Measurement of RF Emissions from a Morrison Wireless Gateway Model No. RGX Transmitter

For	Industrial Scientific Corporation 1 Life Way Pittsburgh, PA 15205
P.O. Number	400276120-
Date Tested	February 13 2018, June 7 through June 14, 2018
Test Personnel	Javier Cardenas, Tylar Jozefczyk and Richard King
Test Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.225 for Digital Modulation Intentional Radiators Operating within the band 13.110-14.010MHz Industry Canada RSS-GEN Industry Canada RSS-210

Test Report By:

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REVISION HISTORY

Revision	Date	Description
—	13 July 2018	Initial release
A	17 July 2018 By REK	Added Rev A to the report number on the cover and throughout the report. Section 3.2 was changed to include the CFR 47_207_ATT_NFC_normal mode and its description. Section 5.1.2 the operational mode was changed from NFC Radio Only to CFR 47_207_ATT_NFC_normal.

Measurement of RF Emissions from a Morrison Wireless Gateway, Model No. RGX Transmitter

1. INTRODUCTION

1.1. Scope of Tests

This report represents the results of the series of radio interference measurements performed on an Industrial Scientific Corporation Morrison Wireless Gateway, Model No. RGX, Serial No. 18052MT-003, transmitter (hereinafter referred to as the EUT). The EUT is contains a digital modulation transmitter. The transmitter was designed to transmit in the 13.110-14.010MHz band using an internal antenna. The EUT was manufactured and submitted for testing by Industrial Scientific Corporation located in Pittsburgh, PA.

1.2. Purpose

The test series was performed to determine if the EUT meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.225 for Intentional Radiators. The test series was also performed to determine if the EUT meets the conducted RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 8.8 and the radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-210, Annex B for transmitters. Testing was performed in accordance with ANSI C63.4-2014.

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 American Association for Laboratory Accreditation (A2LA). A2LA Certificate Number: 1786.01.

1.5. Laboratory Conditions

The temperature at the time of the test was 23^{o}C and the relative humidity was 38%.

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 C.
- ANSI C63.4-2014, "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"
- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”
- Federal Communications Commission Office of Engineering and Technology Laboratory Division Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under Section 15.225, October 4, 2012
- Industry Canada Radio Standards Specification, RSS-Gen, “General Requirements for Compliance of Radio Apparatus”, Issue 5, April 2018
- Industry Canada Radio Standards Specification, RSS-210, “License-Exempt Radio Apparatus: Category I Equipment”, Issue 9, August 2016

3. EUT SETUP AND OPERATION

3.1. General Description

The EUT is an Industrial Scientific Corporation, Morrison Wireless Gateway, Model No. RGX. A block diagram of the EUT setup is shown as Figure 1.

3.1.1. Power Input

The EUT obtained 12V 60Hz power through 2 leads from the secondary of a TDK Lambda Co. step-down transformer, Part No. DT62PW120D-003. The primary of this transformer received 115V 60Hz power through lowpass powerline filters on the wall of the shielded enclosure.

3.1.2. Peripheral Equipment

The following peripheral equipment was submitted with the EUT:

Item	Description
Laptop	Used to load simulation profile

3.1.3. Signal Input/Output Leads

The following interconnect cables were submitted with the EUT:

Item	Description
Ethernet Cable	20 meter length

3.1.4. Grounding

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

3.2. Operational Mode

The EUT was placed on an 80cm high non-conductive stand. The EUT was energized.
For all testing except conducted emissions the EUT was operated in the NFC Radio Only mode. For conducted emissions testing the EUT was operated in the CFR 47_207_ATT_NFC_normal mode.

NFC Radio Only : The EUT was set to transmit at 13.56MHz.

CFR 47_207_ATT_NFC_normal: The RGX Gateway NFC circuit was set to transmit at the following duty cycle: 70 ms on / 1930 ms off to simulate actual NFC "wait" mode as used in actual operation.

3.3. EUT Modifications

No modifications were required for compliance to the FCC 15.225 requirements.

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 C63.4-2014 for site attenuation.

4.2. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 16-1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

Conducted and radiated emission measurements were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths and detector functions specified by the FCC. The receiver bandwidth was 120kHz for the 30MHz to 1000MHz radiated emissions data and 1MHz for the 1000MHz to 5000MHz 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.

Values of Expanded Measurement Uncertainty (95% Confidence) are presented below:

Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2

5. TEST PROCEDURES

5.1. Powerline Conducted Emissions

5.1.1.Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Per 15.207(a) and Industry Canada RSS-Gen section 7.2.4, all radio frequency voltages on the power lines of a transmitter shall be below the values shown below when using a quasi-peak or average detector:

Frequency MHz	Conducted Limit (dBuV)	
	Quasi-peak	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 EUT is considered to have met both requirements and measurements do not need to be performed using the Average detector.

5.1.2.Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

6. The EUT was operated in the CFR 47_207_ATT_NFC_normal mode.
7. Measurements were first made on the 120VAC high line.
8. The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
9. Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
10. The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
11. Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits.
12. Steps (c) through (f) were repeated on the 120VAC neutral line.

12.1.1. Results

The plots and tabular data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line are shown on pages 18 and 21. All power line conducted emissions measured from the EUT were within the specification limits.

Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 2.

12.2. Occupied Bandwidth / 20dB Bandwidth

12.2.1. Requirement

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

12.2.2. Procedures

The EUT was allowed to transmit continuously. The resolution bandwidth (RBW) was set to 200Hz and the span was set to greater than the RBW.

The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

12.2.3. Results

A plot of the 20dB down emission is shown on page 22. This plot shows that the maximum 20 dB bandwidth was 959Hz and that the entire emission at 20dB was within the allowable transmit band. The 99% bandwidth was measured to be 2.78kHz.

12.3. Radiated Spurious Emissions Measurements

12.3.1. Requirements

The EUT must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.225 and RSS-210 Annex B:

Paragraph FCC 15.225 and RSS-210 Annex B has the following radiated emission limits:

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

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

12.3.2. Procedures

(1) 10MHz to 30MHz Frequency Range

A preliminary radiated emissions test was performed to determine the emission characteristics of the EUT. For the preliminary test, an active loop measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 10MHz to 30MHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 10MHz to 30MHz using an active loop antenna. All significant broadband and narrowband signals were measured and recorded using a quasi-peak detector with a 9kHz bandwidth.

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

1. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
2. The active loop antenna was placed at a height of 1 meter.
3. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
4. With the loop antenna in the vertical polarization, the loop antenna was rotated through 360 degrees.

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total. (Per 15.231(f) (2), at

frequencies below 30MHz, measurements may be made at a distance closer than that specified. When performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).)

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

(2) 30MHz to 1000MHz Frequency Range

Since a quasi-peak detector requires long integration times, it is not practical to automatically sweep through the quasi-peak levels. Therefore, radiated emissions from the EUT 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.

The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 30MHz to 1000MHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted. The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

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

1. Measurements from 30MHz to 1000MHz were made using a quasi-peak detector and a broadband bilog antenna.

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

    1. The EUT 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.

12.3.3. Results

The preliminary plots, with the EUT transmitting at 13.56MHz and powered with a power supply and battery, are presented on data pages 23 through 62. The plots are presented for a reference only, and are not used to determine compliance.

The final radiated levels, with the EUT transmitting at 13.56MHz and powered with a power supply and battery, are presented on data pages 63 and 64. As can be seen from the data, all emissions measured from the EUT

were within the specification limits.

Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figure 3 and Figure 4.

12.4. Frequency Stability

12.4.1. Requirements

Per CFR 47 section 15.225(e) and RSS-210 Annex B, the frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20°C to +50°C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C.

12.4.2. Procedure

1. The EUT was placed inside a temperature chamber and the temperature was set to 20°C.
2. The EUT was allowed to soak for at least 20 minutes at temperature.
3. The EUT was powered with 120VAC 60Hz and set to transmit in the NFC Radio Only mode.
4. The EUT was connected to a receiver and then the frequency was measured.
5. Steps (3) and (4) were repeated with the EUT powered at 102VAC 60Hz.
6. Steps (3) and (4) were repeated with the EUT powered at 138VAC 60Hz. The EUT was then powered with the normal supply voltage of 120VAC 60Hz.
7. The temperature of the temperature chamber was then set to -20°C and allowed to soak for at least 20 minutes before being measured.
8. The EUT was then measured and had the result recorded.
9. Steps (7) and (8) were then repeated for the following temperatures: -10°C, 0°C, 10°C, 30°C, 40°C, and 50°C.

12.4.3. Results

Page 65 shows the frequency stability results. As can be seen from the data, the EUT met the frequency stability requirements.

13. OTHER TEST CONDITIONS

13.1. Test Personnel and Witnesses

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

13.2. Disposition of the EUT

The EUT and all associated equipment were returned to Industrial Scientific Corporation upon completion of the tests.

14. CONCLUSIONS

It was determined that the Industrial Scientific Corporation Morrison Wireless Gateway, Model No. RGX, Morrison Wireless Gateway transmitter, Serial No. 18052MT-003, 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 15.225 for Intentional Radiators Operating within the 13.110-14.010MHz band, when tested per ANSI C63.4-2014.

It was also determined that the Industrial Scientific Corporation Morrison Wireless Gateway, Model No. RGX, Morrison Wireless Gateway transmitter, Serial No. 18052MT-003, did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen Section 8.8 and RSS-210 Annex B, for transmitters, when tested per ANSI C63.4-2014.

15. 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.

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the Federal Government.

16. EQUIPMENT LIST

Table 16-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	4/5/2018	4/5/2019
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/5/2018	4/5/2019
CDY6	LAB COMPUTER	ELITE	WORKSTATION		WINDOWS 7	N/A	
EMCE02	TEMPERATURE CHAMBER	THERMOTRON	S-8	15461	-70C TO 150C	6/29/2018	6/29/2019
GRB0	1MHZ, LISN SIGNAL CHECKER	ELITE	LISNCHKR1M	1	1MHZ	1/12/2018	1/12/2019
MEA3	MICRO-OHM METER	KEITHLEY	580	772667	10UOHM-200KOHM	6/13/2018	6/13/2019
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	8/18/2017	8/18/2018
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/10/2018	4/10/2020
PHA0	MAGNETIC FIELD PROBE	ELECTRO-METRICS	EM-6882	134	22-230MHZ	NOTE 1	
PLF1	CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	5/7/2018	5/7/2019
PLF3	CISPR16 50UH LISN	ELITE	CISPER16/70A	003	.15-30MHz	5/7/2018	5/7/2019
RBD1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	100009	20Hz-40GHz	3/9/2018	3/9/2019
RBE1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU26	100096	20Hz-26GHz	6/20/2018	6/20/2019
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	2/20/2018	2/20/2019
RBJ2	EMI RECEIVER	ROHDE & SCHWARZ	ESW8	100987	2HZ-8GHZ	1/18/2018	1/18/2019
SAA1	AC POWER SOURCE/ANALYZER	HEWLETT PACKARD	6813A	3524A-00446	0-300VRMS, 1750VA	NOTE 1	
T1N1	10DB 20W ATTENUATOR	NARDA	766-10	---	DC-4GHZ	4/23/2018	4/23/2020
T1N2	10DB 20W ATTENUATOR	NARDA	766-10	---	DC-4GHZ	6/5/2018	6/5/2020
T1N7	10DB 20W ATTENUATOR	NARDA	766-10	---	DC-4GHZ	5/3/2018	5/3/2020
XLQ3	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	1/9/2018	1/9/2020

I/O: Initial Only
N/A: Not Applicable
Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

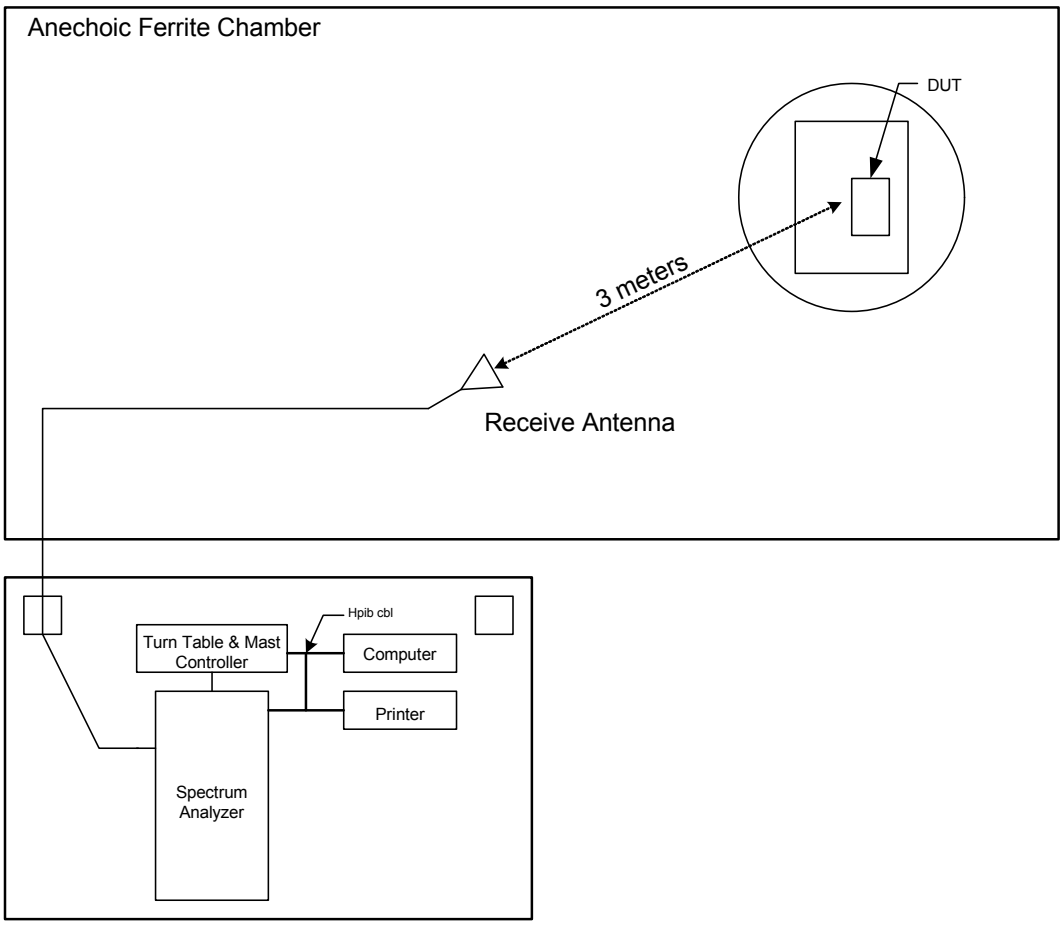


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

Test Setup for Conducted Emissions

Figure 3

Test Setup for Radiated Emissions, below 30MHz – X axis Polarization

Test Setup for Radiated Emissions, below 30MHz – Y axis Polarization

Figure 4

Test Setup for Radiated Emissions, above 30MHz – Horizontal Polarization

Test Setup for Radiated Emissions, above 30MHz – Vertical Polarization

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	INDUSTRIAL SCIENTIFIC CORPORATION
Model	:	RXG GATEWAY (MORRISON GATEWAY)
Serial Number	:	18052MT-003
DUT Mode	:	CFR 47_207_ATT_NFC_normal
Line Tested	:	L1
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-1
Notes	:	No load on antenna port
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Jun 12, 2018 09:52:28 AM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 1 dB margin below limit

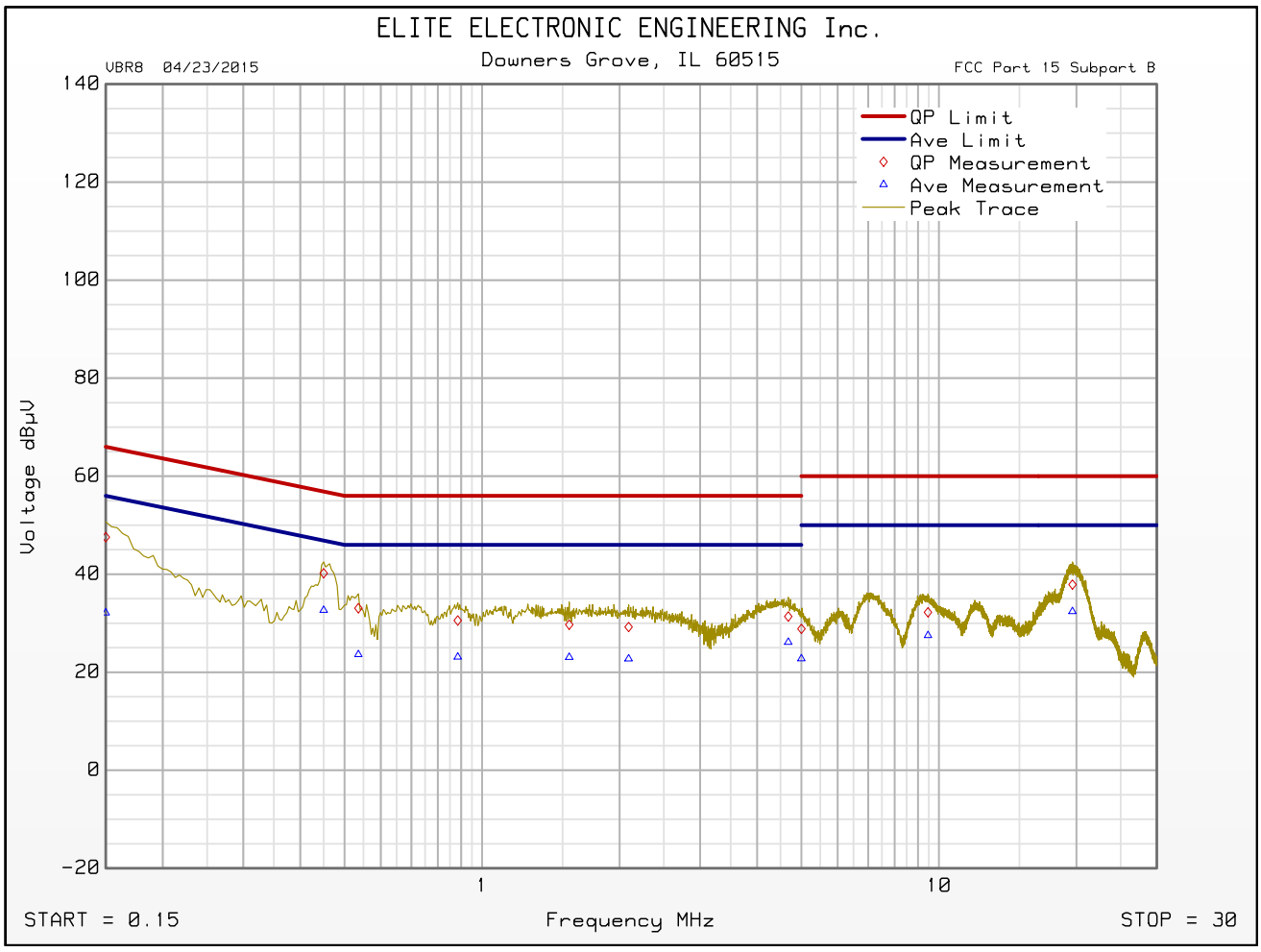
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	47.6	66.0		32.1	56.0	
0.450	40.2	56.9		32.7	46.9	
0.536	33.1	56.0		23.6	46.0	
0.885	30.6	56.0		23.1	46.0	
1.552	29.7	56.0		23.1	46.0	
2.093	29.2	56.0		22.8	46.0	
4.679	31.4	56.0		26.1	46.0	
5.000	28.9	56.0		22.8	46.0	
9.464	32.2	60.0		27.5	50.0	
19.607	37.9	60.0		32.4	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	INDUSTRIAL SCIENTIFIC CORPORATION
Model	:	RXG GATEWAY (MORRISON GATEWAY)
Serial Number	:	18052MT-003
DUT Mode	:	CFR 47_207_ATT_NFC_normal
Line Tested	:	L1
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-1
Notes	:	No load on antenna port
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Jun 12, 2018 09:52:28 AM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	INDUSTRIAL SCIENTIFIC CORPORATION
Model	:	RXG GATEWAY (MORRISON GATEWAY)
Serial Number	:	18052MT-003
DUT Mode	:	CFR 47_207_ATT_NFC_normal
Line Tested	:	L2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-1
Notes	:	No load on antenna port
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Jun 12, 2018 09:46:30 AM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 1 dB margin below limit

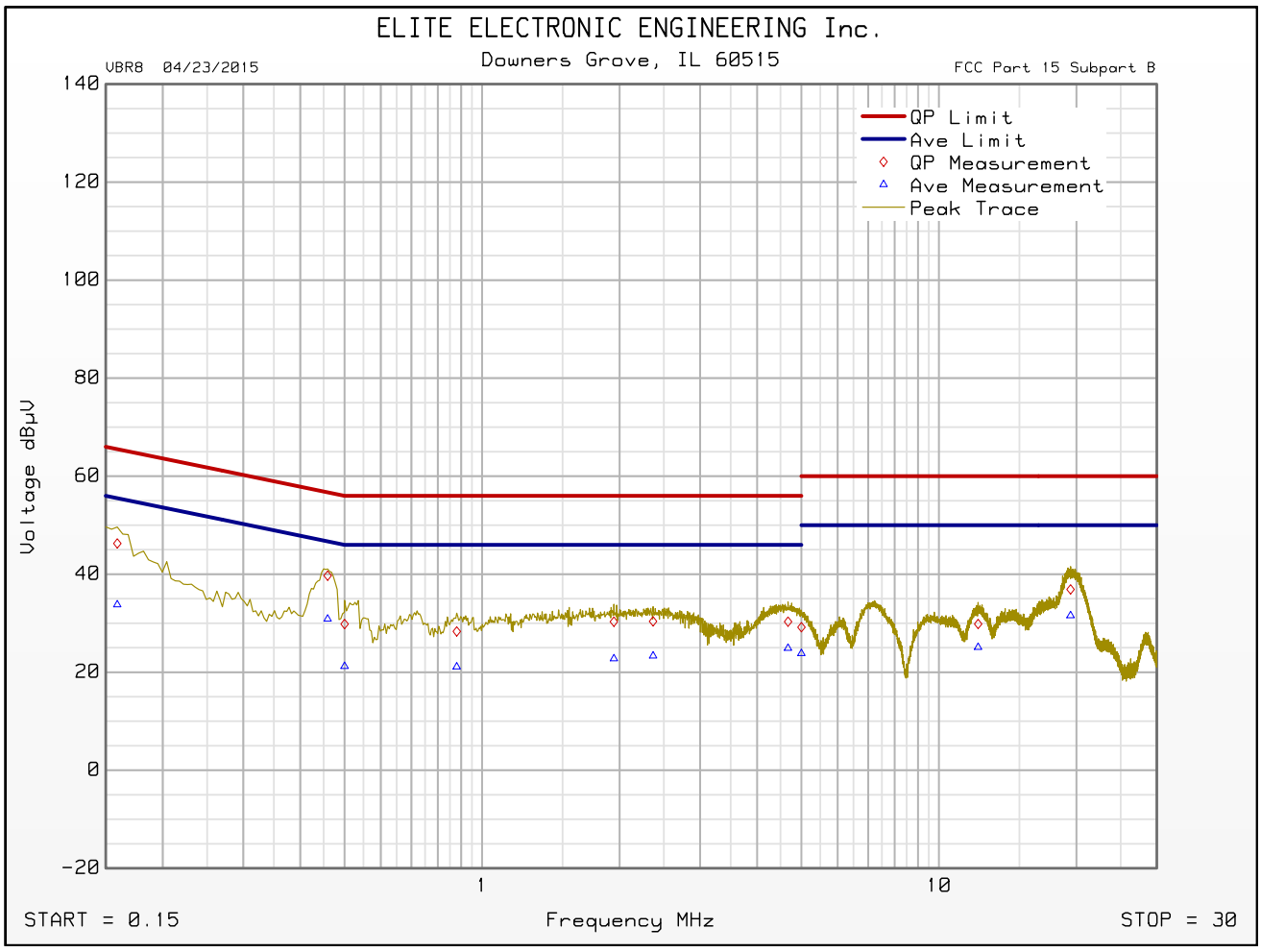
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.159	46.3	65.5		33.8	55.5	
0.459	39.7	56.7		30.9	46.7	
0.500	29.8	56.0		21.2	46.0	
0.880	28.3	56.0		21.1	46.0	
1.943	30.3	56.0		22.8	46.0	
2.367	30.4	56.0		23.3	46.0	
4.675	30.3	56.0		24.9	46.0	
5.000	29.2	56.0		23.8	46.0	
12.186	29.8	60.0		25.1	50.0	
19.414	36.9	60.0		31.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

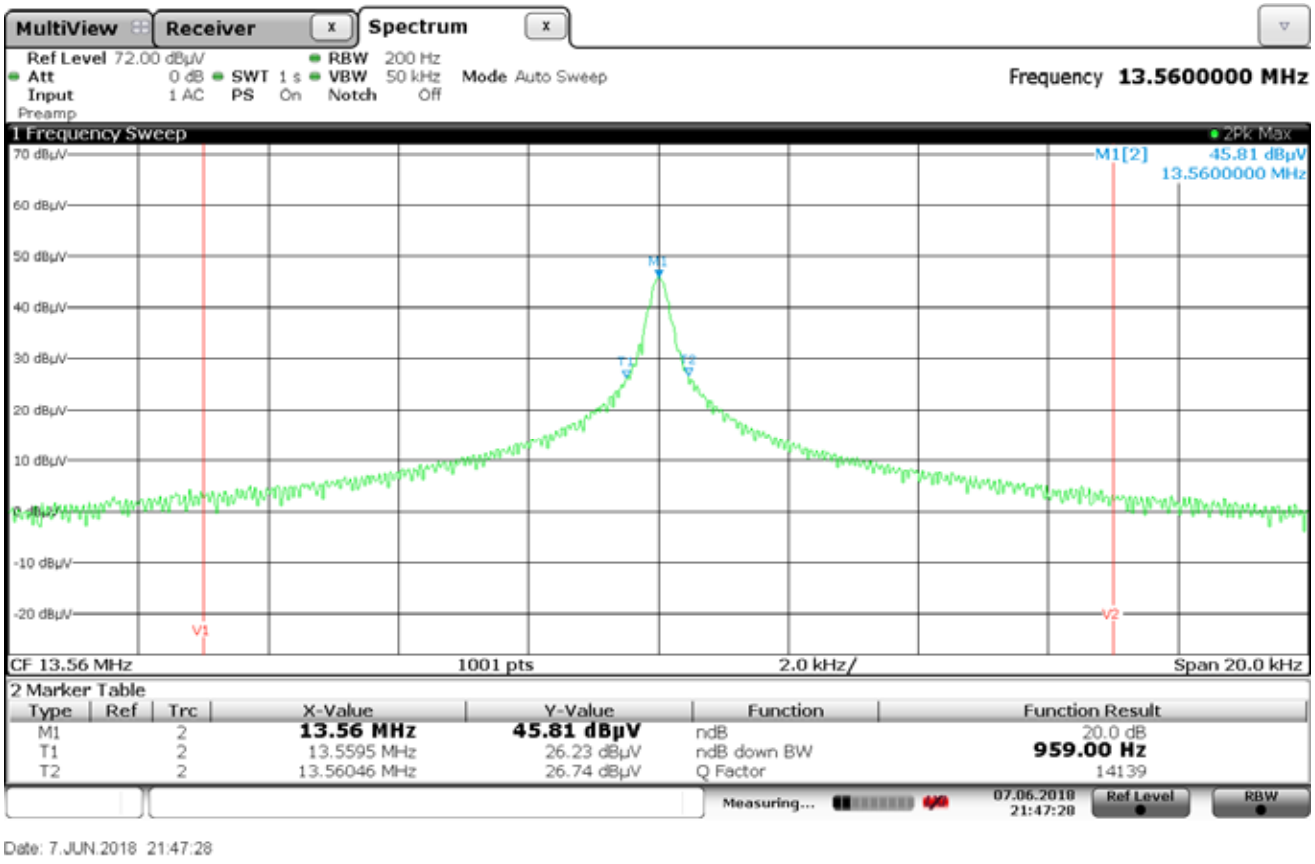
VBR8 04/23/2015

Manufacturer	:	INDUSTRIAL SCIENTIFIC CORPORATION
Model	:	RXG GATEWAY (MORRISON GATEWAY)
Serial Number	:	18052MT-003
DUT Mode	:	CFR 47_207_ATT_NFC_normal
Line Tested	:	L2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-1
Notes	:	No load on antenna port
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Jun 12, 2018 09:46:30 AM



Emissions Meet QP Limit
Emissions Meet Ave Limit

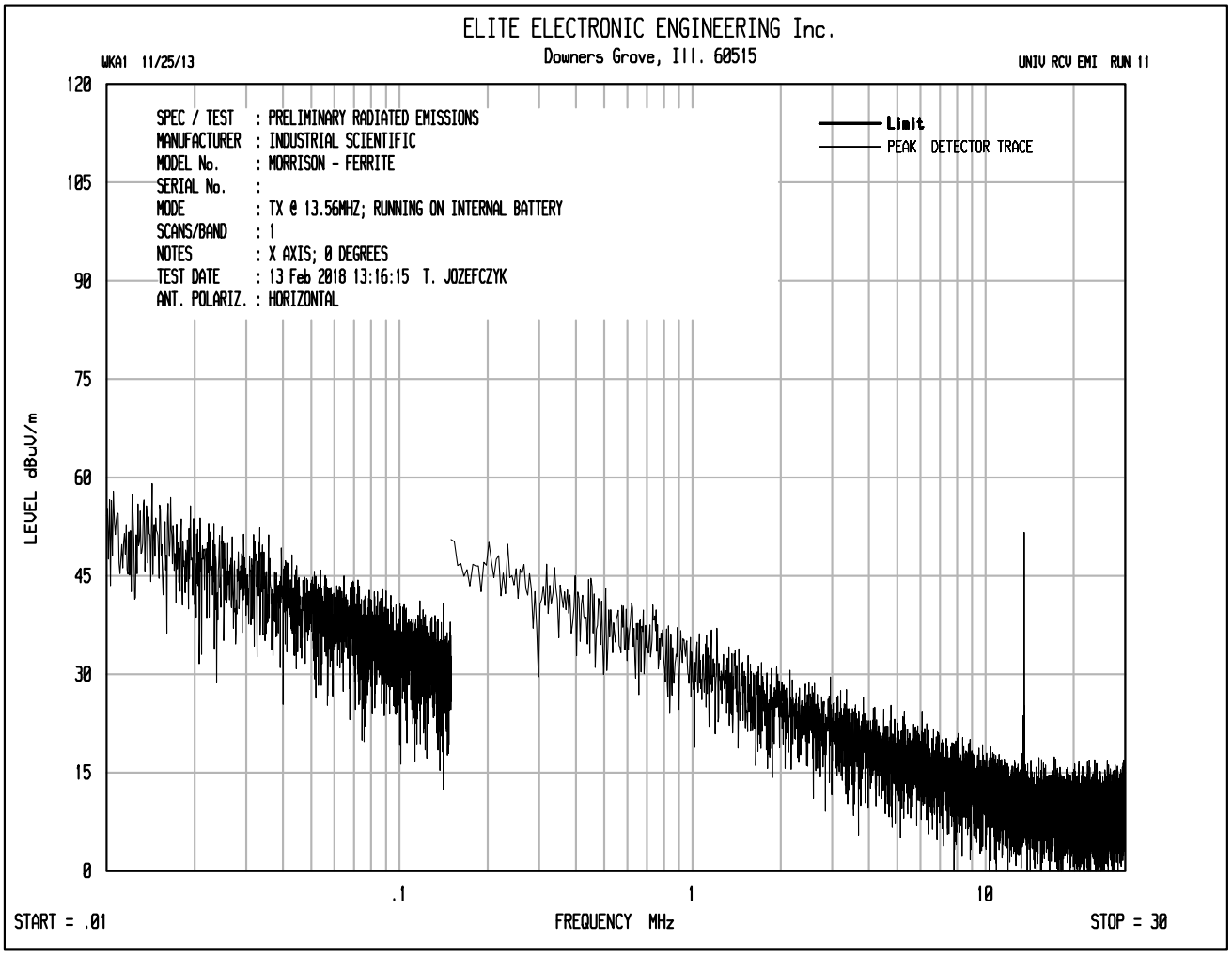
Manufacturer:	Industrial Scientific Corporation
Model No.:	RGX
Serial no.:	18052MT-003
Test Mode:	Tx @ 13.56MHz
Test Date:	June 7, 2018
Test Performed:	FCC 15.215
Notes:	V1 and V2 represent the edges of the allowed transmit band of CFR 47 Part 15.225(a) 13.553-13.567 MHz.

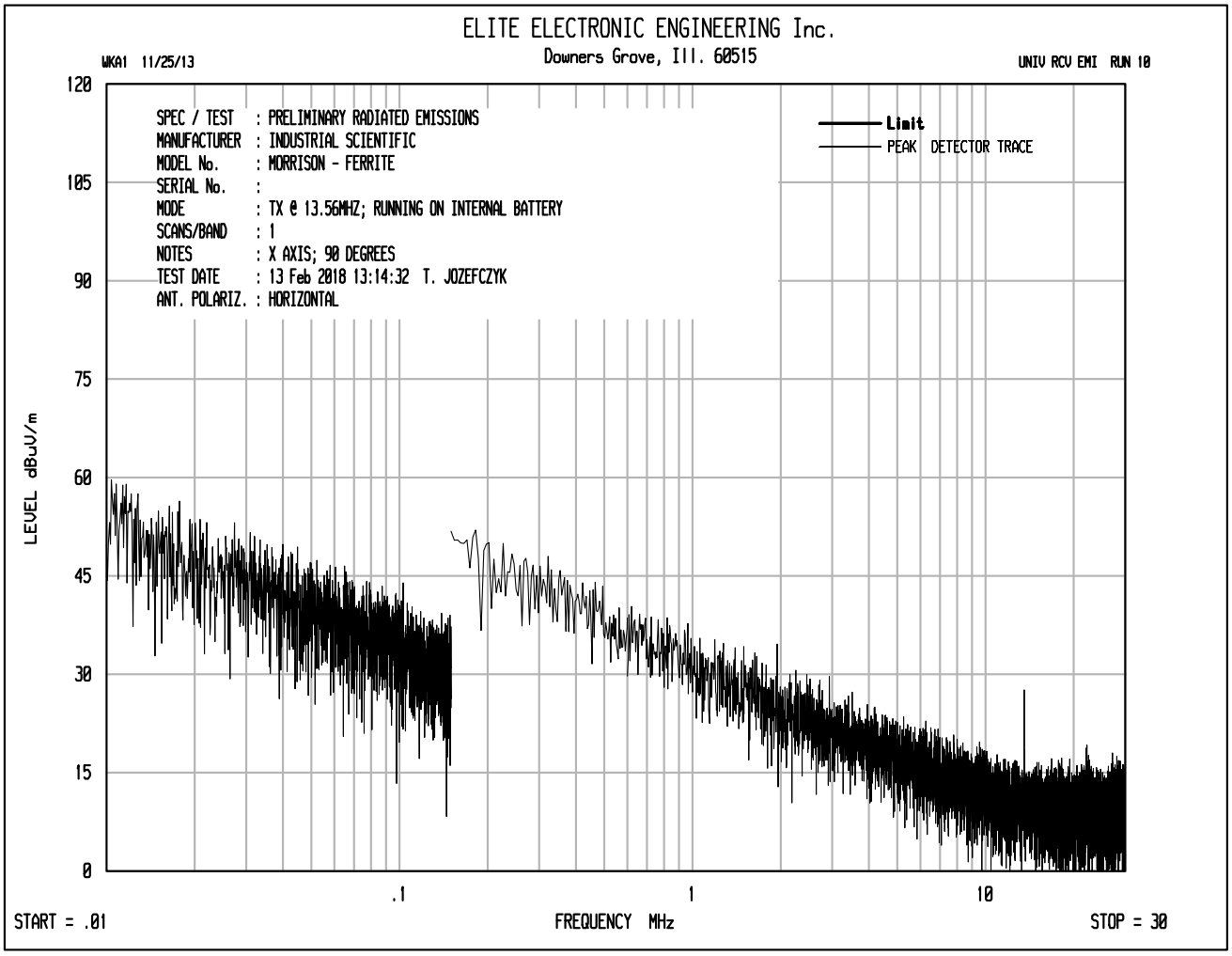


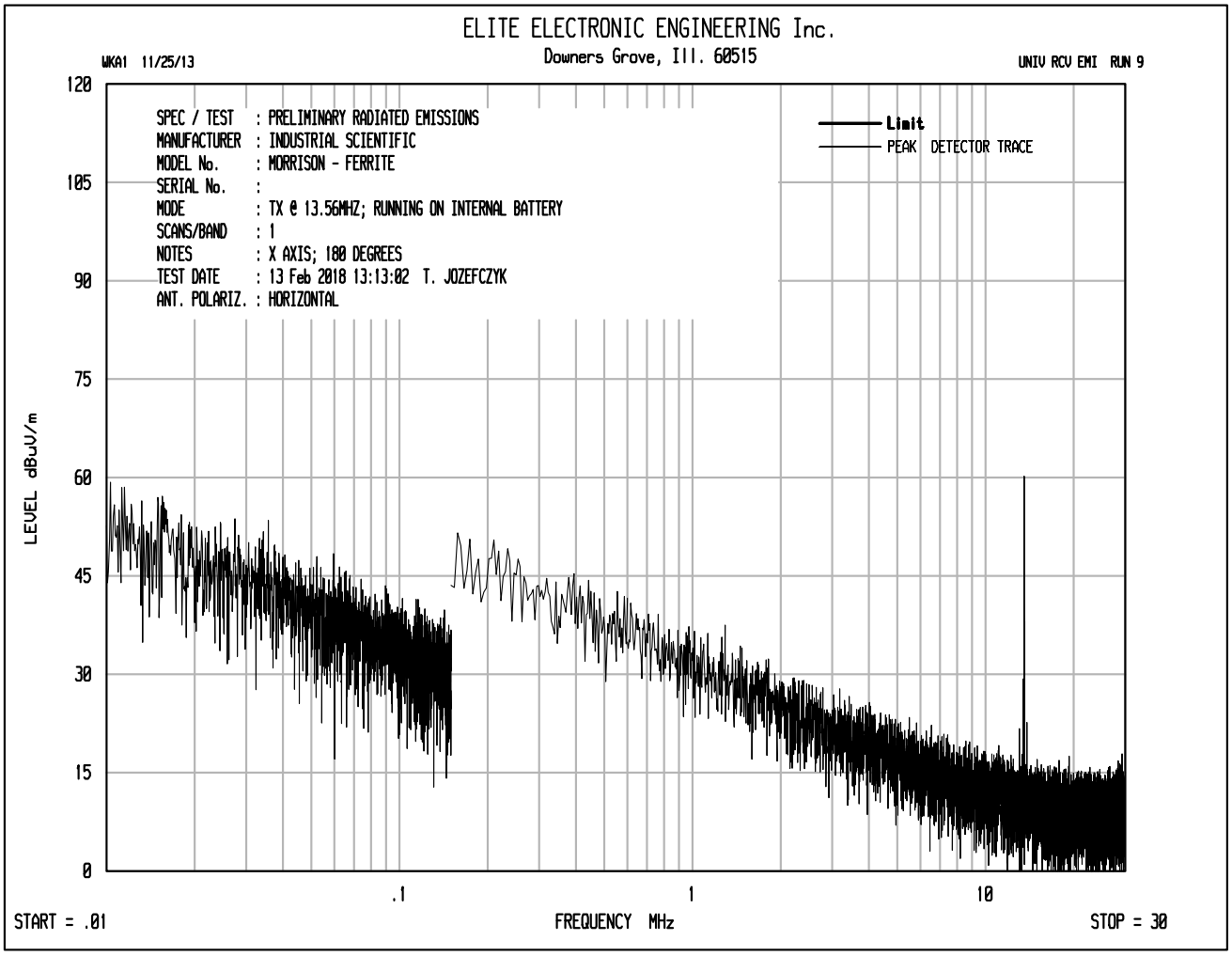
Date: 7.JUN.2018 21:47:28

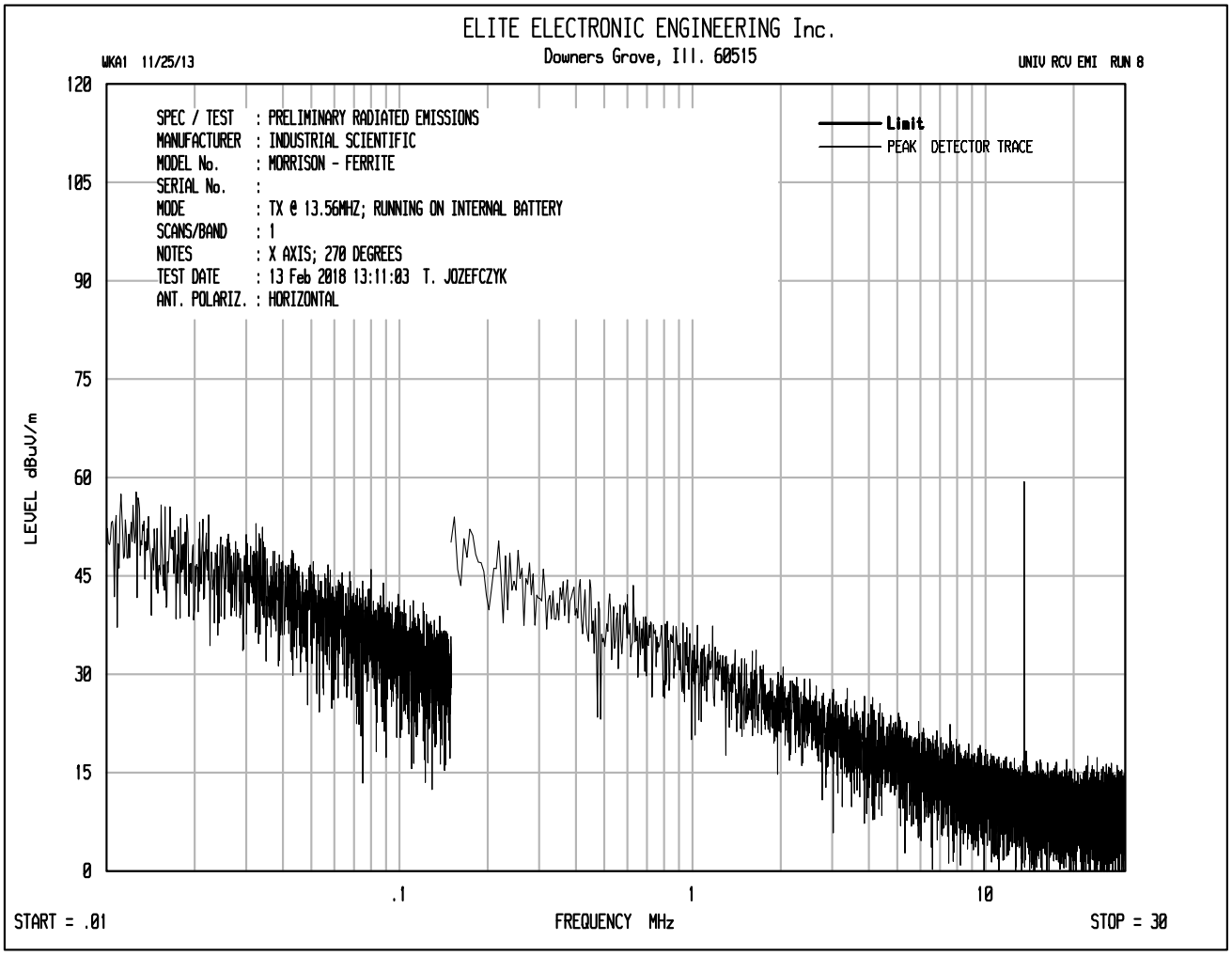
Checked BY Richard E. King :

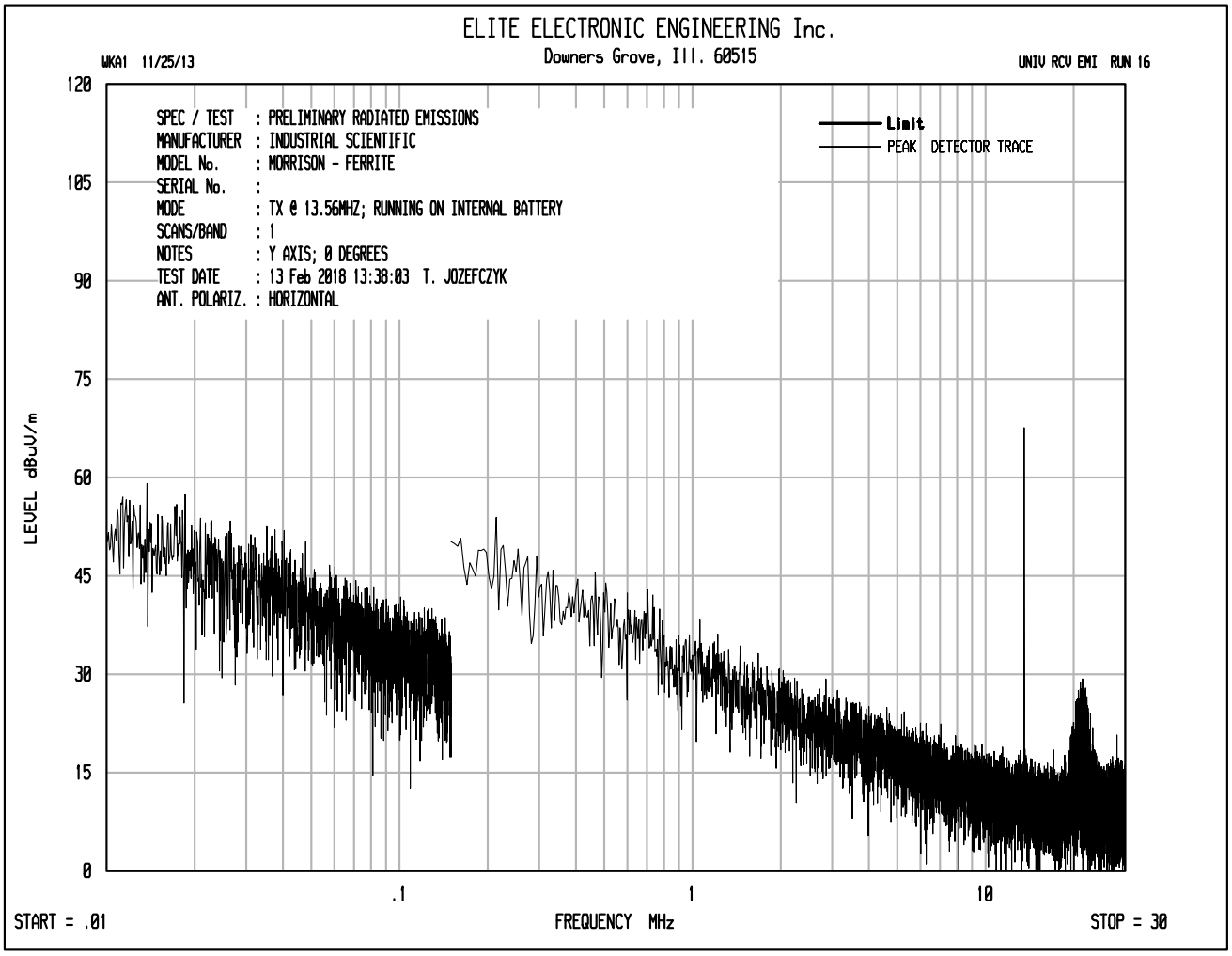
Richard E. King

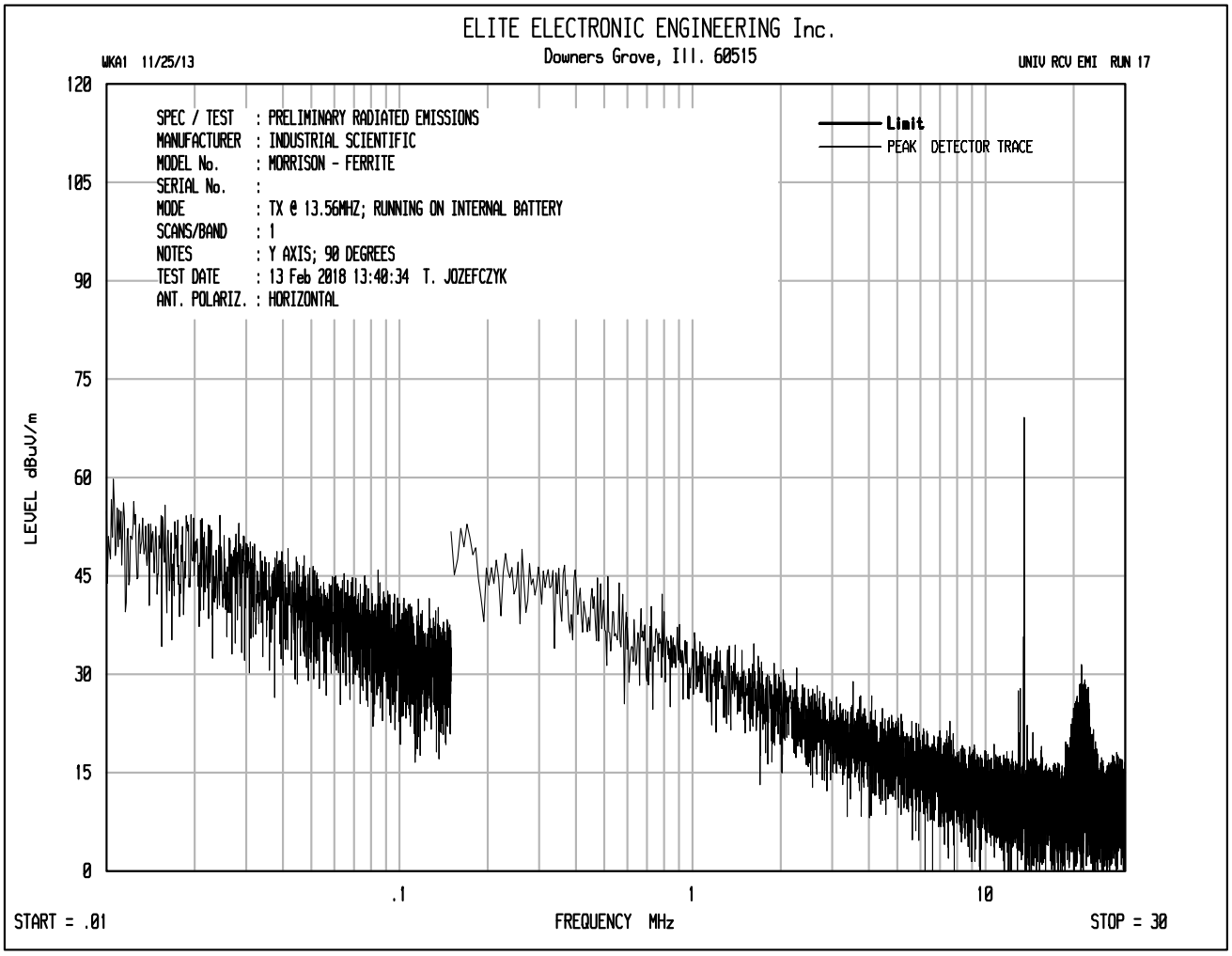

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 11
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : X AXIS; 0 DEGREES
TEST DATE : 13 Feb 2018 13:16:15 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

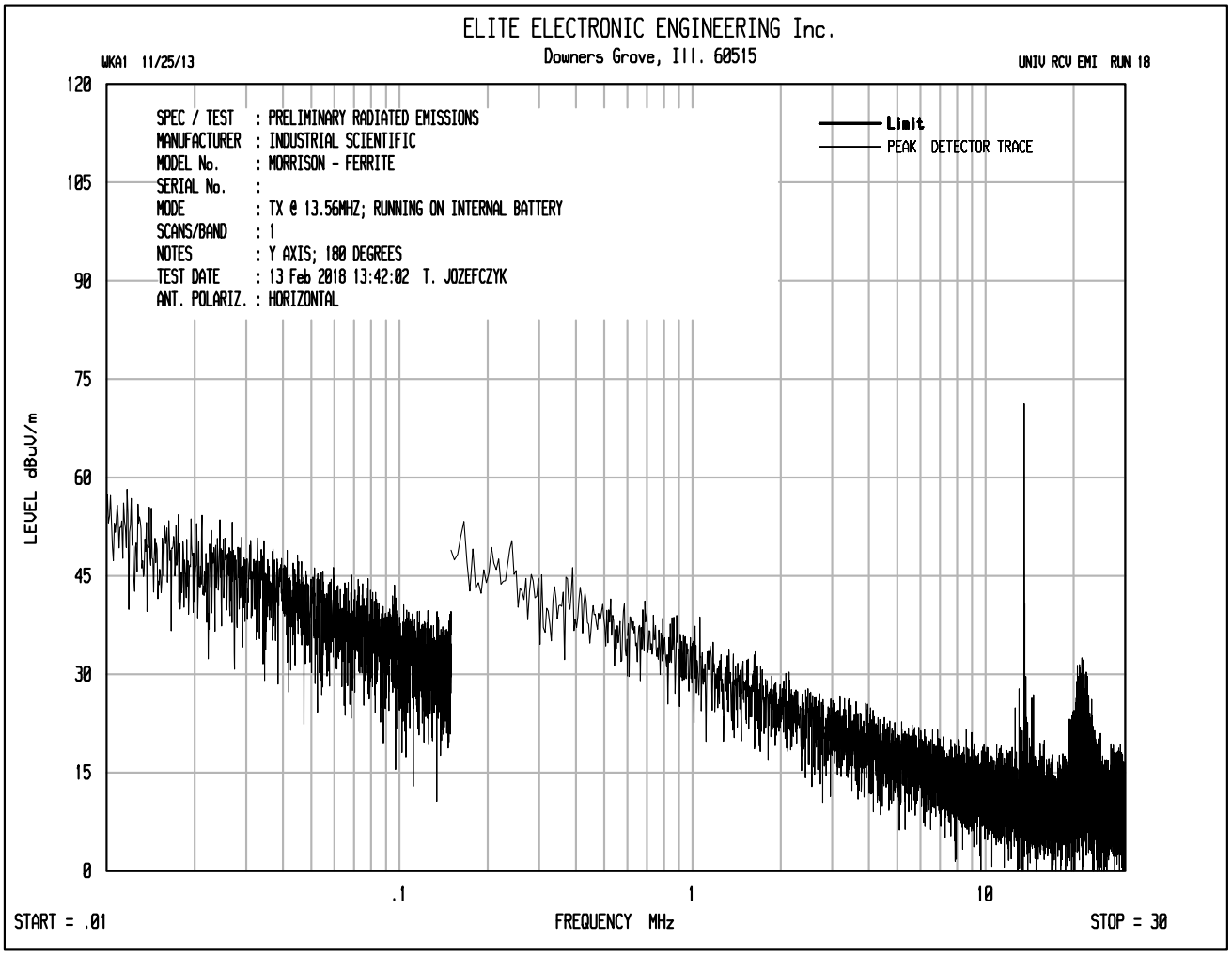

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : X AXIS; 90 DEGREES
TEST DATE : 13 Feb 2018 13:14:32 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

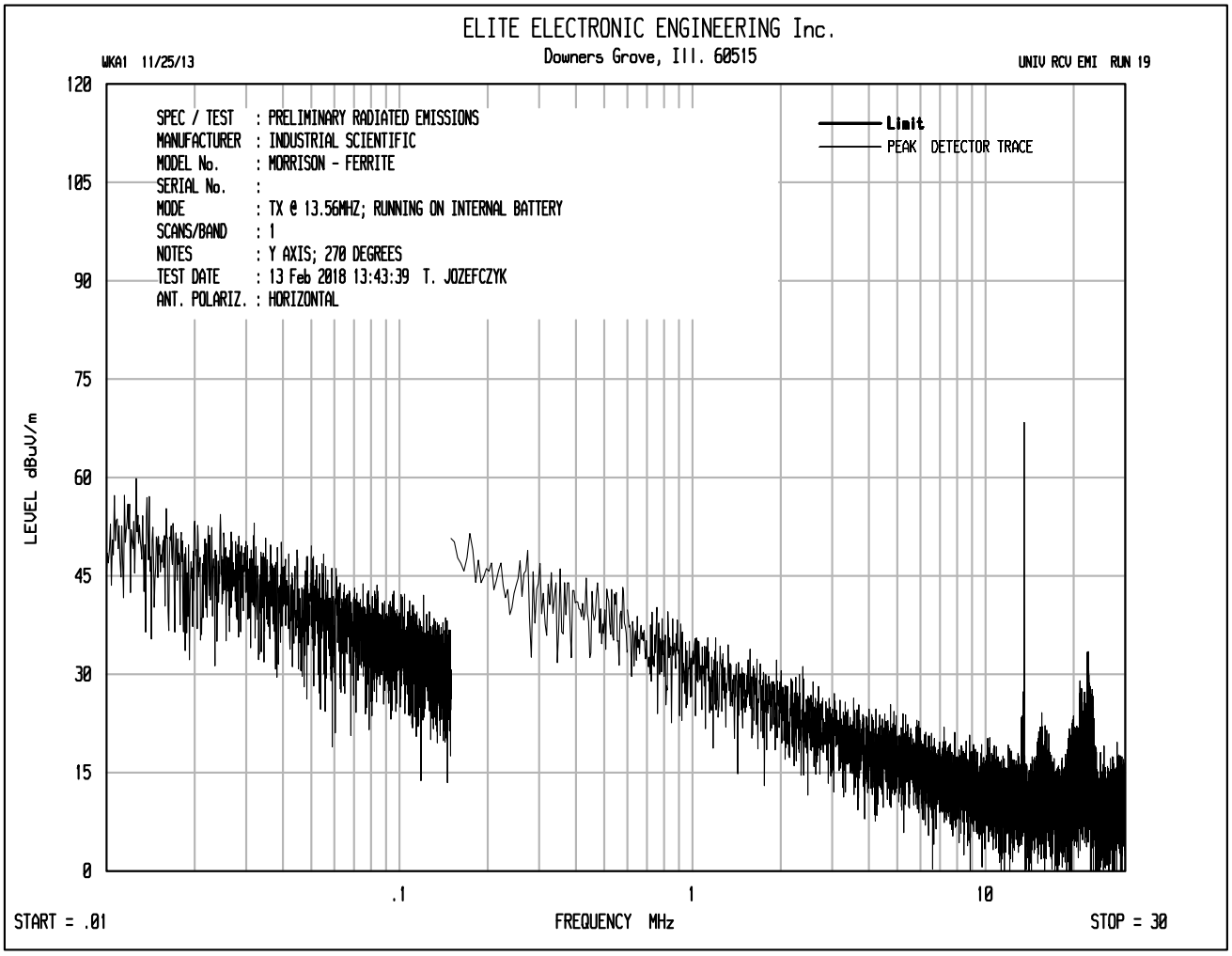

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 9
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : X AXIS; 180 DEGREES
TEST DATE : 13 Feb 2018 13:13:02 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

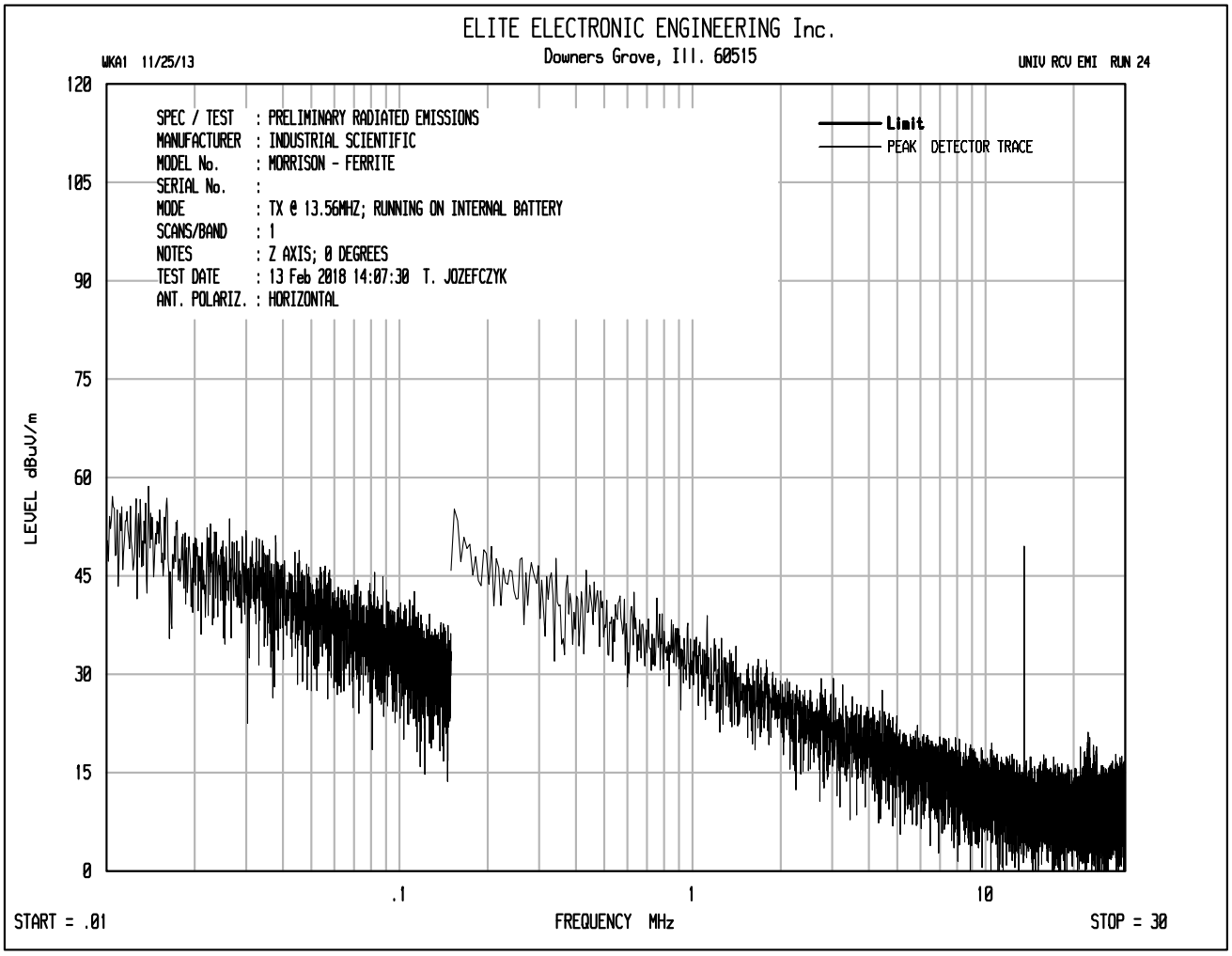

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 8
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : X AXIS; 270 DEGREES
TEST DATE : 13 Feb 2018 13:11:03 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

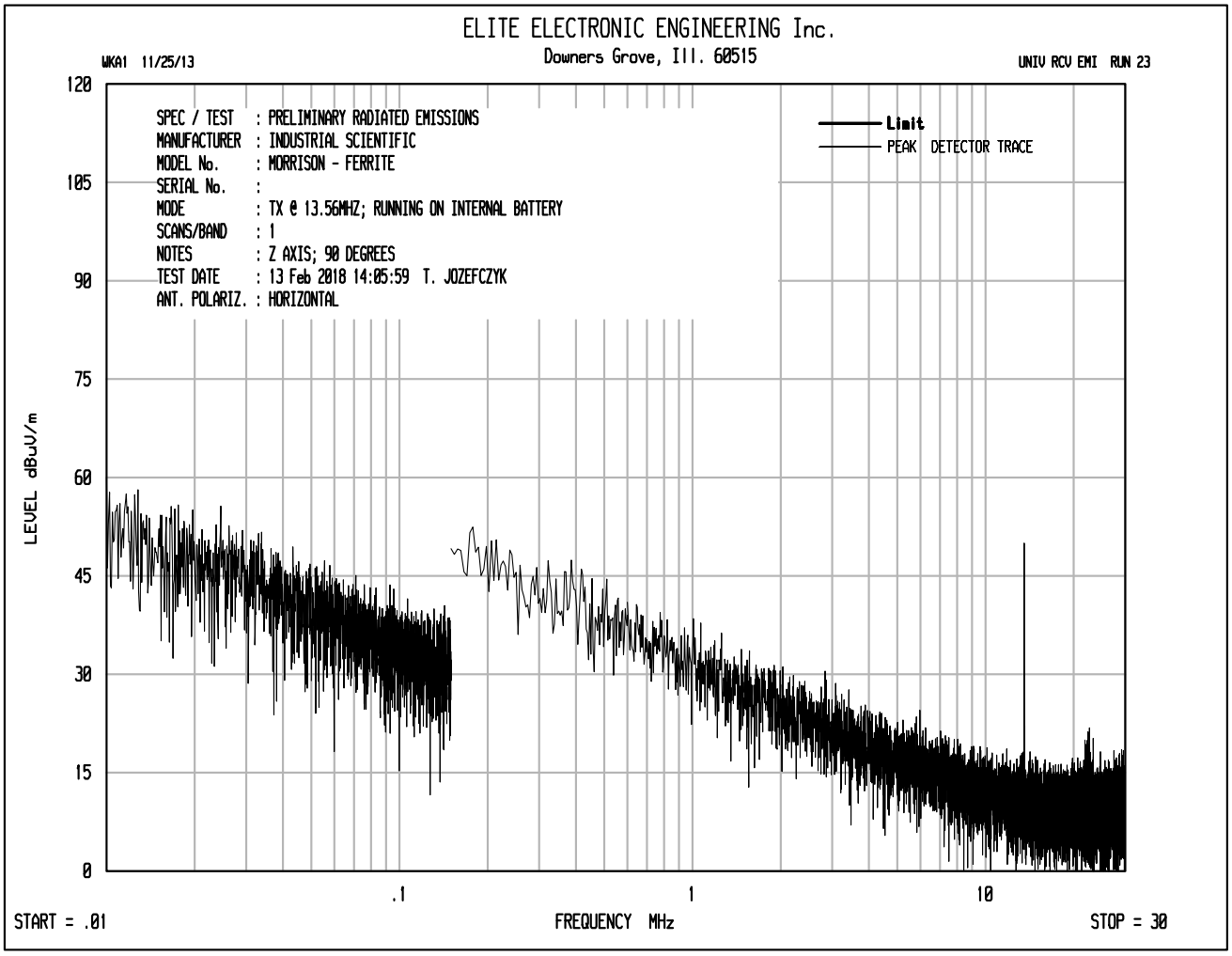

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 16
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 0 DEGREES
TEST DATE : 13 Feb 2018 13:38:03 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

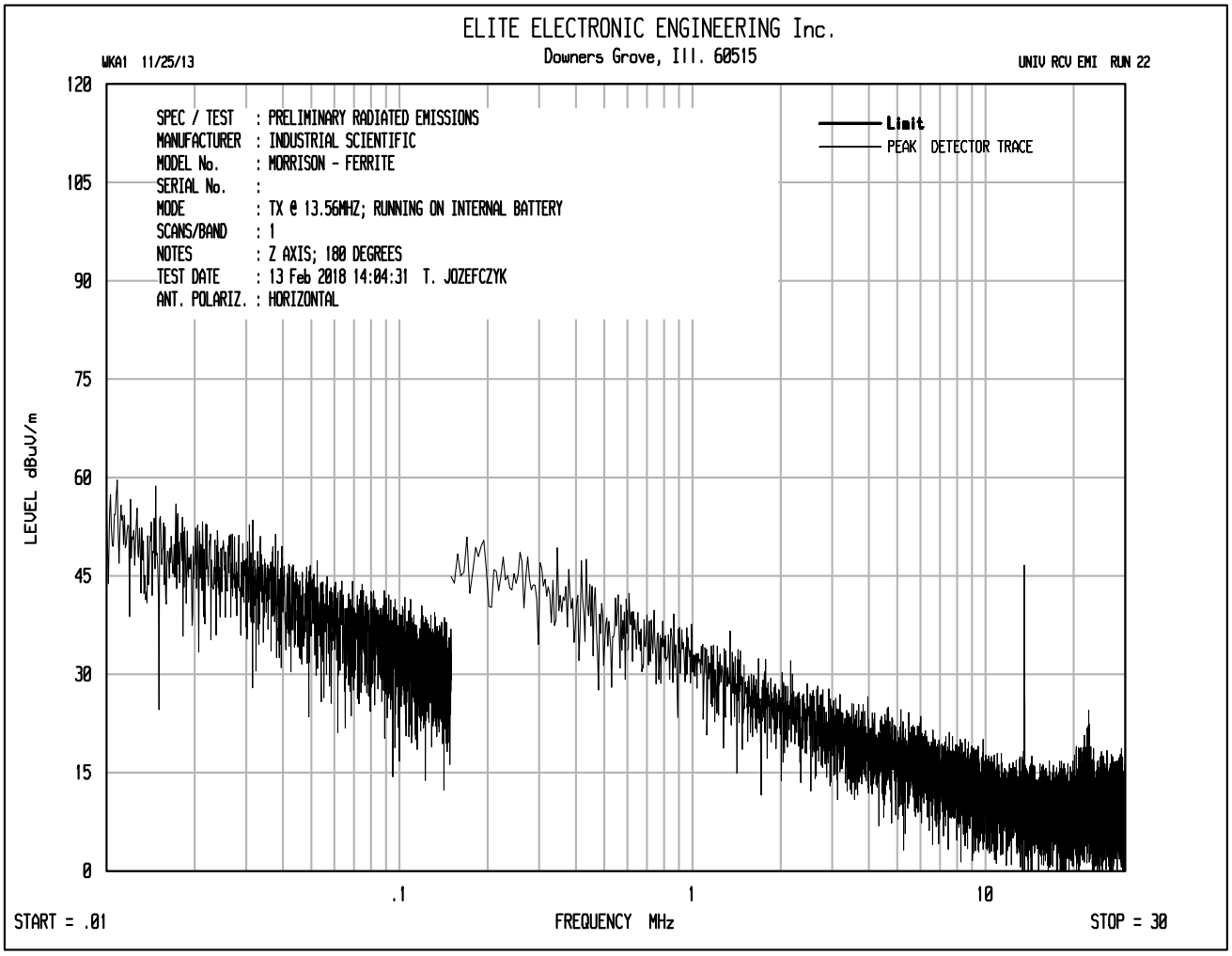

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 17
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 90 DEGREES
TEST DATE : 13 Feb 2018 13:40:34 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

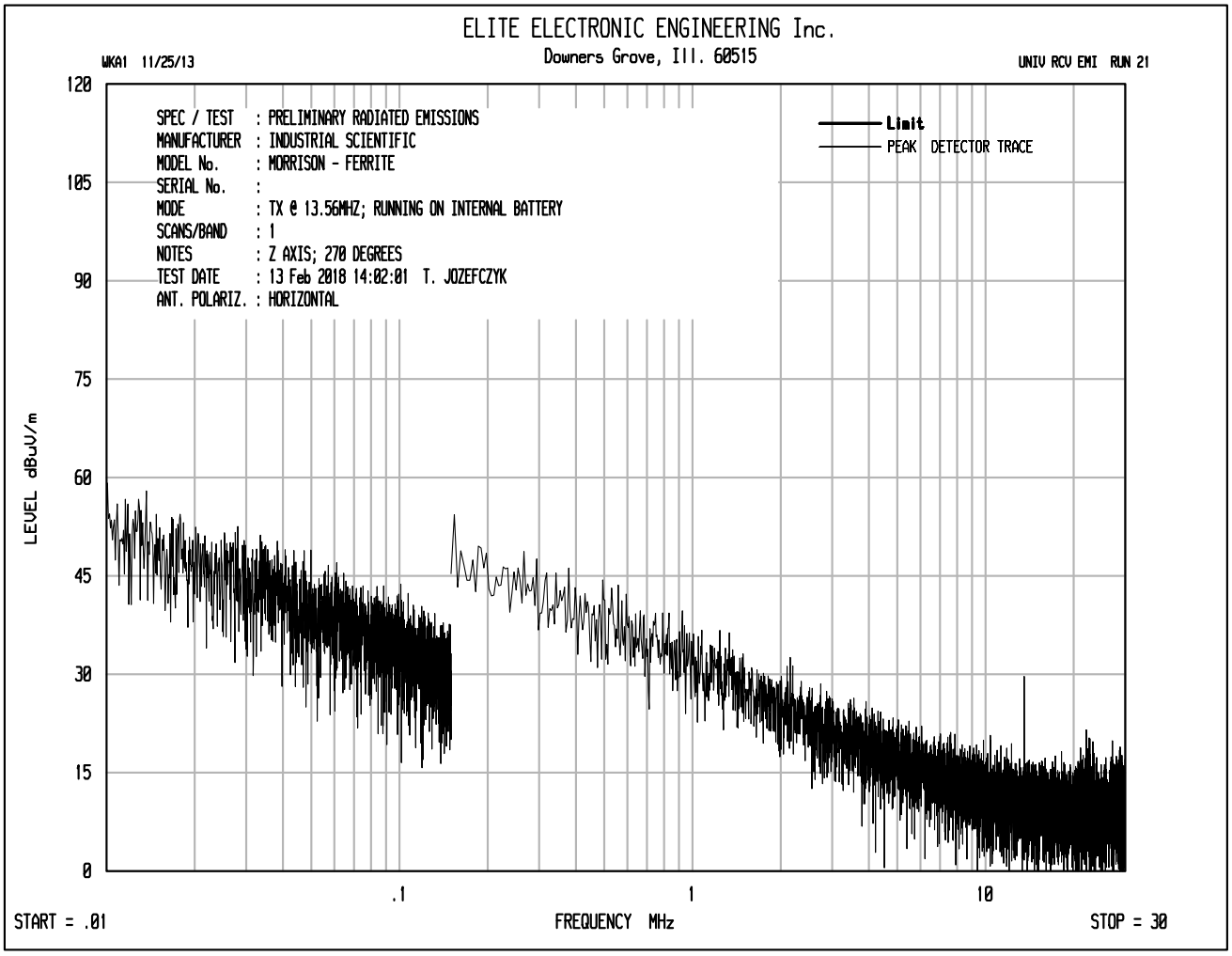

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 18
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 180 DEGREES
TEST DATE : 13 Feb 2018 13:42:02 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

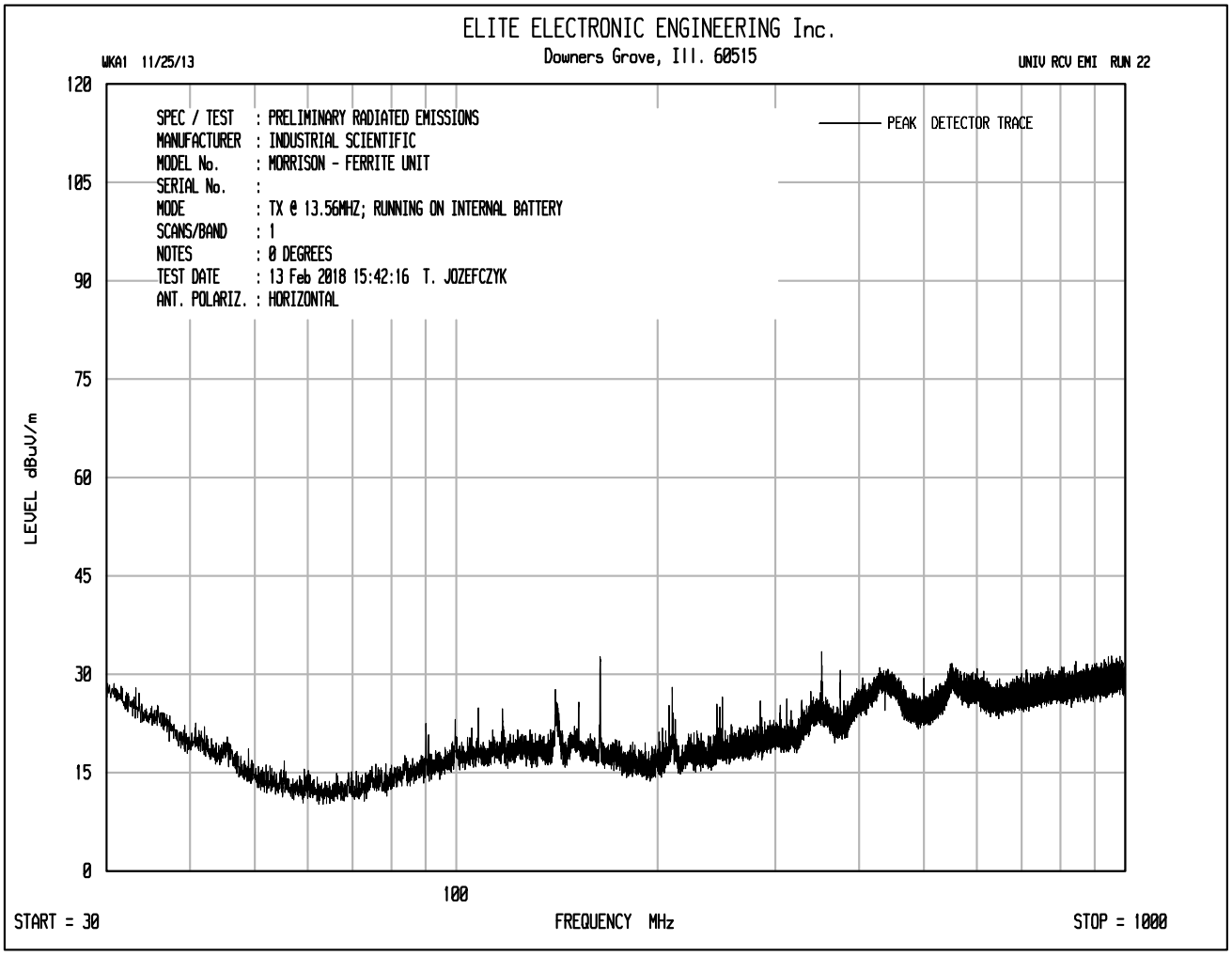

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 19
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 270 DEGREES
TEST DATE : 13 Feb 2018 13:43:39 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

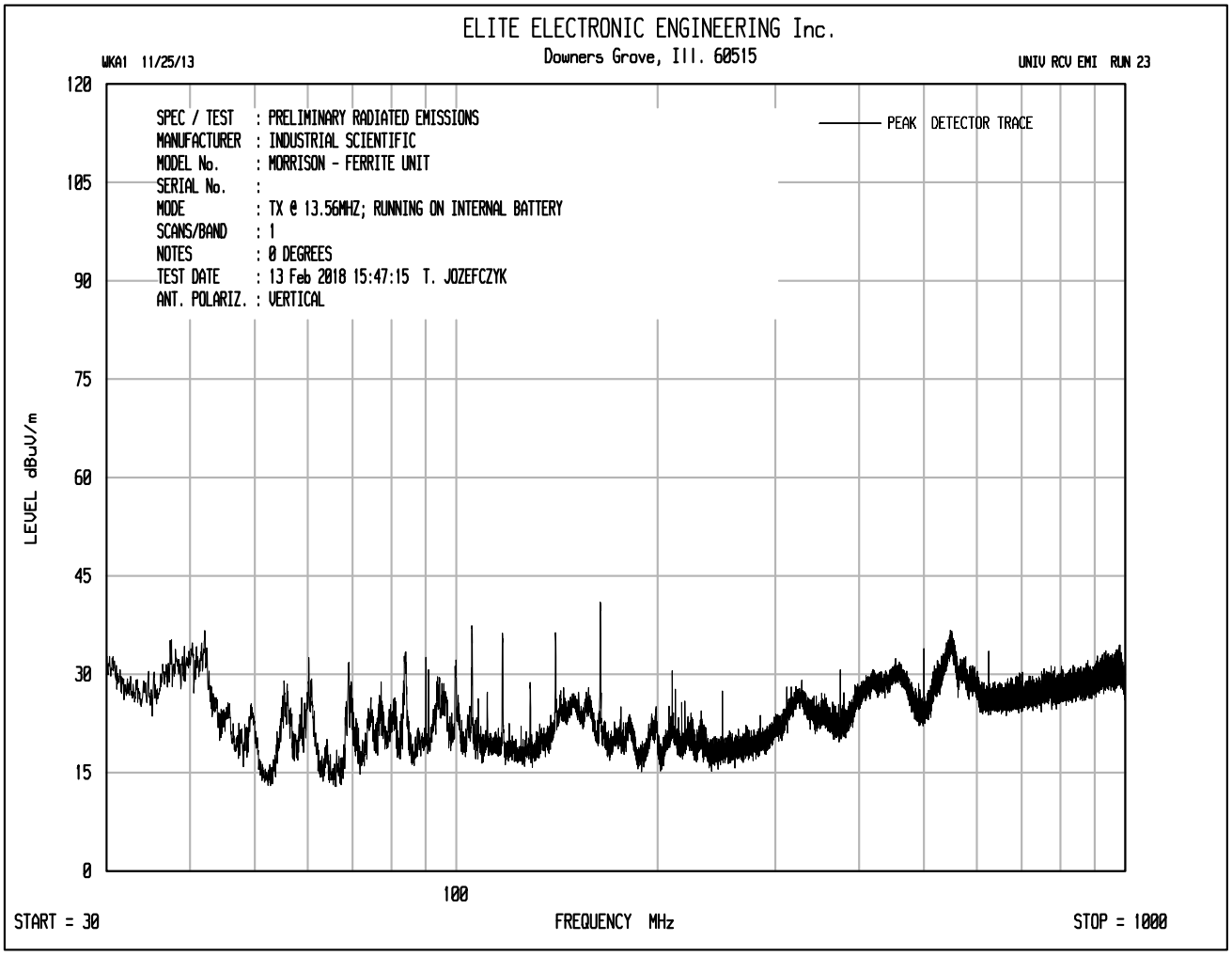

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 24
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Z AXIS; 0 DEGREES
TEST DATE : 13 Feb 2018 14:07:30 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

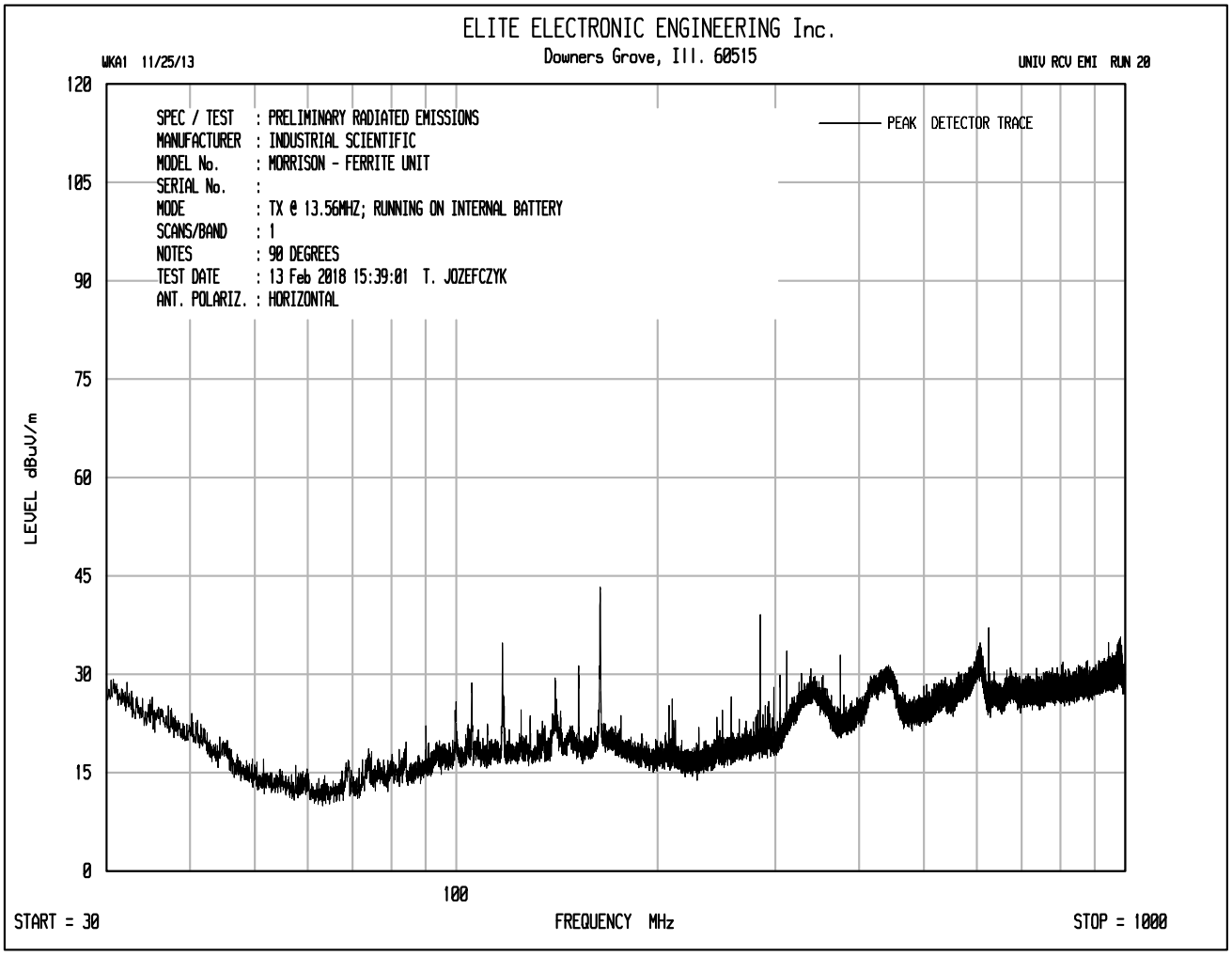

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 23
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Z AXIS; 90 DEGREES
TEST DATE : 13 Feb 2018 14:05:59 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

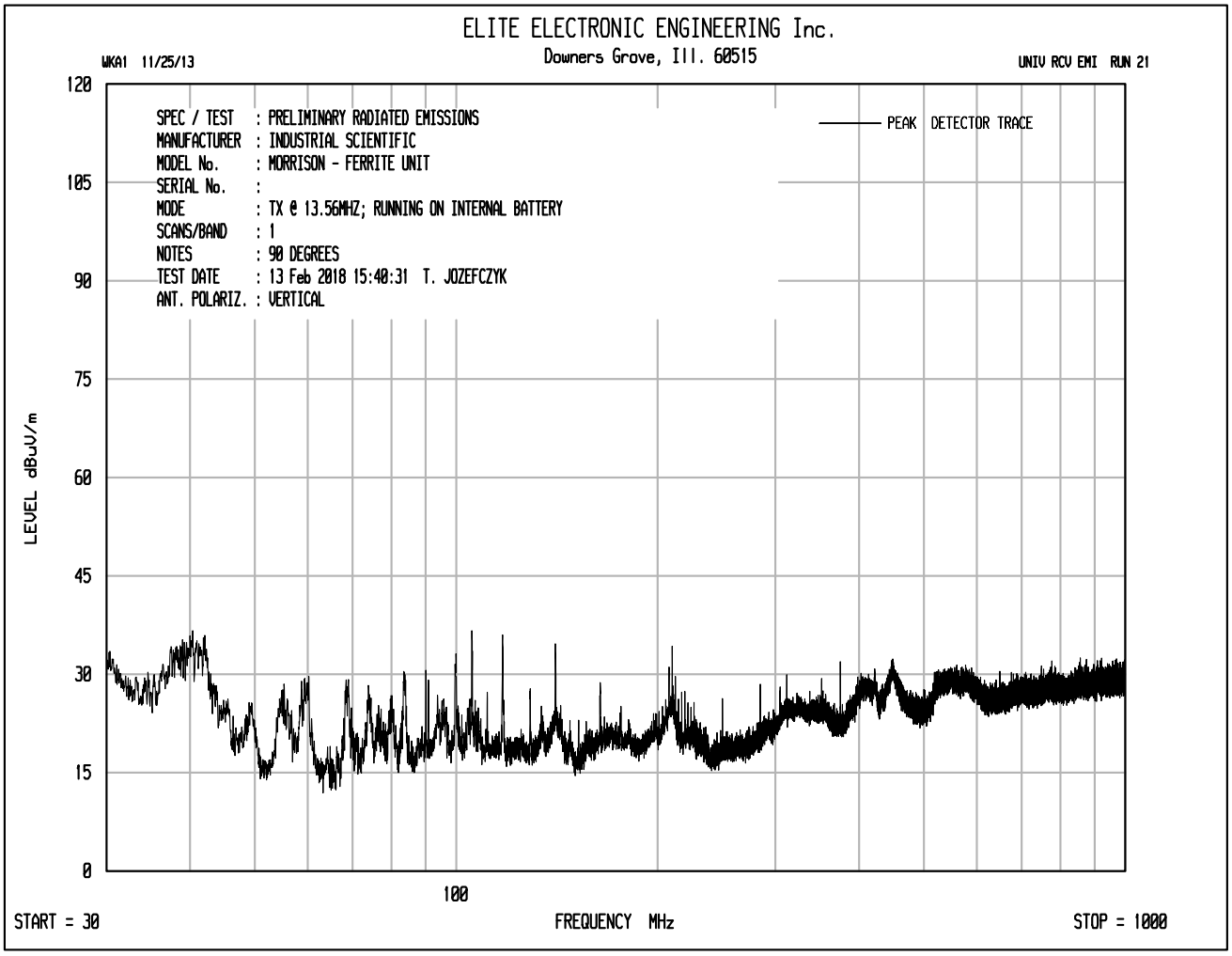

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 22
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Z AXIS; 180 DEGREES
TEST DATE : 13 Feb 2018 14:04:31 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

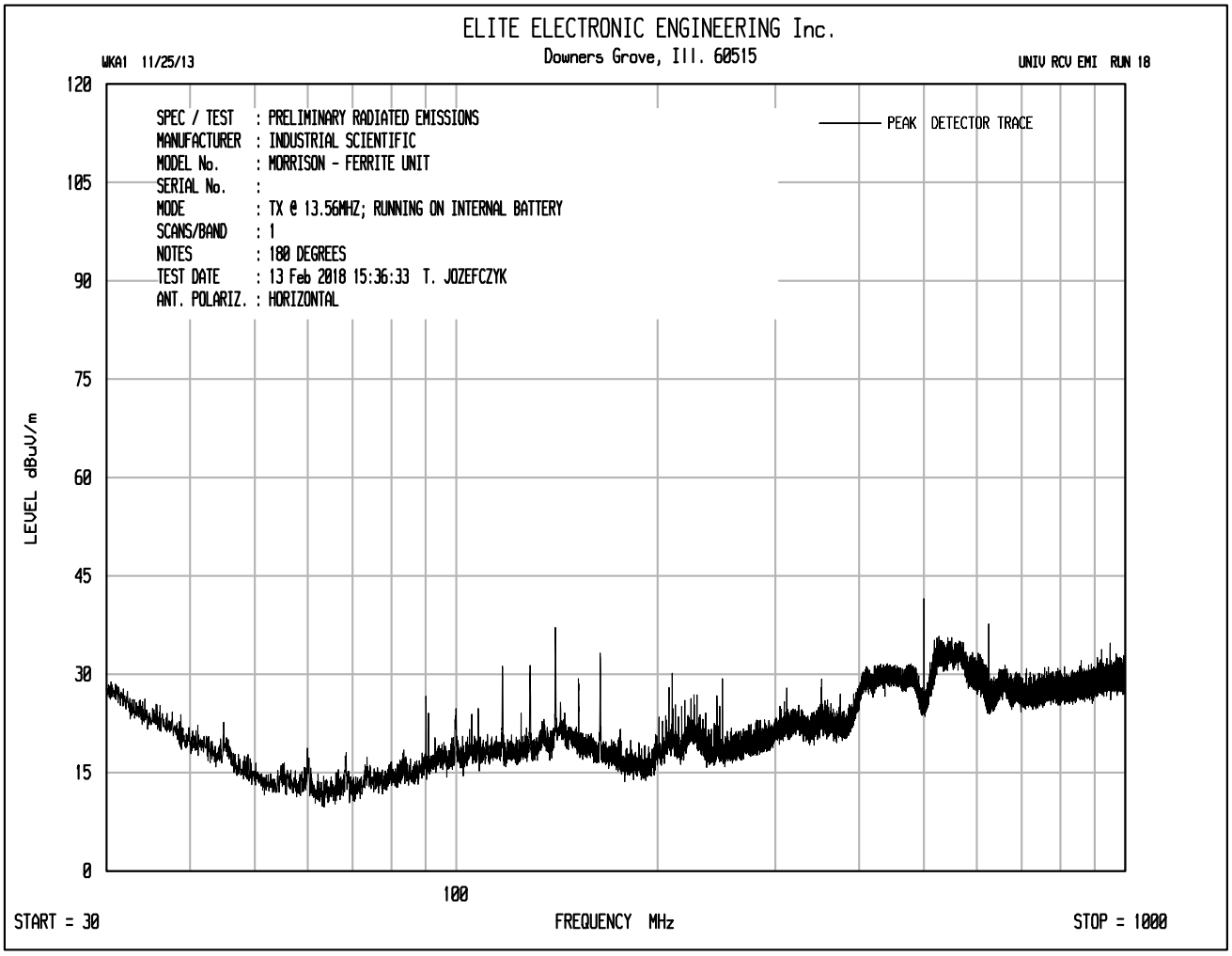

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 21
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Z AXIS; 270 DEGREES
TEST DATE : 13 Feb 2018 14:02:01 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

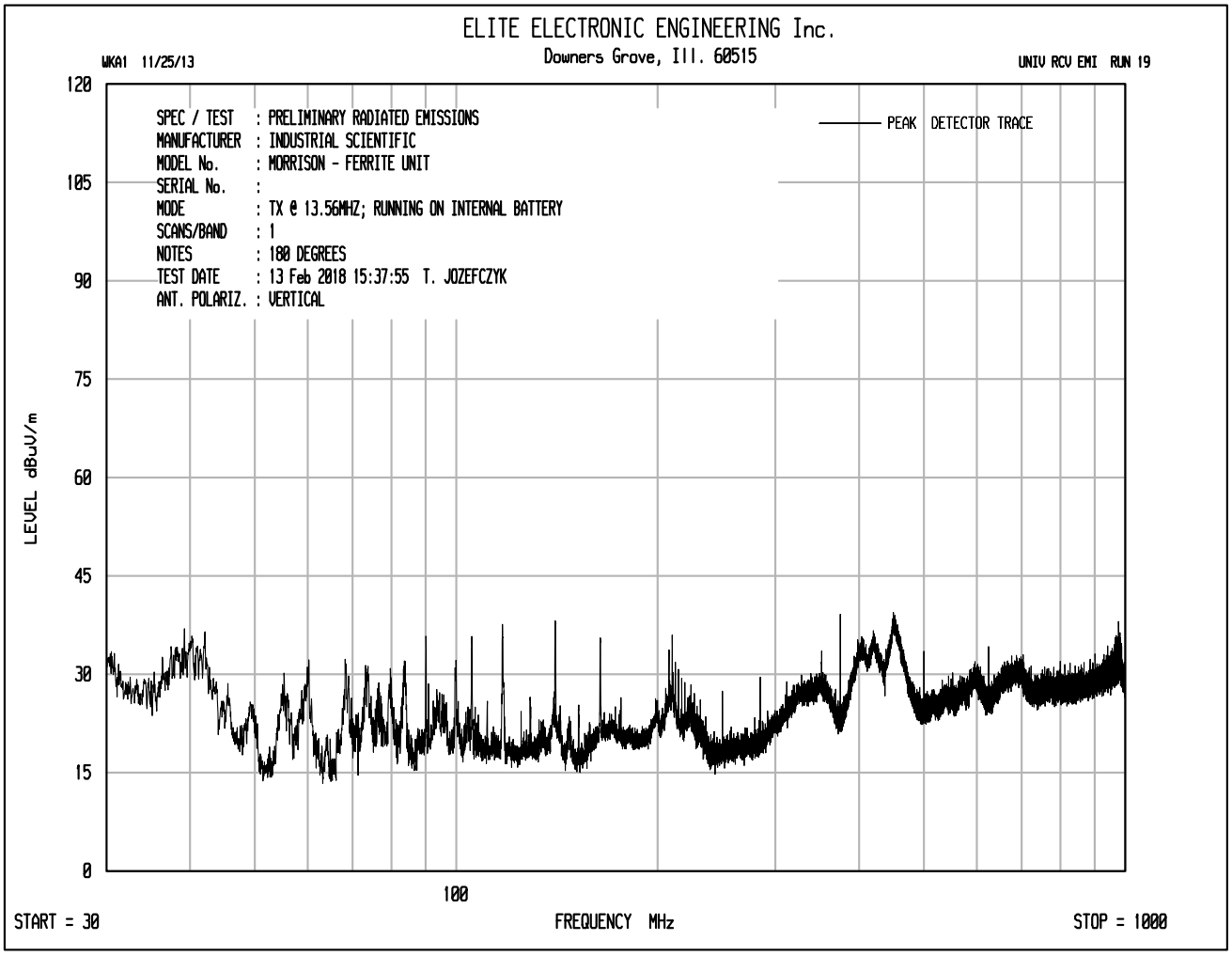

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 22
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 0 DEGREES
TEST DATE : 13 Feb 2018 15:42:16 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

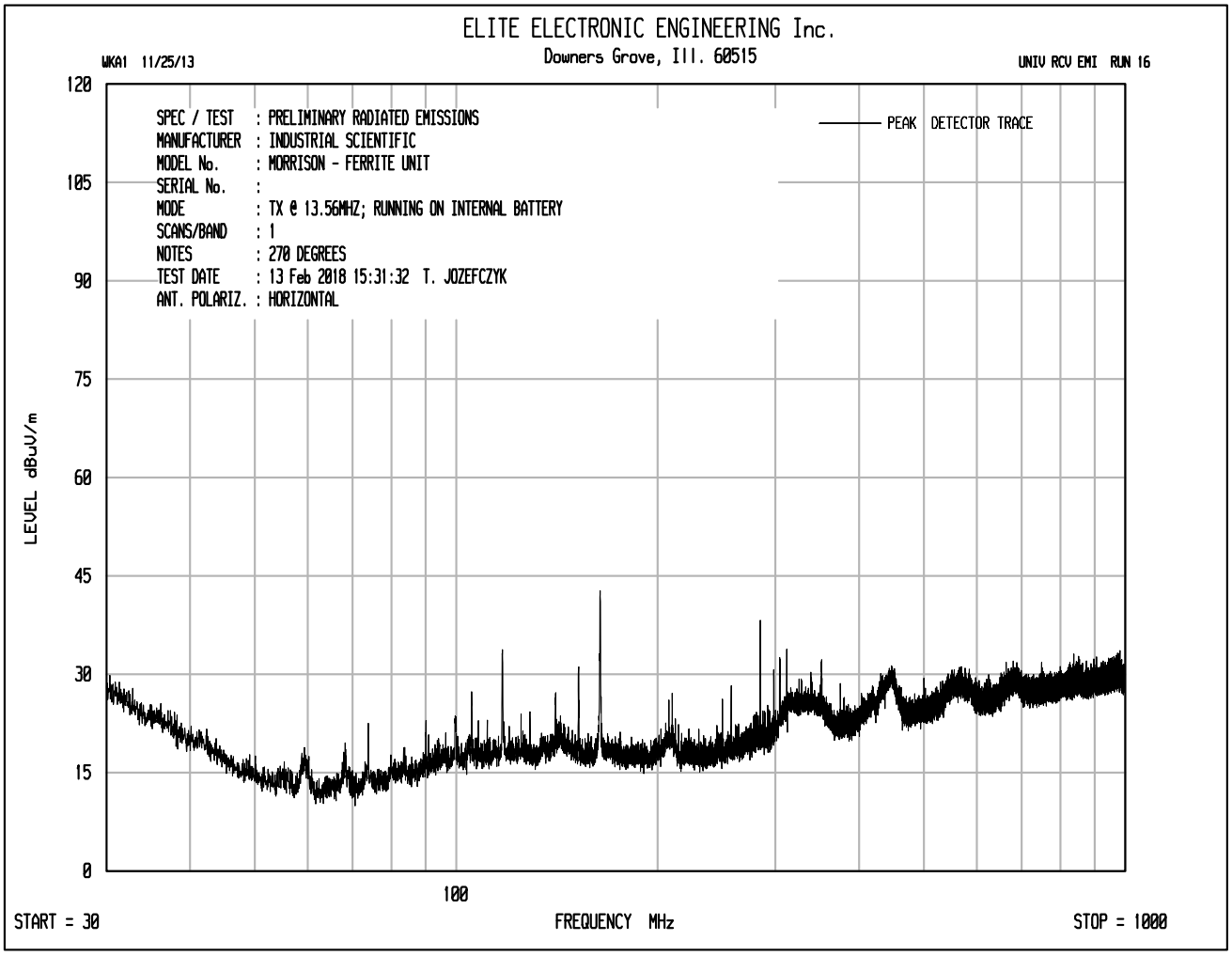

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 23
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 0 DEGREES
TEST DATE : 13 Feb 2018 15:47:15 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

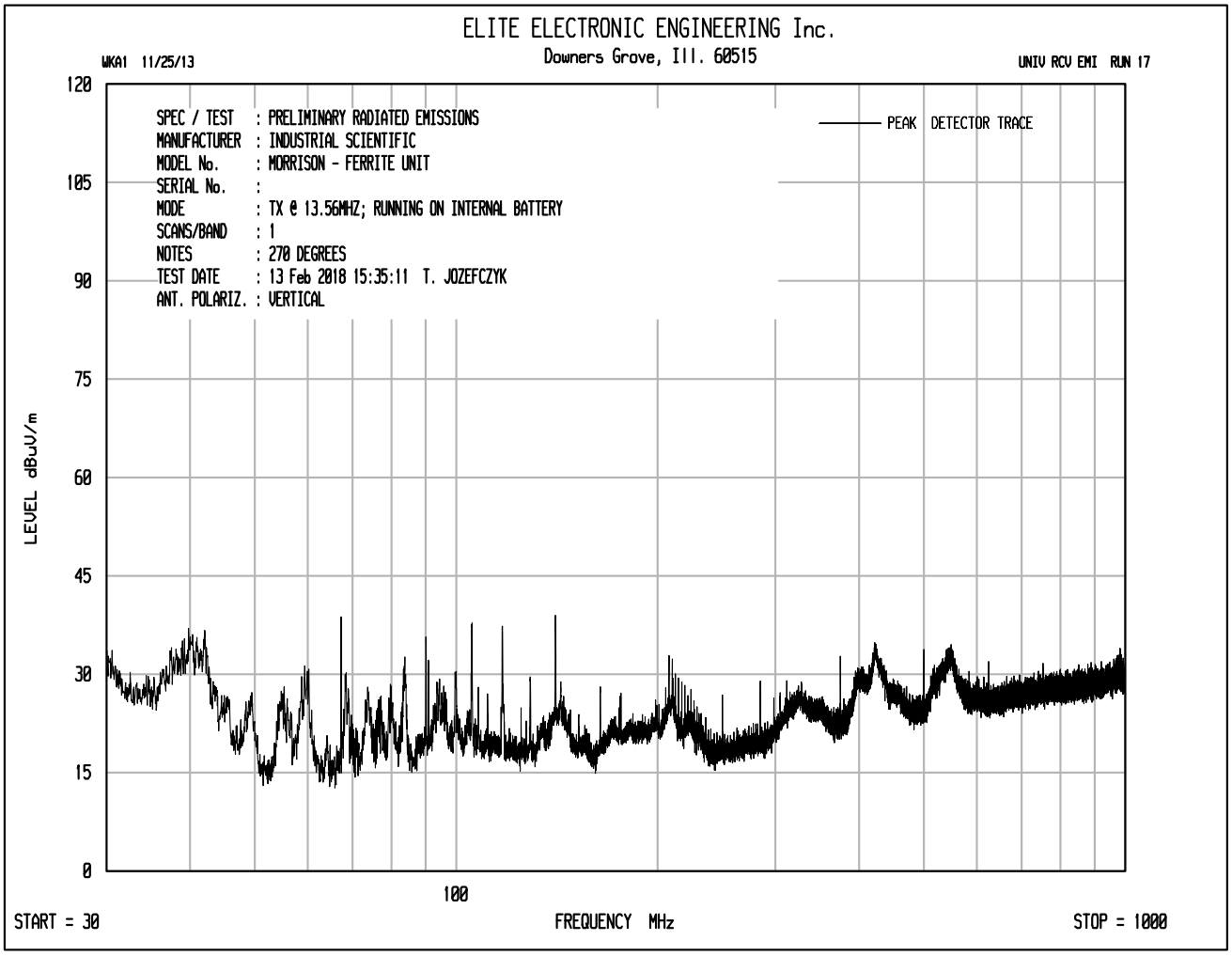

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 20
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 90 DEGREES
TEST DATE : 13 Feb 2018 15:39:01 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

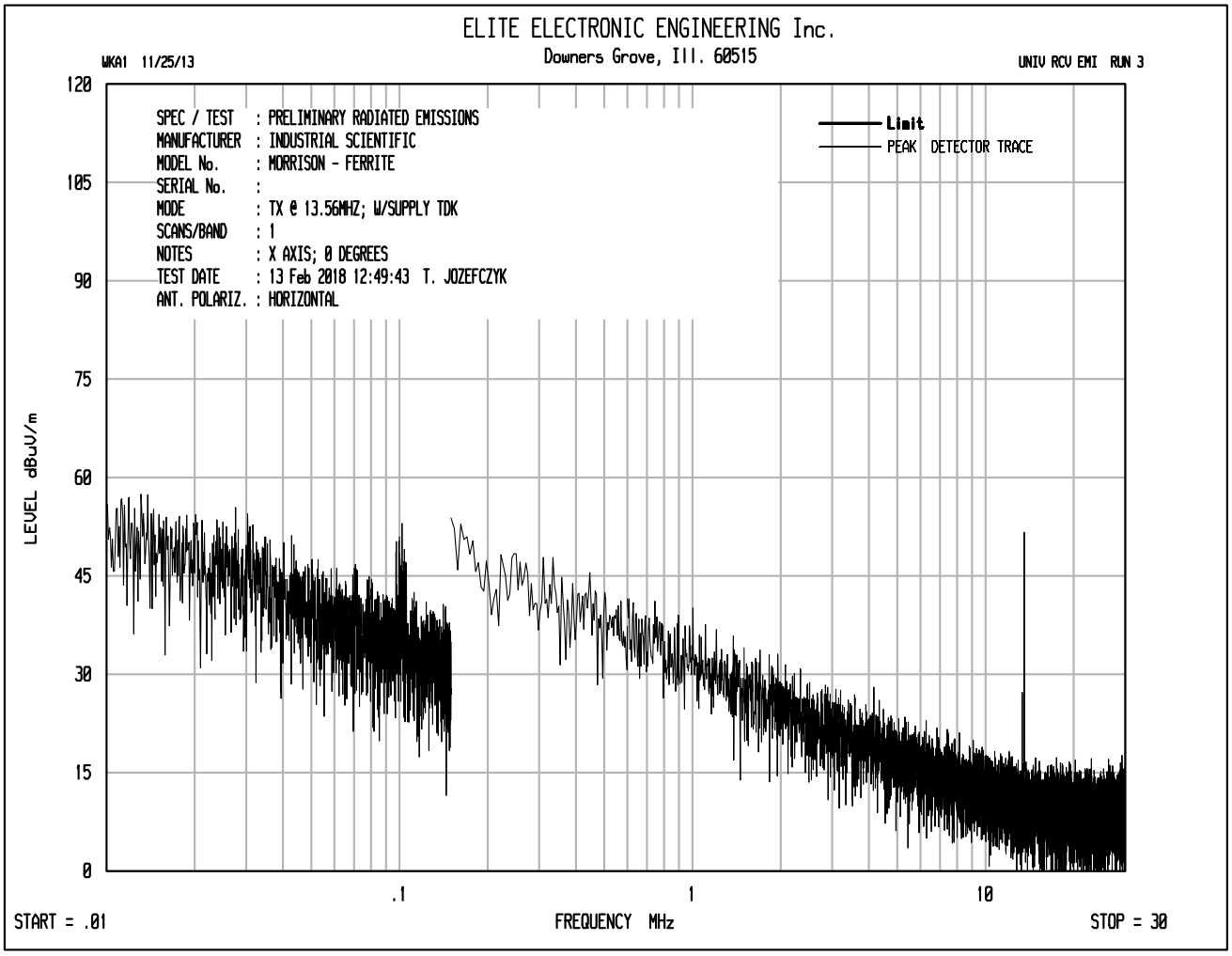

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 21
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 90 DEGREES
TEST DATE : 13 Feb 2018 15:40:31 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

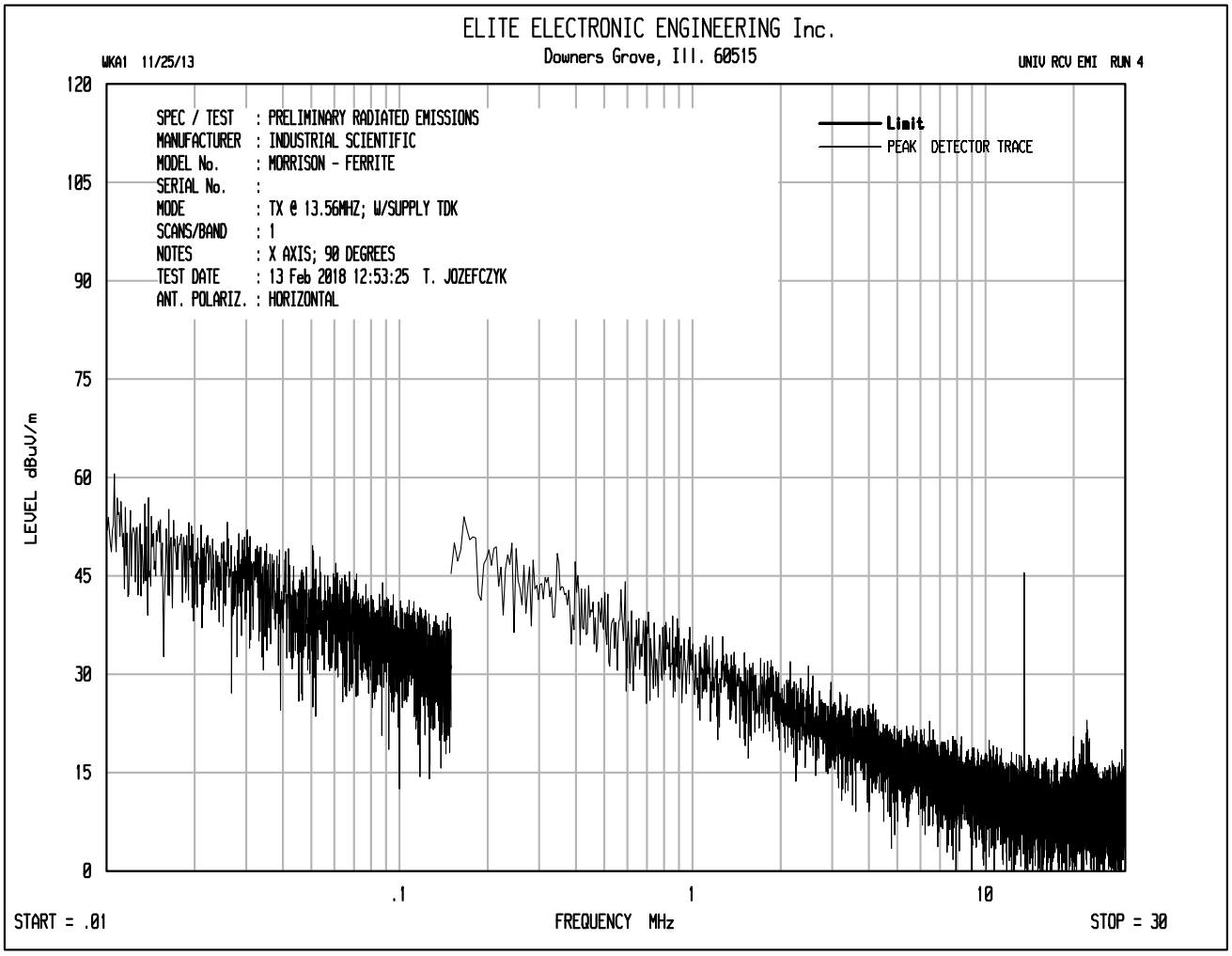

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 18
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 180 DEGREES
TEST DATE : 13 Feb 2018 15:36:33 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

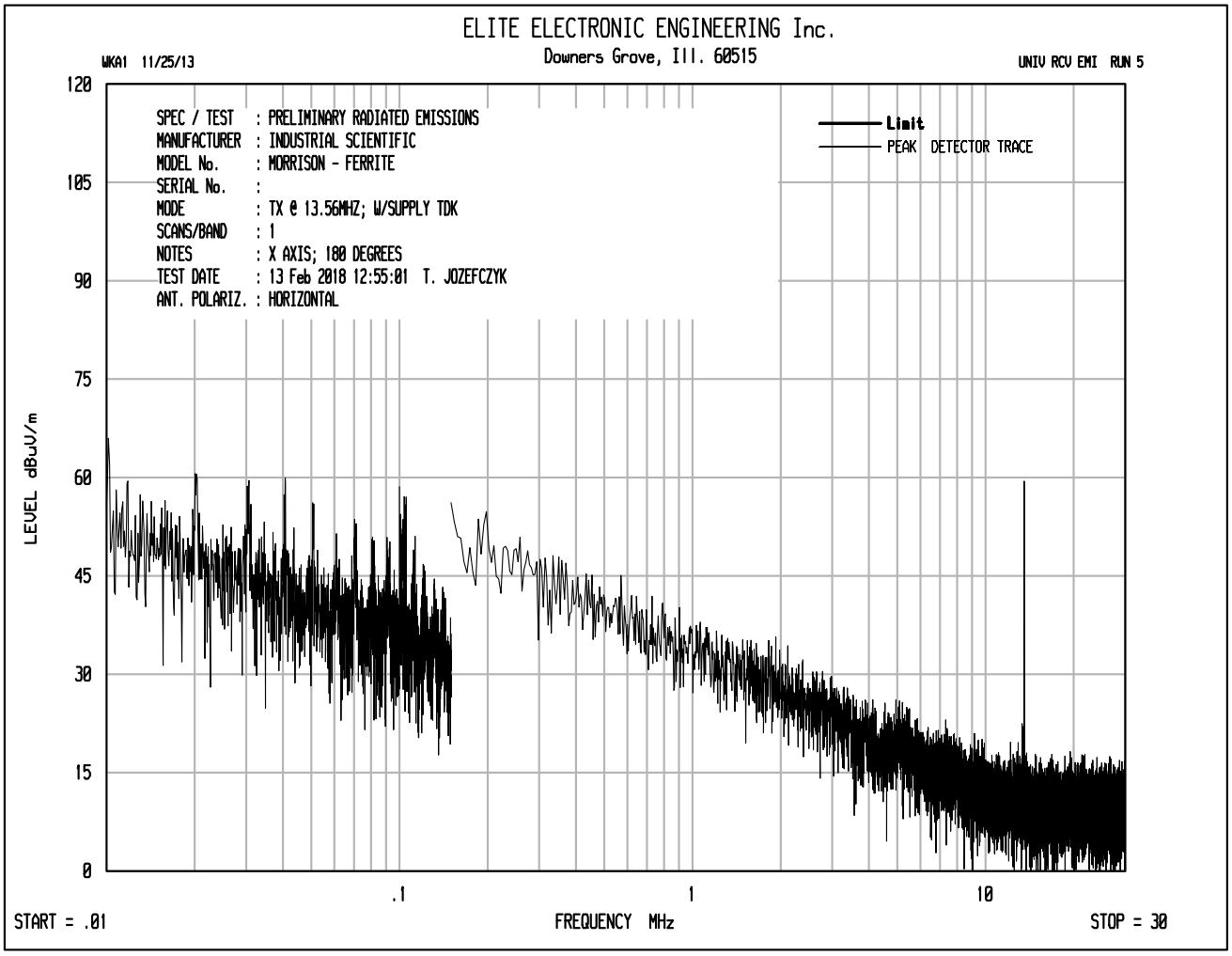

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 19
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 180 DEGREES
TEST DATE : 13 Feb 2018 15:37:55 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

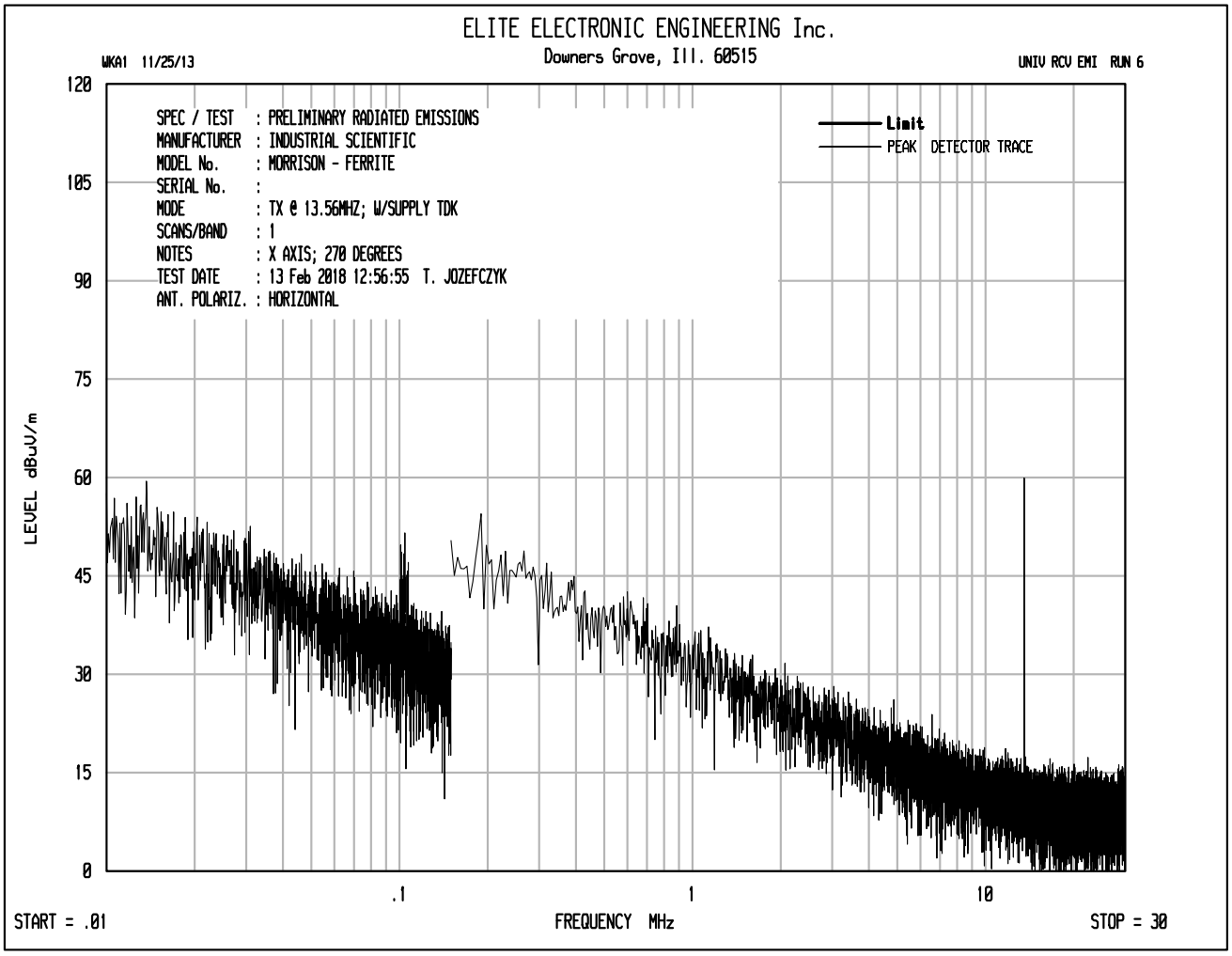

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 16
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 270 DEGREES
TEST DATE : 13 Feb 2018 15:31:32 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

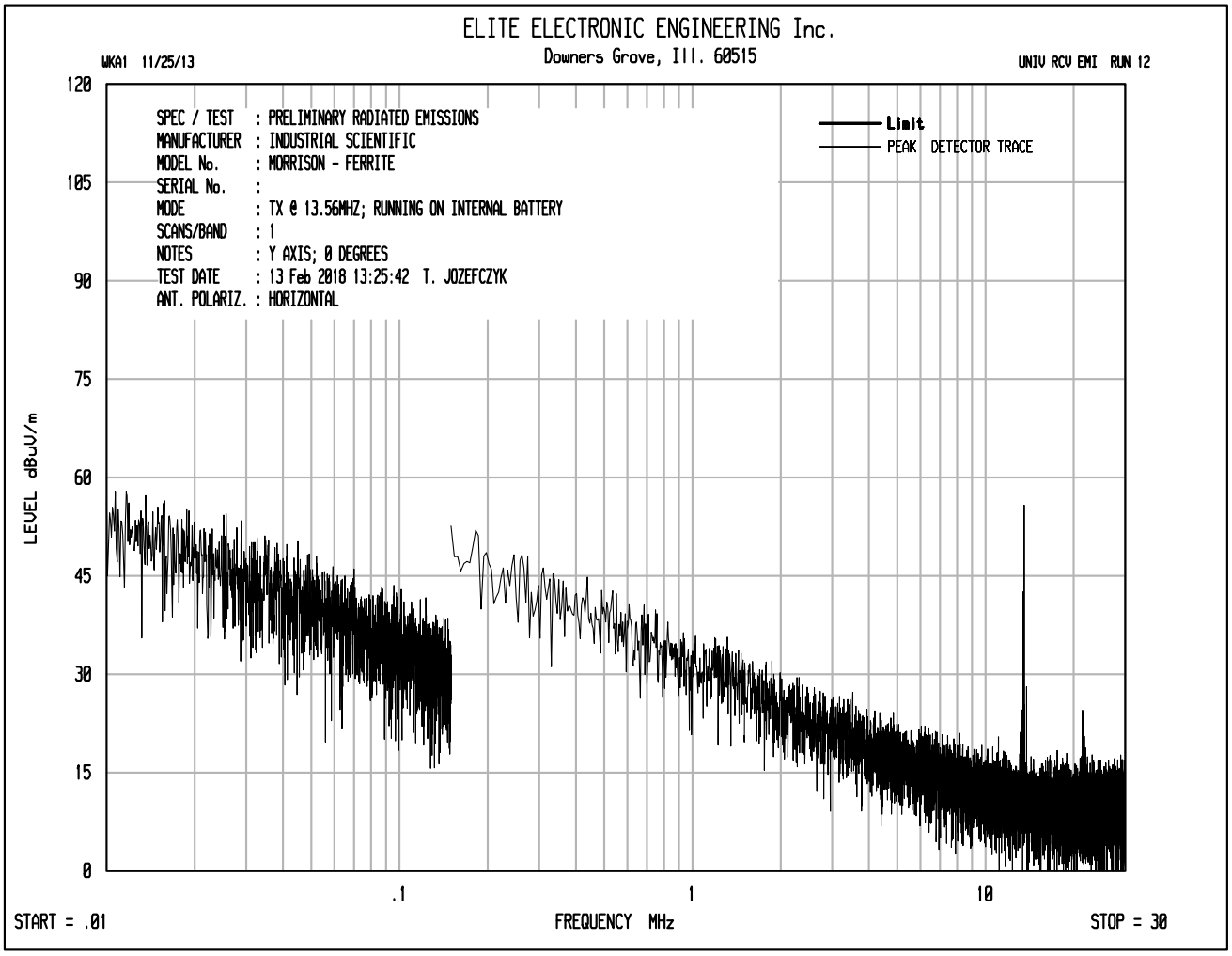

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 17
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : 270 DEGREES
TEST DATE : 13 Feb 2018 15:35:11 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

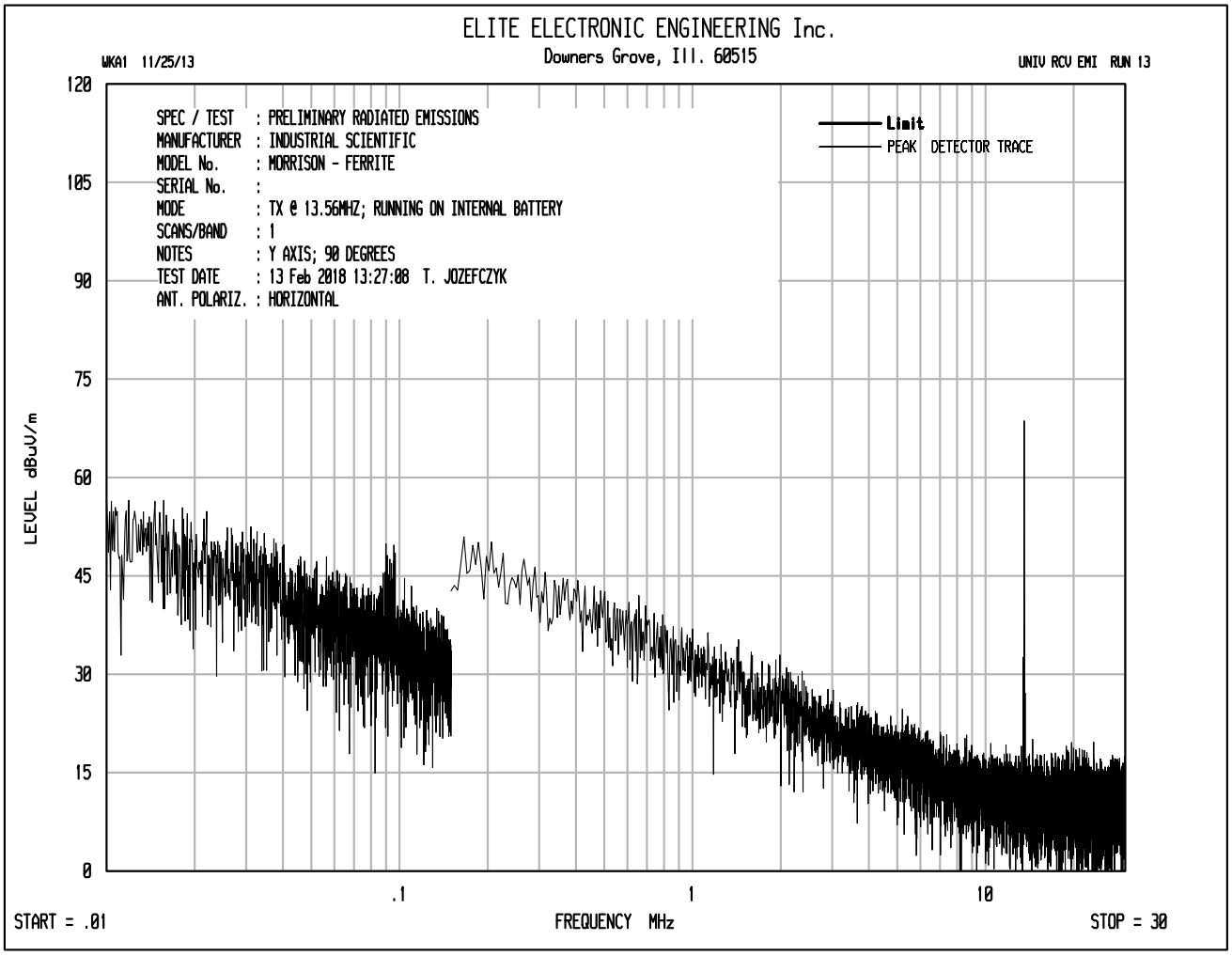

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 3
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : X AXIS; 0 DEGREES
TEST DATE : 13 Feb 2018 12:49:43 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

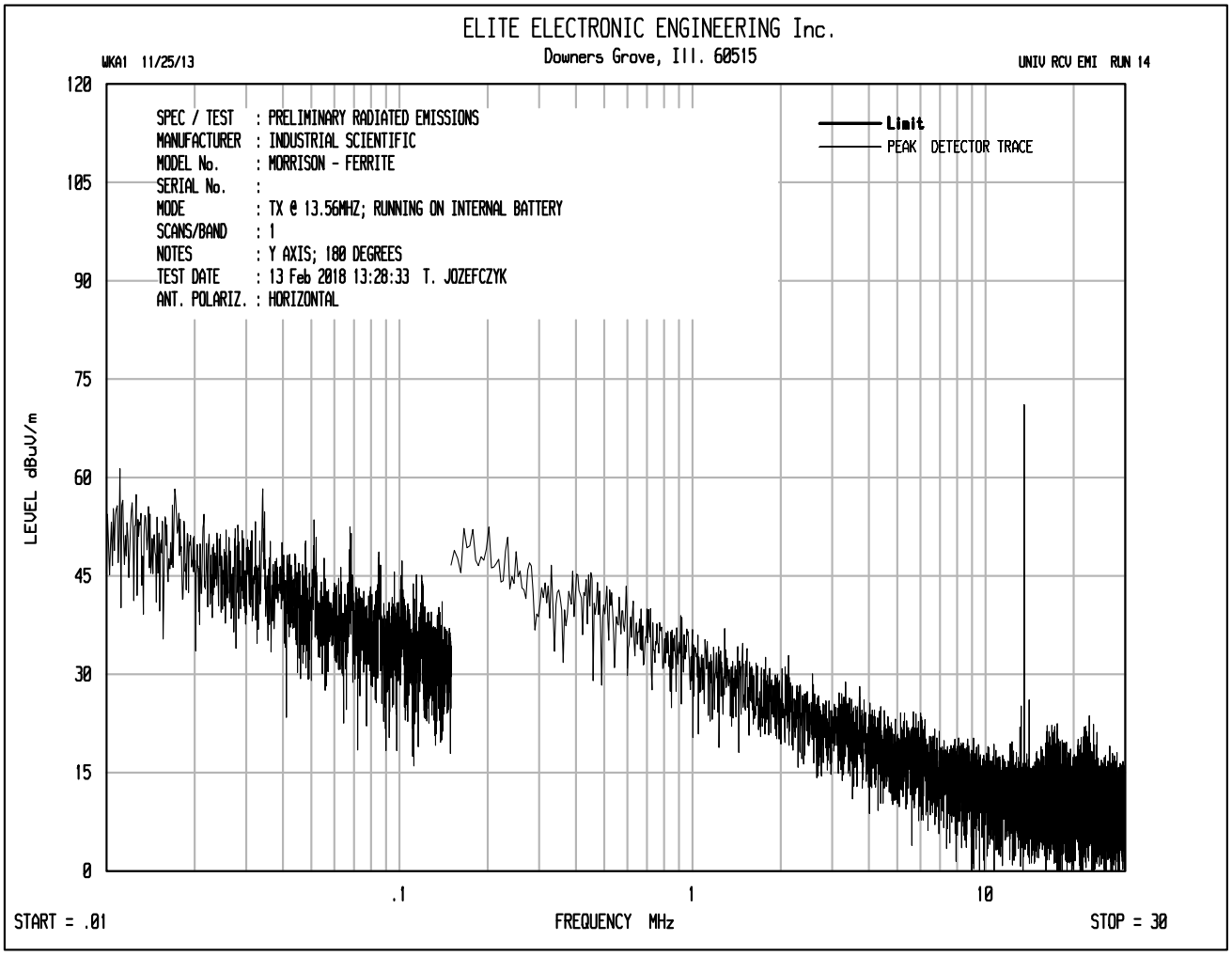

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 4
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : X AXIS; 90 DEGREES
TEST DATE : 13 Feb 2018 12:53:25 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

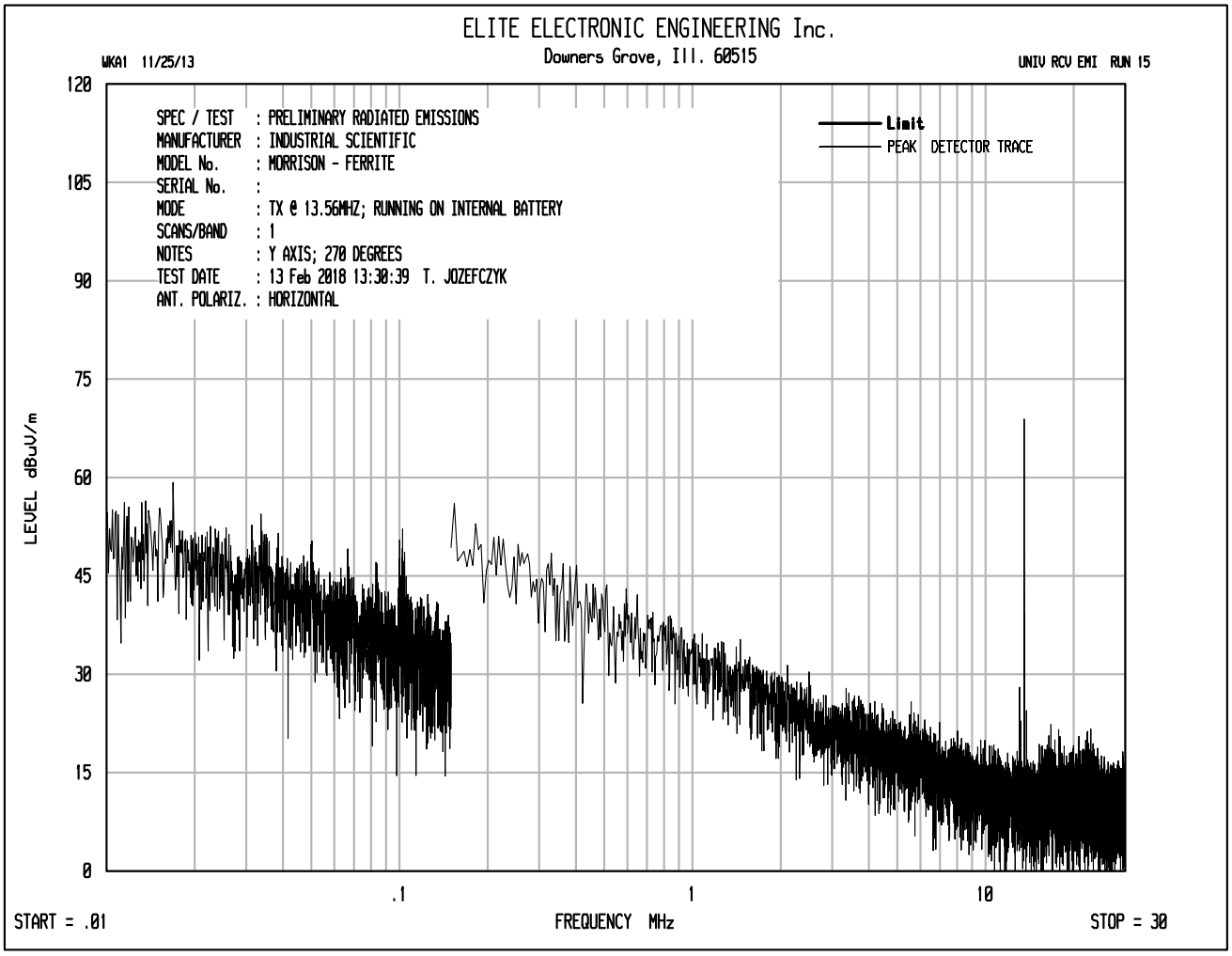

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 5
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : X AXIS; 180 DEGREES
TEST DATE : 13 Feb 2018 12:55:01 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

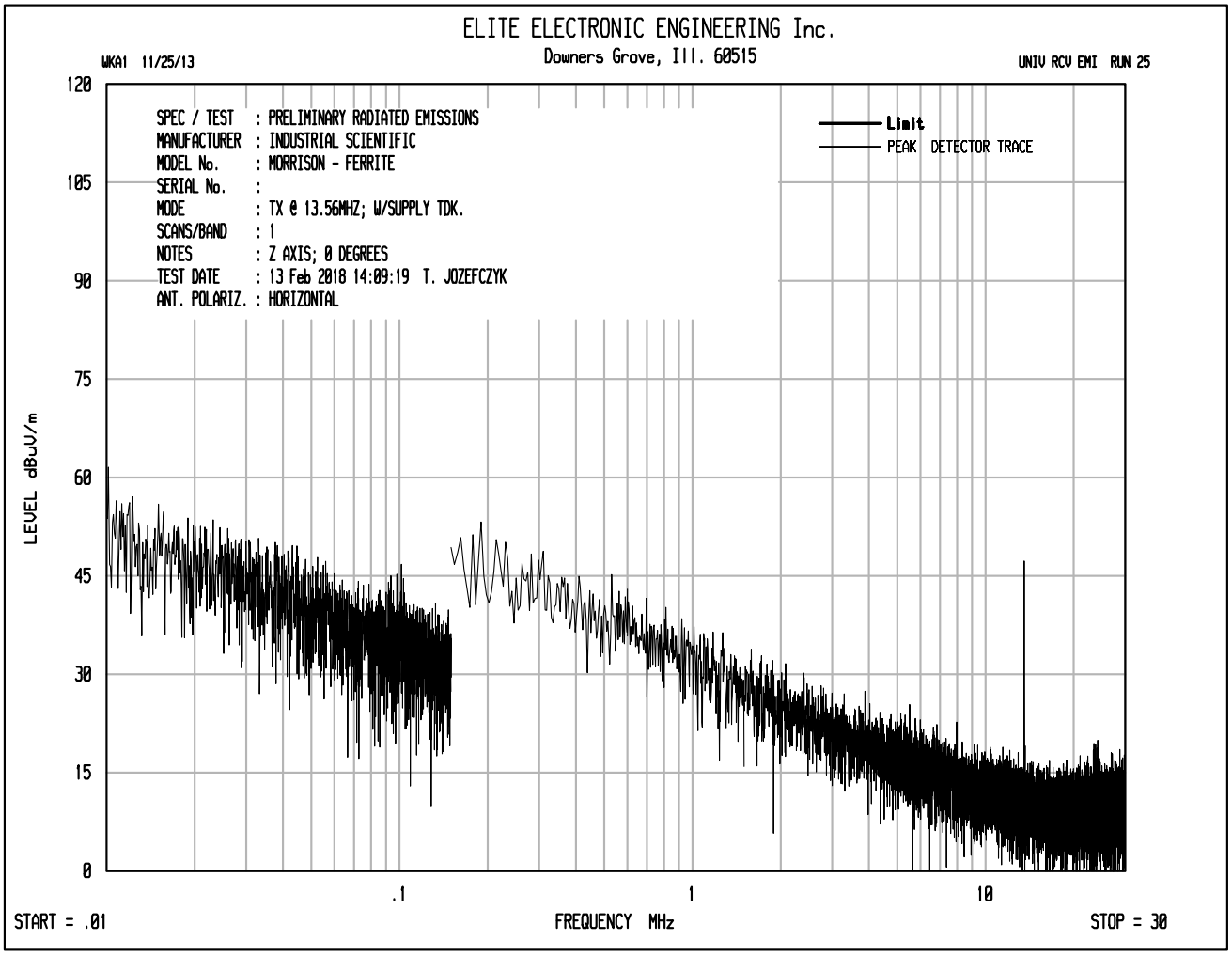

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : X AXIS; 270 DEGREES
TEST DATE : 13 Feb 2018 12:56:55 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

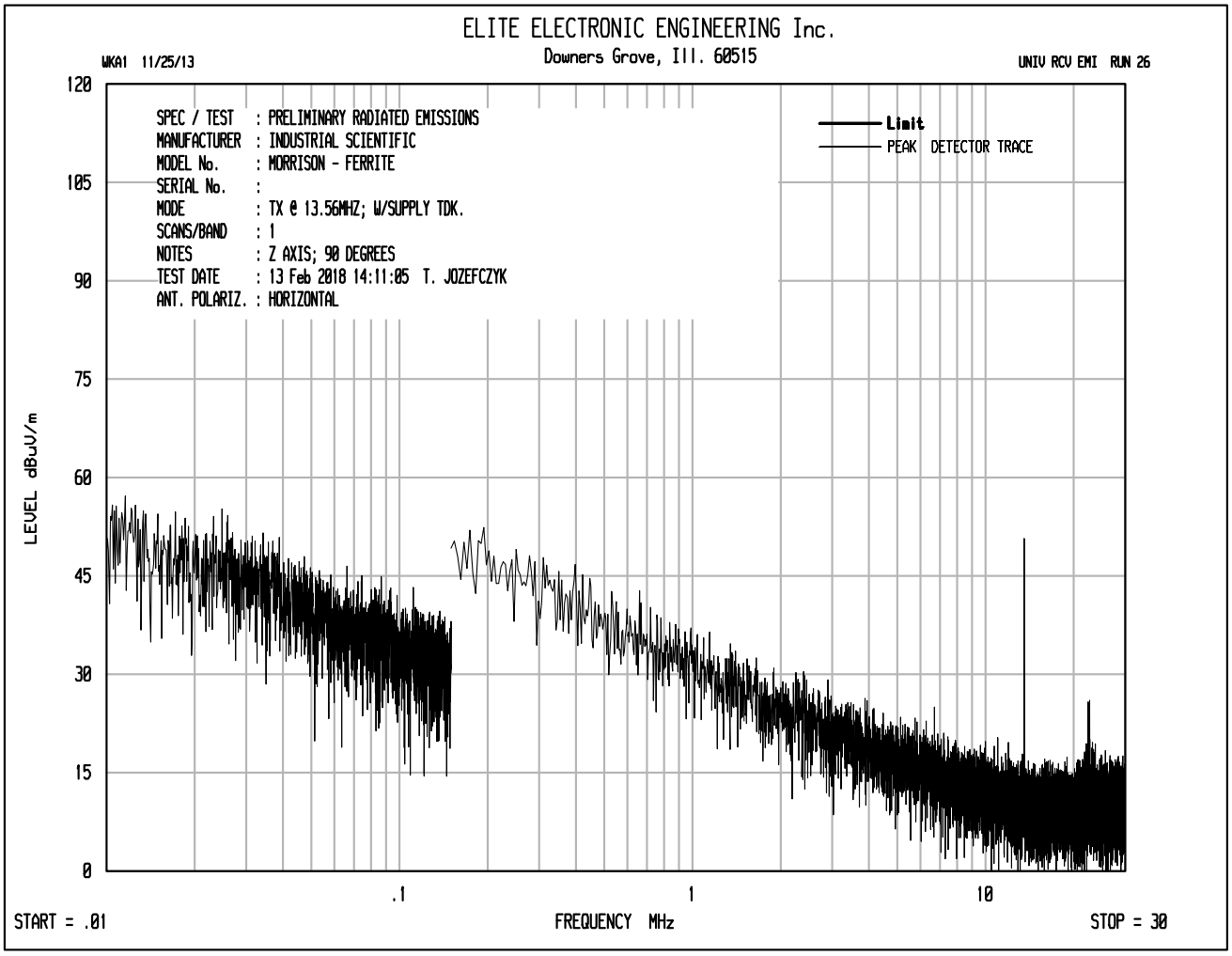

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 12
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 0 DEGREES
TEST DATE : 13 Feb 2018 13:25:42 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

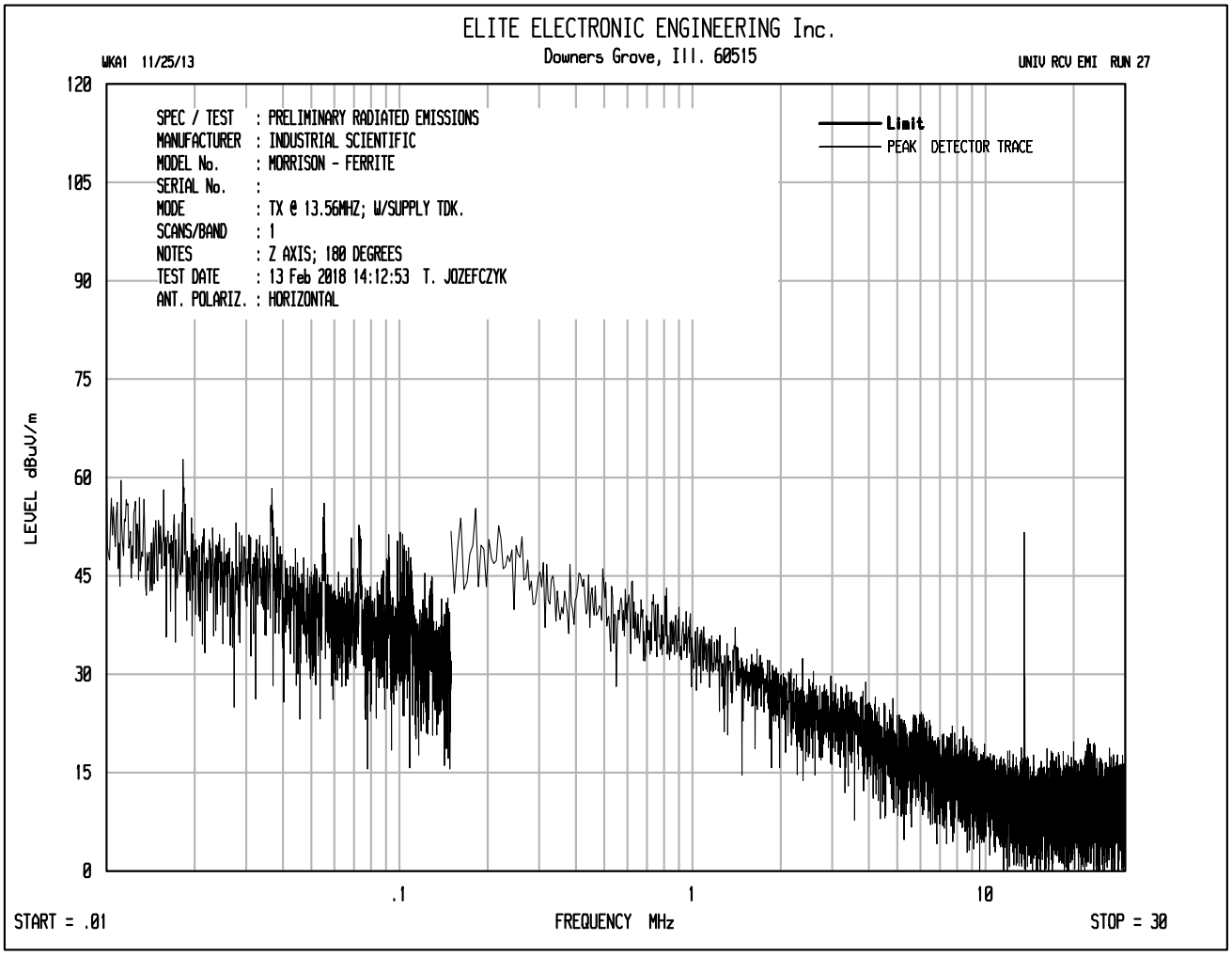

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 90 DEGREES
TEST DATE : 13 Feb 2018 13:27:08 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

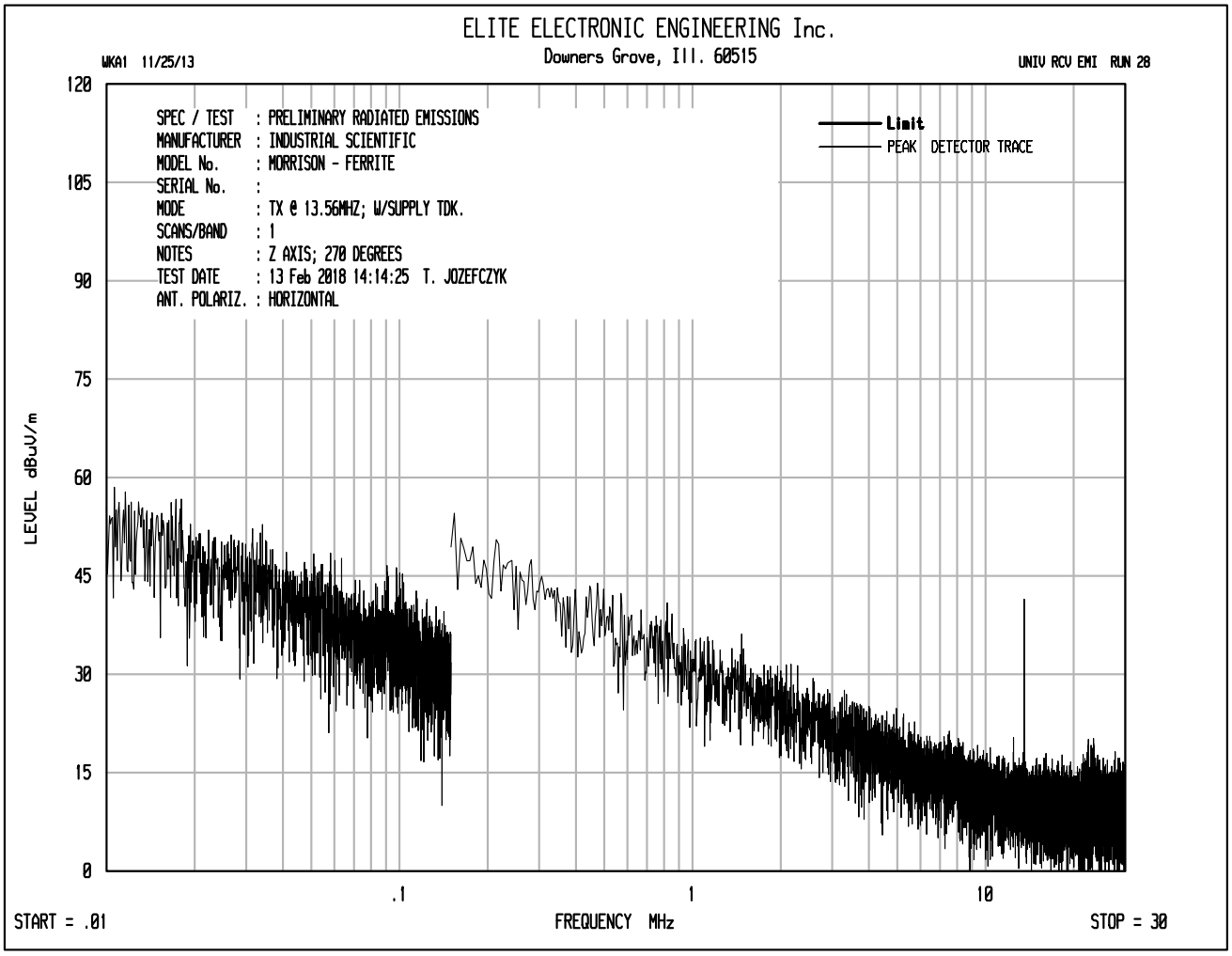

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 14
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 180 DEGREES
TEST DATE : 13 Feb 2018 13:28:33 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

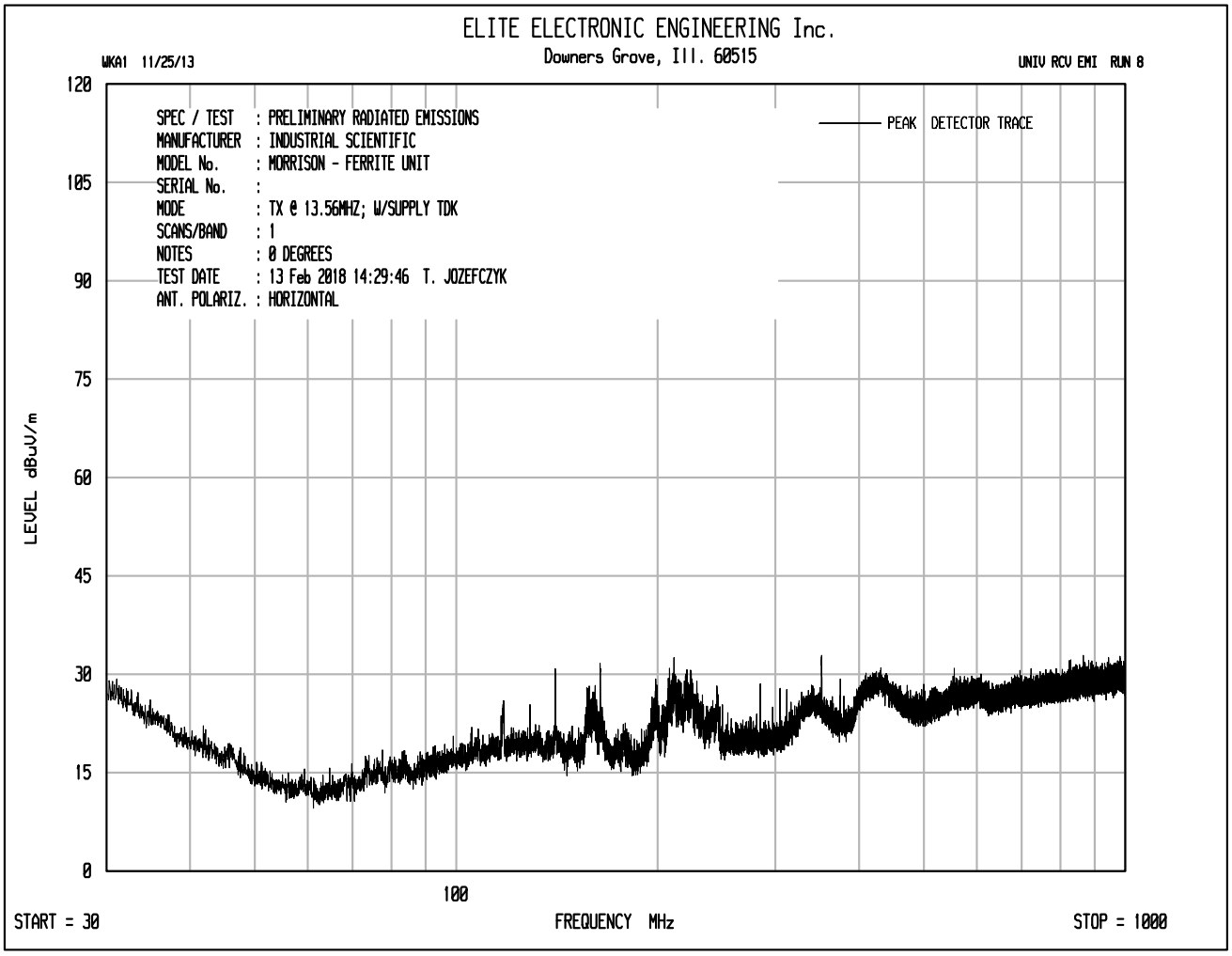

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 15
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; RUNNING ON INTERNAL BATTERY
SCANS/BAND : 1
NOTES : Y AXIS; 270 DEGREES
TEST DATE : 13 Feb 2018 13:30:39 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

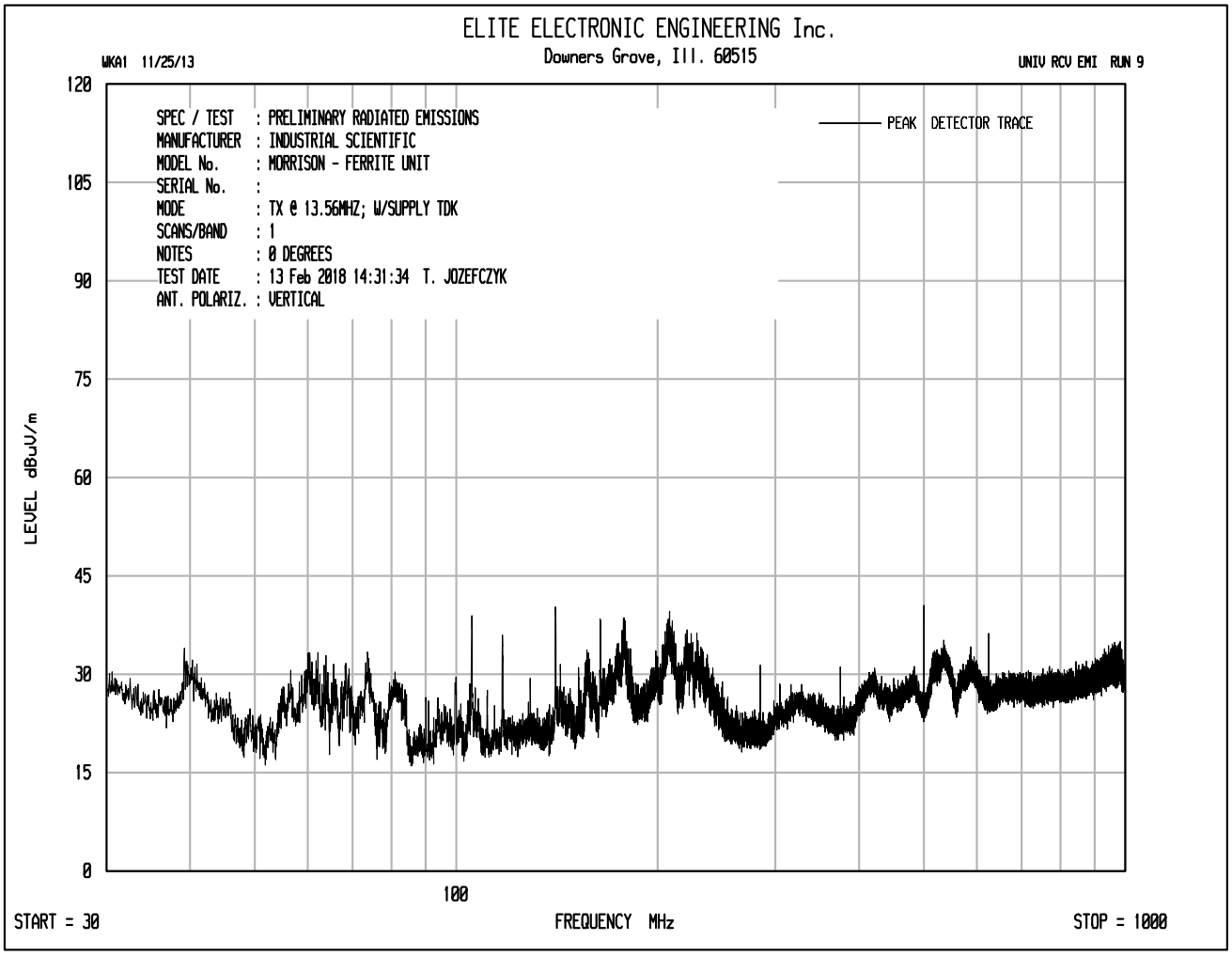

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 25
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK.
SCANS/BAND : 1
NOTES : Z AXIS; 0 DEGREES
TEST DATE : 13 Feb 2018 14:09:19 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

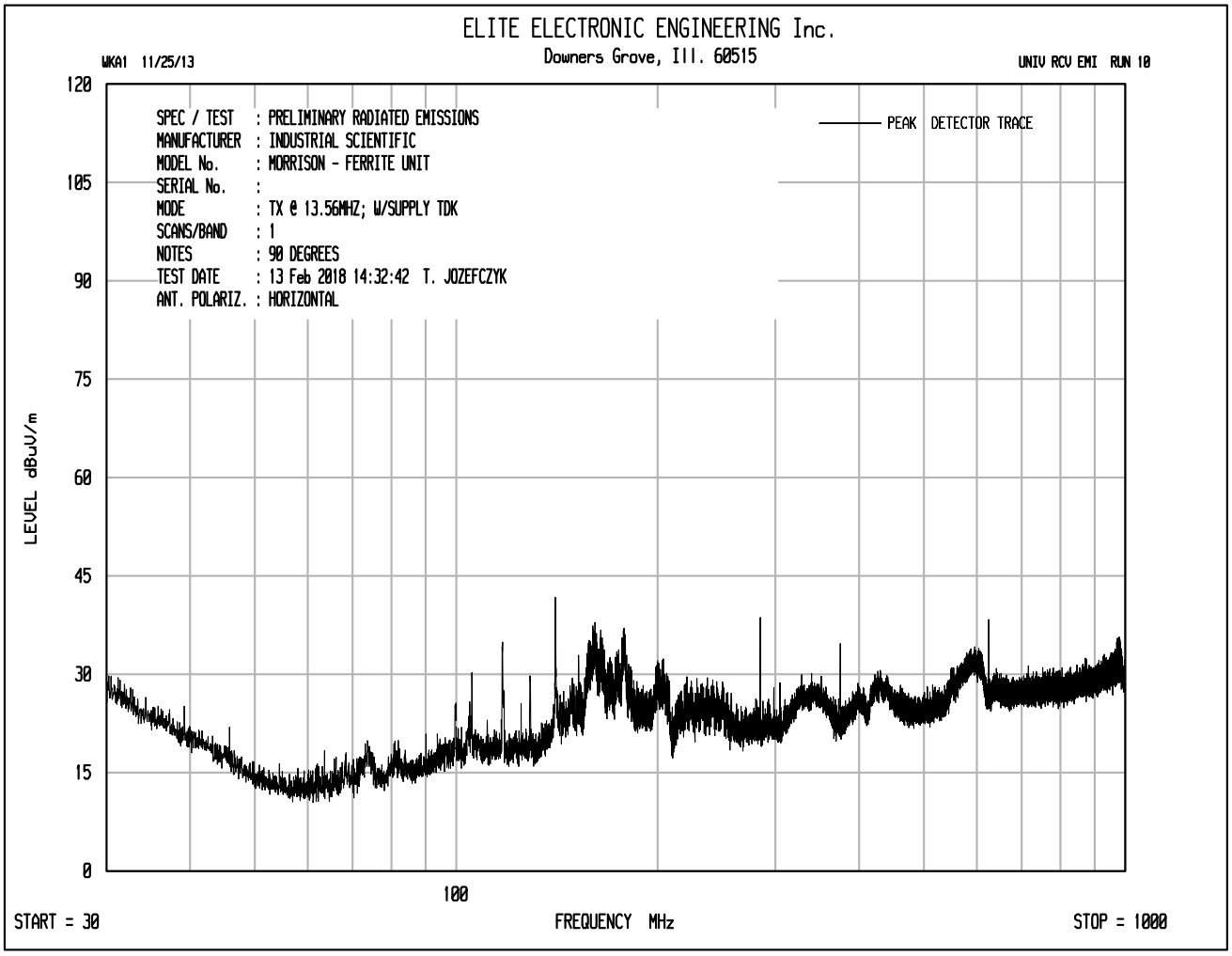

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 26
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK.
SCANS/BAND : 1
NOTES : Z AXIS; 90 DEGREES
TEST DATE : 13 Feb 2018 14:11:05 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

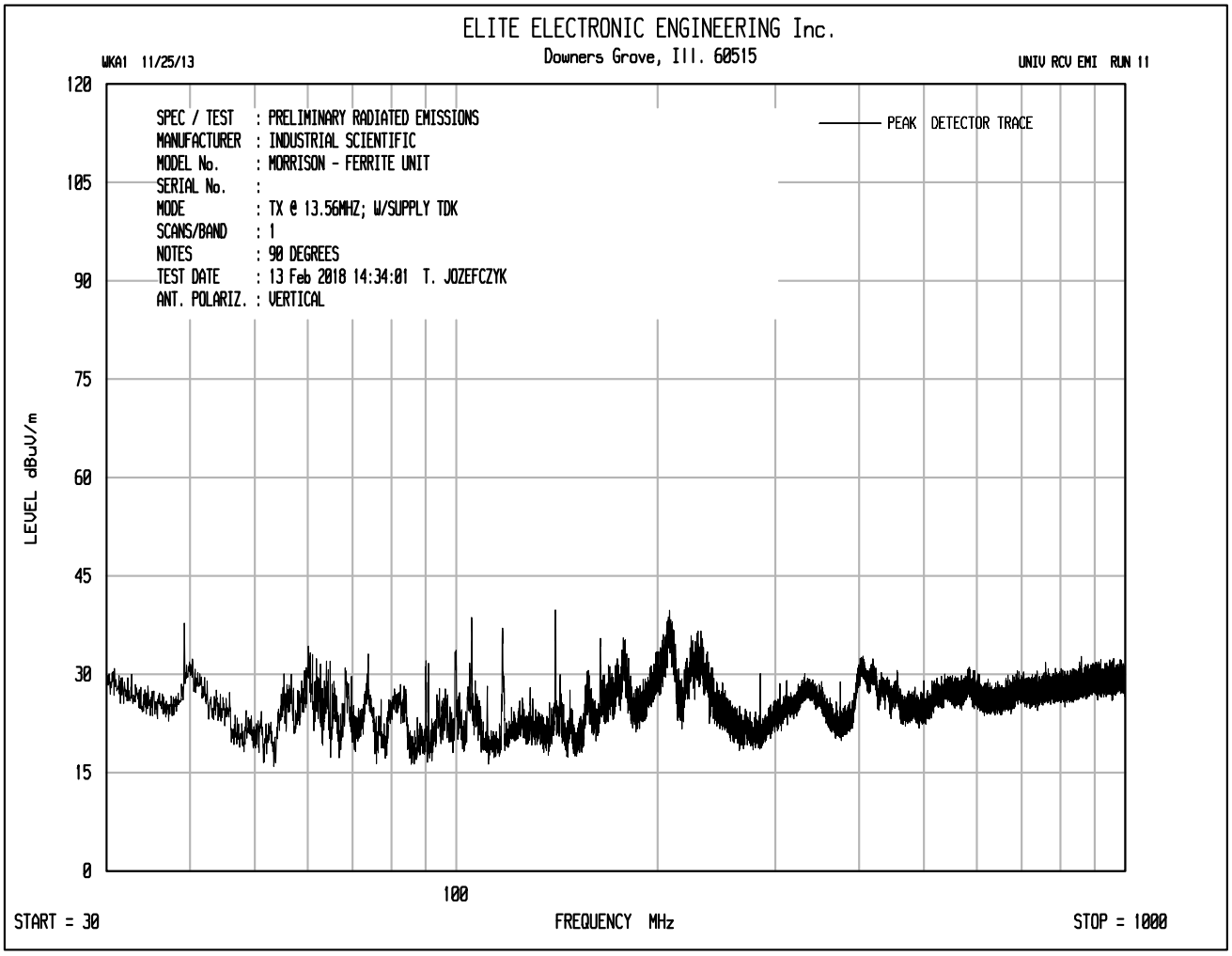

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 27
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK.
SCANS/BAND : 1
NOTES : Z AXIS; 180 DEGREES
TEST DATE : 13 Feb 2018 14:12:53 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

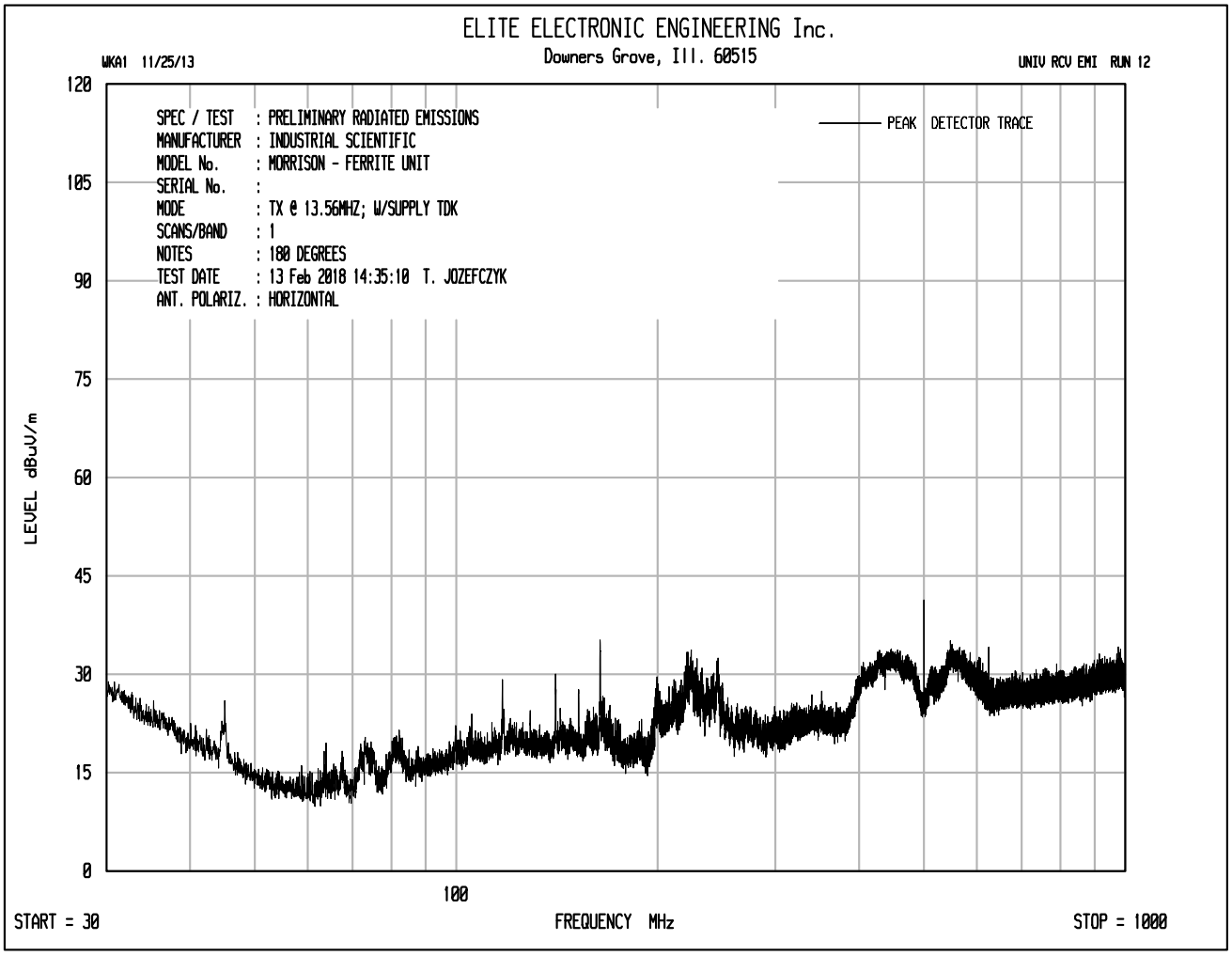

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 28
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK.
SCANS/BAND : 1
NOTES : Z AXIS; 270 DEGREES
TEST DATE : 13 Feb 2018 14:14:25 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

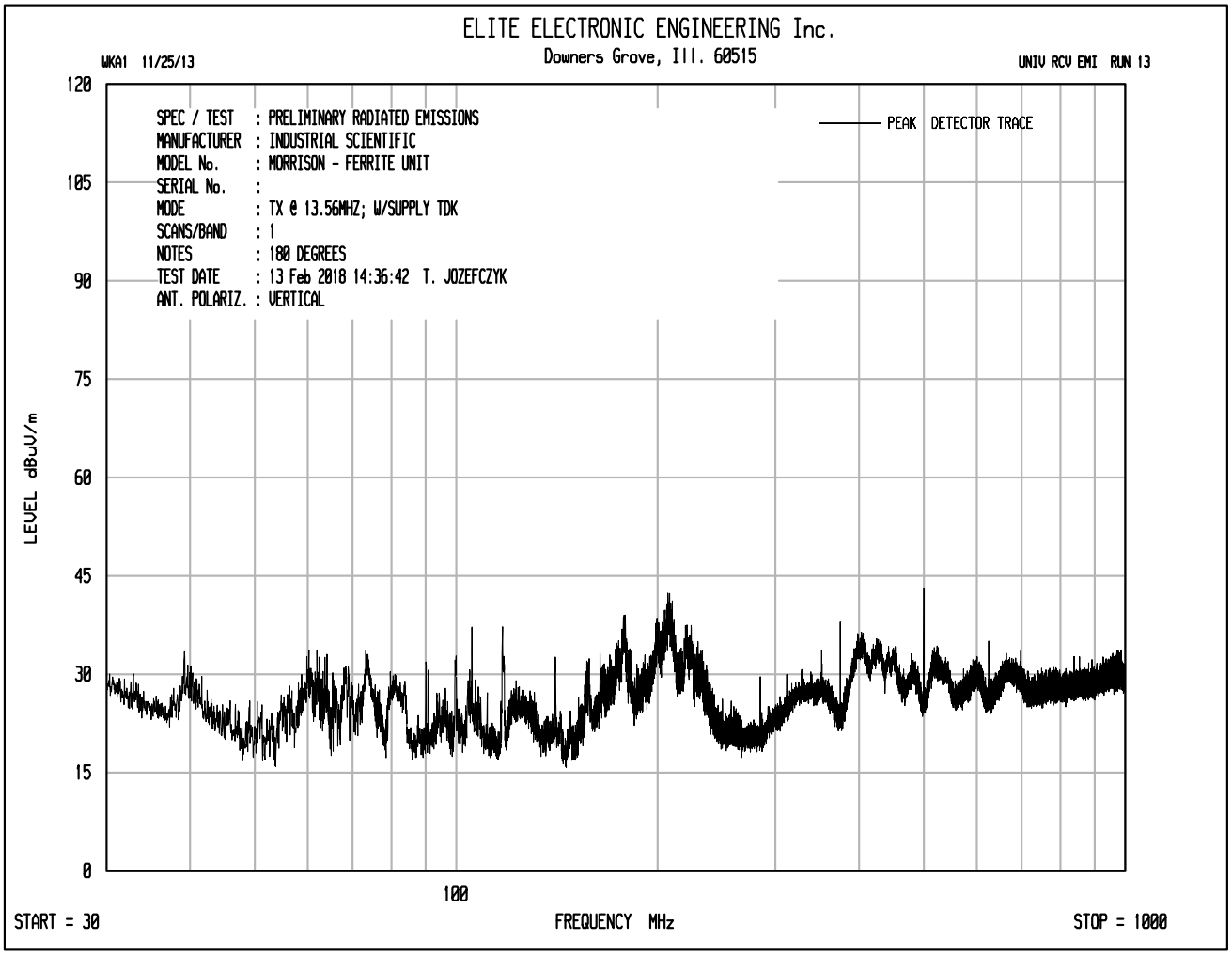

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 8
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 0 DEGREES
TEST DATE : 13 Feb 2018 14:29:46 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

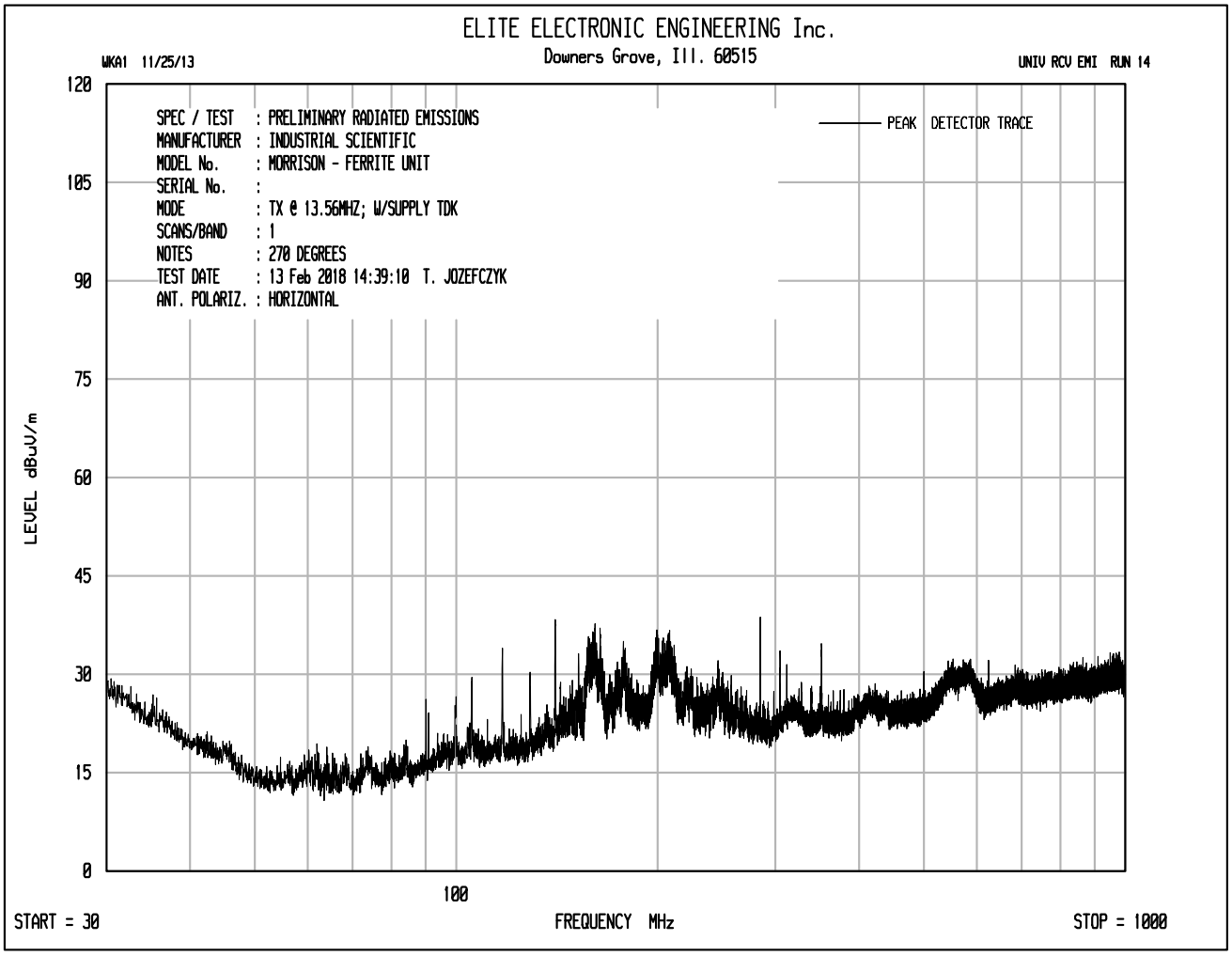

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 9
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 0 DEGREES
TEST DATE : 13 Feb 2018 14:31:34 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

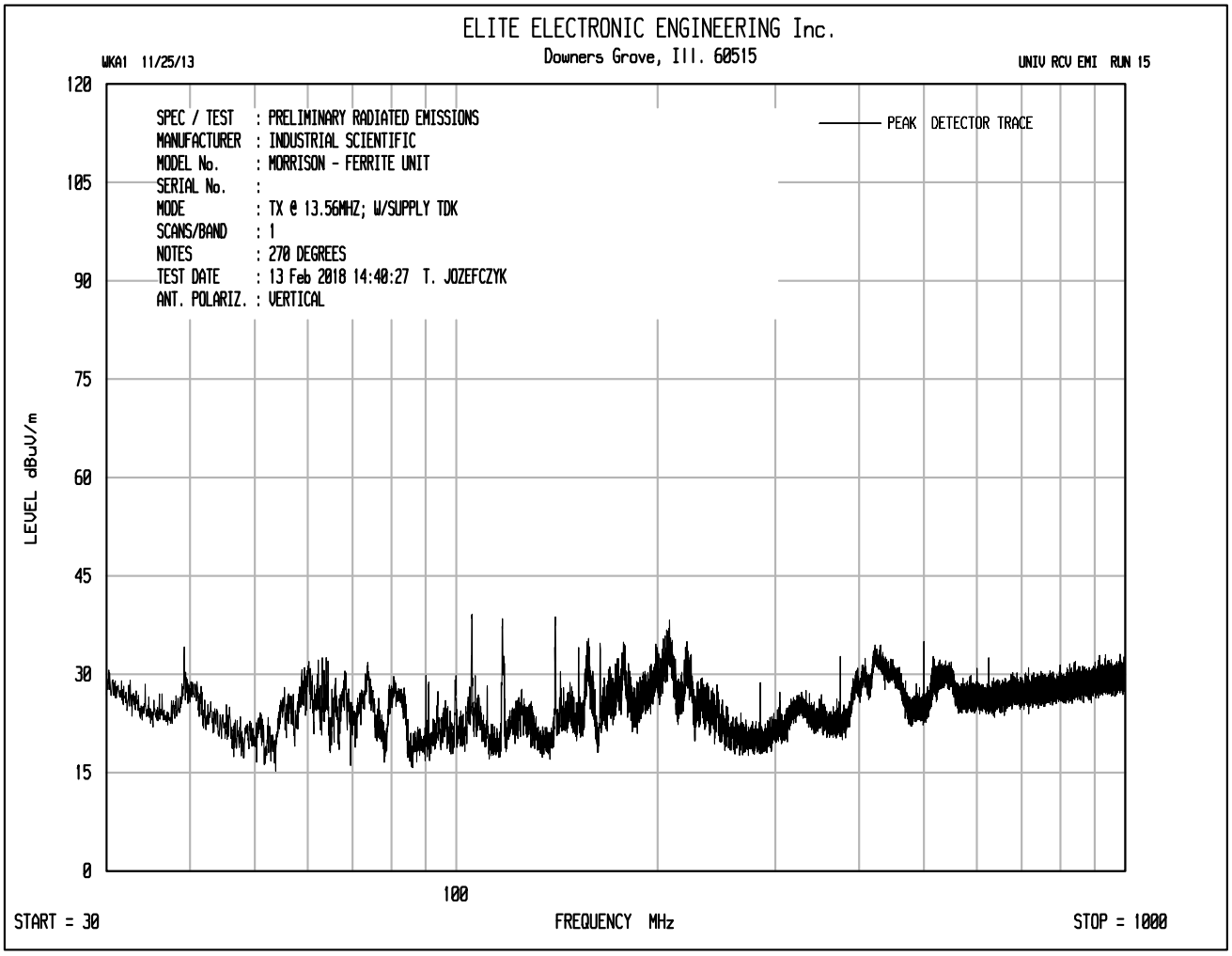

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 90 DEGREES
TEST DATE : 13 Feb 2018 14:32:42 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 11
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 90 DEGREES
TEST DATE : 13 Feb 2018 14:34:01 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 12
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 180 DEGREES
TEST DATE : 13 Feb 2018 14:35:10 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 180 DEGREES
TEST DATE : 13 Feb 2018 14:36:42 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 14
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 270 DEGREES
TEST DATE : 13 Feb 2018 14:39:10 T. JOZEFCZYK
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 15
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : INDUSTRIAL SCIENTIFIC
MODEL No. : MORRISON - FERRITE UNIT
SERIAL No. :
MODE : TX @ 13.56MHZ; W/SUPPLY TDK
SCANS/BAND : 1
NOTES : 270 DEGREES
TEST DATE : 13 Feb 2018 14:40:27 T. JOZEFCZYK
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

Manufacturer: Industrial Scientific Corporation
Model No.: RGX
Serial no.: 18052MT-003
Test Mode: Tx @ 13.56MHz
Test Date: Feb 13, 2018
Test Distance: 3 meters
Test Performed: FCC 15.225 Radiated Emissions

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
13.560	H	51.0		0.4	9.9	0.0	-40.0	21.3	11.6	15848.0	30.0	-62.7
13.560	V	59.8		0.4	9.9	0.0	-40.0	30.1	32.0	15848.0	30.0	-53.9
27.120	H	21.5		0.6	8.4	0.0	-40.0	-9.5	0.3	30.0	30.0	-39.1
27.120	V	23.8		0.6	8.4	0.0	-40.0	-7.2	0.4	30.0	30.0	-36.7
40.680	H	11.7		0.8	20.6	0.0	0.0	33.1	45.2	100.0	3.0	-6.9
40.680	V	12.7		0.8	20.6	0.0	0.0	34.1	50.8	100.0	3.0	-5.9
54.240	H	14.3		0.9	14.9	0.0	0.0	30.2	32.3	100.0	3.0	-9.8
54.240	V	22.4		0.9	14.9	0.0	0.0	38.2	81.6	100.0	3.0	-1.8
67.800	H	13.0		1.0	14.1	0.0	0.0	28.1	25.4	100.0	3.0	-11.9
67.800	V	19.5		1.0	14.1	0.0	0.0	34.6	53.5	100.0	3.0	-5.4
81.360	H	13.7		1.1	13.1	0.0	0.0	27.8	24.6	100.0	3.0	-12.2
81.360	V	23.5		1.1	13.1	0.0	0.0	37.6	75.9	100.0	3.0	-2.4
94.920	H	13.5		1.1	15.3	0.0	0.0	30.0	31.5	150.0	3.0	-13.6
94.920	V	19.7		1.1	15.3	0.0	0.0	36.2	64.3	150.0	3.0	-7.4
108.480	H	16.9		1.2	17.8	0.0	0.0	35.8	61.6	150.0	3.0	-7.7
108.480	V	20.3		1.2	17.8	0.0	0.0	39.3	91.9	150.0	3.0	-4.3
122.040	H	18.1		1.2	18.1	0.0	0.0	37.5	74.8	150.0	3.0	-6.0
122.040	V	13.1		1.2	18.1	0.0	0.0	32.5	42.1	150.0	3.0	-11.0
135.600	H	20.3		1.3	17.8	0.0	0.0	39.4	93.5	150.0	3.0	-4.1
135.600	V	22.6		1.3	17.8	0.0	0.0	41.7	120.9	150.0	3.0	-1.9
42.02	V	18.0		0.8	19.9	0.0	0.0	38.8	87.0	100.0	3.0	-1.2
60.21	V	23.3		0.9	13.7	0.0	0.0	38.0	79.2	100.0	3.0	-2.0

Manufacturer: Industrial Scientific Corporation
Model No.: RGX
Serial no.: 18052MT-003
Test Mode: Tx @ 13.56MHz
Test Date: Feb 13, 2018
Test Distance: 3 meters
Test Performed: FCC 15.225 Radiated Emissions

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
13.560	H	50.3		0.4	9.9	0.0	-40.0	20.6	10.7	15848.0	30.0	-63.4
13.560	V	60.3		0.4	9.9	0.0	-40.0	30.6	33.7	15848.0	30.0	-53.4
27.120	H	22.3		0.6	8.4	0.0	-40.0	-8.6	0.4	30.0	30.0	-38.2
27.120	V	23.1		0.6	8.4	0.0	-40.0	-7.9	0.4	30.0	30.0	-37.4
40.680	H	13.0		0.8	20.6	0.0	0.0	34.4	52.4	100.0	3.0	-5.6
40.680	V	16.7		0.8	20.6	0.0	0.0	38.1	80.4	100.0	3.0	-1.9
54.240	H	11.7		0.9	14.9	0.0	0.0	27.5	23.7	100.0	3.0	-12.5
54.240	V	19.6		0.9	14.9	0.0	0.0	35.4	59.0	100.0	3.0	-4.6
67.800	H	12.7		1.0	14.1	0.0	0.0	27.8	24.5	100.0	3.0	-12.2
67.800	V	20.3		1.0	14.1	0.0	0.0	35.4	58.6	100.0	3.0	-4.6
81.360	H	10.9		1.1	13.1	0.0	0.0	25.0	17.8	100.0	3.0	-15.0
81.360	V	17.1		1.1	13.1	0.0	0.0	31.2	36.4	100.0	3.0	-8.8
94.920	H	12.0		1.1	15.3	0.0	0.0	28.5	26.6	150.0	3.0	-15.0
94.920	V	13.6		1.1	15.3	0.0	0.0	30.1	31.9	150.0	3.0	-13.5
108.480	H	14.6		1.2	17.8	0.0	0.0	33.5	47.3	150.0	3.0	-10.0
108.480	V	15.8		1.2	17.8	0.0	0.0	34.8	54.8	150.0	3.0	-8.7
122.040	H	12.4		1.2	18.1	0.0	0.0	31.7	38.5	150.0	3.0	-11.8
122.040	V	11.3		1.2	18.1	0.0	0.0	30.6	34.0	150.0	3.0	-12.9
135.600	H	11.8		1.3	17.8	0.0	0.0	30.9	35.1	150.0	3.0	-12.6
135.600	V	11.1		1.3	17.8	0.0	0.0	30.2	32.4	150.0	3.0	-13.3
63.79	H	13.2		1.0	13.9	0.0	0.0	28.1	25.3	100.0	3.0	-11.9
90.07	V	22.9		1.1	14.2	0.0	0.0	38.1	80.8	150.0	3.0	-5.4
99.96	V	19.7		1.1	16.4	0.0	0.0	37.3	73.1	150.0	3.0	-6.2
105.50	V	20.2		1.2	17.5	0.0	0.0	38.8	87.4	150.0	3.0	-4.7
117.15	H	18.5		1.2	18.2	0.0	0.0	37.9	78.7	150.0	3.0	-5.6

Manufacturer: Industrial Scientific Corporation
Model No.: RGX
Serial no.: 18052MT-003
Test Mode: Tx @ 13.56MHz
Test Date: June 8, 2018
Test Performed: FCC 15.225(e) Frequency Stability

Temperature °C	Input Voltage	Nominal Frequency Hz	Measured Frequency Hz	Frequency Variation in %			Pass/Fail
				Lower Limit %	Measured Variation %	Upper Limit %	
-20	120.0	13,560,016	13,560,016	-0.010000000	0.000000000	0.010000000	Pass
-20	102.0	13,560,016	13,560,016	-0.010000000	0.000000000	0.010000000	Pass
-20	138.0	13,560,016	13,560,016	-0.010000000	0.000000000	0.010000000	Pass
-10	120.0	13,560,016	13,560,028	-0.010000000	0.000088495	0.010000000	Pass
-10	102.0	13,560,016	13,560,028	-0.010000000	0.000088495	0.010000000	Pass
-10	138.0	13,560,016	13,560,044	-0.010000000	0.000206489	0.010000000	Pass
0	120.0	13,560,016	13,560,051	-0.010000000	0.000258112	0.010000000	Pass
0	102.0	13,560,016	13,560,051	-0.010000000	0.000258112	0.010000000	Pass
0	138.0	13,560,016	13,560,051	-0.010000000	0.000258112	0.010000000	Pass
+10	120.0	13,560,016	13,560,064	-0.010000000	0.000353982	0.010000000	Pass
+10	102.0	13,560,016	13,560,064	-0.010000000	0.000353982	0.010000000	Pass
+10	138.0	13,560,016	13,560,064	-0.010000000	0.000353982	0.010000000	Pass
+20	120.0	13,560,016	13,560,016	-0.010000000	0.000000000	0.010000000	Pass
+20	102.0	13,560,016	13,560,016	-0.010000000	0.000000000	0.010000000	Pass
+20	138.0	13,560,016	13,560,016	-0.010000000	0.000000000	0.010000000	Pass
+30	120.0	13,560,016	13,560,035	-0.010000000	0.000140118	0.010000000	Pass
+30	102.0	13,560,016	13,560,035	-0.010000000	0.000140118	0.010000000	Pass
+30	138.0	13,560,016	13,560,035	-0.010000000	0.000140118	0.010000000	Pass
+40	120.0	13,560,016	13,560,003	-0.010000000	-0.000095870	0.010000000	Pass
+40	102.0	13,560,016	13,560,003	-0.010000000	-0.000095870	0.010000000	Pass
+40	138.0	13,560,016	13,560,003	-0.010000000	-0.000095870	0.010000000	Pass
+50	120.0	13,560,016	13,560,003	-0.010000000	-0.000095870	0.010000000	Pass
+50	102.0	13,560,016	13,560,003	-0.010000000	-0.000095870	0.010000000	Pass
+50	138.0	13,560,016	13,560,003	-0.010000000	-0.000095870	0.010000000	Pass

Checked BY Richard E. King :

Richard E. King