



Measurement of RF Interference from
Two (2) Tx/Rx Lock Boxes
Part No. Snap-On Remote Locking System and
Part No. ECKO Remote Locking System

For Snap-On Tools Corporation
2801 80th Street
Kenosha, WI 53143

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Specification FCC "Code of Federal Regulations" Title 47, Part 15,
Subpart C, Sections 15.207 and 15.231 for
Digital Modulation Intentional Radiators Operating
Periodically Within the Band 40.66-40.70 MHz and
Above 70 MHz
FCC "Code of Federal Regulations" Title 47, Part 15,
Subpart 15B, Section 15.107 and 15.109 for Receivers
Industry Canada RSS-210
Industry Canada RSS-GEN

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REVISION HISTORY

Revision	Date	Description
—	11 Feb 2019	Initial release

Measurement of RF Emissions from Two (2) Tx/Rx Lock Boxes, Part No. Snap-On Remote Locking System and Part No. ECKO Remote Locking System

1. INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on two (2) Snap-On Tools Corporation Tx/Rx Lock Boxes, Part No. Snap-On Remote Locking System, Part No. ECKO Remote Locking System (hereinafter referred to as the EUT). The EUT contains a digital modulation transceiver. The transceiver was designed to periodically transmit and receive in 40.66-40.70 MHz and above 70 MHz band using an internal antenna. The receiver is a super heterodyne receiver with an intermediate frequency of 381kHz. The EUT was manufactured and submitted for testing by Snap-On Tools Corporation located in Kenosha, WI.

1.2 Purpose

The test series was performed to determine if the EUT meets the conducted RF emission requirements, radiated RF emissions requirements, and additional provisions 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 15.231 for Intentional Radiators Operating within the 40.66-40.70 MHz and above 70 MHz band.

The test series was also performed to determine if the EUT meets the conducted RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-Gen, Section 8.8 and the radiated RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-210, Annex 1 for transmitters. Testing was performed in accordance with ANSI C63.10-2013.

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 20°C and the relative humidity was 18%.

2. APPLICABLE DOCUMENTS

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

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subparts B and C
- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-Gen, "General Requirements for Compliance of Radio Apparatus", Issue 5, April 2018

- Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-210, "License-exempt Radio Apparatus: Category I Equipment", Issue 9, August 2016

3. EUT SETUP AND OPERATION

3.1 General Description

The EUT are two (2) Tx/Rx Lock Boxes, Part No. Snap-On Remote Locking System and Part No. ECKO Remote Locking System. A block diagram of the EUT setup is shown as Figure 1.

3.1.1 Power Input

The EUT obtained 24VDC from an AC/DC switching adaptor, Model No. GST120A24-CW, S/N E877B48777. The adaptor received 120V 60Hz from mains.

3.1.2 Grounding

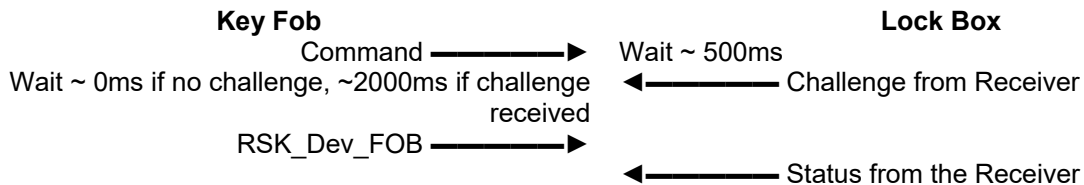
The EUT was ungrounded during the tests.

3.2 Operational Mode

The EUT was programmed to receive commands from a key fob and transmit back the status of the receiver to the key fob.

The EUT was energized. The unit was programmed to operate in one of the following frequencies with the protocol described below:

- Transmit/Receive at 433.92MHz



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.

Conducted and radiated emission tests were performed with an EMI receiver utilizes the bandwidths and detectors specified in the requirements.

4.3 Calibration Traceability

Test equipment is maintained and calibrated on a regular basis with a calibration interval not greater than two years. All calibrations are traceable to the International System Units (SI).

4.4 Measurement Uncertainty

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

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

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

5. TEST PROCEDURES

5.1 Receiver

5.1.1 Powerline Conducted Emissions

5.1.1.1 Requirements

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

CONDUCTED LIMITS FOR A RECEIVER

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

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

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

5.1.1.2 Procedures

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

- a) The EUT was operated in the Rx mode.

- b) Measurements were first made on the 120VAC,60Hz high line.
- c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
- d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
- e) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
- f) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

$$\text{Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB)}$$

- g) Steps (c) through (f) were repeated on the 120VAC,60Hz neutral line.

5.1.1.3 Results

The plots and tabular data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the Rx mode are shown on pages 20 and 27. All power line conducted emissions measured from the EUT were within the specification limits. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown in Figure 2.

5.1.2 Radiated Measurements

5.1.2.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Section 15.109(a), all radio frequency emissions from a receiver shall be below the limits shown on the following table:

RADIATION LIMITS FOR A RECEIVER

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

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

5.1.2.2 Procedures

Testing was performed separately on a low, middle, and high channel. The emissions in the frequency range of 30MHz to 2.5GHz were measured and plotted using a 'screen-dump' utility. 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 EUT was placed on an 80cm high non-conductive stand. 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 2.5GHz 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 28 and 39. The plots are presented for a reference only, and are not used to determine compliance. As can be seen from the data, all emissions measured from the EUT were within the specification limits. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown in Figure 3 and Figure 4.

5.2 Transmitter

5.2.1 Powerline Conducted Emissions

5.2.1.1 Requirements

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

Frequency MHz	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 - 5	56	46
5 - 30	60	50

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

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

5.2.1.2 Procedures

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

- a) The EUT was operated in the Tx mode.
- b) Measurements were first made on the 120VAC,60Hz high line.
- c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
- d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
- e) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
- f) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits.
- g) Steps (c) through (f) were repeated on the 120VAC,60Hz neutral line.

5.2.1.3 Results

The plots and tabular data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the Tx mode are shown on pages 40 and 47. All power line conducted emissions measured from the EUT were within the specification limits. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown in Figure 2.

5.2.2 Periodic Operation Measurements

5.2.2.1 Requirements

Per 15.231(a)(1) and RSS-210 Annex A1.1, a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than five(5) seconds of being released. Also, a transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.2.2.2 Procedures

The spectrum analyzer was set up to display the time domain trace. The EUT was set to transmit normally. The

Spectrum analyzer was used to record the amount of time that the EUT remained active following activation.

5.2.2.3 Results

The plot of the periodic timing is shown on data page 48. The data shows that the EUT ceased operation within the allotted time.

5.2.3 20dB Bandwidth

5.2.3.1 Requirements

In accordance with paragraph 15.231(c) and RSS-Gen Annex A1.3, all emissions within 20dB of the peak amplitude level of the center frequency are required to be within a band less than 0.25% of the center frequency wide.

5.2.3.2 Procedures

The EUT was placed next to a near-field probe. The unit was programmed to transmit separately in each of the modes listed in section 3.3 of this document. The resolution bandwidth was set to 30 kHz and span was set to 300kHz. The frequency spectrum near the fundamental was plotted.

5.2.3.3 Results

The plot of the emissions near the fundamental frequency is presented on data page 49. As can be seen from these data pages, each transmitter met the occupied bandwidth requirements. The 99% bandwidth measurement was 306.69MHz.

5.2.4 Duty Cycle Factor Measurements

5.2.4.1 Procedures

The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal.

With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width with 1msec/div (adjust this for what you need). The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of the "on-time". The trace is recorded.

Next the spectrum analyzer center frequency is set to the transmitter frequency with a zero span width and 10msec/div. This shows if the word is longer than 100msec or shorter than 100msec. If the word period is less than 100msec, the display is set to show at least one word. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).

5.2.4.2 Results

The plots of the duty cycle are shown on data pages 51 and 53.

The EUT transmits a 5.6msec pulse followed by a second pulse at more than 500ms later. Since a word is greater than 100 msec long, the duty cycle factor was computed over a 100msec interval. The duty cycle correction factor was calculated to be -25dB ($-25\text{dB} = 20 \cdot \log(5.6\text{msec}/100\text{msec})$).

5.2.5 Radiated Spurious Emissions Measurements

5.2.5.1 Requirements

The EUT must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.205 et seq. and RSS-Gen Annex A, Table A1.

Paragraph 15.231(b) and RSS-Gen Annex A, Table A1 has the following radiated emission limits:

Fundamental Frequency MHz	Field Intensity uV/m @ 3 meters	Field Strength Harmonics and Spurious @ 3 meters
260 to 470	3,750 to 12,500*	375 to 1,250*

For 433.92MHz, the limit at the fundamental is 10996.7uV/m @ 3m and the limit on the harmonics is 1099.7uV/m @ 3m.

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

Paragraph 15.35(b), when average emissions measurements are specified below 100MHz, there is also a limit on the peak level. The limit applicable to peak RF emissions is 20dB above the maximum permitted average emissions.

5.2.5.2 Procedures

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

A preliminary radiated emissions test was 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 the 10th harmonic of the transmitter was investigated using a peak detector function. The data was then processed by the computer to calculate equivalent field intensity.

The final open field emission tests were then manually performed over the frequency range of 30MHz to the 10th harmonic. Between 30MHz and 1000MHz, a bilog antenna was used as the pick-up device. A broadband double ridged waveguide antenna was used as the pick-up device for all frequencies above 1GHz. All significant broadband and narrowband signals were measured and recorded. The peak detected levels were converted to average levels using a duty cycle factor which was computed from the pulse train.

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

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

5.2.5.3 Results

Preliminary radiated emissions plots with the EUT transmitting at 433.92MHz are shown on pages 54 through 61. Final radiated emissions data are presented on data pages 62 through 65. 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 in Figures 3 and 5.

6. CONCLUSIONS

It was determined that Snap-On Tools Corporation Tx/Rx Lock Box transmitters, Model No. Snap-On Remote Locking System and Model No. ECKO Remote Locking System, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.10-2013.

It was also determined that Snap-On Tools Corporation Tx/Rx Lock Box, Model No. Snap-On Remote Locking System and Model No. ECKO Remote Locking System, transmitter, did fully meet the conducted RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-Gen, Section 8.8 and the radiated RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-210, Annex 1 for transmitters, when tested per ANSI C63.10-2013.

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
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
GRB0	1MHZ, LISN SIGNAL CHECKER	ELITE	LISNCHKR1M	1	1MHZ	1/9/2019	1/9/2021
MEA3	MICRO-OHM METER	KEITHLEY	580	772667	10UOHM-200KOHM	6/13/2018	6/13/2019
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	9/5/2018	9/5/2019
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/31/2018	5/31/2020
PLF3	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	5/7/2018	5/7/2019
PLF5	CISPR16 50UH LISN	ELITE	CISPR16/15A	006	.15-30MHz	5/7/2018	5/7/2019
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	2/20/2018	2/20/2019
XLQ7	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	6/28/2018	6/28/2020

Note: N/A – Not Applicable

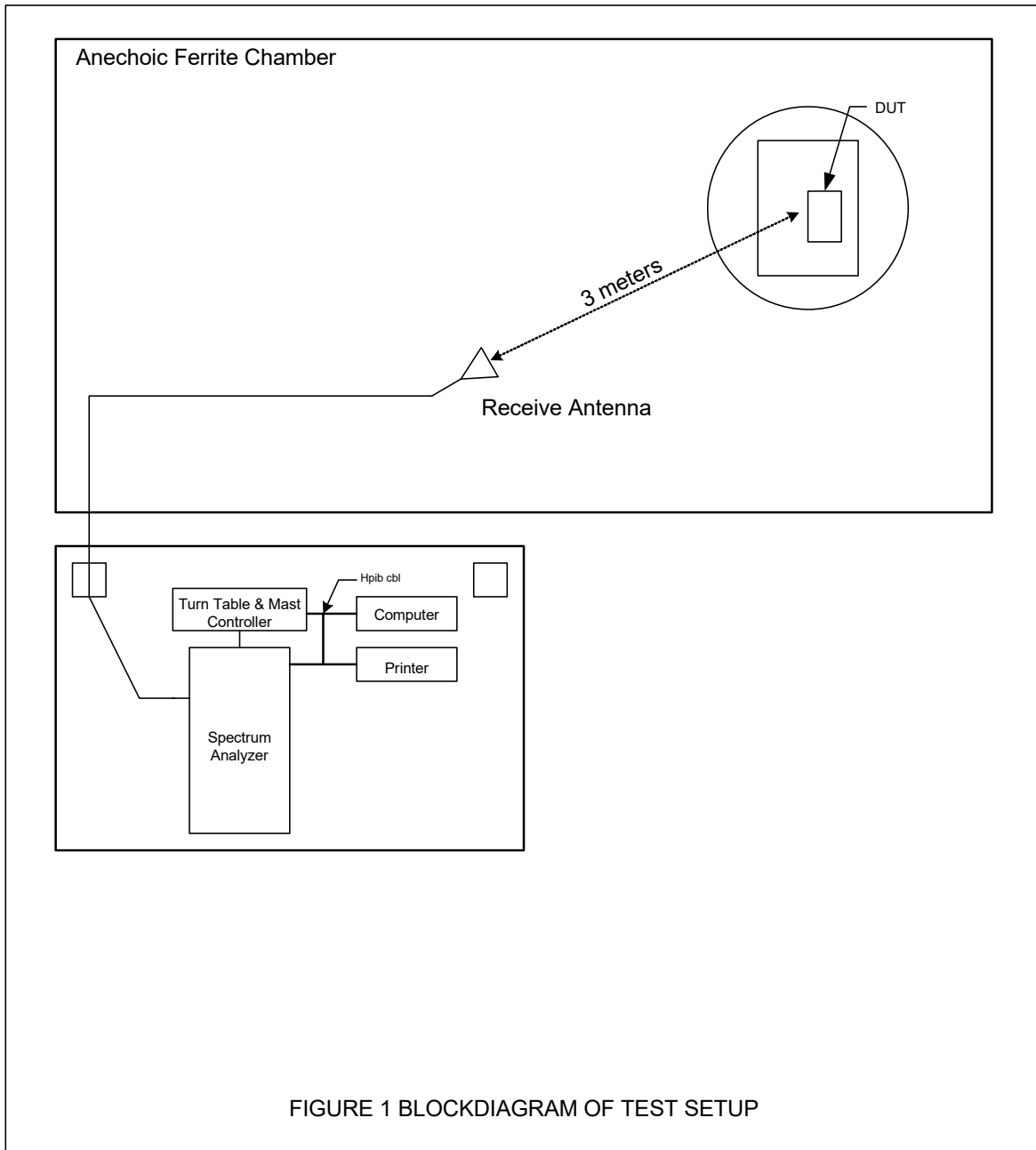
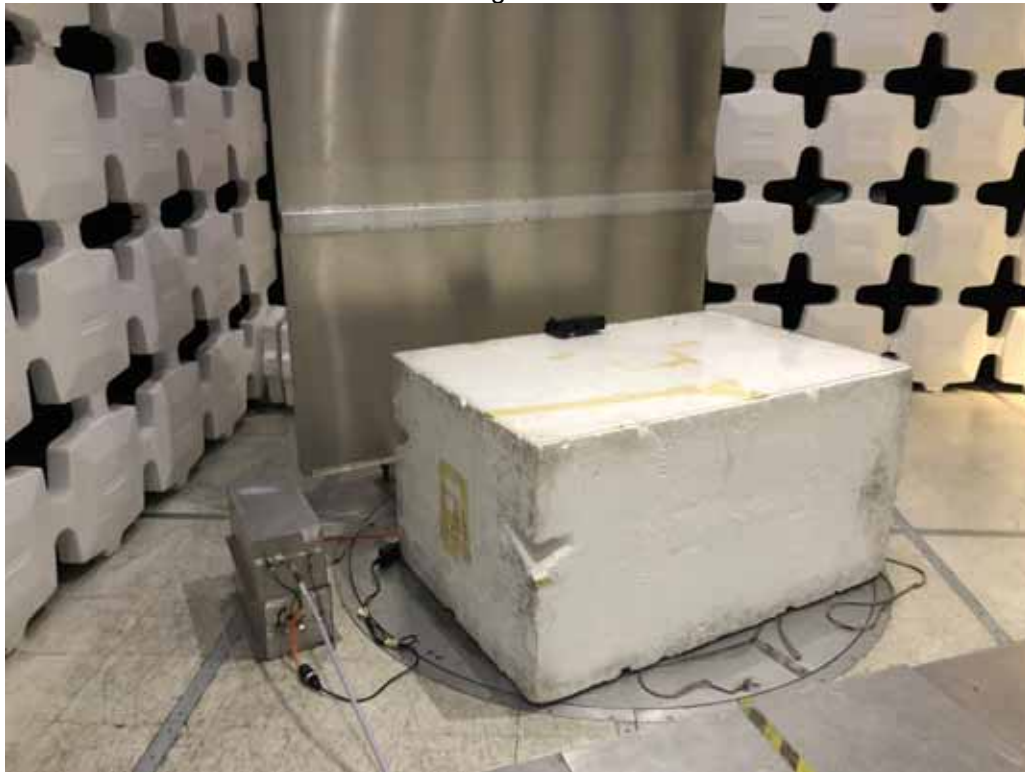
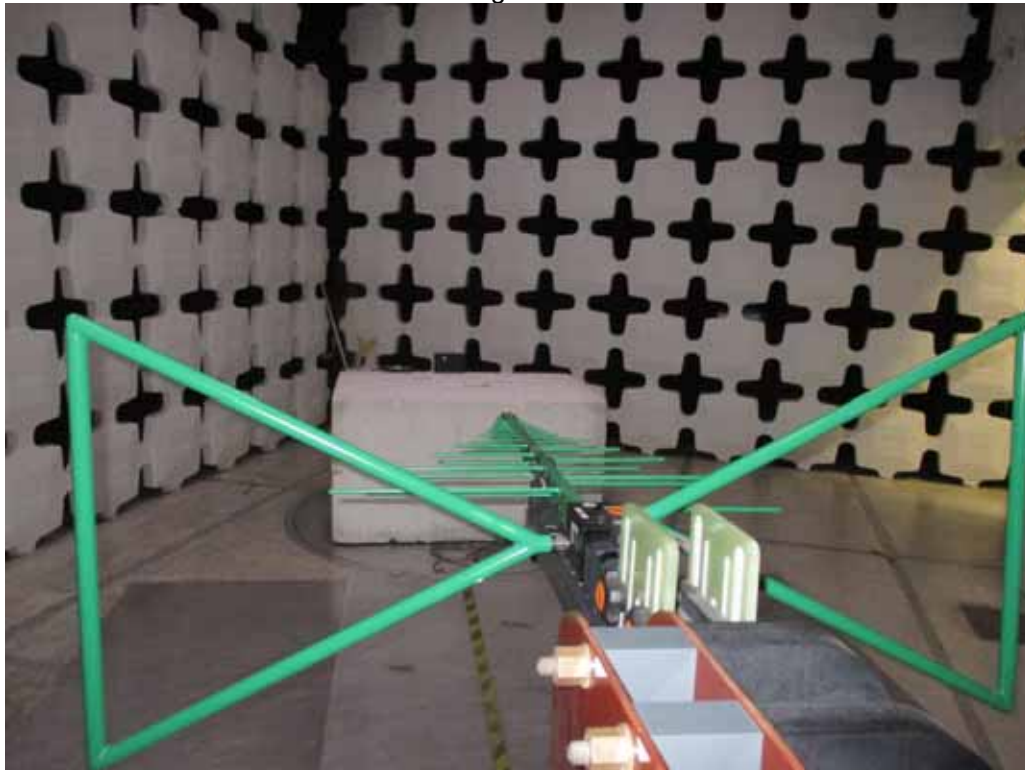


Figure 2



Test Setup for Conducted Emissions

Figure 3

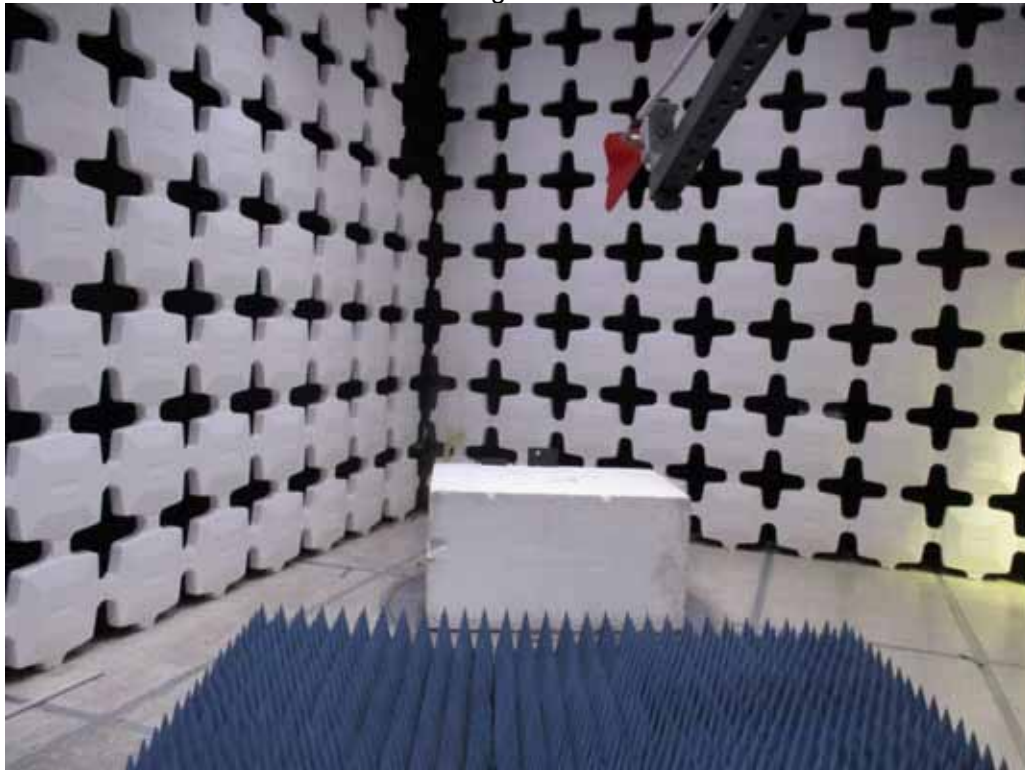


Test Setup for Radiated Emissions – 30MHz to 1GHz, Horizontal Polarization



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

Figure 4



Test Setup for Radiated Emissions – 1GHz to 2.5GHz, Horizontal Polarization

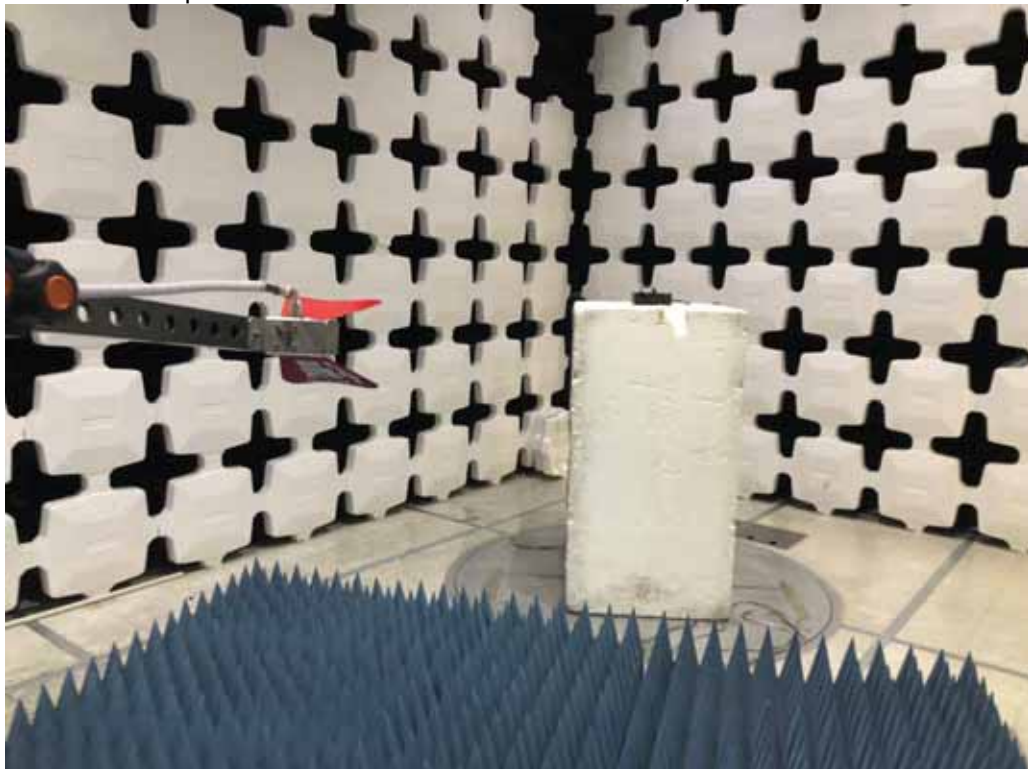


Test Setup for Radiated Emissions – 1GHz to 2.5GHz, Vertical Polarization

Figure 5



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



Test Setup for Radiated Emissions – 1GHz to 5GHz, Vertical Polarization



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : TX OFF
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:56:06 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

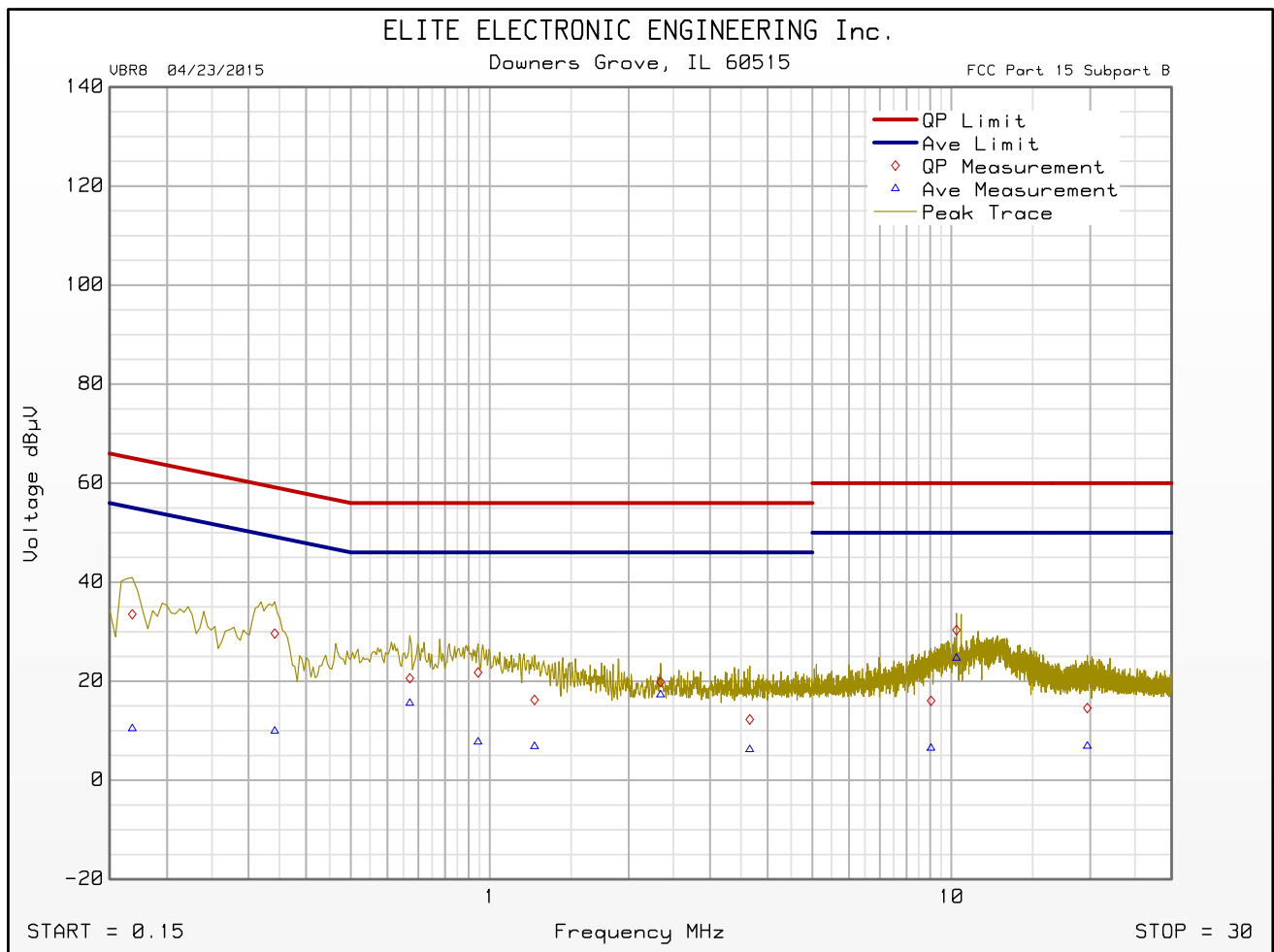
Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.168	33.5	65.1		10.5	55.1	
0.342	29.6	59.2		9.9	49.2	
0.671	20.6	56.0		15.6	46.0	
0.943	21.8	56.0		7.7	46.0	
1.250	16.2	56.0		6.8	46.0	
2.345	19.8	56.0		17.3	46.0	
3.658	12.3	56.0		6.2	46.0	
9.037	16.1	60.0		6.5	50.0	
10.256	30.3	60.0		24.7	50.0	
19.715	14.6	60.0		6.9	50.0	



FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : TX OFF
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:56:06 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : TX OFF
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:39:32 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

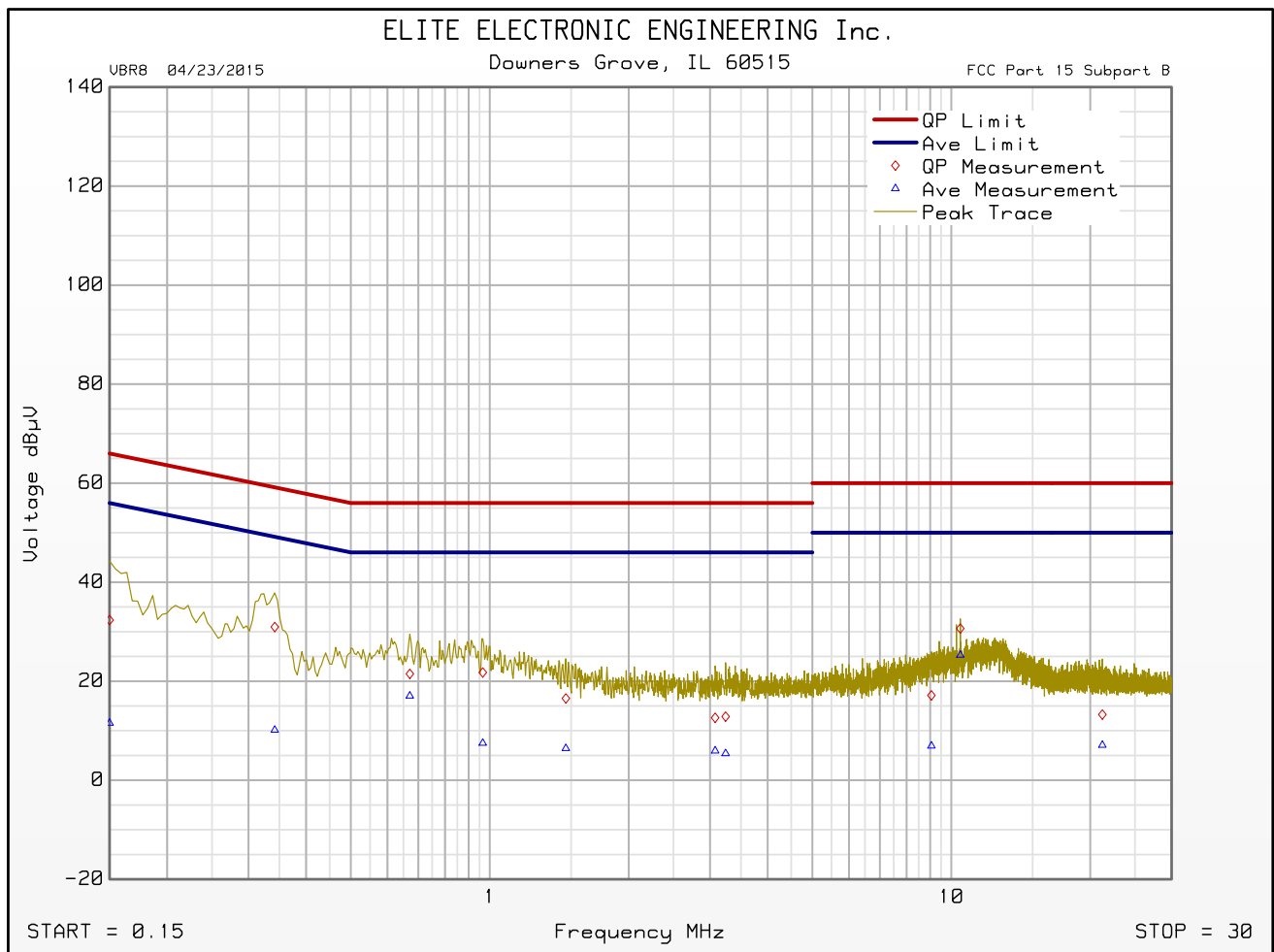
Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.150	32.4	66.0		11.5	56.0	
0.342	30.9	59.2		10.1	49.2	
0.671	21.5	56.0		17.0	46.0	
0.966	21.8	56.0		7.5	46.0	
1.462	16.5	56.0		6.4	46.0	
3.078	12.6	56.0		5.9	46.0	
3.244	12.9	56.0		5.4	46.0	
9.055	17.1	60.0		6.9	50.0	
10.458	30.6	60.0		25.3	50.0	
21.245	13.3	60.0		7.1	50.0	



FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : TX OFF
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:39:32 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

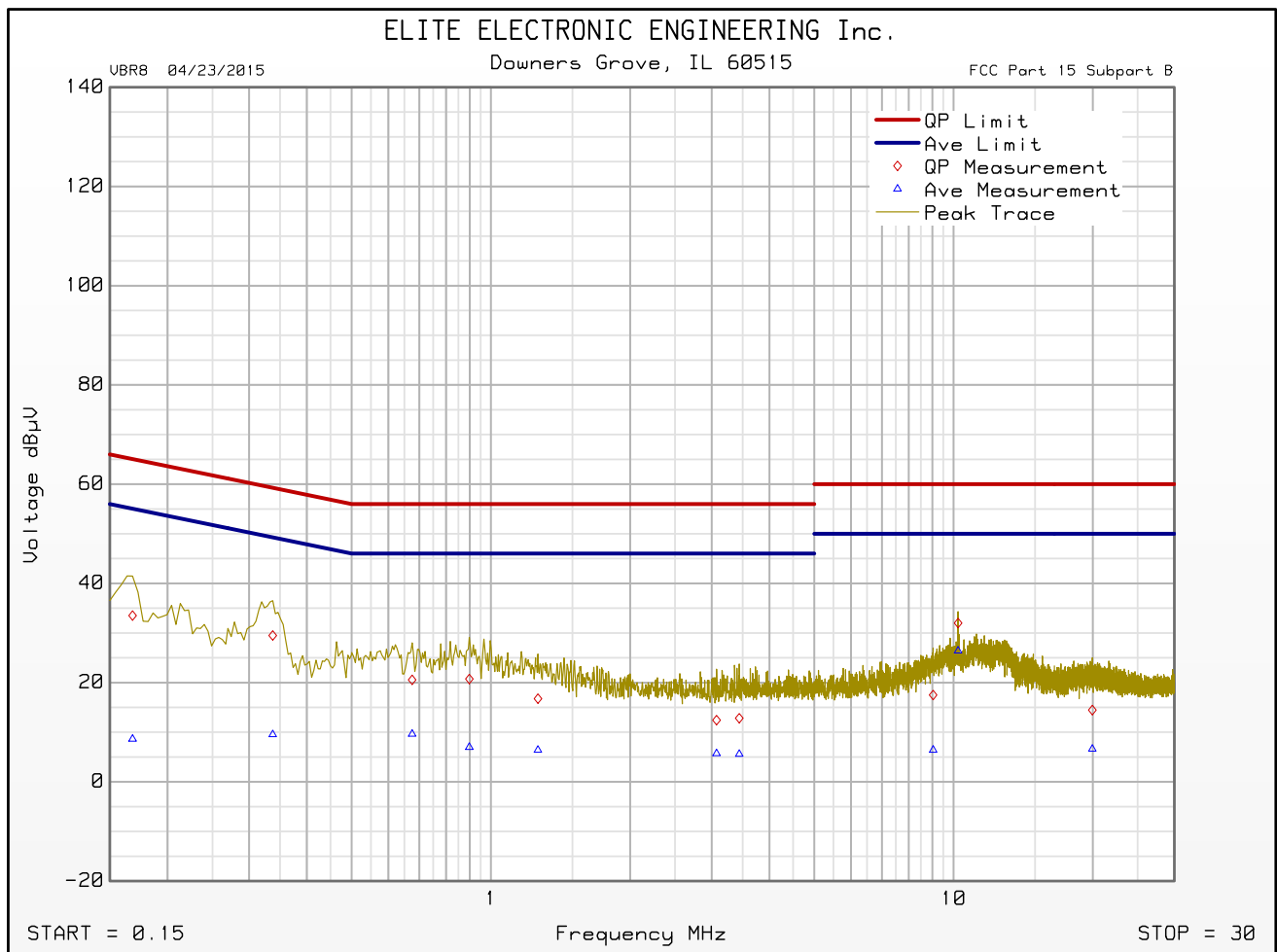
Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode :
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:15:48 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.168	33.5	65.1		8.6	55.1	
0.338	29.5	59.3		9.5	49.3	
0.676	20.6	56.0		9.6	46.0	
0.898	20.7	56.0		7.0	46.0	
1.264	16.8	56.0		6.4	46.0	
3.074	12.4	56.0		5.7	46.0	
3.442	12.8	56.0		5.6	46.0	
9.032	17.5	60.0		6.4	50.0	
10.229	32.0	60.0		26.4	50.0	
19.954	14.5	60.0		6.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
 Model : SNAP-ON
 DUT Revision :
 Serial Number :
 DUT Mode :
 Line Tested : High Line
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : -10
 Notes :
 Test Engineer : J. Cardenas
 Limit : Class B
 Test Date : Jan 22, 2019 03:15:48 PM



Emissions Meet QP Limit
 Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode : TX OFF
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:33:52 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

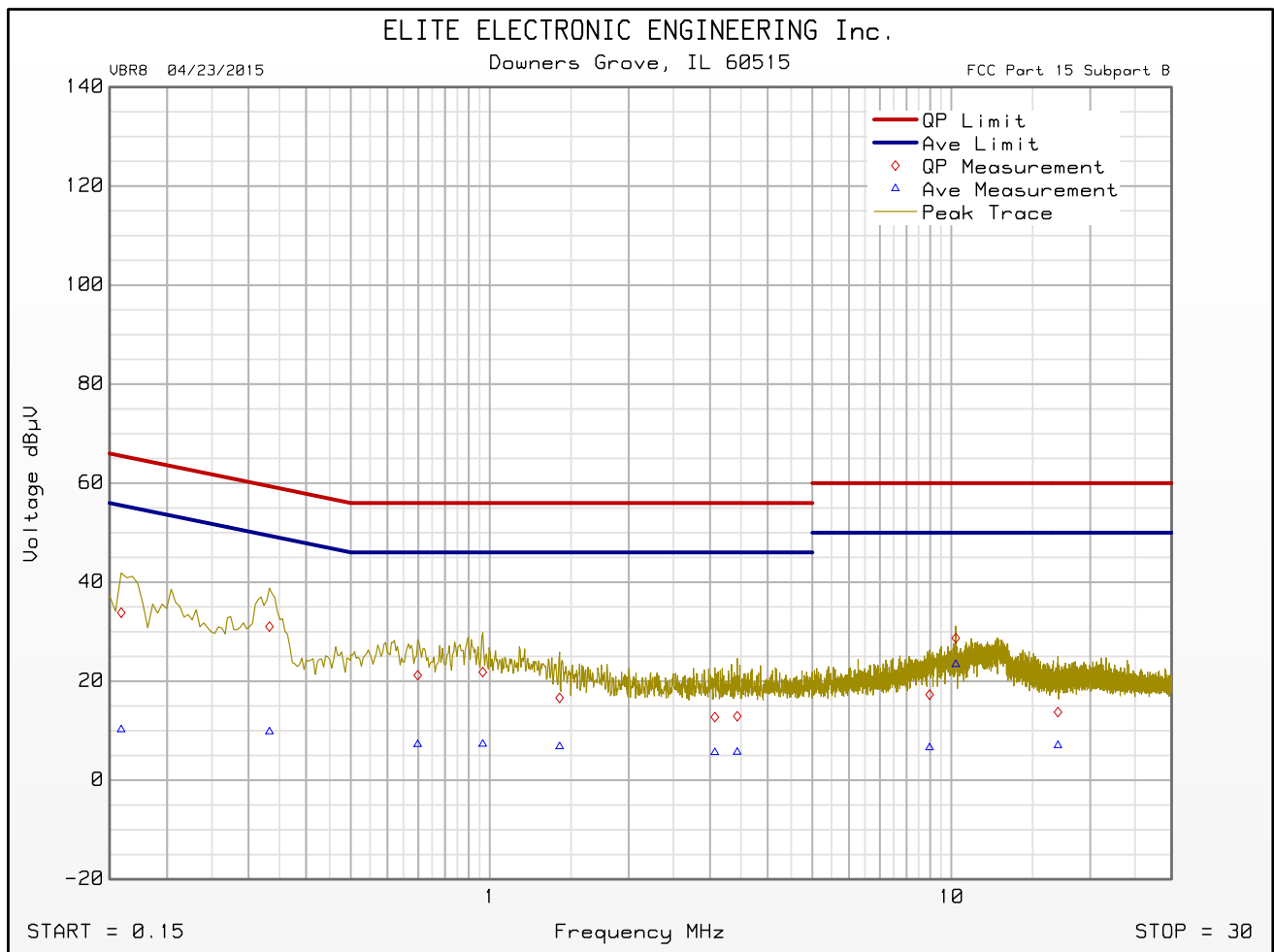
Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.159	33.8	65.5		10.2	55.5	
0.333	31.0	59.4		9.8	49.4	
0.698	21.2	56.0		7.2	46.0	
0.966	21.8	56.0		7.3	46.0	
1.417	16.6	56.0		6.8	46.0	
3.074	12.8	56.0		5.6	46.0	
3.437	12.9	56.0		5.7	46.0	
8.974	17.3	60.0		6.6	50.0	
10.224	28.7	60.0		23.4	50.0	
17.024	13.8	60.0		7.0	50.0	



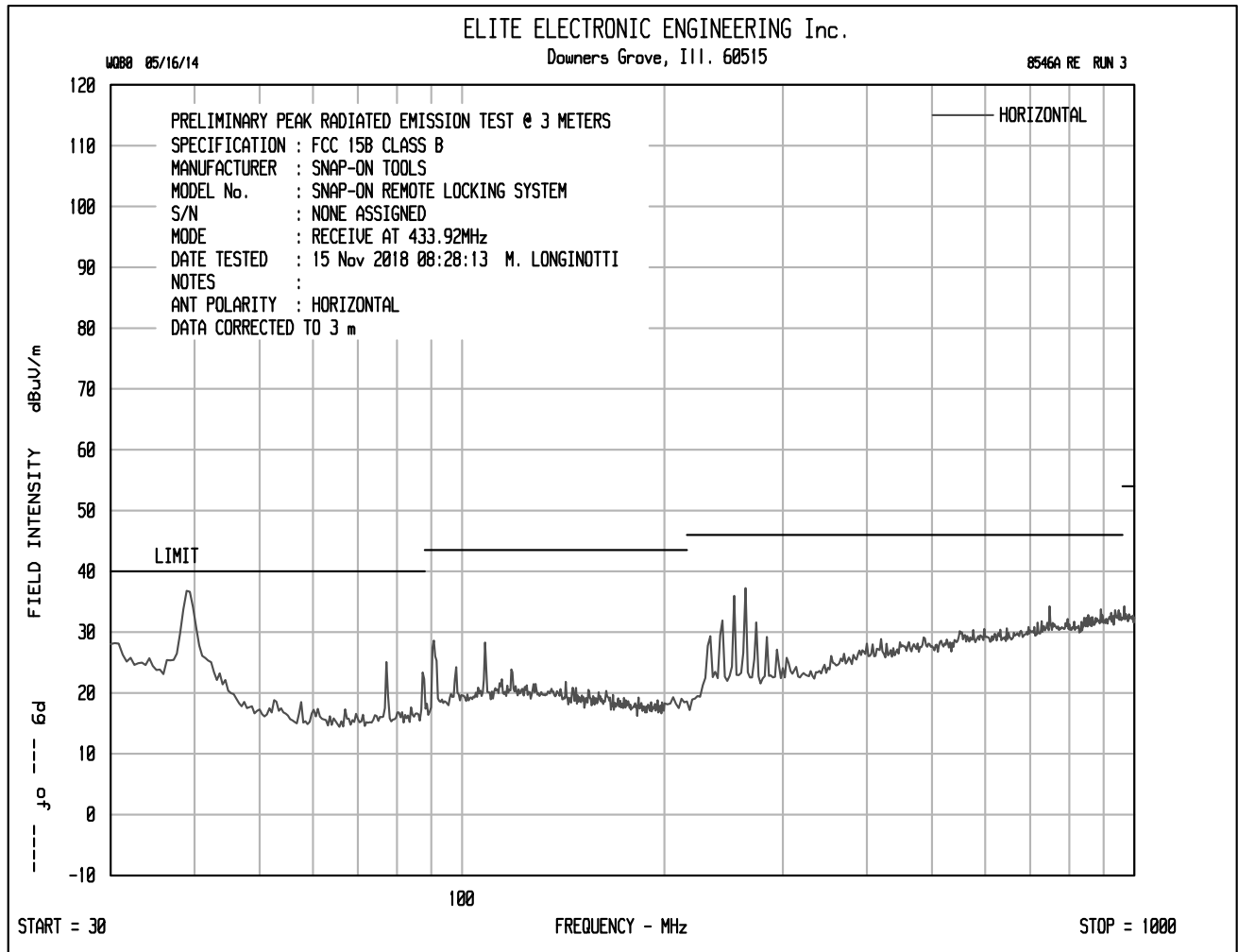
FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

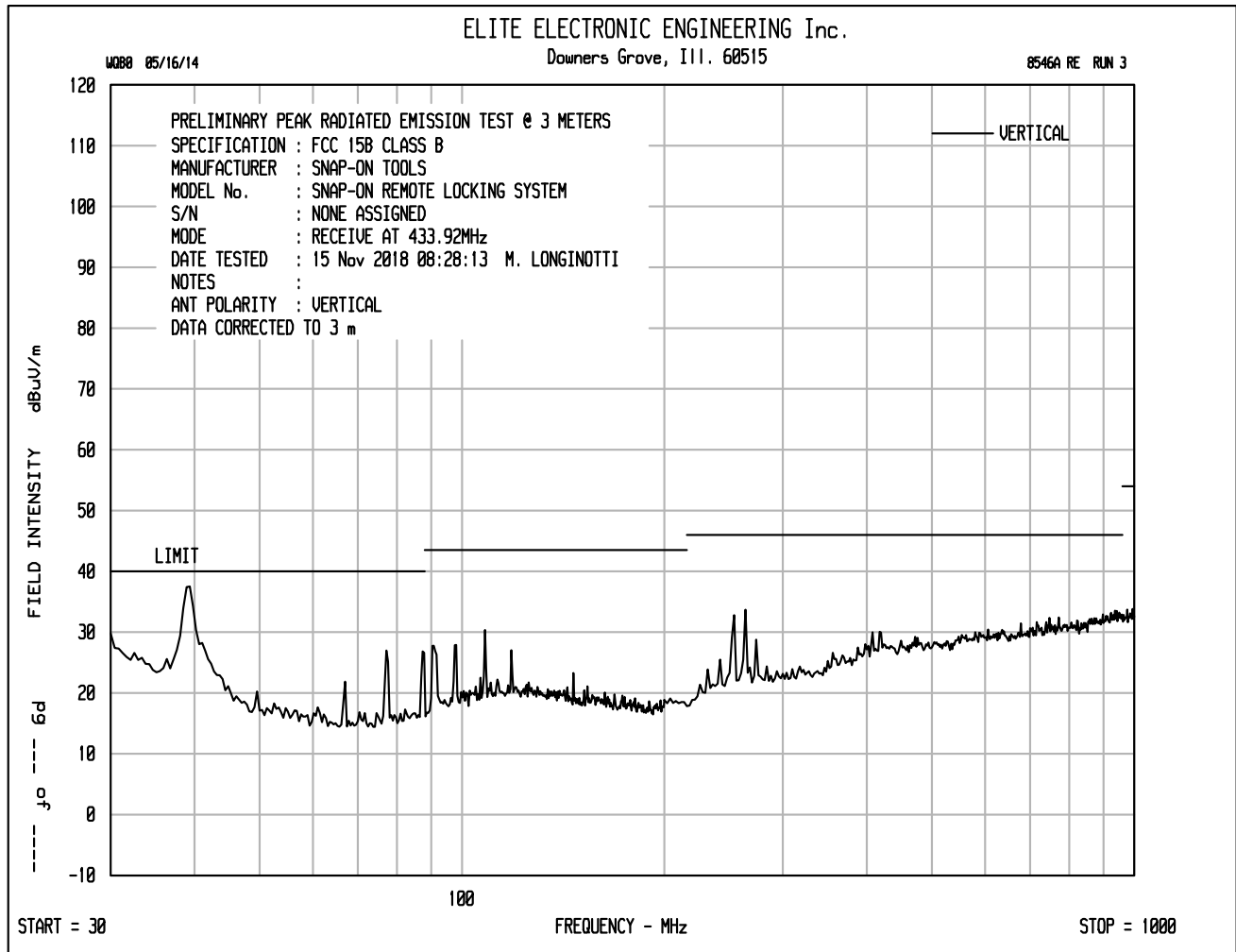
VBR8 04/23/2015

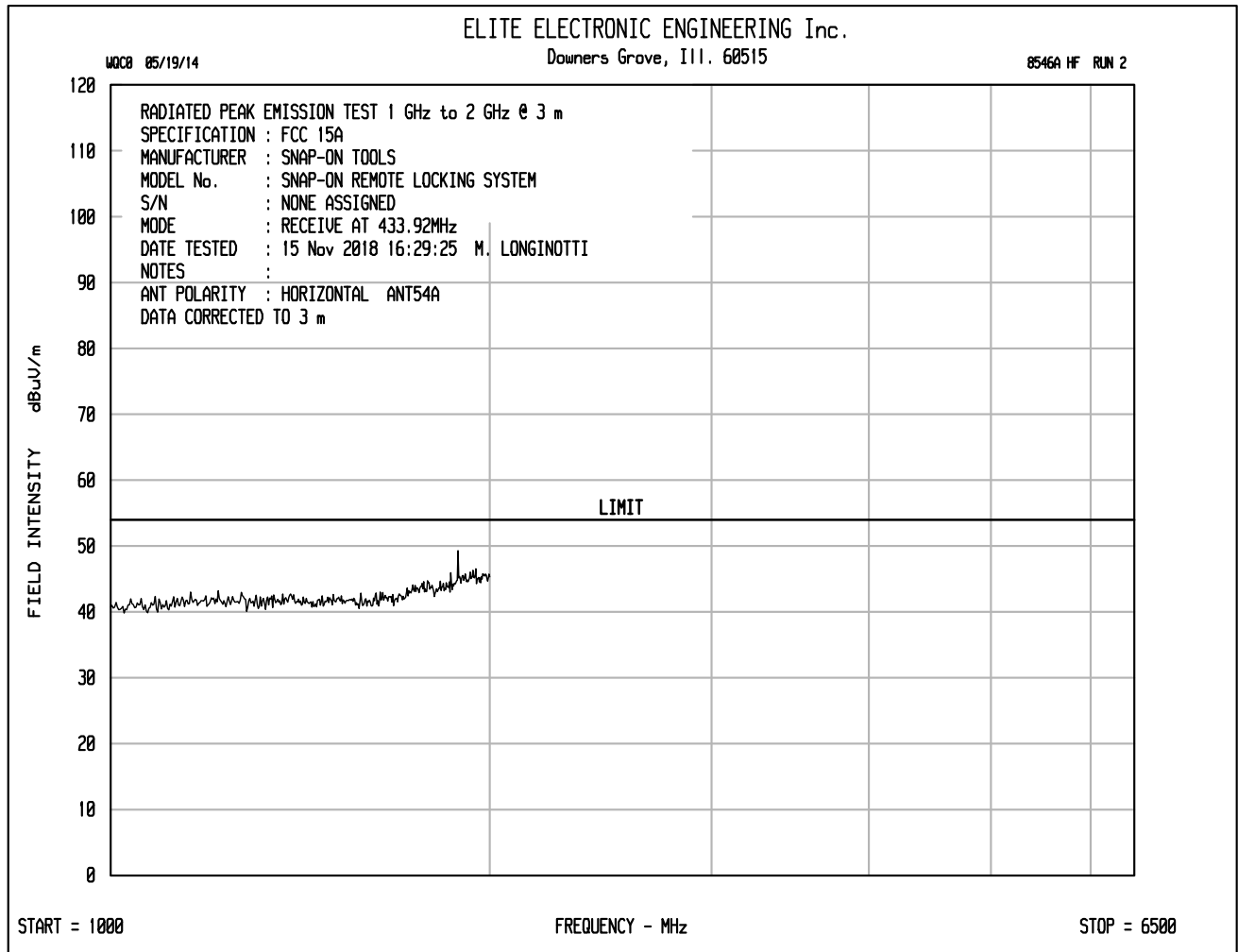
Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode : TX OFF
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:33:52 PM

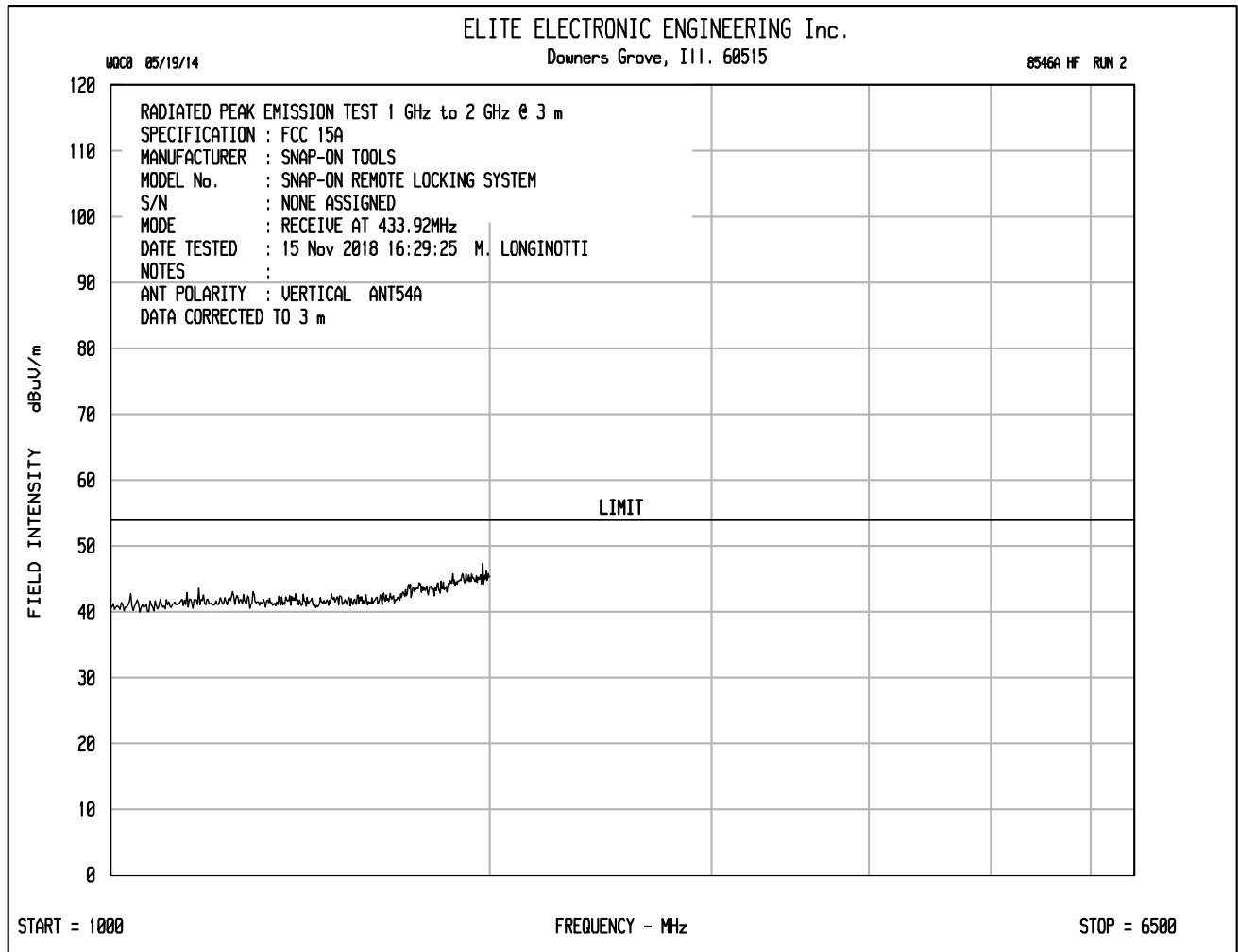


Emissions Meet QP Limit
Emissions Meet Ave Limit











RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
 SPECIFICATION : FCC 15B CLASS B
 MANUFACTURER : SNAP-ON TOOLS
 MODEL NO. : SNAP-ON REMOTE LOCKING SYSTEM
 SERIAL NO. : NONE ASSIGNED
 TEST MODE : RECEIVE AT 433.92MHz
 NOTES :
 TEST DATE : 15 Nov 2018 08:28:13
 TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
39.22	14.1	19.2	.4	0.0	0.0	33.7	40.0	90	200	V
66.62	7.5	12.4	.4	0.0	0.0	20.2	40.0	135	200	V
76.87	13.5	12.8	.4	0.0	0.0	26.7	40.0	180	120	V
107.62	10.1	17.7	.4	0.0	0.0	28.3	43.5	45	200	V
143.77	-7.4	16.9	.6	0.0	0.0	10.1	43.5	315	200	H
147.25	-7.2	16.6	.6	0.0	0.0	10.0	43.5	225	340	V
168.01	-6.6	15.8	.7	0.0	0.0	9.8	43.5	225	340	V
251.11	16.1	18.7	.8	0.0	0.0	35.6	46.0	135	120	H
261.36	16.2	19.9	.8	0.0	0.0	36.8	46.0	135	120	H
416.00	4.0	22.2	1.1	0.0	0.0	27.3	46.0	180	200	V
569.41	-6.2	24.8	1.1	0.0	0.0	19.7	46.0	135	200	H
678.21	-6.3	25.0	1.3	0.0	0.0	20.0	46.0	45	340	V
742.51	3.5	25.7	1.4	0.0	0.0	30.6	46.0	90	340	H
896.90	-5.1	26.4	1.5	0.0	0.0	22.8	46.0	45	340	H
931.37	-2.4	26.6	1.5	0.0	0.0	25.7	46.0	0	340	H

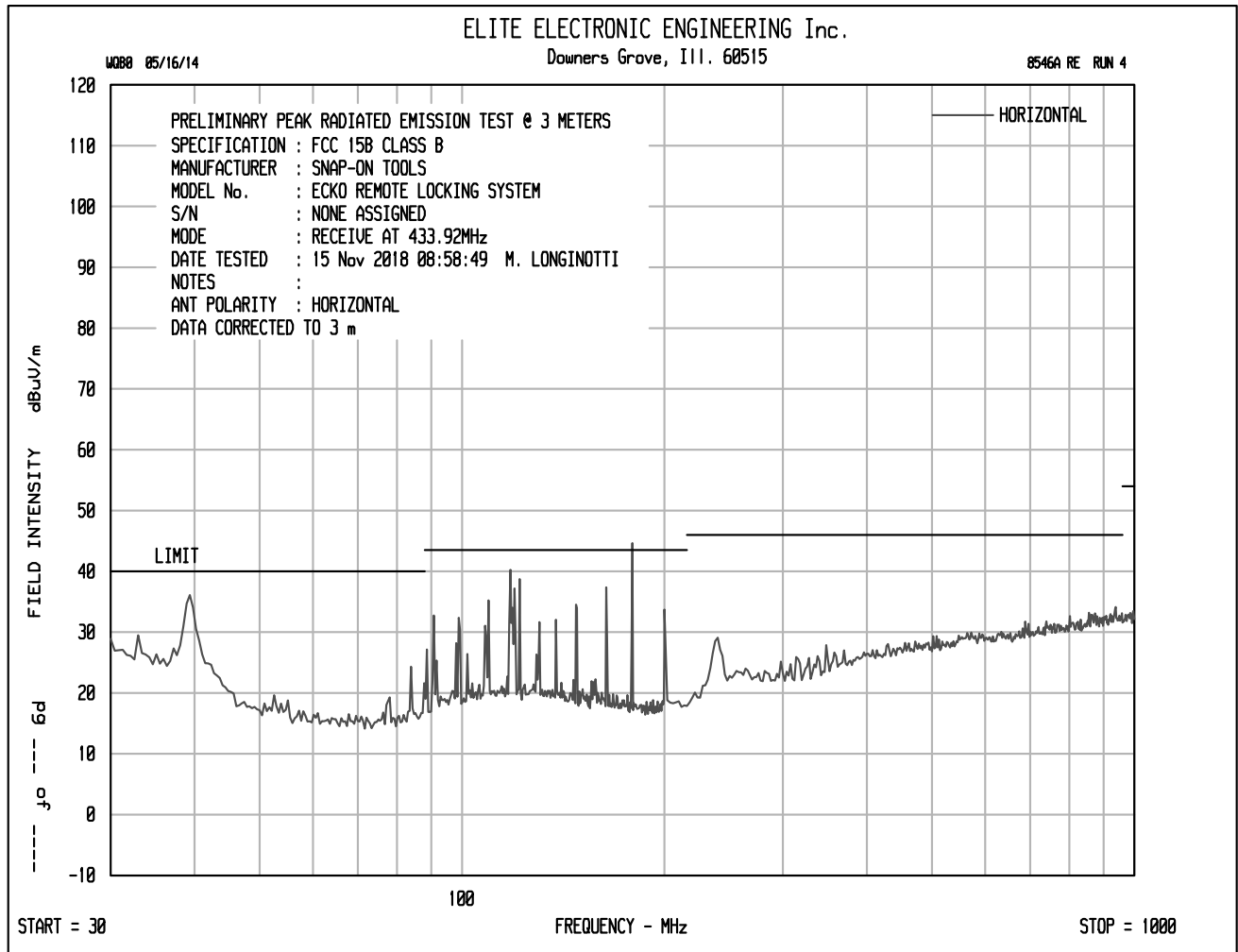
tested by: MARK E. LONGINOTTI
 M. LONGINOTTI

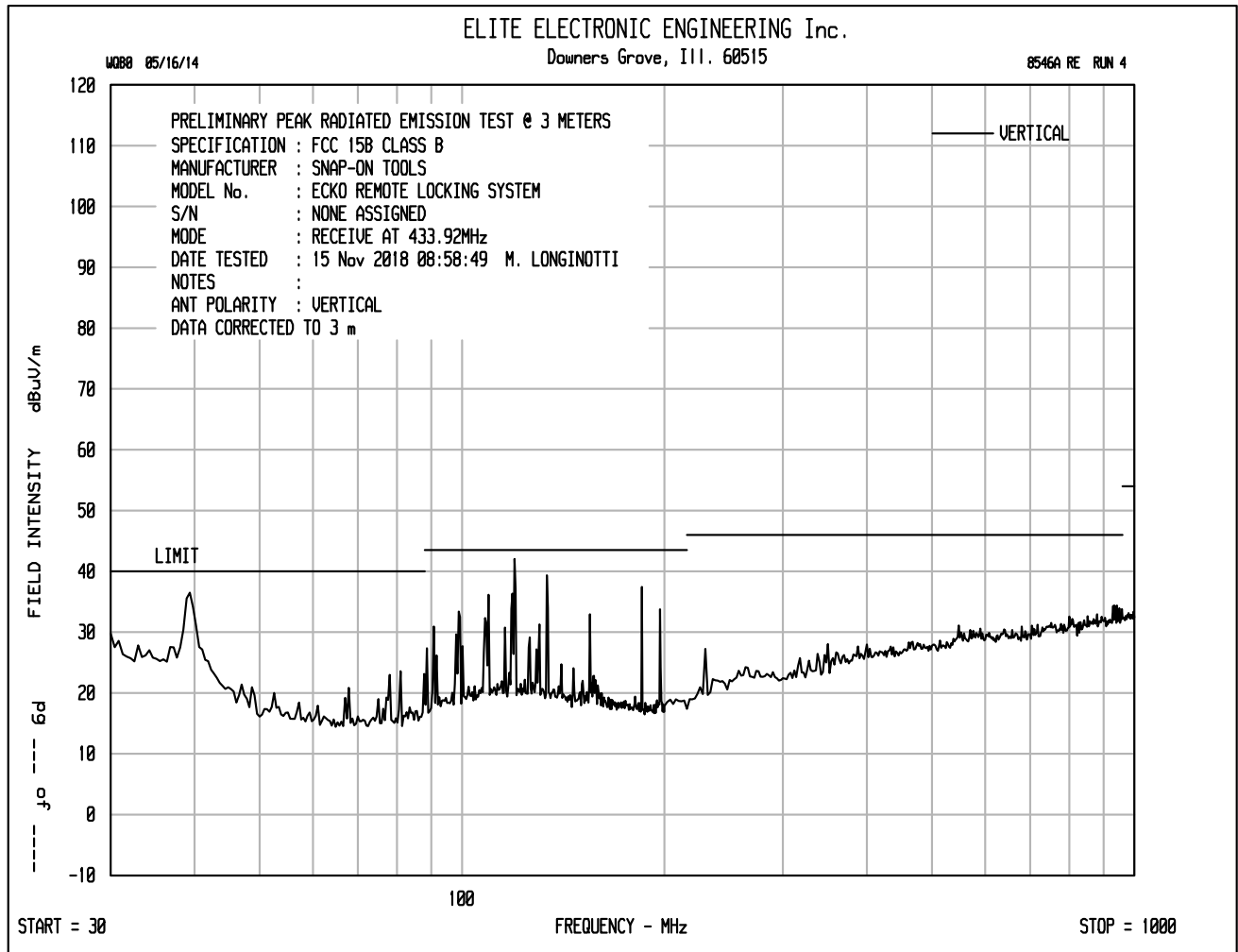


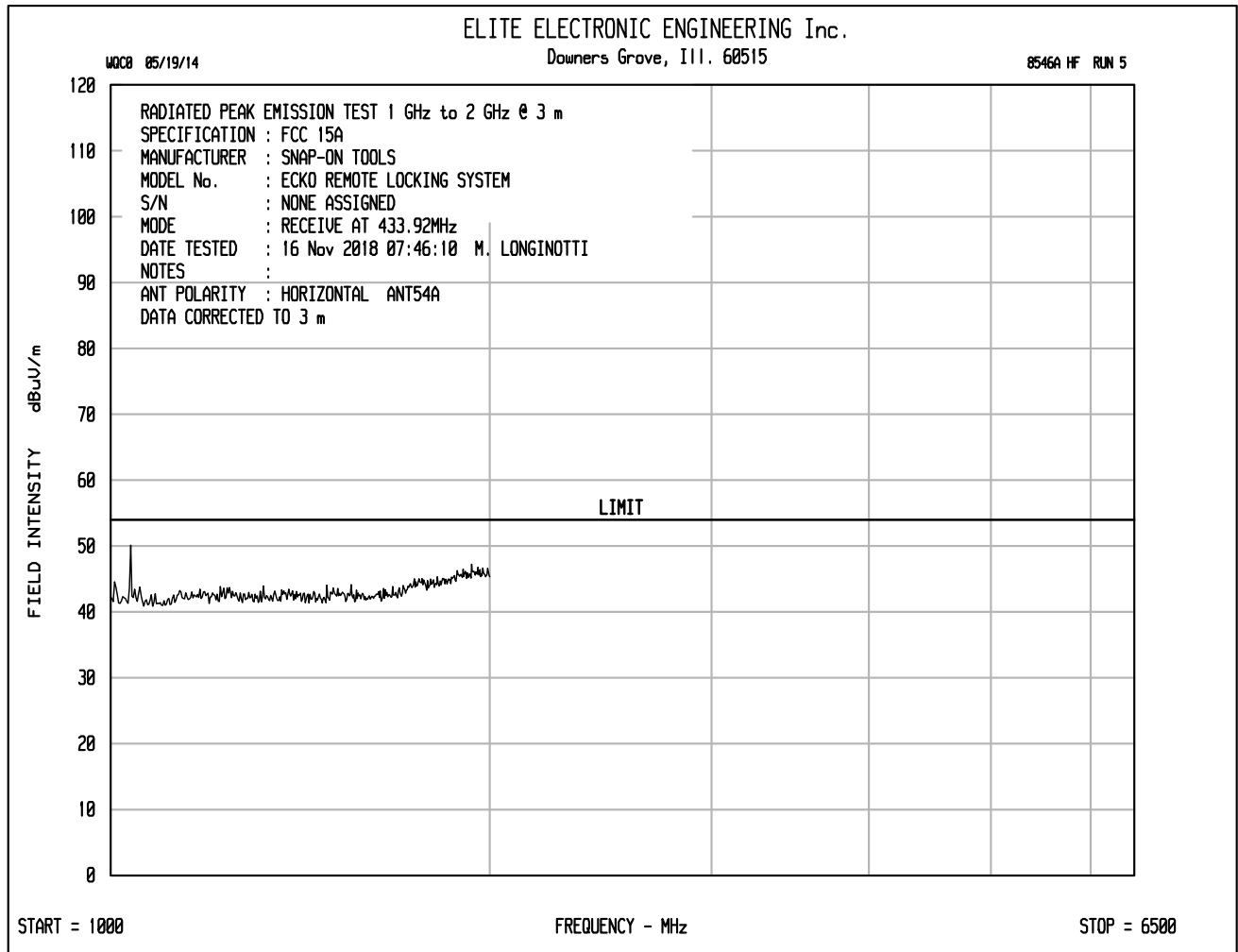
RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM
SPECIFICATION : FCC 15A
MANUFACTURER : SNAP-ON TOOLS
MODEL NO. : SNAP-ON REMOTE LOCKING SYSTEM
SERIAL NO. : NONE ASSIGNED
TEST MODE : RECEIVE AT 433.92MHz
NOTES :
TEST DATE : 15 Nov 2018 16:29:25
TEST DISTANCE : 3 m
ANTENNA : ANT54A

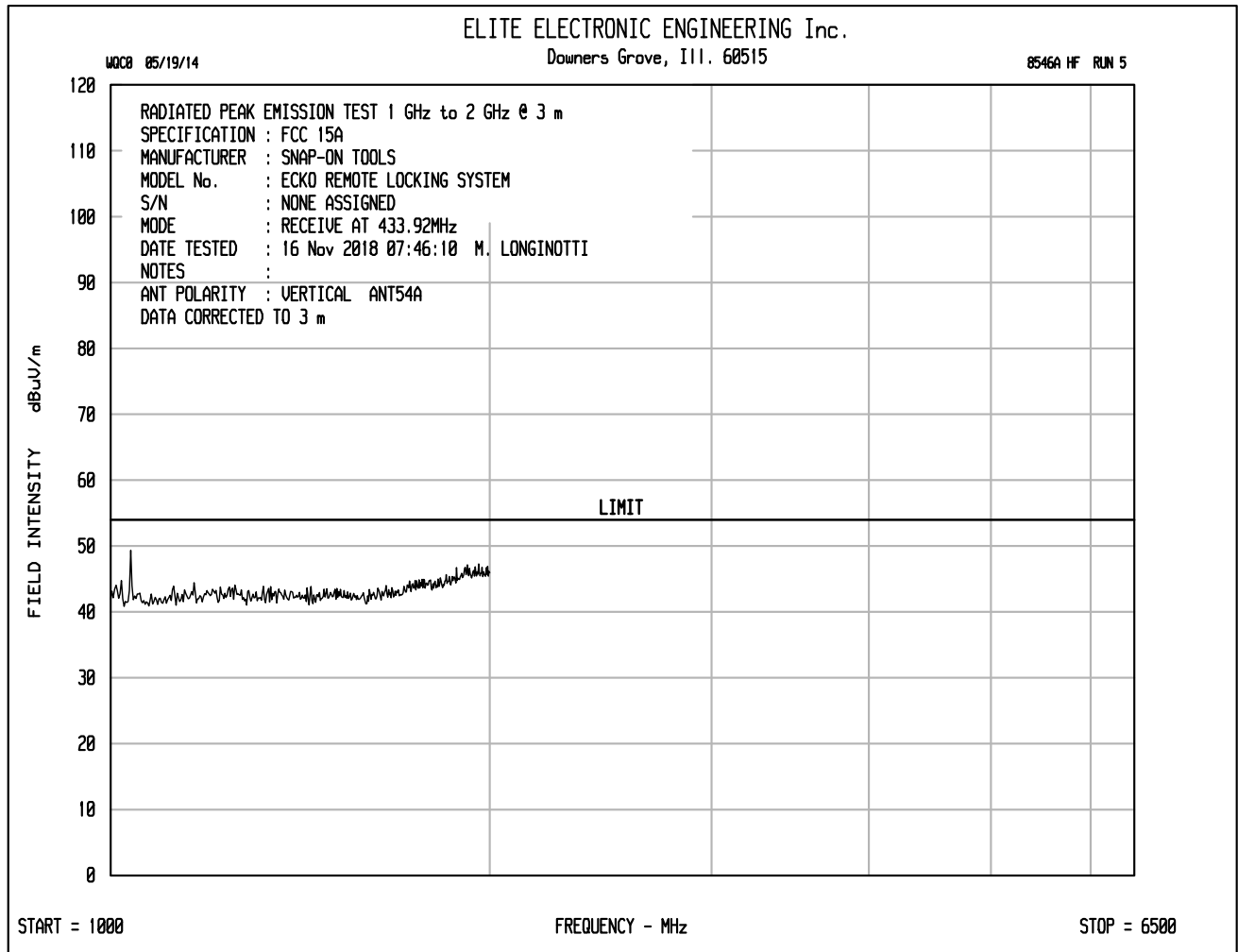
FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1069.98	-3.3	29.2	1.6	0.0	27.5	54.0		0	200	V
1166.70	-3.5	29.8	1.7	0.0	28.0	54.0		45	120	V
1278.21	-3.3	29.7	1.8	0.0	28.2	54.0		315	340	V
1489.55	-3.6	29.3	2.0	0.0	27.7	54.0		90	200	V
1620.22	7.3	29.4	2.1	0.0	38.8	54.0		270	340	H
1766.22	-3.1	30.8	2.1	0.0	29.7	54.0		180	120	H
1885.04	-3.3	31.9	2.2	0.0	30.8	54.0		135	340	H
1975.94	-3.4	32.5	2.3	0.0	31.3	54.0		270	200	V

tested by: MARK E. LONGINOTTI
M. LONGINOTTI











RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
 SPECIFICATION : FCC 15B CLASS B
 MANUFACTURER : SNAP-ON TOOLS
 MODEL NO. : ECKO REMOTE LOCKING SYSTEM
 SERIAL NO. : NONE ASSIGNED
 TEST MODE : RECEIVE AT 433.92MHz
 NOTES :
 TEST DATE : 15 Nov 2018 08:58:49
 TEST DISTANCE : 3 m

FREQUENCY	QP	ANT	CBL	EXT	DIST	TOTAL	QP	AZ	ANT	
MHz	READING	FAC	FAC	ATTN	FAC	dBuV/m	LIMIT	deg	HT	ANT
	dBuV	dB	dB	dB	dB		dBuV/m		cm	POL
39.25	13.7	19.2	.4	0.0	0.0	33.3	40.0	315	120	V
67.23	5.8	12.4	.4	0.0	0.0	18.6	40.0	180	200	V
90.06	10.7	15.0	.4	0.0	0.0	26.0	43.5	0	340	H
118.95	23.4	18.2	.5	0.0	0.0	42.0	43.5	270	120	V
136.30	-6.9	17.5	.6	0.0	0.0	11.2	43.5	90	200	V
163.66	-7.1	16.0	.7	0.0	0.0	9.6	43.5	135	340	H
181.66	-7.1	15.1	.7	0.0	0.0	8.8	43.5	135	200	H
198.65	-7.0	15.4	.8	0.0	0.0	9.1	43.5	135	120	V
346.49	4.9	20.2	1.0	0.0	0.0	26.0	46.0	270	120	V
464.32	-6.0	23.3	1.1	0.0	0.0	18.4	46.0	0	200	H
545.91	-6.5	24.8	1.1	0.0	0.0	19.5	46.0	225	120	V
689.28	-6.3	25.1	1.3	0.0	0.0	20.1	46.0	0	120	H
740.14	-5.6	25.6	1.4	0.0	0.0	21.4	46.0	90	200	H
853.99	-5.6	26.3	1.5	0.0	0.0	22.2	46.0	0	120	H
939.48	-5.2	26.8	1.5	0.0	0.0	23.1	46.0	45	340	V

tested by: MARK E. LONGINOTTI
 M. LONGINOTTI



RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM
SPECIFICATION : FCC 15A
MANUFACTURER : SNAP-ON TOOLS
MODEL NO. : ECKO REMOTE LOCKING SYSTEM
SERIAL NO. : NONE ASSIGNED
TEST MODE : RECEIVE AT 433.92MHz
NOTES :
TEST DATE : 16 Nov 2018 07:46:10
TEST DISTANCE : 3 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
1039.68	-1.3	29.1	1.6	0.0	29.3	54.0		0	199	H
1174.41	-2.3	29.8	1.7	0.0	29.2	54.0		90	340	V
1315.66	-3.1	29.6	1.8	0.0	28.2	54.0		90	120	H
1469.64	-2.6	29.2	1.9	0.0	28.6	54.0		315	340	H
1572.62	-2.5	29.2	2.0	0.0	28.8	54.0		90	199	H
1793.10	-2.8	30.8	2.2	0.0	30.1	54.0		0	340	H
1910.85	-2.4	32.2	2.2	0.0	32.0	54.0		180	200	H
1949.58	-2.4	32.7	2.3	0.0	32.5	54.0		45	199	V

tested by: MARK E. LONGINOTTI
M. LONGINOTTI



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:50:38 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

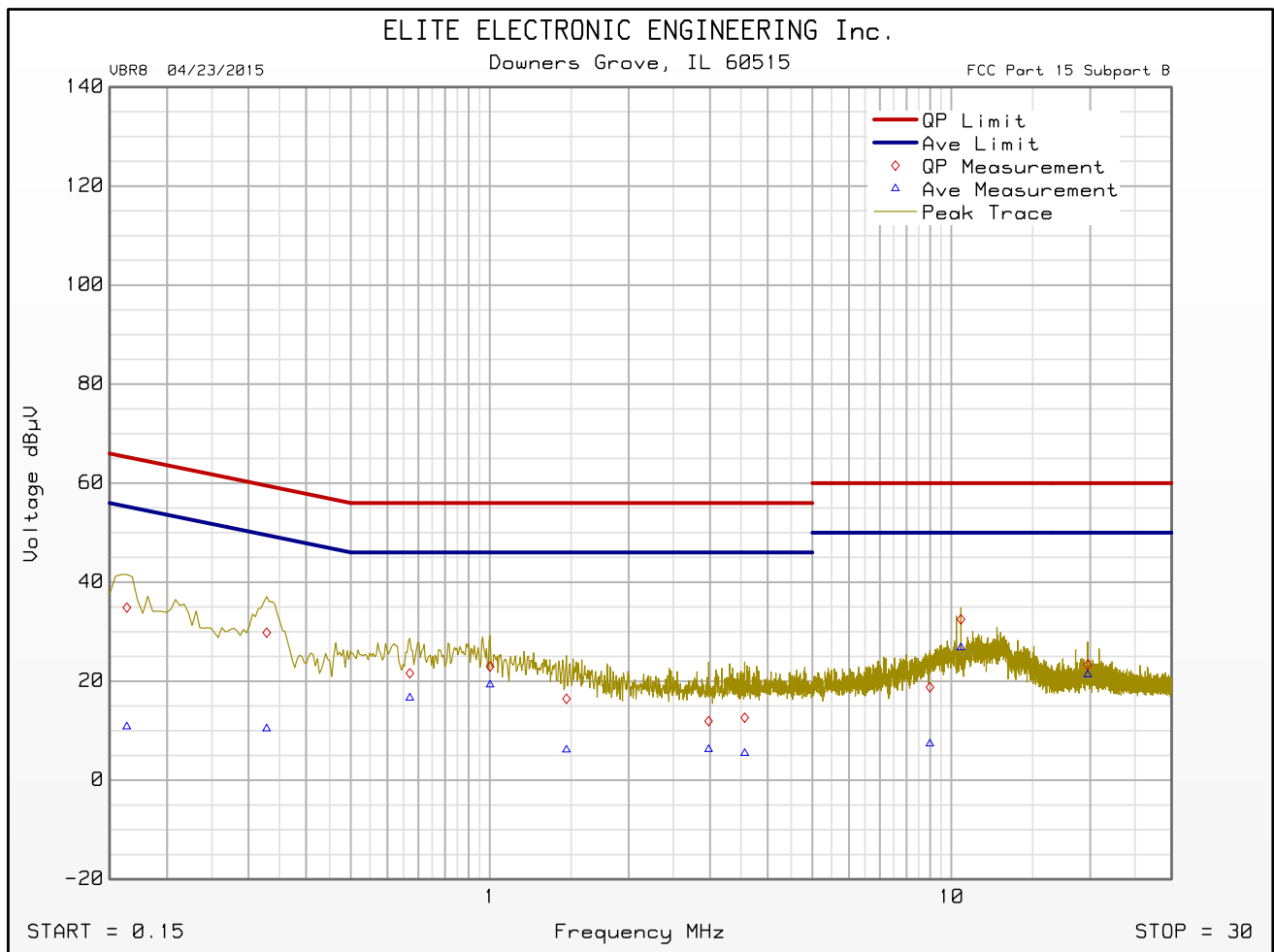
Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.164	34.9	65.3		10.8	55.3	
0.329	29.8	59.5		10.4	49.5	
0.671	21.6	56.0		16.6	46.0	
1.002	23.0	56.0		19.3	46.0	
1.466	16.4	56.0		6.2	46.0	
2.979	11.9	56.0		6.2	46.0	
3.568	12.6	56.0		5.5	46.0	
8.987	18.8	60.0		7.4	50.0	
10.494	32.5	60.0		26.8	50.0	
19.756	23.4	60.0		21.3	50.0	



FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:50:38 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:45:05 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

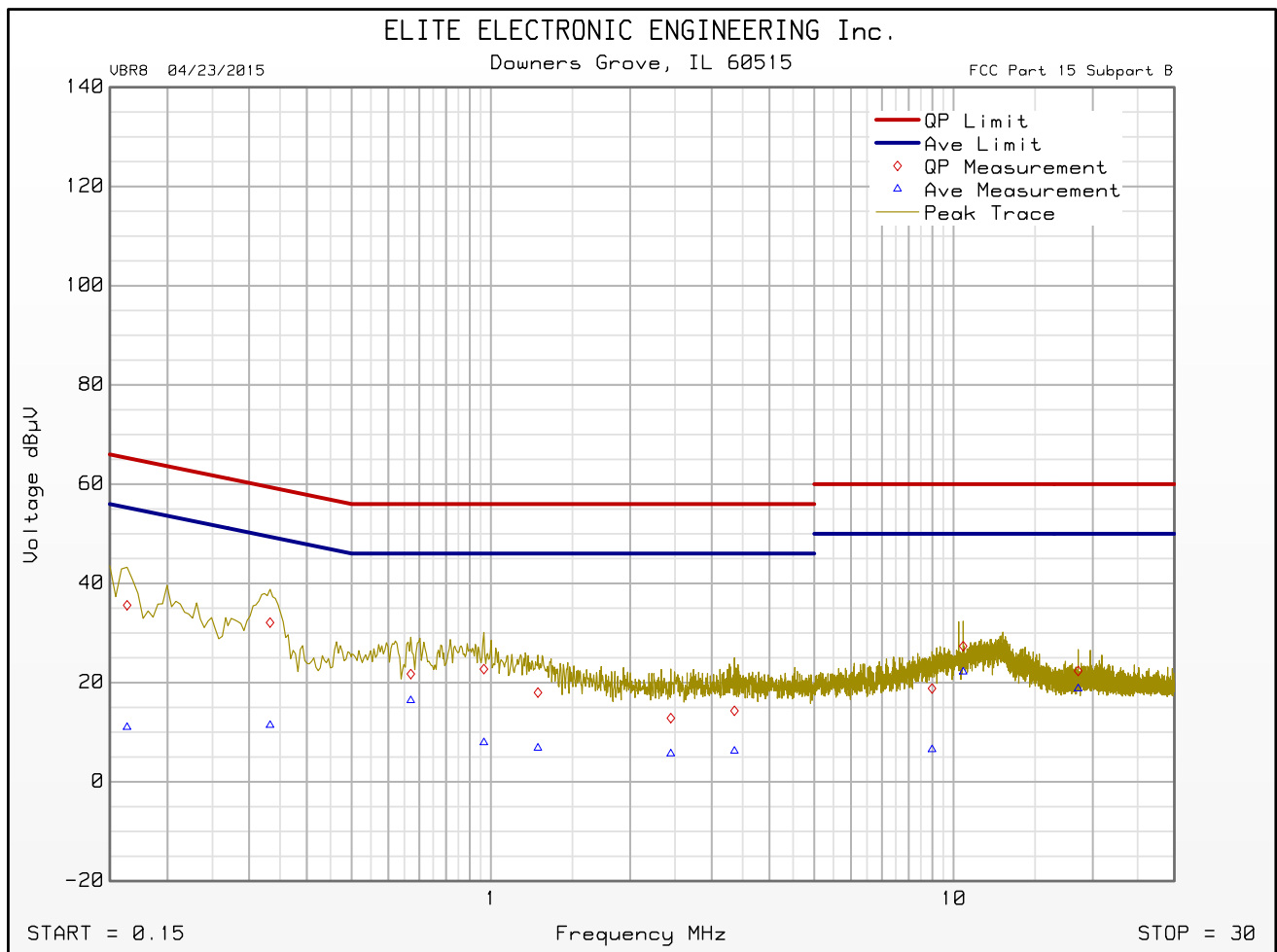
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	35.6	65.3		11.0	55.3	
0.333	32.1	59.4		11.4	49.4	
0.671	21.7	56.0		16.4	46.0	
0.966	22.7	56.0		7.9	46.0	
1.264	18.0	56.0		6.8	46.0	
2.448	12.8	56.0		5.7	46.0	
3.361	14.3	56.0		6.2	46.0	
8.983	18.8	60.0		6.5	50.0	
10.490	27.3	60.0		22.2	50.0	
18.590	22.3	60.0		18.8	50.0	



FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : ECKO
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:45:05 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:23:08 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

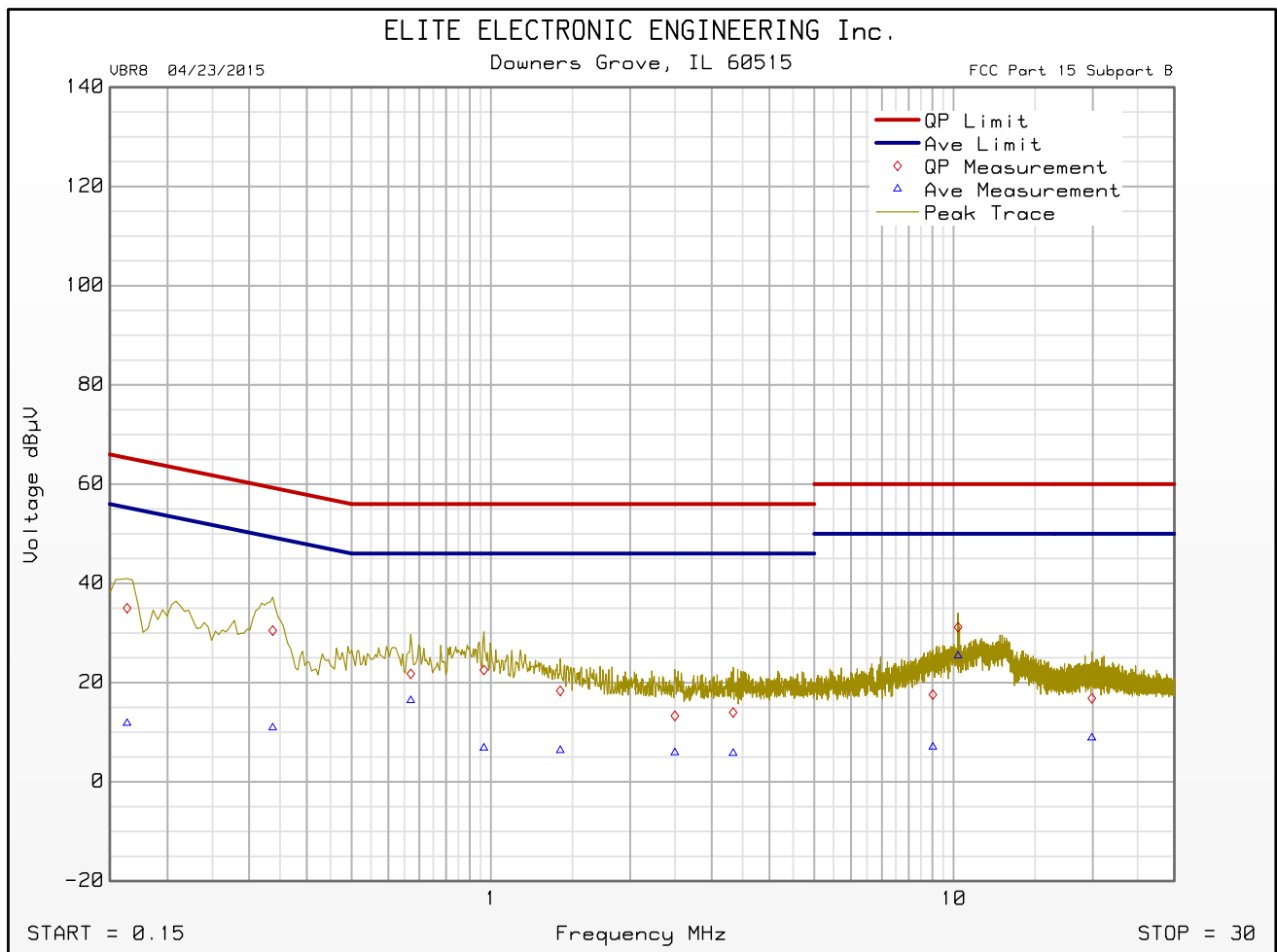
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	35.0	65.3		11.8	55.3	
0.338	30.5	59.3		10.9	49.3	
0.671	21.8	56.0		16.4	46.0	
0.966	22.6	56.0		6.8	46.0	
1.412	18.3	56.0		6.4	46.0	
2.498	13.3	56.0		5.9	46.0	
3.338	14.0	56.0		5.8	46.0	
9.019	17.6	60.0		7.0	50.0	
10.229	31.2	60.0		25.4	50.0	
19.900	16.8	60.0		8.9	50.0	



FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : High Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:23:08 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:28:43 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

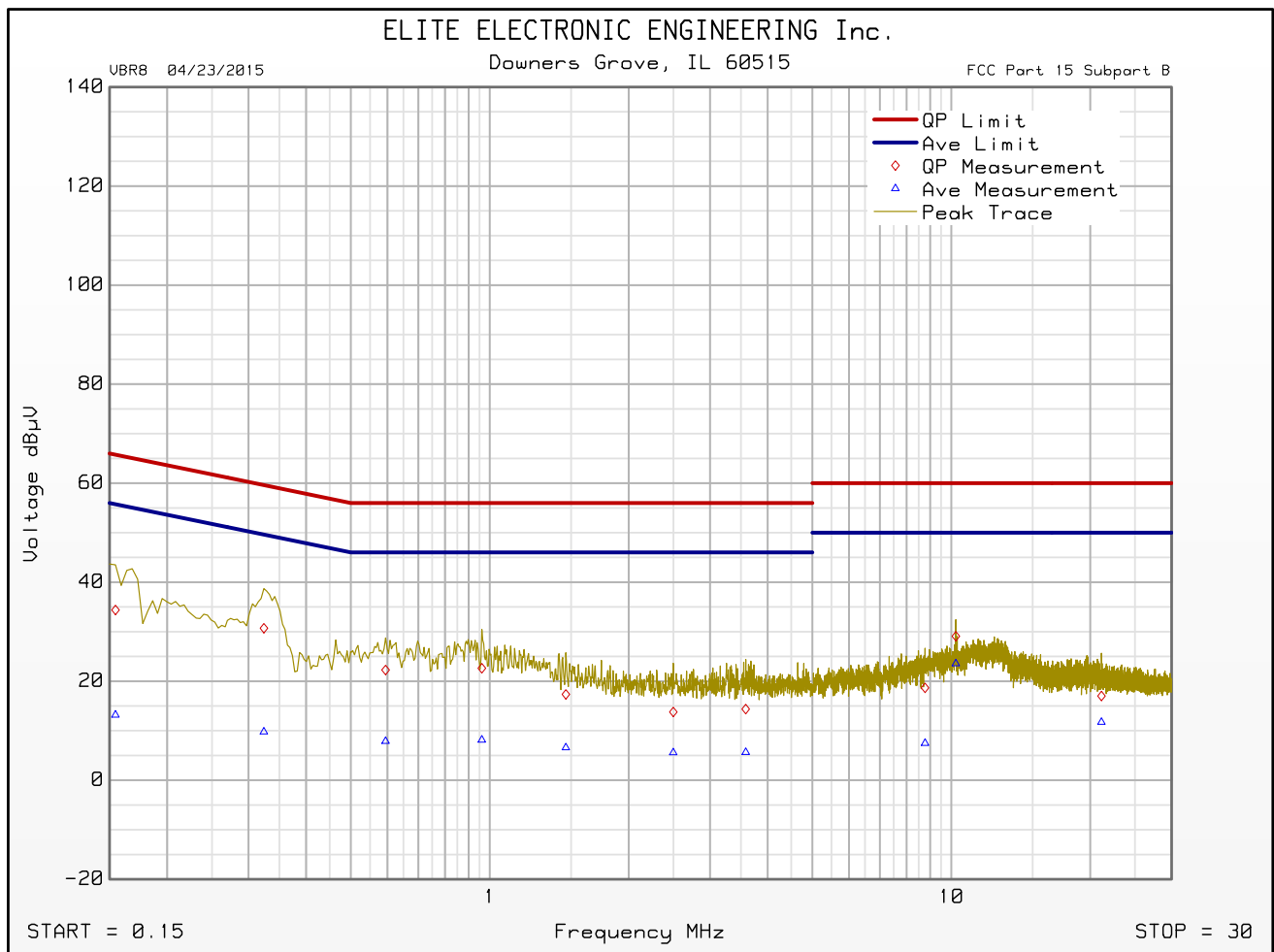
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.155	34.4	65.8		13.2	55.8	
0.324	30.7	59.6		9.8	49.6	
0.595	22.3	56.0		7.9	46.0	
0.961	22.6	56.0		8.1	46.0	
1.462	17.3	56.0		6.6	46.0	
2.498	13.8	56.0		5.6	46.0	
3.586	14.4	56.0		5.6	46.0	
8.771	18.7	60.0		7.5	50.0	
10.229	29.1	60.0		23.5	50.0	
21.151	17.0	60.0		11.7	50.0	



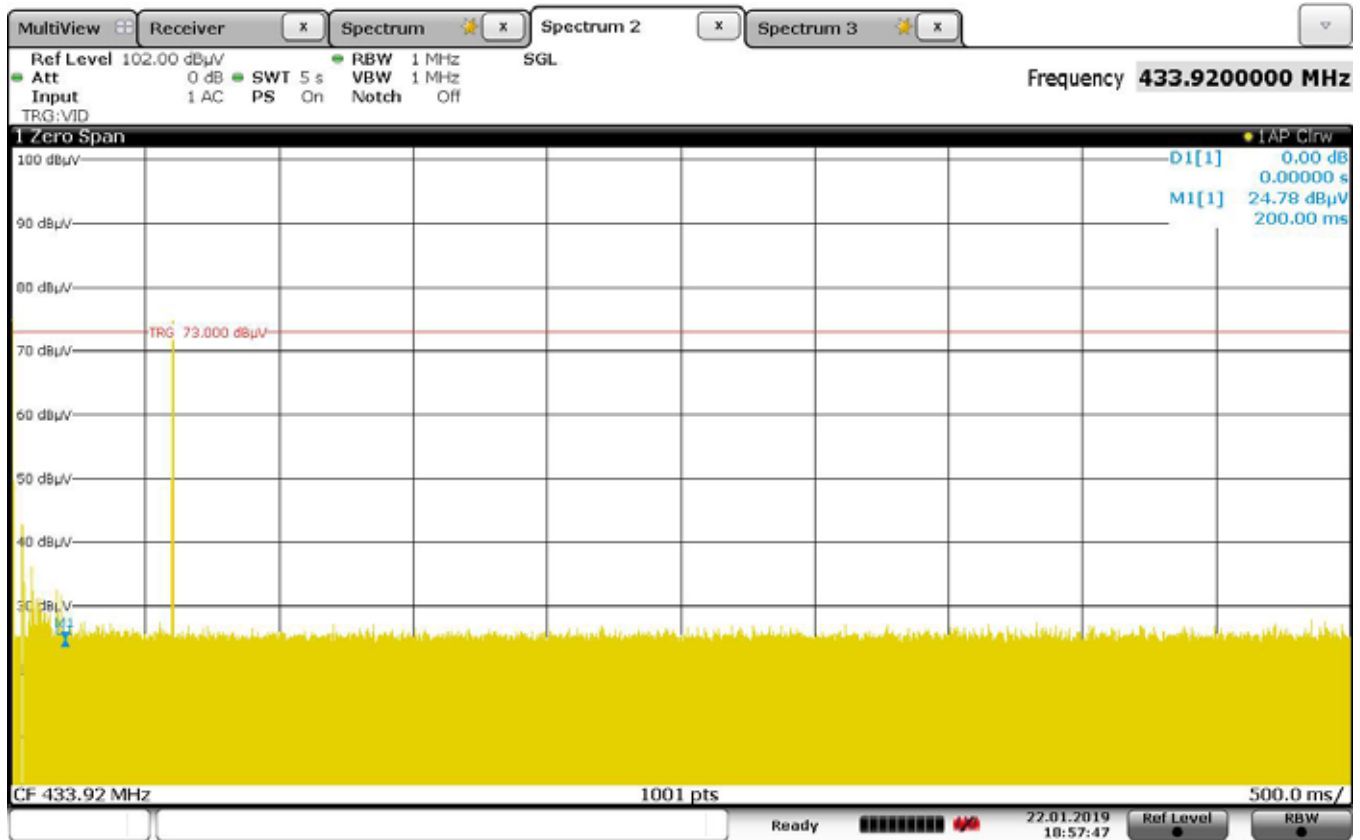
FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 04/23/2015

Manufacturer : SNAP-ON TOOLS CORPORATION
Model : SNAP-ON
DUT Revision :
Serial Number :
DUT Mode : Tx 433.92MHz
Line Tested : Neutral Line
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -10
Notes :
Test Engineer : J. Cardenas
Limit : Class B
Test Date : Jan 22, 2019 03:28:43 PM

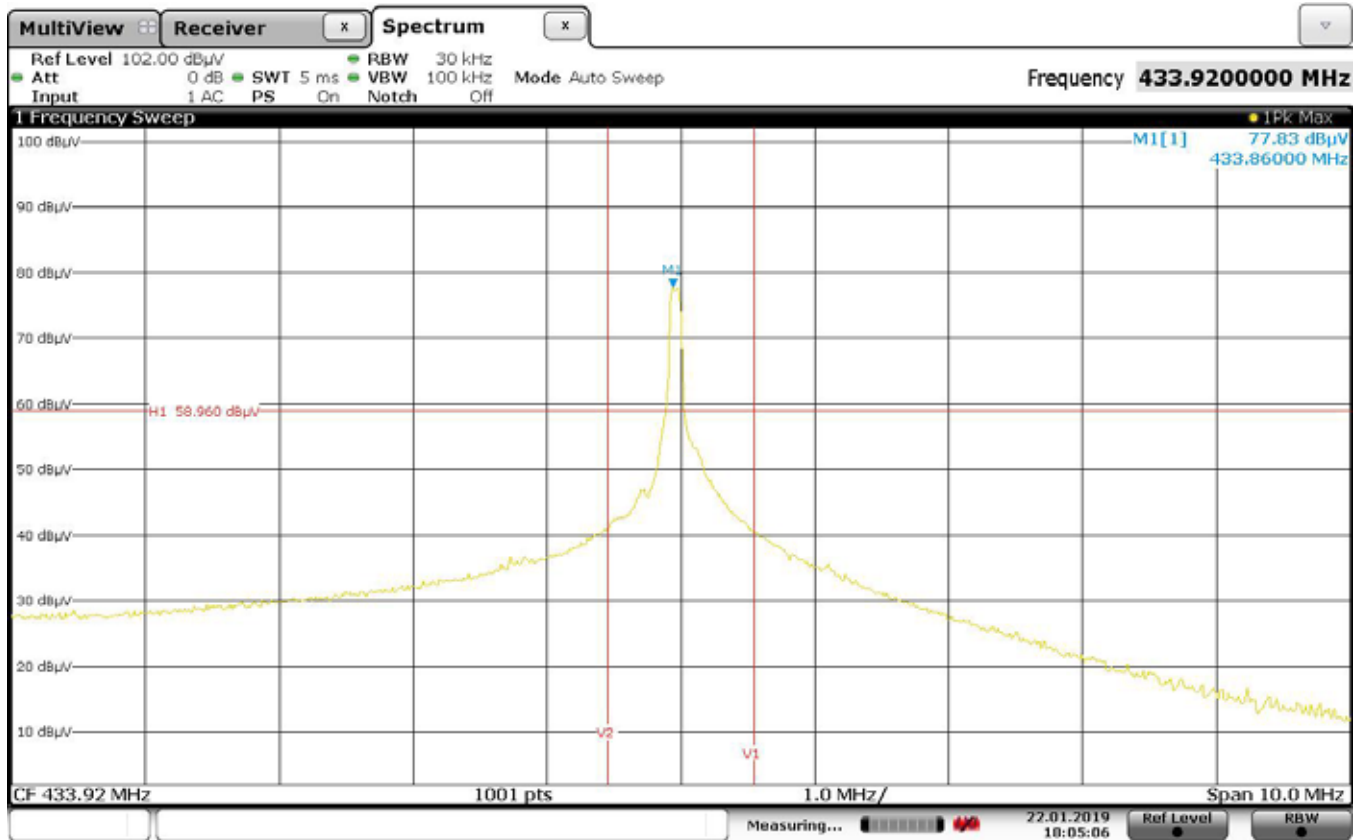


Emissions Meet QP Limit
Emissions Meet Ave Limit



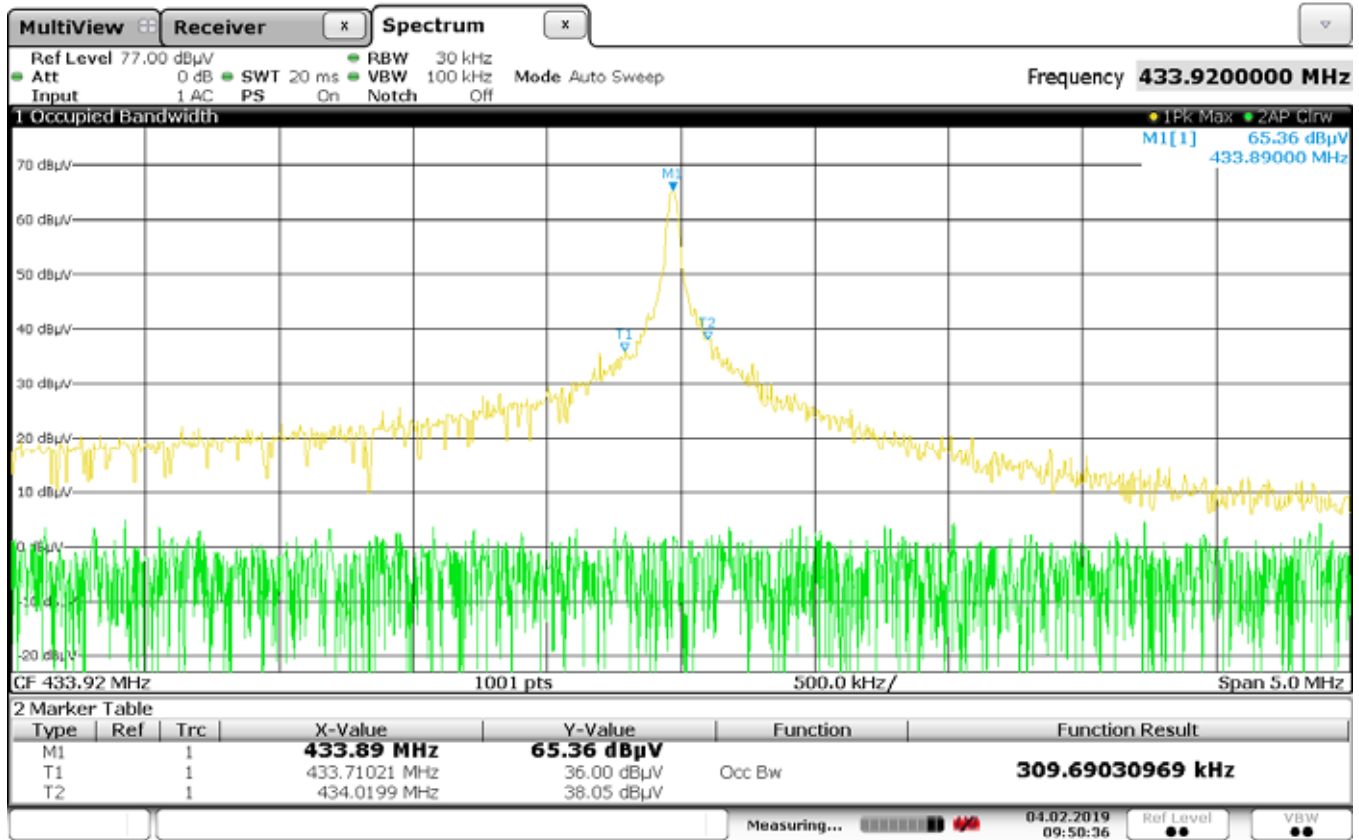
Date: 22 JAN 2019 18:57:47

Manufacturer : Snap-On Tools Corporation
 Model Number : Snap-On Remote Locking System and
 : ECKO Remote Locking System
 Serial Number : N/A
 Test : **Periodic Operation Measurement**
 Mode : Tx 433.92MHz
 Date : Jan 22,2019
 Notes :



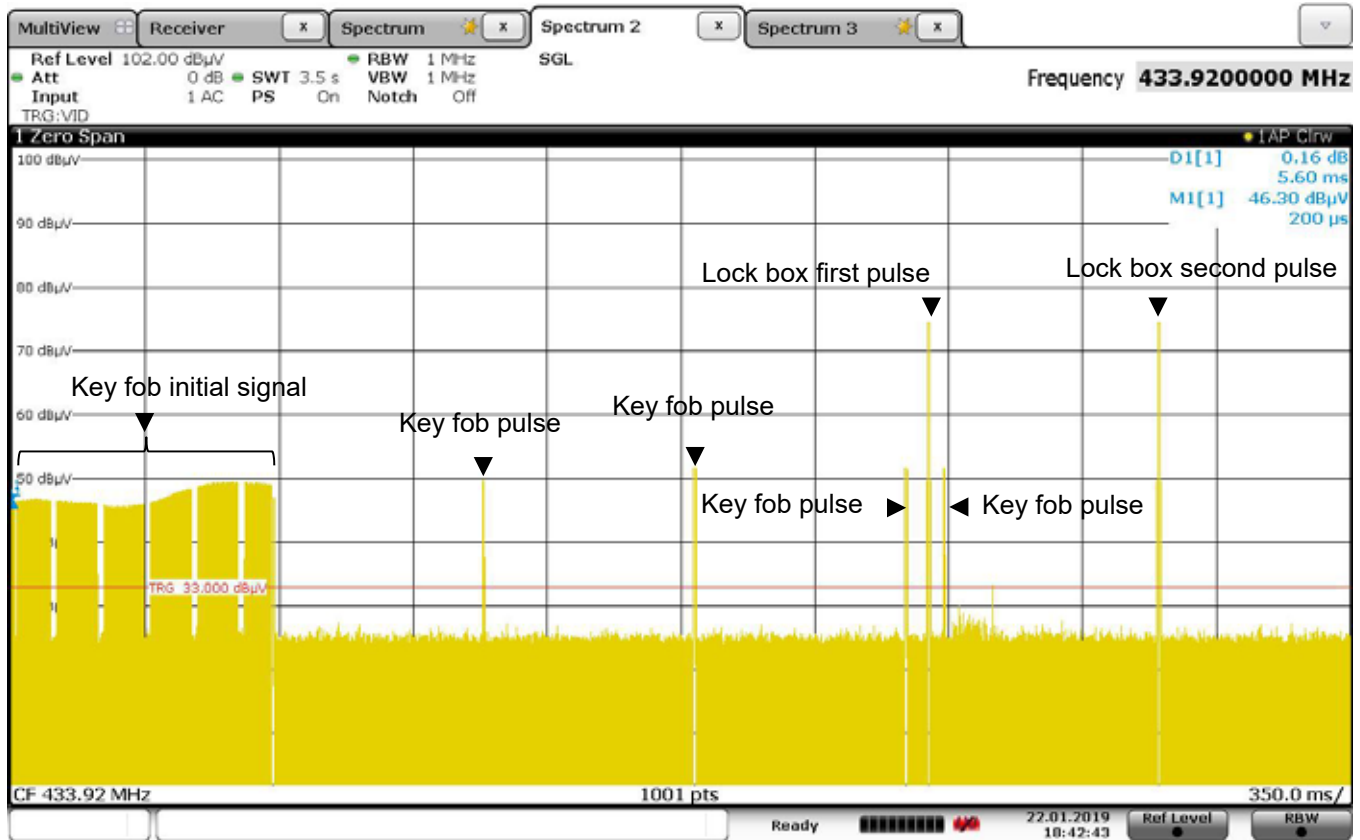
Date: 22 JAN 2019 18:05:07

Manufacturer : Snap-On Tools Corporation
 Model Number : Snap-On Remote Locking System and ECKO Remote Locking System
 Serial Number : N/A
 Test : **20dB Bandwidth**
 Mode : Tx 433.92MHz
 Date : Jan 22,2019
 Notes : The two vertical lines sit at 0.25% of the fundamental frequency



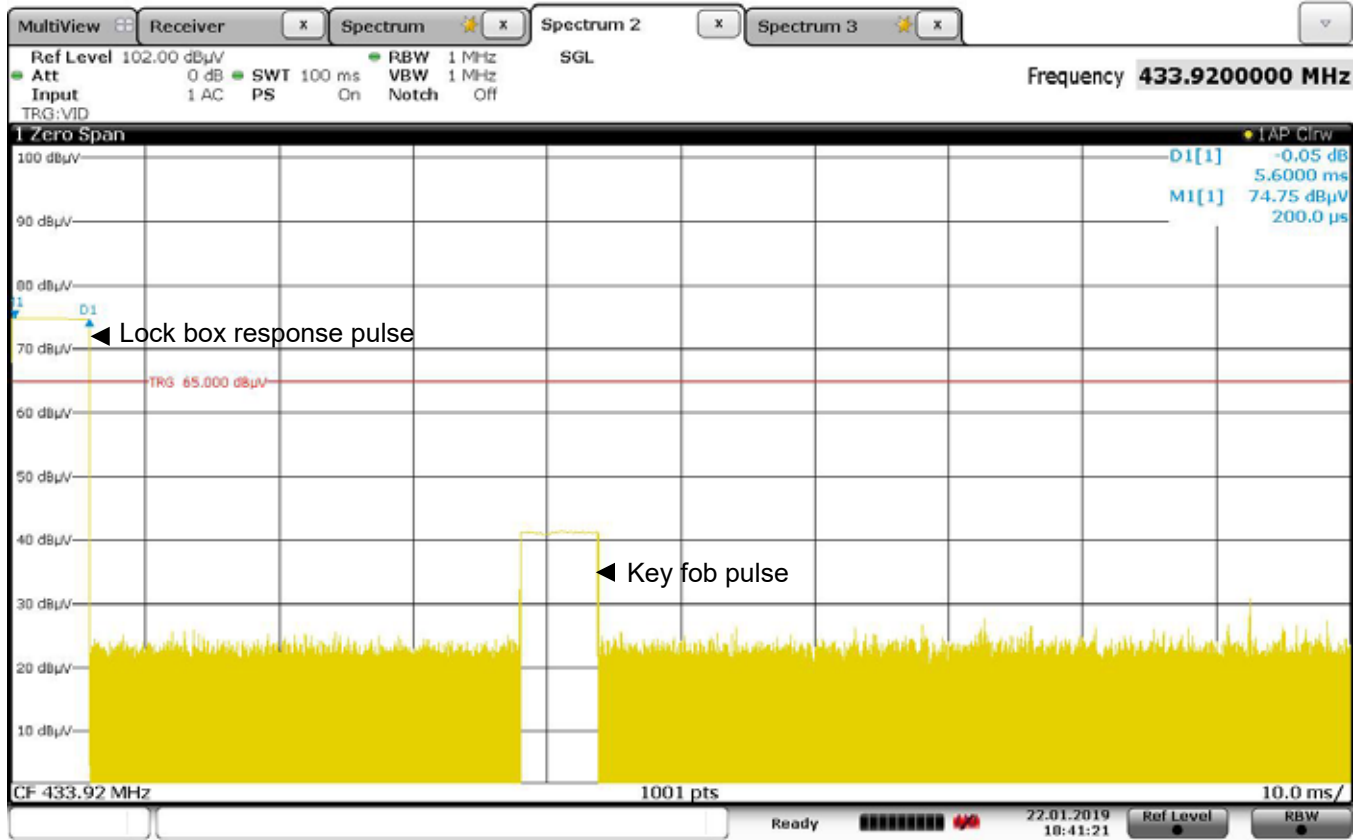
Date: 4 FEB 2019 09:50:35

Manufacturer : Snap-On Tools Corporation
 Model Number : Snap-On Remote Locking System and
 : ECKO Remote Locking System
 Serial Number : N/A
 Test : **99% Bandwidth**
 Mode : Tx 433.92MHz
 Parameters : 99% BW = 306.69MHz
 Date : Jan 22,2019
 Notes



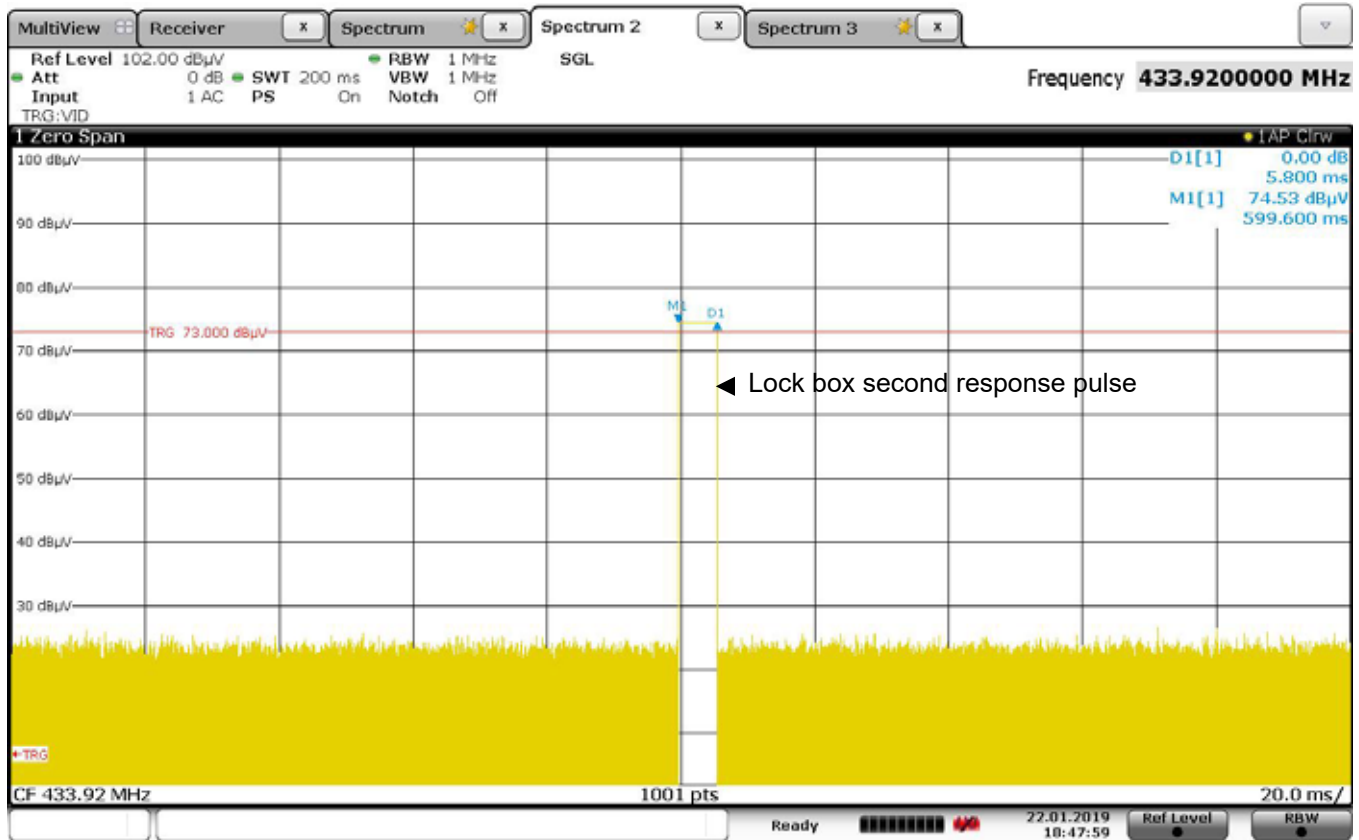
Date: 22 JAN 2019 18:42:43

Manufacturer : Snap-On Tools Corporation
 Model Number : Snap-On Remote Locking System and
 : ECKO Remote Locking System
 Serial Number : N/A
 Test : **Duty Cycle Calculation – Pulse Protocol**
 Mode : Tx 433.92MHz
 Parameters :
 Date : Jan 22,2019
 Notes : 100ms Sweep Time



Date: 22 JAN 2019 18:41:21

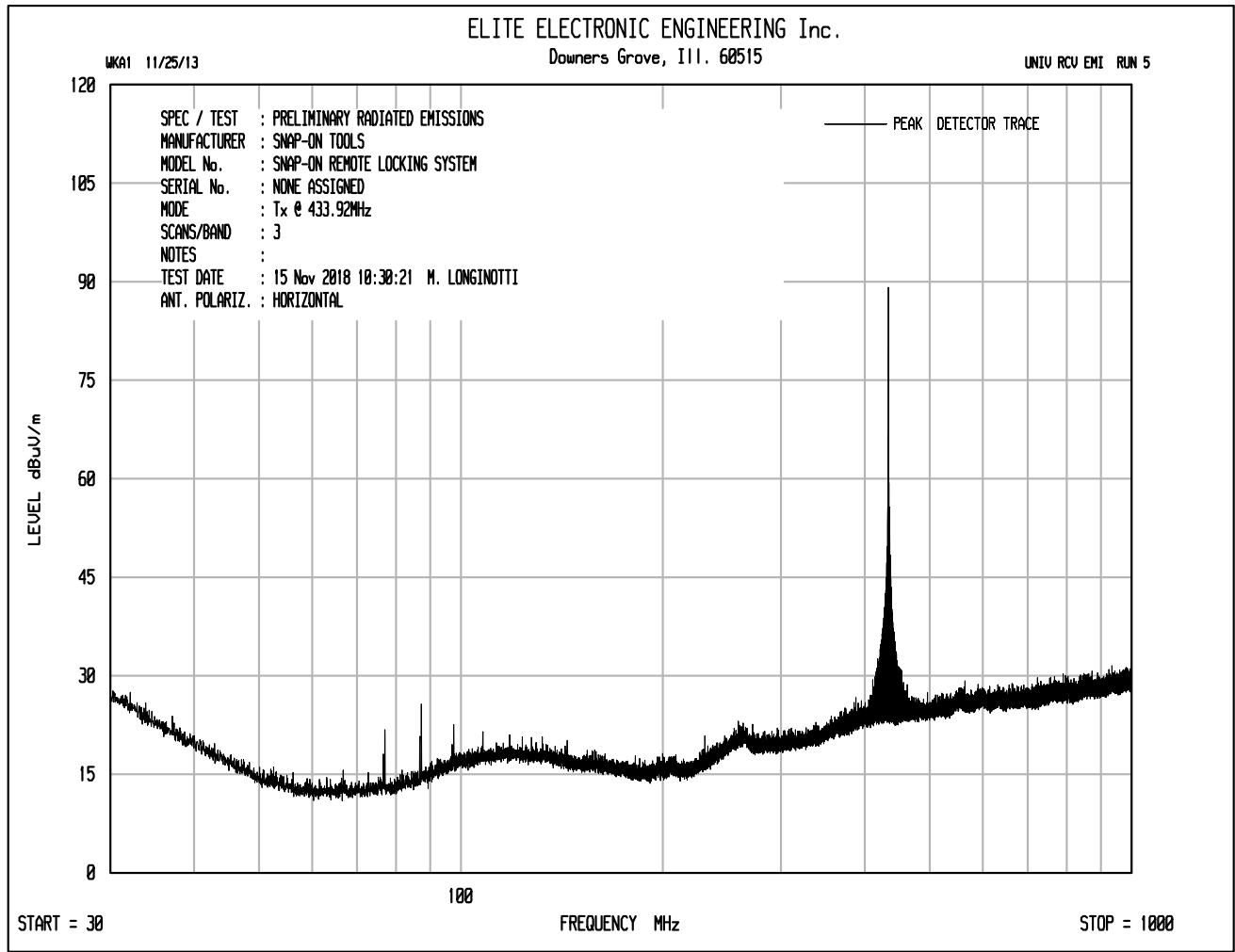
Manufacturer : Snap-On Tools Corporation
 Model Number : Snap-On Remote Locking System and
 : ECKO Remote Locking System
 Serial Number : N/A
 Test : **Duty Cycle Calculation – First Pulse Length**
 Mode : Tx 433.92MHz
 Parameters : Length = 5.6ms
 Date : Jan 22,2019
 Notes : 100ms Sweep Time, The other visible pulse is from the
 : key fob used to prompt a response from the lock box



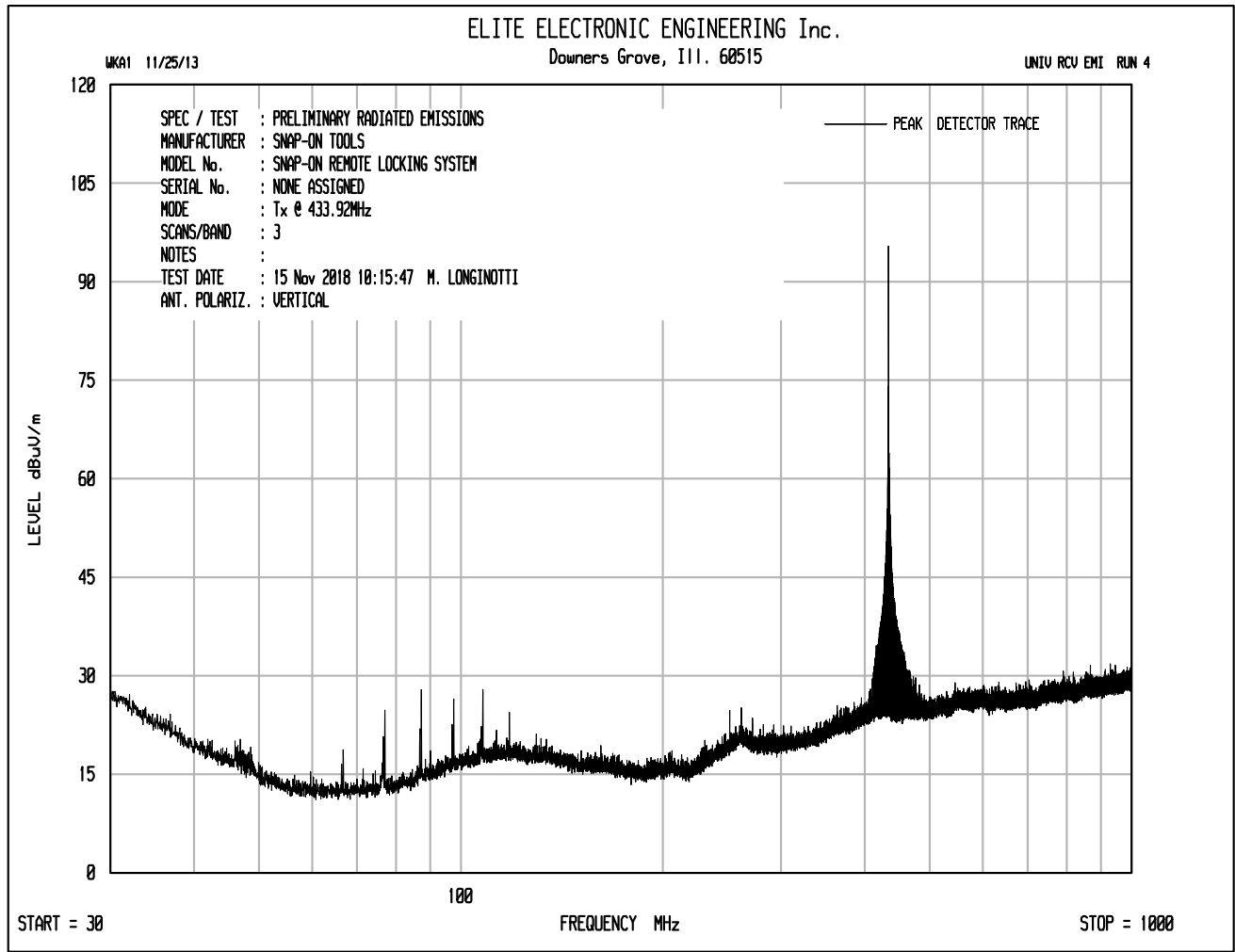
Date: 22 JAN 2019 18:47:58

Manufacturer : Snap-On Tools Corporation
 Model Number : Snap-On Remote Locking System and
 : ECKO Remote Locking System
 Serial Number : N/A
 Test : **Duty Cycle Calculation – Second Pulse Length**
 Mode : Tx 433.92MHz
 Parameters : Length = 5.8ms
 Date : Jan 22,2019
 Notes : The lowest duty cycle permitted is -20dB

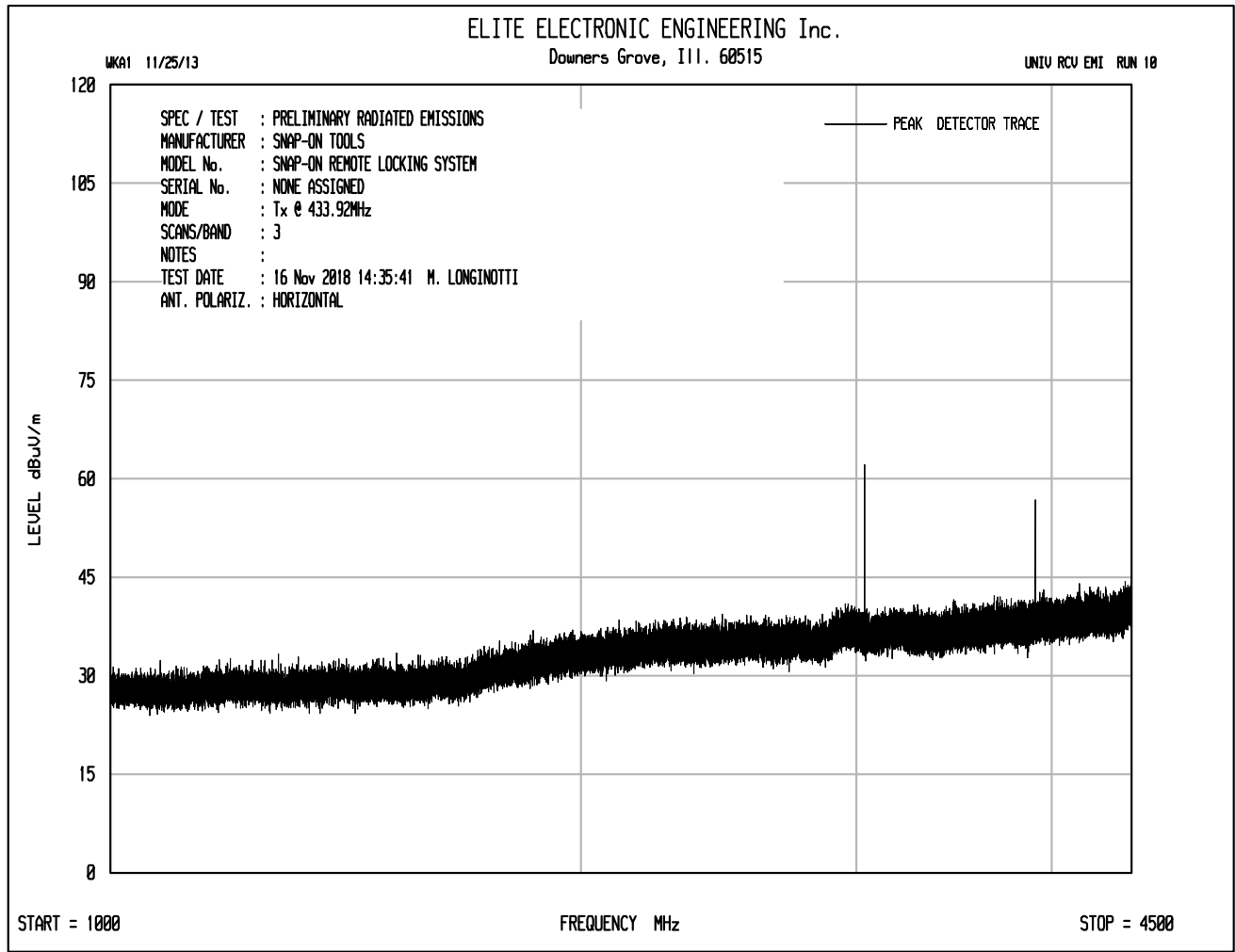
Duty Cycle Calculation = $20 \text{ Log}(5.6\text{ms}/100\text{ms}) = -25.03$



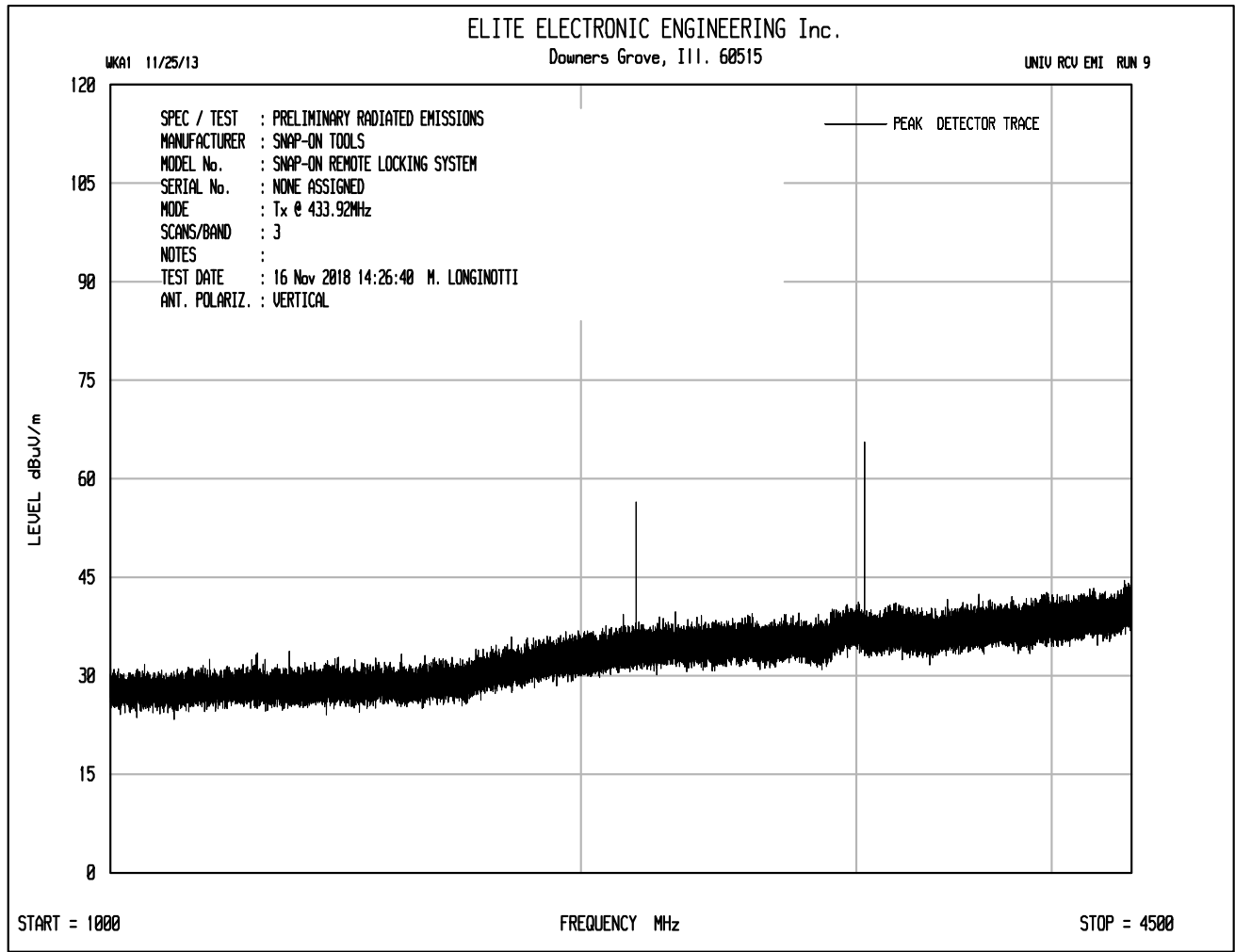
Snap-On



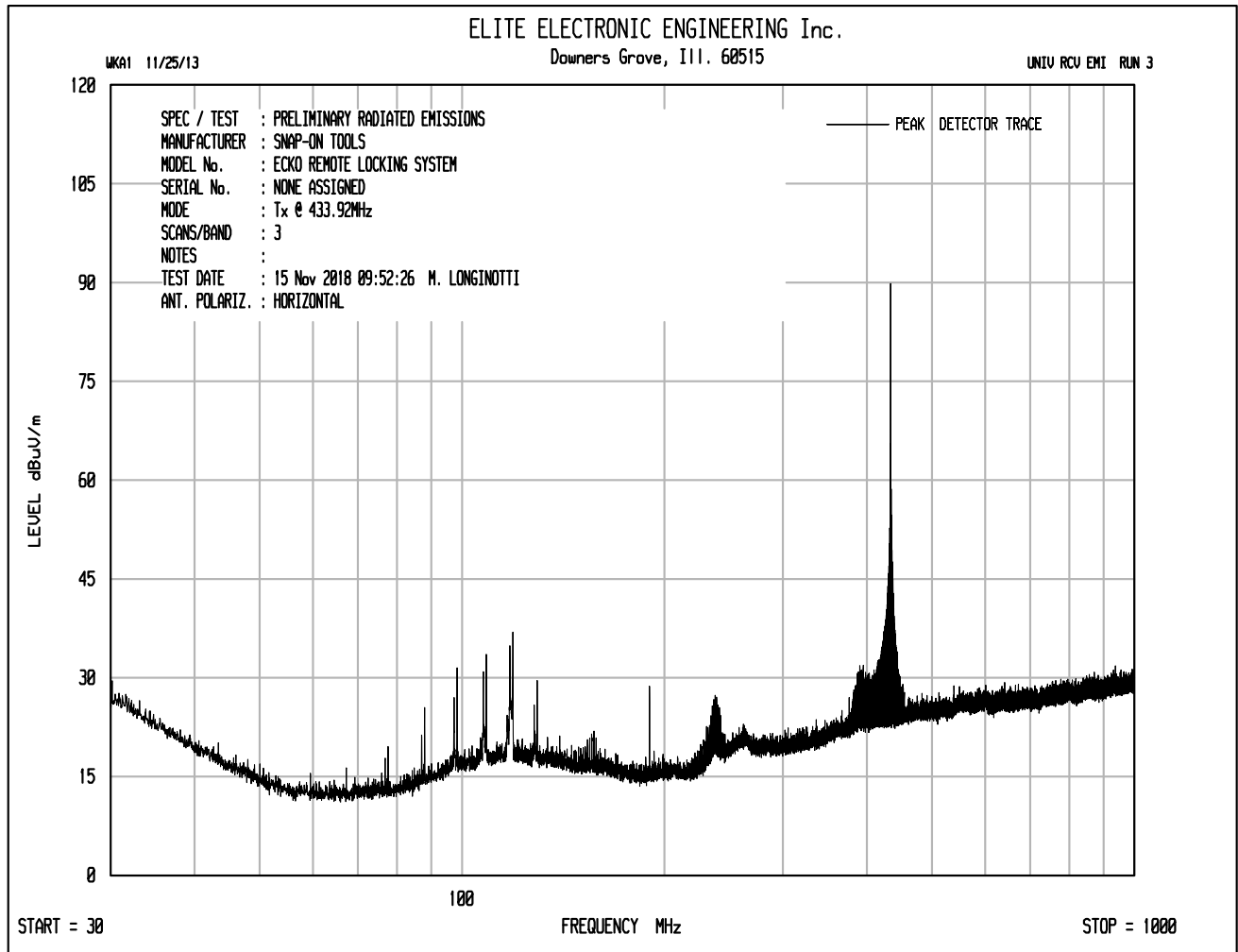
Snap-On



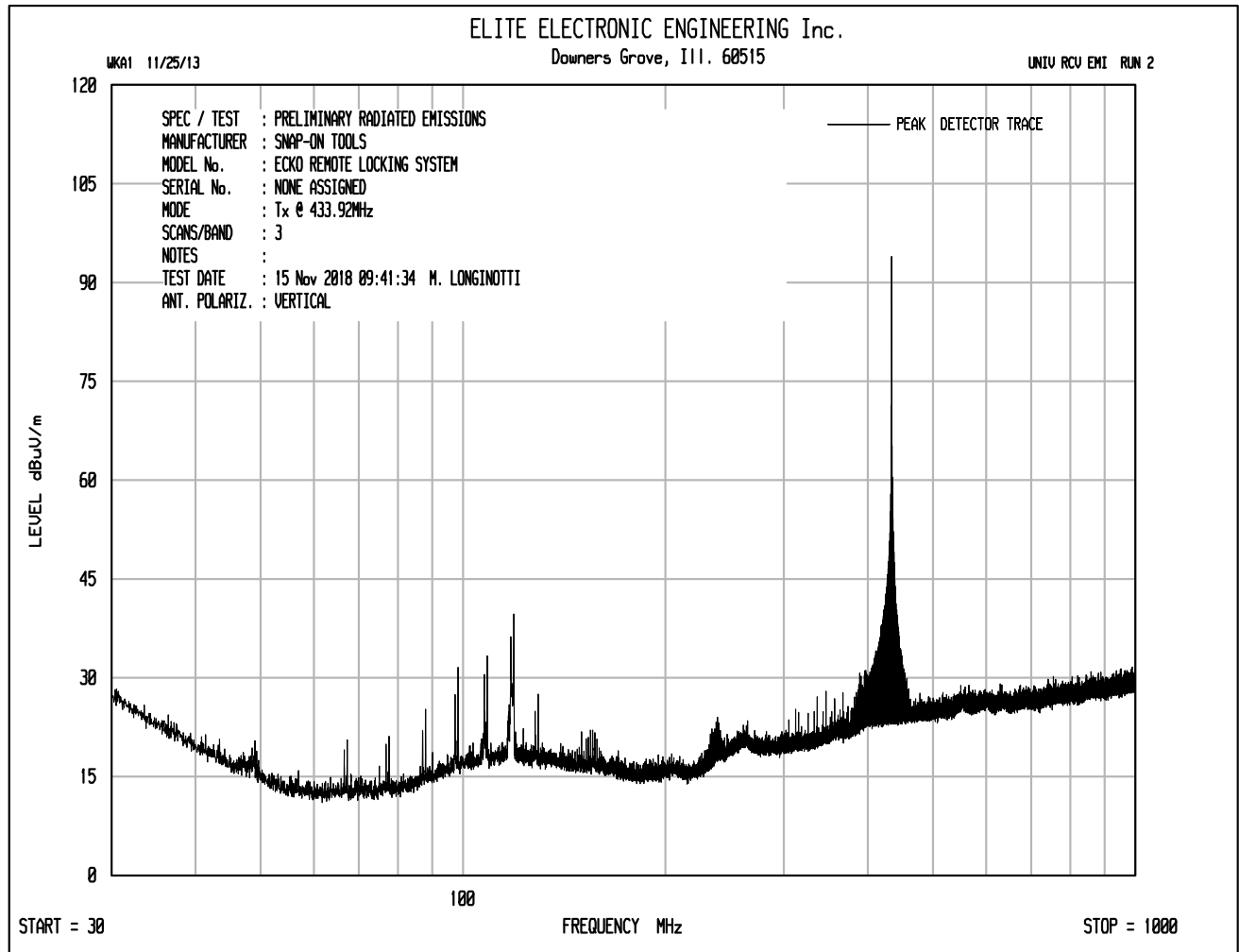
Snap-On



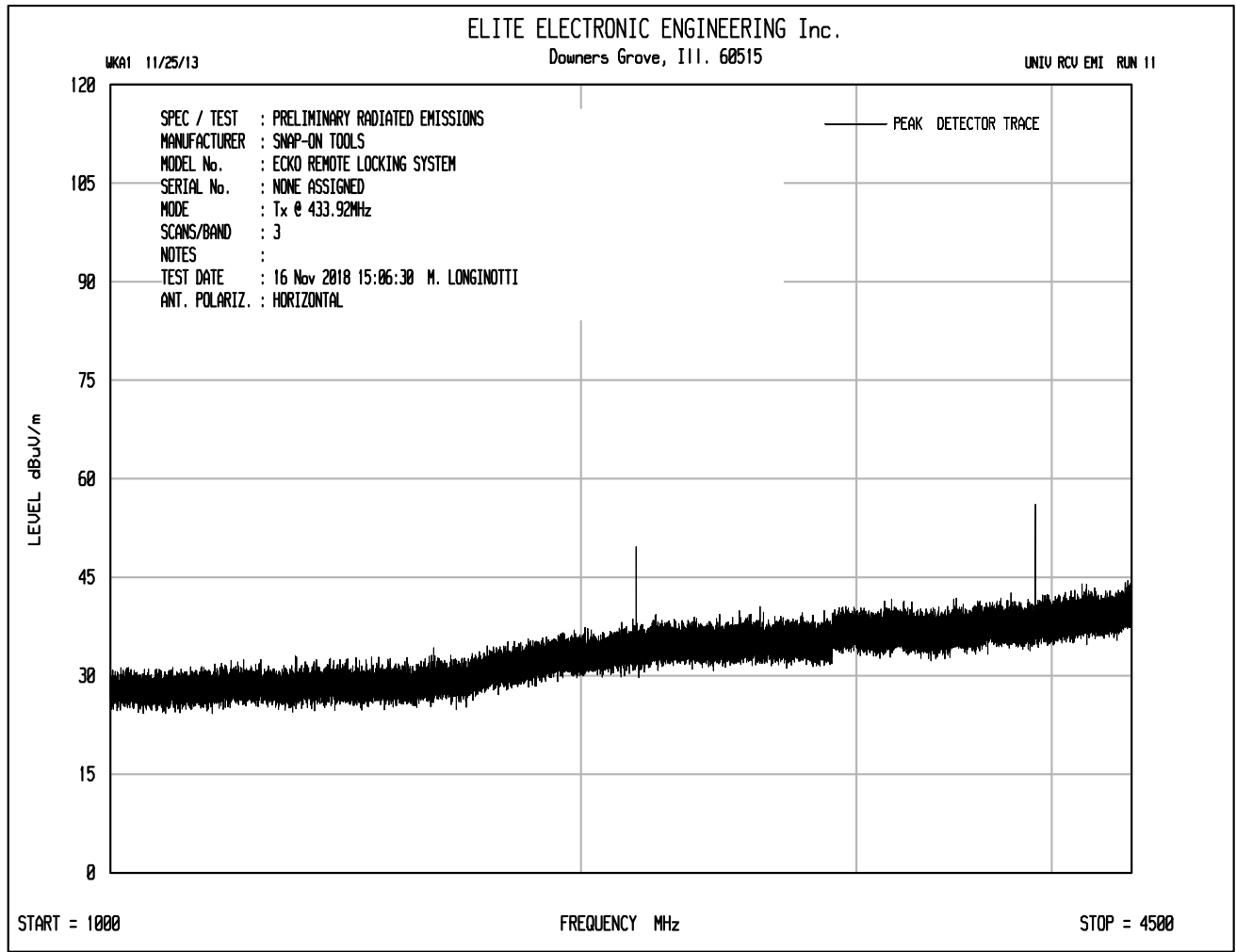
Snap-On



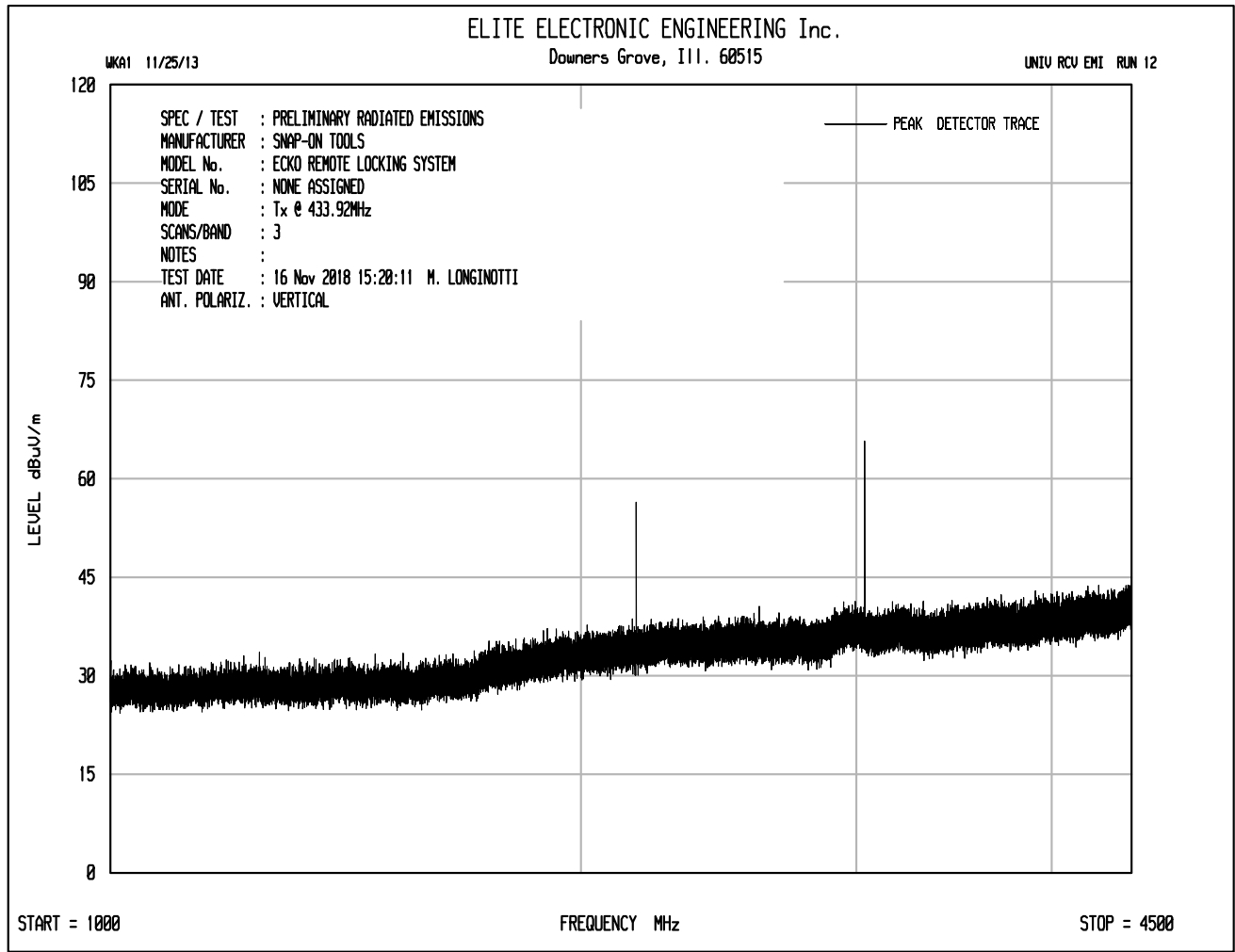
ECKO



ECKO



ECKO



ECKO



Manufacturer : Snap-On Tools Corporation
 Test Item : Tx/Rx Lock Box
 Model No. : Snap-On Remote Locking System
 Serial No. : N/A
 Mode : Tx @ 433.92MHz
 Test Specification : FCC-15.231, RSS-210 Peak Radiated Emissions
 Notes :

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
433.920	H	66.6		1.1	22.3	0.0	90.0	31589.4	109967	-10.8
433.920	V	72.0		1.1	22.3	0.0	95.4	58822.3	109967	-5.4
867.840	H	7.8	*	1.5	26.4	0.0	35.7	61.2	10997	-45.1
867.840	V	7.4	*	1.5	26.4	0.0	35.3	58.4	10997	-45.5
1301.760	H	14.4	*	1.9	29.5	0.0	45.8	195.5	5000	-28.2
1301.760	V	15.2	*	1.9	29.5	0.0	46.6	214.4	5000	-27.4
1735.680	H	14.8	*	2.2	30.5	0.0	47.5	235.8	10997	-33.3
1735.680	V	14.4	*	2.2	30.5	0.0	47.1	225.2	10997	-33.7
2169.600	H	23.1		2.5	33.4	0.0	58.9	884.8	10997	-21.9
2169.600	V	24.9		2.5	33.4	0.0	60.7	1088.5	10997	-20.1
2603.520	H	16.4	*	2.7	33.3	0.0	52.4	417.7	10997	-28.4
2603.520	V	16.9	*	2.7	33.3	0.0	52.9	442.4	10997	-27.9
3037.440	H	27.4		3.0	33.9	0.0	64.3	1636.7	10997	-16.5
3037.440	V	28.8		3.0	33.9	0.0	65.7	1922.9	10997	-15.1
3471.360	H	17.5	*	3.2	34.1	0.0	54.8	548.1	10997	-26.0
3471.360	V	18.2	*	3.2	34.1	0.0	55.5	594.0	10997	-25.3
3905.280	H	20.4		3.4	34.7	0.0	58.5	842.1	5000	-15.5
3905.280	V	21.8		3.4	34.7	0.0	59.9	989.3	5000	-14.1
4339.200	H	17.8	*	3.5	35.1	0.0	56.5	665.4	5000	-17.5
4339.200	V	17.9	*	3.5	35.1	0.0	56.6	673.1	5000	-17.4

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp



Manufacturer : Snap-On Tools Corporation
 Test Item : Tx/Rx Lock Box
 Model No. : Snap-On Remote Locking System
 Serial No. : N/A
 Mode : Tx @ 433.92MHz
 Test Specification : FCC-15.231, RSS-210 Average Radiated Emissions
 Notes :

Freq. (MHz)	Ant Pol	Meter Reading (dBUV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Total (dBUV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
433.920	H	66.6		1.1	22.3	0.0	-25.0	65.0	1776.4	10996.7	-15.8
433.920	V	72.0		1.1	22.3	0.0	-25.0	70.4	3307.8	10996.7	-10.4
867.840	H	7.8	*	1.5	26.4	0.0	-25.0	10.7	3.4	1099.7	-50.1
867.840	V	7.4	*	1.5	26.4	0.0	-25.0	10.3	3.3	1099.7	-50.5
1301.760	H	14.4	*	1.9	29.5	0.0	-25.0	20.8	11.0	500.0	-33.2
1301.760	V	15.2	*	1.9	29.5	0.0	-25.0	21.6	12.1	500.0	-32.4
1735.680	H	14.8	*	2.2	30.5	0.0	-25.0	22.5	13.3	1099.7	-38.4
1735.680	V	14.4	*	2.2	30.5	0.0	-25.0	22.1	12.7	1099.7	-38.8
2169.600	H	23.1		2.5	33.4	0.0	-25.0	33.9	49.8	1099.7	-26.9
2169.600	V	24.9		2.5	33.4	0.0	-25.0	35.7	61.2	1099.7	-25.1
2603.520	H	16.4	*	2.7	33.3	0.0	-25.0	27.4	23.5	1099.7	-33.4
2603.520	V	16.9	*	2.7	33.3	0.0	-25.0	27.9	24.9	1099.7	-32.9
3037.440	H	27.4		3.0	33.9	0.0	-25.0	39.3	92.0	1099.7	-21.5
3037.440	V	28.8		3.0	33.9	0.0	-25.0	40.7	108.1	1099.7	-20.1
3471.360	H	17.5	*	3.2	34.1	0.0	-25.0	29.8	30.8	1099.7	-31.0
3471.360	V	18.2	*	3.2	34.1	0.0	-25.0	30.5	33.4	1099.7	-30.3
3905.280	H	20.4		3.4	34.7	0.0	-25.0	33.5	47.4	500.0	-20.5
3905.280	V	21.8		3.4	34.7	0.0	-25.0	34.9	55.6	500.0	-19.1
4339.200	H	17.8	*	3.5	35.1	0.0	-25.0	31.5	37.4	500.0	-22.5
4339.200	V	17.9	*	3.5	35.1	0.0	-25.0	31.6	37.9	500.0	-22.4

Total (dBUV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle



Manufacturer : Snap-On Tools Corporation
Test Item : Tx/Rx Lock Box
Model No. : ECKO Remote Locking System
Serial No. : N/A
Mode : Tx @ 433.92MHz
Test Specification : FCC-15.231, RSS-210 Peak Radiated Emissions
Notes :

Freq. (MHz)	Ant Pol	Meter Reading (dBUV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Total (dBUV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
433.920	H	66.4		1.1	22.3	0.0	89.8	30870.4	109967	-11.0
433.920	V	71.4		1.1	22.3	0.0	94.8	54896.1	109967	-6.0
867.840	H	7.2	*	1.5	26.4	0.0	35.1	57.1	10997	-45.7
867.840	V	5.1	*	1.5	26.4	0.0	33.0	44.8	10997	-47.8
1301.760	H	15.0	*	1.9	29.5	0.0	46.4	209.5	5000	-27.6
1301.760	V	15.2	*	1.9	29.5	0.0	46.6	214.4	5000	-27.4
1735.680	H	15.9	*	2.2	30.5	0.0	48.6	267.6	10997	-32.2
1735.680	V	14.4	*	2.2	30.5	0.0	47.1	225.2	10997	-33.7
2169.600	H	20.9		2.5	33.4	0.0	56.7	686.8	10997	-24.1
2169.600	V	22.8		2.5	33.4	0.0	58.6	854.7	10997	-22.2
2603.520	H	15.4	*	2.7	33.3	0.0	51.4	372.3	10997	-29.4
2603.520	V	16.3	*	2.7	33.3	0.0	52.3	412.9	10997	-28.5
3037.440	H	24.1		3.0	33.9	0.0	61.0	1119.3	10997	-19.8
3037.440	V	30.7		3.0	33.9	0.0	67.6	2393.1	10997	-13.2
3471.360	H	17.6	*	3.2	34.1	0.0	54.9	554.4	10997	-25.9
3471.360	V	17.9	*	3.2	34.1	0.0	55.2	573.9	10997	-25.6
3905.280	H	22.7		3.4	34.7	0.0	60.8	1097.4	5000	-13.2
3905.280	V	22.3		3.4	34.7	0.0	60.4	1048.0	5000	-13.6
4339.200	H	17.8	*	3.5	35.1	0.0	56.5	665.4	5000	-17.5
4339.200	V	18.3	*	3.5	35.1	0.0	57.0	704.9	5000	-17.0

Total (dBUV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp



Manufacturer : Snap-On Tools Corporation
Test Item : Tx/Rx Lock Box
Model No. : ECKO Remote Locking System
Serial No. : N/A
Mode : Tx @ 433.92MHz
Test Specification : FCC-15.231, RSS-210 Average Radiated Emissions
Notes :

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
433.920	H	66.4		1.1	22.3	0.0	-25.0	64.8	1736.0	10996.7	-16.0
433.920	V	71.4		1.1	22.3	0.0	-25.0	69.8	3087.0	10996.7	-11.0
867.840	H	7.2	*	1.5	26.4	0.0	-25.0	10.1	3.2	1099.7	-50.7
867.840	V	5.1	*	1.5	26.4	0.0	-25.0	8.0	2.5	1099.7	-52.8
1301.760	H	15.0	*	1.9	29.5	0.0	-25.0	21.4	11.8	500.0	-32.6
1301.760	V	15.2	*	1.9	29.5	0.0	-25.0	21.6	12.1	500.0	-32.4
1735.680	H	15.9	*	2.2	30.5	0.0	-25.0	23.6	15.0	1099.7	-37.3
1735.680	V	14.4	*	2.2	30.5	0.0	-25.0	22.1	12.7	1099.7	-38.8
2169.600	H	20.9		2.5	33.4	0.0	-25.0	31.7	38.6	1099.7	-29.1
2169.600	V	22.8		2.5	33.4	0.0	-25.0	33.6	48.1	1099.7	-27.2
2603.520	H	15.4	*	2.7	33.3	0.0	-25.0	26.4	20.9	1099.7	-34.4
2603.520	V	16.3	*	2.7	33.3	0.0	-25.0	27.3	23.2	1099.7	-33.5
3037.440	H	24.1		3.0	33.9	0.0	-25.0	36.0	62.9	1099.7	-24.8
3037.440	V	30.7		3.0	33.9	0.0	-25.0	42.6	134.6	1099.7	-18.2
3471.360	H	17.6	*	3.2	34.1	0.0	-25.0	29.9	31.2	1099.7	-30.9
3471.360	V	17.9	*	3.2	34.1	0.0	-25.0	30.2	32.3	1099.7	-30.6
3905.280	H	22.7		3.4	34.7	0.0	-25.0	35.8	61.7	500.0	-18.2
3905.280	V	22.3		3.4	34.7	0.0	-25.0	35.4	58.9	500.0	-18.6
4339.200	H	17.8	*	3.5	35.1	0.0	-25.0	31.5	37.4	500.0	-22.5
4339.200	V	18.3	*	3.5	35.1	0.0	-25.0	32.0	39.6	500.0	-22.0

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp + Duty Cycle