Measurement of RF Interference from an LTE-M Water Meter Transceiver

For	Badger Meter, Incorporated 4545 W. Brown Deer Rd. Milwaukee, WI 53223
P.O. Number	354177
Date Tested	August 9, 2018
Test Personnel	Javier Cardenas
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 15.109 for Receivers ISED RSS-247 ISED RSS-GEN

Test Report By:

Javier Cardenas
EMC Engineer

Requested By: Ron Settle
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

TABLE OF CONTENTS

REVISION HISTORY

Revision	Date	Description
—	08/27/2018	Initial release

Measurement of RF Emissions from a Water Meter, Part No. LTE-M Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Badger Meter, Incorporated Water Meter, Part No. LTE-M, Serial No. 1, transceiver (hereinafter referred to as the EUT). The EUT is a frequency hopping spread spectrum transceiver. The transceiver was designed to transmit and receive in the 902-928 MHz band using an integrated antenna. The EUT was manufactured and submitted for testing by Badger Meter, Incorporated located in Milwaukee, WI.

1.2 Purpose

The test series was performed to determine if the EUT meets the radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Section 15.109, for receivers and Subpart C, Section 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 Innovation, Science and Economic Development Canada Specification, RSS-Gen, Section 7.2.4 and Section 6 for receivers and the Innovation, Science and Economic Development Canada 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 American Association for Laboratory Accreditation (A2LA), A2LA Lab Code: 1786-01.

1.5 Laboratory Conditions

The temperature at the time of the test was 21C and the relative humidity was 38%.

2 APPLICABLE DOCUMENTS

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

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subparts B and C

- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

- FCC Public Notice, DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", Released March 30, 2000

- Innovation, Science and Economic Development Canada, RSS-247, Issue 2, February 2017, “Spectrum Management and Telecommunications Radio Standards Specification, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”

- Innovation, Science and Economic Development Canada, RSS-GEN, Issue 5, April 2018, “Spectrum

Management and Telecommunications Radio Standards Specification, General Requirements and Information for the Certification of radio communication equipment"

3 EUT SETUP AND OPERATION

3.1 General Description

The EUT is a Water Meter, Part No. LTE-M. A block diagram of the EUT setup is shown as Figure 1.

3.1.1 Power Input

The EUT was powered by 3.6VDC from internal batteries.

3.1.2 Grounding

The EUT was ungrounded during the tests.

3.1.3 Frequency of EUT

The EUT was equipped with an Ublox SARA-R410M-02B Cat-M1 LTE module, FCC ID XPY2AGQN4NNN, that operated at a highest frequency of 1.91GHz. In accordance with 47 CFR 15.33, radiated emissions measurements were made up to 10GHz.

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 904.94MHz
- Transmit at 914.1MHz
- Transmit at 923.79MHz
- Receive at 904.94MHz
- Receive at 914.1MHz
- Receive at 923.79MHz
- Frequency Hopping Enabled

3.3 EUT Modifications

No modifications were required for compliance.

4 TEST FACILITY AND TEST INSTRUMENTATION

4.1 Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 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

Since the EUT was powered by internal batteries with no connections for AC power, no conducted emissions tests were required.

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 Innovation, Science and Economic Development Canada RSS-Gen, Section 7.3, 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 10GHz were measured and plotted using a 'screen-dump' utility. Testing was performed with the antenna of the EUT in place.

For Innovation, Science and Economic Development 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.

    d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

5.1.2.3 Results

The preliminary plots and final radiated levels are presented on pages 23 through 64. As can be seen from the data, all emissions measured from the EUT were within the specification limits. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown as Figure 3 through Figure 6.

5.2 Transmitter

5.2.1 Powerline Conducted Emissions

5.2.1.1 Requirements

Since the EUT is powered by internal batteries and has no connections for AC power, no conducted emissions are required.

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 30dB 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 65 through 67 show that the maximum 20 dB bandwidth was 304.2kHz. The 99% bandwidth was measured to be 302.69kHz.

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 30dB 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 71 shows the carrier frequency separation. As can be seen from this plot, the carrier frequency separation is 407.6kHz, which is greater than the 20dB bandwidth (302.69kHz).

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 30dB 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 72 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 30dB 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 73 and 74 show the plots for the time of occupancy (dwell time). As can be seen from the plots, the time of occupancy can be determined by 4.04ms multiplied by 2. This calculated value is equal to 8.08ms 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 6 dBi.

5.2.6.2 Procedures

The EUT was placed on the non-conductive stand and set to transmit. A dipole antenna (double ridged waveguide antenna for all measurements above 1GHz) was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 20dB bandwidth. The span was set to approximately 5 times the 20 dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle and high hopping frequencies.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a second dipole antenna (double ridged waveguide antenna for all measurements above 1GHz) was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss (and antenna gain for all measurements above 1GHz), as required. The peak power output was calculated for low, middle, and high hopping frequencies.

5.2.6.3 Results

The results are presented on pages 75 and 77. The maximum EIRP measured from the transmitter was 10.9dBm or 0.0123 W which is below the 0.25 Watt limit.

5.2.7 Duty Cycle Factor Measurements

5.2.7.1 Requirements

Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

5.2.7.2 Procedures

a. The EUT was placed on the non-conductive stand and set to hopping enabled.
b. A double ridged waveguide antenna was positioned at a 3 meter distance from the EUT. The output of the antenna was connected to the input of a spectrum analyzer.
c. The center frequency of the spectrum analyzer was set to the transmit frequency of the EUT.
d. The frequency span of the spectrum analyzer was set to 0Hz so that the time domain trace of the transmitted pulse of the EUT was displayed on the spectrum analyzer.
e. The sweep time of the spectrum analyzer was adjusted so that the beginning and end of a single pulse could be seen on the display of the spectrum analyzer.
f. The single sweep function of the spectrum analyzer was used multiple times to determine the maximum pulse width of the EUT.
g. The maximum pulse width display of the spectrum analyzer was recorded and then plotted using a 'screen dump' utility.
h. The sweep time of the spectrum analyzer was then adjusted to 100msec.
i. The single sweep function of the spectrum analyzer was used multiple times to determine the maximum number of transmitted pulses that occurred in a 100msec time period.
j. The maximum number of pulses transmitted in a 100msec time period was recorded and then plotted

using a 'screen dump' utility.

k. The duty cycle correction was calculated using the following equation:

Duty Cycle Correction Factor (dB) = D.C. (dB)
D.C. (dB) = 20 x log [((pulse width (msec)) x (#pulses in a 100msecperiod)) / 100msec]

5.2.7.3 Results

Duty cycle plots are shown on page 78. The EUT transmits a 4.04msec pulse one time in a 100msec period. This results in a duty cycle correction factor of -27.87dB.

5.2.8 Radiated Spurious Emissions Measurements

5.2.8.1 Requirements

Per section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated emissions measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

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

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

5.2.8.2 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 emissions are remeasured using an average detector. If the dwell time per channel of the hopping signal is less than 100msec, then the reading obtained 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

Preliminary radiated emissions plots with the EUT transmitting at 904.94MHz, 914.1MHz, and 923.79MHz are shown on pages 79 through 90. Final radiated emissions data are presented on data pages 91 through 99. As can be seen from the data, all emissions measured from the EUT were within the specification limits. See data pages 91 through 99 for details. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown in Figures 7 through 10.

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 40dB 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 40dB 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 100 through 103 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

It was determined that the Badger Meter, Incorporated Water Meter, Part No. LTE-M frequency hopping spread spectrum transceiver, Serial No. 1, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109 for receivers and Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 902-928 MHz band, when tested per ANSI C63.4-2014.

It was also determined that the Badger Meter, Incorporated Water Meter, Part No. LTE-M frequency hopping spread spectrum transceiver, Serial No. 1 did fully meet the radiated RF emission requirements of the Innovation, Science and Economic Development Canada Radio Standards Specification, RSS-Gen, Section 7.3 for receivers and the Innovation, Science and Economic Development Canada Radio Standards Specification RSS-Gen Section 8.9 and RSS-247 Section 5, 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 A2LA, 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
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/5/2018	4/5/2019
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	4/12/2018	4/12/2019
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
CDY0	WORKSTATION	ELITE	WORKSTATION		WINDOWS 7	N/A	
GRE2	SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	3/6/2018	3/6/2019
MDC26	MULTIMETER (JAVIER)	FLUKE	179	34720014	I;VDC;VAC;R	8/31/2017	8/31/2018
MSV11	OCSILLOSCOPE	LECROY	204Xi-A	LCRY614N49862	2 GHZ	7/26/2018	7/26/2019
MSV12	OSCILLOSCOPE	LECROY	204Xi-A	LCRY614N49829	2GHZ	7/5/2018	7/5/2019
NDD1	TUNED DIPOLE ANTENNA	EMPIRE DEVICES	DM-105/T1	---	20-200MHZ	NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	9/11/2017	9/11/2018
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/31/2018	5/31/2020
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
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	2/23/2018	2/23/2019
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
SHC2	Power Supplies	HENGFU	HF60W-SL-24	A11372702	24V	NOTE 1	
T1N6	10DB 20W ATTENUATOR	NARDA	766-10	---	DC-4GHZ	5/14/2018	5/14/2020
T2D5	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9244	DC-18GHZ	5/14/2018	5/14/2020
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
WQB0	RE_8546A	ELITE	RE_8546A	----	----	I/O	
WQC0	HF_8546A	ELITE	HF_8546A	---	---	I/O	
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.

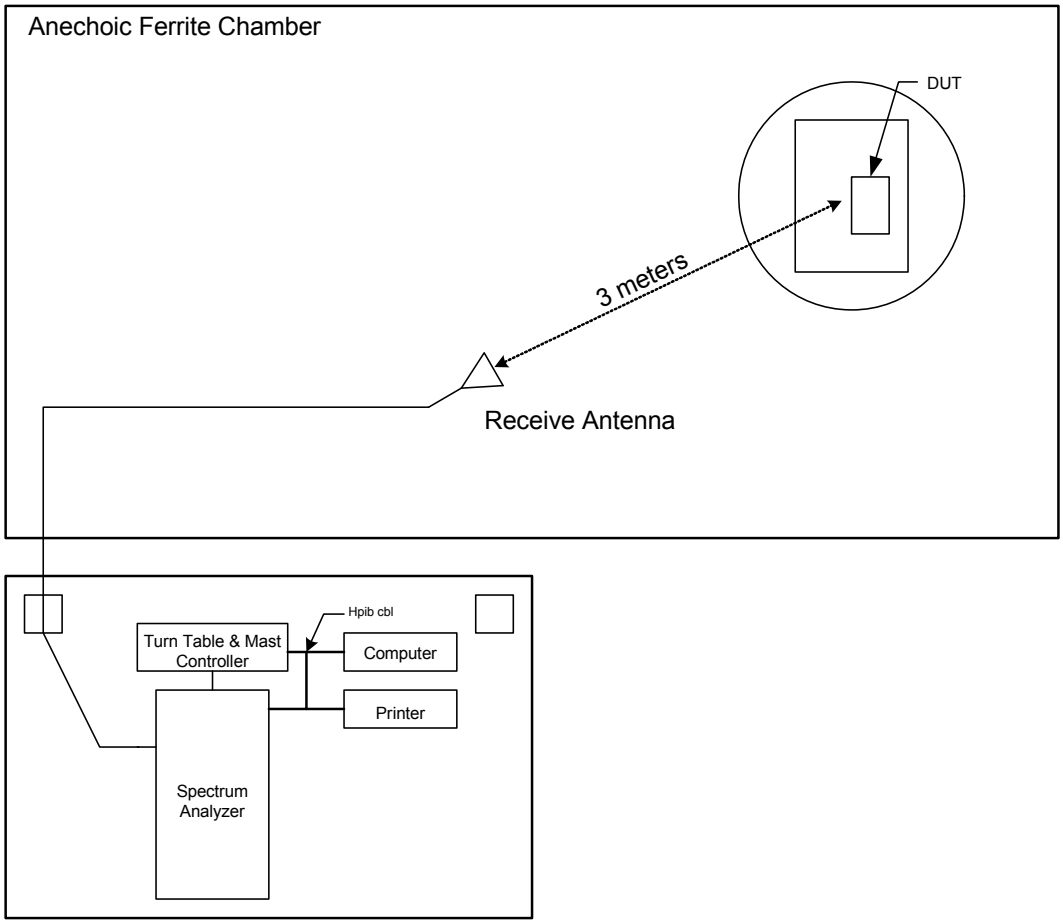


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2 – Photograph of the EUT

Figure 3 – Receiver Test Setup for Radiated Emissions – 30MHz to 1000MHz, Horizontal Polarization

Figure 4 – Receiver Test Setup for Radiated Emissions – 30MHz to 1000MHz, Vertical Polarization

Figure 5 – Receiver Test Setup for Radiated Emissions – 1GHz to 10GHz, Horizontal Polarization

Figure 6 – Receiver Test Setup for Radiated Emissions – 1GHz to 10GHz, Vertical Polarization

Figure 7 – Transmitter Test Setup for Radiated Emissions – 30MHz to 1000MHz, Horizontal Polarization

Figure 8 – Transmitter Test Setup for Radiated Emissions – 30MHz to 1000MHz, Vertical Polarization

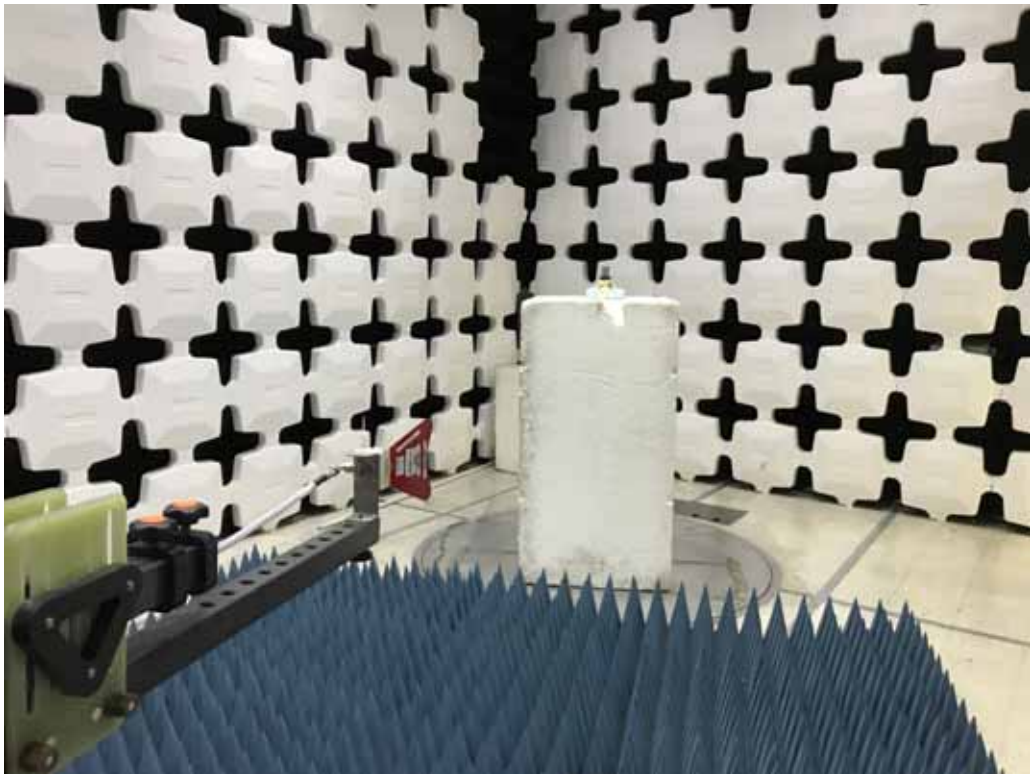


Figure 9 – Transmitter Test Setup for Radiated Emissions – 1GHz to 10GHz, Horizontal Polarization

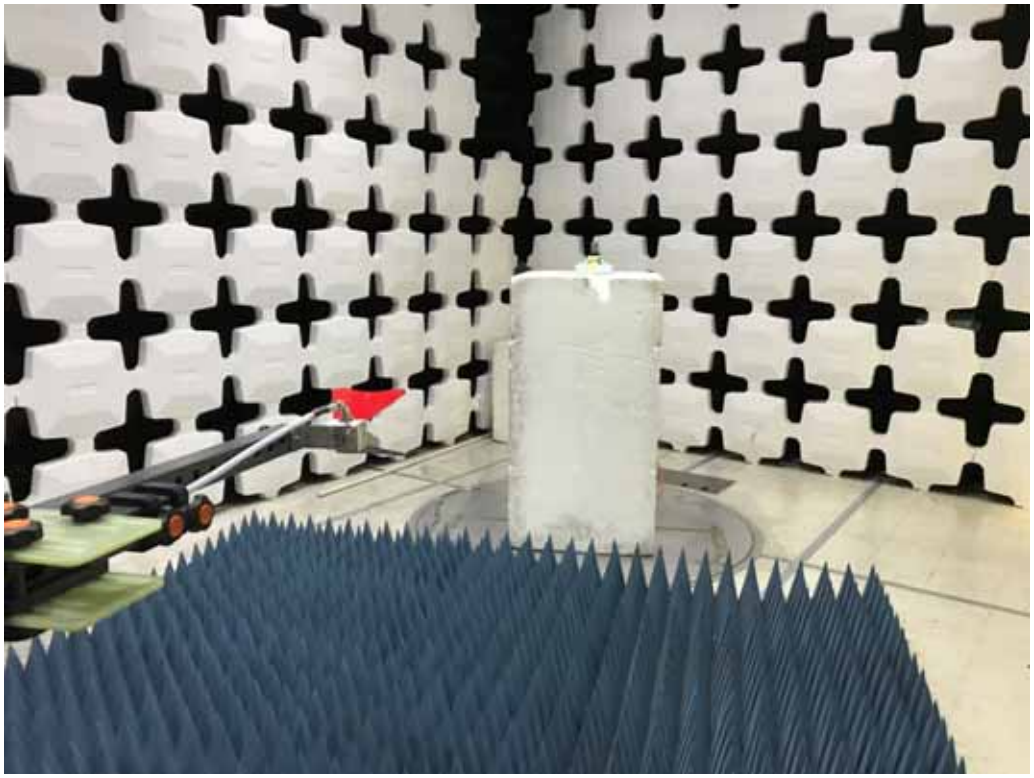
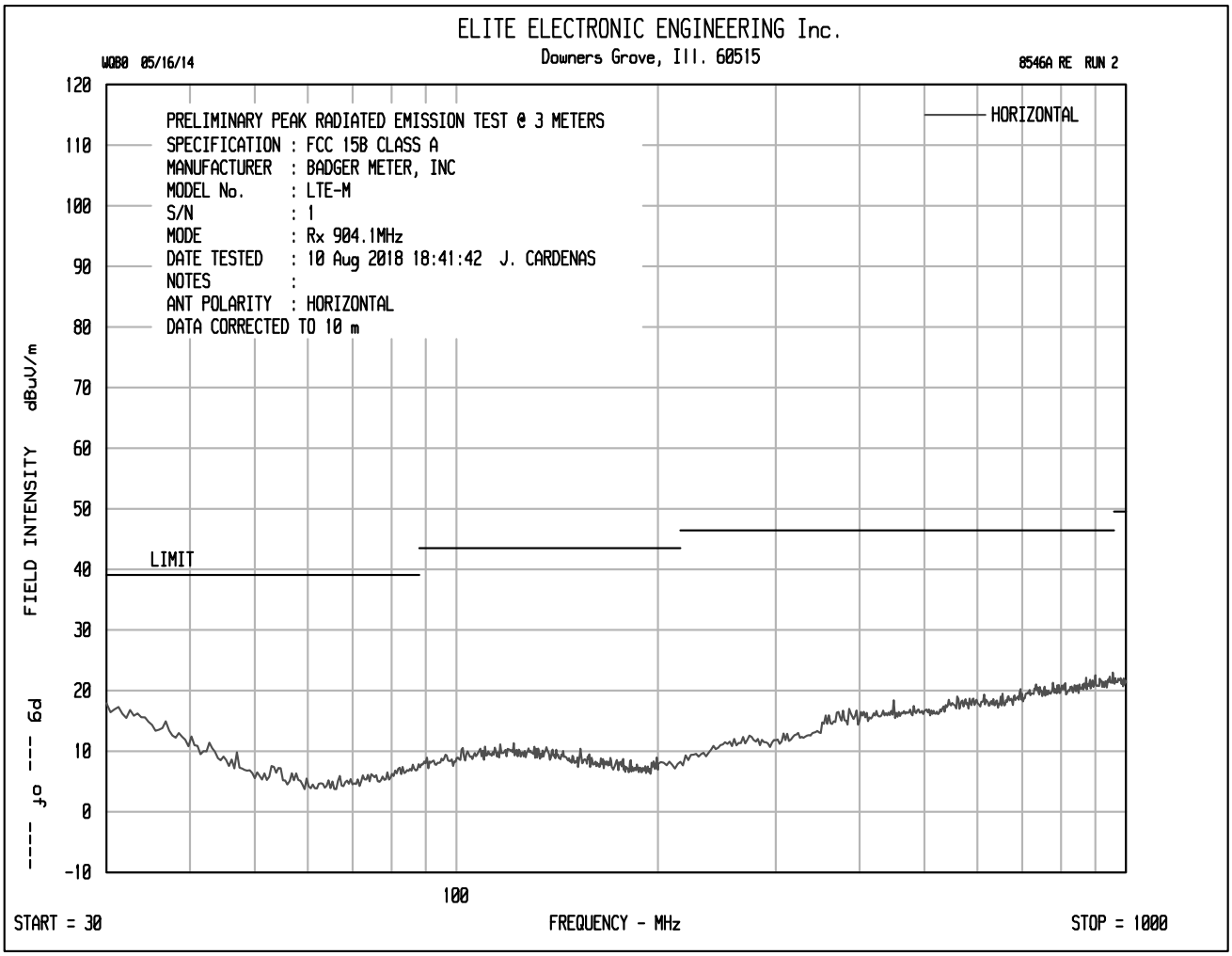
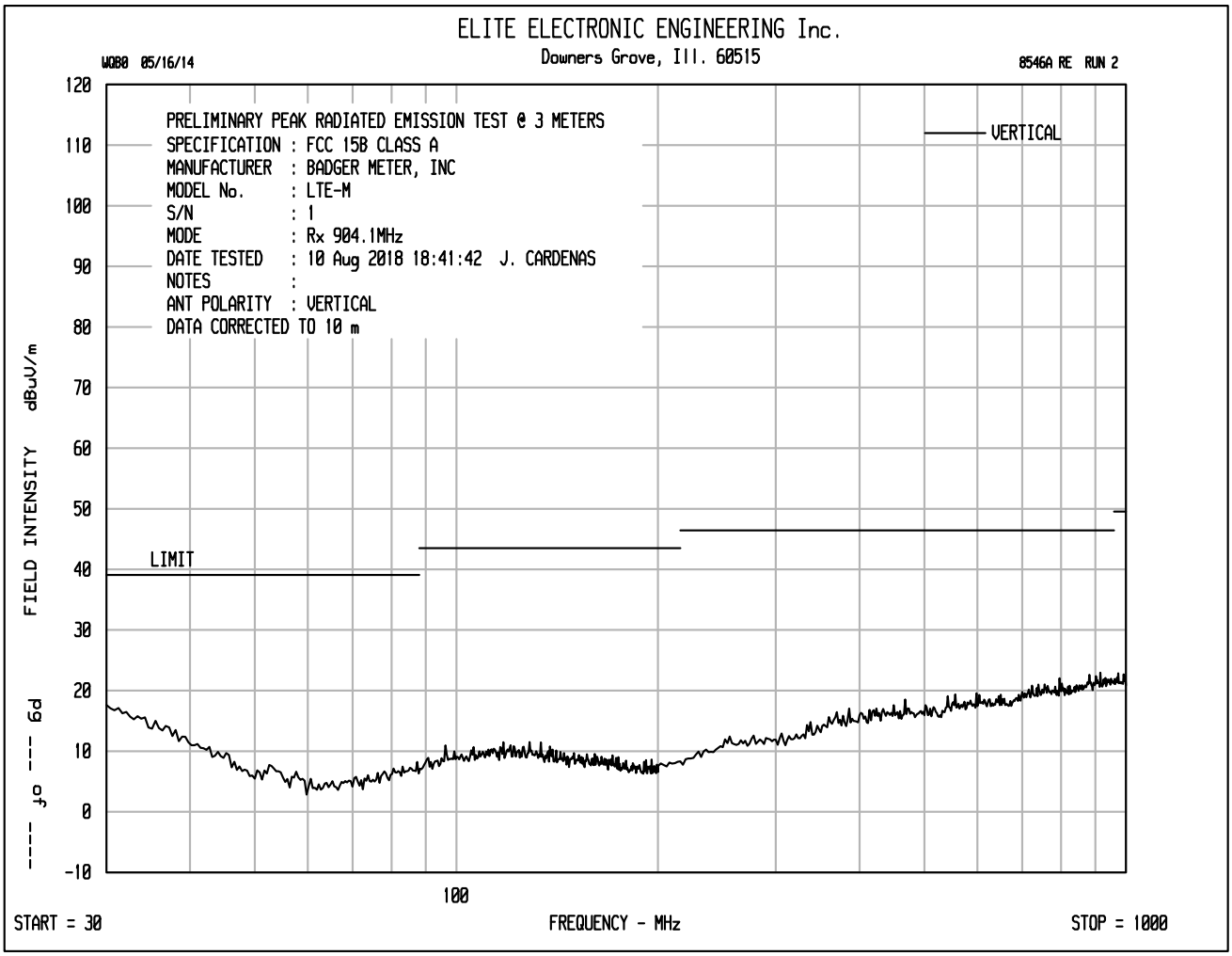


Figure 10 – Transmitter Test Setup for Radiated Emissions – 1GHz to 10GHz, Vertical Polarization


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 2
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
S/N : 1
MODE : Rx 904.1MHz
DATE TESTED : 10 Aug 2018 18:41:42 J. CARDENAS
NOTES :
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 10 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

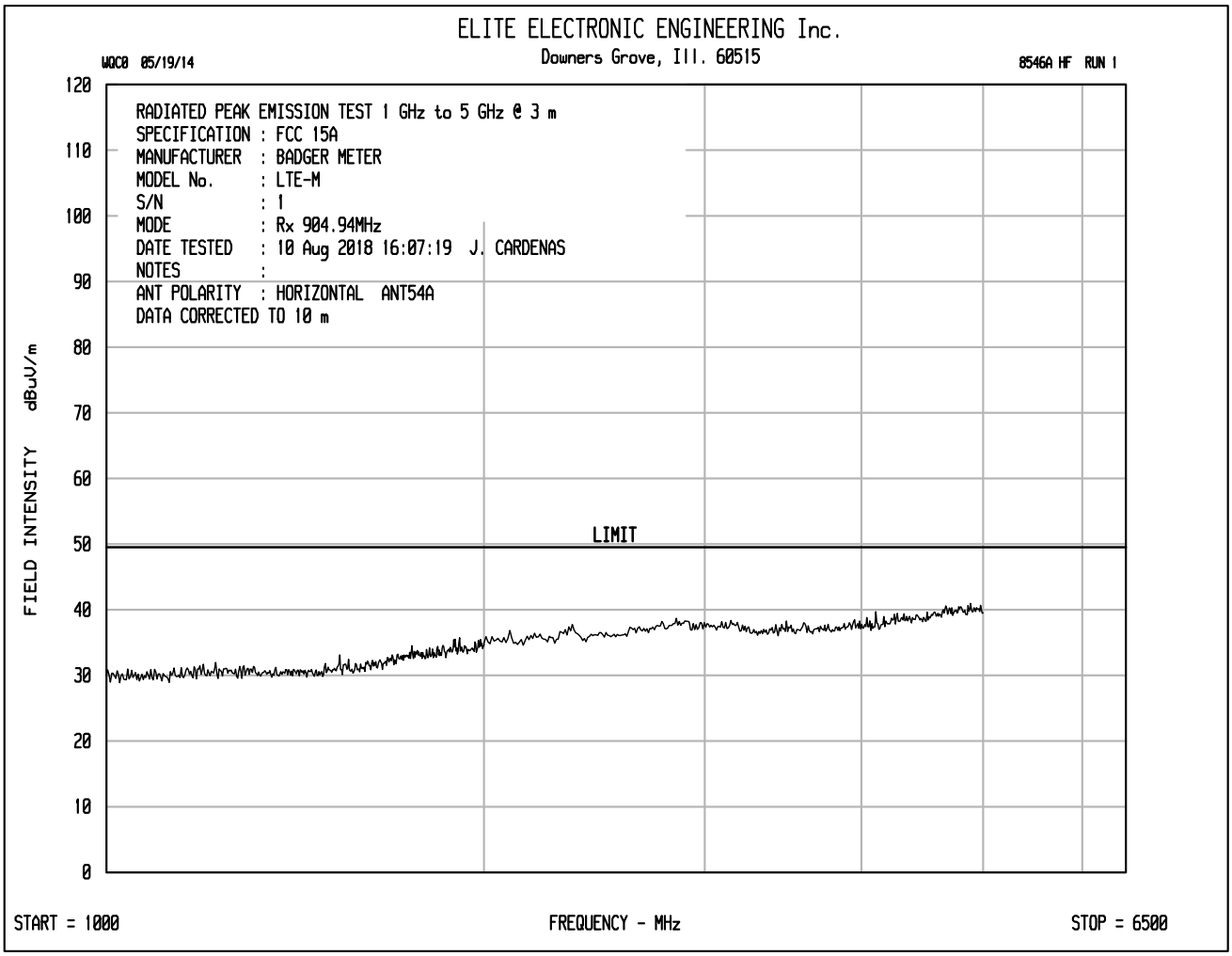

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 2
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
S/N : 1
MODE : Rx 904.1MHz
DATE TESTED : 10 Aug 2018 18:41:42 J. CARDENAS
NOTES :
ANT POLARITY : VERTICAL
DATA CORRECTED TO 10 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

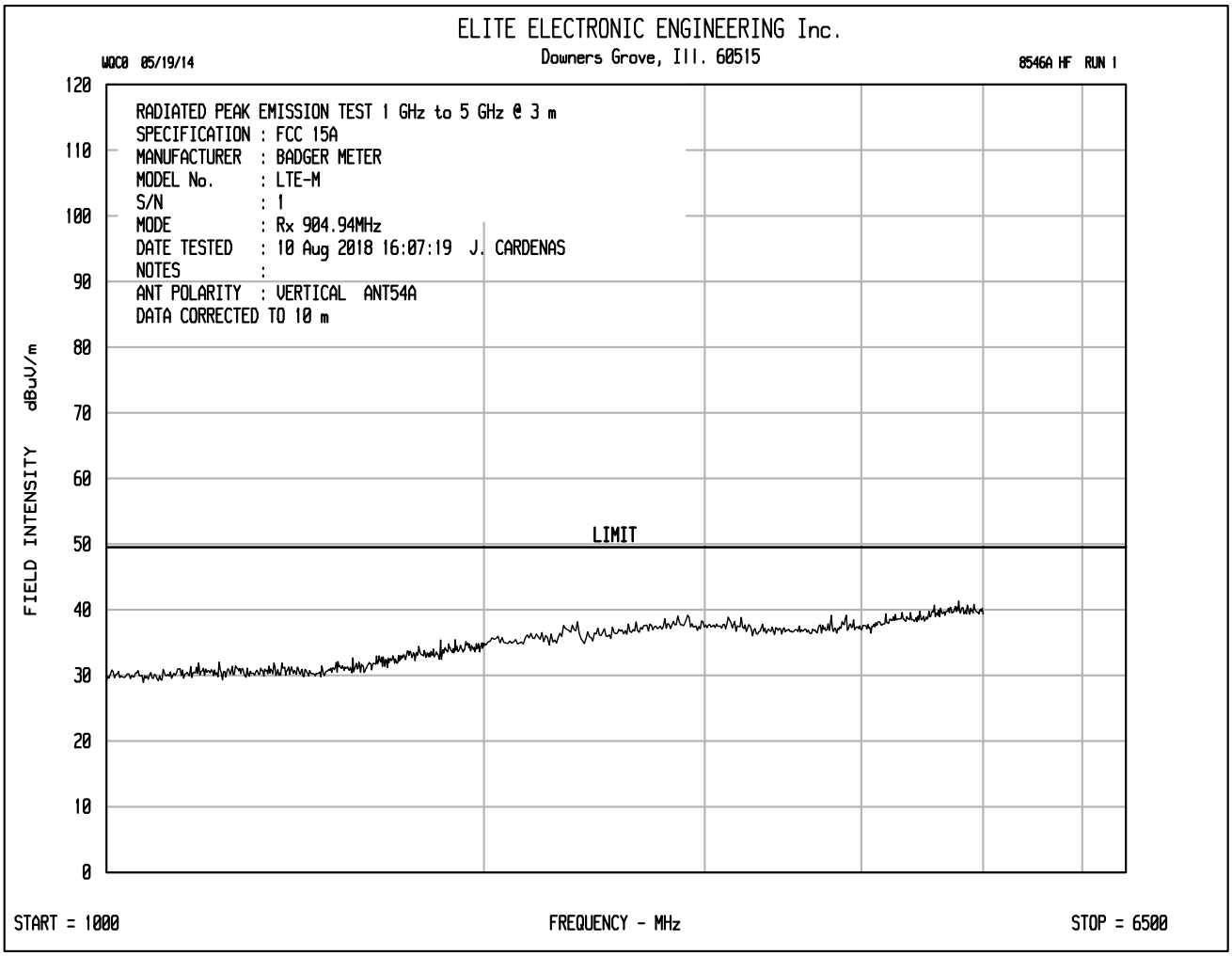
RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL NO. : LTE-M
SERIAL NO. : 1
TEST MODE : Rx 904.1MHz
NOTES :
TEST DATE : 10 Aug 2018 18:41:42
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 10 m)

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
31.04	-8.0	25.7	.4	0.0	-10.5	7.7	39.1	225	200	H
52.11	-6.3	14.3	.4	0.0	-10.5	-2.0	39.1	180	340	V
89.22	-7.2	16.3	.4	0.0	-10.5	-1.0	43.5	90	120	V
115.94	-8.2	18.7	.5	0.0	-10.5	.5	43.5	315	120	V
130.67	-8.0	18.6	.5	0.0	-10.5	.7	43.5	180	120	V
152.33	-7.9	17.3	.6	0.0	-10.5	-.5	43.5	-0	120	H
172.64	-8.2	16.5	.7	0.0	-10.5	-1.4	43.5	225	200	V
261.33	-7.1	18.7	.8	0.0	-10.5	1.9	46.4	315	200	V
357.28	-6.5	21.4	1.0	0.0	-10.5	5.5	46.4	135	200	H
470.76	-6.8	23.2	1.1	0.0	-10.5	7.1	46.4	315	340	V
560.63	-6.9	24.5	1.1	0.0	-10.5	8.2	46.4	135	120	V
587.63	-6.9	24.5	1.1	0.0	-10.5	8.3	46.4	180	340	V
802.49	-6.5	26.2	1.5	0.0	-10.5	10.7	46.4	180	340	V
876.41	-5.9	26.7	1.5	0.0	-10.5	11.9	46.4	90	340	V
949.60	-5.9	27.1	1.5	0.0	-10.5	12.3	46.4	135	340	H

tested by: Javier Cardenas
J. CARDENAS

pg ___ of ____

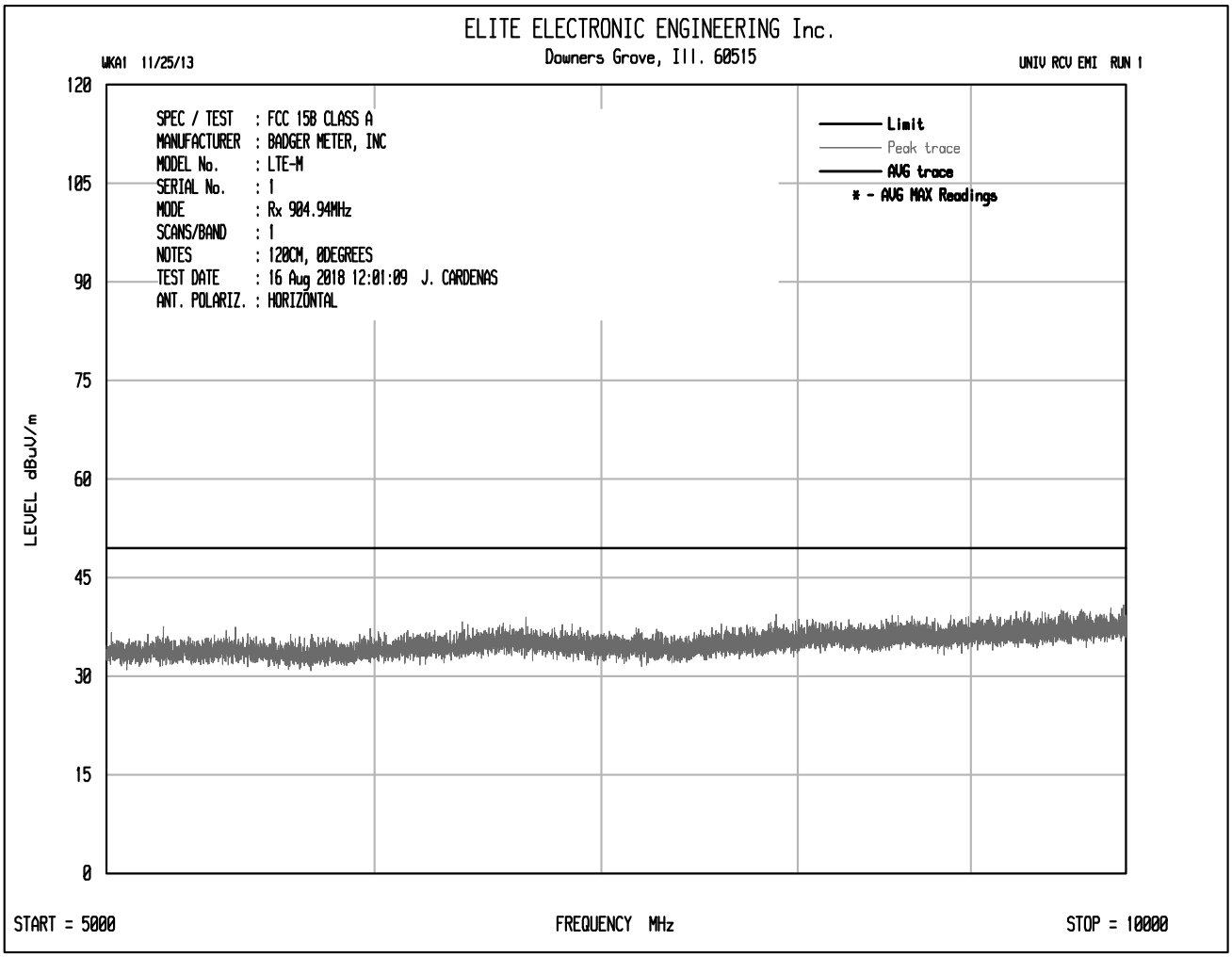

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC0 05/19/14
8546A HF RUN 1
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
S/N : 1
MODE : Rx 904.94MHz
DATE TESTED : 10 Aug 2018 16:07:19 J. CARDENAS
NOTES :
ANT POLARITY : HORIZONTAL ANT54A
DATA CORRECTED TO 10 m
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
LIMIT
START = 1000
FREQUENCY - MHz
STOP = 6500

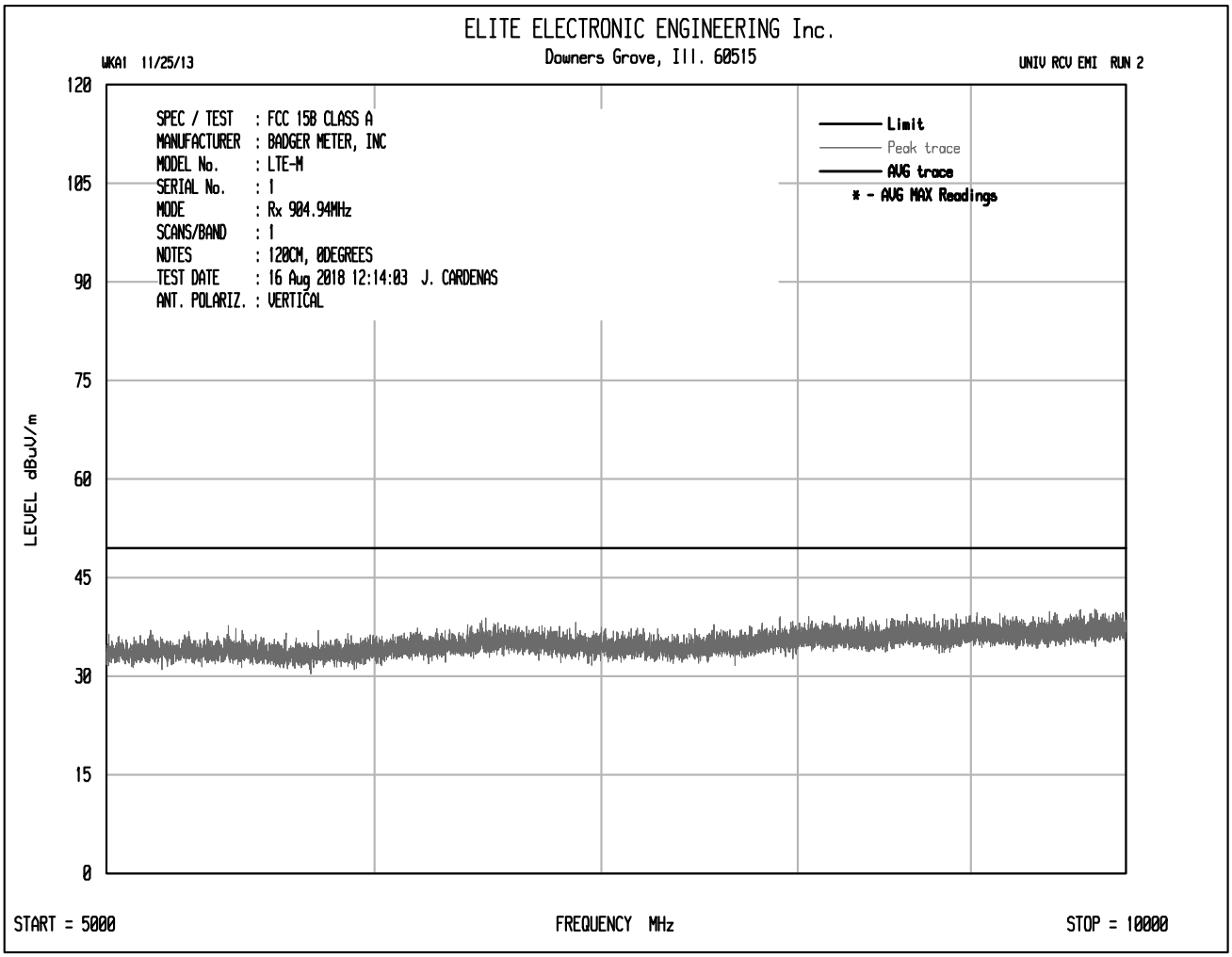

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC0 05/19/14
8546A HF RUN 1
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
S/N : 1
MODE : Rx 904.94MHz
DATE TESTED : 10 Aug 2018 16:07:19 J. CARDENAS
NOTES :
ANT POLARITY : VERTICAL ANT54A
DATA CORRECTED TO 10 m
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
LIMIT
START = 1000
FREQUENCY - MHz
STOP = 6500

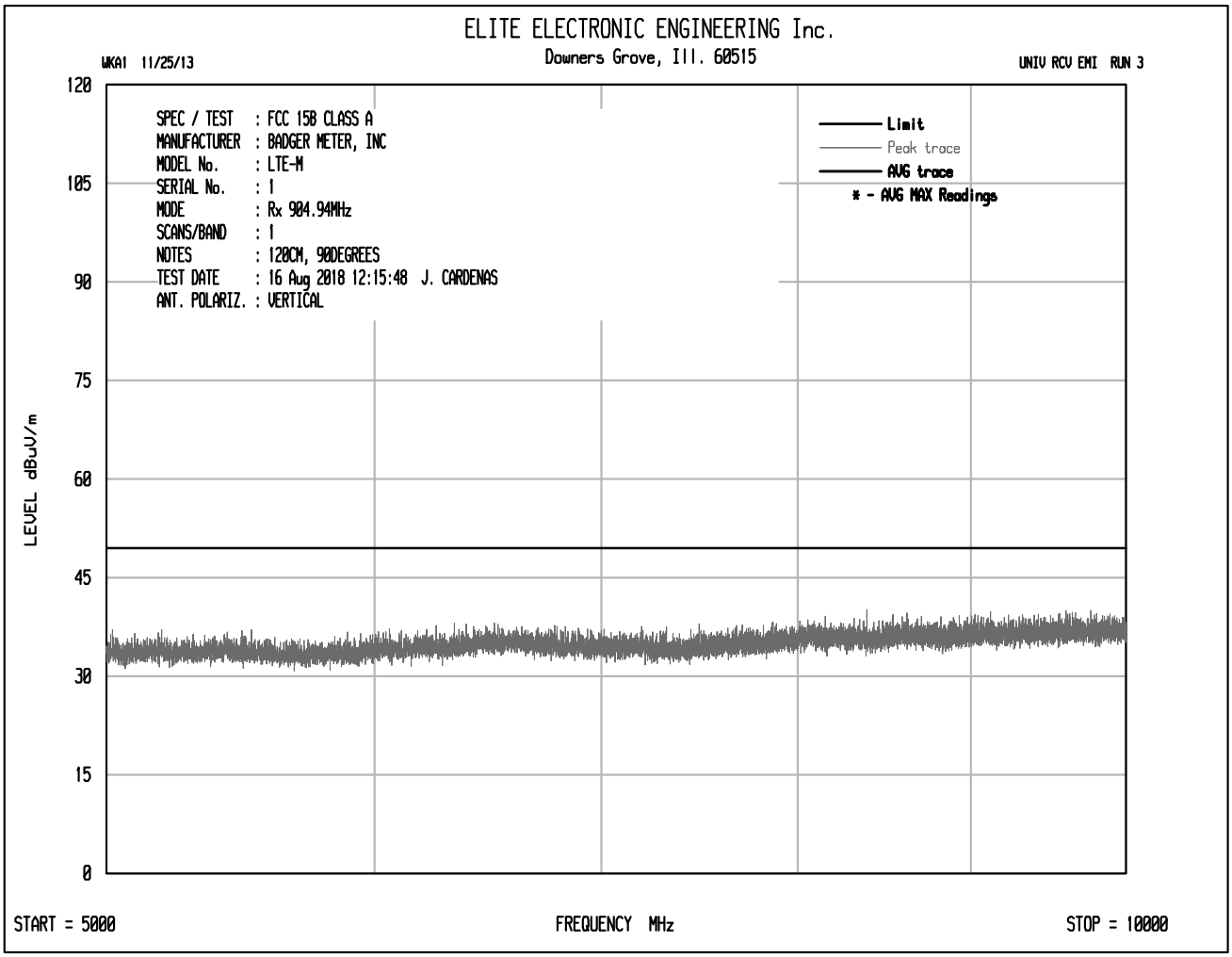
RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL NO. : LTE-M
SERIAL NO. : 1
TEST MODE : Rx 904.94MHz
NOTES :
TEST DATE : 10 Aug 2018 16:07:19
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 10 m)
ANTENNA : ANT54A

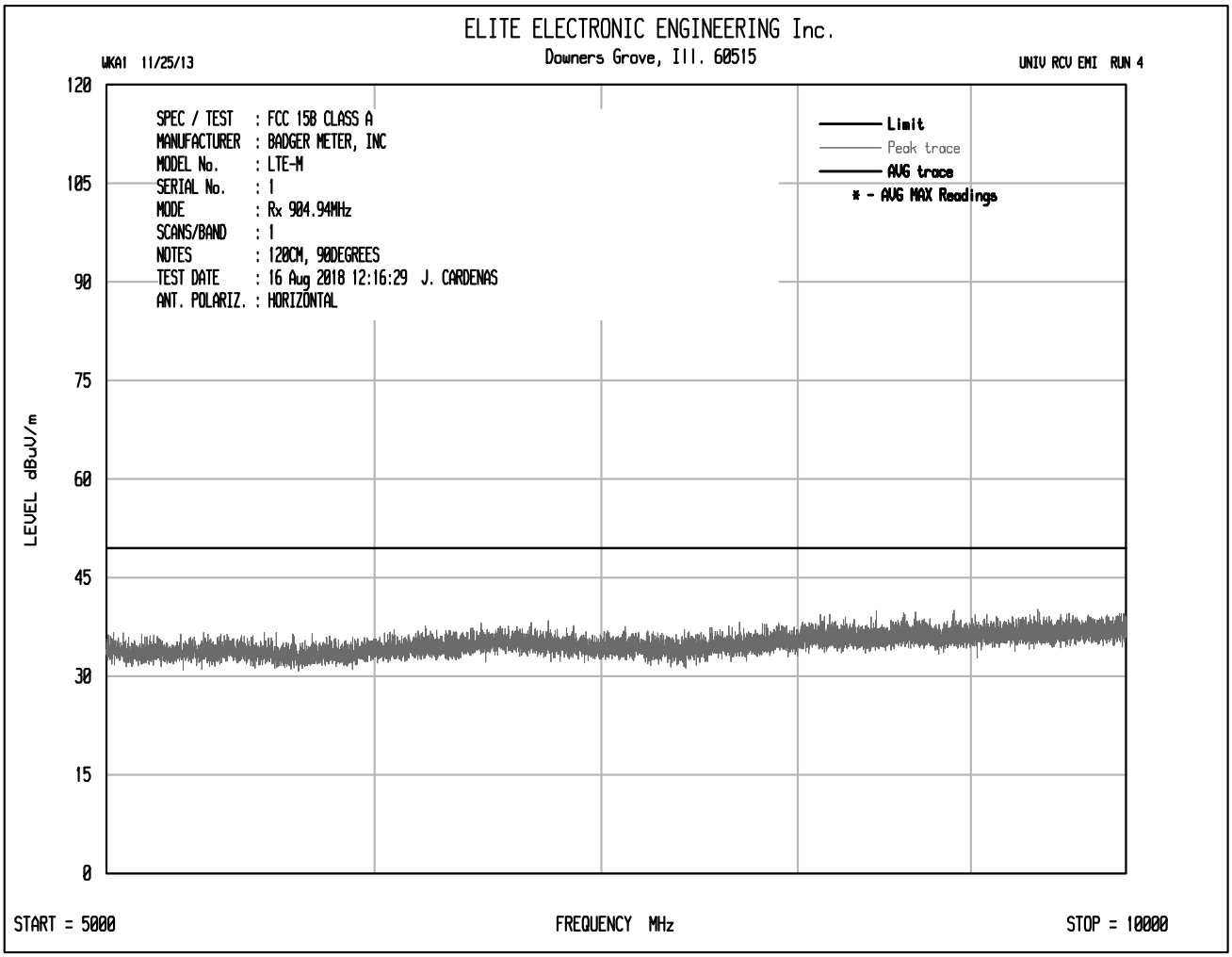
FREQUENCY	AVG READING	ANT FAC	CBL FAC	DIST FAC	TOTAL	AVG LIMIT	PASS/ FAIL	AZ	ANT HT	POLAR
MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m		deg	cm	
1063.15	-4.3	29.3	1.6	-10.5	16.2	49.5		315	340	H
1380.33	-4.7	29.5	1.9	-10.5	16.2	49.5		180	340	V
1648.94	-3.8	30.5	2.1	-10.5	18.3	49.5		315	120	V
1760.70	7.5	31.3	2.1	-10.5	30.5	49.5		315	120	H
2091.78	-3.0	32.7	2.4	-10.5	21.6	49.5		315	120	H
4541.11	-5.0	36.1	3.6	-10.5	24.2	49.5		270	120	V

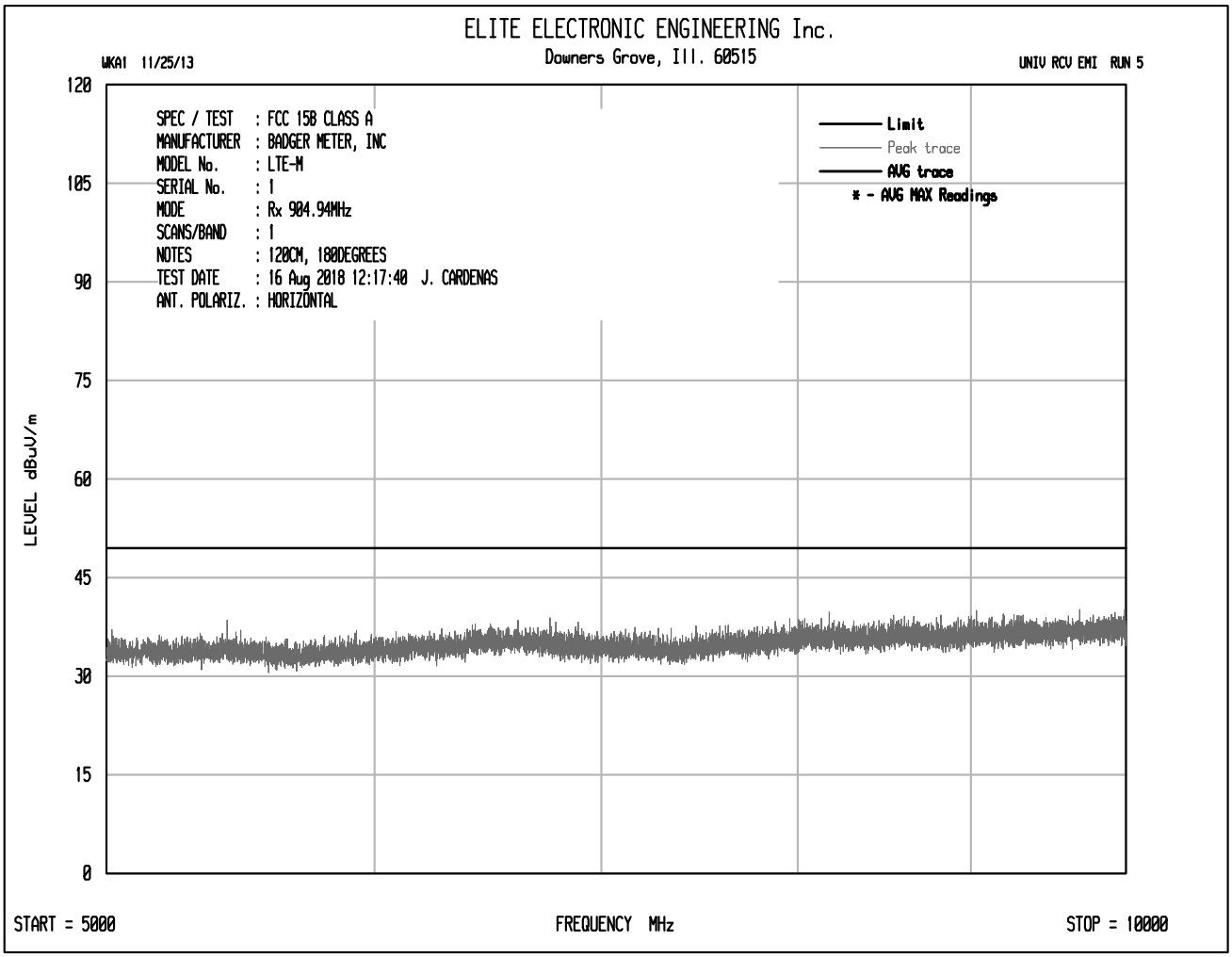
tested by: Javier Cardenas
J. CARDENAS

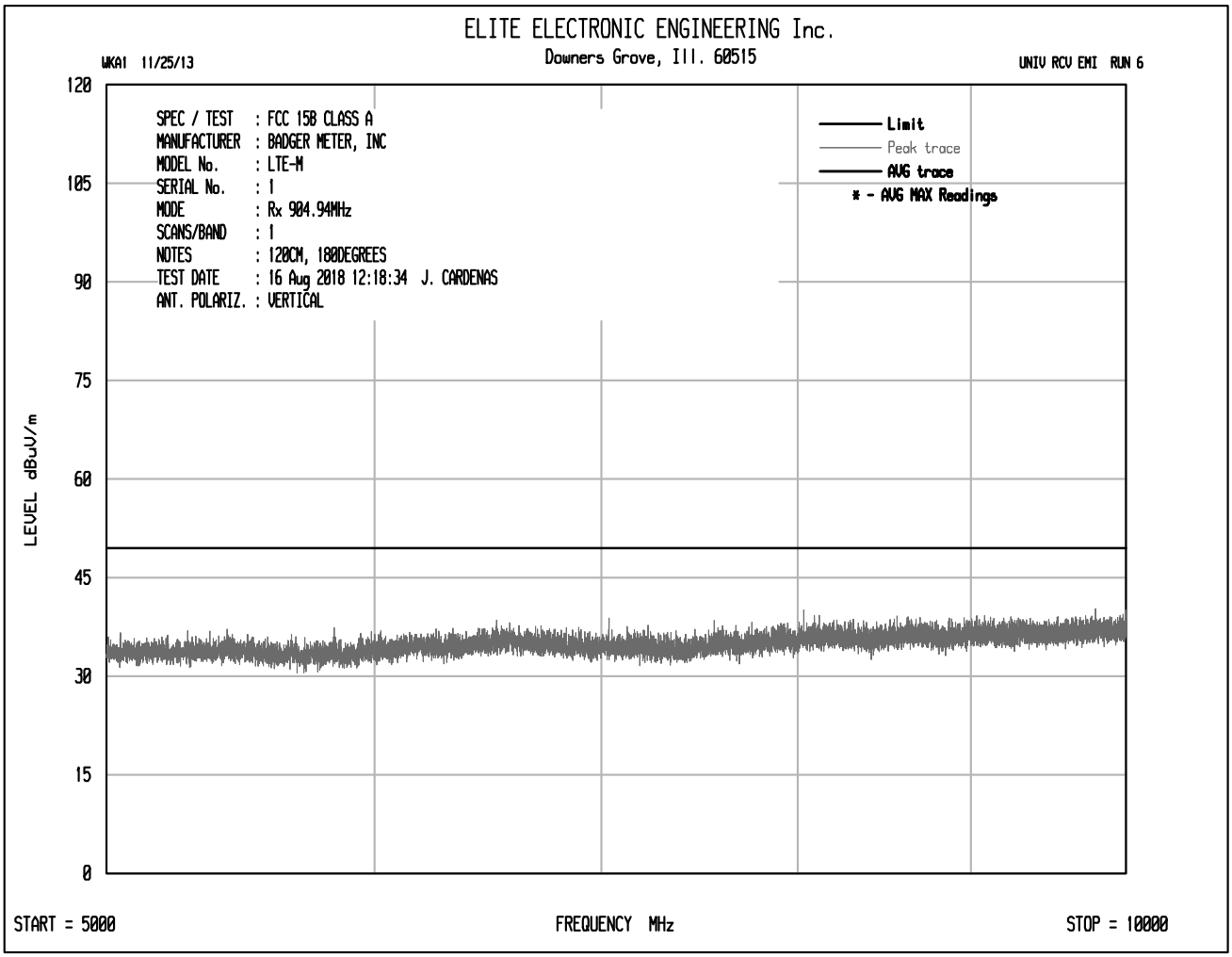

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 1
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 0DEGREES
TEST DATE : 16 Aug 2018 12:01:09 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

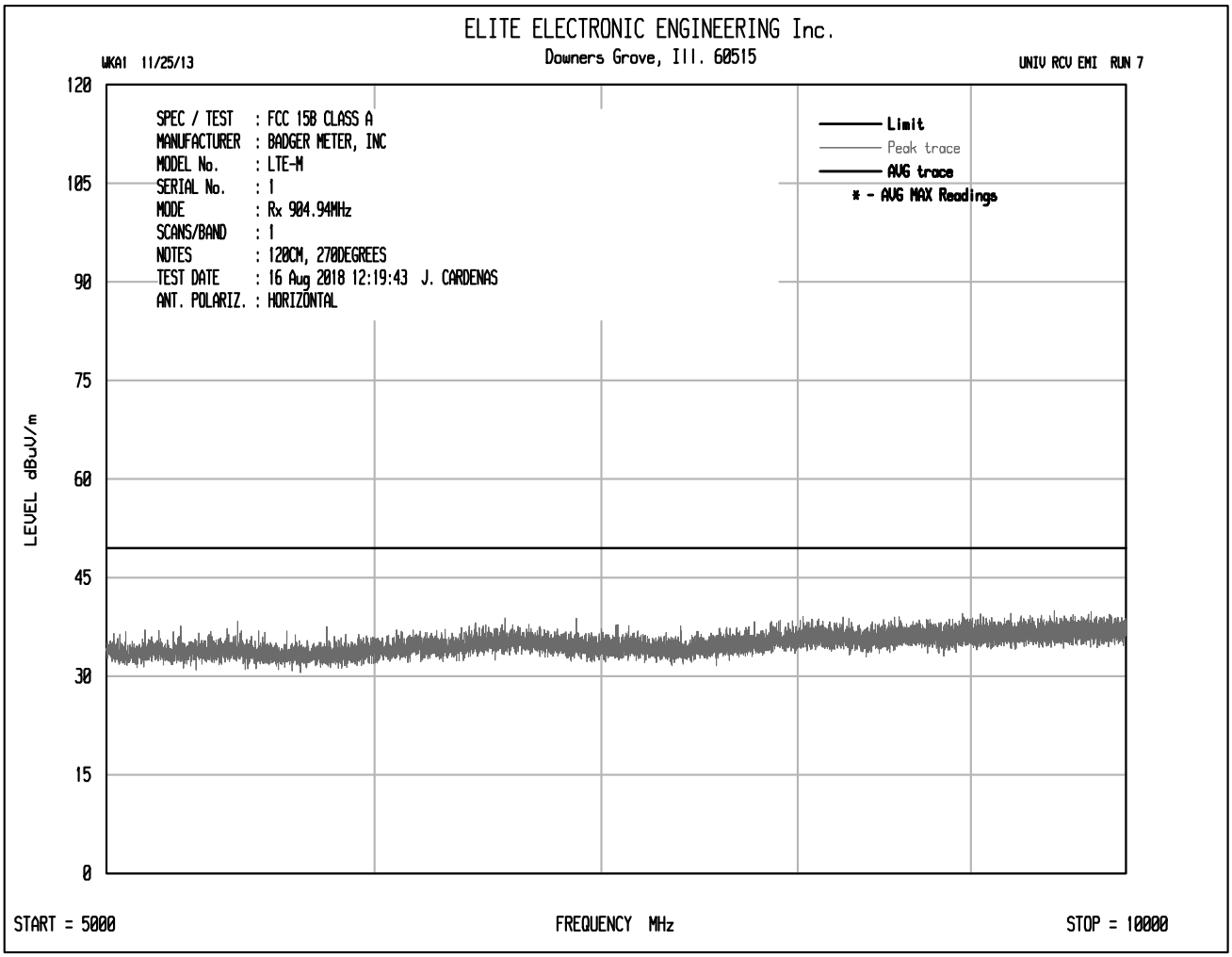

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 2
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 0DEGREES
TEST DATE : 16 Aug 2018 12:14:03 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

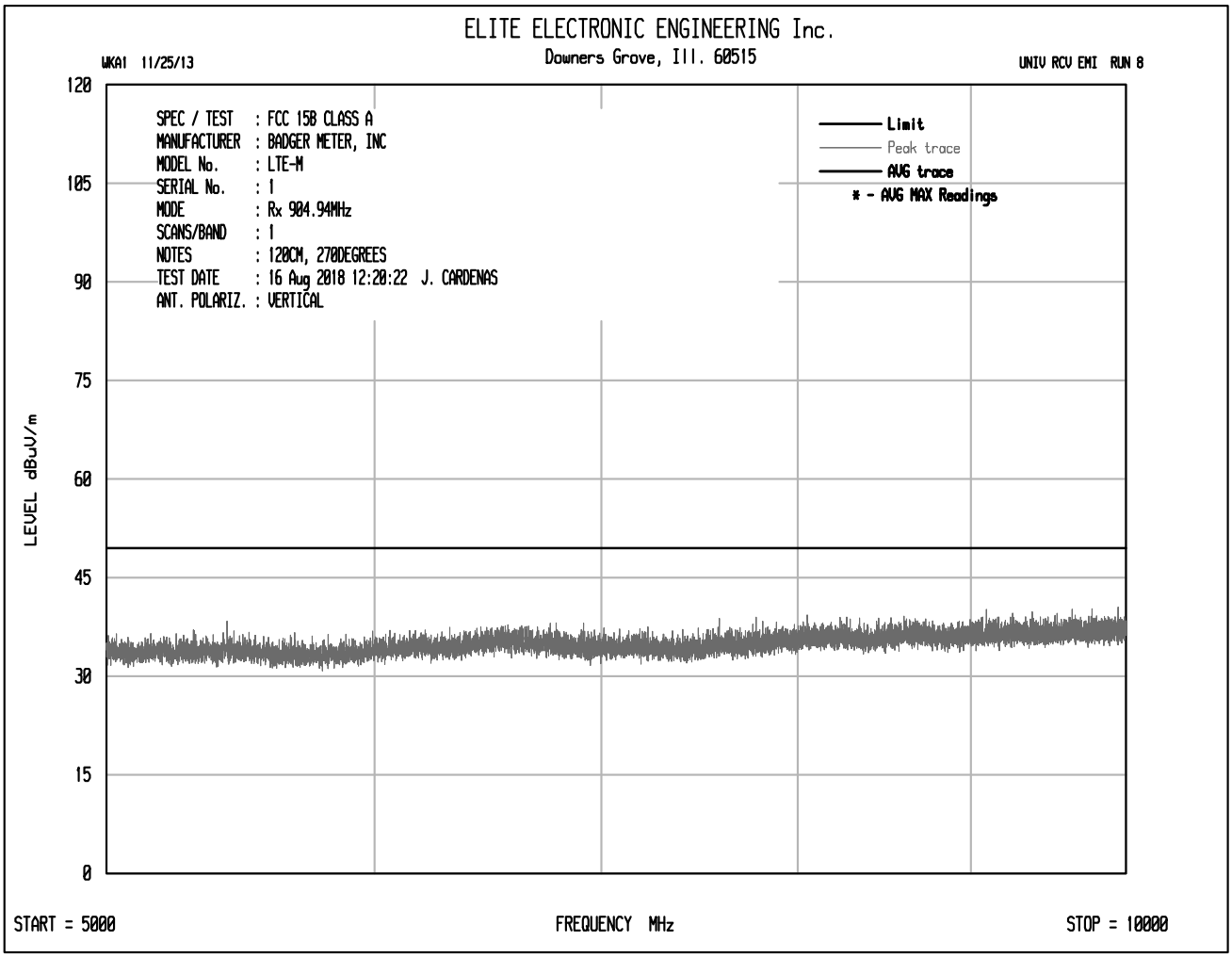

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 3
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 90DEGREES
TEST DATE : 16 Aug 2018 12:15:48 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

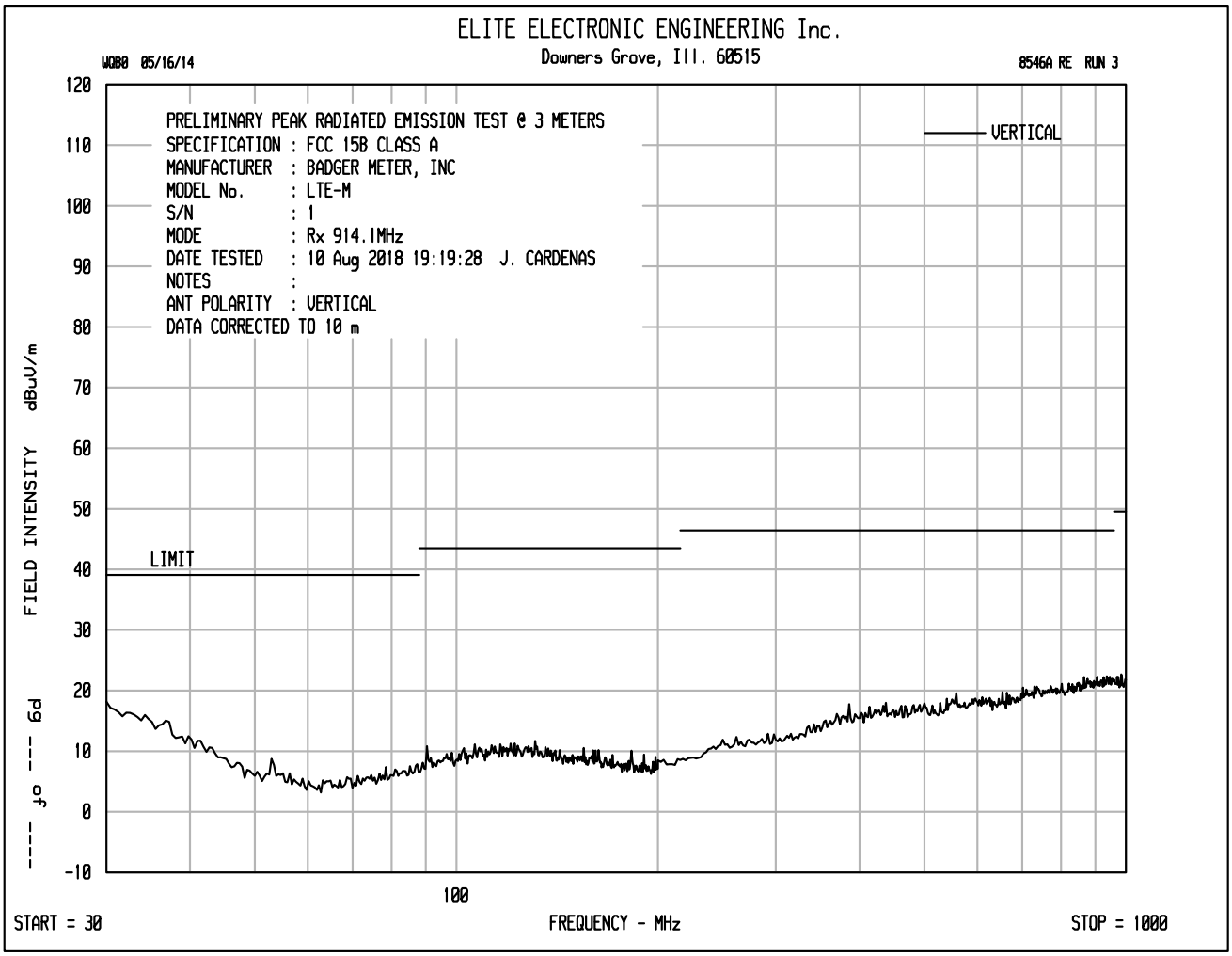

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 4
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 90DEGREES
TEST DATE : 16 Aug 2018 12:16:29 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

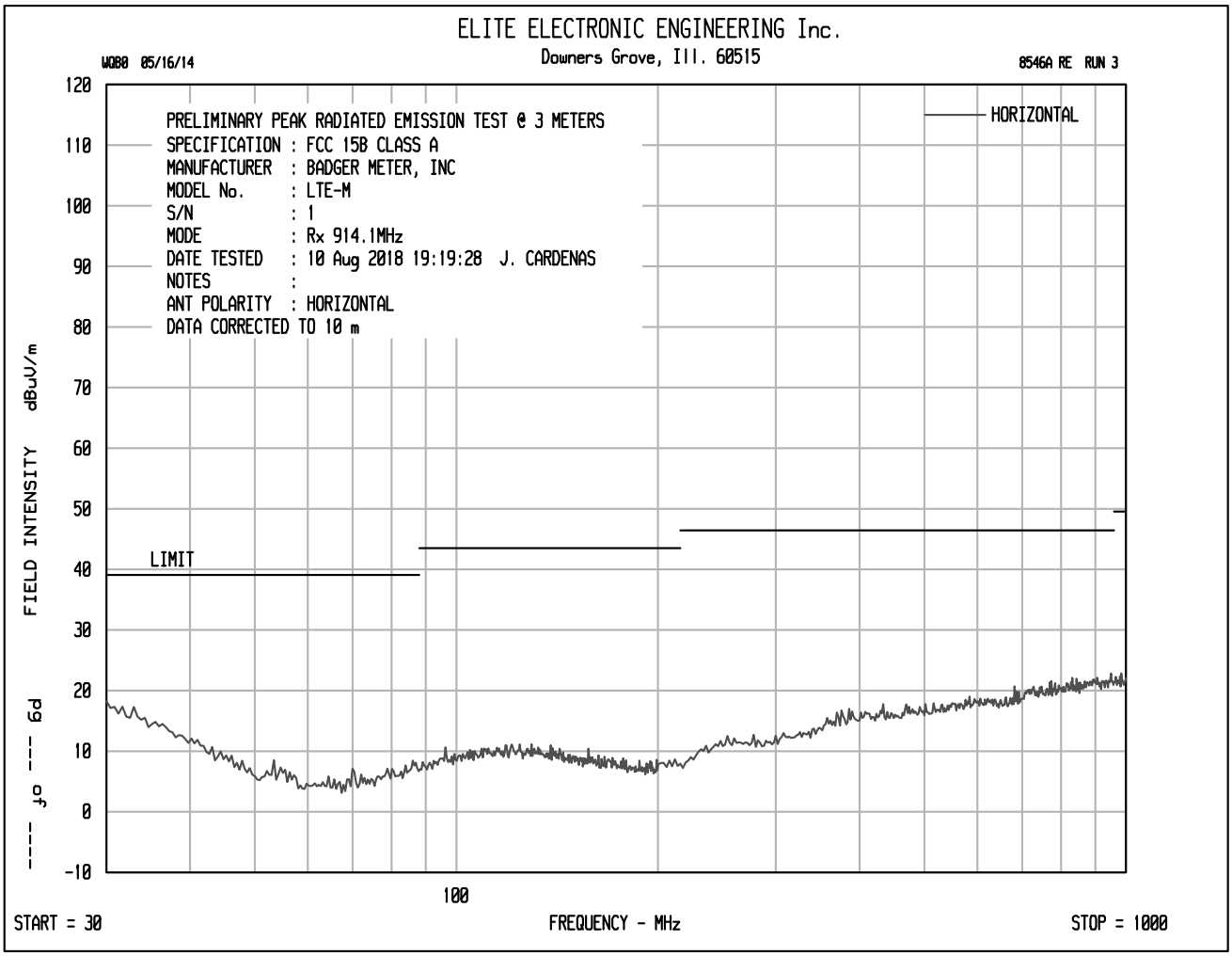

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 5
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 180DEGREES
TEST DATE : 16 Aug 2018 12:17:40 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 6
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 180DEGREES
TEST DATE : 16 Aug 2018 12:18:34 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 7
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 270DEGREES
TEST DATE : 16 Aug 2018 12:19:43 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 8
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 904.94MHz
SCANS/BAND : 1
NOTES : 120CM, 270DEGREES
TEST DATE : 16 Aug 2018 12:20:22 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 3
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
S/N : 1
MODE : Rx 914.1MHz
DATE TESTED : 10 Aug 2018 19:19:28 J. CARDENAS
NOTES :
ANT POLARITY : VERTICAL
DATA CORRECTED TO 10 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- uo --- pg
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 3
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
S/N : 1
MODE : Rx 914.1MHz
DATE TESTED : 10 Aug 2018 19:19:28 J. CARDENAS
NOTES :
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 10 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- uo --- 9d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

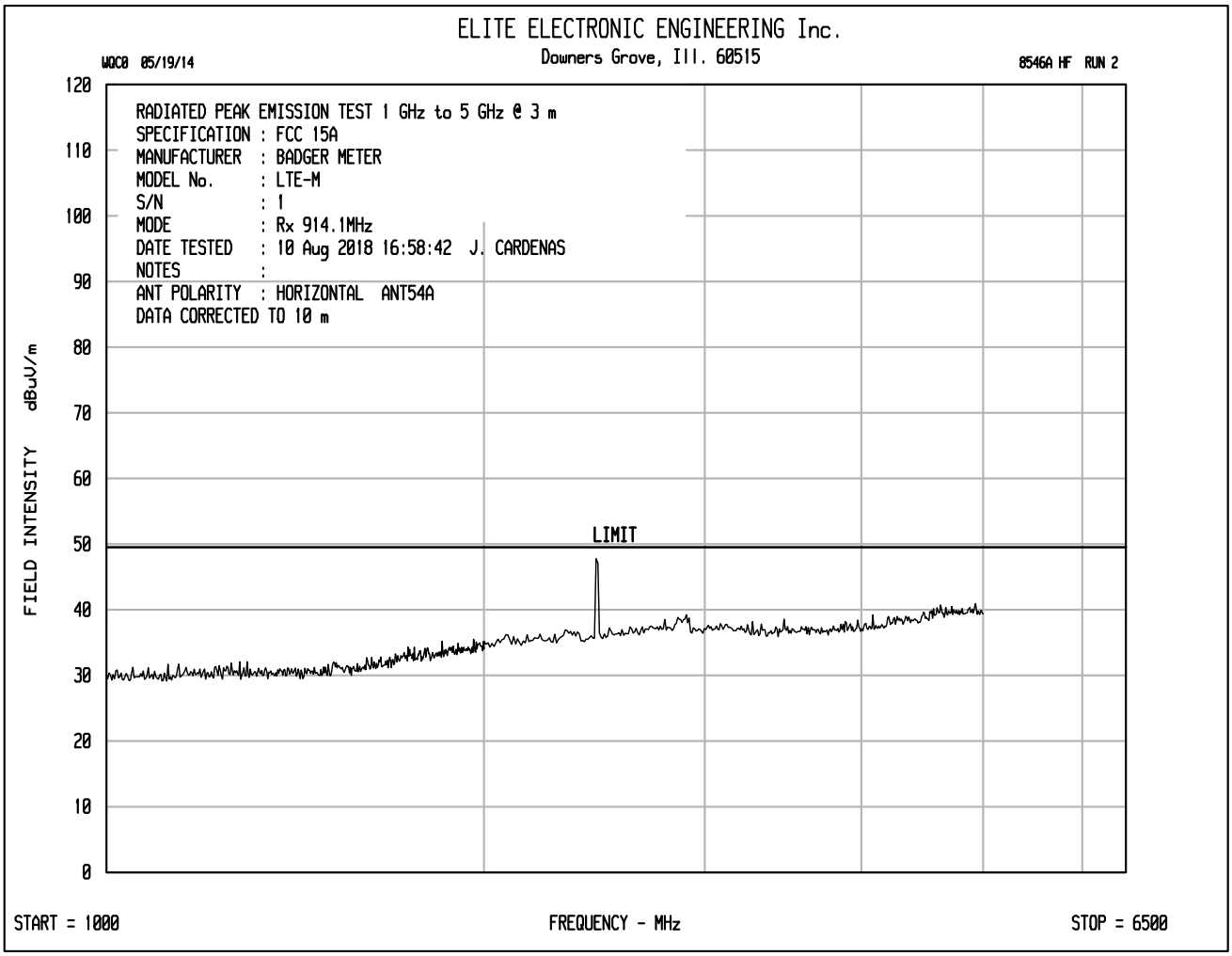
ETR No. 8546A
DATA SHEET TEST NO. 3

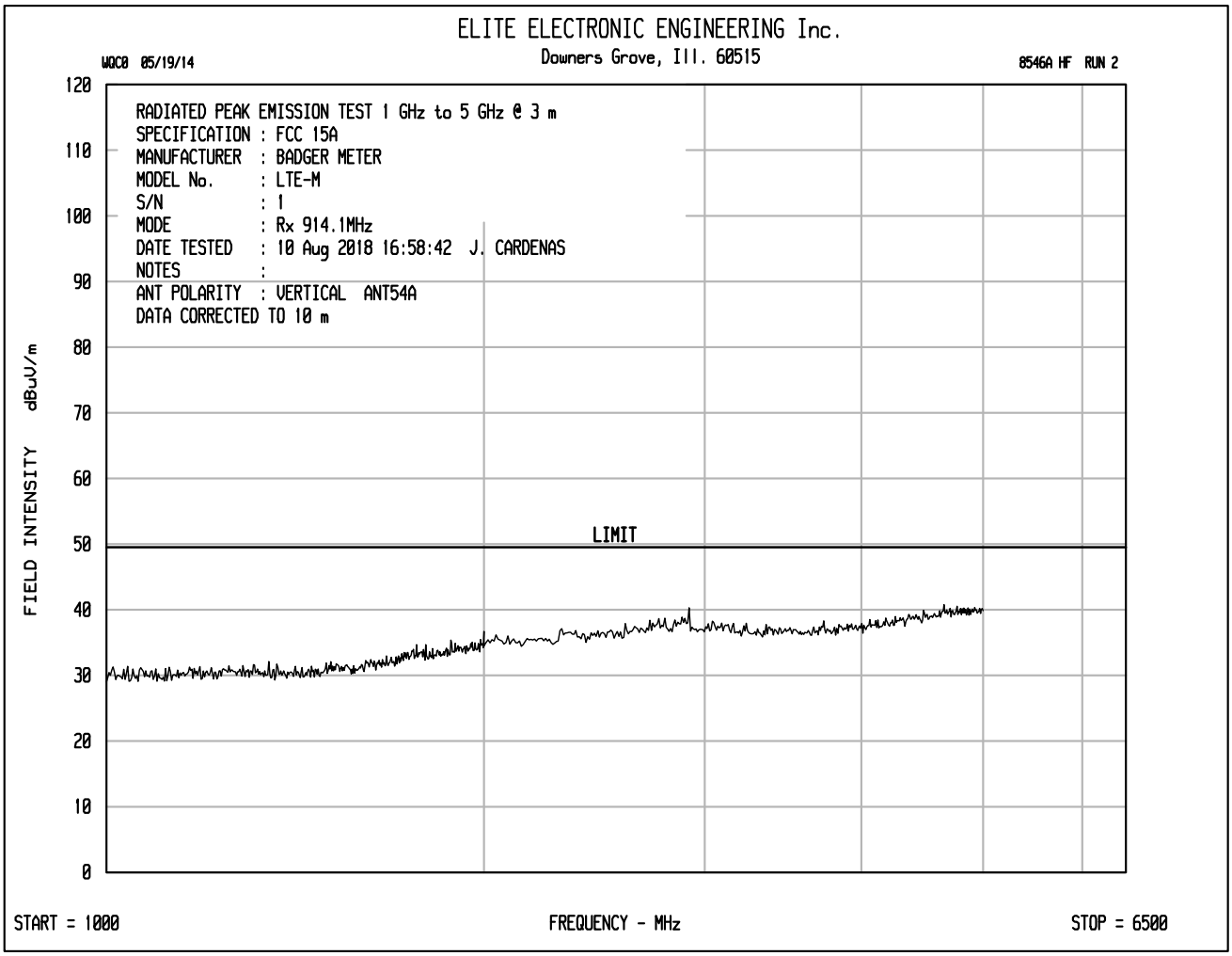
RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL NO. : LTE-M
SERIAL NO. : 1
TEST MODE : Rx 914.1MHz
NOTES :
TEST DATE : 10 Aug 2018 19:19:28
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 10 m)

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
52.50	-6.2	14.3	.4	0.0	-10.5	-1.9	39.1	135	120	V
84.78	-7.0	15.5	.4	0.0	-10.5	-1.5	39.1	225	340	H
122.18	-8.0	18.8	.5	0.0	-10.5	.8	43.5	-0	200	V
130.93	-8.1	18.6	.5	0.0	-10.5	.5	43.5	225	340	V
152.86	-7.9	17.2	.6	0.0	-10.5	-.5	43.5	45	200	V
180.93	-7.9	16.0	.7	0.0	-10.5	-1.6	43.5	-0	120	V
261.11	-7.1	18.7	.8	0.0	-10.5	1.9	46.4	270	340	H
358.88	-6.5	21.4	1.0	0.0	-10.5	5.5	46.4	135	340	H
431.99	-2.4	22.8	1.1	0.0	-10.5	11.1	46.4	225	340	V
553.14	-7.0	24.6	1.1	0.0	-10.5	8.2	46.4	45	340	V
676.82	-7.1	24.8	1.3	0.0	-10.5	8.6	46.4	270	120	H
774.38	-6.6	26.2	1.5	0.0	-10.5	10.7	46.4	180	340	H
901.24	-5.7	26.7	1.5	0.0	-10.5	12.1	46.4	135	340	V
944.13	-5.8	27.0	1.5	0.0	-10.5	12.2	46.4	225	200	H

tested by: Javier Cardenas
J. CARDENAS

pg ___ of ____


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC0 05/19/14
8546A HF RUN 2
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
S/N : 1
MODE : Rx 914.1MHz
DATE TESTED : 10 Aug 2018 16:58:42 J. CARDENAS
NOTES :
ANT POLARITY : HORIZONTAL ANT54A
DATA CORRECTED TO 10 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
WQC0 05/19/14
8546A HF RUN 2
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
S/N : 1
MODE : Rx 914.1MHz
DATE TESTED : 10 Aug 2018 16:58:42 J. CARDENAS
NOTES :
ANT POLARITY : VERTICAL ANT54A
DATA CORRECTED TO 10 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

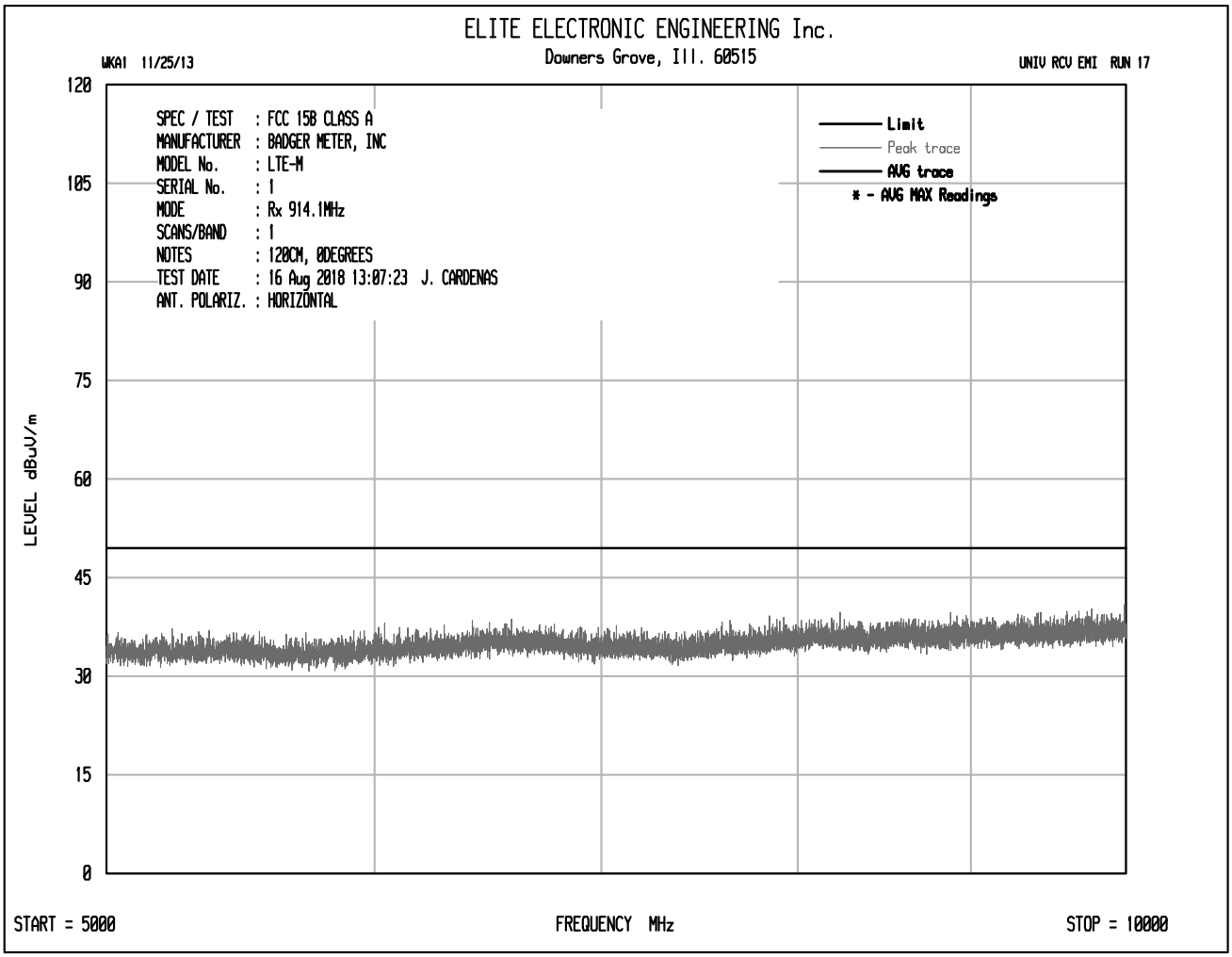
DATA SHEET HF TEST NO. 2

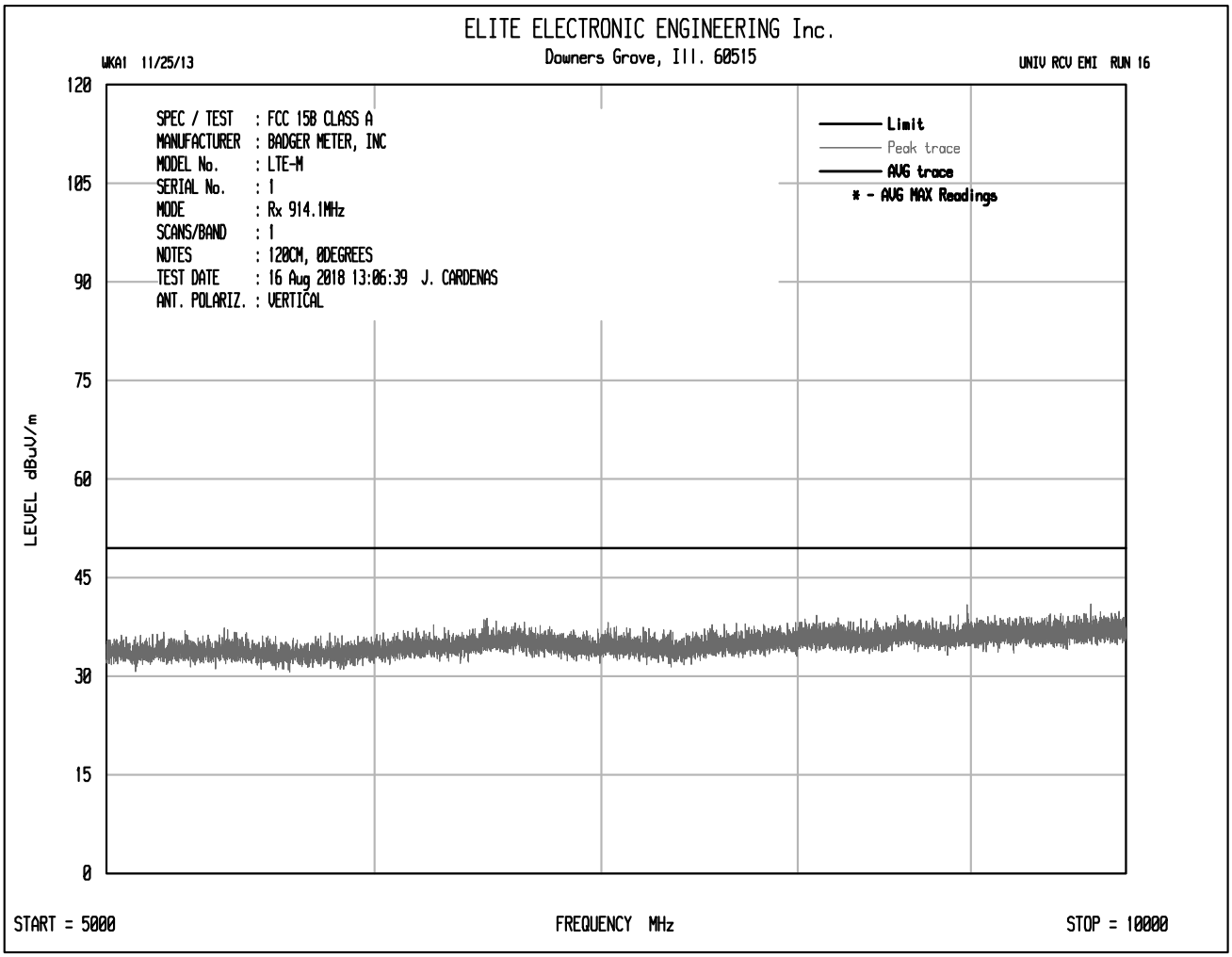
RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

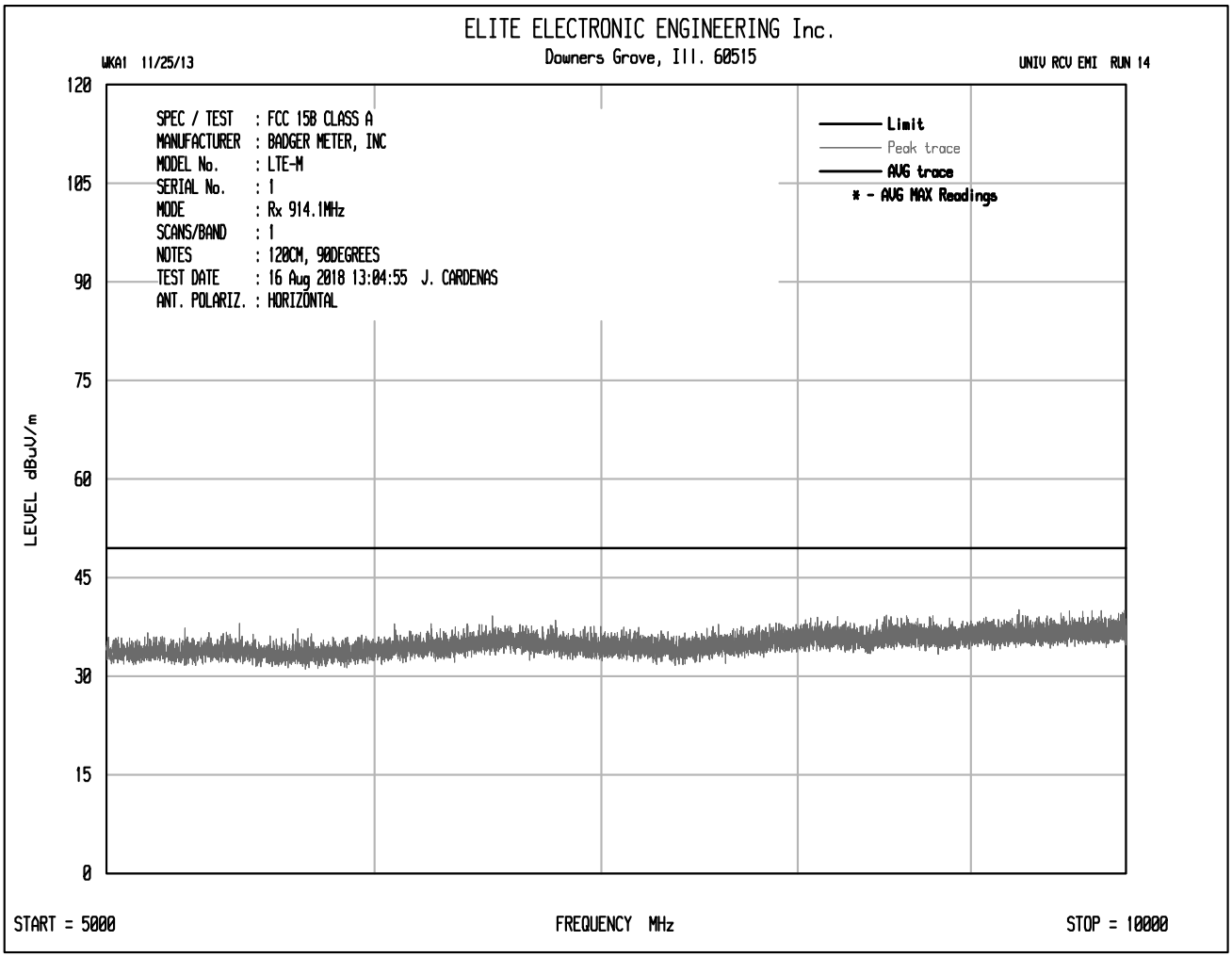
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL NO. : LTE-M
SERIAL NO. : 1
TEST MODE : Rx 914.1MHz
NOTES :
TEST DATE : 10 Aug 2018 16:58:42
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 10 m)
ANTENNA : ANT54A

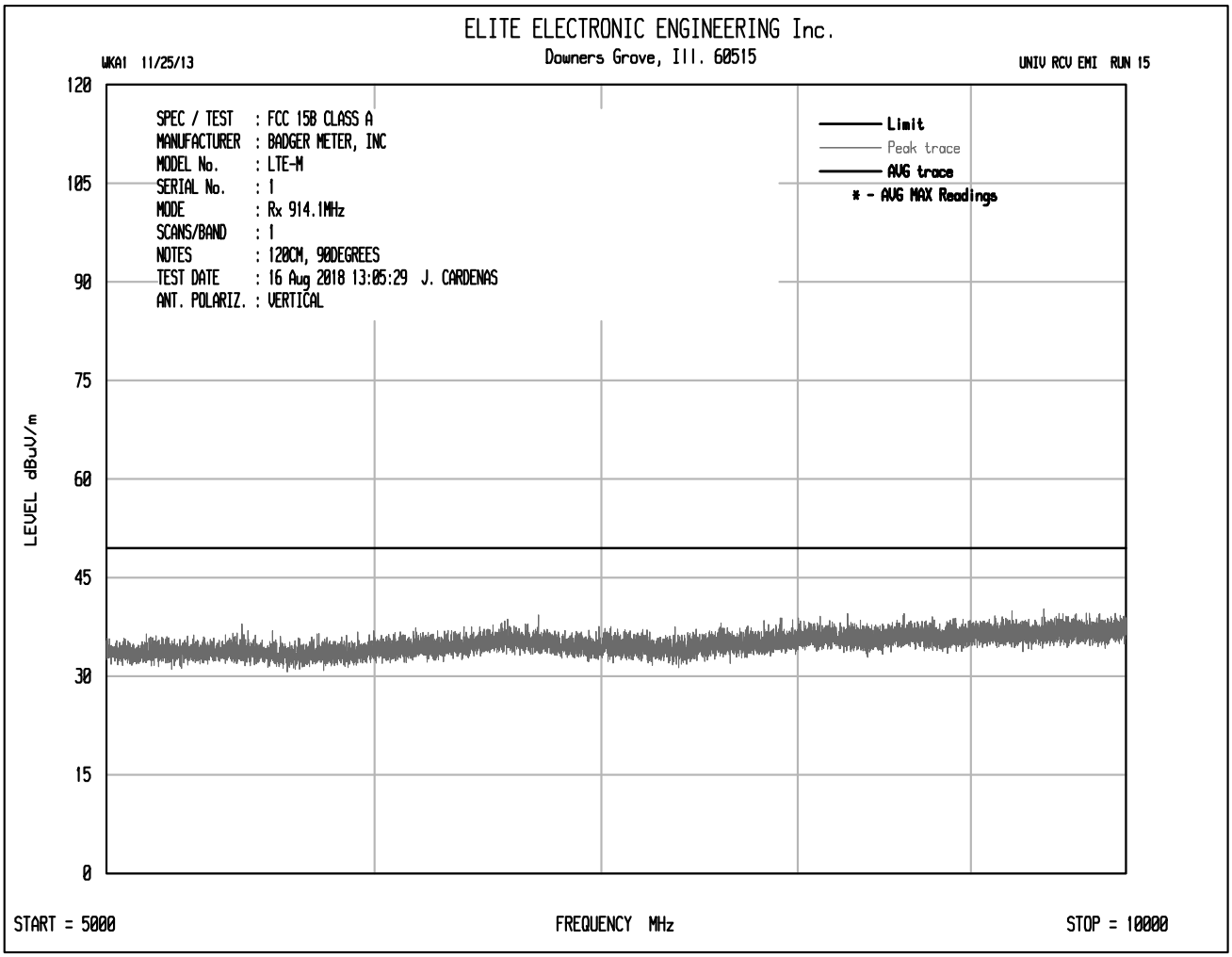
FREQUENCY	AVG READING	ANT FAC	CBL FAC	DIST FAC	TOTAL	AVG LIMIT	PASS/ FAIL	AZ	ANT HT	POLAR
MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m		deg	cm	
1124.51	-4.4	29.4	1.6	-10.5	16.2	49.5		225	340	H
1339.53	-4.6	29.5	1.8	-10.5	16.3	49.5		315	120	V
1745.18	7.2	31.2	2.1	-10.5	30.1	49.5		225	340	V
2013.30	-4.0	32.7	2.3	-10.5	20.5	49.5		225	340	V
2450.25	-2.3	33.1	2.6	-10.5	23.0	49.5		225	340	H
4096.44	-5.4	35.0	3.5	-10.5	22.6	49.5		270	200	H

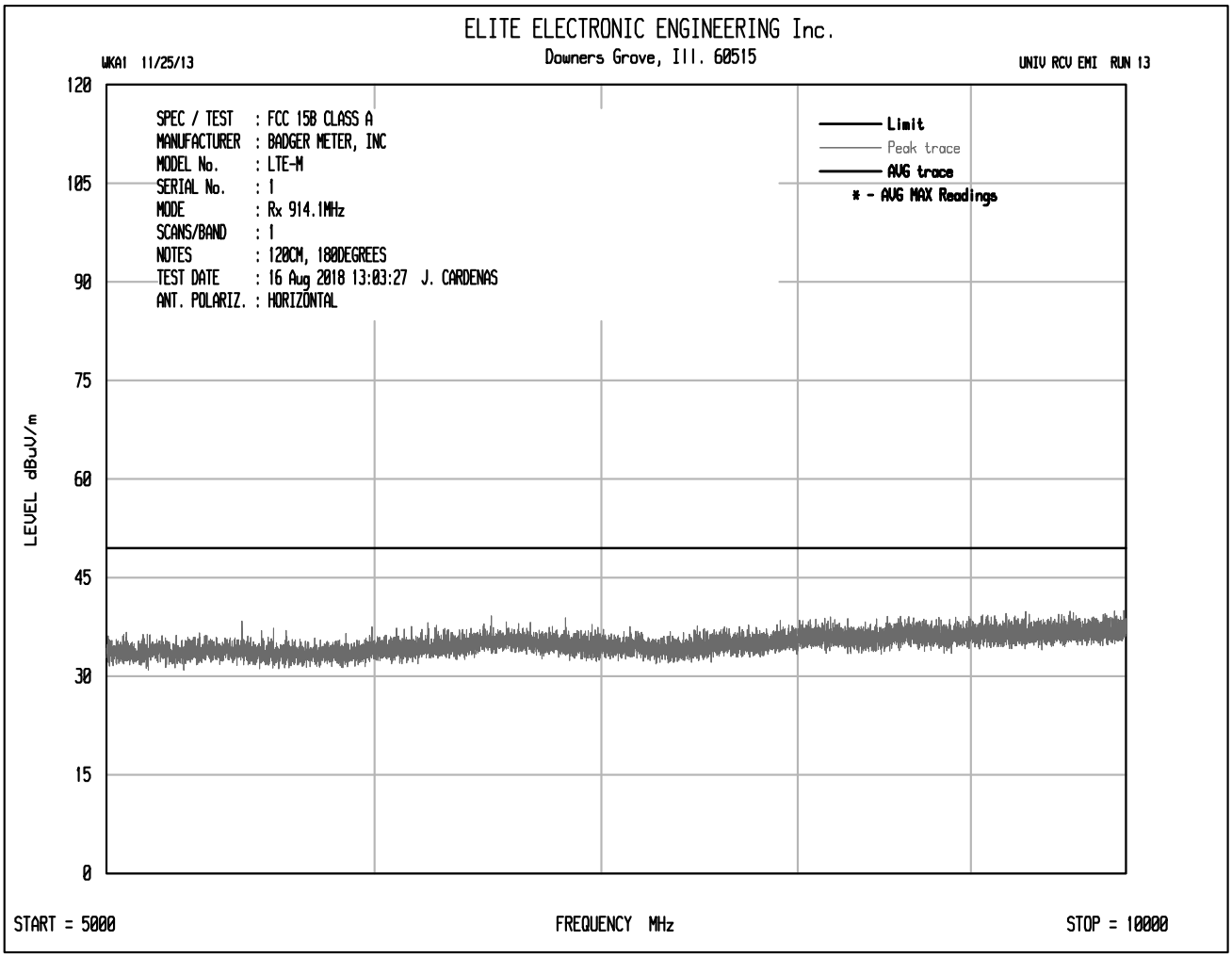
tested by: Javier Cardenas
J. CARDENAS

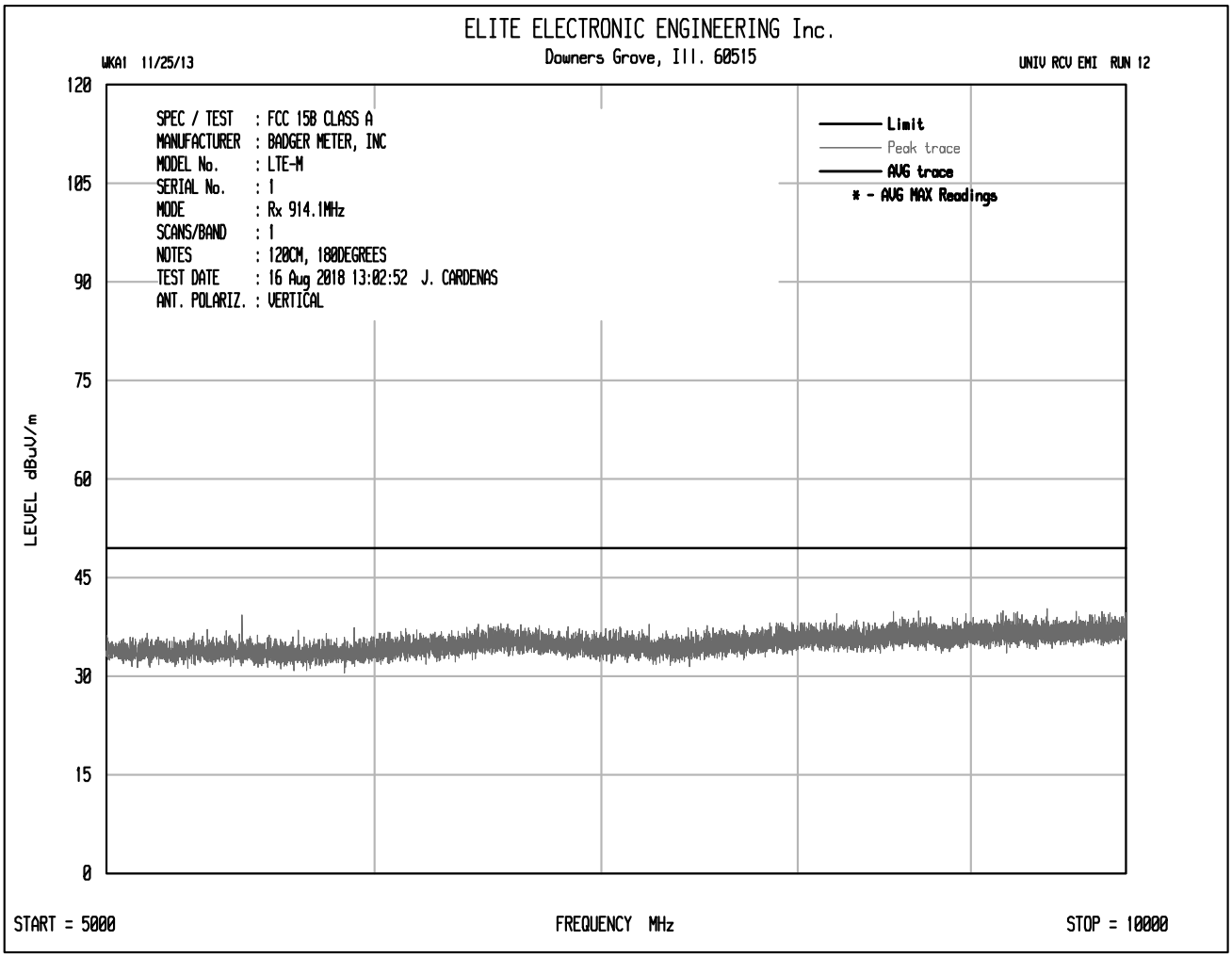

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 17
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 0DEGREES
TEST DATE : 16 Aug 2018 13:07:23 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

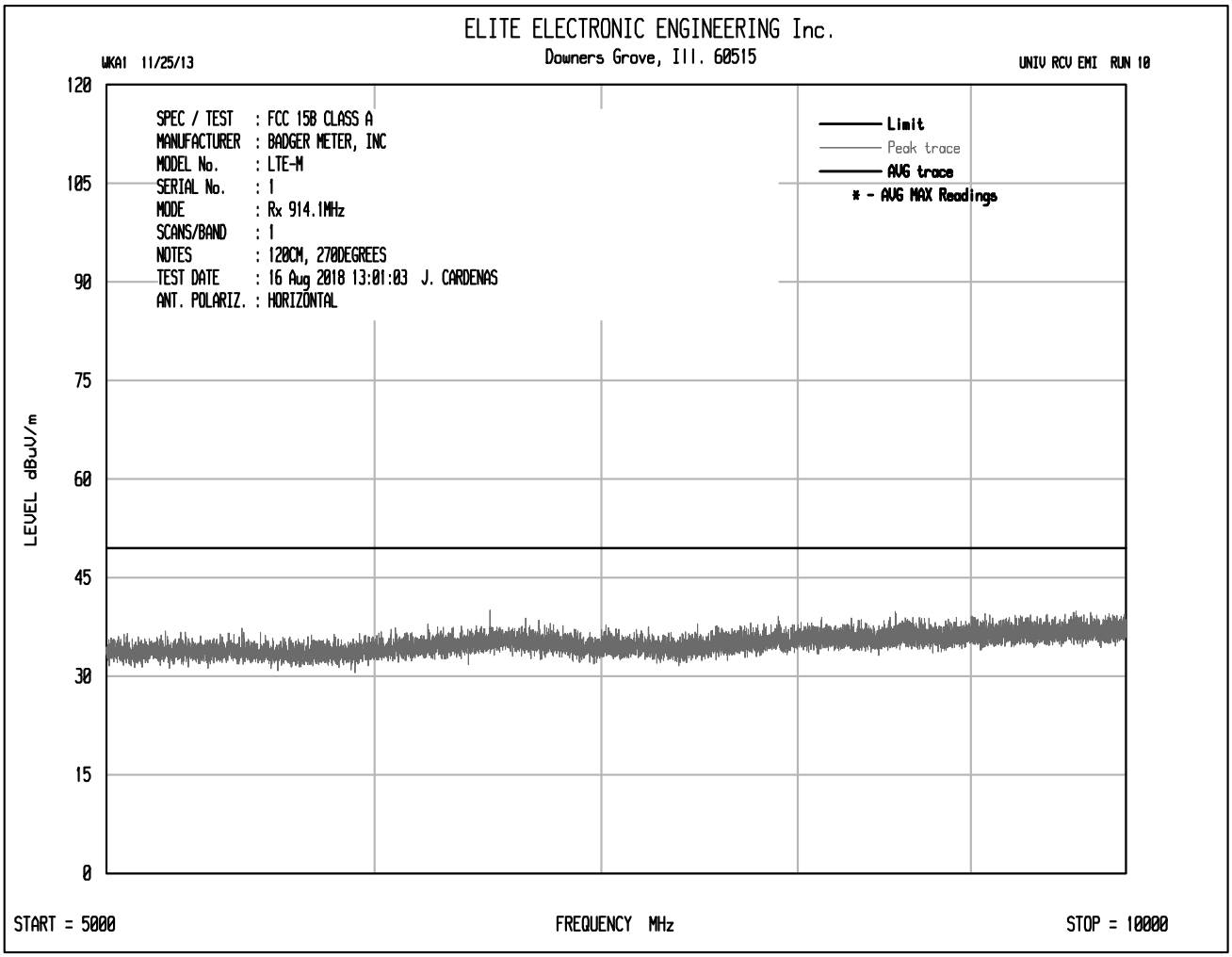

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 16
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 0DEGREES
TEST DATE : 16 Aug 2018 13:06:39 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

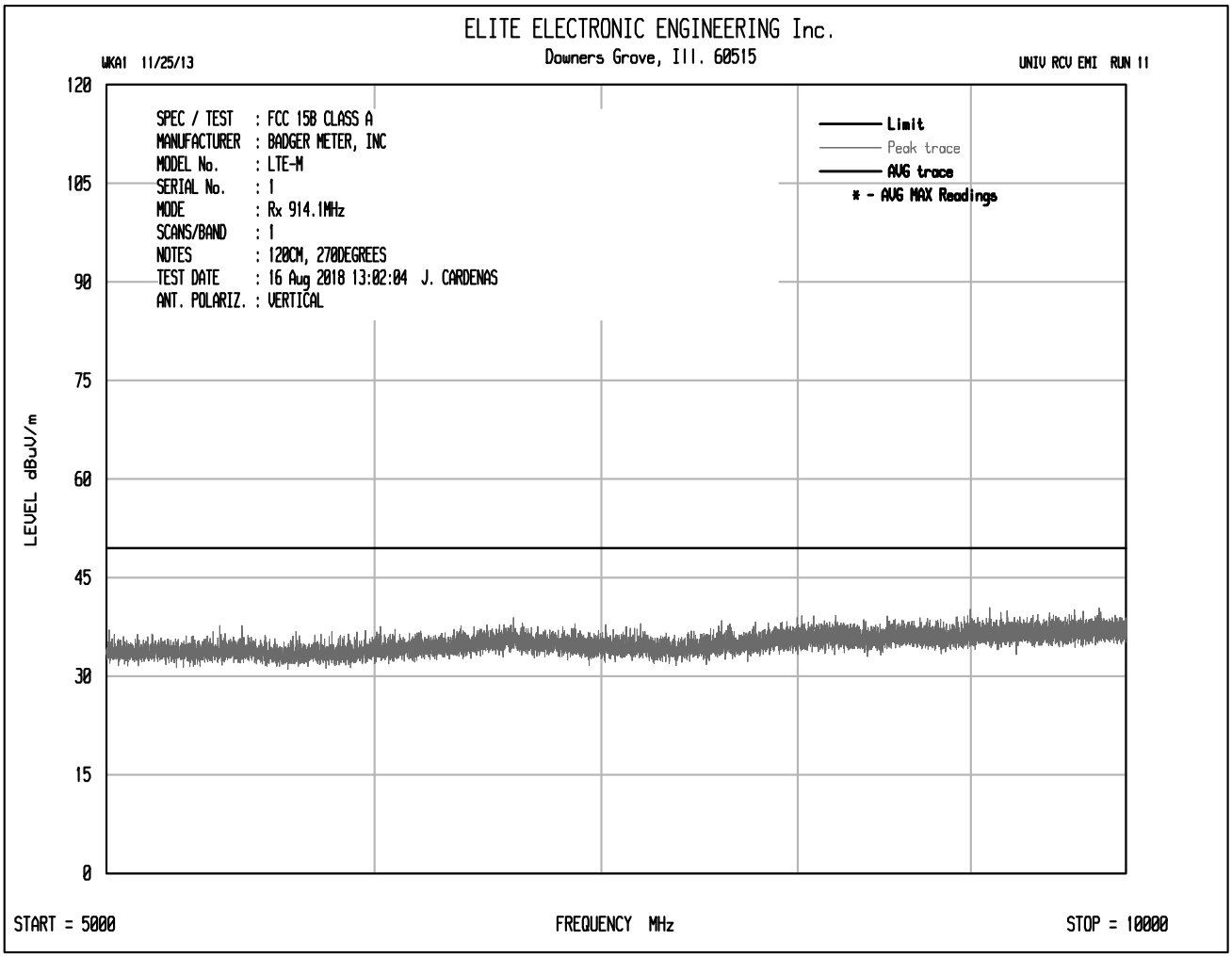

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 14
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 90DEGREES
TEST DATE : 16 Aug 2018 13:04:55 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

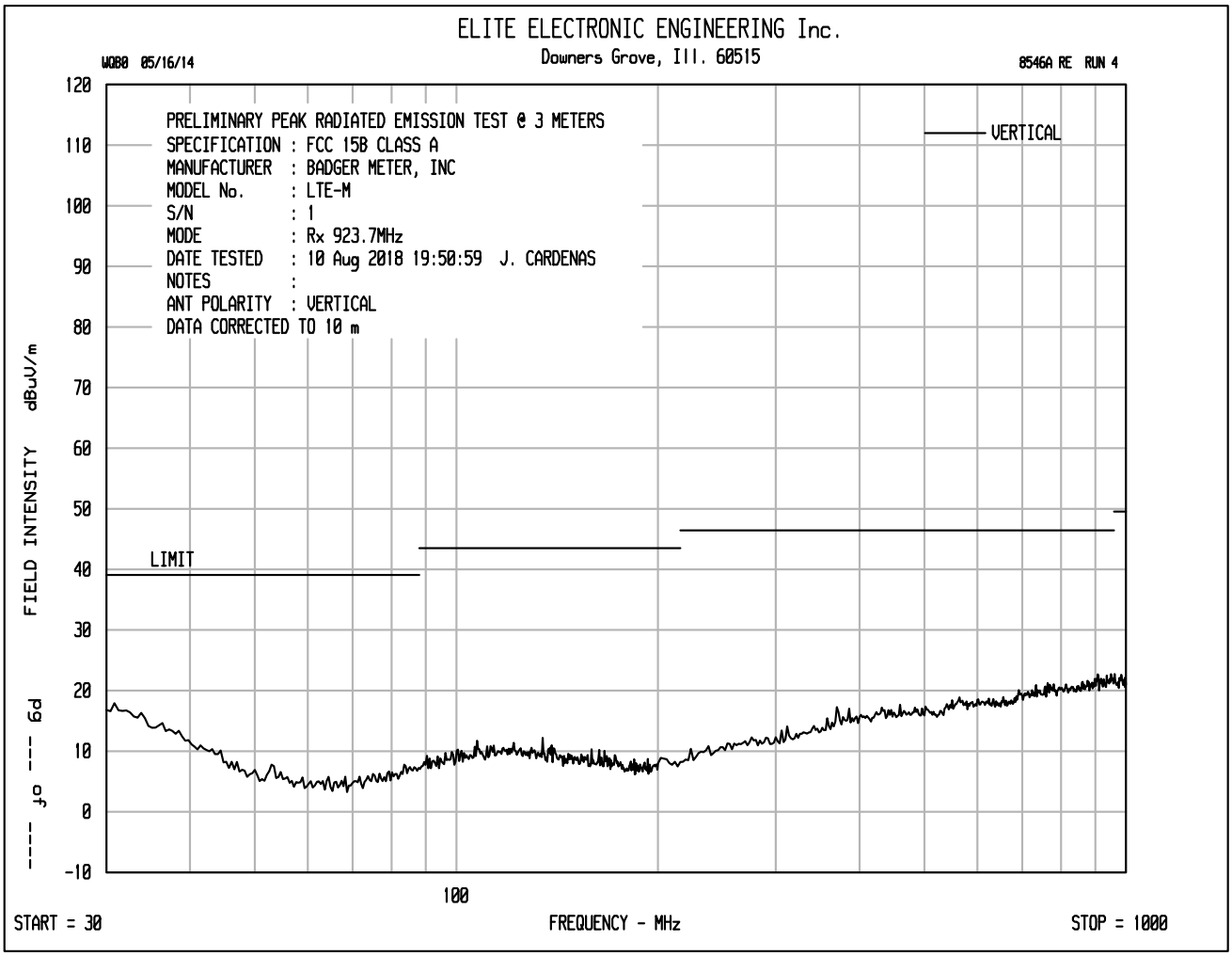

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 15
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 90DEGREES
TEST DATE : 16 Aug 2018 13:05:29 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

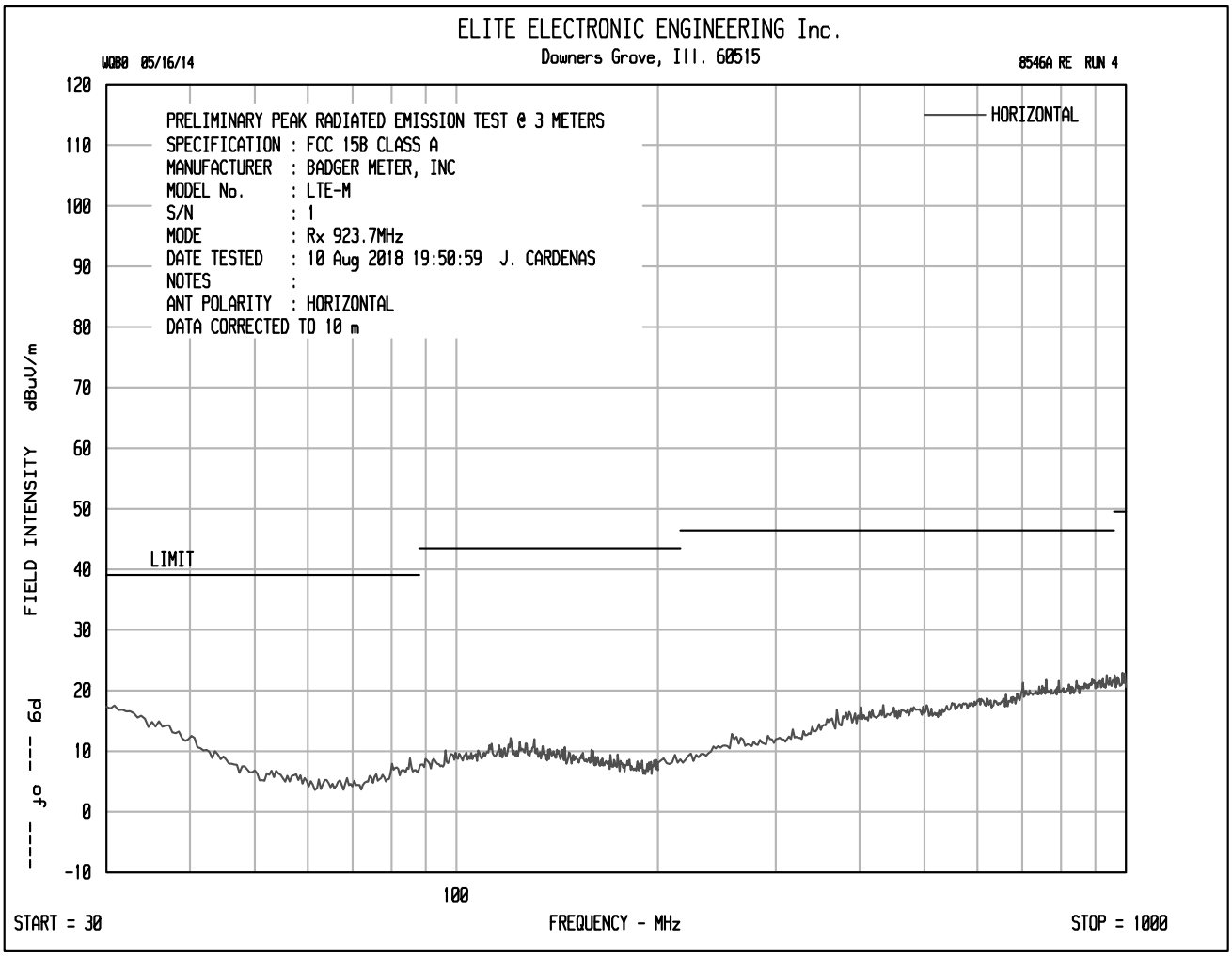

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 13
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 180DEGREES
TEST DATE : 16 Aug 2018 13:03:27 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 12
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 180DEGREES
TEST DATE : 16 Aug 2018 13:02:52 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 10
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 270DEGREES
TEST DATE : 16 Aug 2018 13:01:03 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 11
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 914.1MHz
SCANS/BAND : 1
NOTES : 120CM, 270DEGREES
TEST DATE : 16 Aug 2018 13:02:04 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
W080 05/16/14
8546A RE RUN 4
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
S/N : 1
MODE : Rx 923.7MHz
DATE TESTED : 10 Aug 2018 19:50:59 J. CARDENAS
NOTES :
ANT POLARITY : VERTICAL
DATA CORRECTED TO 10 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- uo --- 09 ----
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 4
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
S/N : 1
MODE : Rx 923.7MHz
DATE TESTED : 10 Aug 2018 19:50:59 J. CARDENAS
NOTES :
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 10 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

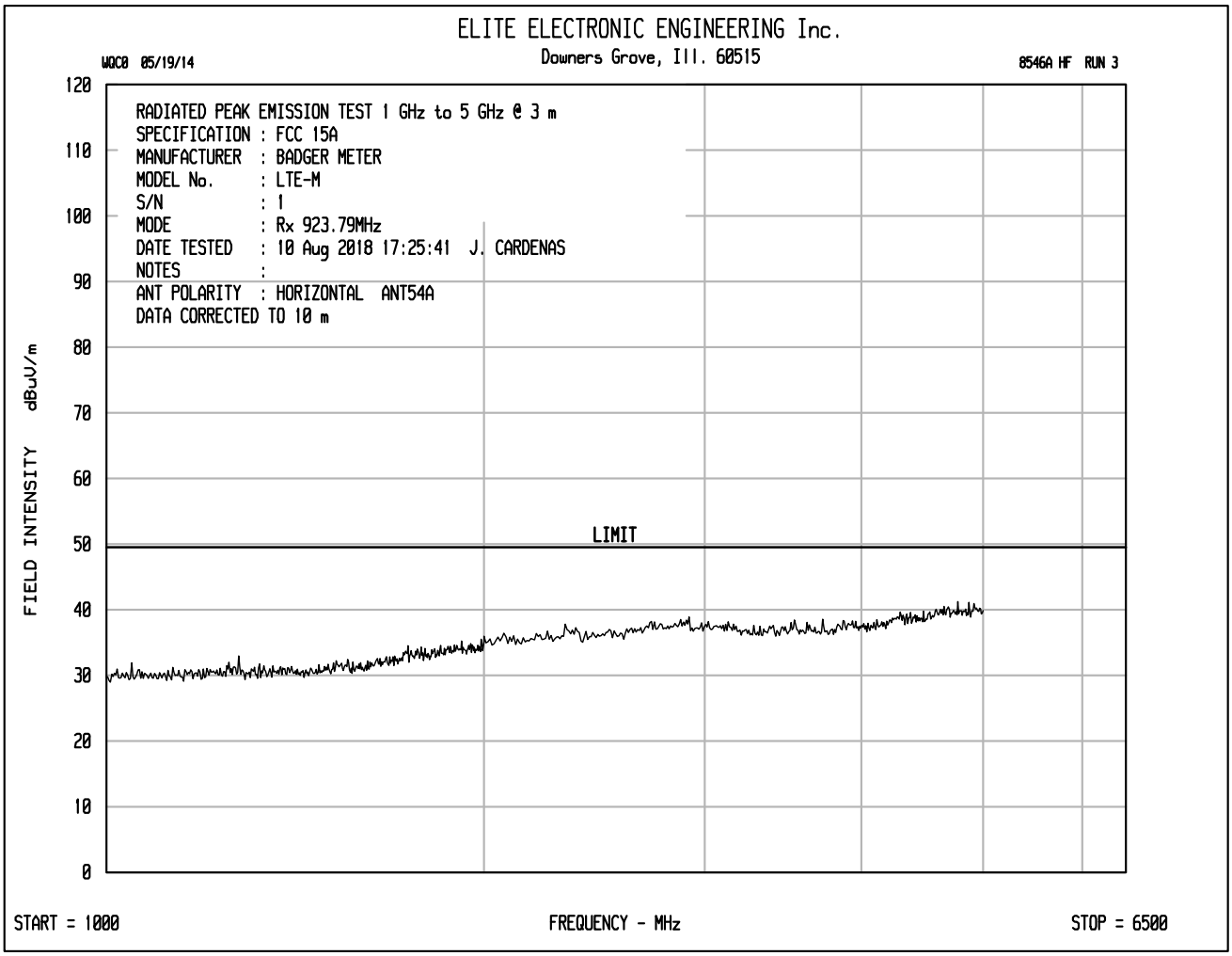
ETR No. 8546A
DATA SHEET TEST NO. 4

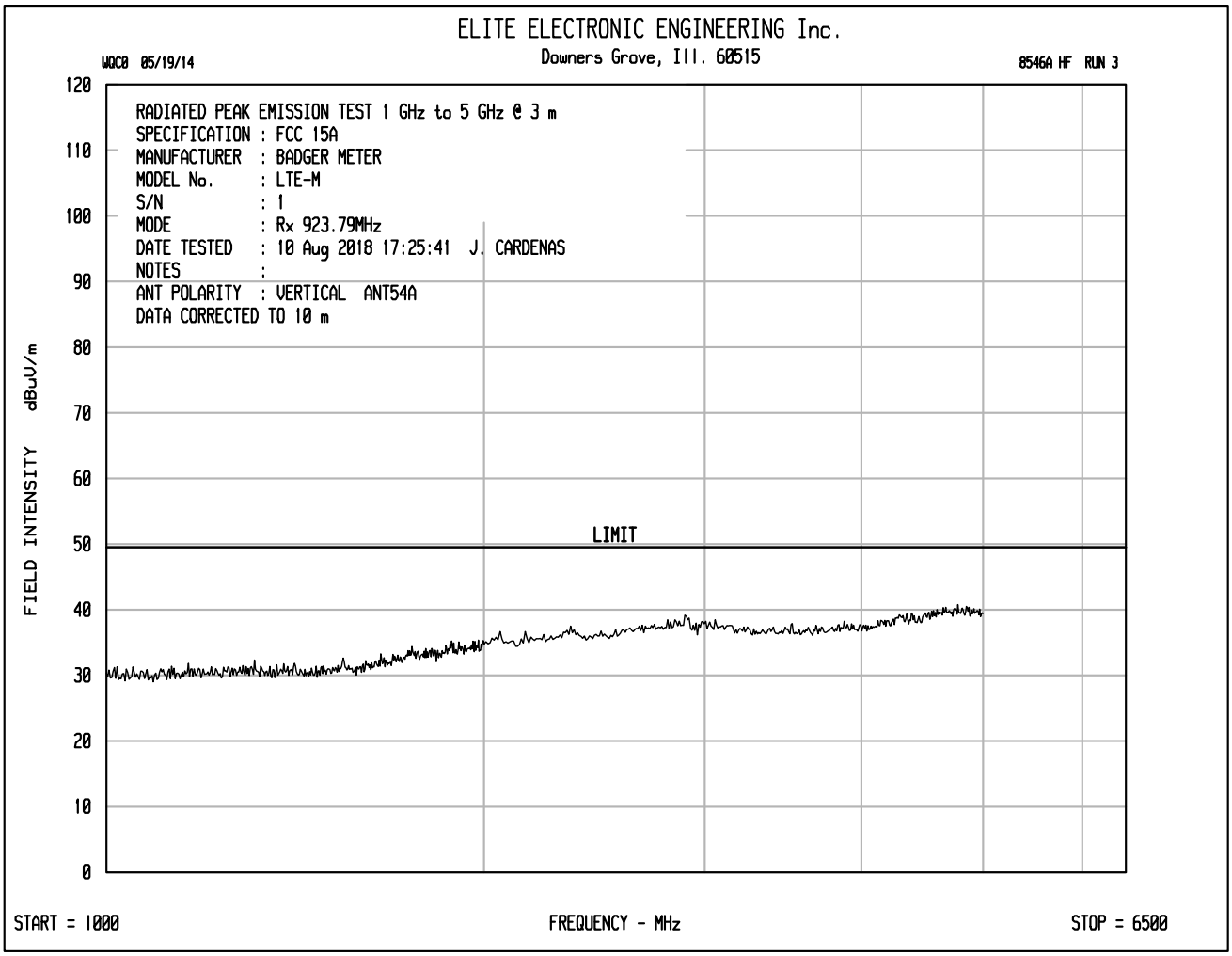
RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL NO. : LTE-M
SERIAL NO. : 1
TEST MODE : Rx 923.7MHz
NOTES :
TEST DATE : 10 Aug 2018 19:50:59
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 10 m)

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
31.53	-8.2	25.5	.4	0.0	-10.5	7.2	39.1	315	340	V
52.40	-6.3	14.3	.4	0.0	-10.5	-2.0	39.1	90	200	V
85.79	-7.3	15.7	.4	0.0	-10.5	-1.6	39.1	45	120	H
120.48	-7.8	18.8	.5	0.0	-10.5	1.0	43.5	315	200	H
132.74	-7.9	18.5	.5	0.0	-10.5	.6	43.5	225	340	V
145.74	-8.2	17.6	.6	0.0	-10.5	-.5	43.5	45	340	H
175.61	-8.2	16.3	.7	0.0	-10.5	-1.7	43.5	90	340	H
255.42	-7.1	18.6	.8	0.0	-10.5	1.8	46.4	-0	120	H
359.95	-6.3	21.4	1.0	0.0	-10.5	5.6	46.4	315	340	V
469.02	-6.8	23.2	1.1	0.0	-10.5	7.1	46.4	180	340	V
567.24	-6.8	24.4	1.1	0.0	-10.5	8.4	46.4	45	340	V
682.74	-6.9	25.0	1.3	0.0	-10.5	9.0	46.4	315	120	H
761.91	-6.6	26.1	1.5	0.0	-10.5	10.5	46.4	315	200	H
908.67	-5.6	26.7	1.5	0.0	-10.5	12.1	46.4	135	340	V
947.62	-5.8	27.0	1.5	0.0	-10.5	12.3	46.4	45	120	V

tested by: Javier Cardenas
J. CARDENAS

pg ___ of ____


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC0 05/19/14
8546A HF RUN 3
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
S/N : 1
MODE : Rx 923.79MHz
DATE TESTED : 10 Aug 2018 17:25:41 J. CARDENAS
NOTES :
ANT POLARITY : HORIZONTAL ANT54A
DATA CORRECTED TO 10 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
WQC0 05/19/14
8546A HF RUN 3
RADIATED PEAK EMISSION TEST 1 GHz to 5 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
S/N : 1
MODE : Rx 923.79MHz
DATE TESTED : 10 Aug 2018 17:25:41 J. CARDENAS
NOTES :
ANT POLARITY : VERTICAL ANT54A
DATA CORRECTED TO 10 m
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
LIMIT
START = 1000
FREQUENCY - MHz
STOP = 6500

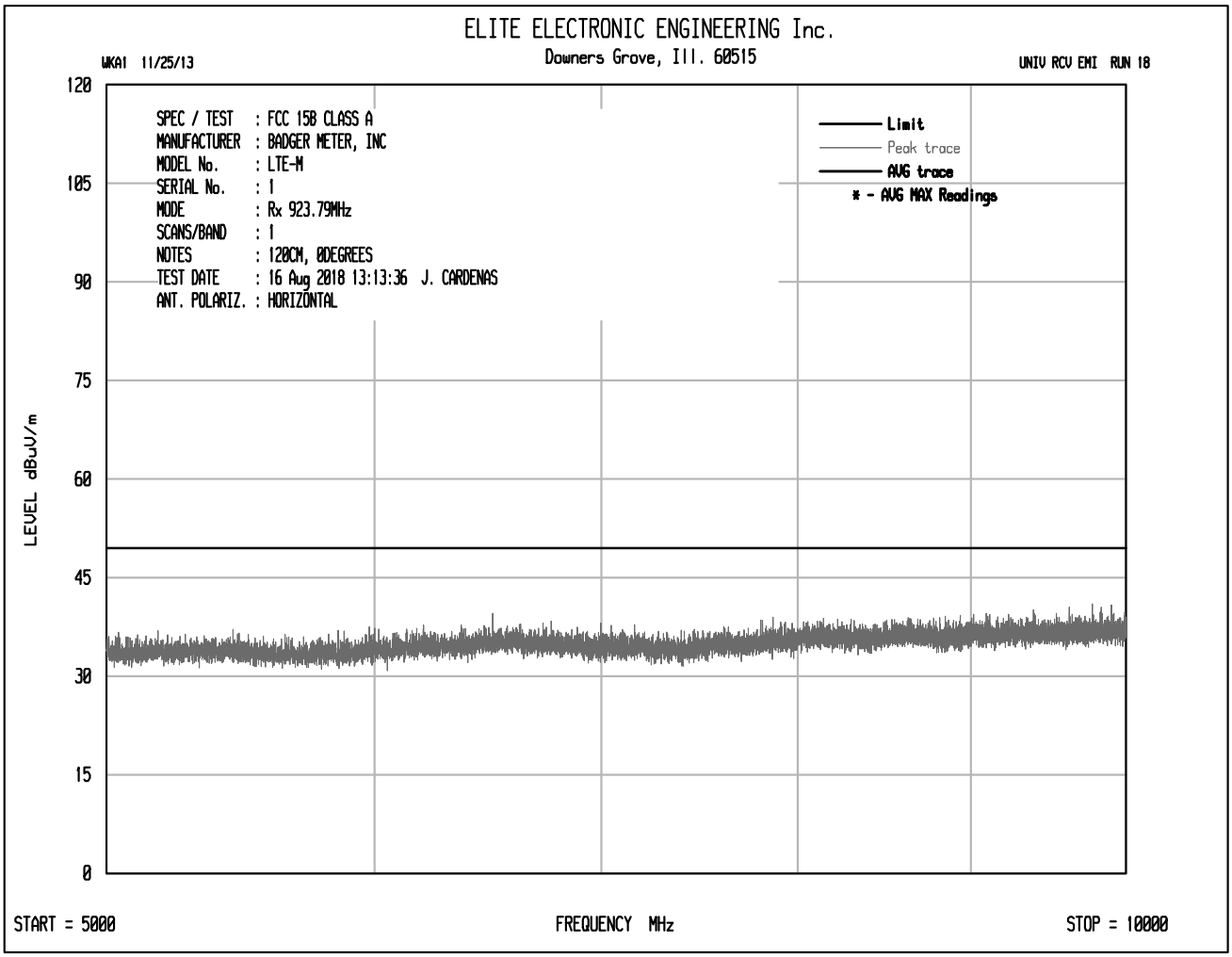
DATA SHEET HF TEST NO. 3

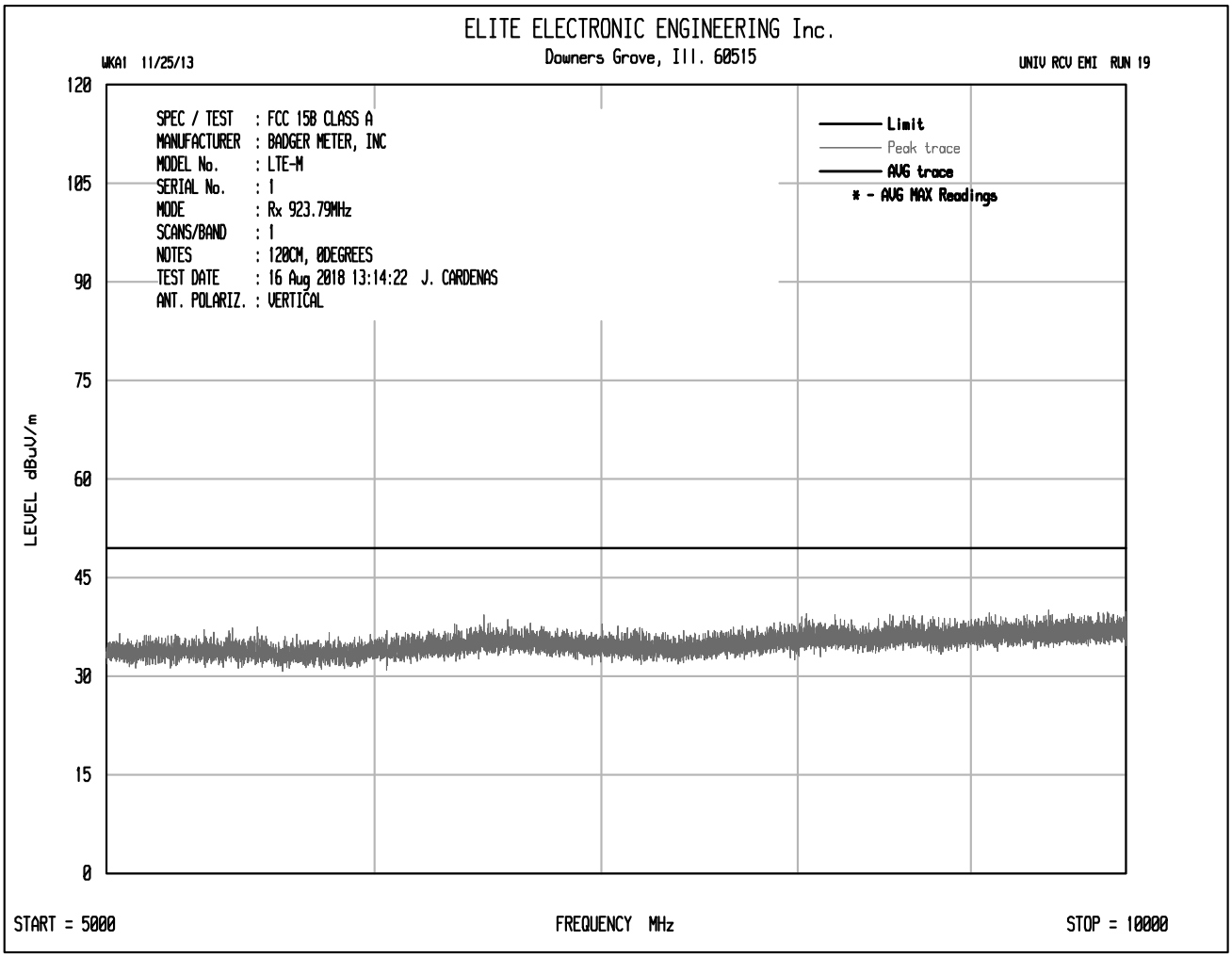
RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

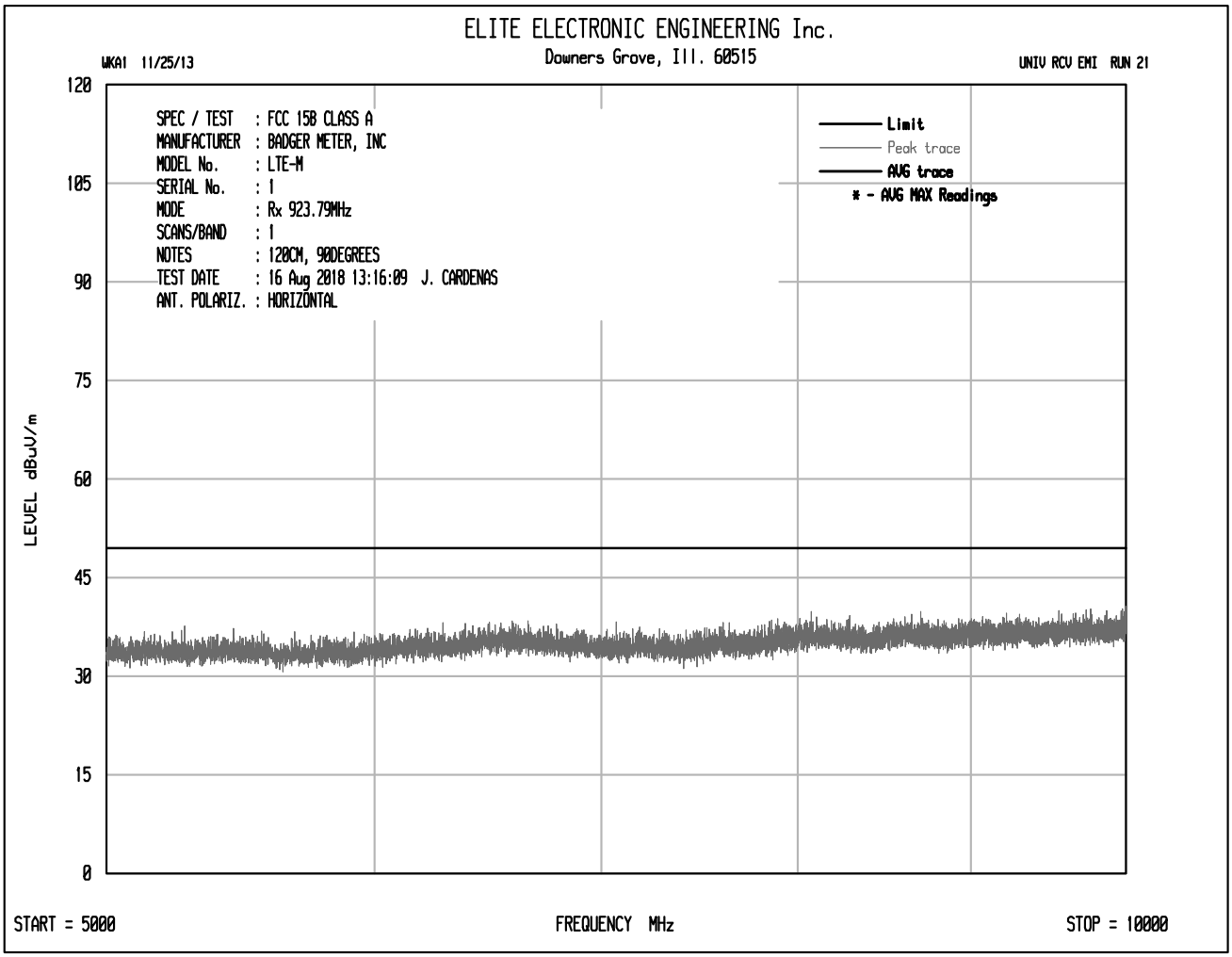
SPECIFICATION : FCC 15A
MANUFACTURER : BADGER METER
MODEL NO. : LTE-M
SERIAL NO. : 1
TEST MODE : Rx 923.79MHz
NOTES :
TEST DATE : 10 Aug 2018 17:25:41
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 10 m)
ANTENNA : ANT54A

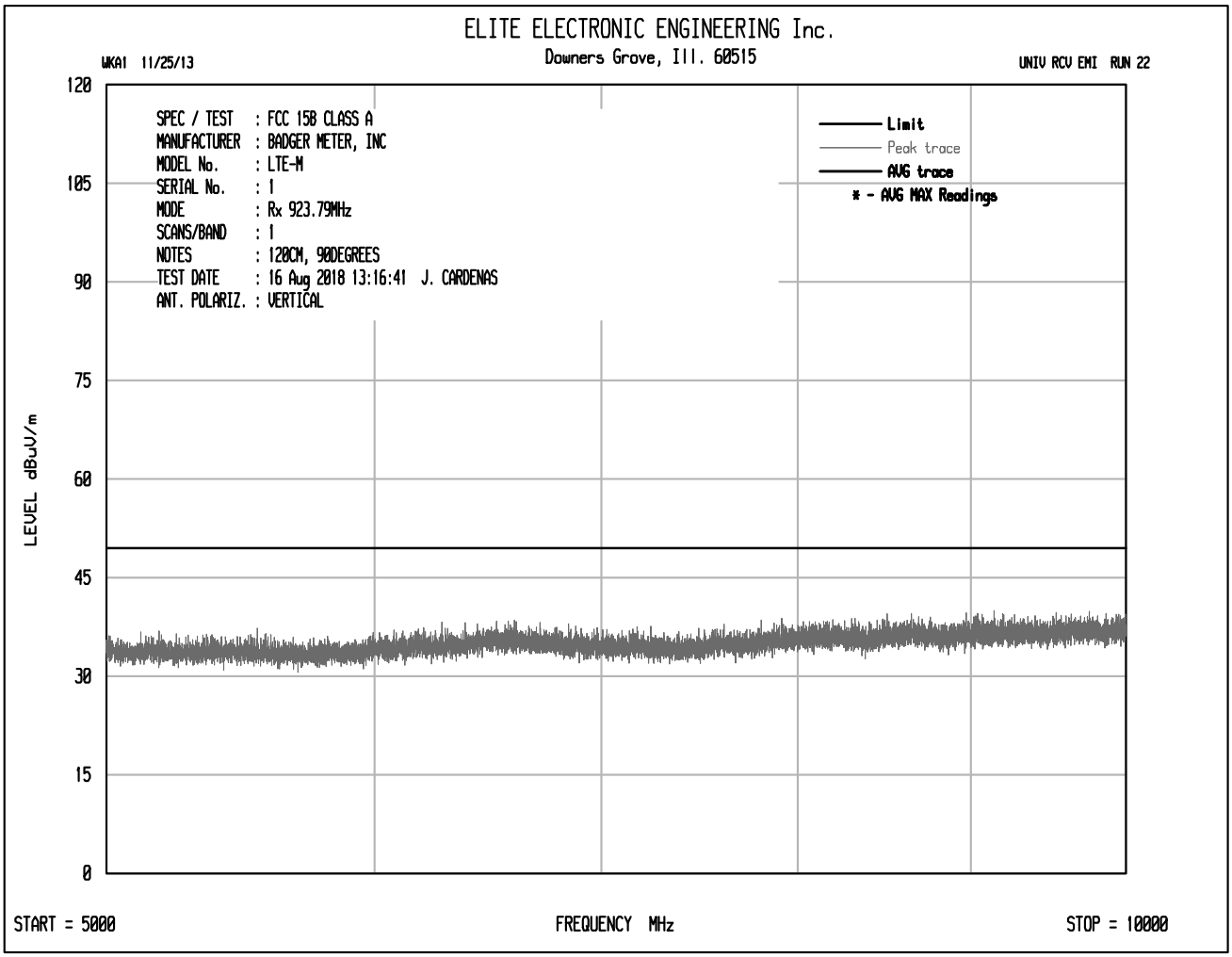
FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1269.41	-3.7	29.7	1.8	-10.5	17.3	49.5		180	120	H
1528.10	-3.5	29.5	2.0	-10.5	17.5	49.5		270	200	H
1757.07	-3.5	31.3	2.1	-10.5	19.4	49.5		180	120	H
2146.26	-4.0	32.7	2.4	-10.5	20.7	49.5		225	200	V
3747.30	-5.6	34.5	3.3	-10.5	21.7	49.5		180	340	H
4217.85	-5.3	35.3	3.5	-10.5	23.0	49.5		315	340	H
4620.74	-5.0	36.4	3.7	-10.5	24.7	49.5		180	200	V

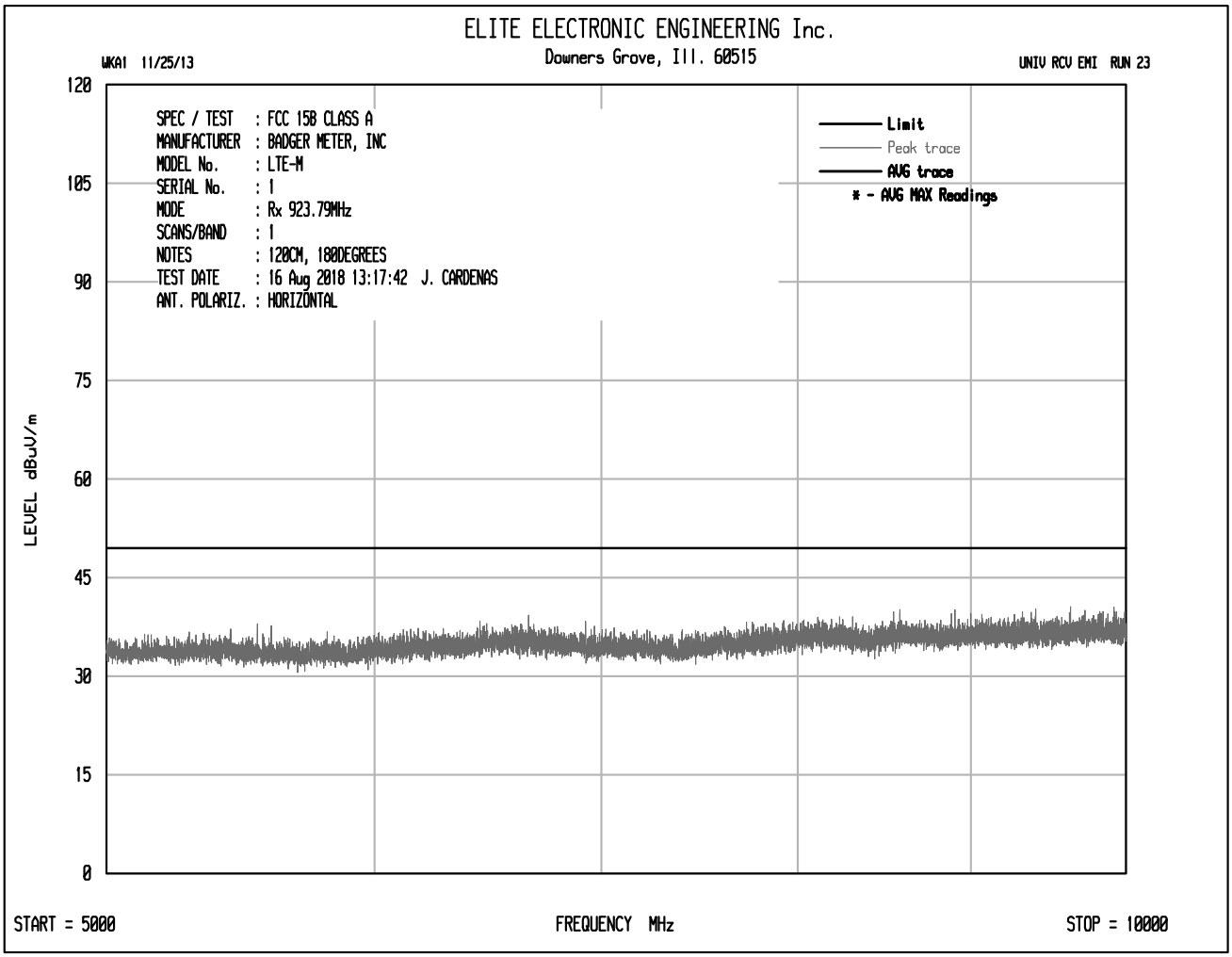
tested by: Javier Cardenas
J. CARDENAS

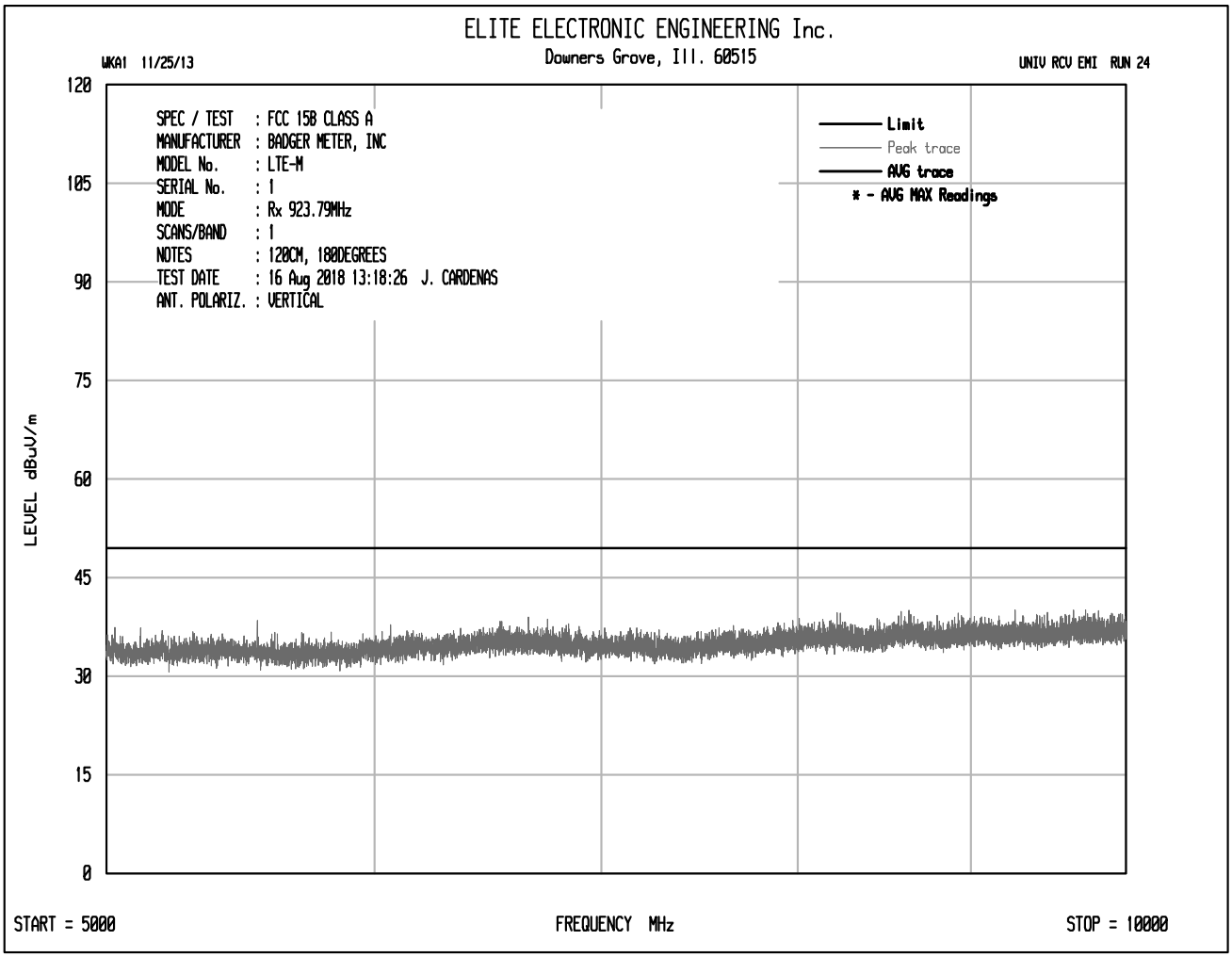

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 18
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 0DEGREES
TEST DATE : 16 Aug 2018 13:13:36 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

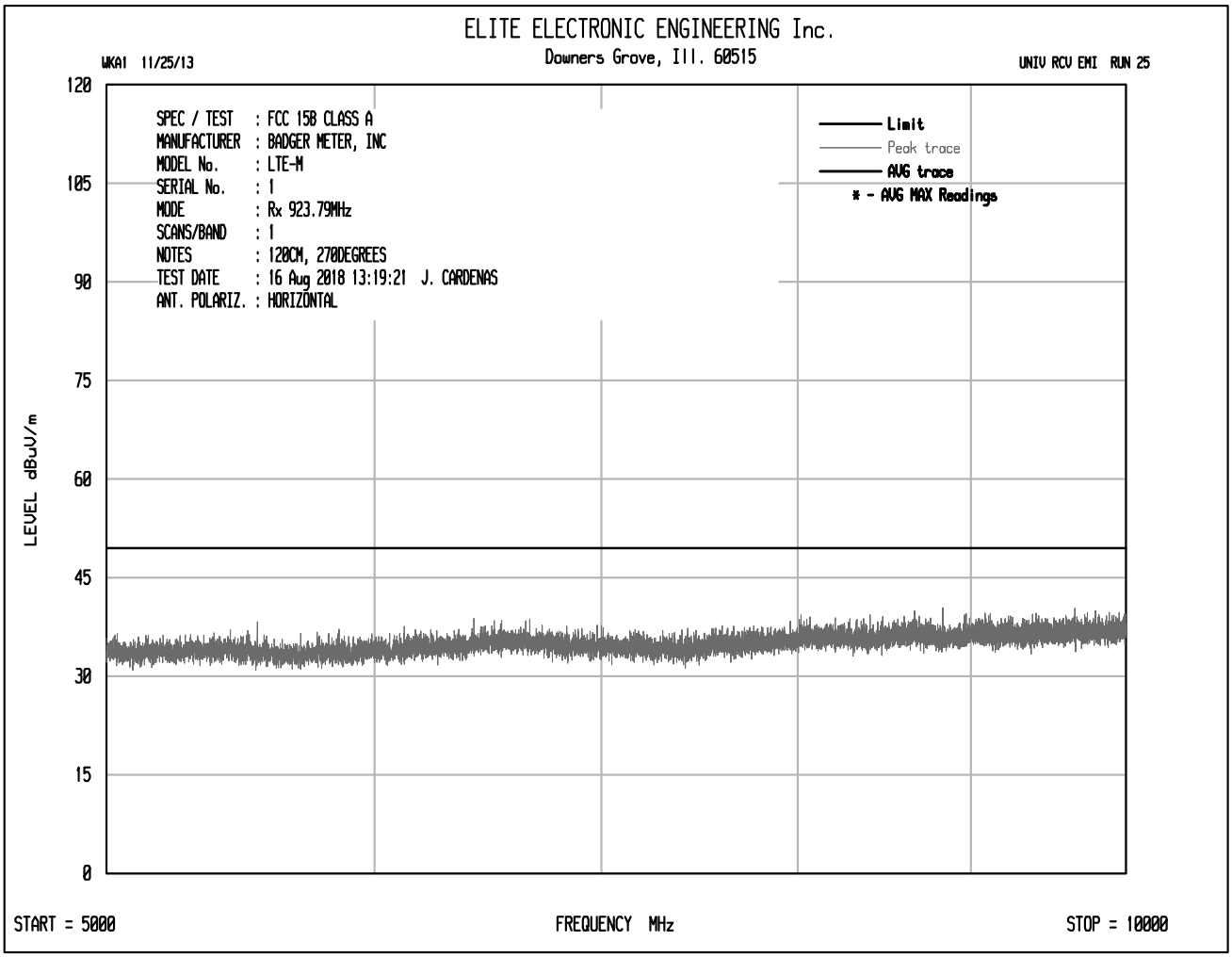

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 19
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 0DEGREES
TEST DATE : 16 Aug 2018 13:14:22 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

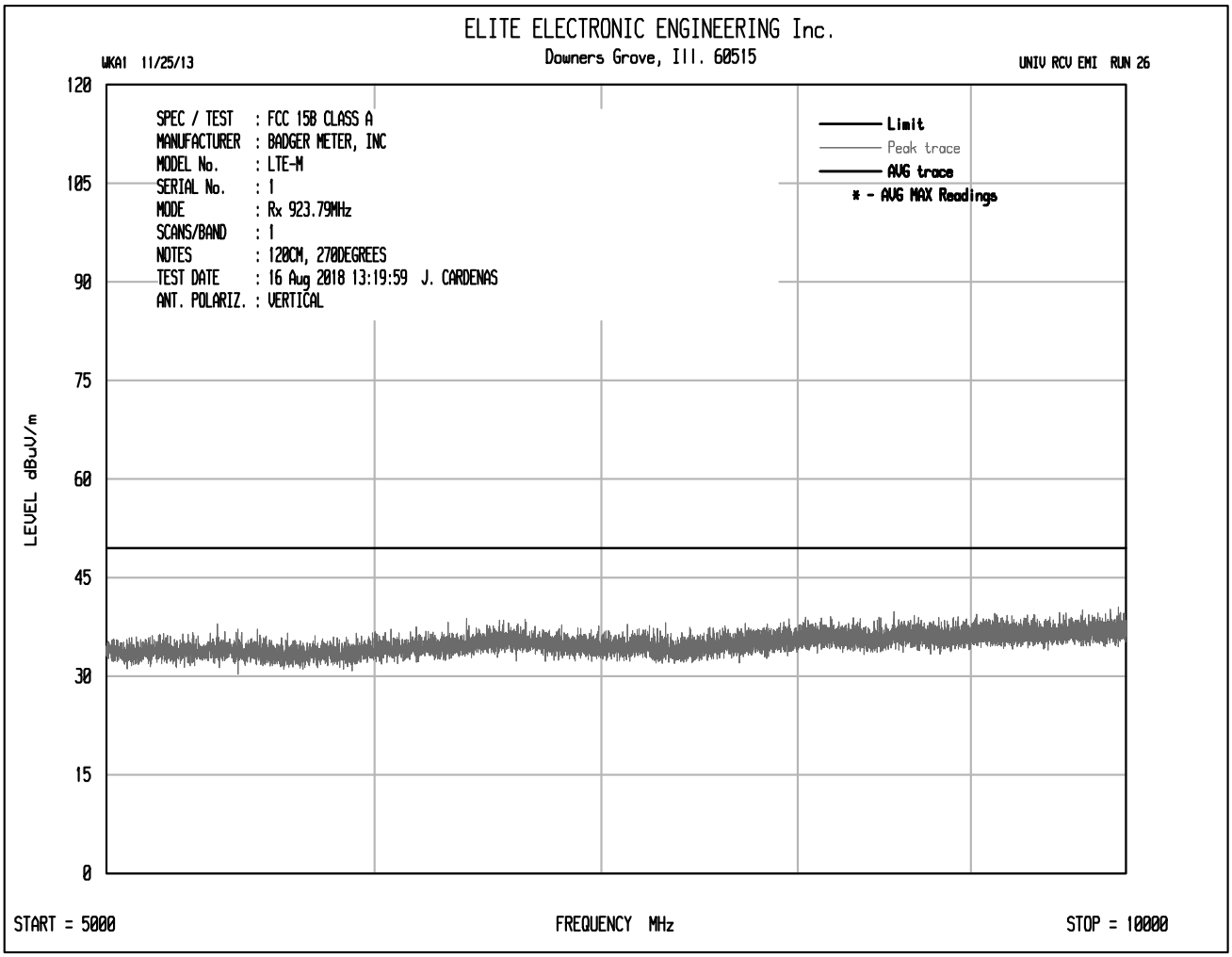

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 21
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 90DEGREES
TEST DATE : 16 Aug 2018 13:16:09 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

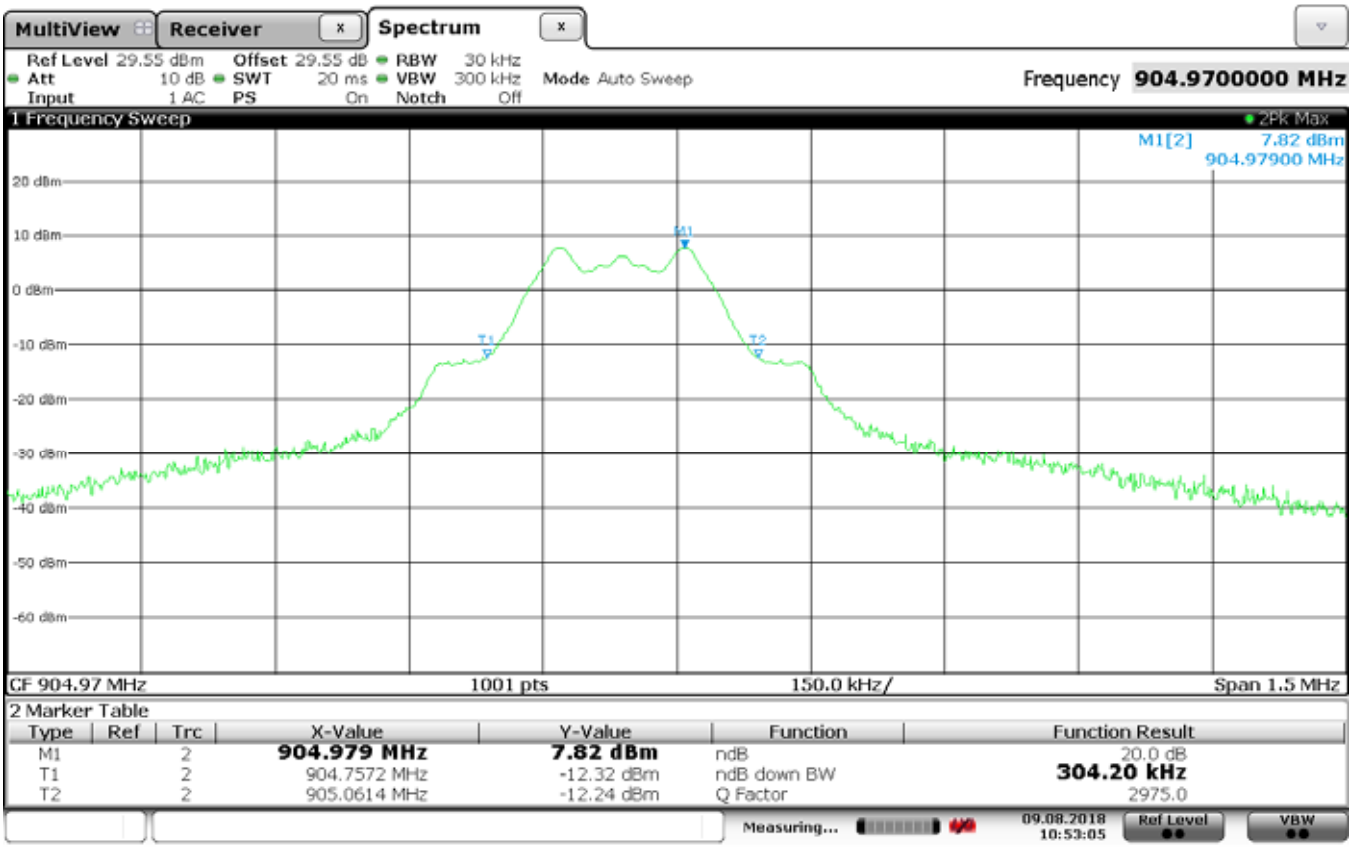

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 22
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 90DEGREES
TEST DATE : 16 Aug 2018 13:16:41 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 23
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 180DEGREES
TEST DATE : 16 Aug 2018 13:17:42 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 24
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 180DEGREES
TEST DATE : 16 Aug 2018 13:18:26 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000

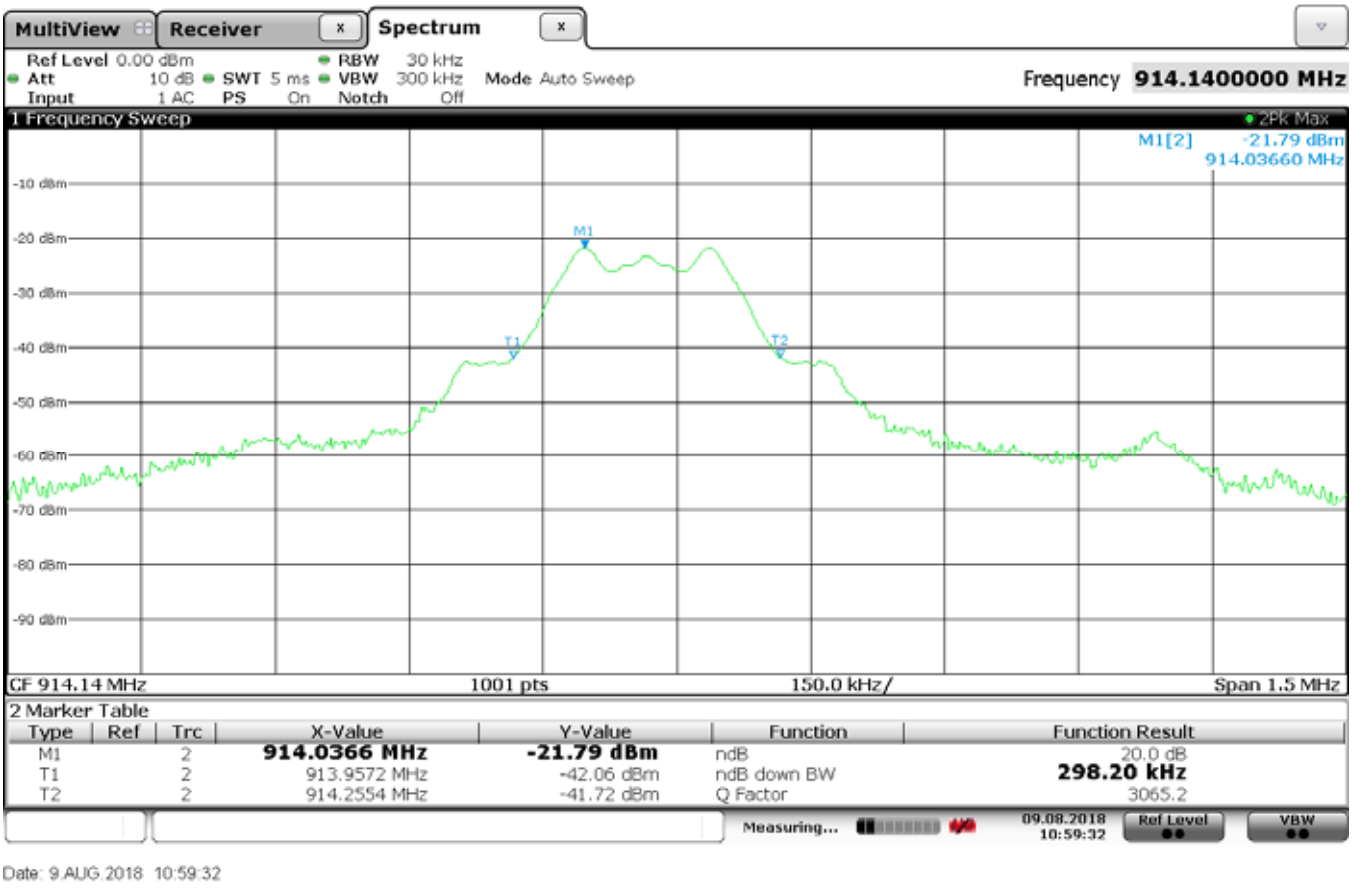

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 25
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 270DEGREES
TEST DATE : 16 Aug 2018 13:19:21 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 26
SPEC / TEST : FCC 15B CLASS A
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Rx 923.79MHz
SCANS/BAND : 1
NOTES : 120CM, 270DEGREES
TEST DATE : 16 Aug 2018 13:19:59 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
Peak trace
AVG trace
* - AVG MAX Readings
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 5000
FREQUENCY MHz
STOP = 10000



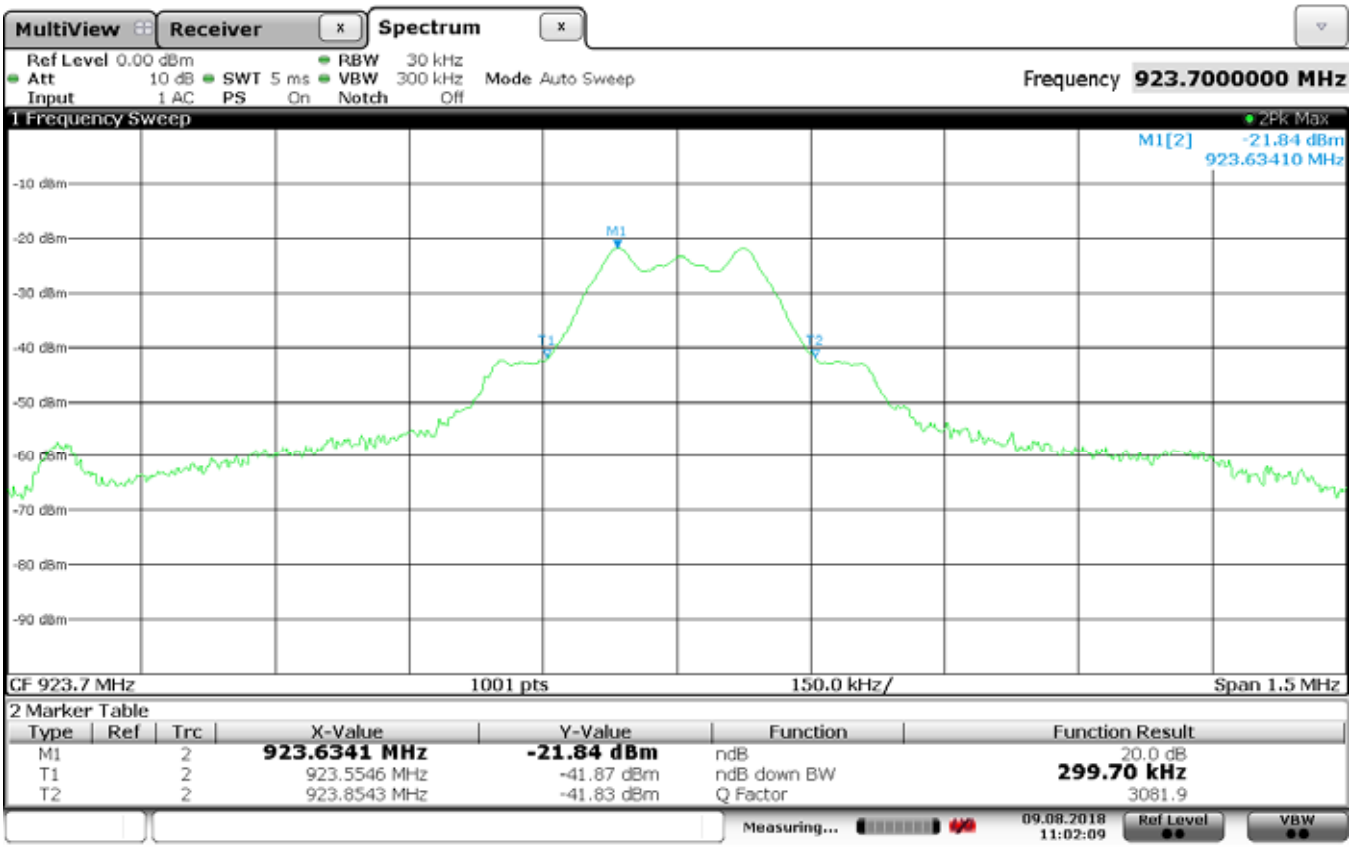
Date: 9.AUG.2018 10:53:05

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a) 20dB Bandwidth**
Mode : Tx 904.94MHz
Parameters : 20dB Bandwidth = 304.2kHz
Date : August 9,2018
Notes :



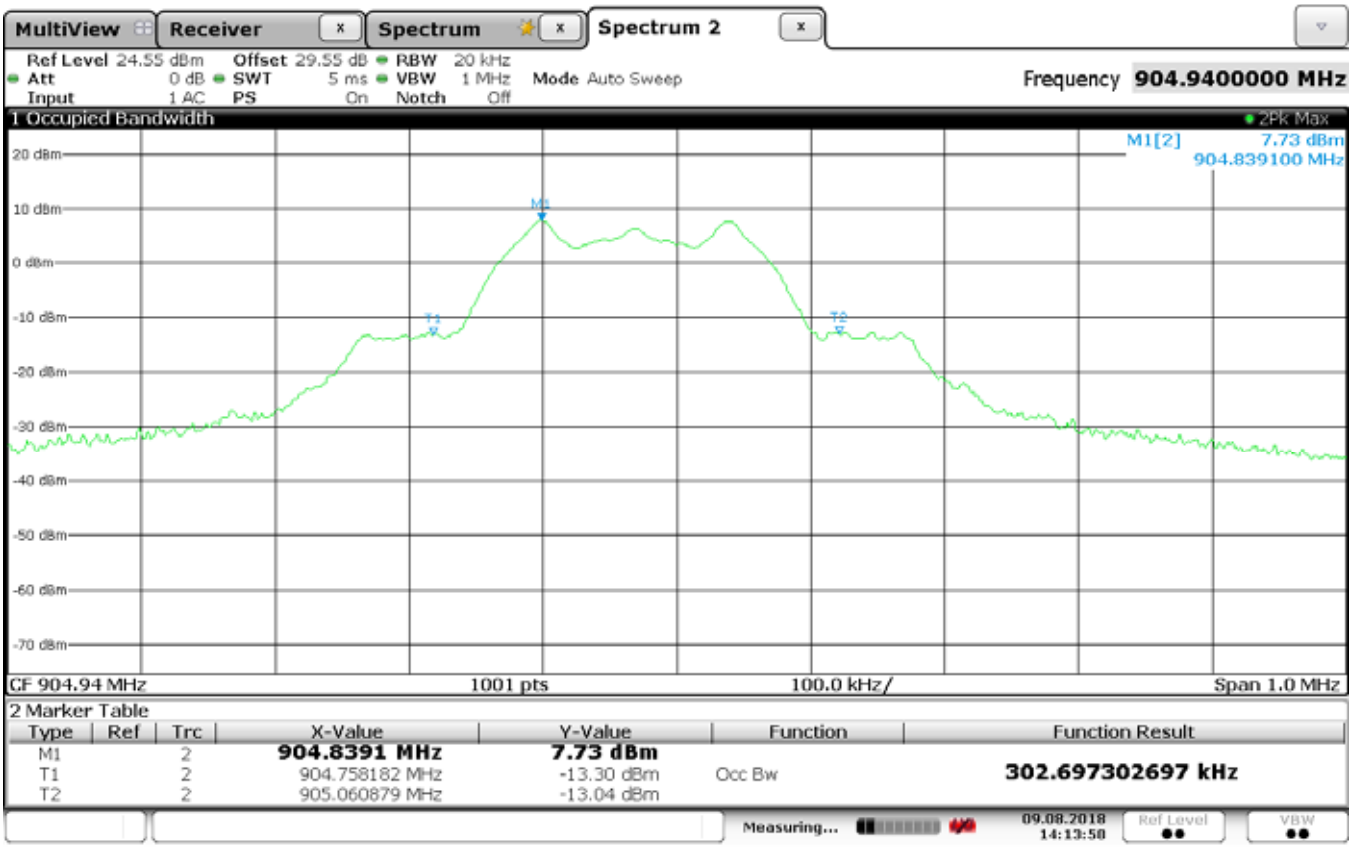
Date: 9.AUG.2018 10:59:32

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a) 20dB Bandwidth**
Mode : Tx 914.1MHz
Parameters : 20dB Bandwidth = 298.2kHz
Date : August 9,2018
Notes :



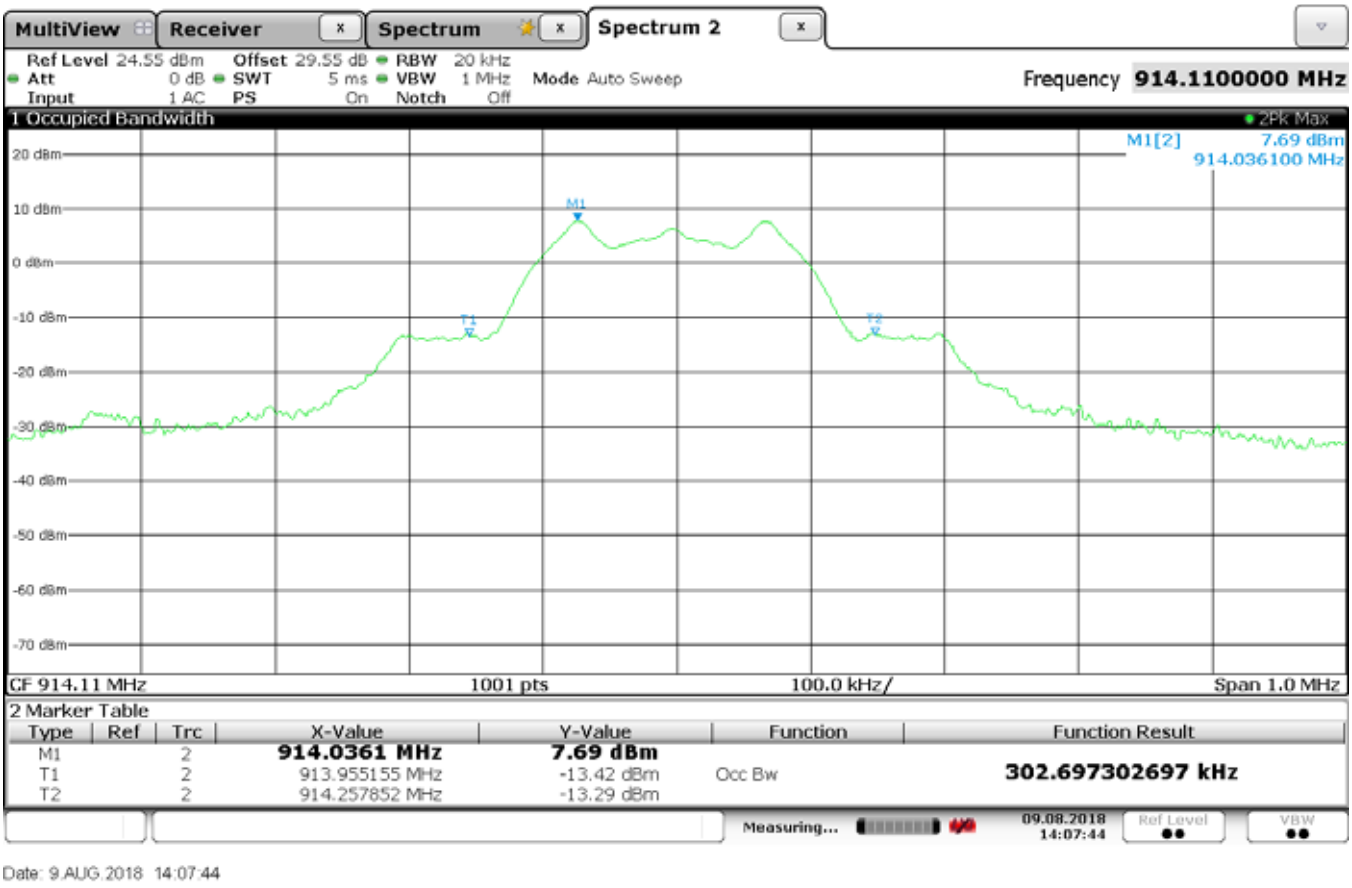
Date: 9.AUG.2018 11:02:09

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a) 20dB Bandwidth**
Mode : Tx 923.79MHz
Parameters : 20dB Bandwidth = 299.7kHz
Date : August 9,2018
Notes :

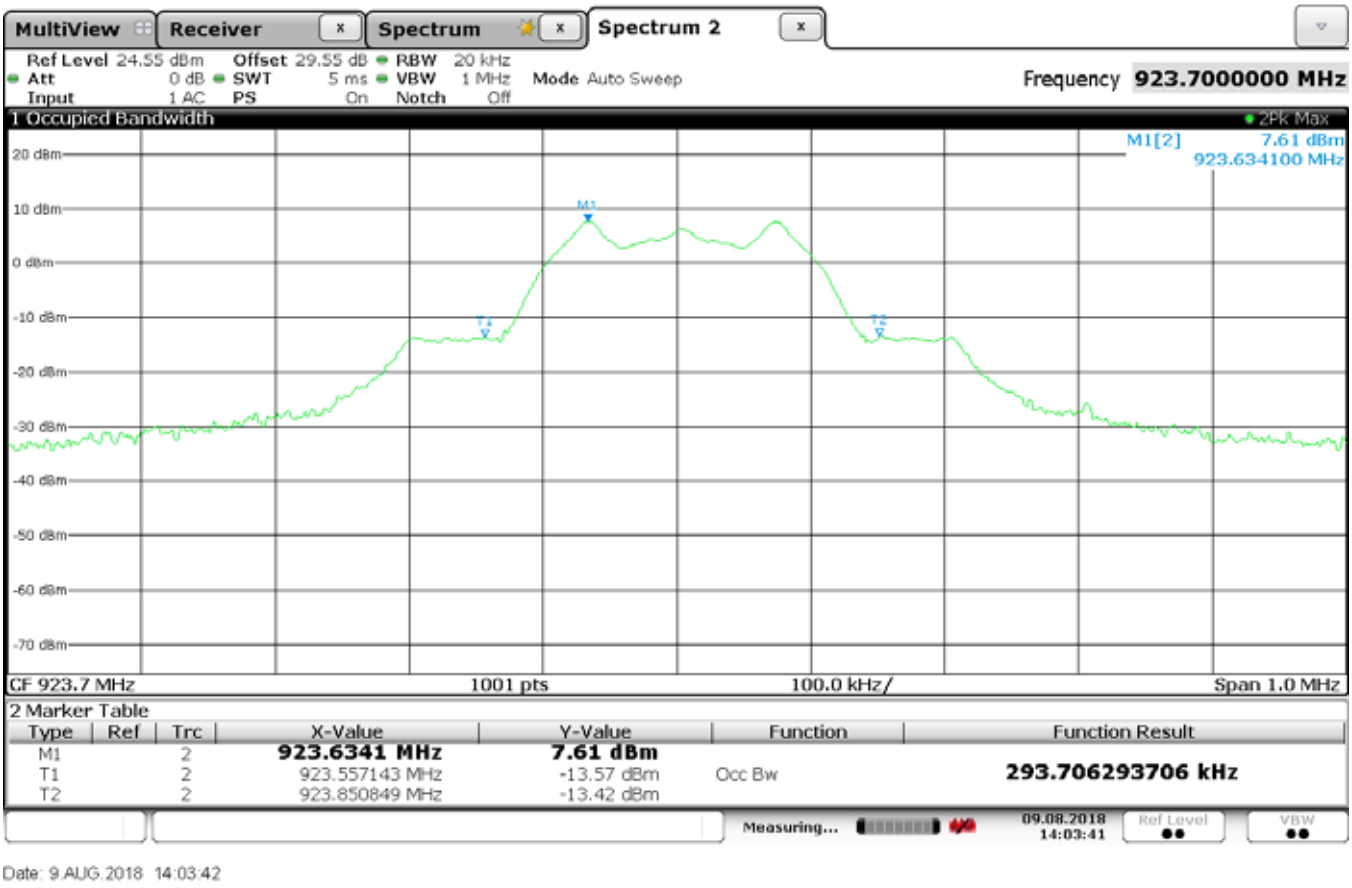


Date: 9.AUG.2018 14:13:58

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **99% Bandwidth**
Mode : Tx 904.94MHz
Parameters : 99% Bandwidth = 302.69kHz
Date : August 9,2018
Notes :

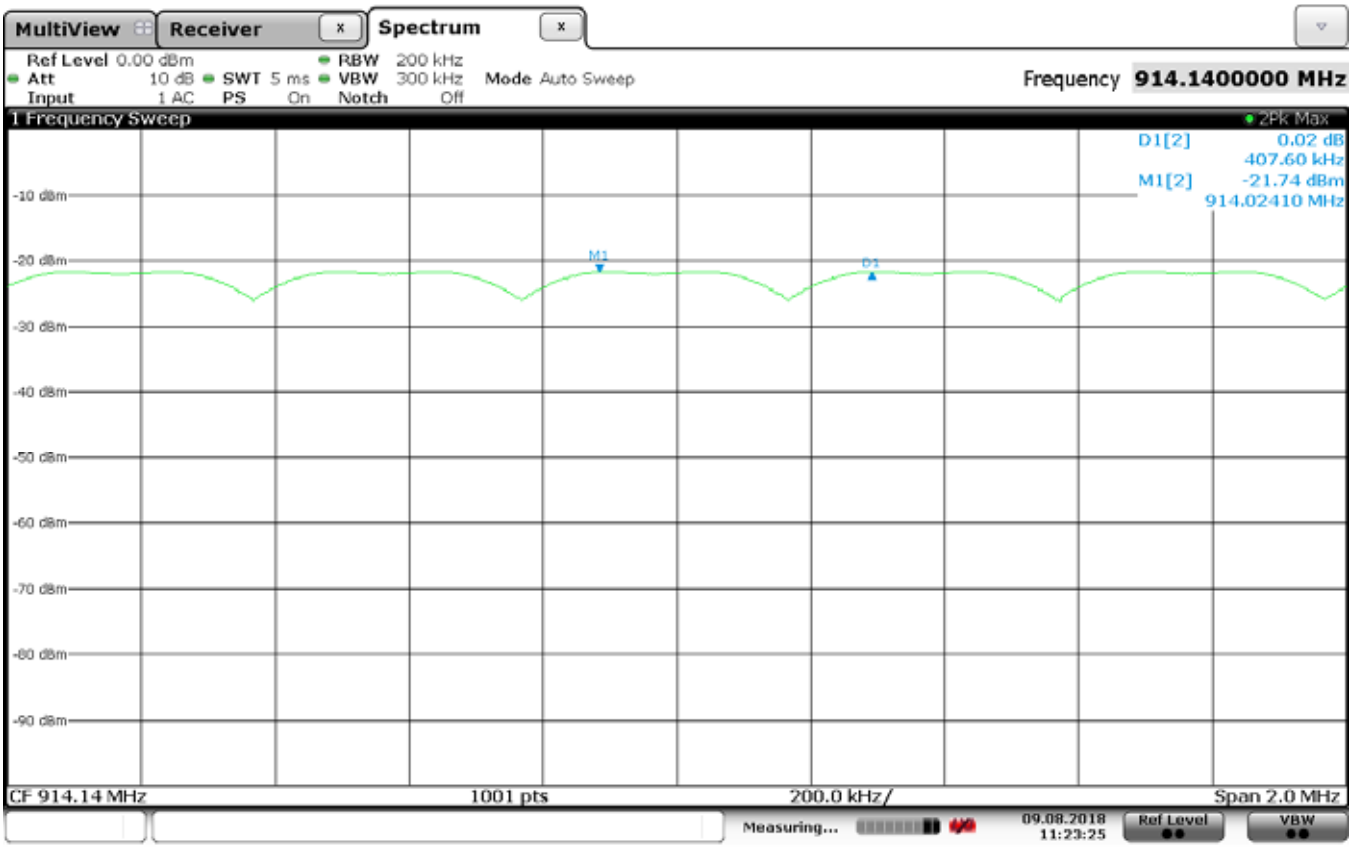


Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **99% Bandwidth**
Mode : Tx 914.1MHz
Parameters : 99% Bandwidth = 302.69kHz
Date : August 9,2018
Notes :

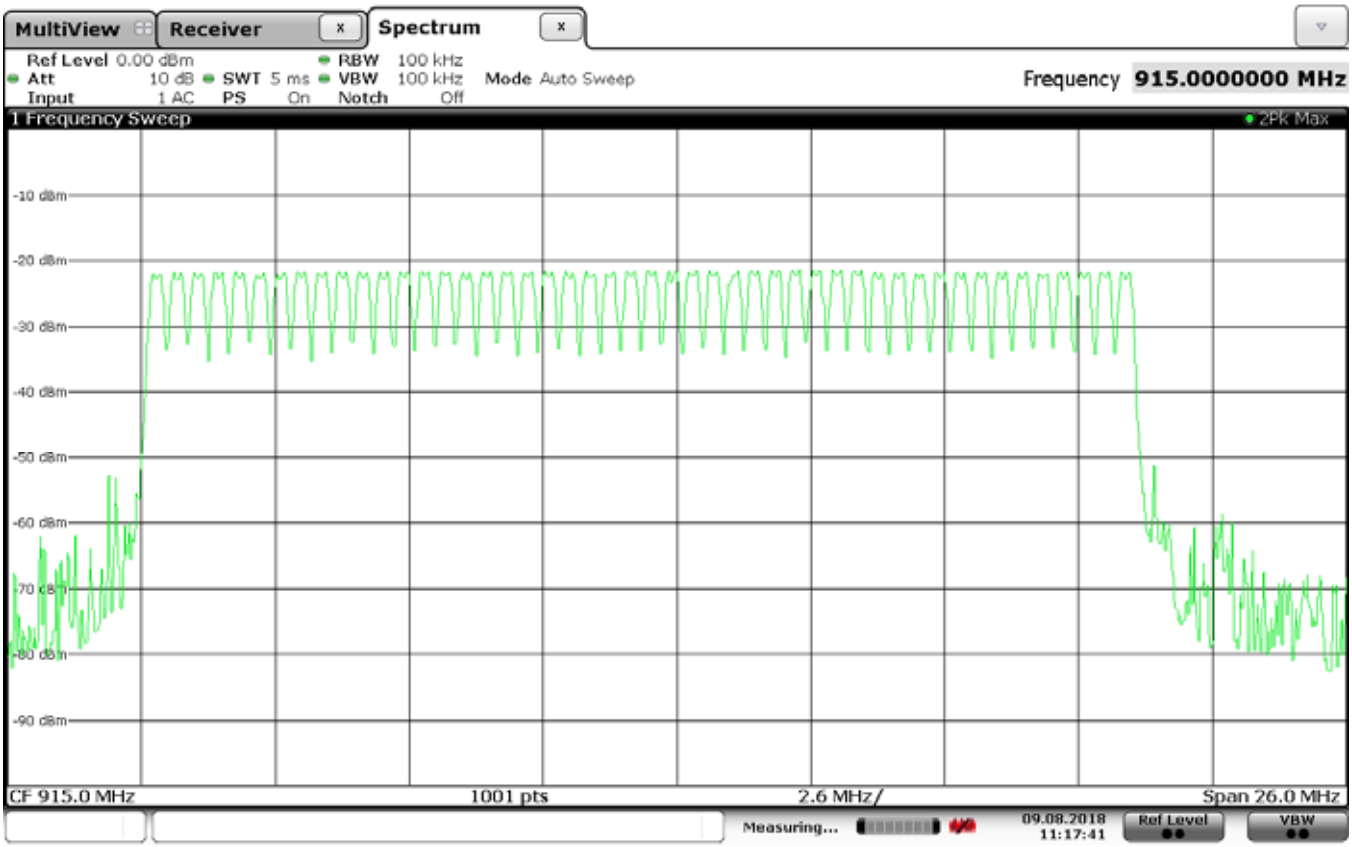


Date: 9.AUG.2018 14:03:42

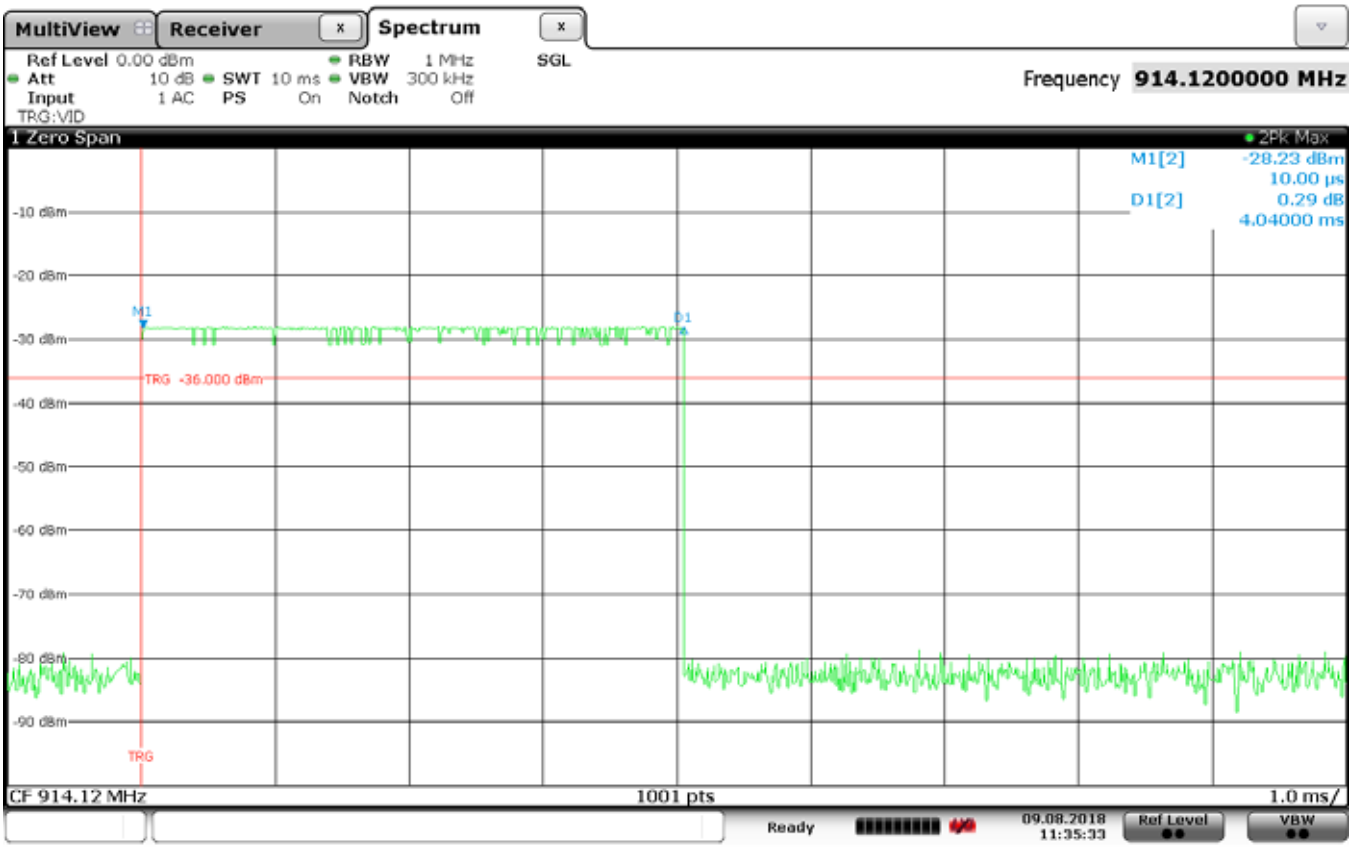
Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **99% Bandwidth**
Mode : Tx 923.79MHz
Parameters : 99% Bandwidth = 293.7kHz
Date : August 9,2018
Notes :



Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a)(1) Carrier Frequency Separation**
Mode : Frequency Hopping Enabled
Parameters : Carrier Frequency Separation = 407.6kHz
Date : August 9,2018
Notes :

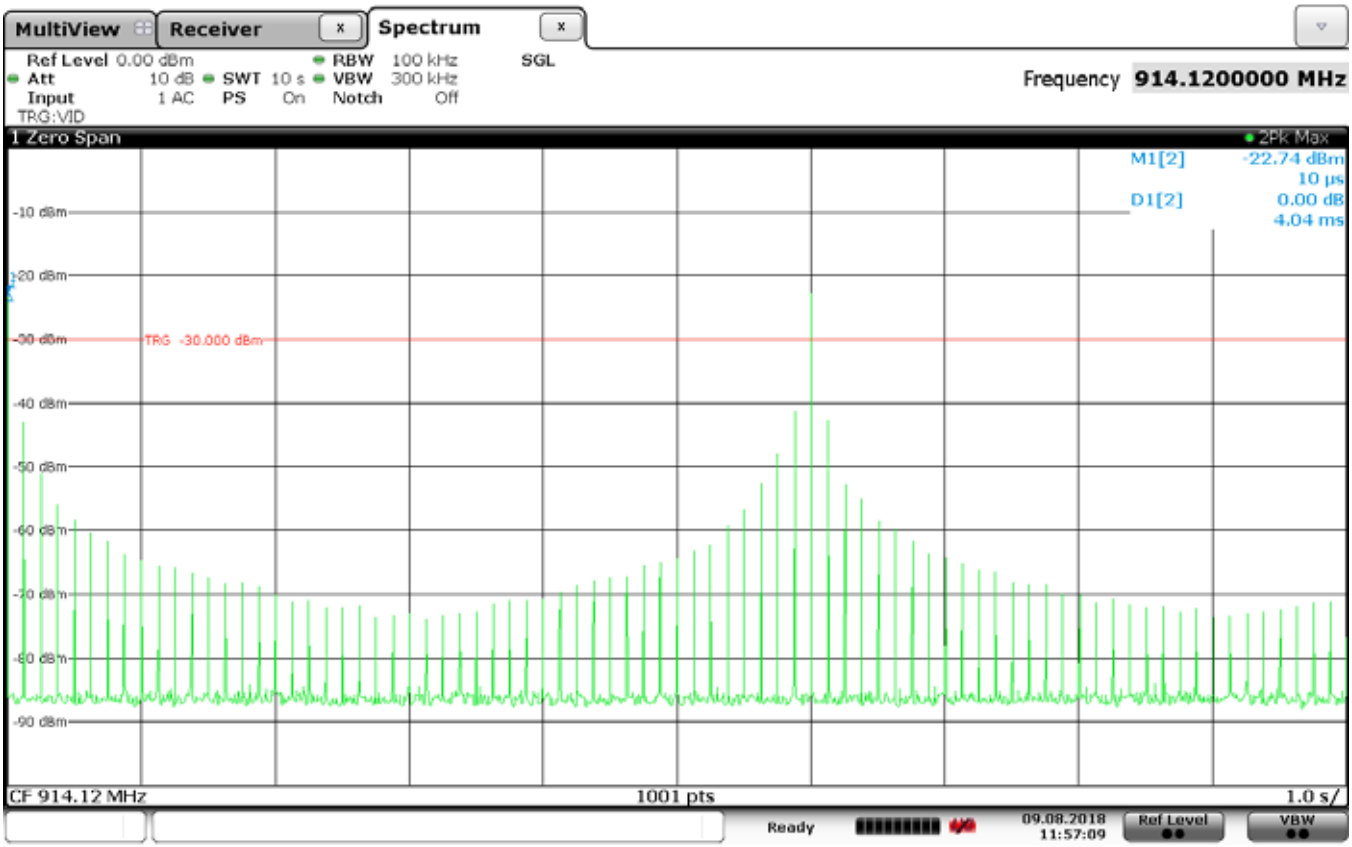


Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a)(1)(i) Number of Hopping Frequencies**
Mode : Frequency Hopping Enabled
Parameters : Number of Hopping Channels = 48
Date : August 9,2018
Notes :



Date: 9.AUG.2018 11:35:32

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a)(1)(i) Dwell Time per Hop**
Mode : Frequency Hopping Enabled
Parameters : Dwell Time per Hop = 4.04ms
Date : August 9,2018
Notes :



Date: 9.AUG.2018 11:57:08

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(a)(1)(i) Number of Hops**
Mode : Frequency Hopping Enabled
Parameters : Time of Occupancy = 2 Hops * 4.04ms = 8.08ms
Date : August 9,2018
Notes :

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)
904.94	H	70.5	0.3	2.2	2.0	0.4	24	-23.6
904.94	V	77.7	10.8	2.2	2.0	10.9	24	-13.1

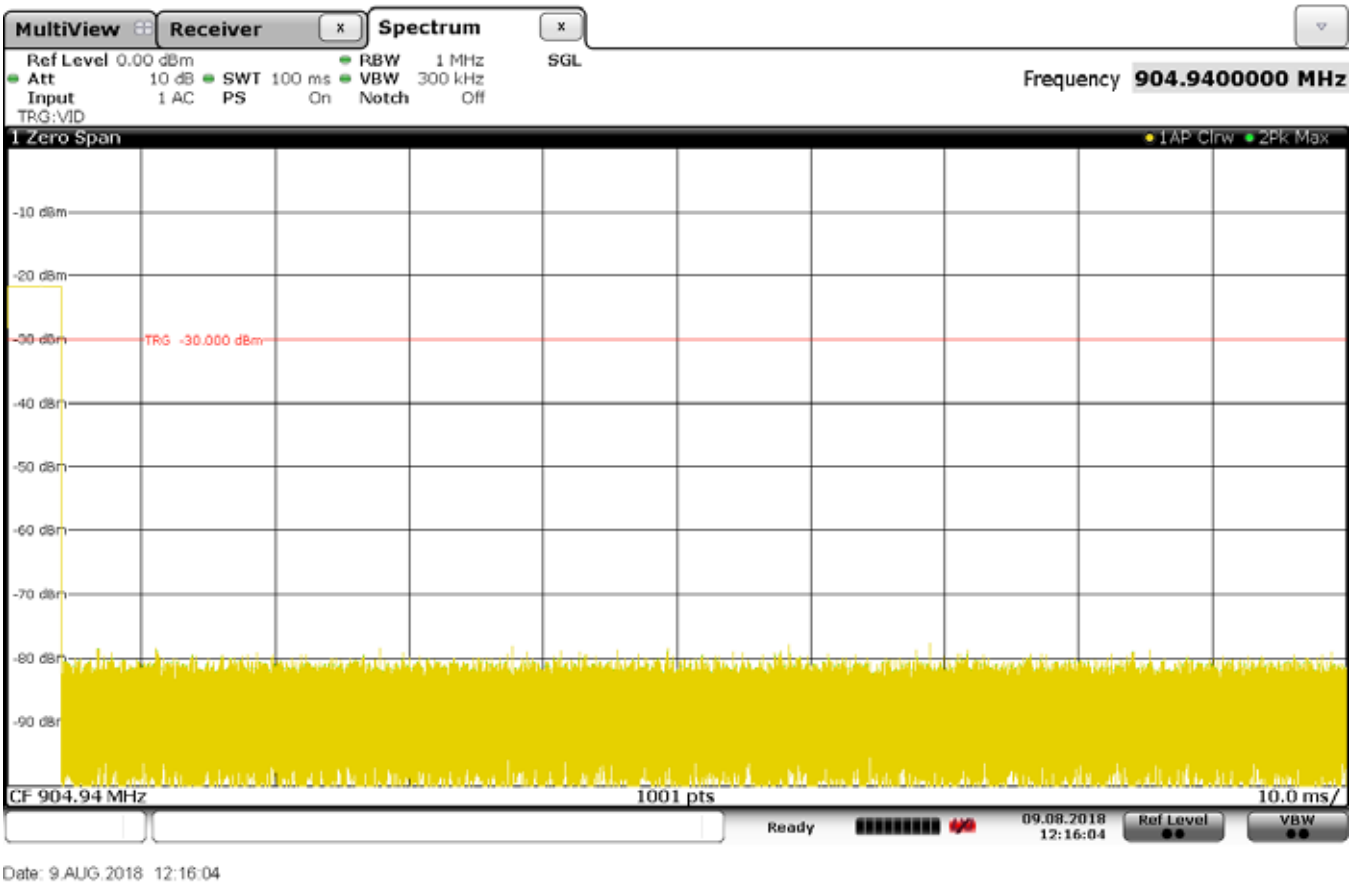
Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(b)(2) Peak Output Power**
Mode : Tx 904.94MHz
Parameters : Max EIRP = 10.9dBm
Date : August 9,2018
Notes :

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)
914.10	H	69.1	-1.0	2.2	2.1	-0.9	24	-23.1
914.10	V	77.1	10.5	2.2	2.1	10.6	24	-13.4

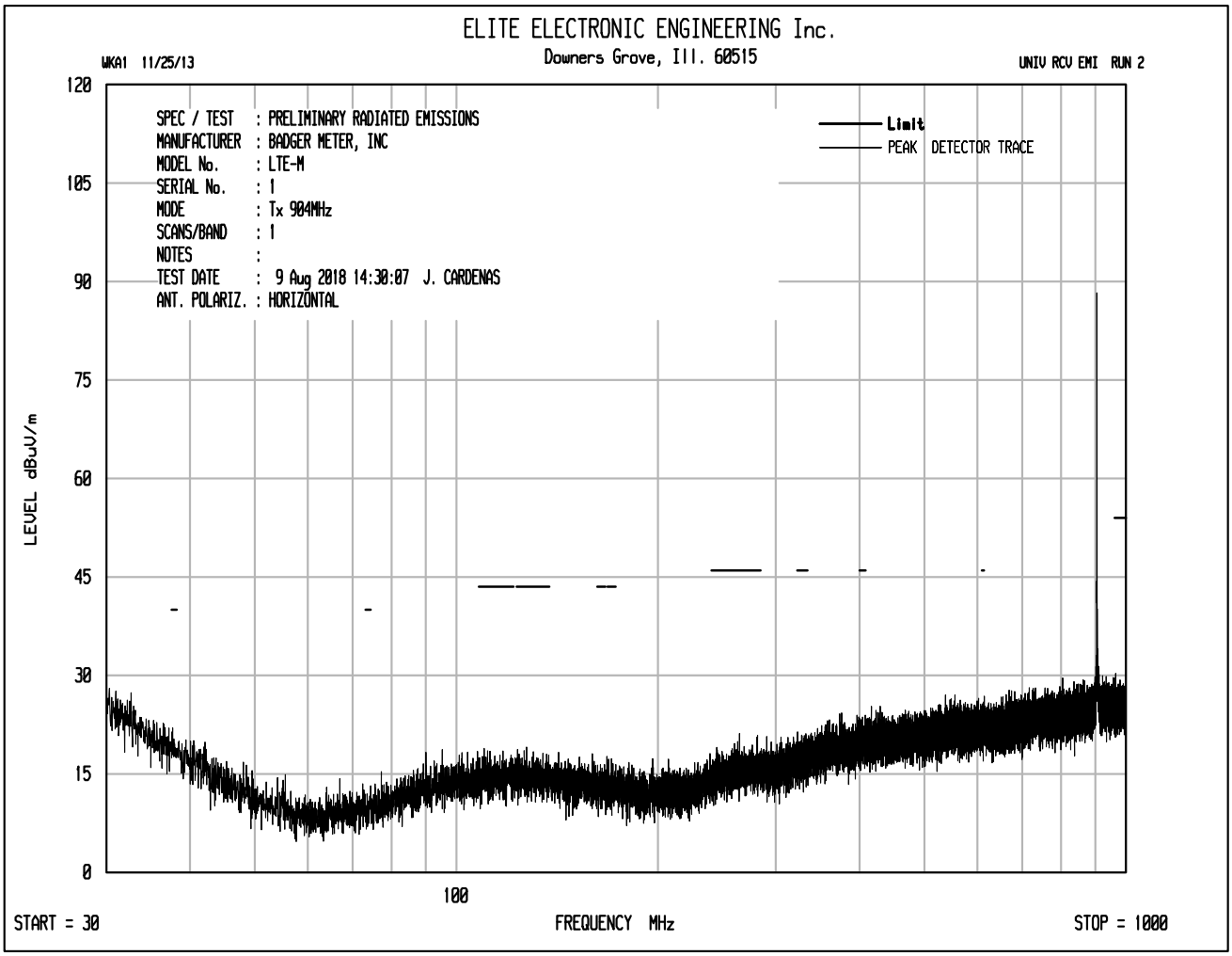
Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(b)(2) Peak Output Power**
Mode : Tx 914.1MHz
Parameters : Max EIRP = 10.6dBm
Date : August 9,2018
Notes :

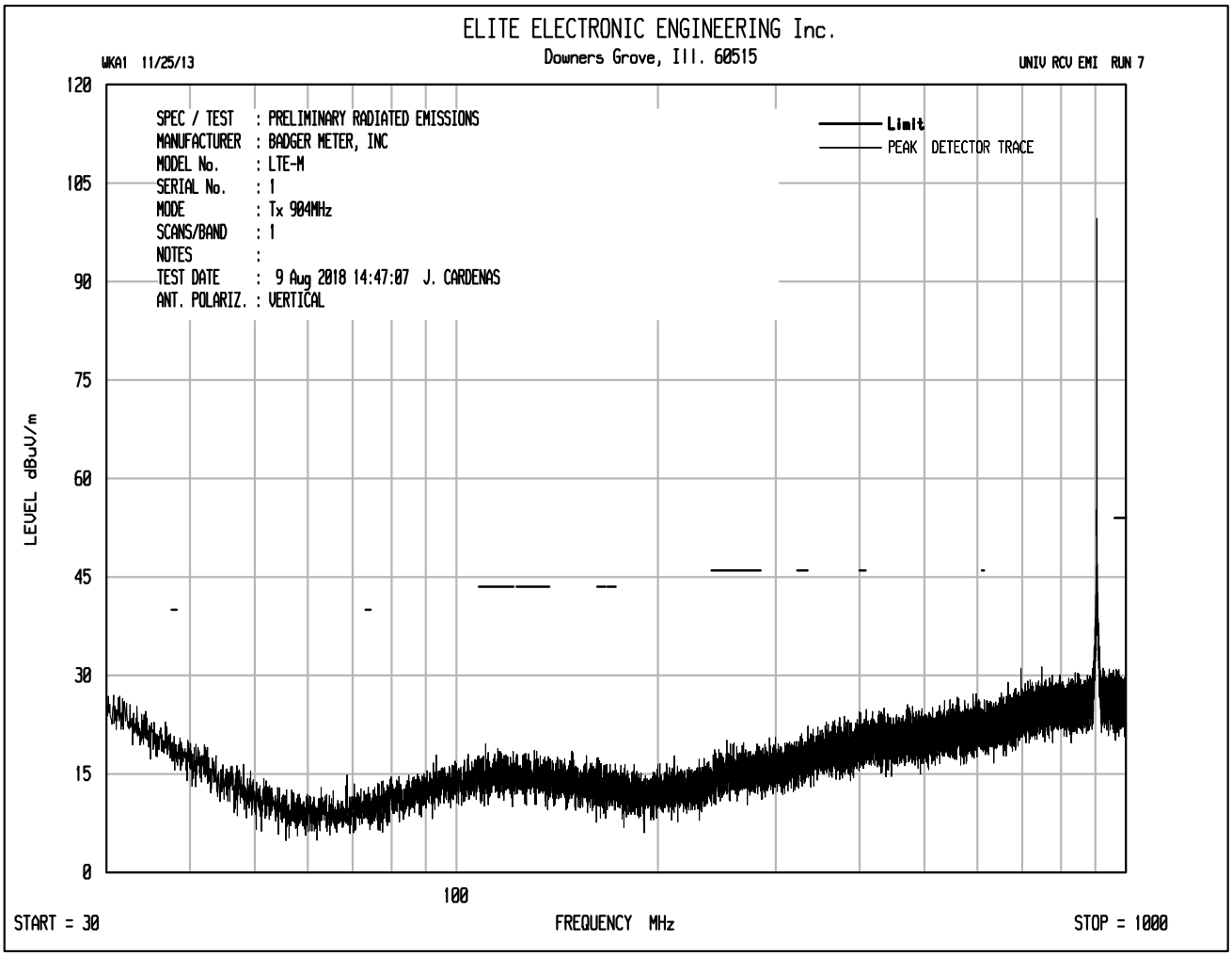
Freq. (MHz)	Ant Pol	Wide BW Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
923.79	H	70.5	0.5	2.2	2.1	0.6	24	-23.4
923.79	V	76.8	10.1	2.2	2.1	10.1	24	-13.9

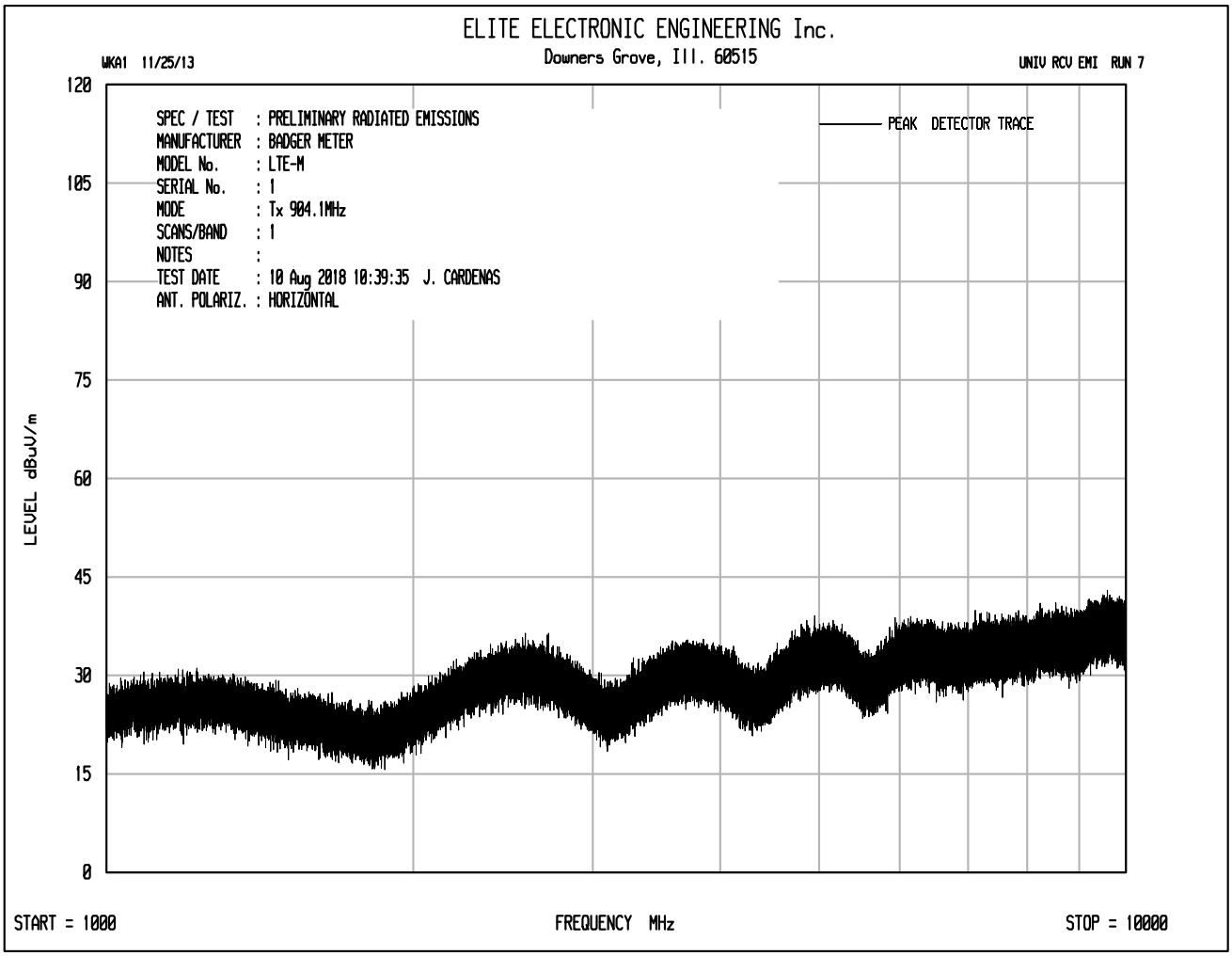
Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(b)(2) Peak Output Power**
Mode : Tx 923.79MHz
Parameters : Max EIRP = 10.1dBm
Date : August 9,2018
Notes

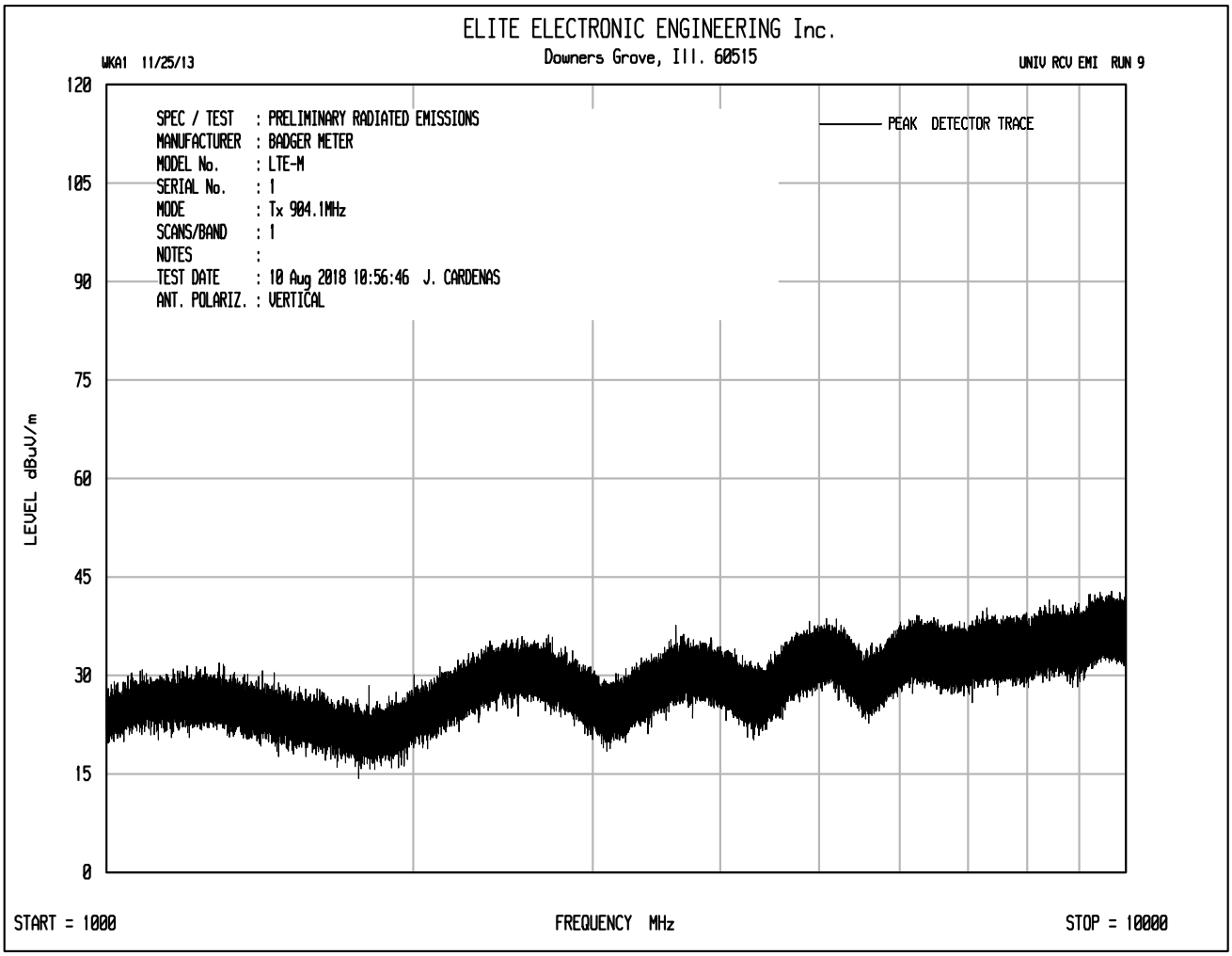


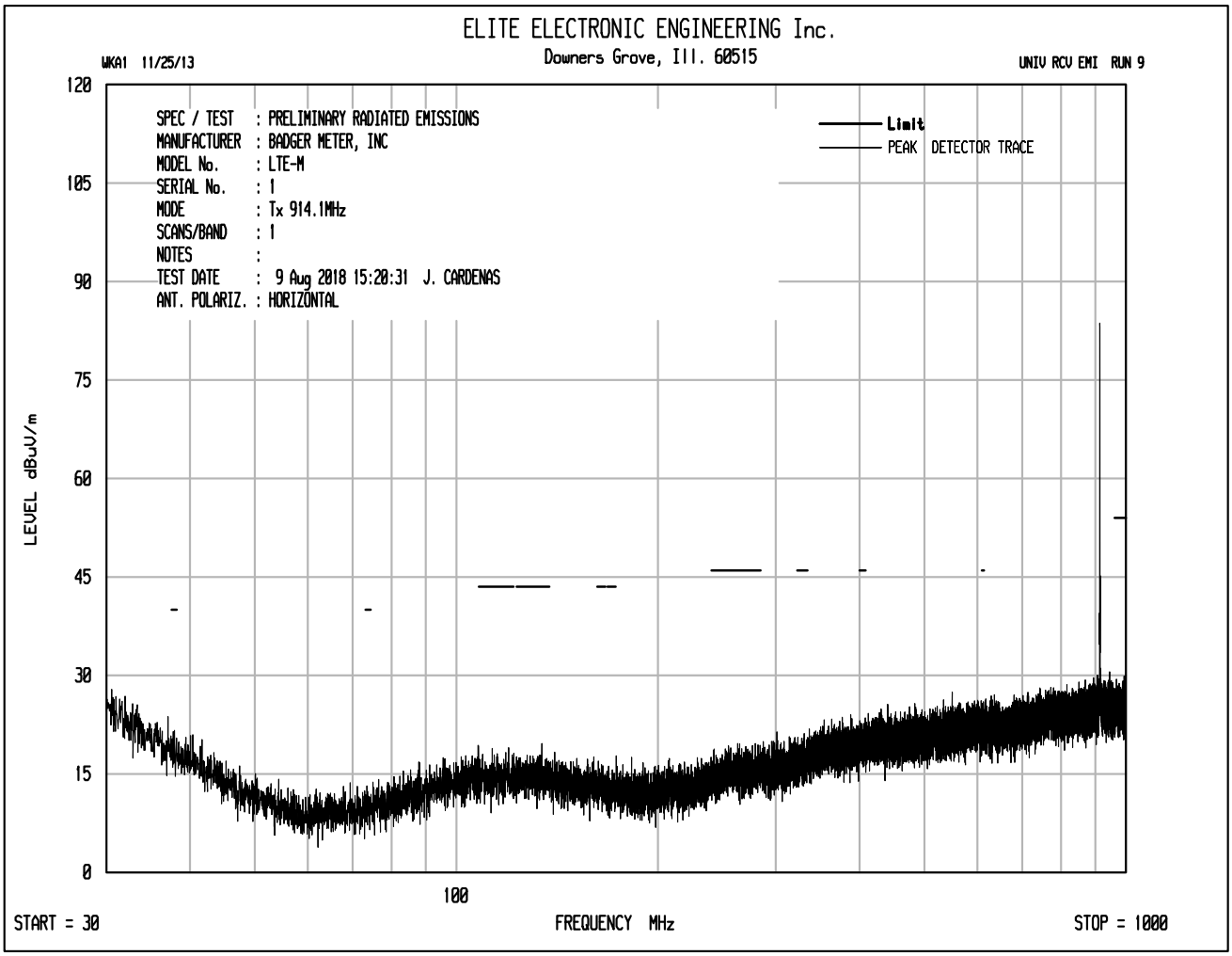
Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **Duty Cycle Correction Factor**
Mode : Tx 904.94MHz
Parameters : D.C (dB) = 20 x log [(4.04ms x 1 pulse) / 100msec] = -27.87dB
Date : August 9,2018
Notes

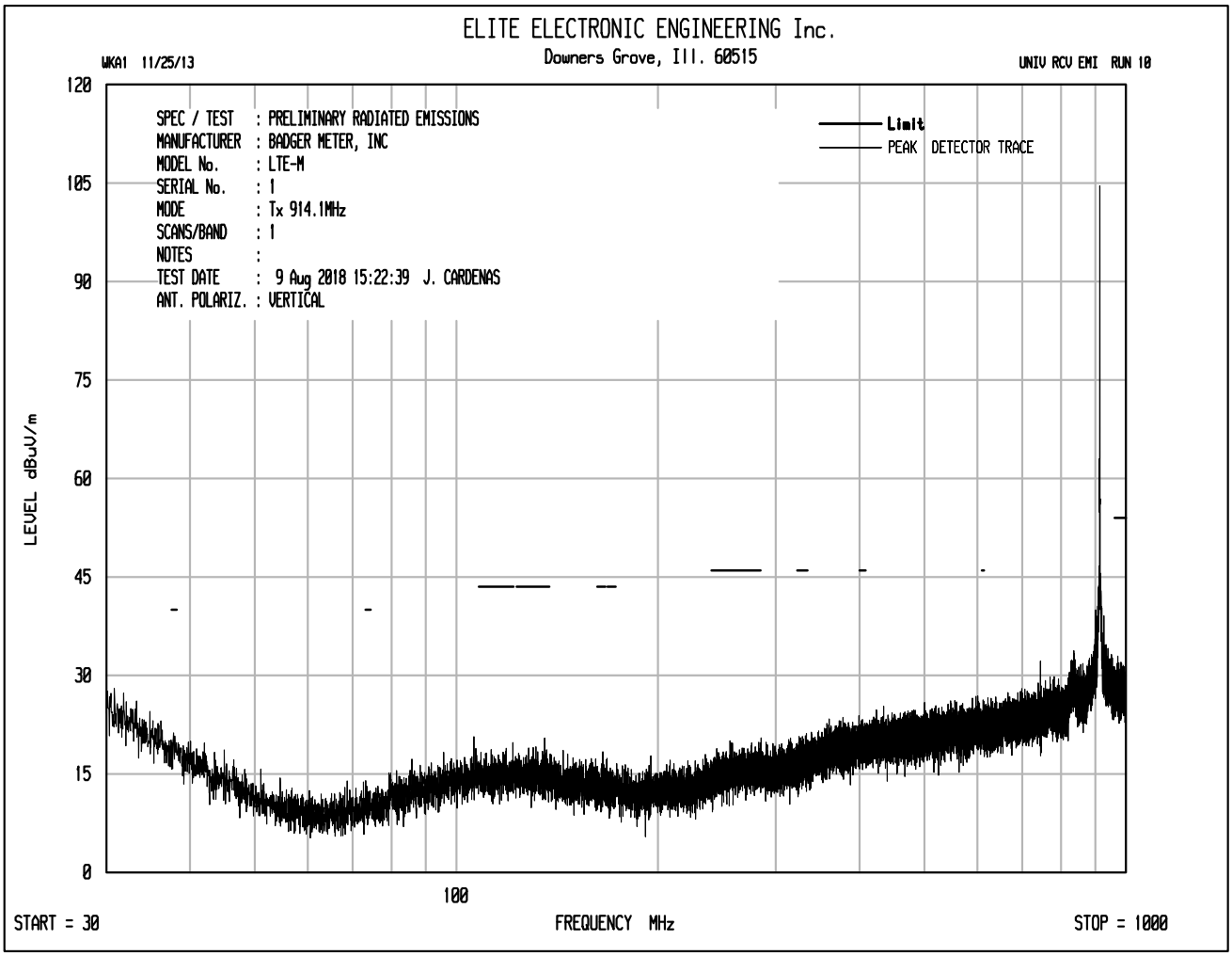

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 2
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 904MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 9 Aug 2018 14:30:07 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

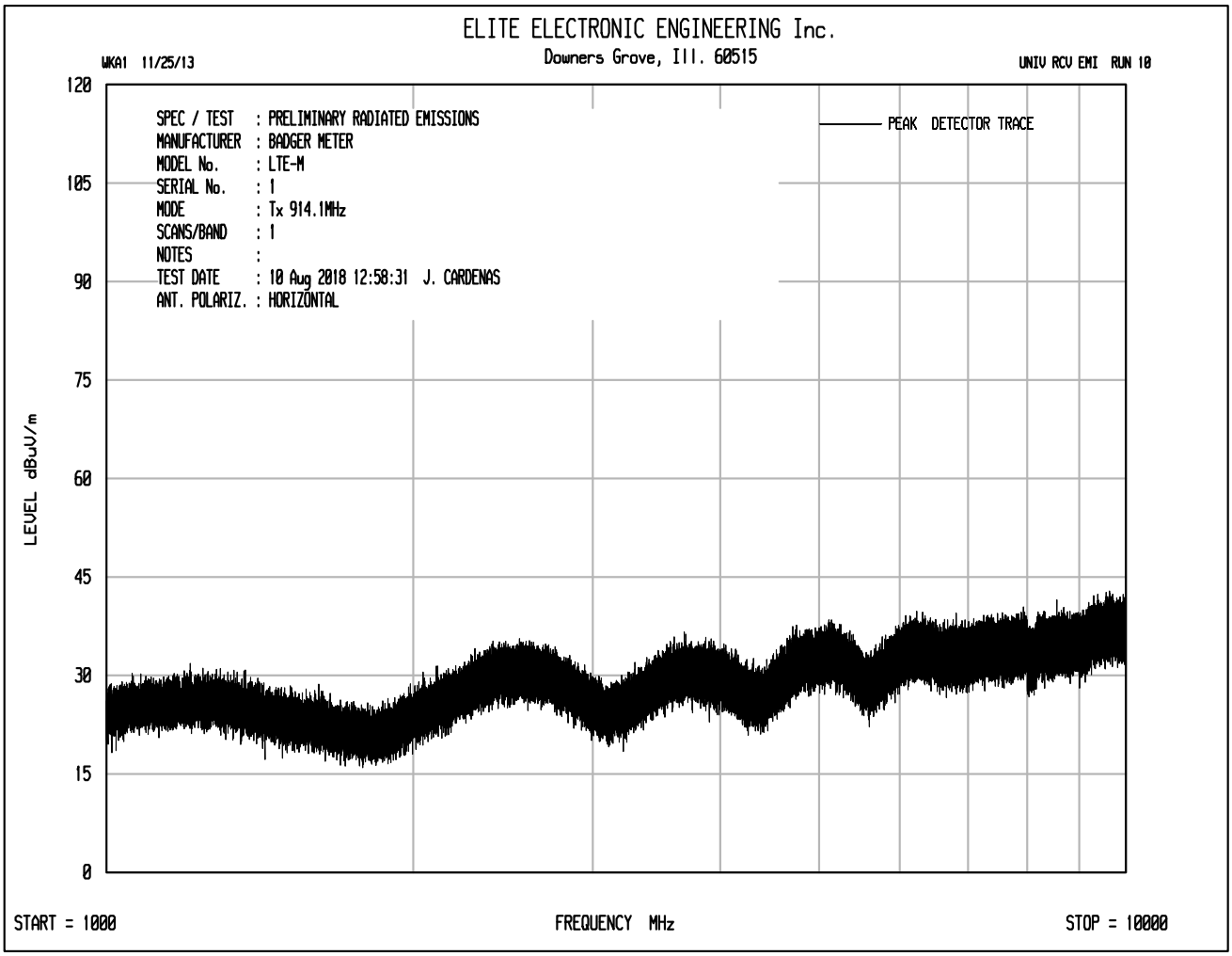

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 7
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 904MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 9 Aug 2018 14:47:07 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

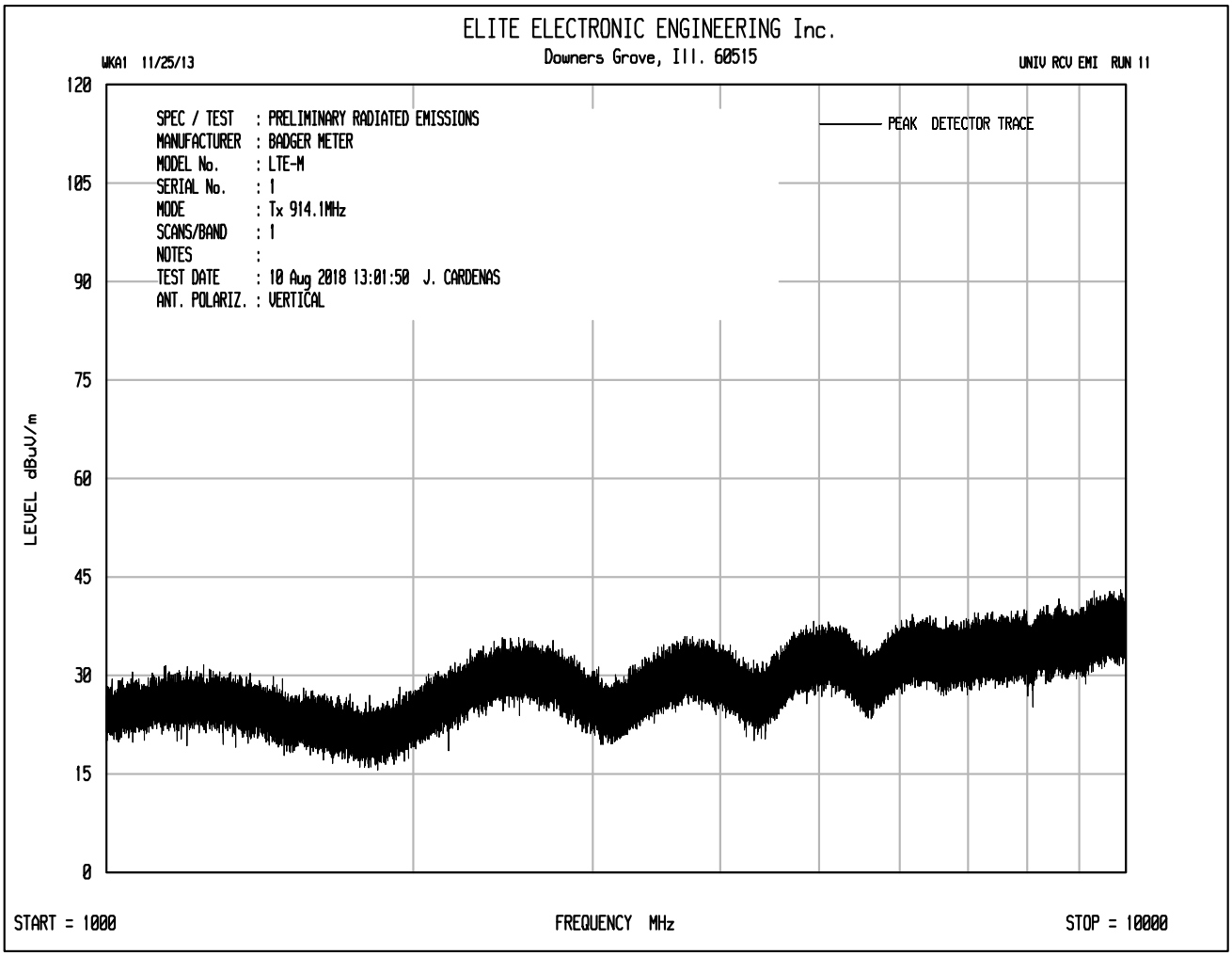

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 7
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 904.1MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Aug 2018 10:39:35 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

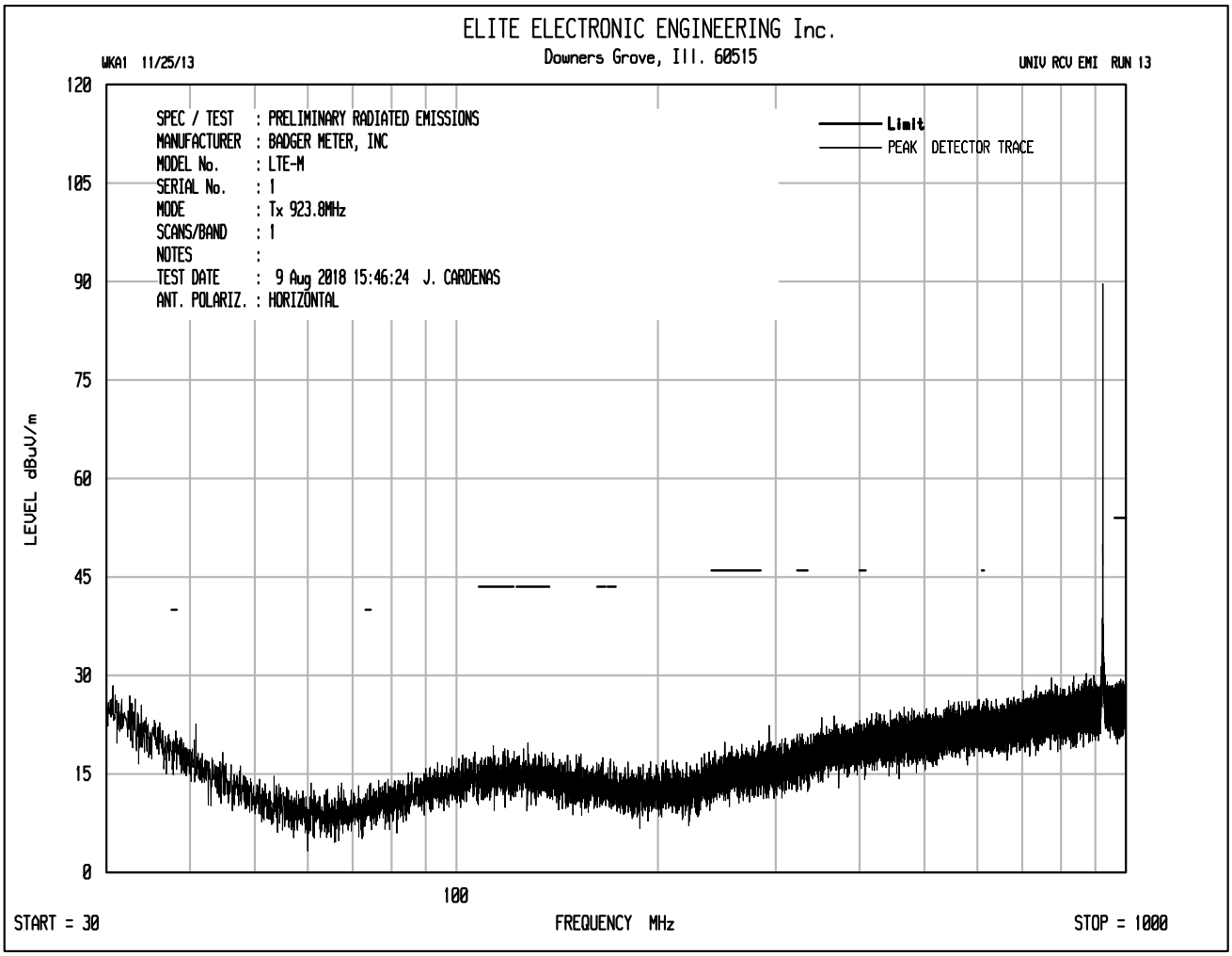

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 9
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 904.1MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Aug 2018 10:56:46 J. CARDENAS
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

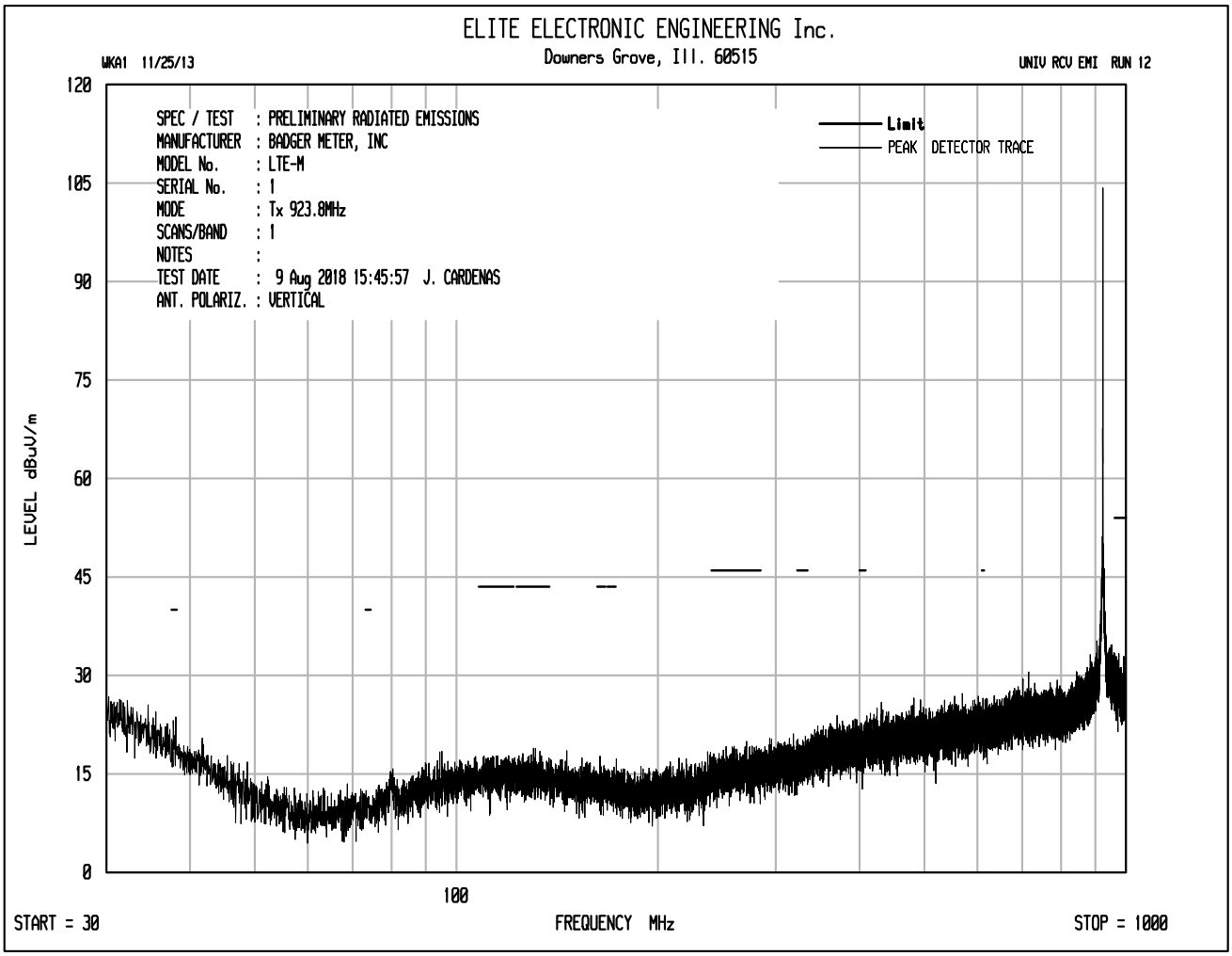

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 9
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 914.1MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 9 Aug 2018 15:20:31 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

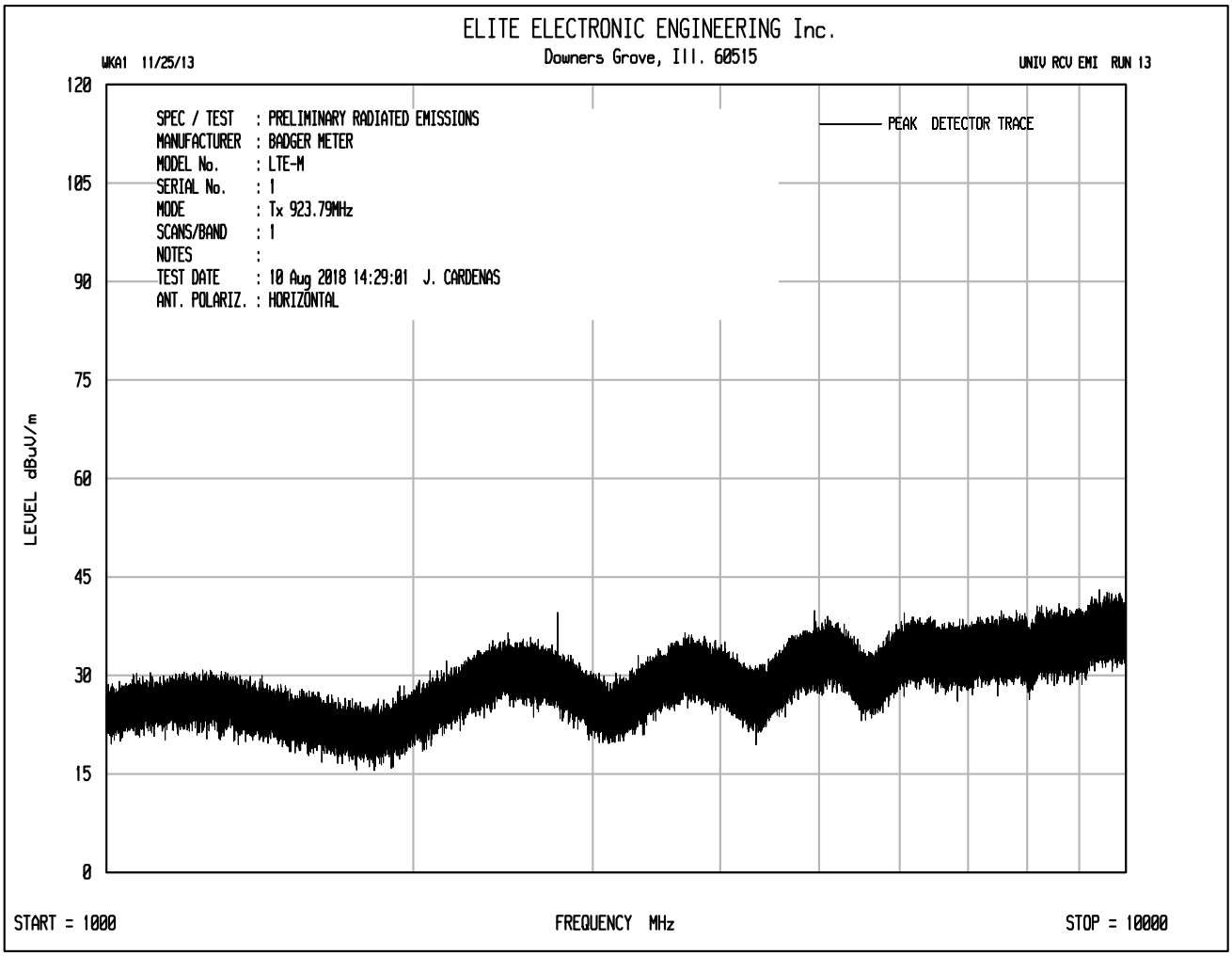

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 914.1MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 9 Aug 2018 15:22:39 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

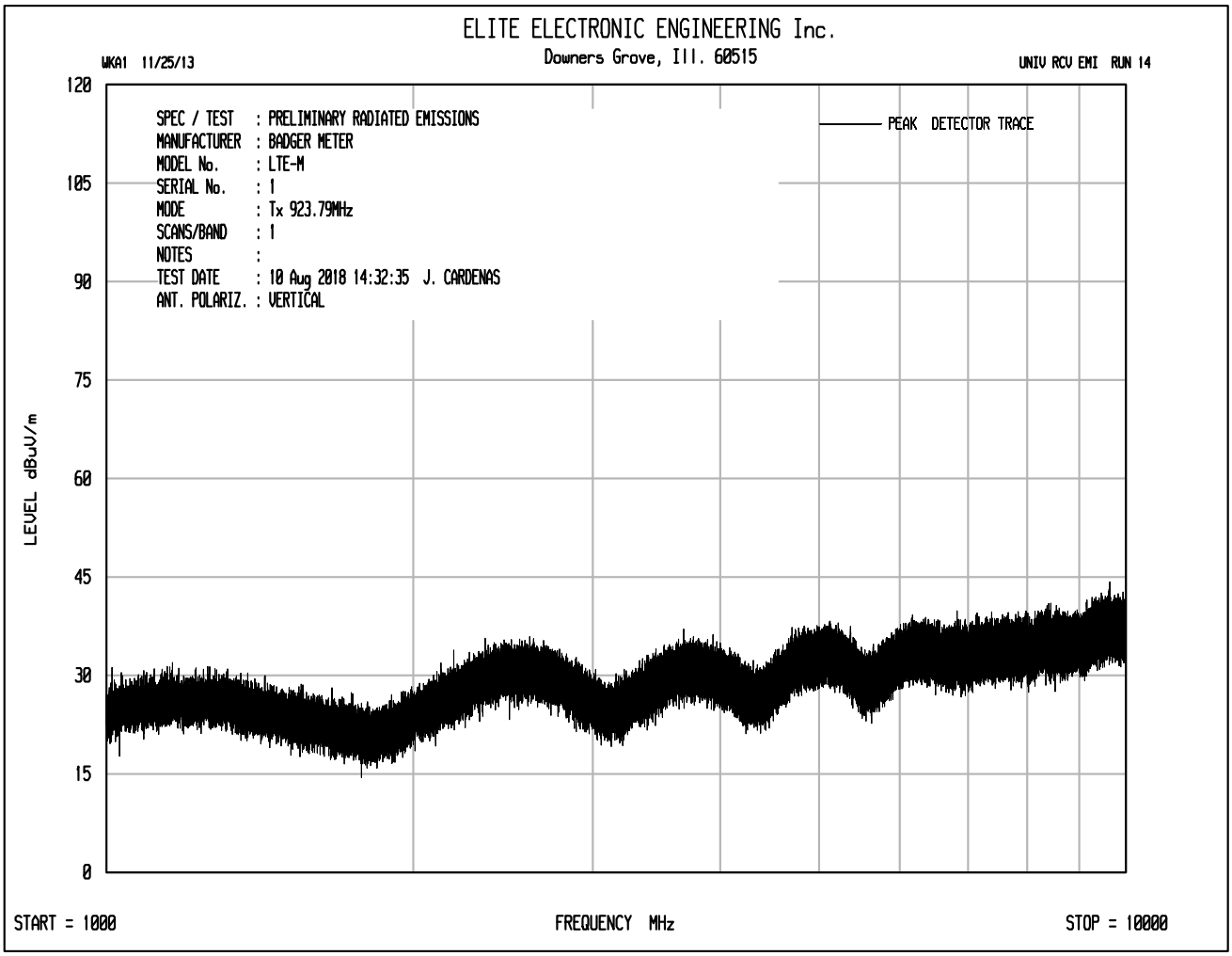

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 914.1MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Aug 2018 12:58:31 J. CARDENAS
ANT. POLARIZ. : 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
WKA1 11/25/13
UNIV RCV EMI RUN 11
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 914.1MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Aug 2018 13:01:50 J. CARDENAS
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
WKA1 11/25/13
UNIV RCV EMI RUN 13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 923.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 9 Aug 2018 15:46:24 J. CARDENAS
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

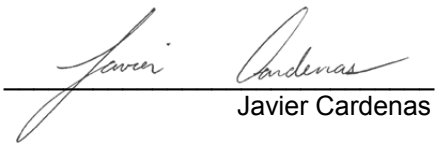

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 12
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER, INC
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 923.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 9 Aug 2018 15:45:57 J. CARDENAS
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 923.79MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Aug 2018 14:29:01 J. CARDENAS
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
WKA1 11/25/13
UNIV RCV EMI RUN 14
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : BADGER METER
MODEL No. : LTE-M
SERIAL No. : 1
MODE : Tx 923.79MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Aug 2018 14:32:35 J. CARDENAS
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions in Restricted Bands**
Mode : Tx 904.94MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Peak Detector with a 1MHz Resolution Bandwidth

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)
2714.82	H	53.1		2.8	33.6	-40.4	49.1	285.2	5000.0	-24.9
2714.82	V	53.8		2.8	33.6	-40.4	49.8	308.4	5000.0	-24.2
3619.76	H	53.0		3.2	34.3	-40.3	50.2	323.8	5000.0	-23.8
3619.76	V	53.1		3.2	34.3	-40.3	50.4	329.4	5000.0	-23.6
4524.70	H	48.3	*	3.6	36.0	-40.1	47.7	243.6	5000.0	-26.2
4524.70	V	48.4	*	3.6	36.0	-40.1	47.9	248.9	5000.0	-26.1
5429.64	H	49.4	*	3.9	36.8	-40.2	49.8	310.1	5000.0	-24.1
5429.64	V	49.4	*	3.9	36.8	-40.2	49.9	311.5	5000.0	-24.1
8144.46	H	50.6	*	4.9	38.4	-40.0	54.0	499.0	5000.0	-20.0
8144.46	V	50.5	*	4.9	38.4	-40.0	53.9	494.5	5000.0	-20.1
9049.40	H	49.8	*	5.0	38.9	-39.7	53.9	497.8	5000.0	-20.0
9049.40	V	49.9	*	5.0	38.9	-39.7	54.0	502.5	5000.0	-20.0

Checked By 
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions in Restricted Bands**
Mode : Tx 904.94MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Average Detector with a 1MHz Resolution Bandwidth

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
2714.82	H	37.85		2.8	33.6	-40.4	-27.9	5.9	2.0	500.0
2714.82	V	39.7		2.8	33.6	-40.4	-27.9	7.8	2.4	500.0
3619.76	H	36.9		3.2	34.3	-40.3	-27.9	6.3	2.1	500.0
3619.76	V	38.0		3.2	34.3	-40.3	-27.9	7.4	2.3	500.0
4524.70	H	32.8	*	3.6	36.0	-40.1	-27.9	4.4	1.7	500.0
4524.70	V	33.0	*	3.6	36.0	-40.1	-27.9	4.6	1.7	500.0
5429.64	H	33.5	*	3.9	36.8	-40.2	-27.9	6.1	2.0	500.0
5429.64	V	34.6	*	3.9	36.8	-40.2	-27.9	7.2	2.3	500.0
8144.46	H	34.5	*	4.9	38.4	-40.0	-27.9	10.0	3.2	500.0
8144.46	V	34.8	*	4.9	38.4	-40.0	-27.9	10.3	3.3	500.0
9049.40	H	33.9	*	5.0	38.9	-39.7	-27.9	10.2	3.2	500.0
9049.40	V	34.1	*	5.0	38.9	-39.7	-27.9	10.4	3.3	500.0

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions not in Restricted Bands**
Mode : Tx 904.94MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Peak Detector with a 100kHz Resolution Bandwidth

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)
904.94	H	70.2		1.6	26.9	0.0	98.6	85126.4		
904.94	V	77.3		1.6	26.9	0.0	105.8	193893.9		
1809.88	H	36.7		2.2	30.9	-40.9	29.0	28.1	19389.4	-56.8
1809.88	V	40.4		2.2	30.9	-40.9	32.7	43.0	19389.4	-53.1
6334.58	H	39.9	*	4.3	38.2	-40.1	42.2	128.6	19389.4	-43.6
6334.58	V	40.5	*	4.3	38.2	-40.1	42.9	139.2	19389.4	-42.9
7239.52	H	39.5	*	4.7	38.1	-40.1	42.2	128.7	19389.4	-43.6
7239.52	V	39.4	*	4.7	38.1	-40.1	42.1	127.1	19389.4	-43.7

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions in Restricted Bands**
Mode : Tx 914.1MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Peak Detector with a 1MHz Resolution Bandwidth

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)
2742.30	H	52.6		2.8	33.7	-40.4	48.8	274.7	5000.0	-25.2
2742.30	V	52.8		2.8	33.7	-40.4	49.0	281.4	5000.0	-25.0
3656.40	H	51.4		3.3	34.6	-40.3	49.0	282.4	5000.0	-25.0
3656.40	V	52.9		3.3	34.6	-40.3	50.5	333.7	5000.0	-23.5
4570.50	H	48.8	*	3.6	36.2	-40.1	48.4	263.1	5000.0	-25.6
4570.50	V	48.7	*	3.6	36.2	-40.1	48.4	262.1	5000.0	-25.6
7312.80	H	50.1	*	4.7	38.1	-40.1	52.9	440.3	5000.0	-21.1
7312.80	V	50.3	*	4.7	38.1	-40.1	53.1	449.5	5000.0	-20.9
8226.90	H	50.9	*	4.9	38.5	-39.9	54.4	526.1	5000.0	-19.6
8226.90	V	51.3	*	4.9	38.5	-39.9	54.8	550.9	5000.0	-19.2
9141.00	H	50.3	*	5.0	38.9	-39.7	54.4	526.5	5000.0	-19.6
9141.00	V	50.7	*	5.0	38.9	-39.7	54.9	553.3	5000.0	-19.1

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions in Restricted Bands**
Mode : Tx 914.1MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Average Detector with a 1MHz Resolution Bandwidth

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
2742.30	H	41.05		2.8	33.7	-40.4	-27.9	9.3	2.9	500.0
2742.30	V	41.4		2.8	33.7	-40.4	-27.9	9.7	3.0	500.0
3656.40	H	42.9		3.3	34.6	-40.3	-27.9	12.6	4.3	500.0
3656.40	V	43.0		3.3	34.6	-40.3	-27.9	12.7	4.3	500.0
4570.50	H	33.3	*	3.6	36.2	-40.1	-27.9	5.0	1.8	500.0
4570.50	V	33.1	*	3.6	36.2	-40.1	-27.9	4.9	1.8	500.0
7312.80	H	34.7	*	4.7	38.1	-40.1	-27.9	9.6	3.0	500.0
7312.80	V	34.7	*	4.7	38.1	-40.1	-27.9	9.6	3.0	500.0
8226.90	H	35.1	*	4.9	38.5	-39.9	-27.9	10.7	3.4	500.0
8226.90	V	35.4	*	4.9	38.5	-39.9	-27.9	11.1	3.6	500.0
9141.00	H	35.2	*	5.0	38.9	-39.7	-27.9	11.5	3.7	500.0
9141.00	V	35.2	*	5.0	38.9	-39.7	-27.9	11.5	3.8	500.0

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions not in Restricted Bands**
Mode : Tx 914.1MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Peak Detector with a 100kHz Resolution Bandwidth

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	69.1		1.6	27.0	0.0	97.6	76093.8		
914.10	V	76.9		1.6	27.0	0.0	105.4	187003.3		
1828.20	H	37.3		2.2	31.1	-40.8	29.8	30.8	18700.3	-55.7
1828.20	V	40.9		2.2	31.1	-40.8	33.4	46.7	18700.3	-52.0
5484.60	H	39.0		3.9	36.8	-40.2	39.5	94.1	18700.3	-46.0
5484.60	V	39.5		3.9	36.8	-40.2	40.0	100.0	18700.3	-45.4
6398.70	H	40.5		4.3	38.0	-40.1	42.6	135.6	18700.3	-42.8
6398.70	V	40.8		4.3	38.0	-40.1	42.9	140.4	18700.3	-42.5

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions in Restricted Bands**
Mode : Tx 923.79MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Peak Detector with a 1MHz Resolution Bandwidth

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)
2771.37	H	51.8		2.8	33.5	-40.4	47.7	243.7	5000.0	-26.2
2771.37	V	51.9		2.8	33.5	-40.4	47.9	247.4	5000.0	-26.1
3695.16	H	52.4		3.3	34.5	-40.2	49.9	312.6	5000.0	-24.1
3695.16	V	52.2		3.3	34.5	-40.2	49.7	305.5	5000.0	-24.3
4618.95	H	49.4	*	3.6	36.4	-40.1	49.2	288.6	5000.0	-24.8
4618.95	V	49.8	*	3.6	36.4	-40.1	49.6	301.5	5000.0	-24.4
7390.32	H	50.1	*	4.7	38.1	-40.1	52.9	441.0	5000.0	-21.1
7390.32	V	50.0	*	4.7	38.1	-40.1	52.8	436.5	5000.0	-21.2
8314.11	H	50.5	*	4.9	38.6	-39.9	54.1	509.3	5000.0	-19.8
8314.11	V	50.8	*	4.9	38.6	-39.9	54.4	524.2	5000.0	-19.6

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions in Restricted Bands**
Mode : Tx 923.79MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Average Detector with a 1MHz Resolution Bandwidth

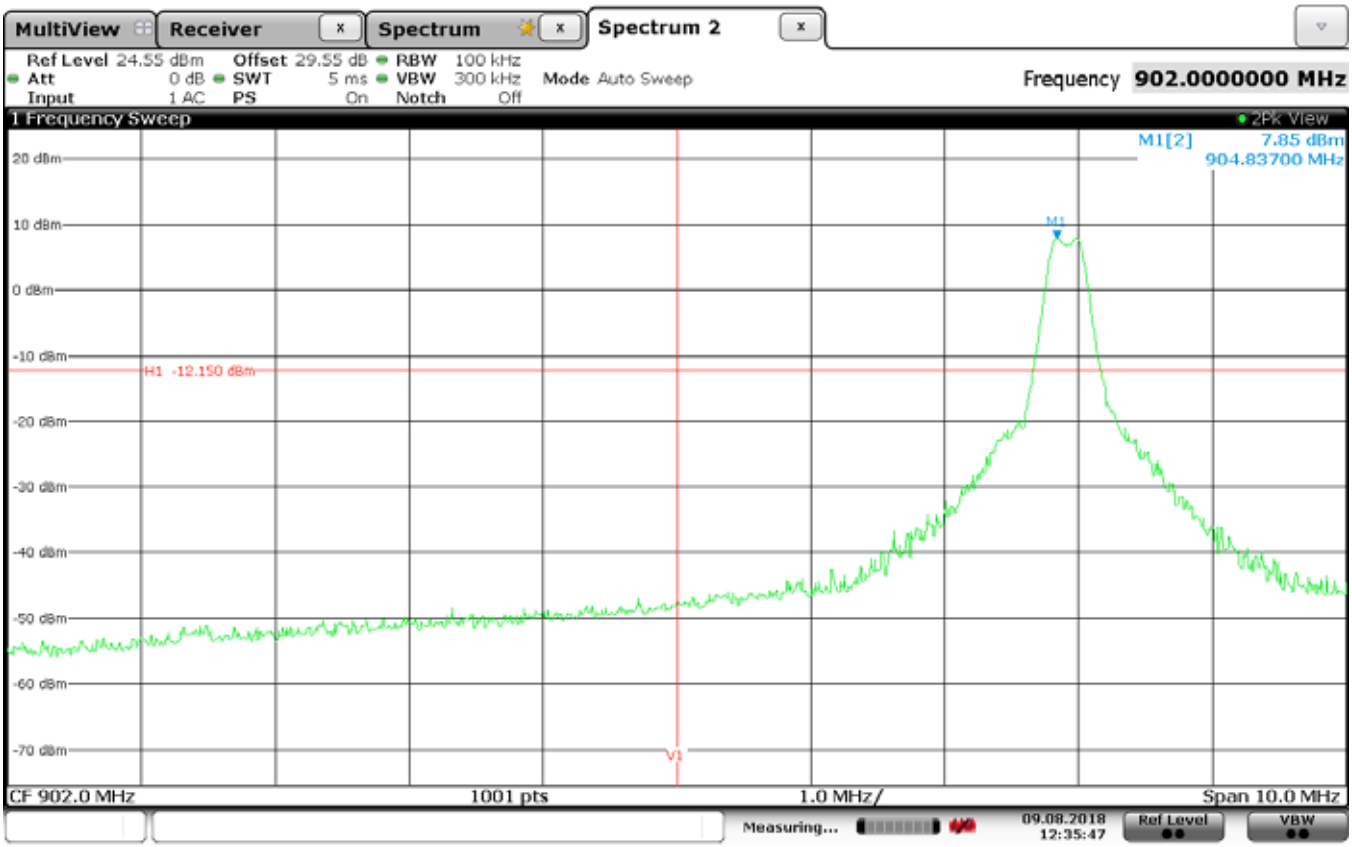
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m
2771.37	H	37.82		2.8	33.5	-40.4	-27.9	5.9	2.0	500.0
2771.37	V	38.1		2.8	33.5	-40.4	-27.9	6.2	2.0	500.0
3695.16	H	38.7		3.3	34.5	-40.2	-27.9	8.3	2.6	500.0
3695.16	V	38.7		3.3	34.5	-40.2	-27.9	8.3	2.6	500.0
4618.95	H	33.6	*	3.6	36.4	-40.1	-27.9	5.5	1.9	500.0
4618.95	V	33.7	*	3.6	36.4	-40.1	-27.9	5.6	1.9	500.0
7390.32	H	34.6	*	4.7	38.1	-40.1	-27.9	9.5	3.0	500.0
7390.32	V	34.5	*	4.7	38.1	-40.1	-27.9	9.5	3.0	500.0
8314.11	H	34.9	*	4.9	38.6	-39.9	-27.9	10.6	3.4	500.0
8314.11	V	34.9	*	4.9	38.6	-39.9	-27.9	10.7	3.4	500.0

Checked By _____
Javier Cardenas

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247, RSS 247 – Peak Radiated Emissions not in Restricted Bands**
Mode : Tx 923.79MHz
Test Distance : 3 meters
Date : August 9,2018
Notes : Peak Detector with a 100kHz Resolution Bandwidth

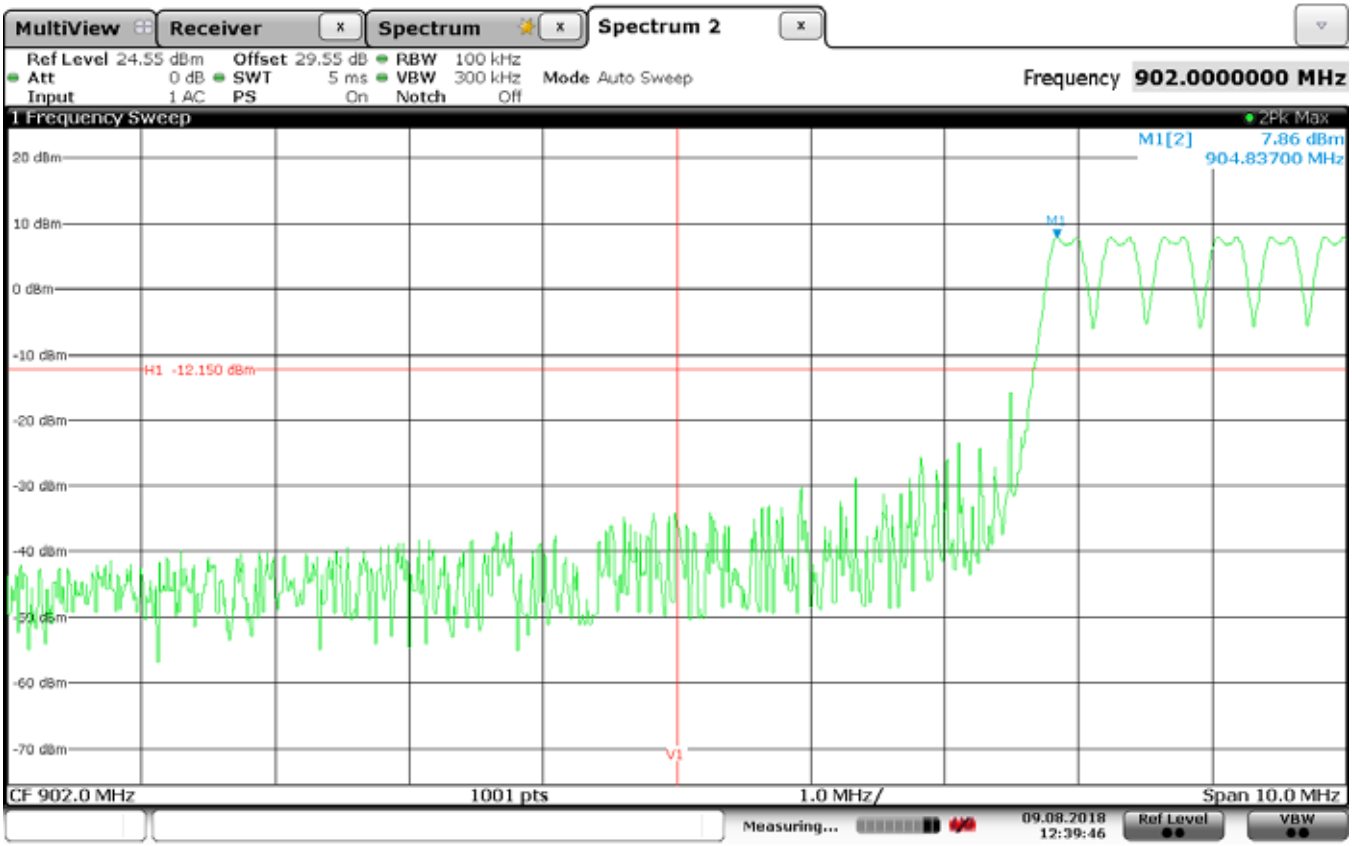
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
923.79	H	70.4		1.6	27.2	0.0	99.2	90917.7		
923.79	V	76.5		1.6	27.2	0.0	105.3	183928.2		
1847.58	H	36.5	*	2.2	31.3	-40.8	29.3	29.1	18392.8	-56.0
1847.58	V	39.5		2.2	31.3	-40.8	32.2	40.9	18392.8	-53.1
5542.74	H	37.2	*	4.0	36.9	-40.2	37.8	77.6	18392.8	-47.5
5542.74	V	37.3	*	4.0	36.9	-40.2	37.9	78.3	18392.8	-47.4
6466.53	H	39.9	*	4.3	37.8	-40.1	41.9	124.8	18392.8	-43.4
6466.53	V	40.0	*	4.3	37.8	-40.1	42.0	125.7	18392.8	-43.3
9237.90	H	40.2	*	5.0	39.0	-39.7	44.6	169.5	18392.8	-40.7
9237.90	V	40.4	*	5.0	39.0	-39.7	44.7	172.7	18392.8	-40.5

Checked By _____
Javier Cardenas

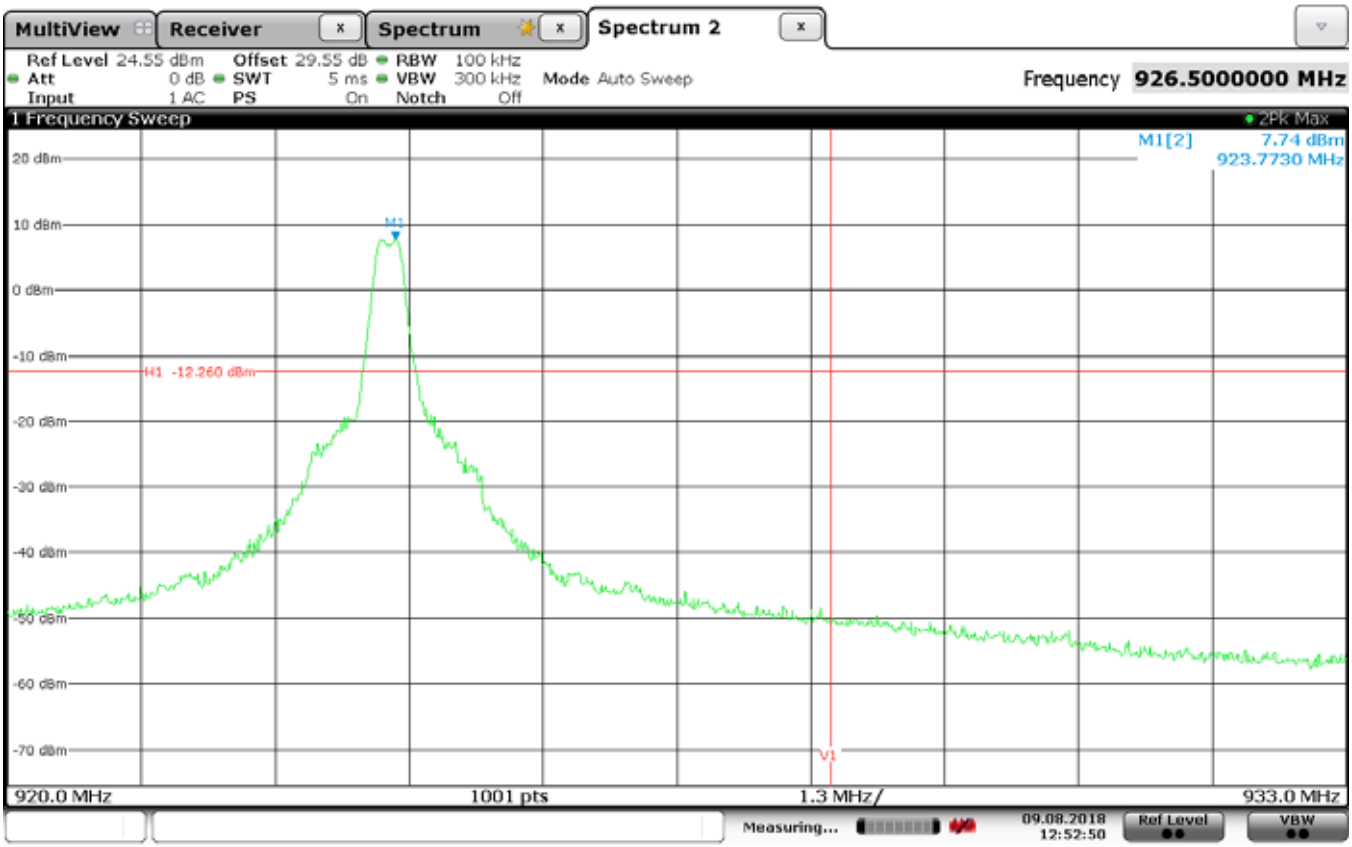


Date: 9.AUG.2018 12:35:47

Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(d) Low Band Edge**
Mode : Tx 904.94MHz
Parameters : Band Edge Compliance in a 100kHz Resolution BW
Date : August 9,2018
Notes : Horizontal Line Represents the 20dB Down Point Below the Peak Emission

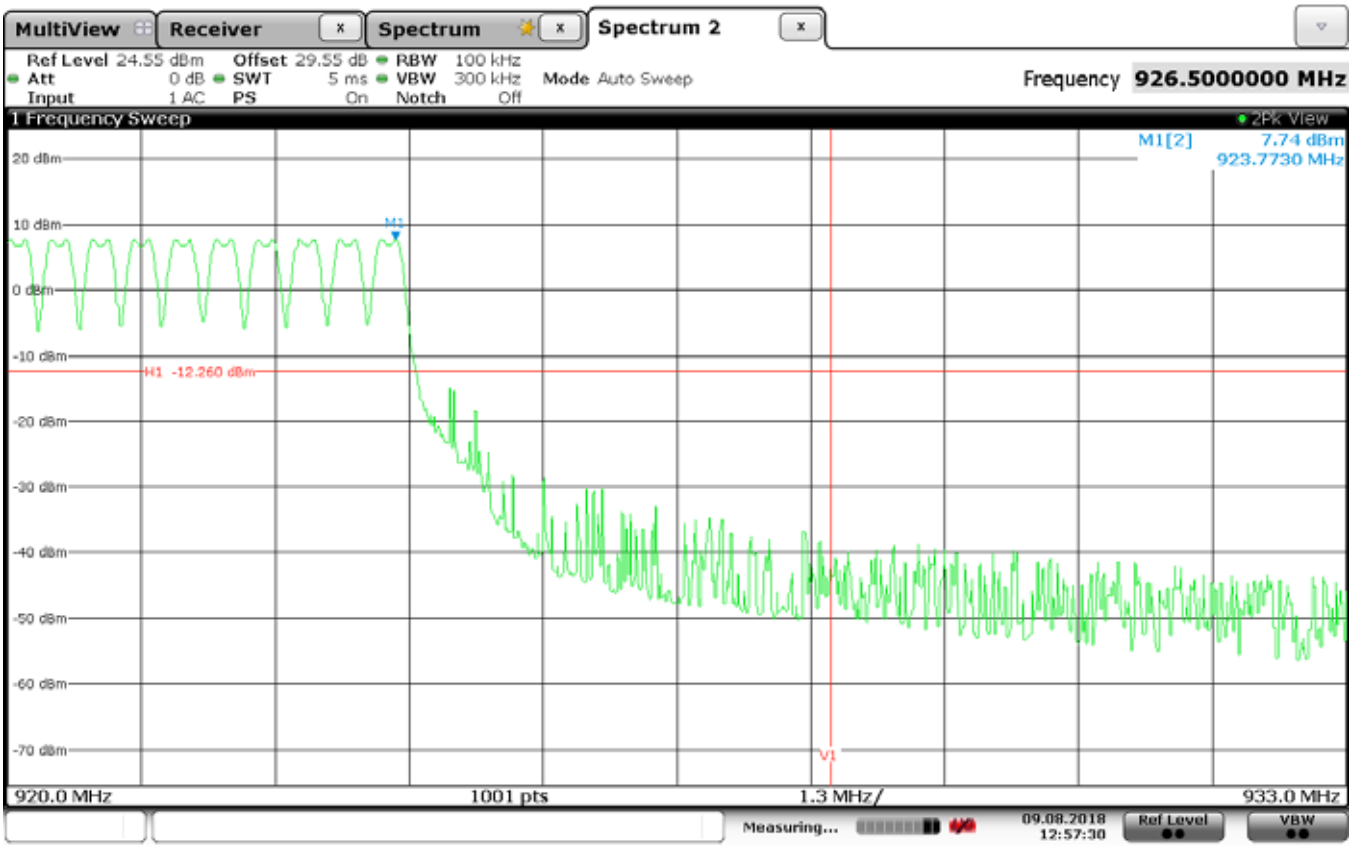


Manufacturer : Badger Meter, Incorporated
Model Number : LTE-M
Serial Number : 1
Test : **FCC 15.247(d) Low Band Edge**
Mode : Tx 904.94MHz
Parameters : Band Edge Compliance in a 100kHz Resolution BW (Hopping Enabled)
Date : August 9,2018
Notes : Horizontal Line Represents the 20dB Down Point Below the Peak Emission



Date: 9.AUG.2018 12:52:50

Manufacturer	: Badger Meter, Incorporated
Model Number	: LTE-M
Serial Number	: 1
Test	: **FCC 15.247(d) High Band Edge**
Mode	: Tx 923.79MHz
Parameters	: Band Edge Compliance in a 100kHz Resolution BW
Date	: August 9,2018
Notes	: Horizontal Line Represents the 20dB Down Point Below the Peak Emission



Date: 9.AUG.2018 12:57:30

Manufacturer	: Badger Meter, Incorporated
Model Number	: LTE-M
Serial Number	: 1
Test	: **FCC 15.247(d) High Band Edge**
Mode	: Tx 923.79MHz
Parameters	: Band Edge Compliance in a 100kHz Resolution BW (Hopping Enabled)
Date	: August 9,2018
Notes	: Horizontal Line Represents the 20dB Down Point Below the Peak Emission