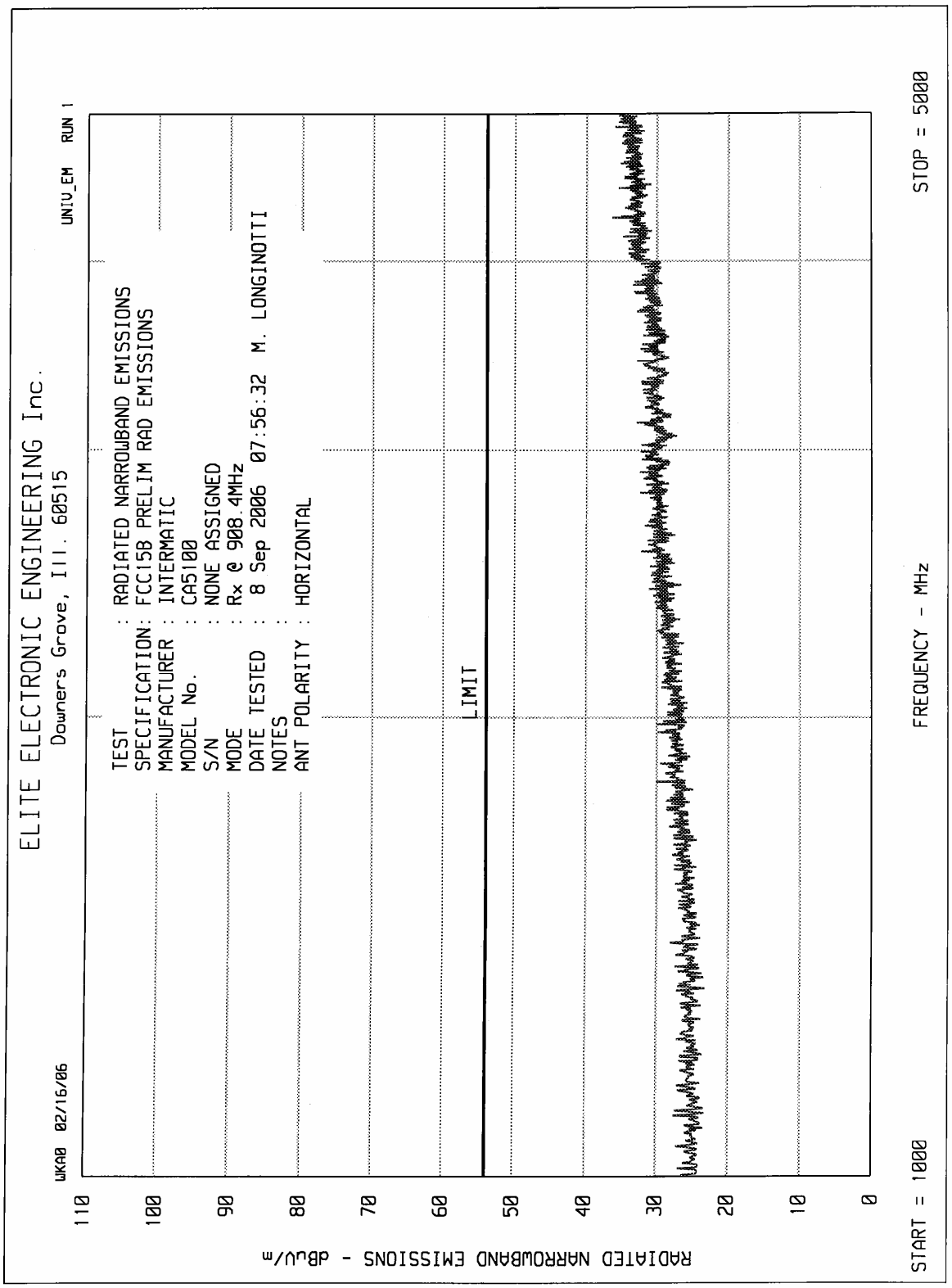
ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : INTERMATIC
MODEL : CA 5100
S/N : N/A
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60HZ RETURN
MODE : TRANSMIT @ 908.4MHz
DATE : 31 Aug 2006
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
.152	59.8	65.9	24.6	55.9	*
.243	44.5	62.0		52.0	
.317	33.0	59.8		49.8	
.361	30.2	58.7		48.7	
.462	27.7	56.7		46.7	
.466	27.5	56.6		46.6	
.943	27.4	56.0		46.0	
1.728	27.2	56.0		46.0	
2.970	27.3	56.0		46.0	
4.523	27.3	56.0		46.0	
6.434	27.0	60.0		50.0	
8.880	26.9	60.0		50.0	
13.079	26.9	60.0		50.0	
16.563	26.9	60.0		50.0	
19.749	26.9	60.0		50.0	
22.055	26.9	60.0		50.0	
24.663	26.9	60.0		50.0	
26.723	26.9	60.0		50.0	

* QP EXCEEDS AVG LIMIT, SEE DATA CHECKED BY: Mark E Longwell for B. LUGO


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION : FCC15B PRELIM RAD EMISSIONS
MANUFACTURER : INTERMATIC
MODEL No. : CA5100
S/N : NONE ASSIGNED
MODE : Rx @ 908.4MHz
DATE TESTED : 8 Sep 2006 08:04:42 M. LONGINOTTI
NOTES :
ANT POLARITY : HORIZONTAL
LIMIT
WKA0 02/16/06
RADIATED NARROWBAND 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 02/15/06
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15B PRELIM RAD EMISSIONS
MANUFACTURER : INTERMATIC
MODEL No. : CA5100
S/N : NONE ASSIGNED
MODE : Rx @ 908.4MHz
DATE TESTED : 8 Sep 2006 07:56:32 M. LONGINOTTI
NOTES :
ANT POLARITY : HORIZONTAL
LIMIT
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 5000

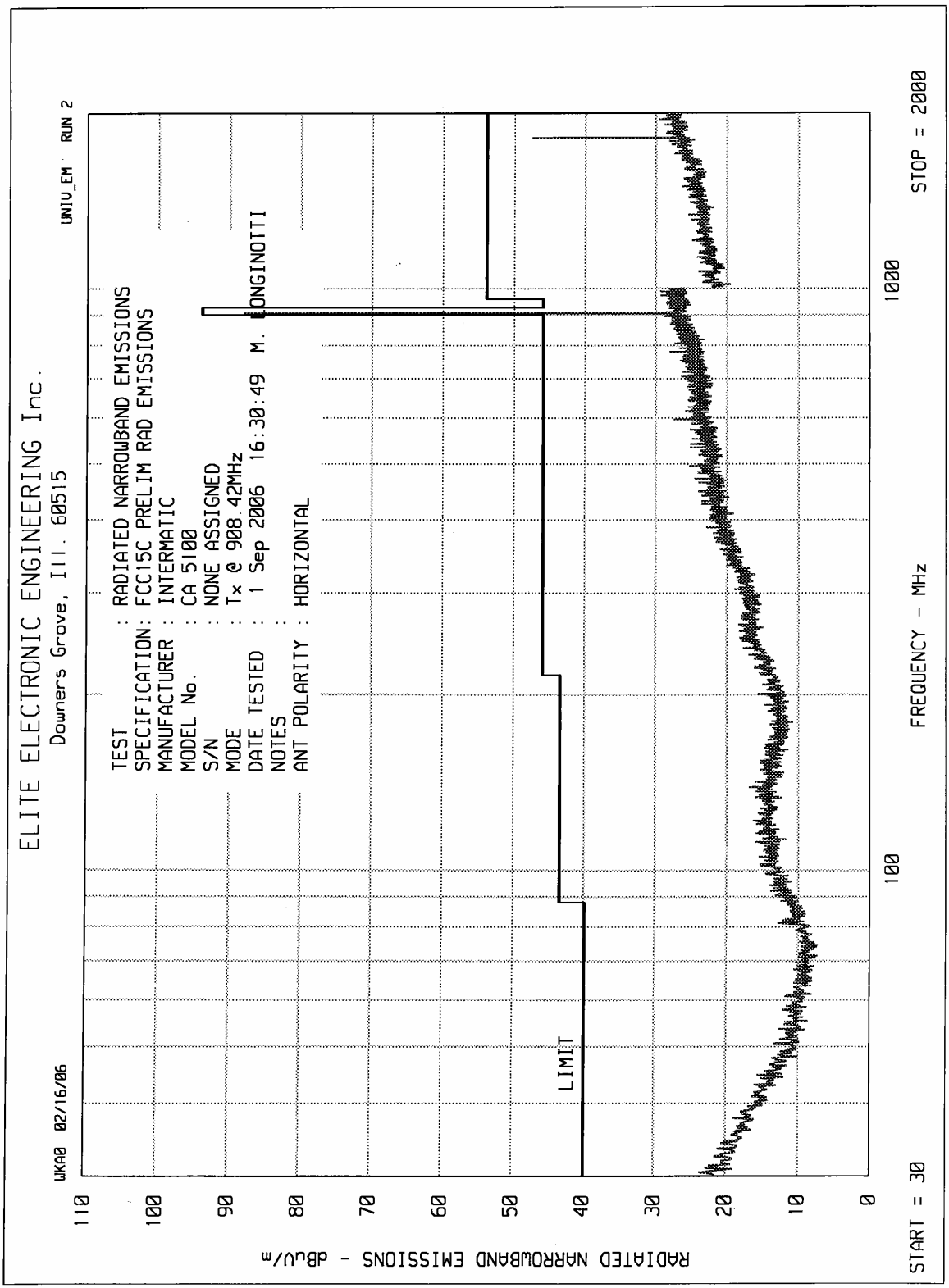
MANUFACTURER : Intermatic
TEST ITEM : Transceiver
MODEL NO. : CA 5100 AC Power Light Switch
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 908.3MHz
TEST DATE : August 30, 2006 through September 8, 2006
TEST DISTANCE : 3 meters

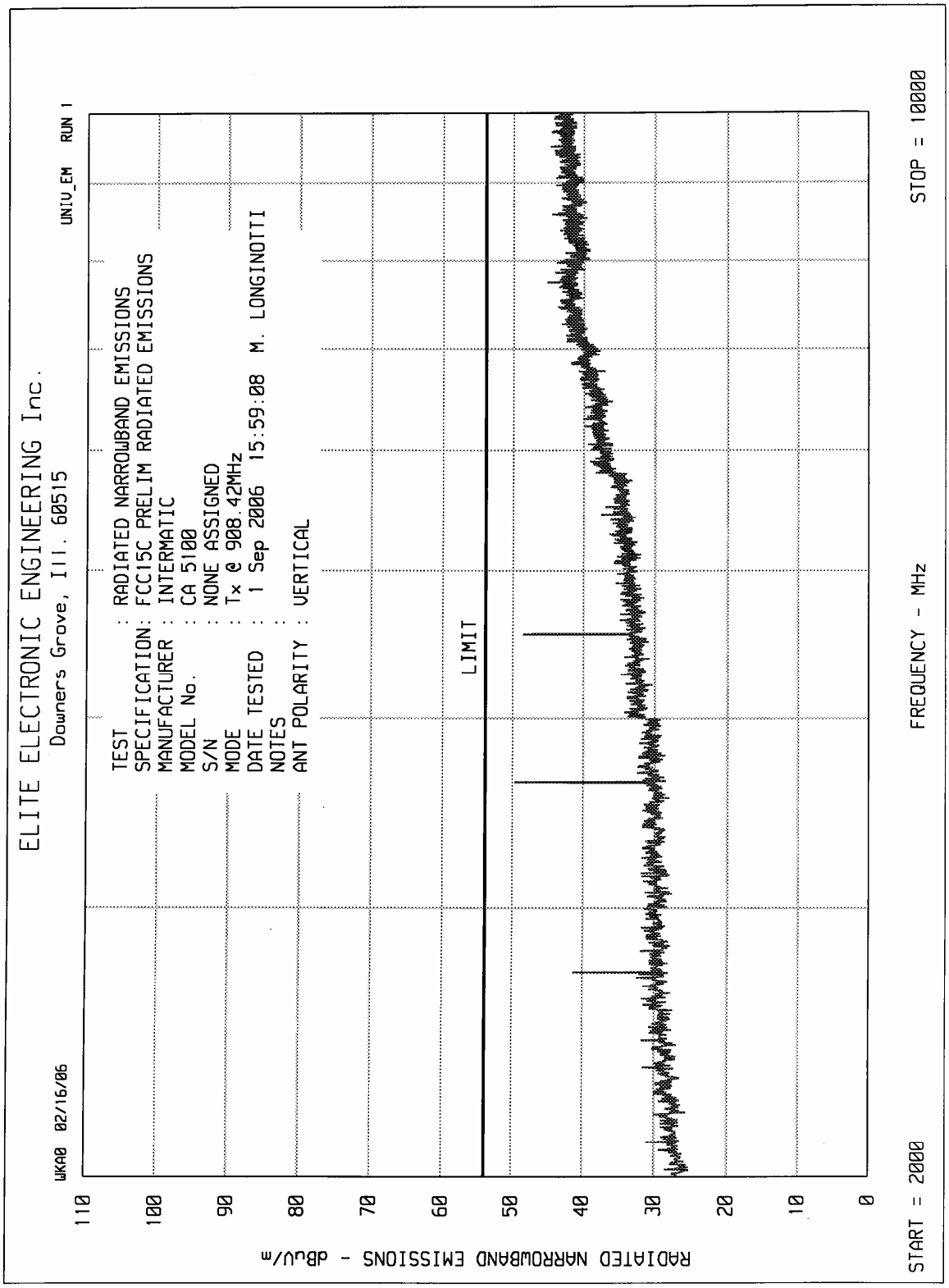
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.3	H	8.1		1.9	27.6	0.0	37.6	76.3	200.0
908.3	V	7.6		1.9	27.6	0.0	37.1	72.0	200.0
1816.6	H	2.8	Ambient	2.9	28.1	0.0	33.7	48.6	500.0
1816.6	V	2.6	Ambient	2.9	28.1	0.0	33.5	47.5	500.0
2724.9	H	2.3	Ambient	3.8	31.4	0.0	37.5	74.8	500.0
2724.9	V	2.4	Ambient	3.8	31.4	0.0	37.6	75.6	500.0
3633.2	H	2.6	Ambient	4.4	32.5	-33.6	5.9	2.0	500.0
3633.2	V	2.6	Ambient	4.4	32.5	-33.6	5.9	2.0	500.0
4541.5	H	2.9	Ambient	4.8	32.9	-32.2	8.4	2.6	500.0
4541.5	V	3.0	Ambient	4.8	32.9	-32.2	8.5	2.7	500.0

H – Horizontal
V = Vertical

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 NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : INTERMATIC
MODEL No. : CA 5100
S/N : NONE ASSIGNED
MODE : Tx @ 908.42MHz
DATE TESTED : 1 Sep 2006 16:30:49 M. LONGINOTTI
NOTES :
ANT POLARITY : HORIZONTAL
LIMIT
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 30
100
1000
STOP = 2000
FREQUENCY - MHz


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 1
WKA0 02/16/06
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RADIATED EMISSIONS
MANUFACTURER : INTERMATIC
MODEL No. : CA 5100
S/N : NONE ASSIGNED
MODE : Tx @ 908.42MHz
DATE TESTED : 1 Sep 2006 15:59:08 M. LONGINOTTI
NOTES :
ANT POLARITY : VERTICAL
LIMIT
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 2000
FREQUENCY - MHz
STOP = 10000

MANUFACTURER : Intermatic
TEST ITEM : Transceiver
MODEL NO. : CA 5100 AC Power Light Switch
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 908.4MHz
TEST DATE : August 30, 2006 through September 8, 2006
TEST DISTANCE : 3 meters

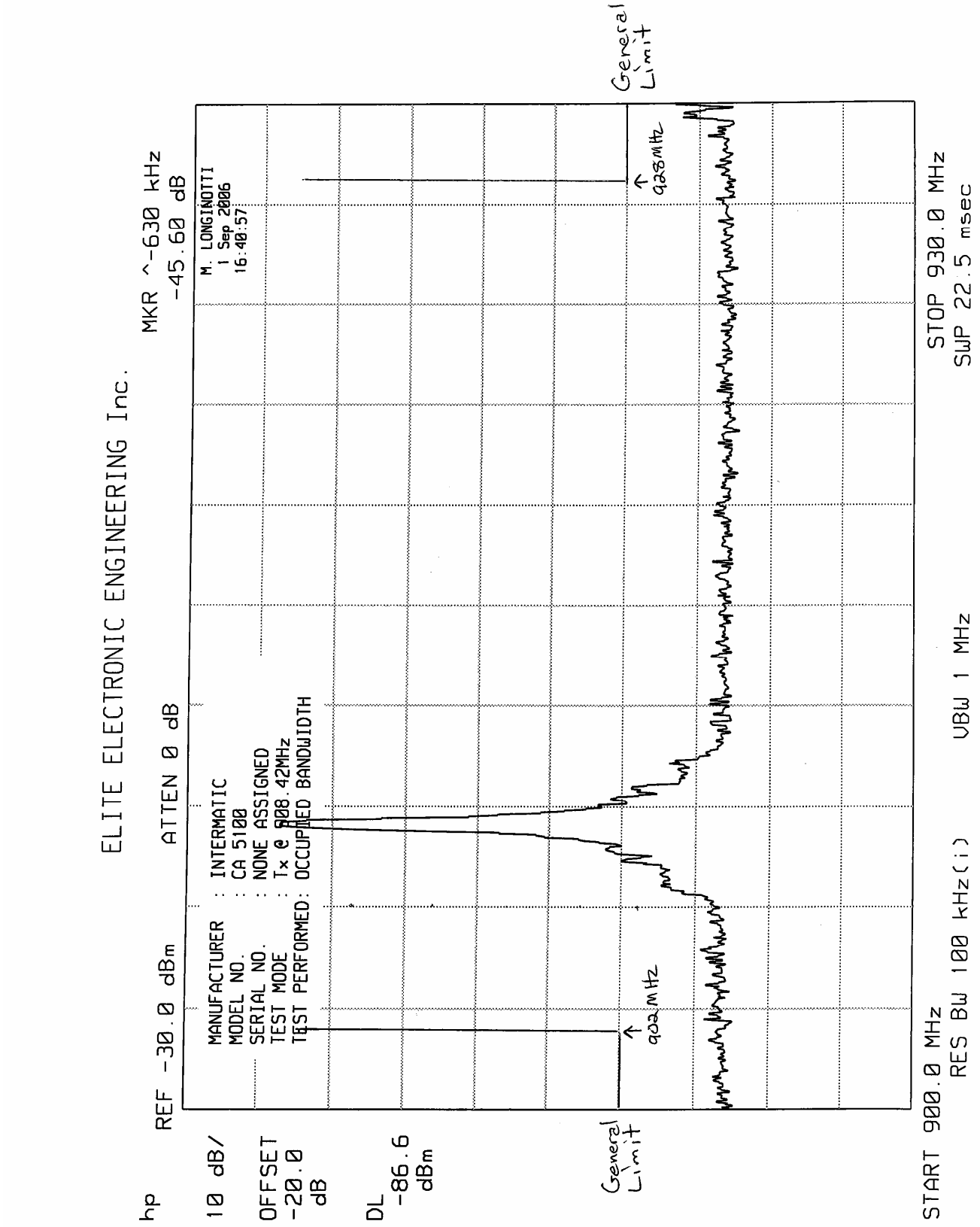
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.4	H	60.7		1.9	27.6	0.0	90.3	32551.8	50000.0
908.4	V	59.9		1.9	27.6	0.0	89.5	29687.6	50000.0
1816.8	H	13.9		2.9	28.1	0.0	44.8	174.4	500.0
1816.8	V	14.6		2.9	28.1	0.0	45.5	189.0	500.0
2725.3	H	6.8	Ambient	3.8	31.4	0.0	42.0	125.5	500.0
2725.3	V	14.1		3.8	31.4	0.0	49.3	290.9	500.0
3633.7	H	11.2		4.4	32.5	0.0	48.1	254.1	500.0
3633.7	V	15.6		4.4	32.5	0.0	52.5	421.7	500.0
4542.1	H	10.0		4.8	32.9	0.0	47.7	243.7	500.0
4542.1	V	15.3		4.8	32.9	0.0	53.0	448.7	500.0
5450.5	H	35.7		5.2	35.3	-31.9	44.4	166.0	500.0
5450.5	V	36.9		5.2	35.3	-31.9	45.6	190.6	500.0
6358.9	H	30.8	Ambient	5.9	36.1	-31.6	41.2	115.4	500.0
6358.9	V	30.1	Ambient	5.9	36.1	-31.6	40.5	106.5	500.0
7267.4	H	29.3	Ambient	6.6	37.7	-31.4	42.2	128.1	500.0
7267.4	V	29.2	Ambient	6.6	37.7	-31.4	42.1	126.7	500.0
8175.8	H	29.0	Ambient	7.1	37.7	-31.7	42.1	126.8	500.0
8175.8	V	29.2	Ambient	7.1	37.7	-31.7	42.3	129.7	500.0
9084.2	H	29.2	Ambient	7.5	38.0	-31.8	42.9	138.9	500.0
9084.2	V	29.1	Ambient	7.5	38.0	-31.8	42.8	137.3	500.0

H – Horizontal

V = Vertical

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

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
hp
REF -30.0 dBm
ATTEN 0 dB
MKR ^-630 kHz
-45.60 dB
10 dB/
OFFSET
-20.0
dB
DL
-86.6
dBm
MANUFACTURER : INTERMATIC
MODEL NO. : CA 5100
SERIAL NO. : NONE ASSIGNED
TEST MODE : Tx @ 908.42MHz
TEST PERFORMED: OCCUPIED BANDWIDTH
M. LONGINOTTI
1 Sep 2006
16:40:57
General Limit
902MHz
938MHz
General Limit
START 900.0 MHz
RES BW 100 kHz(i)
VBW 1 MHz
STOP 930.0 MHz
SWP 22.5 msec