Measurement of RF Interference from a Transceiver Model VERI310 Tag

For : Omicron Technologies
Chicago, IL

Date Received : September 27, 2006
Date Tested : September 27, 2006 through September 29, 2006
Test Personnel : Mark E. Longinotti, NARTE® Certified EMC Test Engineer, ATL-0154-E
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

Test Report By : MARK E. LONGINOTTI
Mark E. Longinotti
NARTE® Certified EMC Test Engineer, ATL-0154-E

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

Elite Electronic Engineering Inc.
1516 Centre Circle
Downers Grove, IL 60515
Tel : (630) 495-9770
Fax: (630) 495-9785
www.elitetest.com

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THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL,
WITHOUT THE WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INC.

Measurement of RF Emissions from a Transceiver,
Model No. VERI310 Tag

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. VERI310 Tag (hereinafter referred to as the test item). Six (6) separate units were submitted for testing. Each of the six units was programmed to operate in one of the following modes:

- Continuously receive at 902.963MHz
- Continuously receive at 915.937MHz
- Continuously receive at 926.996MHz
- Continuously transmit at 902.963MHz
- Continuously transmit at 915.937MHz
- Continuously transmit at 926.996MHz

The test item is designed to transmit and receive in the 902.963MHz to 926.996MHz range using an internal antenna. The test item was submitted for testing by Omicron Technologies located in Chicago, 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°C and the relative humidity was 52%.

2.0 TEST ITEM SET-UP AND OPERATION:

The test item is a Transceiver, Model No. VERI310 Tag. A block diagram of the test item set-up is shown as Figure 1.

2.1 Power Input - The test item was powered by an internal 3.6VDC lithium inorganic battery.

2.2 Grounding - The test item was ungrounded for all tests.

2.3 Peripheral Equipment - The test item was submitted for testing with no peripheral equipment.

2.4 Interconnect Cables - The test item was submitted for testing with no interconnect cables.

2.5 Operational Mode - For all tests, the test item was placed on an 80cm high non-conductive stand. The test item was energized. Emissions tests were performed separately with the test item operating in each of the following modes:

- Continuously receive at 902.963MHz
- Continuously receive at 915.937MHz
- Continuously receive at 926.996MHz
- Continuously transmit at 902.963MHz
- Continuously transmit at 915.937MHz
- Continuously transmit at 926.996MHz

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 - Since the test item was powered by an internal battery, no conducted emissions tests are required.

4.1.2 Transmitter

4.1.2.1 Requirements - Since the test item was powered by an internal battery, no conducted emissions tests are required.

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 RECEIVERS

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.

   d. For hand-held or body-worn devices, the test item was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

4.2.1.3 Results - The preliminary plots, with the test item receiving at 902.963MHz, are presented on pages 15 and 16. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on page 17. 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 902.8MHz. The emissions level at this frequency was 4.3dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 2 and 3.

The preliminary plots, with the test item receiving at 915.937MHz, are presented on pages 18 and 19. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on page 20. 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 915.8MHz. The emissions level at this frequency was 10.3dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 2 and 3.

The preliminary plots, with the test item receiving at 926.996MHz, are presented on pages 21 and 22. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on page 23. 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 926.9MHz. The emissions level at this frequency was 5.0dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 2 and 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 and Spurious 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 10GHz 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 10GHz. 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) For hand-held or body-worn devices, the test item was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

4.2.2.3 Results - The preliminary plots, with the test item transmitting at 902.963MHz, are presented on data pages 24 and 25. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on data page 26. 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 2708.9MHz. The emissions level at this frequency was 3.8dB within the limit. Photographs of the test configuration which yielded the highest or

worst case, radiated emission levels are shown on Figures 2 and 3.

The preliminary plots, with the test item transmitting at 915.937MHz, are presented on data pages 27 and 28. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on data page 29. 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 1831.9MHz. The emissions level at this frequency was 3.7dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 2 and 3.

The preliminary plots, with the test item transmitting at 926.996MHz, are presented on data pages 30 and 31. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on data page 32. 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 1854.0MHz. The emissions level at this frequency was 0.4dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 2 and 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 5 MHz. The frequency spectrum near the fundamental was plotted.

4.3.3 Results - The plot of the emissions near the fundamental frequency, with the test item transmitting at 902.963MHz is presented on data page 33. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

The plot of the emissions near the fundamental frequency, with the test item transmitting at 926.996MHz is presented on data page 34. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

The 99% bandwidth was measured to be 240kHz.

5.0 CONCLUSIONS:

It was determined that the Omicron Technologies Transceiver, Model No. VERI310 Tag, (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								
XZG3	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2421A03059	---		N/A	
Equipment Type: AMPLIFIERS								
APK3	PREAMPLIFIER	AGILENT TECHNOL	8449B	3008A01593	1-26.5GHZ	06/12/06	12	06/12/07
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
NWG0	RIDGED WAVE GUIDE (DCC-MAT	AEL	H1479	104	1-12.4GHZ	10/01/05	12	10/01/06
NWP0	DOUBLE RIDGED WAVEGUIDE AN	EATON	3115	2099	1GHZ-18GHZ	10/01/05	12	10/01/06
Equipment Type: RECEIVERS								
RACD	RF PRESELECTOR	HEWLETT PACKARD	85685A	3010A01205	20HZ-2GHZ	12/23/05	12	12/23/06
RAE7	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	2516A01685	100HZ-22GHZ	08/21/06	12	08/21/07
RAF4	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	2043A00320	0.01-1000MHZ	02/10/06	12	02/10/07

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.

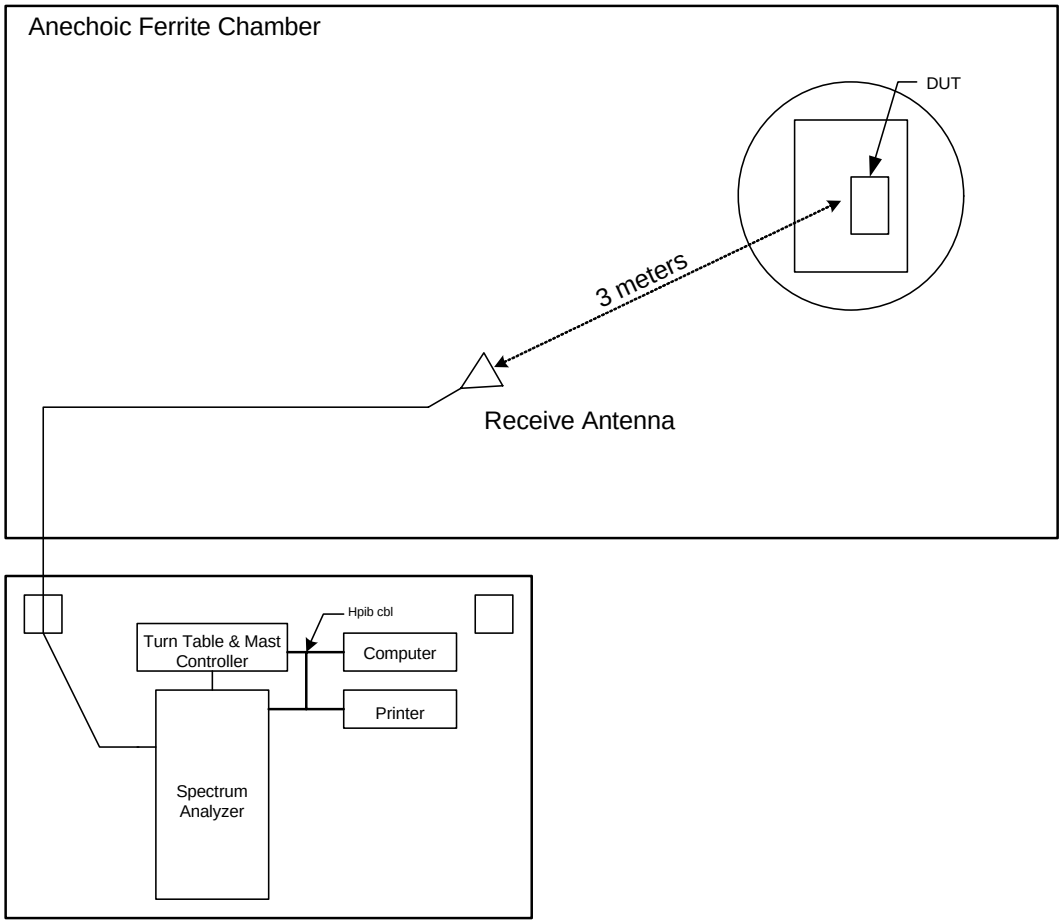
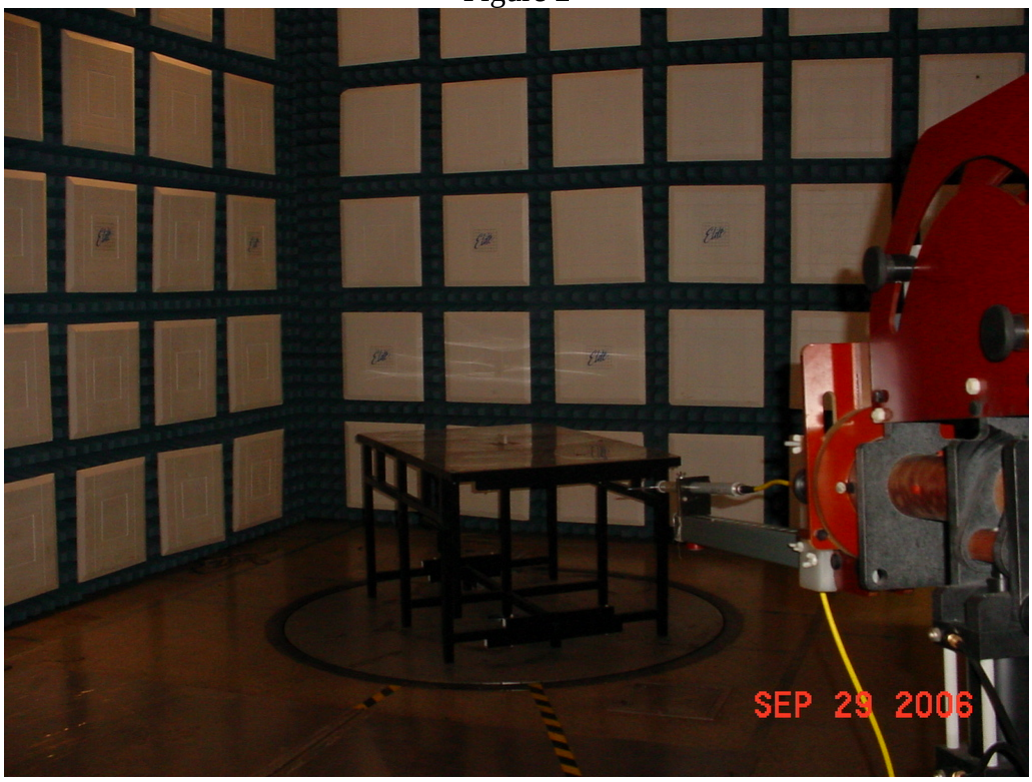
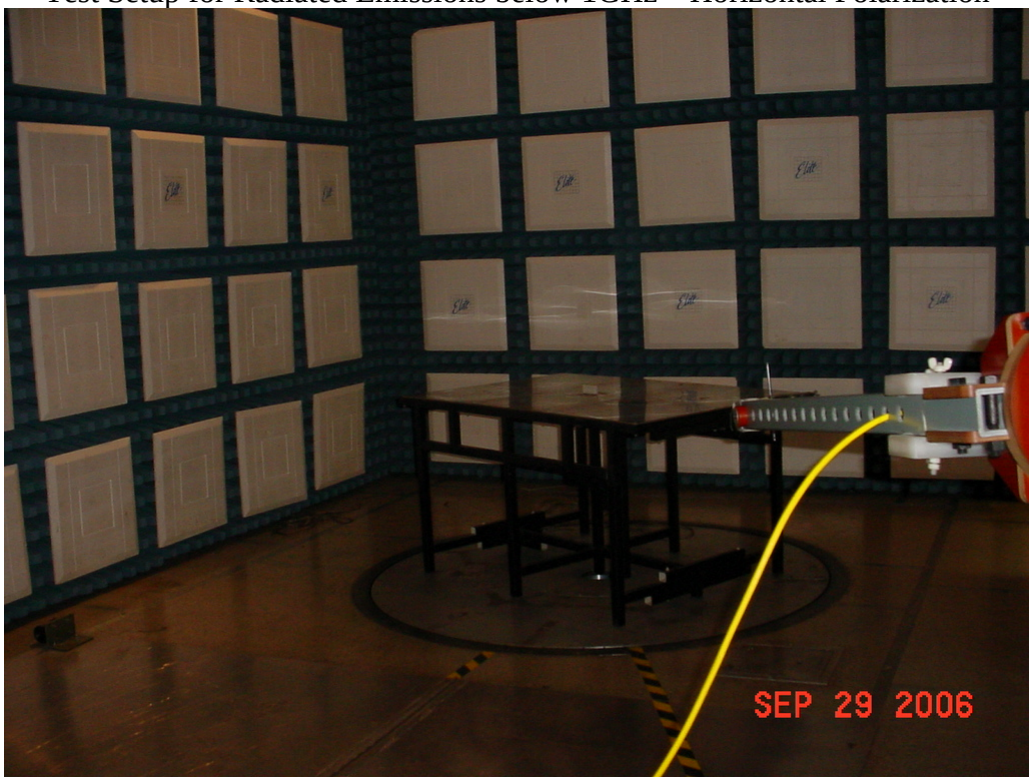


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

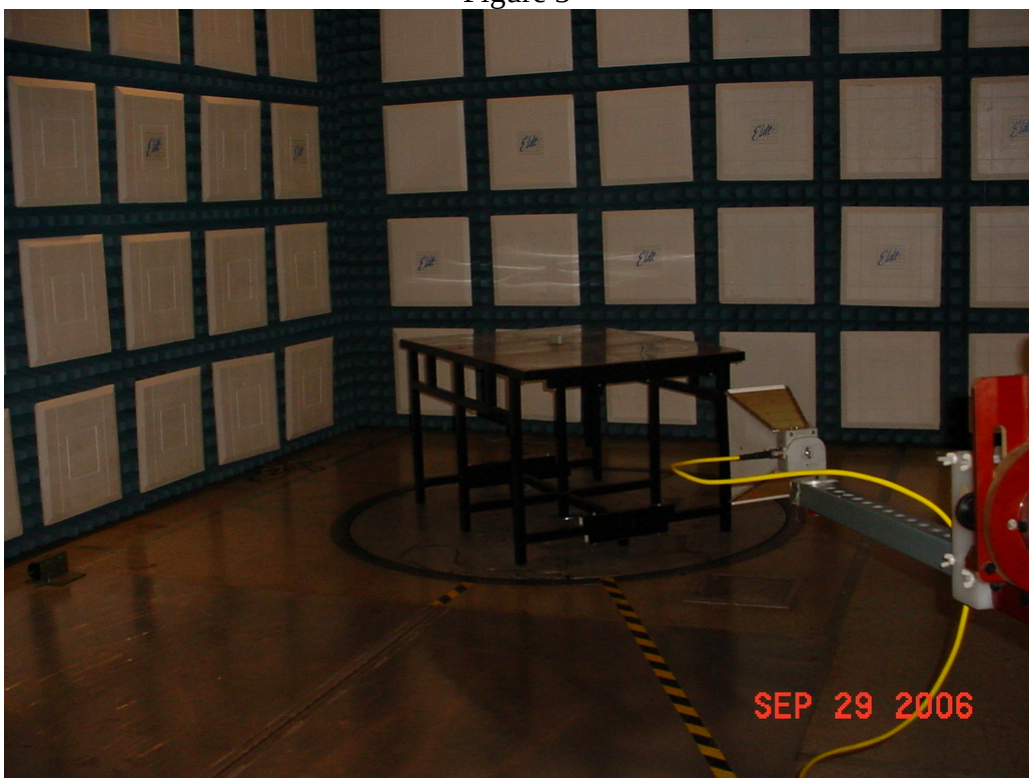


Test Setup for Radiated Emissions below 1GHz – Horizontal Polarization

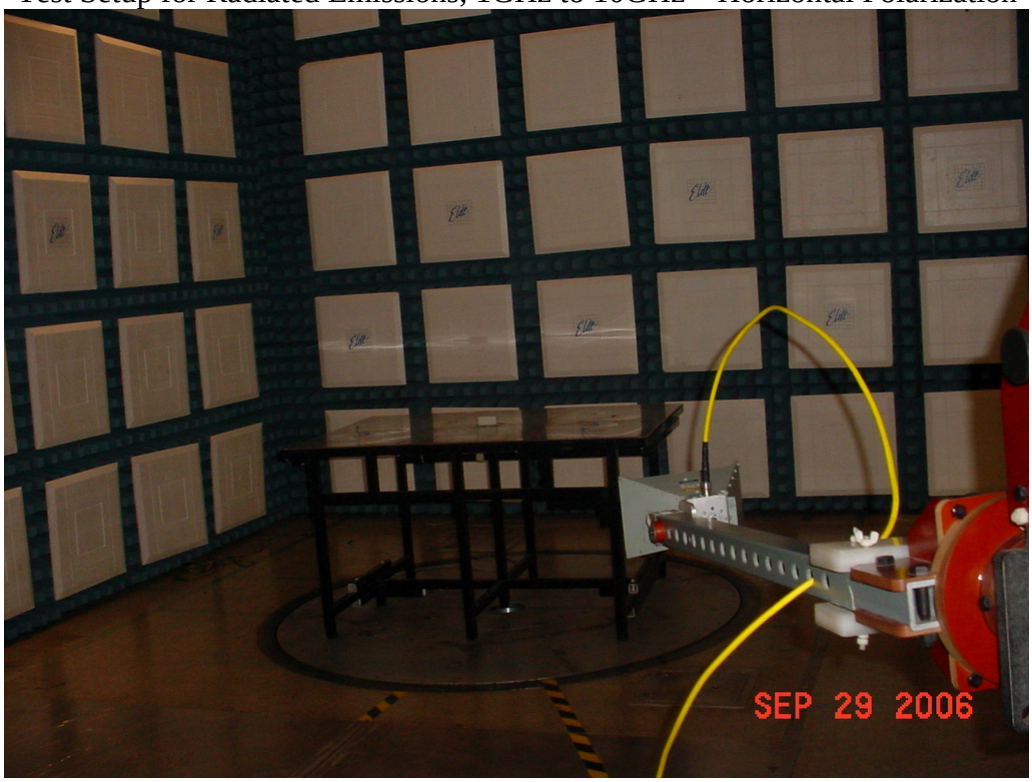


Test Setup for Radiated Emissions below 1GHz – Vertical Polarization

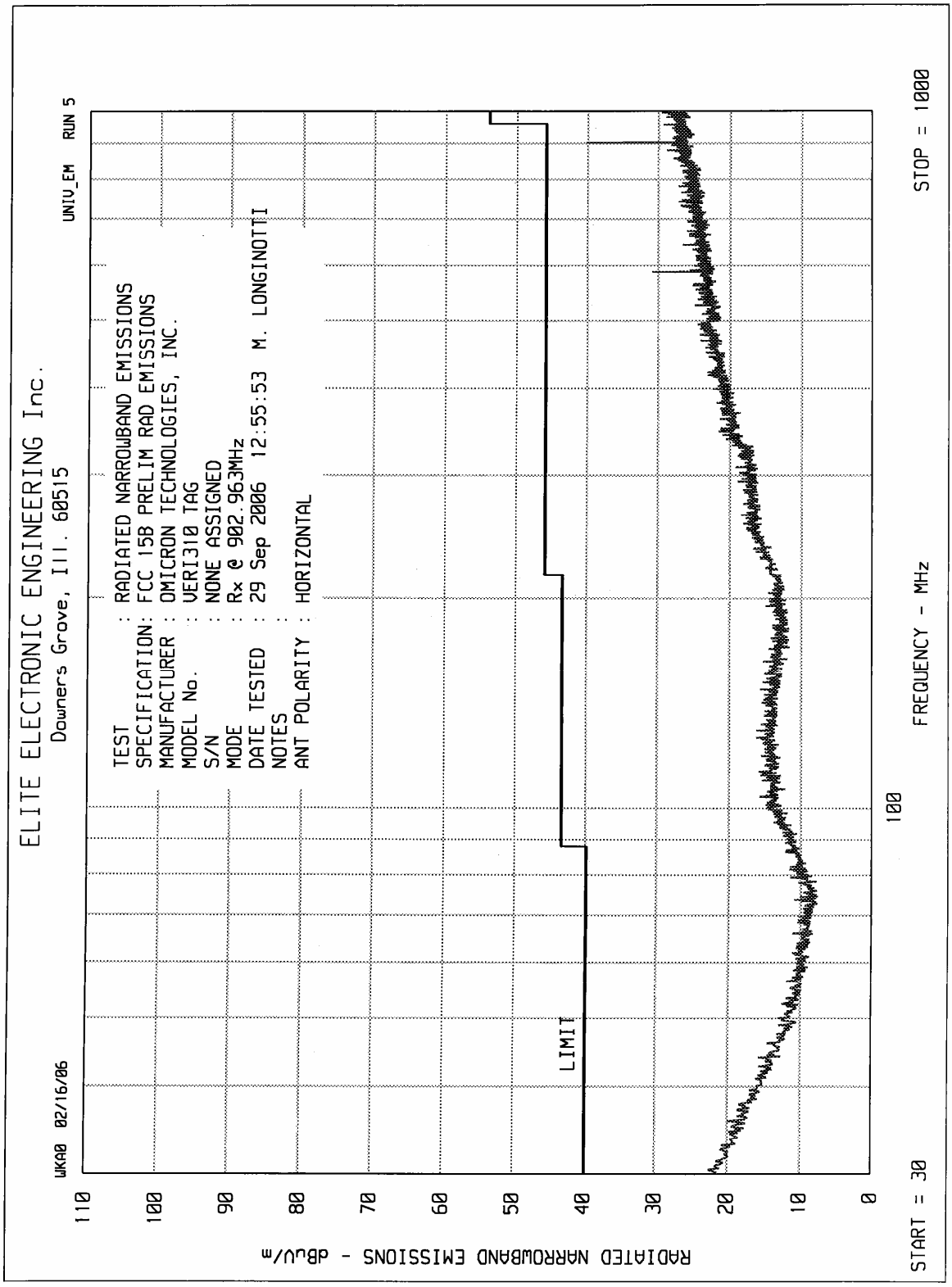
Figure 3

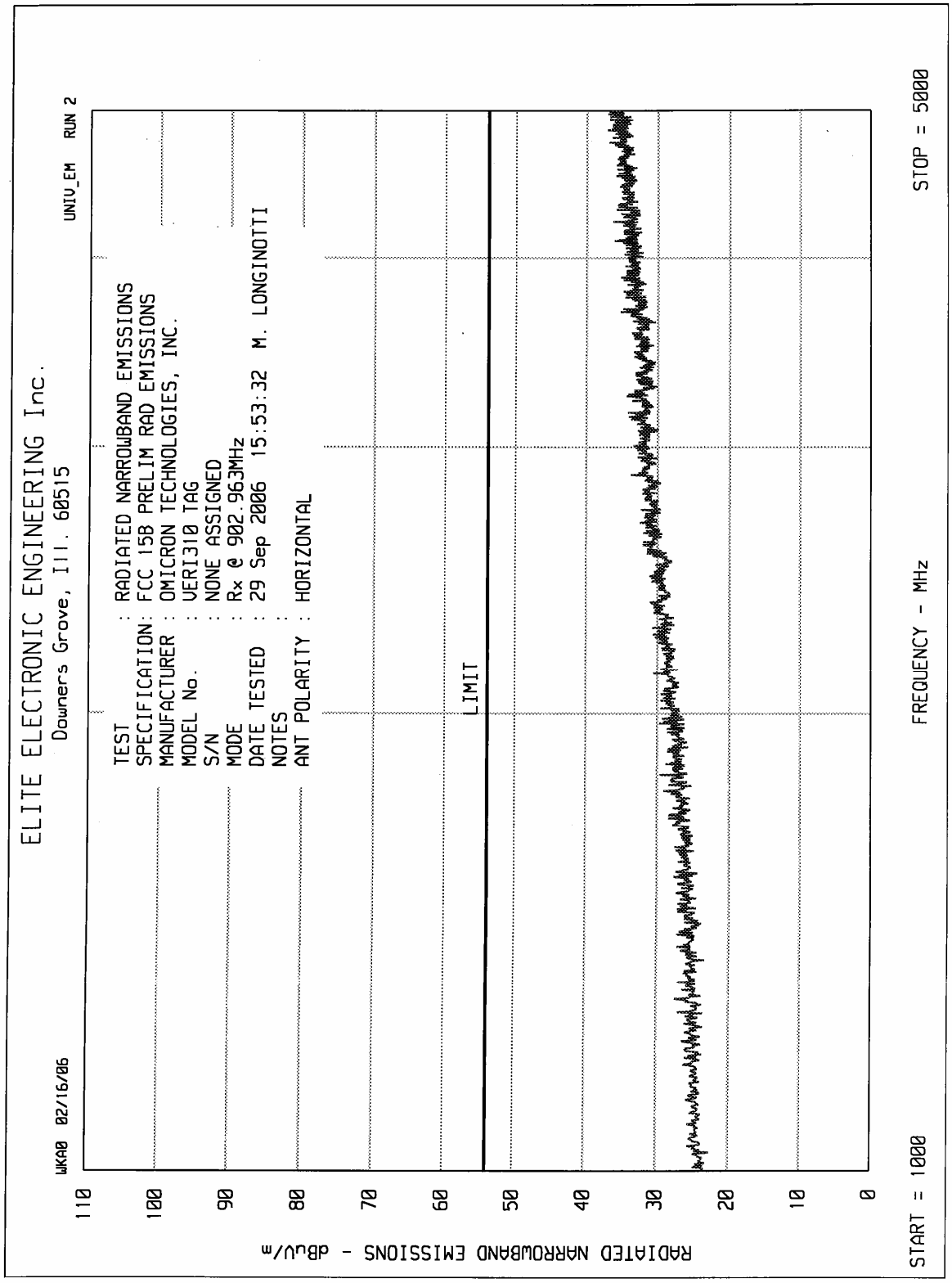


Test Setup for Radiated Emissions, 1GHz to 10GHz – Horizontal Polarization



Test Setup for Radiated Emissions, 1GHz to 10GHz – Vertical Polarization


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 5
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Rx @ 902.963MHz
DATE TESTED : 29 Sep 2006 12:55:53 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
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Rx @ 902.963MHz
DATE TESTED : 29 Sep 2006 15:53:32 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

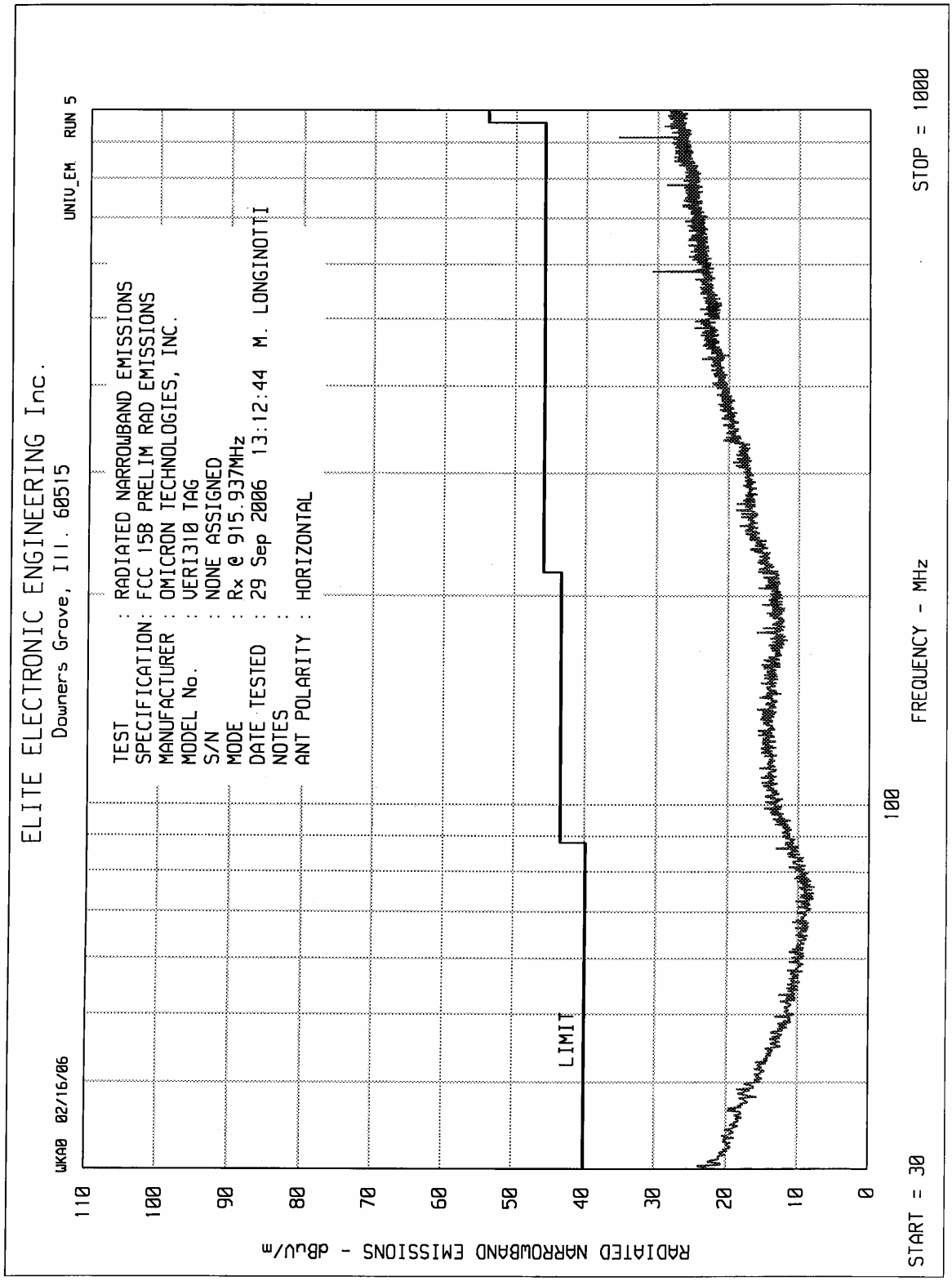
MANUFACTURER : Omicron Technologies
TEST ITEM : Transceiver
MODEL NO. : VERI310 Tag
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 902.963MHz
TEST DATE : September 27, 2006 through September 29, 2006
TEST DISTANCE : 3 meters

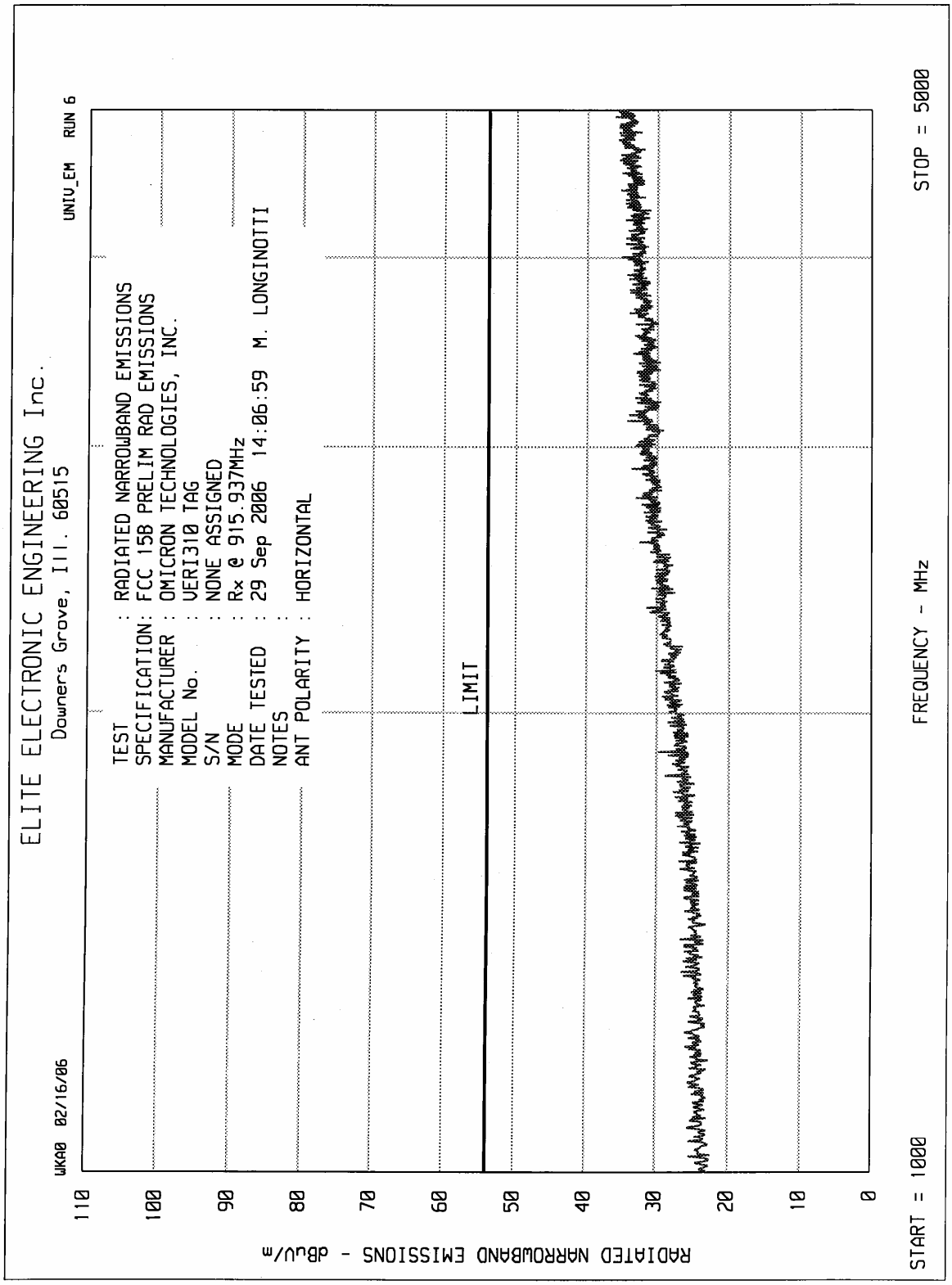
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
902.8	H	17.5		1.9	22.3	0.0	41.7	121.6	200.0
902.8	V	9.8		1.9	22.3	0.0	34.0	50.1	200.0
1805.6	H	32.6	Ambient	2.9	27.4	-34.5	28.4	26.3	500.0
1805.6	V	35.7	Ambient	2.9	27.4	-34.5	31.5	37.6	500.0
2708.5	H	32.8	Ambient	3.7	30.4	-34.5	32.5	42.2	500.0
2708.5	V	32.8	Ambient	3.7	30.4	-34.5	32.5	42.2	500.0
3611.3	H	30.7	Ambient	4.4	32.4	-34.6	32.9	43.9	500.0
3611.3	V	30.5	Ambient	4.4	32.4	-34.6	32.7	42.9	500.0
4514.1	H	31.6	Ambient	4.8	32.8	-34.7	34.5	53.0	500.0
4514.1	V	31.6	Ambient	4.8	32.8	-34.7	34.5	53.0	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
WKAB 02/16/06
UNIV_EM RUN 5
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Rx @ 915.937MHz
DATE TESTED : 29 Sep 2006 13:12:44 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
STOP = 1000
FREQUENCY - MHz


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 6
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Rx @ 915.937MHz
DATE TESTED : 29 Sep 2006 14:06:59 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

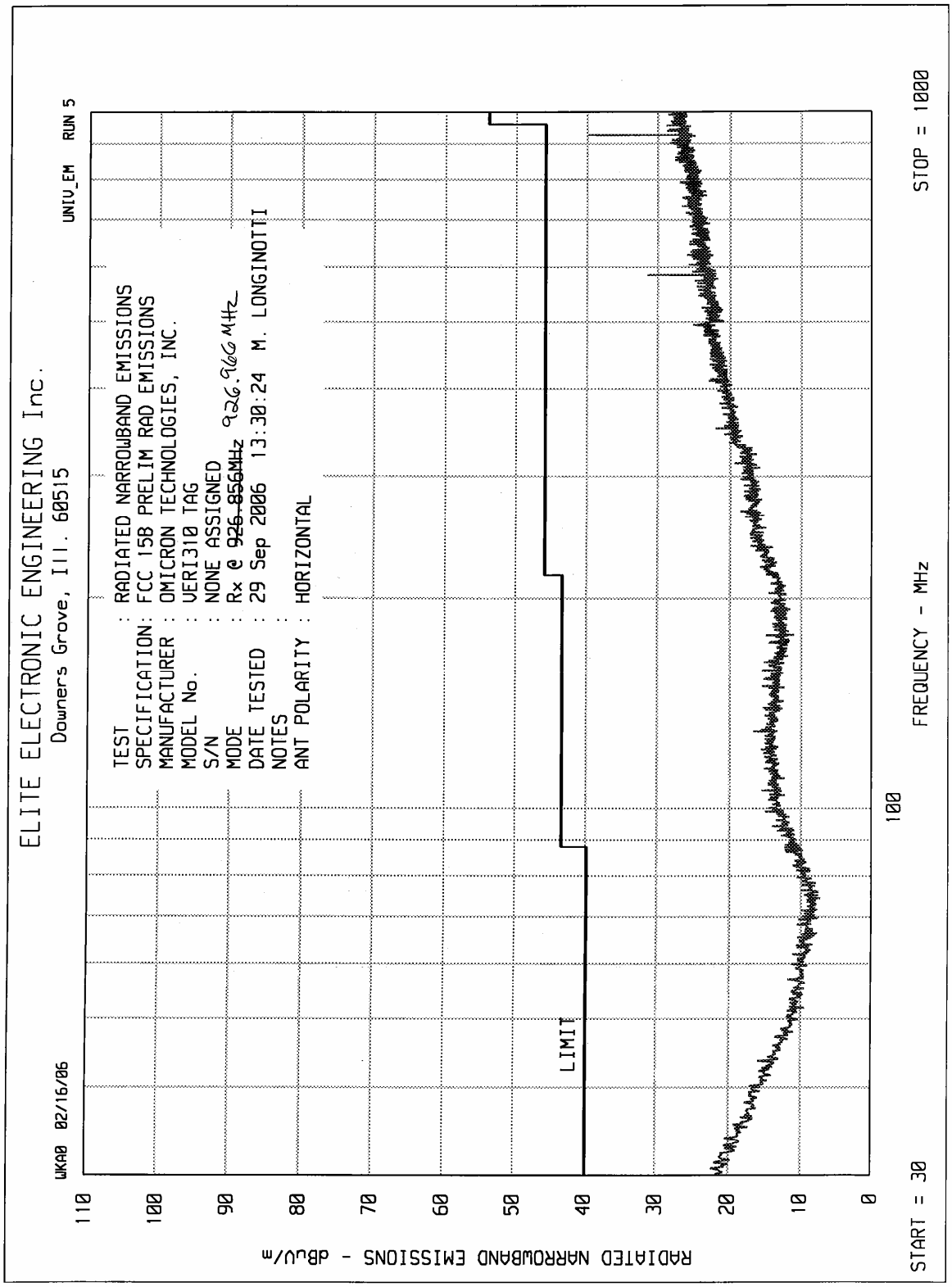
MANUFACTURER : Omicron Technologies
TEST ITEM : Transceiver
MODEL NO. : VERI310 Tag
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 915.937MHz
TEST DATE : September 27, 2006 through September 29, 2006
TEST DISTANCE : 3 meters

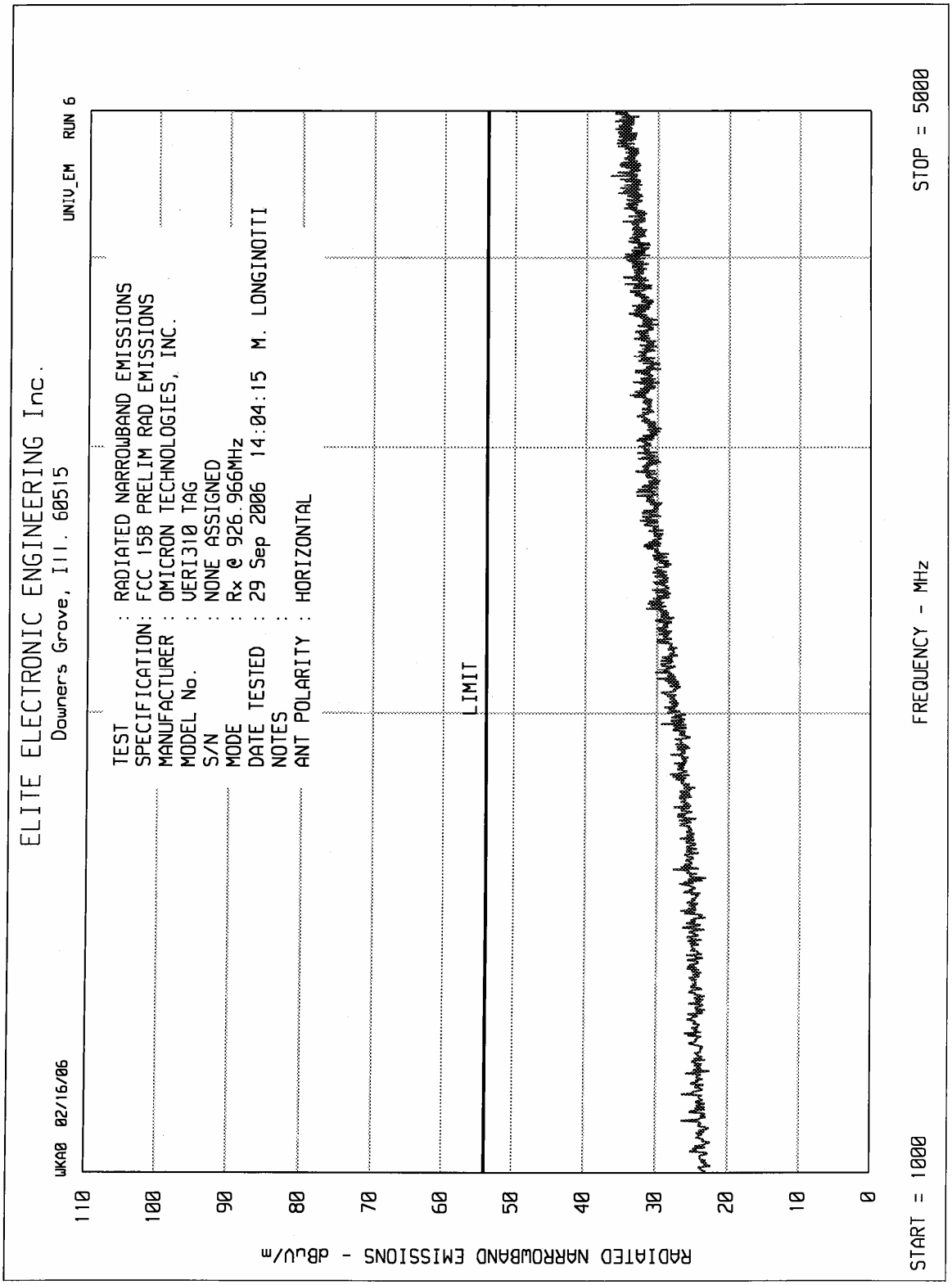
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
915.8	H	11.5		2.0	22.3	0.0	35.8	61.3	200.0
915.8	V	7.6		2.0	22.3	0.0	31.9	39.1	200.0
1831.6	H	31.7	Ambient	2.9	27.6	-34.5	27.6	24.1	500.0
1831.6	V	31.6	Ambient	2.9	27.6	-34.5	27.5	23.8	500.0
2747.4	H	31.8	Ambient	3.8	30.6	-34.5	31.6	38.2	500.0
2747.4	V	31.6	Ambient	3.8	30.6	-34.5	31.4	37.3	500.0
3663.3	H	31.3	Ambient	4.4	32.5	-34.6	33.6	47.9	500.0
3663.3	V	31.3	Ambient	4.4	32.5	-34.6	33.6	47.9	500.0
4579.1	H	31.8	Ambient	4.8	33.0	-34.7	35.0	56.0	500.0
4579.1	V	31.7	Ambient	4.8	33.0	-34.7	34.9	55.4	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
WKA0 02/16/06
UNIV_EM RUN 5
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Rx @ ~~926-856MHz~~ 926.966 MHz
DATE TESTED : 29 Sep 2006 13:30:24 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
FREQUENCY - MHz
STOP = 1000


WKA0 02/16/06
ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 6
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Rx @ 926.966MHz
DATE TESTED : 29 Sep 2006 14:04:15 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

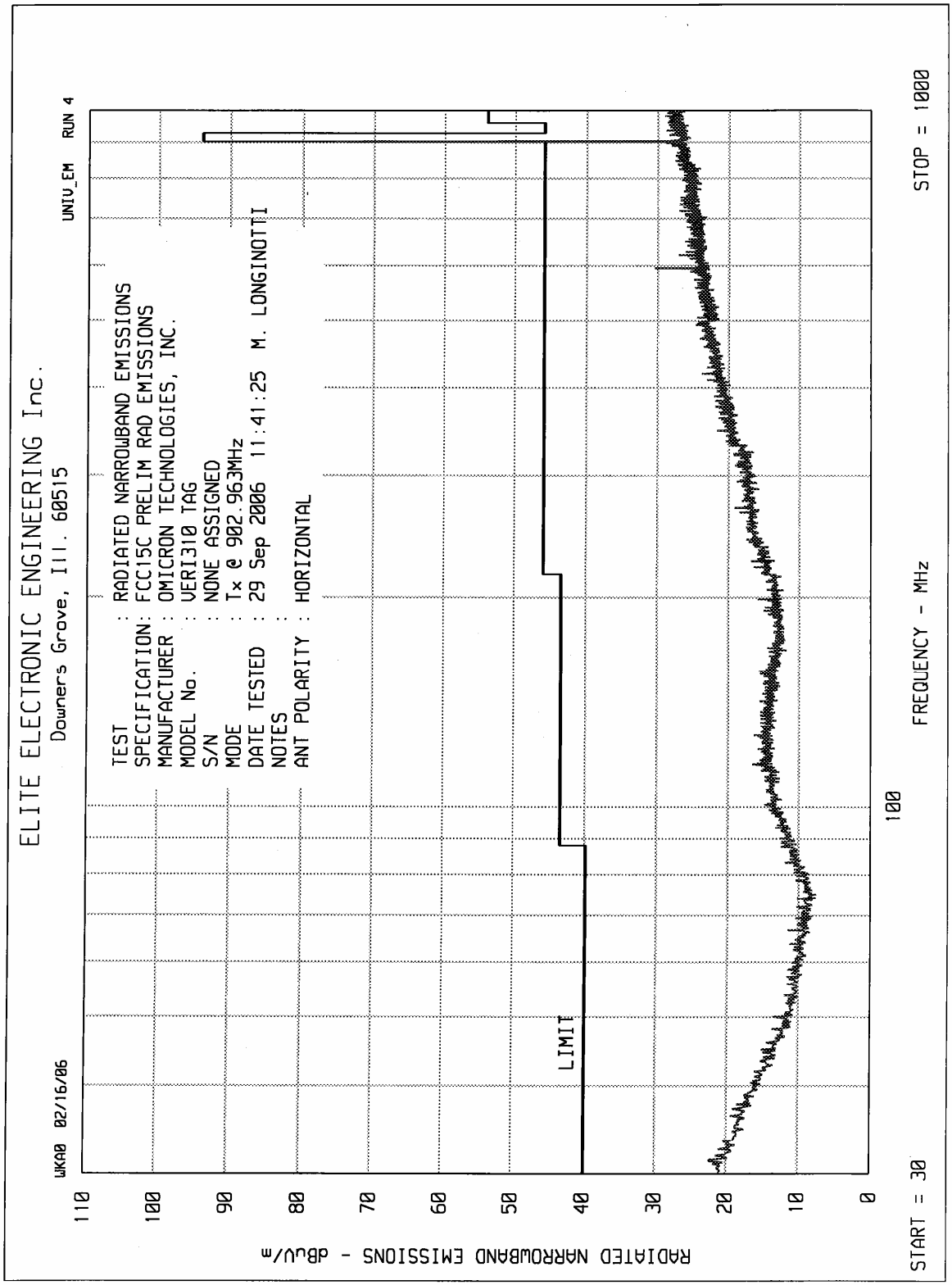
MANUFACTURER : Omicron Technologies
TEST ITEM : Transceiver
MODEL NO. : VERI310 Tag
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 926.996MHz
TEST DATE : September 27, 2006 through September 29, 2006
TEST DISTANCE : 3 meters

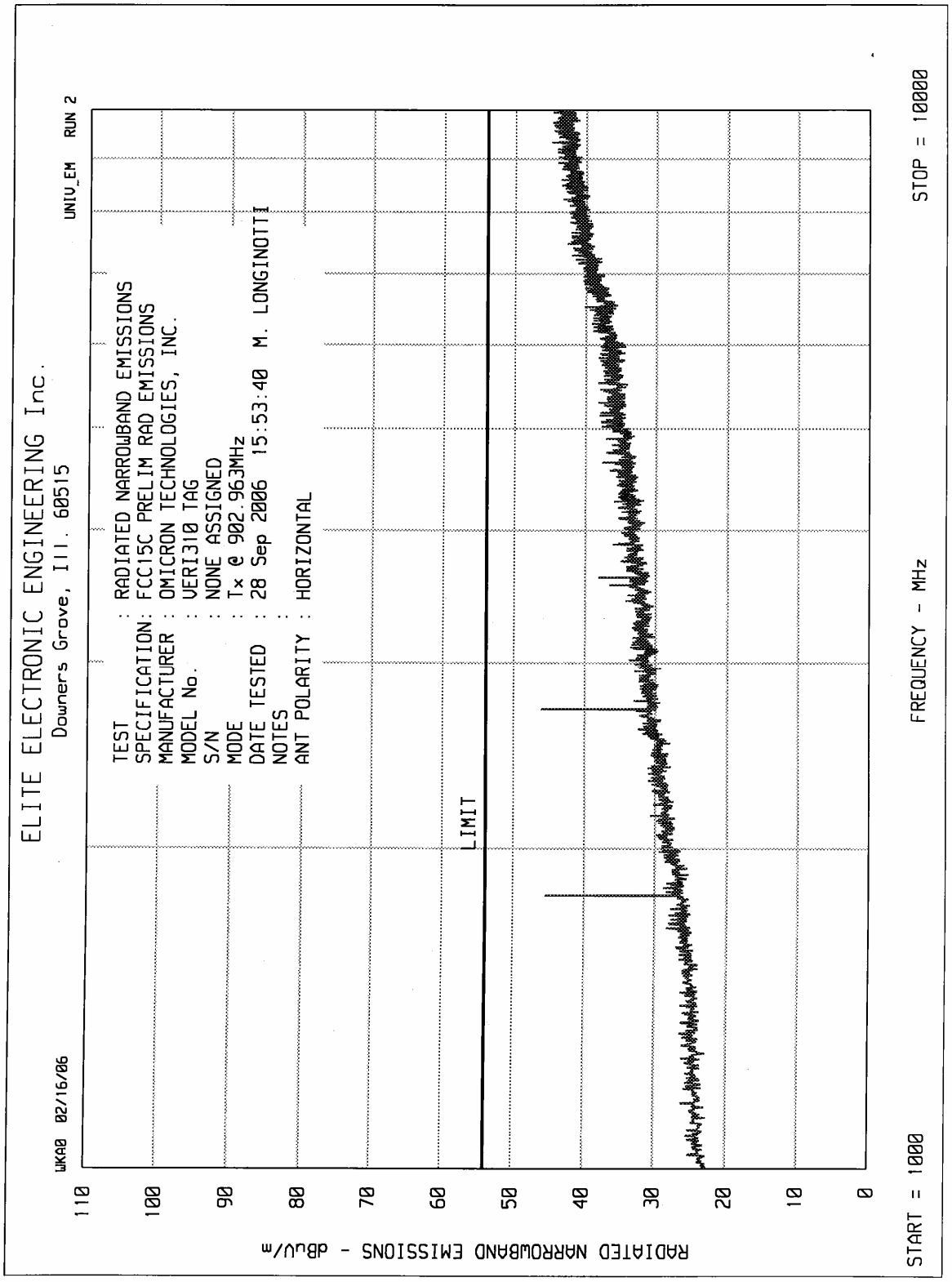
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
926.856	H	16.6		2.0	22.4	0.0	41.0	112.1	200.0
926.856	V	12.4		2.0	22.4	0.0	36.8	69.1	200.0
1853.712	H	32.3	Ambient	2.9	27.7	-34.5	28.4	26.2	500.0
1853.712	V	34.4	Ambient	2.9	27.7	-34.5	30.5	33.4	500.0
2780.568	H	32.2	Ambient	3.8	30.7	-34.5	32.2	40.6	500.0
2780.568	V	32.4	Ambient	3.8	30.7	-34.5	32.4	41.5	500.0
3707.424	H	31.3	Ambient	4.4	32.6	-34.5	33.7	48.7	500.0
3707.424	V	31.4	Ambient	4.4	32.6	-34.5	33.8	49.2	500.0
4634.280	H	32.2	Ambient	4.9	33.2	-34.6	35.6	60.3	500.0
4634.280	V	32.2	Ambient	4.9	33.2	-34.6	35.6	60.3	500.0

H – Horizontal
V = Vertical

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

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 4
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Tx @ 902.963MHz
DATE TESTED : 29 Sep 2006 11:41:25 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
STOP = 1000
FREQUENCY - MHz


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Tx @ 902.963MHz
DATE TESTED : 28 Sep 2006 15:53:40 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 = 10000

MANUFACTURER : Omicron Technologies
TEST ITEM : Transceiver
MODEL NO. : VERI310 Tag
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 902.963MHz
TEST DATE : September 27, 2006 through September 29, 2006
TEST DISTANCE : 3 meters

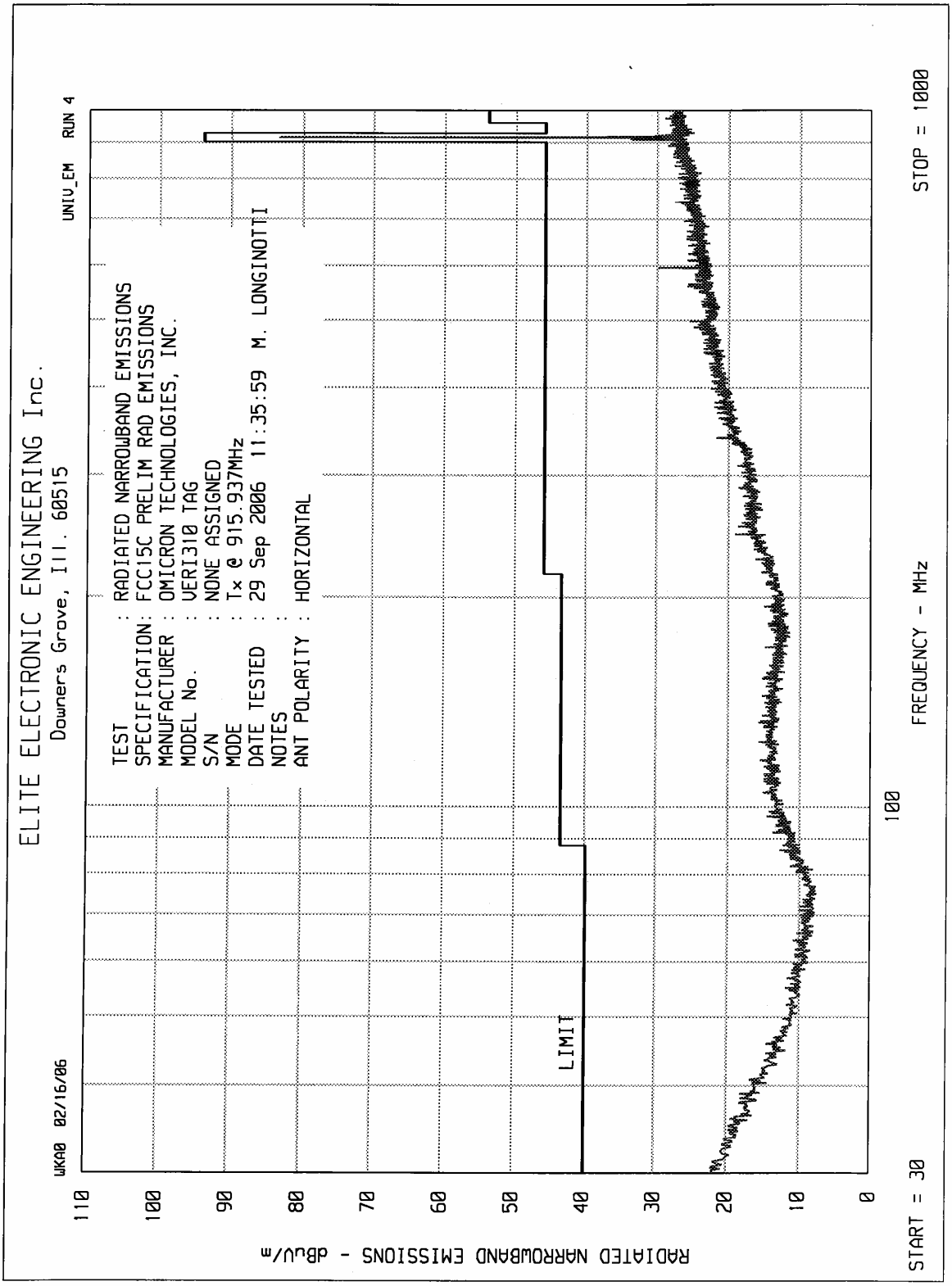
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
902.963	H	52.2		1.9	27.5	0.0	81.6	12045.2	50000.0
902.963	V	45.0		1.9	27.5	0.0	74.4	5257.9	50000.0
1805.926	H	53.0		2.9	27.8	-34.5	49.1	286.0	500.0
1805.926	V	49.2		2.9	27.8	-34.5	45.3	184.7	500.0
2708.889	H	50.7		3.7	30.2	-34.5	50.2	323.2	500.0
2708.889	V	47.4		3.7	30.2	-34.5	46.9	221.0	500.0
3611.852	H	41.8		4.4	33.0	-34.6	44.5	168.2	500.0
3611.852	V	46.9		4.4	33.0	-34.6	49.6	302.5	500.0
4514.815	H	31.6	Ambient	4.8	33.5	-34.7	35.3	57.9	500.0
4514.815	V	35.9	Ambient	4.8	33.5	-34.7	39.6	95.0	500.0
5417.778	H	36.3		5.2	35.3	-34.2	42.6	135.3	500.0
5417.778	V	33.7	Ambient	5.2	35.3	-34.2	40.0	100.3	500.0
6320.741	H	31.5	Ambient	5.8	35.8	-34.5	38.6	85.2	500.0
6320.741	V	31.4	Ambient	5.8	35.8	-34.5	38.5	84.2	500.0
7223.704	H	30.7	Ambient	6.6	37.4	-34.5	40.2	102.1	500.0
7223.704	V	30.7	Ambient	6.6	37.4	-34.5	40.2	102.1	500.0
8126.667	H	31.9	Ambient	7.1	37.7	-34.7	41.9	124.6	500.0
8126.667	V	31.9	Ambient	7.1	37.7	-34.7	41.9	124.6	500.0
9029.630	H	32.0	Ambient	7.5	38.6	-34.6	43.5	149.5	500.0
9029.630	V	32.0	Ambient	7.5	38.6	-34.6	43.5	149.5	500.0

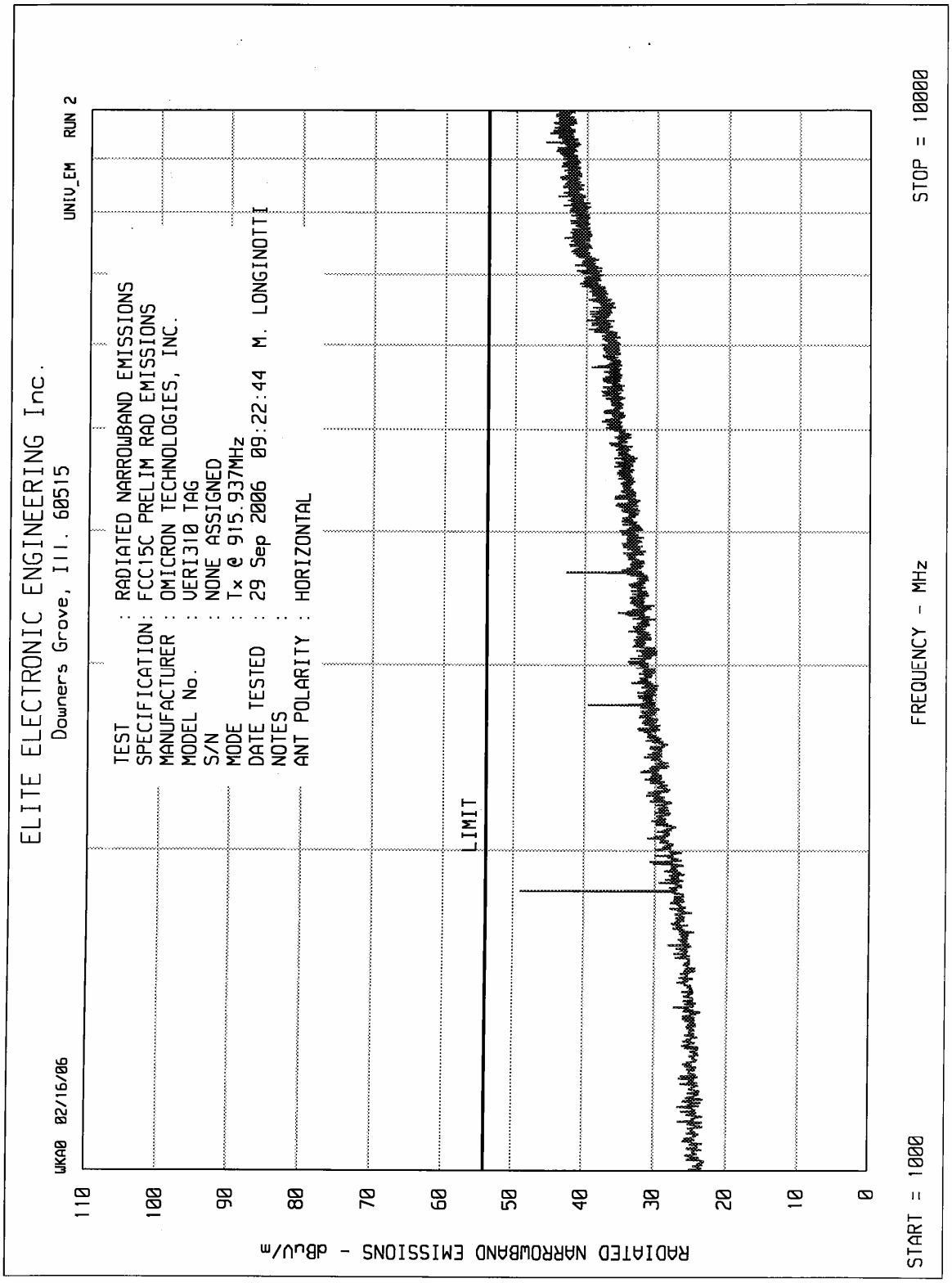
H – Horizontal

V = Vertical

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

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 4
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Tx @ 915.937MHz
DATE TESTED : 29 Sep 2006 11:35:59 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
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Tx @ 915.937MHz
DATE TESTED : 29 Sep 2006 09:22:44 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 = 10000

MANUFACTURER : Omicron Technologies
TEST ITEM : Transceiver
MODEL NO. : VERI310 Tag
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 915.937MHz
TEST DATE : September 27, 2006 through September 29, 2006
TEST DISTANCE : 3 meters

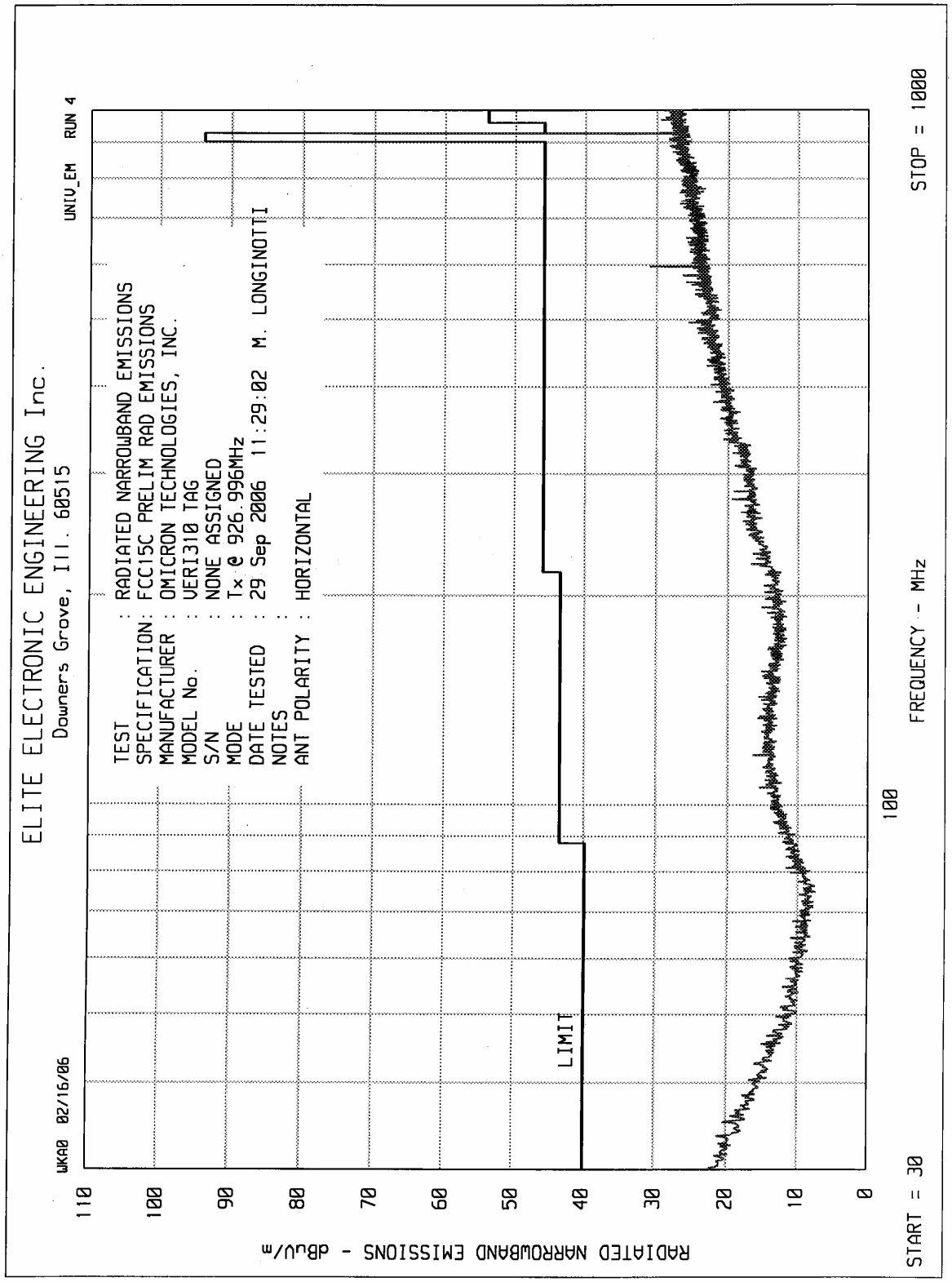
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
915.937	H	41.0		2.0	27.8	0.0	70.7	3442.1	50000.0
915.937	V	55.1		2.0	27.8	0.0	84.8	17451.1	50000.0
1831.874	H	54.0		2.9	27.9	-34.5	50.3	327.2	500.0
1831.874	V	51.8		2.9	27.9	-34.5	48.1	254.0	500.0
2747.811	H	50.4		3.8	30.3	-34.5	50.0	317.2	500.0
2747.811	V	45.9		3.8	30.3	-34.5	45.5	188.9	500.0
3663.748	H	44.2		4.4	33.1	-34.6	47.1	227.0	500.0
3663.748	V	43.7		4.4	33.1	-34.6	46.6	214.3	500.0
4579.685	H	35.1	Ambient	4.8	33.7	-34.7	39.0	88.7	500.0
4579.685	V	33.0	Ambient	4.8	33.7	-34.7	36.9	69.6	500.0
5495.622	H	30.3	Ambient	5.3	35.5	-34.2	36.8	69.6	500.0
5495.622	V	30.3	Ambient	5.3	35.5	-34.2	36.8	69.6	500.0
6411.559	H	32.3	Ambient	5.9	35.8	-34.5	39.5	94.3	500.0
6411.559	V	32.3	Ambient	5.9	35.8	-34.5	39.5	94.3	500.0
7327.496	H	32.3	Ambient	6.7	37.6	-34.6	42.0	125.7	500.0
7327.496	V	32.2	Ambient	6.7	37.6	-34.6	41.9	124.2	500.0
8243.433	H	32.6	Ambient	7.1	37.8	-34.7	42.9	138.9	500.0
8243.433	V	32.6	Ambient	7.1	37.8	-34.7	42.9	138.9	500.0
9159.370	H	32.6	Ambient	7.5	38.6	-34.7	44.0	159.4	500.0
9159.370	V	32.6	Ambient	7.5	38.6	-34.7	44.0	159.4	500.0

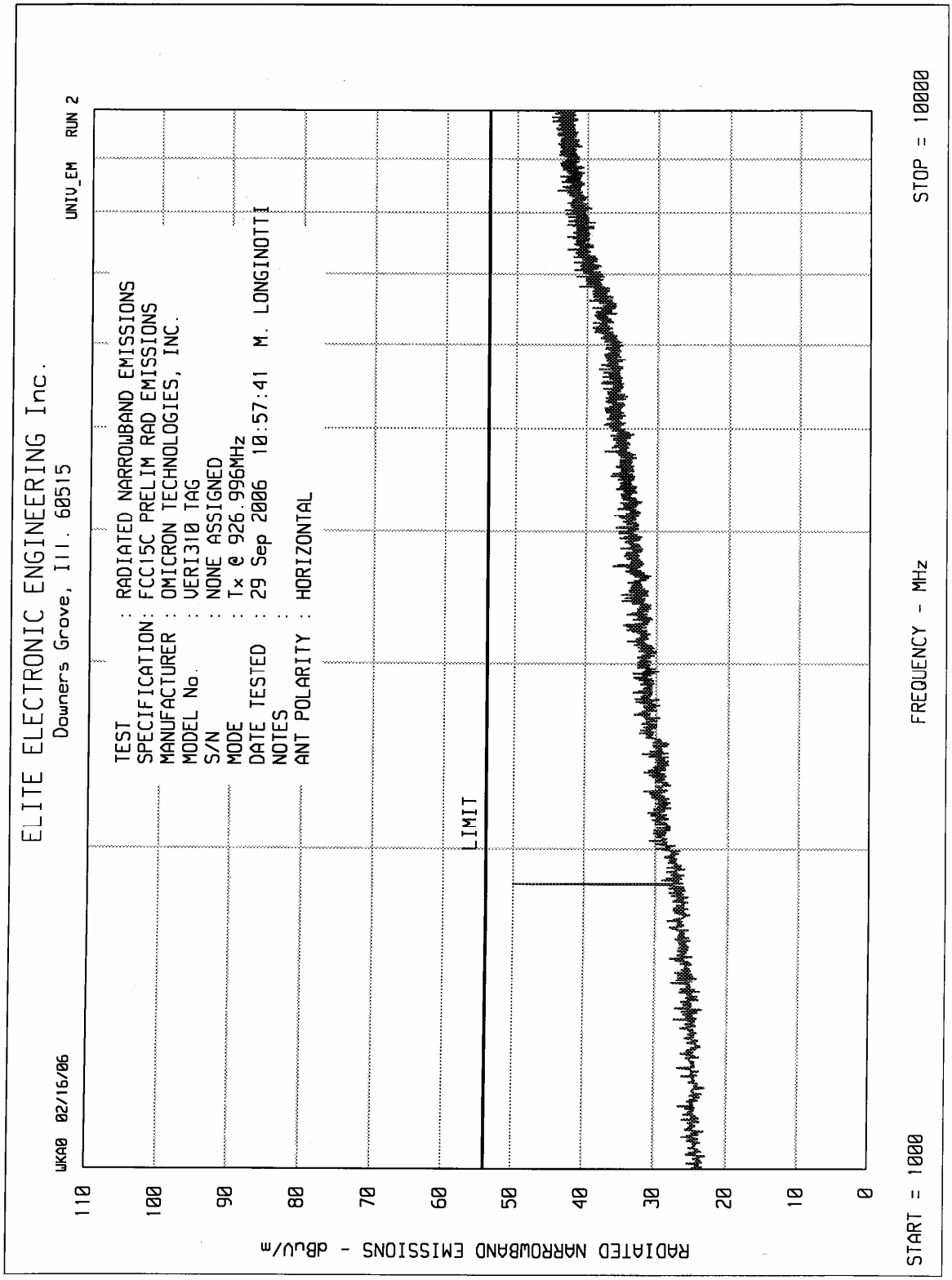
H – Horizontal

V = Vertical

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

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 4
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Tx @ 926.996MHz
DATE TESTED : 29 Sep 2006 11:29:02 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
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 02/16/06
UNIV_EM RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC15C PRELIM RAD EMISSIONS
MANUFACTURER : OMICRON TECHNOLOGIES, INC.
MODEL No. : VERI310 TAG
S/N : NONE ASSIGNED
MODE : Tx @ 926.996MHz
DATE TESTED : 29 Sep 2006 10:57:41 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 = 10000

MANUFACTURER : Omicron Technologies
TEST ITEM : Transceiver
MODEL NO. : VERI310 Tag
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 926.996MHz
TEST DATE : September 27, 2006 through September 29, 2006
TEST DISTANCE : 3 meters

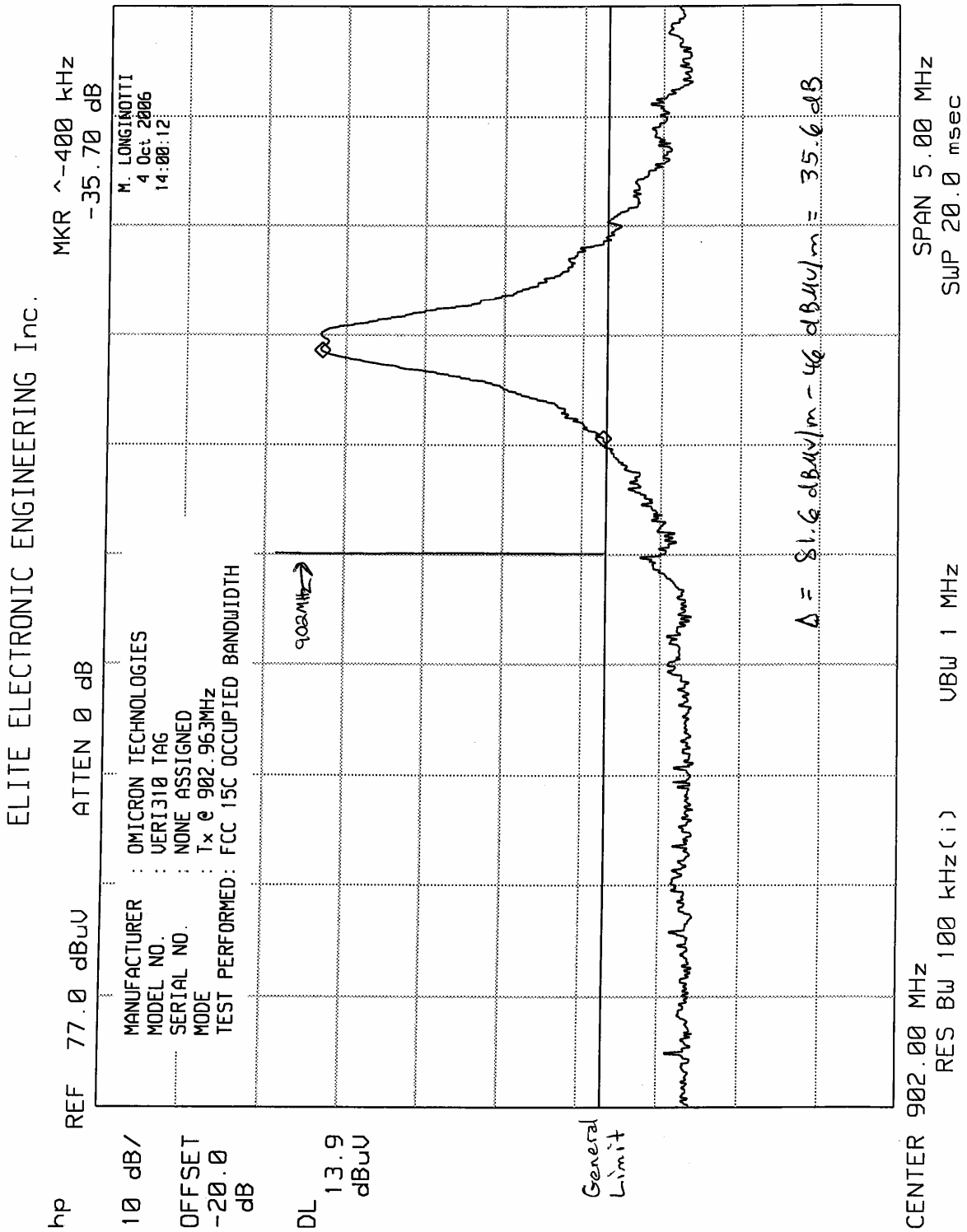
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
926.996	H	54.7		2.0	28.0	0.0	84.7	17193.2	50000.0
926.996	V	47.0		2.0	28.0	0.0	77.0	7085.3	50000.0
1853.992	H	57.1		2.9	28.0	-34.5	53.5	475.2	500.0
1853.992	V	48.4		2.9	28.0	-34.5	44.8	174.5	500.0
2780.988	H	46.1		3.8	30.4	-34.5	45.8	195.9	500.0
2780.988	V	42.1		3.8	30.4	-34.5	41.8	123.6	500.0
3707.984	H	47.1		4.4	33.2	-34.5	50.2	323.4	500.0
3707.984	V	49.7		4.4	33.2	-34.5	52.8	436.3	500.0
4634.980	H	32.5	Ambient	4.9	33.8	-34.6	36.5	67.0	500.0
4634.980	V	37.2		4.9	33.8	-34.6	41.2	115.2	500.0
5561.976	H	31.4	Ambient	5.3	35.5	-34.2	38.0	79.3	500.0
5561.976	V	33.6	Ambient	5.3	35.5	-34.2	40.2	102.2	500.0
6488.972	H	31.7	Ambient	6.0	35.8	-34.5	39.0	88.8	500.0
6488.972	V	31.7	Ambient	6.0	35.8	-34.5	39.0	88.8	500.0
7415.968	H	31.8	Ambient	6.7	37.7	-34.6	41.7	121.0	500.0
7415.968	V	31.8	Ambient	6.7	37.7	-34.6	41.7	121.0	500.0
8342.964	H	32.1	Ambient	7.2	37.9	-34.7	42.6	134.2	500.0
8342.964	V	32.3	Ambient	7.2	37.9	-34.7	42.8	137.4	500.0
9269.960	H	31.8	Ambient	7.5	38.7	-34.8	43.2	144.7	500.0
9269.960	V	31.7	Ambient	7.5	38.7	-34.8	43.1	143.1	500.0

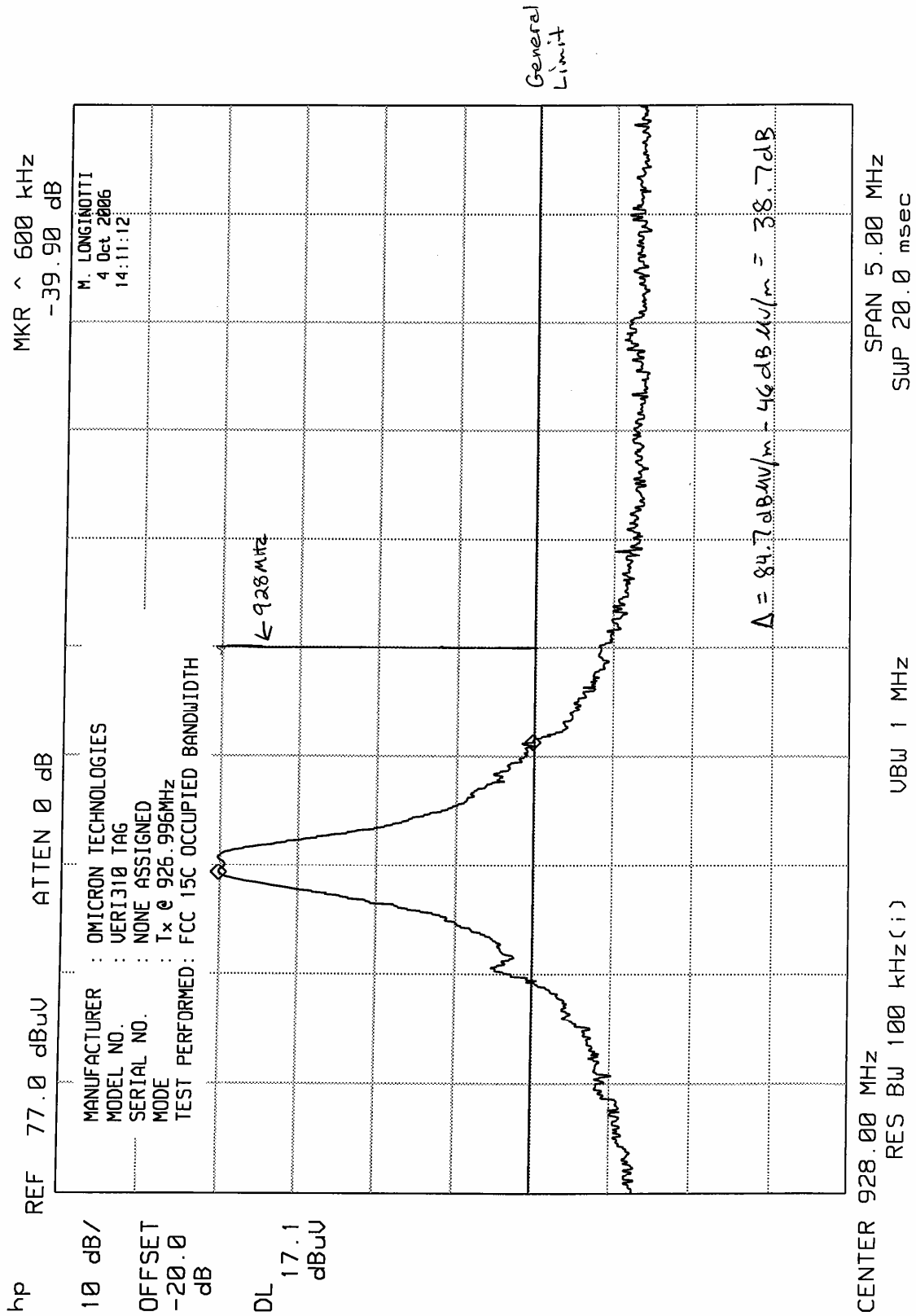
H – Horizontal

V = Vertical

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

Checked By : MARK E. LONGINOTTI


hp
REF 77.0 dBuV
ATTEN 0 dB
MKR ^-400 kHz
-35.70 dB
ELITE ELECTRONIC ENGINEERING Inc.
MANUFACTURER : OMICRON TECHNOLOGIES
MODEL NO. : VERI310 TAG
SERIAL NO. : NONE ASSIGNED
MODE : Tx @ 902.963MHz
TEST PERFORMED: FCC 15C OCCUPIED BANDWIDTH
M. LONGINOTTI
4 Oct 2006
14:00:12
10 dB/
OFFSET
-20.0
dB
DL
13.9
dBuV
General Limit
902MHz
Δ = 81.6 dBuV/m - 46 dBuV/m = 35.6 dB
CENTER 902.00 MHz
RES BW 100 kHz(i)
VBW 1 MHz
SPAN 5.00 MHz
SWP 20.0 msec


ELITE ELECTRONIC ENGINEERING Inc.
hp
REF 77.0 dBuV
ATTEN 0 dB
MKR ^ 600 kHz
-39.90 dB
10 dB/
OFFSET
-20.0
dB
DL
17.1
dBuV
MANUFACTURER : OMICRON TECHNOLOGIES
MODEL NO. : VERI310 TAG
SERIAL NO. : NONE ASSIGNED
MODE : Tx @ 926.996MHz
TEST PERFORMED: FCC 15C OCCUPIED BANDWIDTH
M. LONGINOTTI
4 Oct 2006
14:11:12
928MHz
General Limit
Δ = 84.7dBuV/m - 46dBuV/m = 38.7dB
CENTER 928.00 MHz
RES BW 100 kHz(i)
VBW 1 MHz
SPAN 5.00 MHz
SWP 20.0 msec