Measurement of RF Interference from a Sennco Solutions Master Alarm Transceiver

For	Sennco Solutions 14404 Coil Plus Drive, Unit A Plainfield, IL 60644
P.O. Number	006284
Date Tested	August 12, 2015 and Oct. 10-14, 2016
Test Personnel	Richard King
Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Digital Transmission Systems Operating within the bands 902-928MHz Industry Canada RSS-247 Industry Canada RSS-GEN

Test Report By:

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REVISION HISTORY

Revision	Date	Description
—	02 NOV 2016	Initial release
A	21 NOV 2016	- Added Rev A to the report number on the cover and in the header of each page. - Added the original conducted emissions data to this report.

Measurement of RF Emissions from a Sennco Solutions Master Alarm Transceiver

1. INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Sennco Solutions Master Alarm transceiver (hereinafter referred to as the EUT). No Serial Number was assigned to the EUT. The EUT is a Digital Transmission System (DTS) transceiver. The transceiver was designed to transmit and receive in the 902-928 MHz band using a non-removable rubber duck antenna. The EUT was manufactured and submitted for testing by Sennco Solutions located in Plainfield, IL.

1.2 Purpose

The test series was performed to determine if the EUT continues to meet the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 902-928 MHz band. Testing was performed in accordance with ANSI C63.4-2014.

The test series was also performed to determine if the EUT continues to meets the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, Section 8.8 and RSS-247 Section 5, for Transmitters. Testing was performed in accordance with ANSI C63.4-2014.

This test series excluded the receiver portion test. The receiver portion was previously tested. The results are presented in a separate test report. Since no changes were made in the receiver portion of the EUT no retesting is required.

1.3 Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series

1.4 EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.5 Laboratory Conditions

The temperature at the time of the test was 23C and the relative humidity was 45%.

2. APPLICABLE DOCUMENTS

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

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subparts B and C, dated 1 October 2016.

- 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".

- Federal Communications Commission Office of Engineering Technology Laboratory Division Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under § 15.247, June 9, 2015.

- Industry Canada RSS-247, Issue 1, May 2015, “Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”.

- Industry Canada RSS-GEN, Issue 4, November 2014, “Spectrum Management and

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

- ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

3. EUT SETUP AND OPERATION

3.1 General Description

The EUT is a Sennco Solutions Master Alarm. A block diagram of the EUT setup is shown as Figure 1. A photograph of the EUT is shown as Figure 2.

3.1.1 Power Input

The EUT obtained 5VDC through 2 each, 1.85 meter long power leads of a CUI Power Supply, Part No. ETSA 24027OUDC-P5RP-SZ, Model No. ETSA 24027OUD. The CUI Power Supply was powered with 115V, 60Hz via 2 each, 1.8 meter long power leads.

3.1.2 Peripheral Equipment

No peripheral equipment was submitted with the EUT.

3.1.3 Interconnect Cables

No interconnect cables were submitted with the EUT.

3.1.4 Grounding

The EUT was not grounded during the tests.

3.1.5 Frequency of EUT

The EUT was equipped with a transmitter that transmits in the frequency range 907MHz to 920.8MHz. Per 15.33(a)(1), for an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

1. If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.2 Software

For all tests the EUT had Firmware Version V2.0.02 loaded onto the device to provide correct load characteristics.

3.3 Operational Mode

The EUT was placed on an 80cm high non-conductive stand when testing in the frequency range below 1GHz or a150cm high non-conductive stand when testing in the frequency range above 1GHz.

The EUT and all peripheral equipment were energized.

The EUT programmed to operate at one of the following frequencies:

- Transmit at 907MHz
- Transmit at 913.8MHz
- Transmit at 920.8MHz

3.4 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 emissions tests were performed with an EMI receiver with internal peak, quasi-peak, and average detectors. All measurements were performed using the bandwidths 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 National Institute of Standards and Technology (NIST).

4.4 Measurement Uncertainty

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

The measurement uncertainty for these tests is presented below:

Conducted Emissions Measurements		
Combined Standard Uncertainty	1.06	-1.06
Expanded Uncertainty (95% confidence)	2.12	-2.12

Radiated Emissions Measurements		
Combined Standard Uncertainty	2.09	-2.09
Expanded Uncertainty (95% confidence)	4.19	-4.19

5. TEST PROCEDURES

5.1.1 Powerline Conducted Emissions

5.1.1.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Per 15.207(a) and Industry Canada RSS-Gen section 8.8, all radio frequency voltages on the power lines of a transmitter shall be below the values shown below when using a quasi-peak or average detector:

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

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

5.1.1.2 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 Normal Operation mode.

b) Measurements were first made on the 115V, 60Hz high line of the CUI Power Supply, Part No. ETSA 24027OUDC-P5RP-SZ, Model No. ETSA 24027OUD.

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).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB)

g) Steps (c) through (f) were repeated on the 115V, 60Hz return line of the CUI Power Supply, Part No. ETSA 24027OUDC-P5RP-SZ, Model No. ETSA 24027OUD.

5.1.1.3 Results

The plots and final data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the Normal Operation mode are shown on pages 20 through 23. All power line conducted emissions measured from the EUT were within the specification limits. The emissions level closest to the limit (worst case) occurred at 500kHz. The emissions level at this frequency was 19.9dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.1.2 6dB Bandwidth

5.1.2.1 Requirements

Per 15.247(a)(2),the minimum 6dB bandwidth shall be at least 500kHz for all systems using digital modulation techniques.

5.1.2.2 Procedures

The EUT was setup inside the chamber. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 100kHz and the span was set to greater than the RBW.

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

5.1.2.3 Results

The plots on pages 24 through 26 show that the minimum 6 dB bandwidth was 511.02kHz which is greater than minimum allowable 6dB bandwidth requirement of 500kHz for systems using digital modulation techniques. The 99% bandwidth was measured to be 724.8kHz.

5.1.3 Peak Output Power

5.1.3.1 Requirements

Per section 15.247(b)(3), for systems using digital modulation the maximum peak output conducted power shall not be greater than 1.0W (30dBm). 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 4 Watt (36dBm).

5.1.3.2 Procedures

The EUT was placed on the non-conductive stand and set to transmit. A bilog antenna 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 6dB 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 channels.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a dipole antenna 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 as required. The peak power output was calculated for low, middle, and high hopping frequencies.

5.1.3.3 Results

The results are presented on pages 27 through 29. The maximum EIRP measured from the transmitter was 10.1dBm (10.2mW) which is below the 36dBm (4 Watt) limit.

5.1.4 Radiated Spurious Emissions Measurements

5.1.4.1 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). 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

5.1.4.2 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 bilog antenna. The bilog 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.

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 bilog antenna. The bilog 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.

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, if the emission is pulsed, the reading can be adjusted by a “duty cycle correction factor” derived from 20*log(on time/word length). These readings must be no greater than the limits specified in 15.209(a).

5.1.4.3 Results

Preliminary radiated emissions plots with the EUT transmitting at 907MHz, 913.8MHz, and 920.8MHz are shown on pages 30 through 41. Final radiated emissions data are presented on data pages 42 through 50.

Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figure 4 and Figure 5.

5.1.5 Band Edge Compliance

5.1.5.1 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.

5.1.5.2 Procedures

5.1.5.2.1 Low Band Edge

1) The EUT was setup inside the test chamber on a non-conductive stand.
2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
3) The EUT was set to transmit continuously at the channel closest to the low band-edge.
4) The EUT was maximized for worst case emissions at the measuring antenna. The maximum

meter reading was recorded.

5) 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.

5.1.5.2.2 High Band Edge

1) The EUT was setup inside the test chamber on a non-conductive stand.
2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
3) The EUT was set to transmit continuously at the channel closest to the high band-edge (hopping function disabled).
4) The EUT was maximized for worst case emissions at the measuring antenna.
5) 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.

5.1.5.3 Results

Pages 51 and 52 show the radiated 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.

5.1.6 Power Spectral Density

5.1.6.1 Requirement

Per section 15.247(d), the peak power spectral density from the intentional radiator shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.1.6.2 Procedures

1) The EUT was placed on the non-conductive stand and set to transmit at 907MHz.
2) A broadband measuring antenna was placed near the EUT.
3) To determine the power spectral density, the following spectrum analyzer settings were used:
   a. Center frequency = transmit frequency
   b. Span = 1MHz or wider
   c. Resolution bandwidth (RBW) greater than the 6dB bandwidth.
   d. Sweep time = auto

e. The peak detector and 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.

4) This reading corresponds to the EIRP measured at 907MHz.
5) Turn on the display line and place it at the corresponding +8dBm level. (e.g. if the peak output power is +18dBm then the +8dBm level will be 10dB down from the radiated level and if the peak output power is +6dBm then the +8dBm level will be 2dB above the radiated level.)
6) To determine the power spectral density, the following spectrum analyzer settings were used:
    a. Center frequency = transmit frequency
    b. Span = 1MHz or wider
    c. Resolution bandwidth (RBW) = 100kHz
    d. Sweep time = auto
    e. The peak detector and 'Max-Hold' function was engaged.
    f. The display line represents the 8 dBm limit
    g. The analyzer's display was plotted using a 'screen dump' utility.
7) Steps 2) through 6) were repeated with the EUT set to transmit at 913.8MHz.
8) Steps 2) through 6) were repeated with the EUT set to transmit at 920.8MHz.

5.1.6.3 Results

Pages 53 through 55 show the power spectral density results. As can be seen from these plots, the peak power density is less than 8dBm in a 3kHz band during any time interval of continuous transmission.

6. CONCLUSIONS

It was determined that the Sennco Solutions Master Alarm, digital modulation transceiver, 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 Sennco Solutions Master Alarm, digital modulation transceiver, did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 8.8 and Section 7.1 for receivers and the Industry Canada Radio Standards Specification RSS-Gen Section 8.8 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 NVLAP, NIST or any agency of the Federal Government.

9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/18/2016	4/18/2017
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
GRE1	SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	12/16/2015	12/16/2016
NDC0	88" DIPOLE ANTENNA - FL	ELITE	TD-88	1	---	NOTE 1	
NSDS0	UNIVERSAL SPHERICAL DIPOLE SOURCE	AET	USDS-H	----	10MHz-12GHz	NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	3/23/2016	3/23/2017
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/4/2016	4/4/2018
PHA0	MAGNETIC FIELD PROBE	ELECTRO-METRICS	EM-6882	134	22-230MHZ	NOTE 1	
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	0.009-6500MHZ	2/22/2016	2/22/2017
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	2/22/2016	2/22/2017
RBA1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100146	20HZ-26.5GHZ	2/12/2016	2/12/2017
RBE0	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU26	100095	20Hz-26GHz	3/1/2016	3/1/2017
SAA0	AC POWER SOURCE/ANALYZER - FL	HEWLETT PACKARD	6813A	3524A00445	0-300VRMS,1750VA	NOTE 1	
SHC2	Power Supplies	HENGFU	HF60W-SL-24	A11372702	24V	NOTE 1	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
PLF5	CISPR16 50UH LISN	ELITE	CISPR16/15A	006	.15-30MHz	5/20/2015	5/20/2016
PLF7	CISPR16 50UH LISN	ELITE	CISPR16/15A	008	.15-30MHz	5/20/2015	5/20/2016

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.

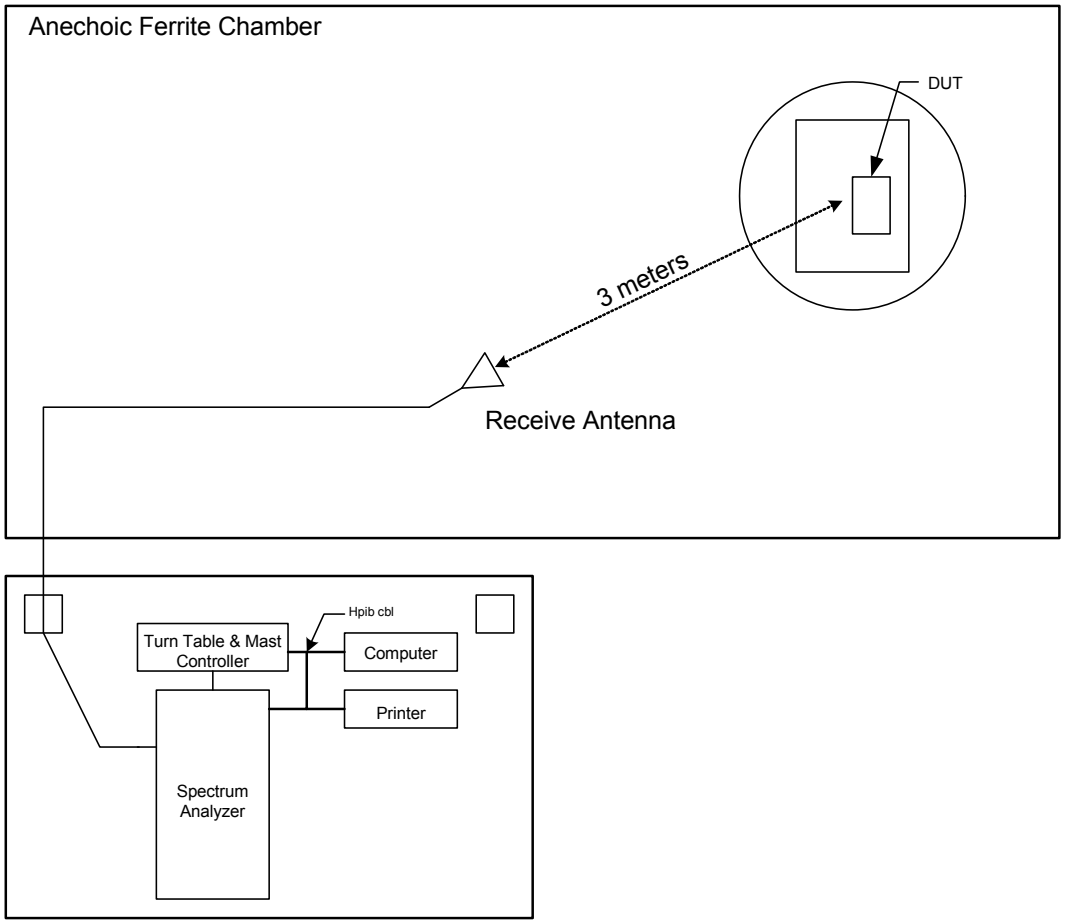


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 03/04/2015

Manufacturer	:	SENNCO SOLUTIONS
Model	:	MASTER ALARM
DUT Revision	:	
Serial Number	:	NONE ASSIGNED
DUT Mode	:	NORMAL OPERTION(Tx@ 907MHz, Rx @ 907MHz,Tx @ 916.8MHz, Rx @ 916.8MHz)
Line Tested	:	115V, 60Hz HIGH
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	TESTED WITH CUI PS P/N: ETSA 24027OUDC-PSRP-SZ
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Aug 12, 2015 01:26:35 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

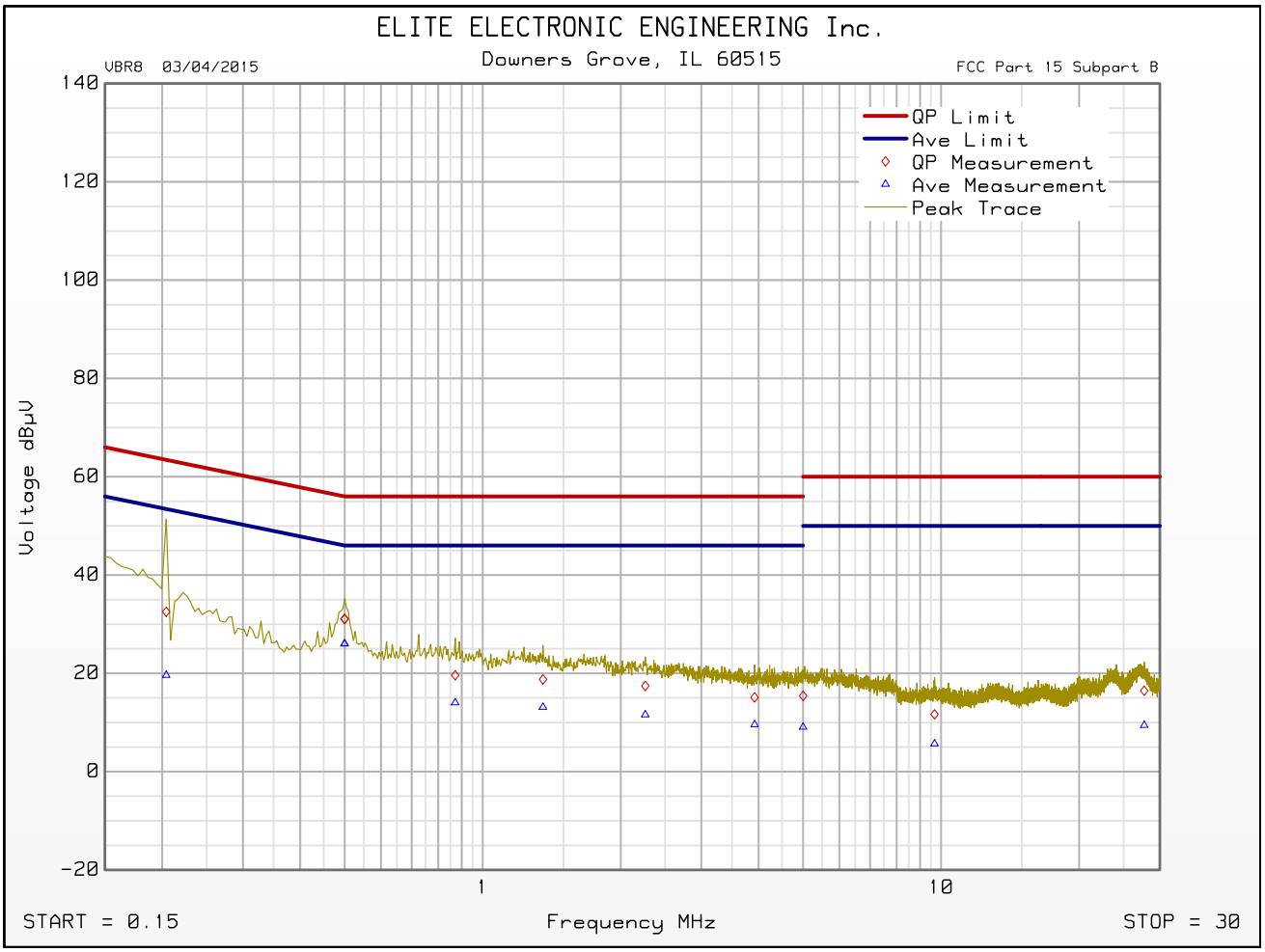
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.204	32.5	63.4		19.6	53.4	
0.500	31.1	56.0		26.0	46.0	
0.500	31.1	56.0		26.1	46.0	
0.871	19.6	56.0		14.0	46.0	
1.354	18.8	56.0		13.1	46.0	
2.264	17.5	56.0		11.6	46.0	
5.000	15.4	56.0		9.1	46.0	
9.680	11.7	60.0		5.7	50.0	
27.743	16.5	60.0		9.5	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 03/04/2015

Manufacturer	:	SENNCO SOLUTIONS
Model	:	MASTER ALARM
DUT Revision	:	
Serial Number	:	NONE ASSIGNED
DUT Mode	:	NORMAL OPERTION(Tx@ 907MHz, Rx @ 907MHz,Tx @ 916.8MHz, Rx @ 916.8MHz)
Line Tested	:	115V, 60Hz HIGH
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	TESTED WITH CUI PS P/N: ETSA 24027OUDC-PSRP-SZ
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Aug 12, 2015 01:26:35 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 03/04/2015

Manufacturer	:	SENNCO SOLUTIONS
Model	:	MASTER ALARM
DUT Revision	:	
Serial Number	:	NONE ASSIGNED
DUT Mode	:	NORMAL OPERTION(Tx@ 907MHz, Rx @ 907MHz,Tx @ 916.8MHz, Rx @ 916.8MHz)
Line Tested	:	115V, 60Hz RETURN
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	TESTED WITH CUI PS P/N: ETSA 24027OUDC-PSRP-SZ
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Aug 12, 2015 01:32:49 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

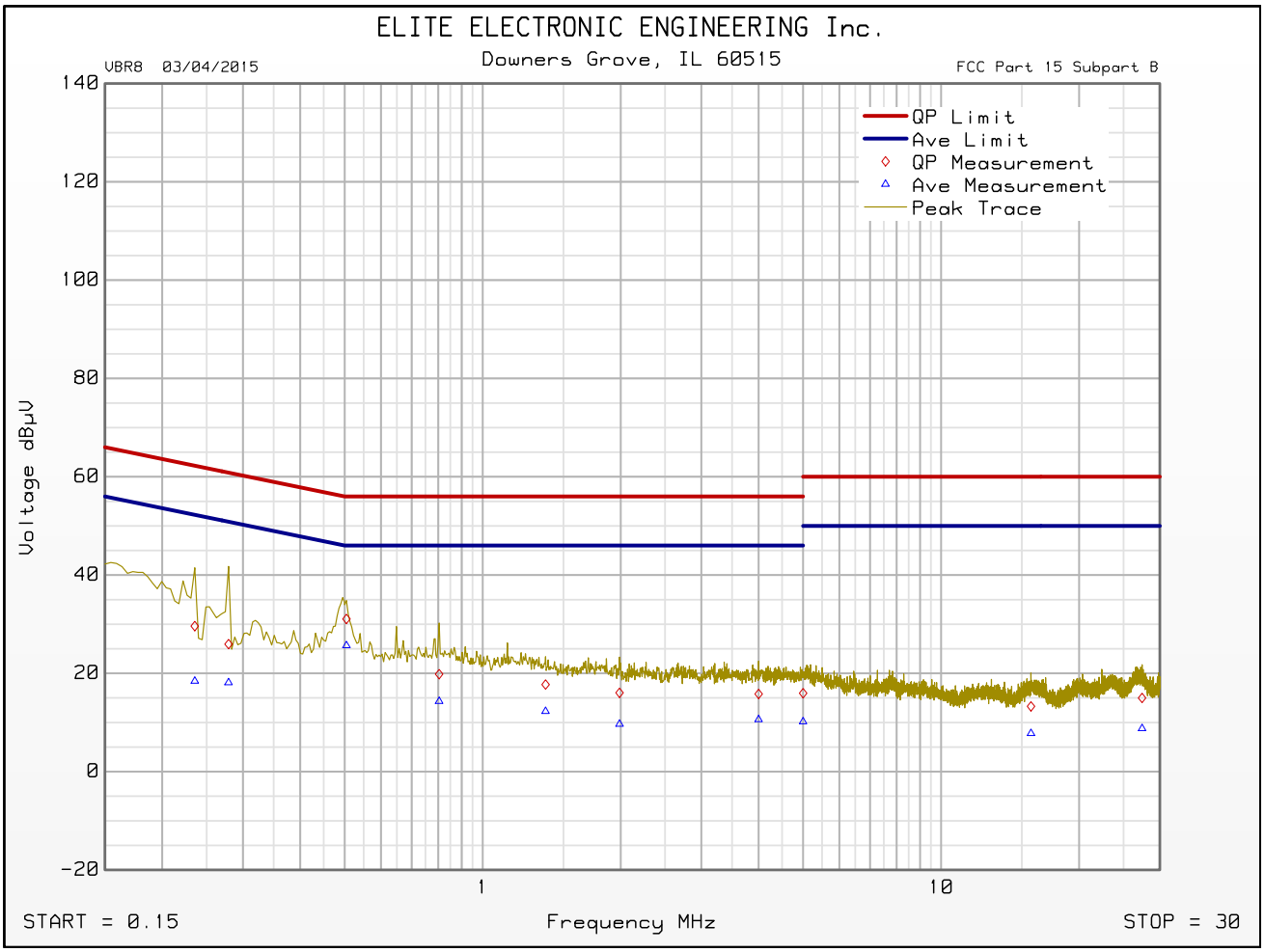
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.236	29.6	62.3		18.4	52.3	
0.279	26.0	60.8		18.1	50.8	
0.505	31.1	56.0		25.6	46.0	
0.804	19.8	56.0		14.3	46.0	
1.372	17.7	56.0		12.3	46.0	
1.989	16.0	56.0		9.7	46.0	
5.000	16.0	56.0		10.2	46.0	
15.710	13.3	60.0		7.8	50.0	
27.442	15.0	60.0		8.8	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

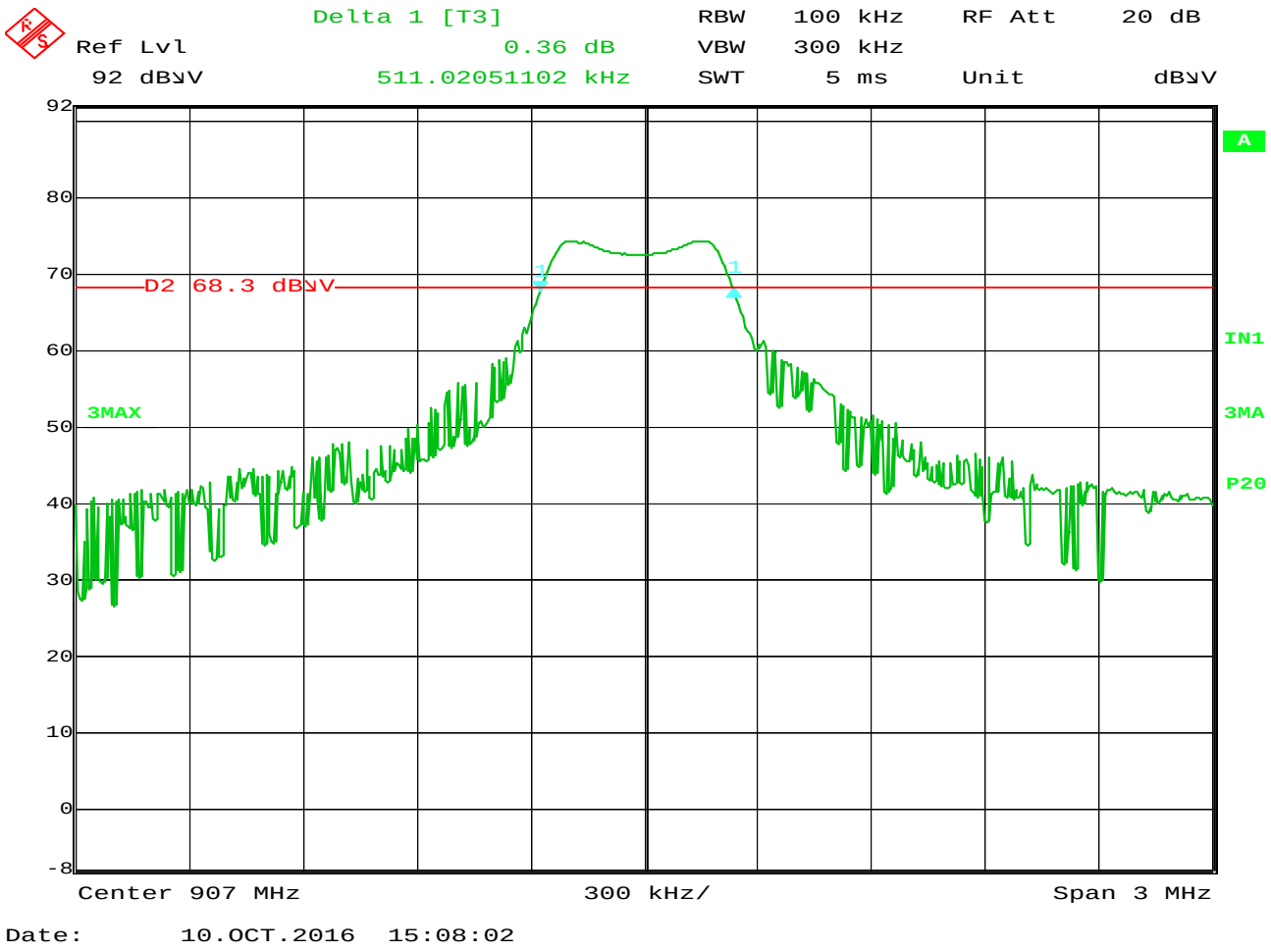
Cumulative Data

VBR8 03/04/2015

Manufacturer	:	SENNCO SOLUTIONS
Model	:	MASTER ALARM
DUT Revision	:	
Serial Number	:	NONE ASSIGNED
DUT Mode	:	NORMAL OPERTION(Tx@ 907MHz, Rx @ 907MHz,Tx @ 916.8MHz, Rx @ 916.8MHz)
Line Tested	:	115V, 60Hz RETURN
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	TESTED WITH CUI PS P/N: ETSA 24027OUDC-PSRP-SZ
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Aug 12, 2015 01:32:49 PM



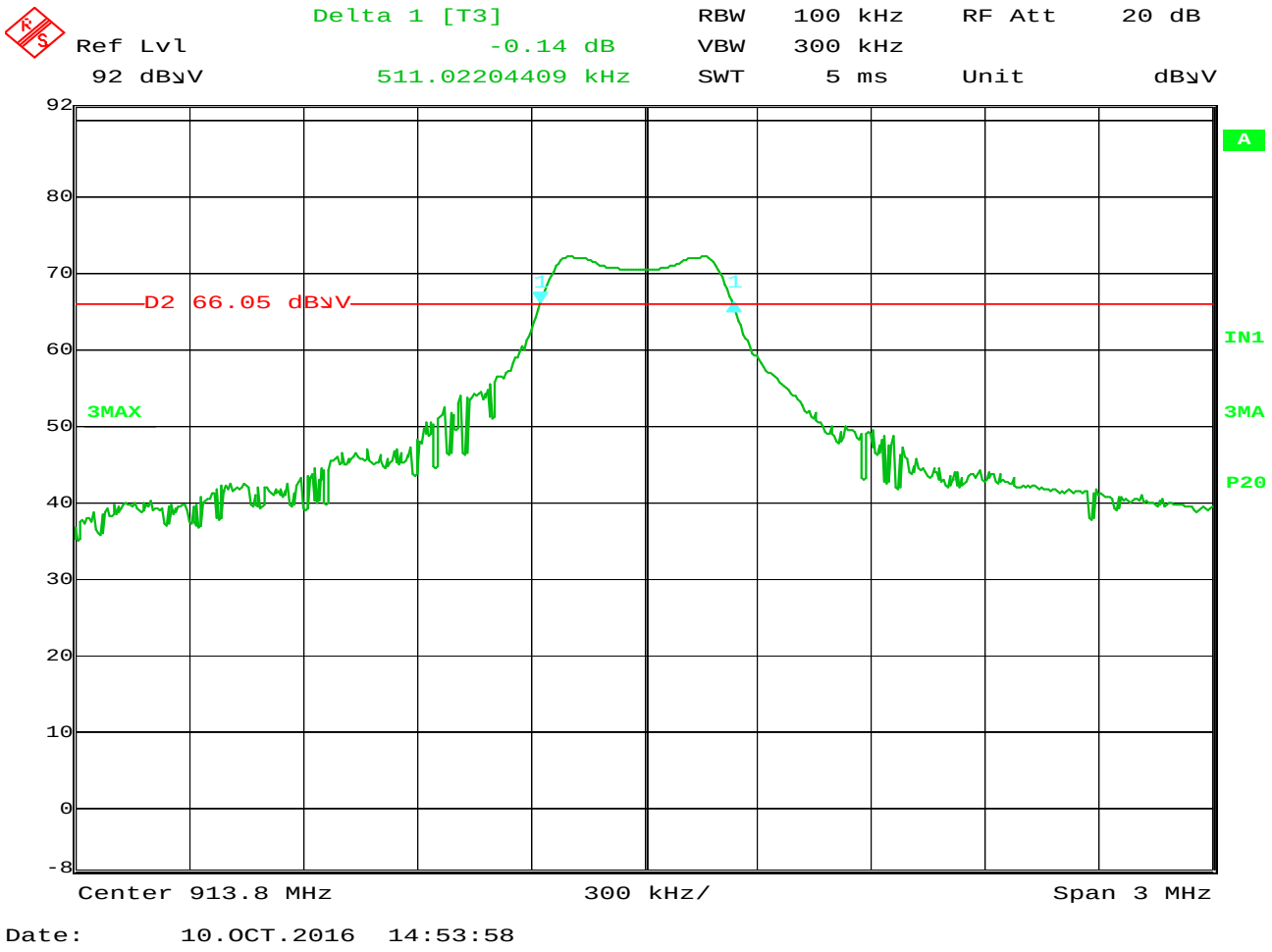
Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC 15.247 6dB bandwidth

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
SERIAL NUMBER	:	
TEST MODE	:	Transmit at 907MHz
TEST PARAMETERS	:	6dB bandwidth
NOTES	:	6dB bandwidth = 511.02kHz
EQUIPMENT USED	:	RBA1, NTA3

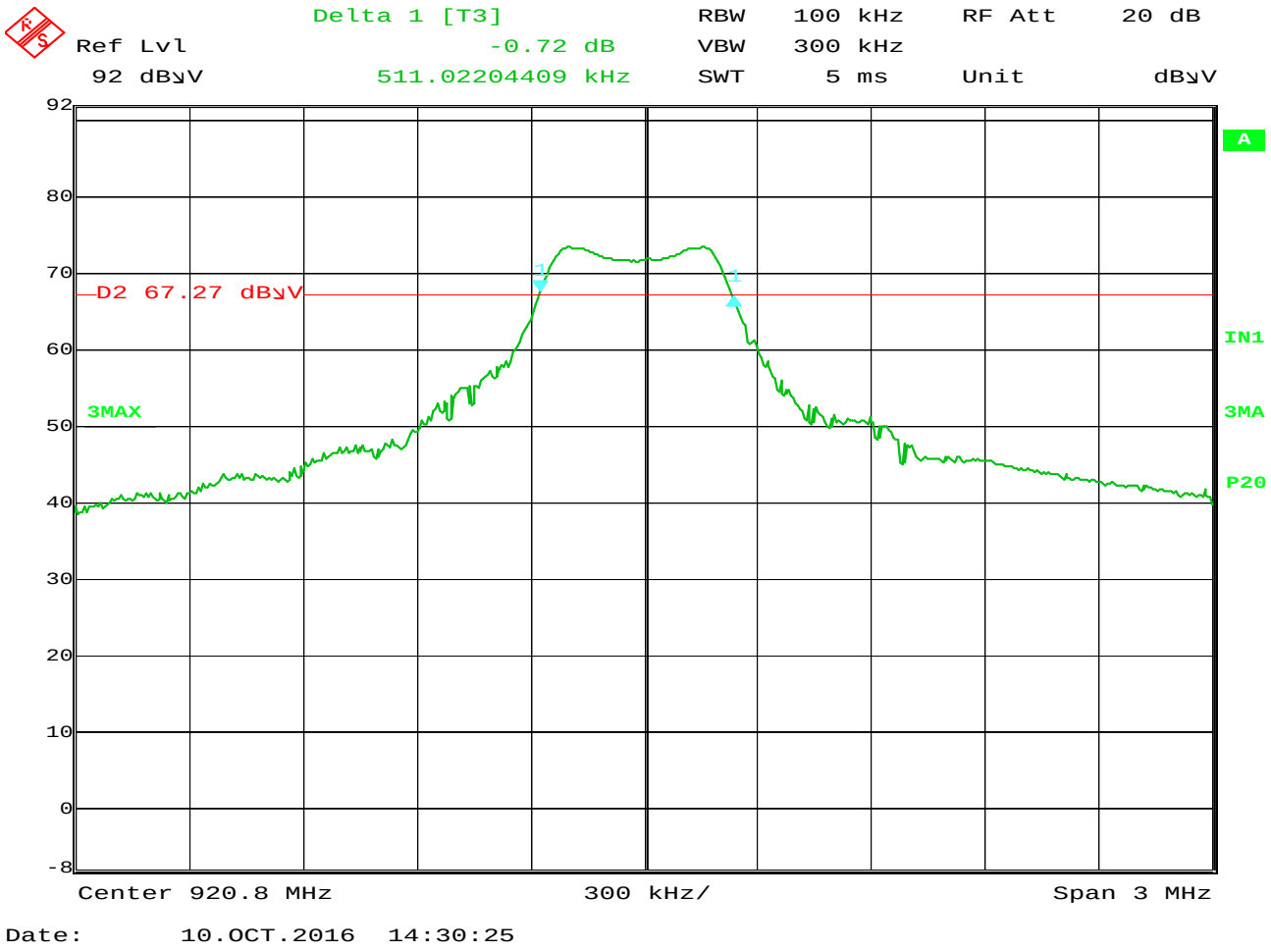
NOTES



FCC 15.247 6dB bandwidth

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
TEST MODE	:	Transmit at 913.8MHz
TEST PARAMETERS	:	6dB bandwidth
NOTES	:	6dB bandwidth = 511.022kHz
EQUIPMENT USED	:	RBA1, NTA3

NOTES



FCC 15.247 6dB bandwidth

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
TEST MODE	:	Transmit at 920.8MHz
TEST PARAMETERS	:	6dB bandwidth
NOTES	:	6dB bandwidth = 511.022kHz
EQUIPMENT USED	:	RBA1, NTA3

NOTES

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : EIPR
TEST DATE : October 10, 2016
TEST MODE : Transmit at 907MHz
TEST PARAMETERS : EIRP
NOTES :
EQUIPMENT USED : RBA0, NTA3, NDQ1, GRE0
TEST DISTANCE : 3 meters

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)
907.00	H	63.5	-1.8	2.2	2.5	-2.1	36.0	-38.1
907.00	V	74.3	10.4	2.2	2.5	10.1	36.0	-25.9

EIRP(dBm) = Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : EIPR
TEST DATE : October 10, 2016
TEST MODE : Transmit at 913.8MHz
TEST PARAMETERS : EIRP
NOTES :
EQUIPMENT USED : RBA0, NTA3, NDQ1, GRE0
TEST DISTANCE : 3 meters

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)
913.80	H	63.0	-2.2	2.2	2.5	-2.5	36.0	-38.5
913.80	V	72.5	8.4	2.2	2.5	8.1	36.0	-27.9

EIRP(dBm) = Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

Checked BY Richard E. King :

Richard E. King

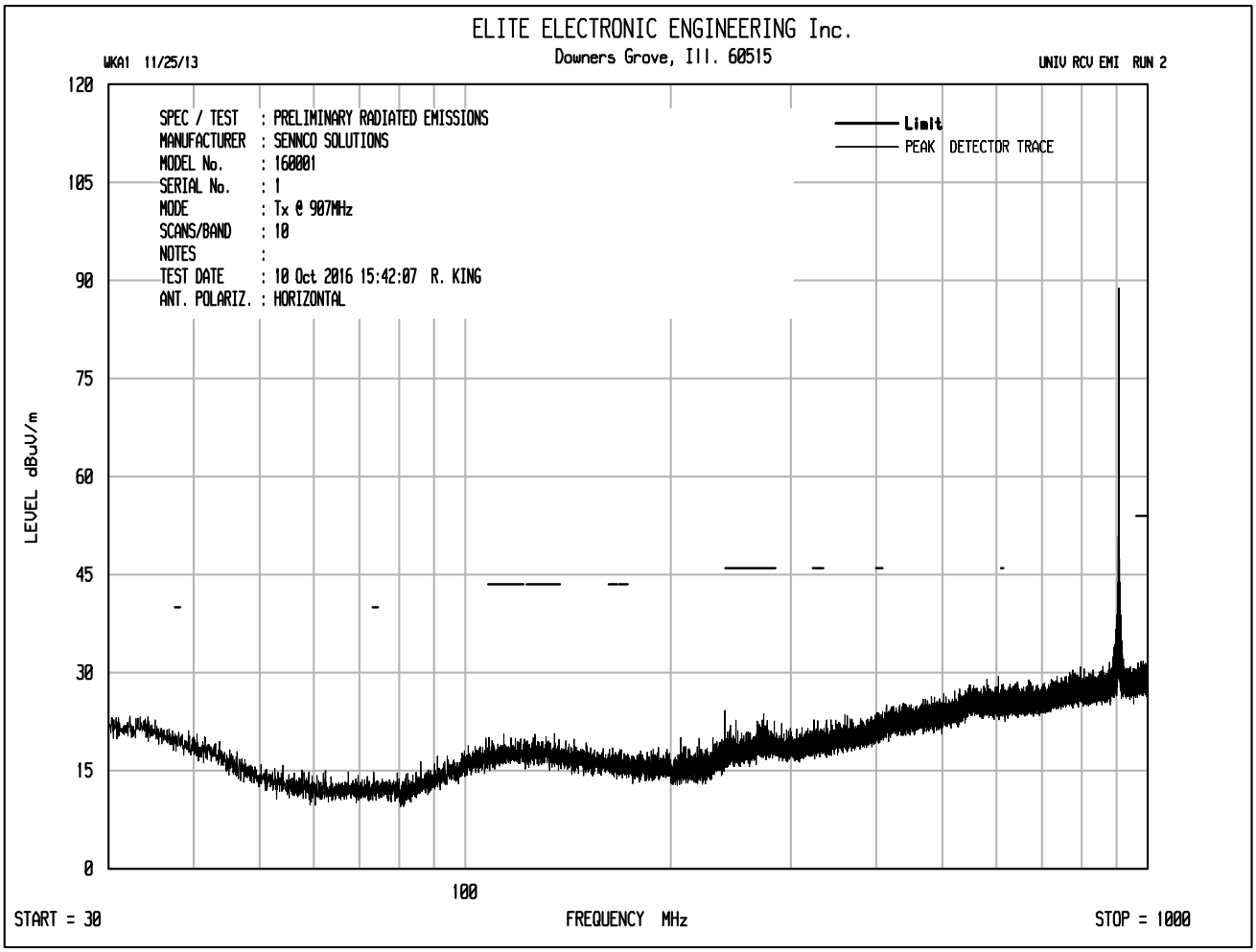
MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : EIPR
TEST DATE : October 10, 2016
TEST MODE : Transmit at 920.8MHz
TEST PARAMETERS : EIRP
NOTES :
EQUIPMENT USED : RBA0, NTA3, NDQ1, GRE0
TEST DISTANCE : 3 meters

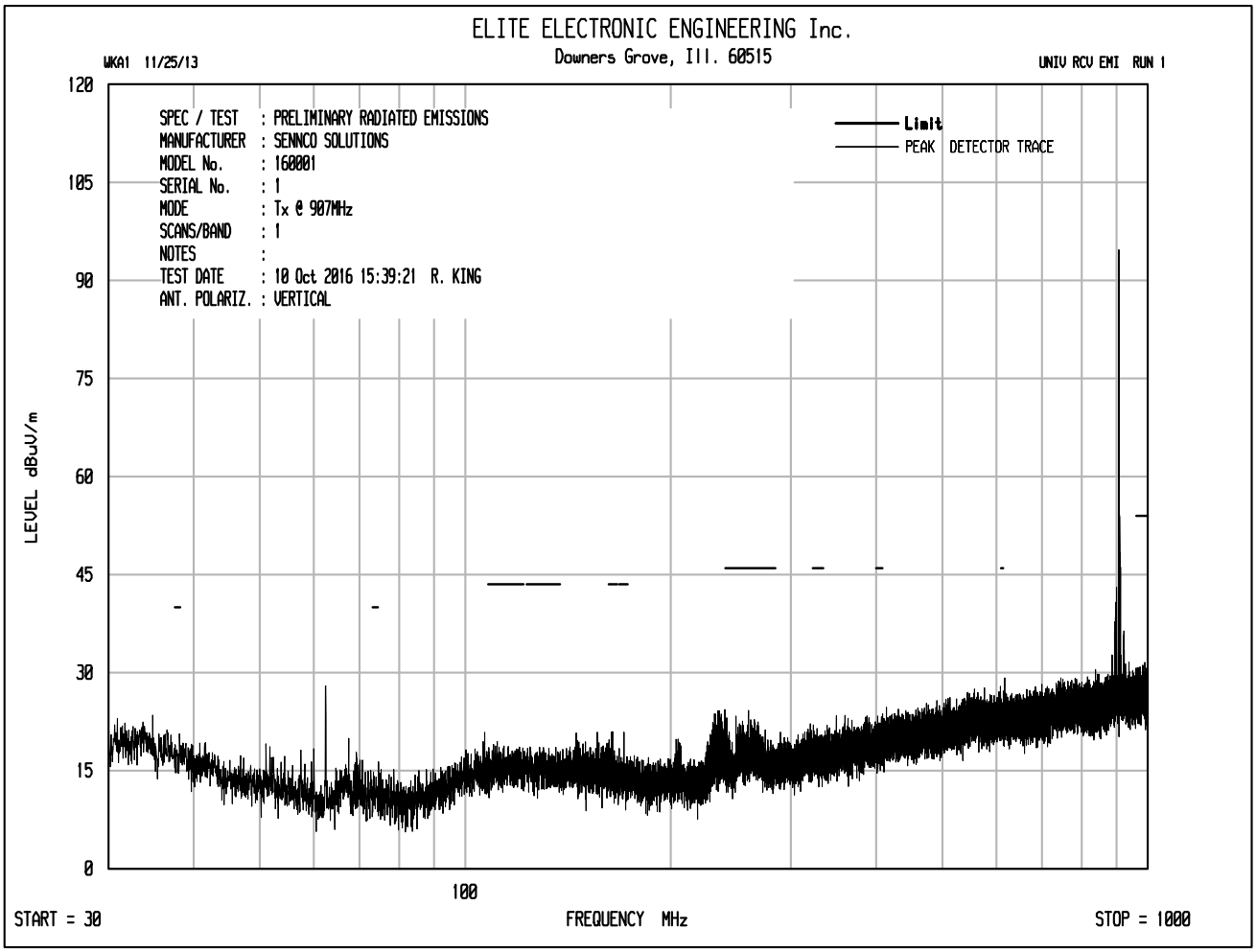
Freq. (MHz)	Ant Pol	Wide BW Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
920.80	H	62.7	-2.0	2.2	2.5	-2.3	36.0	-38.3
920.80	V	73.5	9.6	2.2	2.5	9.3	36.0	-26.7

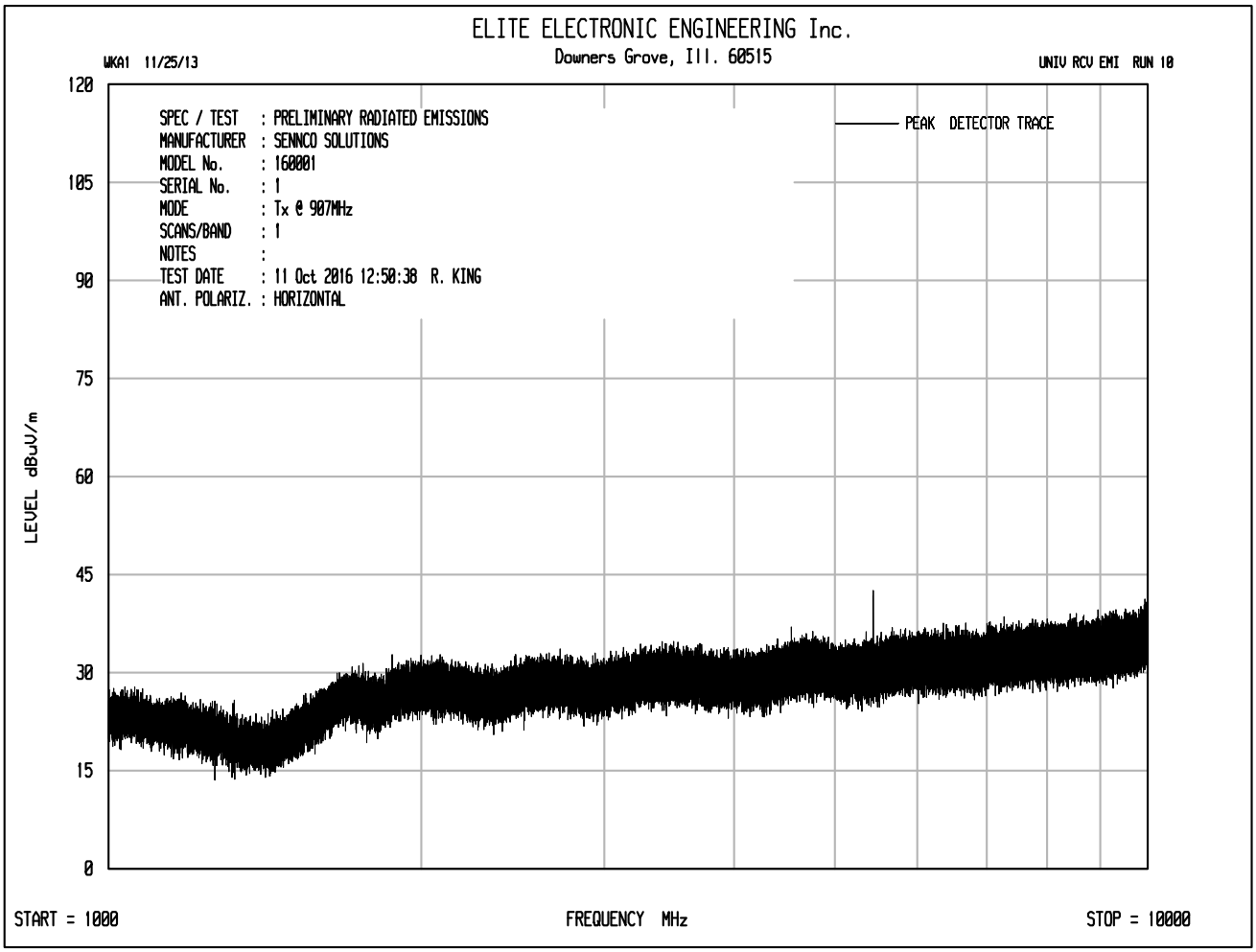
EIRP(dBm) = Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

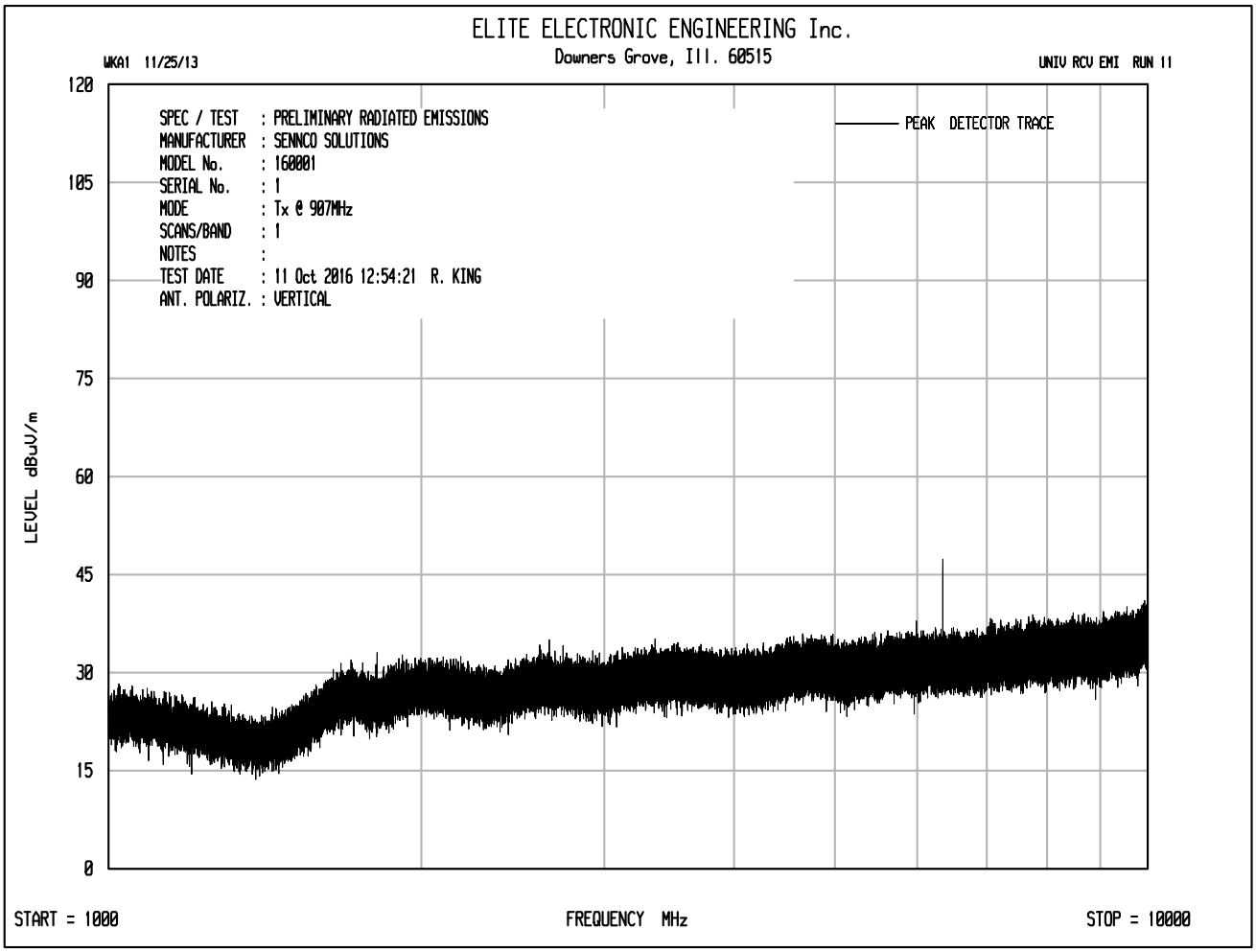
Checked BY Richard E. King :

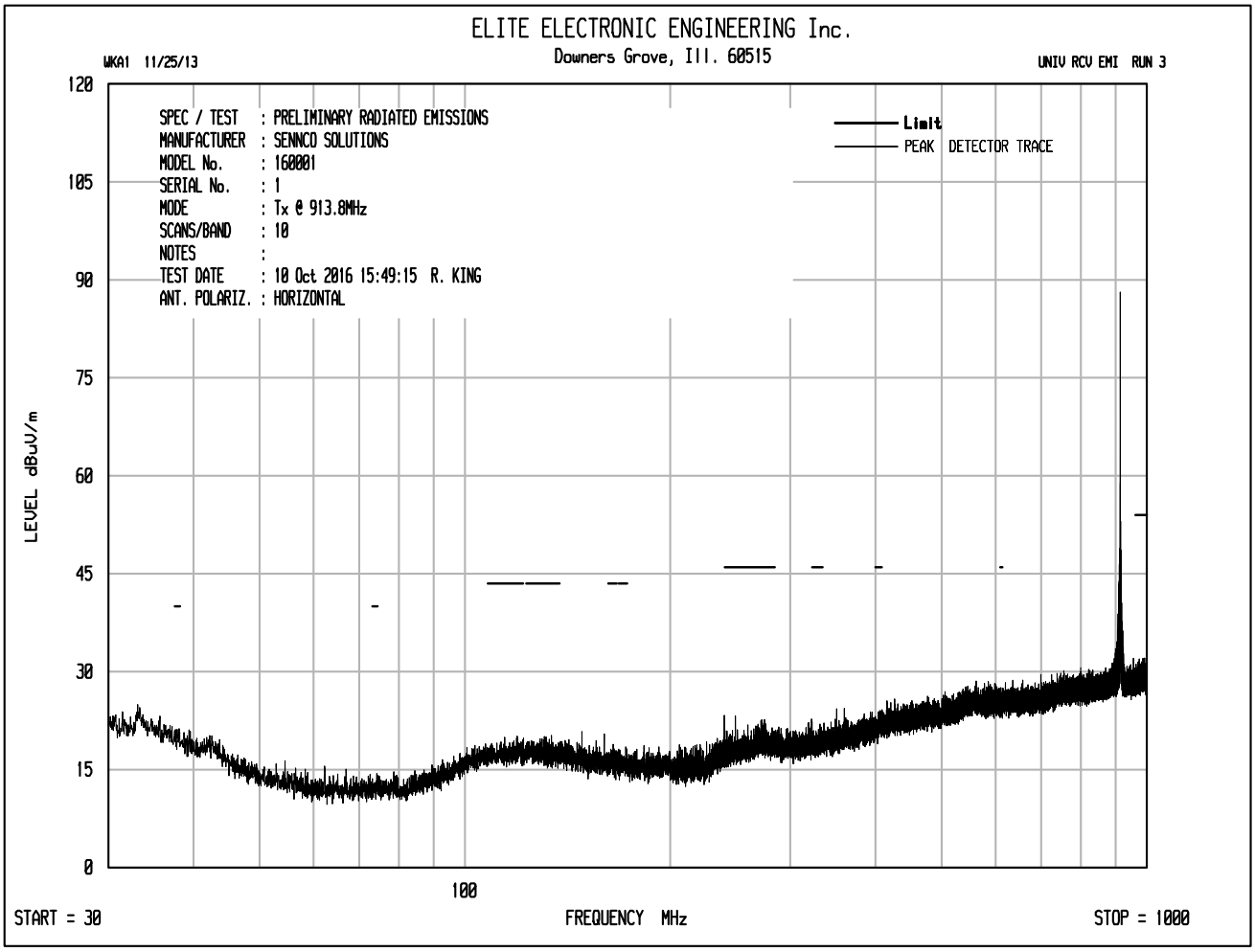
Richard E. King

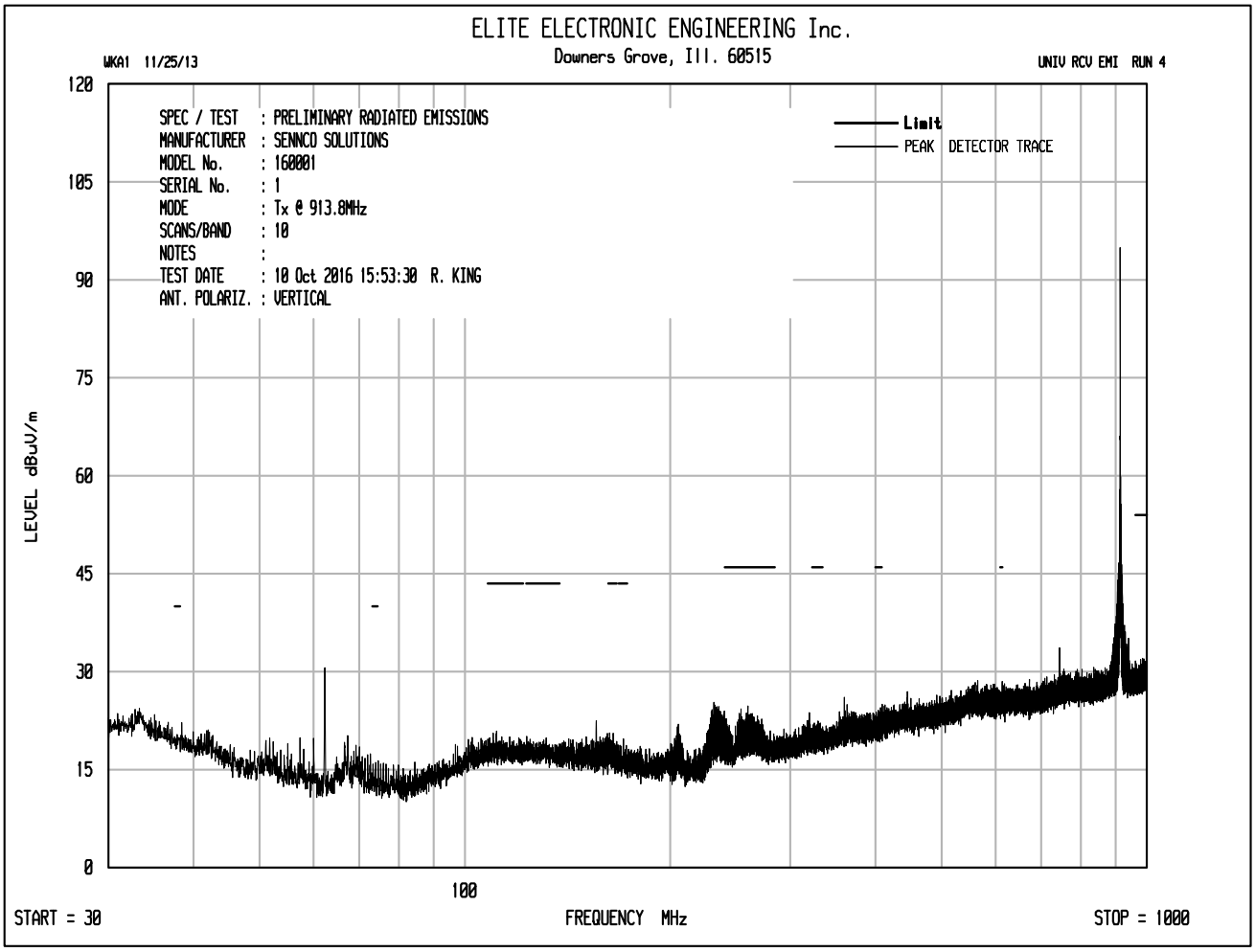

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 2
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 907MHz
SCANS/BAND : 10
NOTES :
TEST DATE : 10 Oct 2016 15:42:07 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

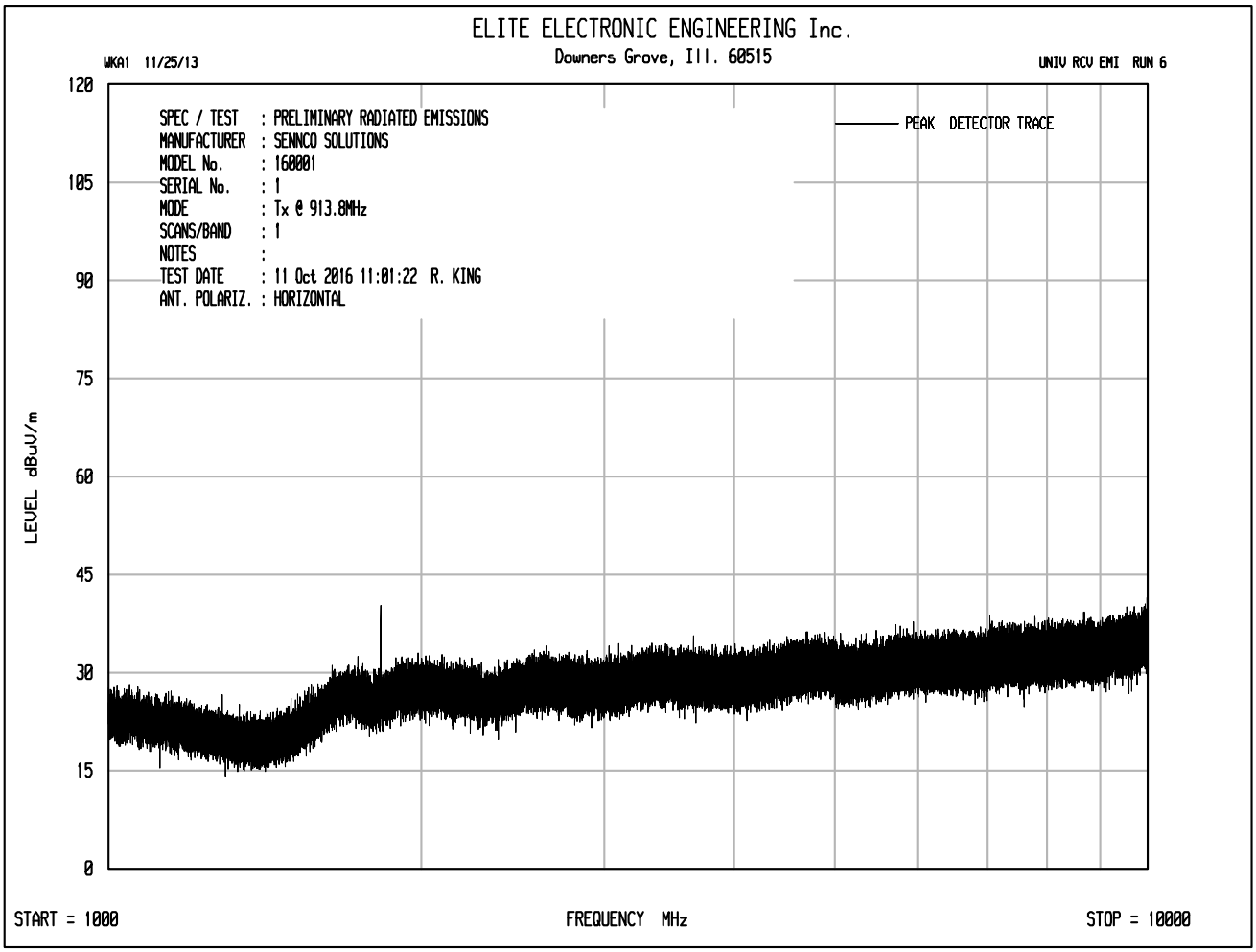

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 1
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 907MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Oct 2016 15:39:21 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

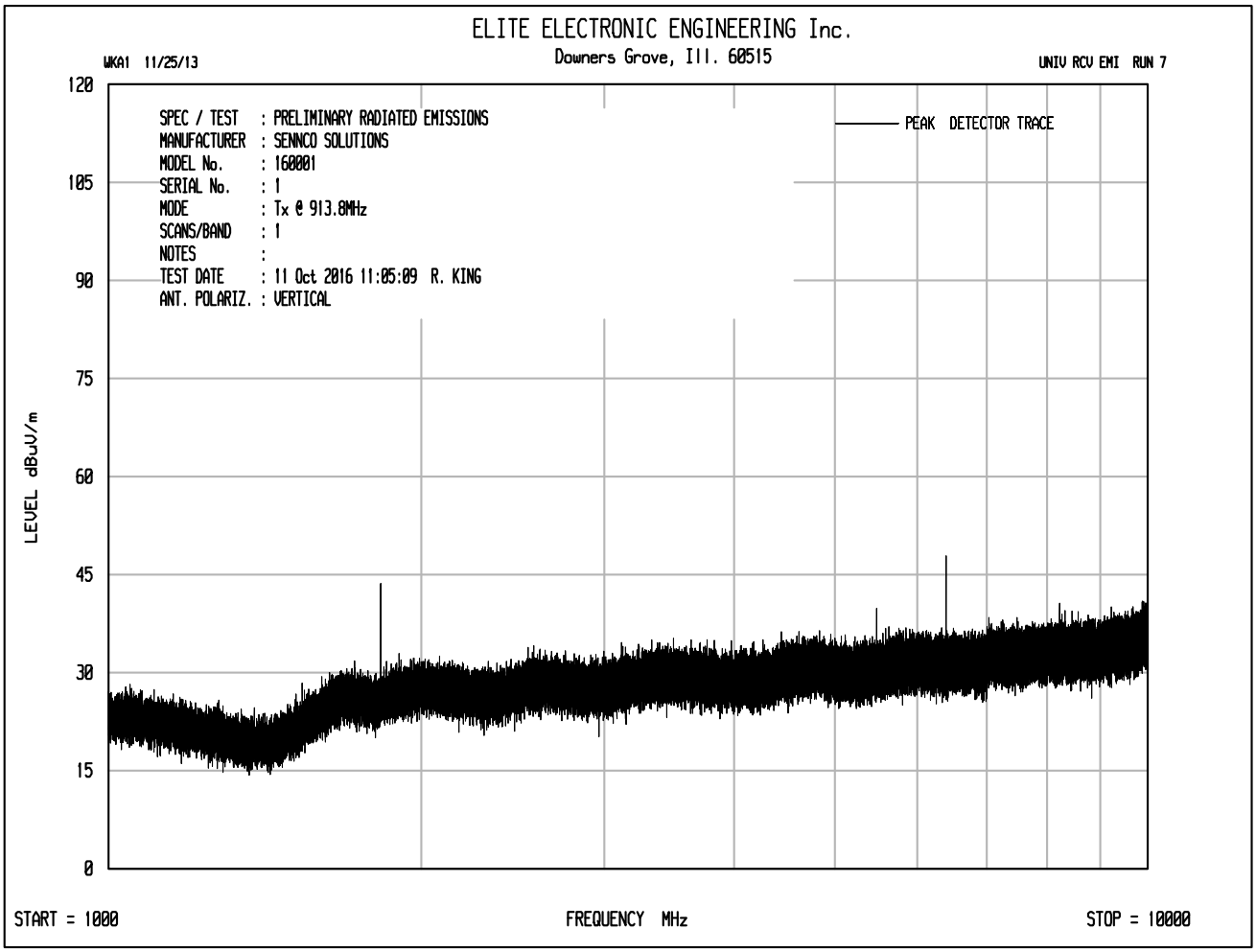

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 907MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 11 Oct 2016 12:50:38 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

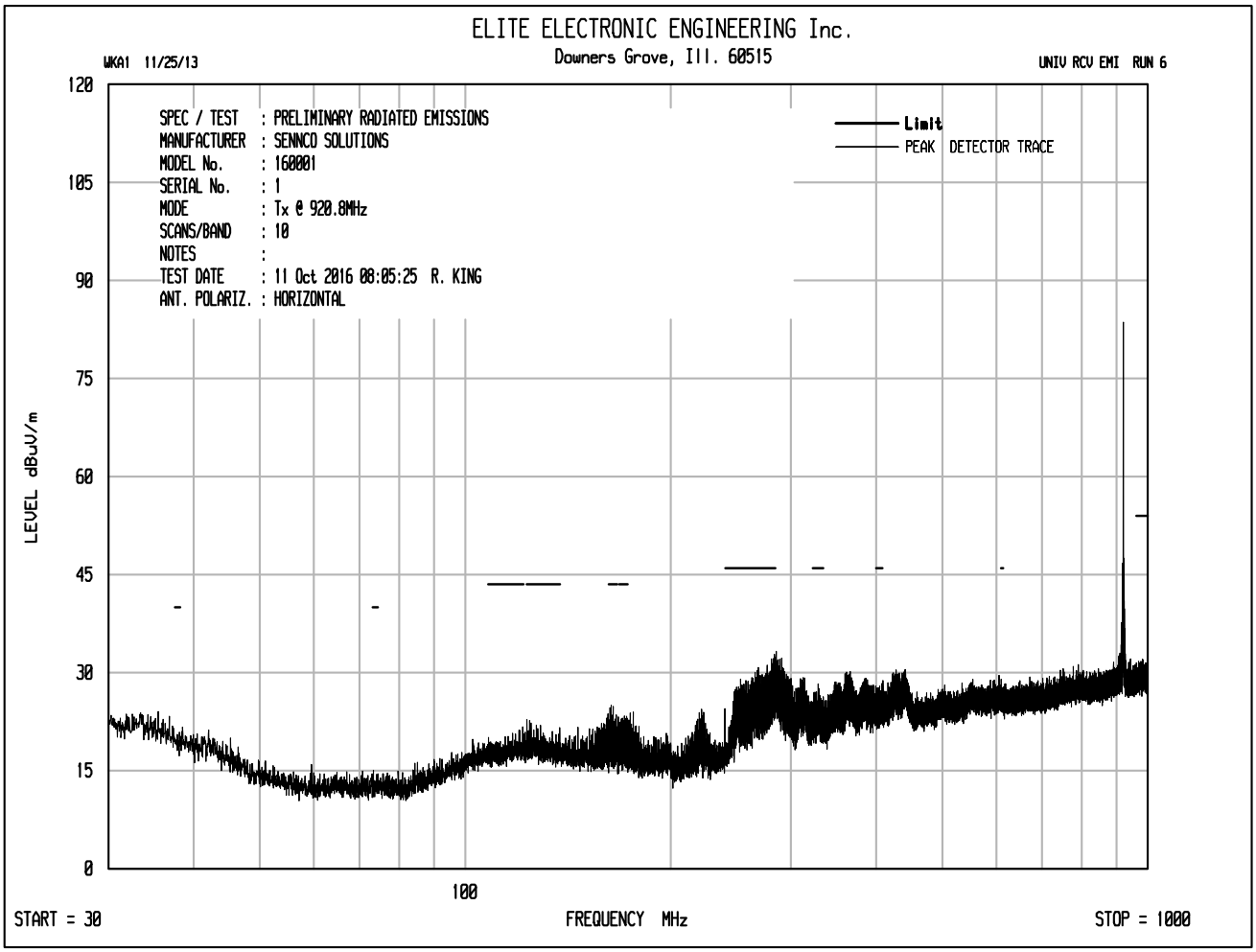

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 11
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 907MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 11 Oct 2016 12:54:21 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

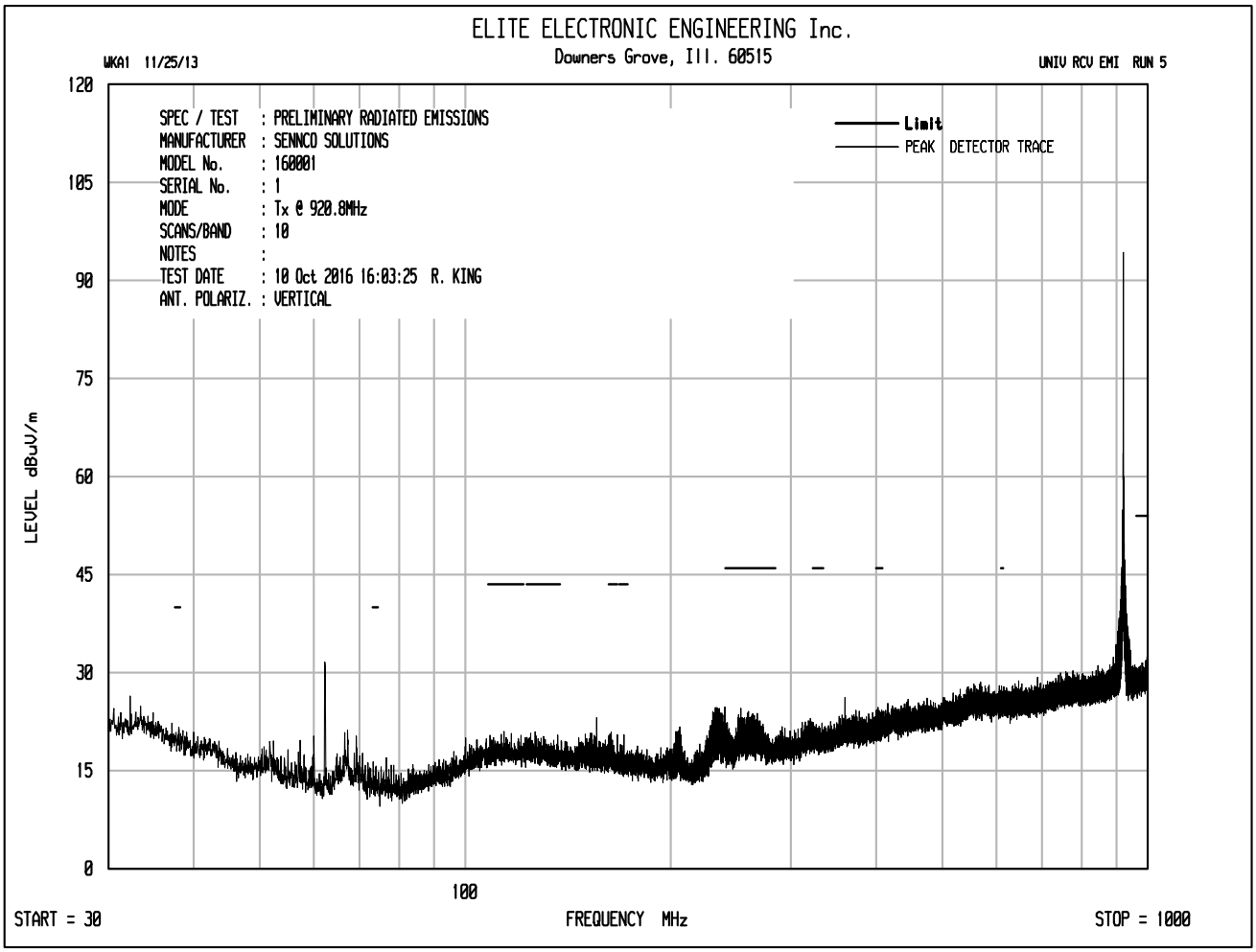

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 3
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 913.8MHz
SCANS/BAND : 10
NOTES :
TEST DATE : 10 Oct 2016 15:49:15 R. KING
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

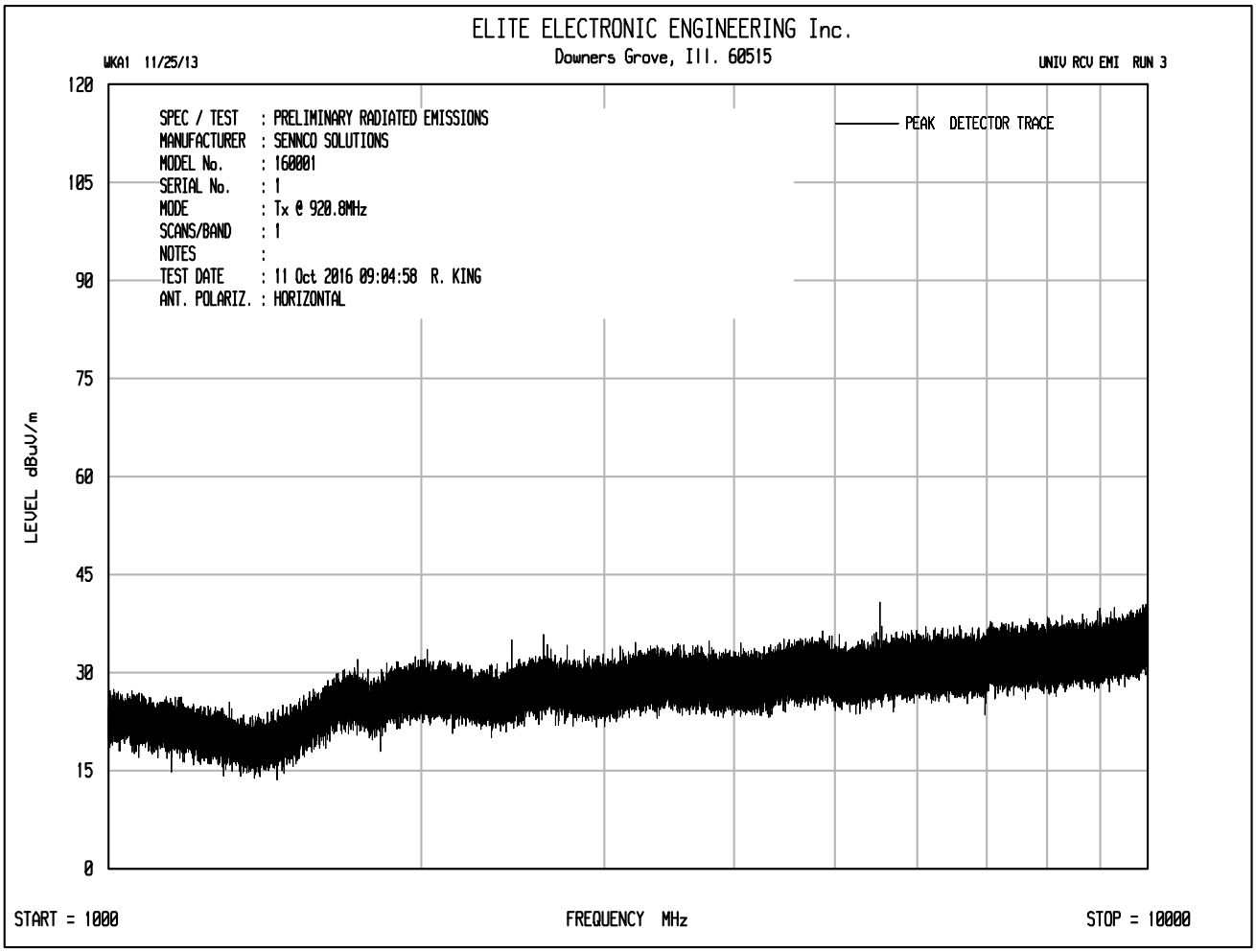

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 4
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 913.8MHz
SCANS/BAND : 10
NOTES :
TEST DATE : 10 Oct 2016 15:53:30 R. KING
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000

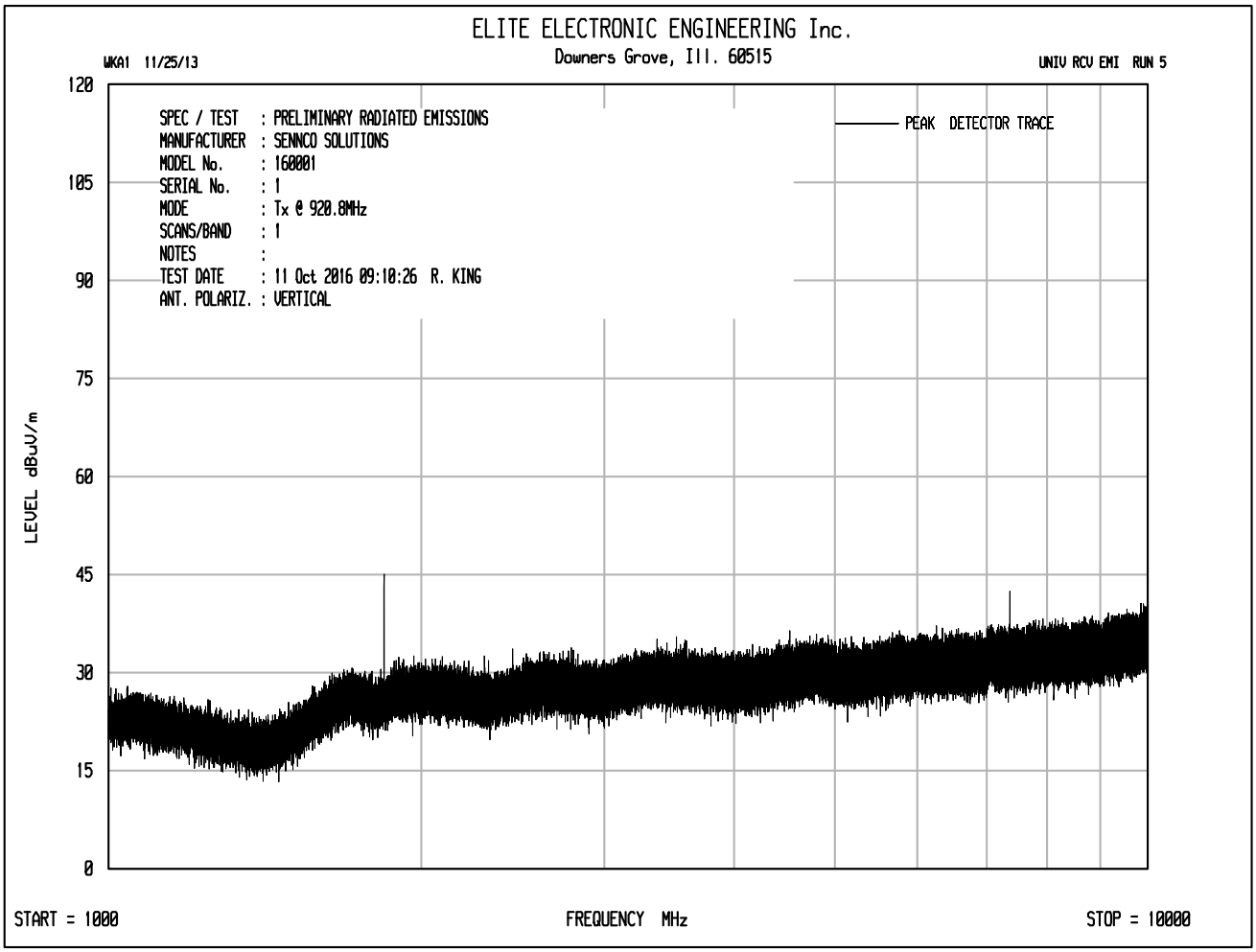

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 913.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 11 Oct 2016 11:01:22 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 7
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 913.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 11 Oct 2016 11:05:09 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 920.8MHz
SCANS/BAND : 10
NOTES :
TEST DATE : 11 Oct 2016 08:05:25 R. KING
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 5
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 920.8MHz
SCANS/BAND : 10
NOTES :
TEST DATE : 10 Oct 2016 16:03:25 R. KING
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 3
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 920.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 11 Oct 2016 09:04:58 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 5
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : SENNCO SOLUTIONS
MODEL No. : 160001
SERIAL No. : 1
MODE : Tx @ 920.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 11 Oct 2016 09:10:26 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Peak Radiated Emissions NOT in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 907MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 100kHz RBW

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)
907.00	H	63.5		1.6	26.5	0.0	91.5	37643.2		
907.00	V	74.3		1.6	26.5	0.0	102.3	130372.7		
1814.00	H	51.2		2.2	30.3	-40.0	43.7	153.3	13037.3	-38.6
1814.00	V	50.1		2.2	30.3	-40.0	42.6	134.2	13037.3	-39.7
6349.00	H	45.2		4.3	35.5	-39.4	45.6	189.8	13037.3	-36.7
6349.00	V	51.2		4.3	35.5	-39.4	51.6	380.5	13037.3	-30.7

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB))

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Peak Radiated Emissions in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 907MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 1MHz RBW

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)
2721.00	H	53.7		2.8	32.5	-39.8	49.2	288.8	5000.0	-24.8
2721.00	V	51.4		2.8	32.5	-39.8	46.9	222.1	5000.0	-27.0
3628.00	H	52.8		3.2	33.0	-39.2	49.9	311.1	5000.0	-24.1
3628.00	V	51.8		3.2	33.0	-39.2	48.8	276.9	5000.0	-25.1
4535.00	H	54.6		3.6	34.1	-39.2	53.0	449.1	5000.0	-20.9
4535.00	V	50.6		3.6	34.1	-39.2	49.1	284.7	5000.0	-24.9
5442.00	H	50.4		3.9	34.8	-39.4	49.8	307.7	5000.0	-24.2
5442.00	V	49.6		3.9	34.8	-39.4	49.0	281.6	5000.0	-25.0
7256.00	H	48.2		4.7	35.7	-39.4	49.1	286.6	5000.0	-24.8
7256.00	V	50.0		4.7	35.7	-39.4	50.9	351.4	5000.0	-23.1
8163.00	H	48.3		4.9	35.8	-39.4	49.5	300.1	5000.0	-24.4
8163.00	V	50.8		4.9	35.8	-39.4	52.1	400.6	5000.0	-21.9
9070.00	H	48.1		5.0	36.1	-39.3	49.8	310.6	5000.0	-24.1
9070.00	V	47.7		5.0	36.1	-39.3	49.4	296.3	5000.0	-24.5

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB))

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Average Radiated Emissions in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 907MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 1MHz RBW converted to average readings using Duty Cycle Correction Factor

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2721.00	H	39.2		2.8	32.5	-39.8	0.0	34.7	54.6	500.0	-19.2
2721.00	V	40.3		2.8	32.5	-39.8	0.0	35.8	61.8	500.0	-18.2
3628.00	H	36.1		3.2	33.0	-39.2	0.0	33.1	45.4	500.0	-20.8
3628.00	V	34.6		3.2	33.0	-39.2	0.0	31.7	38.3	500.0	-22.3
4535.00	H	35.0		3.6	34.1	-39.2	0.0	33.4	47.0	500.0	-20.5
4535.00	V	38.8		3.6	34.1	-39.2	0.0	37.3	73.2	500.0	-16.7
5442.00	H	37.2		3.9	34.8	-39.4	0.0	36.5	67.2	500.0	-17.4
5442.00	V	37.0		3.9	34.8	-39.4	0.0	36.4	66.3	500.0	-17.5
7256.00	H	35.3		4.7	35.7	-39.4	0.0	36.2	64.7	500.0	-17.8
7256.00	V	37.8		4.7	35.7	-39.4	0.0	38.7	86.1	500.0	-15.3
8163.00	H	34.5		4.9	35.8	-39.4	0.0	35.8	61.8	500.0	-18.2
8163.00	V	38.2		4.9	35.8	-39.4	0.0	39.5	94.7	500.0	-14.5
9070.00	H	34.6		5.0	36.1	-39.3	0.0	36.3	65.5	500.0	-17.7
9070.00	V	35.0		5.0	36.1	-39.3	0.0	36.8	69.0	500.0	-17.2

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB)) + D.C. (dB)

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Peak Radiated Emissions NOT in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 913.8MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 100kHz RBW

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)
913.80	H	62.5		1.6	26.5	0.0	90.5	33610.8		
913.80	V	72.5		1.6	26.5	0.0	100.5	106531.8		
1827.60	H	51.8		2.2	30.4	-40.0	44.4	166.2	10653.2	-36.1
1827.60	V	57.4		2.2	30.4	-40.0	50.0	316.8	10653.2	-30.5
5482.80	H	43.6		3.9	34.8	-39.4	43.0	141.0	10653.2	-37.6
5482.80	V	43.5		3.9	34.8	-39.4	42.8	138.6	10653.2	-37.7
6396.60	H	45.5		4.3	35.5	-39.4	45.9	196.9	10653.2	-34.7
6396.60	V	52.4		4.3	35.5	-39.4	52.8	437.4	10653.2	-27.7

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB))

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Peak Radiated Emissions in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 913.8MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 1MHz RBW

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)
2741.40	H	56.9		2.8	32.5	-39.7	52.5	419.7	5000.0	-21.5
2741.40	V	60.9		2.8	32.5	-39.7	56.4	662.9	5000.0	-17.6
3655.20	H	55.9		3.3	33.0	-39.2	53.0	446.6	5000.0	-21.0
3655.20	V	55.6		3.3	33.0	-39.2	52.6	428.9	5000.0	-21.3
4569.00	H	49.2		3.6	34.2	-39.2	47.7	243.0	5000.0	-26.3
4569.00	V	51.3		3.6	34.2	-39.2	49.8	309.8	5000.0	-24.2
7310.40	H	48.8		4.7	35.7	-39.4	49.8	307.8	5000.0	-24.2
7310.40	V	49.7		4.7	35.7	-39.4	50.7	341.4	5000.0	-23.3
8224.20	H	47.8		4.9	35.8	-39.4	49.1	285.6	5000.0	-24.9
8224.20	V	50.1		4.9	35.8	-39.4	51.4	370.5	5000.0	-22.6
9138.00	H	46.3		5.0	36.2	-39.3	48.1	255.1	5000.0	-25.8
9138.00	V	48.6		5.0	36.2	-39.3	50.4	330.5	5000.0	-23.6

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB))

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Average Radiated Emissions in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 913.8MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 1MHz RBW converted to average readings using Duty Cycle Correction Factor

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2741.40	H	36.62		2.8	32.5	-39.7	0.0	32.2	40.6	500.0	-21.8
2741.40	V	37.6		2.8	32.5	-39.7	0.0	33.2	45.5	500.0	-20.8
3655.20	H	36.4		3.3	33.0	-39.2	0.0	33.5	47.1	500.0	-20.5
3655.20	V	35.2		3.3	33.0	-39.2	0.0	32.3	41.1	500.0	-21.7
4569.00	H	36.0		3.6	34.2	-39.2	0.0	34.5	53.0	500.0	-19.5
4569.00	V	35.1		3.6	34.2	-39.2	0.0	33.7	48.2	500.0	-20.3
7310.40	H	35.2		4.7	35.7	-39.4	0.0	36.2	64.4	500.0	-17.8
7310.40	V	36.9		4.7	35.7	-39.4	0.0	37.8	77.5	500.0	-16.2
8224.20	H	34.3		4.9	35.8	-39.4	0.0	35.6	60.4	500.0	-18.4
8224.20	V	37.5		4.9	35.8	-39.4	0.0	38.8	87.0	500.0	-15.2
9138.00	H	33.7		5.0	36.2	-39.3	0.0	35.5	59.8	500.0	-18.4
9138.00	V	34.9		5.0	36.2	-39.3	0.0	36.7	68.3	500.0	-17.3

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB)) + D.C. (dB)

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Peak Radiated Emissions NOT in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 920.8MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 100kHz RBW

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)
920.80	H	62.7		1.6	26.5	0.0	90.7	34377.8		
920.80	V	73.5		1.6	26.5	0.0	101.6	120165.1		
1841.60	H	53.2		2.2	30.5	-40.0	46.0	198.7	12016.5	-35.6
1841.60	V	52.9		2.2	30.5	-40.0	45.6	191.3	12016.5	-36.0
5524.80	H	47.3		4.0	34.8	-39.4	46.7	216.9	12016.5	-34.9
5524.80	V	44.8		4.0	34.8	-39.4	44.2	162.3	12016.5	-37.4
6445.60	H	46.2		4.3	35.5	-39.4	46.7	215.4	12016.5	-34.9
6445.60	V	53.0		4.3	35.5	-39.4	53.4	467.6	12016.5	-28.2
5524.80	H	47.3		4.0	34.8	-39.4	46.7	216.9	12016.5	-34.9
5524.80	V	44.8		4.0	34.8	-39.4	44.2	162.3	12016.5	-37.4
9208.00	H	38.8		5.0	36.2	-39.3	40.7	108.7	12016.5	-40.9
9208.00	V	41.5		5.0	36.2	-39.3	43.4	148.5	12016.5	-38.2

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB))

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Peak Radiated Emissions in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 920.8MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 1MHz RBW

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)
2762.40	H	52.3		2.8	32.5	-39.7	47.9	249.2	5000.0	-26.0
2762.40	V	50.9		2.8	32.5	-39.7	46.5	211.9	5000.0	-27.5
3683.20	H	49.3		3.3	33.0	-39.2	46.4	210.1	5000.0	-27.5
3683.20	V	49.1		3.3	33.0	-39.2	46.2	203.9	5000.0	-27.8
4604.00	H	49.2		3.6	34.3	-39.2	47.8	246.3	5000.0	-26.2
4604.00	V	51.4		3.6	34.3	-39.2	50.0	317.6	5000.0	-23.9
7366.40	H	46.4		4.7	35.7	-39.4	47.4	233.1	5000.0	-26.6
7366.40	V	48.0		4.7	35.7	-39.4	48.9	280.0	5000.0	-25.0
8287.20	H	48.3		4.9	35.8	-39.4	49.6	303.0	5000.0	-24.4
8287.20	V	50.0		4.9	35.8	-39.4	51.3	367.2	5000.0	-22.7

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB))

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

Checked BY Richard E. King :

Richard E. King

MANUFACTURER : Sennco Solutions
MODEL NUMBER : Master Alarm
TEST PERFORMED : Average Radiated Emissions in a restricted band
TEST DATE : October 11, 2016
TEST MODE : Transmit at 920.8MHz
EQUIPMENT USED : RBB0, NTA2, CMA1, CDY0, NWQ2, APW3, XPQ3
TEST DISTANCE : 3 meters
NOTES : Peak Readings with a 1MHz RBW converted to average readings using Duty Cycle Correction Factor

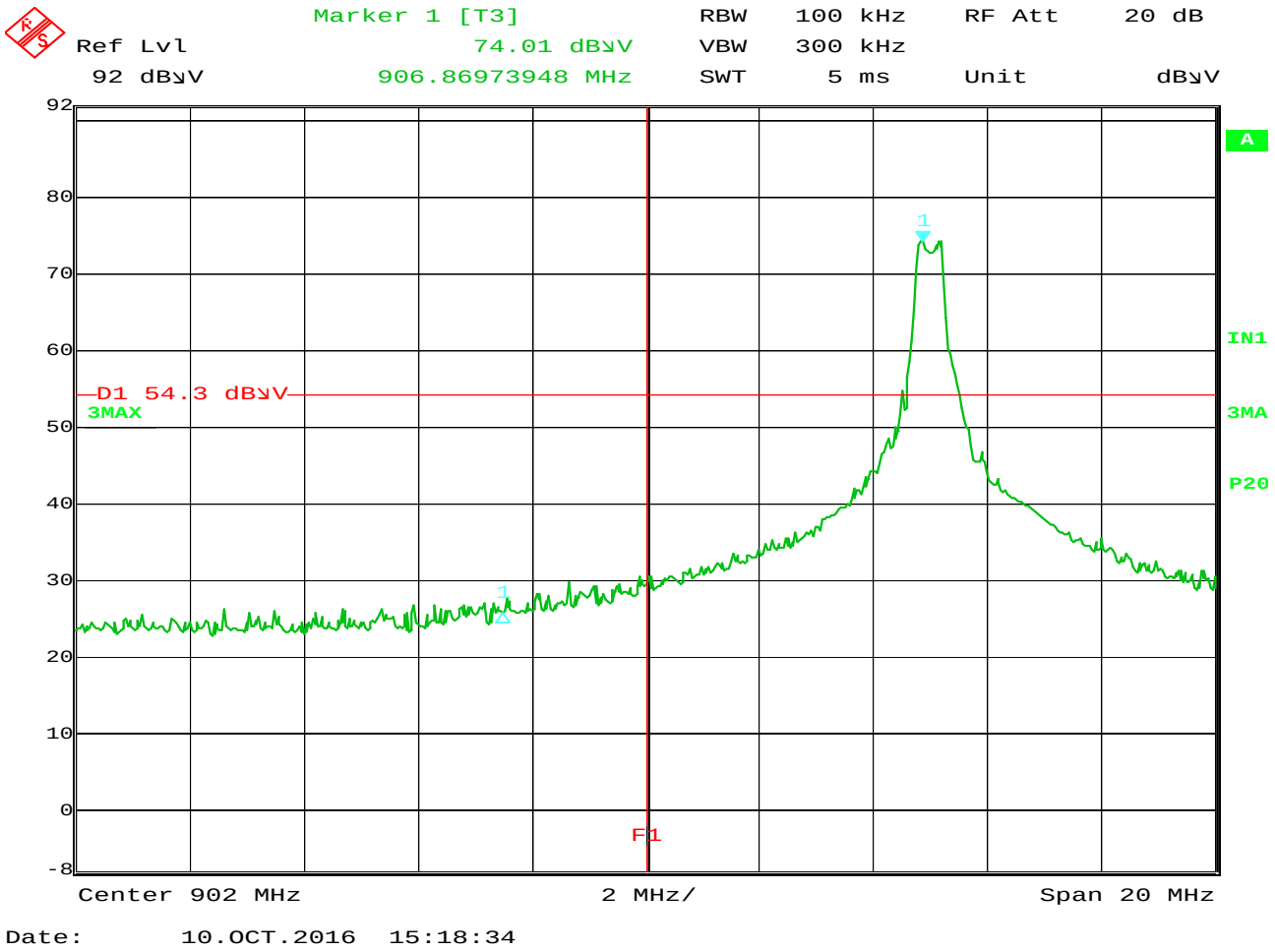
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2762.40	H	41.52		2.8	32.5	-39.7	0.0	37.1	71.8	500.0	-16.9
2762.40	V	39.4		2.8	32.5	-39.7	0.0	35.0	56.3	500.0	-19.0
3683.20	H	36.8		3.3	33.0	-39.2	0.0	33.9	49.5	500.0	-20.1
3683.20	V	36.5		3.3	33.0	-39.2	0.0	33.6	48.1	500.0	-20.3
4604.00	H	36.8		3.6	34.3	-39.2	0.0	35.4	58.9	500.0	-18.6
4604.00	V	39.8		3.6	34.3	-39.2	0.0	38.4	83.0	500.0	-15.6
7366.40	H	34.3		4.7	35.7	-39.4	0.0	35.2	57.5	500.0	-18.8
7366.40	V	35.8		4.7	35.7	-39.4	0.0	36.7	68.7	500.0	-17.2
8287.20	H	35.2		4.9	35.8	-39.4	0.0	36.5	66.7	500.0	-17.5
8287.20	V	34.7		4.9	35.8	-39.4	0.0	36.0	63.0	500.0	-18.0

FS (dBuV/m) = MTR (dBuV) + CF + AF (dB/m) + (- PA (dB)) + D.C. (dB)

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

Checked BY Richard E. King :

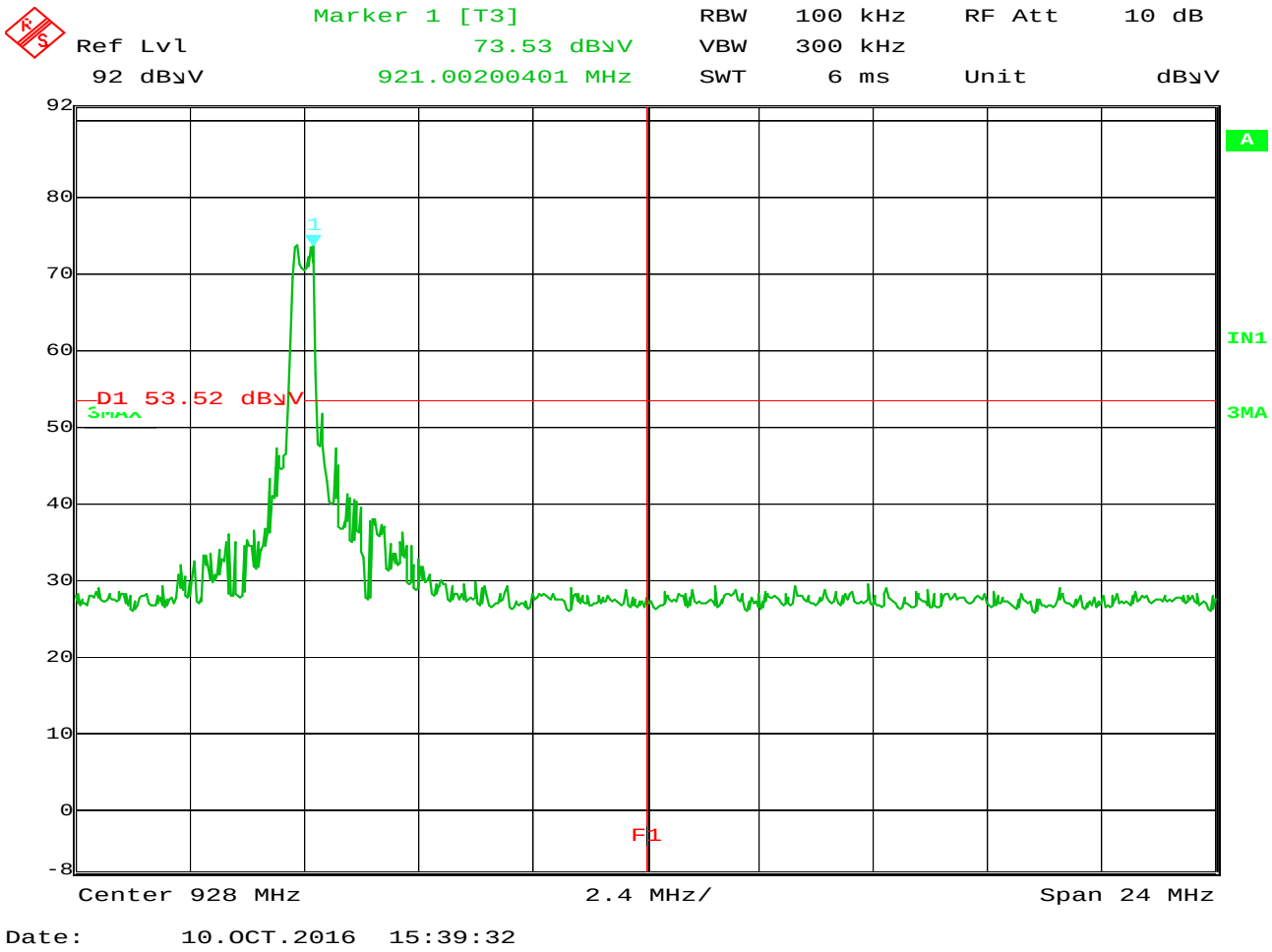
Richard E. King



FCC 15.247 band-edge

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
TEST MODE	:	Transmit at 907MHz
TEST PARAMETERS	:	Band-edge
NOTES	:	Display Line (F1) represents the low band edge. Display Line (D1) represents the 20dB down point from the maximum in-band peak power level.
EQUIPMENT USED	:	RBA1, NTA3

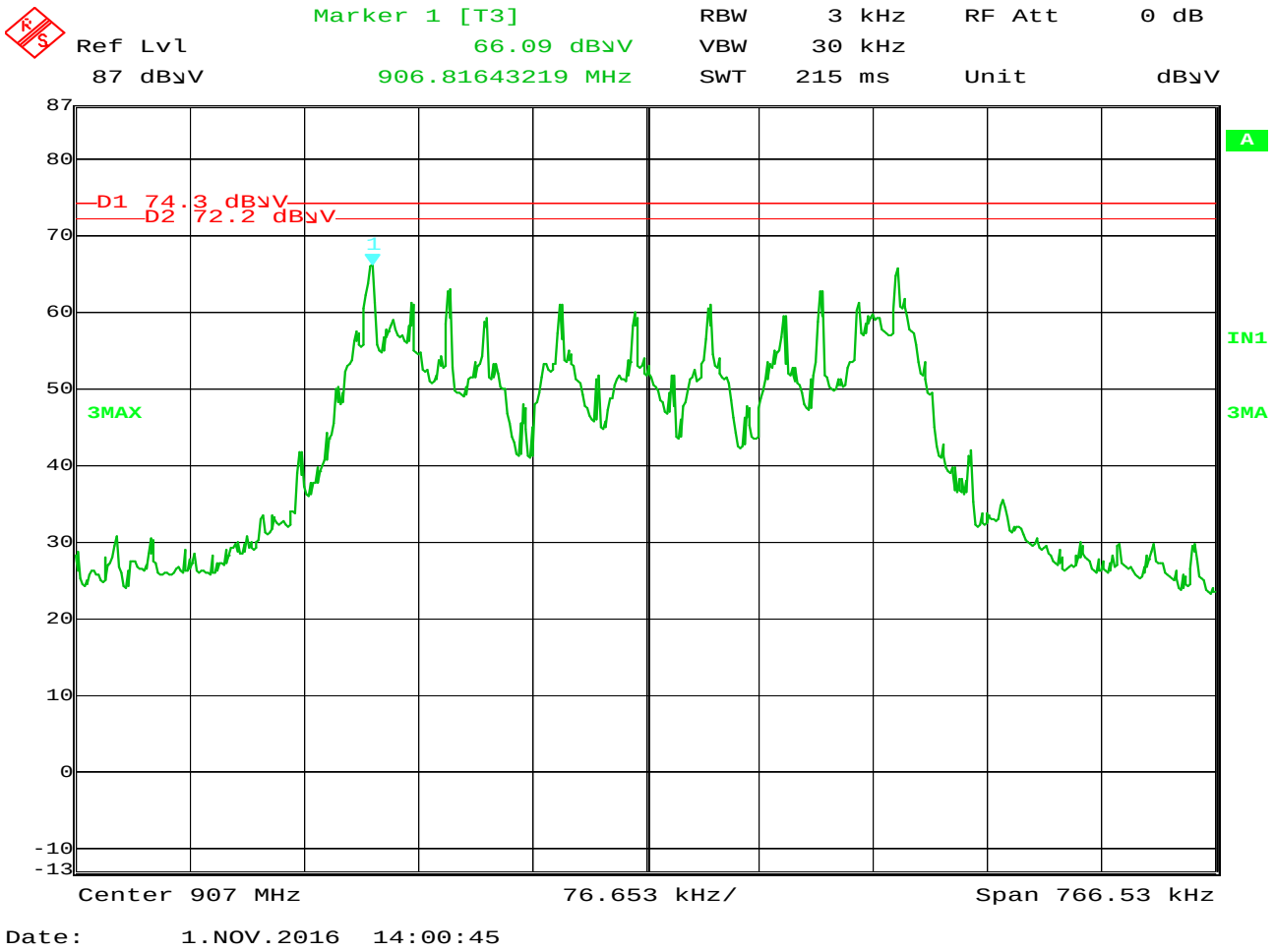
NOTES



FCC 15.247 band-edge

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
TEST MODE	:	Transmit at 920.8MHz
TEST PARAMETERS	:	Band-edge
NOTES	:	Display Line (F1) represents the high band edge. Display Line (D1) represents the 20dB down point from the maximum in-band peak power level.
EQUIPMENT USED	:	RBA1, NTA3

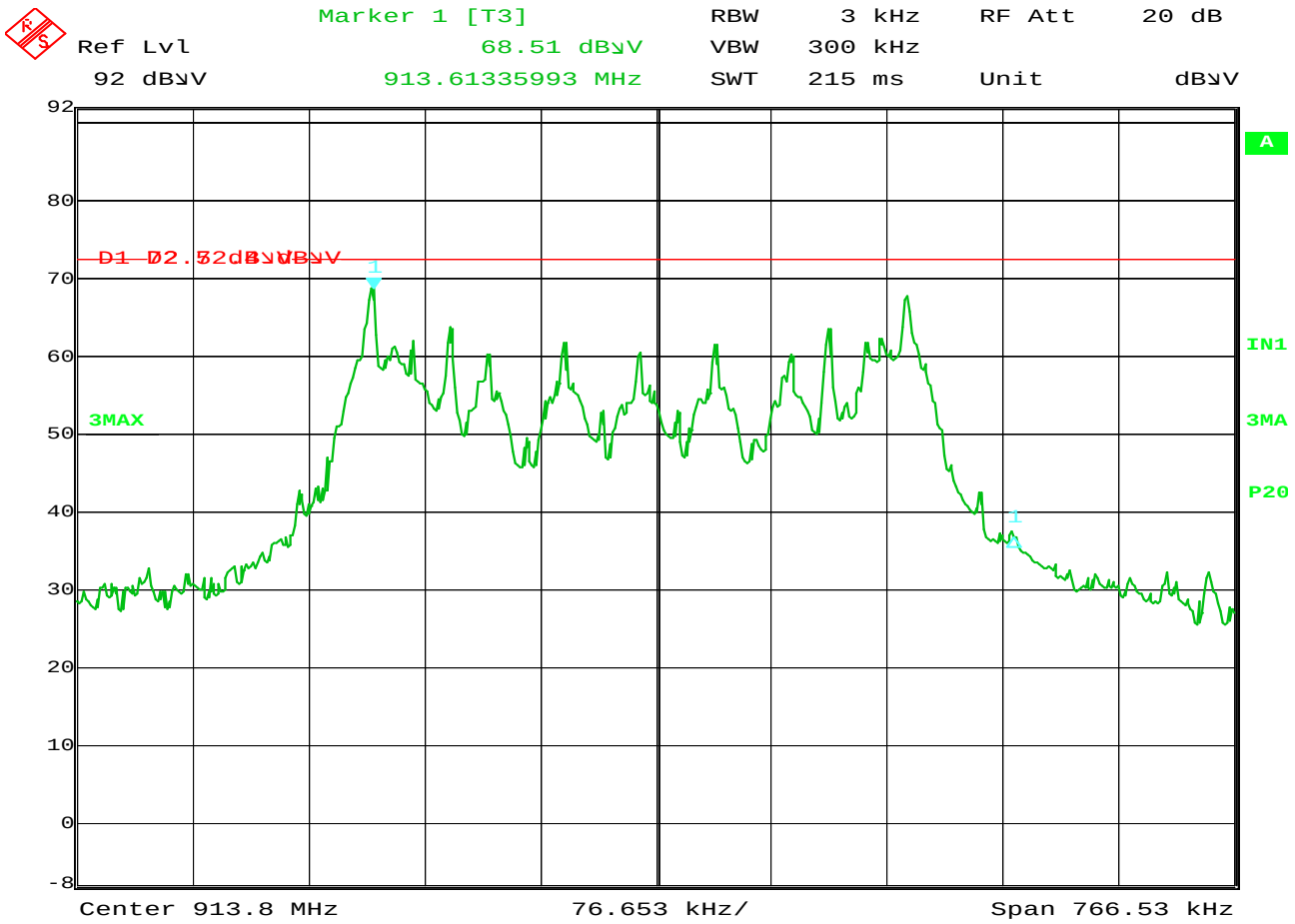
NOTES



FCC 15.247 Power Spectral Density

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
SERIAL NUMBER	:	
TEST MODE	:	Transmit at 907MHz
TEST PARAMETERS	:	Power Spectral Density
	:	Display Line (D1 = 74.3dBuV) corresponds to the EIRP reading of 10.1dBm in a 100kHz RBW.
	:	Display Line (D2 = 72.2dBuV) corresponds to the Power Spectral Density limit of +8.0dBm. Trace 2 represents the Power Spectral Density in a 3kHz RBW
EQUIPMENT USED	:	RBA1, NTA3

NOTES



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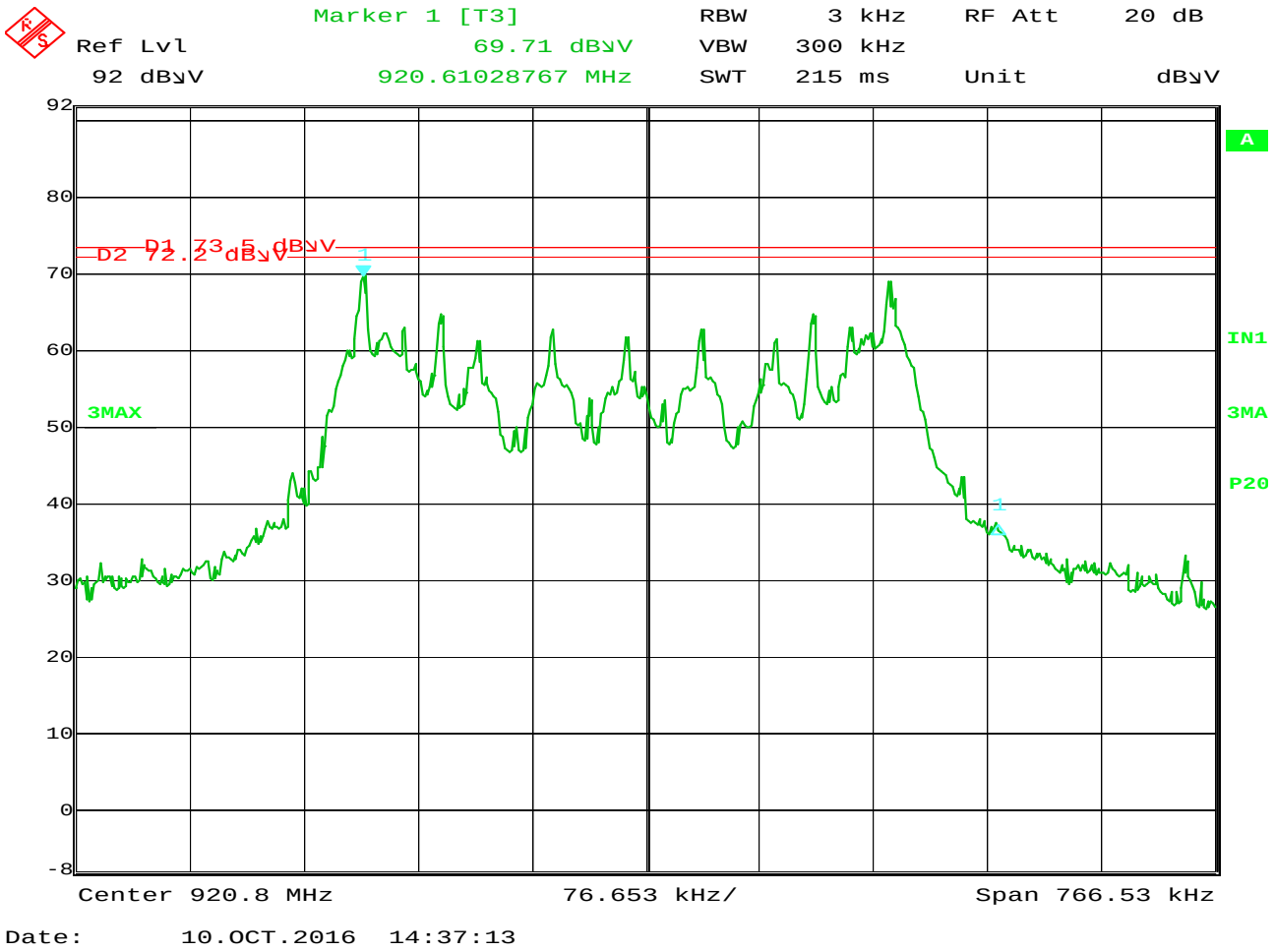
FCC 15.247 Power Spectral Density

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
SERIAL NUMBER	:	
TEST MODE	:	Transmit at 913.8MHz
TEST PARAMETERS	:	Power Spectral Density
	:	Display Line (D1 = 72.5dBuV) corresponds to the EIRP reading of 8.1dBm in a 100kHz RBW.
	:	Display Line (D2 = 72.4dBuV) corresponds to the Power Spectral Density limit of +8.0dBm. Trace 2 represents the Power Spectral Density in a 3kHz RBW
EQUIPMENT USED	:	RBA1, NTA3

NOTES



FCC 15.247 Power Spectral Density

MANUFACTURER	:	Sennco Solutions
MODEL NUMBER	:	Master Alarm
SERIAL NUMBER	:	
TEST MODE	:	Transmit at 920.8MHz
TEST PARAMETERS	:	Power Spectral Density
	:	Display Line (D1 = 73.6dBuV) corresponds to the EIRP reading of 9.3dBm in a 100kHz RBW.
	:	Display Line (D2 = 72.2dBuV) corresponds to the Power Spectral Density limit of +8.0dBm. Trace 2 represents the Power Spectral Density in a 3kHz RBW
EQUIPMENT USED	:	RBA1, NTA3

NOTES