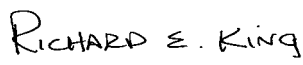


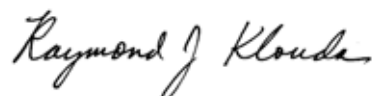


Measurement of RF Interference from a AR9350 Transceiver

For	Horizon Hobby 4105 Fieldstone Rd. Champaign, IL 61822
P.O. Number	20171101EH-01
Date Tested	December 11-14, 2017
Test Personnel	Richard King
Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Digital Modulation Intentional Radiators Operating within the band 2400-2483.5MHz FCC "Code of Federal Regulations" Title 47, Part 15, Subpart 15B, Section 15.107 and 15.109 for Receivers Innovation, Science, and Economic Development Canada RSS-247 Innovation, Science, and Economic Development Canada RSS-GEN

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THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE
WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.

REVISION HISTORY

Revision	Date	Description
—	18 Jan 2018	Initial release

Measurement of RF Emissions from an AR9350 Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Horizon Hobby Test Item, Part No. AR9350, Serial No. SPMAR9350, transceiver (hereinafter referred to as the EUT). The EUT is a frequency hopping spread spectrum transceiver. The transceiver was designed to transmit and receive in the 2400-2483.5 MHz band using a dipole antenna. The EUT was manufactured and submitted for testing by Horizon Hobby located in Champaign, IL.

1.2 Purpose

The test series was performed to determine if the EUT meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109, for receivers and Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 2400-2483.5 MHz band. Testing was performed in accordance with ANSI C63.10.

The test series was also performed to determine if the EUT meets the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 8.8 and Section 7.1.2 for receivers and the Industry Canada Radio Standards Specification RSS-Gen Section 8.8 and RSS-247, for transmitters. Testing was performed in accordance with ANSI C63.10.

1.3 Deviations, Additions and Exclusions

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

1.4 EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by The American Association for Laboratory Accreditation (A2LA). A2LA Certificate Number: 1786.01.

1.5 Laboratory Conditions

The temperature at the time of the test was 22C and the relative humidity was 35%.

2 APPLICABLE DOCUMENTS

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

- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- Federal Communications Commission Office of Engineering and Technology Laboratory Division, Guidance For Performing Compliance Measurements On Digital Transmissions Systems (DTS) Operating Under §15.247
April 5, 2017
- Innovation, Science, and Economic Development Canada RSS-247, Issue 2, February 2017, "Spectrum Management and Telecommunications Radio Standards Specification, Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs), and License-Exempt Local Area Network (LE-LAN) Devices"
- Innovation, Science, and Economic Development Canada RSS-Gen, Issue 4, November 2014,

"Spectrum Management and Telecommunications Radio Standards Specification, General Requirements for Compliance of Radio Apparatus"

3 EUT SET-UP AND OPERATION

3.1 General Description

The EUT is a transceiver, Part No. AR9350. A block diagram of the EUT setup is shown as Figure 1 and Figure 2. A photograph of the EUT is shown as Figure 3.

3.1.1 Power Input

The EUT was powered by 6VDC from a Spektrum NiMH Transmitter Battery Pack.

3.1.2 Peripheral Equipment

The EUT was submitted for testing with no peripheral equipment.

3.1.3 Interconnect Cables

The EUT was submitted for testing with no interconnect cables.

3.1.4 Grounding

The EUT was not grounded.

3.2 Operational Mode

All tests were performed with the EUT operated in at least one of the following modes:

Transmit at 2404MHz

Transmit at 2440MHz

Transmit at 2476MHz

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.

4.3 Calibration Traceability

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

4.4 Measurement Uncertainty

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

The measurement uncertainty for these tests is presented below:

Conducted Emission Measurements		
Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

Radiated Emission Measurements		
Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

5 TEST PROCEDURES

5.1 Receiver

5.1.1 Powerline Conducted Emissions

5.1.1.1 Requirements

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

5.1.2 Radiated Measurements

5.1.2.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Section 15.101(b), receivers operating above 960MHz are exempt from complying with the technical provisions of part 15.

Per Industry Canada RSS-Gen, Issue 4, section 5.3: "Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements. All other receivers are exempted from any Industry Canada certification, testing, labeling, and reporting requirements." Since the receiver operates above 960MHz, the receiver is exempt from complying with the technical provisions of the RSS standards.

5.2 Transmitter

5.2.1 Peak Output Power

5.2.1.1 Requirements

Per section 15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5MHz band that do not employ at least 75 non-overlapping hopping channels, the maximum peak output conducted power shall not be greater than 0.125W (21dBm). 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 0.5 Watt (27dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below 21dBm by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.1.2 Procedures

The EUT was placed on the non-conductive stand and set to transmit. A double ridged waveguide 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 20dB bandwidth. The span was set to approximately 5 times the 20 dB bandwidth.

The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle and high hopping frequencies.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a second double ridged waveguide 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 (and antenna gain for all measurements above 1GHz), as required. The peak power output was calculated for low, middle, and high hopping frequencies.

5.2.1.3 Results

The results are presented on page 16. The maximum EIRP measured from the transmitter was 13.8dBm or 23mW which is below the 0.5 Watt limit.

5.2.2 Radiated Spurious Emissions Measurements

5.2.2.1 Requirements

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

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

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

5.2.2.2 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 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

- 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 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.

- b) The field strengths of all of the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
 - c) To ensure that maximum or worst case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
 - i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
 - ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
 - iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
 - d) All harmonics not in the restricted bands must be at least 20 dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.
- 2) For all emissions in the restricted bands, the following procedure was used:
- a) The field strengths of all emissions below 1 GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
 - b) The field strengths of all emissions above 1 GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. A peak detector with a resolution bandwidth of 1 MHz was used on the spectrum analyzer.
 - c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:
 - i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
 - ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
 - iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
 - d) For all radiated emissions measurements below 1 GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.
 - e) For all radiated emissions measurements above 1 GHz, the peak readings must comply with the 15.35(b) limits. 15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).
 - f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average

detector. An average reading was taken. If the dwell time per channel of the hopping signal is less than 100msec, then the reading obtained with the 10 Hz video bandwidth may be further adjusted by a "duty cycle correction factor", derived from $20 \cdot \log(\text{dwell time}/100\text{msec})$. These readings must be no greater than the limits specified in 15.209(a).

If the dwell time per channel of the hopping signal is less than 100msec, then the reading obtained with the 10 Hz video bandwidth may be further adjusted by a "duty cycle correction factor", derived from $20 \cdot \log(\text{dwell time}/100\text{msec})$. These readings must be no greater than the limits specified in 15.209(a).

5.2.2.3 Results

Preliminary radiated emissions plots with the EUT transmitting at 2404MHz, 2440MHz, and 2476MHz are shown on pages 17 through 39. Final radiated emissions data are presented on data pages 40 through 48. 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 through Figure 5.

6 CONCLUSIONS

It was determined that the Horizon Hobby Test Item, Part No. AR9350 frequency hopping spread spectrum transceiver, Serial No. SPMAR9350, 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 2400-2483.5 MHz band, when tested per ANSI C63.10.

It was also determined that the Horizon Hobby Test Item, Part No. AR9350 frequency hopping spread spectrum transceiver, Serial No. SPMAR9350, did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 8.8 and 7.1.2 for receivers and the Industry Canada Radio Standards Specification RSS-Gen Section 8.8 and RSS-247, for transmitters, when tested per ANSI C63.10.

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

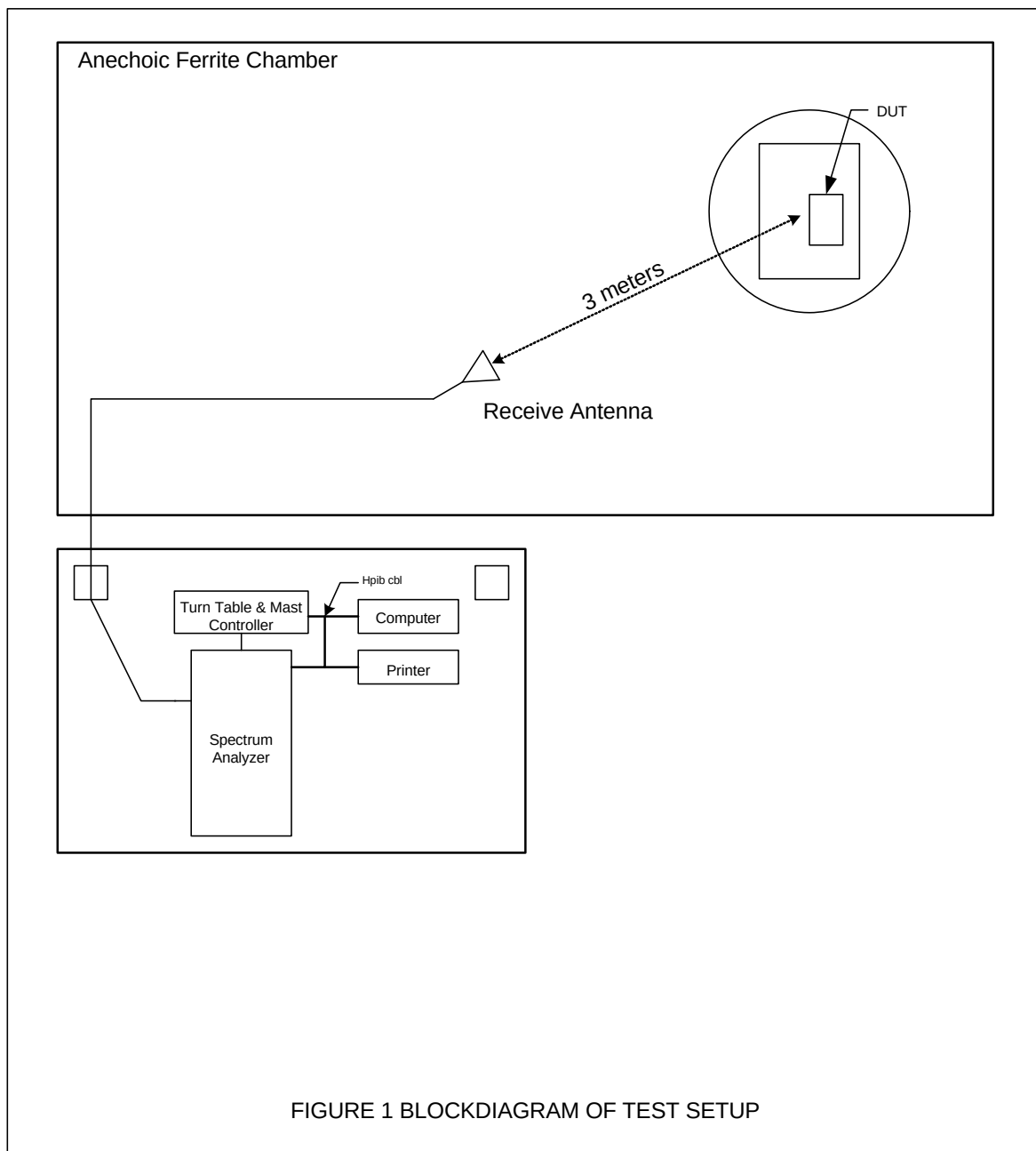
Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	3/22/2017	3/22/2018
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	3/22/2017	3/22/2018
CDY0	WORKSTATION	ELITE	WORKSTATION		WINDOWS 7	N/A	
GBR7	SIGNAL GENERATOR	HEWLETT PACKARD	8648D	3847M00602	9KHZ-4000MHZ	2/16/2017	2/16/2018
GSE0	SIGNAL GENERATOR (40GHZ)	ROHDE & SCHWARZ	SMB100A	175137	100KHZ-40GHZ	8/16/2017	8/16/2018
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	8/18/2017	8/18/2018
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/4/2016	4/4/2018
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	3/2/2016	3/2/2018
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	1/11/2017	1/11/2018
XPR0	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000	001	4.8-20GHZ	9/12/2017	9/12/2019

I/O: Initial Only

N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.



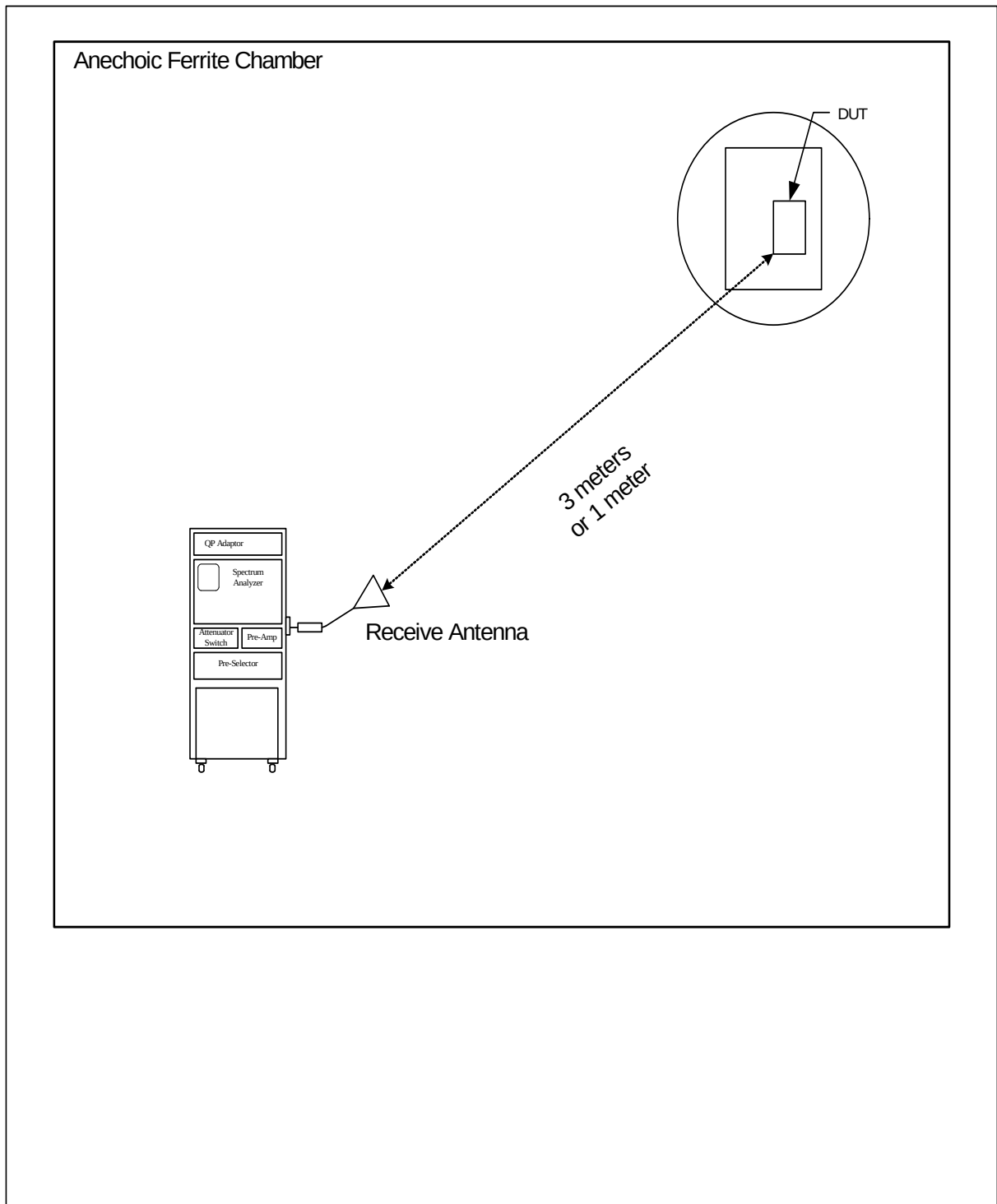


Figure 2: BLOCK DIAGRAM OF TEST SETUP FOR RADIATED EMISSIONS ABOVE 18GHZ

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 18GHz, Horizontal Polarization



Test Setup for Radiated Emissions – 1GHz TO 18GHz, Vertical Polarization

Figure 5



Test Setup for Radiated Emissions – 18GHz TO 25GHz, Horizontal Polarization



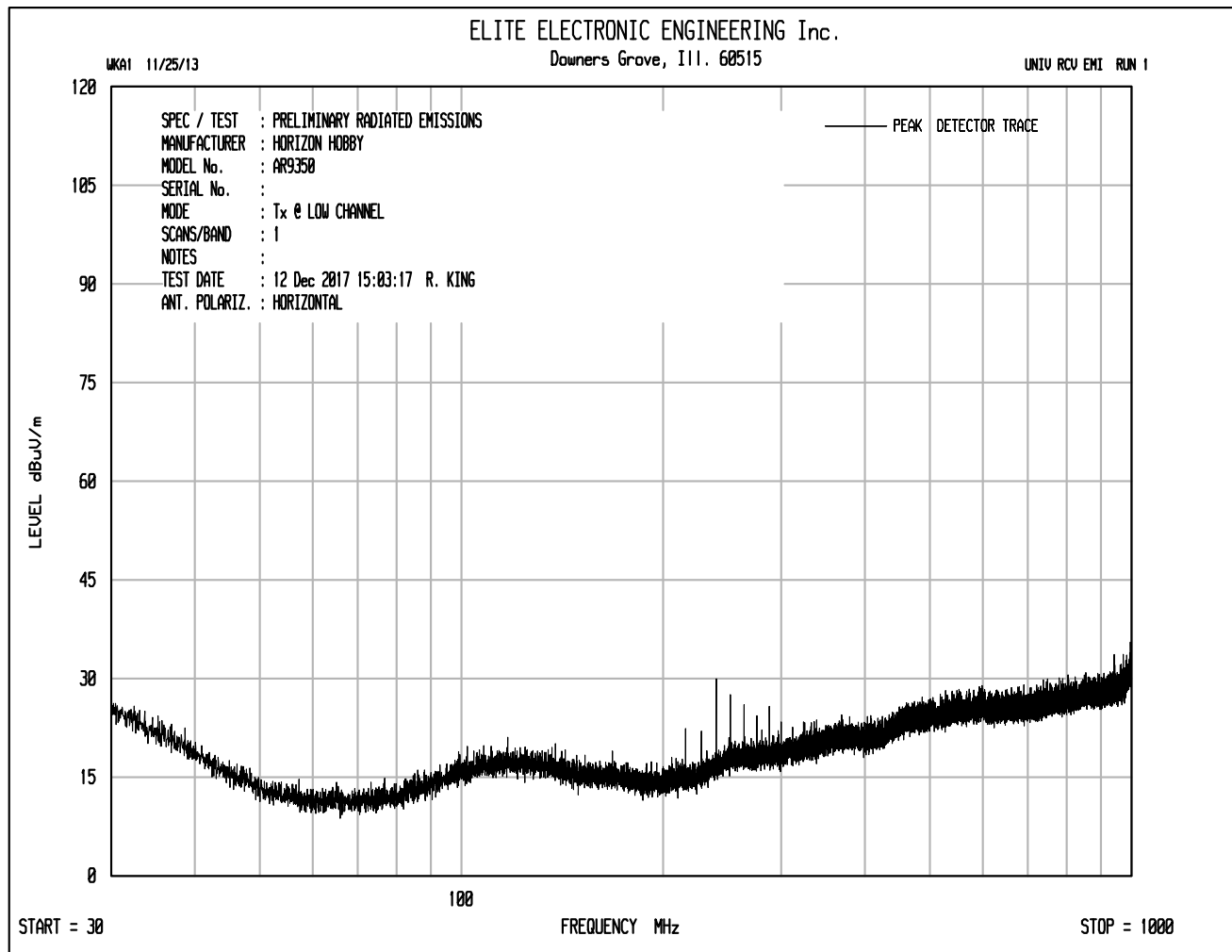
Test Setup for Radiated Emissions – 18GHz TO 25GHz, Vertical Polarization

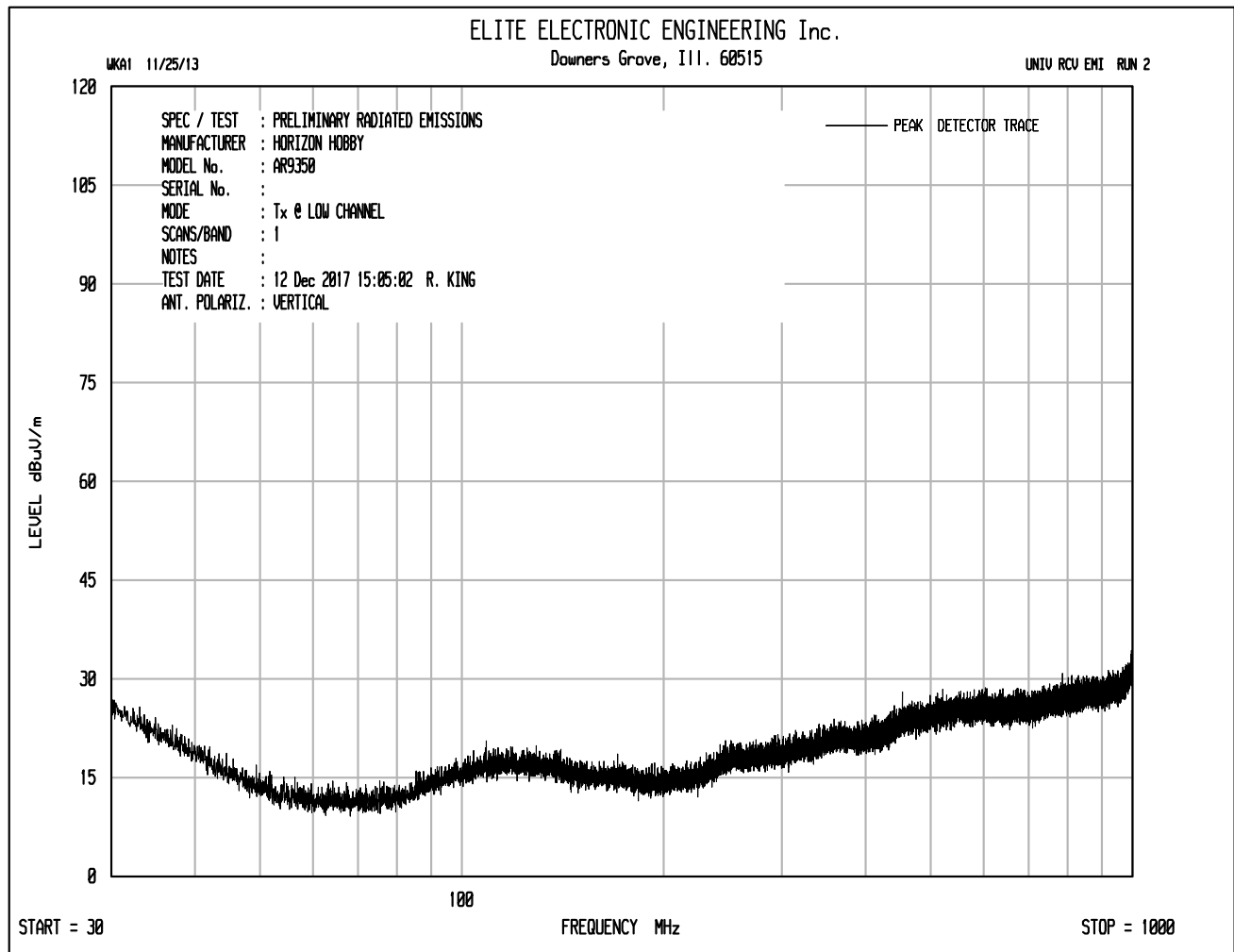
MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14-2017
TEST PERFORMED : Effective Isotropic Radiated Power (EIRP)
MODE : Transmit
NOTES :

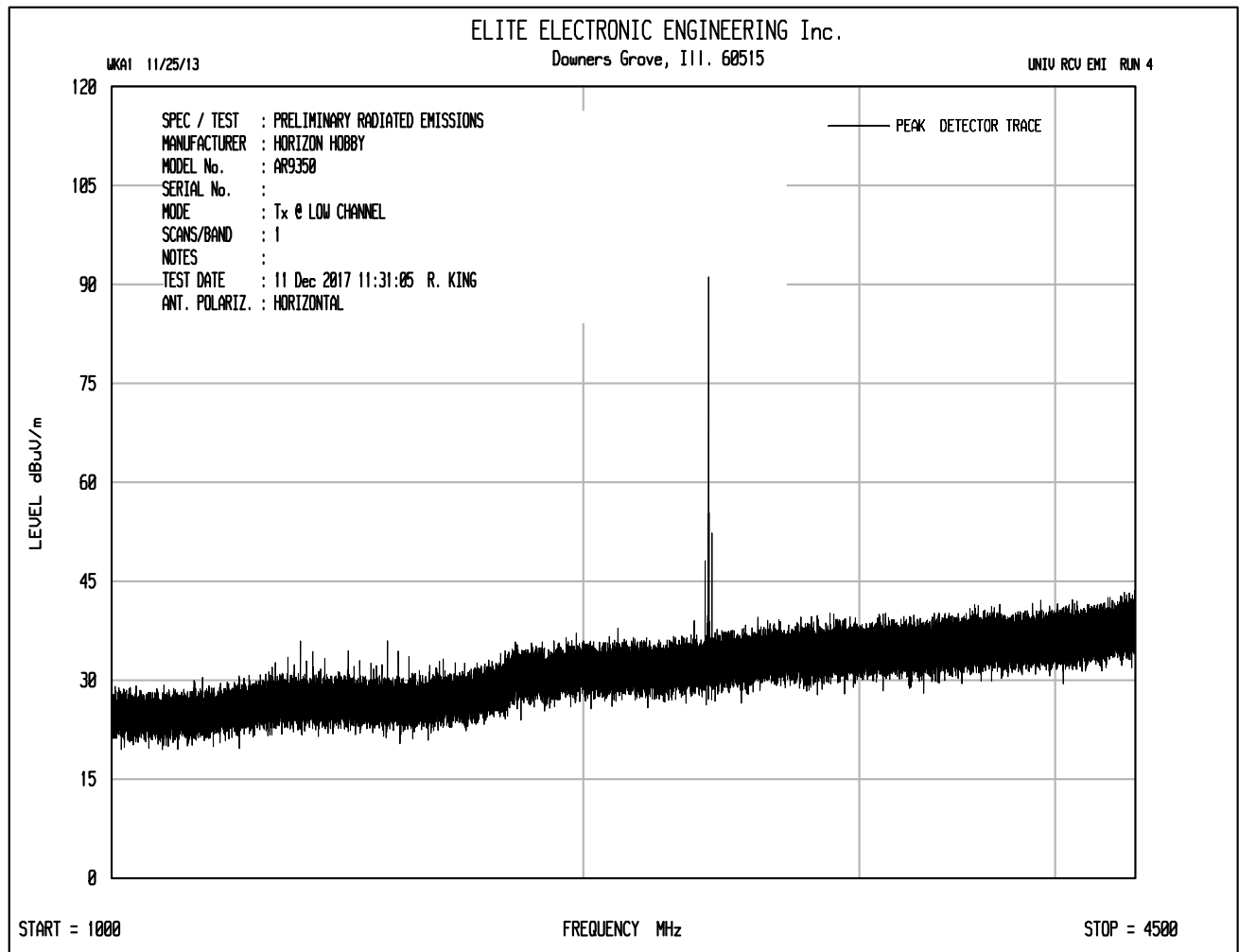
Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2404.00	H	72.6	6.6	5.8	4.1	8.3	27.0	-18.7
2404.00	V	69.7	5.0	5.8	4.1	6.7	27.0	-20.3

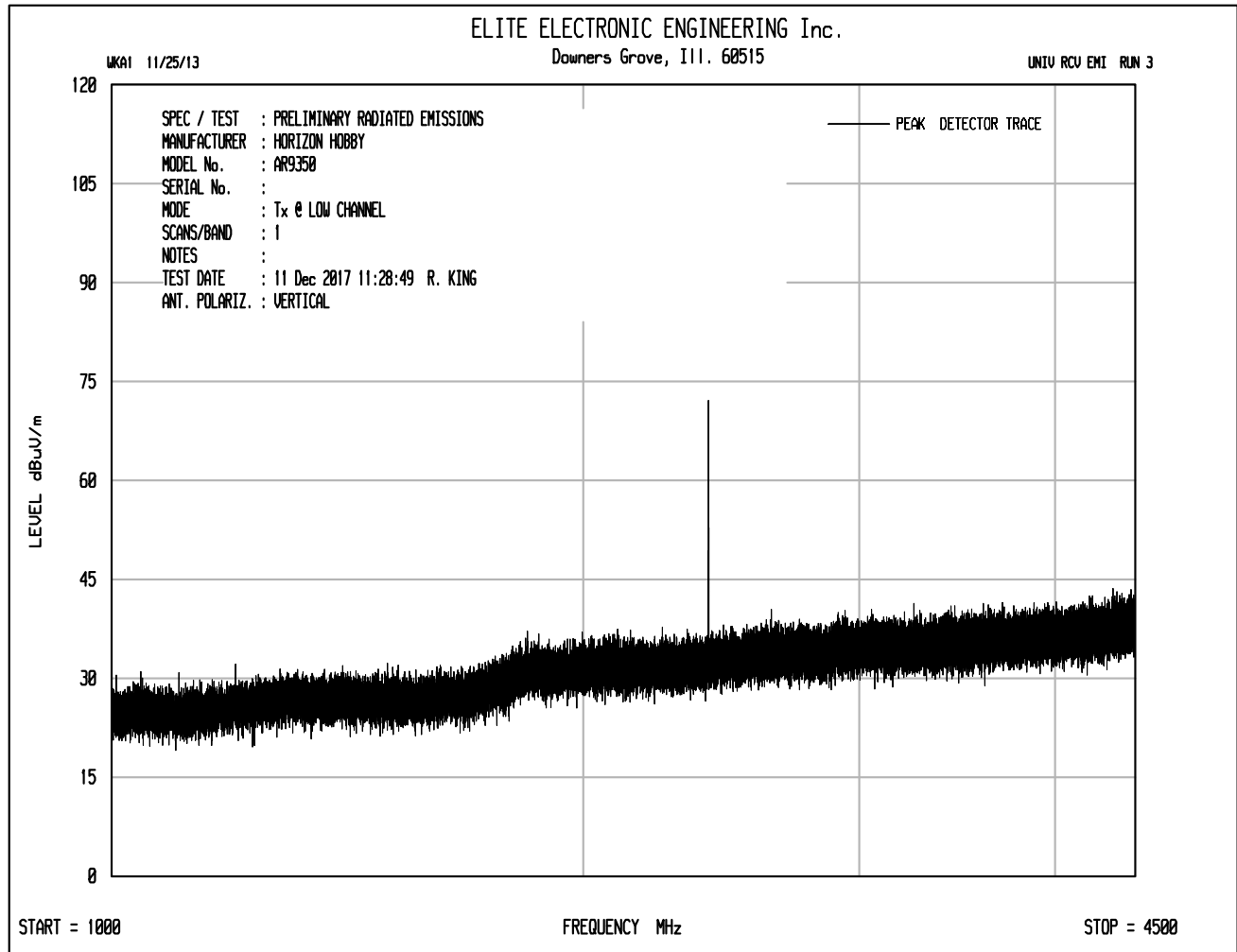
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2440.00	H	75.9	10.4	5.9	4.2	12.1	27.0	-14.9
2440.00	V	77.1	11.2	5.9	4.2	12.9	27.0	-14.1

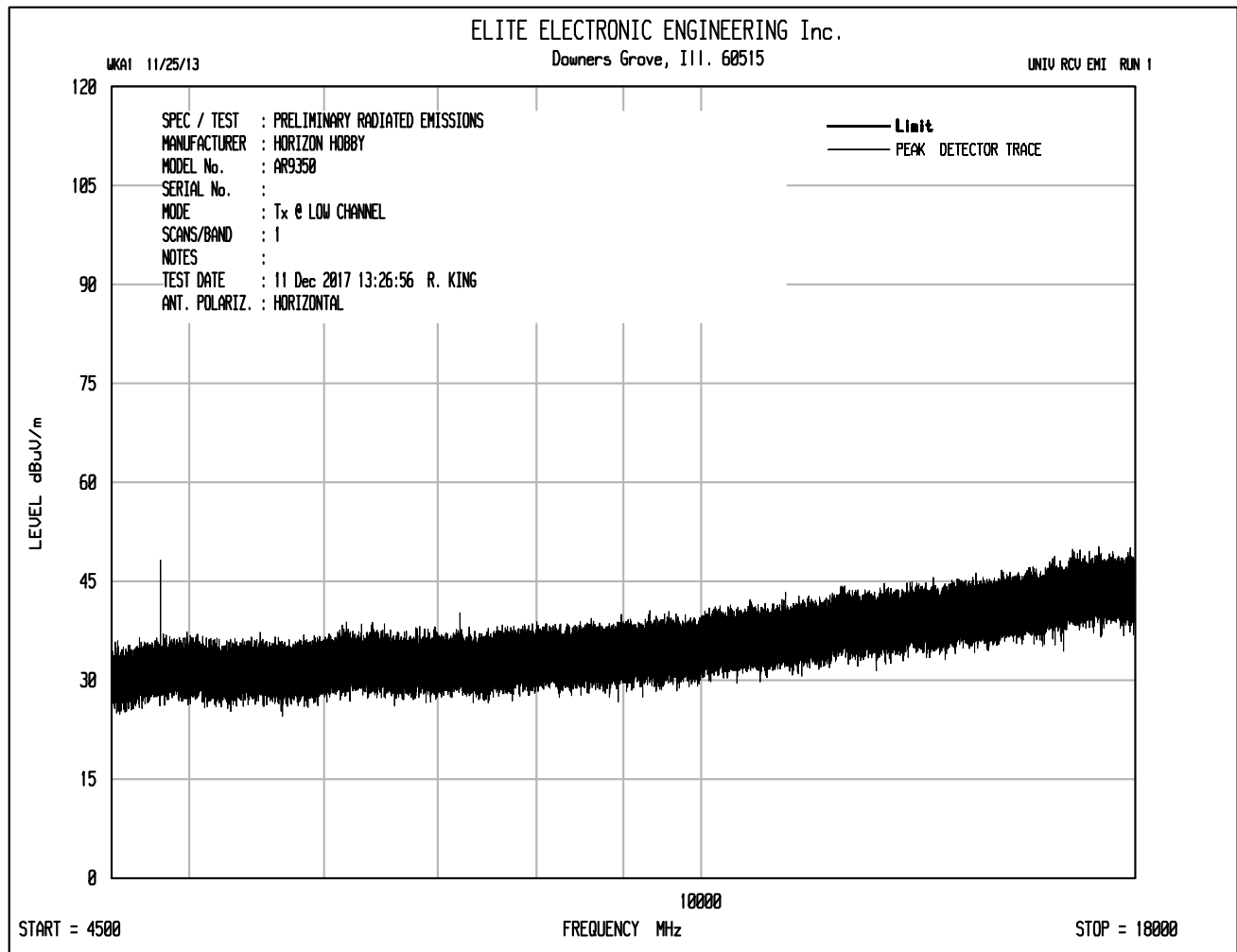
Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2476.00	H	74.3	8.4	5.9	4.2	10.1	27.0	-16.9
2476.00	V	71.6	5.5	5.9	4.2	7.2	27.0	-19.8

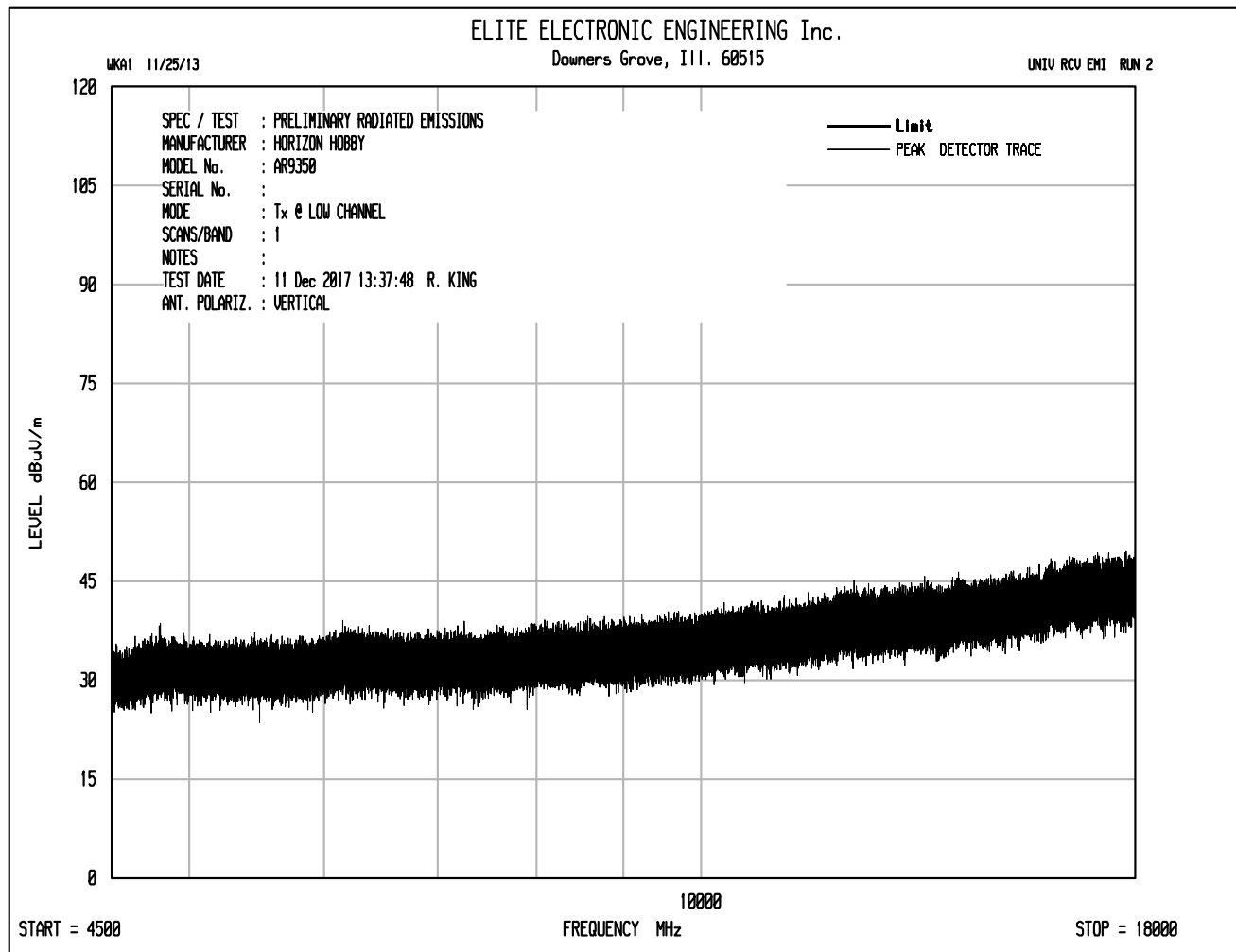


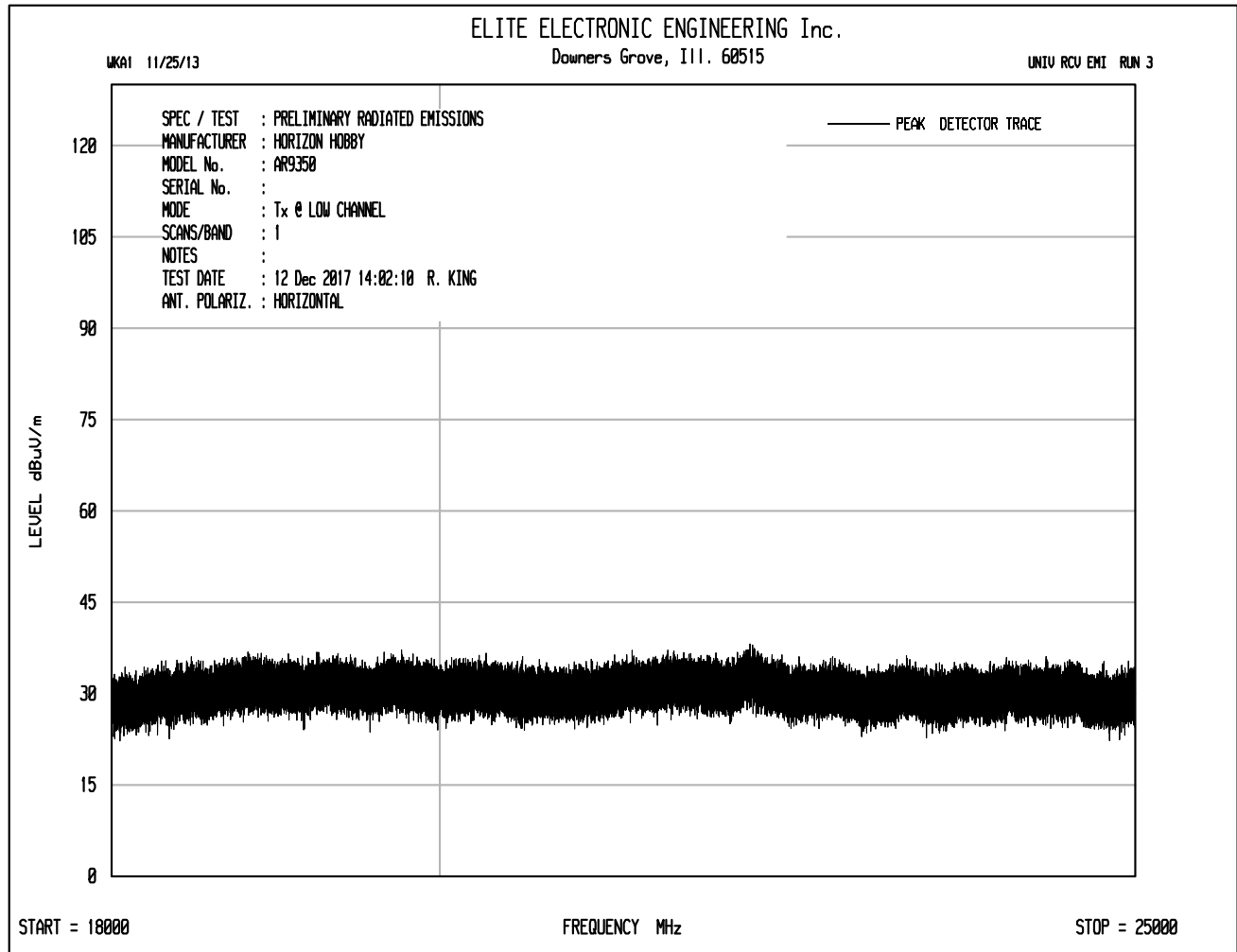


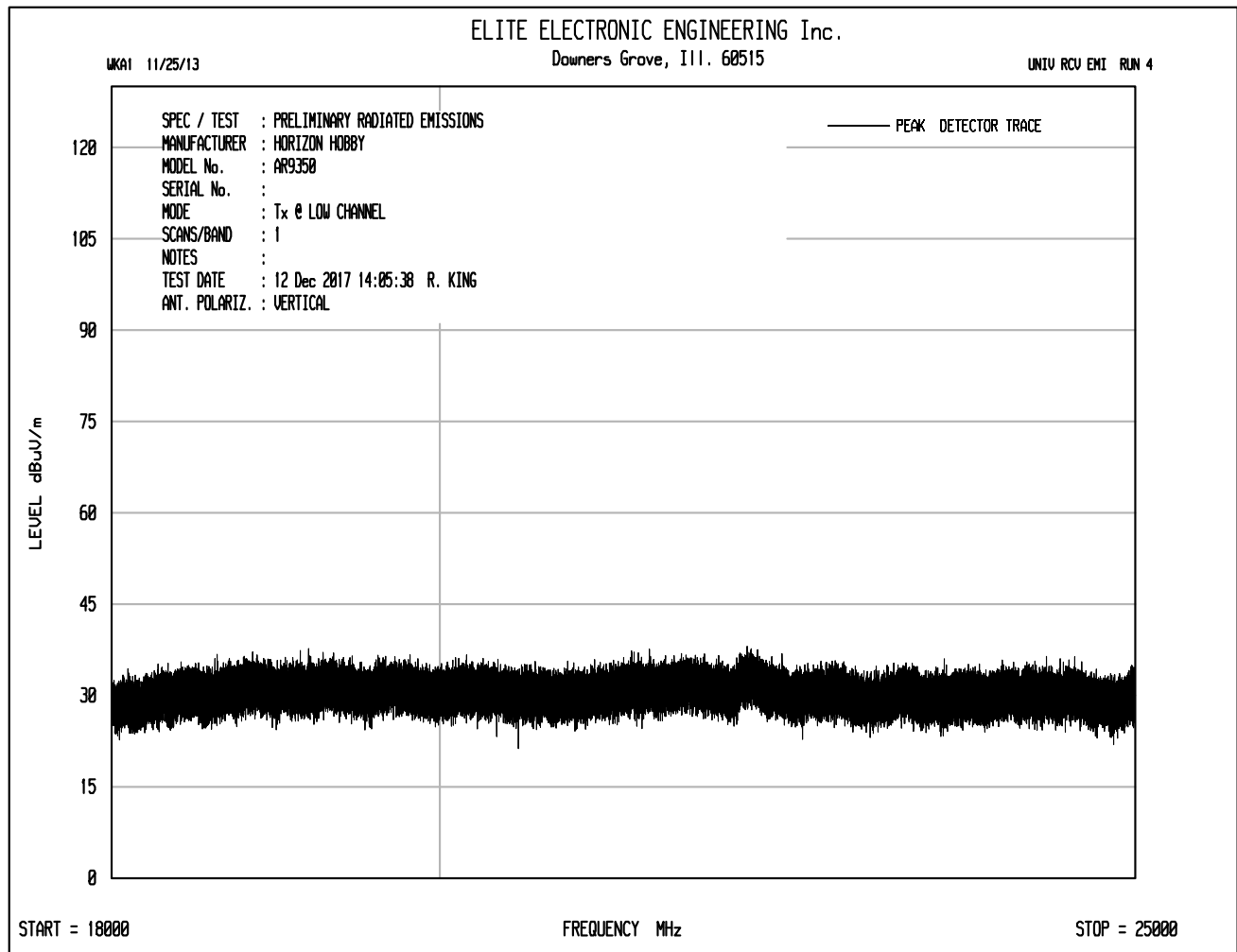


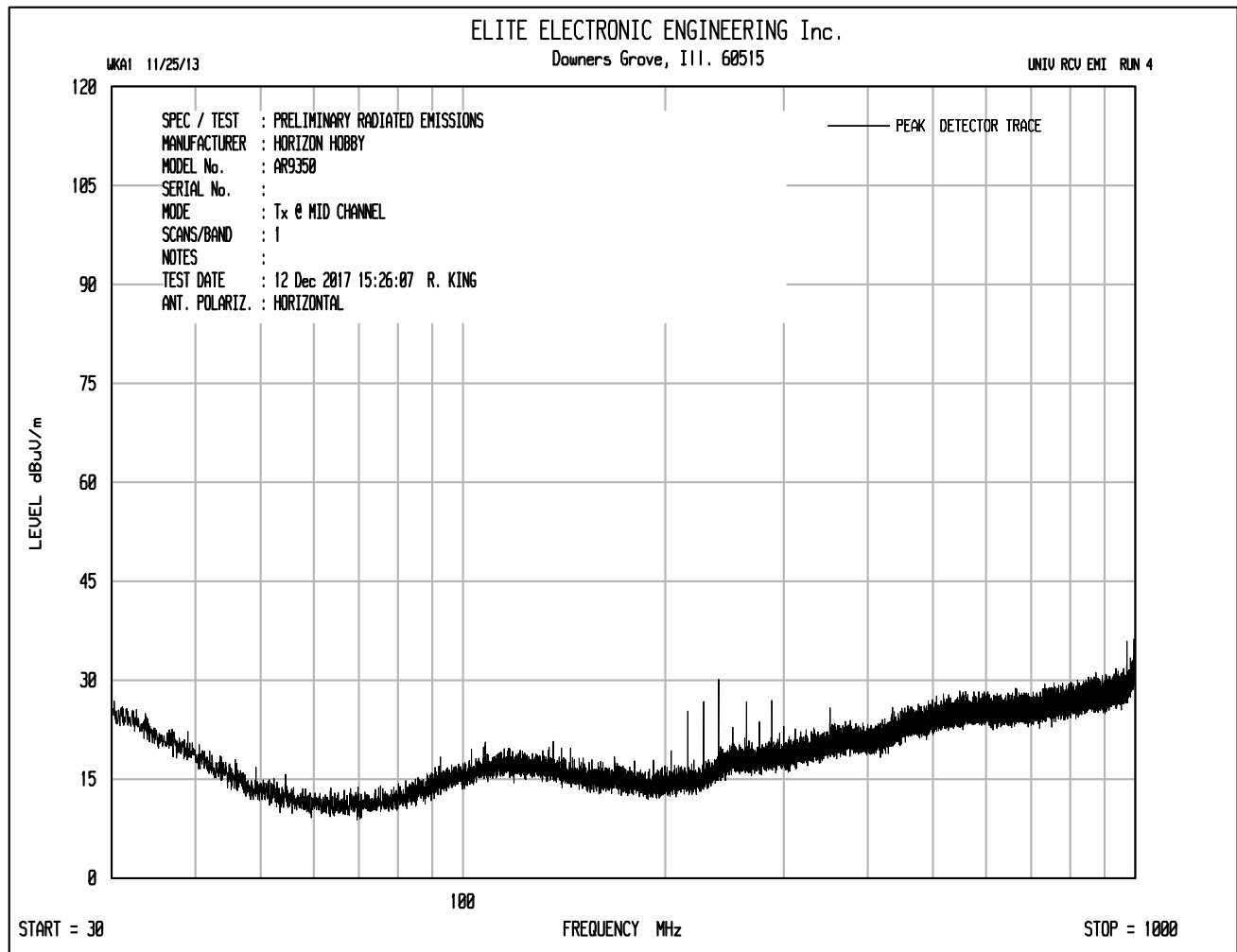


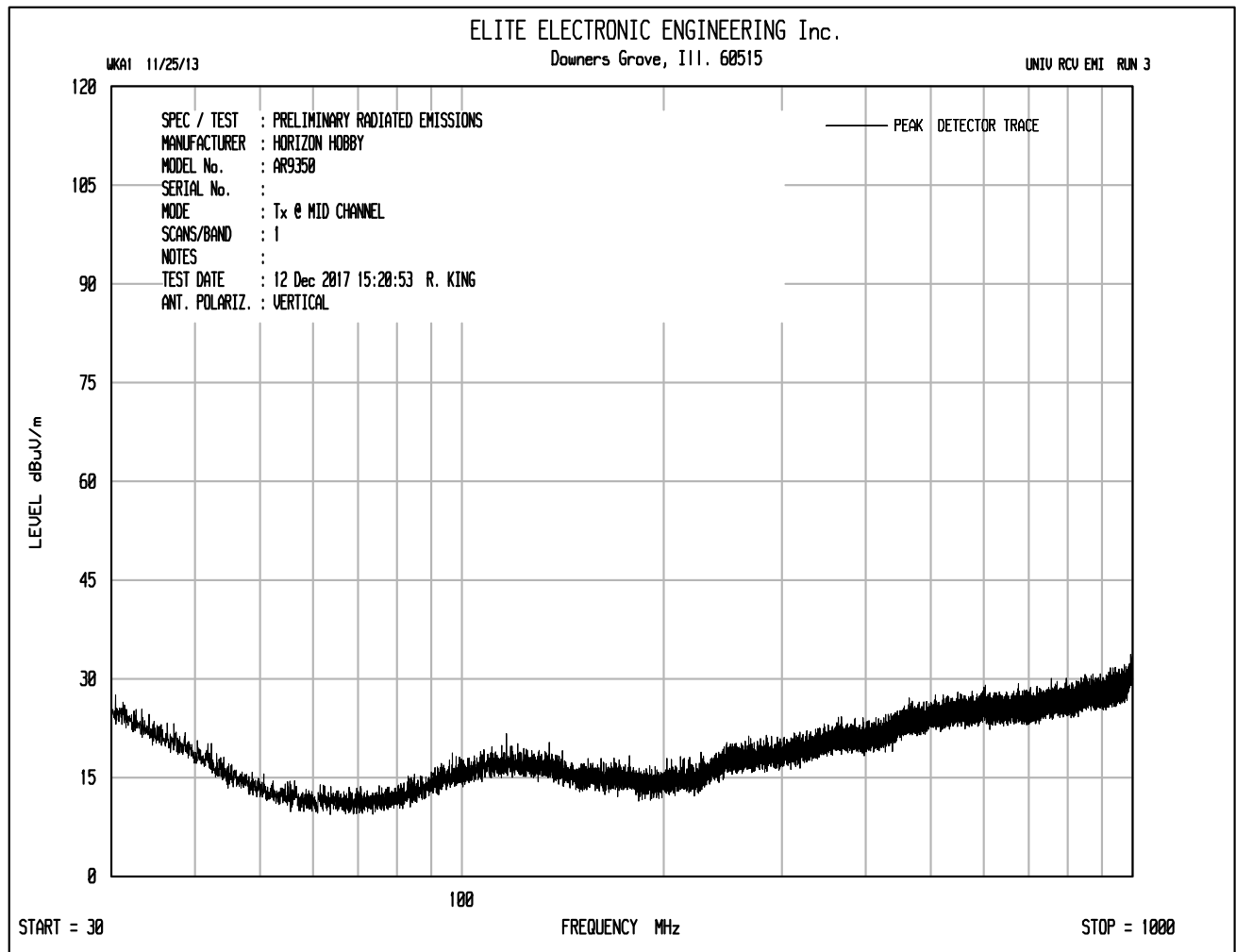


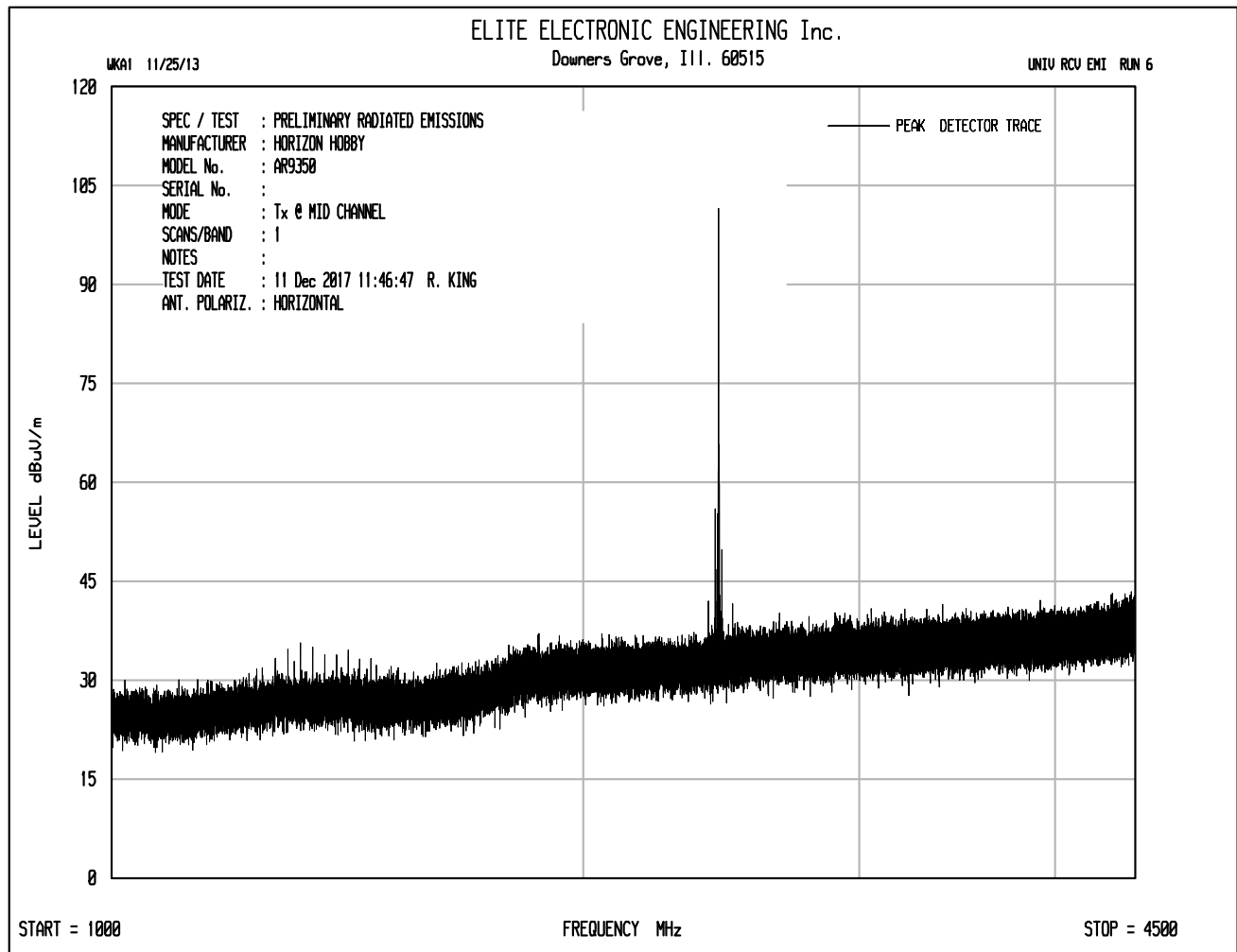


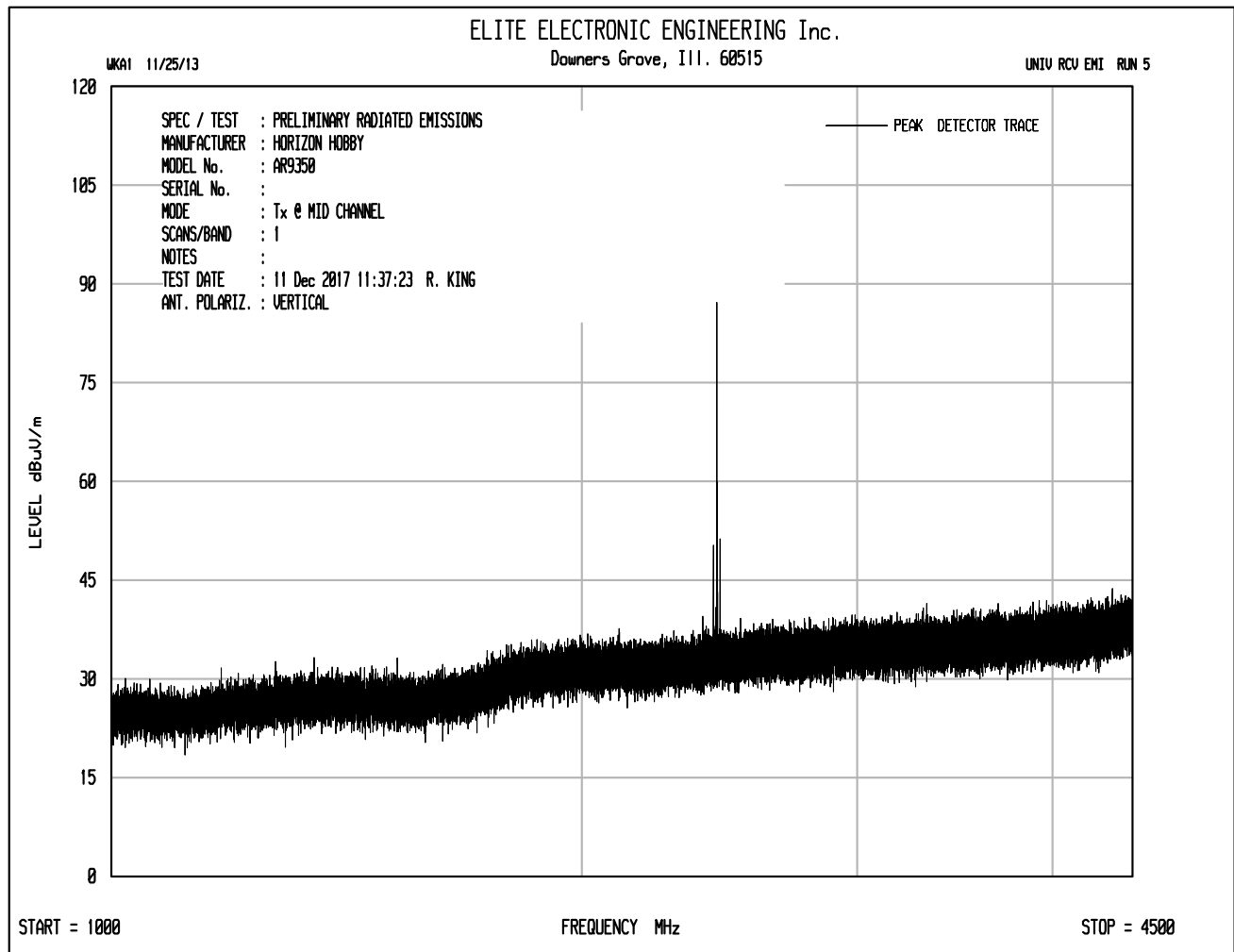


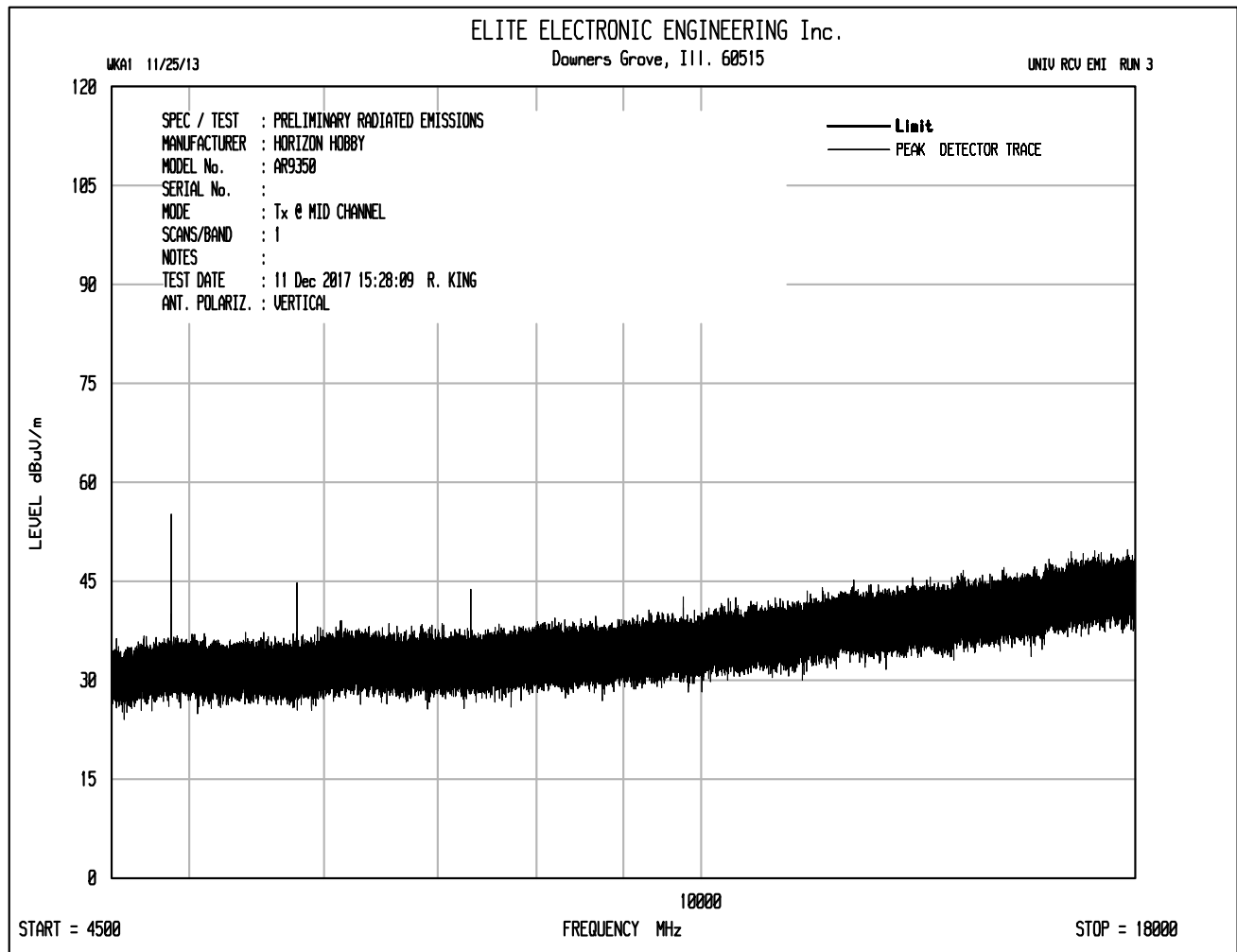


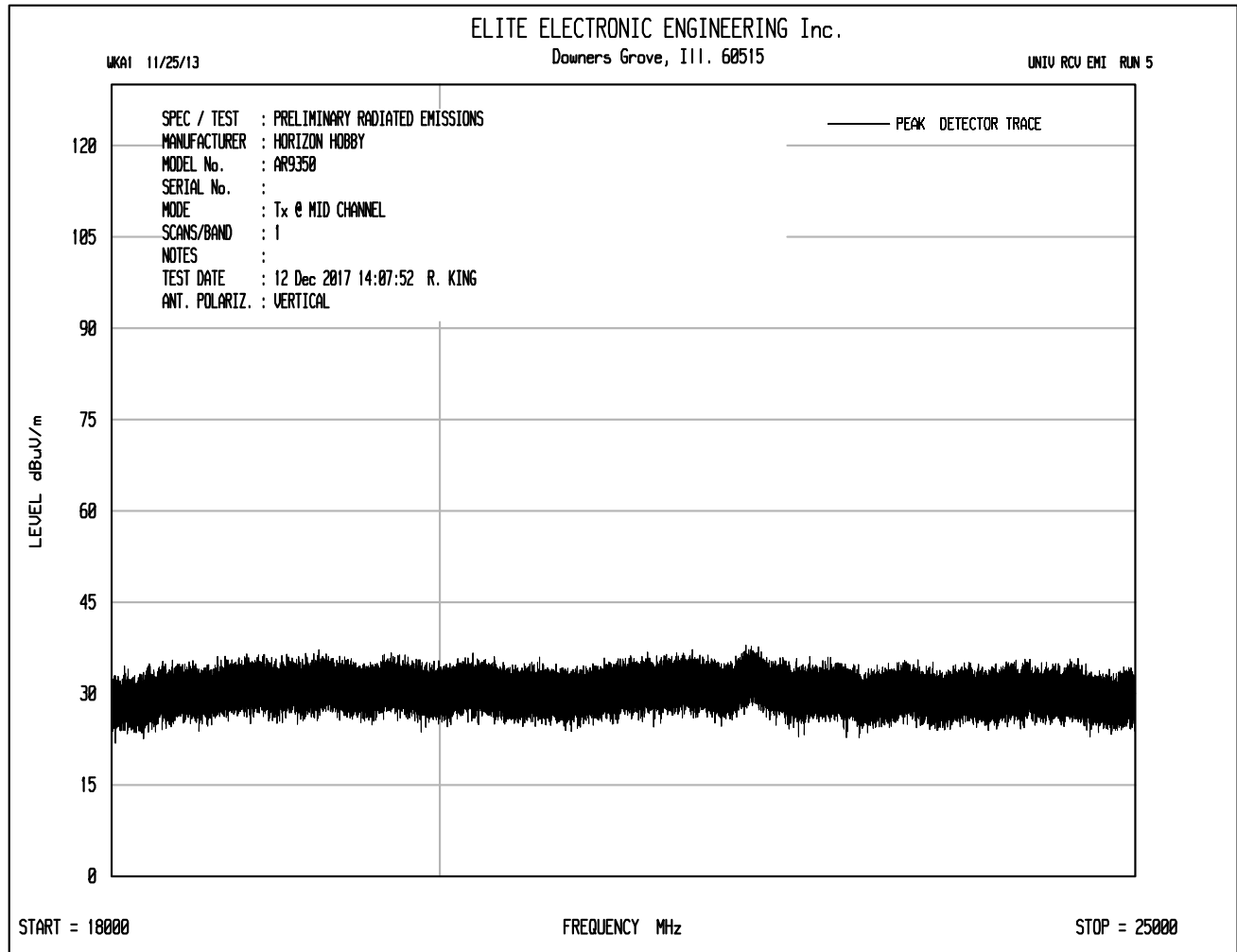


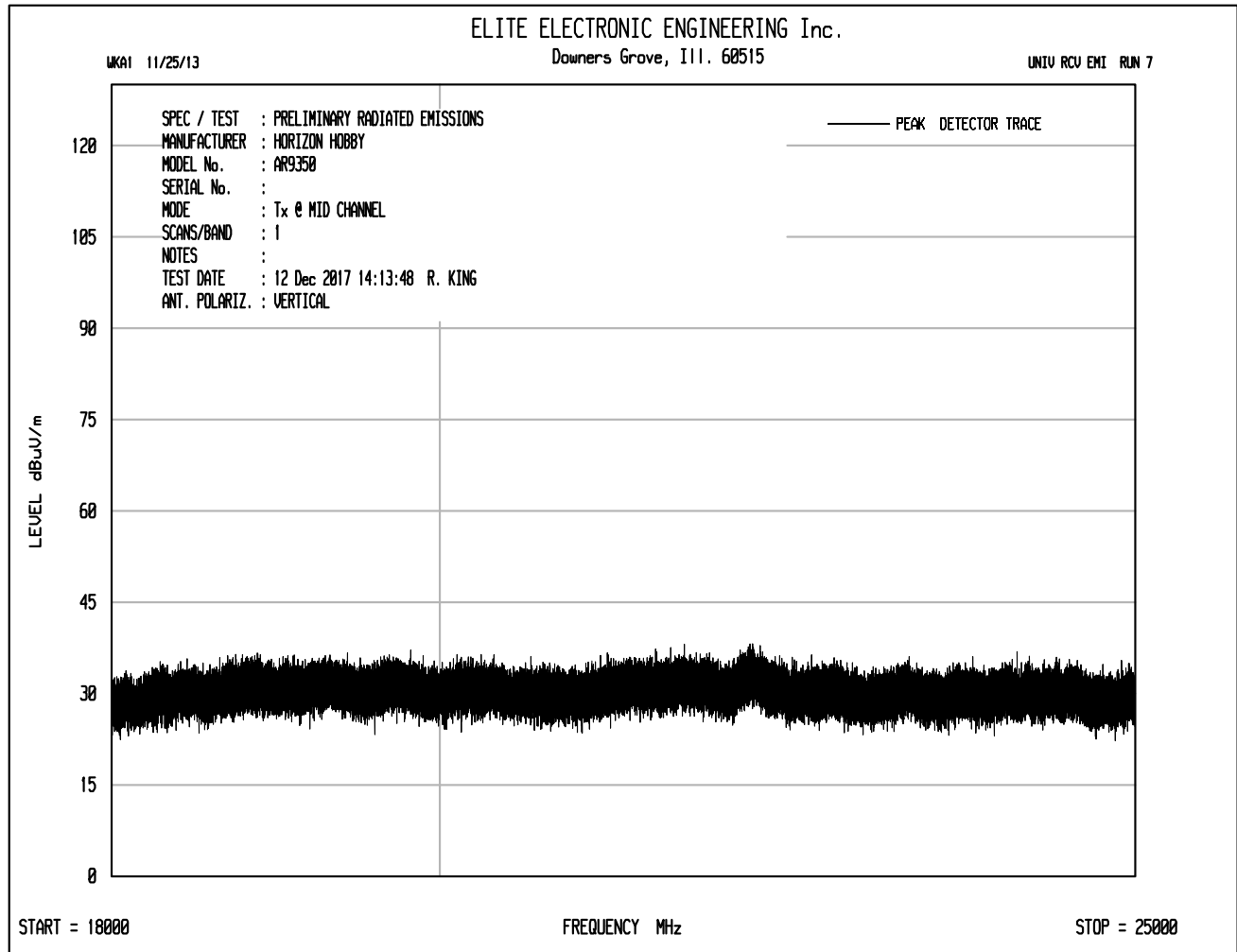


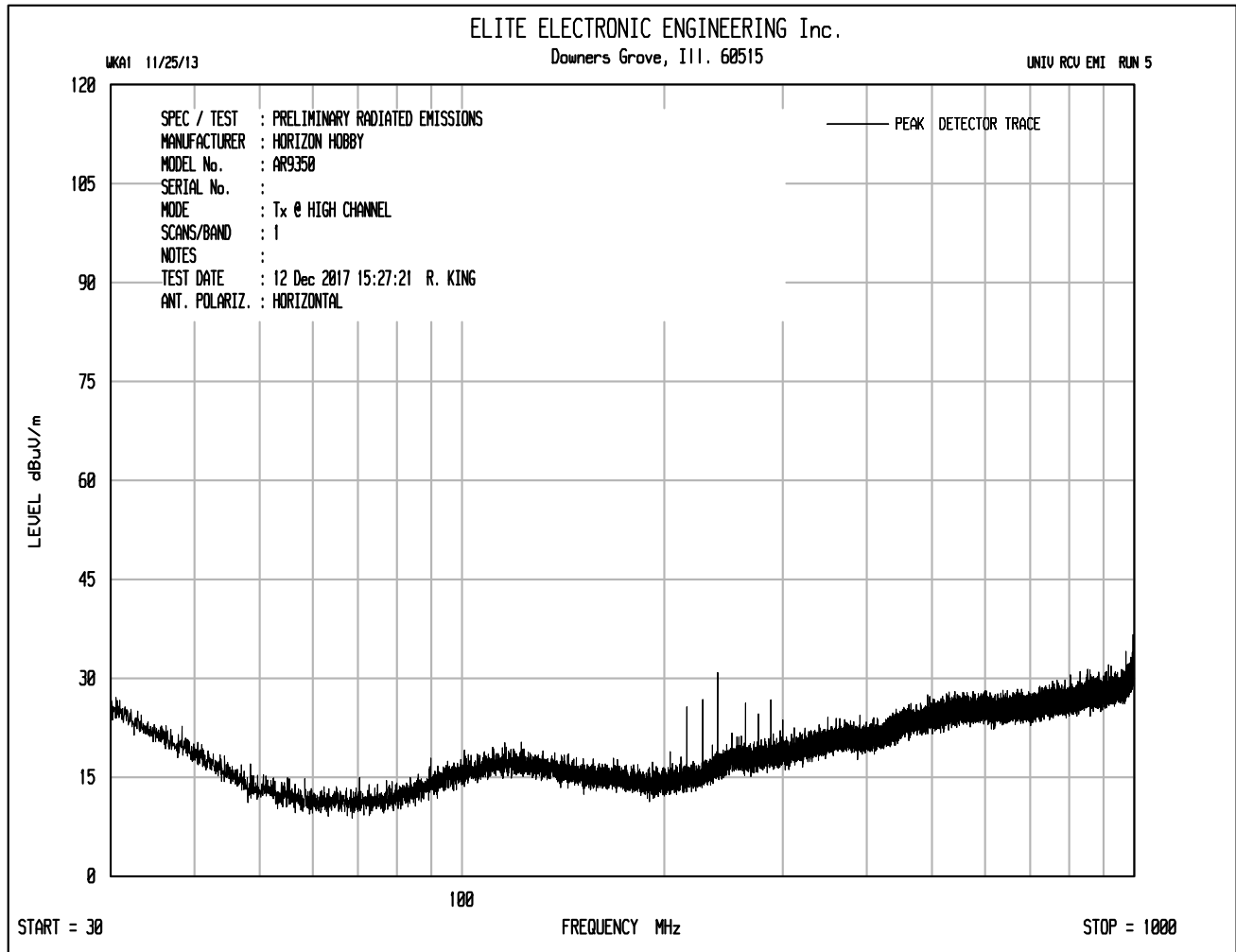


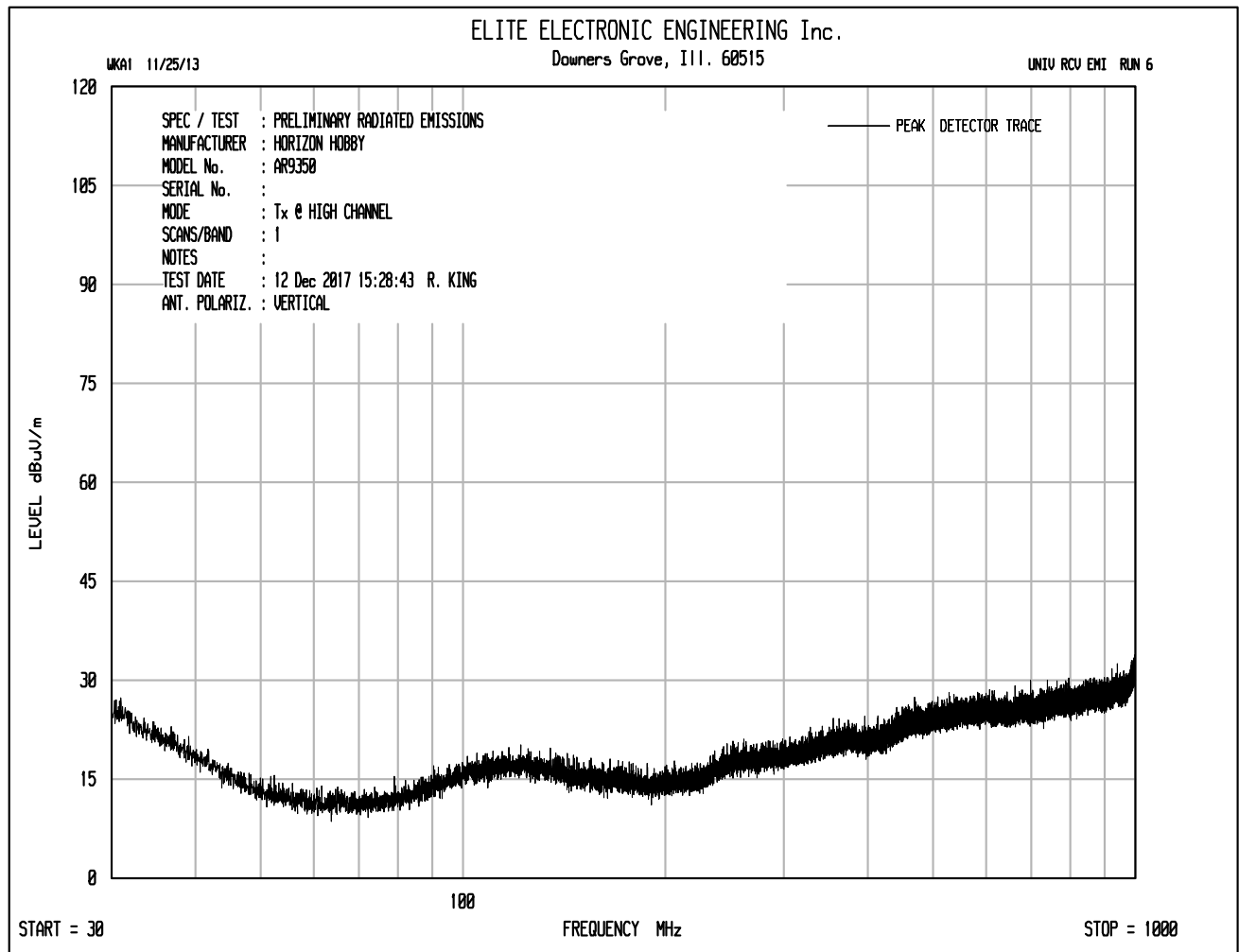


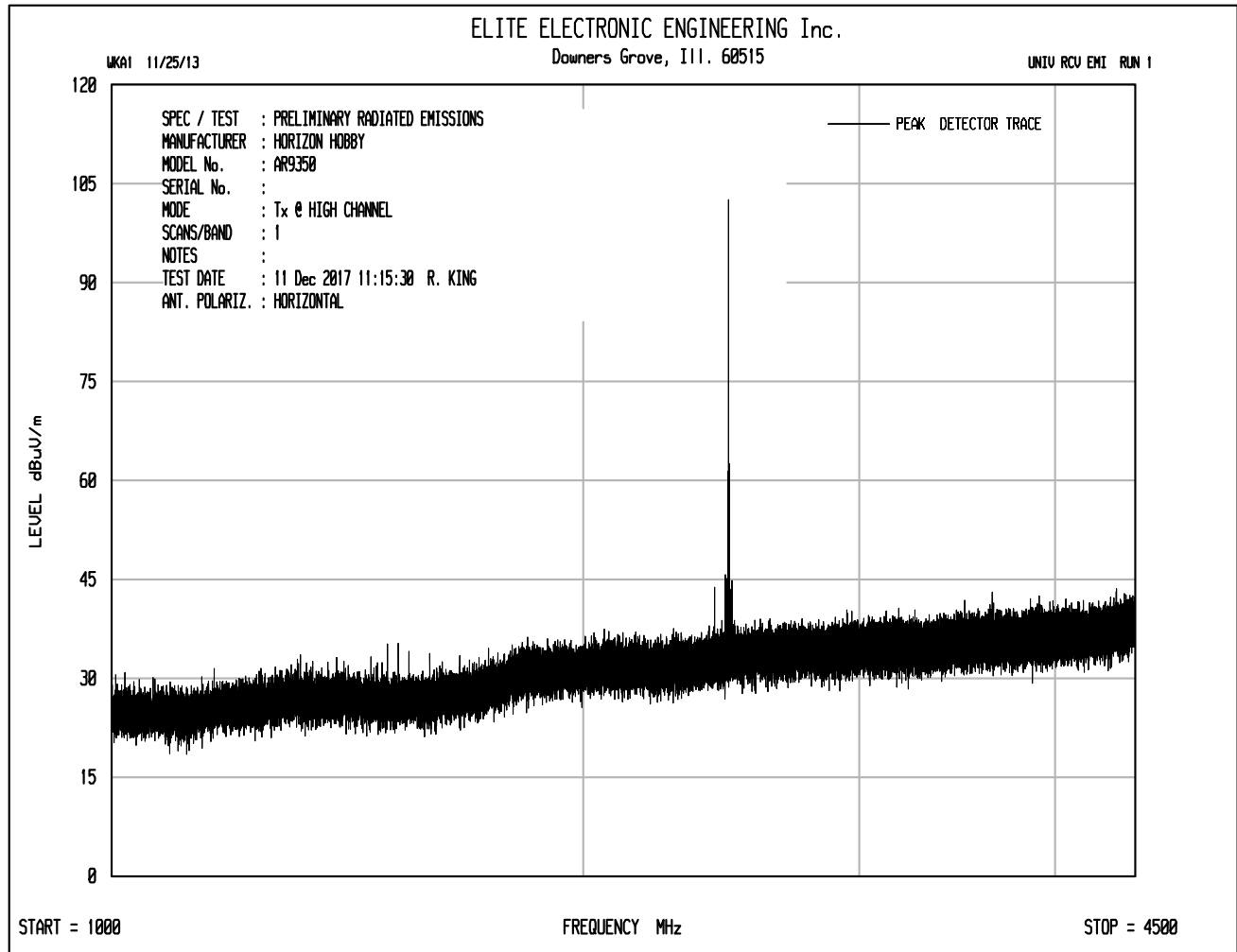


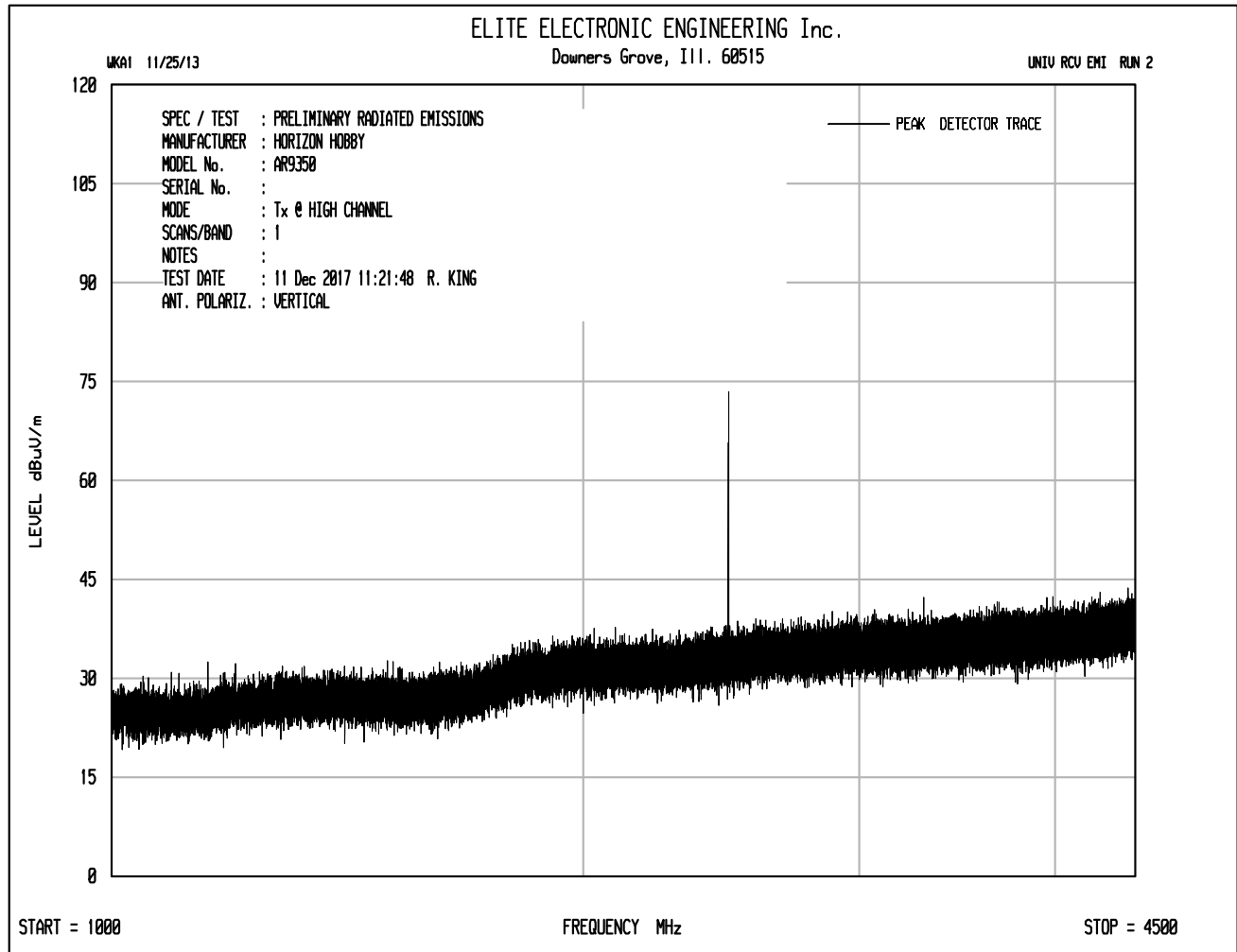


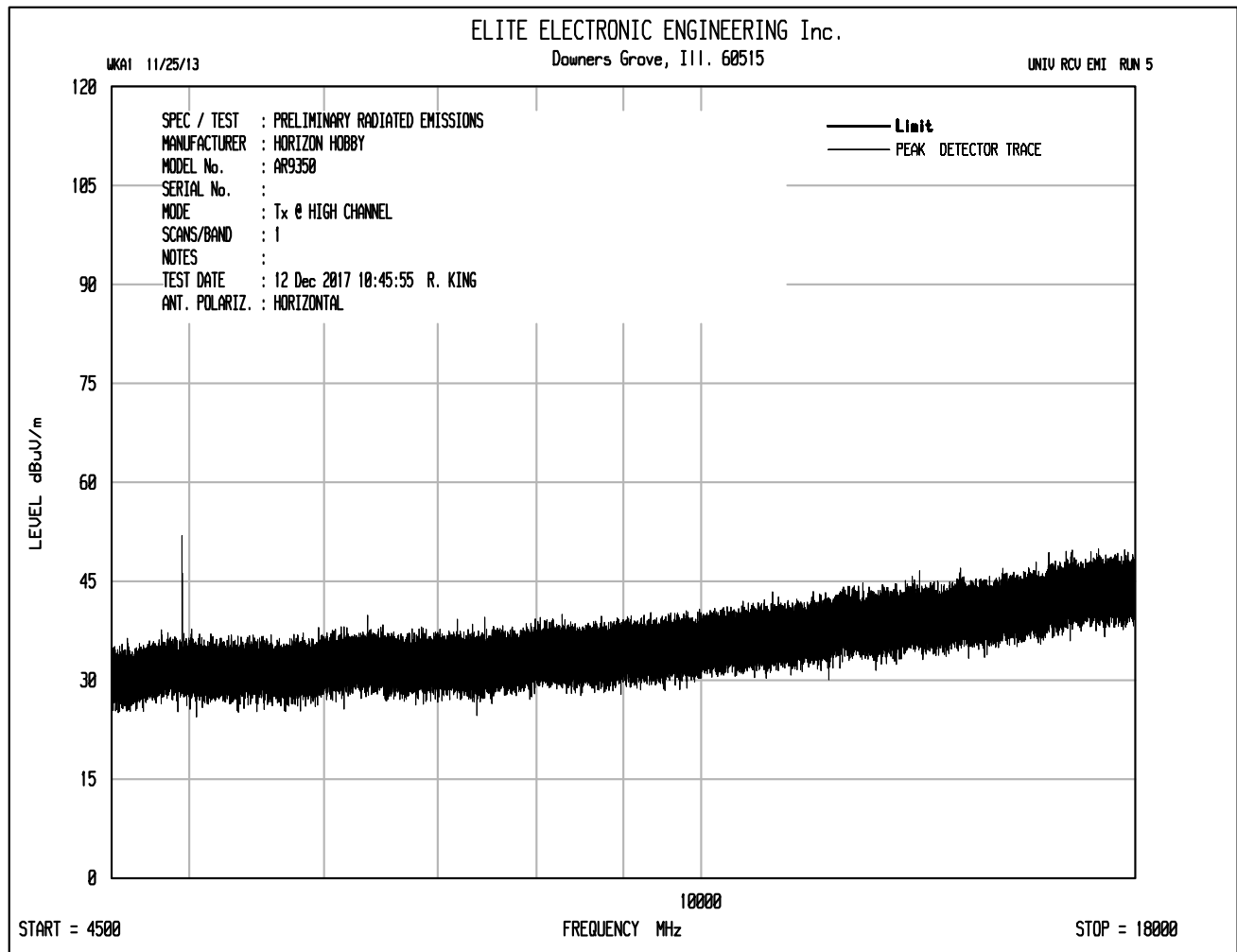


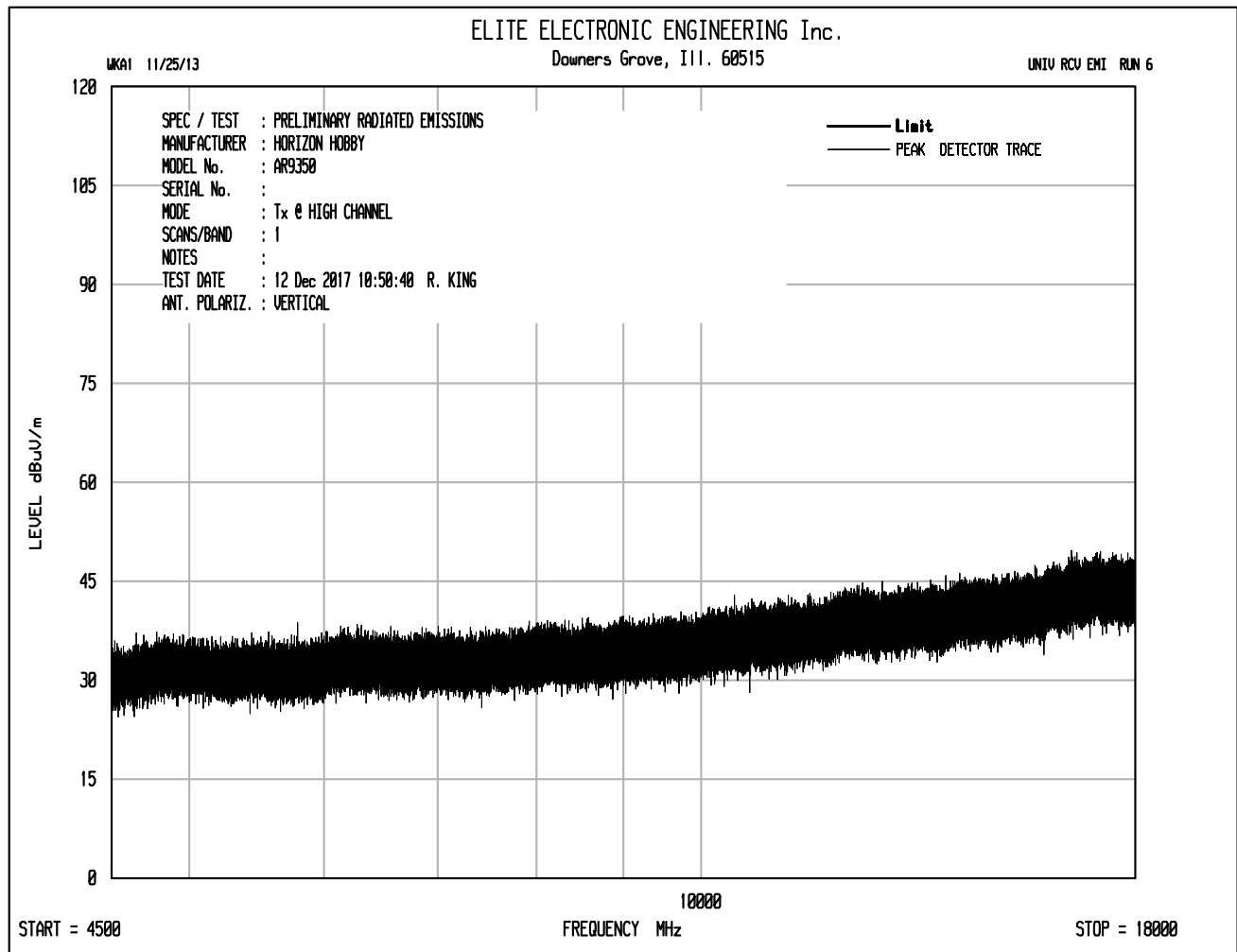


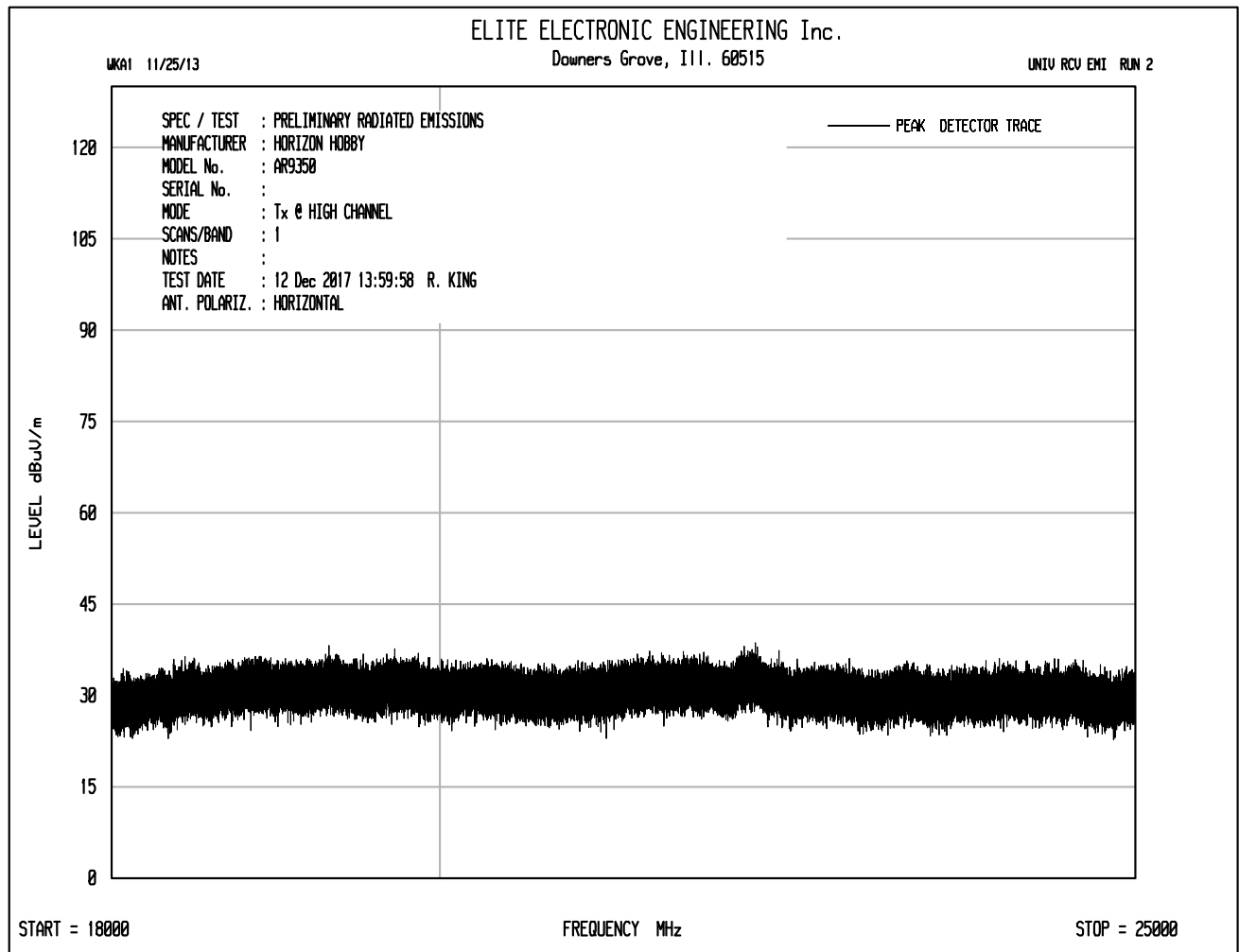


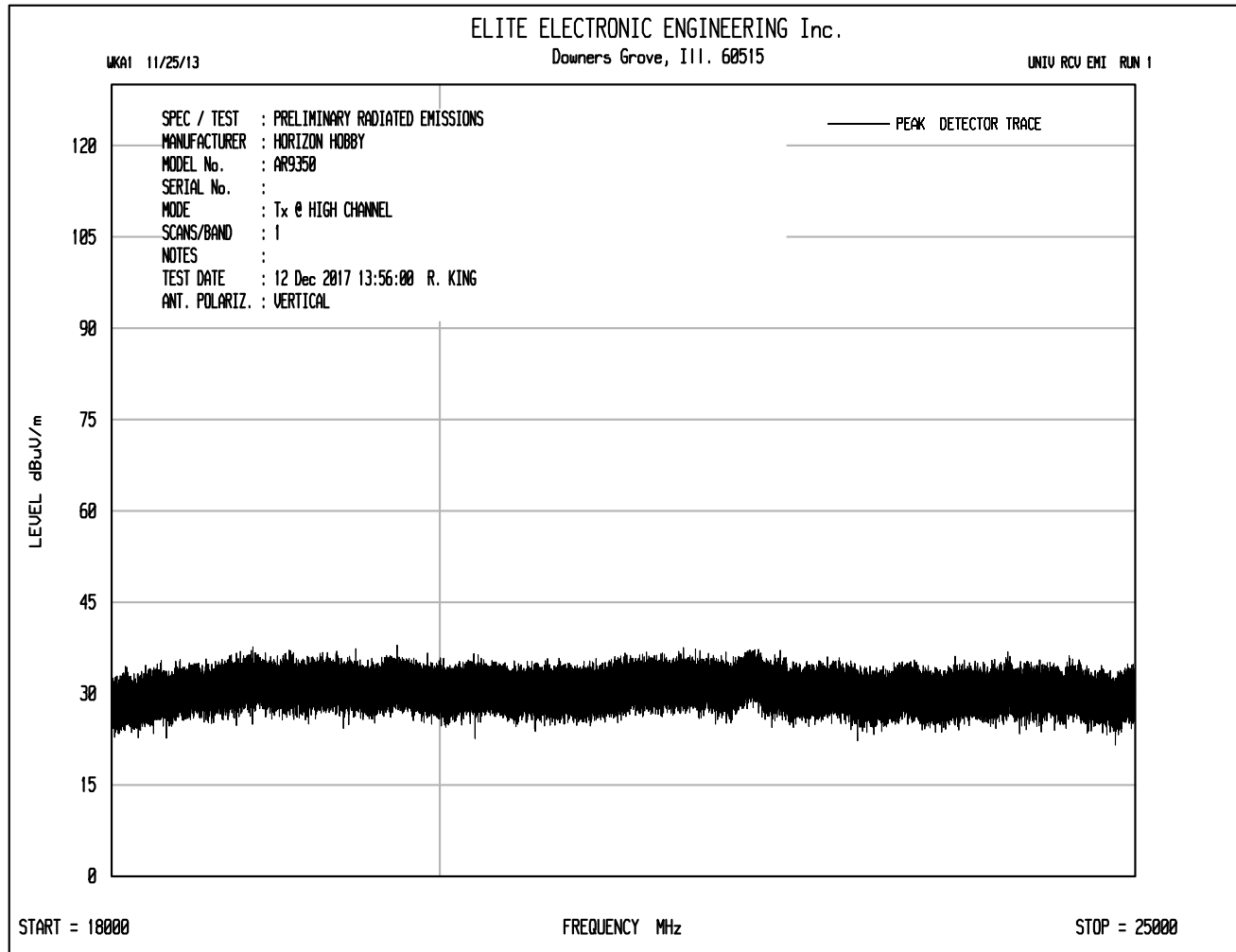












MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14, 2017
TEST PERFORMED : Spurious Radiated Emissions NOT in a Restricted Band
MODE : Transmit at 2404MHz
NOTES : 3 meter test distance
: Peak Readings in a 100kHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	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)
2404.00	H	71.5	3.4	32.0	0.0	106.9	221678.9		
2404.00	V	68.1	3.4	32.0	0.0	103.5	149013.1		
7212.00	H	52.9	6.1	35.7	-39.4	55.2	577.1	22167.9	-31.7
7212.00	V	48.5	6.1	35.7	-39.4	50.9	350.5	22167.9	-36.0
9616.00	H	39.7	6.8	36.6	-39.3	43.9	156.7	22167.9	-43.0
9616.00	V	41.4	6.8	36.6	-39.3	45.5	189.2	22167.9	-41.4
14424.00	H	36.4	8.7	39.6	-38.3	46.4	209.2	22167.9	-40.5
14424.00	V	37.4	8.7	39.6	-38.3	47.4	234.5	22167.9	-39.5
16828.00	H	38.1	9.4	41.7	-37.5	51.8	386.8	22167.9	-35.2
16828.00	V	38.1	9.4	41.7	-37.5	51.8	386.8	22167.9	-35.2
21636.00	H	22.3	2.2	40.6	-28.9	36.2	64.7	22167.9	-50.7
21636.00	V	23.1	2.2	40.6	-28.9	37.0	71.0	22167.9	-49.9
24040.00	H	22.9	2.2	40.6	-30.3	35.5	59.6	22167.9	-51.4
24040.00	V	24.1	2.2	40.6	-30.3	36.7	68.4	22167.9	-50.2

Checked BY RICHARD E. King :

Richard E. King

MANUFACTURER : Horizon Hobby
 MODEL NO. : AR9350
 SERIAL NO. : SPMAR9350
 DATE : December 11-14, 2017
 TEST PERFORMED : Spurious Radiated Emissions in a Restricted Band
 MODE : Transmit at 2404MHz
 NOTES : 3 meter test distance
 : Peak Readings in a 1MHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	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)
4808.00	H	61.4	4.8	34.6	-39.3	61.6	1195.4	5000.0	-12.4
4808.00	V	62.6	4.8	34.6	-39.3	62.8	1372.5	5000.0	-11.2
12020.00	H	49.2	8.0	38.7	-39.2	56.8	689.9	5000.0	-17.2
12020.00	V	49.6	8.0	38.7	-39.2	57.1	716.6	5000.0	-16.9
19232.00	H	33.4	2.2	40.4	-28.7	47.3	230.5	5000.0	-26.7
19232.00	V	33.5	2.2	40.4	-28.7	47.4	233.2	5000.0	-26.6

Checked BY RICHARD E. KING :

Richard E. King

MANUFACTURER : Horizon Hobby
 MODEL NO. : AR9350
 SERIAL NO. : SPMAR9350
 DATE : December 11-14, 2017
 TEST PERFORMED : Spurious Radiated Emissions in Restricted Bands
 MODE : Transmit at 2404MHz
 NOTES : 3 meter test distance
 : Avg Readings in a 1MHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4808.00	H	35.4	4.8	34.6	-39.3	35.5	59.3	500.0	-18.5
4808.00	V	36.3	4.8	34.6	-39.3	36.4	66.1	500.0	-17.6
12020.00	H	33.9	8.0	38.7	-39.2	41.4	117.7	500.0	-12.6
12020.00	V	33.8	8.0	38.7	-39.2	41.3	116.5	500.0	-12.7
19232.00	H	19.9	2.2	40.4	-28.7	33.8	48.7	500.0	-20.2
19232.00	V	19.9	2.2	40.4	-28.7	33.8	48.7	500.0	-20.2

Checked BY RICHARD E. KING :

Richard E. King

MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14, 2017
TEST PERFORMED : Spurious Radiated Emissions NOT in a Restricted Band
MODE : Transmit at 2440MHz
NOTES : 3 meter test distance
: Peak Readings in a 100kHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	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)
2440.00	H	73.9	3.5	32.1	0.0	109.4	294415.9		
2440.00	V	74.6	3.5	32.1	0.0	110.1	320229.5		
9760.00	H	49.4	6.9	36.9	-39.3	53.9	496.8	32022.9	-36.2
9760.00	V	48.3	6.9	36.9	-39.3	52.9	439.3	32022.9	-37.3
14640.00	H	42.3	8.8	39.6	-38.2	52.5	421.0	32022.9	-37.6
14640.00	V	42.2	8.8	39.6	-38.2	52.4	418.1	32022.9	-37.7
17080.00	H	42.6	9.5	41.6	-37.6	56.3	650.1	32022.9	-33.8
17080.00	V	42.6	9.5	41.6	-37.6	56.3	650.1	32022.9	-33.8
21960.00	H	22.3	2.2	40.6	-29.4	35.7	60.9	32022.9	-54.4
21960.00	V	23.1	2.2	40.6	-29.4	36.5	66.8	32022.9	-53.6
24400.00	H	22.9	2.2	40.6	-30.4	35.3	58.3	32022.9	-54.8
24400.00	V	24.1	2.2	40.6	-30.4	36.5	66.9	32022.9	-53.6

Checked BY RICHARD E. KING :

Richard E. King

MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14, 2017
TEST PERFORMED : Spurious Radiated Emissions in a Restricted Band
MODE : Transmit at 2440MHz
NOTES : 3 meter test distance
: Peak Readings in a 1MHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	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)
4880.00	H	69.3	4.9	34.5	-39.3	69.4	2958.4	5000.0	-4.6
4880.00	V	68.4	4.9	34.5	-39.3	68.5	2651.9	5000.0	-5.5
7320.00	H	65.8	6.2	35.7	-39.4	68.2	2562.8	5000.0	-5.8
7320.00	V	64.1	6.2	35.7	-39.4	66.6	2126.7	5000.0	-7.4
12200.00	H	50.0	8.0	38.8	-39.1	57.7	766.9	5000.0	-16.3
12200.00	V	49.5	8.0	38.8	-39.1	57.2	720.7	5000.0	-16.8
19520.00	H	33.4	2.2	40.4	-28.7	47.3	231.0	5000.0	-26.7
19520.00	V	32.3	2.2	40.4	-28.7	46.2	203.5	5000.0	-27.8

Checked BY RICHARD E. KING :

Richard E. King

MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14, 2017
TEST PERFORMED : Spurious Radiated Emissions in Restricted Bands
MODE : Transmit at 2440MHz
NOTES : 3 meter test distance
: Avg Readings in a 1MHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4880.00	H	39.7	4.9	34.5	-39.3	39.8	97.3	500.0	-14.2
4880.00	V	36.8	4.9	34.5	-39.3	36.9	69.8	500.0	-17.1
7320.00	H	35.34	6.2	35.7	-39.4	37.8	77.2	500.0	-16.2
7320.00	V	35.1	6.2	35.7	-39.4	37.5	74.9	500.0	-16.5
12200.00	H	34.2	8.0	38.8	-39.1	41.9	125.0	500.0	-12.0
12200.00	V	34.2	8.0	38.8	-39.1	41.9	124.2	500.0	-12.1
19520.00	H	19.2	2.2	40.4	-28.7	33.1	45.0	500.0	-20.9
19520.00	V	19.4	2.2	40.4	-28.7	33.3	46.1	500.0	-20.7

Checked BY RICHARD E. KING :

Richard E. King

MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14, 2017
TEST PERFORMED : Spurious Radiated Emissions NOT in a Restricted Band
MODE : Transmit at 2476MHz
NOTES : 3 meter test distance
: Peak Readings in a 100kHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	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)
2476.00	H	73.6	3.5	32.1	-39.9	69.4	2949.5		
2476.00	V	68.3	3.5	32.1	-39.9	64.1	1595.0		
9904.00	H	41.4	7.0	37.0	-39.2	46.0	200.3	500.0	-7.9
9904.00	V	39.2	7.0	37.0	-39.2	43.8	155.3	500.0	-10.2
14856.00	H	38.6	8.9	39.6	-38.2	49.0	281.2	500.0	-5.0
14856.00	V	38.6	8.9	39.6	-38.2	49.0	281.2	500.0	-5.0
17332.00	H	38.1	9.7	41.4	-37.7	51.4	373.3	500.0	-2.5
17332.00	V	38.5	9.7	41.4	-37.7	51.8	388.2	500.0	-2.2
24760.00	H	22.9	2.2	40.6	-31.0	34.8	54.9	500.0	-19.2
24760.00	V	24.1	2.2	40.6	-31.0	36.0	63.0	500.0	-18.0

Checked BY RICHARD E. KING :

Richard E. King

MANUFACTURER : Horizon Hobby
 MODEL NO. : AR9350
 SERIAL NO. : SPMAR9350
 DATE : December 11-14, 2017
 TEST PERFORMED : Spurious Radiated Emissions in a Restricted Band
 MODE : Transmit at 2476MHz
 NOTES : 3 meter test distance
 : Peak Readings in a 1MHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	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)
4952.00	H	61.8	4.9	34.5	-39.3	61.9	1242.0	5000.0	-12.1
4952.00	V	61.9	4.9	34.5	-39.3	62.0	1254.9	5000.0	-12.0
7428.00	H	56.7	6.2	35.6	-39.4	59.1	906.1	5000.0	-14.8
7428.00	V	52.6	6.2	35.6	-39.4	55.0	563.9	5000.0	-19.0
12380.00	H	50.3	8.0	38.8	-39.0	58.1	804.5	5000.0	-15.9
12380.00	V	49.8	8.0	38.8	-39.0	57.6	755.2	5000.0	-16.4
19808.00	H	33.4	2.2	40.4	-28.3	47.7	243.2	5000.0	-26.3
19808.00	V	32.3	2.2	40.4	-28.3	46.6	214.3	5000.0	-27.4
22284.00	H	22.3	2.2	40.6	-29.2	35.9	62.1	5000.0	-38.1
22284.00	V	23.1	2.2	40.6	-29.2	36.7	68.1	5000.0	-37.3

Checked BY RICHARD E. KING :

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MANUFACTURER : Horizon Hobby
MODEL NO. : AR9350
SERIAL NO. : SPMAR9350
DATE : December 11-14, 2017
TEST PERFORMED : Spurious Radiated Emissions in Restricted Bands
MODE : Transmit at 2476MHz
NOTES : 3 meter test distance
: Avg Readings in a 1MHz RBW

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4952.00	H	36.4	4.9	34.5	-39.3	36.4	66.4	500.0	-17.5
4952.00	V	36.3	4.9	34.5	-39.3	36.4	65.7	500.0	-17.6
7428.00	H	34.2	6.2	35.6	-39.4	36.6	67.8	500.0	-17.4
7428.00	V	33.9	6.2	35.6	-39.4	36.3	65.3	500.0	-17.7
12380.00	H	34.4	8.0	38.8	-39.0	42.1	128.0	500.0	-11.8
12380.00	V	34.4	8.0	38.8	-39.0	42.1	128.0	500.0	-11.8
19808.00	H	19.2	2.2	40.4	-28.3	33.5	47.4	500.0	-20.5
19808.00	V	19.4	2.2	40.4	-28.3	33.7	48.5	500.0	-20.3
22284.00	H	20.6	2.2	40.6	-29.2	34.2	51.1	500.0	-19.8
22284.00	V	20.5	2.2	40.6	-29.2	34.1	50.5	500.0	-19.9

Checked BY RICHARD E. KING :

Richard E. King