Measurement of RF Interference from an Light Control Module (LCM), Model No. TT10160-01 Transceiver

For : Twisthink, LLC
: 130 Central Ave., Suite 400
: Holland, MI

P.O. No. : 316
Date Tested : June 24 and August 25, 2011
Test Personnel : Richard E King
Specification : FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B and Subpart C, Section 15.247 for Digital Transmission Systems Operating within The band 2400-2483.5MHz
Industry Canada RSS-210
Industry Canada RSS-GEN

Test Report By:

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Approved By:

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Registered Professional
Engineer of Illinois - 44894

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REVISION HISTORY

Revision	Date	Description
—	August 26, 2011	Initial Release

Measurement of RF Emissions from a Light Control Module (LCM), Model No. TT10160-01 Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Light Control Module (LCM), Model No.TT10160-01 transceiver (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was designed to transmit and receive in the 2405MHz to 2475MHz band using an internal antenna. The EUT transmitted using digital transmission system techniques. The EUT was manufactured and submitted for testing by Twisthink, LLC located in Holland, MI.

The receive portion of the EUT is a super-heterodyne type receiver designed to receive in the 2405MHz to 2475MHz band. The EUT contains a tuner which utilizes one local oscillator (LO) which frequency is 4MHz below the tuned frequency.

1.2 Purpose

The test series was performed to determine if the EUT when placed in the metal housing continues to meet 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, Sections15.207 and 15.247 for Intentional Radiators operating within the 2400-2483.5MHz band and Industry Canada RSS-210. 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 23ºC and the relative humidity was 35%.

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, dated 1 October 2010
- 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 8, December 2010, “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 3, December 2010, “Spectrum Management and Telecommunications Radio Standards Specification, General Requirements and Information for the Certification of radio communication equipment”

- Public Notice 558074, “New Guidance on Measurements for Digital Transmission Systems in 15.247”
- Public Notice DA 00-705, “Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems”

3 EUT SET-UP AND OPERATION

3.1 General Description

The EUT is a Light Control Module (LCM), Model No. TT10160-01 transceiver. A block diagram of the EUT set-up is shown as Figure 1. A photograph of the EUT is shown as Figure 2.

3.1.1 Power Input

The EUT was powered with 115V 60Hz AC power through a 2.6 meter long, 3 wire unshielded power cord.

3.1.2 Peripheral Equipment

The EUT was submitted with a six inch test harness connected to a UART board used for setting the transmitter characteristics.

3.1.3 Interconnect Cables

The EUT was connected to the UART board through six inch RJ45 telecom wire.

3.1.4 Grounding

The EUT was grounded only through the third wire of its input power cord.

3.2 Operational Mode

For all tests, the EUT and all peripheral equipment were placed on an 80cm high non-conductive stand. The EUT and all peripheral equipment were energized.

For radiated emissions tests, the EUT was programmed to operate in one of the following modes:

- transmit @ 2405MHz
- transmit @ 2445MHz
- transmit @ 2475MHz
- receive @ 2445MHz

3.3 EUT Modifications

No modifications were required for compliance.

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 Equipment List.

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 Duty Cycle Factor Measurements

5.1.1 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 the 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).

5.1.2 Results

The plots of the duty cycle are shown on data pages 14 and 15. The duty cycle correction factor was calculated to be -41.9dB (-41.9dB = 20*log((.4*2)msec/100msec).

5.2 Radiated Measurements

5.2.1 Receiver

5.2.1.1 Requirements

Per 15.101(b), receivers operating above 960MHz are exempt from complying with the radiated emissions

requirements of 15.109. Therefore, no radiated emissions tests were performed with the EUT operating in the receive mode.

Per RSS-GEN, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

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

RADIATION LIMITS FOR A RECEIVER

Frequency MHz	Distance between EUT 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 Procedure

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.

a) The field strength of all emissions above 1GHz was measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.

b) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:

   i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

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

   iii) For all radiated emissions measurements above 1GHz, if the peak reading is below the limits listed in above, no further measurements are required. If however, the peak readings exceed the limits listed above, then the emissions are re-measured using an average detector.

The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

5.2.1.3 Results

Preliminary radiated emissions plots with the EUT receiving in the 2405-2475MHz band are shown on pages 16 through 19. Final receiver radiated emissions data are presented on data page 20. As can be seen from the data, all emissions measured from the EUT were within the specification limits.

5.2.2 Transmitter

5.2.2.1 Requirements

Per section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or

digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated emissions measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

Paragraph 15.209(a) has the following radiated emission limits:

Frequency MHz	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30.0-88.0	100	3
88.0-216.0	150	3
216.0-960.0	200	3
Above 960	500	3

5.2.2.2 Procedures

Radiated 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.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

2) For all harmonics not in the restricted bands, the following procedure was used:

   a) The field strength of the fundamental was measured using a double-ridged waveguide antenna. The double-ridged waveguide antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.

   b) The field strength of all of the harmonics not in the restricted band was then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.

   c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:

      i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

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

      iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

   d) All harmonics not in the restricted bands must be at least 20dB below level measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.

3) For all emissions in the restricted bands, the following procedure was used:

   a) The field strength of all emissions below 1GHz was measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.

b) The field strength of all emissions above 1GHz was measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.

c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:

   i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

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

   iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are re-measured using a quasi-peak detector.

e) For all radiated emissions measurements above 1GHz, measurements were taken using a 1MHz resolution bandwidth and a 10Hz video bandwidth. For pulsed emissions, these readings were corrected to average levels using a duty cycle factor which was computed from the pulse train. All average levels must comply with the limits specified in 15.209(a).

5.2.2.3 Results

Preliminary radiated emissions plots with the EUT transmitting are shown on pages 21 through 44. The final radiated emissions data is presented on data pages 45 through 50. As can be seen from the data, all emissions measured from the EUT were within the specification limits. Photographs of the test are shown on Figure 4.

6 CONCLUSIONS

It was determined that the Twisthink, LLC Light Control Module (LCM), Model No. TT10160-01 transceiver in the metal housing, did continue to comply with the 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 15.247 for Intentional Radiators Operating within the 2400MHz to 2483.5MHz band and Industry Canada RSS-210, when tested per ANSI C63.4-2003.

7 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 EUT at the test date. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

8 ENDORSEMENT DISCLAIMER

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
APK4	PREAMPLIFIER OPT H02	HEWLETT PACKARD	8449B	3008A00329	1-26.5GHZ	4/6/2011	4/6/2012
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	8/27/2010	8/27/2011
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	8/27/2010	8/27/2011
GRE0	SIGNAL GENERATOR	AGILENT TECHNOLOGIES	E4438C	MY42083127	250KHZ-6GHZ	3/31/2011	3/31/2012
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA1	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL6112	2054	0.03-2GHZ	11/11/2010	11/11/2011
NWF0	RIDGED WAVE GUIDE	EMCO	3105	2035	1-12.4GHZ	1/29/2011	1/29/2012
NWI0	RIDGED WAVE GUIDE	AEL	H1498	153	2-18GHZ	1/29/2011	1/29/2012
NWI1	RIDGED WAVE GUIDE	AEL	H1498	154	2-18GHZ	1/29/2011	1/29/2012
RACA	RF PRESELECTOR	HEWLETT PACKARD	85685A	2926A00980	20HZ-2GHZ	3/17/2011	3/17/2012
RAEC	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	3014A06690	100HZ-22GHZ	3/11/2011	3/11/2012
RAF5	QUASIPEAK ADAPTOR	HEWLETT PACKARD	85650A	2043A00151	0.01-1000MHZ	3/11/2011	3/11/2012
RBB0	EMI TEST RECEIVER 20HZ TO 40 GHZ	ROHDE & SCHWARZ	ESIB40	100250	20 HZ TO 40GHZ	3/24/2011	3/24/2012
XOB2	ADAPTER	HEWLETT PACKARD	K281C,012	09407	18-26.5GHZ	NOTE 1	
XZG4	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2223A01683	---	N/A	

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.

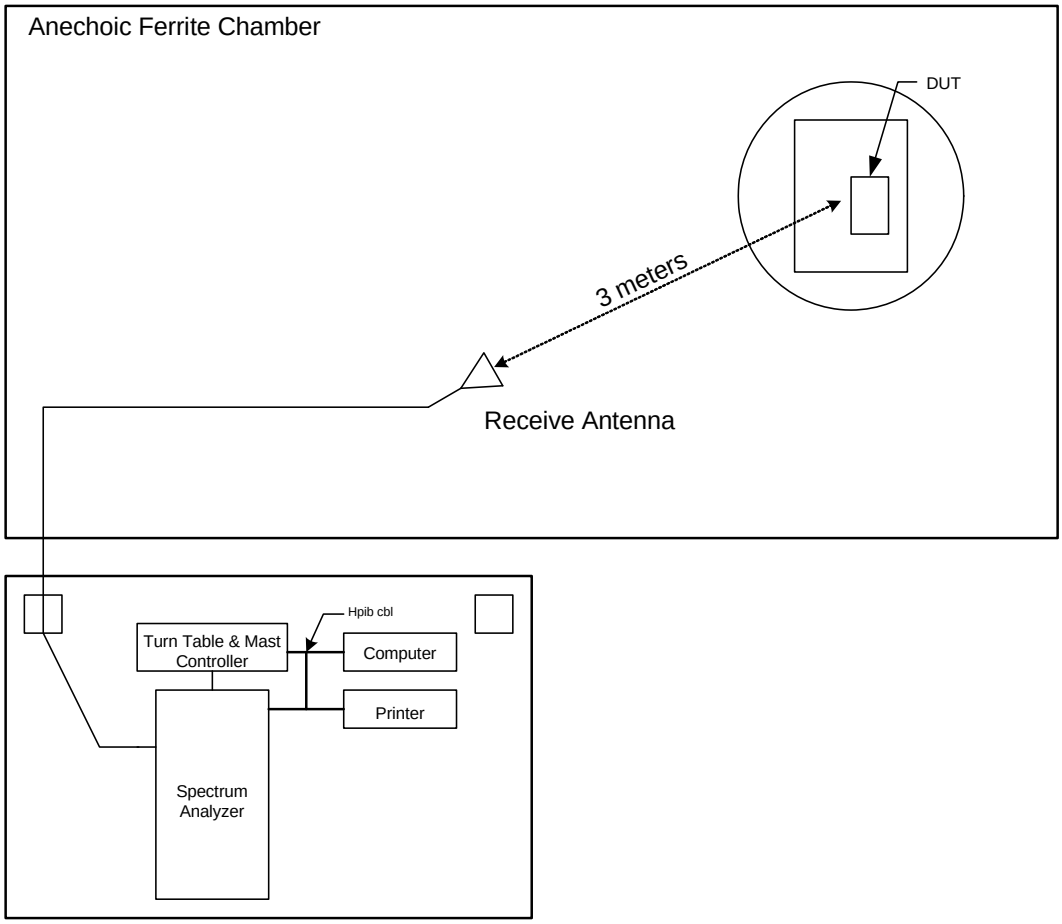
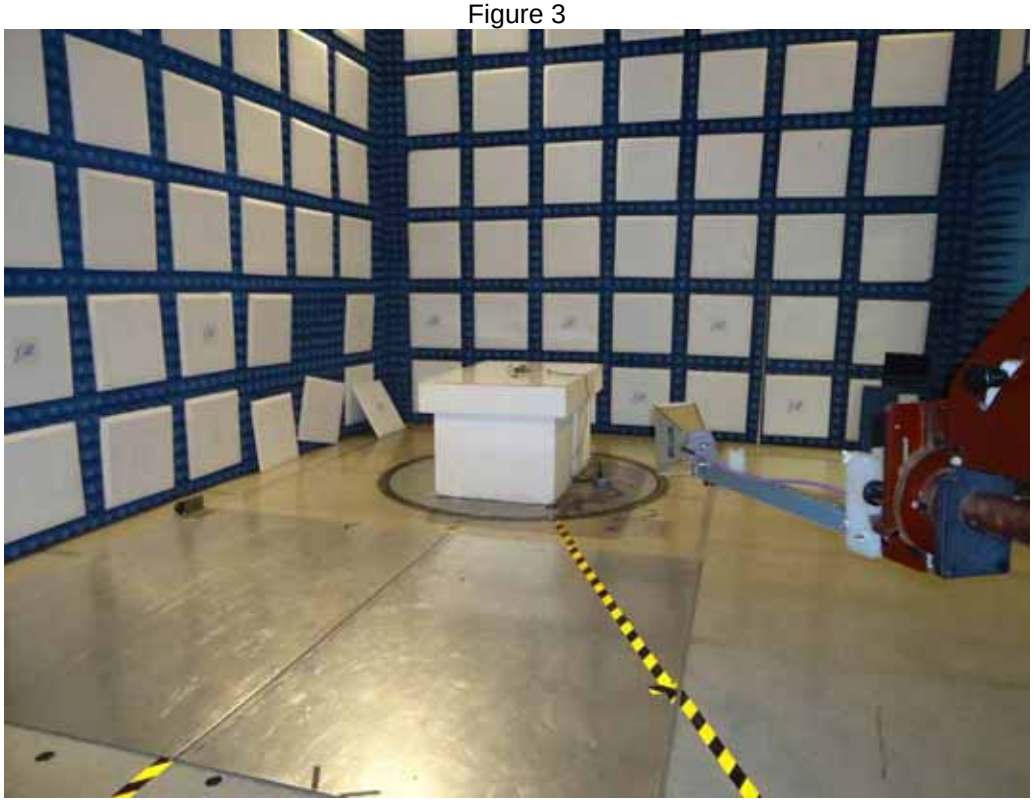
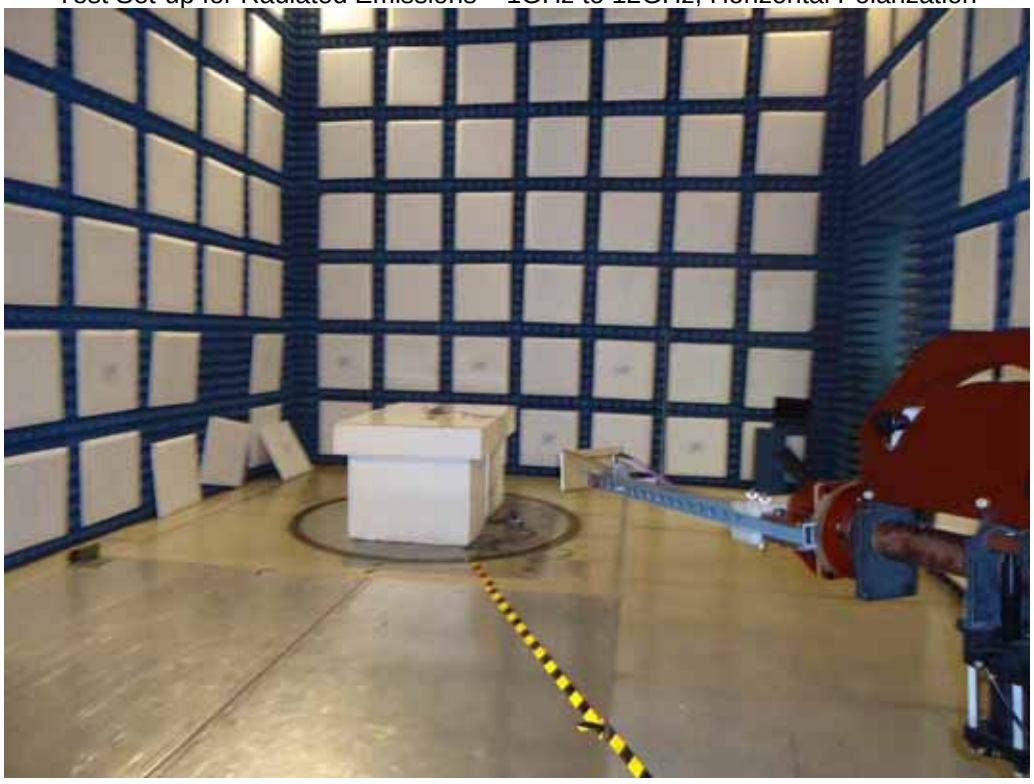


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

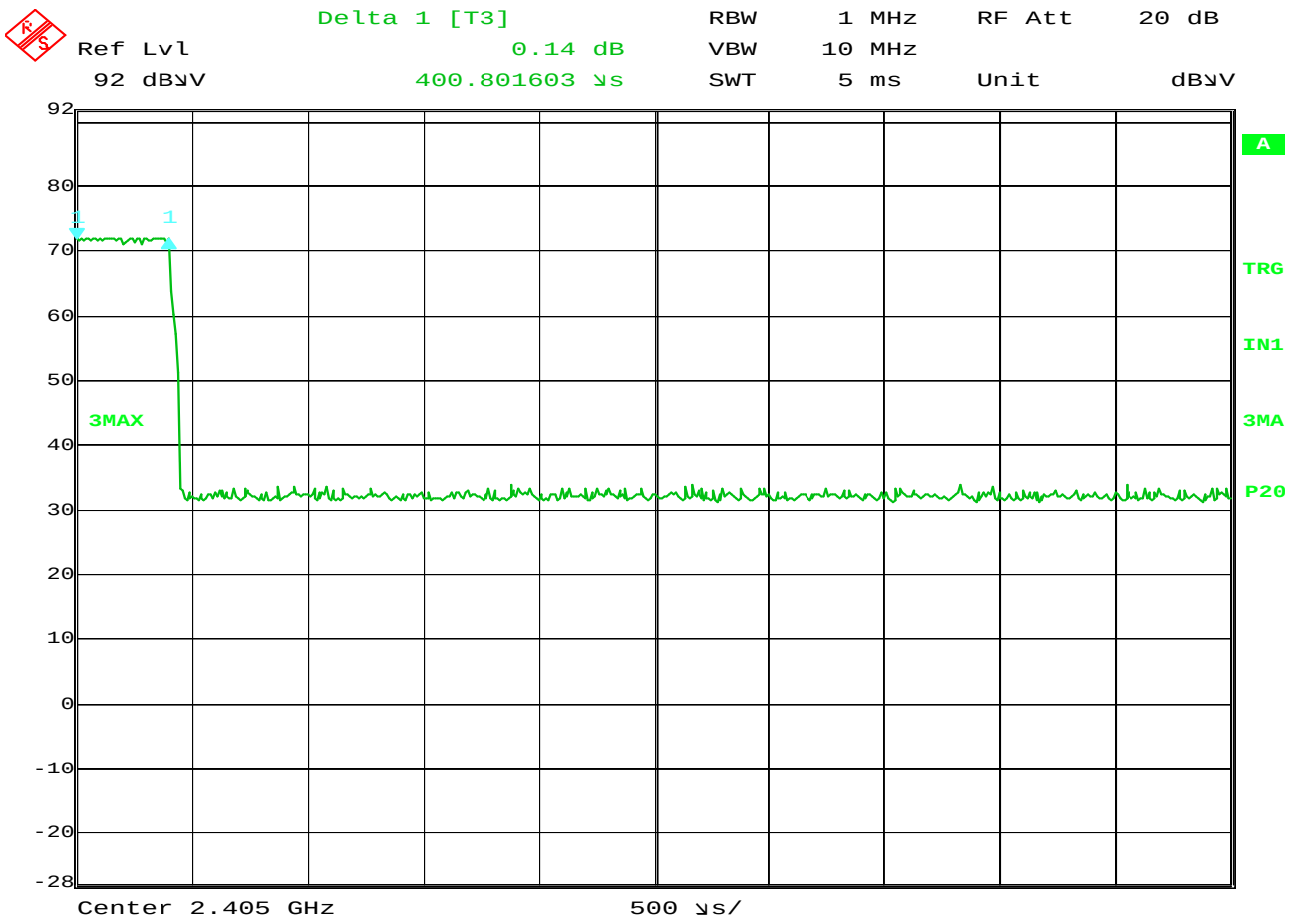
Figure 3



Test Set-up for Radiated Emissions – 1GHz to 12GHz, Horizontal Polarization



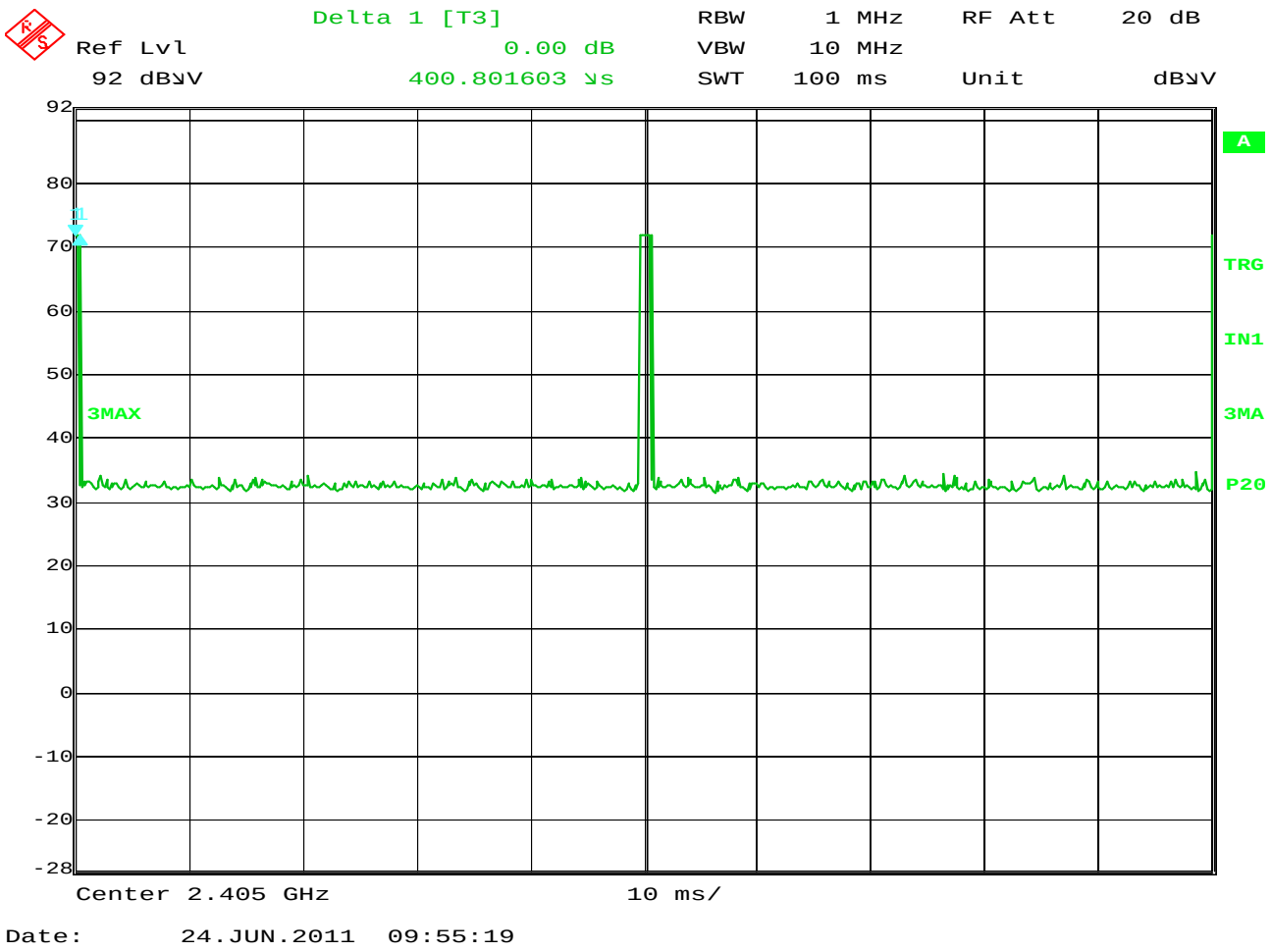
Test Set-up for Radiated Emissions – 1GHz to 12GHz, Vertical Polarization



FCC 15.247 Duty Cycle

MANUFACTURER	: Twisthink, LLC
PRODUCT NAME	: Light Control Module (LCM)
MODEL NUMBER	: TT10160-01
TEST MODE	: Transmit @ 2405MHz
TEST PARAMETERS	: Pulse width
TEST PARAMETERS	: 400.8uS

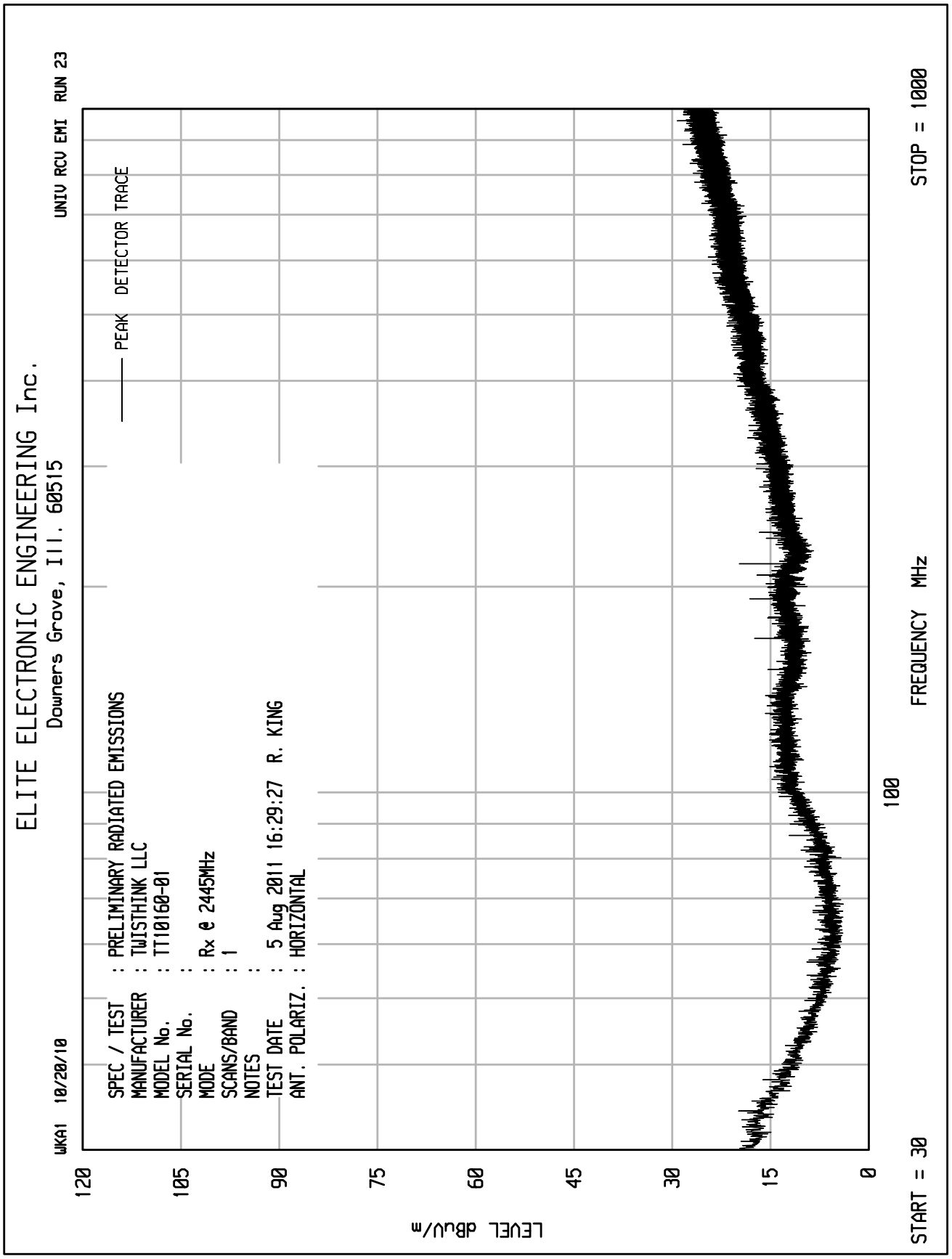
NOTES



FCC 15.247 Duty Cycle

MANUFACTURER	: Twisthink, LLC
PRODUCT NAME	: Light Control Module (LCM)
MODEL NUMBER	: TT10160-01
TEST MODE	: Transmit @ 2405MHz
TEST PARAMETERS	: Number of pulses in 100mS
TEST PARAMETERS	: 20*LOG((.4*2)/100) = -41.9dB

NOTES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Downers Grove, Ill. 60515
UNIV RCV EMI RUN 23
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Rx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:29:27 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
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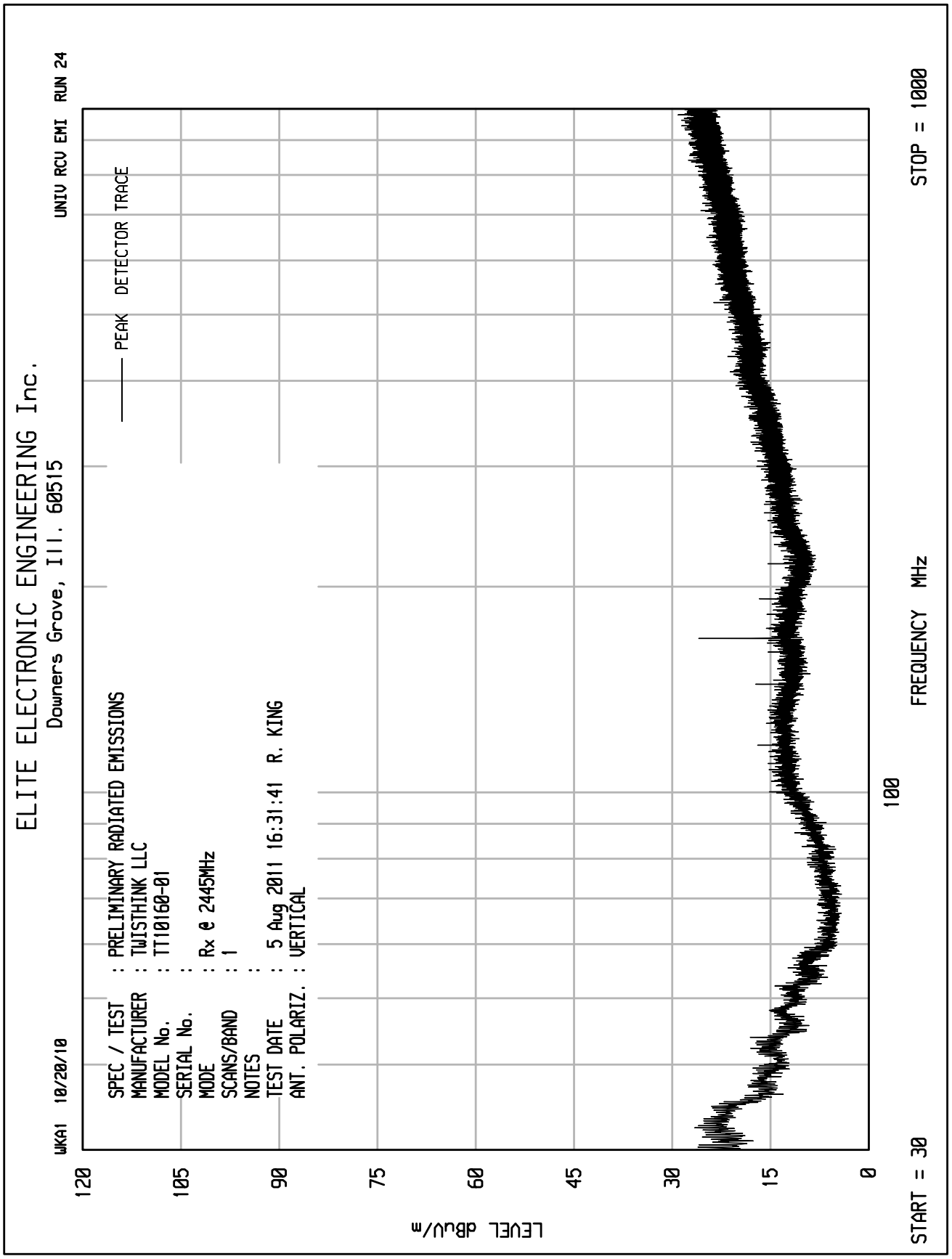
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000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Downers Grove, Ill. 60515
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MANUFACTURER : TWISTHINK LLC
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SERIAL No. :
MODE : Rx @ 2445MHz
SCANS/BAND : 1
NOTES :
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ANT. POLARIZ. : VERTICAL
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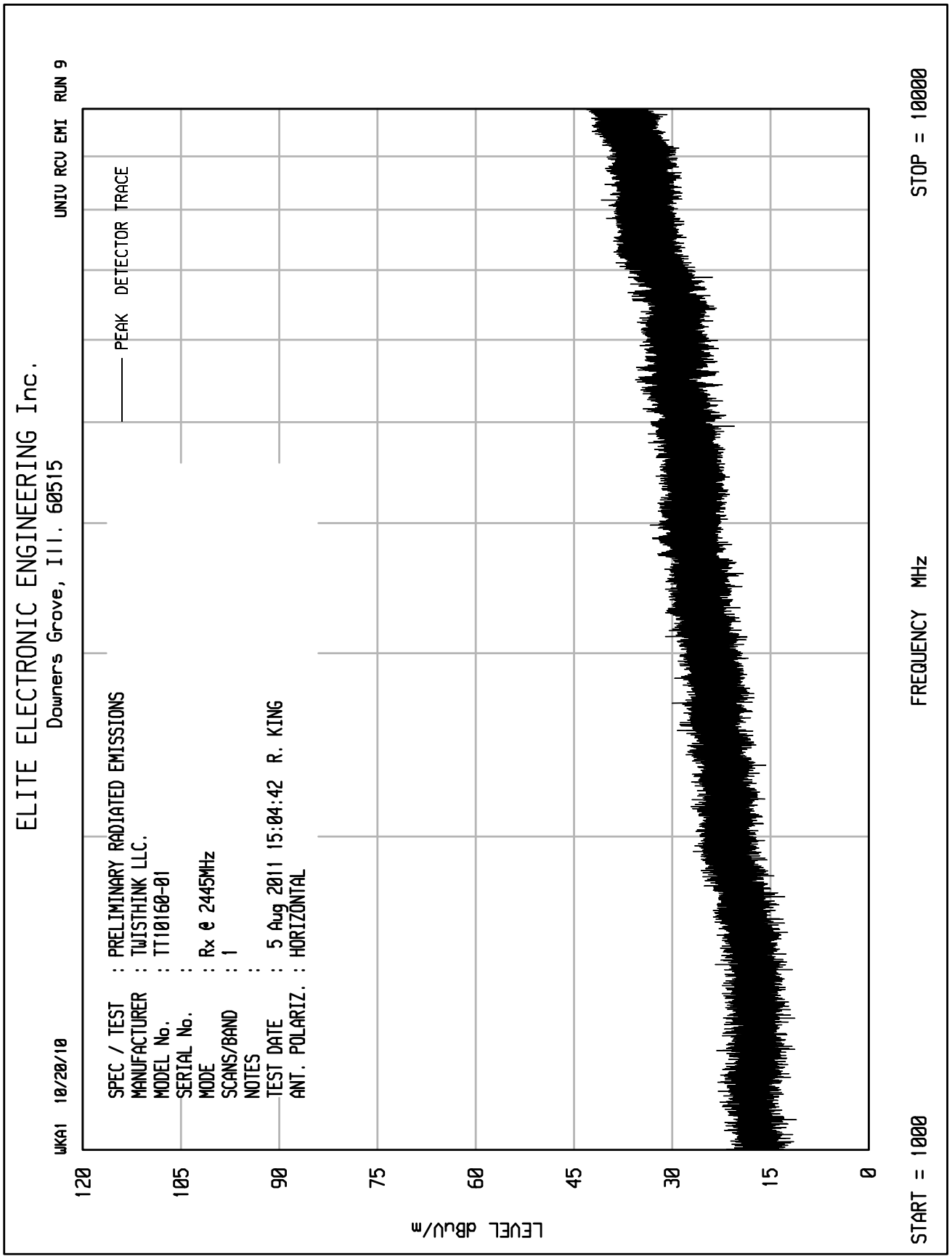
START = 30
100
FREQUENCY MHz
STOP = 1000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WKA1 10/20/10
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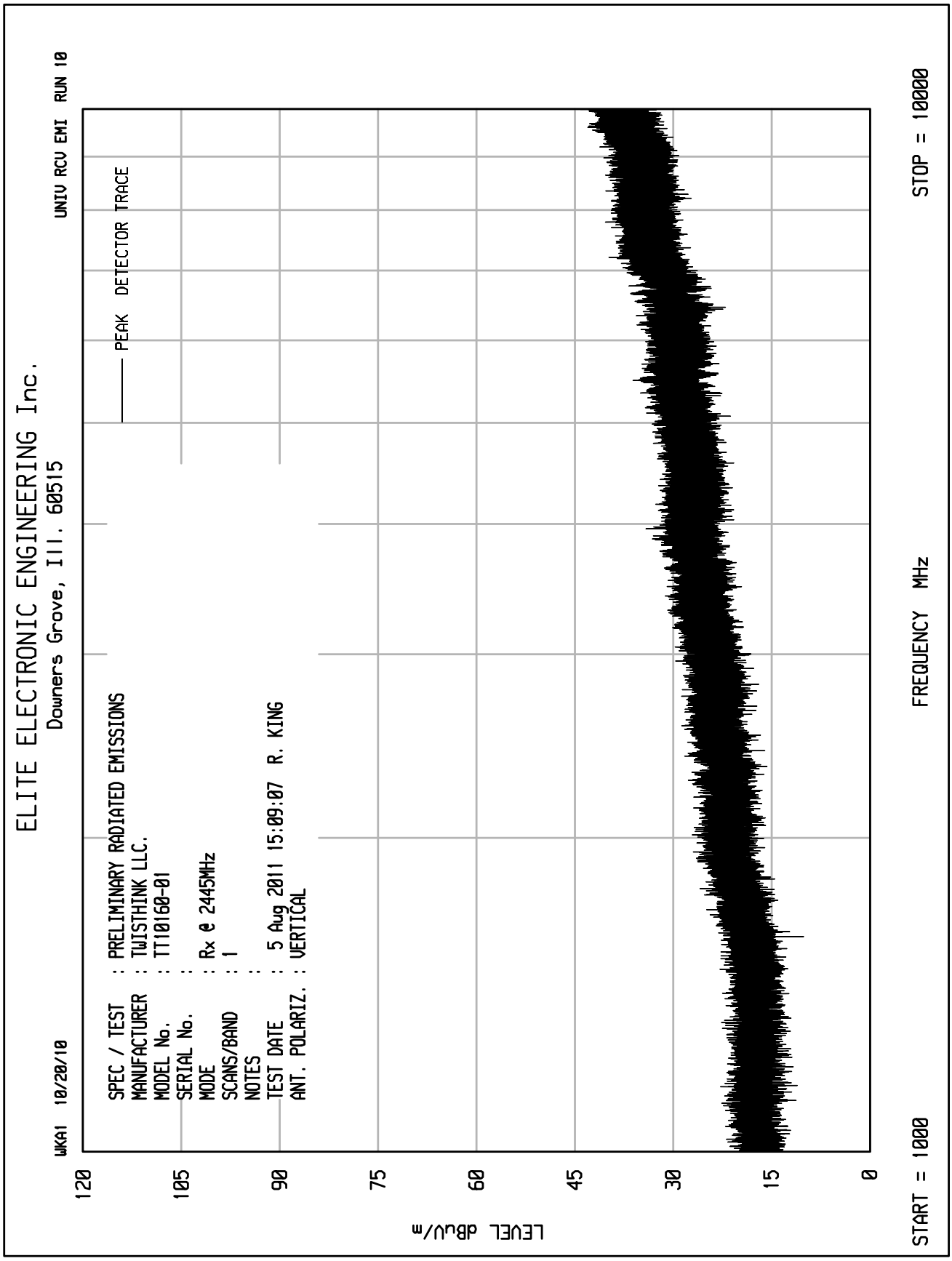
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 10
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
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MODEL No. : TT10160-01
SERIAL No. :
MODE : Rx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:09:07 R. KING
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PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

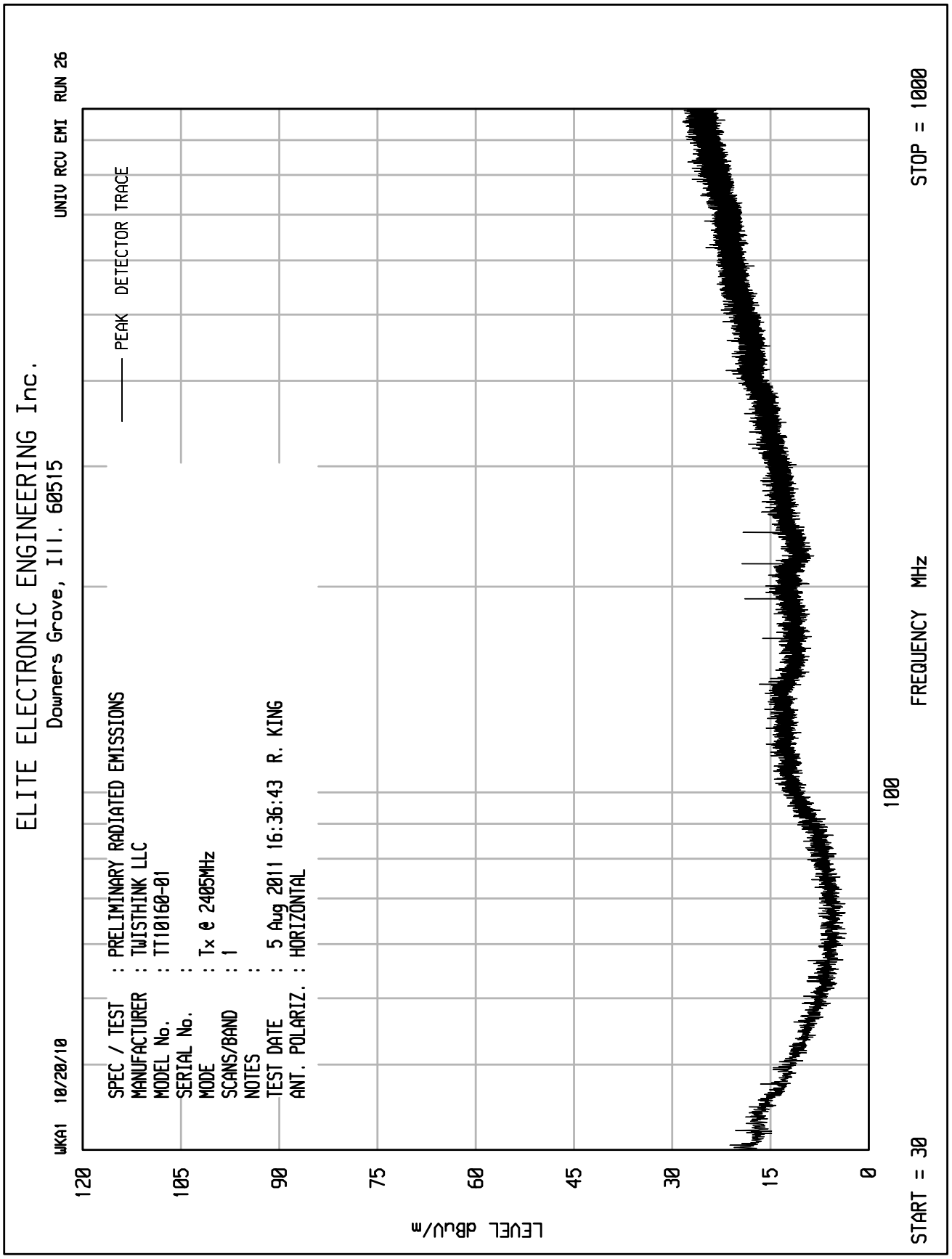
Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : Industry Canada Radiated Receiver Emissions
Date : August 25, 2011
Mode : Receive @ 2445MHz
Test Distance : 3 meters
Notes : none

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
2441.0	H	46.6	*	3.8	30.4	-40.3	40.5	106.3	500	-13.4
2441.0	V	46.3	*	3.8	30.4	-40.3	40.2	102.7	500	-13.7
4882.0	H	45.0	*	5.8	33.8	-40.1	44.5	167.1	500	-9.5
4882.0	V	44.8	*	5.8	33.8	-40.1	44.2	162.8	500	-9.7
7323.0	H	44.3	*	7.7	37.8	-39.7	50.0	316.5	500	-4.0
7323.0	V	45.0	*	7.7	37.8	-39.7	50.7	342.7	500	-3.3

Checked BY Richard E. King :

Richard E. King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Downers Grove, Ill. 60515
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WKA1 10/20/10
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SERIAL No. :
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SCANS/BAND : 1
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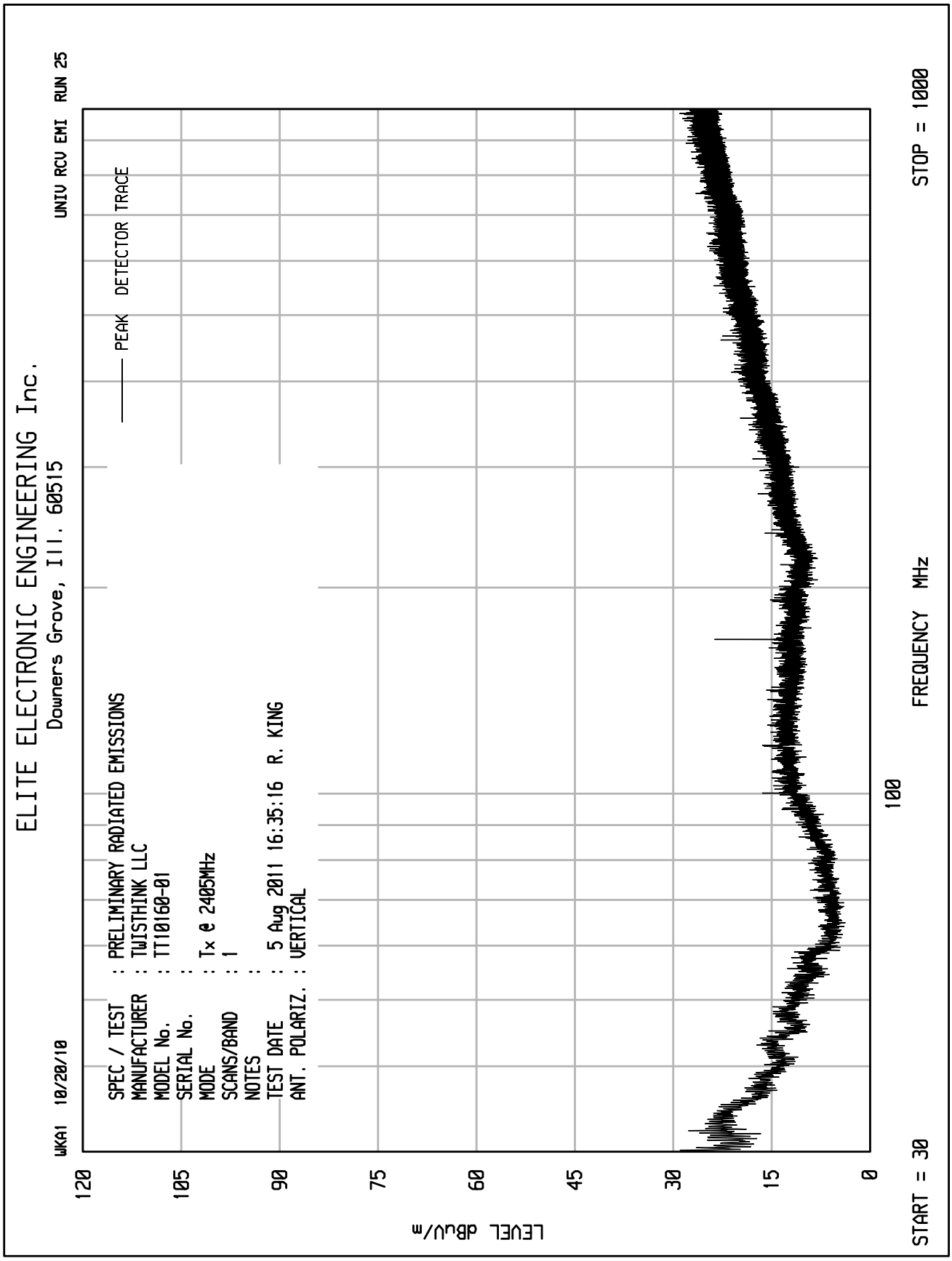
100
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 25
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2405MHz
SCANS/BAND : 1
NOTES :
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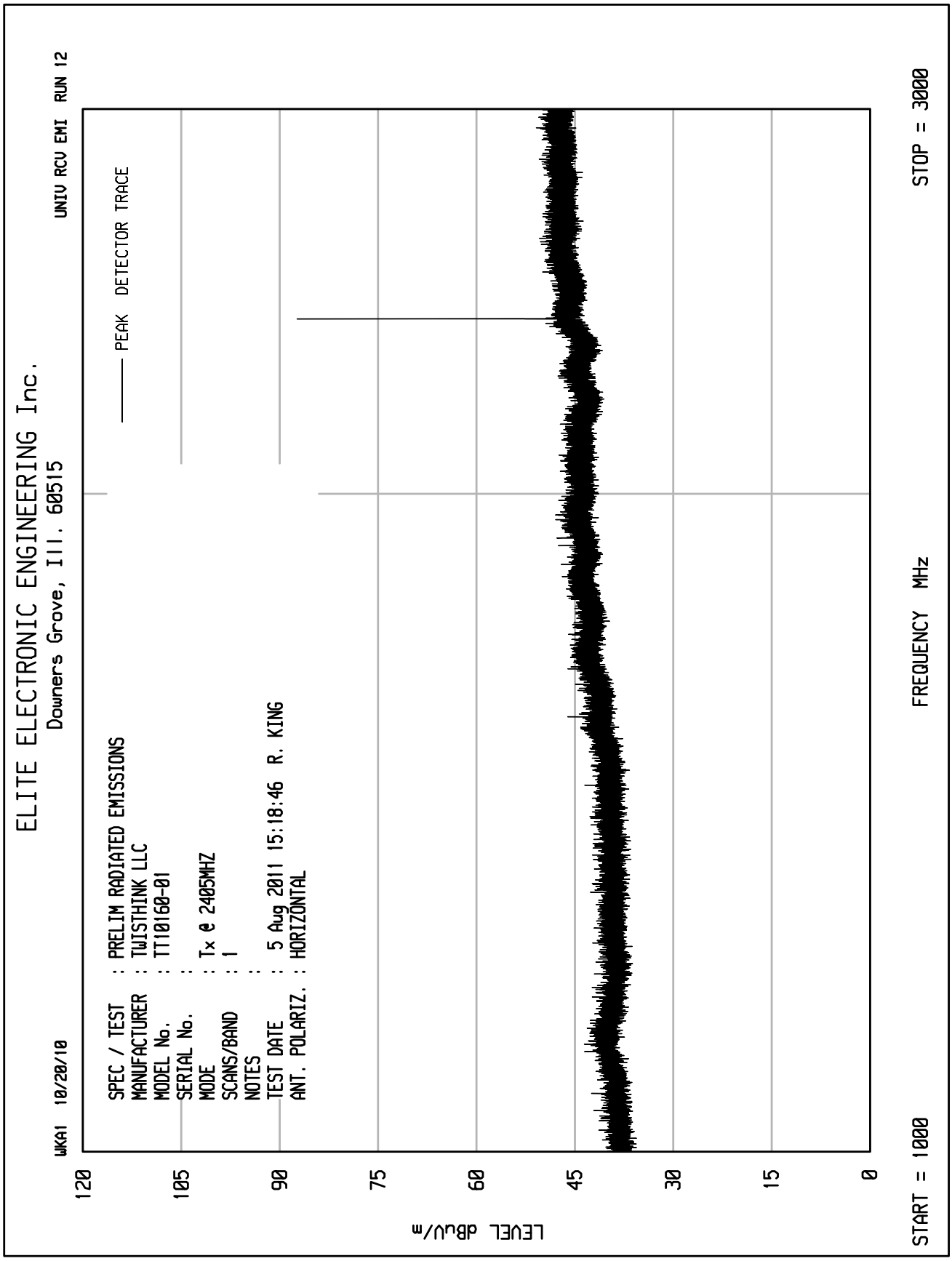
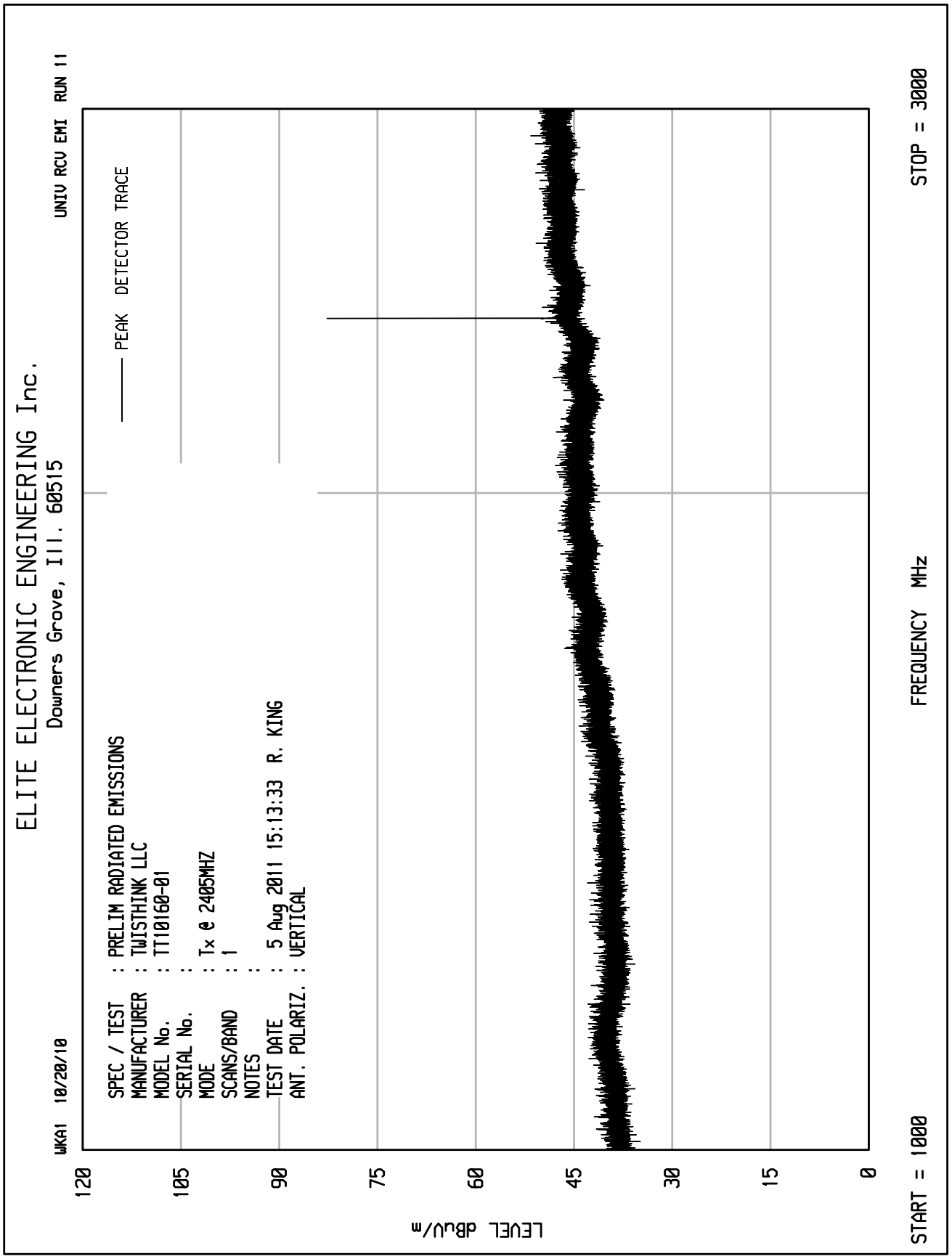
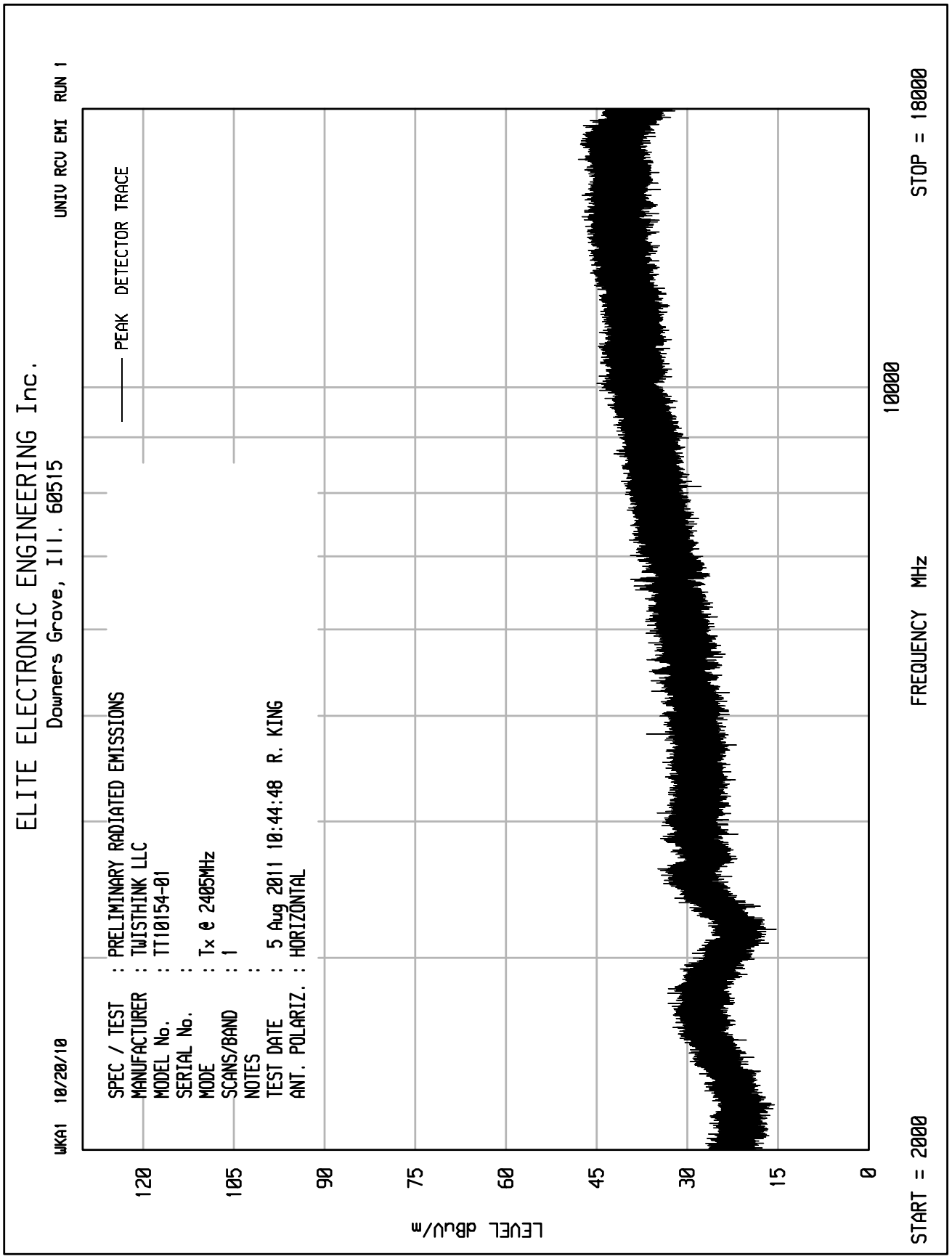
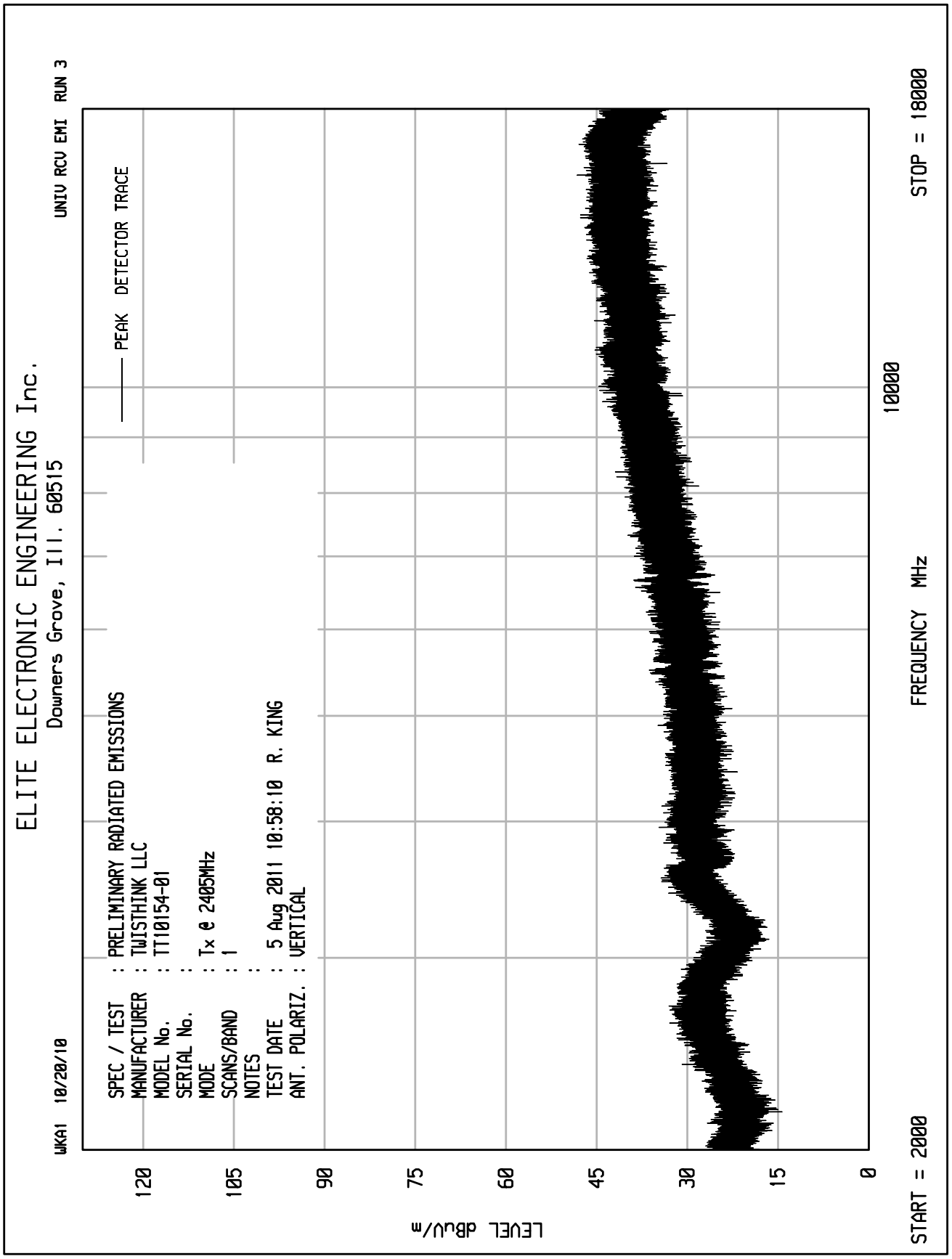
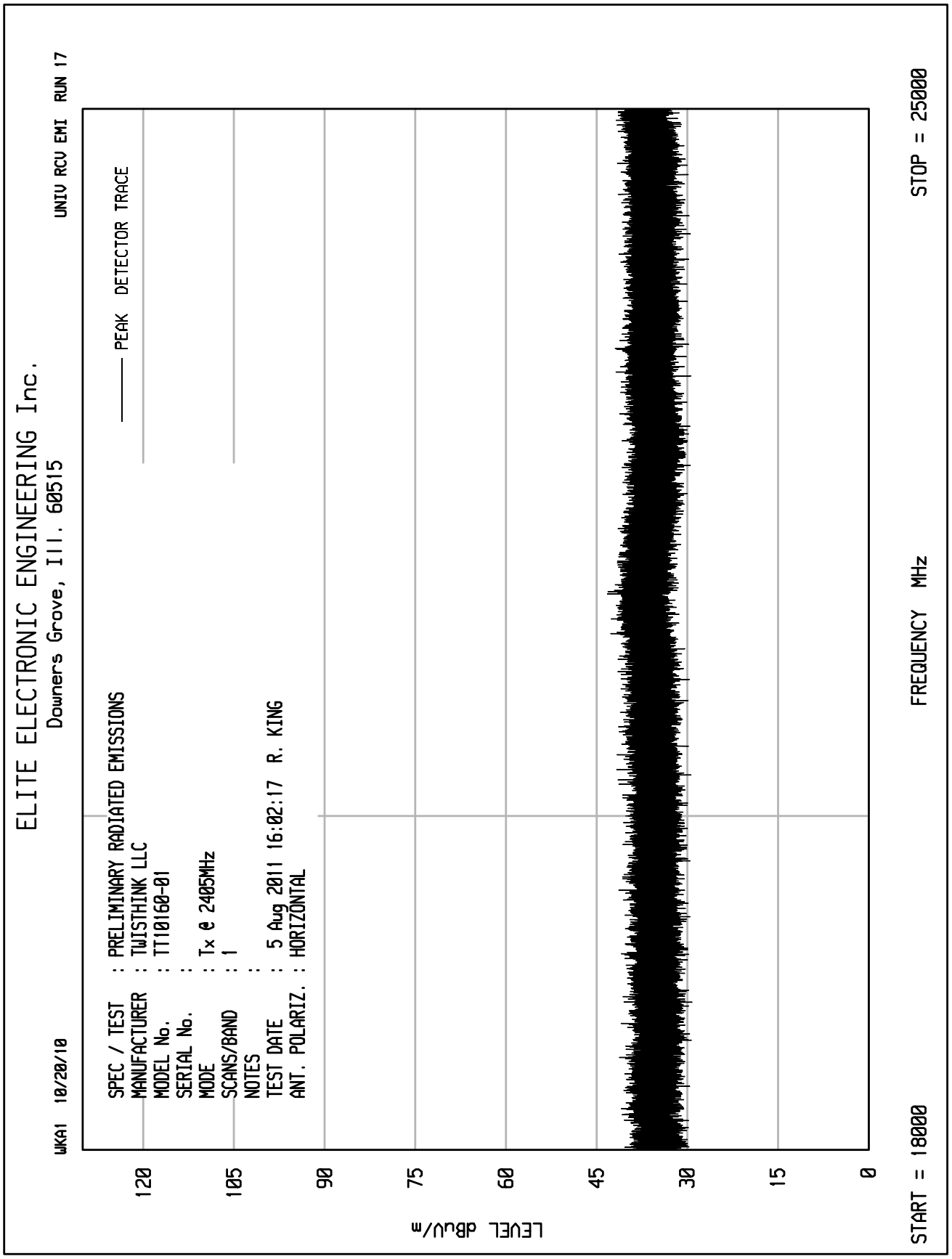
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

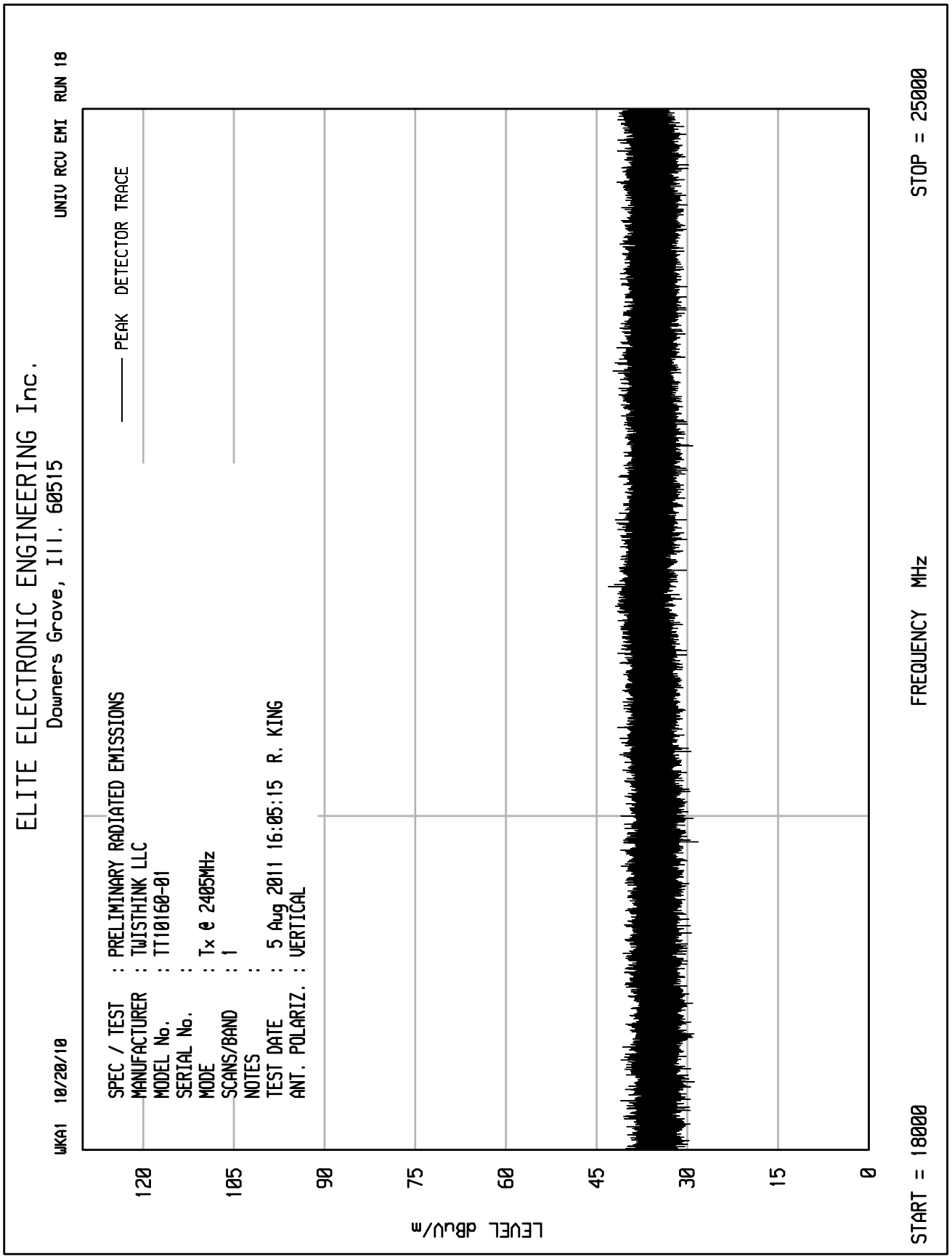

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 12
WKA1 10/20/10
SPEC / TEST : PRELIM RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2405MHZ
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:18:46 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 3000

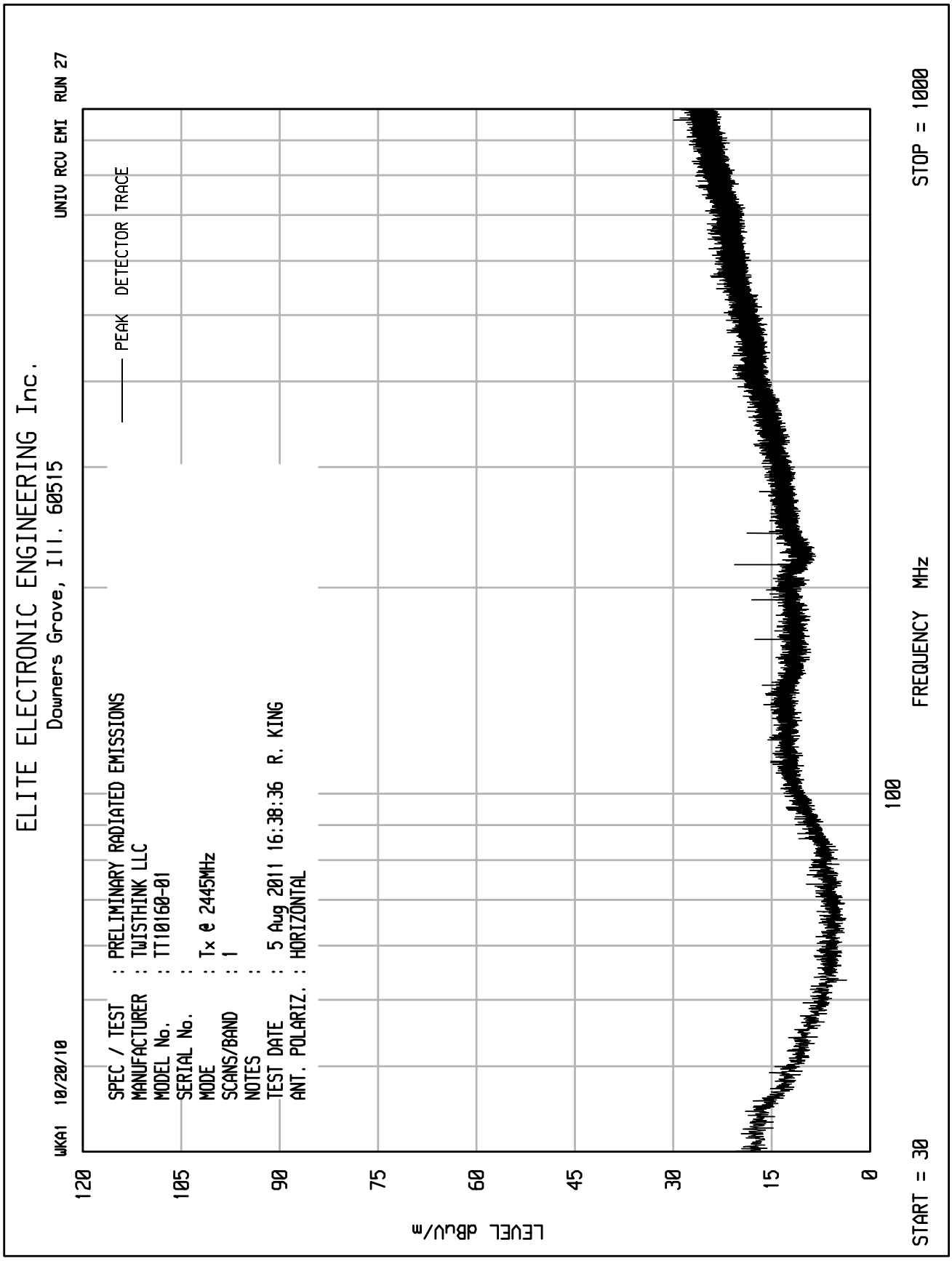

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 11
WKA1 10/20/10
SPEC / TEST : PRELIM RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2405MHZ
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:13:33 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 3000

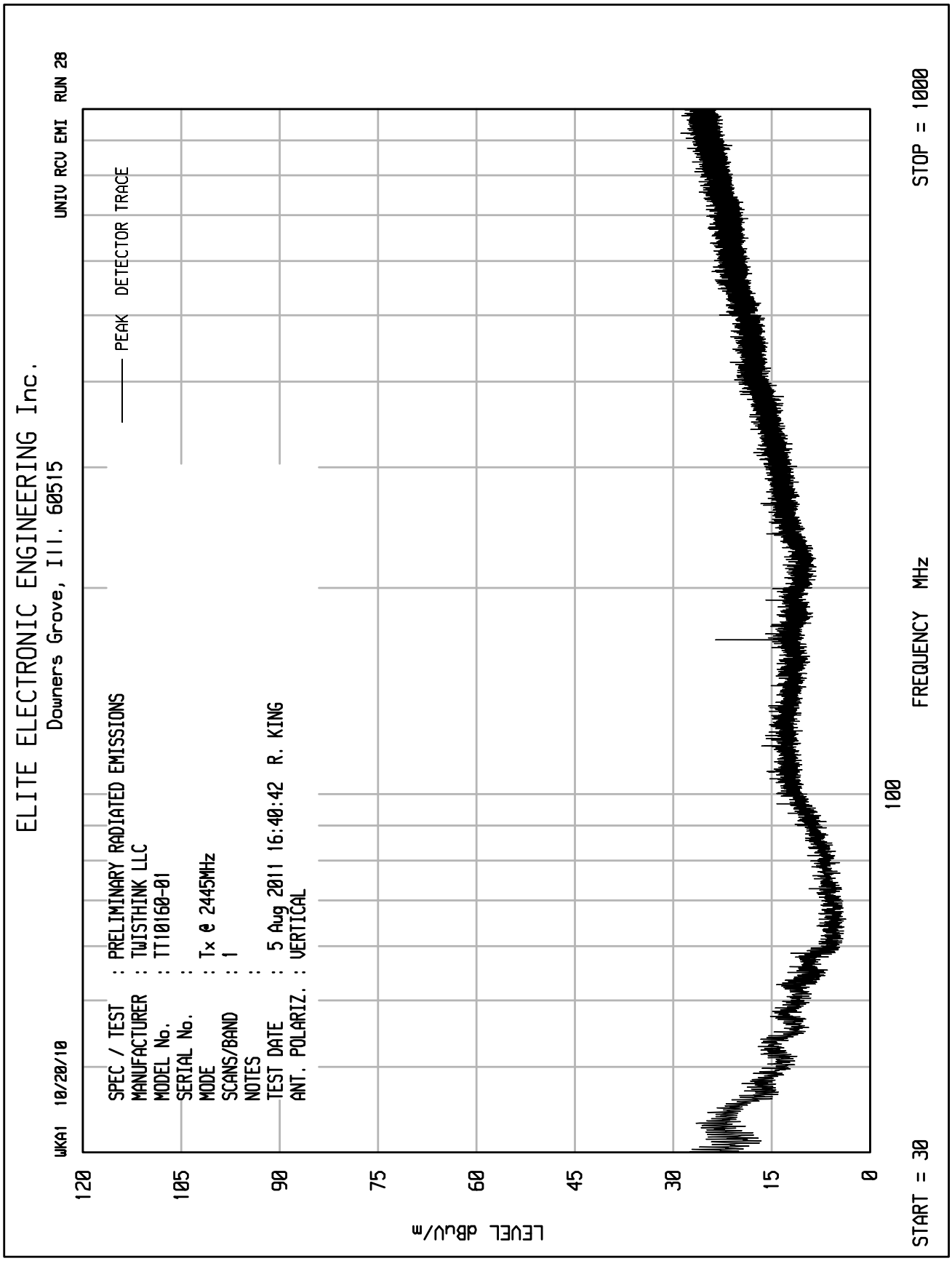

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 1
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10154-01
SERIAL No. :
MODE : Tx @ 2405MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 10:44:48 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 2000
10000
FREQUENCY MHz
STOP = 18000

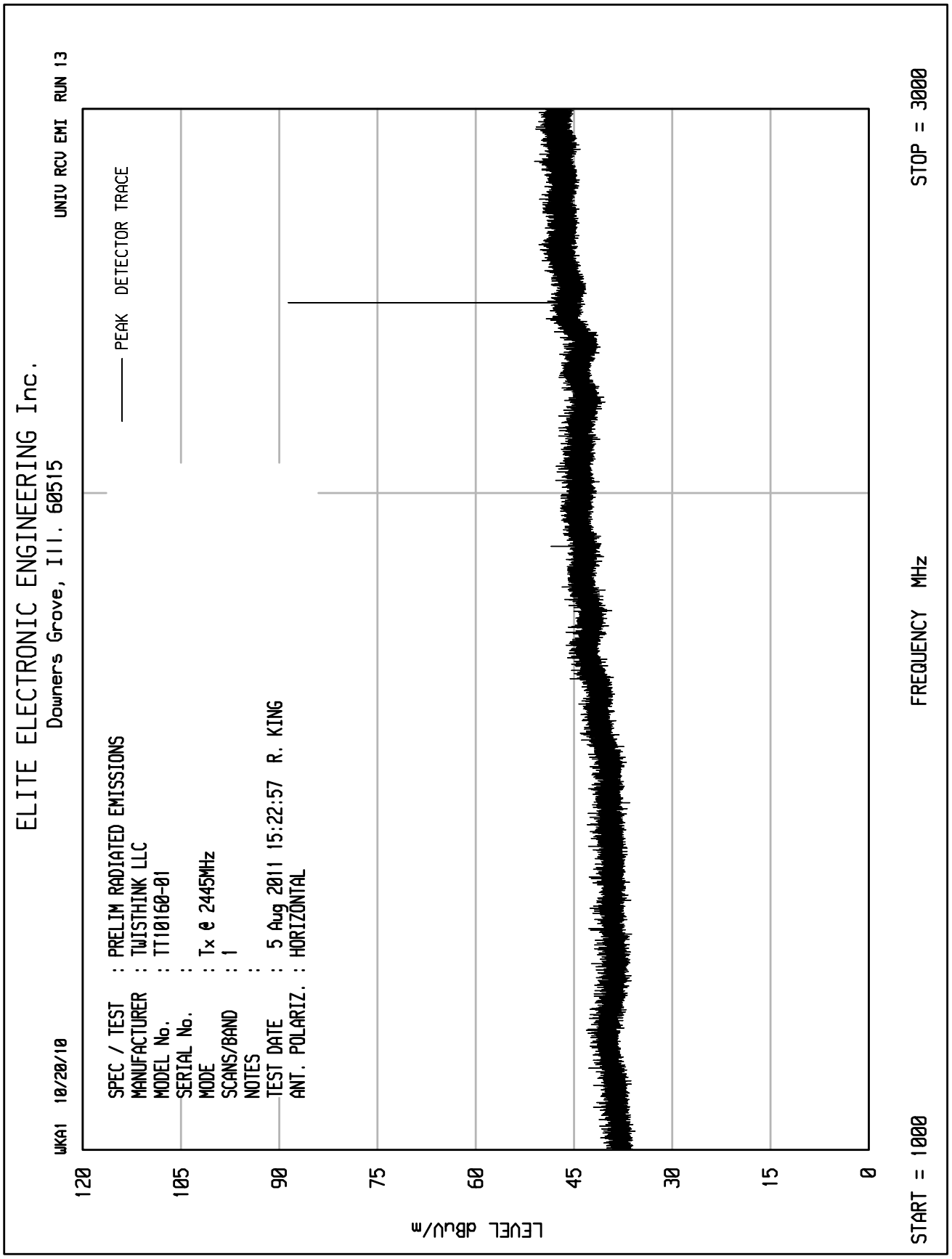

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 3
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10154-01
SERIAL No. :
MODE : Tx @ 2405MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 10:58:10 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 2000
10000
FREQUENCY MHz
STOP = 18000

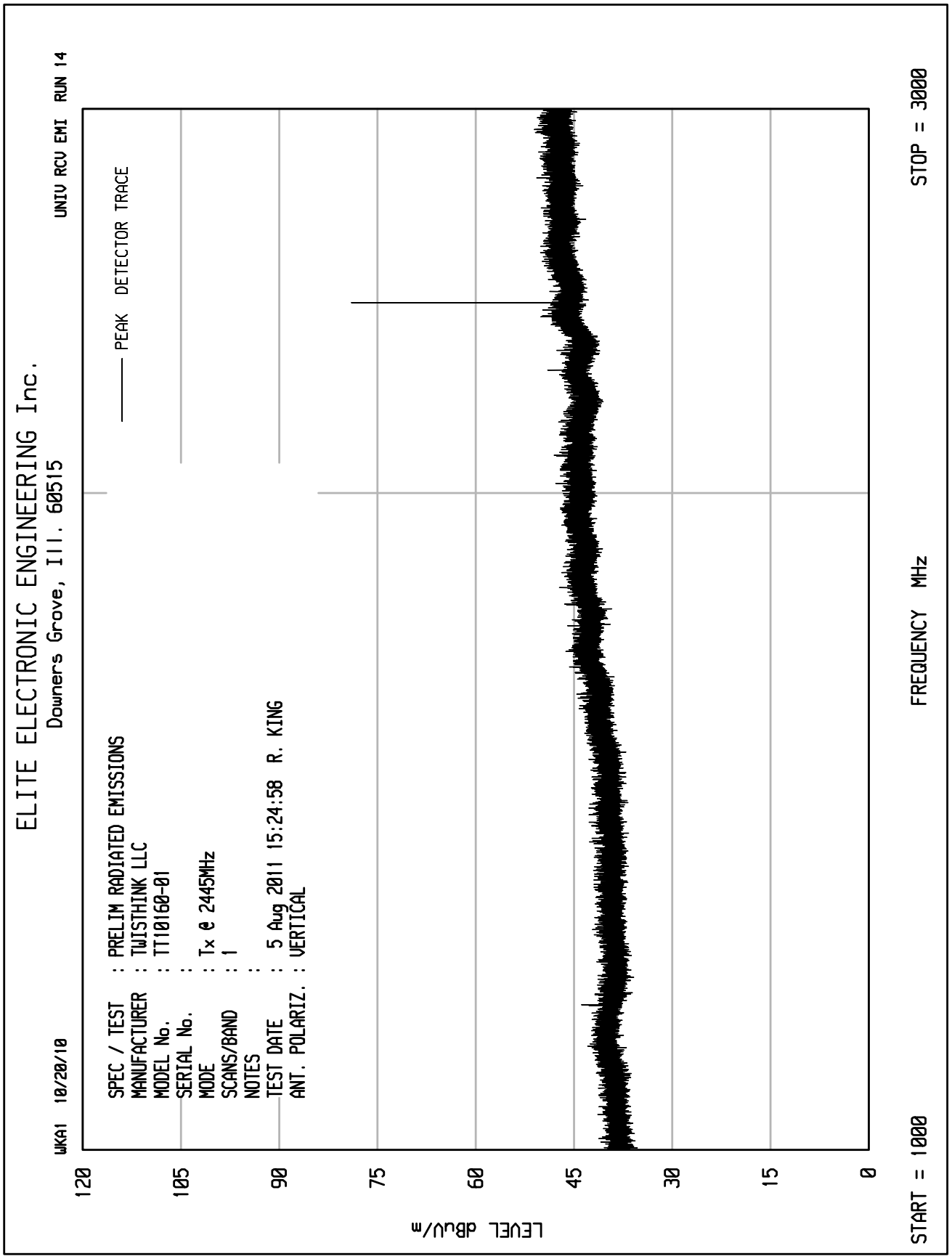

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 17
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2405MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:02:17 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 18000
FREQUENCY MHz
STOP = 25000

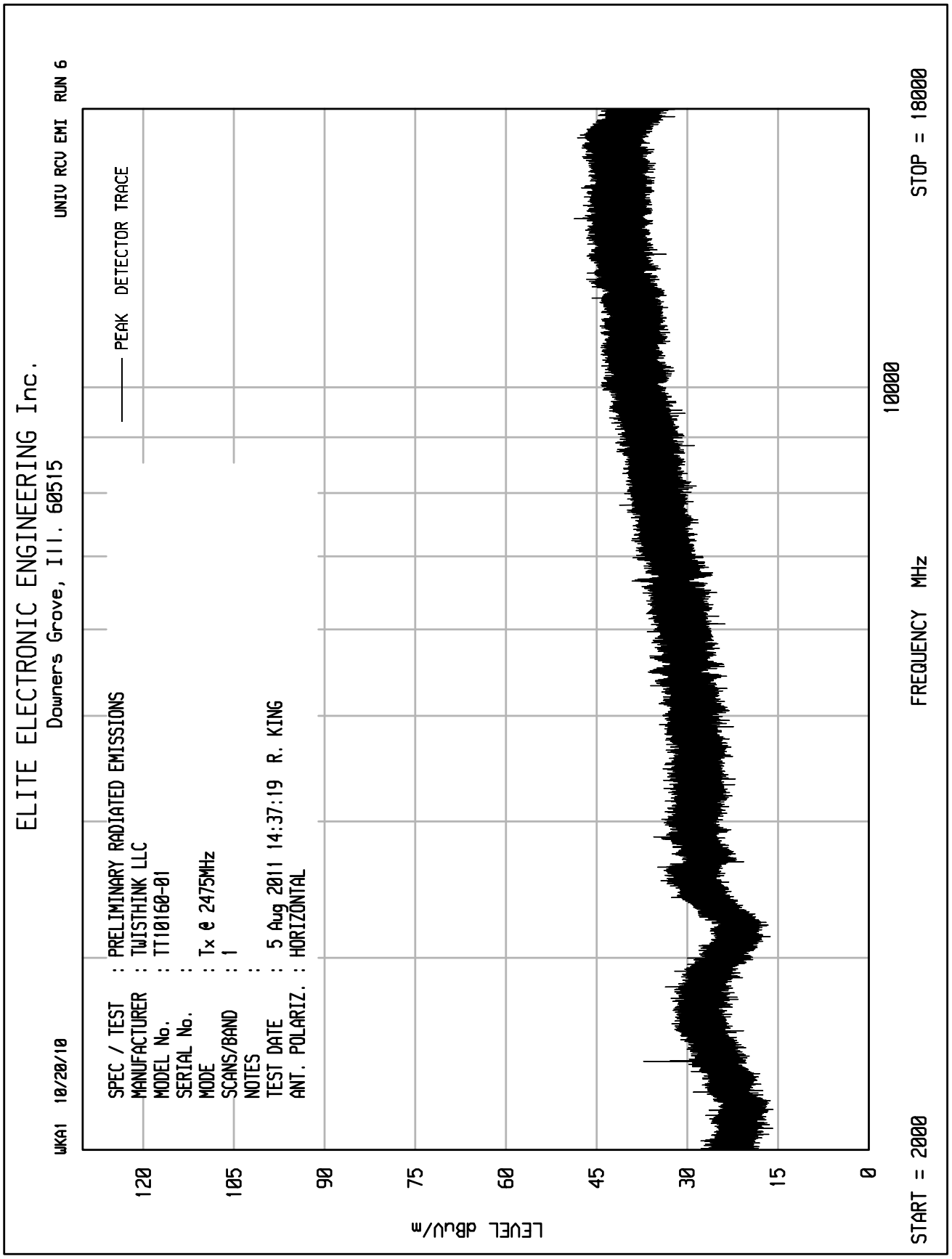

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 18
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2405MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:05:15 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 18000
FREQUENCY MHz
STOP = 25000

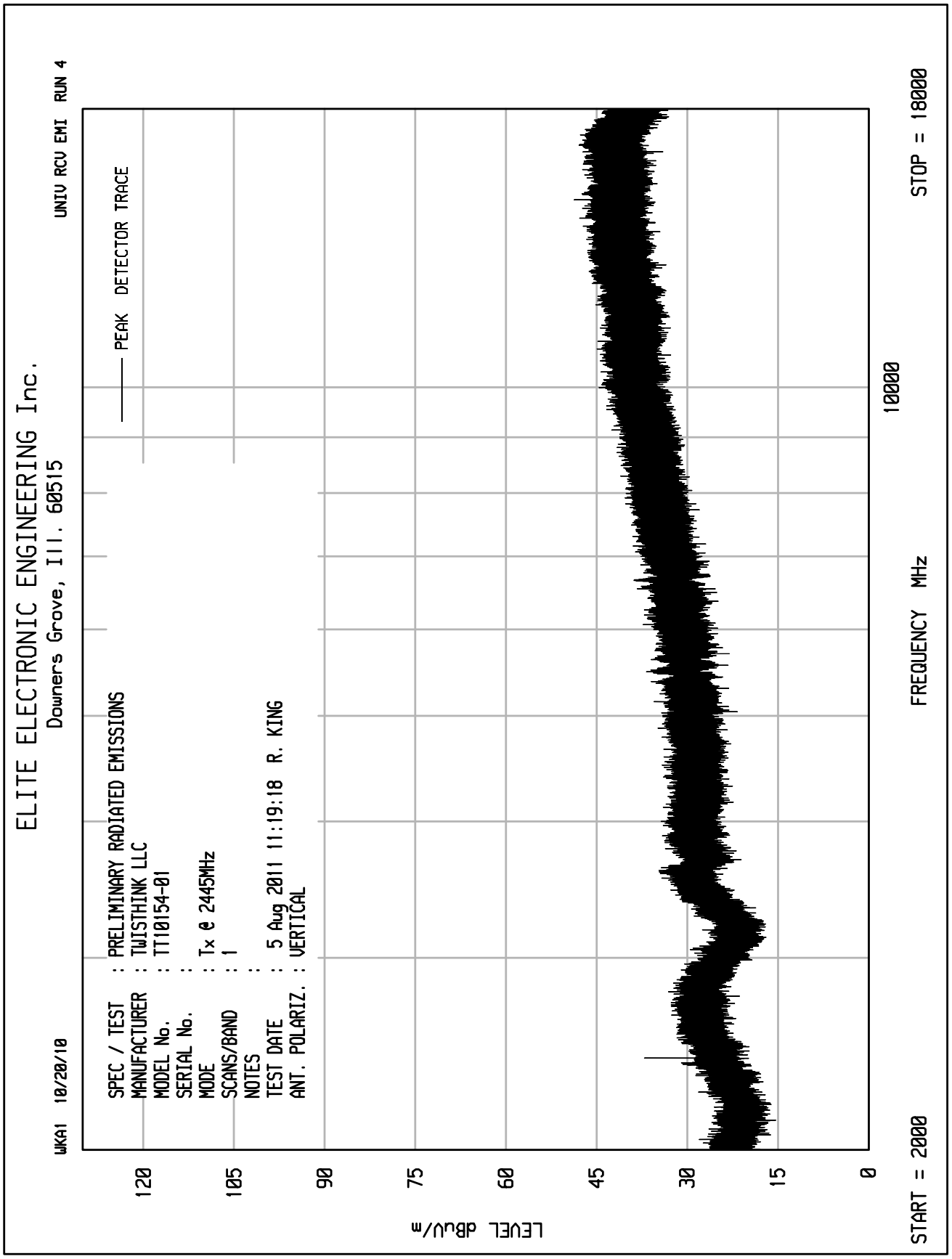

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 27
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:38:36 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

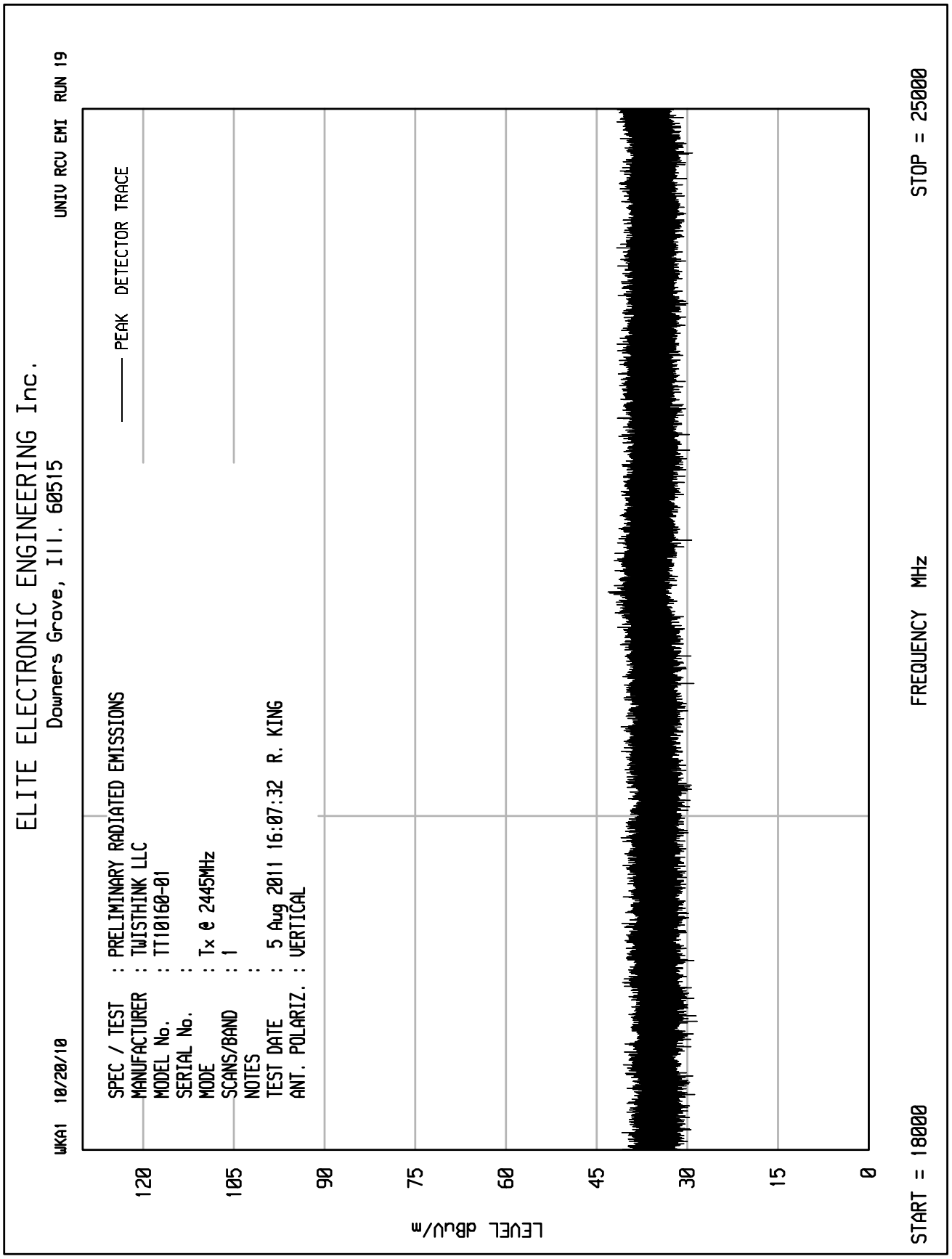

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 20
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:40:42 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

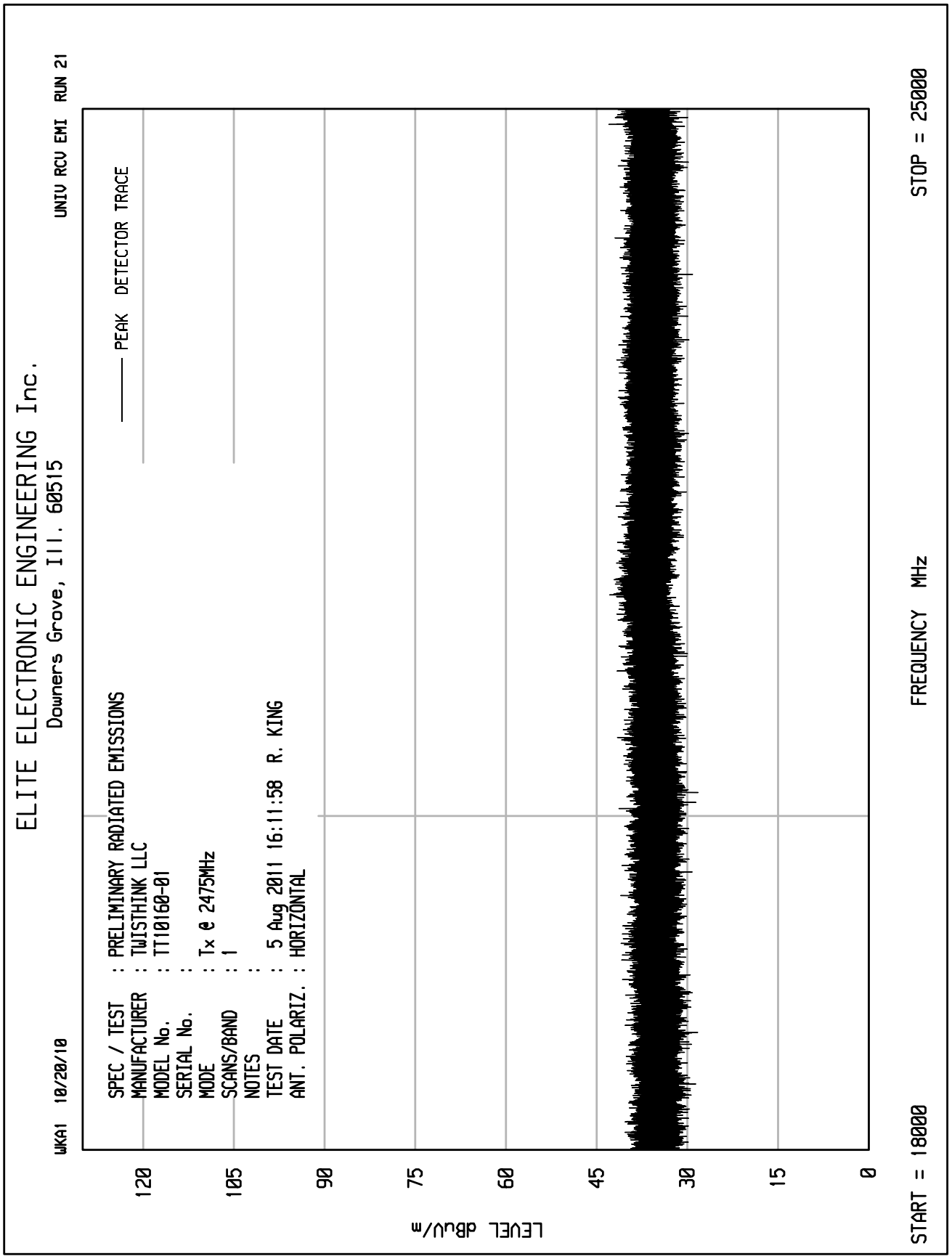

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 13
WKA1 10/20/10
SPEC / TEST : PRELIM RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:22:57 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 3000

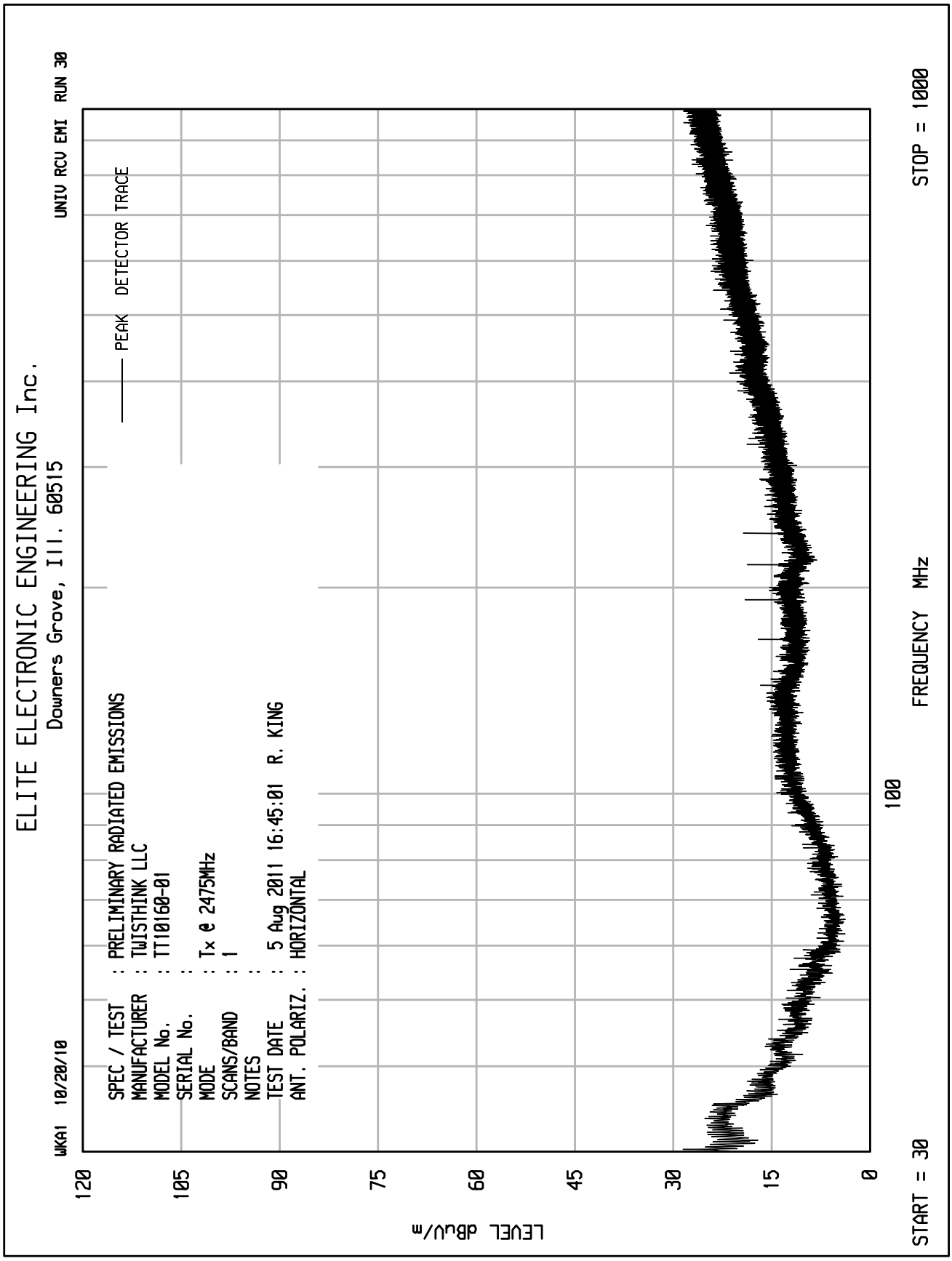

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 14
WKA1 10/20/10
SPEC / TEST : PRELIM RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:24:58 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 3000

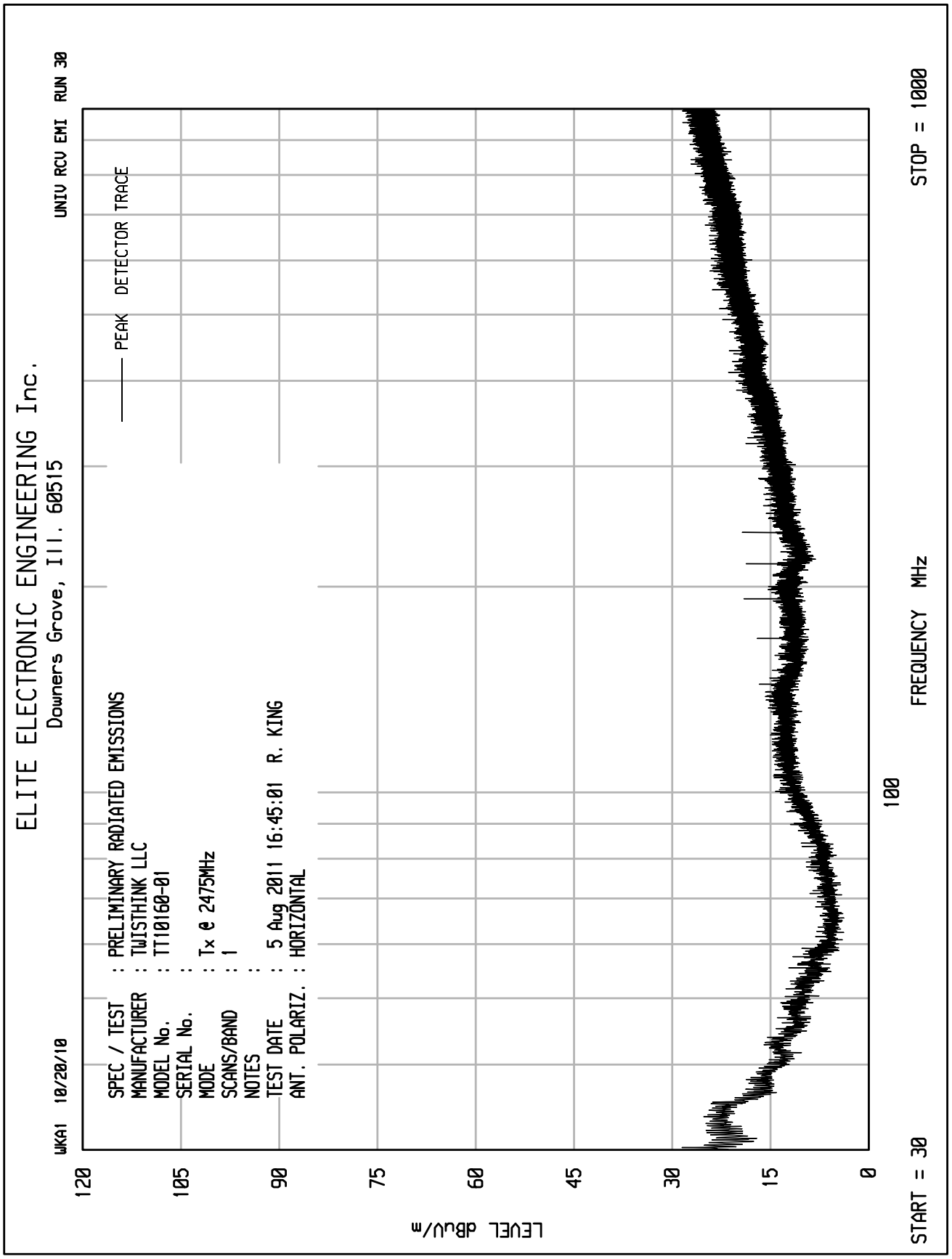

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 6
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 14:37:19 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 2000
10000
FREQUENCY MHz
STOP = 18000

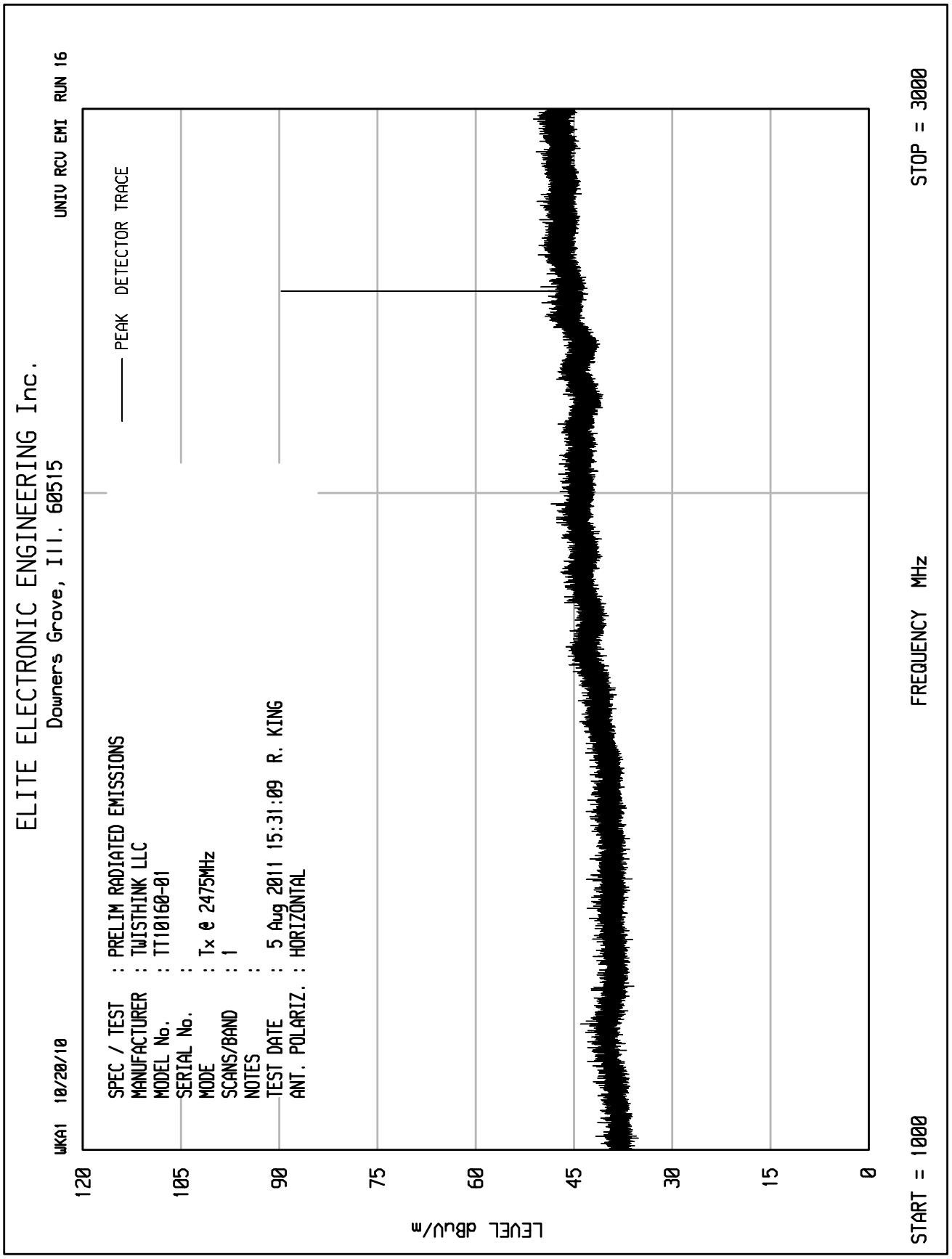

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 4
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10154-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 11:19:18 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 2000
10000
FREQUENCY MHz
STOP = 18000

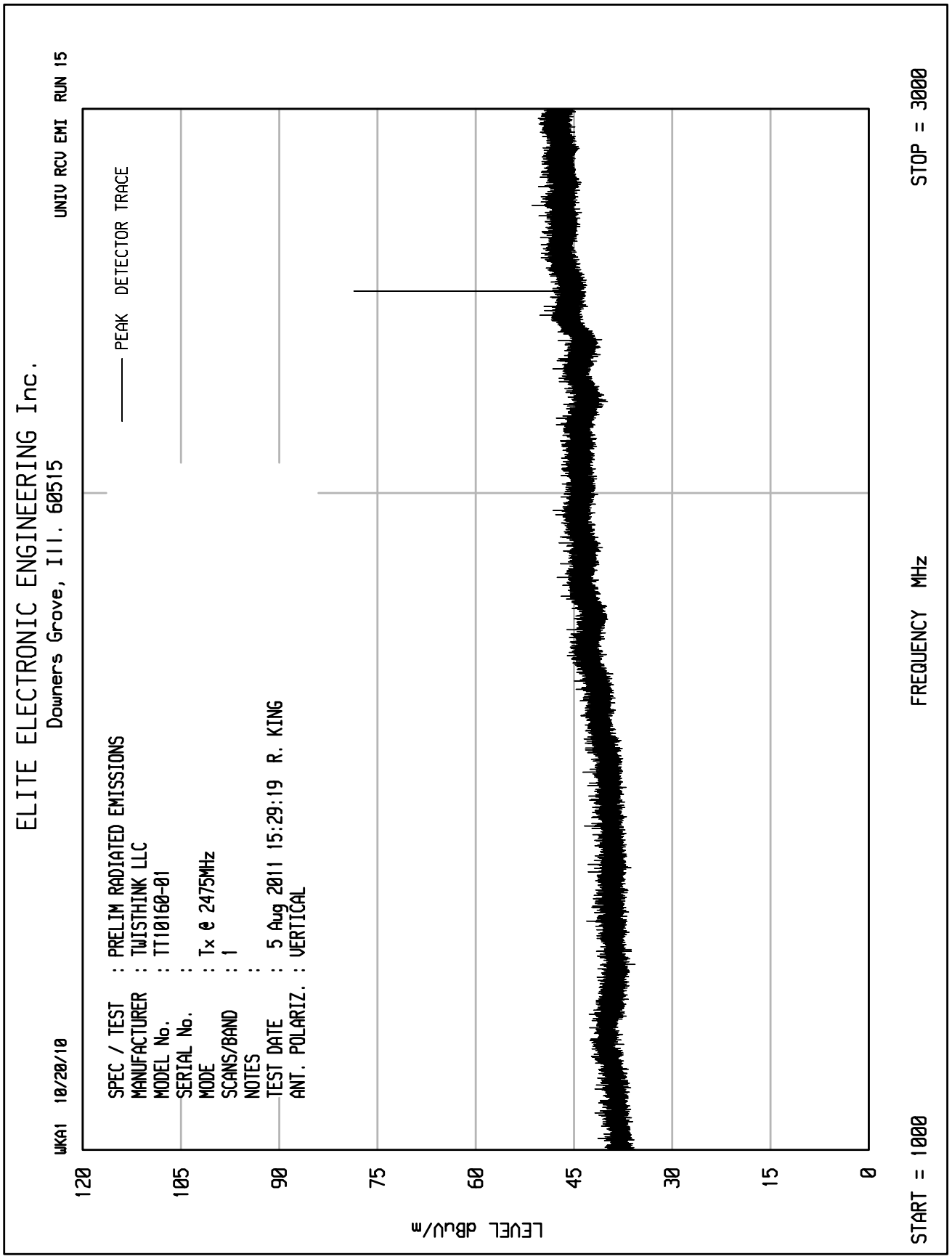

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 19
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:07:32 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 18000
FREQUENCY MHz
STOP = 25000

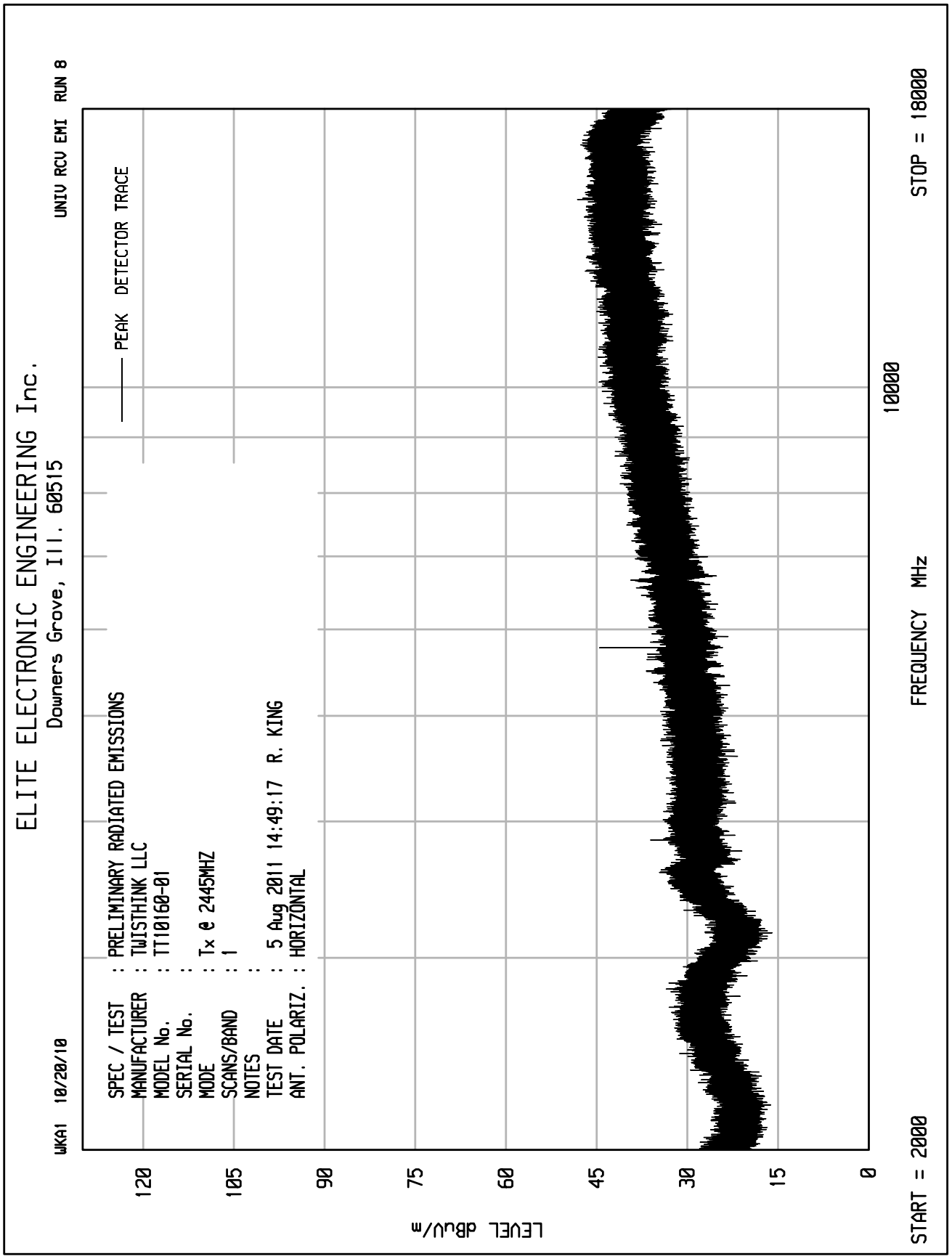

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 21
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:11:58 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 18000
FREQUENCY MHz
STOP = 25000

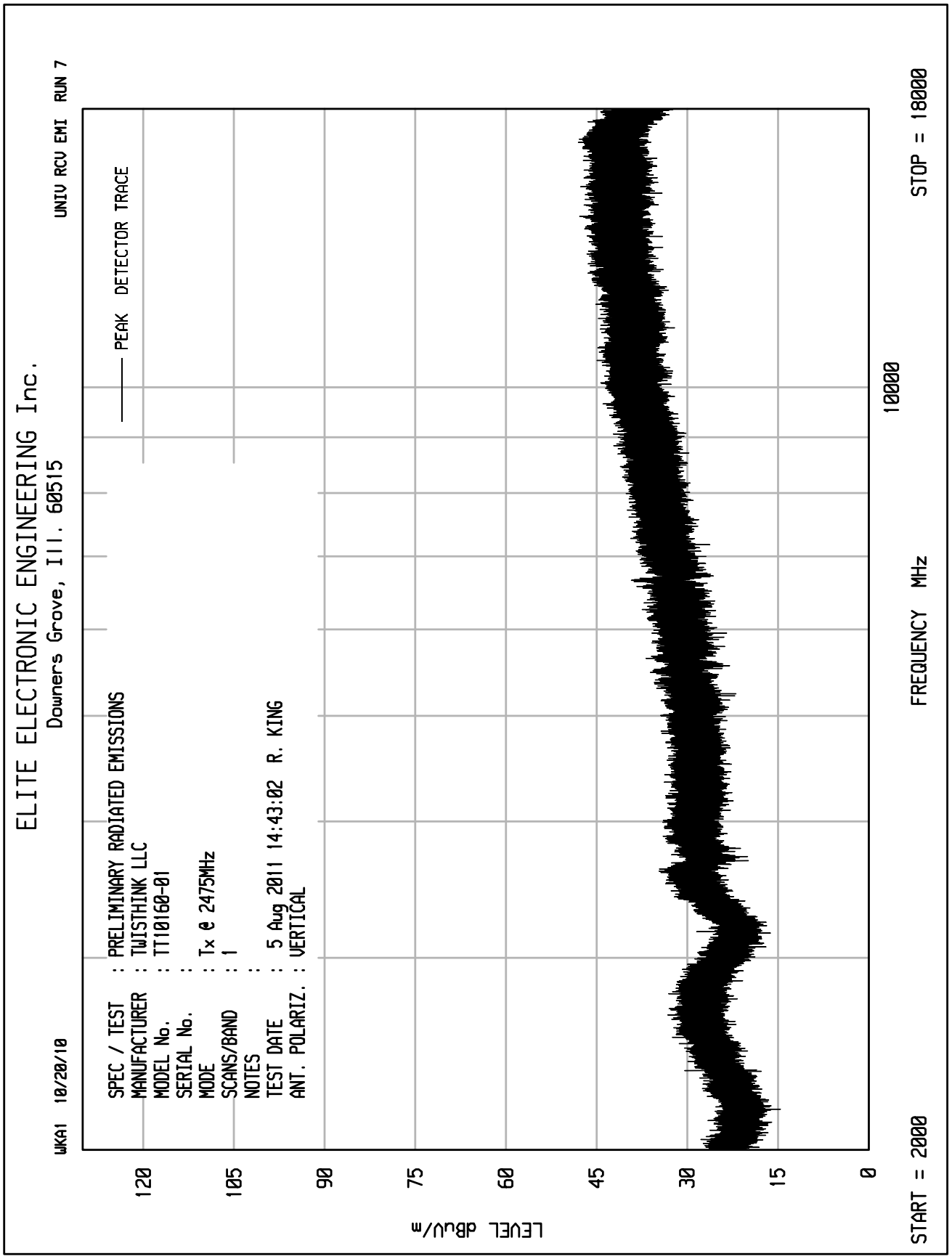

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 30
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:45:01 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

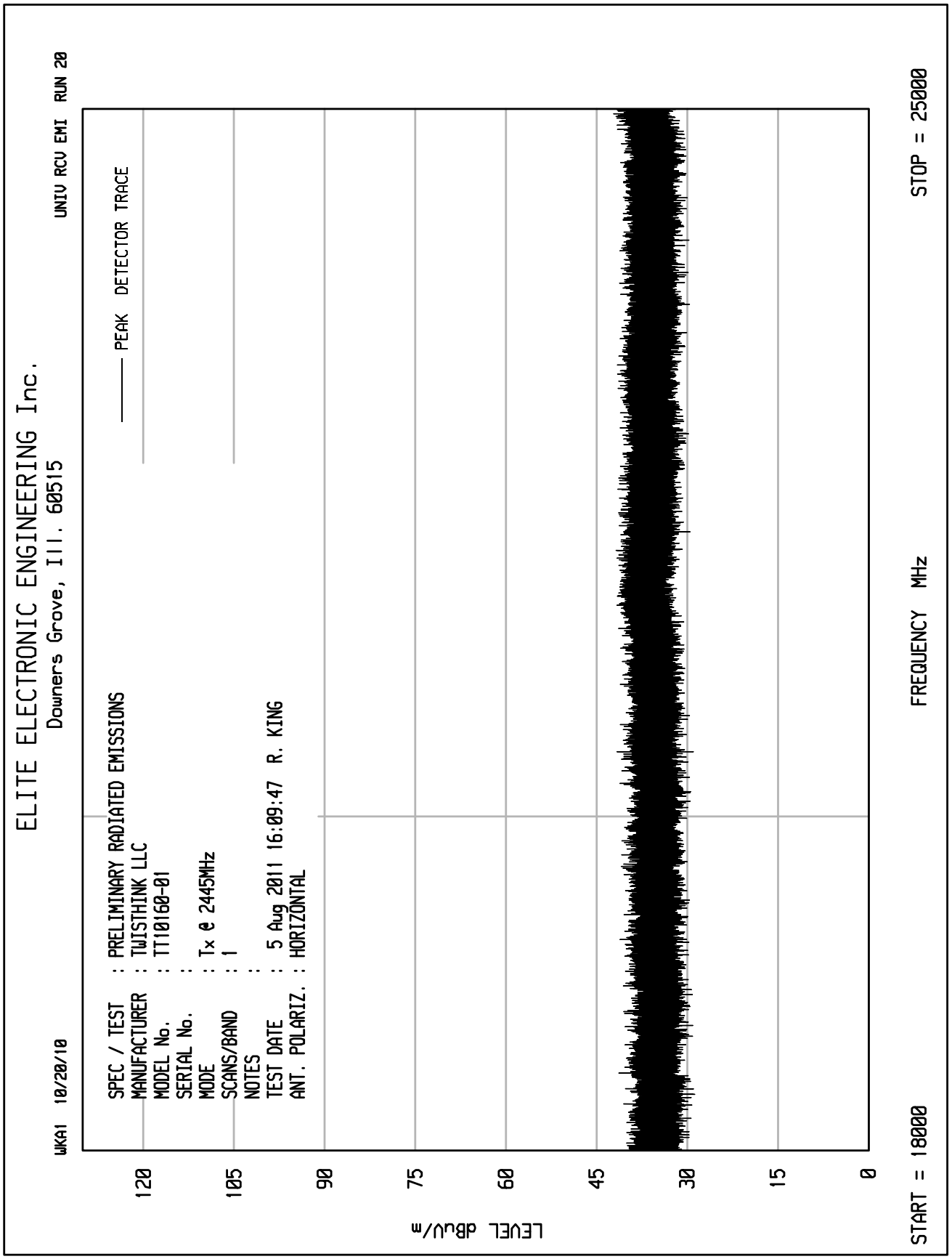

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 30
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:45:01 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

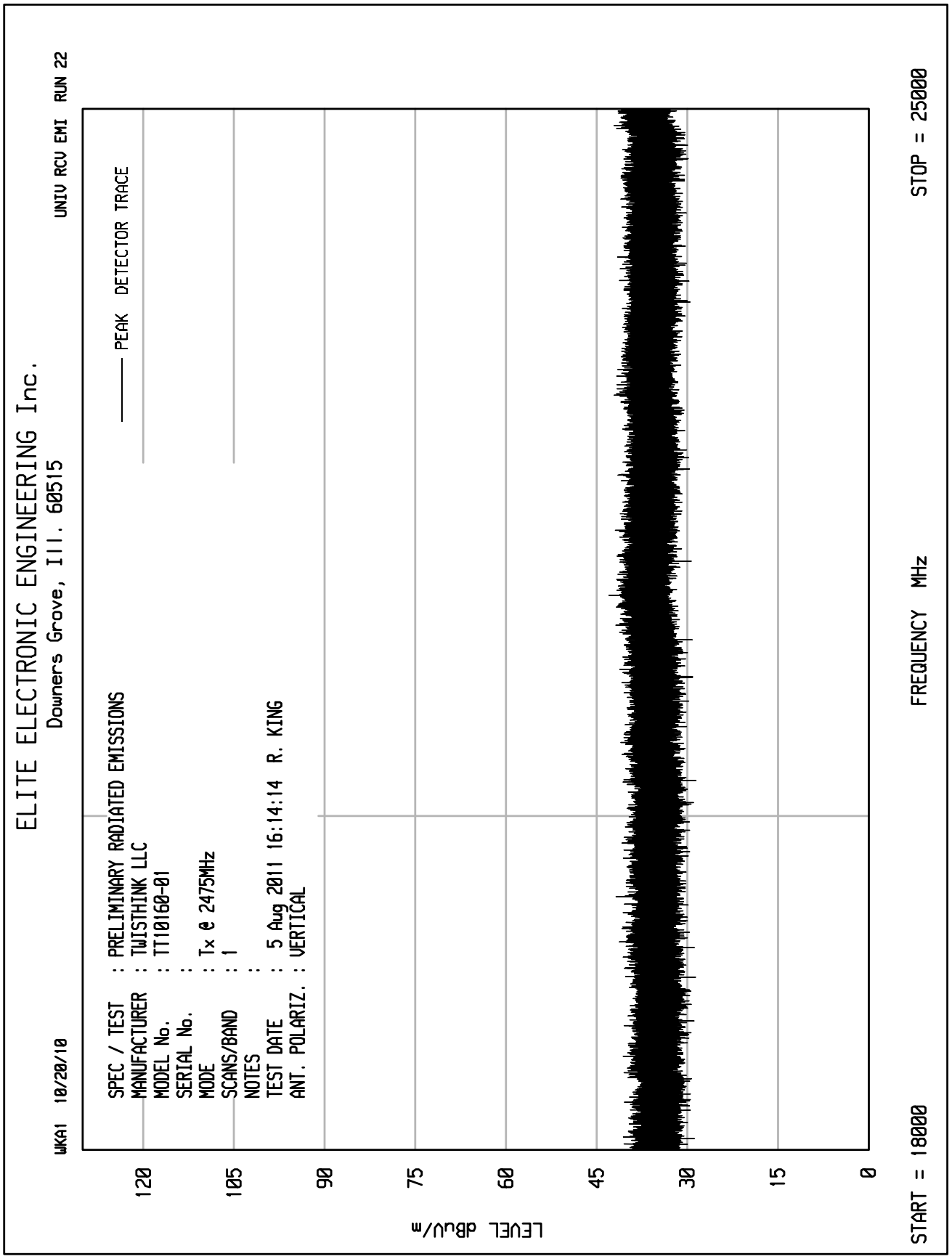

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 16
WKA1 10/20/10
SPEC / TEST : PRELIM RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:31:09 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 3000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 15
WKA1 10/20/10
SPEC / TEST : PRELIM RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 15:29:19 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 3000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 8
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHZ
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 14:49:17 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 2000
10000
STOP = 18000
FREQUENCY MHz


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 7
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 14:43:02 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 2000
10000
FREQUENCY MHz
STOP = 18000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 20
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2445MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:09:47 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 18000
FREQUENCY MHz
STOP = 25000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 22
WKA1 10/20/10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : TWISTHINK LLC
MODEL No. : TT10160-01
SERIAL No. :
MODE : Tx @ 2475MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 5 Aug 2011 16:14:14 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 18000
FREQUENCY MHz
STOP = 25000

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Radiated Emissions
Date : August 5, 2011
Mode : Transmit @ 2405MHz
Test Distance : 3 meters
Notes : Peak Data

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
2405.00	H	63.1	3.4	31.3	0.0	97.8	77640.9		
2405.00	V	67.7	3.4	31.3	0.0	102.4	132005.1		
4810.00	H	48.6	4.9	34.8	-40.1	48.2	257.1	5000.0	-25.8
4810.00	V	50.1	4.9	34.8	-40.1	49.8	308.7	5000.0	-24.2
7215.00	H	35.8	6.1	38.1	-39.8	40.2	102.8	13200.5	-42.2
7215.00	V	33.8	6.1	38.1	-39.8	38.2	81.5	13200.5	-44.2
9620.00	H	36.7	6.8	39.6	-38.8	44.4	165.7	13200.5	-38.0
9620.00	V	35.9	6.8	39.6	-38.8	43.6	151.6	13200.5	-38.8
12025.00	H	44.7	8.0	41.4	-39.6	54.5	529.8	5000.0	-19.5
12025.00	V	46.1	8.0	41.4	-39.6	55.9	623.2	5000.0	-18.1
14430.00	H	36.2	8.7	43.7	-39.9	48.7	271.9	13200.5	-33.7
14430.00	V	35.0	8.7	43.7	-39.9	47.5	237.0	13200.5	-34.9
16835.00	H	36.7	9.4	44.7	-38.7	52.1	402.9	13200.5	-30.3
16835.00	V	37.6	9.4	44.7	-38.7	53.0	448.0	13200.5	-29.4
19240.00	H	46.5	2.2	40.4	-40.2	48.9	277.9	5000.0	-25.1
19240.00	V	47.7	2.2	40.4	-40.2	50.0	317.9	5000.0	-23.9
21645.00	H	34.6	2.2	40.6	-26.2	51.1	360.8	13200.5	-31.3
21645.00	V	34.1	2.2	40.6	-26.2	50.6	340.6	13200.5	-31.8
24050.00	H	33.2	2.2	40.6	-27.4	48.7	270.7	13200.5	-33.8
24050.00	V	33.6	2.2	40.6	-27.4	49.1	283.5	13200.5	-33.4

Checked BY Richard E. King :

Richard E. King

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Radiated Emissions
Date : August 5, 2011
Mode : Transmit @ 2405MHz
Test Distance : 3 meters
Notes : Average Data

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
4810.0	H	41.4	4.9	34.8	-40.1	-41.9	-0.8	0.9	500.0	-54.8
4810.0	V	45.2	4.9	34.8	-40.1	-41.9	3.0	1.4	500.0	-51.0
12025.0	H	35.6	8.0	41.4	-39.6	-41.9	3.5	1.5	500.0	-50.5
12025.0	V	35.1	8.0	41.4	-39.6	-41.9	3.0	1.4	500.0	-51.0
19240.0	H	33.7	2.2	40.4	-27.5	-41.9	6.9	2.2	500.0	-47.1
19240.0	V	34.1	2.2	40.4	-27.5	-41.9	7.3	2.3	500.0	-46.7

Checked BY Richard E. King :

Richard E. King

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Radiated Emissions
Date : August 5, 2011
Mode : Transmit @ 2445MHz
Test Distance : 3 meters
Notes : Peak Data

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
2445.00	H	60.3	3.4	31.3	0.0	95.1	56914.3		
2445.00	V	63.3	3.4	31.3	0.0	98.1	80393.6		
4890.00	H	48.6	5.0	34.9	-40.1	48.2	257.9	5000.0	-25.7
4890.00	V	50.4	5.0	34.9	-40.1	50.1	318.8	5000.0	-23.9
7335.00	H	44.8	6.2	38.2	-39.7	49.4	296.2	5000.0	-24.5
7335.00	V	44.7	6.2	38.2	-39.7	49.3	290.1	5000.0	-24.7
9780.00	H	35.3	6.9	39.8	-38.7	43.3	146.7	8039.4	-34.8
9780.00	V	35.6	6.9	39.8	-38.7	43.6	151.8	8039.4	-34.5
12225.00	H	44.4	8.0	41.5	-39.4	54.5	529.3	5000.0	-19.5
12225.00	V	45.4	8.0	41.5	-39.4	55.4	588.5	5000.0	-18.6
14670.00	H	36.6	8.8	44.2	-40.1	49.5	299.5	8039.4	-28.6
14670.00	V	36.6	8.8	44.2	-40.1	49.5	299.5	8039.4	-28.6
17115.00	H	34.7	9.6	44.7	-38.7	50.3	325.7	8039.4	-27.8
17115.00	V	36.4	9.6	44.7	-38.7	51.9	393.0	8039.4	-26.2
19560.00	H	33.7	2.2	40.4	-27.1	49.1	286.7	5000.0	-24.8
19560.00	V	34.1	2.2	40.4	-27.1	49.5	300.2	5000.0	-24.4
22005.00	H	34.6	2.2	40.6	-27.0	50.4	330.3	8039.4	-27.7
22005.00	V	34.1	2.2	40.6	-27.0	49.9	311.9	8039.4	-28.2
24450.00	H	33.2	2.2	40.6	-27.5	48.6	268.5	8039.4	-29.5
24450.00	V	33.6	2.2	40.6	-27.5	49.0	281.1	8039.4	-29.1

Checked BY Richard E. King :

Richard E. King

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Radiated Emissions
Date : August 5, 2011
Mode : Transmit @ 2445MHz
Test Distance : 3 meters
Notes : Average Data

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
4890.0	H	39.9	5.0	34.9	-40.1	-41.9	-2.4	0.8	500.0	-56.3
4890.0	V	45.0	5.0	34.9	-40.1	-41.9	2.7	1.4	500.0	-51.2
7335.0	H	49.4	6.2	38.2	-39.7	-41.9	12.1	4.0	500.0	-41.8
7335.0	V	49.6	6.2	38.2	-39.7	-41.9	12.3	4.1	500.0	-41.7
12225.0	H	45.9	8.0	41.5	-39.4	-41.9	14.1	5.0	500.0	-39.9
12225.0	V	47.0	8.0	41.5	-39.4	-41.9	15.1	5.7	500.0	-38.8
19560.0	H	33.7	2.2	40.4	-27.1	-41.9	7.2	2.3	500.0	-46.7
19560.0	V	34.1	2.2	40.4	-27.1	-41.9	7.6	2.4	500.0	-46.3

Checked BY Richard E. King :

Richard E. King

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Radiated Emissions
Date : August 5, 2011
Mode : Transmit @ 2475MHz
Test Distance : 3 meters
Notes : Peak Data

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
2475.00	H	62.1	3.5	31.4	0.0	96.9	70049.6		
2475.00	V	65.9	3.5	31.4	0.0	100.7	108869.4		
4950.00	H	46.9	5.0	34.9	-40.2	46.6	213.1	5000.0	-27.4
4950.00	V	47.4	5.0	34.9	-40.2	47.1	226.5	5000.0	-26.9
7425.00	H	43.6	6.2	38.2	-39.7	48.3	260.8	5000.0	-25.7
7425.00	V	45.0	6.2	38.2	-39.7	49.7	304.7	5000.0	-24.3
9900.00	H	35.1	7.0	39.9	-38.6	43.3	146.5	10886.9	-37.4
9900.00	V	34.1	7.0	39.9	-38.6	42.3	130.0	10886.9	-38.5
12375.00	H	45.7	8.0	41.5	-39.3	55.9	626.5	5000.0	-18.0
12375.00	V	44.8	8.0	41.5	-39.3	55.1	566.8	5000.0	-18.9
14850.00	H	36.1	8.9	44.5	-40.2	49.3	292.3	10886.9	-31.4
14850.00	V	35.6	8.9	44.5	-40.2	48.8	275.3	10886.9	-31.9
17325.00	H	36.7	9.7	44.6	-39.0	52.0	398.0	10886.9	-28.7
17325.00	V	35.0	9.7	44.6	-39.0	50.3	329.2	10886.9	-30.4
19800.00	H	33.7	2.2	40.4	-26.9	49.4	294.4	5000.0	-24.6
19800.00	V	34.1	2.2	40.4	-26.9	49.8	308.3	5000.0	-24.2
22275.00	H	34.6	2.2	40.6	-27.1	50.3	328.7	5000.0	-23.6
22275.00	V	34.1	2.2	40.6	-27.1	49.8	310.3	5000.0	-24.1
24750.00	H	33.2	2.2	40.7	-27.2	48.8	275.8	10886.9	-31.9
24750.00	V	33.6	2.2	40.7	-27.2	49.2	288.8	10886.9	-31.5

Checked BY Richard E. King :

Richard E. King

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Radiated Emissions
Date : August 5, 2011
Mode : Transmit @ 2475MHz
Test Distance : 3 meters
Notes : Average Data

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

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Total dBuV/m at 3 M	Total uV/m at 3M	Limit uV/m at 3M	Margin (dB)
4950.0	H	38.8	5.0	34.9	-40.2	-41.9	-3.4	0.7	500.0	-57.4
4950.0	V	40.8	5.0	34.9	-40.2	-41.9	-1.4	0.9	500.0	-55.4
7425.0	H	36.2	6.2	38.2	-39.7	-41.9	-1.0	0.9	500.0	-55.0
7425.0	V	34.2	6.2	38.2	-39.7	-41.9	-3.0	0.7	500.0	-57.0
12375.0	H	35.7	8.0	41.5	-39.3	-41.9	4.0	1.6	500.0	-50.0
12375.0	V	35.2	8.0	41.5	-39.3	-41.9	3.6	1.5	500.0	-50.4
19800.0	H	33.7	2.2	40.4	-26.9	-41.9	7.5	2.4	500.0	-46.5
19800.0	V	34.1	2.2	40.4	-26.9	-41.9	7.9	2.5	500.0	-46.1
22275.0	H	34.6	2.2	40.6	-27.1	-41.9	8.4	2.6	500.0	-45.5
22275.0	V	34.1	2.2	40.6	-27.1	-41.9	7.9	2.5	500.0	-46.0

Checked BY Richard E. King :

Richard E. King

DATA SHEET

Manufacturer : Twisthink, LLC
EUT : Light Control Module (LCM)
Model No. : TT10160-01
Test Specification : FCC Part 15, Subpart C, Section 15.247, Peak Output Power
Date : August 5, 2011
Notes : EIRP = Matched Signal - Cable Loss + Antenna Gain

Freq (MHz)	Ant Pol	Meter Reading (dBuV)	Matched SIG. GEN. (dB)	Equivalent Ant Gain (dB)	CBL (dB)	Total (dBm)	Limit
2405.00	H	63.1	-4.6	8.3	3.0	0.7	36
2405.00	V	67.7	-1.3	8.3	3.0	4.0	36
2445.00	H	61.4	-5.1	8.4	3.1	0.2	36
2445.00	V	64.9	-4.1	8.4	3.1	1.2	36
2475.00	H	62.1	-6.1	8.4	3.1	-0.8	36
2475.00	V	65.9	-3.1	8.4	3.1	2.2	36

Checked BY Richard E. King :

Richard E. King