Measurement of RF Interference from an Orion SE Handheld Transceiver

For	Badger Meter, Incorporated 4545 W. Brown Deer Road Milwaukee, WI 53223
P.O. Number	344115
Date Tested	March 13-22, 2018
Test Personnel	Richard King
Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Frequency Hopping Spread Spectrum Intentional Radiators within the bands 902-928MHz FCC “Code of Federal Regulations” Title 47, Part15, Subpart 15B, Section 15.107 and 15.109 for Receivers Industry Canada RSS-210 Industry Canada RSS-GEN

Test Report By:

Richard King
EMC Engineer

Requested By:

Randy Schultz
Badger Meter, Incorporated

Approved By:

Raymond J. Klouda
Registered Professional
Engineer of Illinois - 44894

Elite Electronic Engineering Inc.
1516 CENTRE CIRCLE
DOWNERS GROVE, IL 60515
TEL: 630 - 495 - 9770
FAX: 630 - 495 - 9785
www.elitetest.com

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REVISION HISTORY

Revision	Date	Description
—	04/13/2018	Initial release

Measurement of RF Emissions from Part No. Orion SE Handheld Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This report presents the results of the RF emissions measurements performed on a Transceiver, Model No. Orion SE Handheld (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Badger Meter, Incorporated located in Milwaukee, WI.

The EUT is a super-heterodyne type receiver designed to tune over the range 902-928MHz. The EUT was equipped with either a Nearson S161TR-915 6 inch external antenna referred to as a “Duck” antenna or a Laird B8965C 12 inch magnetic antenna referred to as a Whip antenna.

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 B, Sections 15.107 and 15.109, for receivers and Subpart C, Sections 15.207 and 15.249 for Intentional Radiators Operating within the 902-928 MHz band.

The test series was also performed to determine if the EUT meets the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 7.2.4 and Section 6 for receivers and the Industry Canada Radio Standards Specification RSS-Gen Section 7.2.4 and RSS-210 Annex 8, 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 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 24.2°C and the relative humidity was humidity 18%.

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, Subparts B and C, dated 10 April 2018
- 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"
- FCC Public Notice, DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", Released March 30, 2000
- Federal Communications Commission Office of Engineering and Technology Laboratory Division Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under Section 15.247, October 4, 2012

- Industry Canada RSS-247, Issue 2, February 2014, “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 4, November 2014, “Spectrum Management and Telecommunications Radio Standards Specification, General Requirements and Information for the Certification of radio communication equipment”

3 EUT SET-UP AND OPERATION

3.1 General Description

The EUT is a Transceiver, Part No. Orion SE Handheld. A block diagram of the EUT setup is shown as Figure 1.

3.1.1 Power Input

The EUT was powdered by a laptop through its USB port and supplied with 5V DC.

3.1.2 Peripheral Equipment

The following peripheral equipment was submitted with the EUT:

Item	Description
Laptop	Provided power and device commands

3.1.3 Interconnect Cables

The following interconnect cables were submitted with the EUT:

Item	Description
USB Cable	Unterminated 3 foot USB cable connected to the USB port of the EUT

3.1.4 Grounding

The EUT was not grounded during the tests.

3.2 Operational Mode

For all tests, the EUT was placed on an 80cm high non-conductive stand. The EUT was energized. The unit was programmed to operate in one of the following modes:

- Transmit at 904.9 MHz
- Transmit at 914.1 MHz
- Transmit at 923.7 MHz
- Receive at 904.9 MHz
- Receive at 914.1 MHz
- Receive at 923.7 MHz
- Frequency Hopping Enabled

3.3 EUT Modifications

In order to reduce the spurious emission levels, the EUT was modified by placing three (3) Fair-Rite Model 0431164281 ferrite beads on the USB power cable to the EUT.

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 9-1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

Conducted emission tests were performed with a spectrum analyzer in conjunction with a quasi-peak adapter. Radiated emissions were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths specified by the FCC and with the quasi-peak and average detector functions. The spectrum analyzer bandwidth was 120kHz for the 30MHz to 1000MHz radiated emissions data.

4.3 Calibration Traceability

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

4.4 Measurement Uncertainty

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

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 Receiver

5.1.1 Powerline Conducted Emissions

5.1.1.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, 15.107(a) and Industry Canada RSS-Gen section 7.2.4, all radio frequency voltages on the power lines of a receiver shall be below the values shown below when using a quasi-peak or average detector:

CONDUCTED LIMITS FOR A RECEIVER

Frequency MHz	RFI Voltage dBuV(QP)	RFI Voltage dBuV(Average)
0.15-0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5-5	56	46
5-30	60	50

Note 1: The lower limit shall apply at the transition frequencies.
Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the EUT is considered to have met both requirements and measurements do not need to be performed using the Average detector.

5.1.1.2 Procedures

The interference on each power lead 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.

a) The EUT was operated in Rx mode.

b) Measurements were first made on the High line.

c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.

d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.

e) 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.)

f) 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.

g) Steps (c) through (f) were repeated on the Neutral line.

5.1.1.3 Results

The plots and tabular data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in Rx mode are shown on pages 28 through 31.

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

5.1.2 Radiated Measurements

5.1.2.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Section 15.109(a) and Industry Canada RSS-Gen, Section 6.1, all radio frequency emissions from a receiver shall be below the limits shown in 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.

5.1.2.2 Procedures

For FCC, testing was performed separately on a low, middle, and high channel. The emissions in the frequency range of 30MHz to 5GHz were measured and plotted using a 'screen-dump' utility.

Testing was performed with the antenna of the EUT in place.

For Industry Canada, testing was performed on a middle channel. The emissions in the frequency range of 30MHz to 3 times the highest tunable or local oscillator frequency, whichever is the higher, were measured and plotted. Testing was performed with the antenna of the EUT in place.

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 C63.4-2014 for site attenuation.

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

Since a quasi-peak detector and an average detector require long integration times, it is not practical to automatically sweep through the quasi-peak and average 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 or average detector.

The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 30MHz to 1GHz 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 frequency range from 1GHz to 10GHz was investigated using a peak detector function with the double ridged waveguide 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.

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 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna.

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

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

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

c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

5.1.2.3 Results

The preliminary plots and final radiated levels are presented on pages 36 through 71. The plots are presented for reference only, and are not used to determine compliance. 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 as Figure 3 and Figure 4.

5.2 Transmitter

5.2.1 Powerline Conducted Emissions

5.2.1.1 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:

CONDUCTED LIMITS FOR A TRANSMITTER

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.

5.2.1.1 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.

a) The EUT was operated in the Tx mid-channel mode.

b) Measurements were first made on the 115, 60Hz L1 line.

c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.

d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.

e) 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.)

f) 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.

g) Steps (c) through (f) were repeated on the 115, 60Hz L2 line.

5.2.1.1 Results

The plots and tabular data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the Tx mode are shown on pages 32 through 35.

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

5.2.2 20dB Bandwidth

5.2.2.1 Requirements

Per 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Per section 15.247(a)(1)(i), for frequency hopping systems operating in the 902-928MHz band, the 20dB bandwidth shall be measured for determination of the carrier frequency separation limits and must not exceed 500 kHz. If the 20dB bandwidth of the hopping channel is less than 250kHz, the system shall use at least 50 hopping channels. If the 20dB bandwidth of the hopping channel is 250kHz or greater (but not greater than 500kHz), the system shall use at least 25 hopping channels.

5.2.2.2 Procedures

The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation.

With the hopping function disabled, the EUT was allowed to transmit continuously. The frequency hopping channel was set separately to low, middle, and high hopping channels. The resolution bandwidth (RBW) was set to ≥ 1% of the 20 dB BW. The span was set to approximately 2 to 3 times the 20 dB bandwidth.

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.

5.2.2.3 Results

The plots on pages 72 through 74 show that the maximum 20 dB bandwidth was 312.7kHz. The maximum 99% bandwidth was measured to be 307.7kMHz.

Therefore, since the 20dB bandwidth of the hopping channel is 250kHz or greater, but not greater than 500kHz, the system shall use at least 25 hopping channels.

5.2.3 Carrier Frequency Separation

5.2.3.1 Requirements

Per section 15.247 (a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

5.2.3.2 Procedures

The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation. With the hopping function enabled, the EUT was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to > to 1% of the span. The peak detector and 'Max-Hold' function were engaged. The span was set wide enough to capture the peaks of at least two adjacent channels.
When the trace had stabilized after multiple scans, the marker-delta function was used to determine the separation between the peaks of the adjacent channels. The analyzer's display was plotted using a 'screen dump' utility.

5.2.3.3 Results

Page 78 shows the carrier frequency separation. As can be seen from this plot, the carrier frequency separation is 399.6kHz, which is greater than the 20dB bandwidth (312.7kHz).

5.2.4 Number of Hopping Frequencies

5.2.4.1 Requirements

Per section 15.247(a)(1)(i), for frequency hopping systems operating in the 902-928MHz band, the 20dB bandwidth shall be measured for determination of the carrier frequency separation limits and must not exceed 500 kHz. If the 20dB bandwidth of the hopping channel is less than 250kHz, the system shall use at least 50 hopping channels. If the 20dB bandwidth of the hopping channel is 250kHz or greater (but not greater than 500kHz), the system shall use at least 25 hopping channels.

5.2.4.2 Procedures

The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation. With the hopping function enabled, the EUT was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to ≥ to 1% of the span. The peak detector and 'Max-Hold' function were engaged. The span was set wide enough to capture the entire frequency band of operation.

The EUT's signal was allowed to stabilize after multiple scans. The number of hopping frequencies was counted. The analyzer's display was plotted using a 'screen dump' utility.

5.2.4.3 Results

Page 79 shows the number of hopping frequencies. As can be seen from this plot, the number of hopping frequencies is 48 which is equal to (or greater than) 25 which is the minimum number of required hopping frequencies for systems with a 20dB bandwidth greater than 250kHz.

5.2.5 Time of Occupancy

5.2.5.1 Requirements

Per section 15.247(a)(1)(i), for frequency hopping systems operating in the 902-928MHz band, if the 20dB bandwidth of the hopping channel is 250kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

5.2.5.2 Procedures

The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation. With the hopping function enabled, the EUT was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to 1 MHz. The peak detector and 'Max-Hold' function were engaged. With the span set to 0Hz, the sweep time was adjusted to capture a single event in order to measure the dwell time per hop. The analyzer's display was plotted using a 'screen dump' utility. Then, the sweep time was expanded to 10 seconds to capture the number of hops in the appropriate sweep time. A single sweep was made. The analyzer's display was plotted using a 'screen dump' utility.

The dwell time in the specified time period was then calculated from dwell time per hop multiplied by the number of hops in the specified time period.

5.2.5.3 Results

Pages 80 and 81 show the plots for the time of occupancy (0.02sec). As can be seen from the plots, the time of occupancy can be determined by 0.01sec per hop multiplied by 2 hops. This calculated value is equal to 0.02 seconds which is less than the 0.4 seconds maximum allowed.

5.2.6 Peak Output Power

5.2.6.1 Requirements

Per section 15.247(b)(2), for frequency hopping systems operating in the 902-928MHz band and employing less than 50

hopping channels, but at least 25 hopping channels, the maximum peak output conducted power shall not be greater than 0.25W (24dBm). Per section 15.247(b)(4), this limit is based on the use of antennas with directional gains that do not exceed 6dBi. Since the limit allows for a 6dBi antenna gain, the maximum EIRP can be increased by 6dB to 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below 24dBm by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.2.6.2 Procedures

The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation. With the hopping function disabled, the EUT was allowed to transmit continuously. The frequency hopping channel was set separately to low, middle, and high hopping channels. The resolution bandwidth (RBW) was set to greater than the 20dB bandwidth. The span was set to approximately 5 times the 20 dB bandwidth. The 'Max-Hold' function was engaged. The maximum meter reading was recorded. The peak power output was calculated for the low, middle and high hopping frequencies.

5.2.6.3 Results

The results are presented on pages 82 through 84. The maximum peak conducted output power from the transmitter was 0.011W (10.25 dBm) which is below the 0.25 Watt limit.

The results are presented on pages 85 through 86. The maximum EIRP measured from the transmitter was 15.4 dBm or 0.034 W which is below the 1 Watt limit.

5.2.7 Antenna Conducted Spurious Emissions

5.2.7.1 Requirements

Per section 15.247(c), the spurious emissions in any 100 kHz BW outside the frequency band must be at least 20dB below the highest 100 kHz BW level measured within the band.

5.2.7.2 Procedures

The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation. The frequency hopping function was disabled. The resolution bandwidth (RBW) was set to 100kHz. The peak detector and 'Max-Hold' function were engaged. The emissions in the frequency range from 30MHz to 10GHz were observed and plotted separately with the EUT transmitting at low, middle and high hopping frequencies.

5.2.7.3 Results

The results of the antenna conducted emissions levels were plotted. These plots are presented on pages 87 through 89. These plots show that the spurious emissions were at least 20 dB below the level of the fundamental.

5.2.8 Radiated Spurious Emissions Measurements

5.2.8.1 Requirements

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

5.2.8.2 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 10.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 10.0GHz.

1) For all harmonics not in the restricted bands, the following procedure was used:
   a) The field strength of the fundamental was measured using a dipole antenna. The dipole antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
   b) The field strengths of all of the harmonics not in the restricted band were 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 100 kHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst case emission levels at the fundamental and harmonics 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.
      iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
   d) All harmonics not in the restricted bands must be at least 20 dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.
2) For all emissions in the restricted bands, the following procedure was used:
   a) The field strengths of all emissions below 1 GHz were 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 100 kHz was used on the spectrum analyzer.
   b) The field strengths of all emissions above 1 GHz were 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 1 MHz 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.
      iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
   d) For all radiated emissions measurements below 1 GHz, 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 remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1 GHz, the peak readings must comply with the 15.35(b) limits. 15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).

f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken. If the dwell time per channel of the hopping signal is less than 100msec, then the reading obtained with the 10 Hz video bandwidth may be further adjusted by a “duty cycle correction factor”, derived from 20*log(dwell time/100msec). These readings must be no greater than the limits specified in 15.209(a).

5.2.8.3 Results

Initial testing produced results which were in excess of the emissions limits. The EUT was modified by placing three Fair-Rite Brand model 0431164281 ferrite beads on the USB power cable to the EUT. With these ferrite beads in place the EUT meet the spurious emissions limit.

Preliminary and final radiated emissions plots with the EUT transmitting at 904.9MHz, 914.1MHz, and 923.7MHz are shown on pages 90 through 143.

Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 3 through 6.

5.2.9 Band Edge Compliance

5.2.9.1 Requirements

Per section 15.247(d), the emissions at the band-edges must be at least 20dB below the highest level measured within the band but attenuation below the general limits listed in 15.209(a) is not required.

5.2.9.2 Procedures

5.2.9.2.1 Low Band Edge

1) The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation.
2) The EUT was set to transmit continuously at the channel closest to the low band-edge (hopping function disabled).
3) To determine the band edge compliance, the following spectrum analyzer settings were used:

    a. Center frequency = low band-edge frequency.
    b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
    c. Resolution bandwidth (RBW) ≥ 1% of the span.
    d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
    e. The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)
    f. The analyzer's display was plotted using a 'screen dump' utility.

4) Step 3) was repeated with the frequency hopping function enabled.

5.2.9.2.2 High Band Edge

1) The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation.
2) The EUT was set to transmit continuously at the channel closest to the high band-edge (hopping function disabled).
3) To determine the band edge compliance, the following spectrum analyzer settings were used:

    a. Center frequency = high band-edge frequency.
    b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
    c. Resolution bandwidth (RBW) ≥ 1% of the span.
    d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
    e. The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the right of the center frequency (band-edge) must be below the display line.)
    f. The analyzer's display was plotted using a 'screen dump' utility.

4) Step 3) was repeated with the frequency hopping function enabled.

5.2.9.3 Results

Pages 144 through 147 show the conducted band-edge compliance results. As can be seen from these plots, the emissions at the low end band-edge and the high end band-edge are within the 20 dB down limits.

6 CONCLUSIONS

With the modifications per paragraph 3.3, the Badger Meter, Incorporated Transceiver, Part No. Orion SE Handheld frequency hopping spread spectrum transceiver, Serial No. None Assigned did fully meet the conducted and radiated emissions 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 902-928 MHz band, when tested per ANSI C63.4-2014.

With the modifications per paragraph 3.3, the Badger Meter, Incorporated Transceiver, Part No. Orion SE Handheld frequency hopping spread spectrum transceiver, Serial No. None Assigned, did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 7.2.4 and Section 6 for receivers and the Industry Canada Radio Standards Specification RSS-Gen Section 7.2.4 and RSS-210 Annex 8, for transmitters, when tested per ANSI C63.4-2014.

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 certification, approval, or endorsement by NVLAP, NIST or any agency of the Federal Government.

9 EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
CDU2	LAPTOP COMPUTER	DELL	PRECISION	---	---	N/A	
GSE0	SIGNAL GENERATOR (40GHZ)	ROHDE & SCHWARZ	SMB100A	175137	100KHZ-40GHZ	8/17/2017	8/17/2018
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	9/11/2017	9/11/2018
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	8/18/2017	8/18/2018
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/18/2016	5/18/2018
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/4/2016	4/4/2018
PLF2	CISPR16 50UH LISN	ELITE	CISPR16/70A	002	.15-30MHz	5/4/2017	5/4/2018
PLF4	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	5/4/2017	5/4/2018
RAKI	RF SECTION	HEWLETT PACKARD	85462A	3411A00181	0.009-6500MHZ	3/1/2018	3/1/2019
RAKJ	RF FILTER SECTION	HEWLETT PACKARD	85460A	3330A00154	---	2/23/2018	2/23/2019
RBG0	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101533	10HZ-44GHZ	12/7/2017	12/7/2018
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	2/23/2018	2/23/2019
SHC2	Power Supplies	HENGFU	HF60W-SL-24	A11372702	24V	NOTE 1	
T1E1	10DB 25W ATTENUATOR	WEINSCHEL	46-10-43	AU1883	DC-18GHZ	7/7/2016	7/7/2018
T2SA	20DB 25W ATTENUATOR	WEINSCHEL	46-20-34	CD5015	DC-18GHZ	7/7/2016	7/7/2018
XLJ10	50 OHM, 2W TERMINATION	JFW INDUSTRIES	50T-199	---	DC-2GHZ	6/29/2017	6/29/2019
XPQ2	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	3	1.8-10GHZ	9/12/2017	9/12/2019

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.

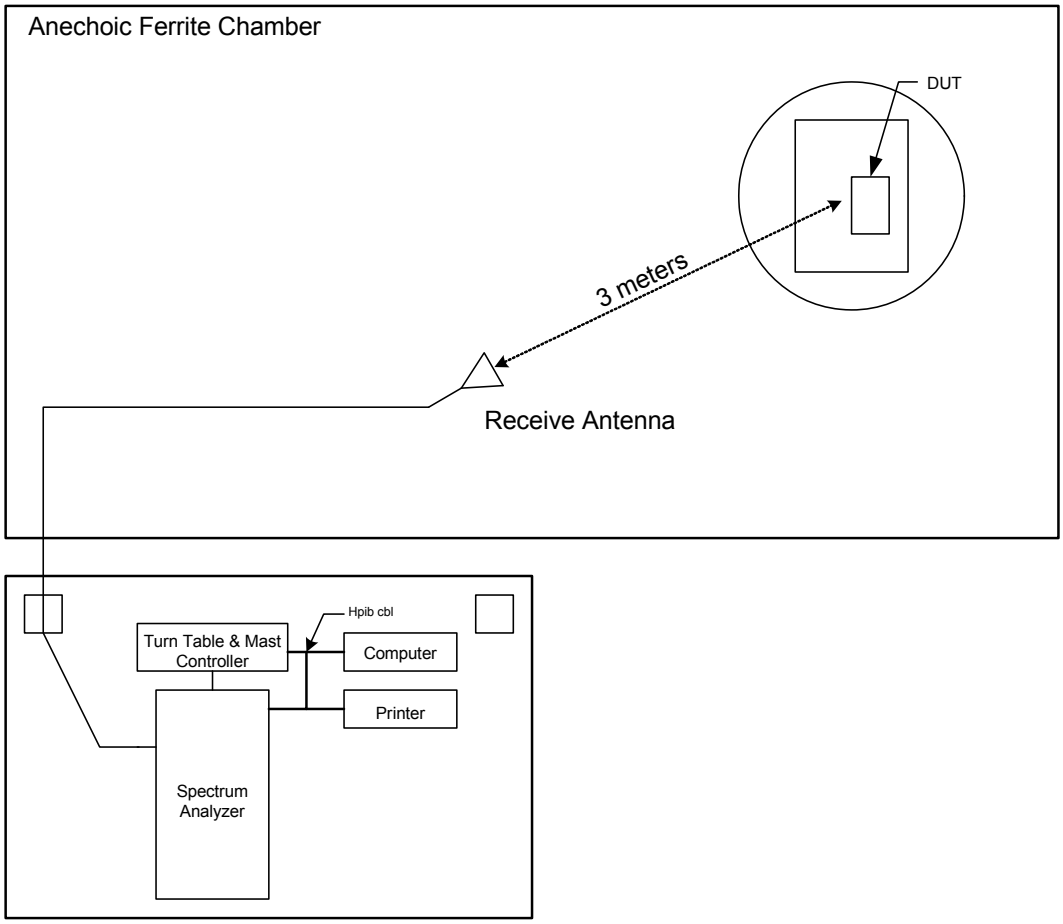
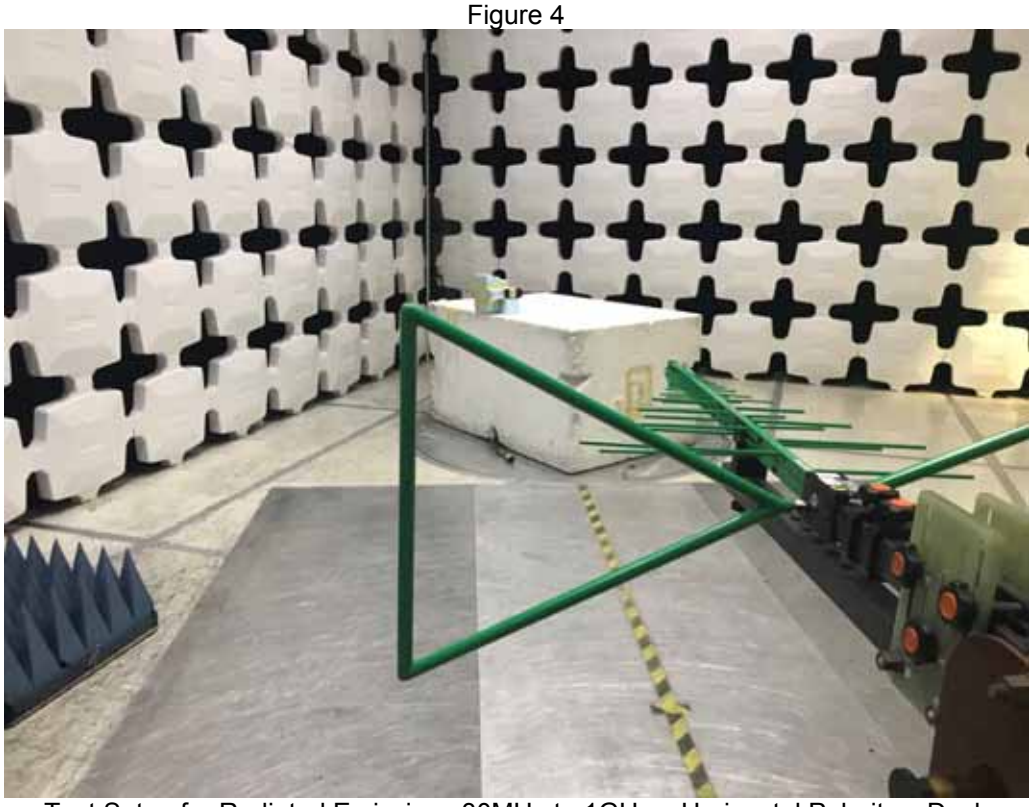


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 3

Test Setup for Conducted Emissions

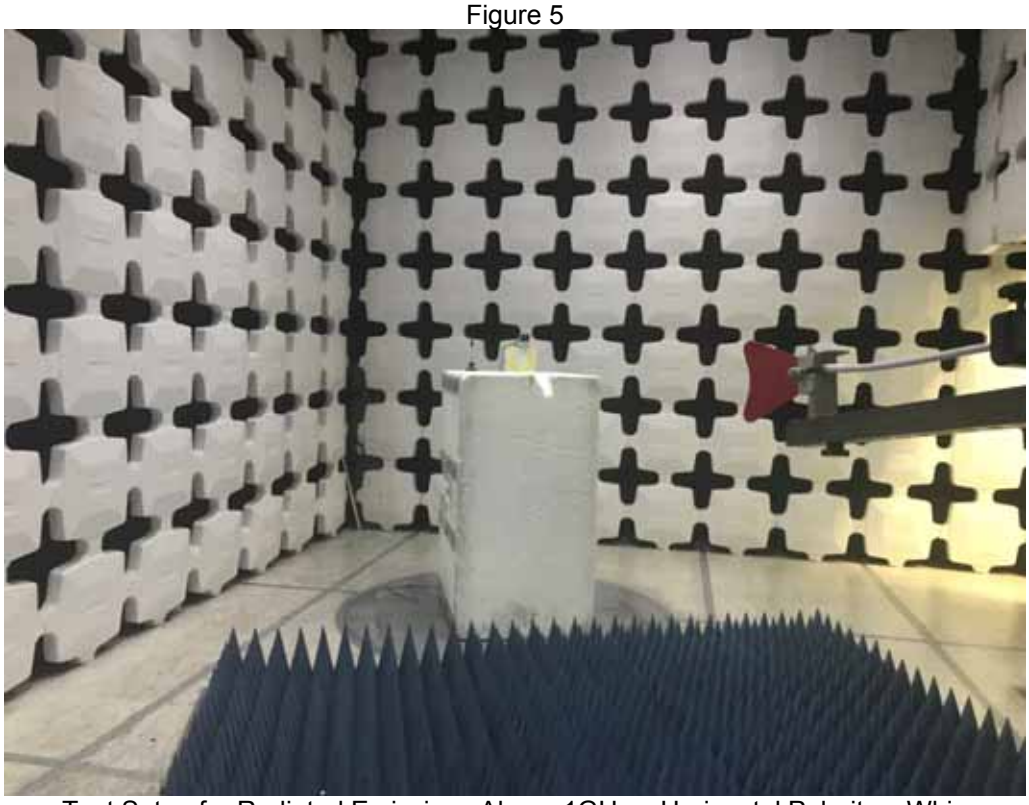
Figure 4



Test Setup for Radiated Emissions 30MHz to 1GHz – Horizontal Polarity – Duck

Test Setup for Radiated Emissions 30MHz to 1GHz – Vertical Polarity - Duck

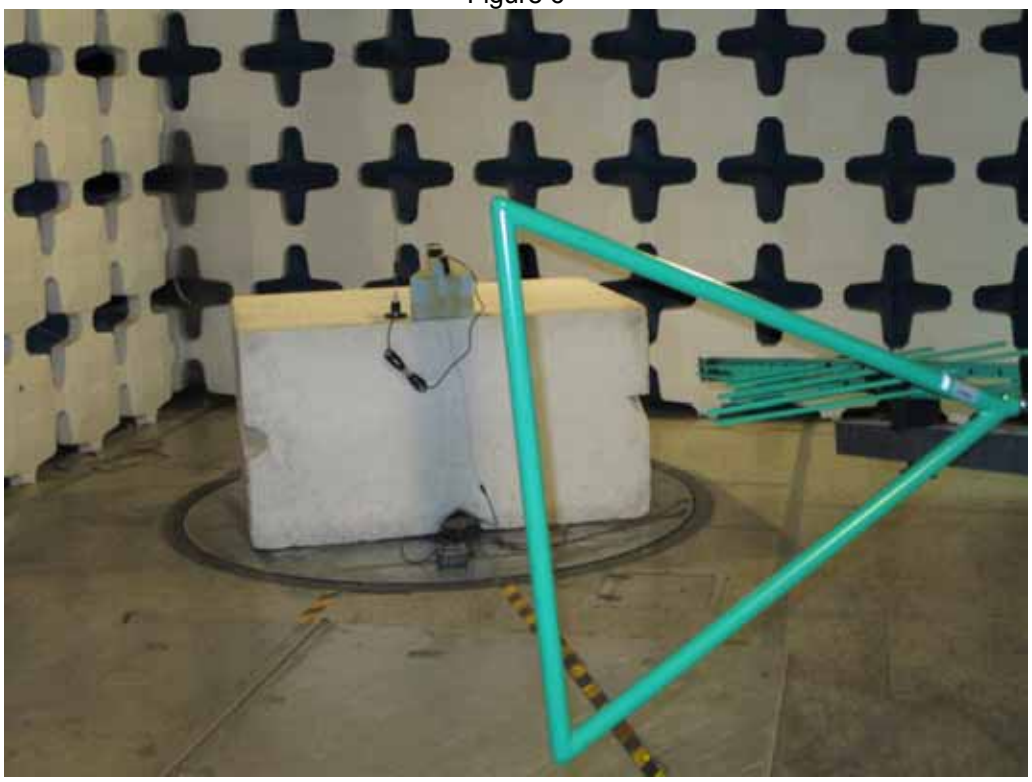
Figure 5



Test Setup for Radiated Emissions Above 1GHz – Horizontal Polarity – Whip

Test Setup for Radiated Emissions Above 1GHz – Vertical Polarity - Duck

Figure 6



Test Setup for Radiated Emissions 30MHz to 1GHz – Horizontal Polarity – Whip

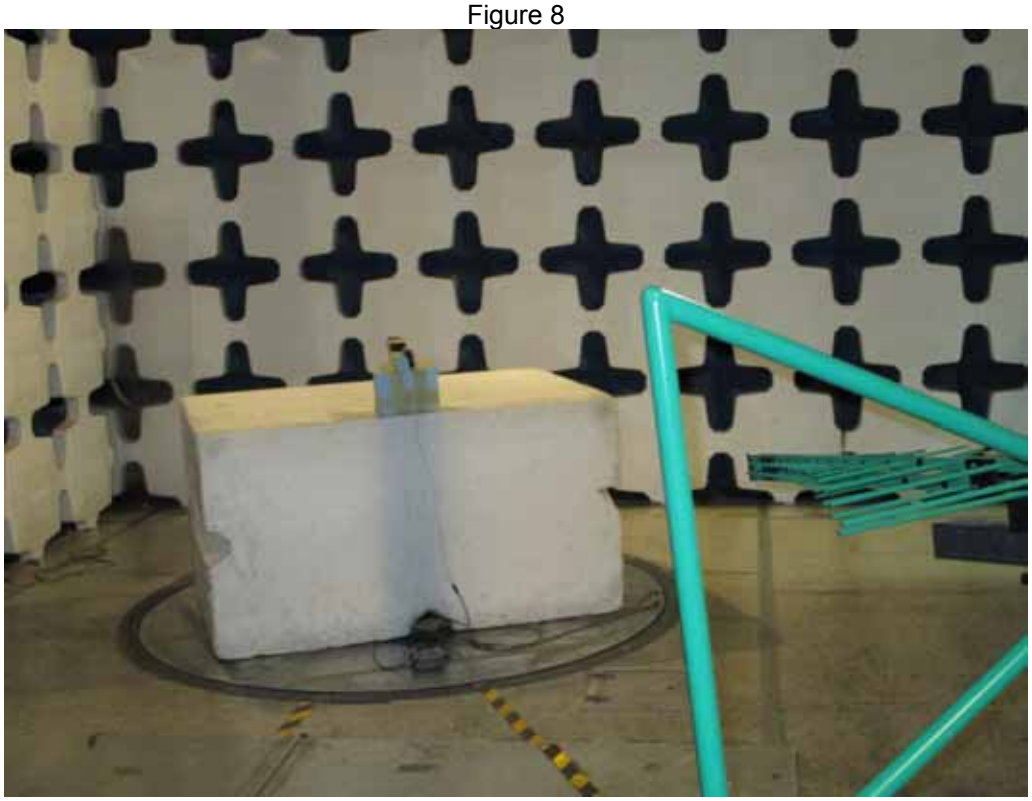
Test Setup for Radiated Emissions 1GHz to 18GHz – Vertical Polarity - Whip

Figure 7

Test Setup for Radiated Emissions 1GHz to 18GHz – Horizontal Polarity – Whip

Test Setup for Radiated Emissions 1GHz to 18GHz – Vertical Polarity - Whip

Figure 8



Test Setup for Radiated Rx Emissions 30MHz to 1GHz – Horizontal Polarity - Duck

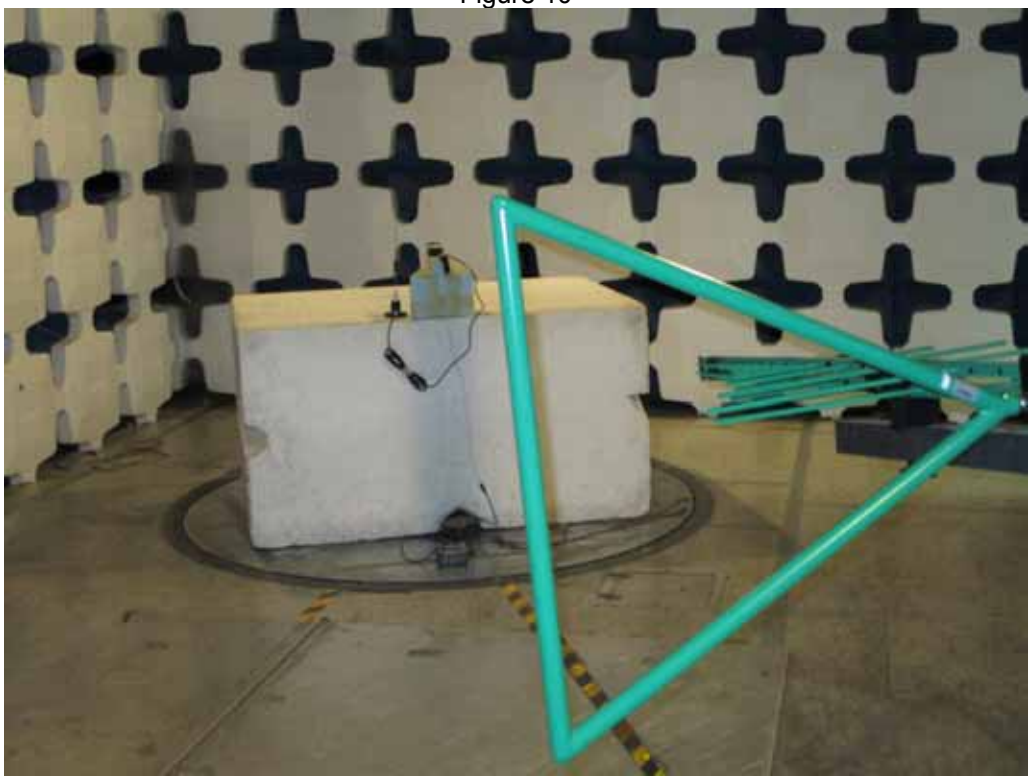
Test Setup for Radiated Rx Emissions 30MHz to 1GHz – Vertical Polarity - Duck

Figure 9

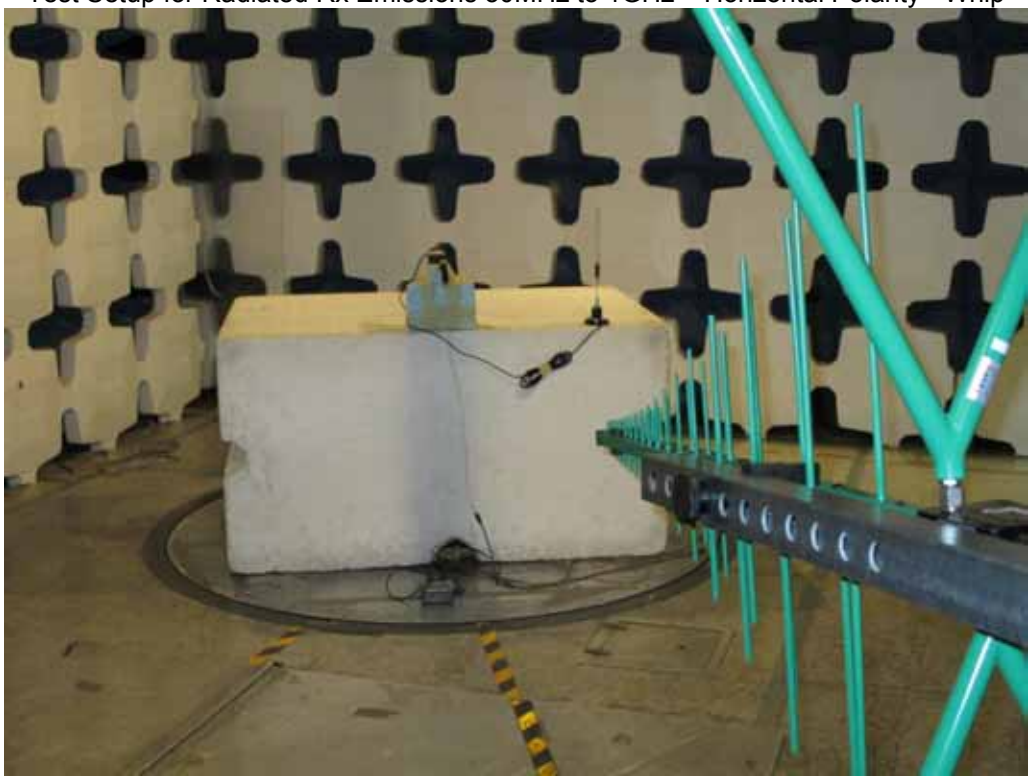
Test Setup for Radiated Rx Emissions Above 1GHz – Horizontal Polarity - Duck

Test Setup for Radiated Rx Emissions Above 1GHz – Vertical Polarity - Duck

Figure 10

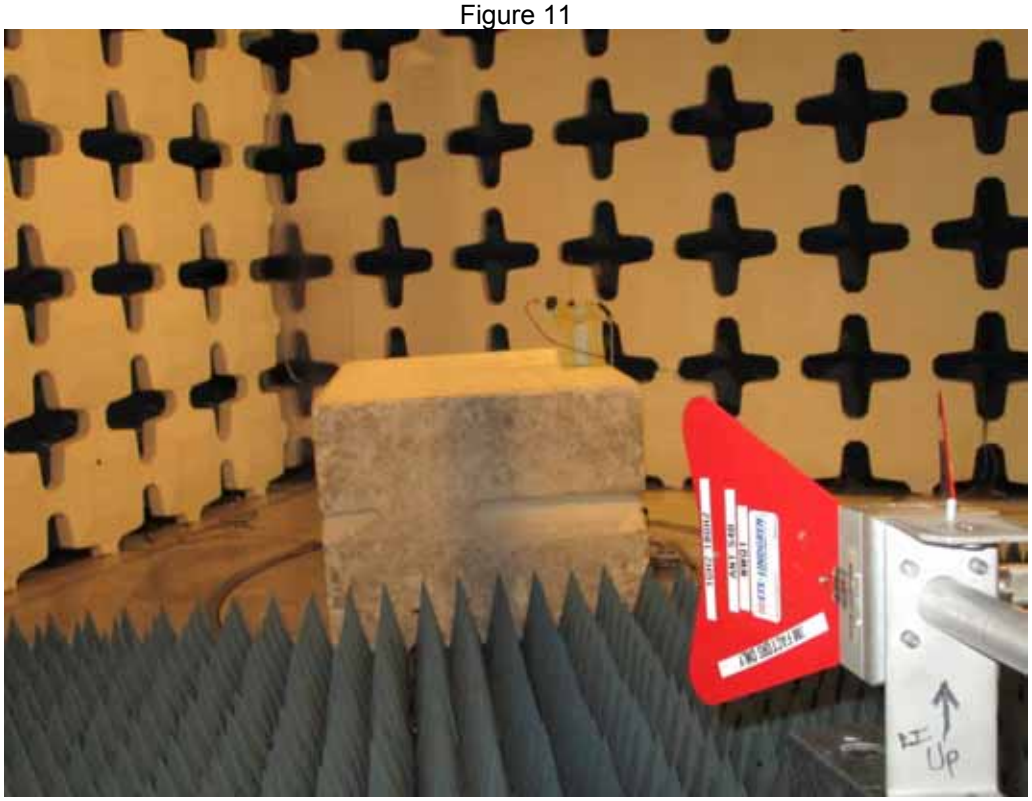


Test Setup for Radiated Rx Emissions 30MHz to 1GHz – Horizontal Polarity - Whip

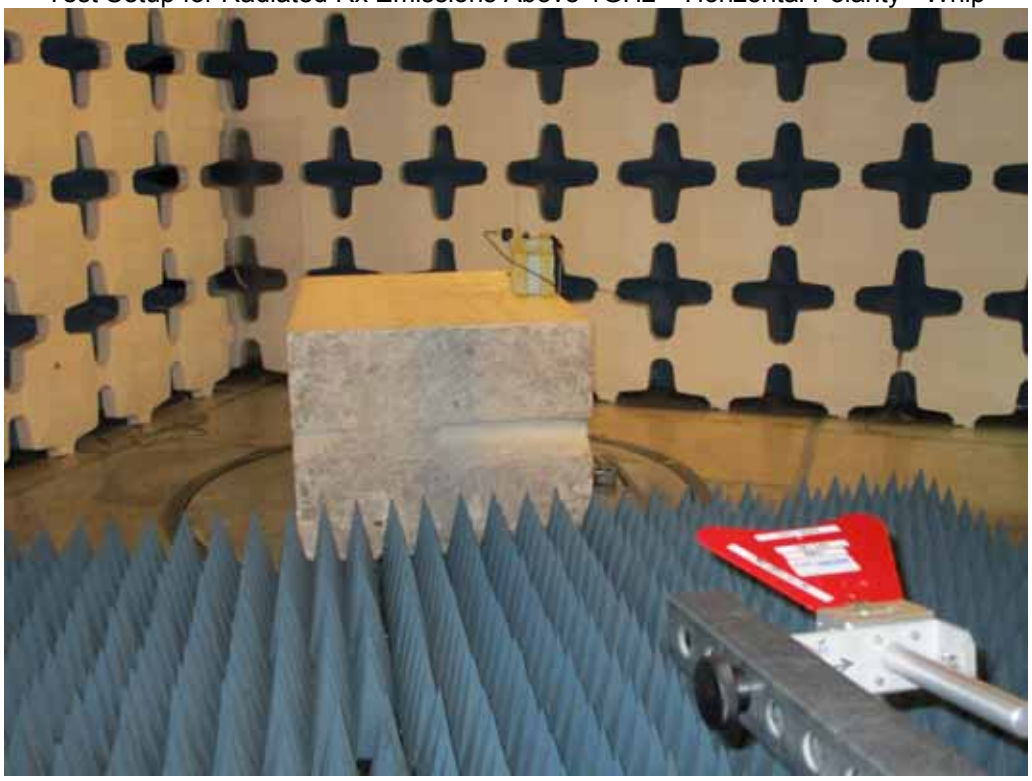


Test Setup for Radiated Rx Emissions 30MHz to 1GHz – Vertical Polarity - Whip

Figure 11



Test Setup for Radiated Rx Emissions Above 1GHz – Horizontal Polarity - Whip



Test Setup for Radiated Rx Emissions Above 1GHz – Vertical Polarity - Whip

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Rx 914.1 MHz
Line Tested : High
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : R. King
Test Date : Mar 13, 2018
Limit : Class B
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB
: margin below limit

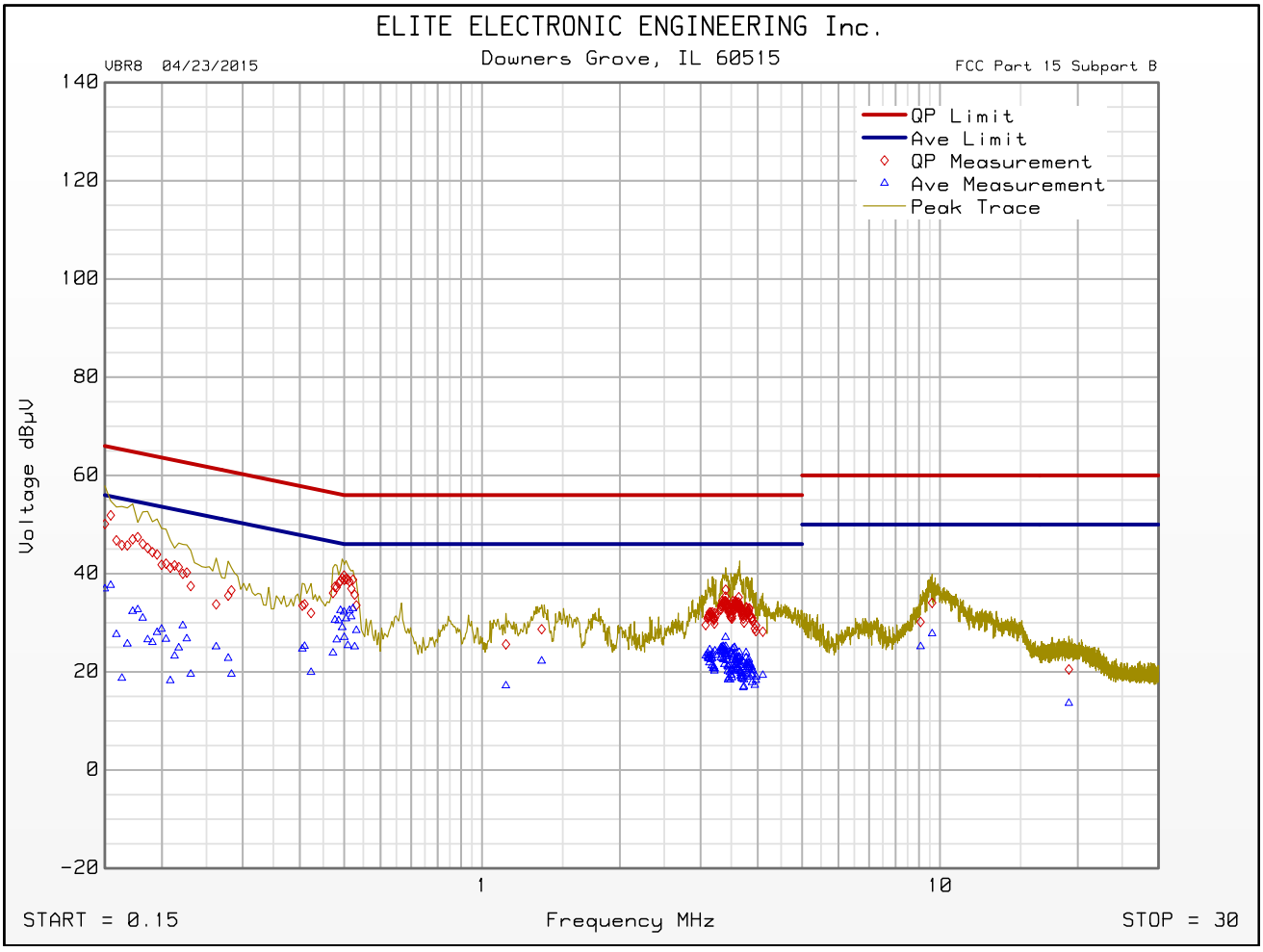
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.155	51.9	65.8		37.6	55.8	
0.500	39.6	56.0		32.2	46.0	
0.505	38.9	56.0		30.8	46.0	
1.128	25.6	56.0		17.2	46.0	
1.349	28.7	56.0		22.2	46.0	
3.140	32.1	56.0		24.5	46.0	
9.073	30.2	60.0		25.2	50.0	
9.612	34.1	60.0		27.8	50.0	
19.121	20.5	60.0		13.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Rx 914.1 MHz
Line Tested	: High
Scan Step Time [ms]	: 30
Meas. Threshold [dB]	: -10
Notes	:
Test Engineer	: R. King
Test Date	: Mar 13, 2018
Limit	: Class B



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Rx 914.1 MHz
Line Tested : Neutral
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : R. King
Test Date : Mar 13, 2018
Limit : Class B
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB
: margin below limit

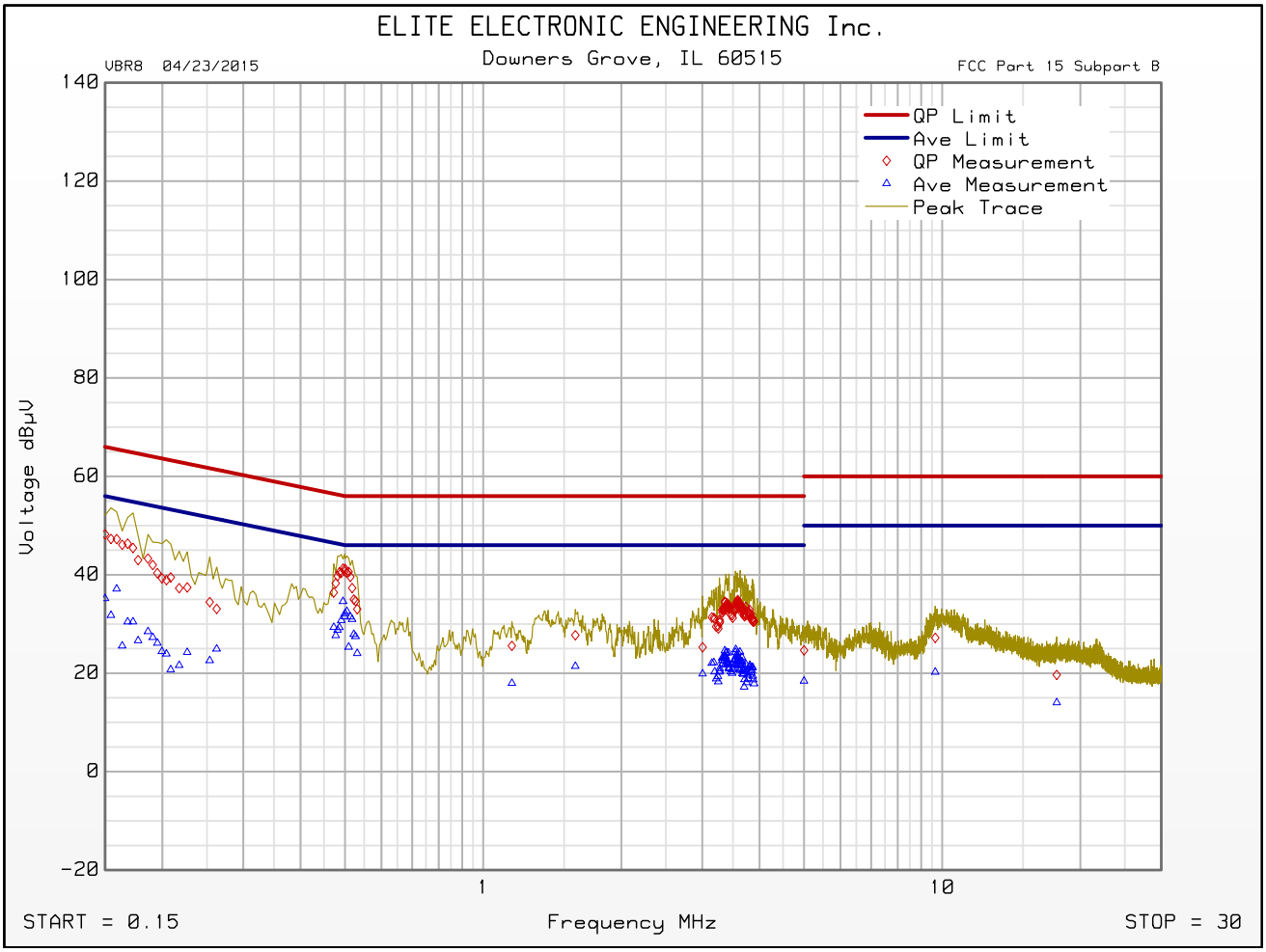
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	48.2	66.0		35.2	56.0	
0.500	41.2	56.0		32.1	46.0	
1.155	25.6	56.0		18.0	46.0	
1.588	27.7	56.0		21.4	46.0	
3.006	25.3	56.0		19.9	46.0	
3.586	34.9	56.0		24.2	46.0	
5.000	24.7	56.0		18.4	46.0	
9.657	27.2	60.0		20.2	50.0	
17.762	19.7	60.0		14.0	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Rx 914.1 MHz
Line Tested	: Neutral
Scan Step Time [ms]	: 30
Meas. Threshold [dB]	: -10
Notes	:
Test Engineer	: R. King
Test Date	: Mar 13, 2018
Limit	: Class B



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Tx 914.1 MHz
Line Tested : High
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : R. King
Test Date : Mar 13, 2018
Limit : Class B
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB
: margin below limit

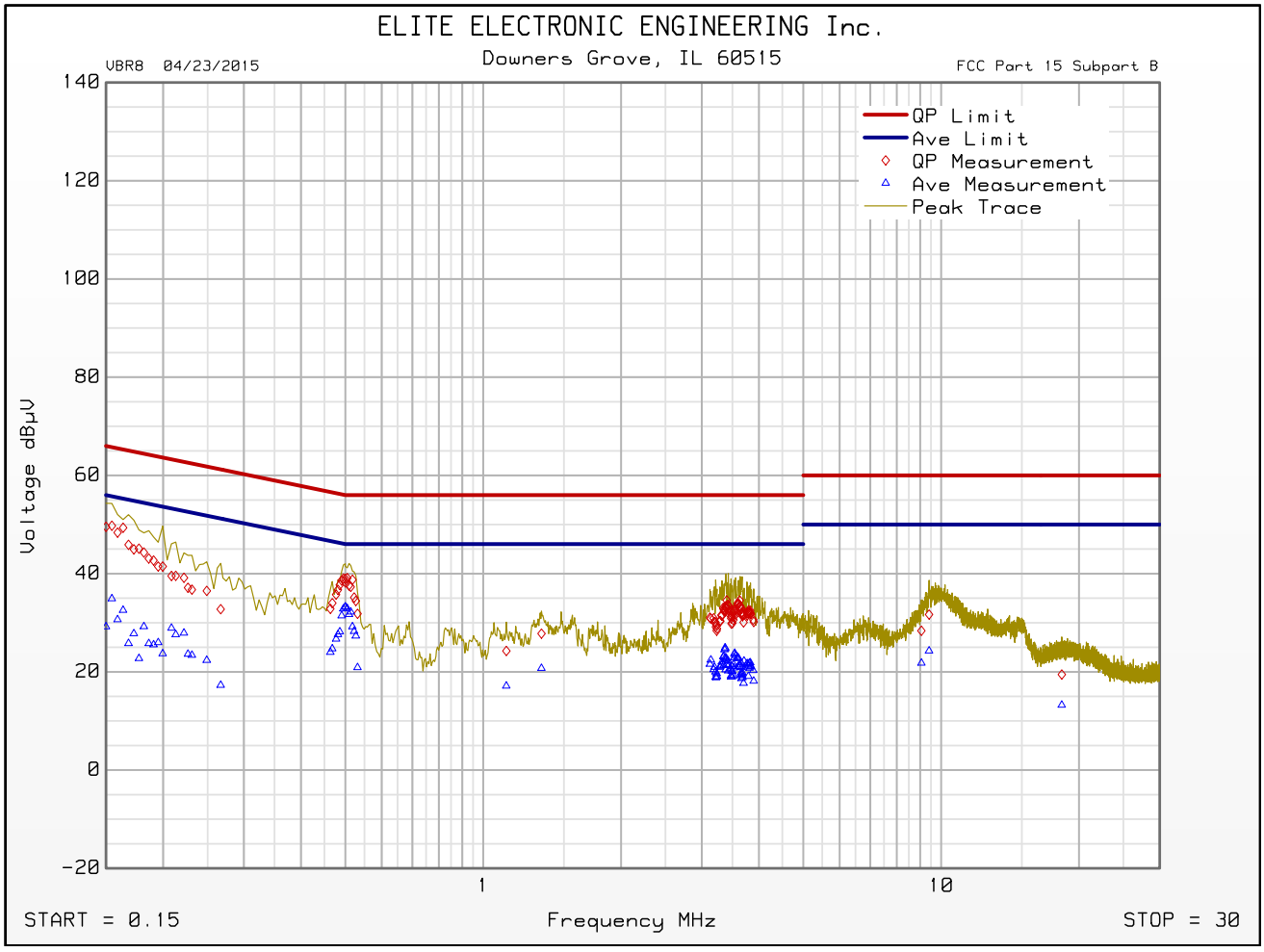
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	49.3	65.3		32.5	55.3	
0.500	39.0	56.0		33.2	46.0	
0.505	39.1	56.0		32.9	46.0	
1.123	24.3	56.0		17.1	46.0	
1.340	27.8	56.0		20.7	46.0	
3.128	31.0	56.0		21.6	46.0	
3.401	34.6	56.0		21.5	46.0	
9.055	28.4	60.0		21.8	50.0	
9.410	31.7	60.0		24.3	50.0	
18.343	19.5	60.0		13.2	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 914.1 MHz
Line Tested	: High
Scan Step Time [ms]	: 30
Meas. Threshold [dB]	: -10
Notes	:
Test Engineer	: R. King
Test Date	: Mar 13, 2018
Limit	: Class B



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Tx 914.1 MHz
Line Tested : Neutral
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : R. King
Test Date : Mar 13, 2018
Limit : Class B
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB
: margin below limit

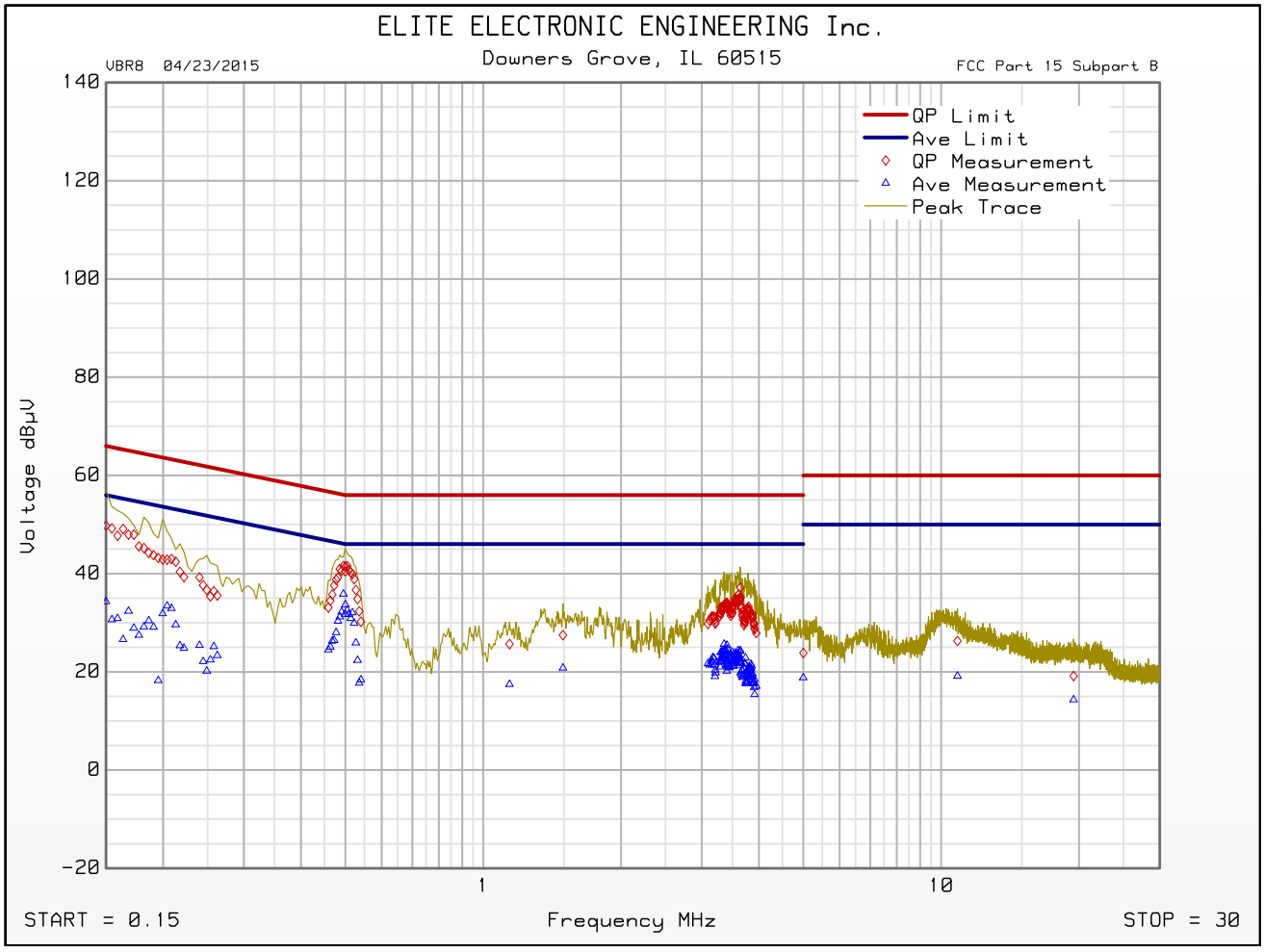
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	49.1	65.3		26.6	55.3	
0.495	41.6	56.1		35.8	46.1	
0.505	41.5	56.0		32.6	46.0	
1.141	25.7	56.0		17.5	46.0	
1.493	27.5	56.0		20.8	46.0	
3.119	30.5	56.0		21.4	46.0	
3.644	37.2	56.0		24.3	46.0	
5.000	23.8	56.0		18.8	46.0	
10.854	26.3	60.0		19.2	50.0	
19.468	19.1	60.0		14.3	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

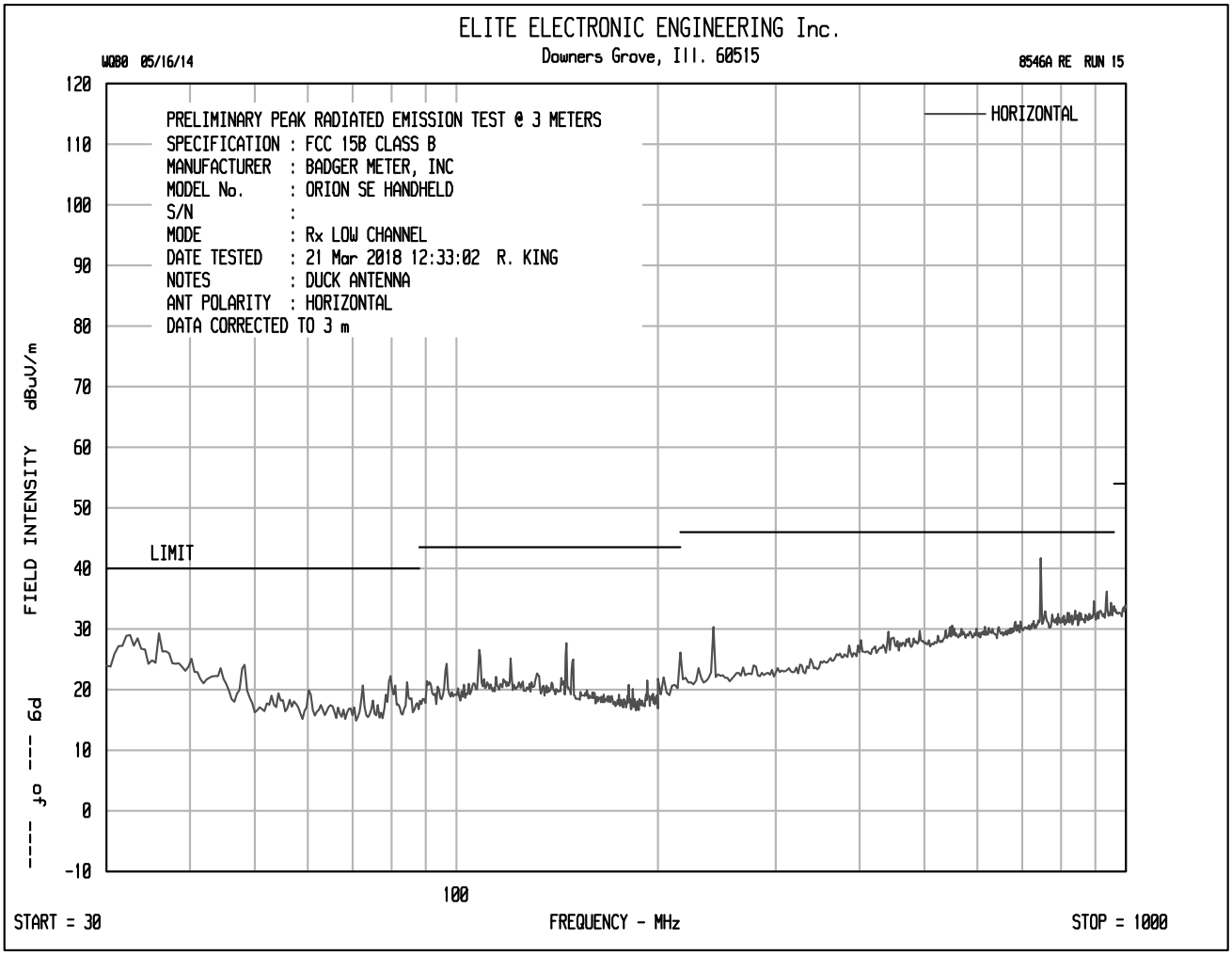
Cumulative Data

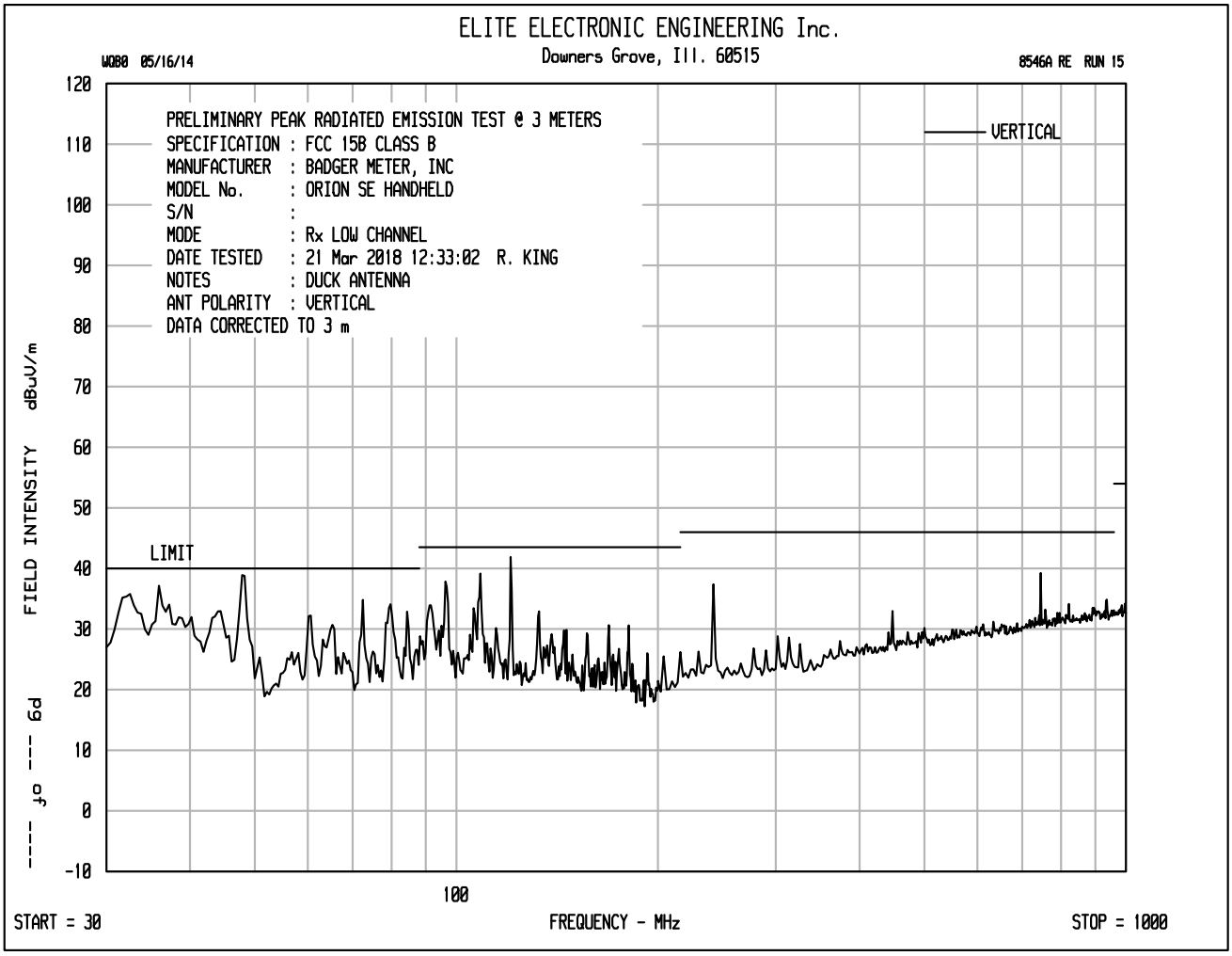
VBR8 04/23/2015

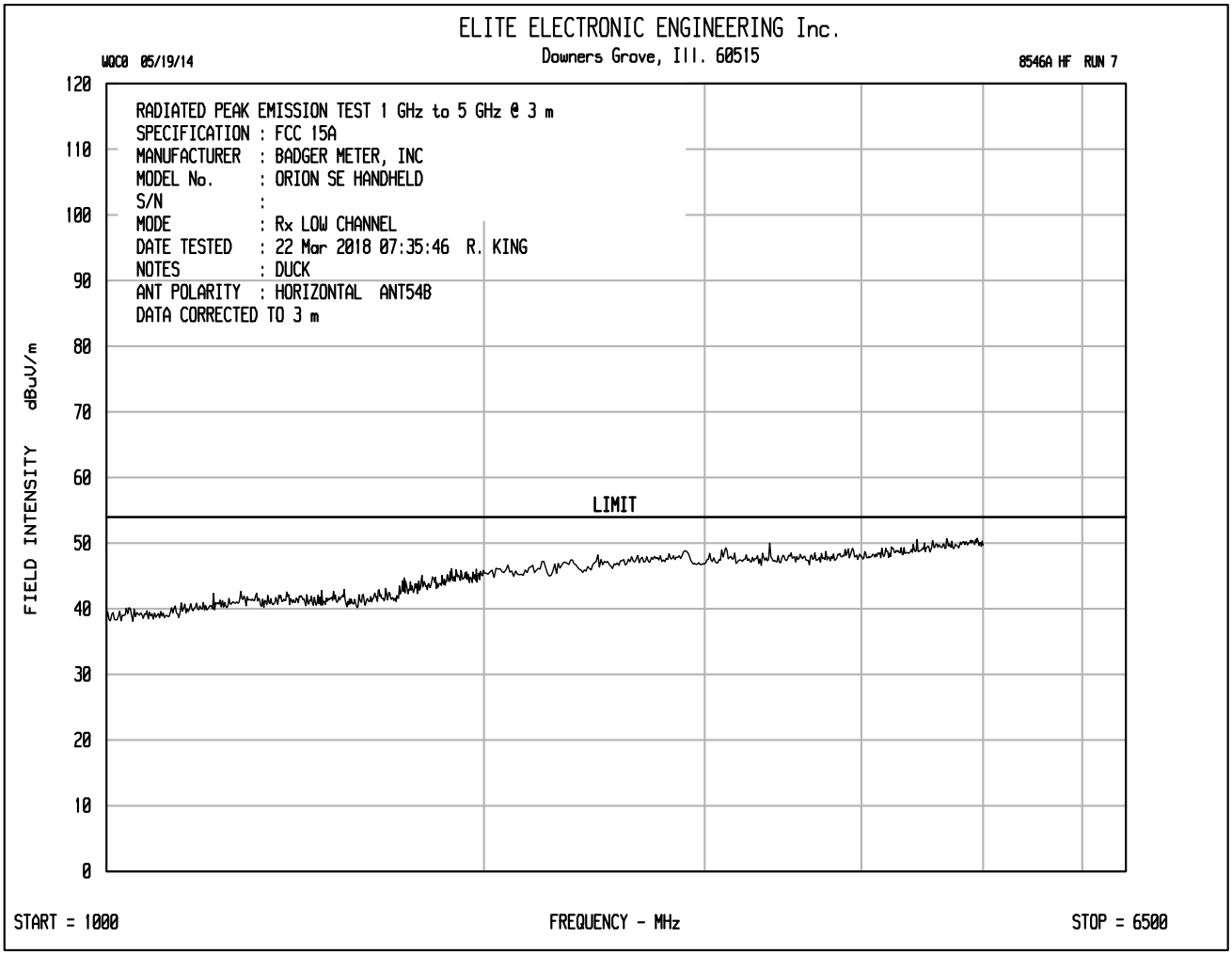
Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 914.1 MHz
Line Tested	: Neutral
Scan Step Time [ms]	: 30
Meas. Threshold [dB]	: -10
Notes	:
Test Engineer	: R. King
Test Date	: Mar 13, 2018
Limit	: Class B

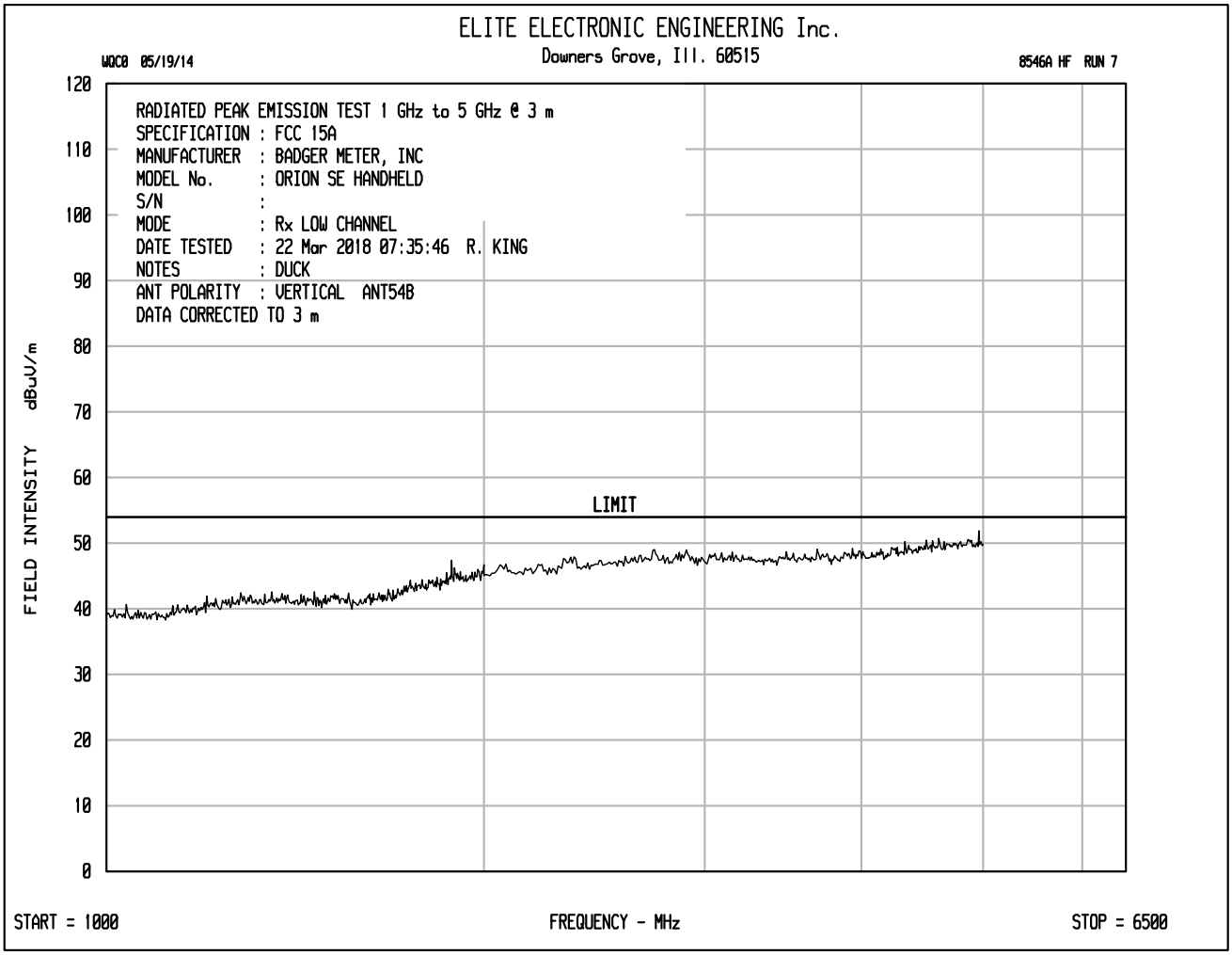


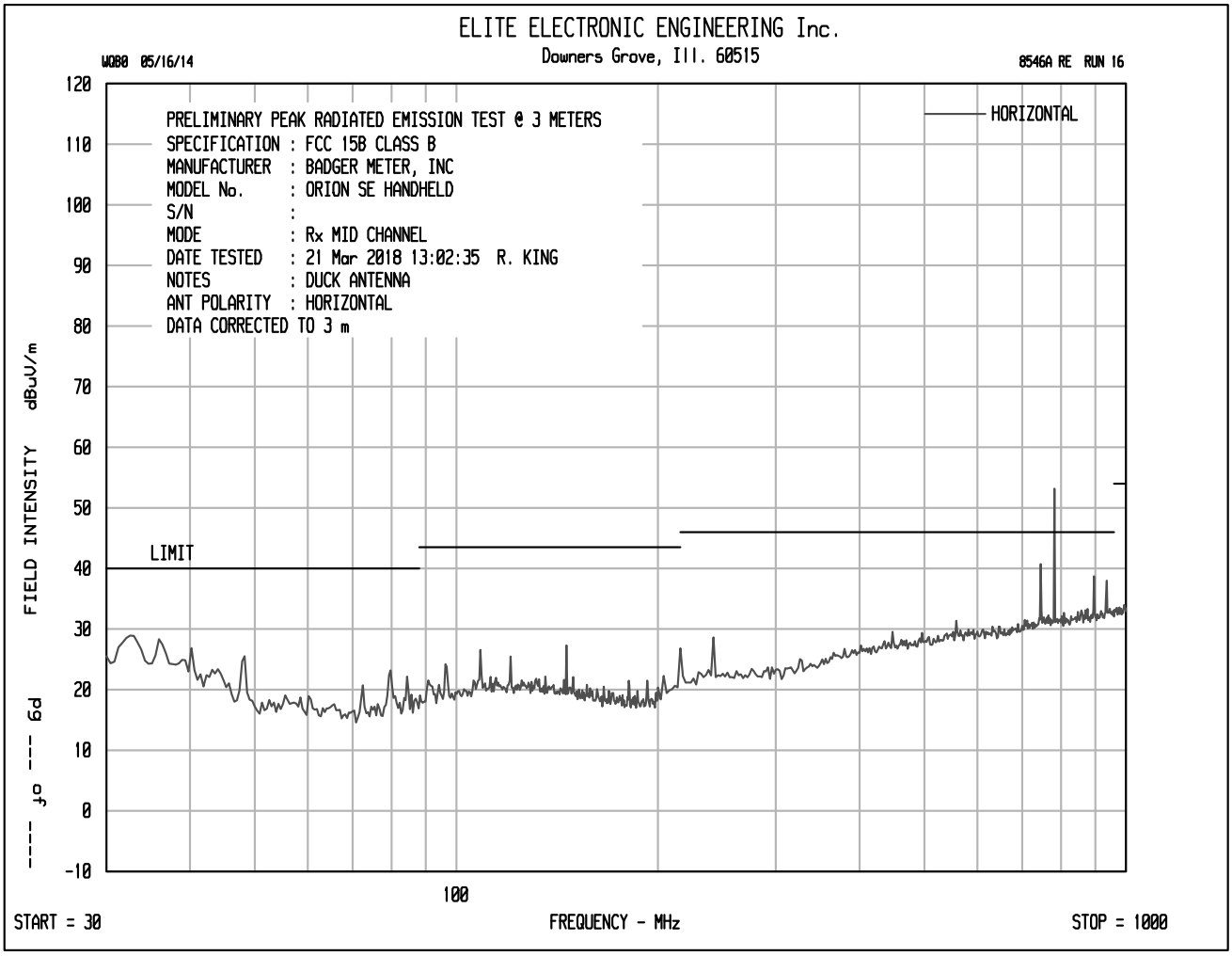
Emissions Meet QP Limit
Emissions Meet Ave Limit

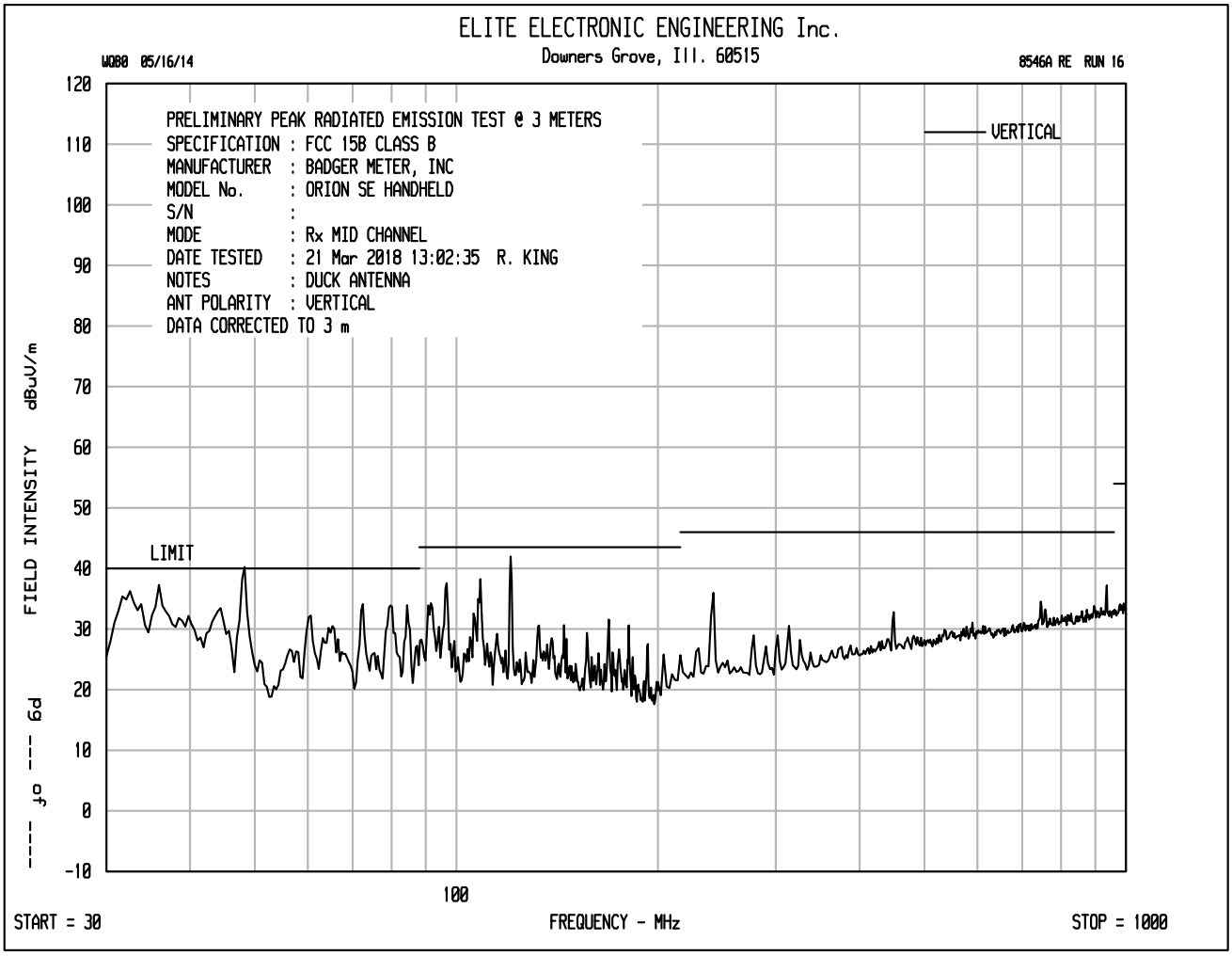

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 15
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 21 Mar 2018 12:33:02 R. KING
NOTES : DUCK ANTENNA
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

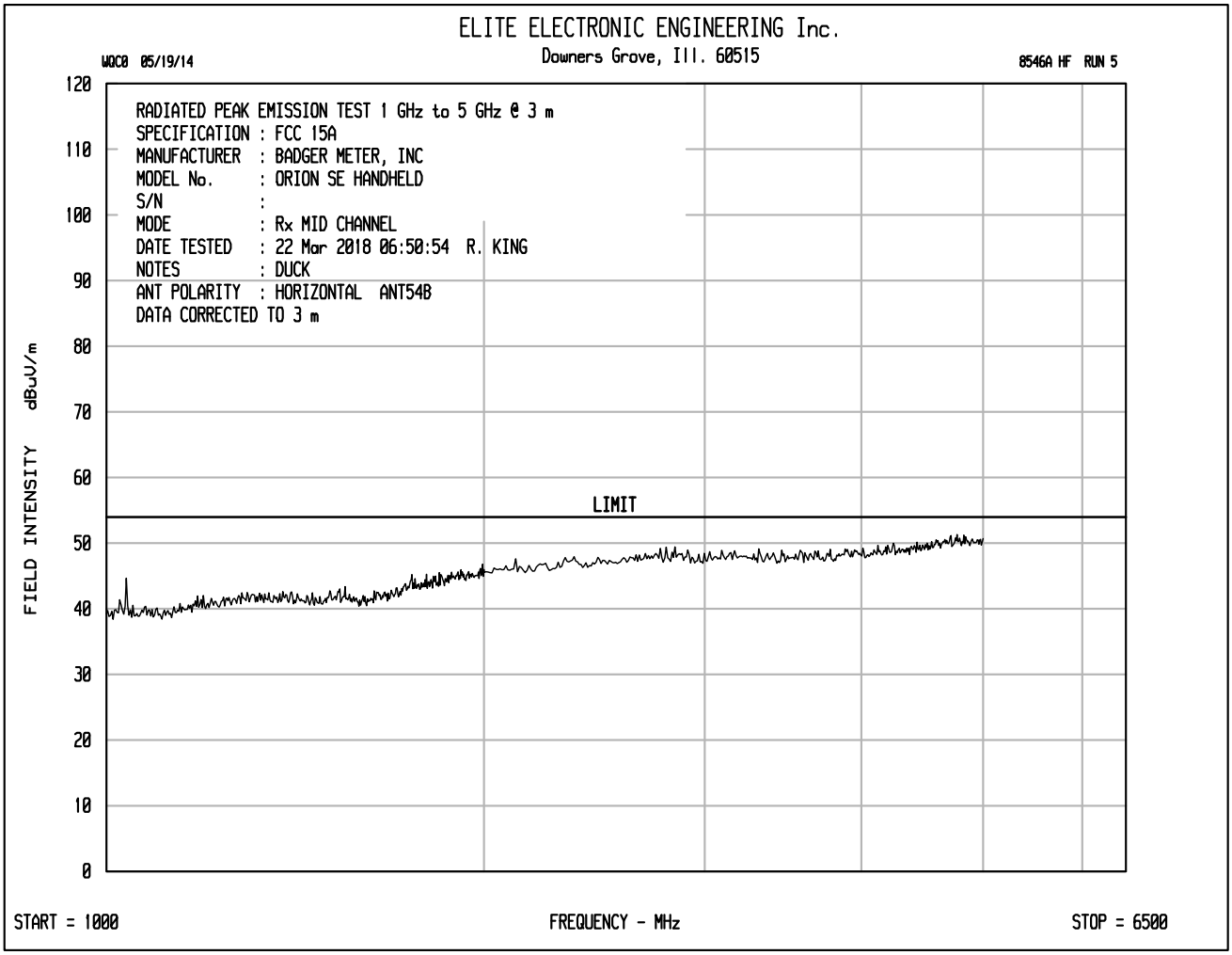

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 15
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 21 Mar 2018 12:33:02 R. KING
NOTES : DUCK ANTENNA
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

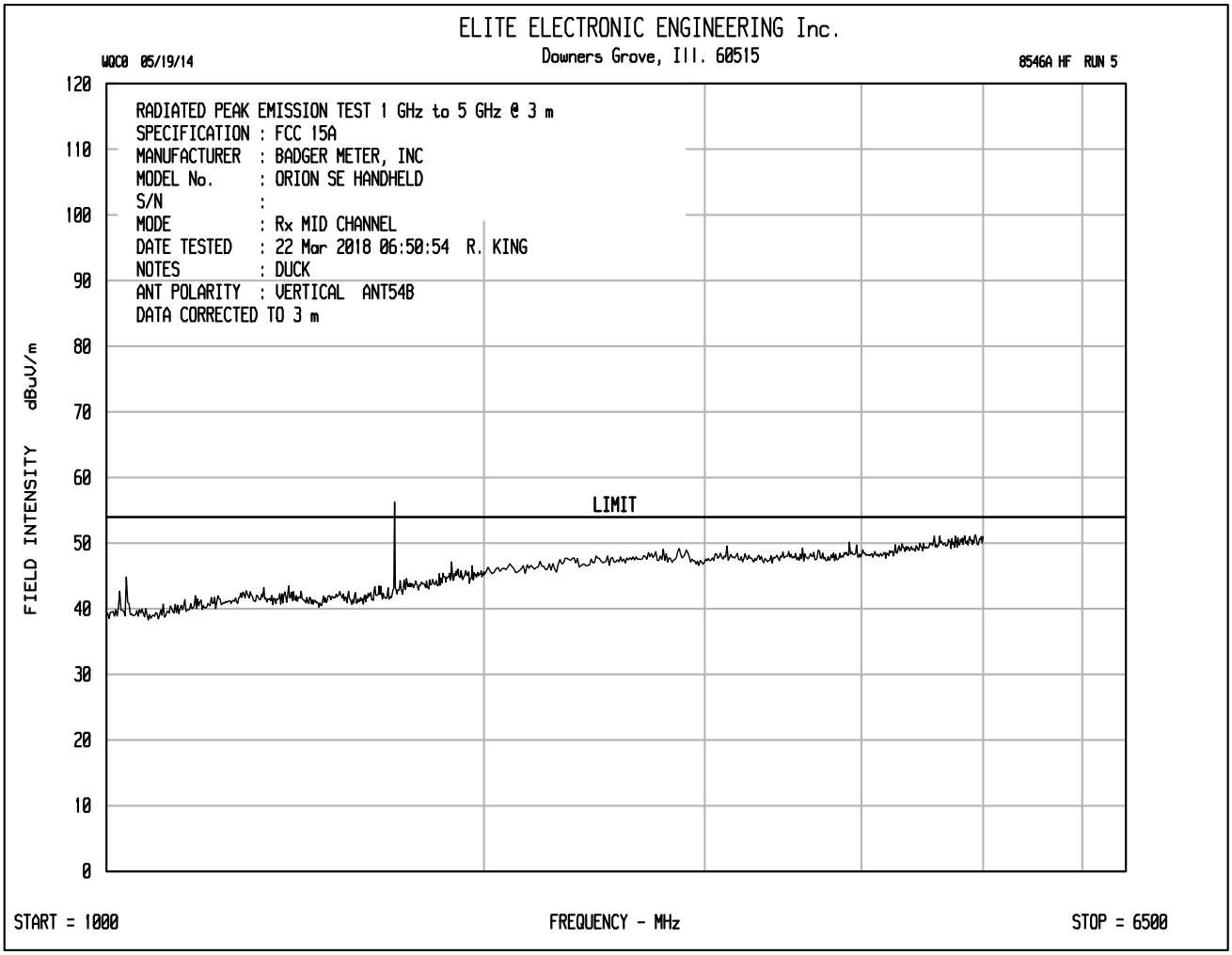

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 7
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 22 Mar 2018 07:35:46 R. KING
NOTES : DUCK
ANT POLARITY : HORIZONTAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500

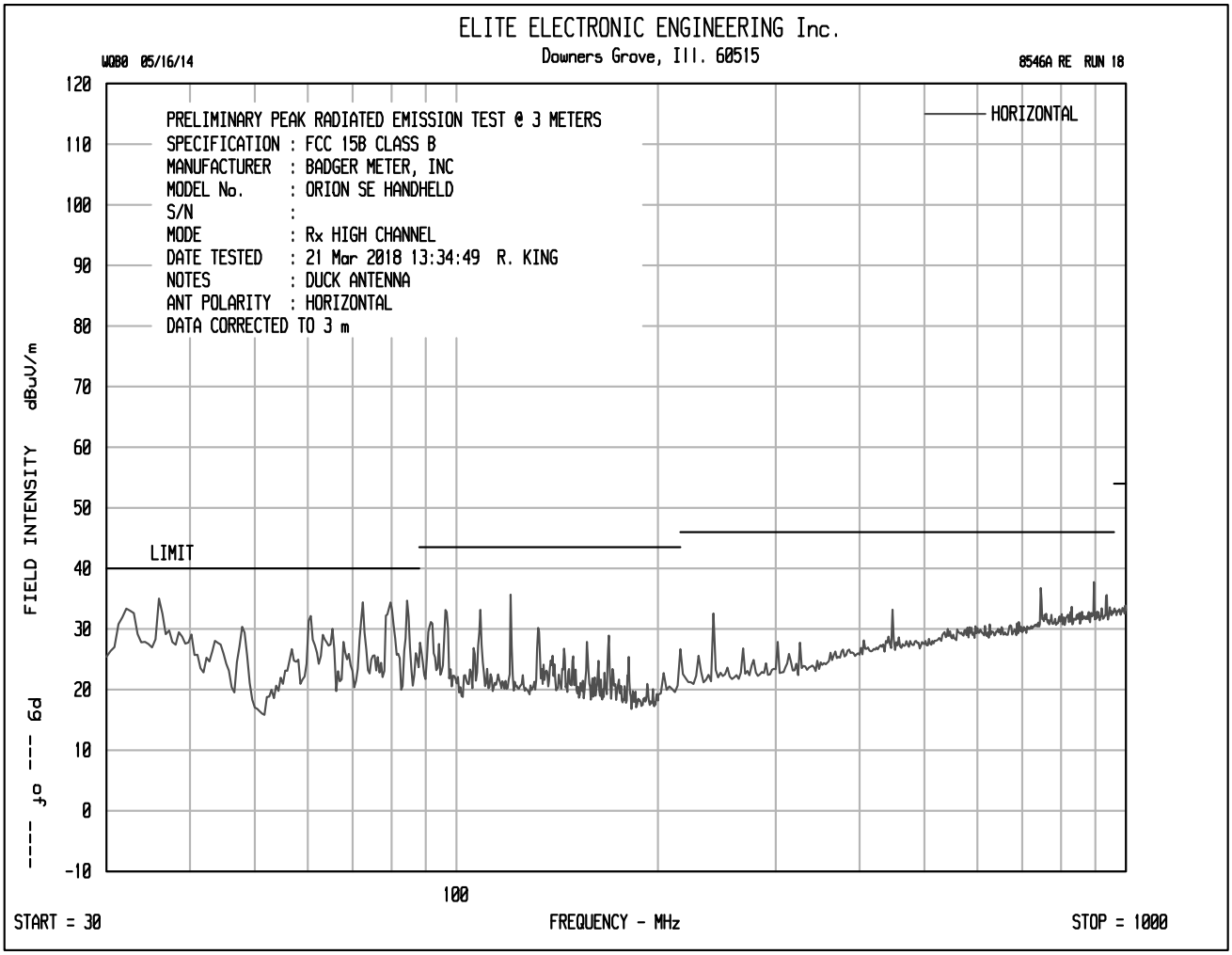

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 7
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 22 Mar 2018 07:35:46 R. KING
NOTES : DUCK
ANT POLARITY : VERTICAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500

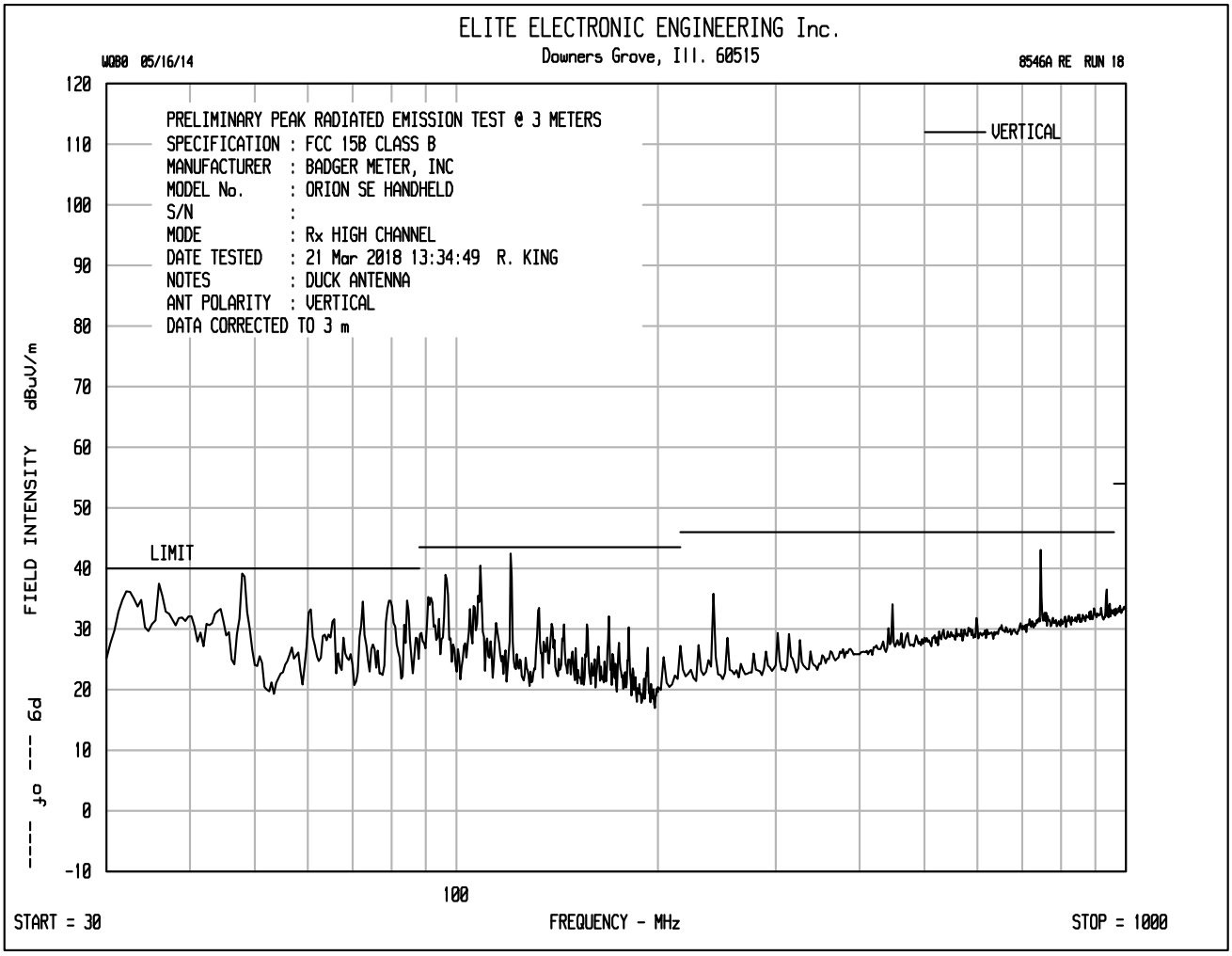

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 16
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 21 Mar 2018 13:02:35 R. KING
NOTES : DUCK ANTENNA
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

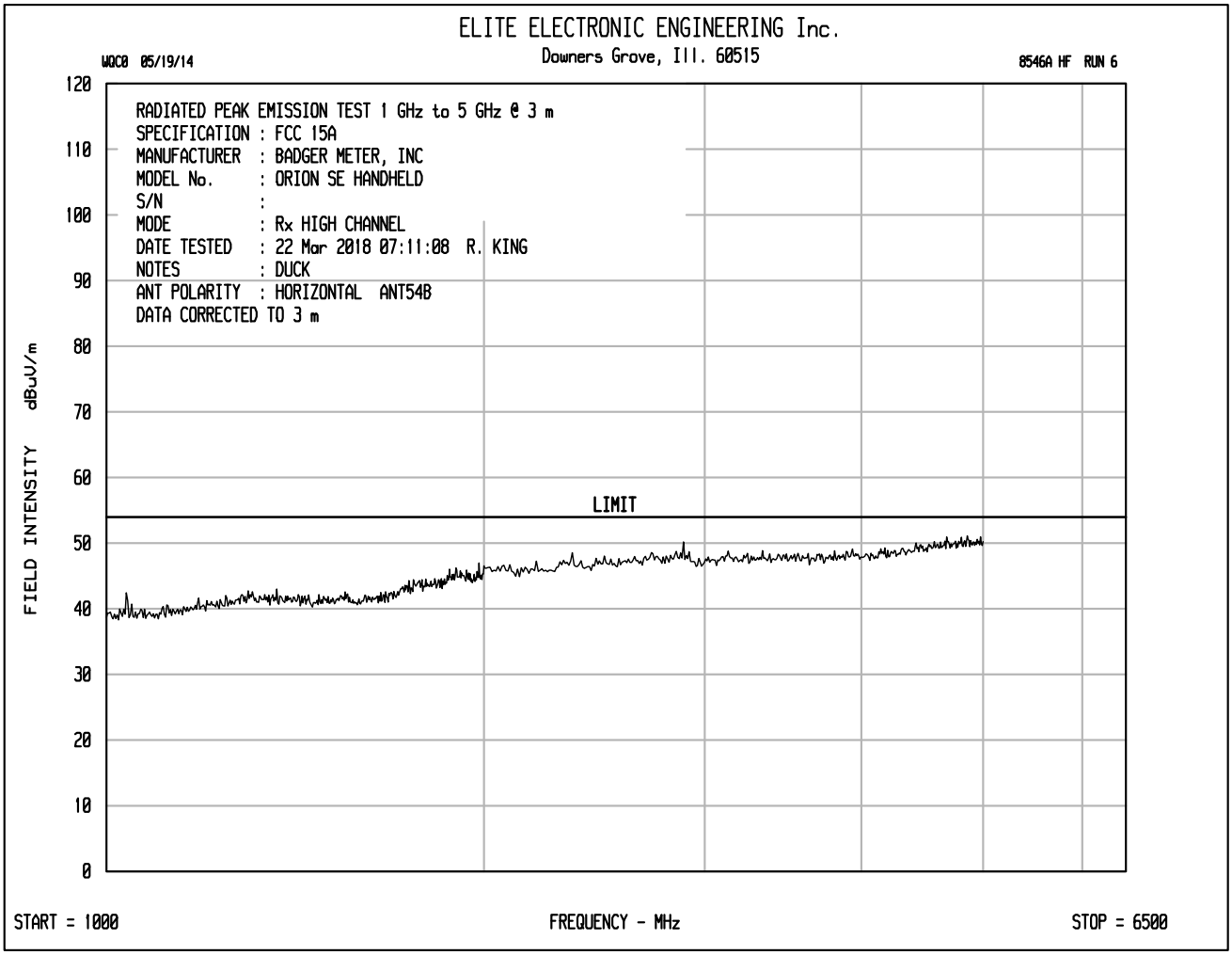

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 16
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 21 Mar 2018 13:02:35 R. KING
NOTES : DUCK ANTENNA
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

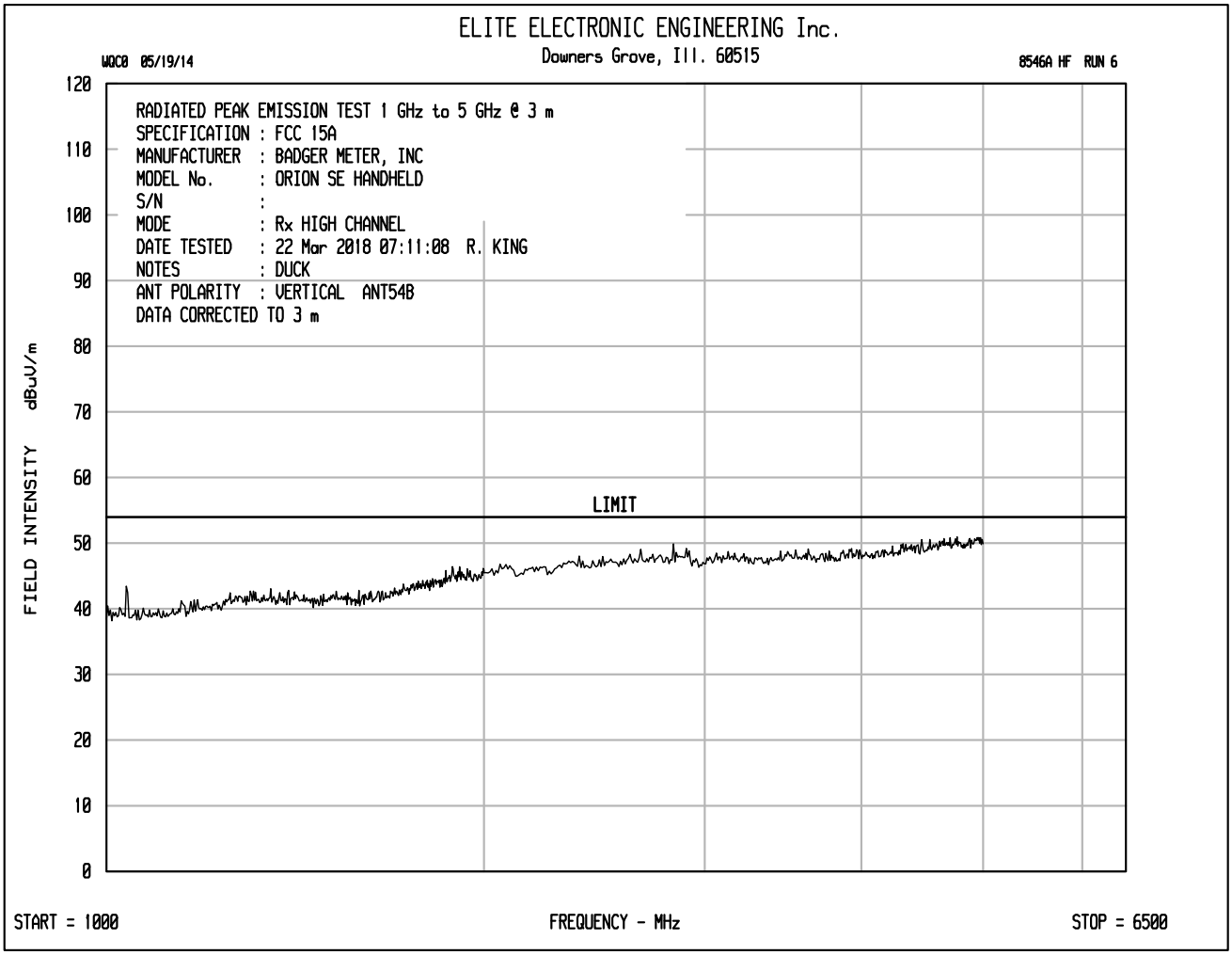

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 5
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 22 Mar 2018 06:50:54 R. KING
NOTES : DUCK
ANT POLARITY : HORIZONTAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 5
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 22 Mar 2018 06:50:54 R. KING
NOTES : DUCK
ANT POLARITY : VERTICAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 18
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 21 Mar 2018 13:34:49 R. KING
NOTES : DUCK ANTENNA
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 18
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 21 Mar 2018 13:34:49 R. KING
NOTES : DUCK ANTENNA
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 6
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 22 Mar 2018 07:11:08 R. KING
NOTES : DUCK
ANT POLARITY : HORIZONTAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 6
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 22 Mar 2018 07:11:08 R. KING
NOTES : DUCK
ANT POLARITY : VERTICAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500

ETR No. 8546A
DATA SHEET TEST NO. 15

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx LOW CHANNEL
NOTES : DUCK ANTENNA
TEST DATE : 21 Mar 2018 12:33:02
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
48.01	21.8	15.0	.5	0.0	0.0	37.3	40.0	-0	120	V
72.00	17.7	12.4	.5	0.0	0.0	30.6	40.0	180	120	V
95.98	20.5	16.1	.5	0.0	0.0	37.1	43.5	315	120	V
120.01	22.9	18.2	.6	0.0	0.0	41.8	43.5	270	120	V
131.99	9.1	17.8	.7	0.0	0.0	27.6	43.5	270	200	V
145.43	10.1	16.9	.8	0.0	0.0	27.7	43.5	45	120	V
168.00	11.1	15.6	.9	0.0	0.0	27.6	43.5	225	120	V
240.02	16.1	18.0	1.0	0.0	0.0	35.1	46.0	-0	340	V
300.02	6.0	19.0	1.0	0.0	0.0	26.0	46.0	225	200	V
449.68	-5.7	22.6	1.5	0.0	0.0	18.3	46.0	45	200	V
554.14	-6.0	24.6	1.5	0.0	0.0	20.0	46.0	90	340	H
677.68	-6.0	24.9	1.7	0.0	0.0	20.5	46.0	45	200	H
742.50	10.3	25.5	1.9	0.0	0.0	37.7	46.0	315	200	H
899.23	-4.8	26.3	2.0	0.0	0.0	23.5	46.0	-0	120	H
929.62	4.3	26.6	2.0	0.0	0.0	32.9	46.0	270	340	H

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 7

RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx LOW CHANNEL
NOTES : DUCK
TEST DATE : 22 Mar 2018 07:35:46
TEST DISTANCE : 3 m
ANTENNA : ANT54B

FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1034.31	-4.0	27.0	2.0	0.0	25.1	54.0		45	200	V
1234.17	-3.7	28.6	2.3	0.0	27.3	54.0		225	200	H
1284.74	-3.9	29.1	2.4	0.0	27.6	54.0		315	340	H
1772.44	-3.4	30.2	2.8	0.0	29.7	54.0		90	340	H
1858.64	-3.5	31.2	2.9	0.0	30.5	54.0		315	120	V
2461.68	-3.0	32.4	3.5	0.0	32.8	54.0		270	340	H
2702.03	-3.2	32.8	3.7	0.0	33.2	54.0		270	340	V
4957.00	-4.2	34.7	5.0	0.0	35.6	54.0		90	200	V

Checked BY Richard E. King :

Richard E. King

ETR No. 8546A
DATA SHEET TEST NO. 16

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx MID CHANNEL
NOTES : DUCK ANTENNA
TEST DATE : 21 Mar 2018 13:02:35
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
48.00	22.9	15.0	.5	0.0	0.0	38.4	40.0	0	120	V
72.00	19.3	12.4	.5	0.0	0.0	32.2	40.0	225	200	V
96.01	19.9	16.1	.5	0.0	0.0	36.6	43.5	315	120	V
120.01	22.5	18.2	.6	0.0	0.0	41.4	43.5	0	120	V
132.02	9.3	17.7	.7	0.0	0.0	27.8	43.5	315	200	V
144.09	9.4	17.0	.8	0.0	0.0	27.1	43.5	315	120	V
168.03	12.2	15.6	.9	0.0	0.0	28.7	43.5	225	120	V
240.02	16.4	18.0	1.0	0.0	0.0	35.3	46.0	225	200	V
312.03	6.8	19.3	1.1	0.0	0.0	27.2	46.0	225	200	V
445.49	5.3	22.5	1.5	0.0	0.0	29.3	46.0	180	120	V
552.02	-5.5	24.6	1.5	0.0	0.0	20.6	46.0	270	340	H
587.04	-5.9	24.5	1.5	0.0	0.0	20.2	46.0	180	120	V
776.42	-5.7	25.9	2.0	0.0	0.0	22.2	46.0	90	200	H
900.20	-4.8	26.3	2.0	0.0	0.0	23.5	46.0	135	200	H
937.13	-5.0	26.7	2.0	0.0	0.0	23.7	46.0	135	120	H

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 5

RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx MID CHANNEL
NOTES : DUCK
TEST DATE : 22 Mar 2018 06:50:54
TEST DISTANCE : 3 m
ANTENNA : ANT54B

FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1652.62	-3.4	28.9	2.7	0.0	28.2	54.0		315	120	V
1719.12	-3.4	29.5	2.8	0.0	28.9	54.0		270	200	V
1880.12	-3.4	31.4	2.9	0.0	31.0	54.0		270	340	V
2144.80	-3.4	31.7	3.2	0.0	31.4	54.0		270	340	H
2839.09	-2.5	32.7	3.8	0.0	33.9	54.0		270	340	H
3576.68	-4.3	33.2	4.3	0.0	33.1	54.0		270	340	V

Checked BY Richard E. King :

Richard E. King

ETR No. 8546A
DATA SHEET TEST NO. 18

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx HIGH CHANNEL
NOTES : DUCK ANTENNA
TEST DATE : 21 Mar 2018 13:34:49
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
48.01	22.2	15.0	.5	0.0	0.0	37.7	40.0	-0	120	V
72.01	19.4	12.4	.5	0.0	0.0	32.3	40.0	225	200	V
95.98	21.5	16.1	.5	0.0	0.0	38.1	43.5	315	120	V
120.01	23.7	18.2	.6	0.0	0.0	42.6	43.5	315	120	V
131.99	11.3	17.8	.7	0.0	0.0	29.7	43.5	270	121	V
156.06	9.7	16.2	.8	0.0	0.0	26.8	43.5	180	120	V
168.05	12.5	15.6	.9	0.0	0.0	29.0	43.5	180	120	V
240.01	15.8	18.0	1.0	0.0	0.0	34.8	46.0	315	200	V
300.02	5.5	19.0	1.0	0.0	0.0	25.6	46.0	180	200	V
445.49	3.8	22.5	1.5	0.0	0.0	27.8	46.0	315	340	V
577.76	-5.9	24.5	1.5	0.0	0.0	20.1	46.0	270	340	H
605.13	-6.0	24.6	1.5	0.0	0.0	20.1	46.0	270	120	V
742.50	6.9	25.5	1.9	0.0	0.0	34.3	46.0	-0	200	V
891.00	4.2	26.3	2.0	0.0	0.0	32.5	46.0	225	120	H
940.27	-5.0	26.7	2.0	0.0	0.0	23.7	46.0	-0	200	V

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 6

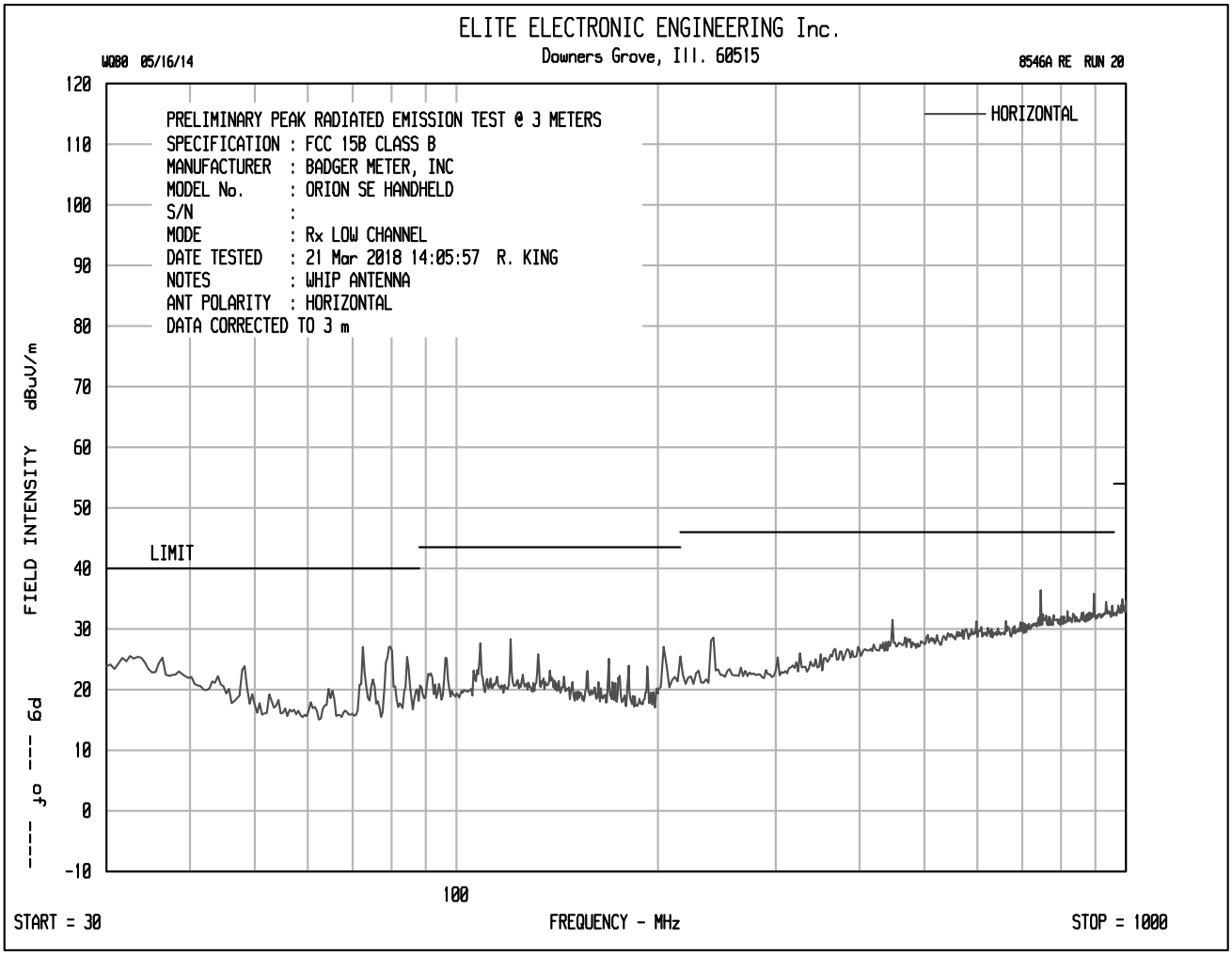
RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

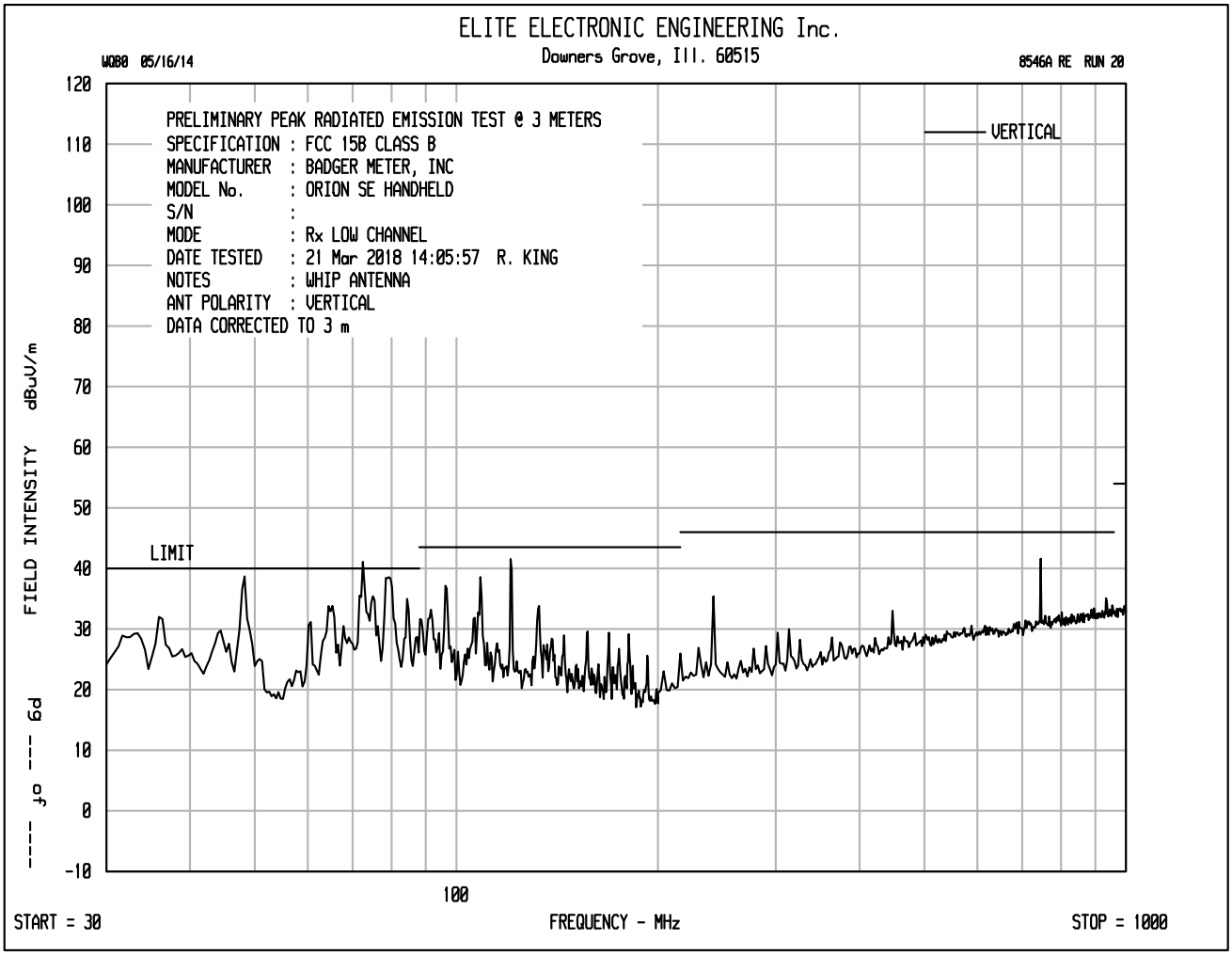
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx HIGH CHANNEL
NOTES : DUCK
TEST DATE : 22 Mar 2018 07:11:08
TEST DISTANCE : 3 m
ANTENNA : ANT54B

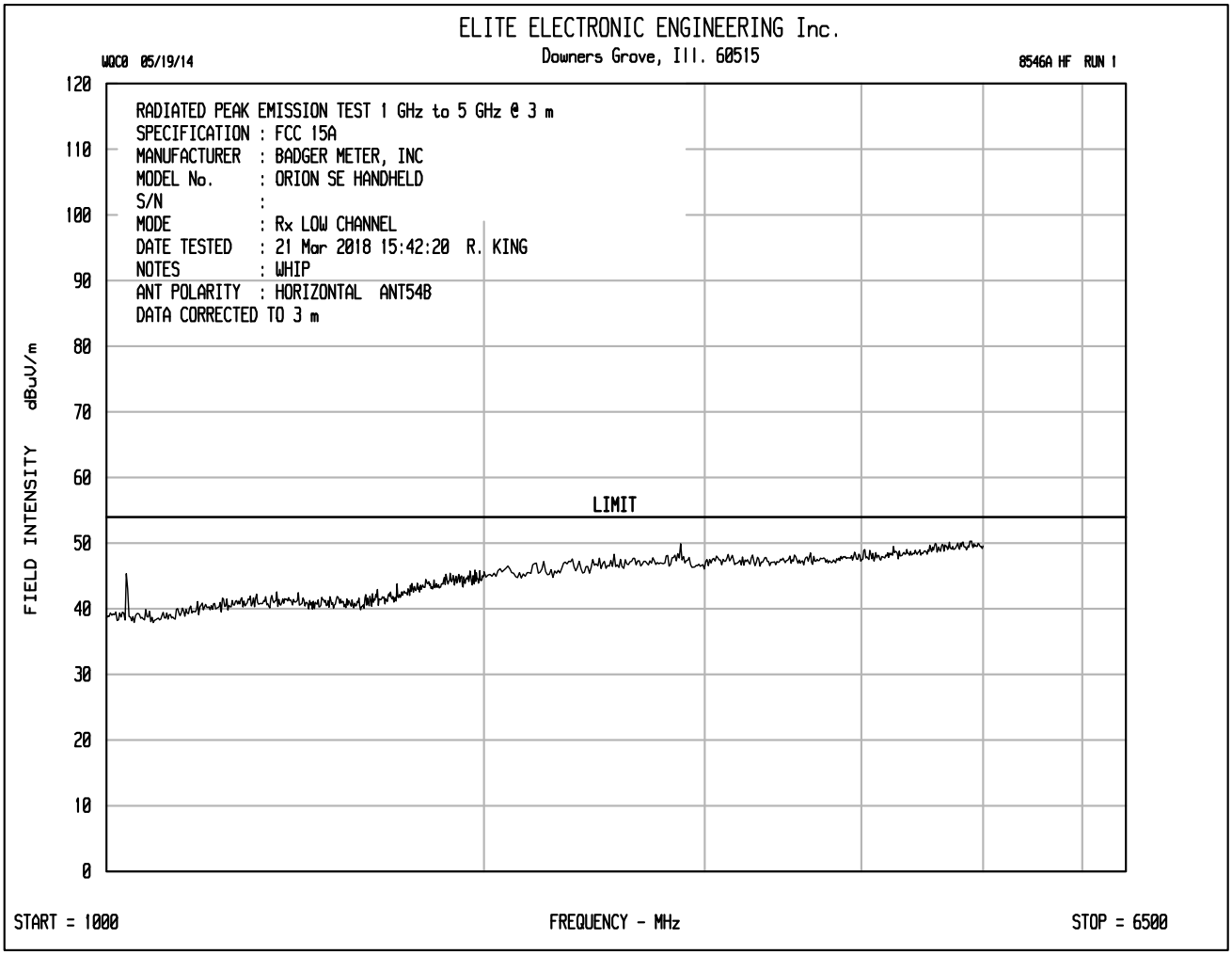
FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1345.39	-3.5	29.1	2.4	0.0	28.0	54.0		135	200	V
1520.79	-3.4	28.4	2.6	0.0	27.6	54.0		270	121	V
1555.98	-2.9	28.4	2.6	0.0	28.2	54.0		270	121	V
1805.94	-3.1	30.7	2.9	0.0	30.4	54.0		315	200	H
1896.71	-3.5	31.6	2.9	0.0	31.0	54.0		270	121	V
2895.53	-2.5	32.7	3.8	0.0	34.0	54.0		270	121	H
4238.47	-4.2	33.6	4.6	0.0	34.1	54.0		270	200	V
4872.46	-4.3	34.8	4.9	0.0	35.4	54.0		225	121	H

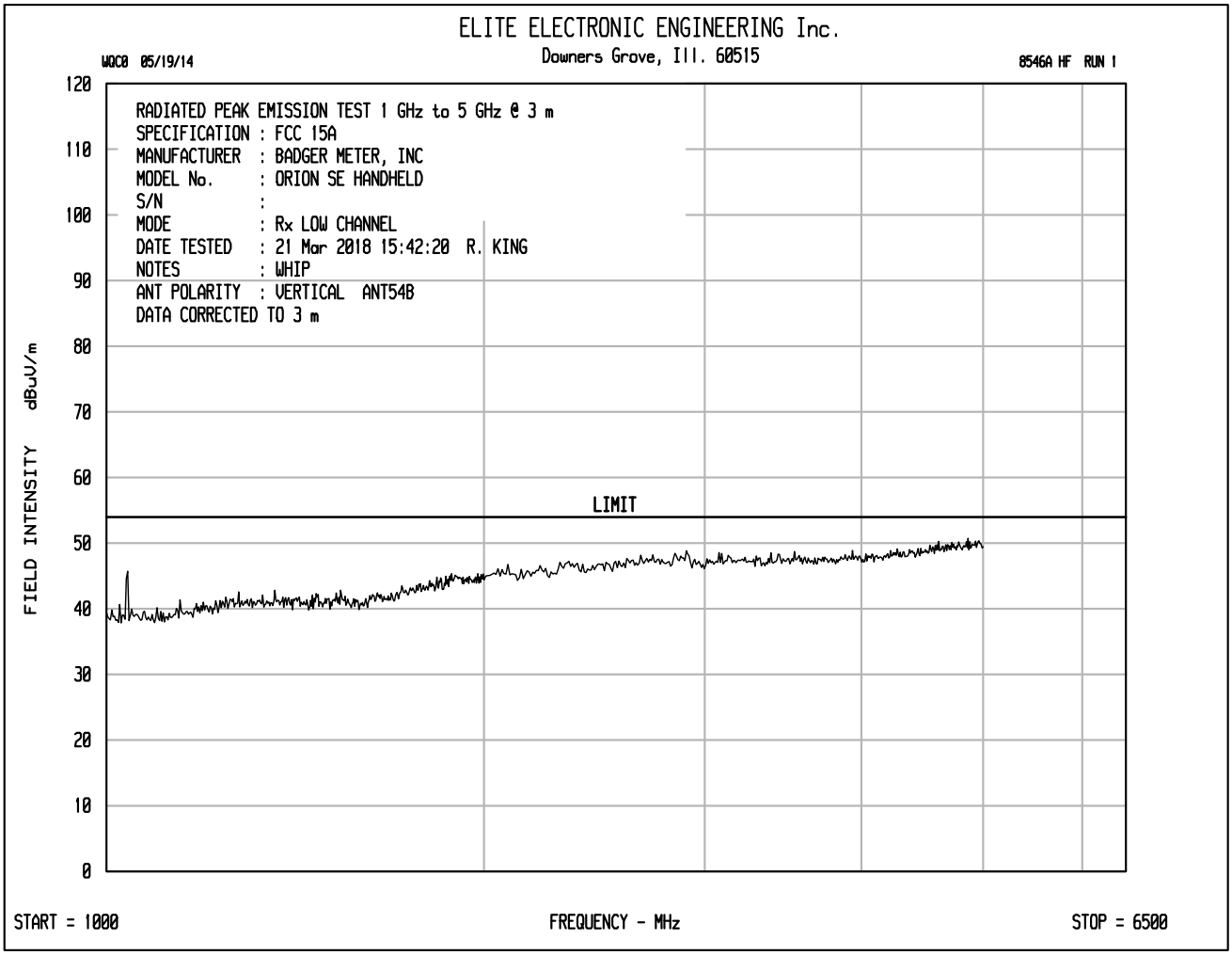
Checked BY Richard E. King :

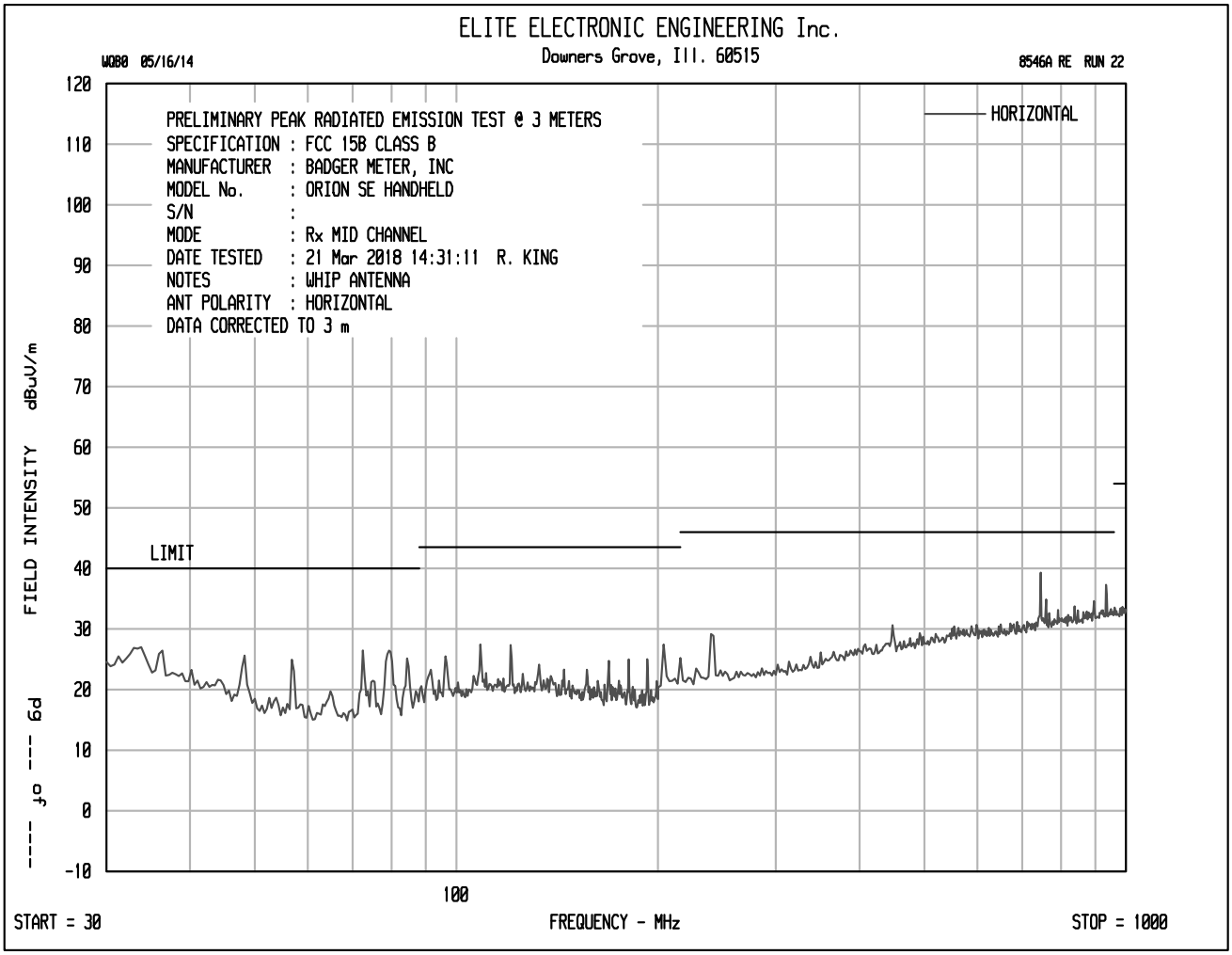
Richard E. King

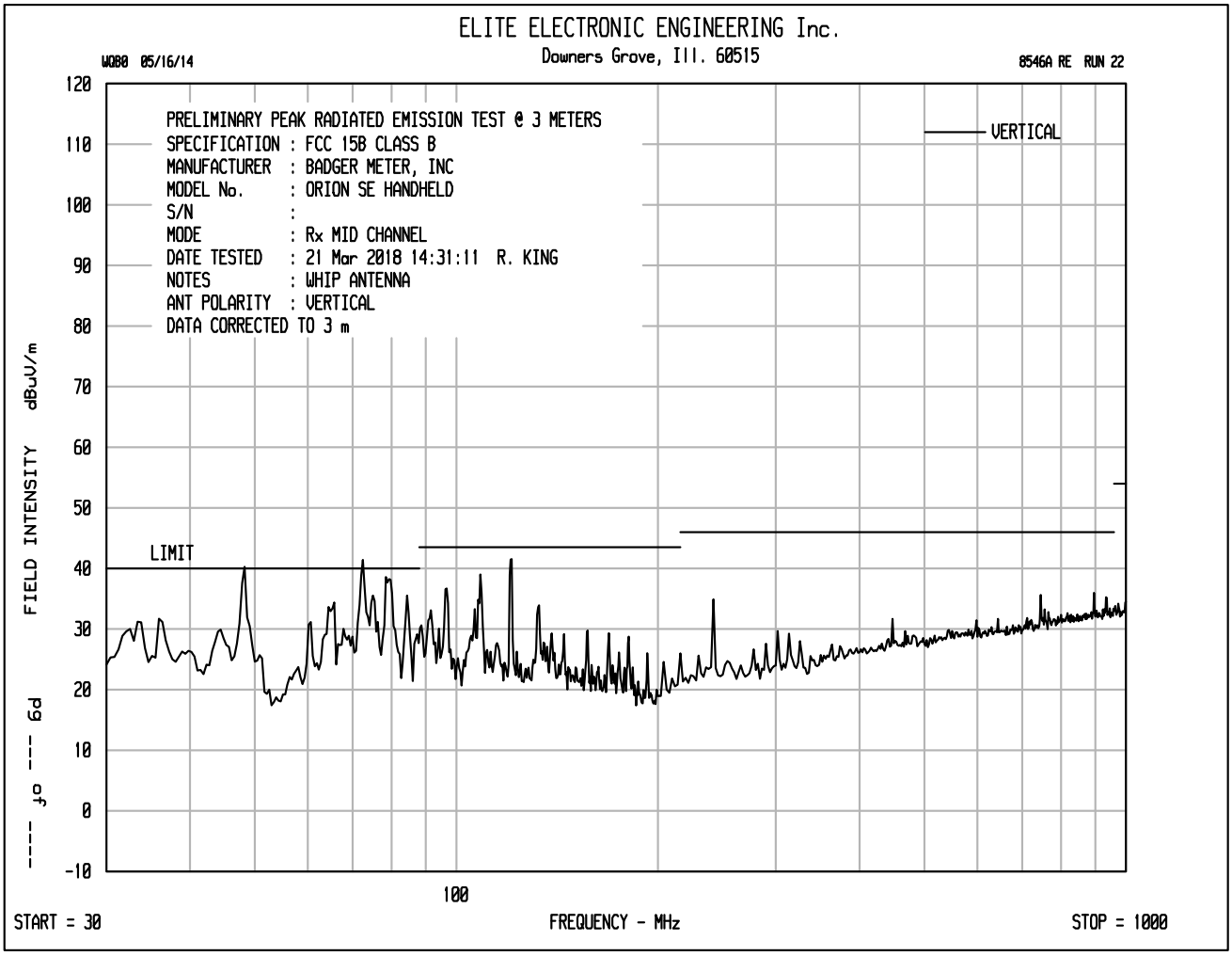

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 20
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 21 Mar 2018 14:05:57 R. KING
NOTES : WHIP ANTENNA
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

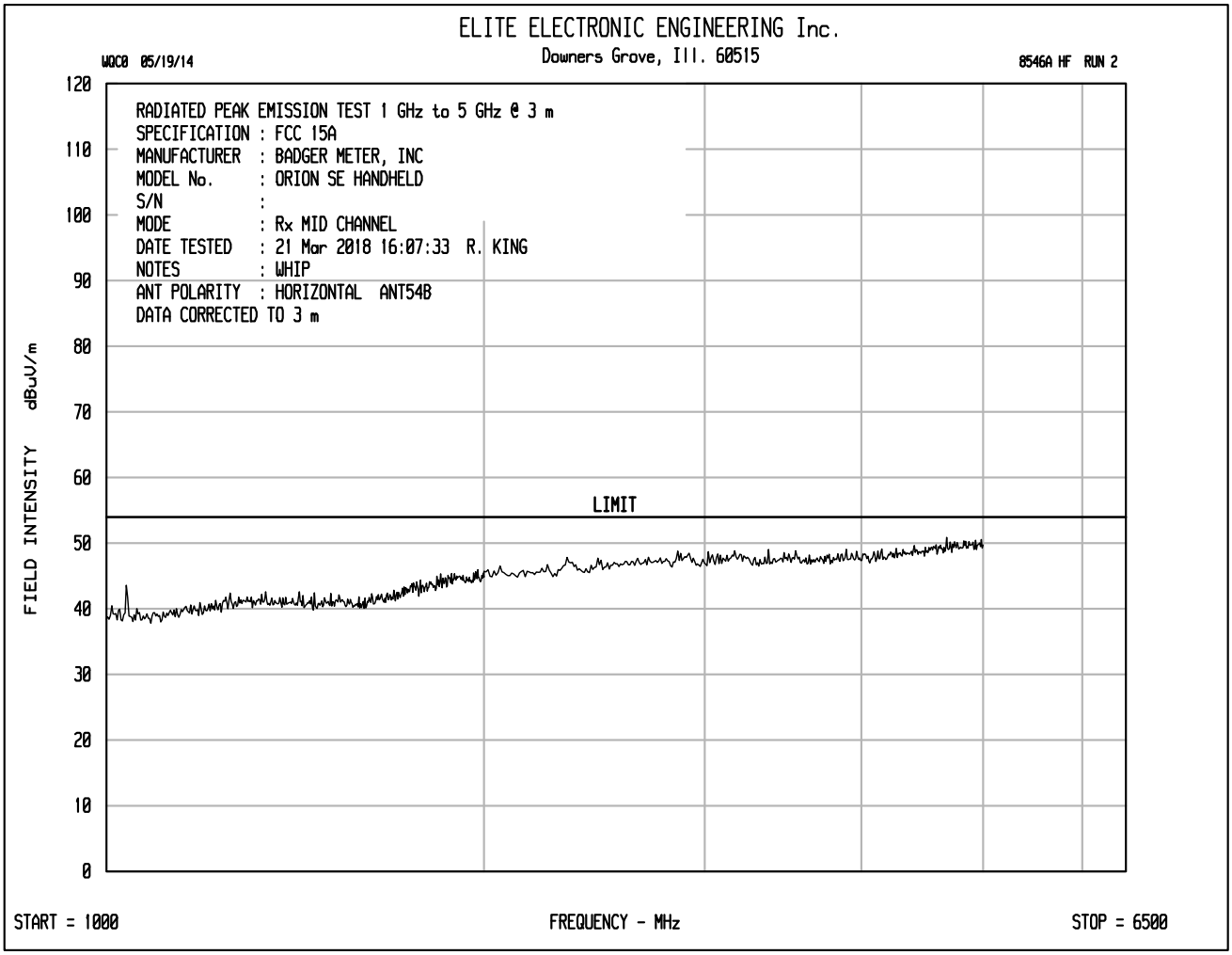

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 20
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 21 Mar 2018 14:05:57 R. KING
NOTES : WHIP ANTENNA
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

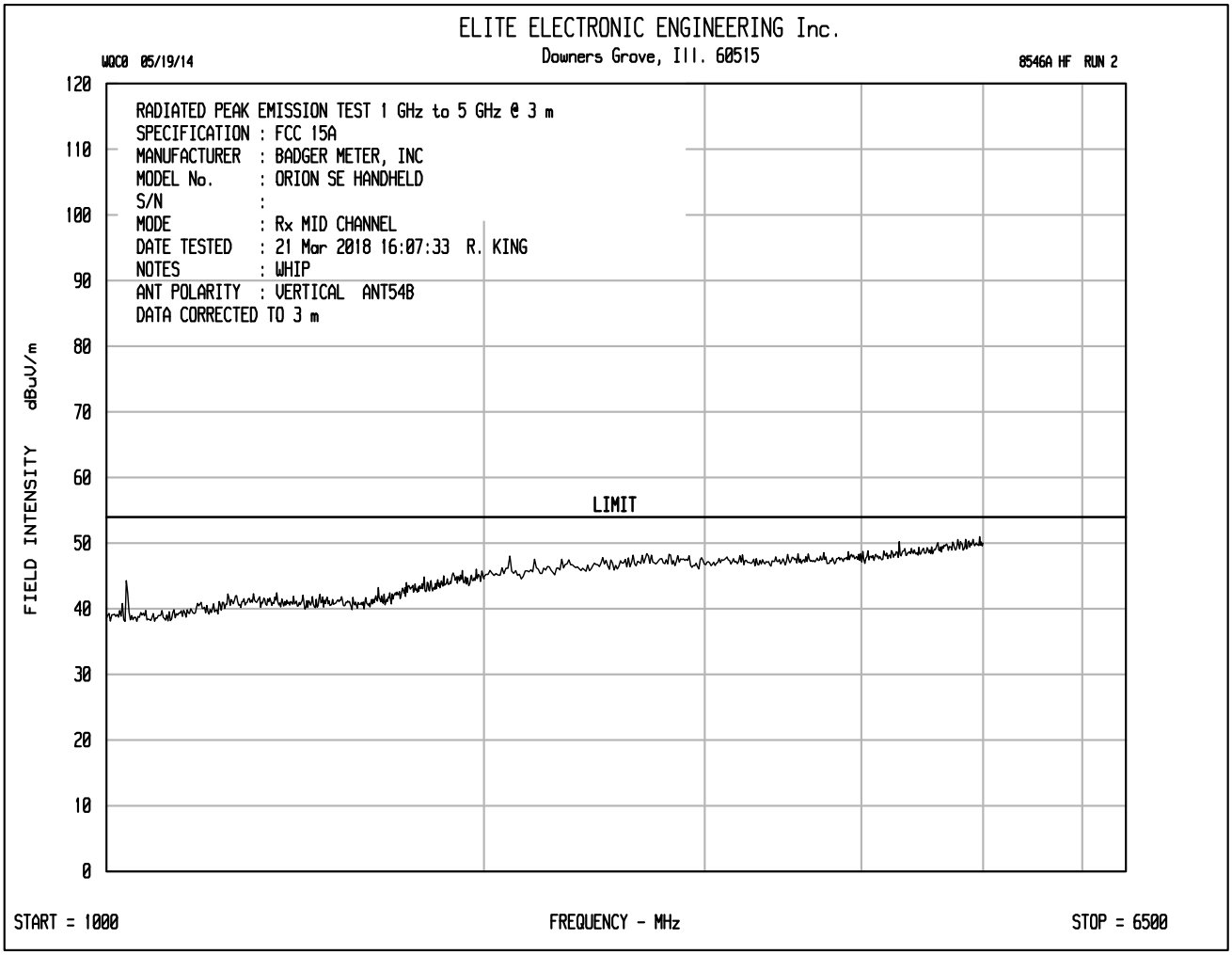

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 1
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 21 Mar 2018 15:42:20 R. KING
NOTES : WHIP
ANT POLARITY : HORIZONTAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500

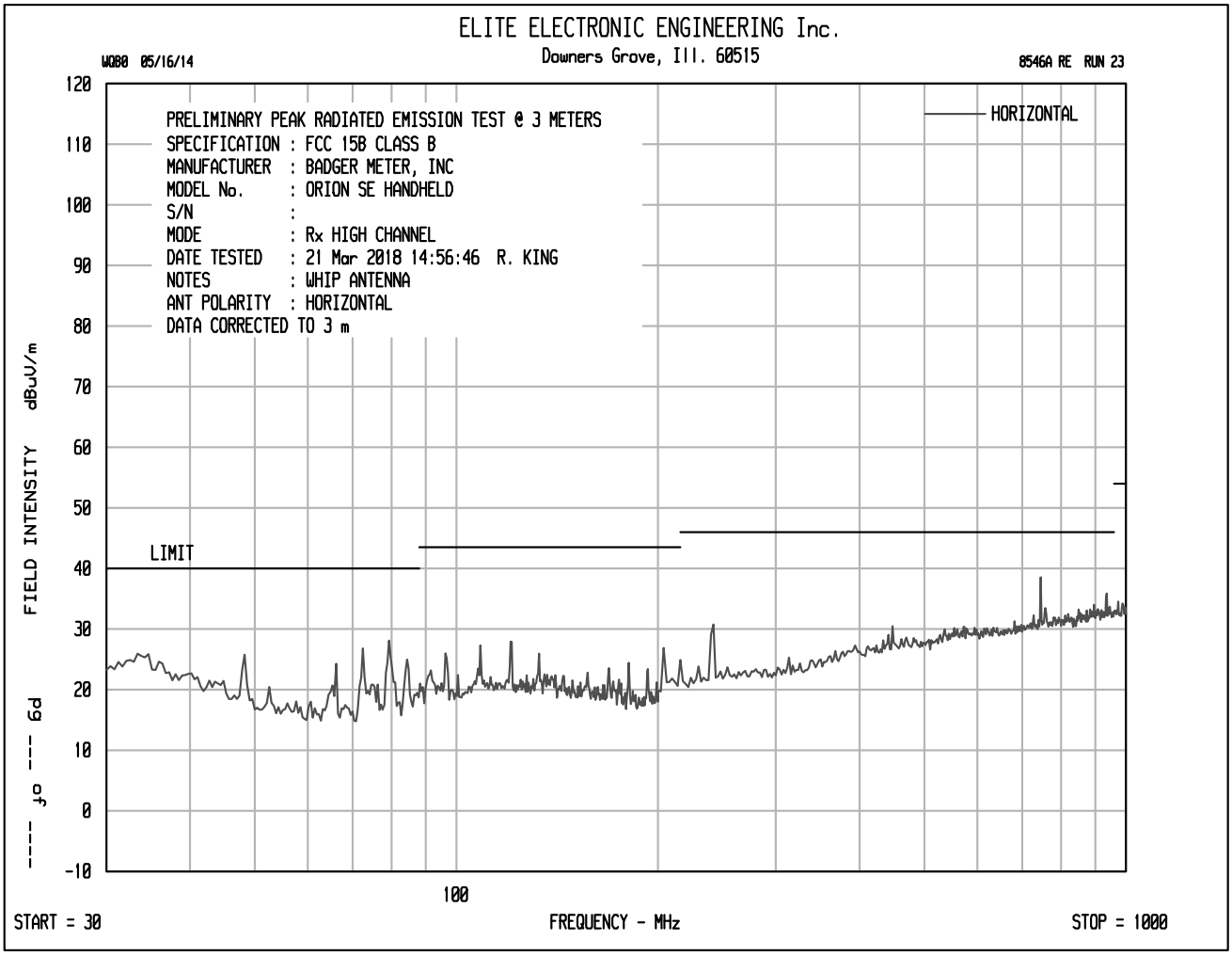

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 1
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx LOW CHANNEL
DATE TESTED : 21 Mar 2018 15:42:20 R. KING
NOTES : WHIP
ANT POLARITY : VERTICAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500

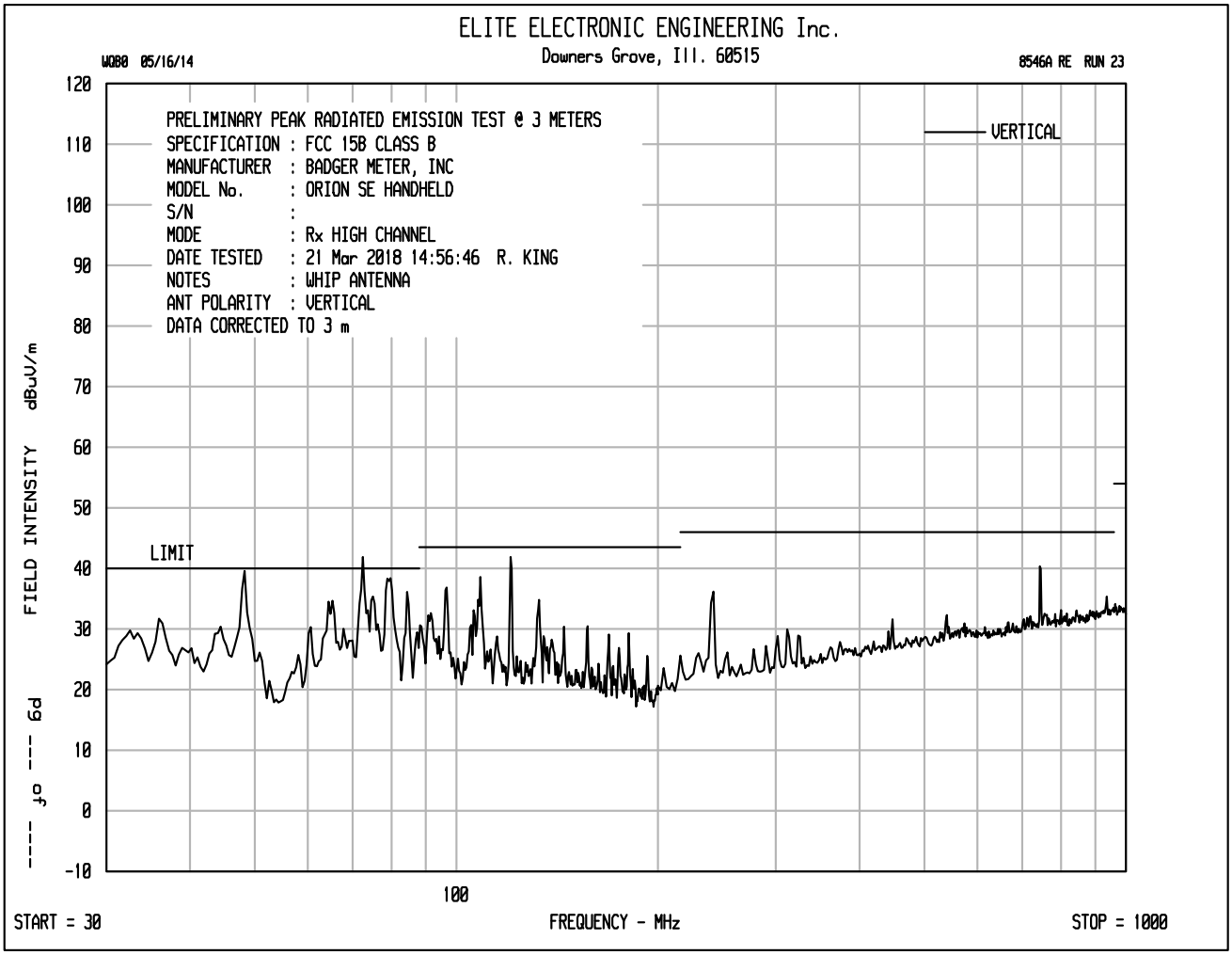

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 22
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 21 Mar 2018 14:31:11 R. KING
NOTES : WHIP ANTENNA
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

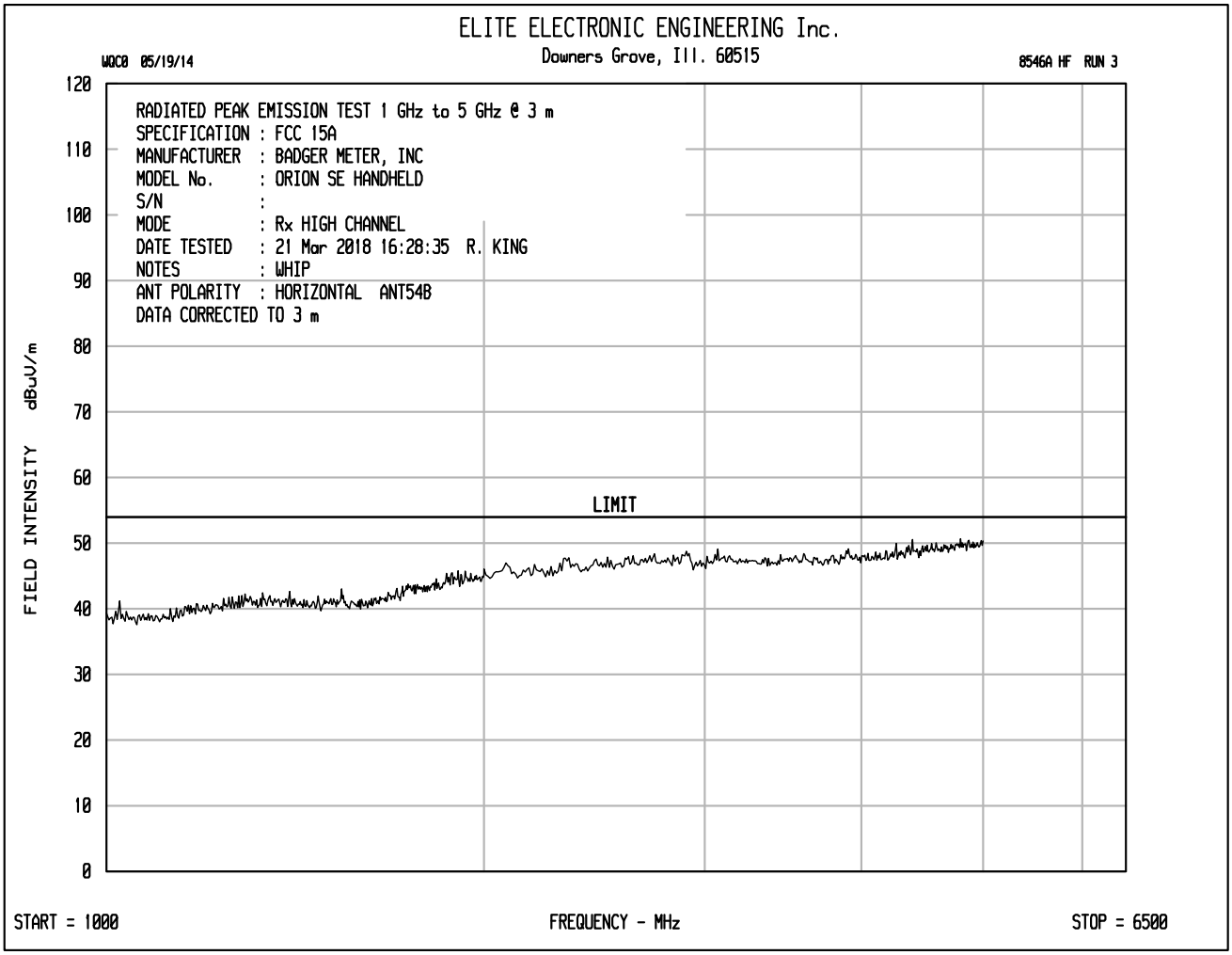

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 22
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 21 Mar 2018 14:31:11 R. KING
NOTES : WHIP ANTENNA
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

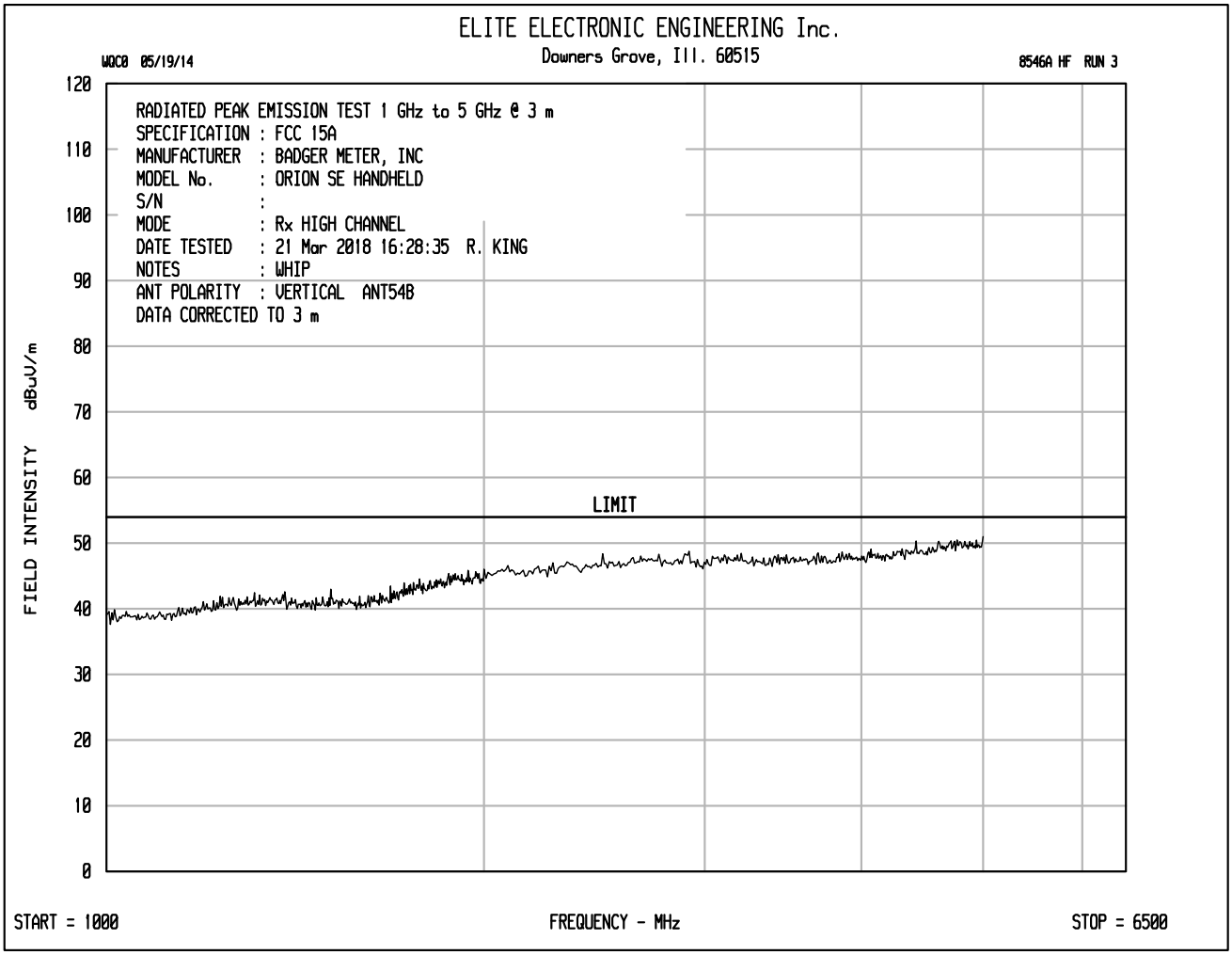

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 2
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 21 Mar 2018 16:07:33 R. KING
NOTES : WHIP
ANT POLARITY : HORIZONTAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 2
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx MID CHANNEL
DATE TESTED : 21 Mar 2018 16:07:33 R. KING
NOTES : WHIP
ANT POLARITY : VERTICAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 23
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 21 Mar 2018 14:56:46 R. KING
NOTES : WHIP ANTENNA
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 23
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 21 Mar 2018 14:56:46 R. KING
NOTES : WHIP ANTENNA
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- to --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 3
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 21 Mar 2018 16:28:35 R. KING
NOTES : WHIP
ANT POLARITY : HORIZONTAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC8 05/19/14
8546A HF RUN 3
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL No. : ORION SE HANDHELD
S/N :
MODE : Rx HIGH CHANNEL
DATE TESTED : 21 Mar 2018 16:28:35 R. KING
NOTES : WHIP
ANT POLARITY : VERTICAL ANT54B
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500

ETR No. 8546A
DATA SHEET TEST NO. 20

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx LOW CHANNEL
NOTES : WHIP ANTENNA
TEST DATE : 21 Mar 2018 14:05:57
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
48.00	21.6	15.0	.5	0.0	0.0	37.1	40.0	-0	120	V
72.08	26.9	12.4	.5	0.0	0.0	39.9	40.0	180	120	V
79.08	23.3	12.9	.5	0.0	0.0	36.7	40.0	180	120	V
120.01	22.7	18.2	.6	0.0	0.0	41.6	43.5	315	120	V
132.08	13.6	17.7	.7	0.0	0.0	32.1	43.5	225	120	V
155.99	10.8	16.2	.8	0.0	0.0	27.8	43.5	180	120	V
168.05	11.2	15.6	.9	0.0	0.0	27.7	43.5	225	120	V
240.02	15.7	18.0	1.0	0.0	0.0	34.7	46.0	270	200	V
311.97	6.4	19.3	1.1	0.0	0.0	26.8	46.0	315	200	V
445.49	4.6	22.5	1.5	0.0	0.0	28.6	46.0	45	200	V
571.98	-5.9	24.5	1.5	0.0	0.0	20.1	46.0	180	200	V
664.03	-6.1	24.8	1.7	0.0	0.0	20.5	46.0	270	120	H
742.49	9.6	25.5	1.9	0.0	0.0	37.0	46.0	45	120	V
903.13	-4.7	26.4	2.0	0.0	0.0	23.7	46.0	225	120	H
929.62	6.8	26.6	2.0	0.0	0.0	35.4	46.0	45	120	V

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 1

RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx LOW CHANNEL
NOTES : WHIP
TEST DATE : 21 Mar 2018 15:42:20
TEST DISTANCE : 3 m
ANTENNA : ANT54B

FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1012.58	-4.2	27.0	2.0	0.0	24.8	54.0		270	121	V
1249.54	-3.9	28.8	2.3	0.0	27.2	54.0		180	340	V
1408.47	-4.1	28.9	2.5	0.0	27.3	54.0		270	200	H
1821.81	-3.9	30.8	2.9	0.0	29.8	54.0		225	200	H
2875.66	-3.0	32.7	3.8	0.0	33.5	54.0		180	340	H
4868.66	-4.5	34.8	4.9	0.0	35.2	54.0		270	120	V

Checked BY Richard E. King :

Richard E. King

ETR No. 8546A
DATA SHEET TEST NO. 22

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx MID CHANNEL
NOTES : WHIP ANTENNA
TEST DATE : 21 Mar 2018 14:31:11
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
48.01	23.3	15.0	.5	0.0	0.0	38.8	40.0	315	120	V
72.03	25.4	12.4	.5	0.0	0.0	38.3	40.0	180	120	V
78.23	22.0	12.8	.5	0.0	0.0	35.3	40.0	225	120	V
120.01	22.8	18.2	.6	0.0	0.0	41.6	43.5	270	120	V
132.04	12.8	17.7	.7	0.0	0.0	31.3	43.5	225	120	V
156.02	9.9	16.2	.8	0.0	0.0	26.9	43.5	180	120	V
168.03	11.2	15.6	.9	0.0	0.0	27.7	43.5	270	120	V
240.02	15.4	18.0	1.0	0.0	0.0	34.4	46.0	-0	200	V
300.02	5.4	19.0	1.0	0.0	0.0	25.4	46.0	-0	200	V
445.50	6.9	22.5	1.5	0.0	0.0	30.9	46.0	90	120	V
550.20	-6.0	24.6	1.5	0.0	0.0	20.1	46.0	270	340	H
640.92	-6.0	24.8	1.6	0.0	0.0	20.4	46.0	270	120	V
742.49	12.2	25.5	1.9	0.0	0.0	39.6	46.0	-0	340	H
894.46	-4.8	26.3	2.0	0.0	0.0	23.5	46.0	-0	340	V
931.33	2.0	26.6	2.0	0.0	0.0	30.6	46.0	-0	120	H

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 2

RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx MID CHANNEL
NOTES : WHIP
TEST DATE : 21 Mar 2018 16:07:33
TEST DISTANCE : 3 m
ANTENNA : ANT54B

FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1024.88	-.9	27.0	2.0	0.0	28.2	54.0		225	120	V
1796.25	-3.6	30.6	2.8	0.0	29.9	54.0		270	340	V
1921.18	-3.8	31.6	2.9	0.0	30.8	54.0		225	340	V
3542.54	-4.6	33.1	4.2	0.0	32.8	54.0		270	120	H
4180.10	-4.9	33.6	4.6	0.0	33.3	54.0		315	340	H
4958.37	-4.4	34.7	5.0	0.0	35.3	54.0		315	120	V

Checked BY Richard E. King :

Richard E. King

ETR No. 8546A
DATA SHEET TEST NO. 23

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx HIGH CHANNEL
NOTES : WHIP ANTENNA
TEST DATE : 21 Mar 2018 14:56:46
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
48.01	22.4	15.0	.5	0.0	0.0	37.9	40.0	315	120	V
71.99	26.1	12.4	.5	0.0	0.0	39.0	40.0	225	200	V
79.06	22.3	12.9	.5	0.0	0.0	35.7	40.0	180	120	V
120.01	22.8	18.2	.6	0.0	0.0	41.7	43.5	270	120	V
132.03	12.4	17.7	.7	0.0	0.0	30.9	43.5	225	120	V
156.01	9.4	16.2	.8	0.0	0.0	26.4	43.5	225	120	V
180.01	11.5	14.9	.9	0.0	0.0	27.3	43.5	225	120	V
240.02	15.2	18.0	1.0	0.0	0.0	34.1	46.0	0	200	V
312.01	7.1	19.3	1.1	0.0	0.0	27.5	46.0	315	200	V
445.49	6.5	22.5	1.5	0.0	0.0	30.5	46.0	90	340	V
538.91	-6.1	24.3	1.5	0.0	0.0	19.8	46.0	180	120	V
689.59	-5.8	24.9	1.7	0.0	0.0	20.8	46.0	135	120	H
742.49	12.0	25.5	1.9	0.0	0.0	39.5	46.0	315	200	V
894.51	-4.9	26.3	2.0	0.0	0.0	23.4	46.0	0	120	H
931.33	2.8	26.6	2.0	0.0	0.0	31.4	46.0	45	340	H

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 3

RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER, INC
MODEL NO. : ORION SE HANDHELD
SERIAL NO. :
TEST MODE : Rx HIGH CHANNEL
NOTES : WHIP
TEST DATE : 21 Mar 2018 16:28:35
TEST DISTANCE : 3 m
ANTENNA : ANT54B

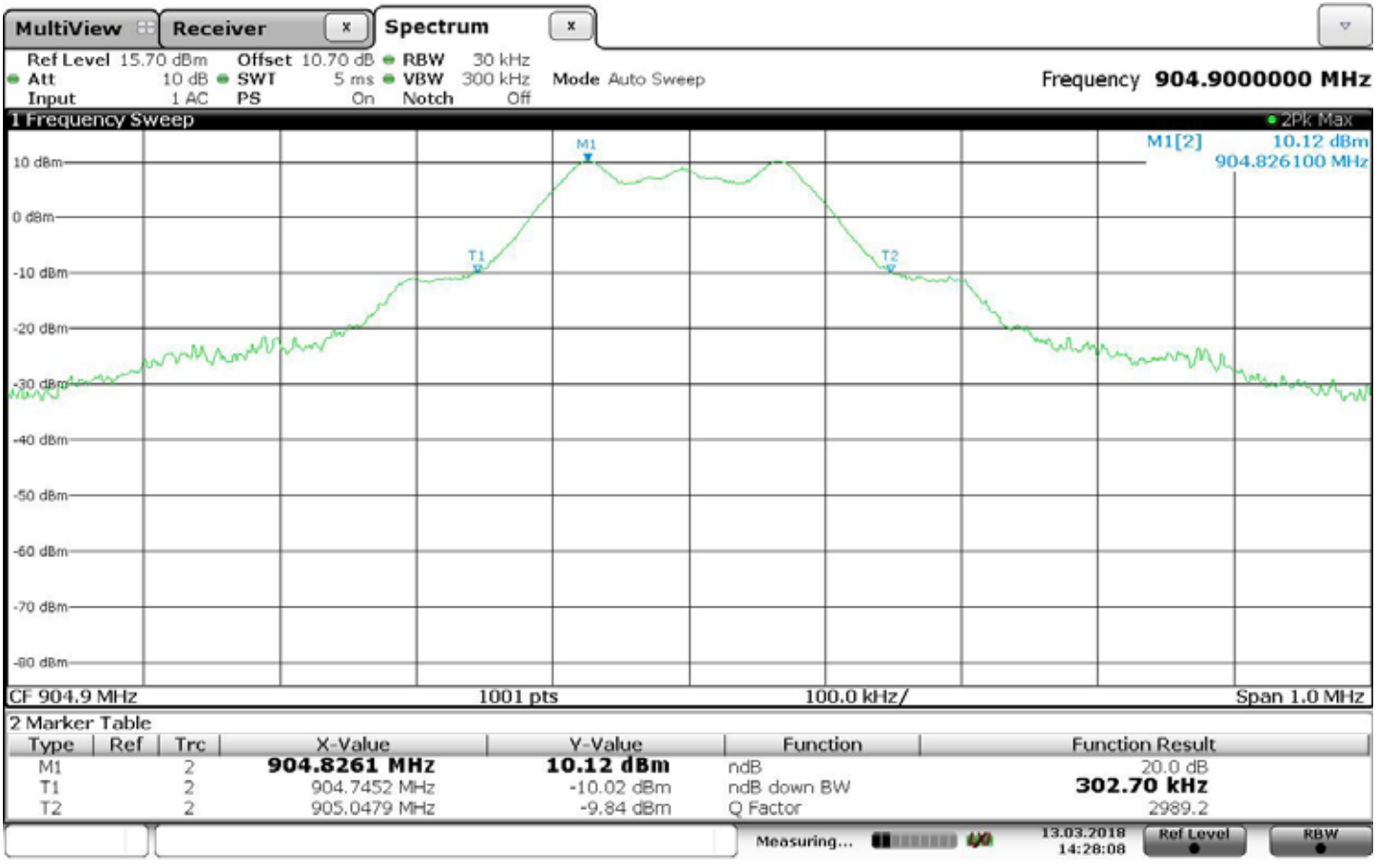
FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1407.78	-4.0	28.9	2.5	0.0	27.4	54.0		315	120	H
1502.90	-4.0	28.3	2.6	0.0	26.9	54.0		270	340	V
1923.19	-3.7	31.6	2.9	0.0	30.8	54.0		270	120	H
2104.51	-3.5	31.8	3.1	0.0	31.4	54.0		315	120	H
2480.57	-3.4	32.4	3.5	0.0	32.6	54.0		315	340	V
4977.30	-4.4	34.7	5.0	0.0	35.4	54.0		315	120	V

Checked BY Richard E. King :

Richard E. King

FCC Part 15.247 20 dB Bandwidth

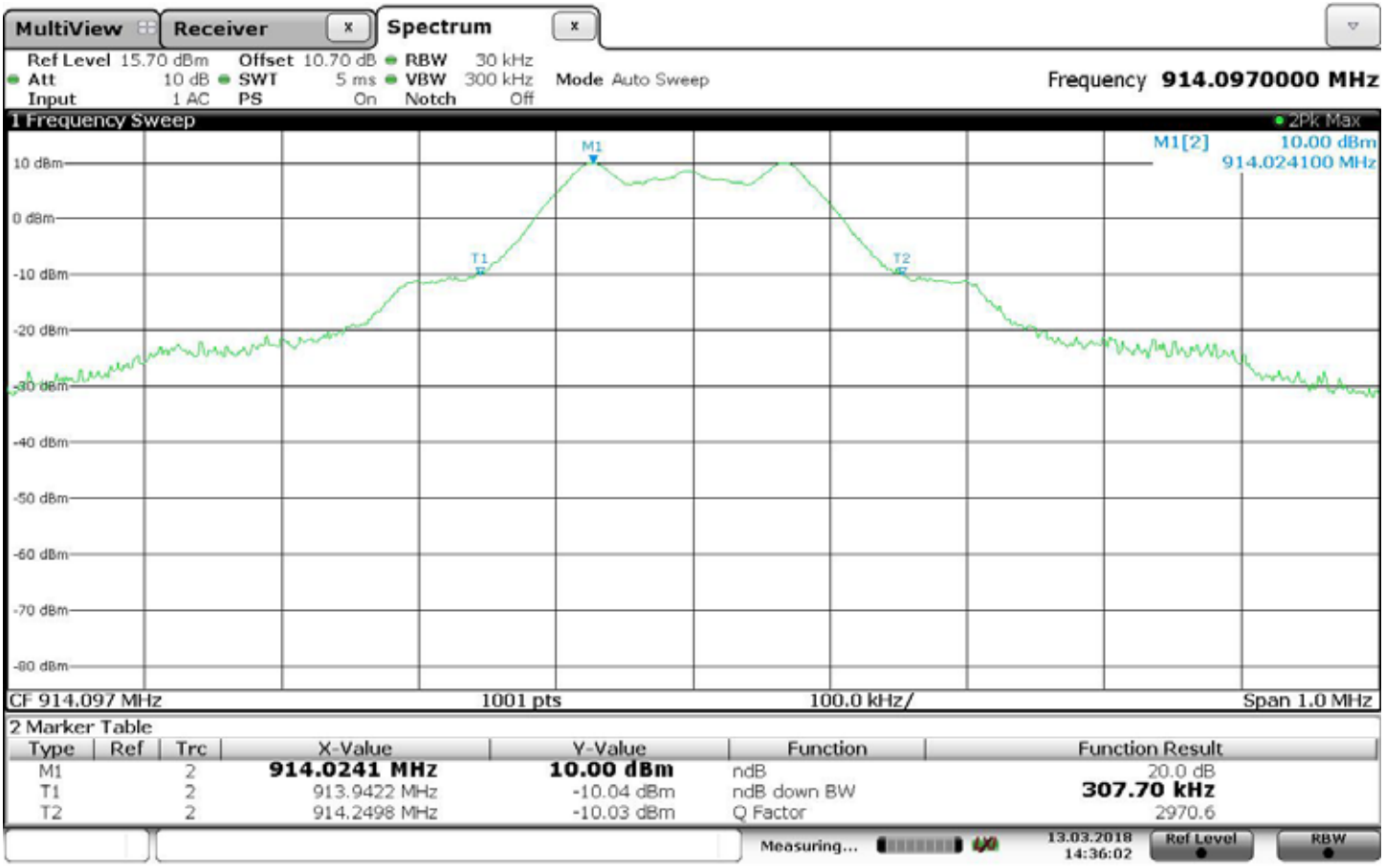
Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Tx 904.9 MHz
Test : 20dB BW = 307.7kHz
Test Engineer : R. King
Test Date : Mar 13, 2018



Date: 13.MAR.2018 14:28:07

FCC Part 15.247 20 dB Bandwidth

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 914.1 MHz
Test	: 20dB BW = 307.7kHz
Test Engineer	: R. King
Test Date	: Mar 13, 2018



Date: 13.MAR.2018 14:36:02

FCC Part 15.247 20 dB Bandwidth

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 923.7 MHz
Test	: 20dB BW = 312.7kHz
Test Engineer	: R. King
Test Date	: Mar 13, 2018

Date: 13.MAR.2018 14:41:33

ISED RSS GEN 99% Peak Power Bandwidth

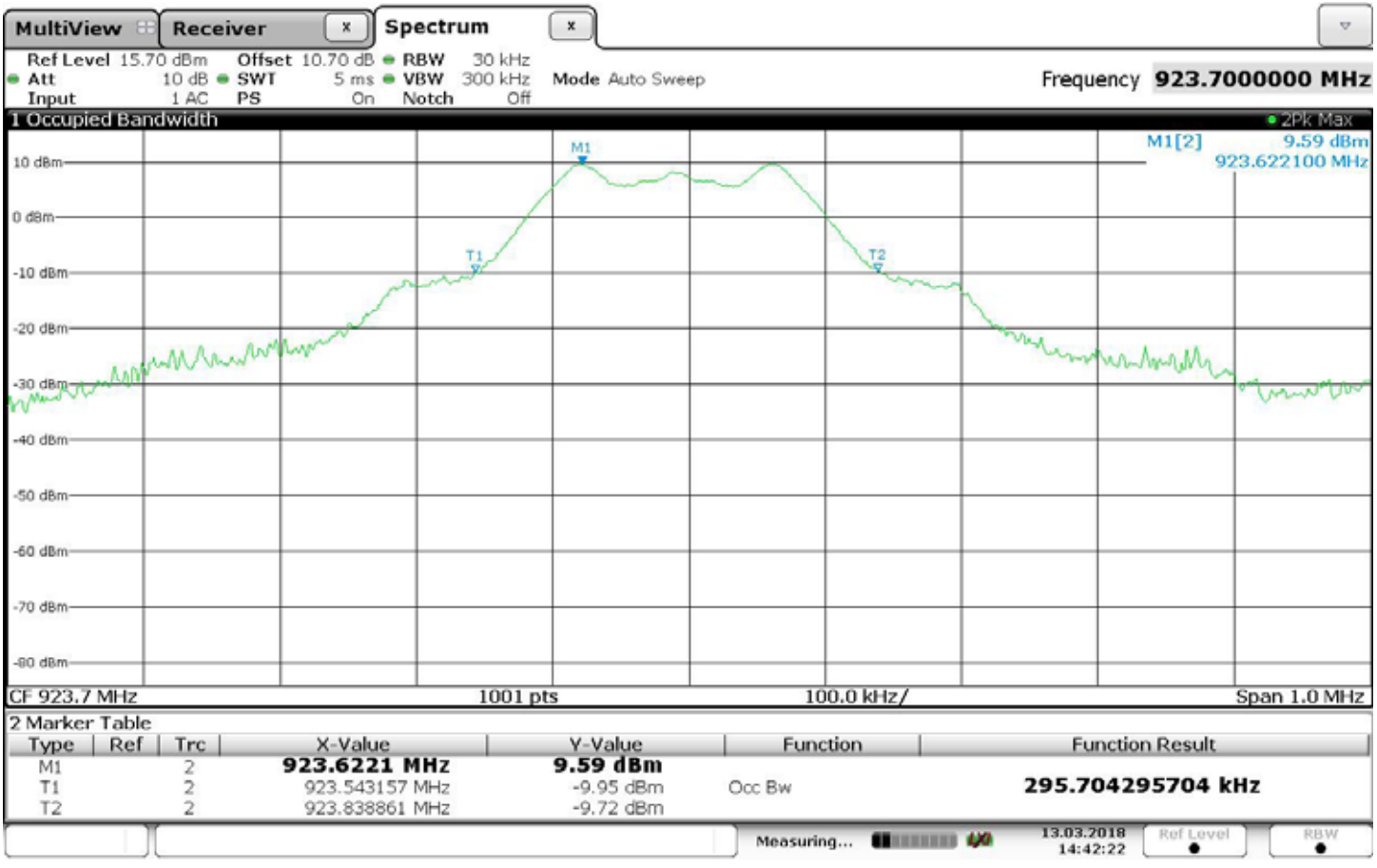
Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 904.9 MHz
Test	: 99% BW = 307.7 kHz
Test Engineer	: R. King
Test Date	: Mar 13, 2018

ISED RSS GEN 99% Peak Power Bandwidth

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 914.1 MHz
Test	: 99% BW = 299.7 kHz
Test Engineer	: R. King
Test Date	: Mar 13, 2018

ISED RSS GEN 99% Peak Power Bandwidth

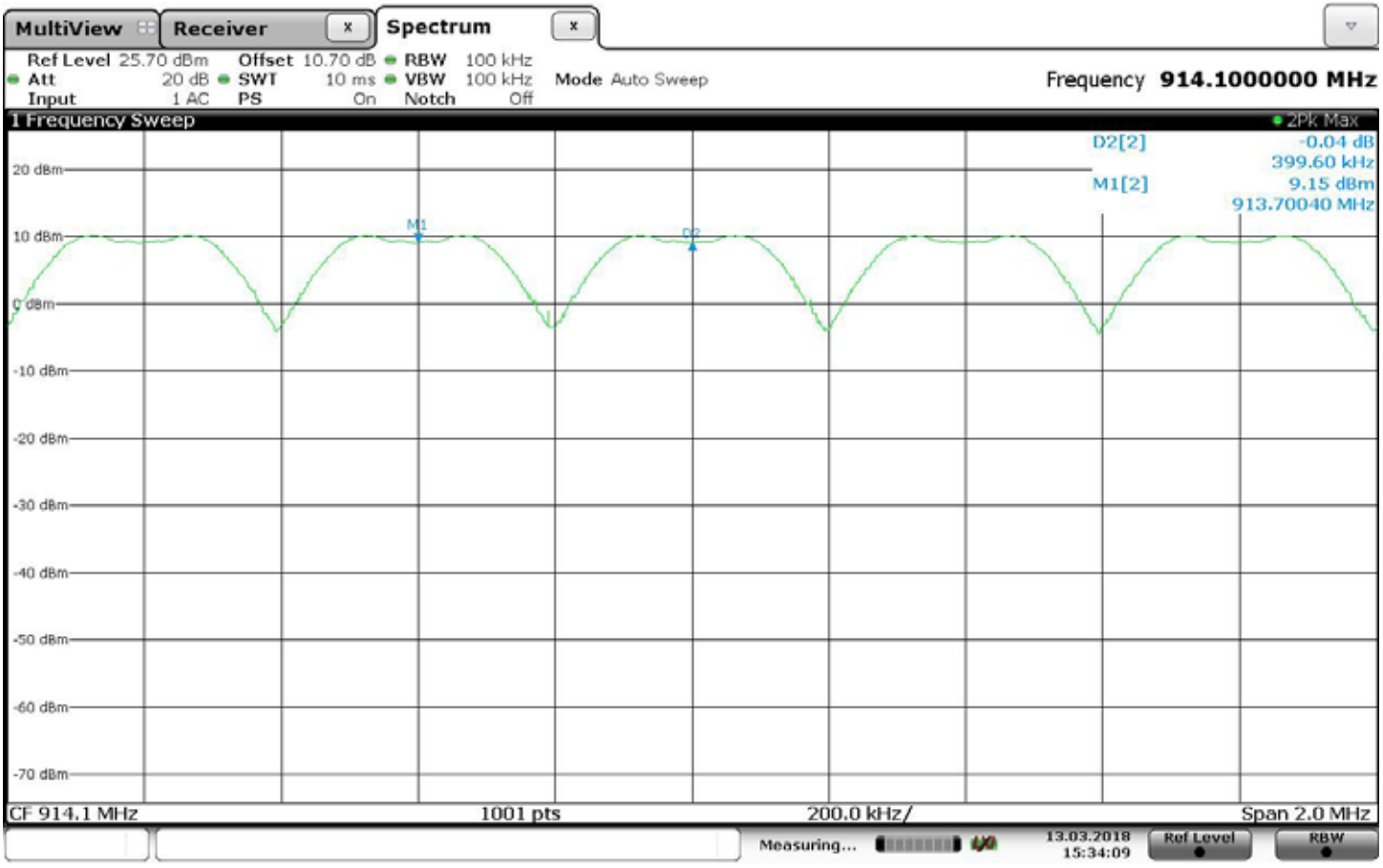
Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Tx 923.7 MHz
Test : 99% BW = 295.7 kHz
Test Engineer : R. King
Test Date : Mar 13, 2018



Date: 13.MAR.2018 14:42:22

FCC Part 15.247 Carrier Frequency Separation

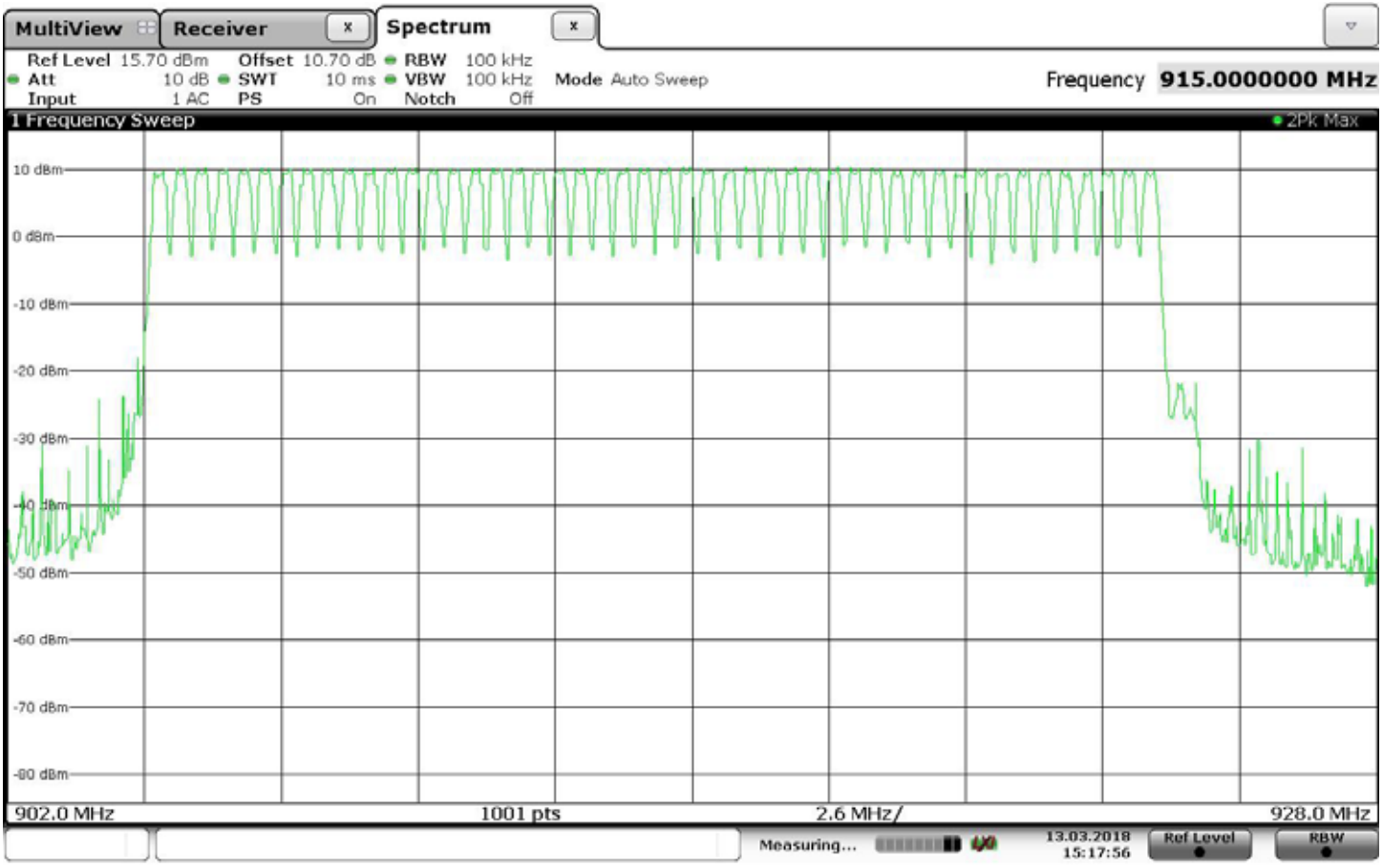
Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Hopping
Test	: CFS = 399.6kHz
Test Engineer	: R. King
Test Date	: Mar 13, 2018



Date: 13.MAR.2018 15:34:09

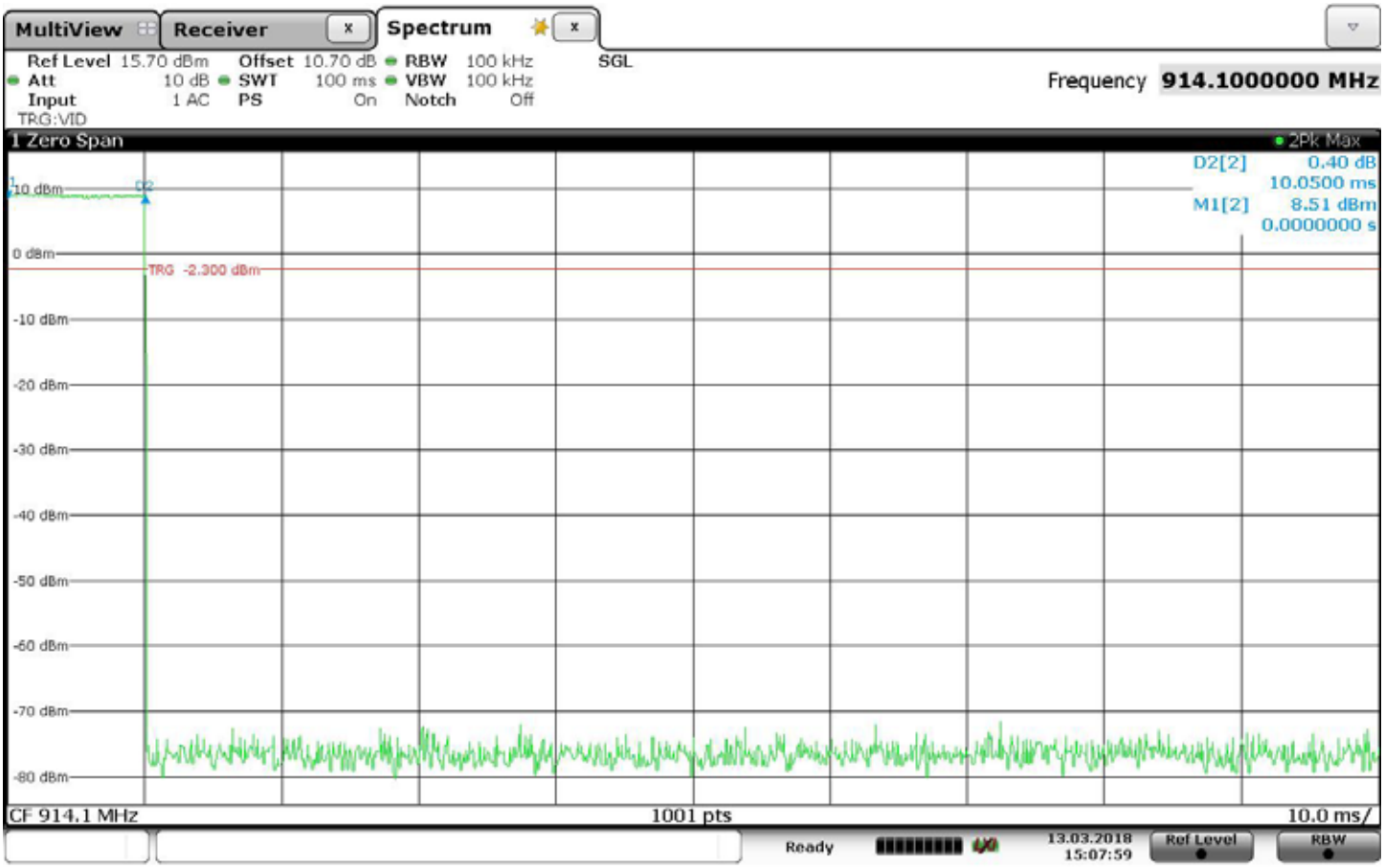
FCC Part 15.247 Number of Hopping Channels

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Hopping
Test	: NHC = 48
Test Engineer	: R. King
Test Date	: Mar 13, 2018



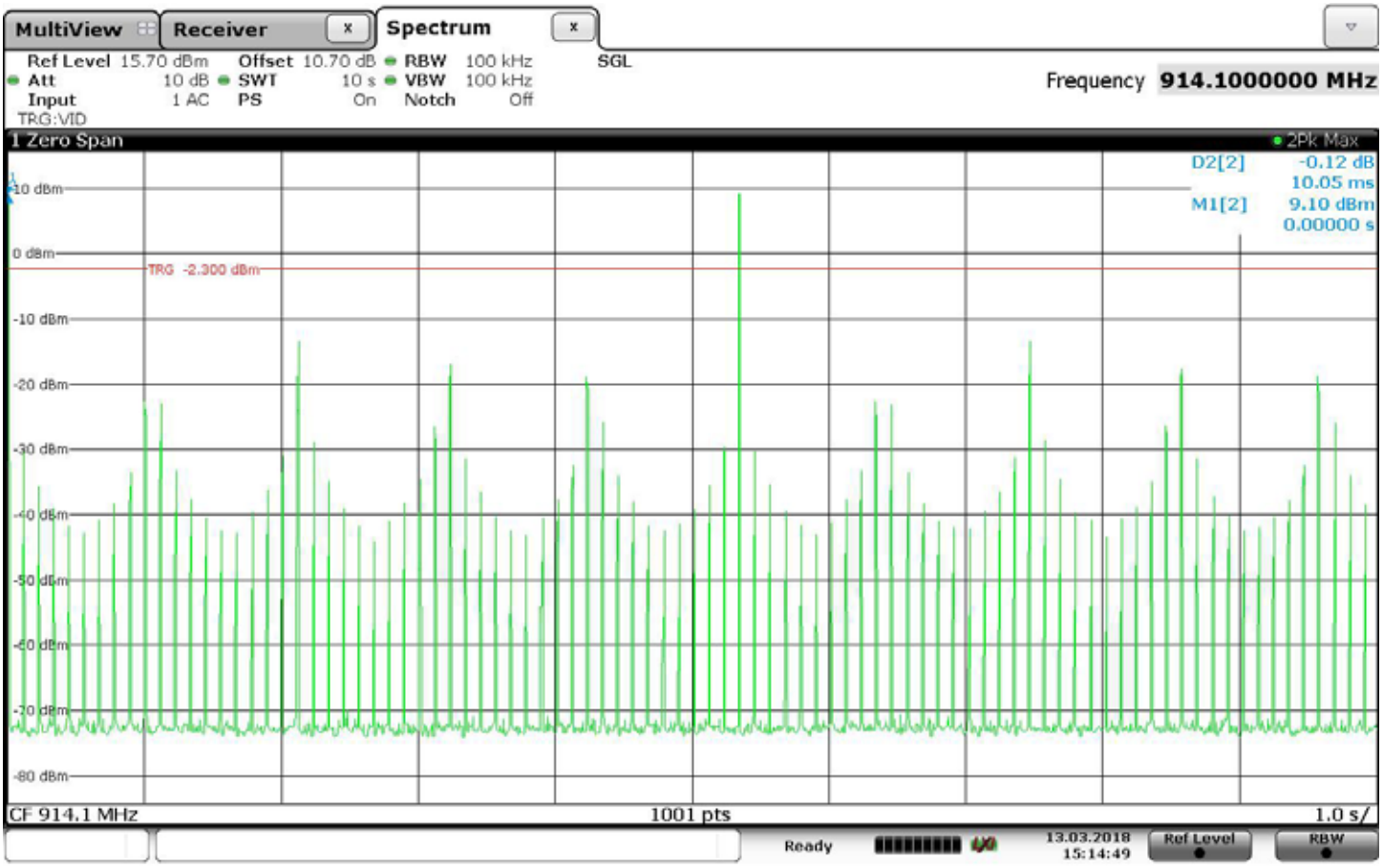
FCC Part 15.247 Dwell Time

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Hopping
Test : Dwell Time Pulse Width = 10.05 mS
Test Engineer : R. King
Test Date : Mar 13, 2018



FCC Part 15.247 Dwell Time

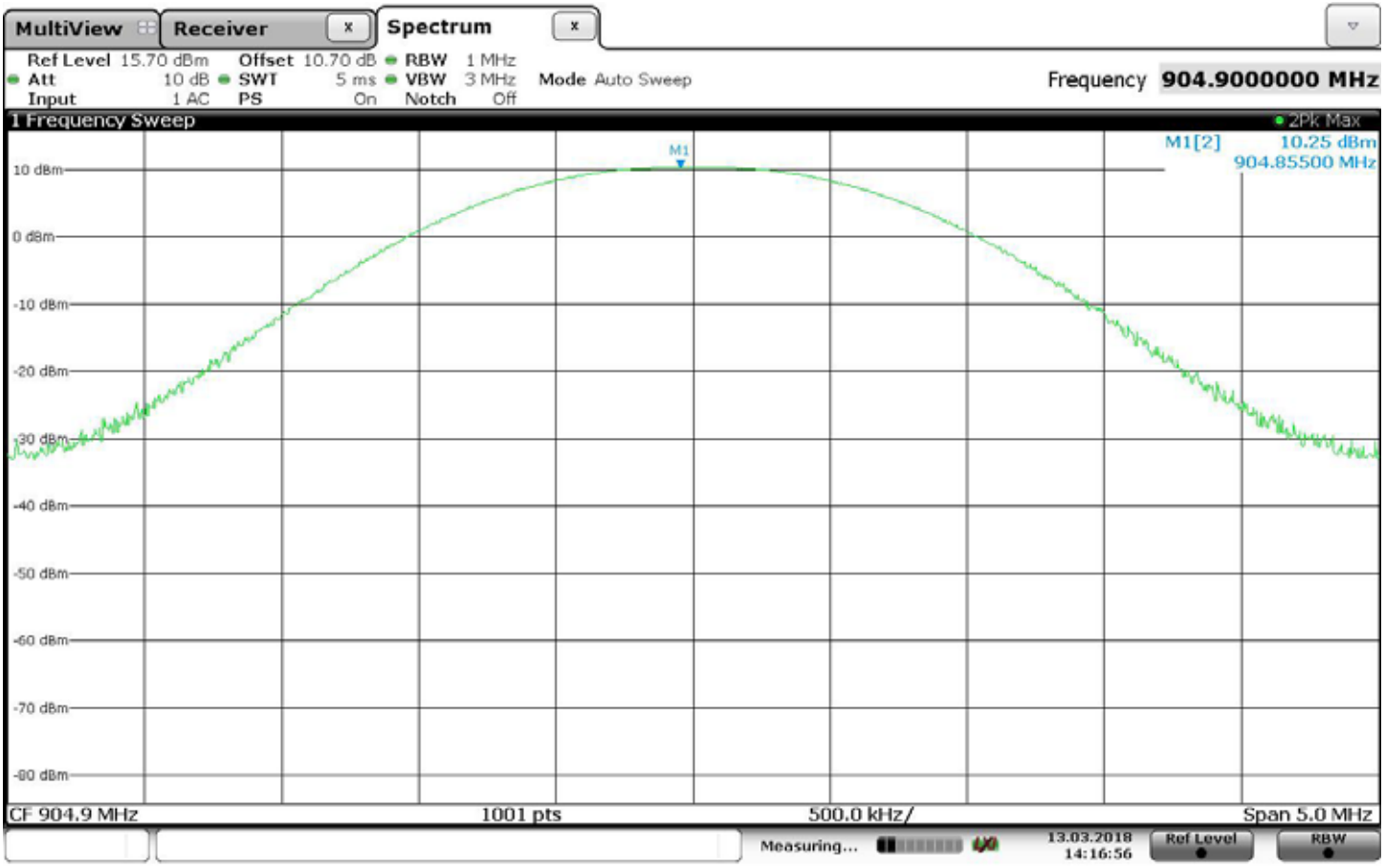
Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Hopping
Test	: Dwell Time = 2 hops in 10 seconds
Test Engineer	: R. King
Test Date	: Mar 13, 2018



Date: 13.MAR.2018 15:14:49

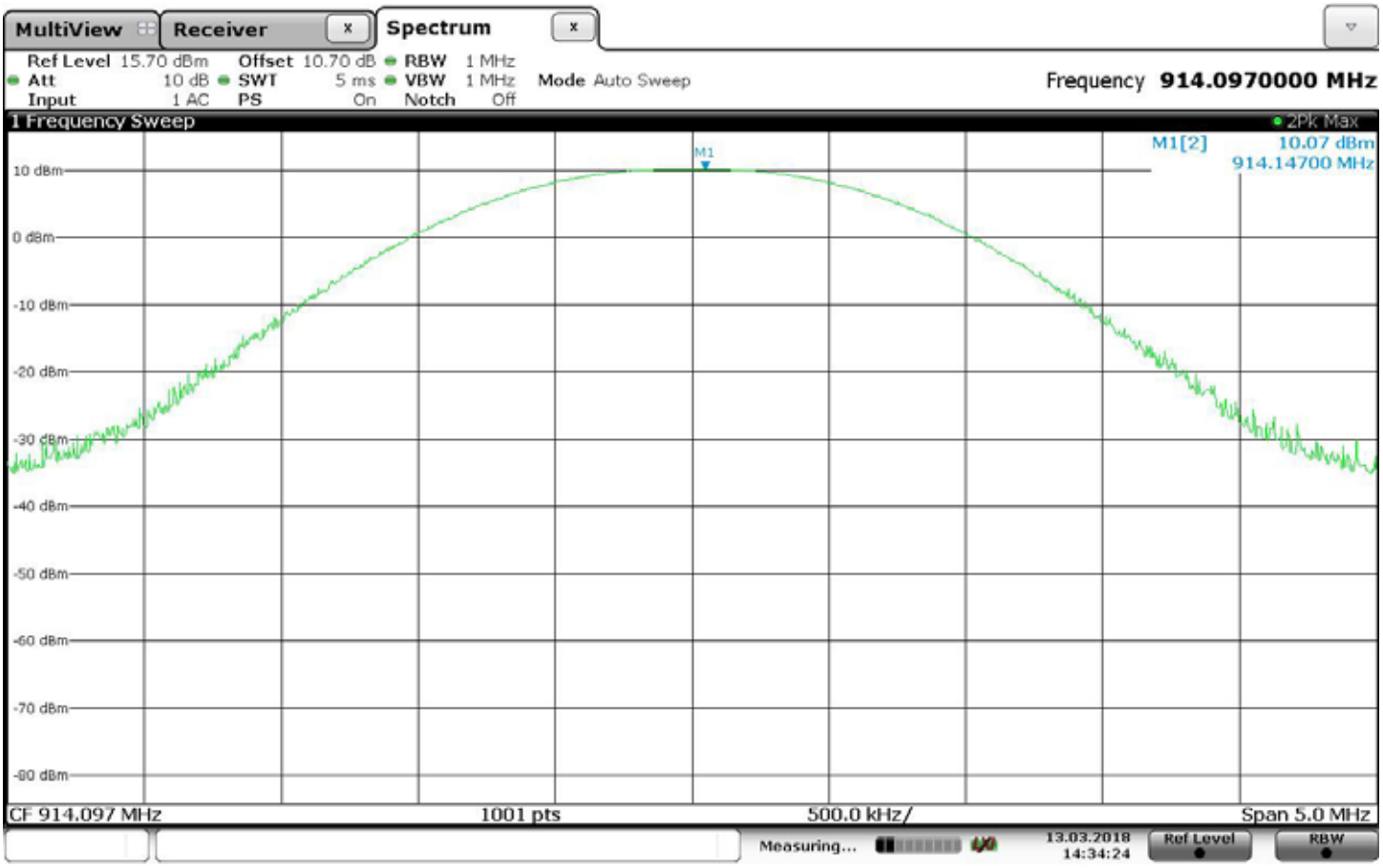
FCC Part 15.247 Peak Power Output

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 904.9 MHz
Test	: Power Output = 10.25dBm
Test Engineer	: R. King
Test Date	: Mar 13, 2018



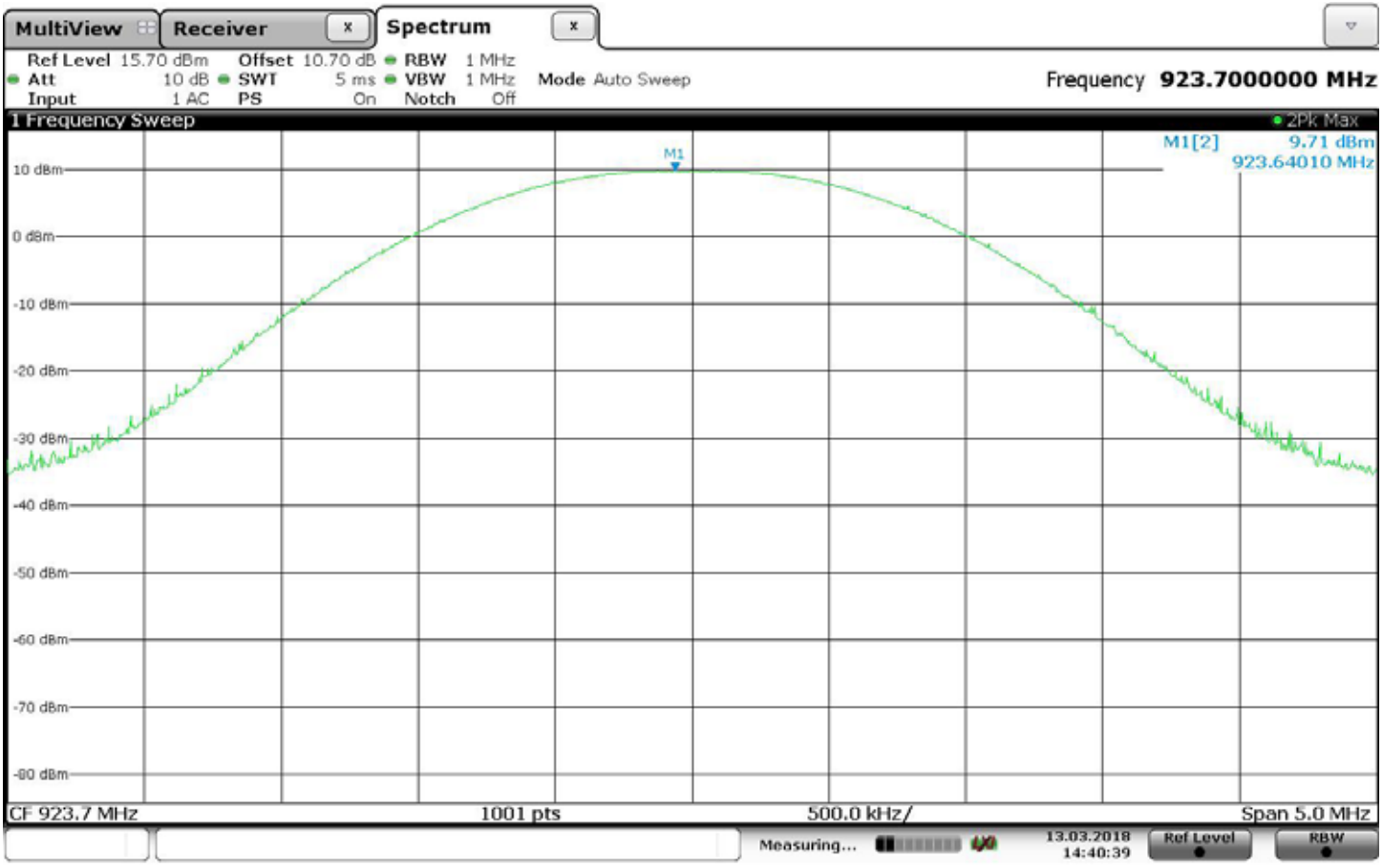
FCC Part 15.247 Peak Power Output

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Serial No. : None Assigned
Mode : Tx 914.1 MHz
Test : Power Output = 10.07dBm
Test Engineer : R. King
Test Date : Mar 13, 2018



FCC Part 15.247 Peak Power Output

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 923.7 MHz
Test	: Power Output = 9.71dBm
Test Engineer	: R. King
Test Date	: Mar 13, 2018



Date: 13.MAR.2018 14:40:39

Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Mode : Transmitting
Test Specification : FCC-15.247, RSS-247 Peak Output Power
Date : March 14, 2018
Test Distance : 3
Notes : Duck

Freq. (MHz)	Ant Pol	Wide BW Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
904.80	H	83.7	13.3	2.2	1.6	13.8	30.0	-16.2
904.80	V	77.4	8.2	2.2	1.6	8.7	30.0	-21.3
914.10	H	83.3	12.8	2.2	1.6	13.3	30.0	-16.7
914.10	V	78.1	8.9	2.2	1.6	9.4	30.0	-20.6
923.70	H	83.9	13.4	2.2	1.7	13.9	30.0	-16.1
923.70	V	73.7	4.5	2.2	1.7	5.0	30.0	-25.0

Checked BY Richard E. King :

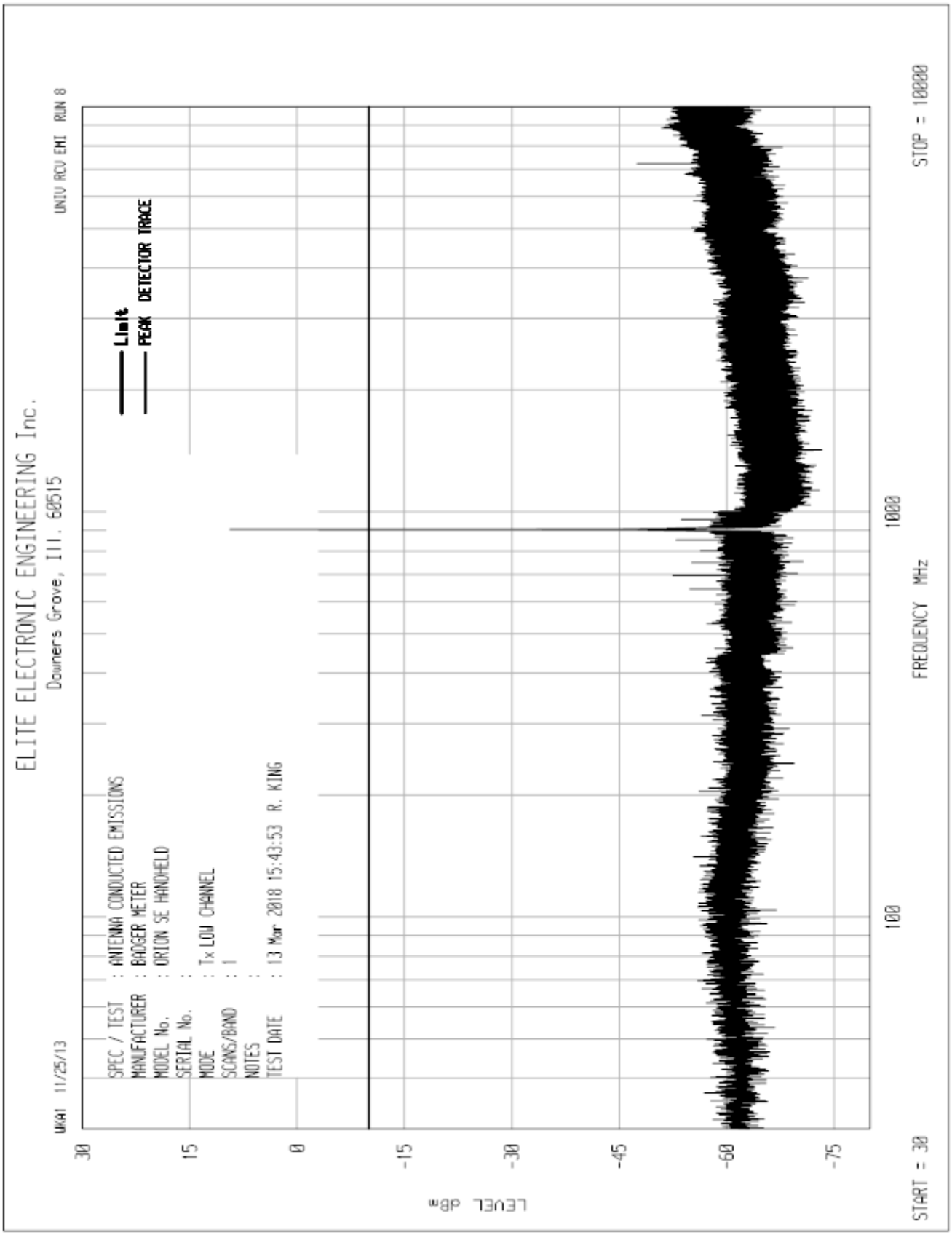
Richard E. King

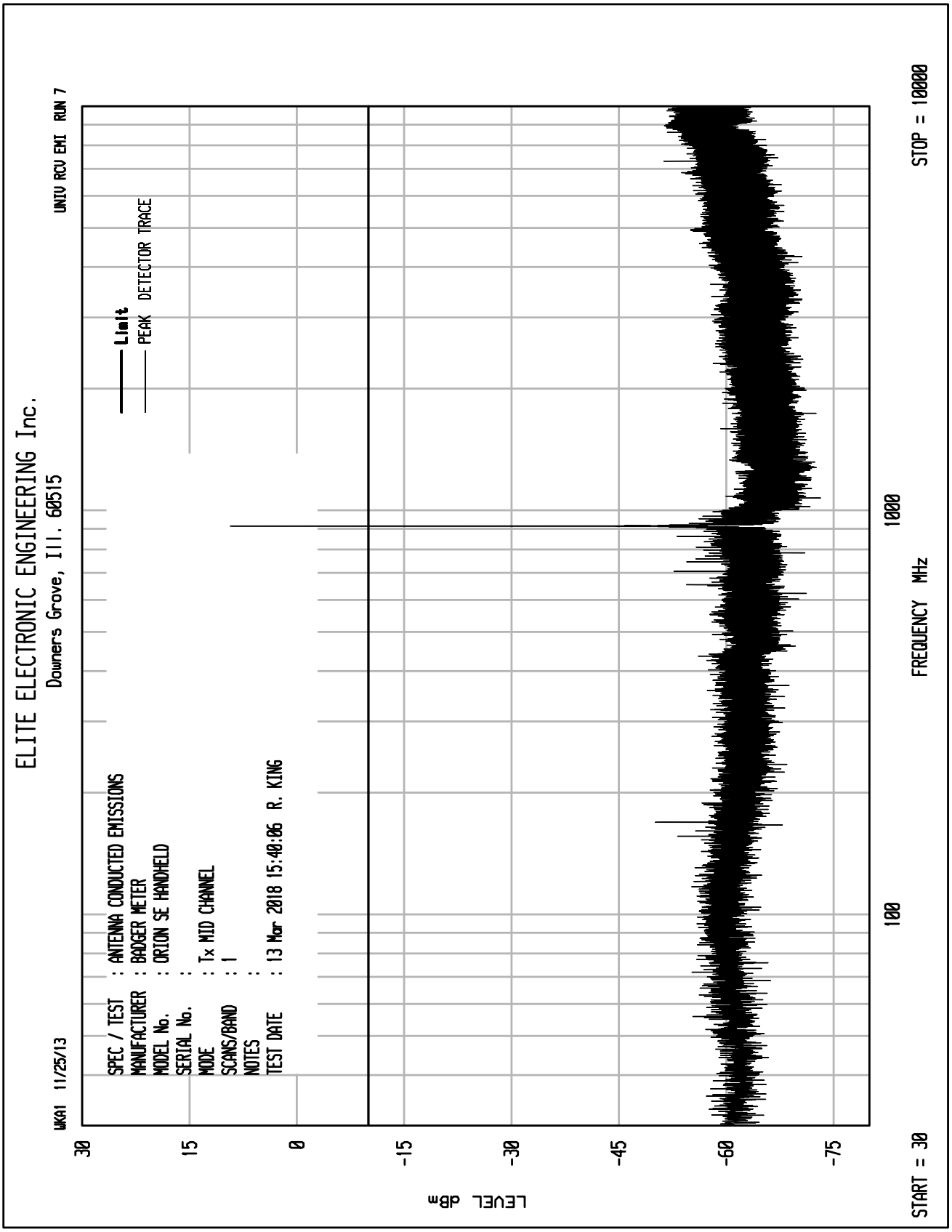
Manufacturer : Badger Meter, Incorporated
Test Item : Transceiver
Model No. : Orion SE Handheld
Mode : Transmitting
Test Specification : FCC-15.247, RSS-247 Peak Output Power
Date : March 14, 2018
Test Distance : 3
Notes : Whip

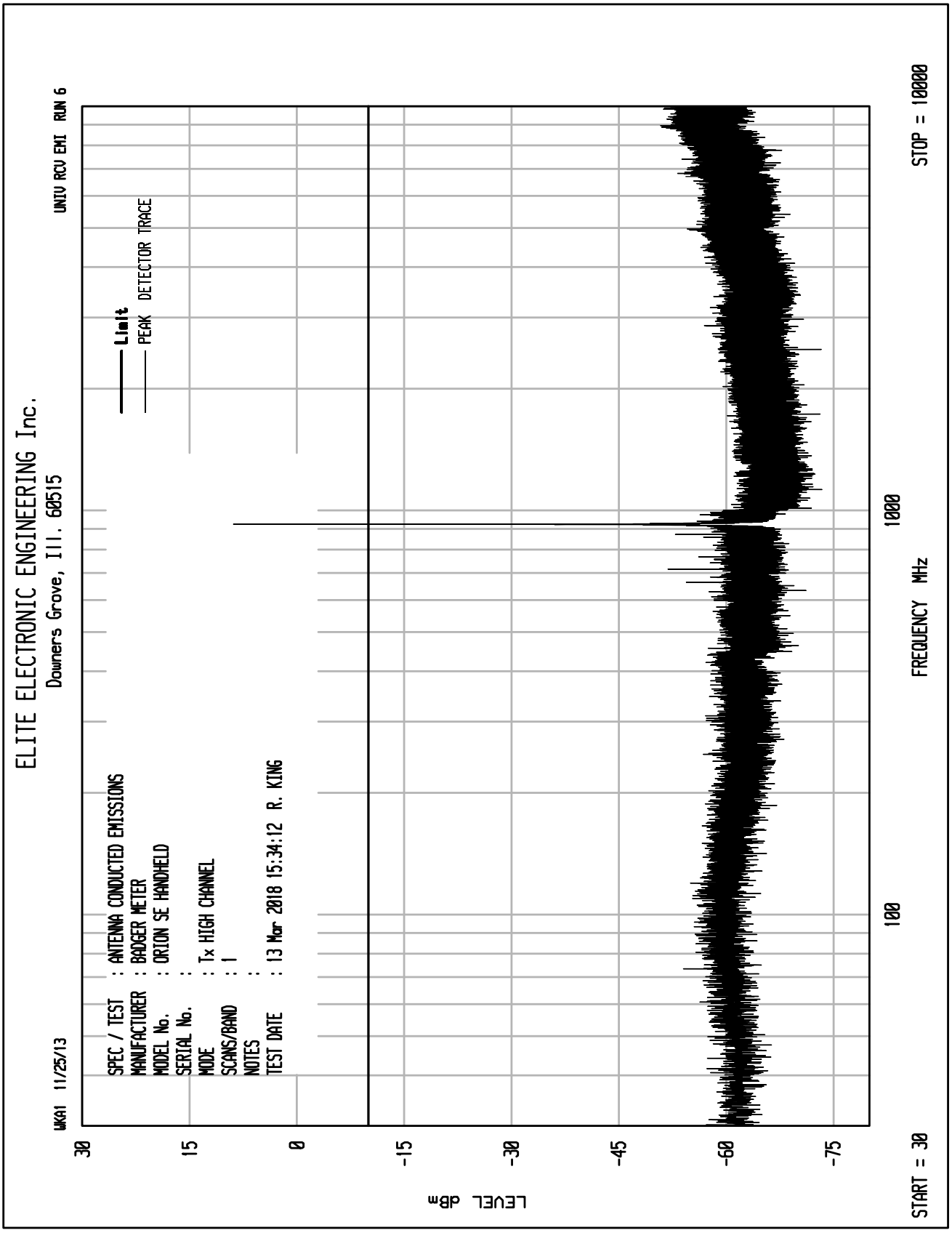
Freq. (MHz)	Ant Pol	Wide BW Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
904.90	H	73.9	3.5	2.2	1.6	4.0	30.0	-26.0
904.90	V	82.9	13.7	2.2	1.6	14.3	30.0	-15.7
914.10	H	74.0	3.5	2.2	1.6	4.0	30.0	-26.0
914.10	V	83.7	14.5	2.2	1.6	15.0	30.0	-15.0
923.70	H	73.6	3.1	2.2	1.7	3.6	30.0	-26.4
923.70	V	84.1	14.9	2.2	1.7	15.4	30.0	-14.6

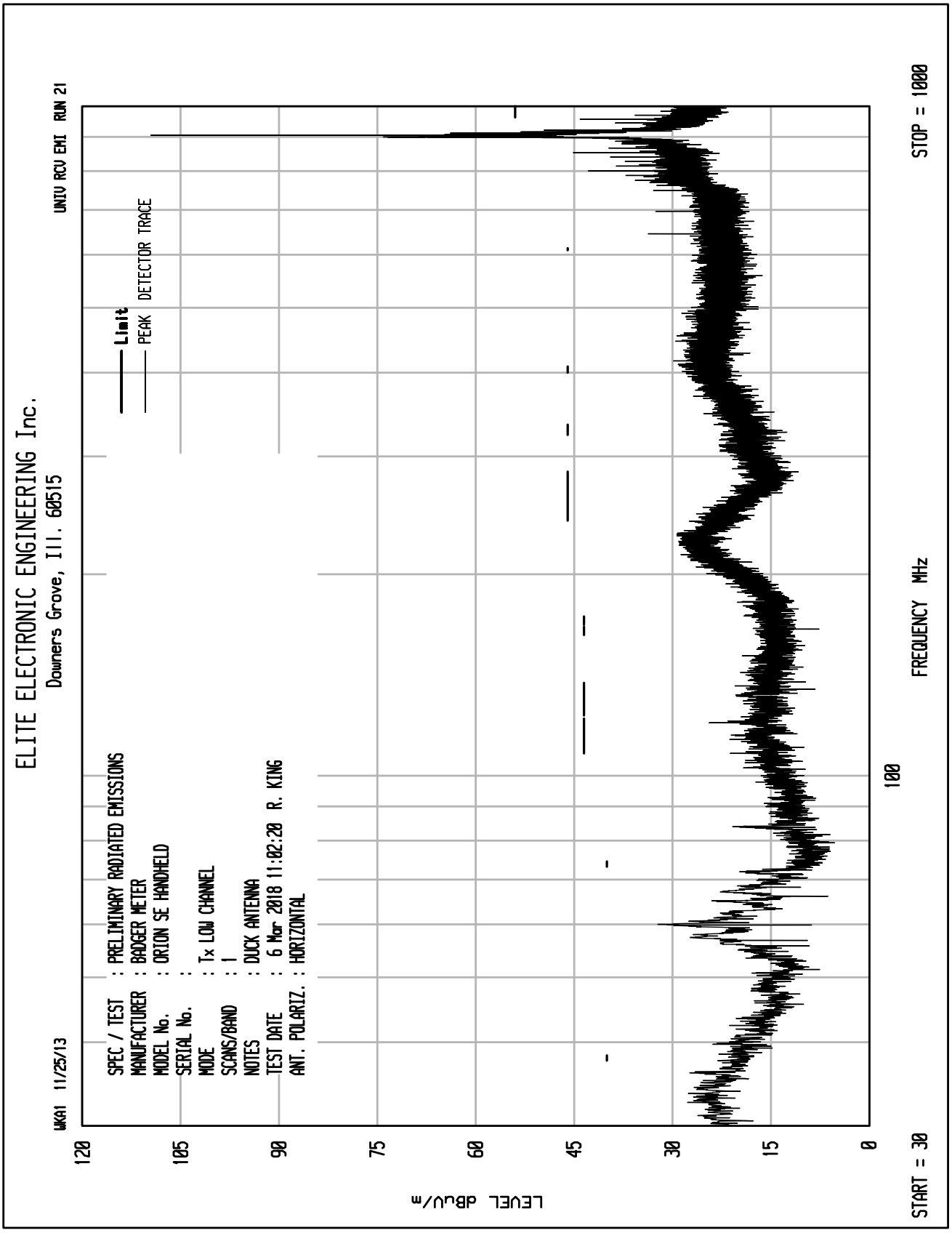
Checked BY Richard E. King :

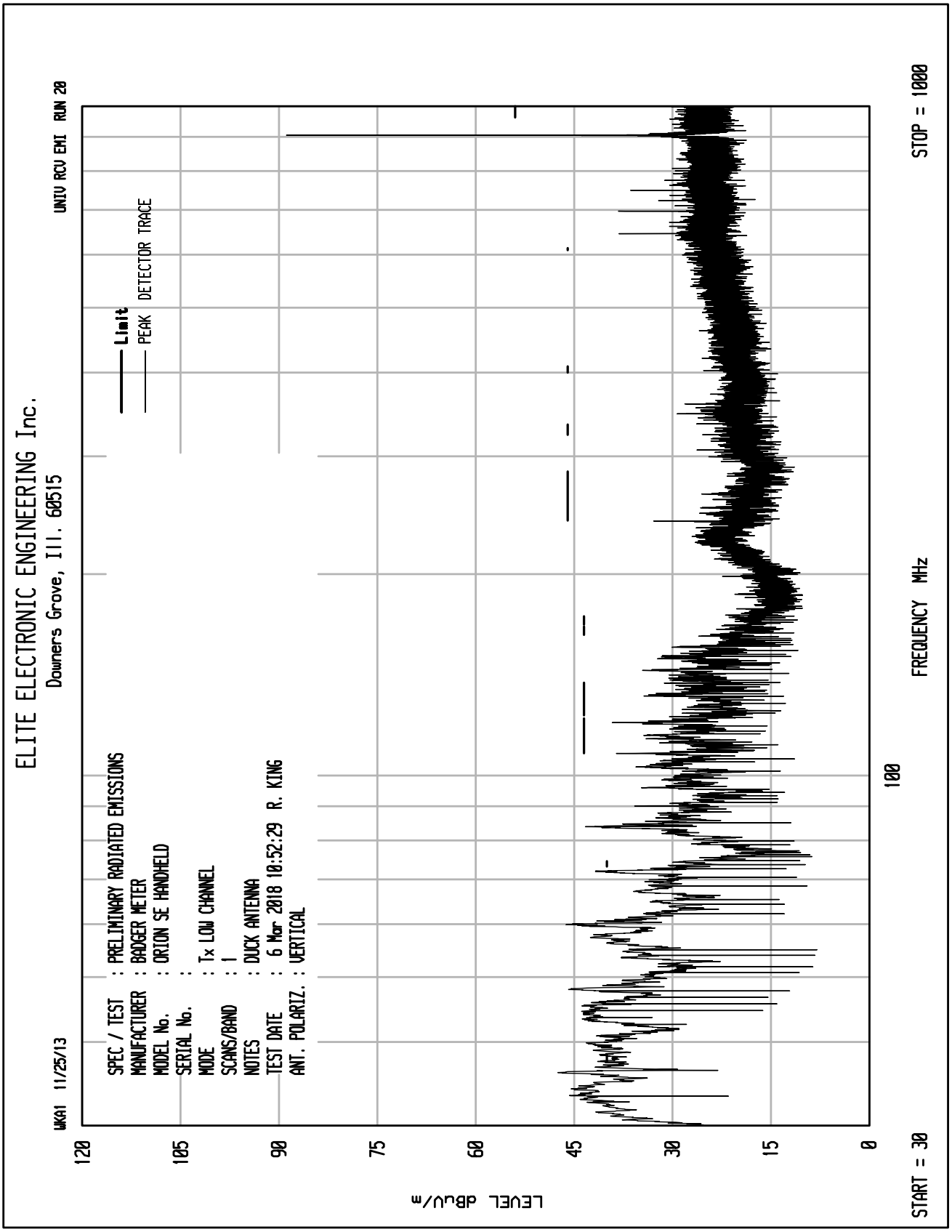
Richard E. King

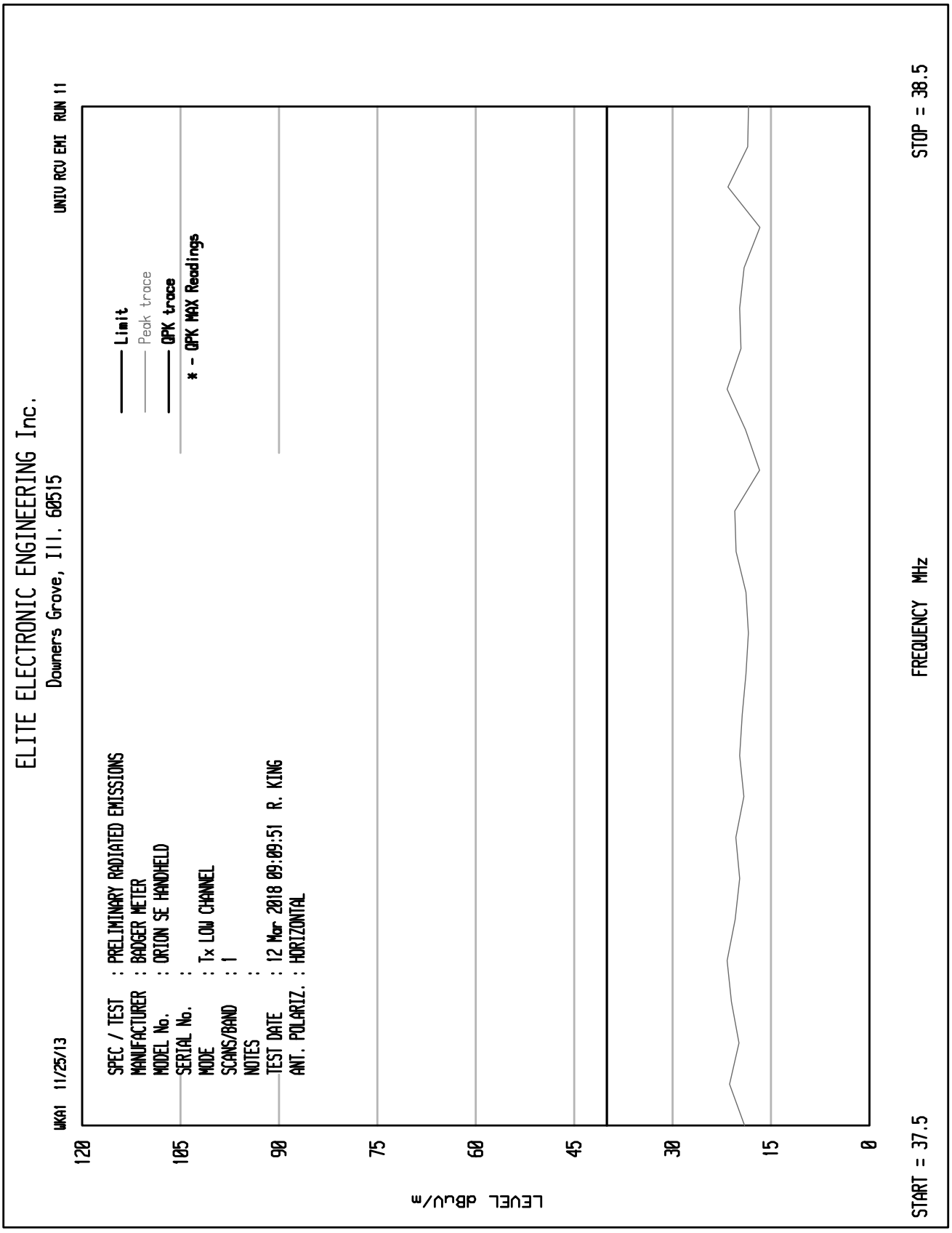

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 8
UKAI 11/25/13
SPEC / TEST : ANTENNA CONDUCTED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 13 Mar 2018 15:43:53 R. KING
Limit
PEAK DETECTOR TRACE
LEVEL dBm
30
15
0
-15
-30
-45
-60
-75
START = 30
100
1000
STOP = 10000
FREQUENCY MHz

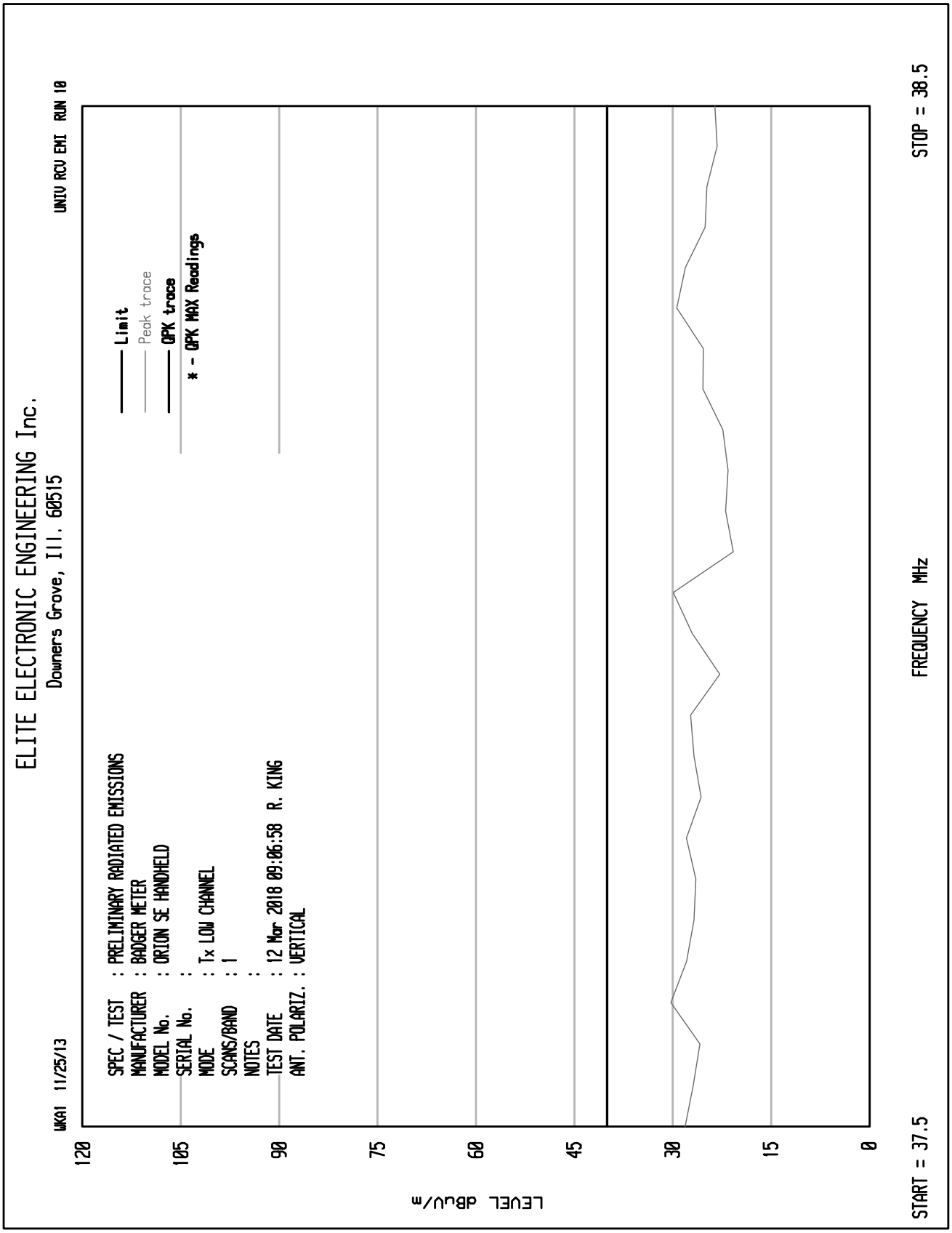

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 7
WKAI 11/25/13
SPEC / TEST : ANTENNA CONDUCTED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 13 Mar 2018 15:40:06 R. KING
Limit
PEAK DETECTOR TRACE
LEVEL dBm
30
15
0
-15
-30
-45
-60
-75
START = 30
100
1000
STOP = 10000
FREQUENCY MHz

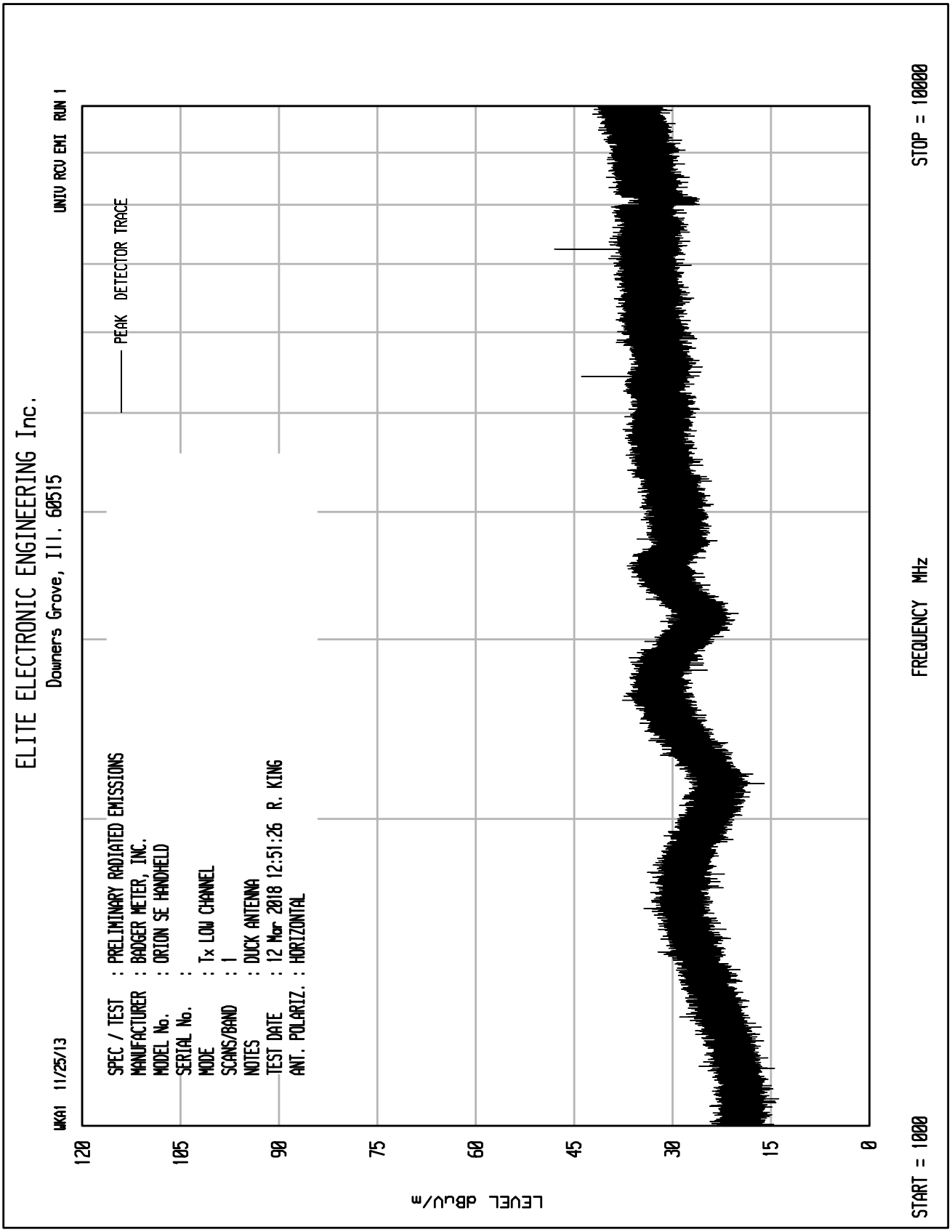

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 6
WKAI 11/25/13
SPEC / TEST : ANTENNA CONDUCTED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 13 Mar 2018 15:34:12 R. KING
Limit
PEAK DETECTOR TRACE
LEVEL dBm
30
15
0
-15
-30
-45
-60
-75
START = 30
100
1000
STOP = 10000
FREQUENCY MHz

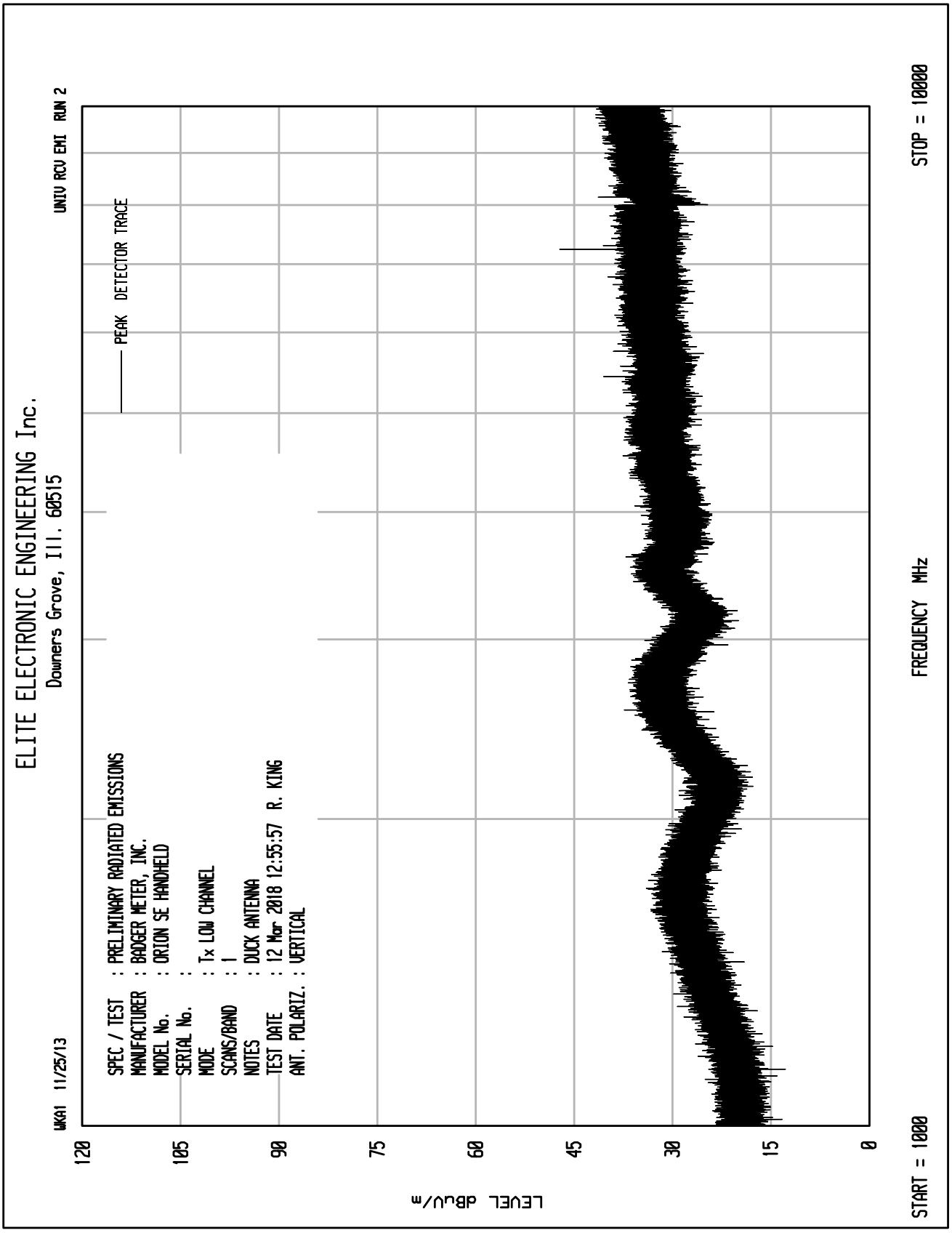

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 21
WKA1 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 11:02:20 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

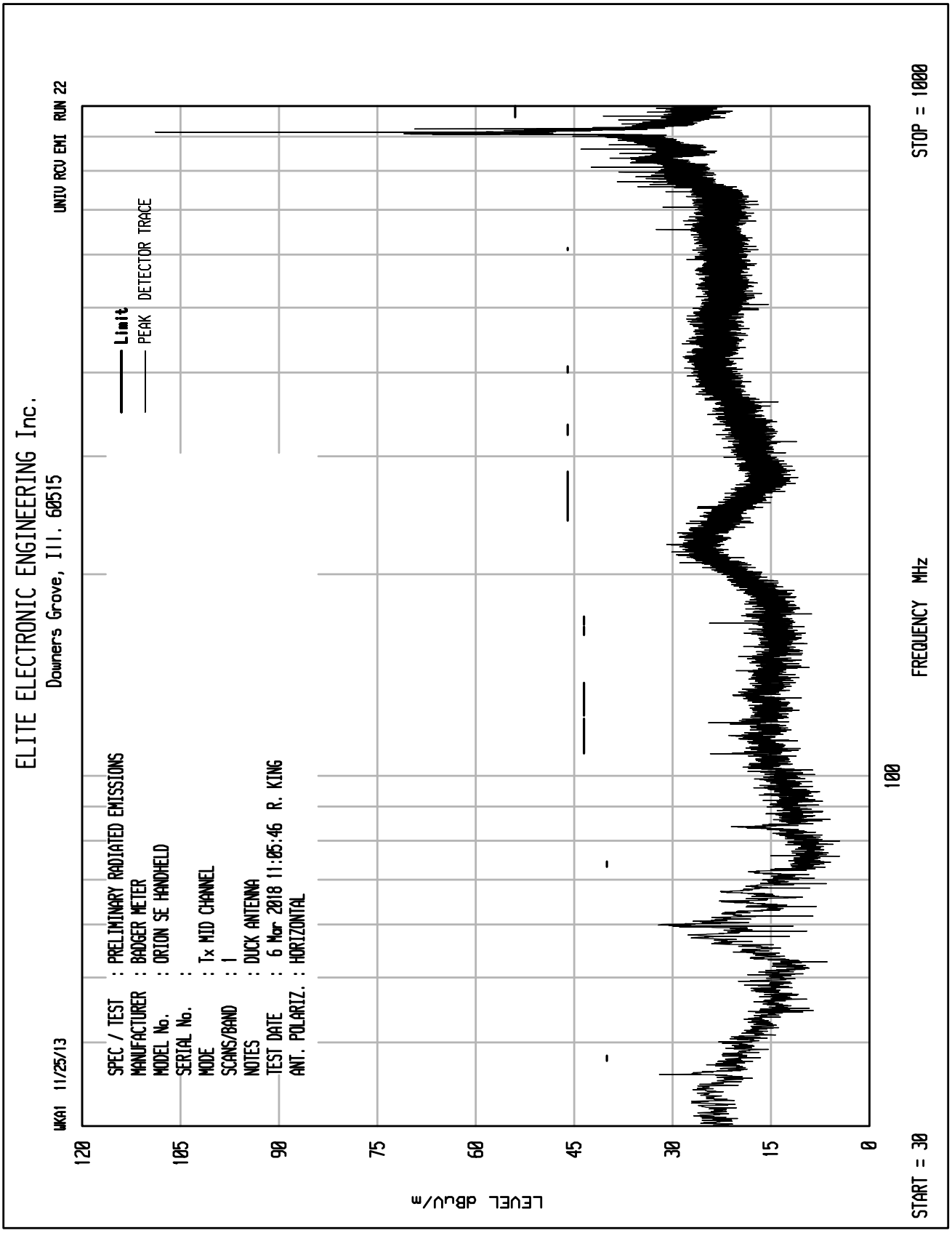

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 20
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 10:52:29 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

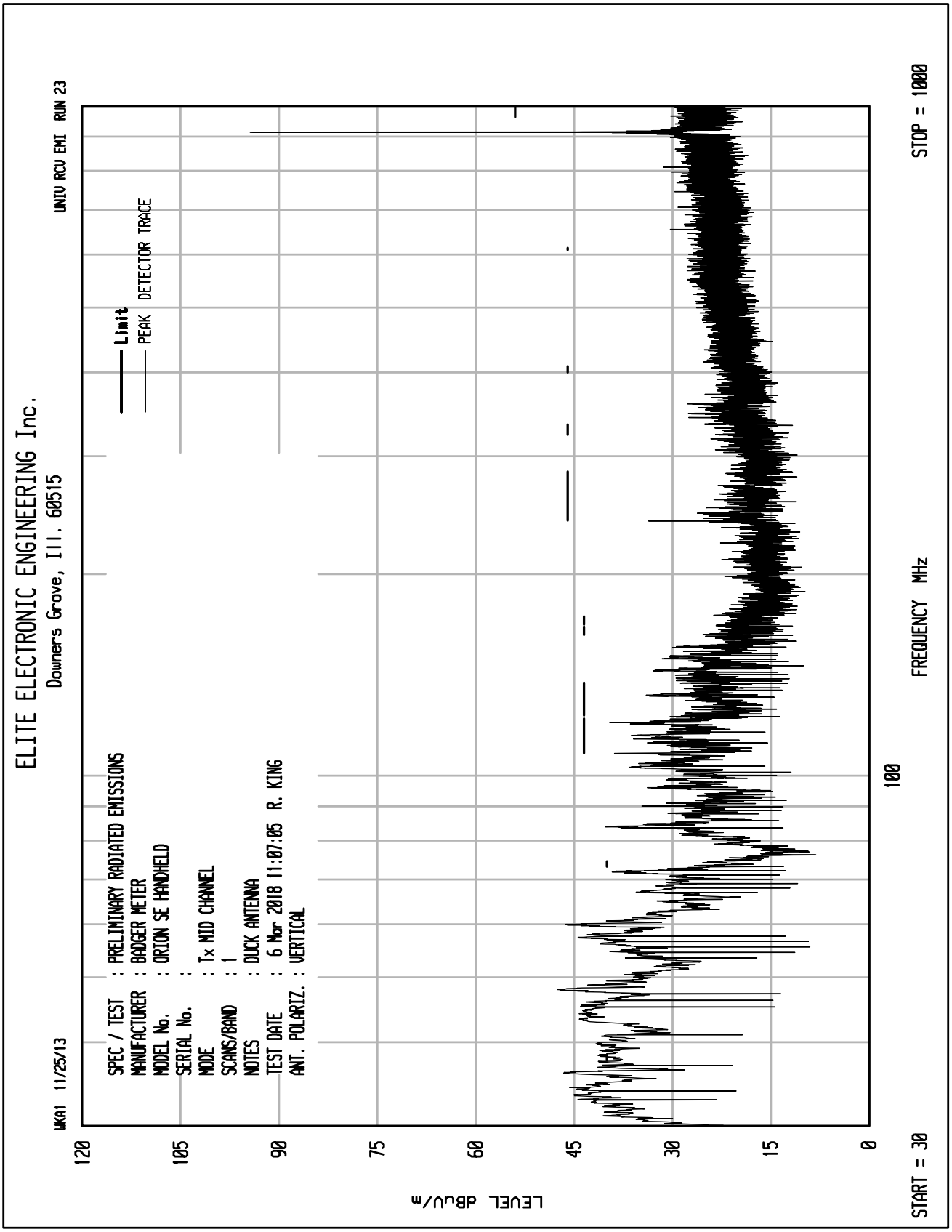

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 11
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 12 Mar 2018 09:09:51 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

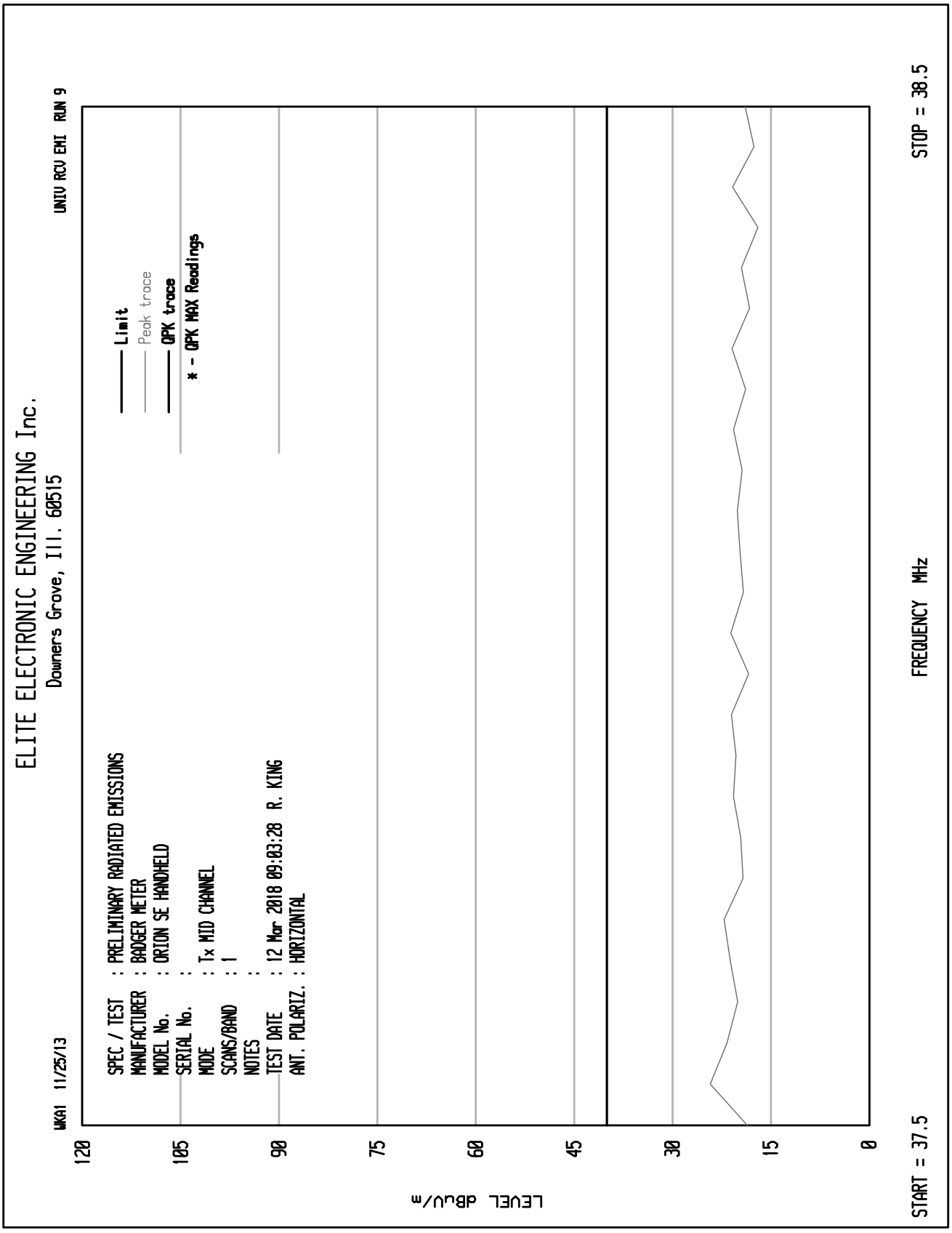

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 10
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 12 Mar 2018 09:06:58 R. KING
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

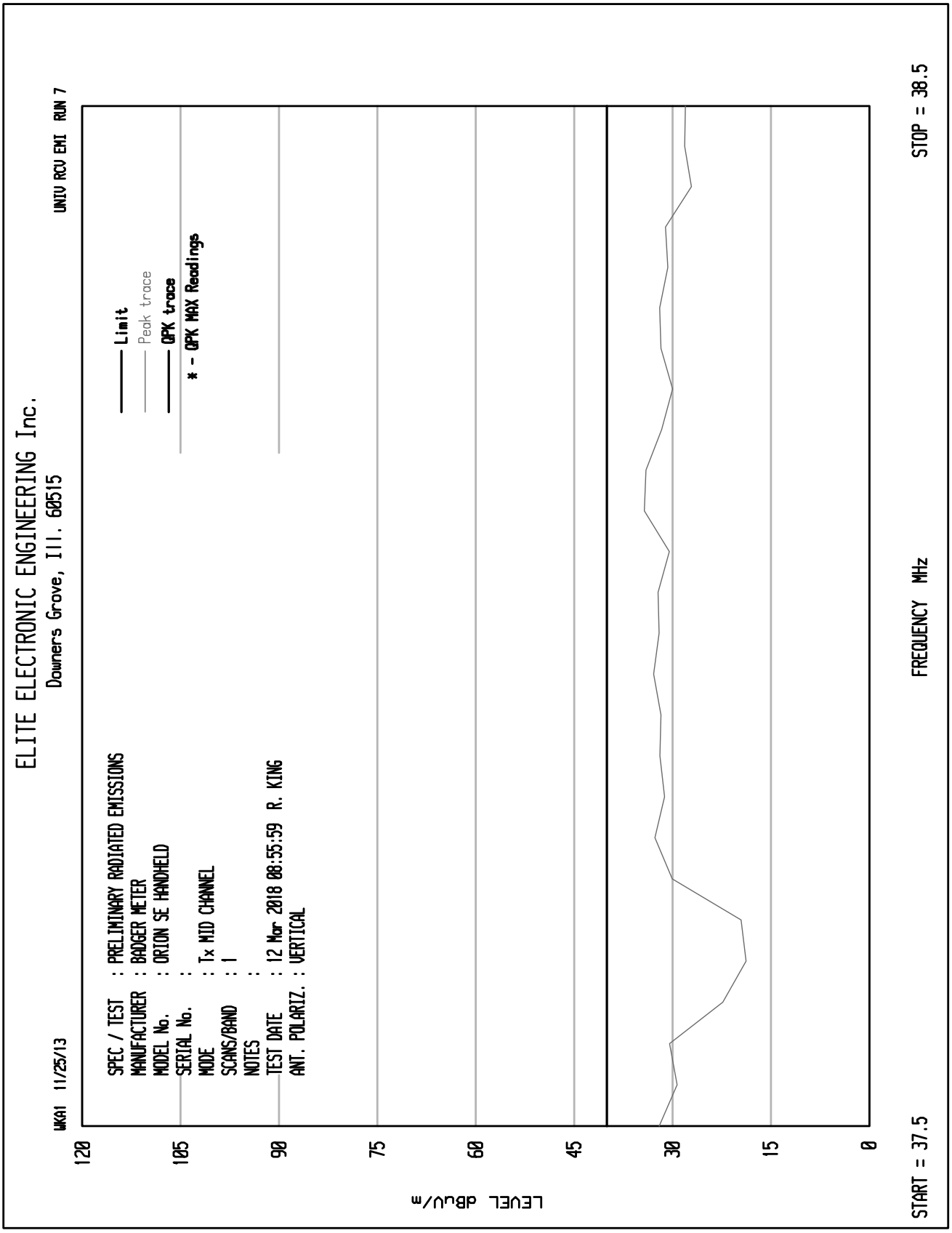

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 1
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 12 Mar 2018 12:51:26 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 = 10000

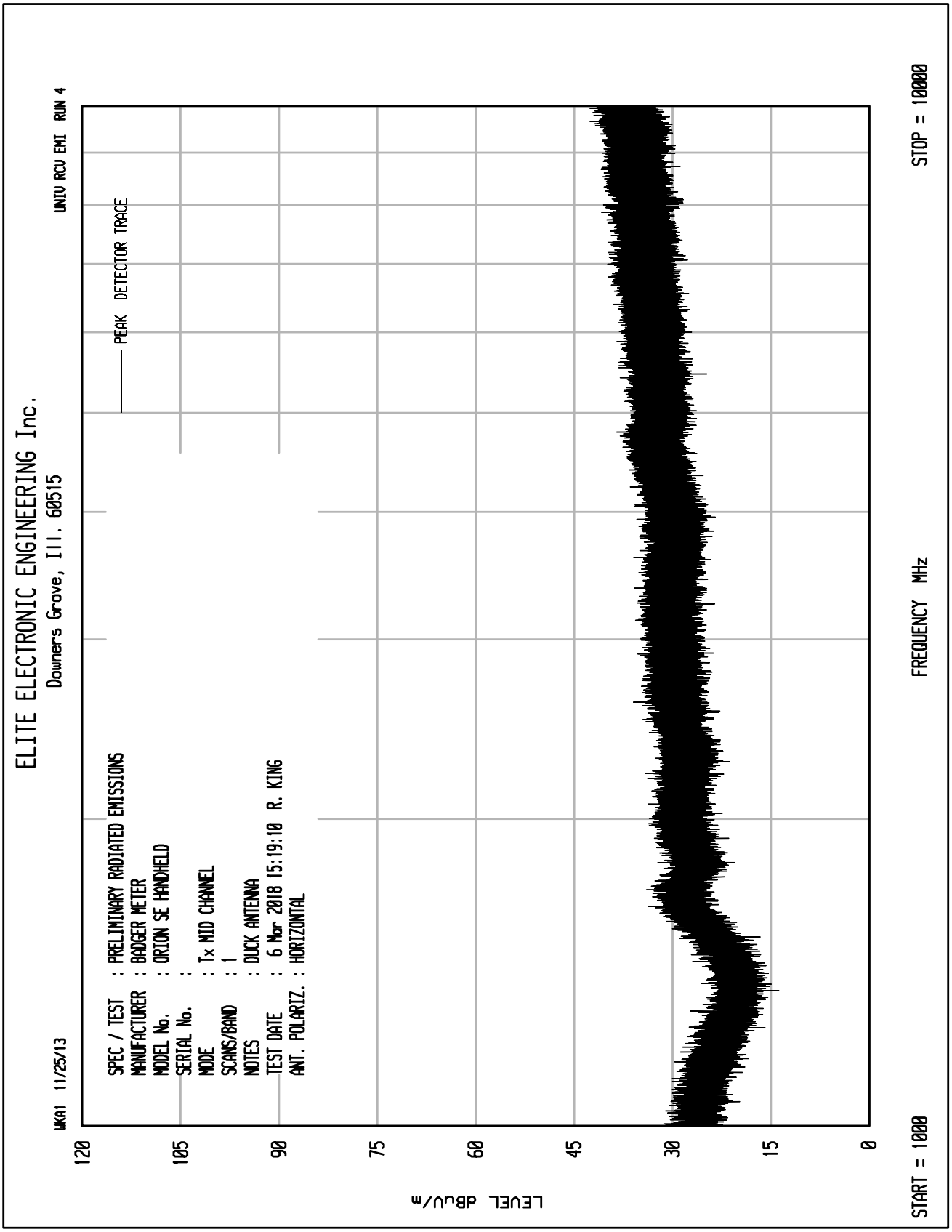

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 2
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 12 Mar 2018 12:55:57 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 = 10000

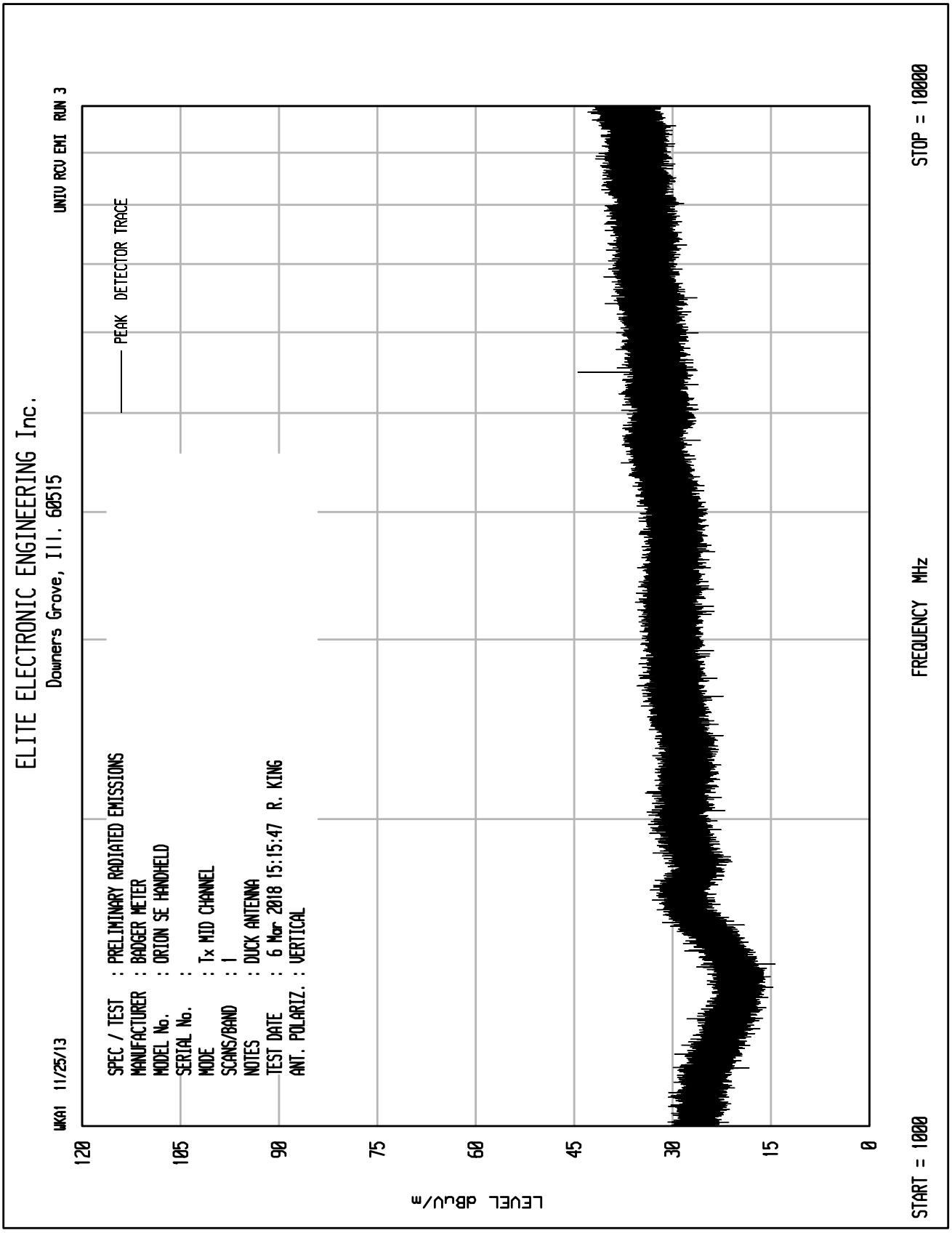

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 22
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 11:05:46 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

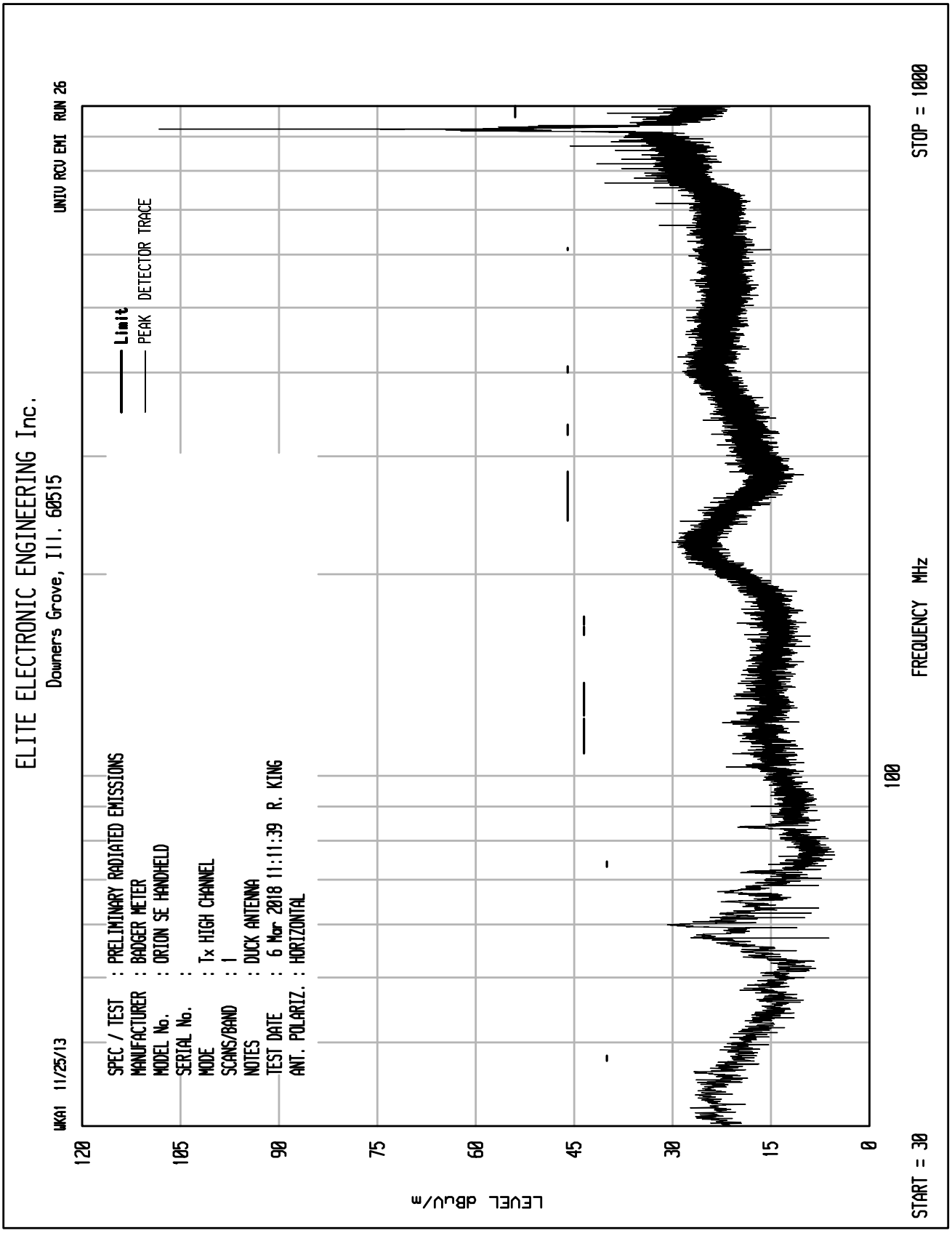

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 23
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 11:07:05 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

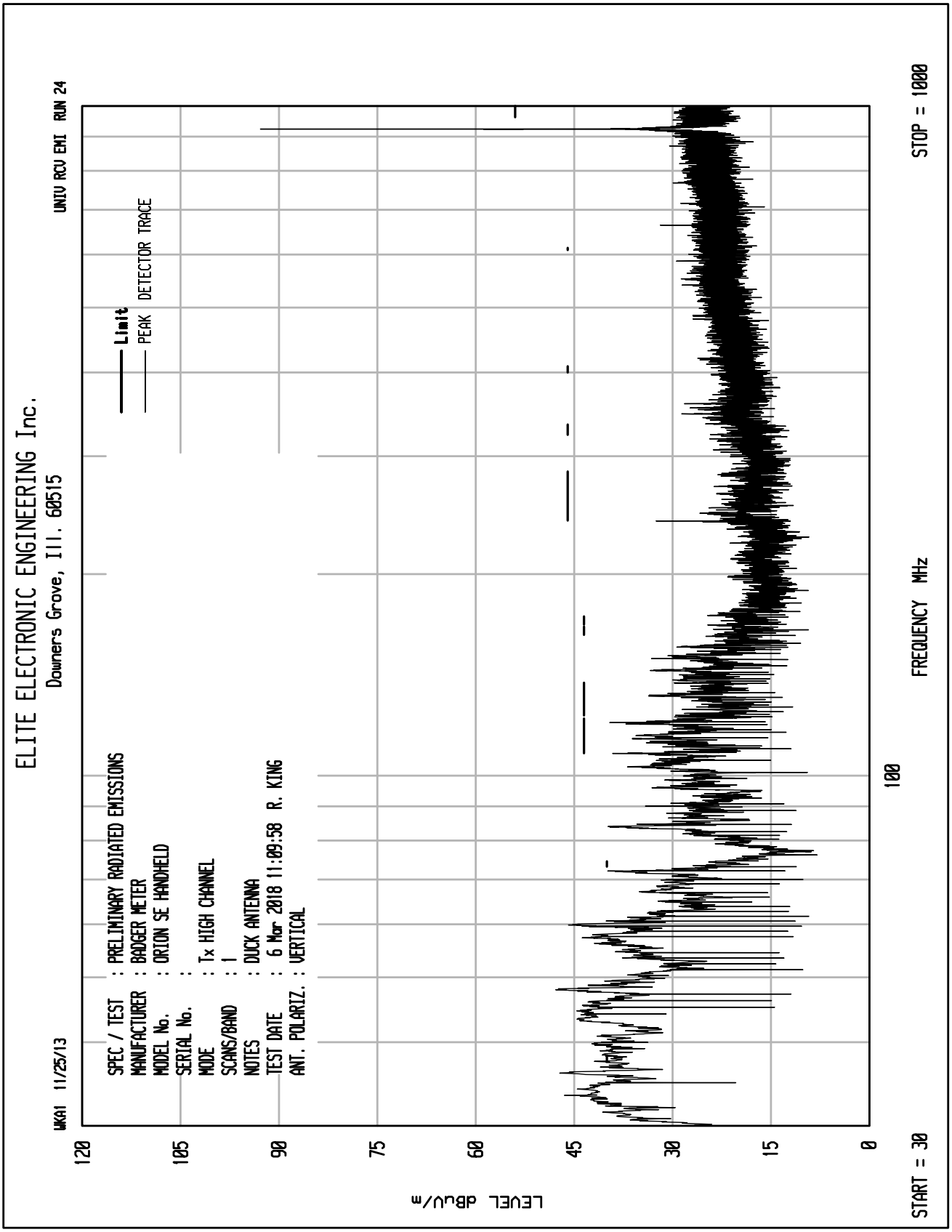

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 9
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 12 Mar 2018 09:03:28 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

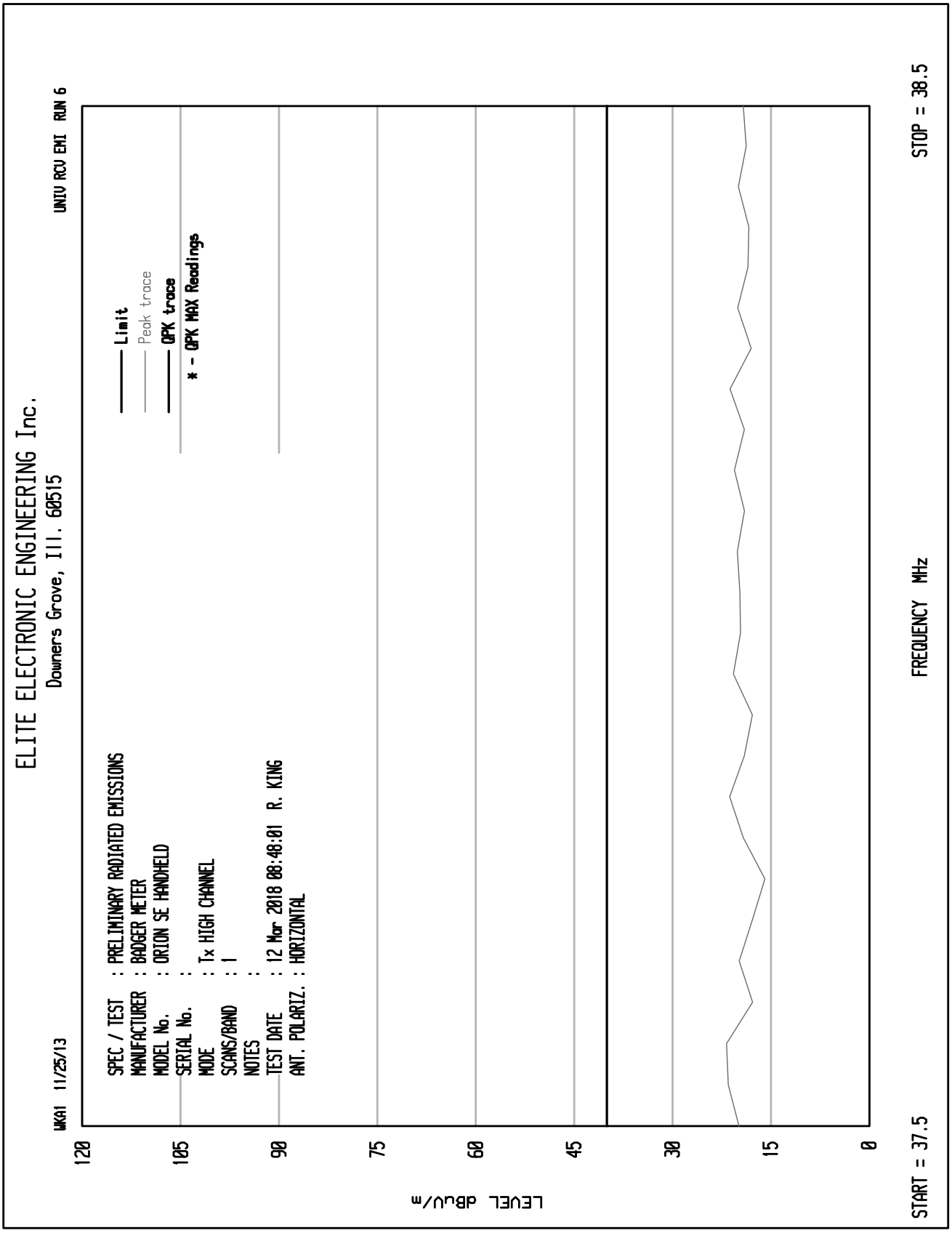

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 7
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 12 Mar 2018 08:55:59 R. KING
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

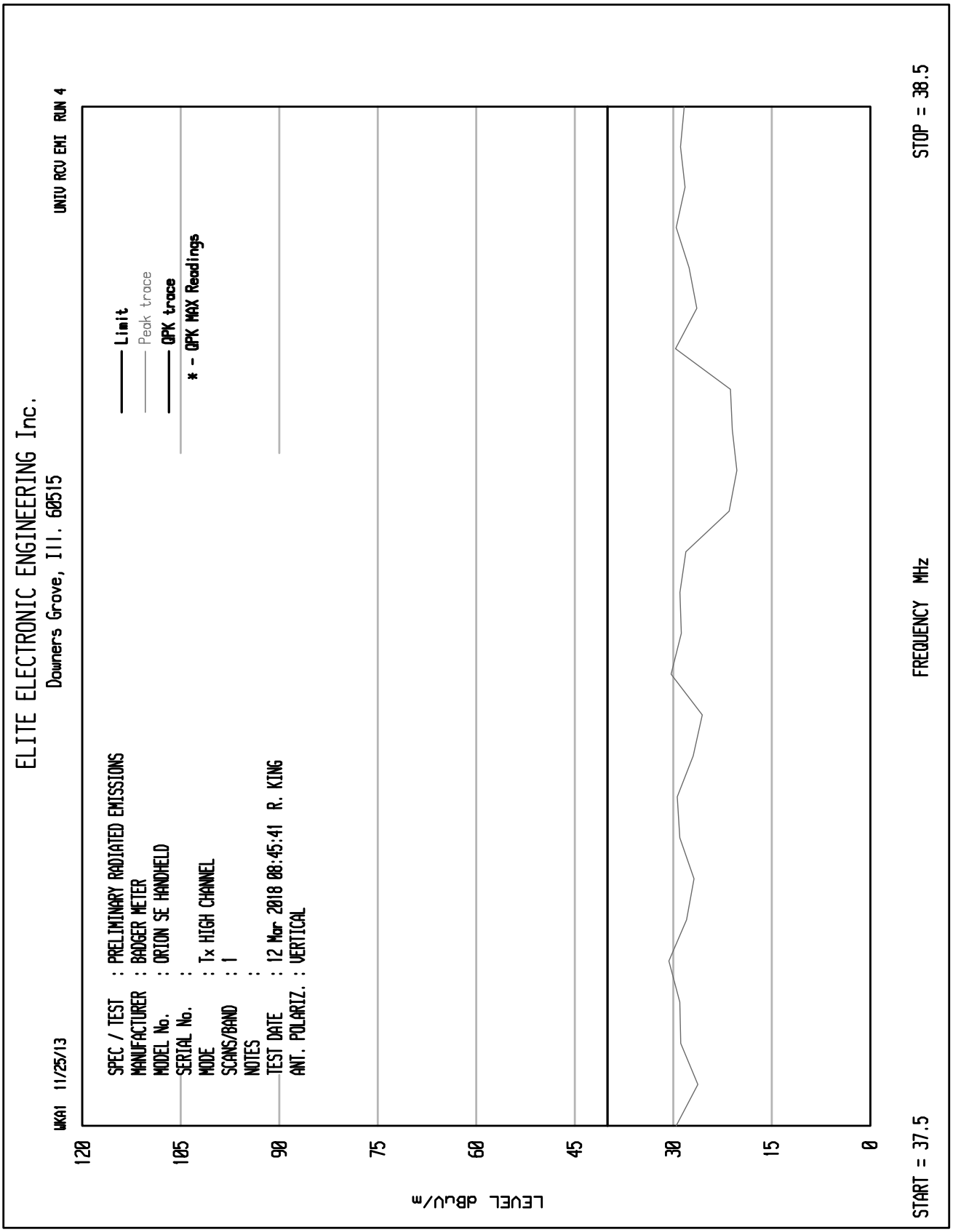

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 4
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 15:19:10 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

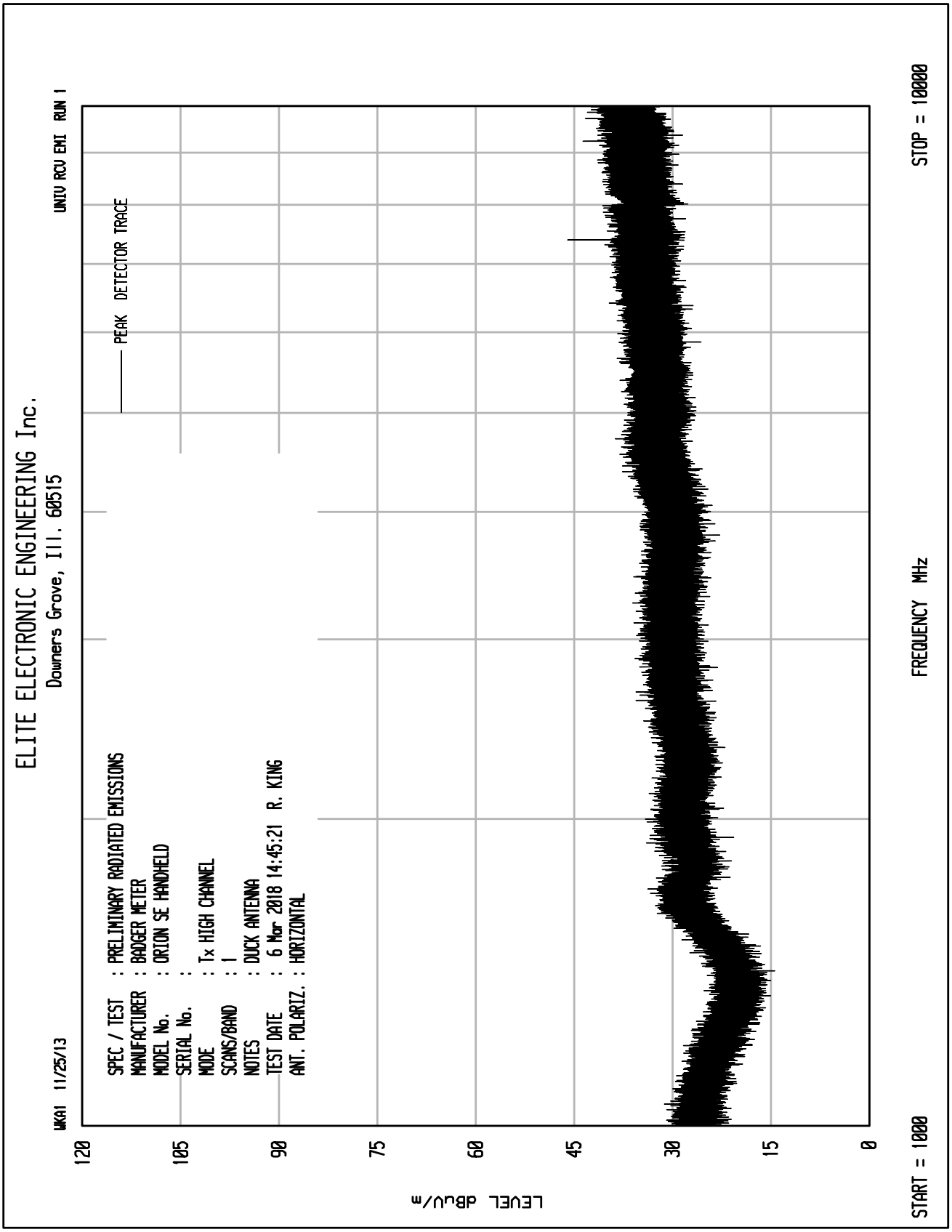

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 3
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 15:15:47 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

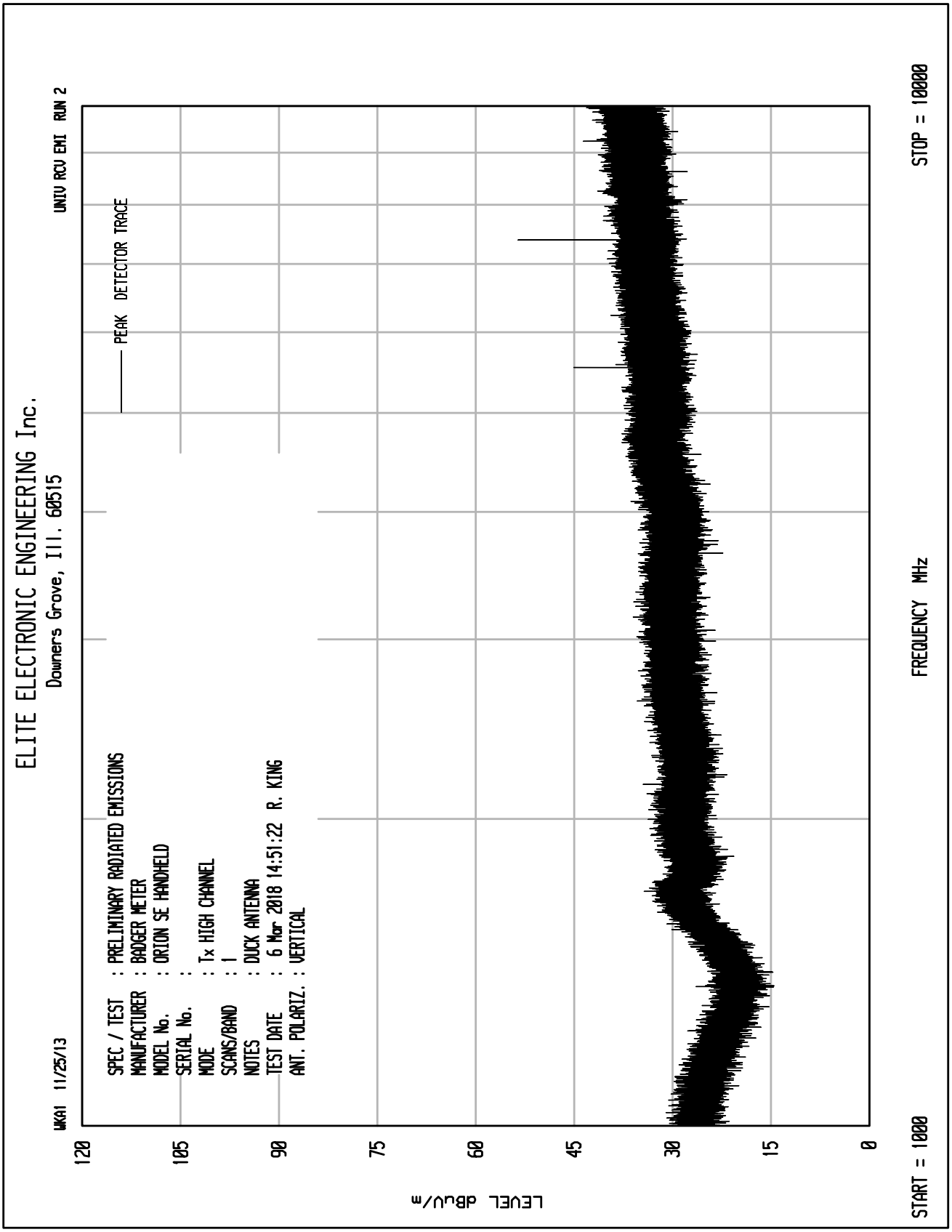

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 26
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 11:11:39 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

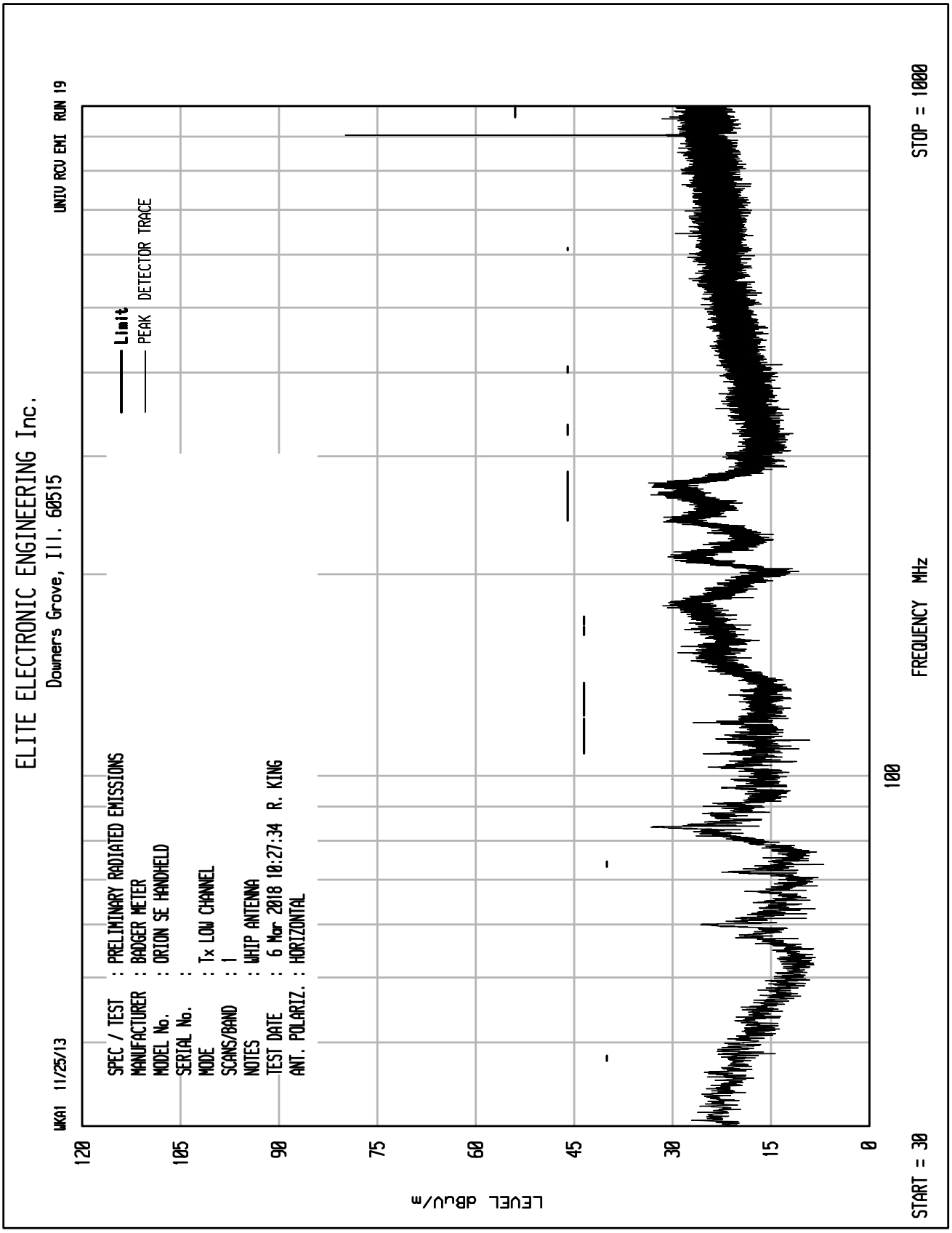

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 24
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 11:09:58 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

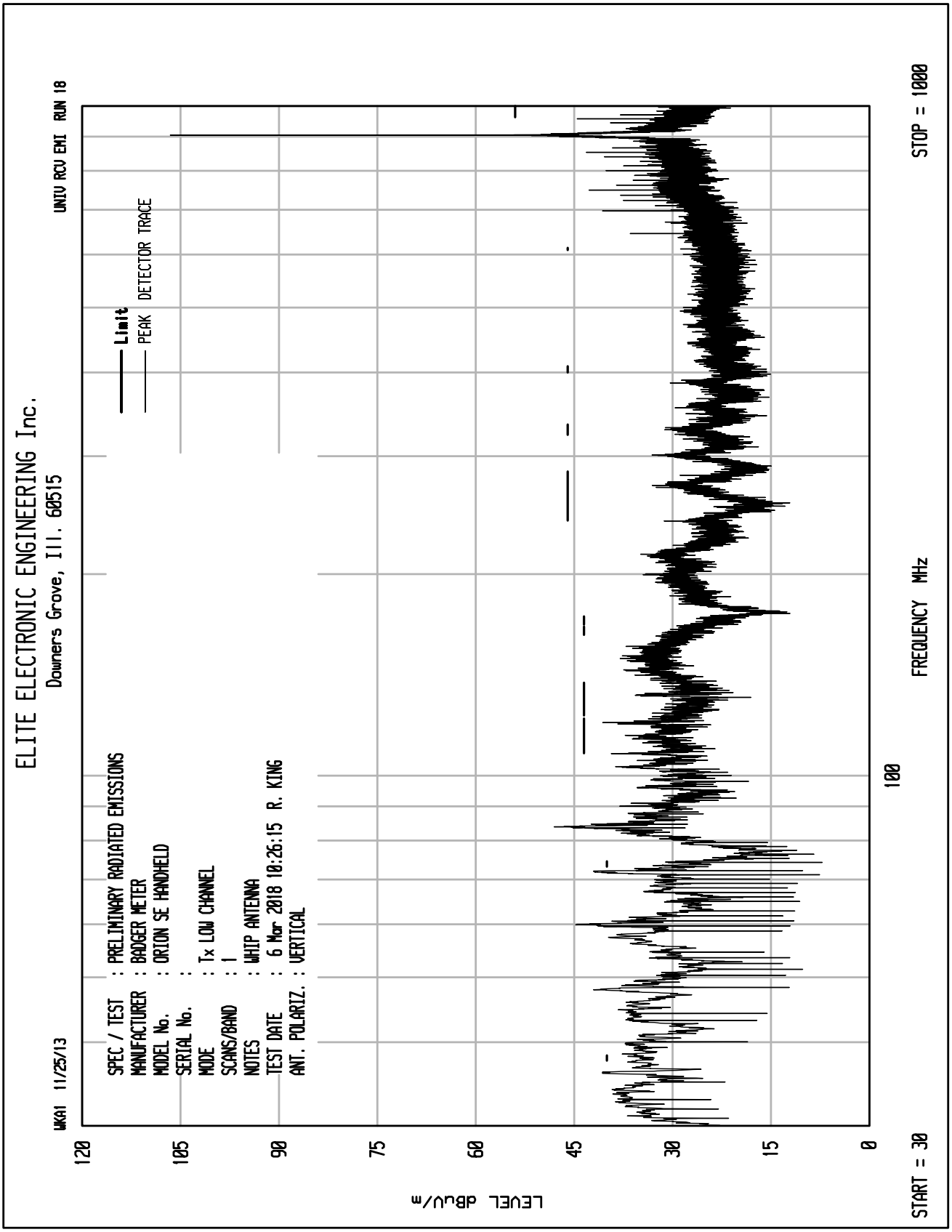

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 6
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 12 Mar 2018 08:48:01 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

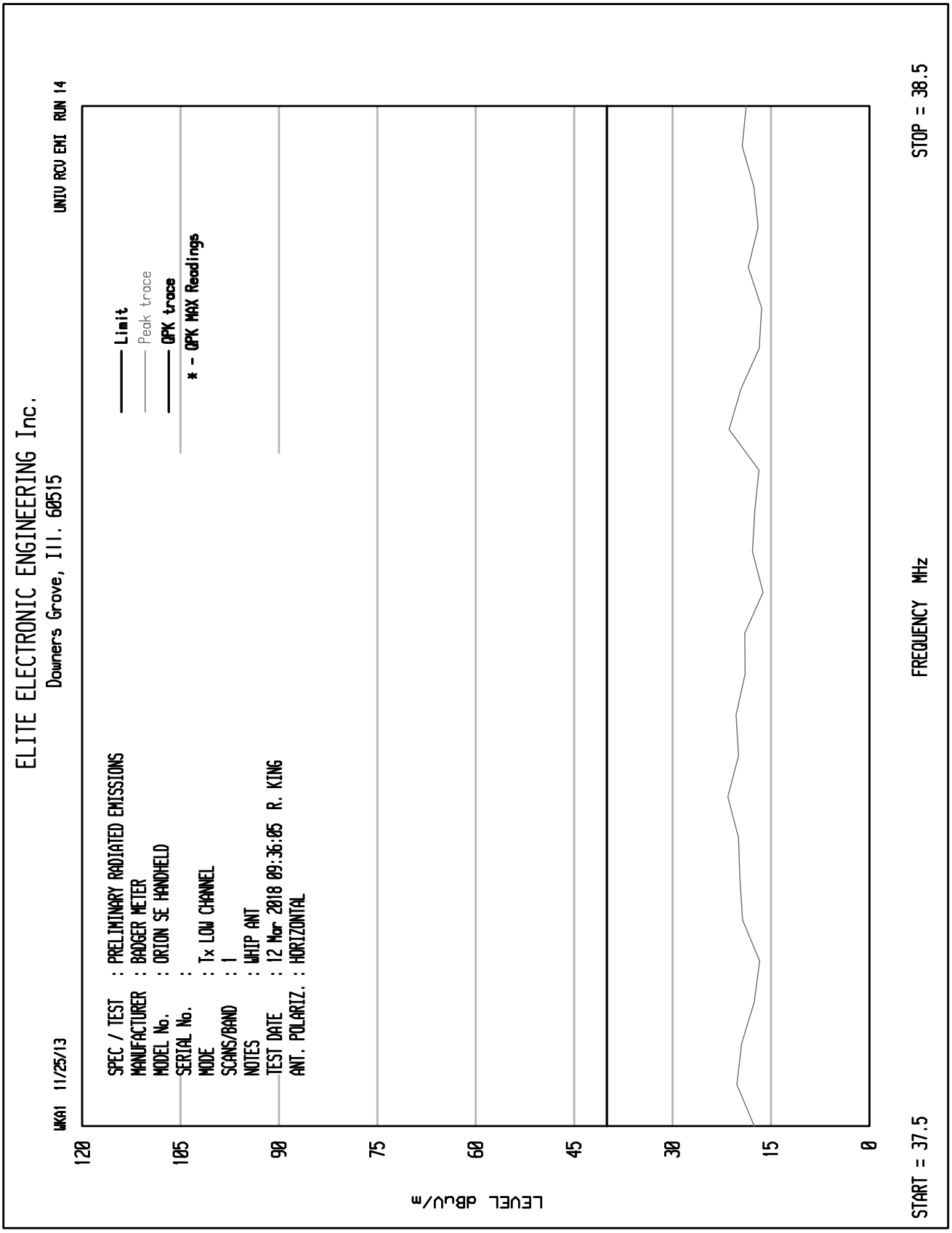

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 4
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES :
TEST DATE : 12 Mar 2018 08:45:41 R. KING
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

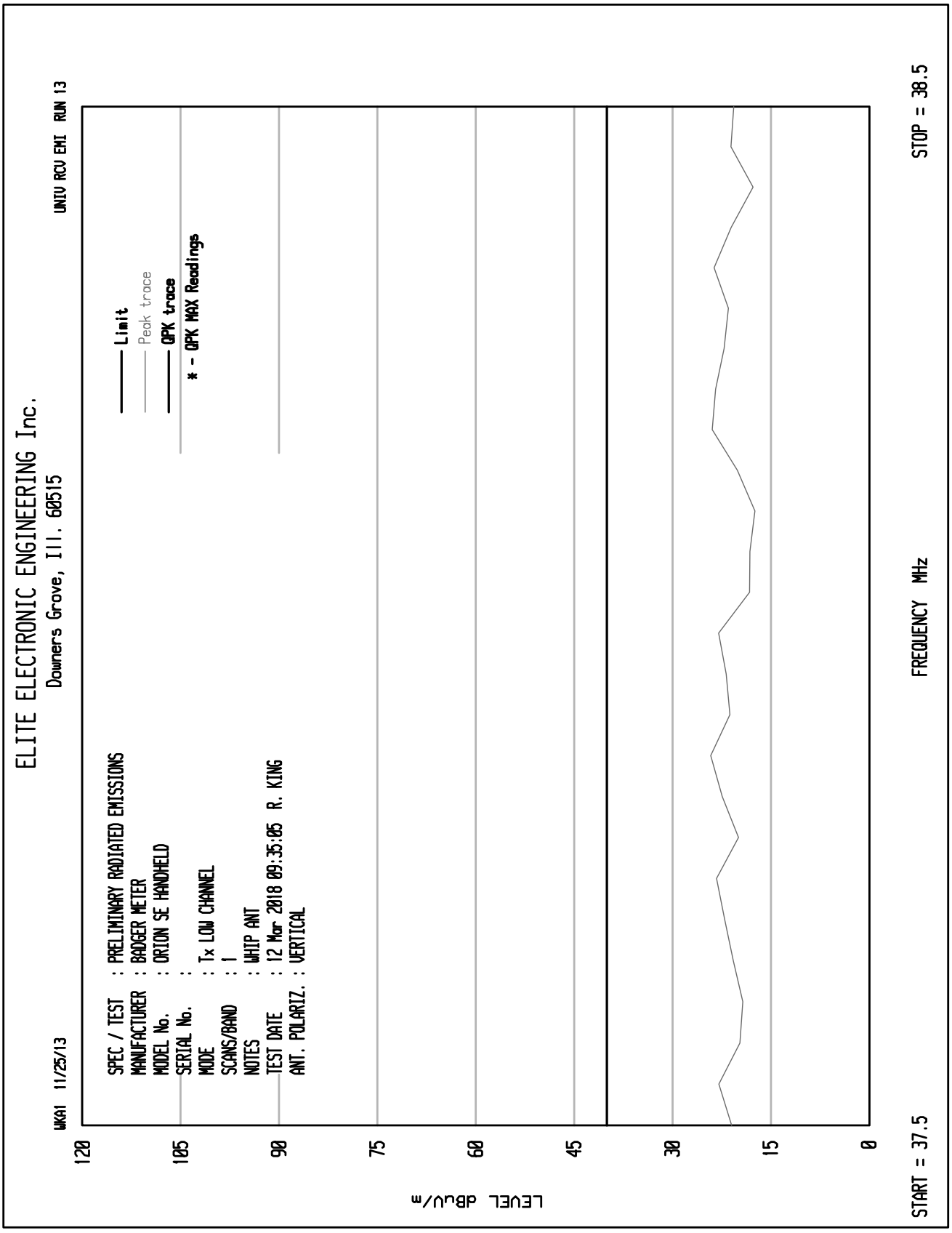

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 1
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 14:45:21 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

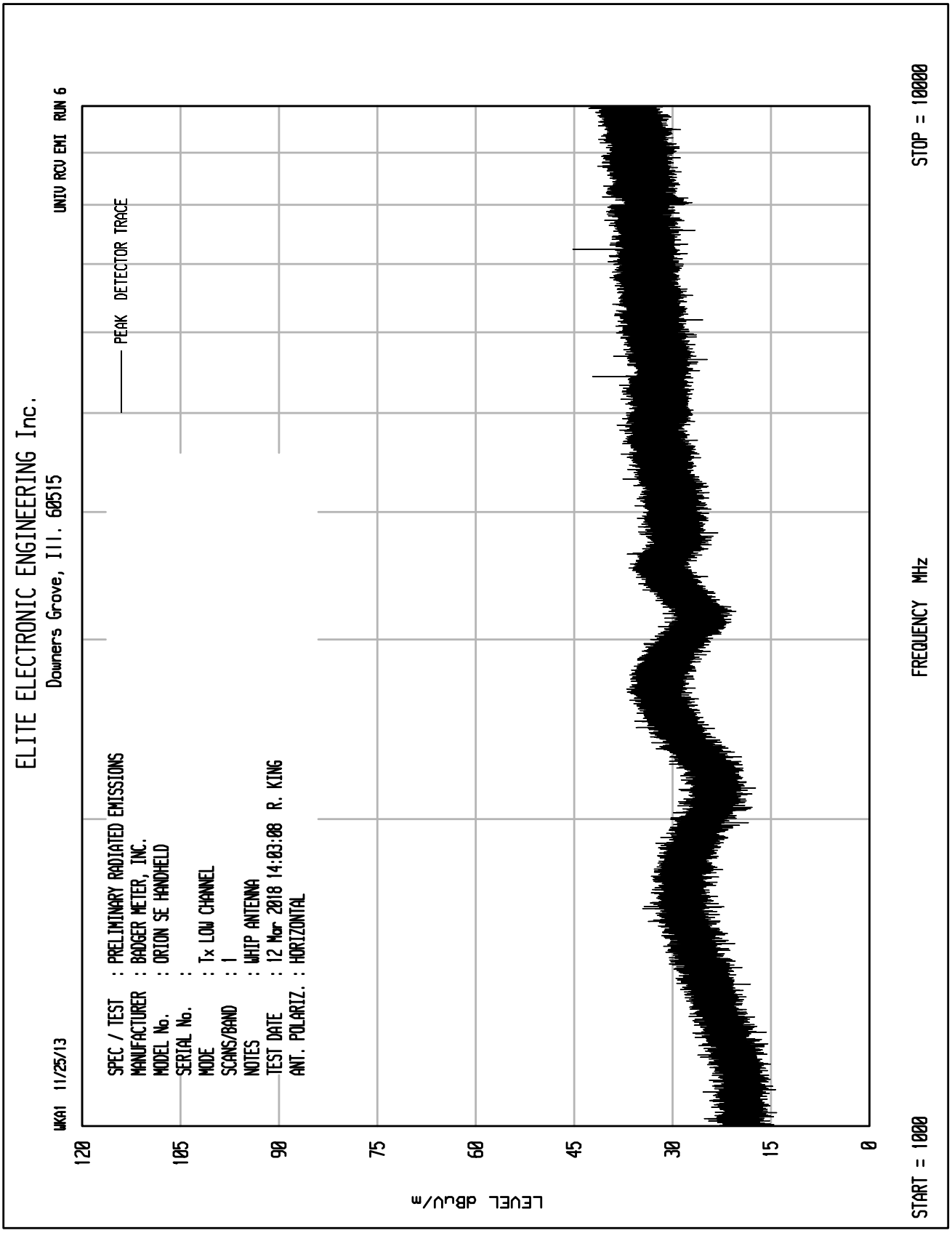

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 2
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : DUCK ANTENNA
TEST DATE : 6 Mar 2018 14:51:22 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

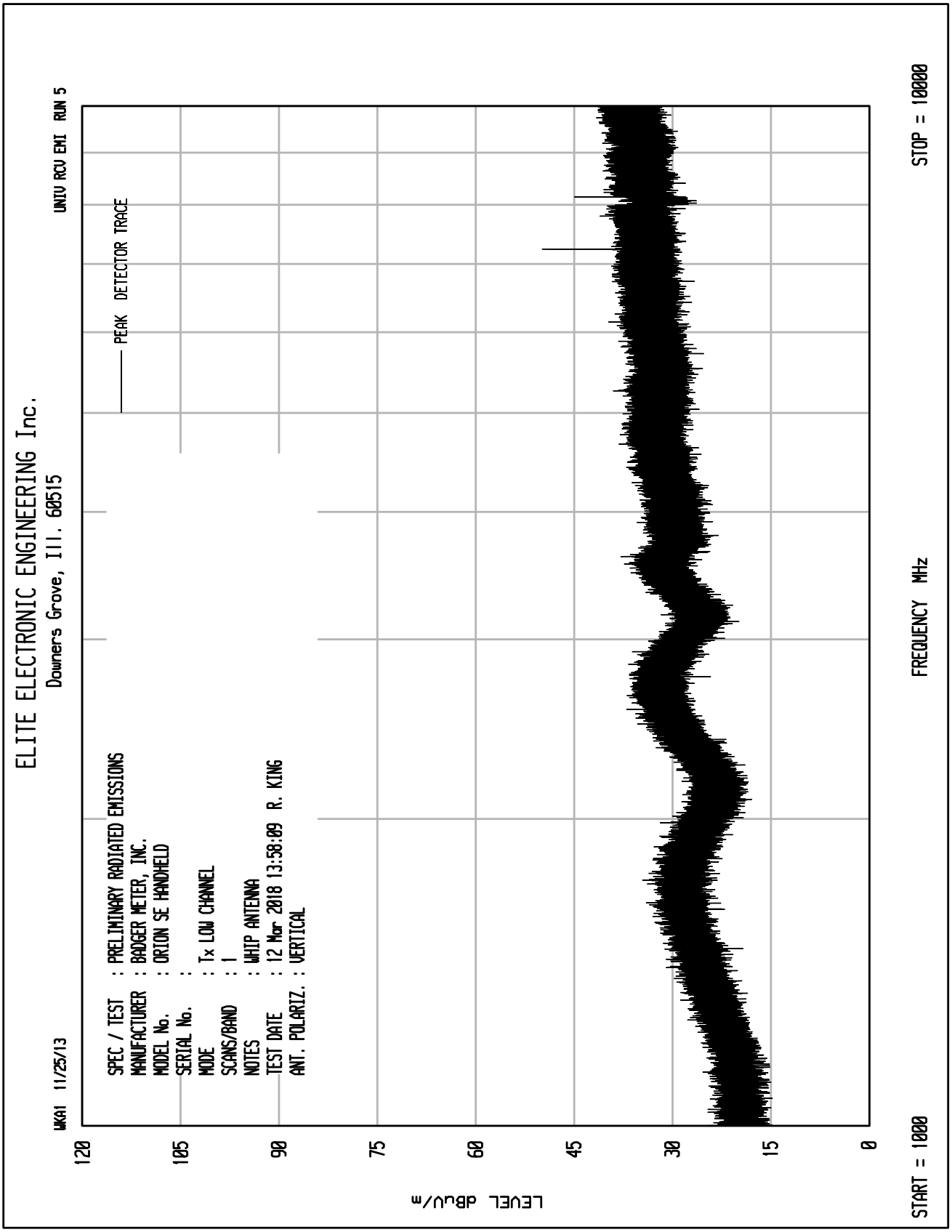

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 19
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 6 Mar 2018 10:27:34 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

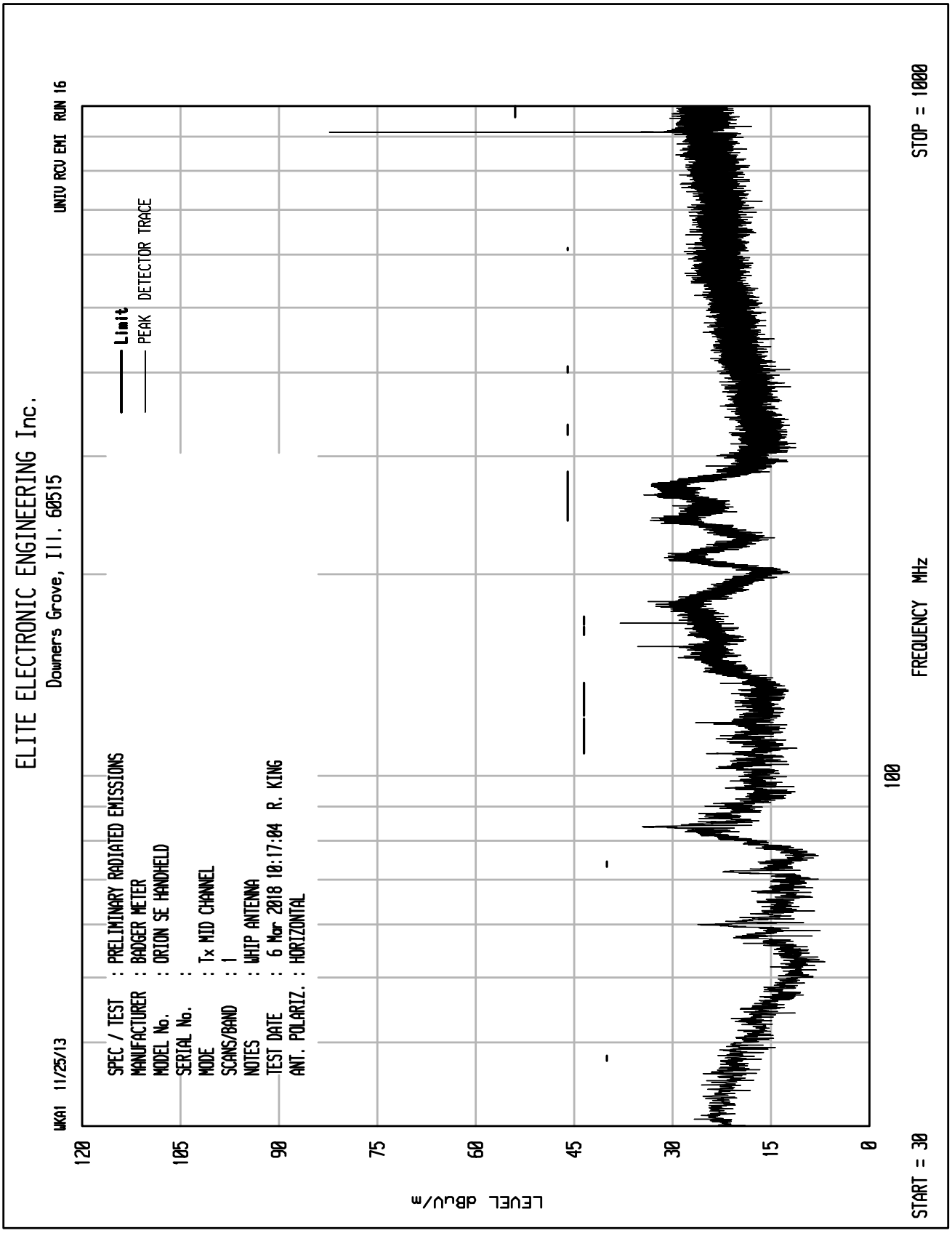

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 18
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 6 Mar 2018 10:26:15 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

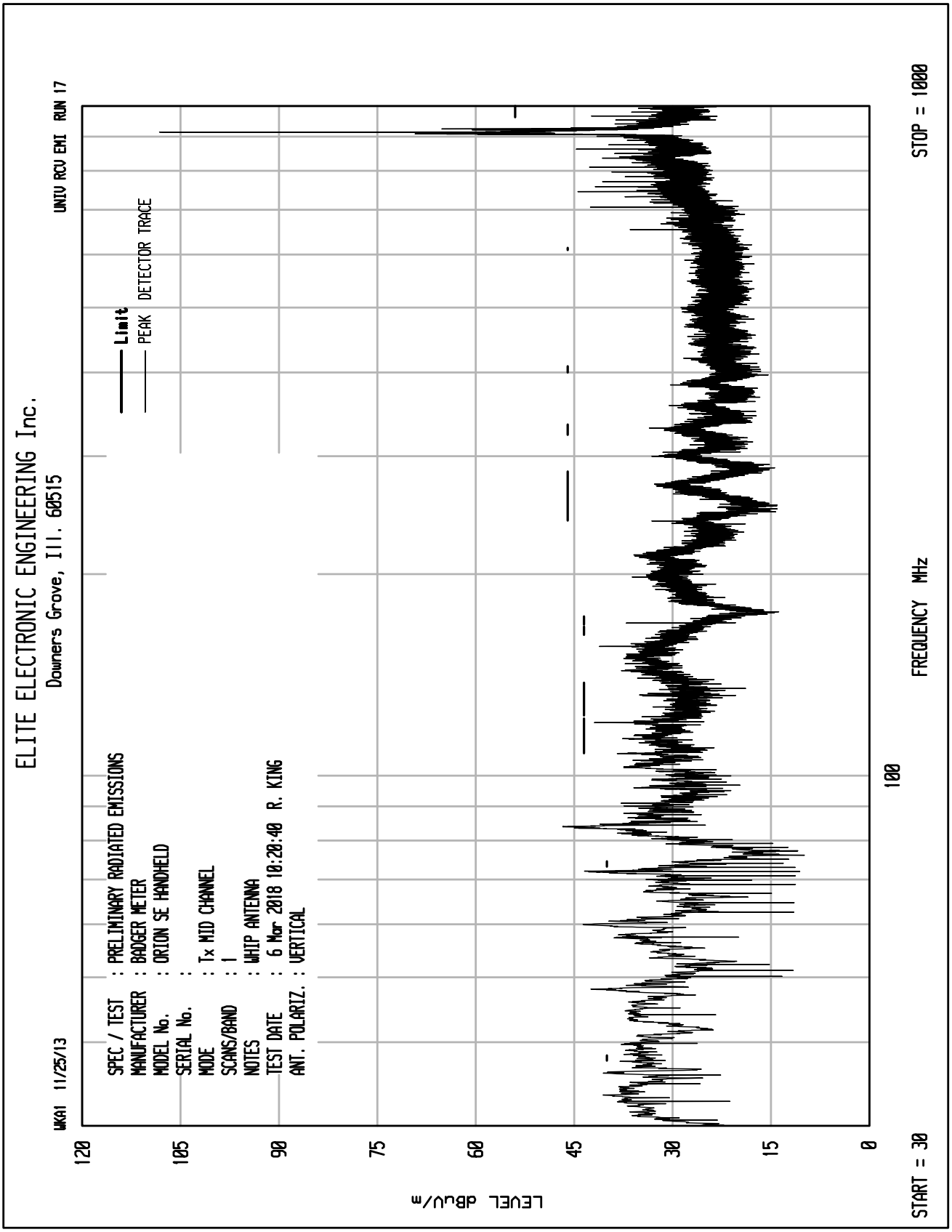

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKAI 11/25/13
UNIV RCU EMI RUN 14
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANT
TEST DATE : 12 Mar 2018 09:36:05 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

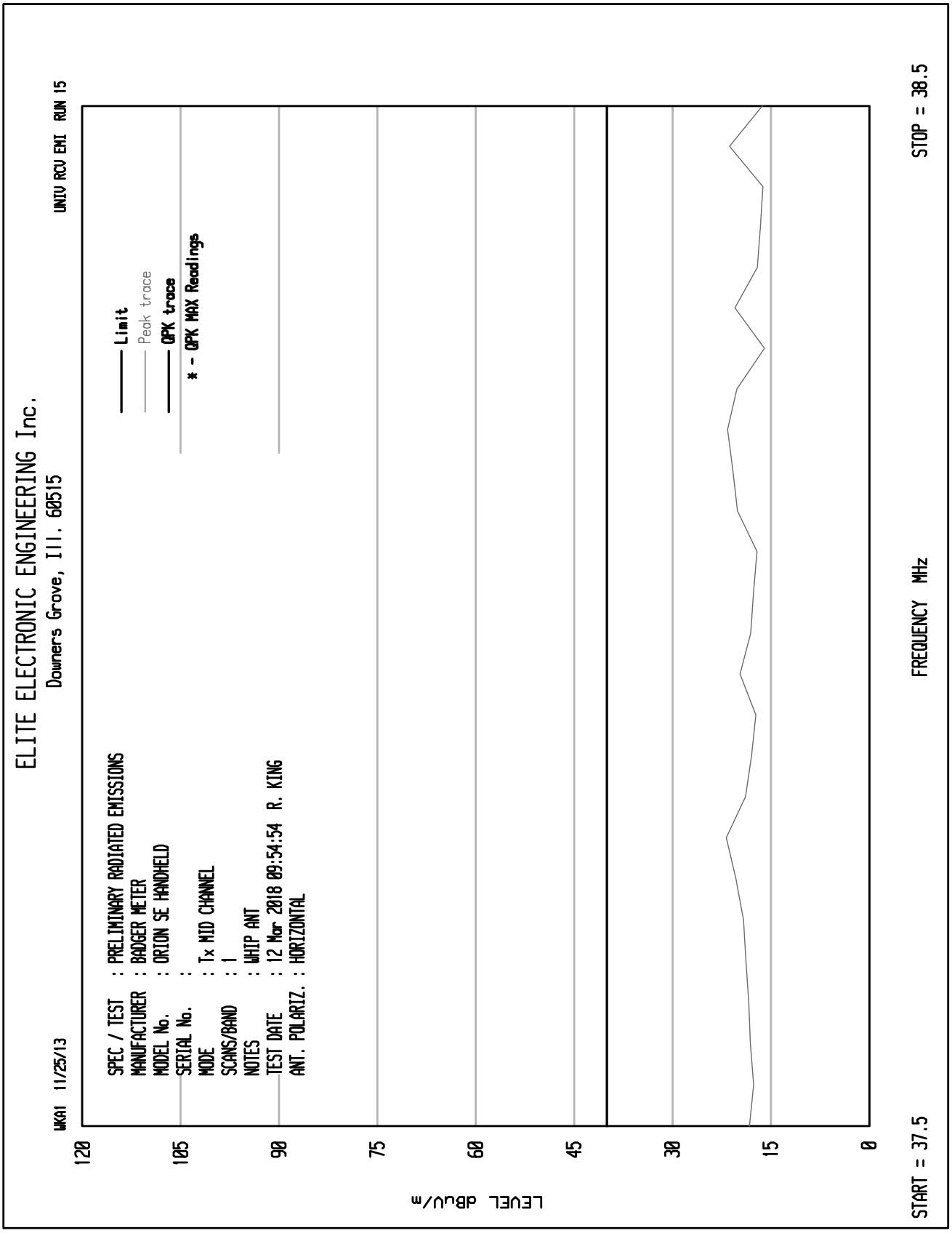

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKAI 11/25/13
UNIV RCU EMI RUN 13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANT
TEST DATE : 12 Mar 2018 09:35:05 R. KING
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

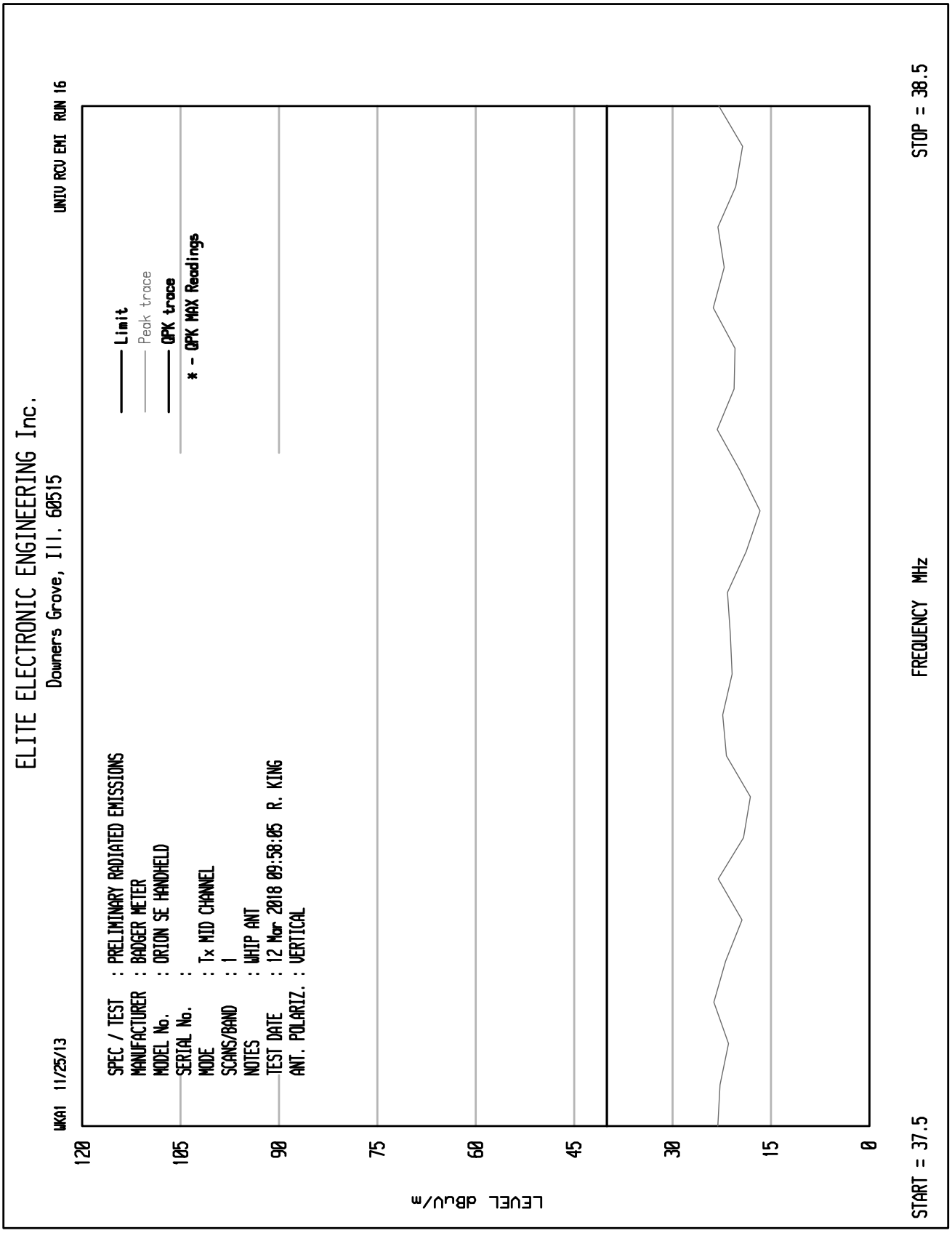

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 6
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 12 Mar 2018 14:03:08 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 = 10000

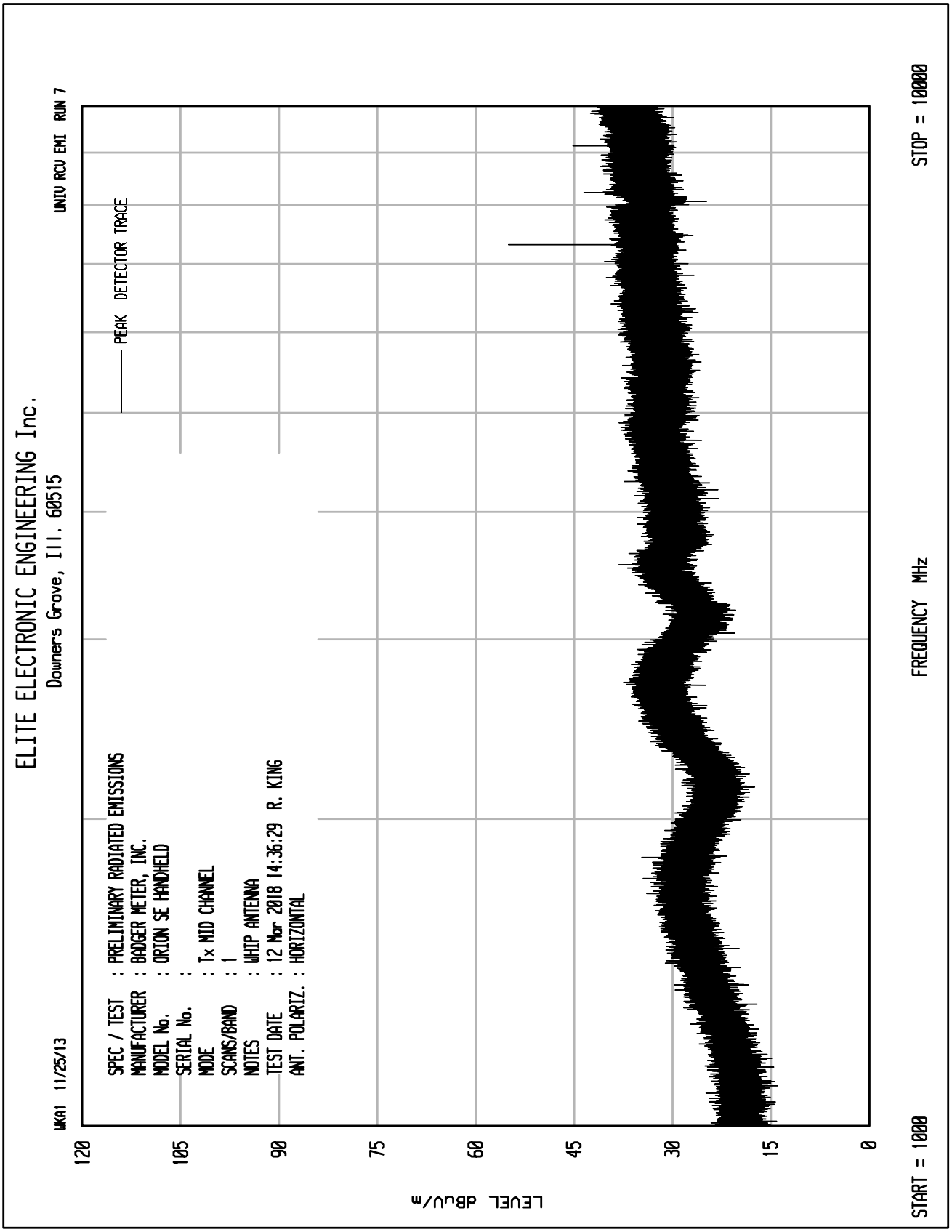

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 5
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx LOW CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 12 Mar 2018 13:58:09 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 = 10000

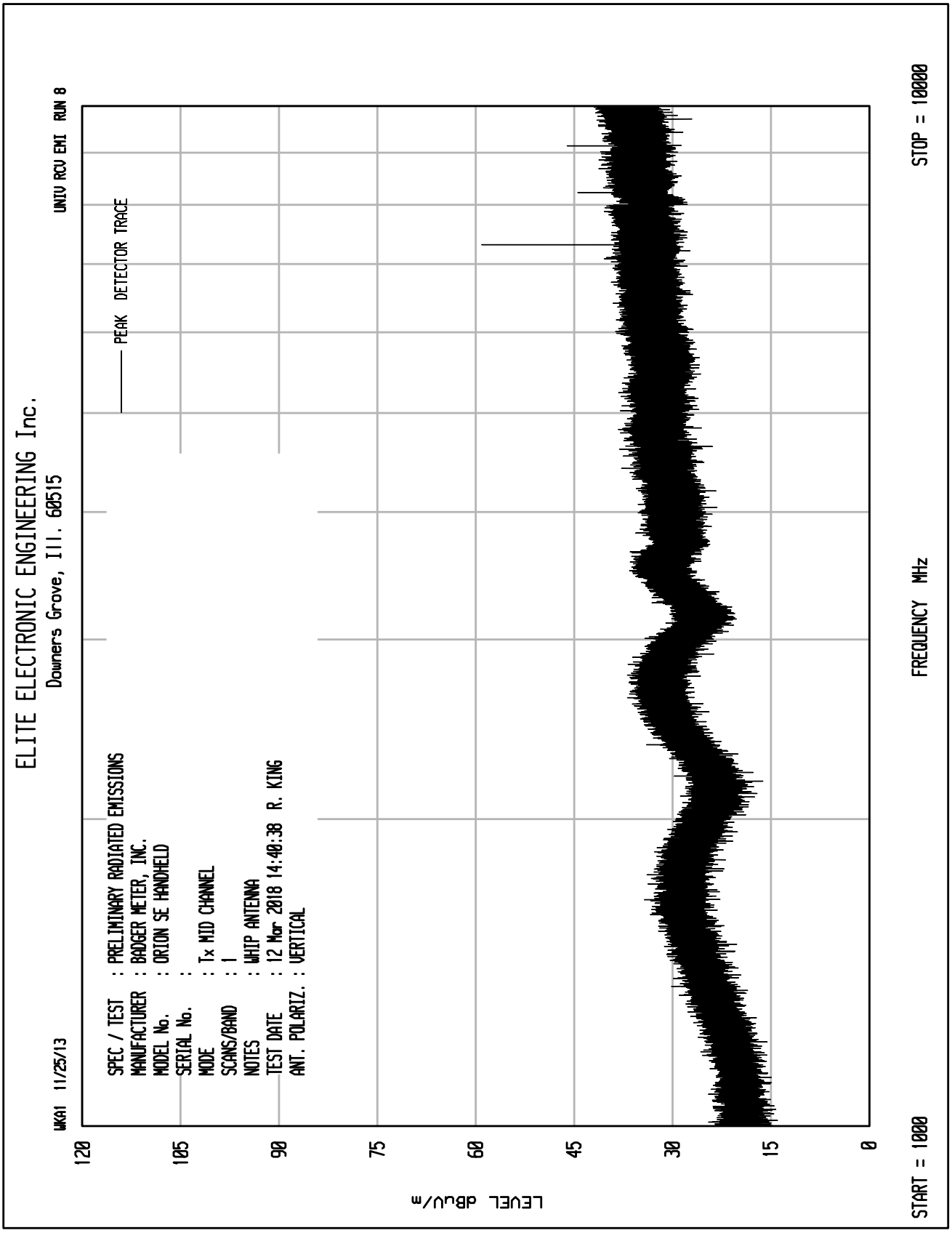

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 16
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 6 Mar 2018 10:17:04 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

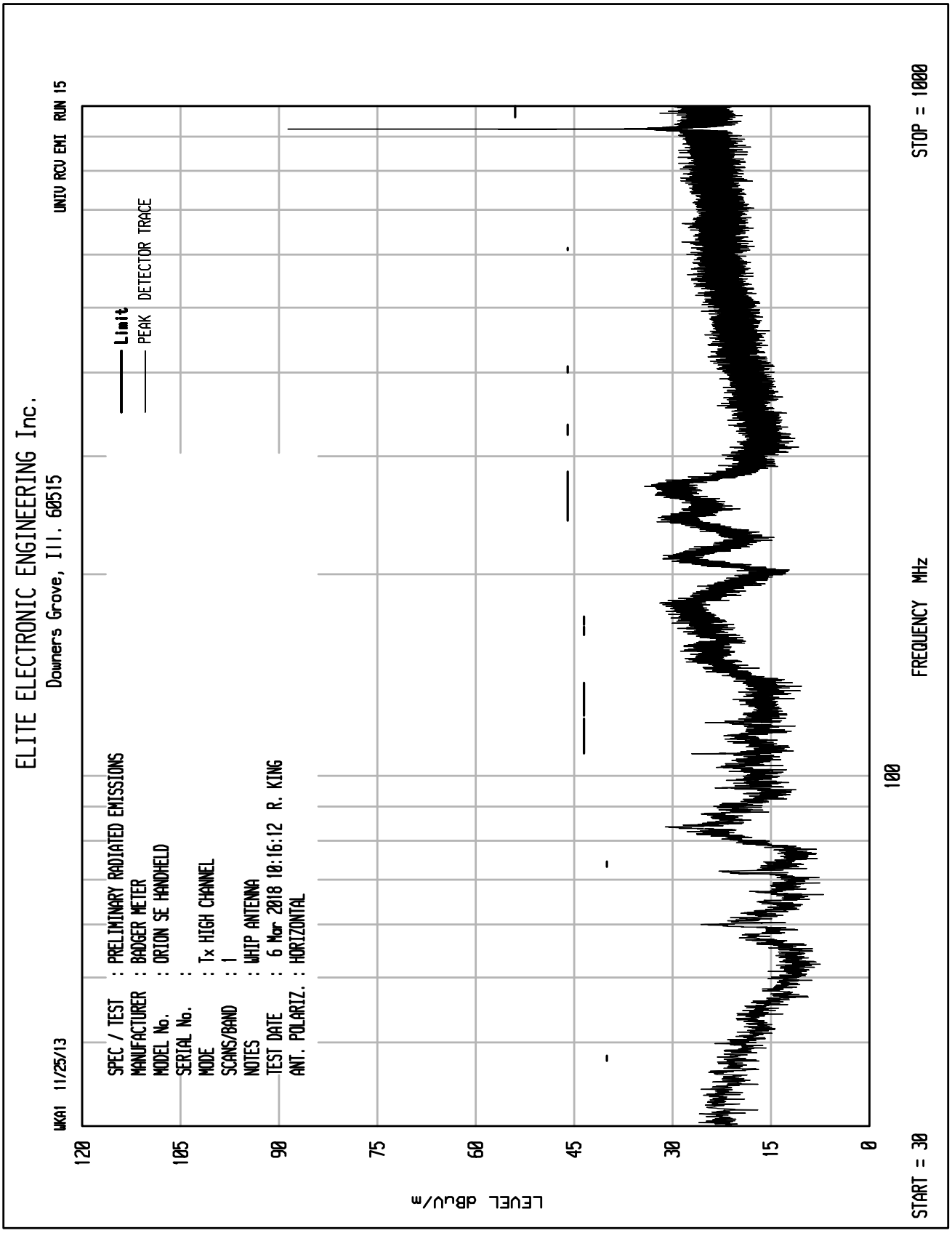

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 17
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 6 Mar 2018 10:20:40 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 30
100
FREQUENCY MHz
STOP = 1000

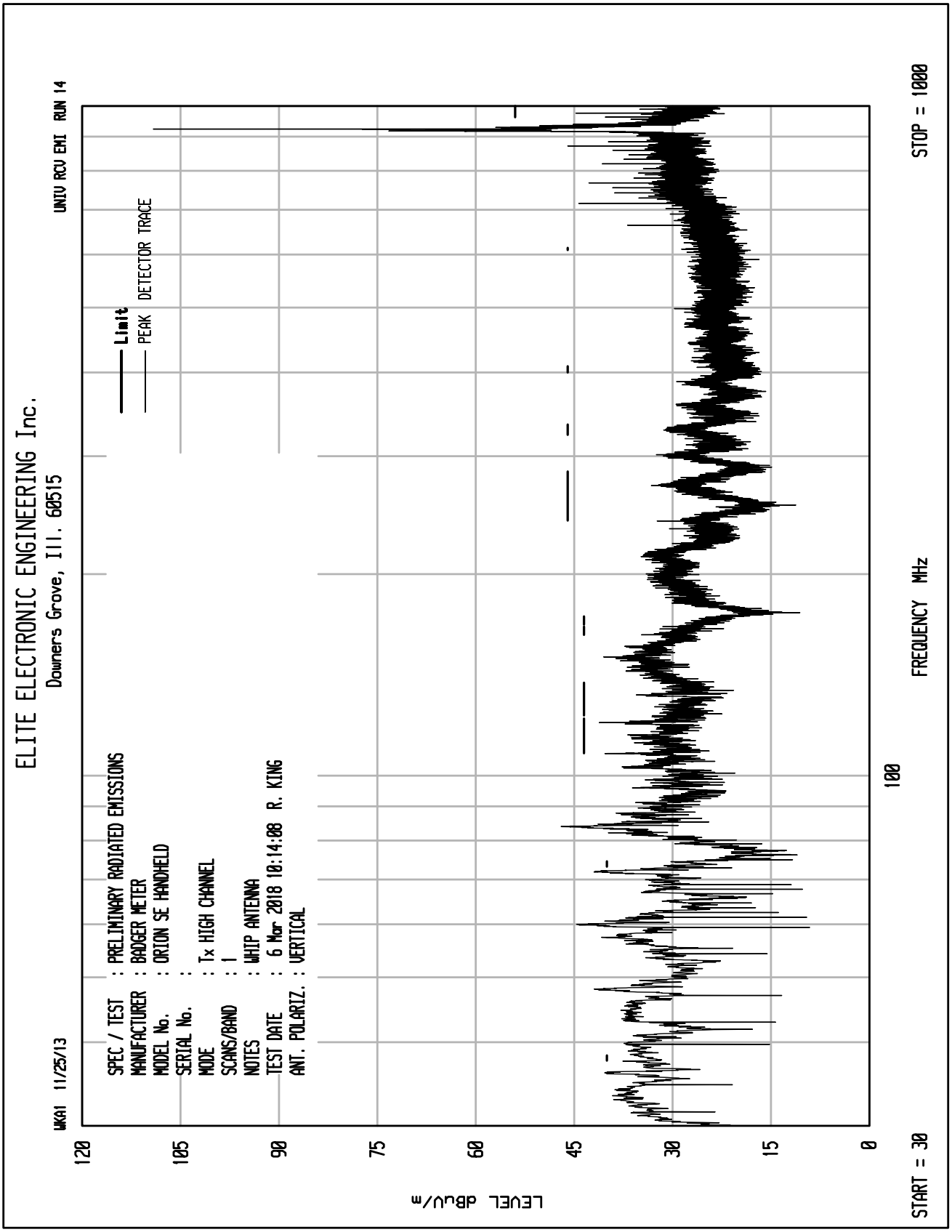

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 15
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANT
TEST DATE : 12 Mar 2018 09:54:54 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

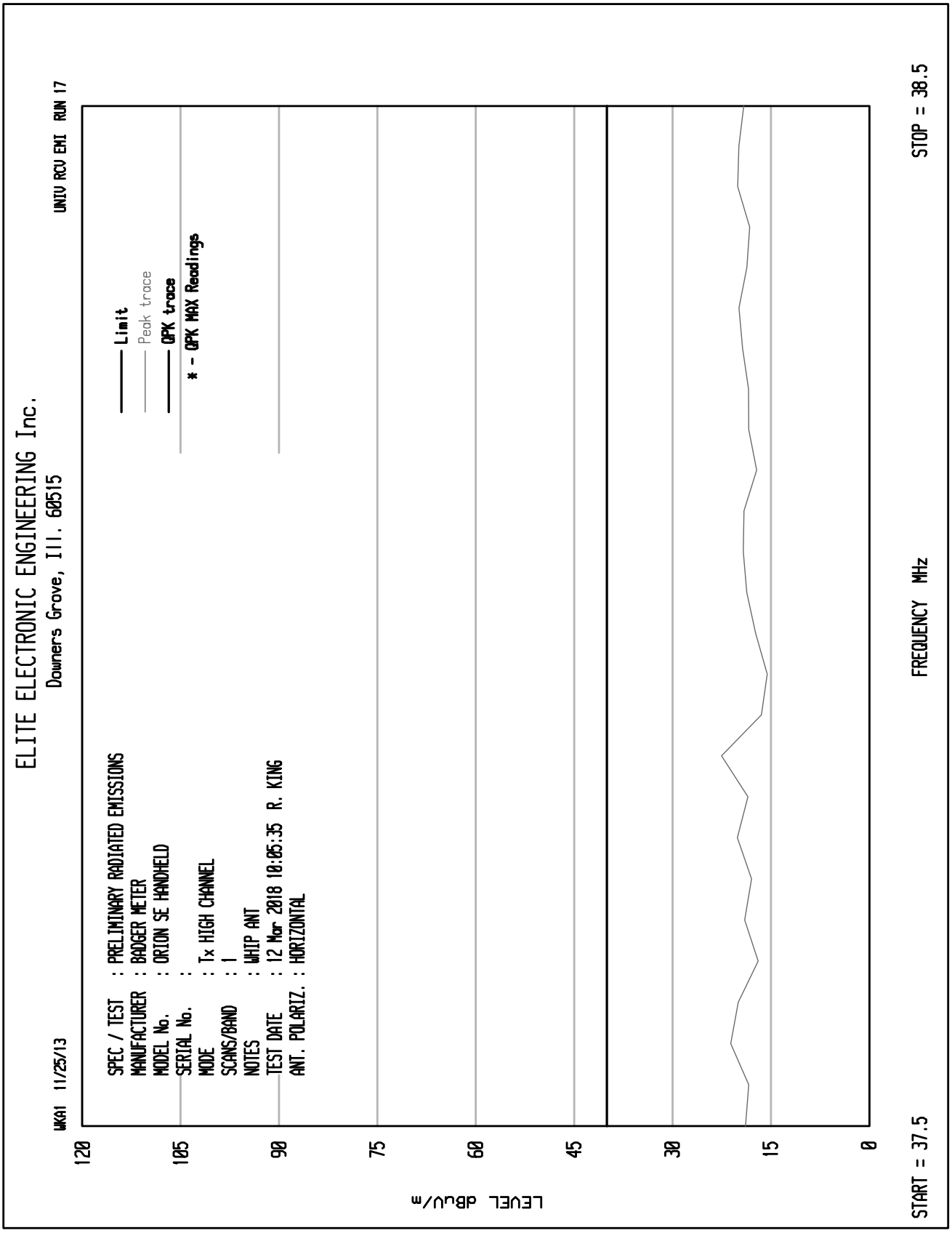

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 16
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANT
TEST DATE : 12 Mar 2018 09:58:05 R. KING
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5

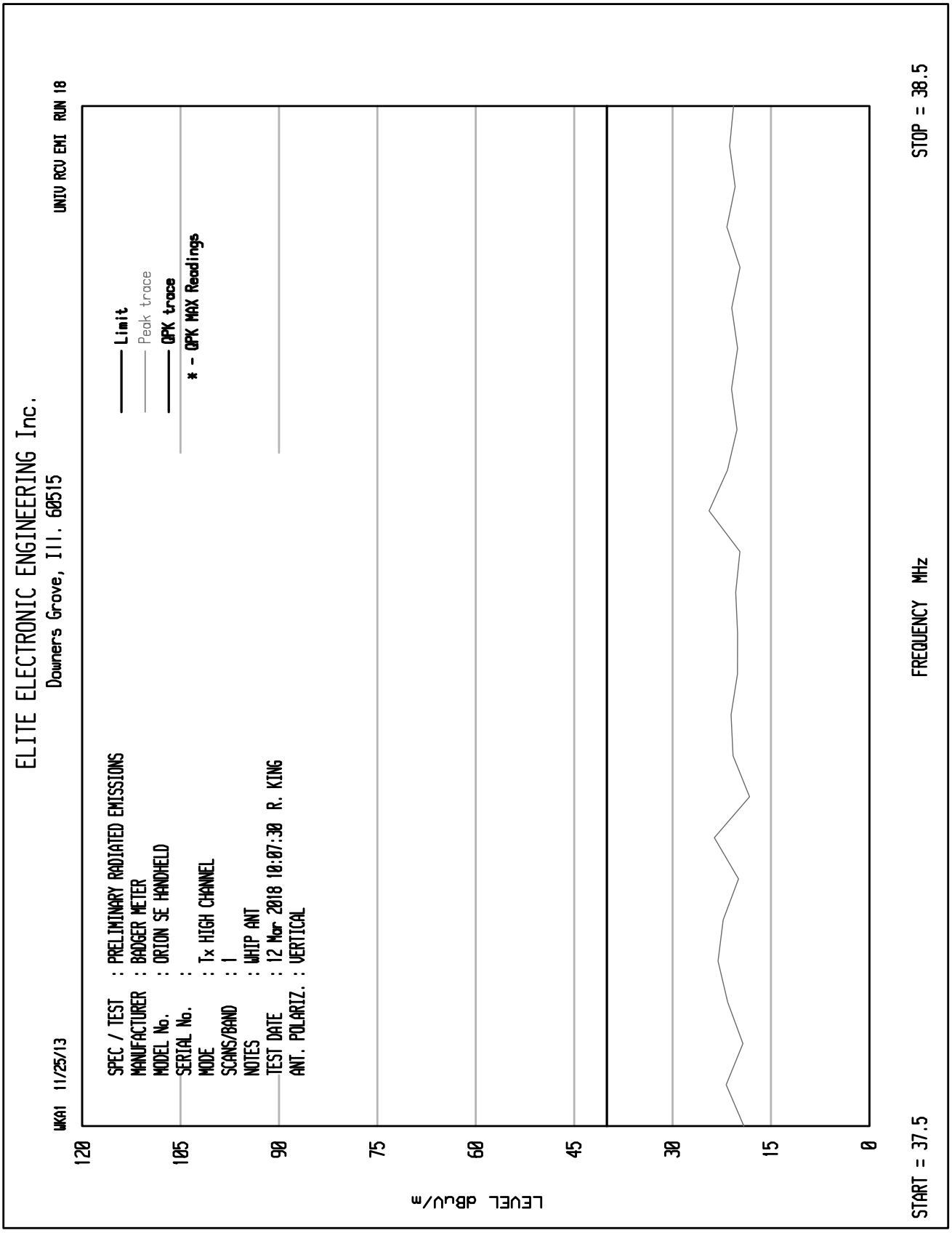

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 7
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 12 Mar 2018 14:36:29 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 = 10000

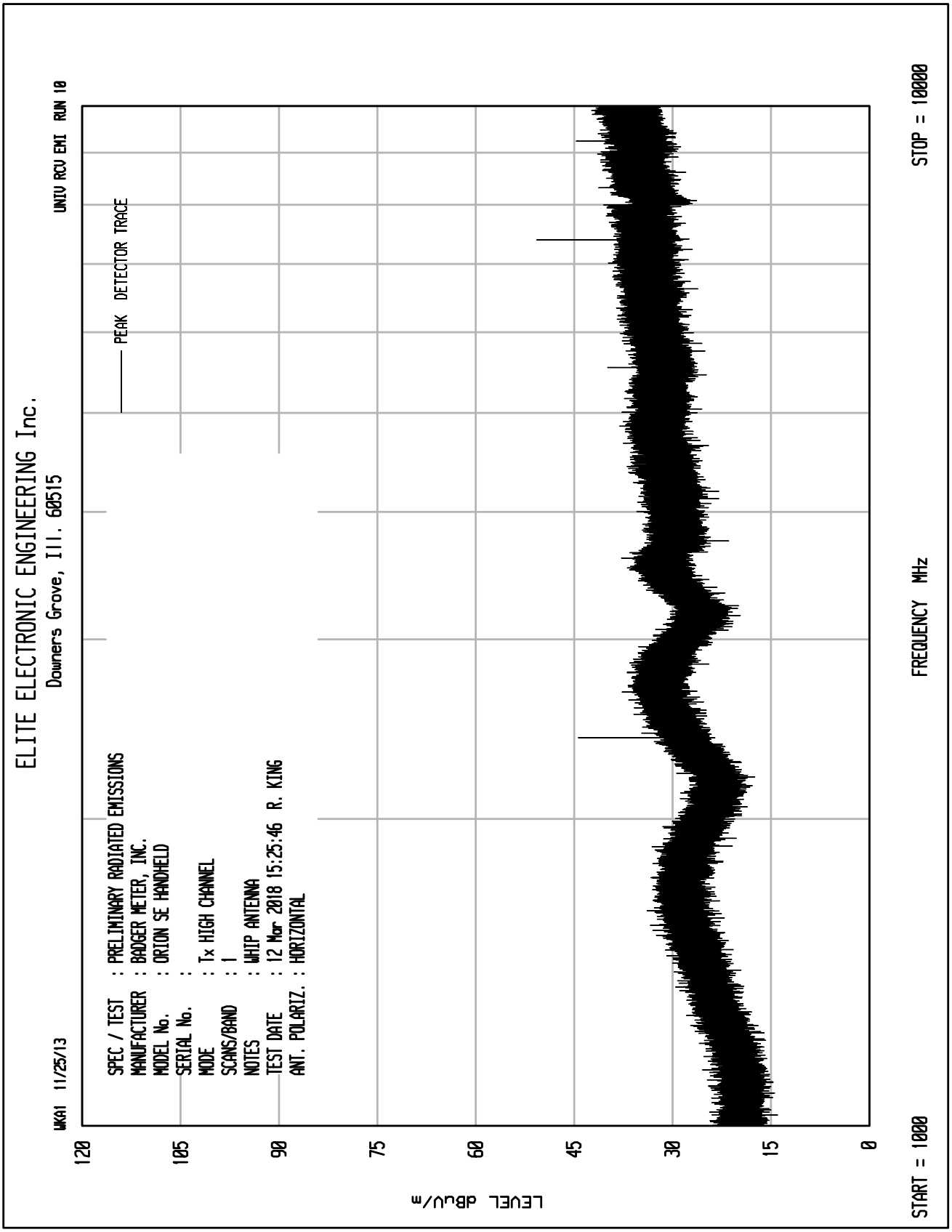

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 8
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx MID CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 12 Mar 2018 14:40:38 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 = 10000

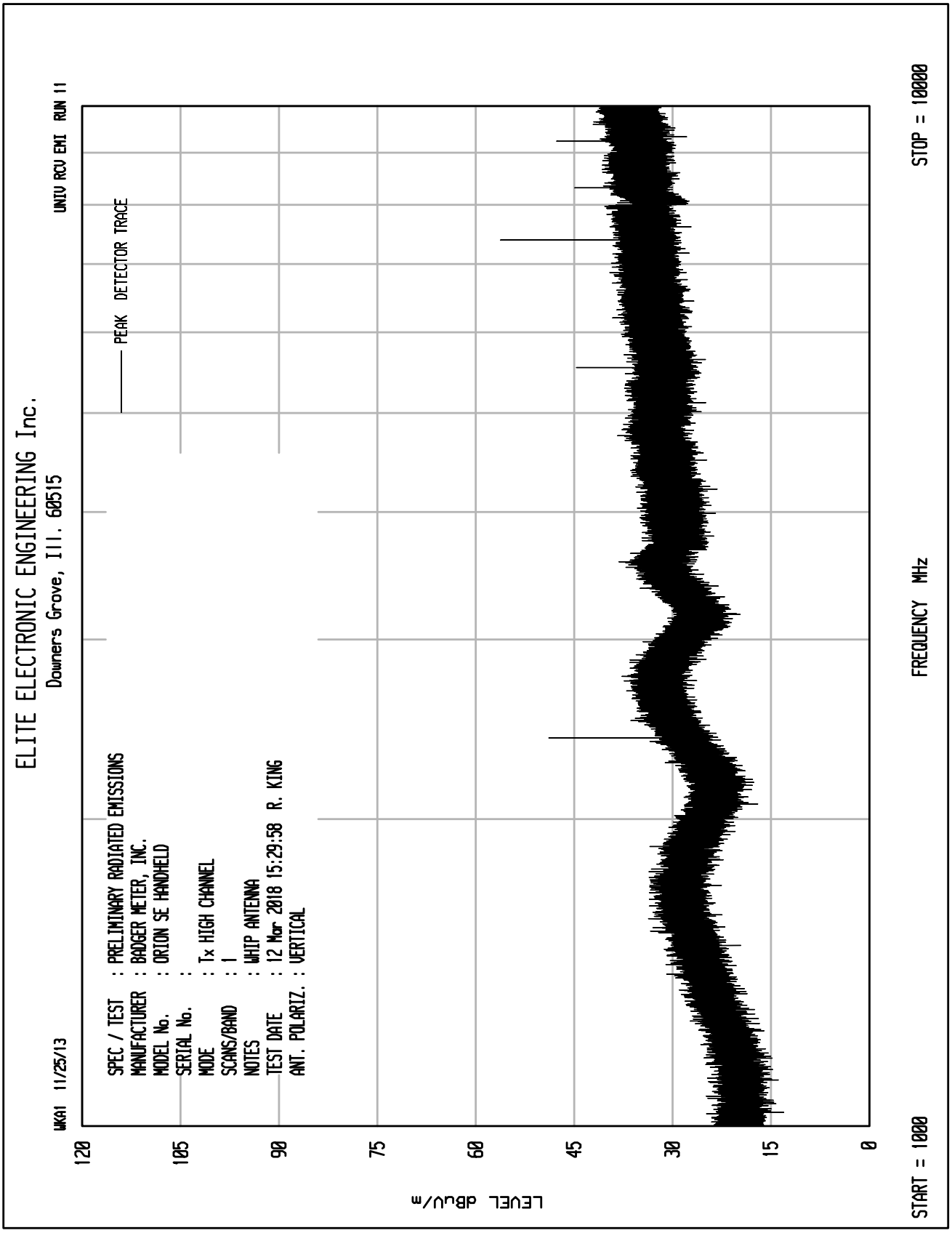

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 15
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 6 Mar 2018 10:16:12 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
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 RCU EMI RUN 14
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 6 Mar 2018 10:14:08 R. KING
ANT. POLARIZ. : VERTICAL
Limit
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
WKAI 11/25/13
UNIV RCU EMI RUN 17
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANT
TEST DATE : 12 Mar 2018 10:05:35 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 18
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANT
TEST DATE : 12 Mar 2018 10:07:30 R. KING
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
QPK trace
* - QPK MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 37.5
FREQUENCY MHz
STOP = 38.5


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCU EMI RUN 10
WKAI 11/25/13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC.
MODEL No. : ORION SE HANDHELD
SERIAL No. :
MODE : Tx HIGH CHANNEL
SCANS/BAND : 1
NOTES : WHIP ANTENNA
TEST DATE : 12 Mar 2018 15:25:46 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 = 10000



Manufacturer : Badger Meter

Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 904.9 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Peak Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2714.40	H	53.4	*	2.8	34.0	-40.5	49.7	306.3	5000.0	-24.3
2714.40	V	54.0	*	2.8	34.0	-40.5	50.3	326.0	5000.0	-23.7
3619.20	H	51.4	*	3.2	34.3	-39.8	49.1	283.6	5000.0	-24.9
3619.20	V	51.3	*	3.2	34.3	-39.8	49.0	282.6	5000.0	-25.0
4524.00	H	50.2	*	3.6	36.0	-40.2	49.6	302.0	5000.0	-24.4
4524.00	V	49.9	*	3.6	36.0	-40.2	49.3	292.8	5000.0	-24.6
5428.80	H	51.9		3.9	37.0	-39.5	53.3	463.8	5000.0	-20.7
5428.80	V	54.4		3.9	37.0	-39.5	55.8	614.2	5000.0	-18.2
8143.20	H	48.5		4.9	38.5	-39.8	52.1	404.2	5000.0	-21.8
8143.20	V	51.8		4.9	38.5	-39.8	55.5	592.3	5000.0	-18.5
9048.00	H	49.4		5.0	38.9	-39.7	53.5	473.5	5000.0	-20.5
9048.00	V	52.1		5.0	38.9	-39.7	56.2	645.4	5000.0	-17.8

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 904.9 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Average Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2714.40	H	38.21	*	2.8	34.0	-40.5	0.0	34.5	53.1	500.0	-19.5
2714.40	V	38.8	*	2.8	34.0	-40.5	0.0	35.0	56.5	500.0	-18.9
3619.20	H	35.9	*	3.2	34.3	-39.8	0.0	33.6	47.6	500.0	-20.4
3619.20	V	35.9	*	3.2	34.3	-39.8	0.0	33.6	47.7	500.0	-20.4
4524.00	H	34.6	*	3.6	36.0	-40.2	0.0	34.0	50.1	500.0	-20.0
4524.00	V	34.4	*	3.6	36.0	-40.2	0.0	33.8	49.1	500.0	-20.1
5428.80	H	34..1		3.9	37.0	-39.5	0.0	1.4	1.2	500.0	-52.6
5428.80	V	34.3		3.9	37.0	-39.5	0.0	35.7	60.7	500.0	-18.3
8143.20	H	32.8		4.9	38.5	-39.8	0.0	36.4	66.2	500.0	-17.6
8143.20	V	36.5		4.9	38.5	-39.8	0.0	40.2	102.0	500.0	-13.8
9048.00	H	33.2		5.0	38.9	-39.7	0.0	37.3	73.6	500.0	-16.6
9048.00	V	38.5		5.0	38.9	-39.7	0.0	42.6	135.5	500.0	-11.3

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Non-Restricted Bands
Date : March 5, 2018
Mode : Tx 904.9 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Peak Detector with 100kHz Resolution Bandwidth
Notes :

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
904.80	H	83.7		1.6	26.9	0.0	112.1	404003.2		
904.80	V	77.4		1.6	26.9	0.0	105.8	196058.1		
1809.60	H	42.7		2.2	31.6	-40.7	35.8	61.4	40400.3	-56.4
1809.60	V	42.5		2.2	31.6	-40.7	35.6	60.6	40400.3	-56.5
6333.60	H	39.2		4.3	38.0	-39.6	41.9	124.0	40400.3	-50.3
6333.60	V	42.0		4.3	38.0	-39.6	44.6	170.6	40400.3	-47.5
7238.40	H	56.6		4.7	38.3	-39.8	59.9	983.6	40400.3	-32.3
7238.40	V	54.7		4.7	38.3	-39.8	57.9	784.9	40400.3	-34.2

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 914.1 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Peak Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2742.29	H	51.3	*	2.8	34.1	-40.5	47.7	242.5	5000.0	-26.3
2742.29	V	51.0	*	2.8	34.1	-40.5	47.5	235.9	5000.0	-26.5
3656.39	H	49.5	*	3.3	34.3	-39.9	47.2	230.4	5000.0	-26.7
3656.39	V	50.2	*	3.3	34.3	-39.9	47.9	249.4	5000.0	-26.0
4570.49	H	50.4	*	3.6	36.2	-40.1	50.1	319.9	5000.0	-23.9
4570.49	V	50.3	*	3.6	36.2	-40.1	50.0	314.4	5000.0	-24.0
7312.78	H	49.4	*	4.7	38.2	-39.8	52.5	422.2	5000.0	-21.5
7312.78	V	49.4	*	4.7	38.2	-39.8	52.6	426.6	5000.0	-21.4
8226.87	H	49.6	*	4.9	38.6	-39.8	53.3	462.2	5000.0	-20.7
8226.87	V	50.0	*	4.9	38.6	-39.8	53.7	484.5	5000.0	-20.3
9140.97	H	49.6	*	5.0	38.8	-39.7	53.7	485.8	5000.0	-20.3
9140.97	V	50.3	*	5.0	38.8	-39.7	54.5	529.6	5000.0	-19.5

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 914.1 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Average Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2742.29	H	36.16	*	2.8	34.1	-40.5	0.0	32.6	42.6	500.0	-21.4
2742.29	V	36.2	*	2.8	34.1	-40.5	0.0	32.6	42.8	500.0	-21.3
3656.39	H	34.6	*	3.3	34.3	-39.9	0.0	32.3	41.1	500.0	-21.7
3656.39	V	34.6	*	3.3	34.3	-39.9	0.0	32.3	41.1	500.0	-21.7
4570.49	H	34.9	*	3.6	36.2	-40.1	0.0	34.6	53.8	500.0	-19.4
4570.49	V	35.0	*	3.6	36.2	-40.1	0.0	34.7	54.1	500.0	-19.3
7312.78	H	34.4	*	4.7	38.2	-39.8	0.0	37.5	75.3	500.0	-16.4
7312.78	V	34.4	*	4.7	38.2	-39.8	0.0	37.5	75.1	500.0	-16.5
8226.87	H	34.0	*	4.9	38.6	-39.8	0.0	37.8	77.3	500.0	-16.2
8226.87	V	34.2	*	4.9	38.6	-39.8	0.0	37.9	78.8	500.0	-16.1
9140.97	H	34.2	*	5.0	38.8	-39.7	0.0	38.4	82.8	500.0	-15.6
9140.97	V	34.3	*	5.0	38.8	-39.7	0.0	38.4	83.4	500.0	-15.6

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Non-Restricted Bands
Date : March 5, 2018
Mode : Tx 914.1 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Peak Detector with 100kHz Resolution Bandwidth
Notes :

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
914.10	H	83.3		1.6	27.0	0.0	111.8	390702.6		
914.10	V	78.1		1.6	27.0	0.0	106.7	216693.7		
1828.19	H	41.0	*	2.2	31.7	-40.7	34.3	51.9	39070.3	-57.5
1828.19	V	40.3	*	2.2	31.7	-40.7	33.6	47.6	39070.3	-58.3
5484.58	H	38.6	*	3.9	36.8	-39.5	39.8	97.5	39070.3	-52.1
5484.58	V	39.0	*	3.9	36.8	-39.5	40.3	103.1	39070.3	-51.6
6398.68	H	39.2	*	4.3	37.9	-39.6	41.8	123.1	39070.3	-50.0
6398.68	V	39.0	*	4.3	37.9	-39.6	41.5	119.5	39070.3	-50.3

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 923.7 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Peak Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2771.10	H	50.9	*	2.8	34.2	-40.5	47.4	235.1	5000.0	-26.6
2771.10	V	51.1	*	2.8	34.2	-40.5	47.7	242.5	5000.0	-26.3
3694.80	H	51.2	*	3.3	34.4	-39.9	49.0	281.3	5000.0	-25.0
3694.80	V	51.1	*	3.3	34.4	-39.9	48.8	276.5	5000.0	-25.1
4618.50	H	50.2	*	3.6	36.4	-40.0	50.2	325.0	5000.0	-23.7
4618.50	V	50.8	*	3.6	36.4	-40.0	50.8	347.8	5000.0	-23.2
7389.60	H	55.6		4.7	38.2	-39.8	58.7	858.8	5000.0	-15.3
7389.60	V	57.9		4.7	38.2	-39.8	60.9	1114.0	5000.0	-13.0
8313.30	H	52.2		4.9	38.7	-39.8	56.0	628.3	5000.0	-18.0
8313.30	V	53.9		4.9	38.7	-39.8	57.7	766.7	5000.0	-16.3
2771.10	H	50.9	*	2.8	34.2	-40.5	47.4	235.1	5000.0	-26.6
2771.10	V	51.1	*	2.8	34.2	-40.5	47.7	242.5	5000.0	-26.3

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 923.7 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Average Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2771.10	H	36.05	*	2.8	34.2	-40.5	0.0	32.6	42.7	500.0	-21.4
2771.10	V	35.6	*	2.8	34.2	-40.5	0.0	32.2	40.6	500.0	-21.8
3694.80	H	34.8	*	3.3	34.4	-39.9	0.0	32.5	42.3	500.0	-21.4
3694.80	V	35.2	*	3.3	34.4	-39.9	0.0	32.9	44.4	500.0	-21.0
4618.50	H	34.9	*	3.6	36.4	-40.0	0.0	34.9	55.4	500.0	-19.1
4618.50	V	34.9	*	3.6	36.4	-40.0	0.0	34.9	55.6	500.0	-19.1
7389.60	H	48.0		4.7	38.2	-39.8	0.0	51.1	358.8	500.0	-2.9
7389.60	V	50.3		4.7	38.2	-39.8	0.0	53.4	467.1	500.0	-0.6
8313.30	H	39.6		4.9	38.7	-39.8	0.0	43.4	148.5	500.0	-10.5
8313.30	V	43.2		4.9	38.7	-39.8	0.0	47.0	223.7	500.0	-7.0
2771.10	H	36.05	*	2.8	34.2	-40.5	0.0	32.6	42.7	500.0	-21.4
2771.10	V	35.6	*	2.8	34.2	-40.5	0.0	32.2	40.6	500.0	-21.8

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Non-Restricted Bands
Date : March 5, 2018
Mode : Tx 923.7 MHz
Notes : Test Distance is 3 meters w/ Duck Antenna
Notes : Peak Detector with 100kHz Resolution Bandwidth
Notes :

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
923.70	H	83.9		1.6	27.2	0.0	112.7	429145.2		
923.70	V	73.7		1.6	27.2	0.0	102.5	133077.4		
1847.40	H	40.0	*	2.2	31.8	-40.7	33.4	46.7	42914.5	-59.3
1847.40	V	42.3		2.2	31.8	-40.7	35.7	60.7	42914.5	-57.0
5542.20	H	46.4		4.0	36.9	-39.5	47.7	243.8	42914.5	-44.9
5542.20	V	48.8		4.0	36.9	-39.5	50.2	321.8	42914.5	-42.5
6465.90	H	40.6		4.3	37.9	-39.6	43.1	143.1	42914.5	-49.5
6465.90	V	43.1		4.3	37.9	-39.6	45.7	192.5	42914.5	-47.0

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 904.9 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Peak Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2714.70	H	53.6	*	2.8	34.0	-40.5	49.9	313.9	5000.0	-24.0
2714.70	V	53.5	*	2.8	34.0	-40.5	49.8	308.9	5000.0	-24.2
3619.60	H	51.5	*	3.2	34.3	-39.8	49.2	288.8	5000.0	-24.8
3619.60	V	51.5	*	3.2	34.3	-39.8	49.2	287.2	5000.0	-24.8
4524.50	H	50.0	*	3.6	36.0	-40.2	49.4	295.9	5000.0	-24.6
4524.50	V	50.3	*	3.6	36.0	-40.2	49.7	304.9	5000.0	-24.3
5429.40	H	51.3		3.9	37.0	-39.5	52.7	430.3	5000.0	-21.3
5429.40	V	52.9		3.9	37.0	-39.5	54.3	520.3	5000.0	-19.7
8144.10	H	50.5		4.9	38.5	-39.8	54.2	511.8	5000.0	-19.8
8144.10	V	51.4		4.9	38.5	-39.8	55.0	562.5	5000.0	-19.0
9049.00	H	50.8		5.0	38.9	-39.7	54.9	555.1	5000.0	-19.1
9049.00	V	51.4		5.0	38.9	-39.7	55.6	600.3	5000.0	-18.4

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 904.9 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Average Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2714.70	H	38.60	*	2.8	34.0	-40.5	0.0	34.9	55.6	500.0	-19.1
2714.70	V	38.3	*	2.8	34.0	-40.5	0.0	34.6	53.6	500.0	-19.4
3619.60	H	35.9	*	3.2	34.3	-39.8	0.0	33.6	47.7	500.0	-20.4
3619.60	V	35.9	*	3.2	34.3	-39.8	0.0	33.6	47.6	500.0	-20.4
4524.50	H	34.3	*	3.6	36.0	-40.2	0.0	33.7	48.4	500.0	-20.3
4524.50	V	34.4	*	3.6	36.0	-40.2	0.0	33.8	48.9	500.0	-20.2
5429.40	H	39.6		3.9	37.0	-39.5	0.0	41.0	112.4	500.0	-13.0
5429.40	V	42.0		3.9	37.0	-39.5	0.0	43.4	148.2	500.0	-10.6
8144.10	H	34.4		4.9	38.5	-39.8	0.0	38.1	80.0	500.0	-15.9
8144.10	V	35.4		4.9	38.5	-39.8	0.0	39.1	90.0	500.0	-14.9
9049.00	H	36.0		5.0	38.9	-39.7	0.0	40.2	101.8	500.0	-13.8
9049.00	V	35.8		5.0	38.9	-39.7	0.0	39.9	98.7	500.0	-14.1

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Non-Restricted Bands
Date : March 5, 2018
Mode : Tx 904.9 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Peak Detector with 100kHz Resolution Bandwidth
Notes :

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
904.90	H	73.9		1.6	26.9	0.0	102.3	130771.5		
904.90	V	82.9		1.6	26.9	0.0	111.4	369839.2		
1809.80	H	42.6	*	2.2	31.6	-40.7	35.7	60.9	36983.9	-55.7
1809.80	V	42.5	*	2.2	31.6	-40.7	35.6	60.1	36983.9	-55.8
6334.30	H	40.0		4.3	38.0	-39.6	42.6	135.3	36983.9	-48.7
6334.30	V	41.9		4.3	38.0	-39.6	44.5	168.2	36983.9	-46.8
7239.20	H	53.5		4.7	38.3	-39.8	56.7	685.2	36983.9	-34.6
7239.20	V	57.5		4.7	38.3	-39.8	60.7	1081.0	36983.9	-30.7

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 914.1 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Peak Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2742.29	H	53.5	*	2.8	34.1	-40.5	50.0	314.6	5000.0	-24.0
2742.29	V	53.5	*	2.8	34.1	-40.5	50.0	314.6	5000.0	-24.0
3656.39	H	50.5	*	3.3	34.3	-39.9	48.2	257.3	5000.0	-25.8
3656.39	V	50.8	*	3.3	34.3	-39.9	48.6	267.9	5000.0	-25.4
4570.49	H	49.7	*	3.6	36.2	-40.1	49.4	295.8	5000.0	-24.6
4570.49	V	49.6	*	3.6	36.2	-40.1	49.3	292.8	5000.0	-24.6
7312.78	H	54.9		4.7	38.2	-39.8	58.0	797.0	5000.0	-15.9
7312.78	V	59.4		4.7	38.2	-39.8	62.5	1336.5	5000.0	-11.5
8226.87	H	50.6		4.9	38.6	-39.8	54.3	519.2	5000.0	-19.7
8226.87	V	50.9		4.9	38.6	-39.8	54.6	537.4	5000.0	-19.4
9140.97	H	50.6		5.0	38.8	-39.7	54.8	547.5	5000.0	-19.2
9140.97	V	50.1		5.0	38.8	-39.7	54.3	517.5	5000.0	-19.7

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 914.1 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Average Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2742.29	H	37.97	*	2.8	34.1	-40.5	0.0	34.4	52.5	500.0	-19.6
2742.29	V	38.0	*	2.8	34.1	-40.5	0.0	34.4	52.5	500.0	-19.6
3656.39	H	35.5	*	3.3	34.3	-39.9	0.0	33.2	45.5	500.0	-20.8
3656.39	V	35.4	*	3.3	34.3	-39.9	0.0	33.2	45.5	500.0	-20.8
4570.49	H	34.2	*	3.6	36.2	-40.1	0.0	33.9	49.6	500.0	-20.1
4570.49	V	34.3	*	3.6	36.2	-40.1	0.0	34.0	49.9	500.0	-20.0
7312.78	H	45.0		4.7	38.2	-39.8	0.0	48.1	254.7	500.0	-5.9
7312.78	V	50.7		4.7	38.2	-39.8	0.0	53.9	493.1	500.0	-0.1
8226.87	H	34.5		4.9	38.6	-39.8	0.0	38.2	81.5	500.0	-15.8
8226.87	V	33.8		4.9	38.6	-39.8	0.0	37.5	75.0	500.0	-16.5
9140.97	H	35.4		5.0	38.8	-39.7	0.0	39.5	94.9	500.0	-14.4
9140.97	V	35.1		5.0	38.8	-39.7	0.0	39.3	91.8	500.0	-14.7

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Non-Restricted Bands
Date : March 5, 2018
Mode : Tx 914.1 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Peak Detector with 100kHz Resolution Bandwidth
Notes :

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
914.10	H	74.0		1.6	27.0	0.0	102.5	133766.2		
914.10	V	83.7		1.6	27.0	0.0	112.3	411477.7		
1828.19	H	42.1	*	2.2	31.7	-40.7	35.3	58.4	41147.8	-57.0
1828.19	V	41.7	*	2.2	31.7	-40.7	34.9	55.7	41147.8	-57.4
5484.58	H	44.7		3.9	36.8	-39.5	45.9	197.3	41147.8	-46.4
5484.58	V	48.2		3.9	36.8	-39.5	49.4	296.5	41147.8	-42.8
6398.68	H	39.6		4.3	37.9	-39.6	42.2	128.9	41147.8	-50.1
6398.68	V	42.7		4.3	37.9	-39.6	45.3	184.4	41147.8	-47.0

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 923.7 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Peak Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2771.10	H	53.2	*	2.8	34.2	-40.5	49.7	307.1	5000.0	-24.2
2771.10	V	53.5	*	2.8	34.2	-40.5	50.0	316.8	5000.0	-24.0
3694.80	H	50.2	*	3.3	34.4	-39.9	47.9	248.7	5000.0	-26.1
3694.80	V	50.1	*	3.3	34.4	-39.9	47.8	245.9	5000.0	-26.2
4618.50	H	48.9	*	3.6	36.4	-40.0	48.9	278.8	5000.0	-25.1
4618.50	V	49.1	*	3.6	36.4	-40.0	49.1	284.7	5000.0	-24.9
7389.60	H	57.4		4.7	38.2	-39.8	60.5	1061.5	5000.0	-13.5
7389.60	V	57.4		4.7	38.2	-39.8	60.5	1060.2	5000.0	-13.5
8313.30	H	50.8		4.9	38.7	-39.8	54.5	533.5	5000.0	-19.4
8313.30	V	51.6		4.9	38.7	-39.8	55.3	585.0	5000.0	-18.6
2771.10	H	53.2	*	2.8	34.2	-40.5	49.7	307.1	5000.0	-24.2
2771.10	V	53.5	*	2.8	34.2	-40.5	50.0	316.8	5000.0	-24.0

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 5, 2018
Mode : Tx 923.7 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Average Detector with 1MHz Resolution Bandwidth
Notes : Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2771.10	H	37.83	*	2.8	34.2	-40.5	0.0	34.4	52.4	500.0	-19.6
2771.10	V	37.8	*	2.8	34.2	-40.5	0.0	34.4	52.5	500.0	-19.6
3694.80	H	34.7	*	3.3	34.4	-39.9	0.0	32.4	41.9	500.0	-21.5
3694.80	V	34.7	*	3.3	34.4	-39.9	0.0	32.4	41.9	500.0	-21.5
4618.50	H	33.8	*	3.6	36.4	-40.0	0.0	33.8	49.1	500.0	-20.2
4618.50	V	33.8	*	3.6	36.4	-40.0	0.0	33.7	48.7	500.0	-20.2
7389.60	H	47.9		4.7	38.2	-39.8	0.0	50.9	352.7	500.0	-3.0
7389.60	V	49.3		4.7	38.2	-39.8	0.0	52.3	413.9	500.0	-1.6
8313.30	H	34.9		4.9	38.7	-39.8	0.0	38.7	86.2	500.0	-15.3
8313.30	V	36.2		4.9	38.7	-39.8	0.0	40.0	99.9	500.0	-14.0
2771.10	H	37.83	*	2.8	34.2	-40.5	0.0	34.4	52.4	500.0	-19.6
2771.10	V	37.8	*	2.8	34.2	-40.5	0.0	34.4	52.5	500.0	-19.6

Checked BY Richard E. King :

Richard E. King

Manufacturer : Badger Meter
Model No. : Orion SE Handheld
Serial No. : None Assigned
Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Non-Restricted Bands
Date : March 5, 2018
Mode : Tx 923.7 MHz
Notes : Test Distance is 3 meters w/ Whip Antenna
Notes : Peak Detector with 100kHz Resolution Bandwidth
Notes :

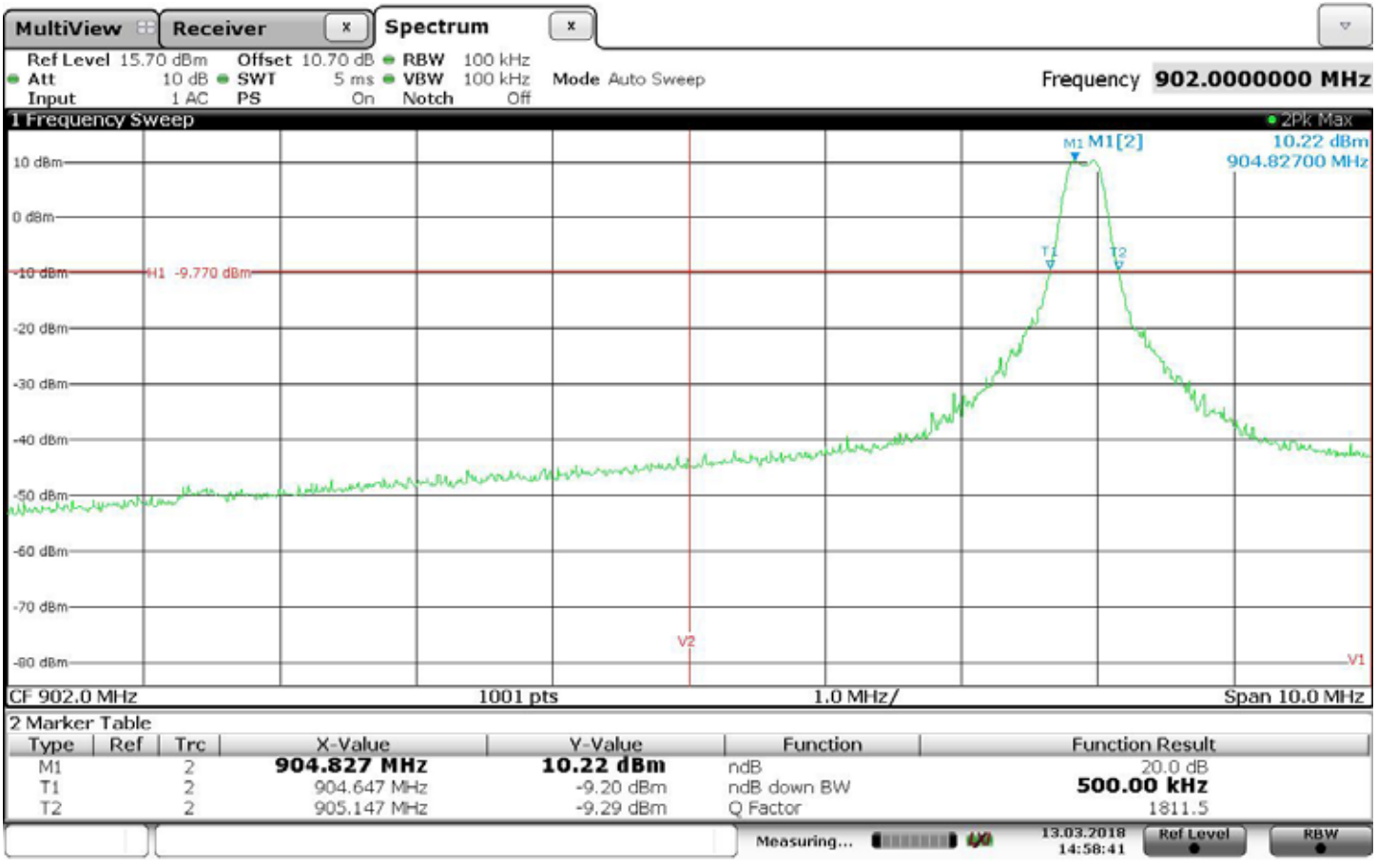
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
923.70	H	73.6		1.6	27.2	0.0	102.4	131554.1		
923.70	V	84.1		1.6	27.2	0.0	112.9	442185.2		
1847.40	H	41.7	*	2.2	31.8	-40.7	35.1	56.7	44218.5	-57.8
1847.40	V	41.8	*	2.2	31.8	-40.7	35.2	57.5	44218.5	-57.7
5542.20	H	45.4		4.0	36.9	-39.5	46.7	216.3	44218.5	-46.2
5542.20	V	48.2		4.0	36.9	-39.5	49.6	301.4	44218.5	-43.3
6465.90	H	41.9		4.3	37.9	-39.6	44.5	167.7	44218.5	-48.4
6465.90	V	42.4		4.3	37.9	-39.6	45.0	177.0	44218.5	-48.0

Checked BY Richard E. King :

Richard E. King

FCC Part 15.247 Band-edge Compliance

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 904.9 MHz
Test	: 20 dB Down in 100kHz RBW
Test Engineer	: R. King
Test Date	: Mar 13, 2018



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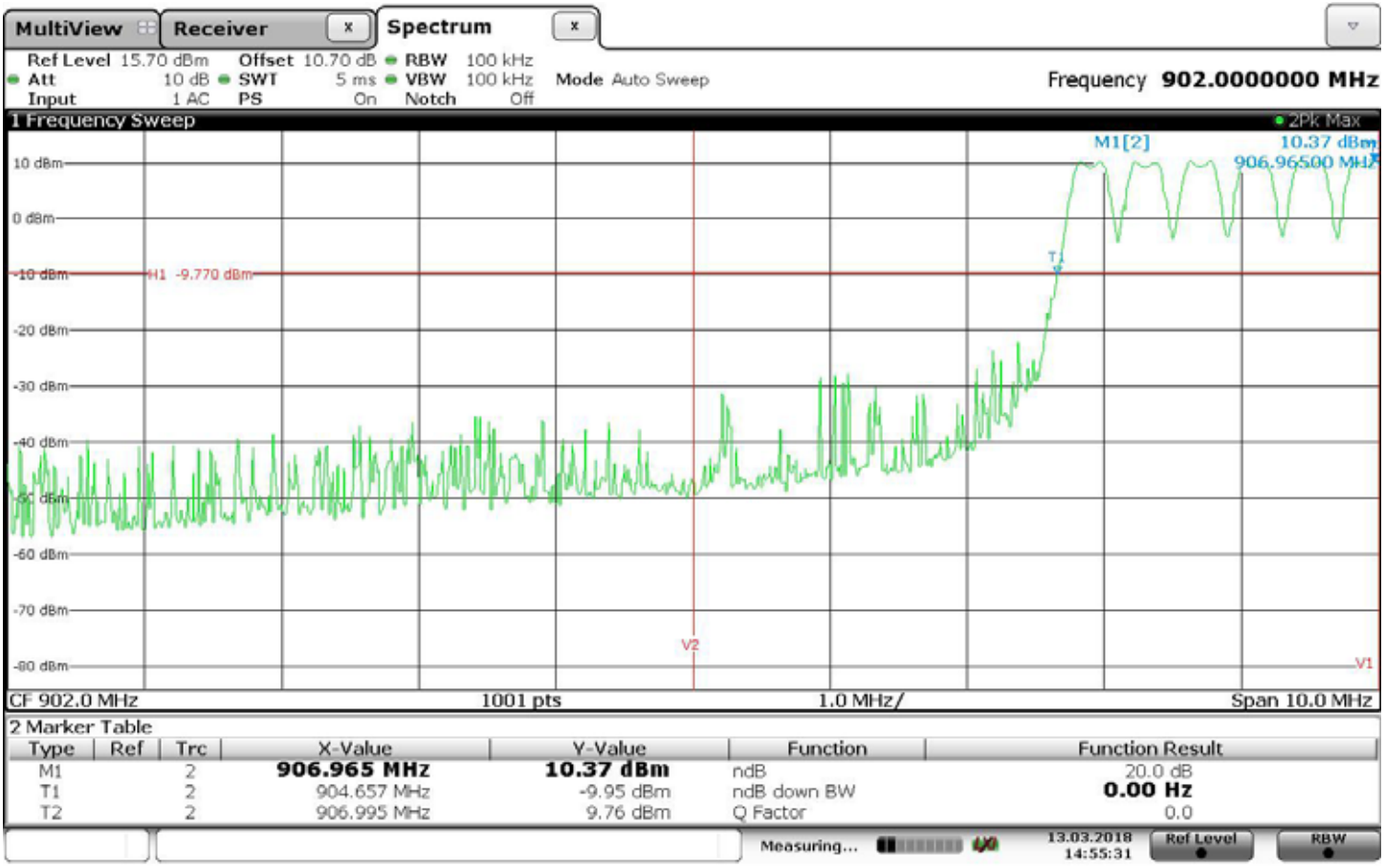
FCC Part 15.247 Band-edge Compliance

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Hopping
Test	: 20 dB Down in 100kHz RBW
Test Engineer	: R. King
Test Date	: Mar 13, 2018



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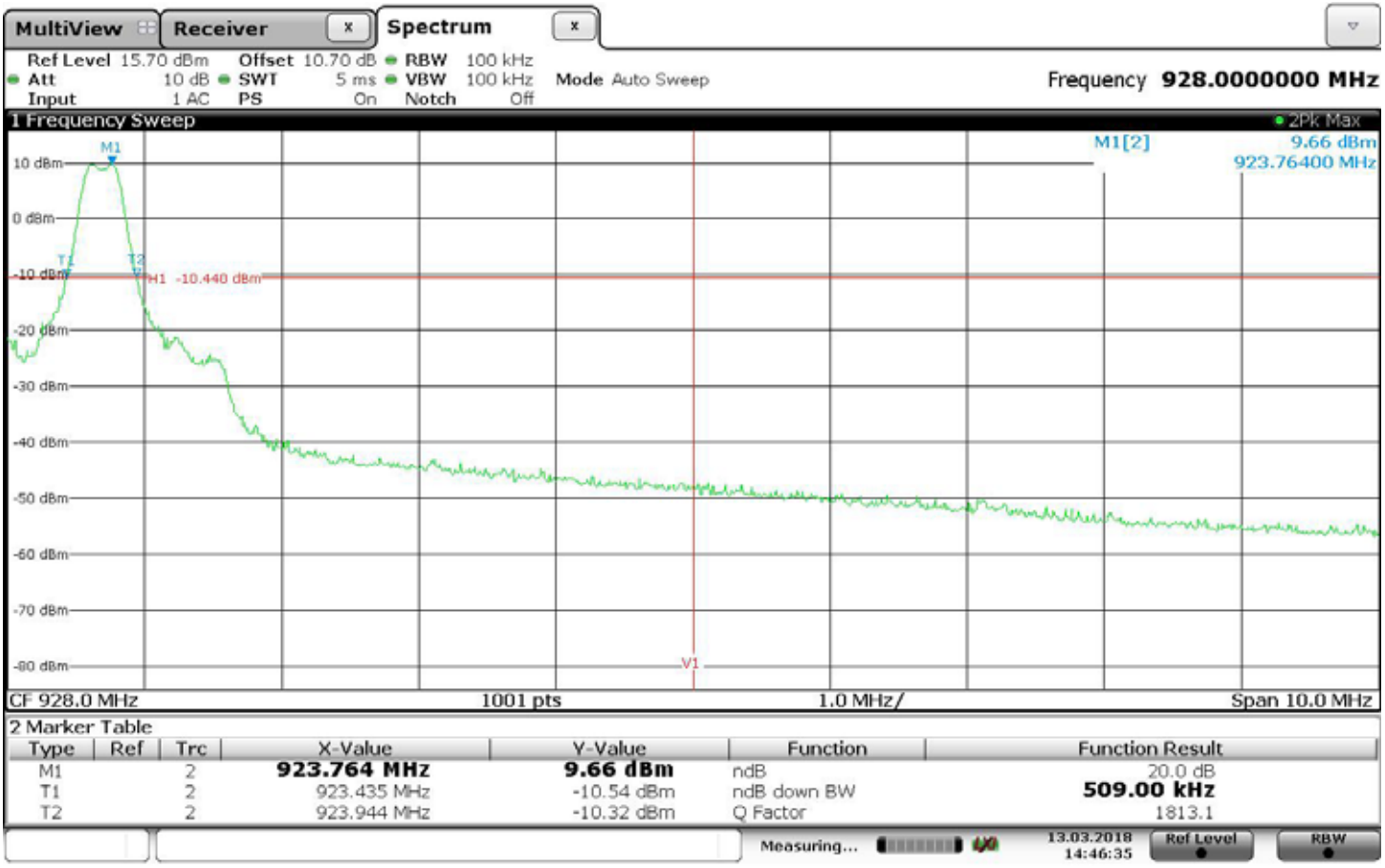
FCC Part 15.247 Band-edge Compliance

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Tx 923.7 MHz
Test	: 20 dB Down in 100kHz RBW
Test Engineer	: R. King
Test Date	: Mar 13, 2018



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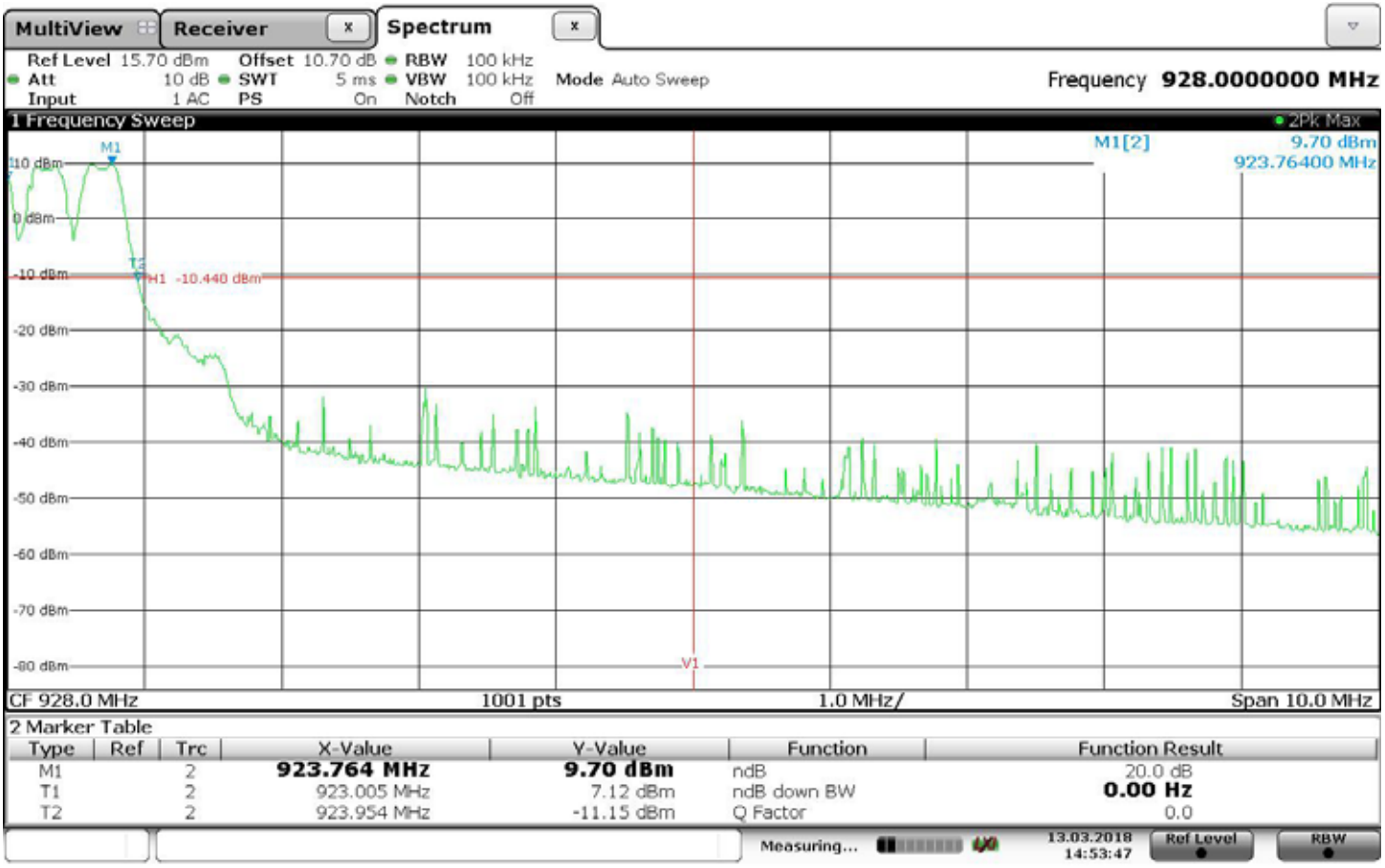
FCC Part 15.247 Band-edge Compliance

Manufacturer	: Badger Meter, Incorporated
Test Item	: Transceiver
Model No.	: Orion SE Handheld
Serial No.	: None Assigned
Mode	: Hopping
Test	: 20 dB Down in 100kHz RBW
Test Engineer	: R. King
Test Date	: Mar 13, 2018



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