Measurement of RF Interference from a Whole House Fan, Model WHSP2000 with Super Heterodyne Receiver, Part Number 35486 and Remote Control Transmitter, Part Number 35487

For : Air Vent, Inc.
Dallas, TX

P.O. No. : 310880
Date Received : October 4, 2005
Date Tested : October 4, 2005 and October 5, 2005
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 and Subpart C, Sections 15.207 and 15.231

Test Report By : Mark E. Longinotti

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Registered Professional Engineer of Illinois - 44894

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TABLE OF CONTENTS

Measurement of RF Emissions from a Whole House Fan, Model WHSP2000 with Super Heterodyne Receiver, Part Number 35486 and Remote Control Transmitter, Part Number 35487

1.0 INTRODUCTION:

1.1 Description of Test Item - This document presents the results of the series of radio interference measurements performed on a Super Heterodyne Receiver, Model No.WHSP2000, Part No. 35486 (hereinafter referred to as the receiver) and a Remote Control Transmitter, Model No. WHSP2000, Part No. 35487 (hereinafter referred to as the transmitter). No serial number was assigned to the receiver or the transmitter. The receiver was designed to receive at approximately 315MHz. The receiver contained one local oscillator, IF, at 10.7MHz. The transmitter was designed to transmit at approximately 315MHz using an internal antenna. The test item was submitted for testing by Air Vent, Inc. located in Dallas, TX.

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 for receivers, and Subpart C, Sections 15.207 and 15.231 for Intentional Radiators. 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 2004

- 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 22°C and the relative humidity was 62%.

2.0 TEST ITEM SETUP AND OPERATION:

The test item is a Whole House Fan, Model WHSP2000 with Super Heterodyne Receiver, Part

Number 35486 and Remote Control Transmitter, Part Number 35487. A block diagram of the test item setup is shown as Figure 1.

2.1 Power Input - The receiver, Part No. 35486, was powered with 115V, 60Hz via a 3 wire, 1.7 meter-long unshielded power cable. For conducted emissions tests, each AC power lead to the receiver 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.

The transmitter, Part No. 35487, was powered with 3VDC via 2 "AA" batteries.

2.2 Grounding - The receiver, Part No. 35486, was grounded via the third wire of the input power cable. The transmitter, Part No. 35487, was ungrounded during testing.

2.3 Peripheral Equipment - No peripheral equipment was submitted with the receiver or the transmitter.

2.4 Interconnect Cables - No interconnect cables were submitted with the receiver or the transmitter.

2.5 Operational Mode - All tests were performed separately on the receiver and the transmitter. For receiver tests, the receiver was placed on an 80cm high non-conductive stand. The test item was powered up. Upon power up, the receiver went into continuous receive mode.

For transmitter tests, the transmitter was placed on an 80cm high non-conductive stand. During testing, the transmit button was pressed down so that the transmitter would operate in the continuous transmit mode.

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 15.231 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 of the receiver, Part No. 35486, are presented on pages 17 and 18. The conducted limit for receivers is shown as a reference. The final quasi-peak results are presented on pages 19 and 20. 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 24.066MHz. 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 - Since the test item was powered by internal batteries, no conducted emissions tests were performed.

4.2 Duty Cycle Factor Measurements (Transmitter)Error! Bookmark not defined.:

4.2.1 Procedures: The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal.

With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width with 10msec/div. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of a word period. If the word period exceeds 100 msec the word period is set to 100 msec. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).

4.2.2 Results: The plot of the duty cycle is shown on data page 21. The duty cycle factor was computed to be -12.0dB.

4.3 Radiated Measurements

4.3.1 Receiver

4.3.1.1 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.

4.3.1.2 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 2GHz, the broadband measuring antenna was positioned at a 3 meter distance from the test item. The frequency range from 30MHz to 2GHz 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.

4.3.1.3 Results - The preliminary plots are presented on pages 22 and 23. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on pages 24. As can be seen from the data, all emissions measured from the test item were within the specification limits for receivers. The emissions level closest to the limit (worst case) occurred at 304.3MHz. The emissions level at this frequency was 25.3dB within the limit. Photographs of the test configuration which yielded the highest or worst case radiated emission levels are shown on Figure 3a.

4.3.2 Transmitter -

4.3.2.1 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 15.231(b) has the following radiated emission limits:

Fundamental Frequency MHz	Field Intensity uV/m @ 3 meters	Field Strength Harmonics and Spurious @ 3 meters
260 to 470	3,750 to 12,500*	375 to 1,250*

* - Linear Interpolation

For 315.05MHz, the limit at the fundamental is 6043.8uV/m @ 3m and the limit on the harmonics is 604.4uV/m @ 3m.

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.

4.3.2.2 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 4GHz 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 4GHz. 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. The peak detected levels were converted to average levels using a duty cycle factor which was computed from the pulse train.

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.

4.3.2.3 Results - The preliminary plots are presented on pages 25 and 26. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on data page 27. As can be seen from the data, all emissions measured from the test item were within the specification limits for transmitters. The emissions level closest to the limit (worst case) occurred at 2205.2MHz. The emissions level at this frequency was 11.1dB within the limit. Photographs of the test configuration which yielded the highest or worst case radiated emission levels are shown on Figures 3b and 3c.

4.4 Occupied Bandwidth Measurements

4.4.1 Requirement - In accordance with paragraph 15.231(c), all emissions within 20dB of the peak amplitude level of the center frequency are required to be within a band less than 0.25% of the center frequency wide

4.4.2 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 30 kHz and span was set to 2 MHz. The frequency spectrum near the fundamental was plotted

4.4.3 Results - The plot of the emissions near the fundamental frequency are presented on data page 28. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

5.0 CONCLUSIONS:

It was determined that the Air Vent, Inc., Whole House Fan, Model WHSP2000 with Super Heterodyne Receiver, Part Number 35486 (no serial number was assigned to the test item) 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 when tested per ANSI C63.4-2003.

It was determined that the Air Vent, Inc., Whole House Fan, Model WHSP2000 with Remote Control Transmitter, Part Number 35487 (no serial number was assigned to the test item) did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.231 for Intentional Radiators 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								
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---		N/A	
Equipment Type: AMPLIFIERS								
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	02/07/05	12	02/07/06
Equipment Type: ANTENNAS								
NDP0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB3	311	140-400MHZ	02/01/05	12	02/01/06
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	02/01/05	12	02/01/06
NWF0	RIDGED WAVE GUIDE	EMCO	3105	2035	1-12.4GHZ	09/05/04	13	10/05/05
Equipment Type: ATTENUATORS								
T1E1	10DB, 25W ATTENUATOR	WEINSCHEL	46-10-43	AU1883	DC-18GHZ	12/02/04	12	12/02/05
Equipment Type: CONTROLLERS								
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	03/04/05	12	03/04/06
PLLA	50UH LISN 462D	ELITE	462D/70A	011	0.01-400MHZ	03/04/05	12	03/04/06
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	02/04/05	12	02/04/06
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	02/07/05	12	02/07/06
RAF3	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	02/04/05	12	02/04/06
RAKI	RF SECTION	HEWLETT PACKARD	85462A	3411A00181	0.009-6500MHZ	02/11/05	12	02/11/06
RAKJ	RF FILTER SECTION	HEWLETT PACKARD	85460A	3330A00154	---	02/11/05	12	02/11/06

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.

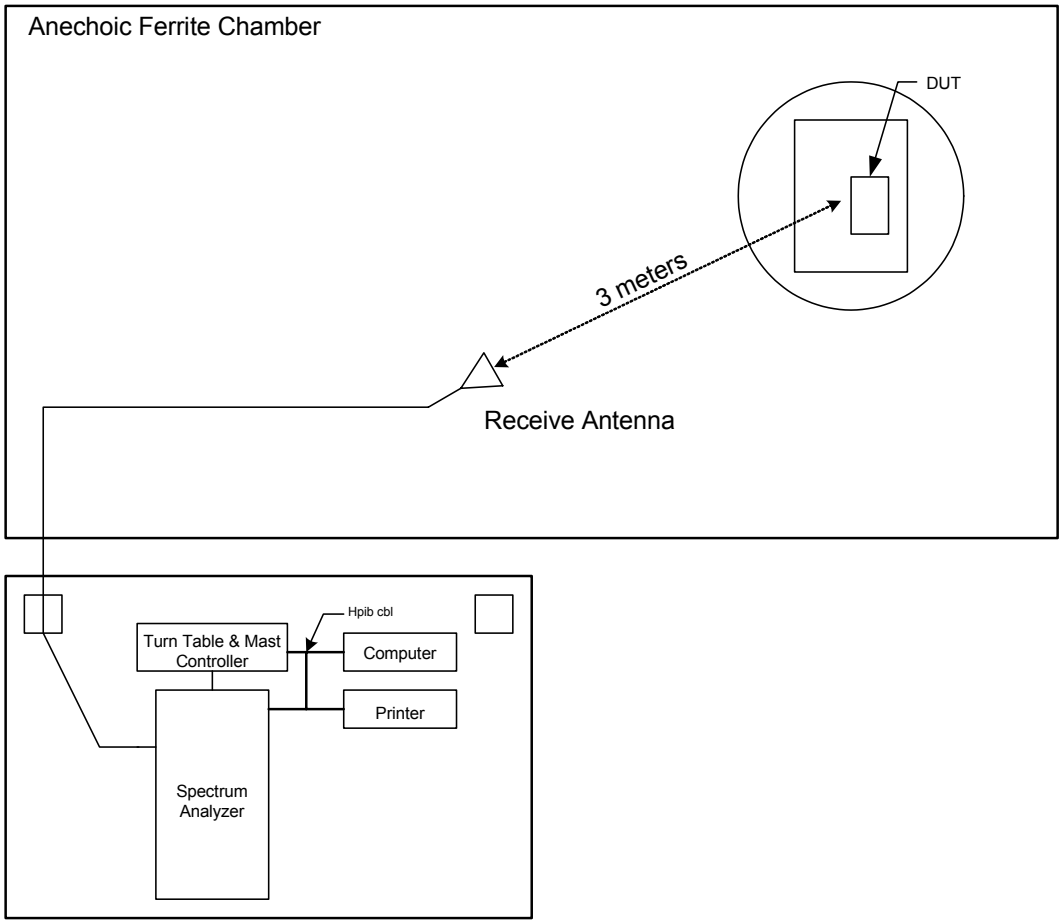
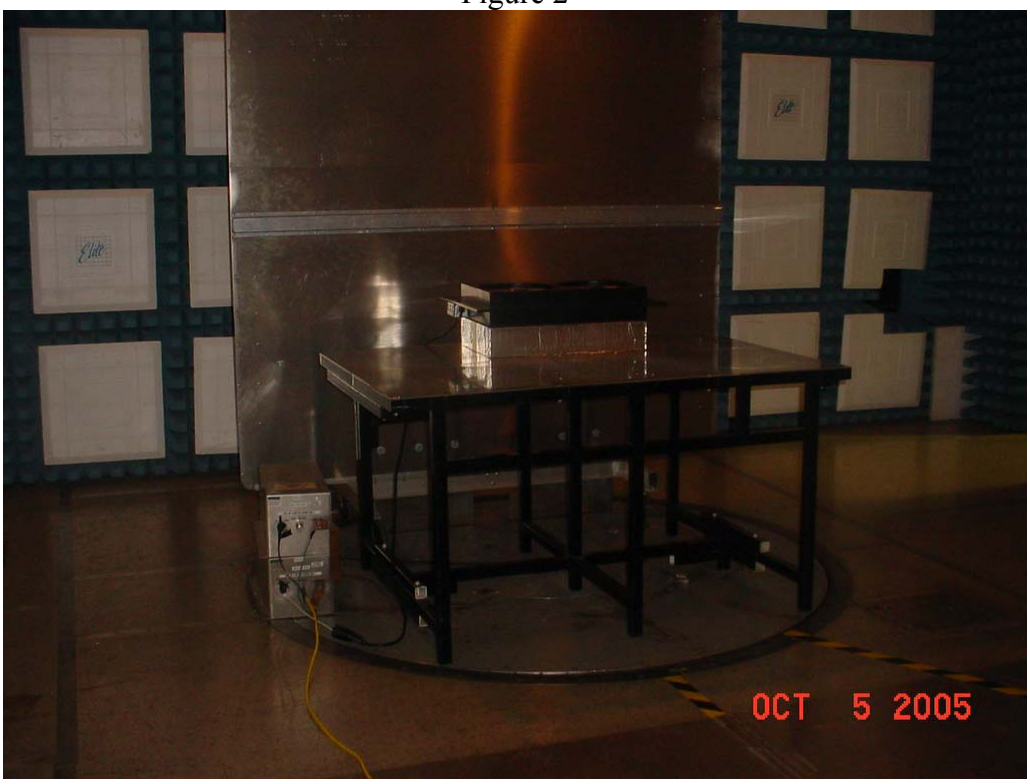


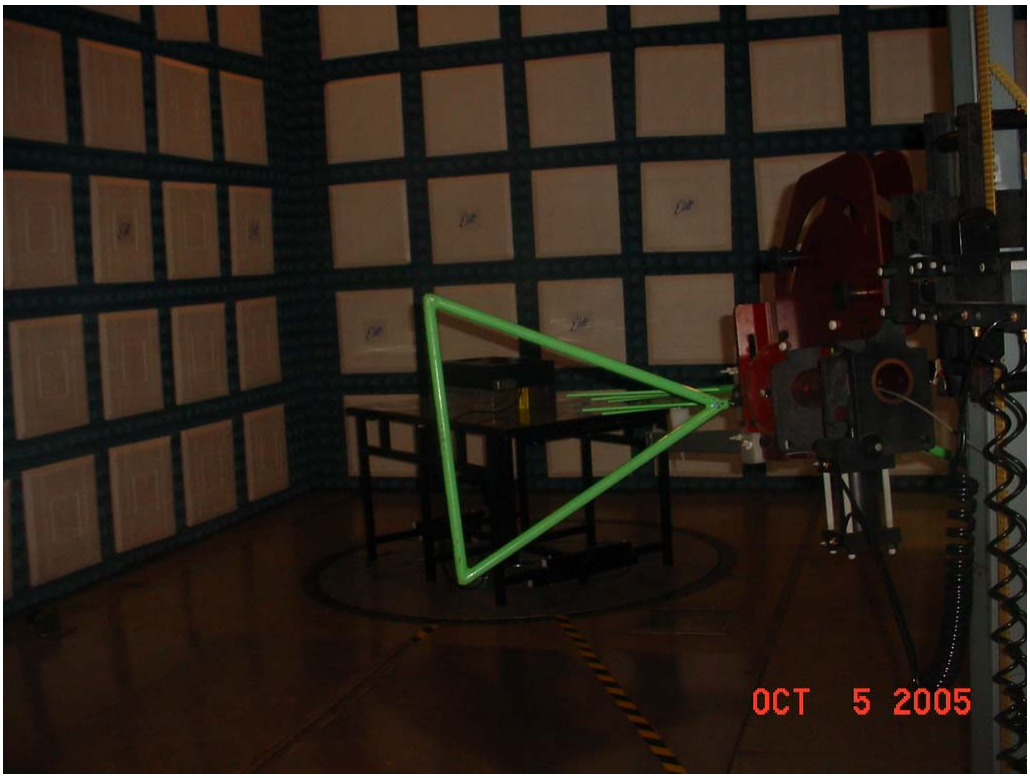
FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

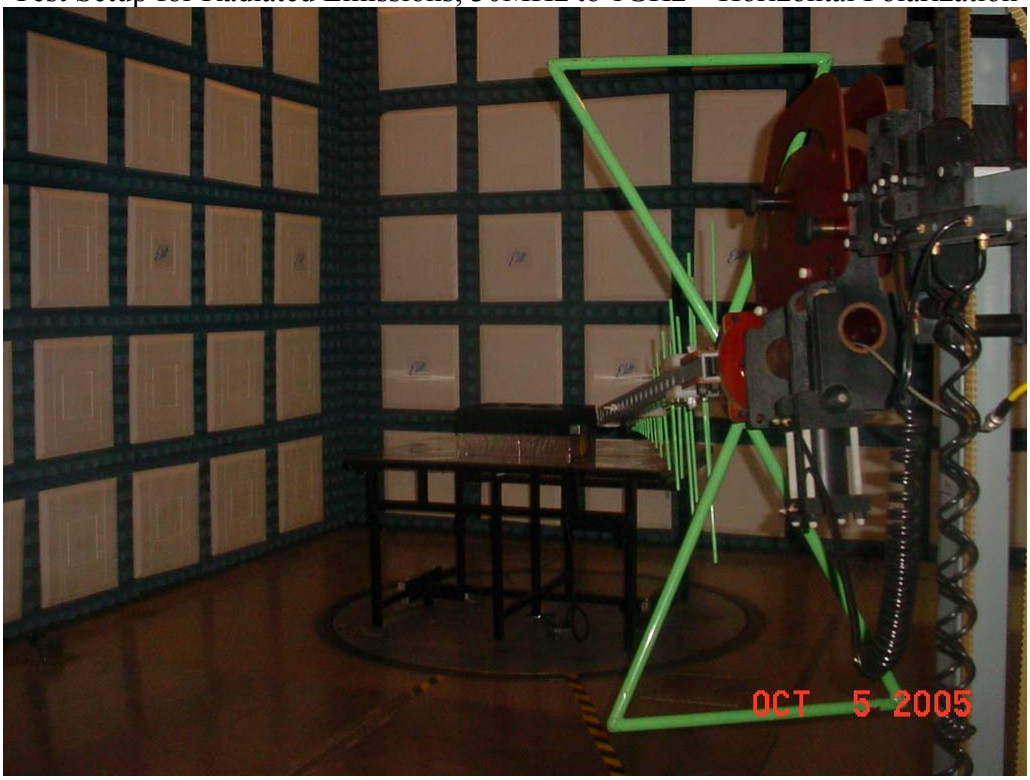


Test Setup for Conducted Emissions

Figure 3a
Receive at 315MHz



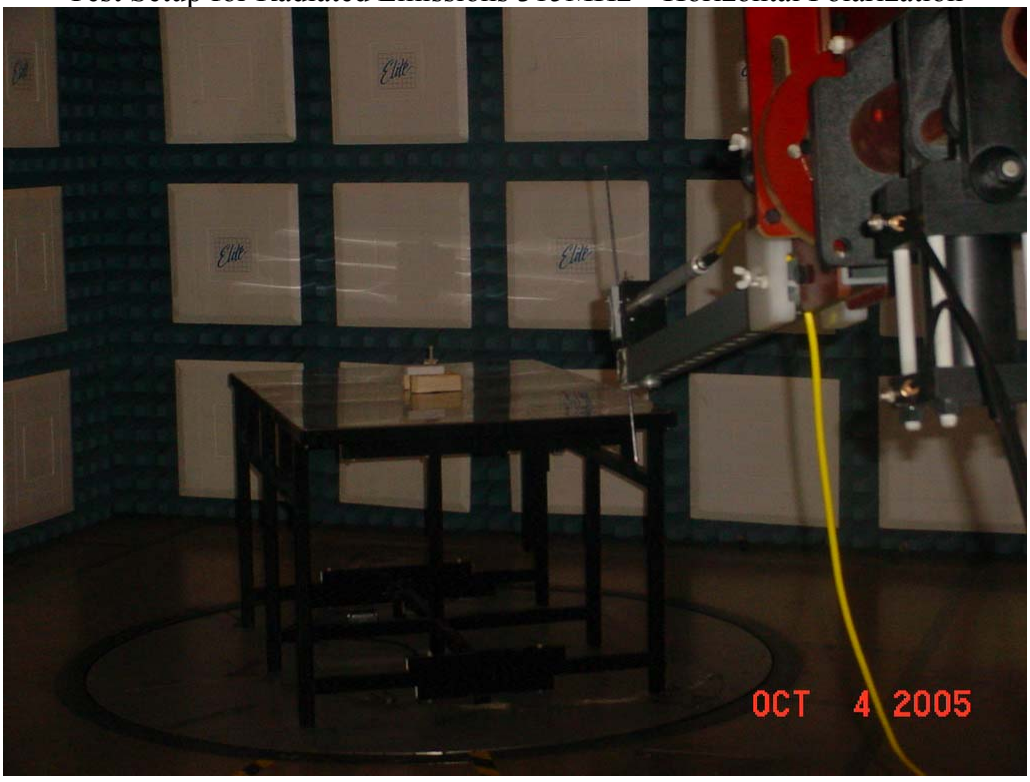
Test Setup for Radiated Emissions, 30MHz to 1GHz – Horizontal Polarization



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

Figure 3b
Transmit at 315MHz

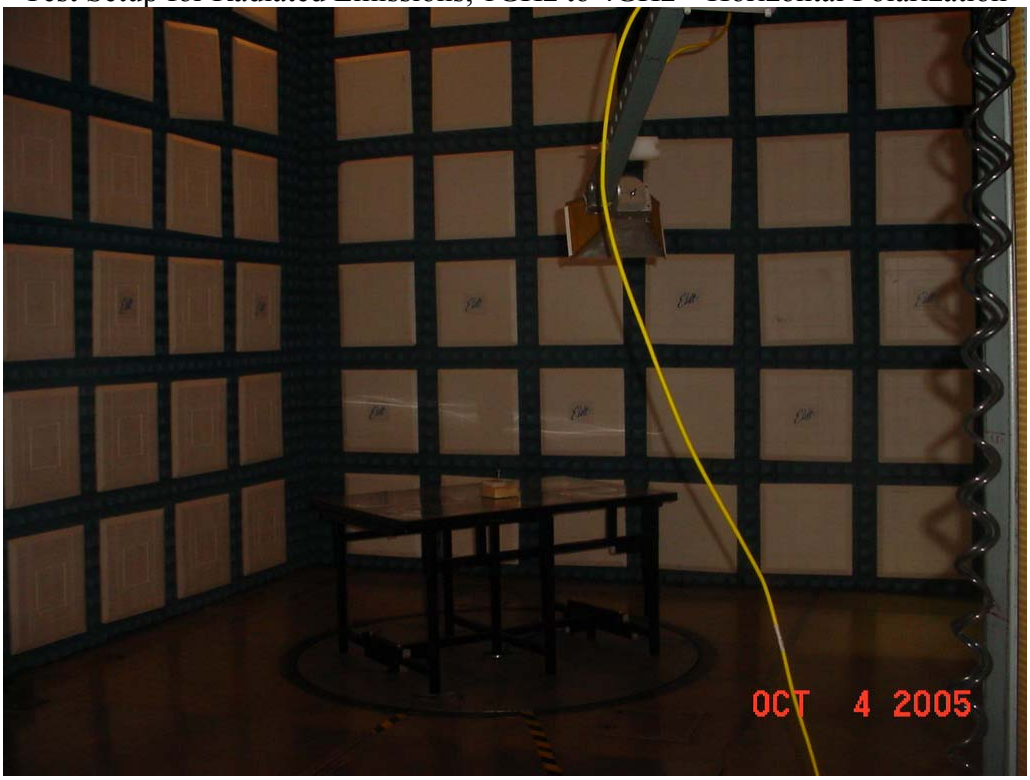
Test Setup for Radiated Emissions 315MHz – Horizontal Polarization



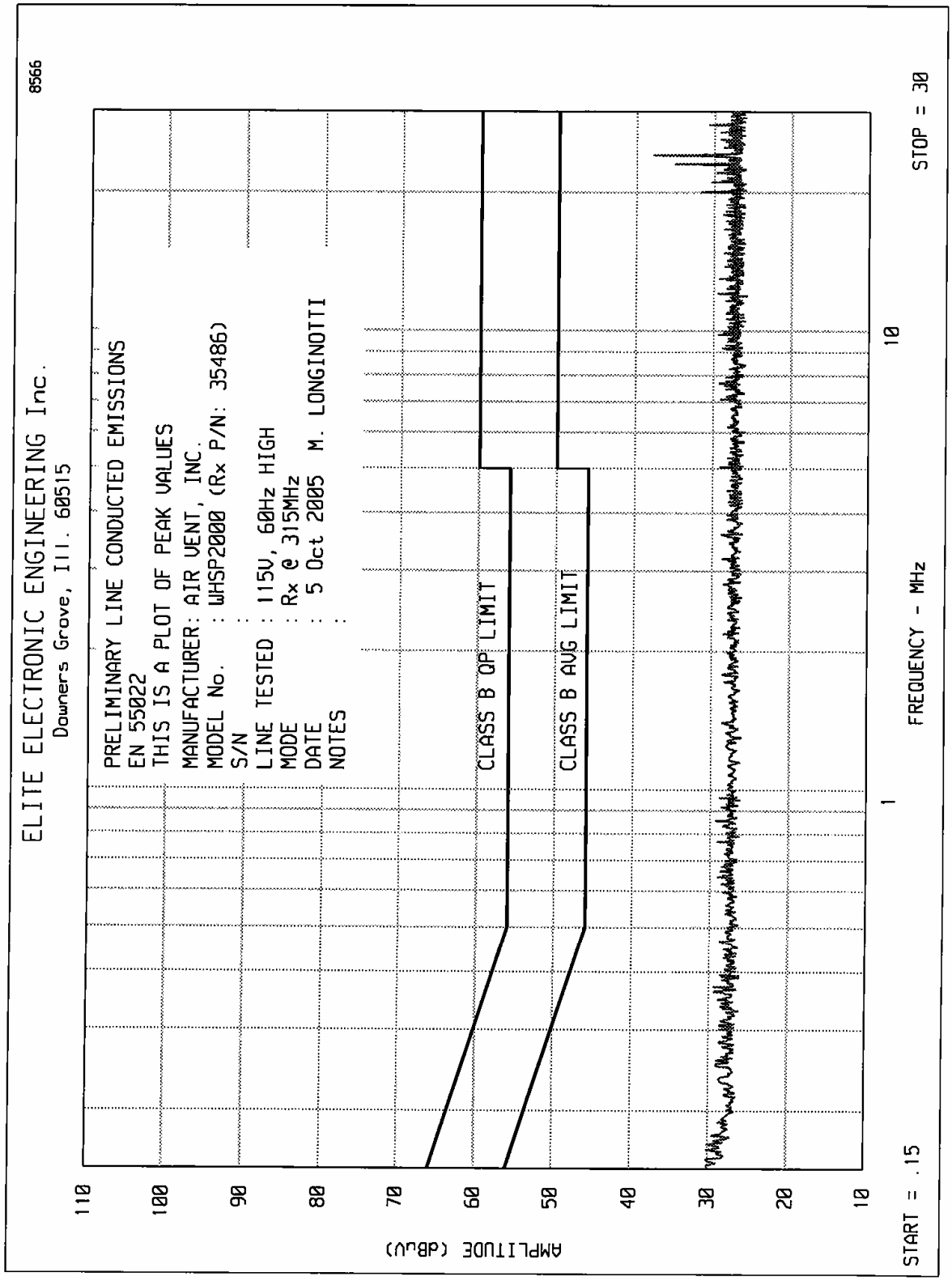
Test Setup for Radiated Emissions 908.4MHz – Vertical Polarization

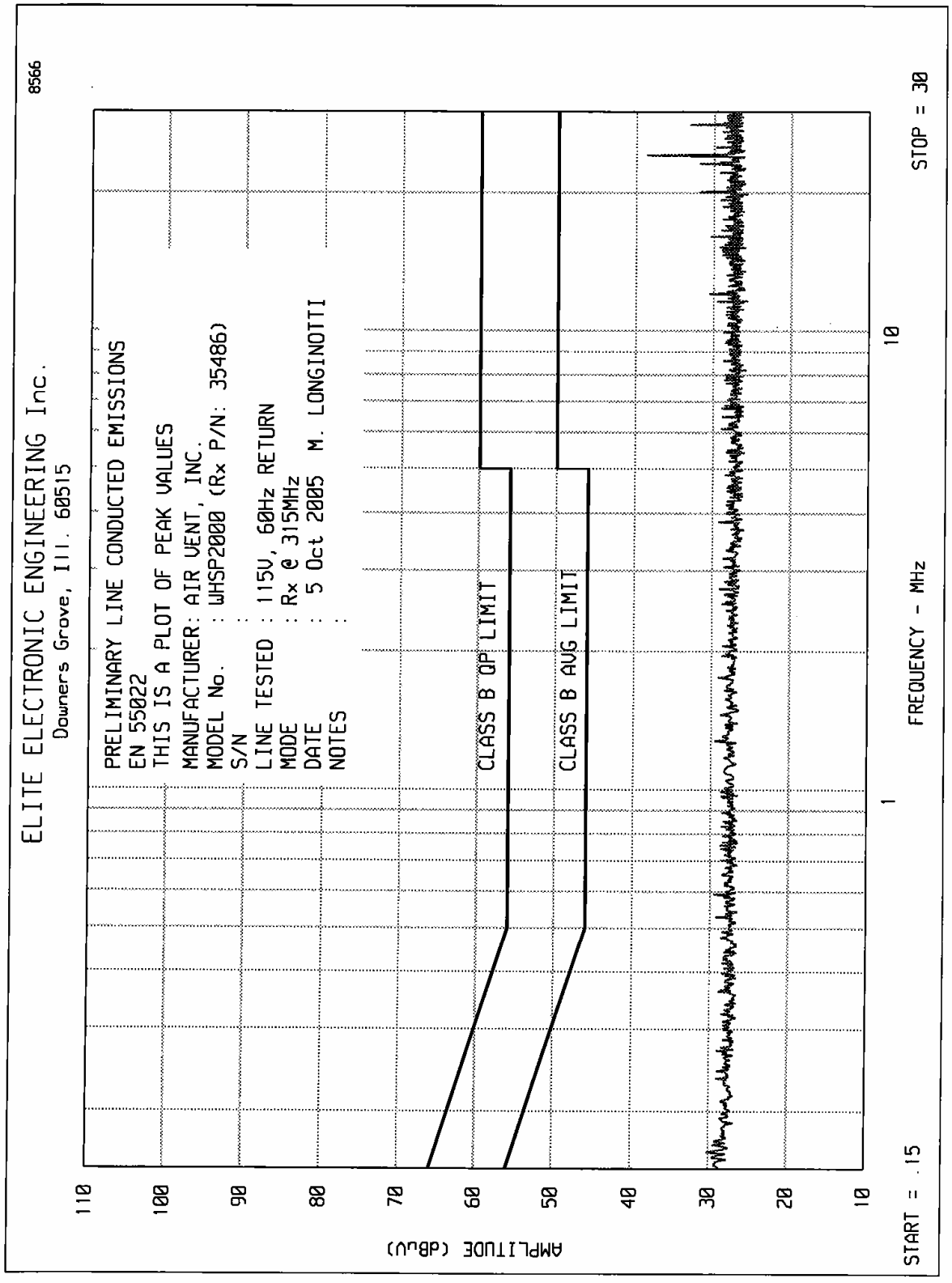
Figure 3c
Transmit at 315MHz

Test Setup for Radiated Emissions, 1GHz to 4GHz – Horizontal Polarization



Test Setup for Radiated Emissions, 1GHz to 4GHz – Vertical Polarization


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8566
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: AIR VENT, INC.
MODEL No. : WHSP2000 (Rx P/N: 35486)
S/N :
LINE TESTED : 115V, 60Hz HIGH
MODE : Rx @ 315MHz
DATE : 5 Oct 2005 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


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8566
PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: AIR VENT, INC.
MODEL No. : WHSP2000 (Rx P/N: 35486)
S/N : :
LINE TESTED : 115V, 60Hz RETURN
MODE : Rx @ 315MHz
DATE : 5 Oct 2005 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 : AIR VENT, INC.
MODEL : WHSP2000 (Rx P/N: 35486)
S/N :
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz HIGH
MODE : Rx @ 315MHz
DATE : 5 Oct 2005
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
.242	29.3	62.0		52.0	
.454	25.7	56.8		46.8	
.921	25.9	56.0		46.0	
2.261	25.6	56.0		46.0	
3.830	25.7	56.0		46.0	
5.327	25.3	60.0		50.0	
7.659	25.1	60.0		50.0	
10.463	25.3	60.0		50.0	
14.248	25.1	60.0		50.0	
17.298	25.3	60.0		50.0	
20.029	25.7	60.0		50.0	
23.063	28.5	60.0		50.0	
24.064	33.0	60.0		50.0	
26.863	25.3	60.0		50.0	

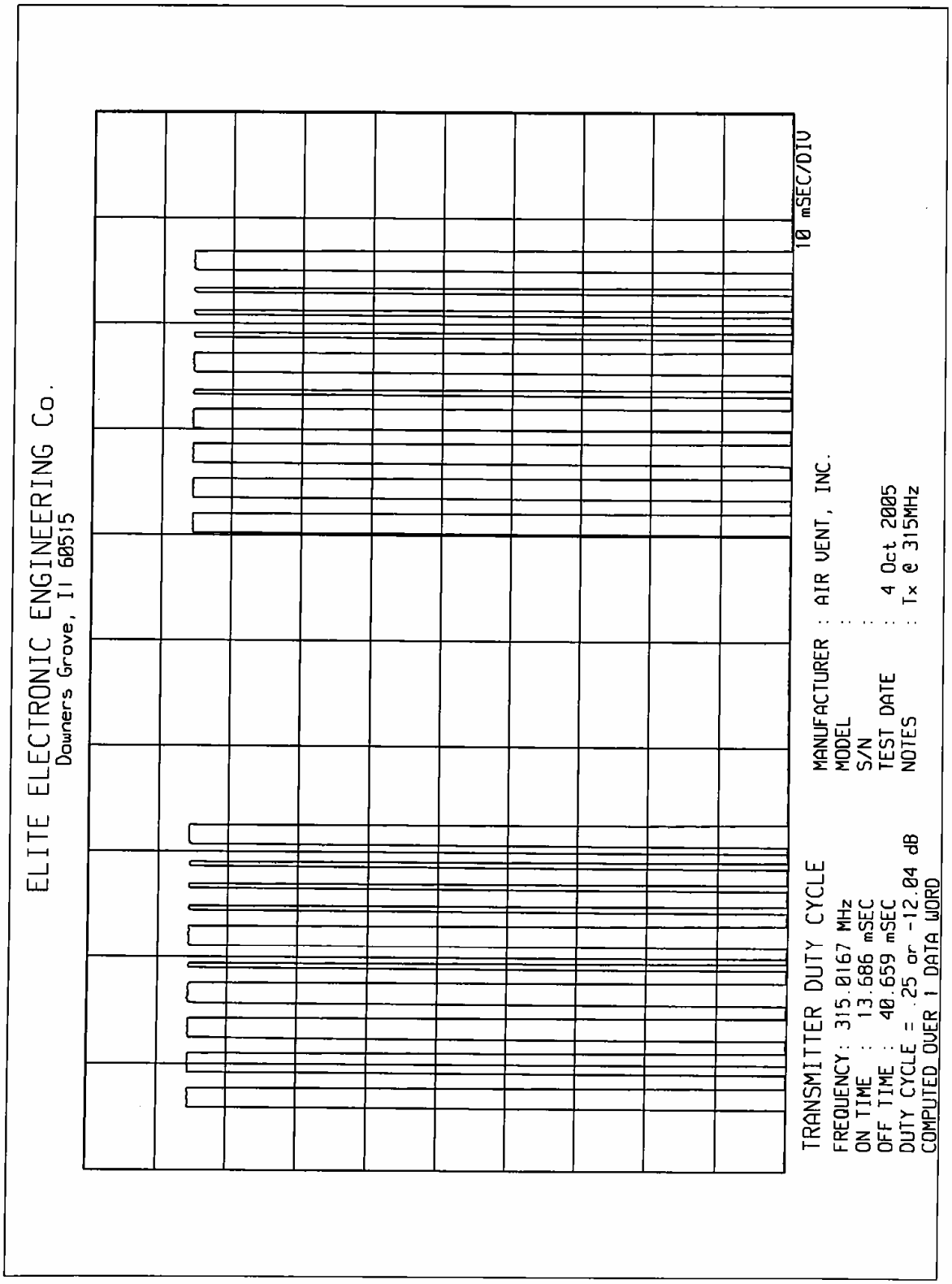
CHECKED BY: Mark E. Longinotti
M. LONGINOTTI

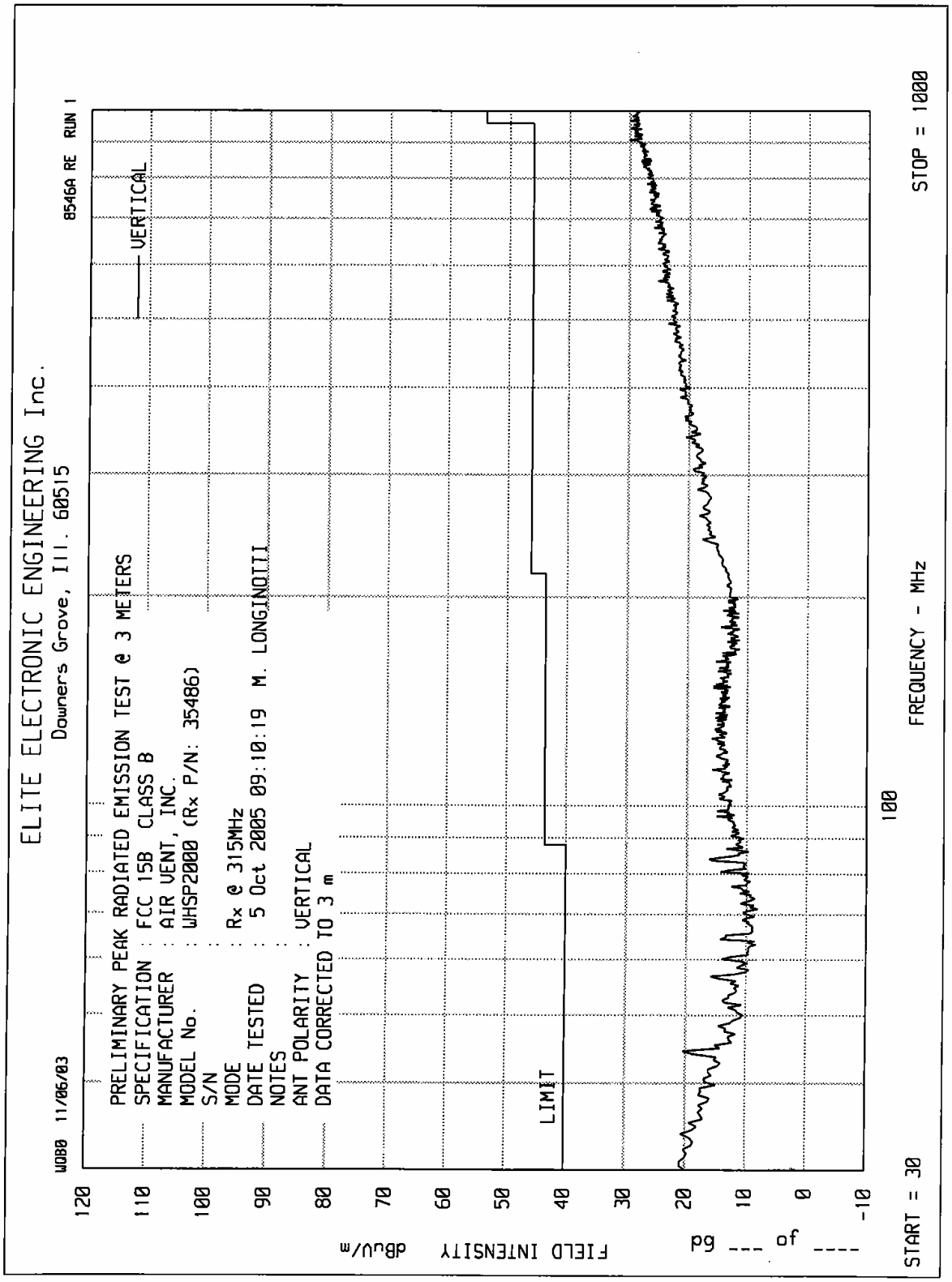
ETR No.
ELITE ELECTRONIC ENGINEERING CO.

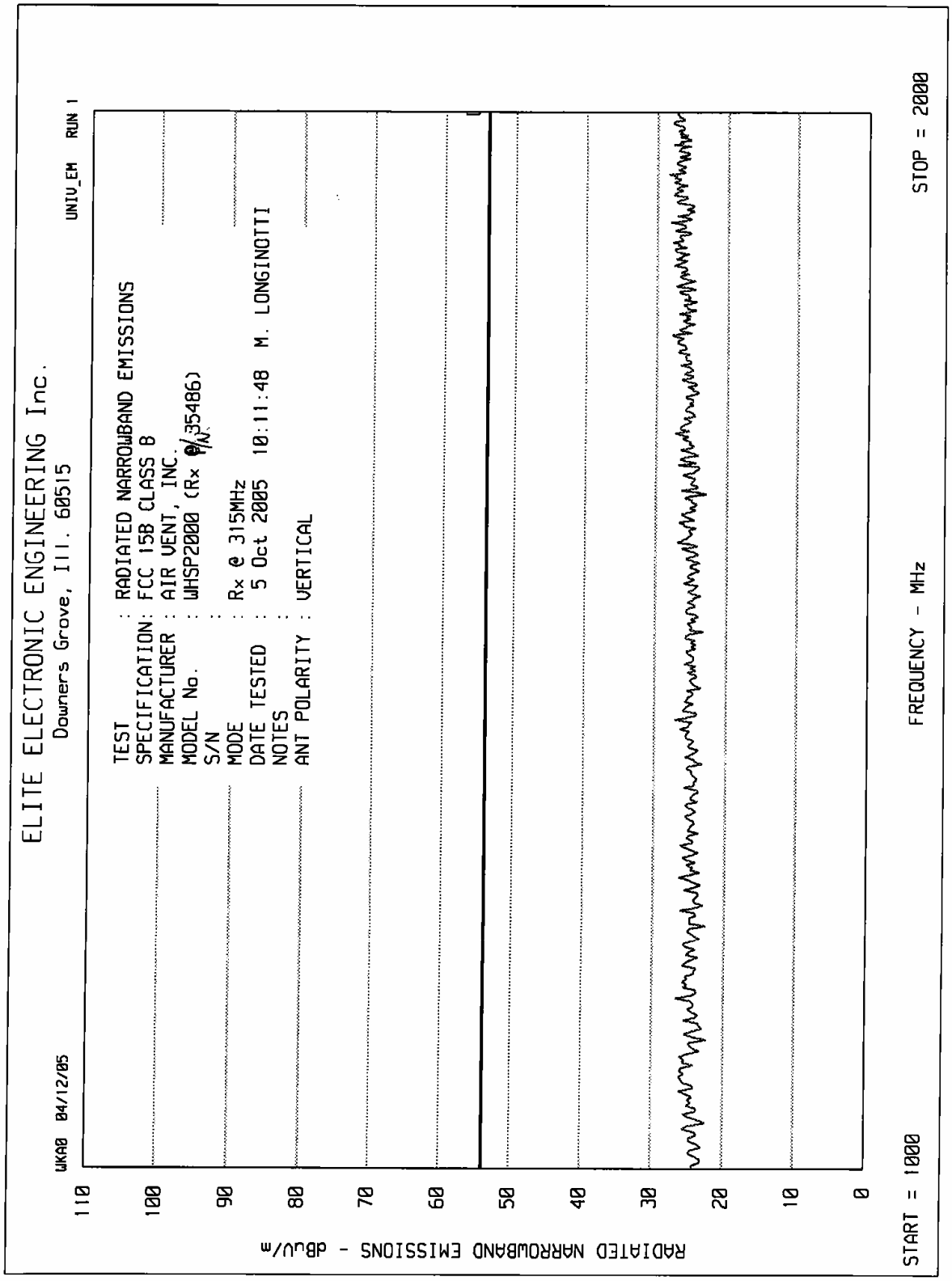
MANUFACTURER : AIR VENT, INC.
MODEL : WHSP2000 (Rx P/N: 35486)
S/N :
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115V, 60Hz RETURN
MODE : Rx @ 315MHz
DATE : 5 Oct 2005
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.229	29.0	62.5		52.5	
.581	26.2	56.0		46.0	
.820	25.7	56.0		46.0	
1.266	25.9	56.0		46.0	
2.722	25.6	56.0		46.0	
4.815	25.7	56.0		46.0	
6.063	25.3	60.0		50.0	
8.560	25.4	60.0		50.0	
12.032	26.0	60.0		50.0	
14.613	25.3	60.0		50.0	
17.468	25.3	60.0		50.0	
20.062	26.9	60.0		50.0	
24.067	33.0	60.0		50.0	
24.066	33.1	60.0		50.0	
28.075	27.3	60.0		50.0	

CHECKED BY: Mark E Longinotti
M. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Il 60515
10 mSEC/DIV
TRANSMITTER DUTY CYCLE
FREQUENCY: 315.0167 MHz
ON TIME : 13.686 mSEC
OFF TIME : 40.659 mSEC
DUTY CYCLE = .25 or -12.04 dB
COMPUTED OVER 1 DATA WORD
MANUFACTURER : AIR VENT, INC.
MODEL :
S/N :
TEST DATE : 4 Oct 2005
NOTES : Tx @ 315MHz


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8546A RE RUN 1
WDBB 11/06/03
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : AIR VENT, INC.
MODEL No. : WHSP2000 (Rx P/N: 35486)
S/N : .
MODE : Rx @ 315MHz
DATE TESTED : 5 Oct 2005 09:10:19 M. LONGINOTTI
NOTES : .
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
FREQUENCY - MHz
START = 30
STOP = 1000
pg --- of ----


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 04/12/05
UNIV_EM RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15B CLASS B
MANUFACTURER : AIR VENT, INC.
MODEL No. : WHSP2000 (Rx P/N 35486)
S/N :
MODE : Rx @ 315MHz
DATE TESTED : 5 Oct 2005 10:11:48 M. LONGINOTTI
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 2000

MANUFACTURER : Air Vent, Inc.
TEST ITEM : Whole House Fan, Model with Super Heterodyne Receive
MODEL NO. : WHSP2000 (Receiver Part No. 35486)
TEST SPECIFICATION : FCC 15.109(a), Radiated Emissions
MODE : Receive @ 315MHz
TEST DATE : October 5, 2005
TEST DISTANCE : 3 meters

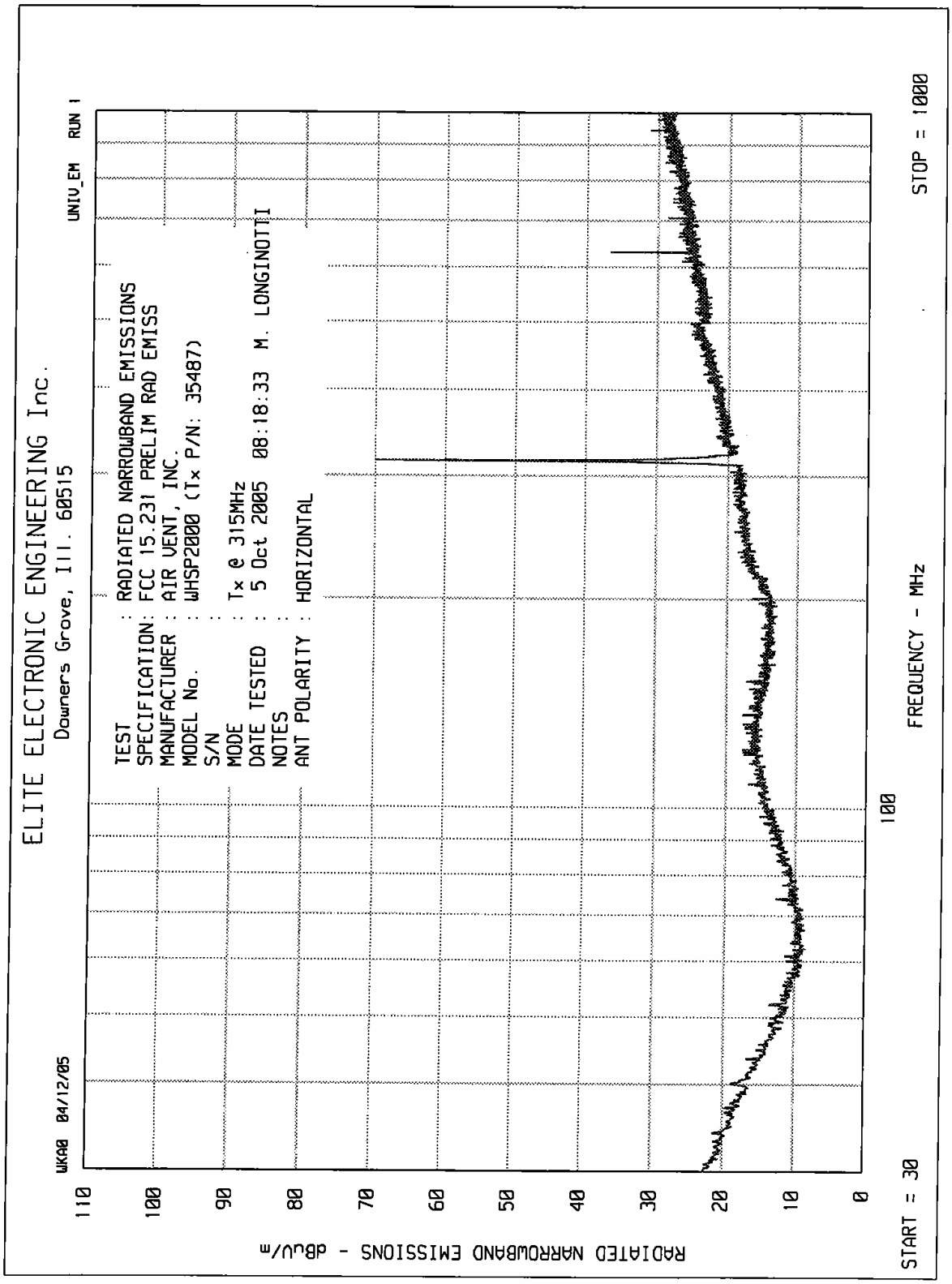
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Total dBuV/m	Total uV/m	Limit uV/m
304.3	H	5.1		1.3	14.3	20.7	10.8	200.0
304.3	V	4.8		1.3	14.3	20.4	10.5	200.0
608.6	H	3.0	Ambient	1.7	19.9	24.6	17.0	200.0
608.6	V	2.2	Ambient	1.7	19.9	23.8	15.5	200.0
912.9	H	2.3	Ambient	2.0	23.1	27.3	23.2	200.0
912.9	V	3.5	Ambient	2.0	23.1	28.5	26.6	200.0
1217.2	H	7.4	Ambient	2.3	26.3	36.0	62.8	500.0
1217.2	V	7.6	Ambient	2.3	26.3	36.2	64.3	500.0
1521.5	H	7.8	Ambient	2.6	26.8	37.2	72.4	500.0
1521.5	V	8.3	Ambient	2.6	26.8	37.7	76.7	500.0
1825.8	H	8.4	Ambient	2.9	28.1	39.4	93.0	500.0
1825.8	V	9.8	Ambient	2.9	28.1	40.8	109.3	500.0

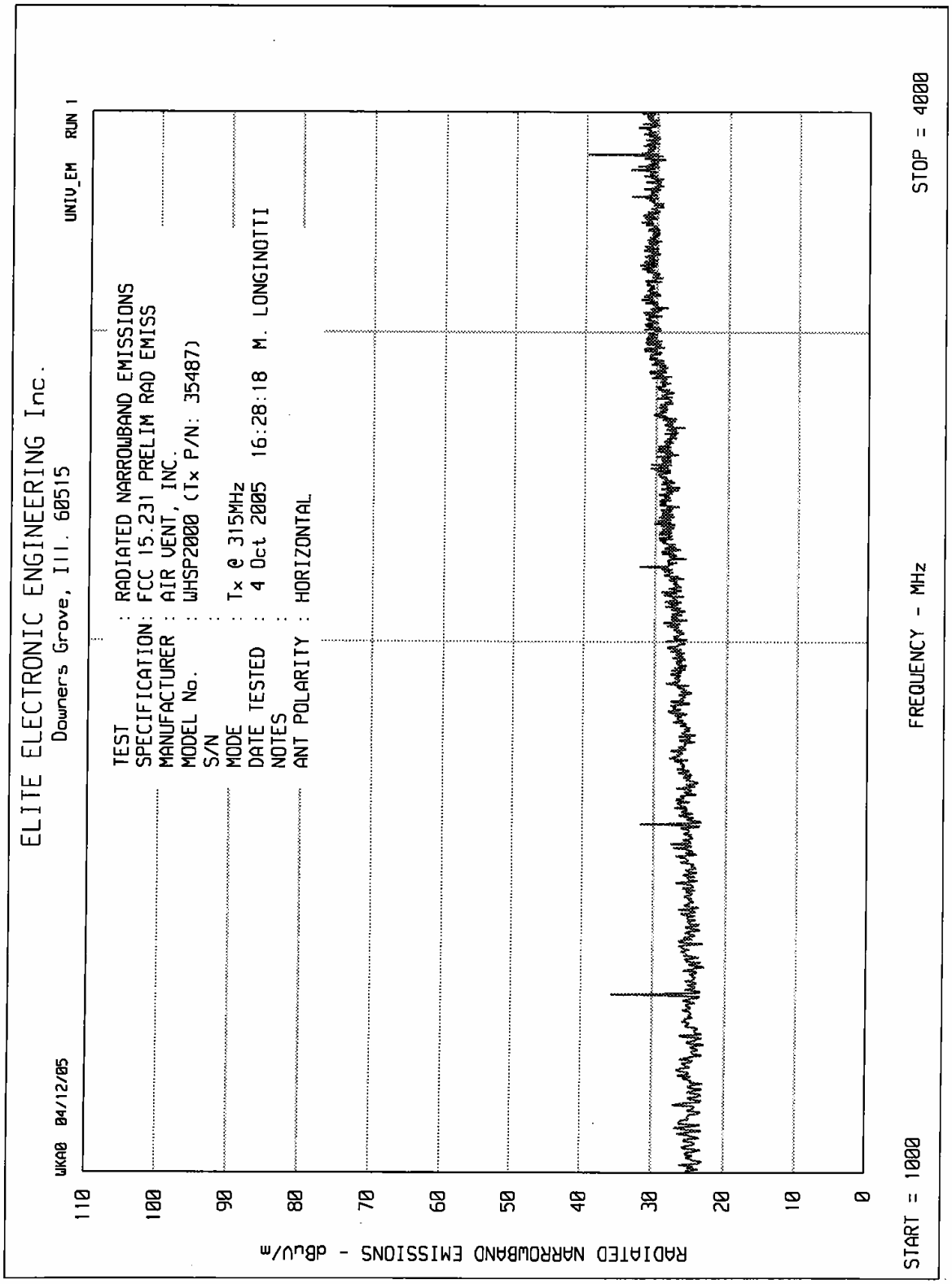
H – Horizontal

V = Vertical

Total = Meter Reading + Cable Loss + Antenna Factor

Checked By : MARK E. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV_EM RUN 1
WKA0 04/12/05
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15.231 PRELIM RAD EMISS
MANUFACTURER : AIR VENT, INC.
MODEL No. : WHSP2000 (Tx P/N: 35487)
S/N :
MODE : Tx @ 315MHz
DATE TESTED : 5 Oct 2005 08:18:33 M. LONGINOTTI
NOTES :
ANT POLARITY : HORIZONTAL
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 04/12/05
TEST : RADIATED NARROWBAND EMISSIONS
SPECIFICATION: FCC 15.231 PRELIM RAD EMISS
MANUFACTURER : AIR VENT, INC.
MODEL No. : WHSP2000 (Tx P/N: 35487)
S/N :
MODE : Tx @ 315MHz
DATE TESTED : 4 Oct 2005 16:28:18 M. LONGINOTTI
NOTES :
ANT POLARITY : HORIZONTAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 4000

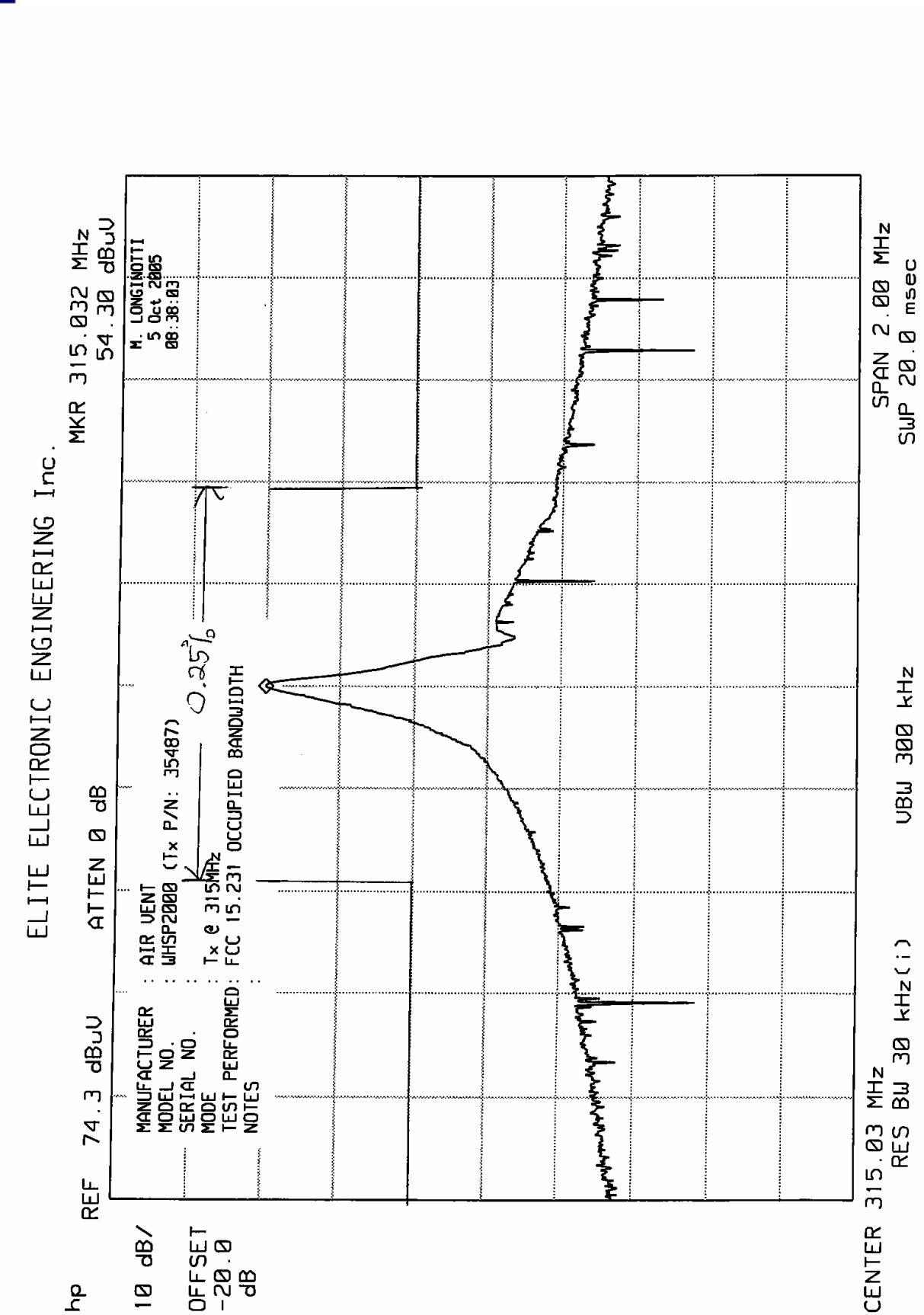
ETR No.
DATA PAGE

SPECIFICATION : FCC PART 15C TRANSMITTER OPEN FIELD DATA
MANUFACTURER : AIR VENT, INC.
MODEL : WHSP2000 (Tx P/N: 35487)
S/N :
TEST DATE : 4 Oct 2005
NOTES : Tx @ 315.05MHz
TEST ANTENNA : ROBERTS DIPOLE & DRWG ANTENNAS

FREQUENCY MHz	ANT POL	MTR RDG dBuV	CBL FAC dB	ANT FAC dB	DUTY CYCLE dB	TOTAL dBuV/m @3m	TOTAL uV/m @3m	LIMIT uV/m @3m	NOTES
315.05	H	52.1	1.3	18.7	-12.0	60.1	1010.4	6043.8	
315.05	V	34.6	1.3	18.7	-12.0	42.6	134.7	6043.8	
630.07	H	22.4	1.7	24.6	-12.0	36.7	68.8	604.4	
630.07	V	16.9	1.7	24.6	-12.0	31.2	36.5	604.4	
945.10	H	14.5	2.0	28.4	-12.0	32.9	43.9	604.4	
945.10	V	9.9AMB	2.0	28.4	0.0	40.3	103.4	604.4	
1260.00	H	22.2	2.3	26.4	-12.0	38.8	87.6	604.4	
1260.00	V	20.4	2.3	26.4	-12.0	37.0	71.2	604.4	
1575.20	H	18.8AMB	2.7	27.1	0.0	48.5	266.5	500.0	*
1575.20	V	18.0AMB	2.7	27.1	0.0	47.7	243.0	500.0	*
1890.20	H	18.5AMB	2.9	28.4	0.0	49.8	309.3	604.4	
1890.20	V	18.1AMB	2.9	28.4	0.0	49.4	295.3	604.4	
2205.20	H	22.1	3.2	29.6	-12.0	42.9	139.5	500.0	*
2205.20	V	18.5AMB	3.2	29.6	0.0	51.3	368.5	500.0	*
2520.30	H	18.3AMB	3.6	30.7	0.0	52.5	423.9	604.4	
2520.30	V	18.0AMB	3.6	30.7	0.0	52.2	409.5	604.4	
2835.40	H	6.8AMB	3.9	31.8	0.0	42.4	132.4	500.0	*
2835.40	V	7.1AMB	3.9	31.8	0.0	42.7	137.0	500.0	*
3150.50	H	8.7AMB	4.1	32.3	0.0	45.1	179.8	604.4	
3150.50	V	8.2AMB	4.1	32.3	0.0	44.6	169.7	604.4	

* DENOTES A FREQUENCY CONFLICT WITH RESTRICTED BANDS

checked by: Mark E. Longinotti
M. LONGINOTTI


ELITE ELECTRONIC ENGINEERING Inc.
MKR 315.032 MHz
54.30 dBuV
M. LONGINOTTI
5 Oct 2005
08:38:03
hp
REF 74.3 dBuV
ATTEN 0 dB
10 dB/
OFFSET
-20.0
dB
MANUFACTURER : AIR VENT
MODEL NO. : WHSP2000 (Tx P/N: 35487)
SERIAL NO. :
MODE : Tx @ 315MHz
TEST PERFORMED: FCC 15.231 OCCUPIED BANDWIDTH
NOTES :
0.25%
SPAN 2.00 MHz
SWP 20.0 msec
VBW 300 kHz
CENTER 315.03 MHz
RES BW 30 kHz(i)