



Measurement of RF Interference from a Model XA0285 Rev. 2 Transceiver

For : Twisthink, LLC
130 Central Avenue, Suite 400
Holland, MI 49423

P.O. No. : 158
Date Tested : April 21, 2008 and April 24, 2008
Test Personnel : Mark E. Longinotti
Specifications : FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B,
for receivers and Subpart C; Section 15.249 for Intentional
Radiators: Operating within the 902MHz to 928MHz band;
Industry Canada RSS-210; Industry Canada RSS-GEN

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Revision History

Revision	Date	Description
—	April 25, 2008	Initial release

Measurement of RF Emissions from a XA0285 Rev. 2 Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Transceiver, Part No. XA0285 Rev. 2, Serial No. None Assigned, (hereinafter referred to as the test item). The test item was designed to transmit at approximately 908.42MHz and receive at approximately 908.42MHz using an internal antenna. The test item was manufactured and submitted for testing by Twisthink, LLC located in Holland, MI.

1.2 Purpose

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

1.3 Deviations, Additions and Exclusions

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

1.4 EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.5 Laboratory Conditions

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

2 APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart B for Receivers, dated 1 October 2005
- ANSI C63.4-2003, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- Industry Canada RSS-210, Issue 6, September 2005, "Spectrum Management and Telecommunications Radio Standards Specification, Low-power License-exempt radio communication devices (All Frequency Bands): Category I Equipment"
- Industry Canada RSS-GEN, Issue 1, September 2005, "Spectrum Management and Telecommunications Radio Standards Specification, General Requirements and Information for the Certification of radio communication equipment"

3 TEST ITEM SETUP AND OPERATION

3.1 General Description

The test item is a Transceiver, Part No. XA0285 Rev. 2. A block diagram of the test item setup is shown as Figure 1. Photographs of the test item are shown as Figure 2.

3.1.1 Power Input

The test item could be powered by 5VDC from an external power supply, Manufacturer: CUI, Inc., M/N: EPS050100, P/N: EPS050100-P6P or by 9VDC from an internal 9V Alkaline battery. The power supply was connected to the test item via a 1.75 meter long, 2 wire unshielded power cable. The power supply was powered with 115V, 60Hz. For conducted emissions tests, each primary lead was connected through a line impedance



stabilization network (LISN) which was located on the ground plane. The network complies with the requirements of Paragraph 4.1.2 of ANSI C63.4-2003.

3.1.2 Peripheral Equipment

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

3.1.3 Interconnect Cables

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

3.1.4 Grounding

The test item was ungrounded during the test.

3.2 Operational Mode

For all tests, the test item was placed on an 80cm high non-conductive stand. The test item was programmed so that upon power up it could operate in one of the following modes:

- receive continuously at 908.42MHz
- transmit continuously at 908.42MHz

3.3 Test Item Modifications

No modifications were required for compliance to the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109. In order to meet the requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, and Subpart C, Sections 15.207 and 15.249 requirements, the output power of the test item was set to level "HP10" when powered with 5VDC via the CUI, Inc. power supply. The output power of the test item was set to level "LP11" when powered with 9VDC from an internal 9V alkaline battery.

4 TEST FACILITY AND TEST INSTRUMENTATION

4.1 Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2003 for site attenuation.

4.2 Test Instrumentation

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

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

Radiated emissions were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths specified by the FCC and with the quasi-peak detector function. The receiver bandwidth was 120kHz for the 30MHz to 1000MHz radiated emissions data.

4.3 Calibration Traceability

Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.4 Measurement Uncertainty

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

The measurement uncertainty for these tests is presented below:

Conducted Emission Measurements

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

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

5 TEST PROCEDURES

5.1 Powerline Conducted Emissions

5.1.1 Receiver

5.1.1.1 Requirements

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

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

* - Decreases with the logarithm of the frequency.

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the test item is considered to have met both requirements and measurements do not need to be performed using the Average detector.

5.1.1.2 Procedures

The interference on each power lead was measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. The meter terminal of the LISN not under test was terminated with 50 ohms. Measurements were first made over the entire frequency range from 150 kHz through 30MHz with a peak detector and the results were automatically plotted. The data thus obtained was then searched by the computer for the highest levels. Quasi-peak measurements were automatically performed at the frequencies selected from the highest peak measurements, and the results printed.

5.1.1.3 Results

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

The emissions level closest to the limit (worst case) occurred at 942kHz. The emissions level at this frequency was 5.1dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.1.2 Transmitter

5.1.2.1 Requirements

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

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

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the test item is considered to have met both requirements and measurements do not need to be performed using the Average detector.

5.1.2.2 Procedures

The interference on each power lead was measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. The meter terminal of the LISN not under test was terminated with 50 ohms. Measurements were first made over the entire frequency range from 150 kHz through 30MHz with a peak detector and the results were automatically plotted. The data thus obtained was then searched by the computer for the highest levels. Quasi-peak measurements were automatically performed at the frequencies selected from the highest peak measurements, and the results printed.

5.1.2.3 Results

The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 22 and 23. The conducted limit for intentional radiators is shown as a reference. The final quasi-peak results are presented on pages 24 and 25. As can be seen from the data, all emissions measured from the test item were within the specification limits.

The emissions level closest to the limit (worst case) occurred at 1.211MHz. The emissions level at this frequency was 0.4dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.2 Radiated Measurements

5.2.1 Receiver

5.2.1.1 Requirements

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

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

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

5.2.1.2 Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 2003 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

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

For preliminary radiated emissions sweeps from 30MHz to 5GHz, the broadband measuring antenna was positioned at a 3 meter distance from the test item. The frequency range from 30MHz to 5GHz was investigated using a peak detector function with the bilog antenna below 1GHz and the double-ridged waveguide antenna above 1GHz. The maximum levels were plotted.

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

- 1) Measurements below 1GHz were made using a quasi-peak detector and a bilog antenna. Measurements above 1GHz were made using an average detector and a double ridged waveguide antenna.
- 2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:
 - a. The test item was rotated so that all of its sides were exposed to the receiving antenna.
 - b. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - c. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

5.2.1.3 Results

The preliminary plots, with the test item AC Powered, are presented on pages 26 and 29. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on pages 30 and 31. As can be seen from the data, all emissions measured from the test item were within the specification limits for receivers. The emissions level closest to the limit (worst case) occurred at 875.10MHz. The emissions level at this frequency was 1.6dB within the limit. Photographs of the test configuration are shown on Figure 4.

The preliminary plots, with the test item DC Powered, are presented on pages 32 through 35. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on pages 36 and 37. 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 1816.4MHz. The emissions level at this frequency was 2.4dB within the limit. Photographs of the test configuration are shown on Figure 4.

5.2.2 Transmitter

5.2.2.1 Requirements

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

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

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

5.2.2.2 Procedures

All measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters

prevent extraneous signals from entering the enclosure on these leads. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2003 for site attenuation.

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

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

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

- 1) The test item was rotated so that all of its sides were exposed to the receiving antenna.
- 2) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
- 3) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

5.2.2.3 Results

The preliminary plots, with the test item transmitting at 908.42MHz and AC Powered, are presented on data pages 38 and 39. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels, with the test item transmitting at 908.4MHz and AC Powered, are presented on data page 40. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closest to the limit (worst case) occurred at 908.42MHz. The emissions level at this frequency was 1.7dB within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 5.

The preliminary plots, with the test item transmitting at 908.42MHz and DC Powered, are presented on data pages 41 and 42. 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 908.42MHz and DC Powered, are presented on data page 43. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closest to the limit (worst case) occurred at 908.42Hz. The emissions level at this frequency was 1.6 within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 5.

5.3 Occupied Bandwidth Measurements

5.3.1 Requirements

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

5.3.2 Procedure

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

5.3.3 Results

The plots of the emissions near the fundamental frequency are presented on data pages 44 and 45. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

The 99% bandwidth was measured to be 144.3kHz.



6 OTHER TEST CONDITIONS

6.1 Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated.

6.2 Disposition of the Test Item

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

7 CONCLUSIONS

It was determined that the Twisthink, LLC Transceiver, Part No. XA0285 Rev. 2, Serial No. None Assigned, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109 for receivers, and Subpart C, Sections 15.207 and 15.249 for Intentional Radiators Operating within the 902MHz -928MHz band, when tested per ANSI C63.4-2003.

8 CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

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



9 EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APK5	PREAMPLIFIER	HEWLETT PACKARD	8449B	M9331A00183	2GHZ-22GHZ	6/5/2007	6/5/2008
APQ2	PREAMPLIFIER	ROHDE & SCHWARZ	TS-PR40	1000022	26.5GHZ-40GHZ	10/29/2007	10/29/2008
APW2	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10	PL2925	1GHZ-20GHZ	11/30/2007	11/30/2008
CDS2	COMPUTER	GATEWAY	MFATXPNT NMZ 500L	0028483108	1.8GHZ	N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---	N/A	
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	3/4/2008	3/4/2009
NTA1	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL6112	2054	0.03-2GHZ	6/5/2007	6/5/2008
NWH0	RIDGED WAVE GUIDE	TENSOR	4105	2081	1-12.4GHZ	10/13/2007	10/13/2008
PLL9	50UH LISN 462D	ELITE ELECTRONIC ENG	462D/70A	010	0.01-400MHZ	3/5/2008	3/5/2009
PLLA	50UH LISN 462D	ELITE ELECTRONIC ENG	462D/70A	011	0.01-400MHZ	3/5/2008	3/5/2009
RAC2	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	2504A01234	100HZ-22GHZ	8/21/2007	8/21/2008
RACH	RF PRESELECTOR	HEWLETT PACKARD	85685A	8574A00284	20HZ-2GHZ	8/17/2007	8/17/2008
RAF6	QUASIPeAK ADAPTOR	HEWLETT PACKARD	85650A	2412A00403	0.01-1000MHZ	8/21/2007	8/21/2008
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	0.009-6500MHZ	11/21/2007	11/21/2008
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	11/21/2007	11/21/2008
RBA1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100146	20HZ-26.5GHZ	9/9/2007	9/9/2008
T1N1	10DB 20W ATTENUATOR	NARDA	766-10		DC-4GHZ	9/4/2007	9/4/2008
XZG5	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2508A05689	PROGRAMMABLE	NOTE 1	

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.

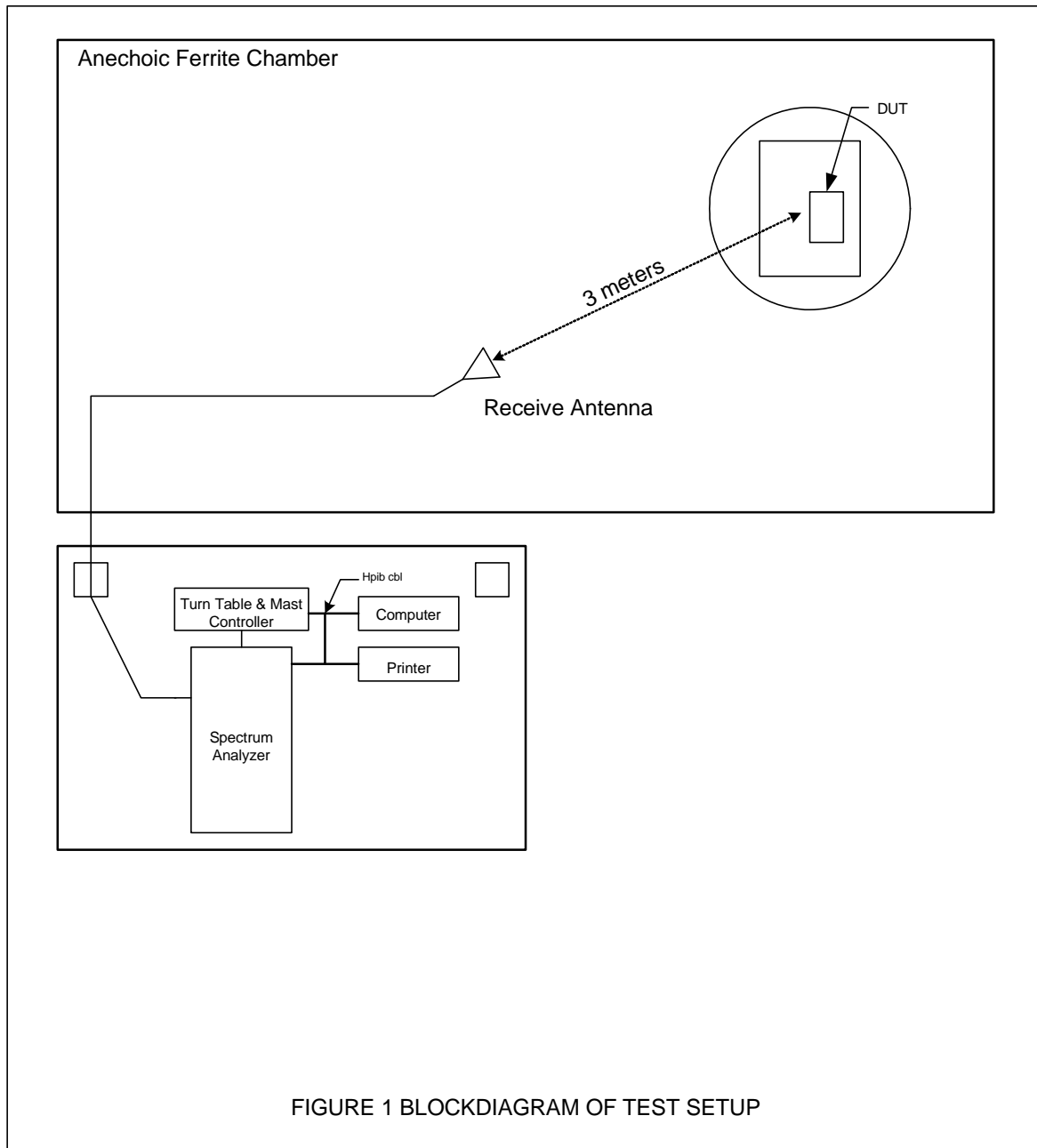
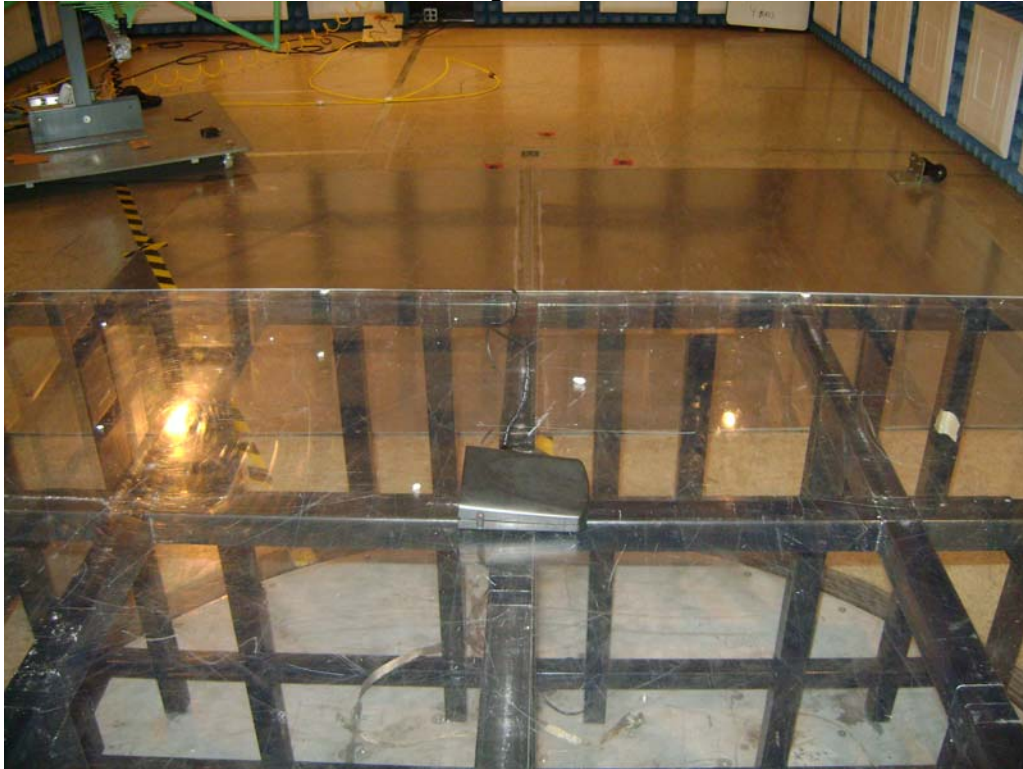


Figure 2

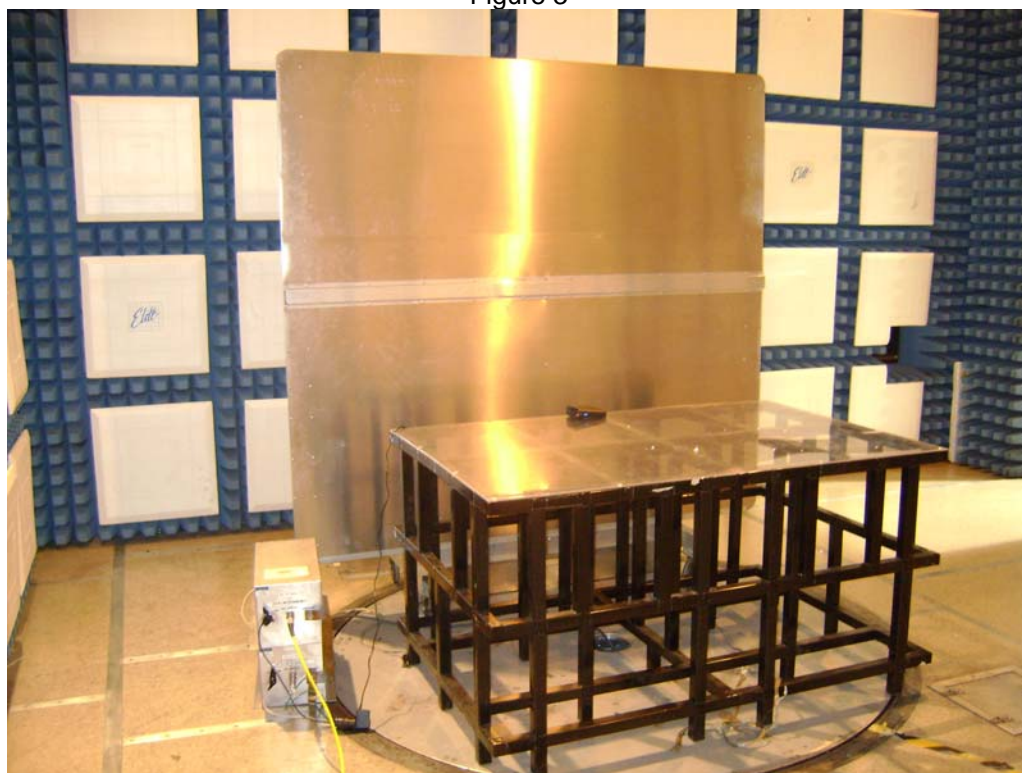


Test Setup – AC Powered



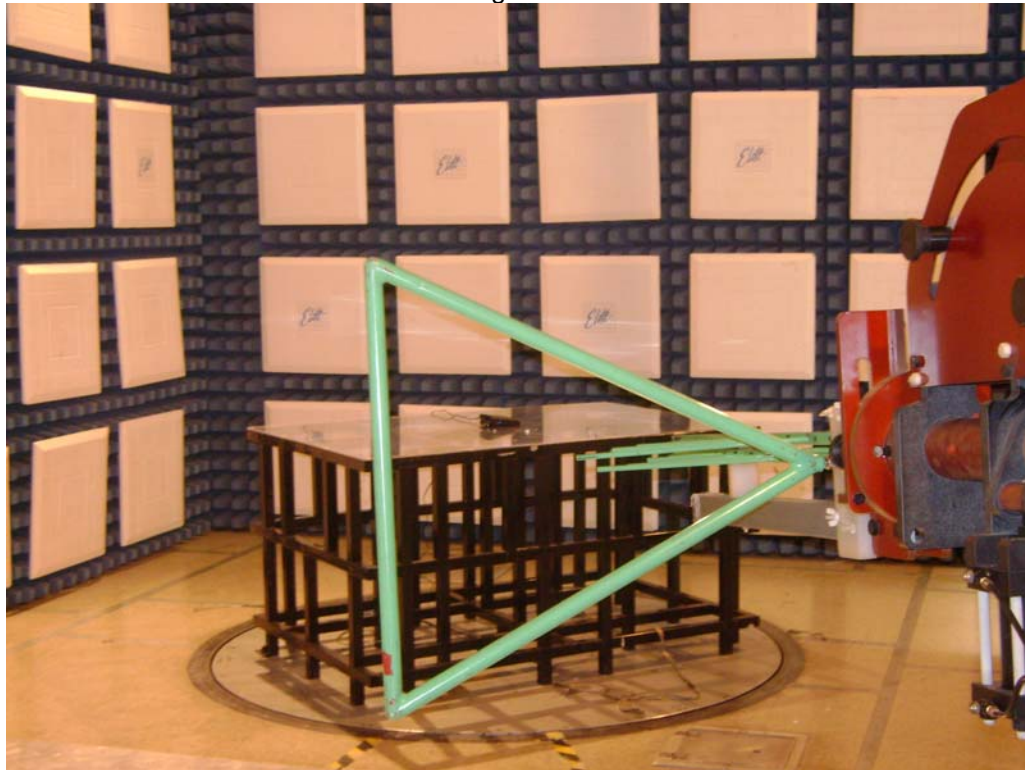
Test Setup – DC Powered

Figure 3

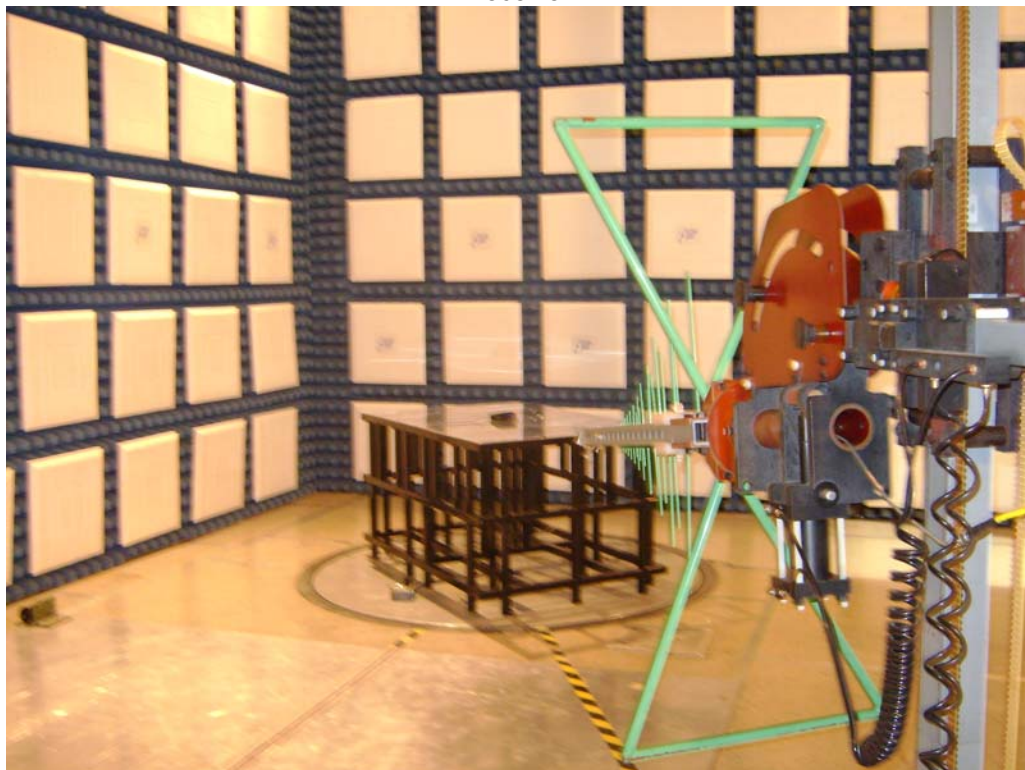


Test Setup for Conducted Emissions

Figure 4



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



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

Figure 5



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

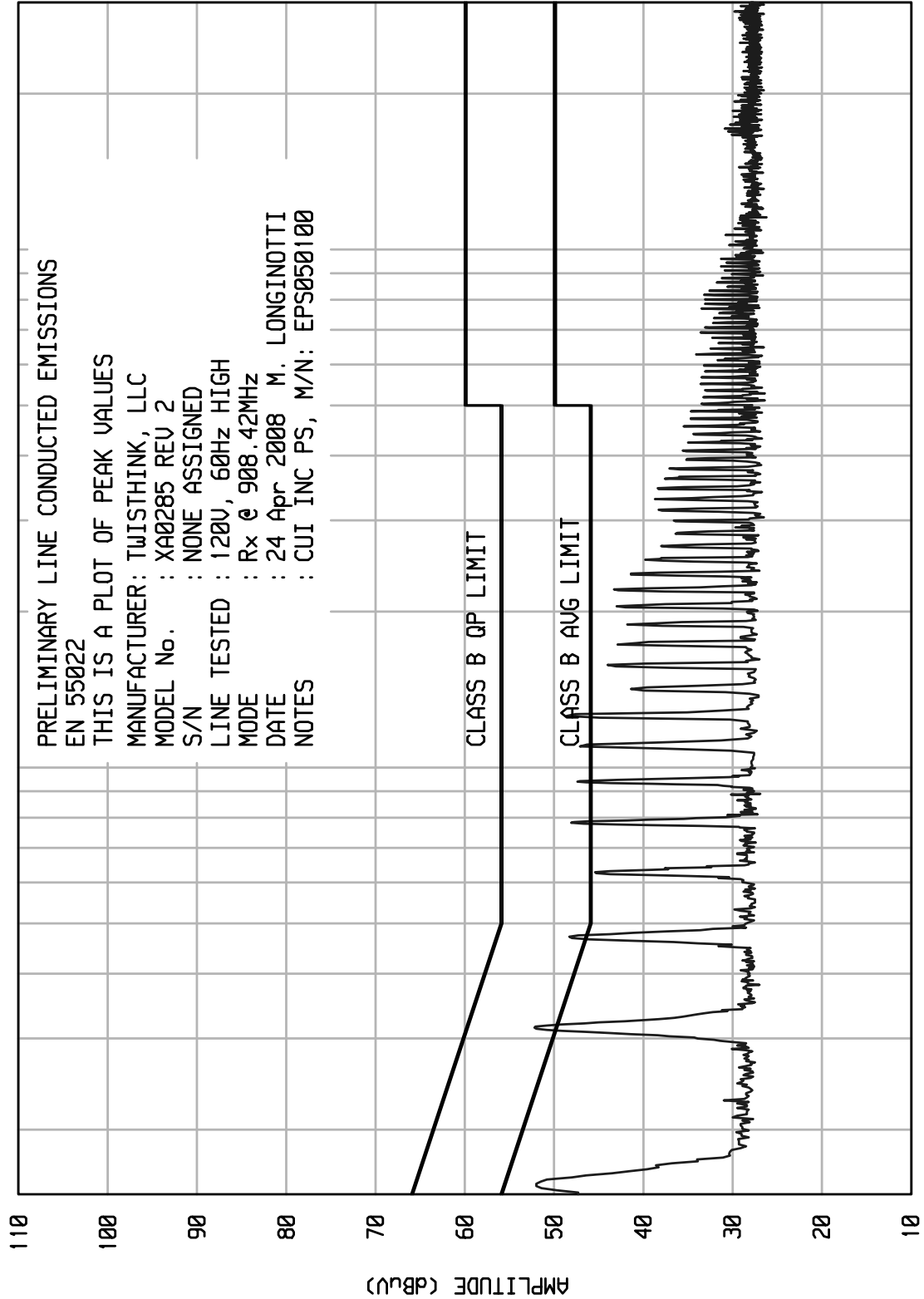


Test Setup for Radiated Emissions – 908MHz – Vertical Polarization - Transmitter

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

8566



8566

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515

PRELIMINARY LINE CONDUCTED EMISSIONS
EN 55022

THIS IS A PLOT OF PEAK VALUES

MANUFACTURER: TWISTHINK, LLC

MODEL No. : XA0285 REV 2

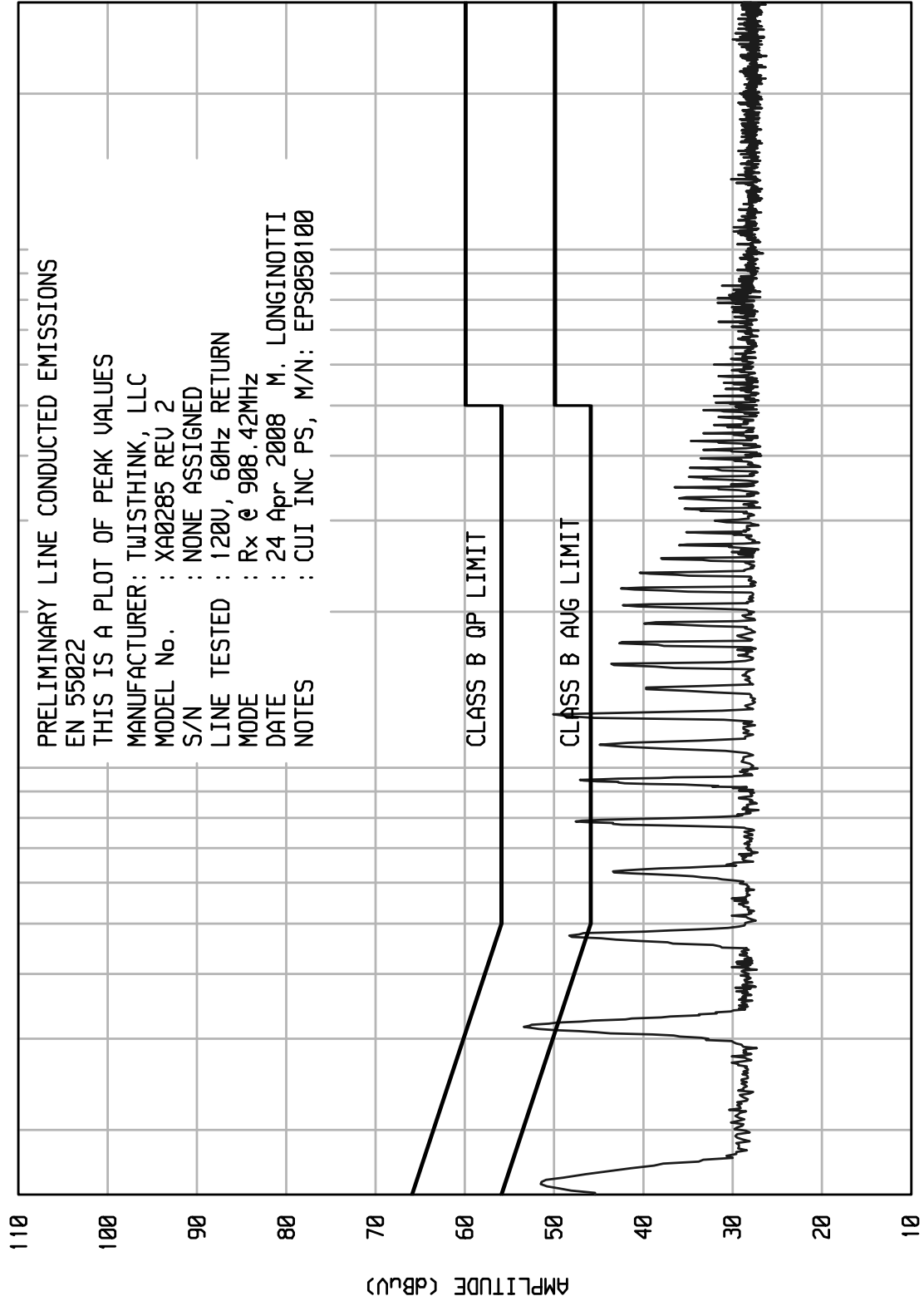
S/N : NONE ASSIGNED

LINE TESTED : 120V, 60Hz RETURN

MODE : Rx @ 908.42MHz

DATE : 24 Apr 2008 M. LONGINOTTI

NOTES : CUI INC PS, M/N: EPS050100





ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : TWISTHINK, LLC
MODEL : XA0285 REV 2
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V, 60Hz HIGH
MODE : Rx @ 908.42MHz
DATE : 24 Apr 2008
NOTES : CUI INC PS, M/N: EPS050100
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
.158	49.8	65.5		55.5	
.315	50.5	59.8	43.3	49.8	*
.472	46.5	56.5	39.8	46.5	*
.786	46.1	56.0	38.2	46.0	*
.942	45.5	56.0		46.0	
1.255	47.2	56.0	40.9	46.0	*
2.039	41.1	56.0		46.0	
2.196	41.0	56.0		46.0	
2.353	39.4	56.0		46.0	
3.293	35.8	56.0		46.0	
4.076	32.6	56.0		46.0	
4.232	32.7	56.0		46.0	
7.367	29.1	60.0		50.0	
9.247	27.0	60.0		50.0	
12.225	25.3	60.0		50.0	
16.618	25.7	60.0		50.0	
18.489	25.4	60.0		50.0	
21.443	25.1	60.0		50.0	
24.009	25.1	60.0		50.0	
27.953	25.0	60.0		50.0	

* QP EXCEEDS AVG LIMIT, SEE DATA

CHECKED BY:

MARK E. LONGINOTTI

M. LONGINOTTI



ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : TWISTHINK, LLC
MODEL : XA0285 REV 2
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V, 60Hz RETURN
MODE : Rx @ 908.42MHz
DATE : 24 Apr 2008
NOTES : CUI INC PS, M/N: EPS050100
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
.160	46.0	65.5		55.5	
.317	47.1	59.8		49.8	
.475	42.9	56.4		46.4	
.789	41.5	56.0		46.0	
.948	41.3	56.0		46.0	
1.263	44.6	56.0		46.0	
1.737	36.8	56.0		46.0	
2.052	35.9	56.0		46.0	
2.367	34.1	56.0		46.0	
3.156	30.0	56.0		46.0	
3.471	29.5	56.0		46.0	
4.260	27.2	56.0		46.0	
5.208	25.9	60.0		50.0	
7.734	25.9	60.0		50.0	
9.100	25.3	60.0		50.0	
11.950	25.3	60.0		50.0	
15.438	25.1	60.0		50.0	
17.998	25.3	60.0		50.0	
20.515	25.1	60.0		50.0	
24.863	25.1	60.0		50.0	
27.534	25.1	60.0		50.0	

CHECKED BY: MARK E. LONGINOTTI
M. LONGINOTTI

8566

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515

PRELIMINARY LINE CONDUCTED EMISSIONS

EN 55022

THIS IS A PLOT OF PEAK VALUES

MANUFACTURER: TWISTHINK, LLC

MODEL No. : XA0285 REV 2

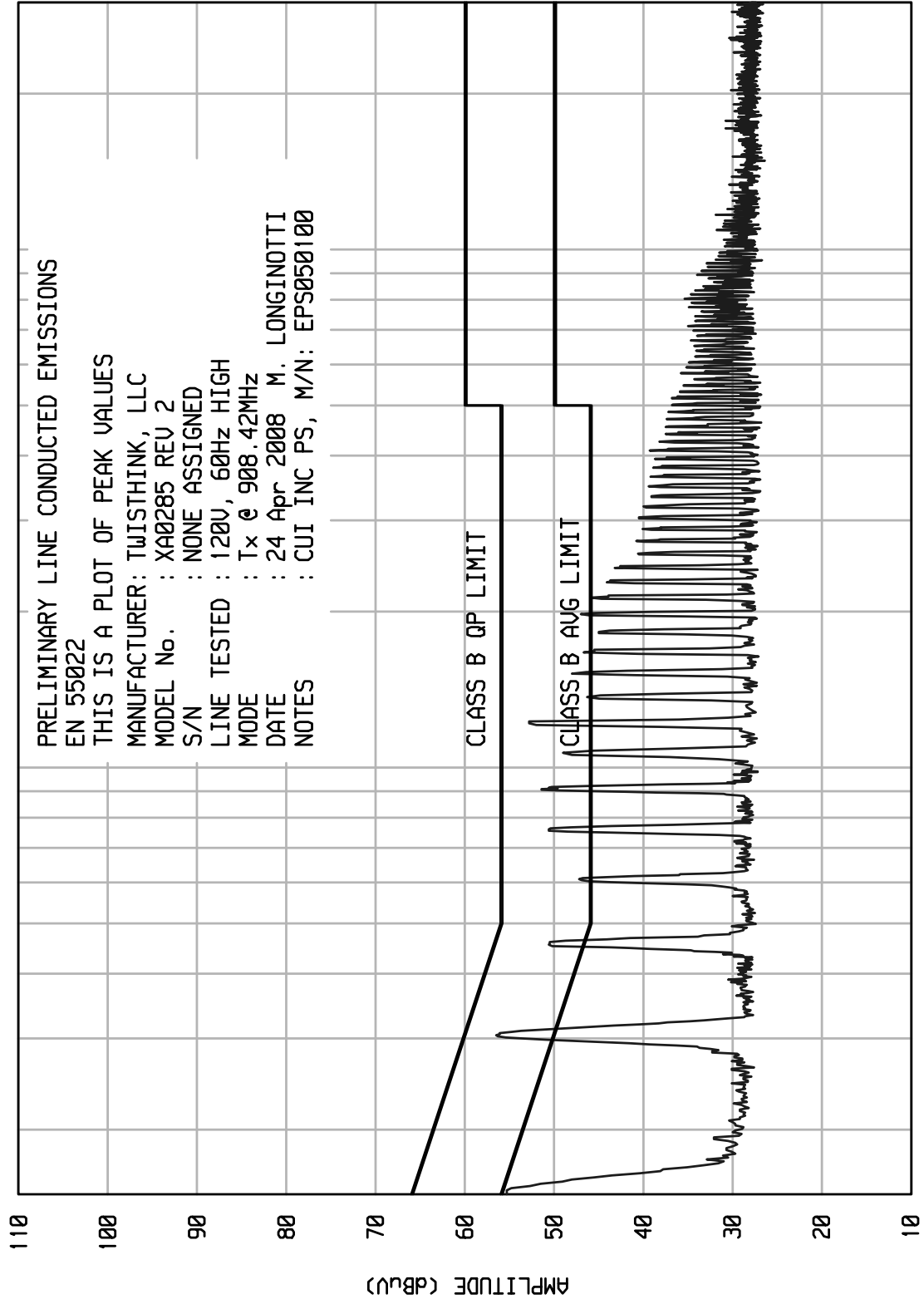
S/N : NONE ASSIGNED

LINE TESTED : 120V, 60Hz HIGH

MODE : Tx @ 908.42MHz

DATE : 24 Apr 2008 M. LONGINOTTI

NOTES : CUI INC PS, M/N: EPS050100



8566

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515

PRELIMINARY LINE CONDUCTED EMISSIONS

EN 55022

THIS IS A PLOT OF PEAK VALUES

MANUFACTURER: TWISTHINK, LLC

MODEL No. : XA0285 REV 2

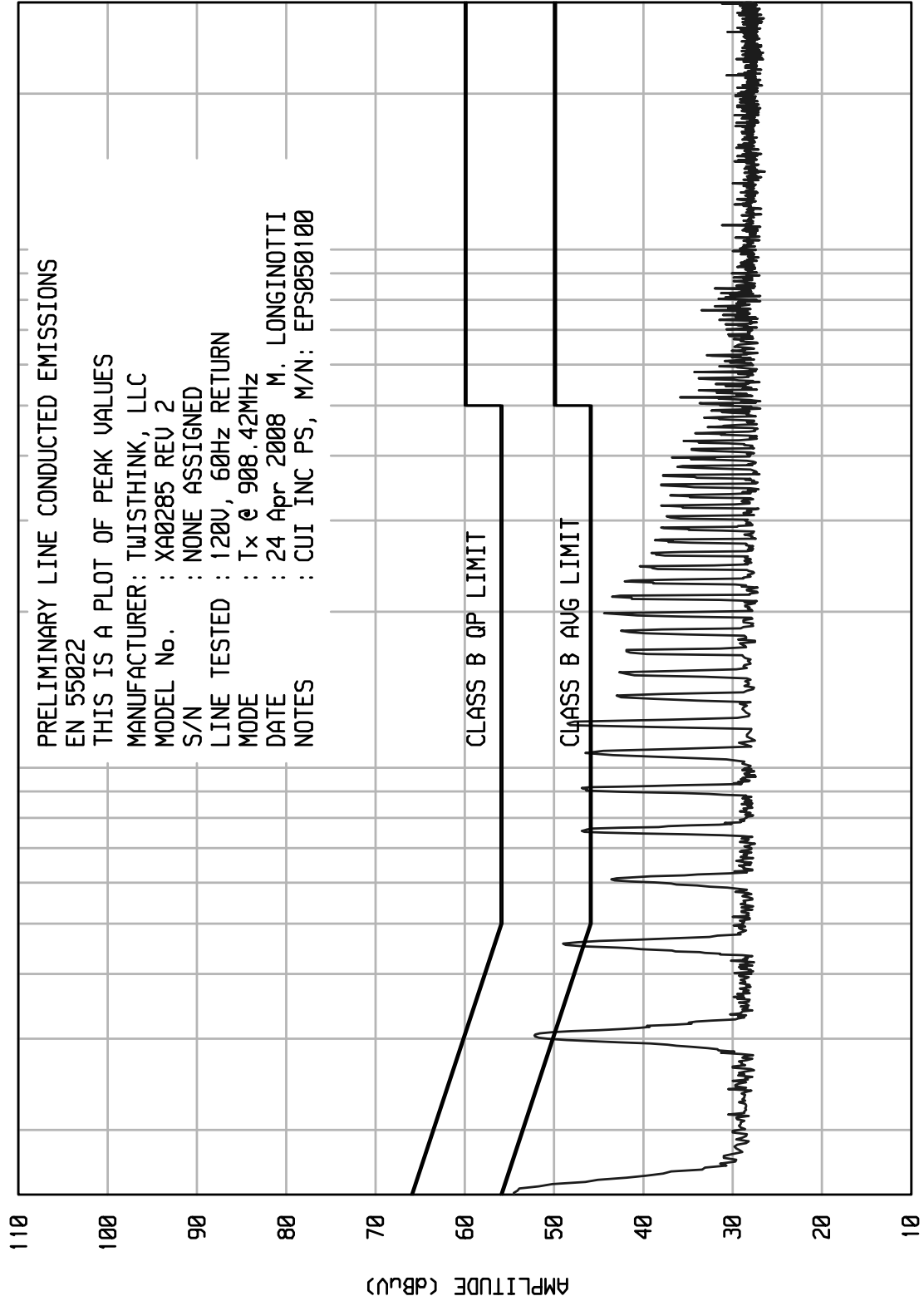
S/N : NONE ASSIGNED

LINE TESTED : 120V, 60Hz RETURN

MODE : Tx @ 908.42MHz

DATE : 24 Apr 2008 M. LONGINOTTI

NOTES : CUI INC PS, M/N: EPS050100





ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : TWISTHINK, LLC
MODEL : XA0285 REV 2
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V, 60Hz HIGH
MODE : Tx @ 908.42MHz
DATE : 24 Apr 2008
NOTES : CUI INC PS, M/N: EPS050100
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
.153	53.4	65.8		55.8	
.304	54.6	60.1	48.6	50.1	*
.456	48.5	56.8	43.4	46.8	*
.758	48.8	56.0	43.8	46.0	*
.910	49.2	56.0	43.7	46.0	*
1.211	50.9	56.0	45.6	46.0	*
1.968	44.6	56.0		46.0	
2.270	41.9	56.0		46.0	
2.421	40.5	56.0		46.0	
3.027	38.1	56.0		46.0	
4.085	36.0	56.0		46.0	
4.994	33.9	56.0		46.0	
6.211	31.8	60.0		50.0	
8.933	29.2	60.0		50.0	
11.962	26.0	60.0		50.0	
15.140	25.4	60.0		50.0	
18.482	25.7	60.0		50.0	
20.885	25.4	60.0		50.0	
23.976	25.3	60.0		50.0	
27.408	25.3	60.0		50.0	

* QP EXCEEDS AVG LIMIT, SEE DATA

CHECKED BY:

MARK E. LONGINOTTI

M. LONGINOTTI

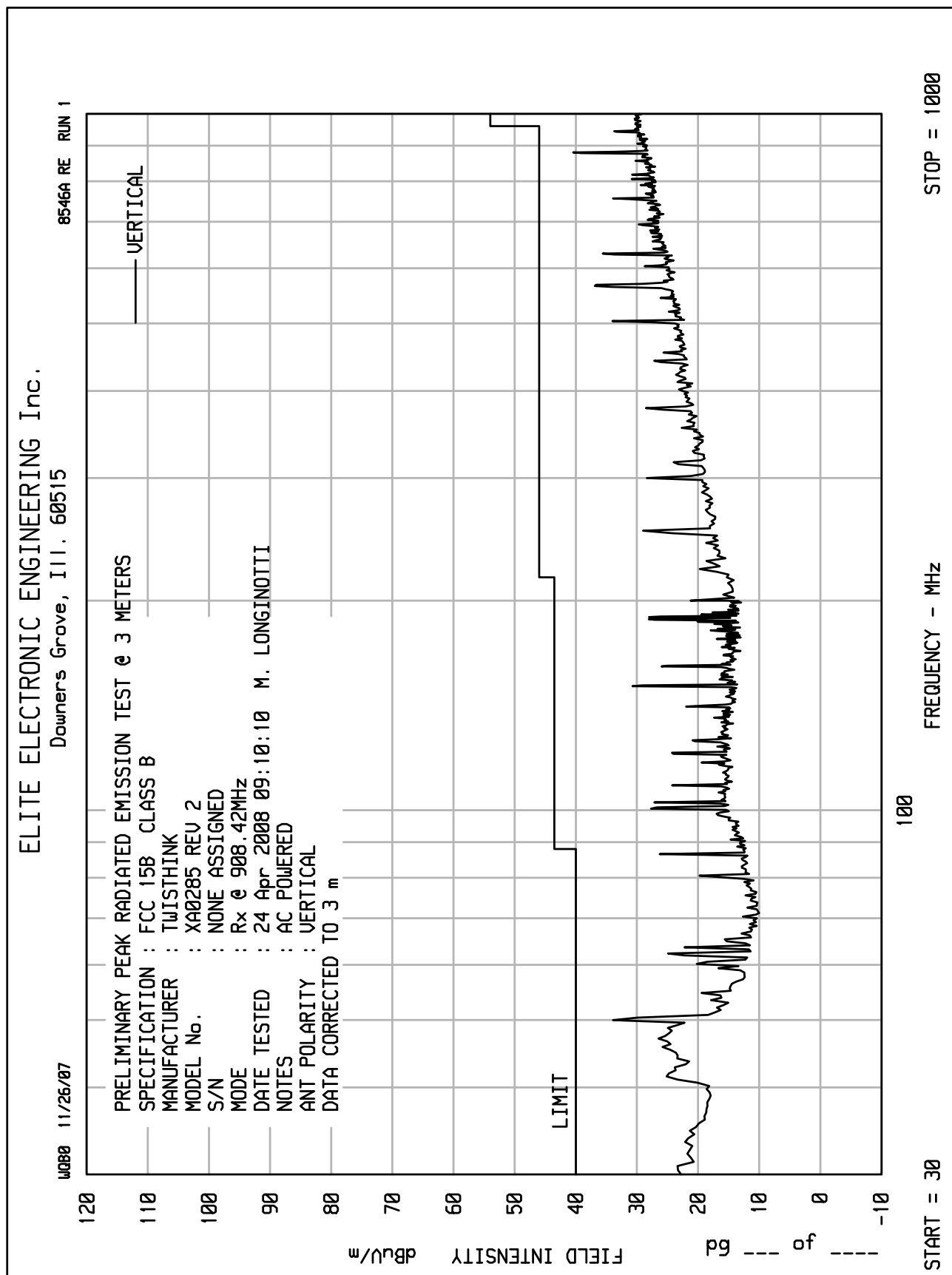


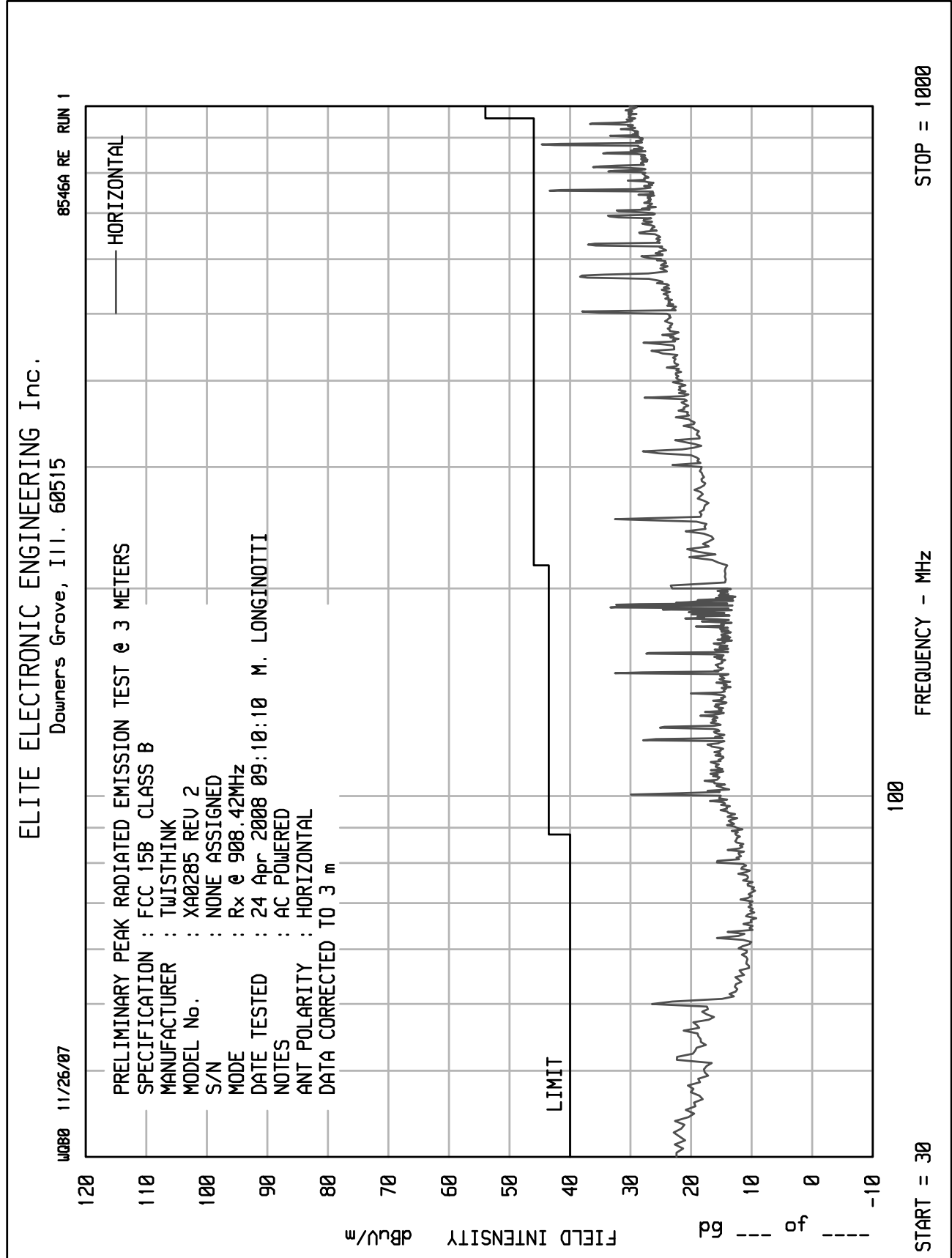
ETR No.
ELITE ELECTRONIC ENGINEERING CO.

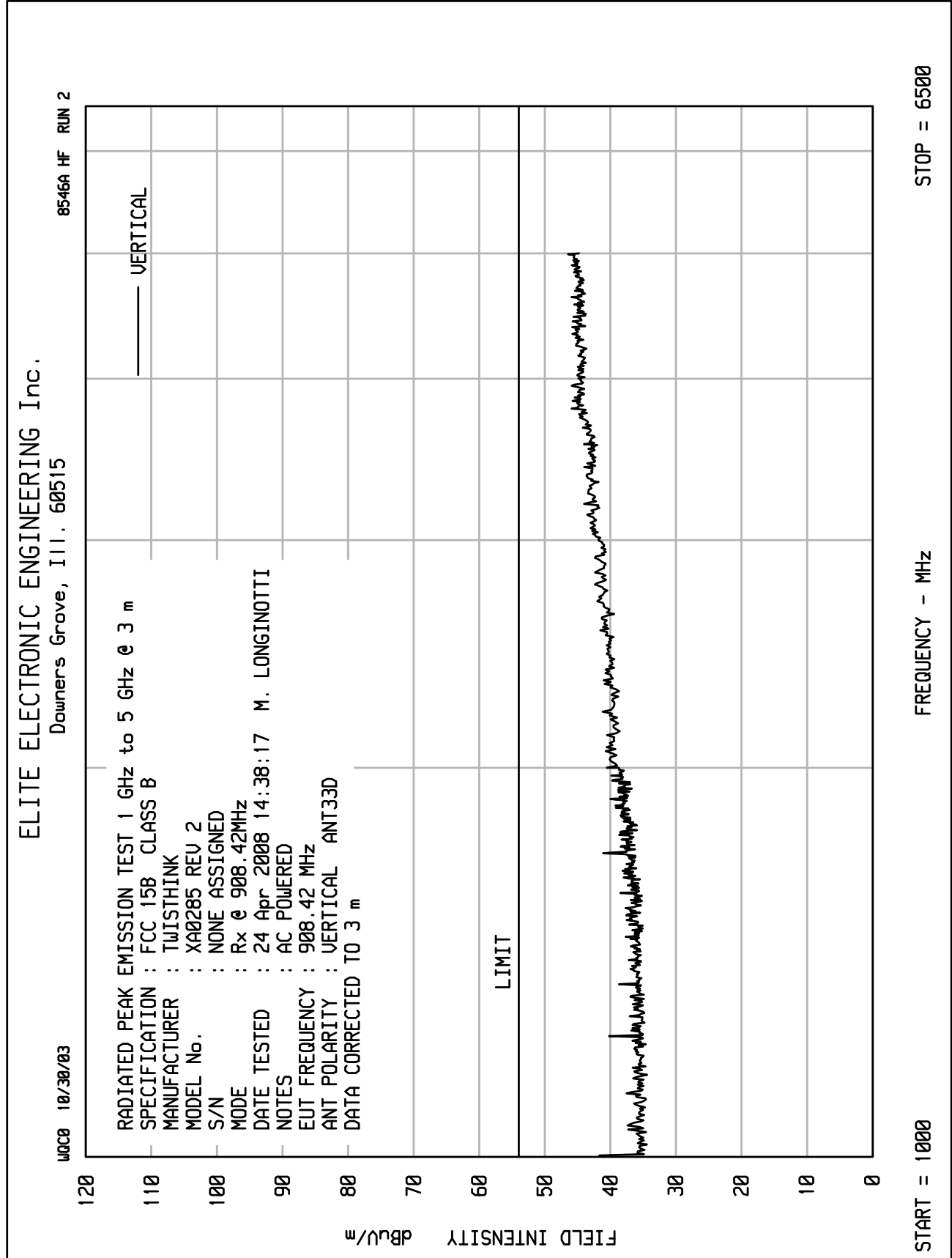
MANUFACTURER : TWISTHINK, LLC
MODEL : XA0285 REV 2
S/N : NONE ASSIGNED
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V, 60Hz RETURN
MODE : Tx @ 908.42MHz
DATE : 24 Apr 2008
NOTES : CUI INC PS, M/N: EPS050100
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

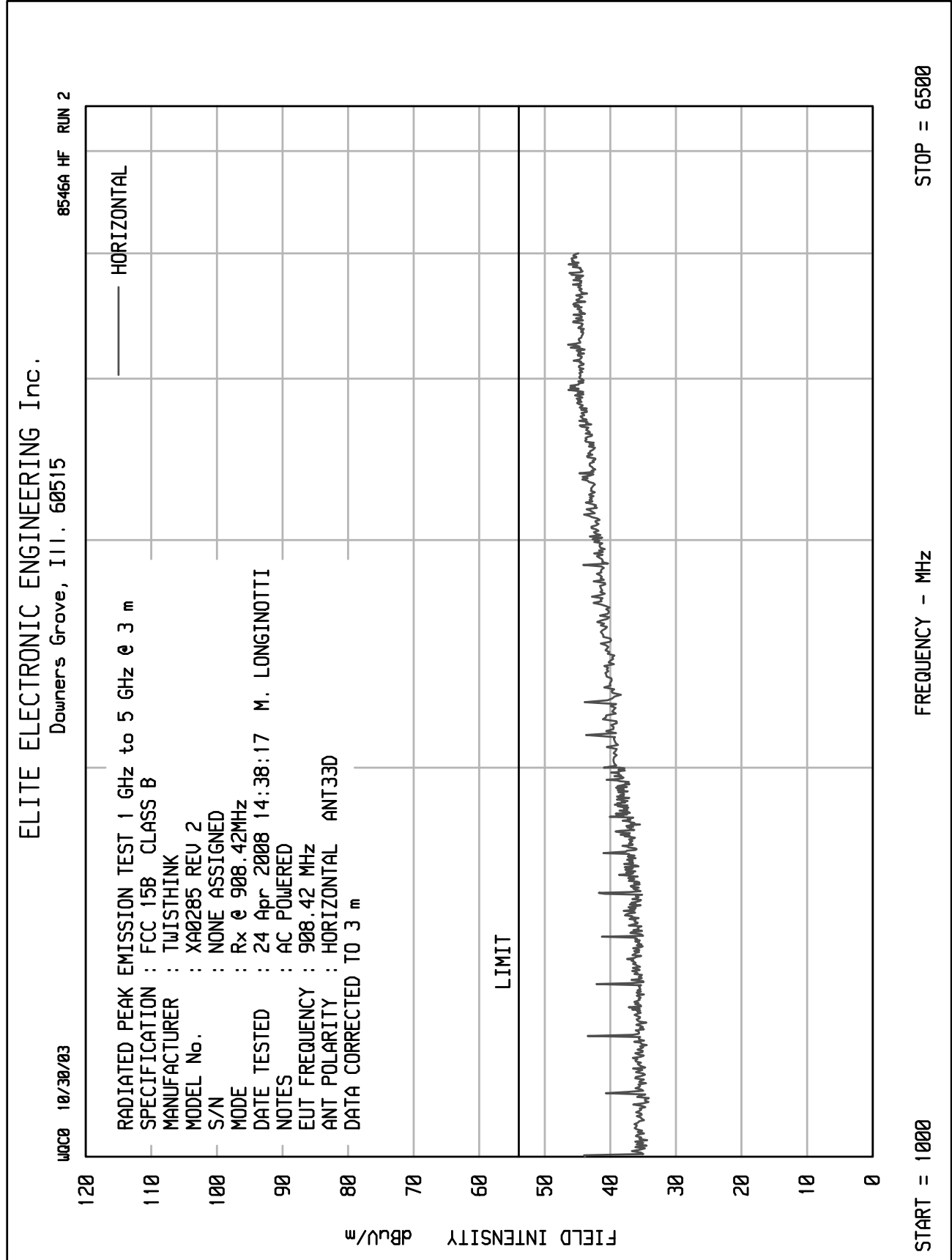
FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.154	51.5	65.8		55.8	
.305	49.6	60.1		50.1	
.457	44.5	56.7		46.7	
.758	44.0	56.0		46.0	
.909	43.6	56.0		46.0	
1.211	45.7	56.0		46.0	
1.981	38.7	56.0		46.0	
2.133	38.1	56.0		46.0	
2.438	35.7	56.0		46.0	
3.200	31.9	56.0		46.0	
4.264	29.2	56.0		46.0	
6.505	25.6	60.0		50.0	
8.962	25.4	60.0		50.0	
12.168	25.1	60.0		50.0	
15.669	25.3	60.0		50.0	
18.118	25.3	60.0		50.0	
21.142	25.3	60.0		50.0	
24.127	25.1	60.0		50.0	
26.779	25.3	60.0		50.0	

CHECKED BY: MARK E. LONGINOTTI
M. LONGINOTTI











ETR No. 8546A
DATA SHEET TEST NO. 1
RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL NO. : XA0285 REV 2
SERIAL NO. : NONE ASSIGNED
TEST MODE : Rx @ 908.42MHz
NOTES : AC POWERED
TEST DATE : 24 Apr 2008 09:10:10
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 3 m)

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	POLAR
50.02	22.3	9.4	.6	0.0	0.0	32.3	40.0	225	120	V
61.79	18.1	6.6	.7	0.0	0.0	25.5	40.0	0	200	V
85.91	.1	9.0	.9	0.0	0.0	10.0	40.0	225	120	V
100.02	18.1	11.5	1.0	0.0	0.0	30.6	43.5	225	200	H
125.03	11.7	12.6	1.0	0.0	0.0	25.3	43.5	225	340	H
150.03	18.5	11.5	1.0	0.0	0.0	31.0	43.5	225	340	H
186.80	21.0	10.5	1.0	0.0	0.0	32.5	43.5	225	200	H
250.04	17.7	13.3	1.3	0.0	0.0	32.3	46.0	225	120	H
296.41	.6	14.3	1.5	0.0	0.0	16.4	46.0	135	200	V
375.05	10.3	16.0	1.5	0.0	0.0	27.8	46.0	135	120	V
561.83	16.1	19.6	1.9	0.0	0.0	37.6	46.0	135	200	H
625.07	13.9	20.1	2.1	0.0	0.0	36.1	46.0	135	340	H
750.08	19.4	21.3	2.4	0.0	0.0	43.1	46.0	315	120	H
875.10	19.4	22.5	2.5	0.0	0.0	44.4	46.0	315	120	H
938.34	9.2	23.6	2.5	0.0	0.0	35.2	46.0	180	120	H

pg ____ of ____

tested by:

MARK E. LONGINOTTI

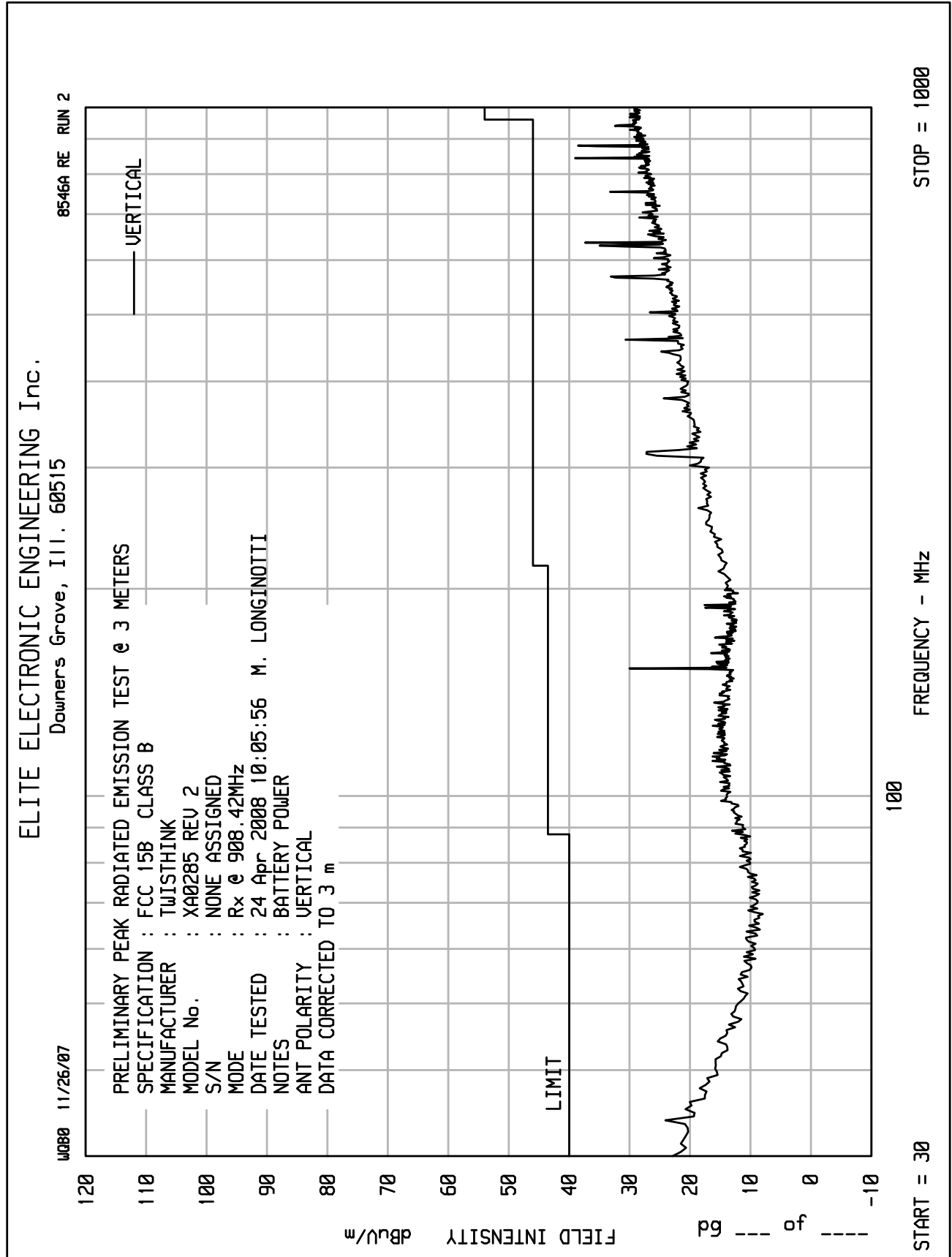
M. LONGINOTTI

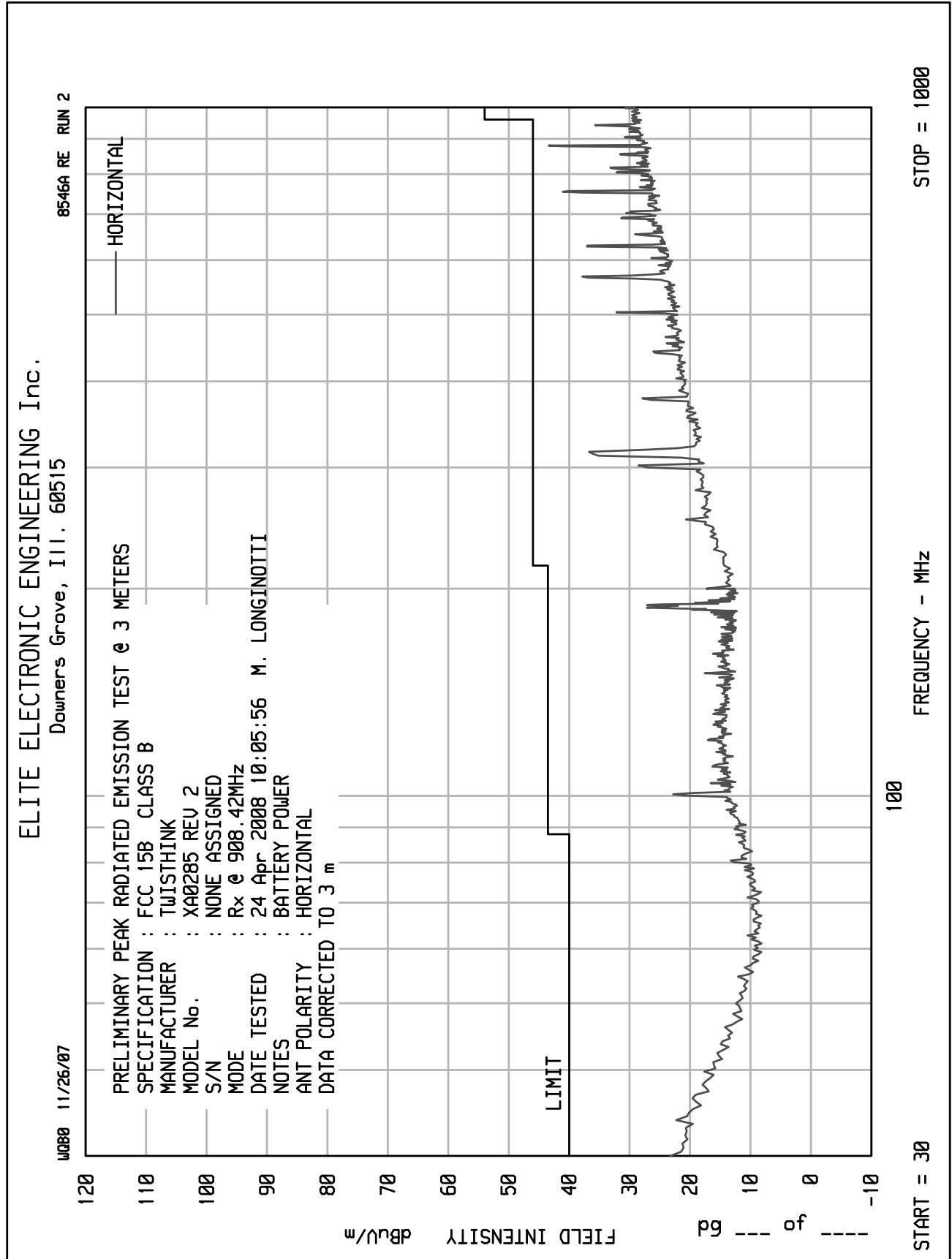


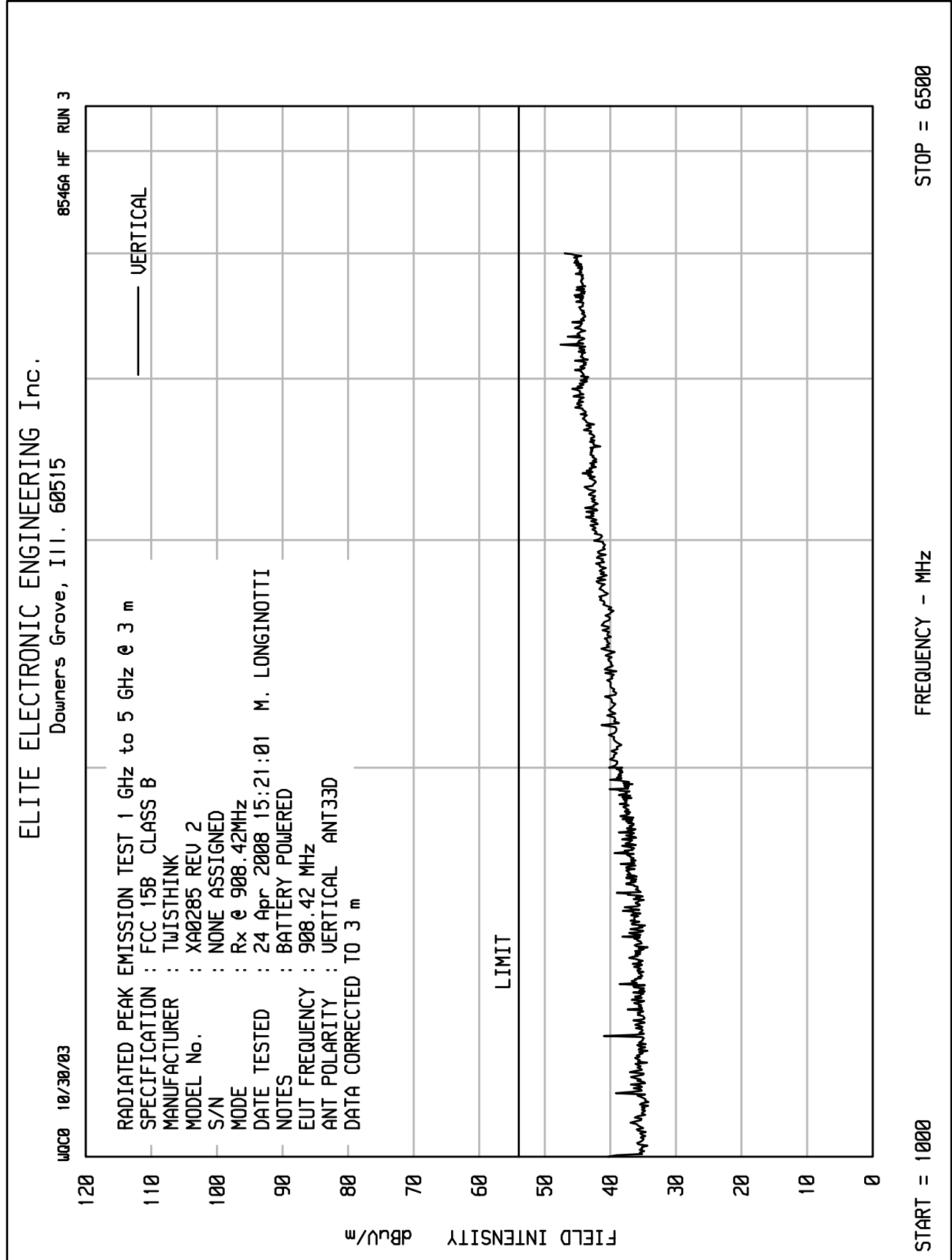
ETR No.
DATA SHEET
HF TEST NO. 2
RADIATED AVG EMISSION MEASUREMENTS ≥ 1000 MHz in a 3 m ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL NO. : XA0285 REV 2
SERIAL NO. : NONE ASSIGNED
TEST MODE : Rx @ 908.42MHz
NOTES : AC POWERED
TEST DATE : 24 Apr 2008 14:38:17
EUT FREQUENCY : 908.42 MHz
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 3 m)
ANTENNA : ANT33D

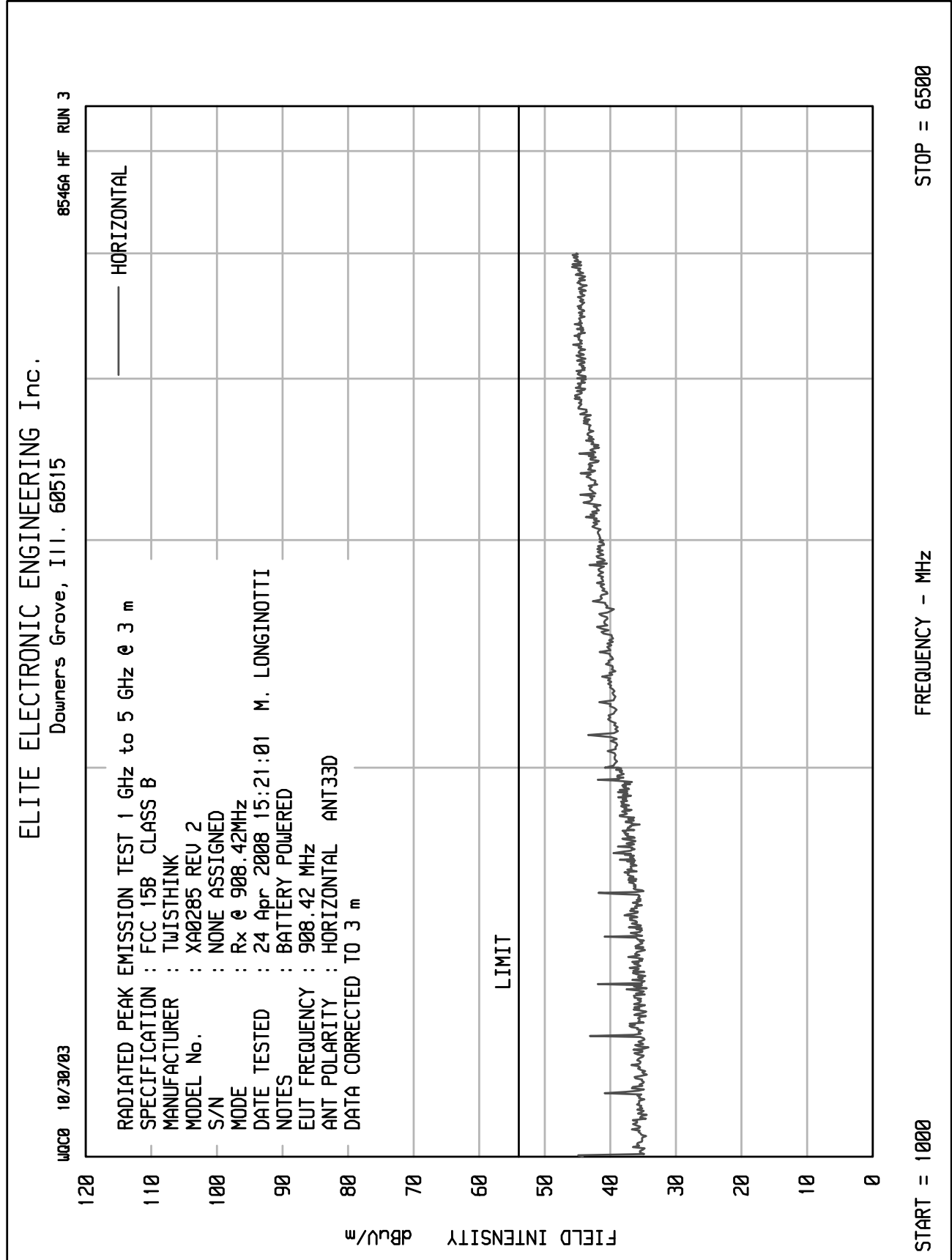
FREQUENCY	AVG	ANT	CBL	DIST	TOTAL	AVG	PASS/	AZ	ANT	POLAR
MHz	READING	FAC	FAC	FAC	dBuV/m	LIMIT	FAIL	deg	HT	
	dBuV	dB	dB	dB		dBuV/m			cm	
1000.10	14.4	25.0	2.5	0.0	41.9	54.0		135	200	H
1250.12	11.9	25.6	2.8	0.0	40.2	54.0		315	340	H
1375.13	11.5	25.8	3.0	0.0	40.3	54.0		315	120	H
1500.14	6.9	26.0	3.1	0.0	36.0	54.0		0	120	H
1600.14	-2.6	26.5	3.2	0.0	27.1	54.0		315	120	H
1712.12	-5.2	27.0	3.3	0.0	25.1	54.0		45	340	V
1838.17	-5.1	27.6	3.4	0.0	25.8	54.0		180	120	H
2125.20	9.3	28.6	3.7	0.0	41.5	54.0		270	120	H
2250.21	8.3	28.9	3.8	0.0	41.1	54.0		270	120	H
2875.27	1.9	31.0	4.5	0.0	37.5	54.0		0	120	H
3375.31	2.8	32.4	4.9	0.0	40.1	54.0		315	120	H
3785.78	-6.9	33.6	5.2	0.0	31.9	54.0		225	200	V
3910.57	-7.1	33.9	5.3	0.0	32.2	54.0		45	340	H
4261.08	-6.8	33.8	5.6	0.0	32.5	54.0		0	120	H
4973.55	-8.2	35.0	6.0	0.0	32.8	54.0		45	340	V

tested by: MARK E. LONGINOTTI
M. LONGINOTTI











ETR No. 8546A
DATA SHEET TEST NO. 2
RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL NO. : XA0285 REV 2
SERIAL NO. : NONE ASSIGNED
TEST MODE : Rx @ 908.42MHz
NOTES : BATTERY POWER
TEST DATE : 24 Apr 2008 10:05:56
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 3 m)

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	POLAR
34.07	-6.2	17.3	.5	0.0	0.0	11.6	40.0	44	120	V
54.39	-5.2	8.1	.7	0.0	0.0	3.5	40.0	44	120	H
80.02	3.4	8.1	.9	0.0	0.0	12.4	40.0	44	340	H
100.02	10.2	11.5	1.0	0.0	0.0	22.7	43.5	315	200	H
126.01	-.2	12.5	1.0	0.0	0.0	13.4	43.5	315	120	V
152.43	.4	11.4	1.0	0.0	0.0	12.8	43.5	-1	200	V
186.79	16.1	10.5	1.0	0.0	0.0	27.6	43.5	270	200	H
189.74	7.5	10.5	1.0	0.0	0.0	19.0	43.5	315	200	H
313.28	21.1	14.6	1.5	0.0	0.0	37.2	46.0	179	120	H
460.30	.6	17.6	1.7	0.0	0.0	20.0	46.0	45	200	V
561.83	16.2	19.6	1.9	0.0	0.0	37.7	46.0	135	200	H
632.67	.5	20.3	2.1	0.0	0.0	22.9	46.0	270	200	V
750.08	17.7	21.3	2.4	0.0	0.0	41.4	46.0	135	120	H
875.08	18.6	22.5	2.5	0.0	0.0	43.6	46.0	315	120	H
936.87	9.4	23.6	2.5	0.0	0.0	35.5	46.0	135	120	H

pg ____ of ____

tested by:

MARK E. LONGINOTTI

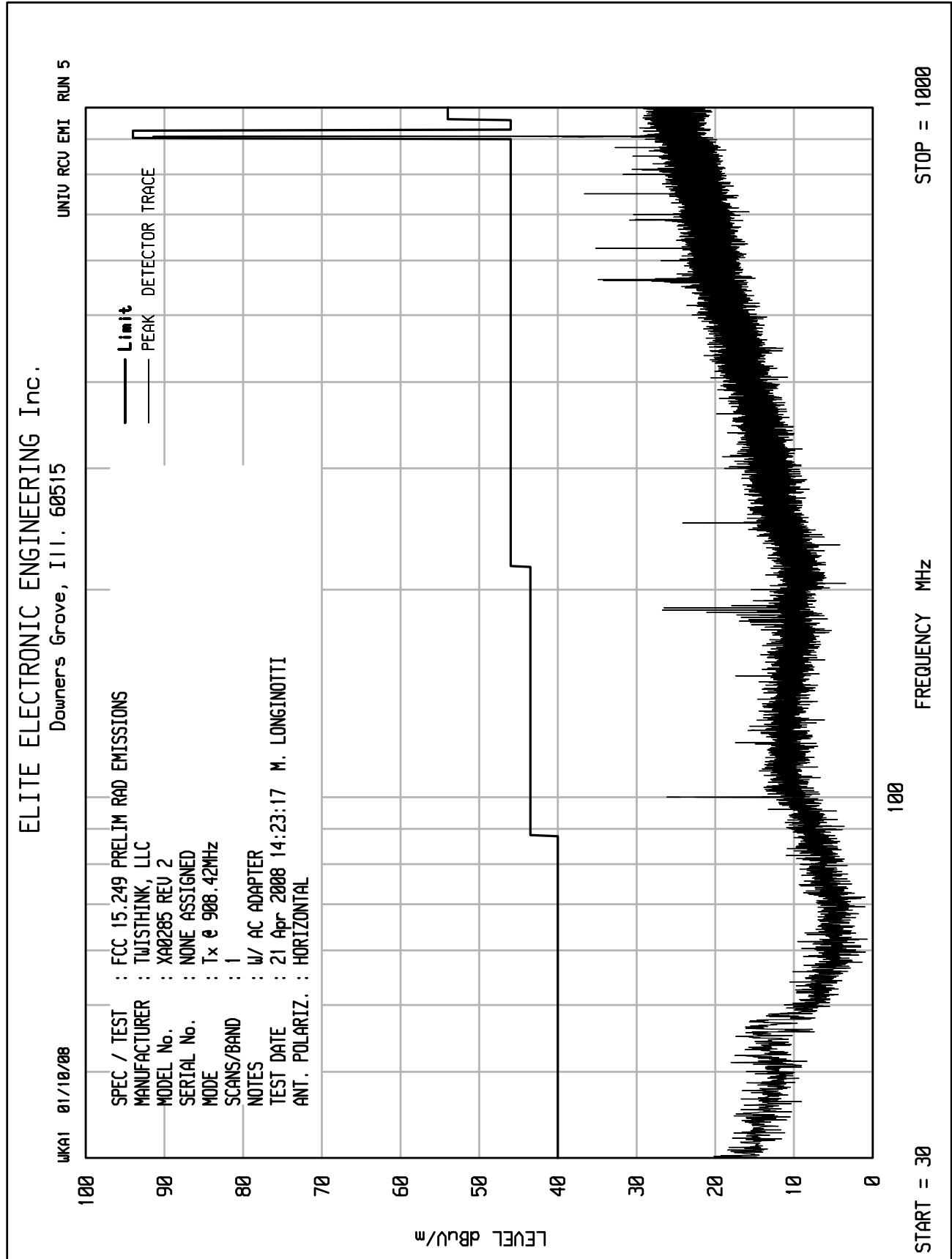
M. LONGINOTTI

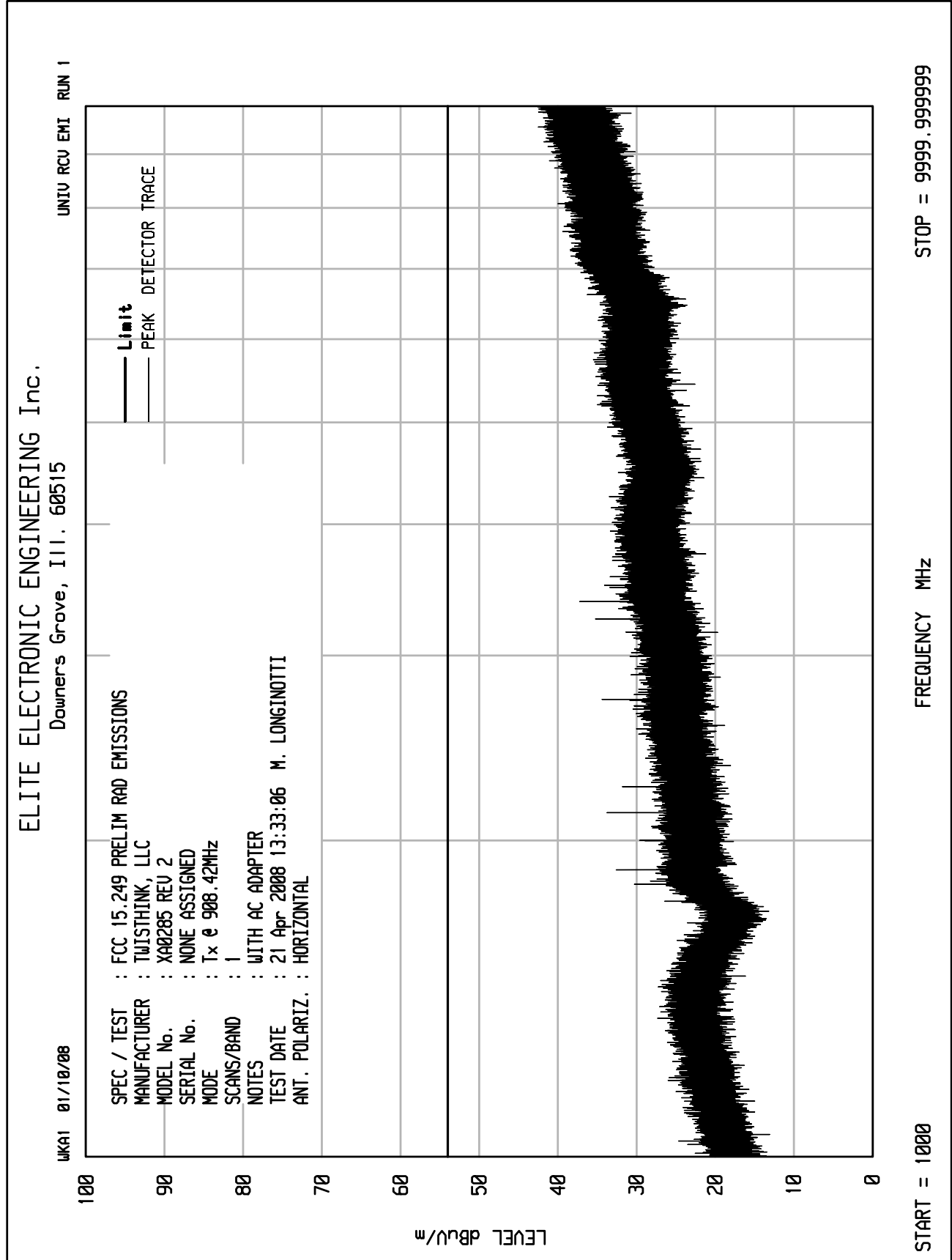


ETR No.
DATA SHEET
HF TEST NO. 3
RADIATED AVG EMISSION MEASUREMENTS ≥ 1000 MHz in a 3 m ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL NO. : XA0285 REV 2
SERIAL NO. : NONE ASSIGNED
TEST MODE : Rx @ 908.42MHz
NOTES : BATTERY POWERED
TEST DATE : 24 Apr 2008 15:21:01
EUT FREQUENCY : 908.42 MHz
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 3 m)
ANTENNA : ANT33D

FREQUENCY	AVG	ANT	CBL	DIST	TOTAL	AVG	PASS/	AZ	ANT	POLAR
MHz	READING	FAC	FAC	FAC	dBuV/m	LIMIT	FAIL	deg	HT	
	dBuV	dB	dB	dB		dBuV/m			cm	
1000.10	14.7	25.0	2.5	0.0	42.2	54.0		135	120	H
1250.12	13.1	25.6	2.8	0.0	41.5	54.0		315	340	H
1375.13	10.9	25.8	3.0	0.0	39.7	54.0		315	200	H
1500.14	8.6	26.0	3.1	0.0	37.7	54.0		315	120	H
1582.06	-4.9	26.4	3.2	0.0	24.7	54.0		-0	120	H
1704.30	-4.6	27.0	3.3	0.0	25.6	54.0		315	200	H
1921.53	-4.8	27.9	3.4	0.0	26.5	54.0		315	120	V
2125.20	7.8	28.6	3.7	0.0	40.0	54.0		135	120	H
2582.98	-4.9	29.9	4.2	0.0	29.2	54.0		90	340	H
2875.27	2.3	31.0	4.5	0.0	37.9	54.0		0	120	H
3250.30	1.6	32.1	4.8	0.0	38.5	54.0		314	120	H
3797.68	-6.4	33.6	5.3	0.0	32.5	54.0		90	200	V
3903.93	-8.0	33.9	5.3	0.0	31.2	54.0		180	200	V
4273.77	-7.5	33.8	5.6	0.0	31.9	54.0		-0	120	V
5008.22	-8.3	35.1	6.0	0.0	32.8	54.0		135	340	V

tested by: MARK E. LONGINOTTI
M. LONGINOTTI







MANUFACTURER : Twistthink, LLC
TEST ITEM : Transceiver
MODEL NO. : XA0285 Rev. 2
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 908.42MHz, AC Powered
TEST DATE : April 25, 2008
TEST DISTANCE : 3 meters
NOTES : Power Level = HP10

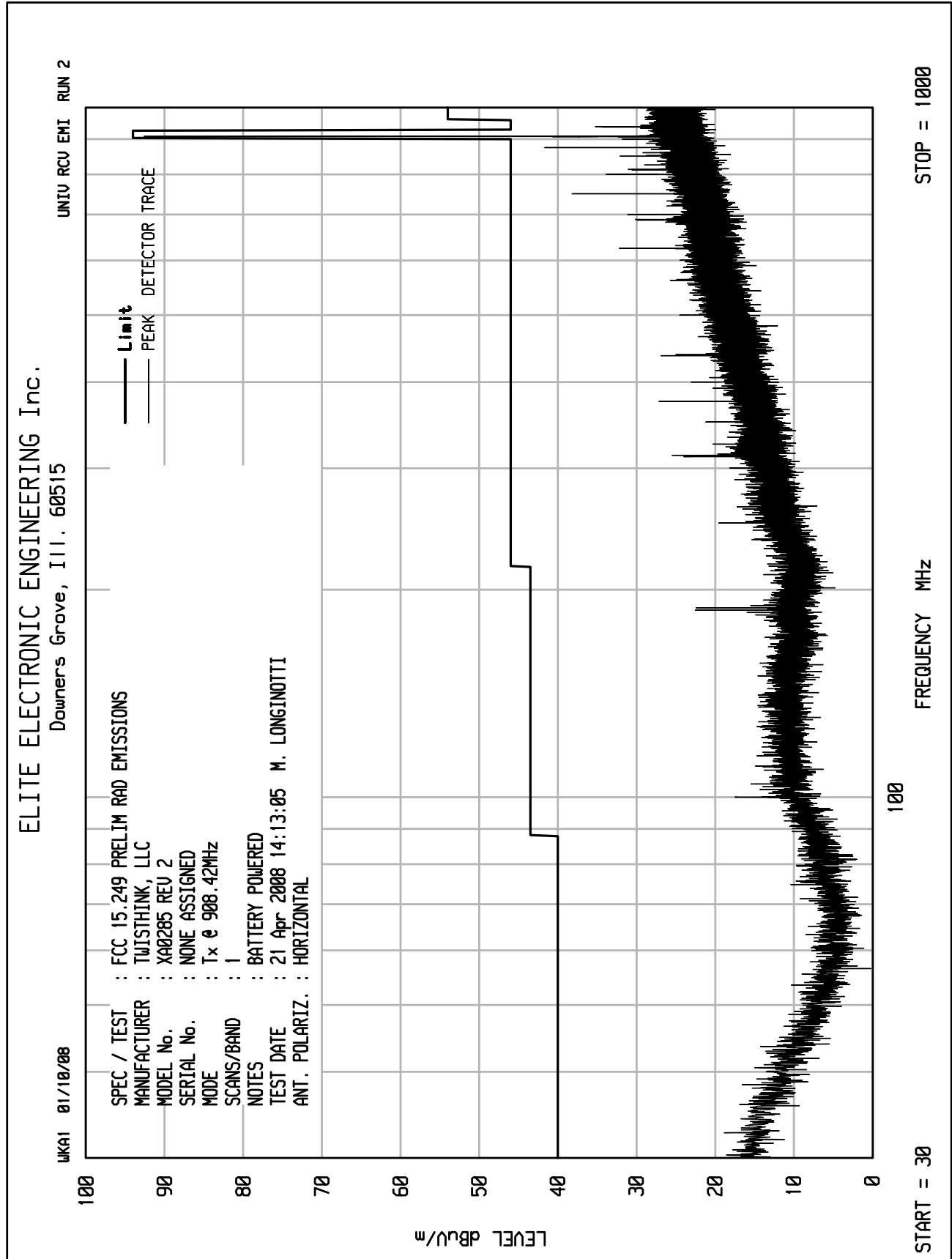
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.42	H	62.5		1.9	27.8	0.0	92.2	40971.1	50000.0
908.42	V	60.8		1.9	27.8	0.0	90.5	33688.2	50000.0
1816.84	H	41.0		2.9	27.5	-40.6	30.8	34.6	500.0
1816.84	V	39.9		2.9	27.5	-40.6	29.7	30.4	500.0
2725.26	H	41.8		3.8	30.2	-40.3	35.5	59.3	500.0
2725.26	V	40.9		3.8	30.2	-40.3	34.6	53.5	500.0
3633.68	H	34.8	Ambient	4.4	33.9	-40.1	33.0	44.5	500.0
3633.68	V	31.4	Ambient	4.4	33.9	-40.1	29.6	30.1	500.0
4542.10	H	32.7	Ambient	4.8	34.0	-40.0	31.6	37.9	500.0
4542.10	V	30.6	Ambient	4.8	34.0	-40.0	29.5	29.8	500.0
5450.52	H	32.9	Ambient	5.2	36.4	-40.1	34.4	52.6	500.0
5450.52	V	30.7	Ambient	5.2	36.4	-40.1	32.2	40.8	500.0
6358.94	H	32.5	Ambient	5.9	36.2	-39.9	34.6	54.0	500.0
6358.94	V	30.5	Ambient	5.9	36.2	-39.9	32.6	42.9	500.0
7267.36	H	32.9	Ambient	6.6	38.1	-39.8	37.9	78.5	500.0
7267.36	V	33.2	Ambient	6.6	38.1	-39.8	38.2	81.3	500.0
8175.78	H	32.3	Ambient	7.1	37.9	-39.5	37.8	77.4	500.0
8175.78	V	32.2	Ambient	7.1	37.9	-39.5	37.7	76.5	500.0
9084.20	H	33.1	Ambient	7.5	38.5	-39.0	40.0	100.6	500.0
9084.20	V	33.2	Ambient	7.5	38.5	-39.0	40.1	101.7	500.0

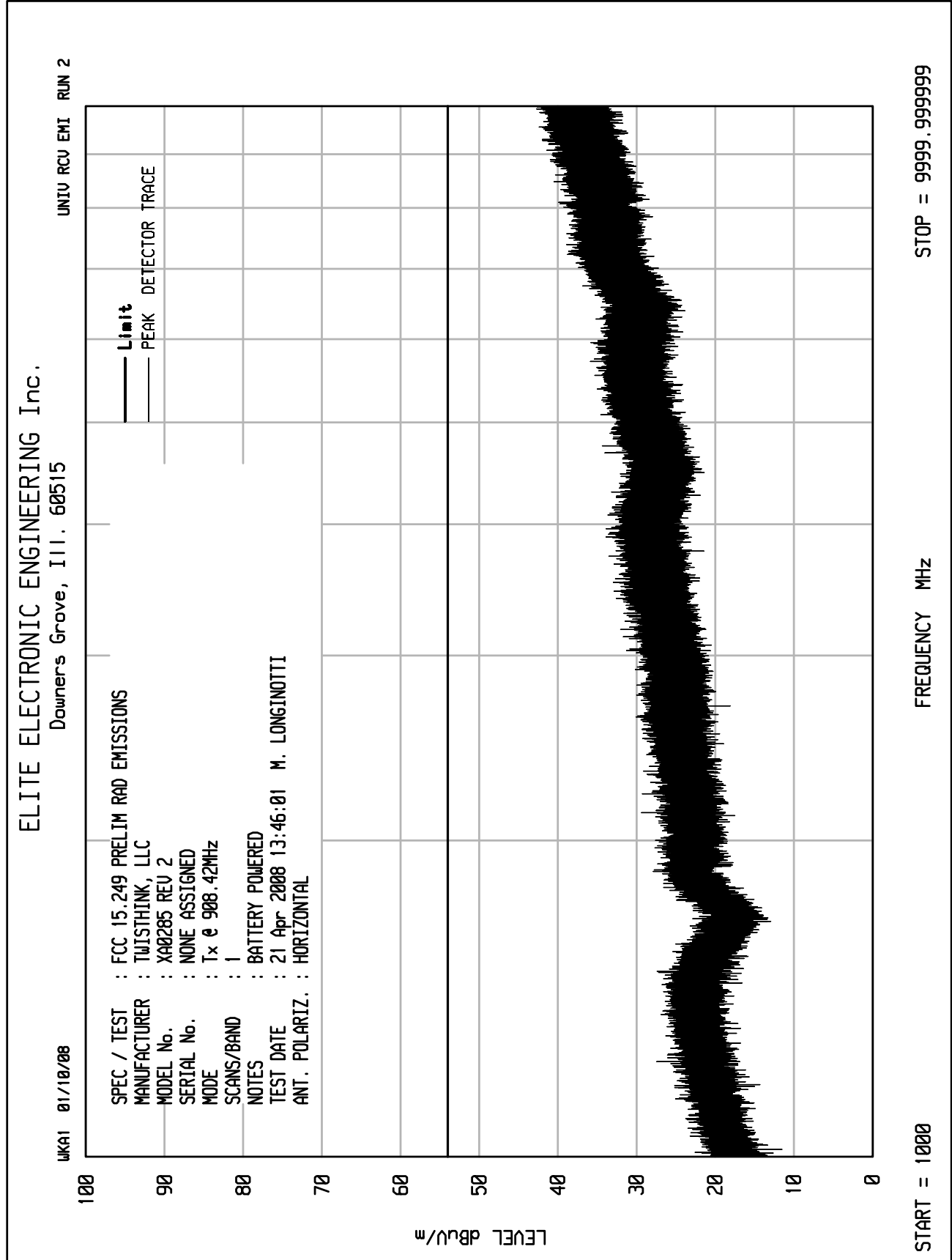
H – Horizontal

V = Vertical

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

Checked By : MARK E. LONGINOTTI







MANUFACTURER : Twistthink, LLC
TEST ITEM : Transceiver
MODEL NO. : XA0285 Rev. 2
SERIAL NO. : None Assigned
TEST SPECIFICATION : FCC 15.249(a), Radiated Emissions
MODE : Transmit @ 908.42MHz, Battery Powered
TEST DATE : April 25, 2008
TEST DISTANCE : 3 meters
NOTES : Power Level = LP11

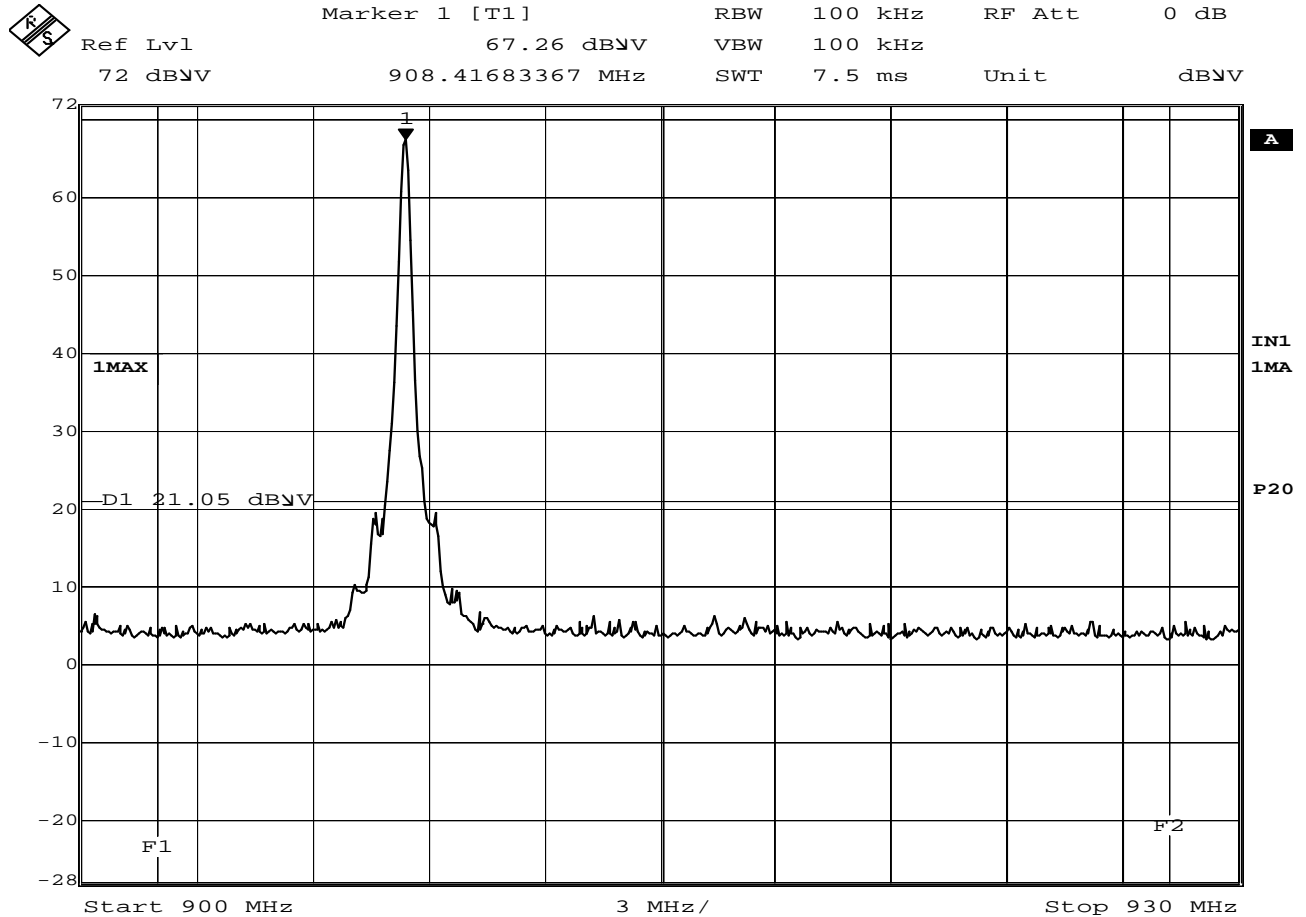
Frequency MHz	Antenna Polarity	Meter Reading dBuV	Ambient	Cable Loss dB	Antenna Factor dB	Preamp Gain dB	Total dBuV/m	Total uV/m	Limit uV/m
908.42	H	62.6		1.9	27.8	0.0	92.3	41445.5	50000.0
908.42	V	51.7		1.9	27.8	0.0	81.4	11816.2	50000.0
1816.84	H	41.2		2.9	27.5	-40.6	31.0	35.4	500.0
1816.84	V	36.9	Ambient	2.9	27.5	-40.6	26.7	21.6	500.0
2725.26	H	40.3		3.8	30.2	-40.3	34.0	49.9	500.0
2725.26	V	34.1	Ambient	3.8	30.2	-40.3	27.8	24.5	500.0
3633.68	H	31.0	Ambient	4.4	33.9	-40.1	29.2	28.7	500.0
3633.68	V	33.2	Ambient	4.4	33.9	-40.1	31.4	37.0	500.0
4542.10	H	30.3	Ambient	4.8	34.0	-40.0	29.2	28.7	500.0
4542.10	V	31.7	Ambient	4.8	34.0	-40.0	30.6	33.8	500.0
5450.52	H	30.4	Ambient	5.2	36.4	-40.1	31.9	39.4	500.0
5450.52	V	32.0	Ambient	5.2	36.4	-40.1	33.5	47.4	500.0
6358.94	H	30.1	Ambient	5.9	36.2	-39.9	32.2	40.9	500.0
6358.94	V	31.6	Ambient	5.9	36.2	-39.9	33.7	48.6	500.0
7267.36	H	32.5	Ambient	6.6	38.1	-39.8	37.5	75.0	500.0
7267.36	V	32.6	Ambient	6.6	38.1	-39.8	37.6	75.9	500.0
8175.78	H	31.5	Ambient	7.1	37.9	-39.5	37.0	70.6	500.0
8175.78	V	31.5	Ambient	7.1	37.9	-39.5	37.0	70.6	500.0
9084.20	H	32.6	Ambient	7.5	38.5	-39.0	39.5	94.9	500.0
9084.20	V	32.4	Ambient	7.5	38.5	-39.0	39.3	92.8	500.0

H – Horizontal

V = Vertical

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

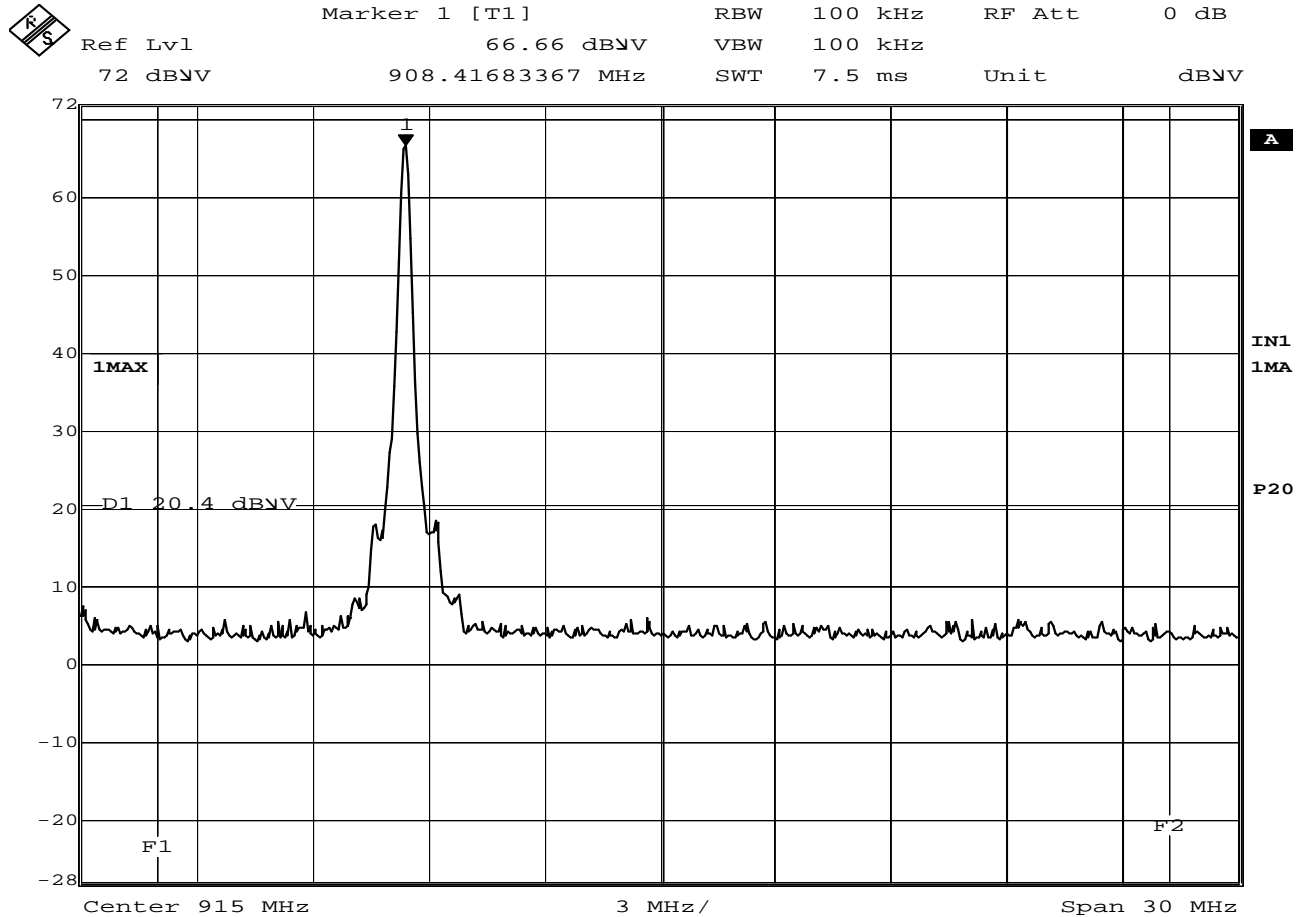
Checked By : MARK E. LONGINOTTI



Date: 21.APR.2008 15:14:50

FCC 15.249 (d) BANDWIDTH

MANUFACTURER : Twisthink
 MODEL NUMBER : XA0285 Rev 2
 SERIAL NUMBER : None Assigned
 TEST MODE : Tx @ 908.42MHz
 TEST PARAMETER : Display Line (D1) represents the General limit
 : at 902MHz and 928MHz. Display Line (F1)
 : represents 902MHz and display line (F2)
 : represents 928MHz.
 EQUIPMENT USED : RBA1, NTA1
 NOTES : with AC adapter



Date: 21.APR.2008 15:34:29

FCC 15.249 (d) BANDWIDTH

MANUFACTURER : Twisthink
MODEL NUMBER : XA0285 Rev 2
SERIAL NUMBER : None Assigned
TEST MODE : Tx @ 908.42MHz
TEST PARAMETER : Display Line (D1) represents the General limit
: at 902MHz and 928MHz. Display Line (F1)
: represents 902MHz and display line (F2)
: represents 928MHz.
EQUIPMENT USED : RBA1, NTA1
NOTES : Battery powered