Engineering Test Report No. 2103913-01 Rev. A		
Report Date	March 21, 2022	
Manufacturer Name	Fastenal	
Manufacturer Address	2001 Theurer Blvd. Winona, MN 55987	
Product Name Brand/Model No.	Repeater, Model No. 922194623	
Date Received	February 9, 2022	
Test Dates	February 10, 2022 through February 15, 2022	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Sections 15.207 and 15.247 Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-247	
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515	FCC Reg. Number: 269750 IC Reg. Number: 2987A CAB Identifier: US0107
Signature	Mark E. Longinotti	
Tested by	Mark E. Longinotti	
Signature	Raymond J Klouda	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	01N9964-112921-0906	

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Sections 15.207 and 15.247 and Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-247 test specifications. The data presented in this test report pertains to the EUT on the test dates specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Table of Contents

1. Report Revision History

Revision	Date	Description
–	23 MAR 2022	Initial Release of Engineering Test Report No. 2103913-01
A	06 SEP 2022 By Mark Longinotti	– Throughout report: Changed Report No. from 2103913-01 to 2103913-01 Rev A. – Cover page and Throughout report: Changed Model No. from FAST-60-601-000003 to 922194623 per email from Chuck Wilde of NeoTech on September 1, 2022.

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on one (1) Repeater (hereinafter referred to as the Equipment Under Test (EUT)).

Additionally, this document includes the results of limited spurious emissions measurements performed on the EUT. The product is equipped with the following pre-certified radio modules:

- Microchip LoRa transceiver, M/N: RN2903, FCC ID: T9JRN2903, operating in the frequency range 902.3MHz to 927.5MHz. (The EUT will only utilize the frequency range of 903MHz to 914.2MHz.)

- Ublox Bluetooth 5.1 Low Energy (BLE) module, M/N: BMD-360, FCC ID: XPYBMD360, operating in the frequency range 2402MHz to 2480MHz

The nature of these measurements is to ensure that the radio module and host remain in compliance with the emissions requirements of the FCC and Innovation, Science, and Economic Development Canada after the integration process.

The EUT was identified as follows:

EUT Identification	
Product Description	Repeater
Model/Part No.	922194623
Device Type	Digitally Modulated Transmission Device
Band of Operation	902-928MHz and 2400-2483.5MHz
Software/Firmware Version	LoRa (902MHz – 928MHz): repeater-pic32_rf_test_cw- a9432aaebd0f81976a4a5a9c833c22d36d94c35e.hex BLE (2400MHz – 2483.5MHz): nrf52811_mod_0dBm_ch2.hex nrf52811_mod_0dBm_ch40.hex nrf52811_mod_0dBm_ch80.hex
Rated Output Power	LoRa (902MHz – 928MHz): 18.5dBm BLE (2400MHz – 2483.5MHz): 0dBm
Antenna Type	LoRa (902MHz – 928MHz): ANTX100P001BWPEN3 YAGEO Penta-Band WWAN Antenna BLE (2400MHz – 2483.5MHz): Meandering Inverted “F” (Integrated on the module)
Manufacturer Supplied* Antenna Gain (dBi)	LoRa (902MHz – 928MHz): 4.5dBi BLE (2400MHz – 2483.5MHz): -1dBi
Size of EUT	8cm diameter x 3cm tall

*- Antenna gain is supplied by the manufacturer and Elite is not responsible for the accuracy of the antenna gain.

The EUT listed above was used throughout the test series.

3. Power Input

The EUT obtained 5VDC power through a 2-wire, 1.6m power cable from the output of a CUI, Inc. power supply, Model No. SDI18-5-UD. The power supply was powered with 120V, 60Hz power via a 2-wire, 2.9m power cable.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

The EUT was submitted for testing along with a Lenovo ThinkPad computer which was used to program the EUT to operate in the proper test mode.

6. Interconnect Leads

No interconnect leads were used during the tests.

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

The EMC tests were performed with the EUT operating in one or more of the test modes described below:

- LoRa Transmit at 903.0MHz, power = 18.5dBm
- LoRa Transmit at 907.8MHz, power = 18.5dBm
- LoRa Transmit at 914.2MHz, power = 18.5dBm
- Bluetooth Transmit at 2402MHz, power = 0dBm
- Bluetooth Transmit at 2440MHz, power = 0dBm
- Bluetooth Transmit at 2480MHz, power = 0dBm
- LoRa Transmit at 903.0MHz, Bluetooth Transmit at 2480MHz

See the specific test section for the applicable test modes.

9. Test Specifications

The tests were performed to selected portions of, and in accordance with the following test specifications:

- Federal Communications Commission “Code of Federal Regulations,” Title 47, Part 15, Subpart C

- 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 Compliance Measurements On Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 April 2, 2019 KDB 558074 D01v05r02

- RSS-247 Issue 2, February 2017, “Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”

- RSS-Gen Issue 5, March 2019, Amendment 1, February 2021, Amendment 2, Innovation, Science, and Economic Development Canada, “Spectrum Management and Telecommunications, Radio Standards Specification, General Requirements for Compliance of Radio Apparatus”

- 996369 D04 Module Integration Guide v02, October 13, 2020

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Fastenal and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Sections 15.207 and 15.247, Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-247, and ANSI C63.10-2013 specifications.

11. Deviation, Additions to, or Exclusions from Test Specifications

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

12. Laboratory Conditions

The following were the laboratory conditions while the EMC tests were performed:

Ambient Parameters	Value
Temperature	21°C
Relative Humidity	18%
Atmospheric Pressure	1010mb

13. Summary

The following EMC tests were performed, and the results are shown below:

Test Description	Test Requirements	Test Methods	Results
RF Conducted Emissions (AC Mains)	FCC 15C 15.207 ISED RSS-GEN, Section 8.8	ANSI C63.10:2013	Conforms
Module Integration – Emissions	KDB 996369	ANSI C63.10:2013	Conforms

14. Sample Calculations

For Powerline Conducted Emissions:

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 (dBµV) = MTR (dBµV) + CF (dB).

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBµV/m) = MTR (dBµV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBµV/m term to µV/m, the dBµV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in µV/m terms.

Formula 2: FS (µV/m) = AntiLog [(FS (dBµV/m))/20]

15. Statement of Conformity

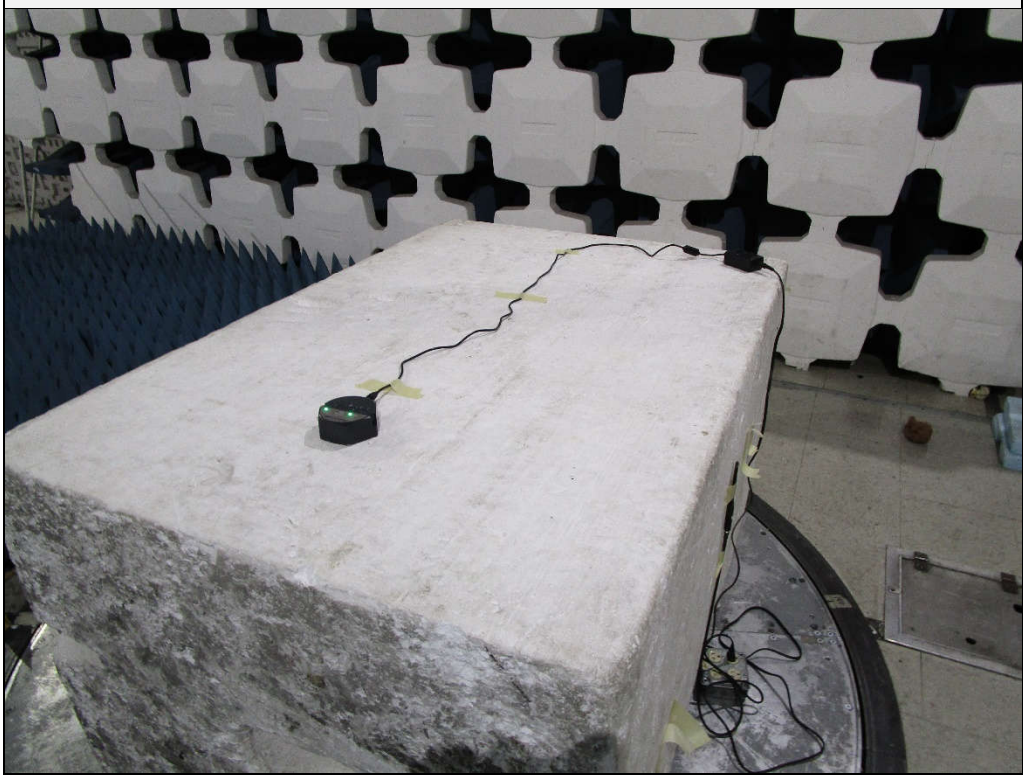
The Fastenal Repeater, Model No. 922194623, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Sections 15.207 and 15.247 and Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-247.

16. 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 FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Sections 15.207 and 15.247 and Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-247 test specifications. The data presented in this test report pertains to the EUT on the

test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT

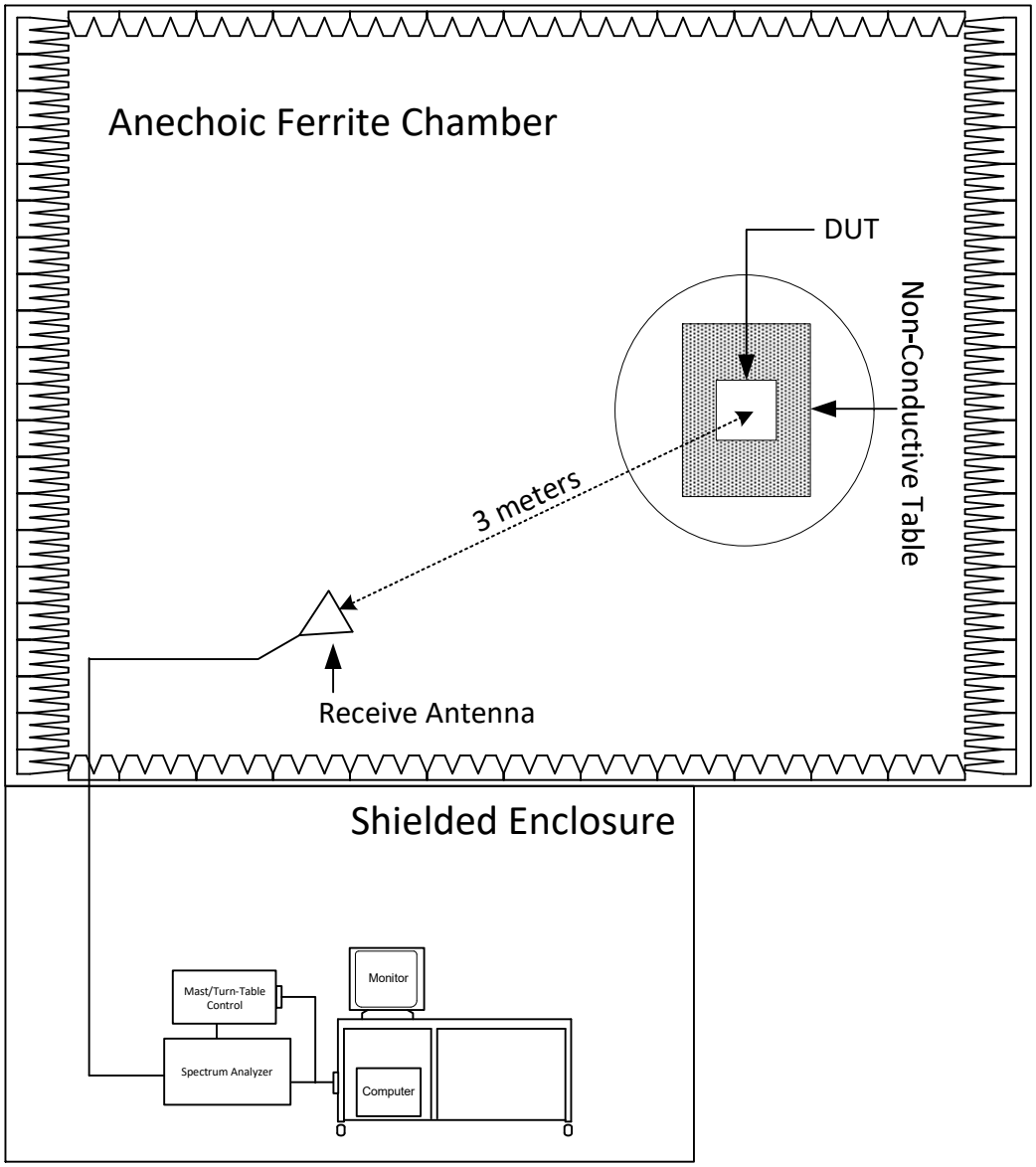


18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW14	PREAMPLIFIER	PLANAR	PE2-35-120-5R0-10-12-SFF	PL22671	1-20GHz	9/21/2021	9/21/2022
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GRE2	SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	3/5/2021	3/5/2022
NDQ1	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	313	400-1000MHZ	7/28/2020	7/28/2022
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/20/2020	10/20/2022
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/7/2020	4/7/2022
PLF5	CISPR16 50UH LISN	ELITE	CISPR16/15A	006	.15-30MHz	4/7/2021	4/7/2022
PLF8	CISPR16 50UH LISN	ELITE	CISPR16/15A	009	.15-30MHz	4/7/2021	4/7/2022
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/11/2021	3/11/2022
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
T1EP	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	CD6792	DC-18GHZ	3/1/2022	3/1/2024
VBR8	CISPR EN FCC CE VOLTAGE.exe					N/A	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
XPQ3	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	4	1.8GHZ-10GHZ	9/7/2021	9/7/2023
XPQ4	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000-O/O	1	4.8-20GHZ	9/7/2021	9/7/2023

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required
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.

19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. RF Conducted Emissions (AC Mains)

EUT Information	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Mode	LoRa Transmit at 903.0MHz, Bluetooth Transmit at 2480MHz

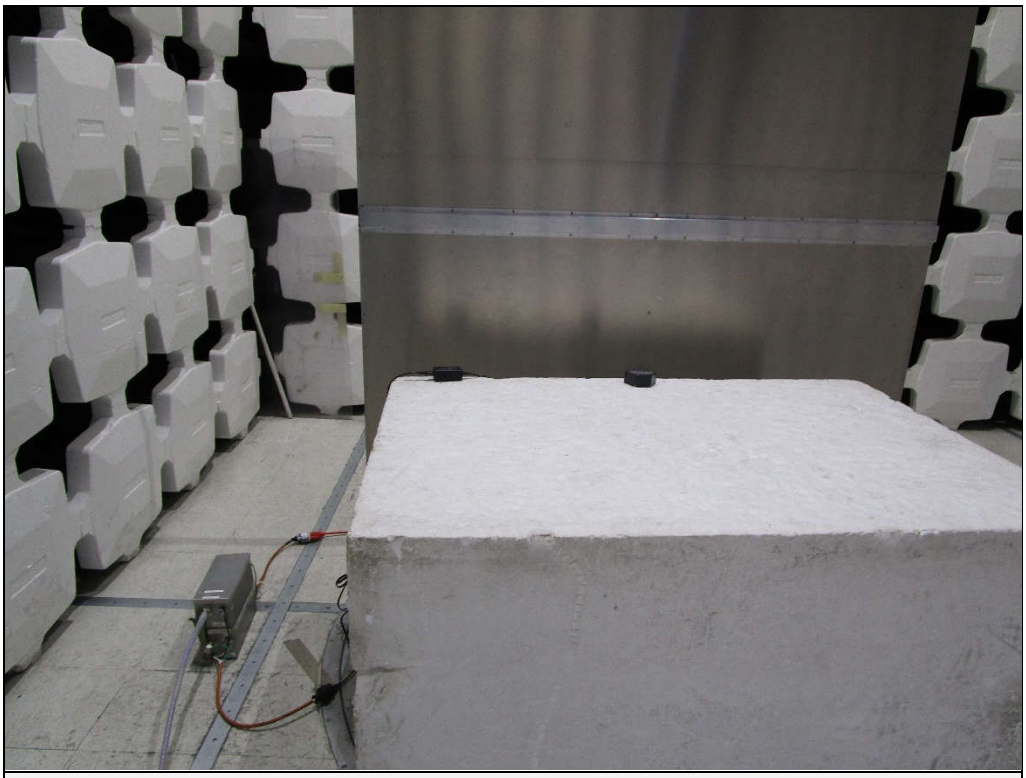
Test Site Information	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic
Test Site Used	Room 29
Note	N/A

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7

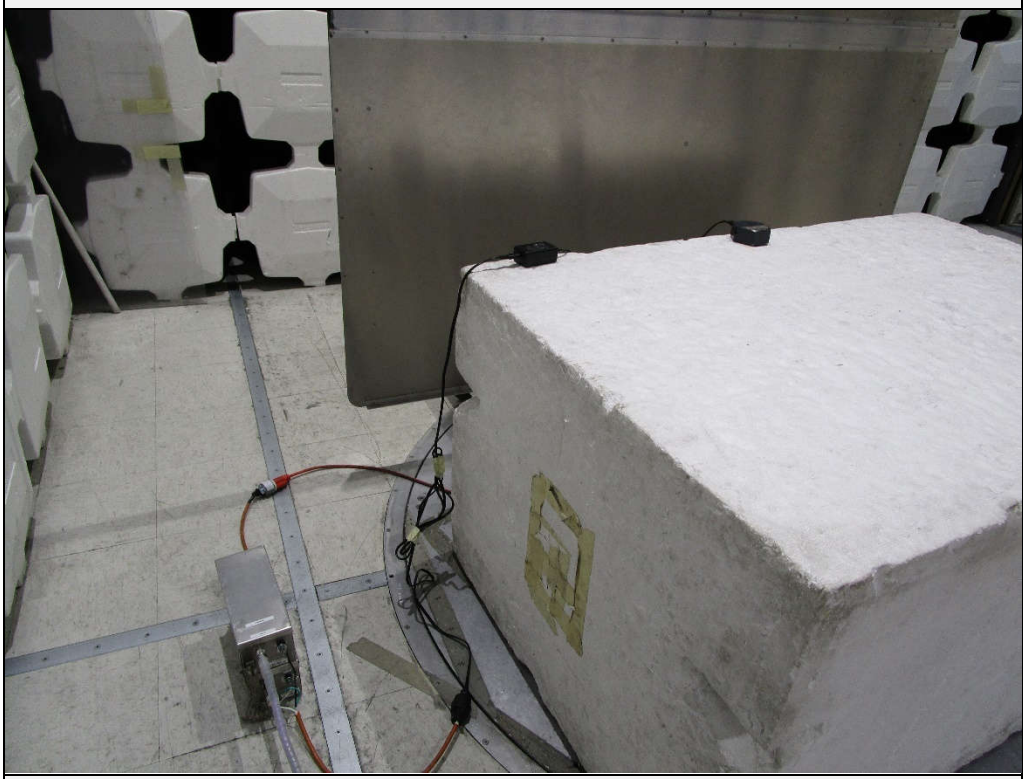
Requirements
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table.

Conducted Emissions Class B Limits		
Frequency (MHz)	Conducted limit (dBµV)	
	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.		

Procedure
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. 1) The EUT was operated in the LoRa Transmit at 903.0MHz, Bluetooth Transmit at 2480MHz mode. 2) Measurements were first made on the 120V, 60Hz high line of the CUI AC Adapter, M/N: SDI18-5-UD which was used to provide 5VDC to the EUT. 3) The frequency range from 150kHz to 30MHz was broken up into smaller frequency sub-bands. 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector. 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 3dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 3dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.) 6) Steps (4) and (5) 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 (dBµV) = MTR (dBµV) + CF (dB) 7) Steps (3) through (6) were repeated on the 120V, 60Hz return line of the CUI AC Adapter, M/N: SDI18-5-UD which was used to provide 5VDC to the EUT.



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)

FCC Part 15 Subpart C Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	Fastenal
Model	:	Repeater
DUT Revision	:	
Serial Number	:	
DUT Mode	:	LoRa Transmit at 903MHz, BLE Transmit at 2480MHz
Line Tested	:	120V, 60Hz High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Tested with CUI AC Adapter, M/N: SDI18-5-UD
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Feb 15, 2022 03:16:42 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 3 dB margin below limit

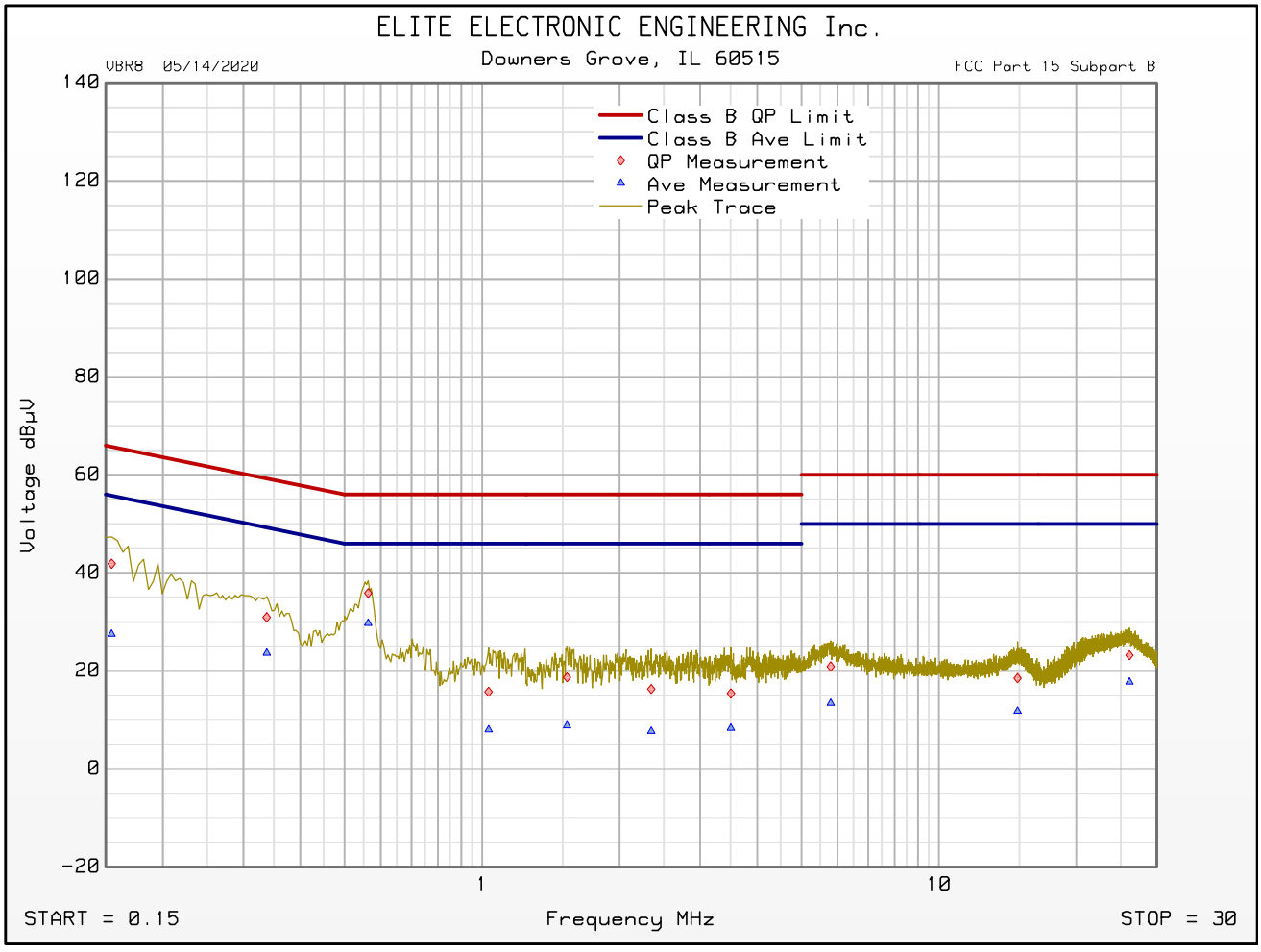
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.155	41.9	65.8		27.5	55.8	
0.338	30.9	59.3		23.6	49.3	
0.563	35.9	56.0		29.7	46.0	
1.033	15.7	56.0		8.0	46.0	
1.534	18.7	56.0		8.8	46.0	
2.345	16.3	56.0		7.7	46.0	
3.505	15.4	56.0		8.3	46.0	
5.797	20.9	60.0		13.4	50.0	
14.868	18.5	60.0		11.8	50.0	
26.137	23.2	60.0		17.7	50.0	

FCC Part 15 Subpart C Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	Fastenal
Model	:	Repeater
DUT Revision	:	
Serial Number	:	
DUT Mode	:	LoRa Transmit at 903MHz, BLE Transmit at 2480MHz
Line Tested	:	120V, 60Hz High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Tested with CUI AC Adapter, M/N: SDI18-5-UD
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Feb 15, 2022 03:16:42 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart C Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	Fastenal
Model	:	Repeater
DUT Revision	:	
Serial Number	:	
DUT Mode	:	LoRa Transmit at 903MHz, BLE Transmit at 2480MHz
Line Tested	:	120V, 60Hz Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Tested with CUI AC Adapter, M/N: SDI18-5-UD
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Feb 15, 2022 03:11:24 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 3 dB margin below limit

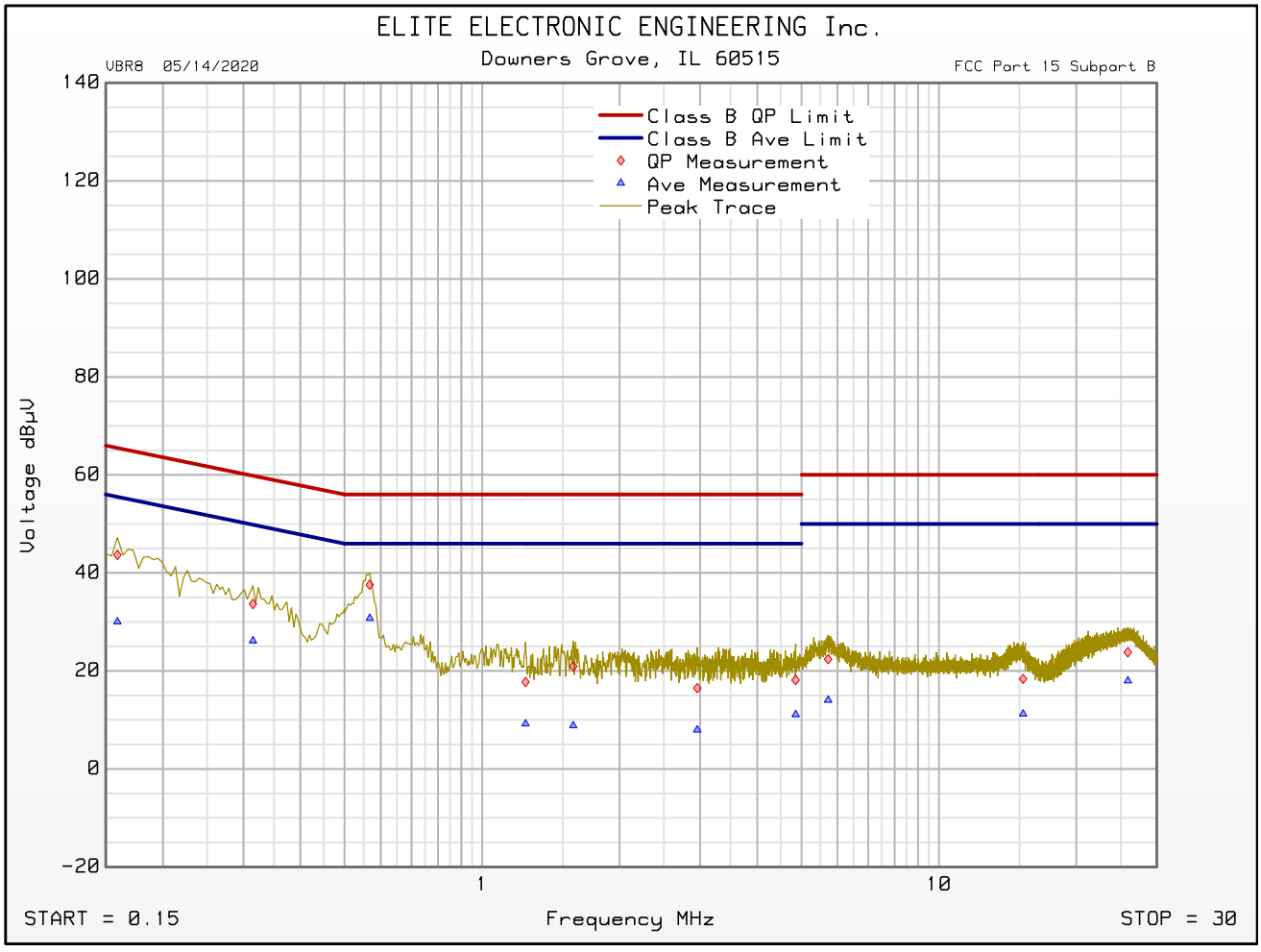
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.159	43.7	65.5		30.1	55.5	
0.315	33.7	59.8		26.2	49.8	
0.568	37.6	56.0		30.7	46.0	
1.245	17.7	56.0		9.2	46.0	
1.583	20.9	56.0		8.8	46.0	
2.957	16.5	56.0		8.0	46.0	
4.855	18.1	56.0		11.1	46.0	
5.720	22.4	60.0		14.1	50.0	
15.287	18.4	60.0		11.2	50.0	
25.916	23.8	60.0		18.0	50.0	

FCC Part 15 Subpart C Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	Fastenal
Model	:	Repeater
DUT Revision	:	
Serial Number	:	
DUT Mode	:	LoRa Transmit at 903MHz, BLE Transmit at 2480MHz
Line Tested	:	120V, 60Hz Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Tested with CUI AC Adapter, M/N: SDI18-5-UD
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Feb 15, 2022 03:11:24 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

21. Module Integration – Emissions Test

EUT Information	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Mode	LoRa Transmit at 903.0MHz LoRa Transmit at 907.8MHz LoRa Transmit at 914.2MHz Bluetooth Transmit at 2402MHz Bluetooth Transmit at 2440MHz Bluetooth Transmit at 2480MHz LoRa Transmit at 903.0MHz, Bluetooth Transmit at 2480MHz

Test Site Information	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
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
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Requirements
Per KDB 996369, section 3.0, testing of the host product with all the transmitters installed is recommended, to verify that the host product meets all the applicable FCC rules. The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. EIRP: Per FCC 15.247, Section (b)(3), for systems using digital modulation, the maximum peak conducted output power shall not exceed 1 watt. Per FCC 15.247, Section (b)(4), the conducted output power limit is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. Spurious Radiated Emissions: Per FCC 15.247(d) in any 100 kHz 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 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in §15.209(a) is not required. Radiated emissions which fall in the restricted bands, as defined in FCC 15.205, Section (a), must comply with the radiated emission limits specified in FCC 15.209, Section (a).

Procedures
Radiated measurements 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 and anechoic absorber material is installed over the ferrite tiles. 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. Peak EIRP (below 1GHz): The EUT was placed on an 80cm high non-conductive stand and set to transmit. A bilog antenna was placed at a test distance of 3 meters from the EUT. a) The following settings were employed on the EMI Test Receiver: 1) Center Frequency = Transmit frequency of EUT 2) Span ≥ 3 x RBW 3) RBW ≥ DTS Bandwidth 4) VBW ≥ 3 x RBW 5) Number of points in sweep ≥ (2 x span /RBW) 6) Sweep time = Auto 7) Detector = Peak 8) Trace = Max hold

b) Allow trace to stabilize
c) Use peak marker function to determine the peak amplitude level.

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 and antenna gain.

Peak EIRP (above 1GHz):

The EUT was placed on a 1.5-meter-high non-conductive stand and set to transmit. A double ridged waveguide antenna was placed at a test distance of 3 meters from the EUT.

a) The following settings were employed on the EMI Test Receiver:

1)	Center Frequency	= Transmit frequency of EUT
2)	Span	≥ 3 x RBW
3)	RBW	≥ DTS Bandwidth
4)	VBW	≥ 3 x RBW
5)	Number of points in sweep	≥ (2 x span /RBW)
6)	Sweep time	= Auto
7)	Detector	= Peak
8)	Trace	= Max hold

b) Allow trace to stabilize
c) Use peak marker function to determine the peak amplitude level.

The equivalent power was determined using equation G.1 in C63.10 to convert field intensity levels measured at 3 meters into EIRP readings.

Spurious Radiated Emissions:

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 frequency range from 30MHz to 18.0GHz was investigated using a peak detector function.

The final emission tests were then manually performed over the frequency range of 30MHz to 18.0GHz.

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 double ridged waveguide antenna (bilog antenna for the 902-928MHz range). The waveguide antenna (bilog antenna for the 902-928MHz range) was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5 meter high (80cm high for 902 – 928MHz range) non-conductive stand. 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. The EUT was placed on a 1.5-meter-high non-conductive stand. 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 20dB 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 1GHz were measured using a bi-log antenna. The bilog antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.

b) The field strengths of all emissions above 1GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 1MHz 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.

d) For all radiated emissions measurements below 1GHz, 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 1GHz, 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 20dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1GHz must be no greater than 20dB above the limits specified in §15.209(a).

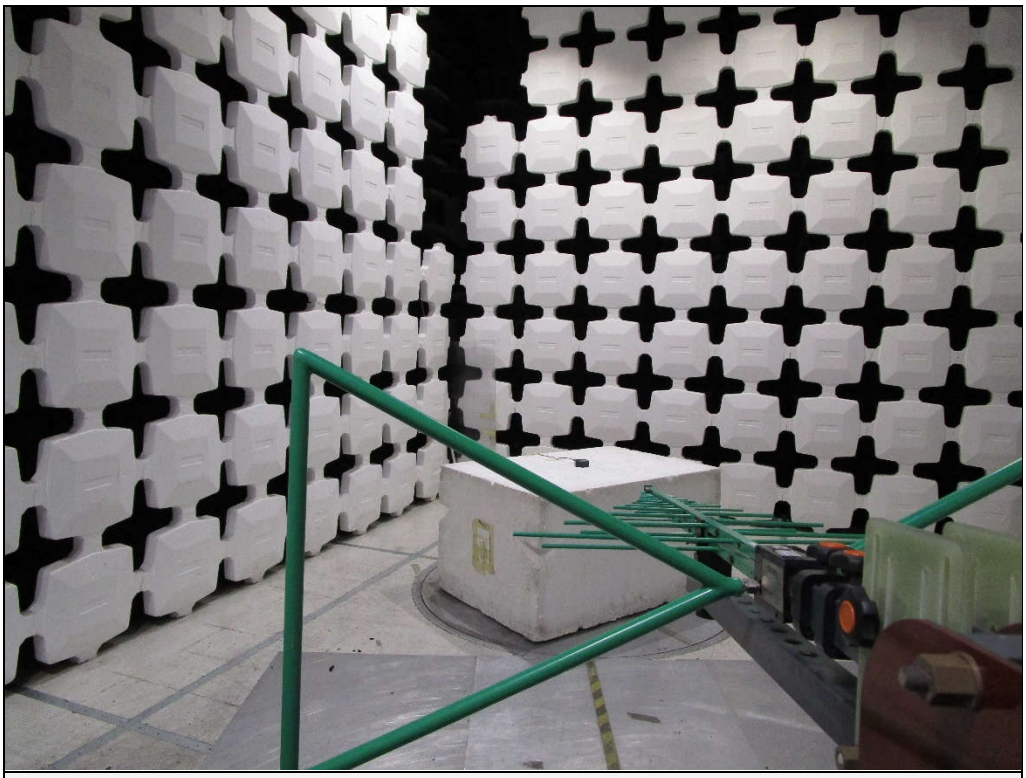
f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector and an average reading was taken.

Intermodulation Case Spurious Radiated Emissions:

The frequency range from 30MHz to 18GHz was investigated using a peak detector function. If any intermodulation products were found during the preliminary radiated emissions sweeps, the emissions at that frequency were maximized using the following techniques:

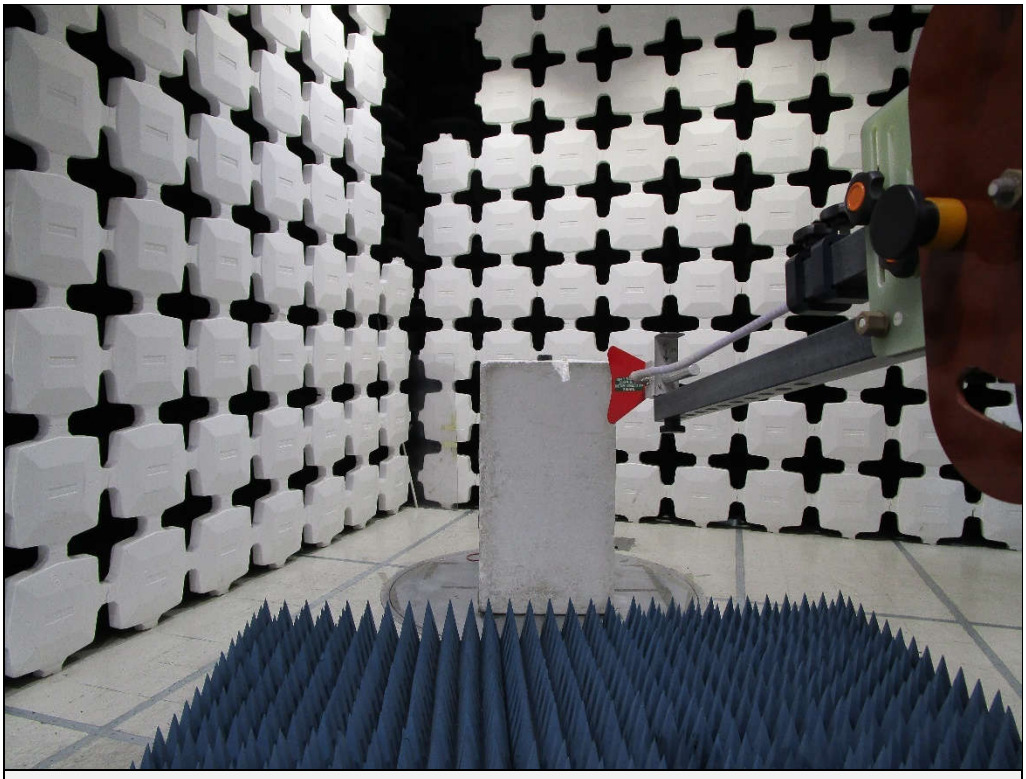
i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

All measured intermodulation products must meet the least stringent emissions limits that are applicable to the EUT. If no intermodulation products are detected, the EUT is considered to have met the intermodulation case spurious radiated emissions requirements for all applicable standards.

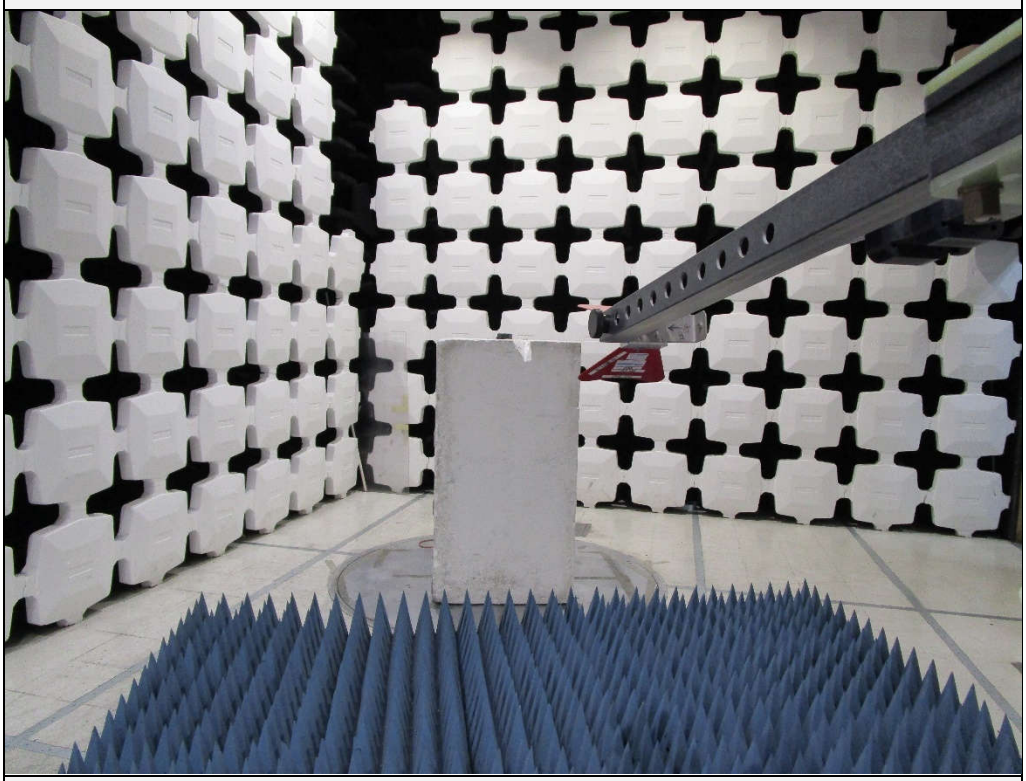


Test Setup for Spurious Emissions: 30MHz to 1GHz, Horizontal Polarization

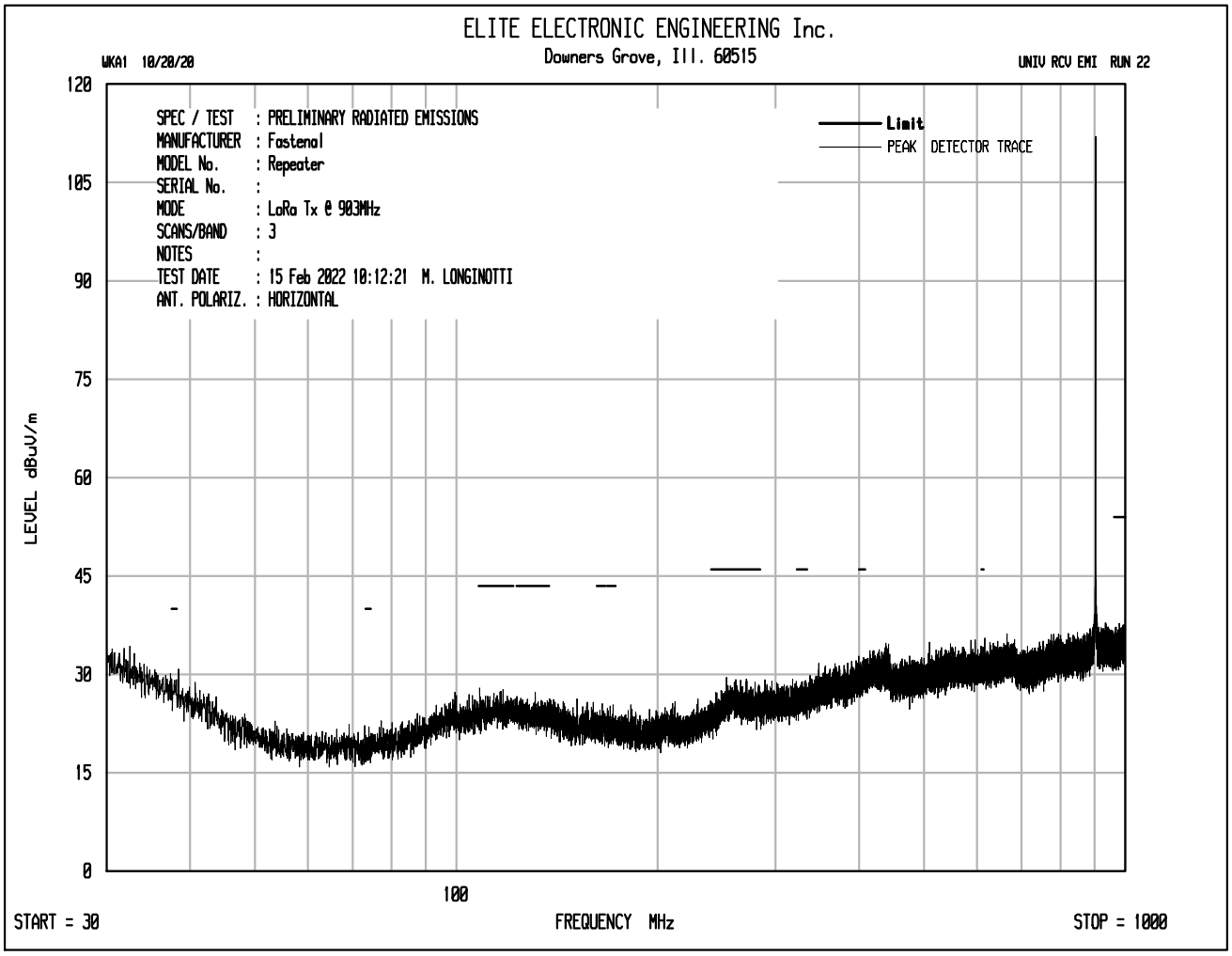
Test Setup for Spurious Emissions: 30MHz to 1GHz, Vertical Polarization

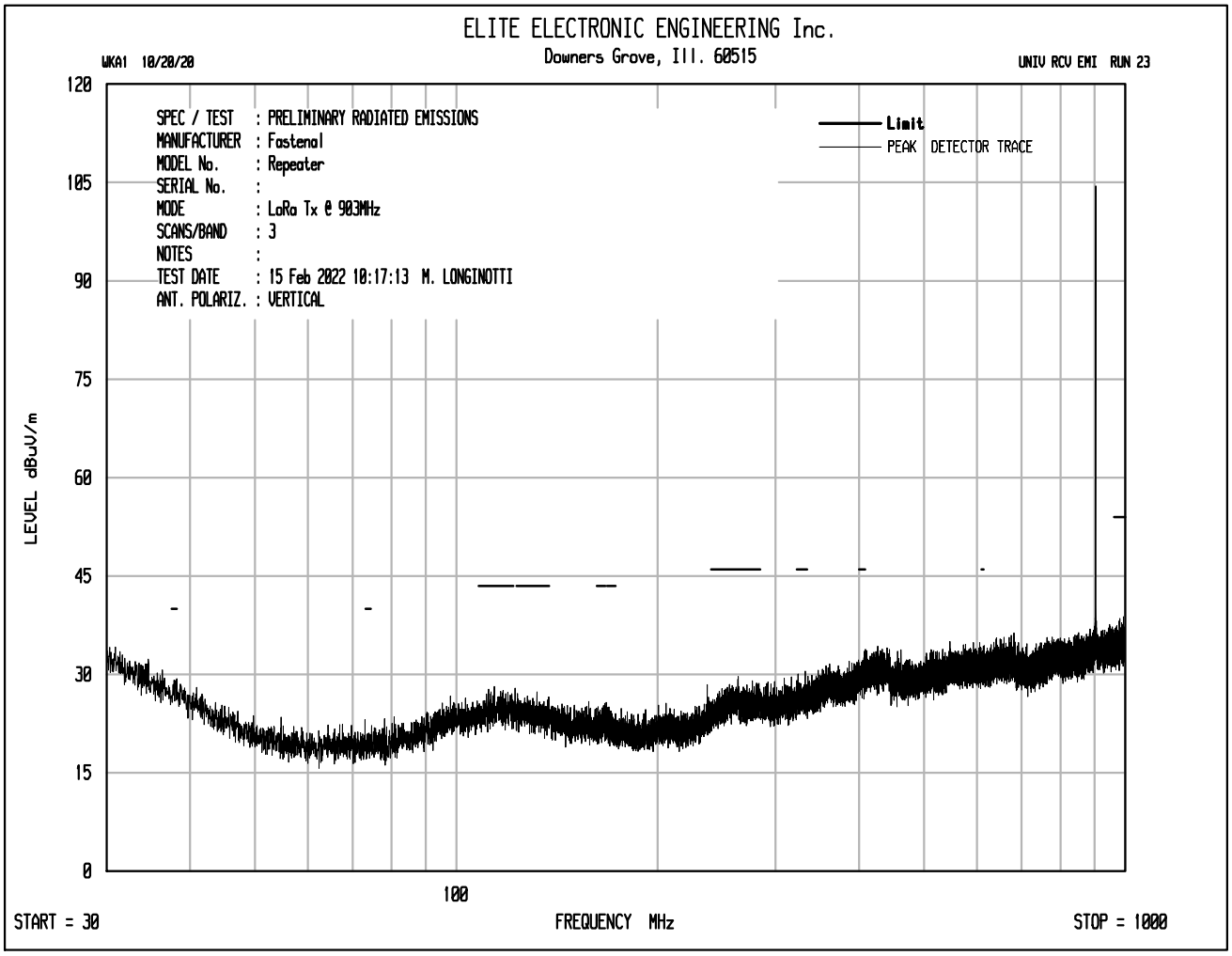


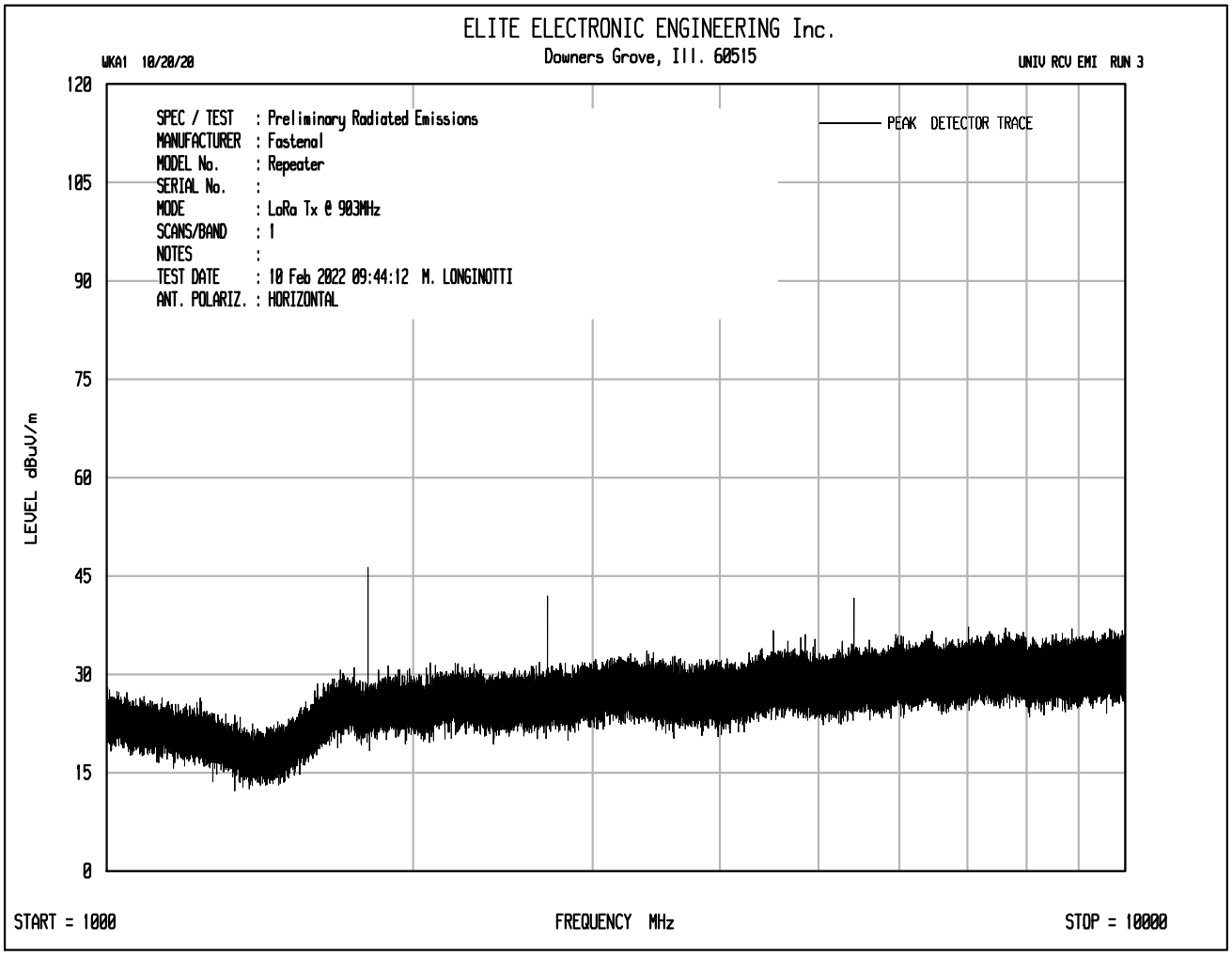
Test Setup for Spurious Emissions: Above 1GHz, Horizontal Polarization

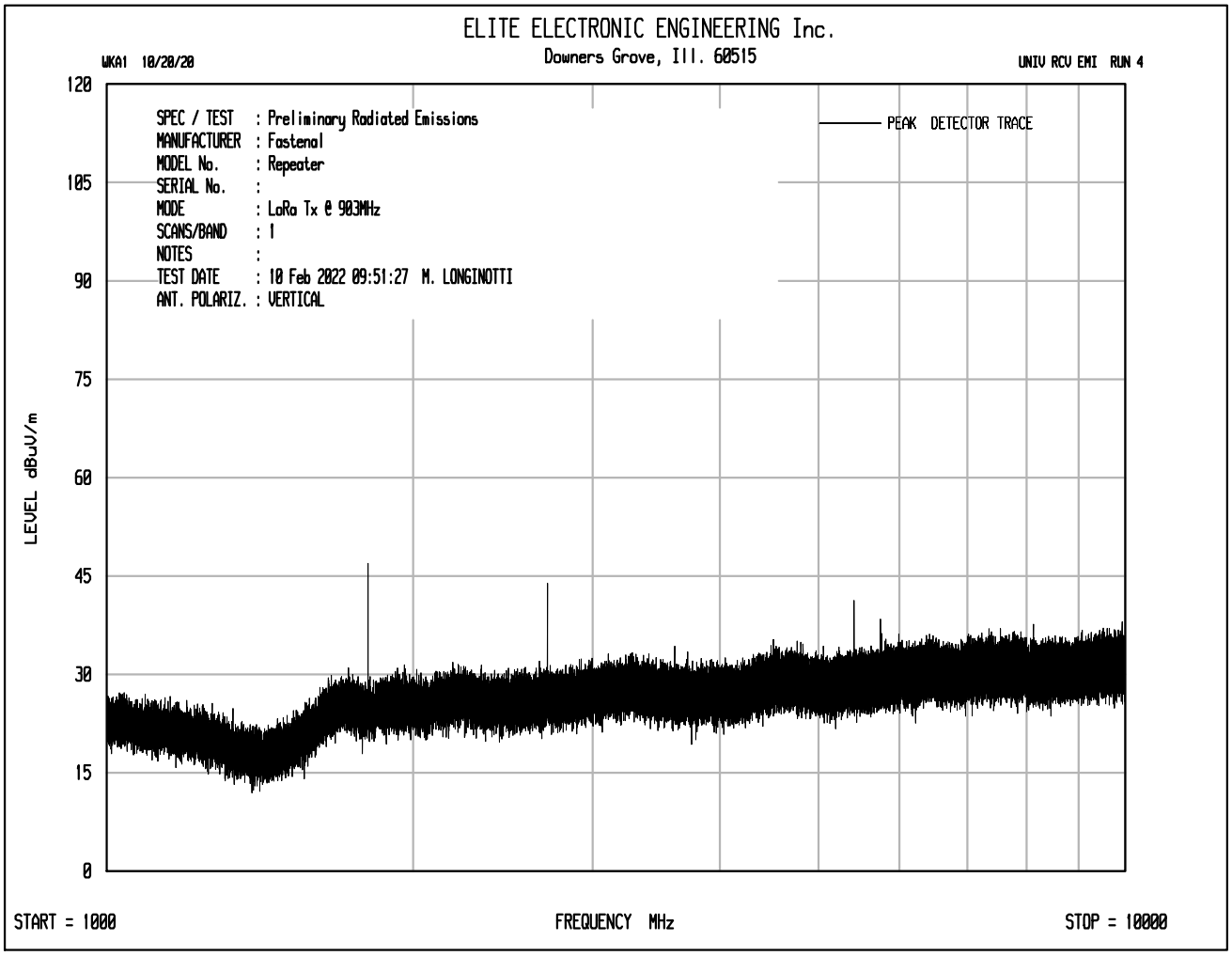


Test Setup for Spurious Emissions: Above 1GHz, Vertical Polarization


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 22
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 903MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 10:12:21 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 23
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 903MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 10:17:13 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 3
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 903MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Feb 2022 09:44:12 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 4
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 903MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Feb 2022 09:51:27 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Peak EIRP
Mode	LoRa Transmit at 903.0MHz
Frequency Tested	903MHz
Notes	Power Setting = 18.5dBm

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
903.00	H	84.2	15.0	2.2	2.0	15.1	36.0	-20.9
	V	76.6	8.1	2.2	2.0	8.2	36.0	-27.8

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Case Spurious Emissions
Mode	LoRa Transmit at 903.0MHz
Frequency Tested	903MHz
Notes	Power Setting = 18.5dBm

Spurious Emissions in the Restricted Bands - Peak

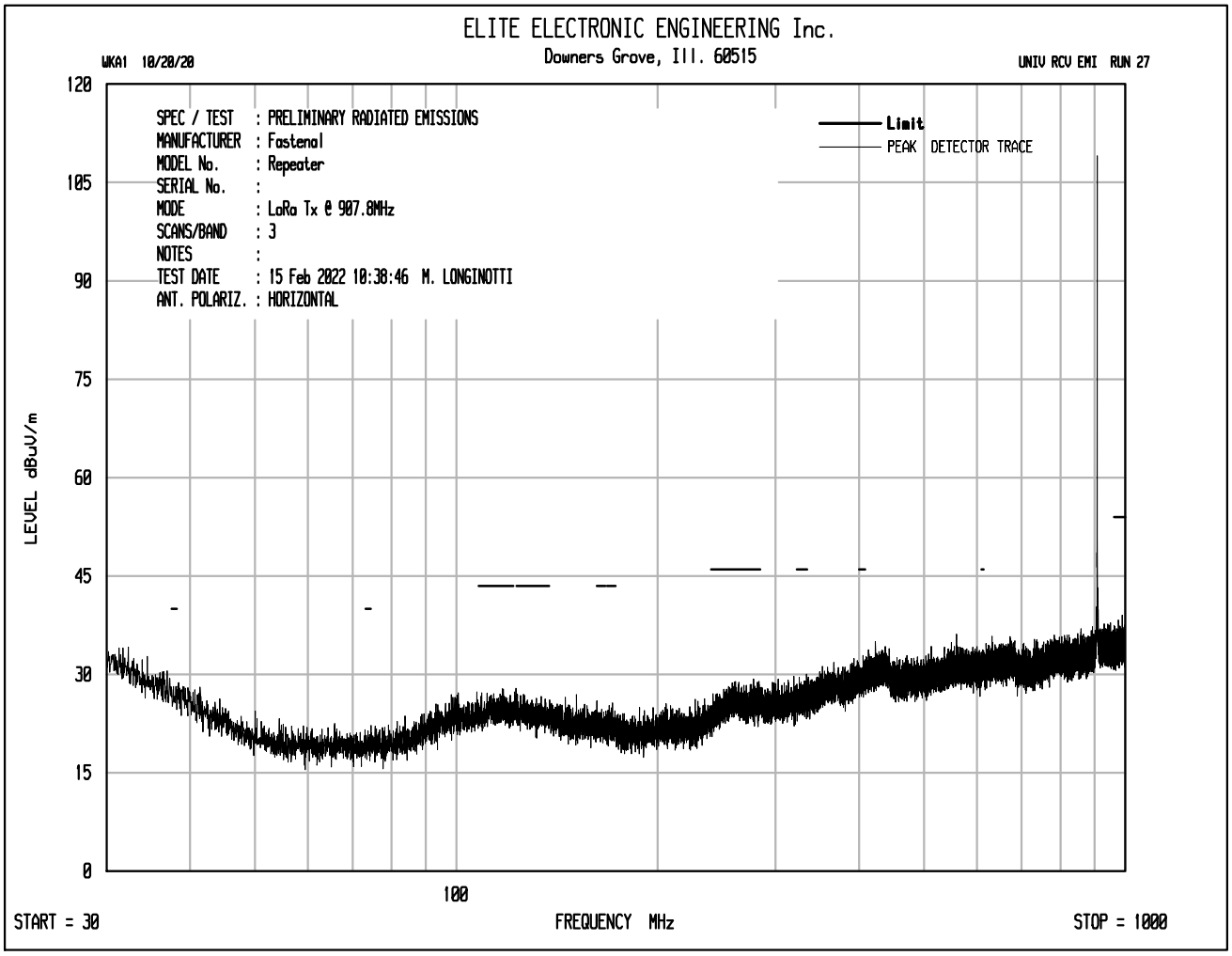
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
2709.00	H	55.0		2.8	33.4	-40.2	51.0	355.4	5000.0	-23.0
	V	55.8		2.8	33.4	-40.2	51.8	389.7	5000.0	-22.2
3612.00	H	49.7		3.2	34.6	-39.5	48.0	252.2	5000.0	-25.9
	V	50.0		3.2	34.6	-39.5	48.3	261.1	5000.0	-25.6
4515.00	H	50.5		3.6	36.0	-39.6	50.5	333.3	5000.0	-23.5
	V	50.4		3.6	36.0	-39.6	50.4	329.5	5000.0	-23.6
5418.00	H	51.1		3.9	36.6	-39.5	52.1	403.9	5000.0	-21.9
	V	50.2		3.9	36.6	-39.5	51.2	364.2	5000.0	-22.8
8127.00	H	47.5	Ambient	4.9	38.3	-39.6	51.1	360.4	5000.0	-22.8
	V	49.2		4.9	38.3	-39.6	52.8	438.3	5000.0	-21.1
9030.00	H	47.9	Ambient	5.0	38.6	-39.4	52.1	401.0	5000.0	-21.9
	V	47.7	Ambient	5.0	38.6	-39.4	51.9	391.9	5000.0	-22.1

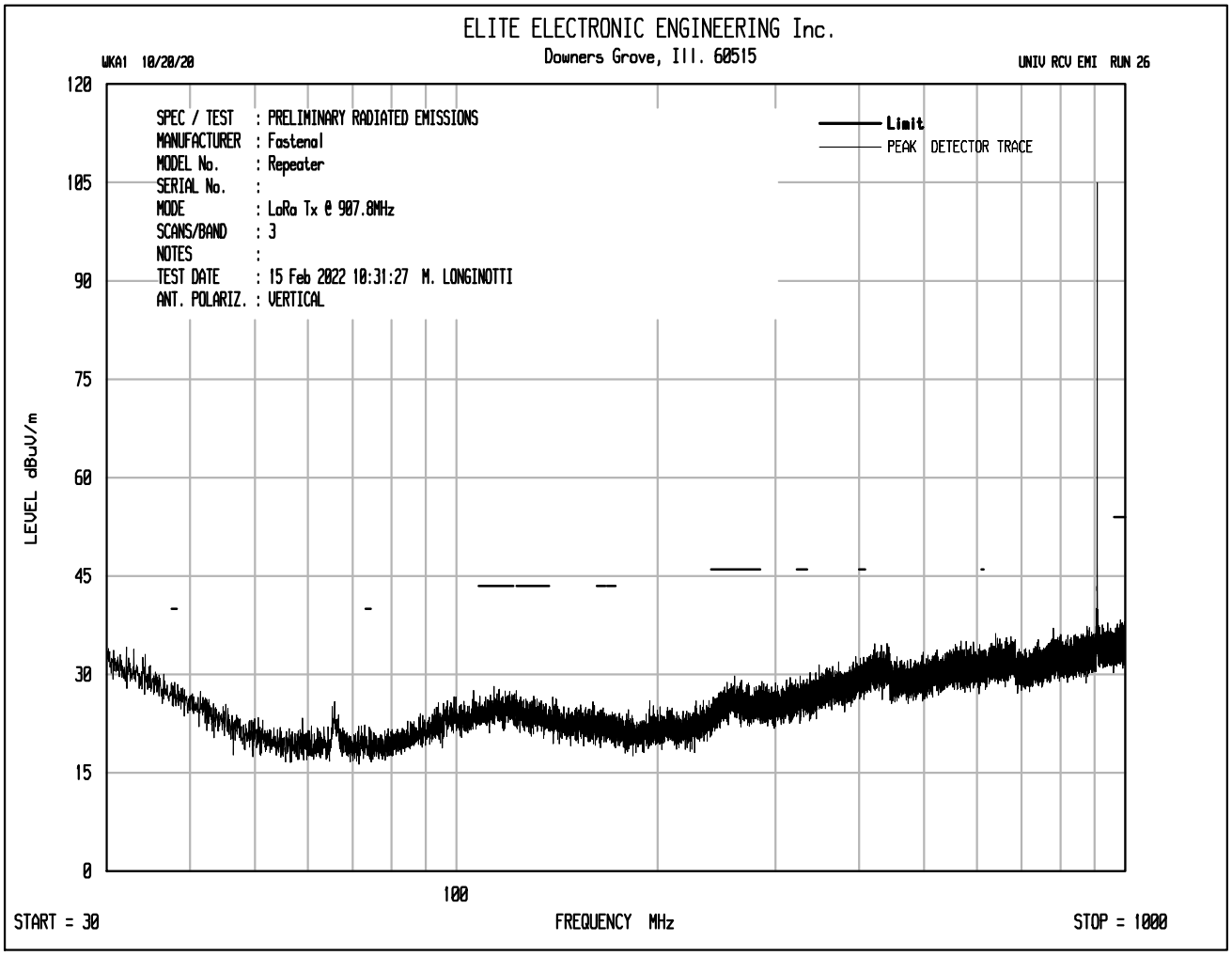
Note: Since all peak readings were below the average limit, no average readings were taken.

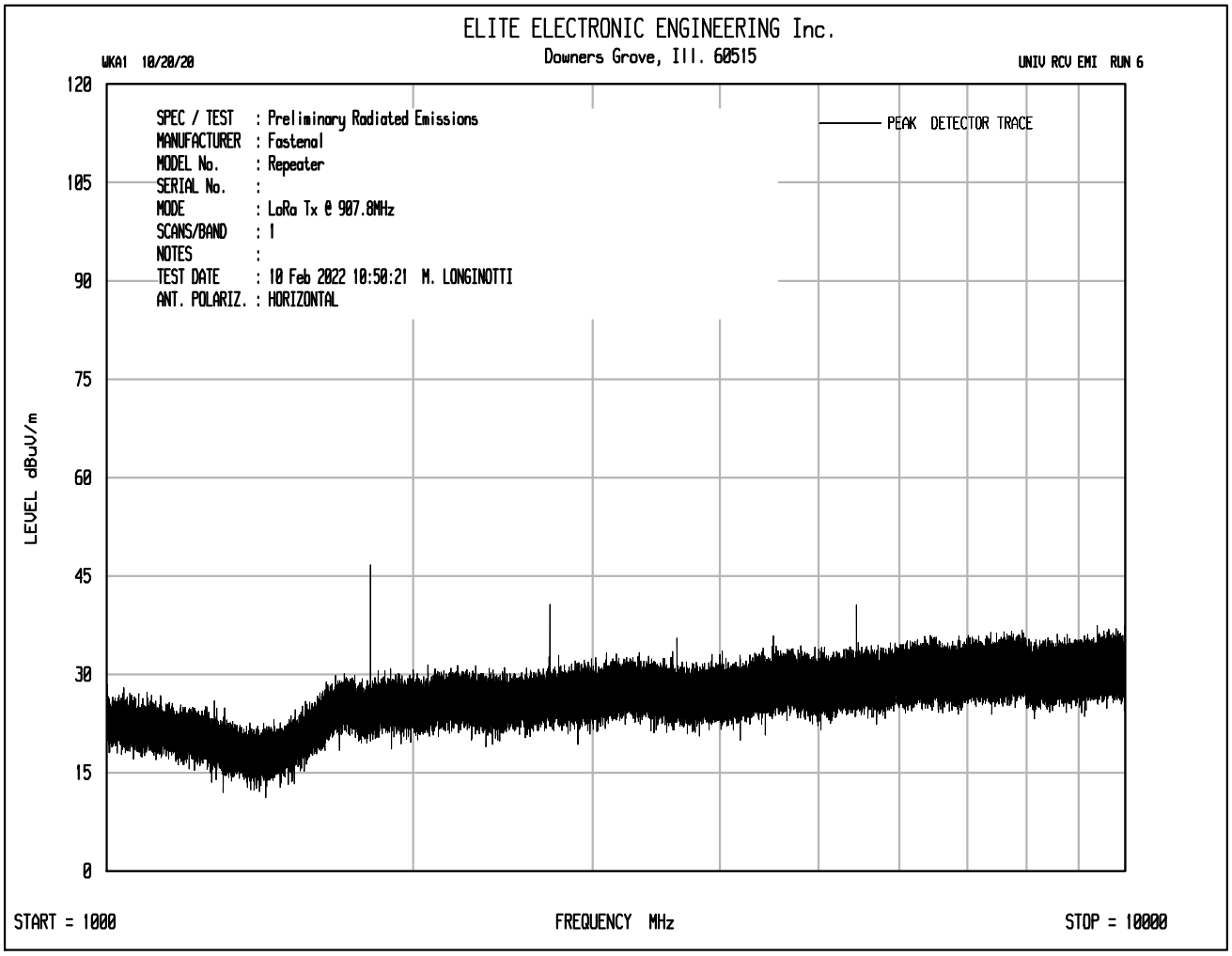
Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Case Spurious Emissions
Mode	LoRa Transmit at 903.0MHz
Frequency Tested	903MHz
Notes	Power Setting = 18.5dBm

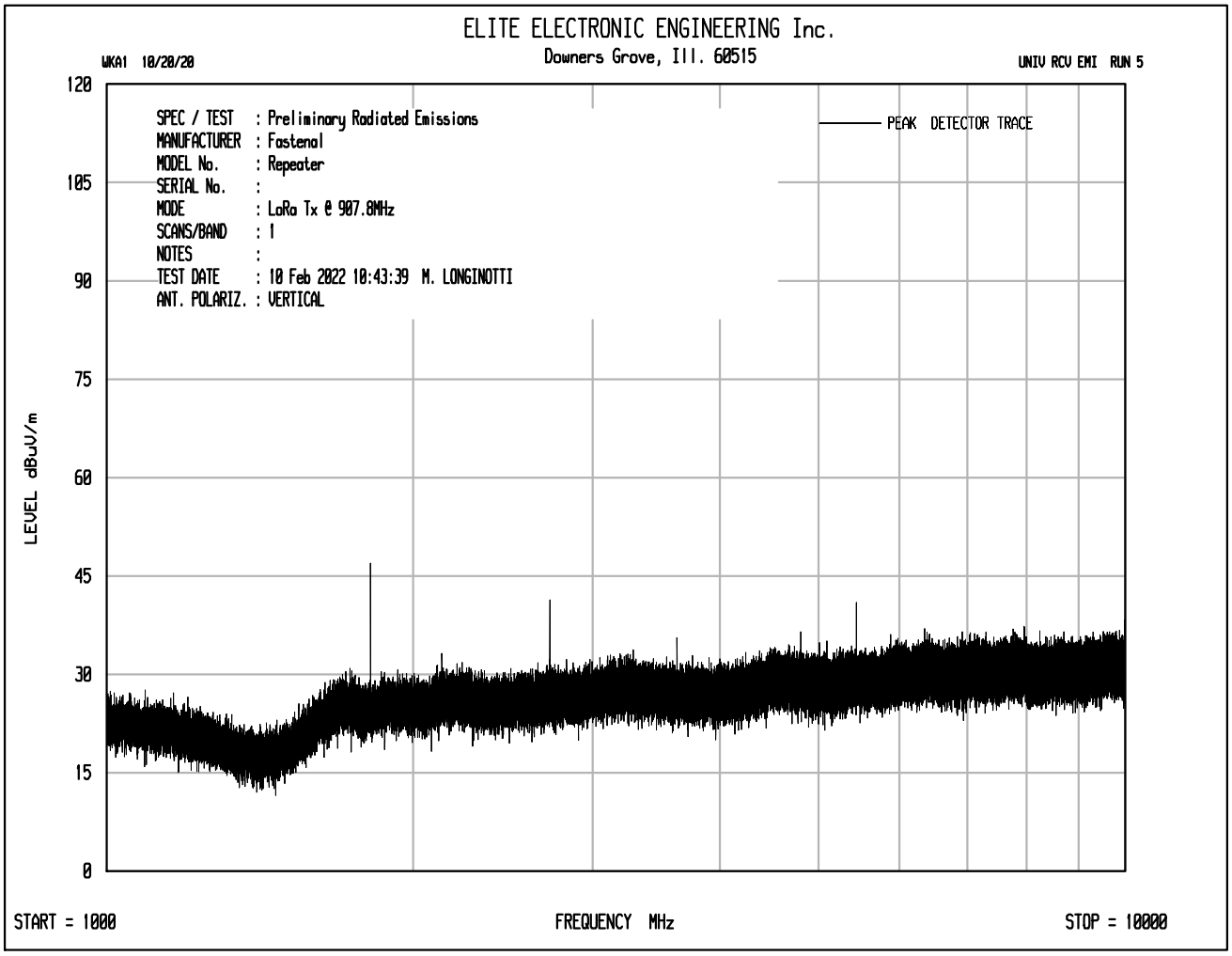
Spurious Emissions not in the Restricted Bands - Peak

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
903.00	H	84.10		1.6	26.5	0.0	112.1	402811.1	NA	NA
	V	76.50		1.6	26.5	0.0	104.5	167919.6	NA	NA
1806.00	H	54.50		2.2	31.5	-40.1	48.1	254.5	40281.1	-44.0
	V	55.70		2.2	31.5	-40.1	49.3	292.2	40281.1	-42.8
6321.00	H	45.00		4.3	38.1	-39.6	47.8	245.4	40281.1	-44.3
	V	43.10		4.3	38.1	-39.6	45.9	197.2	40281.1	-46.2
7224.00	H	40.40		4.6	38.4	-39.7	43.8	154.2	40281.1	-48.3
	V	41.50		4.6	38.4	-39.7	44.9	175.1	40281.1	-47.2


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 27
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 907.8MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 10:38:46 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 26
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 907.8MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 10:31:27 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 6
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 907.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Feb 2022 10:50:21 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 5
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 907.8MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Feb 2022 10:43:39 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Peak EIRP
Mode	LoRa Transmit at 907.8MHz
Frequency Tested	907.8MHz
Notes	Power Setting = 18.5dBm

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
907.80	H	81.4	12.0	2.2	2.0	12.1	36.0	-23.9
	V	77.2	8.8	2.2	2.0	8.9	36.0	-27.1

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Case Spurious Emissions
Mode	LoRa Transmit at 907.8MHz
Frequency Tested	907.8MHz
Notes	Power Setting = 18.5dBm

Spurious Emissions in the Restricted Bands - Peak

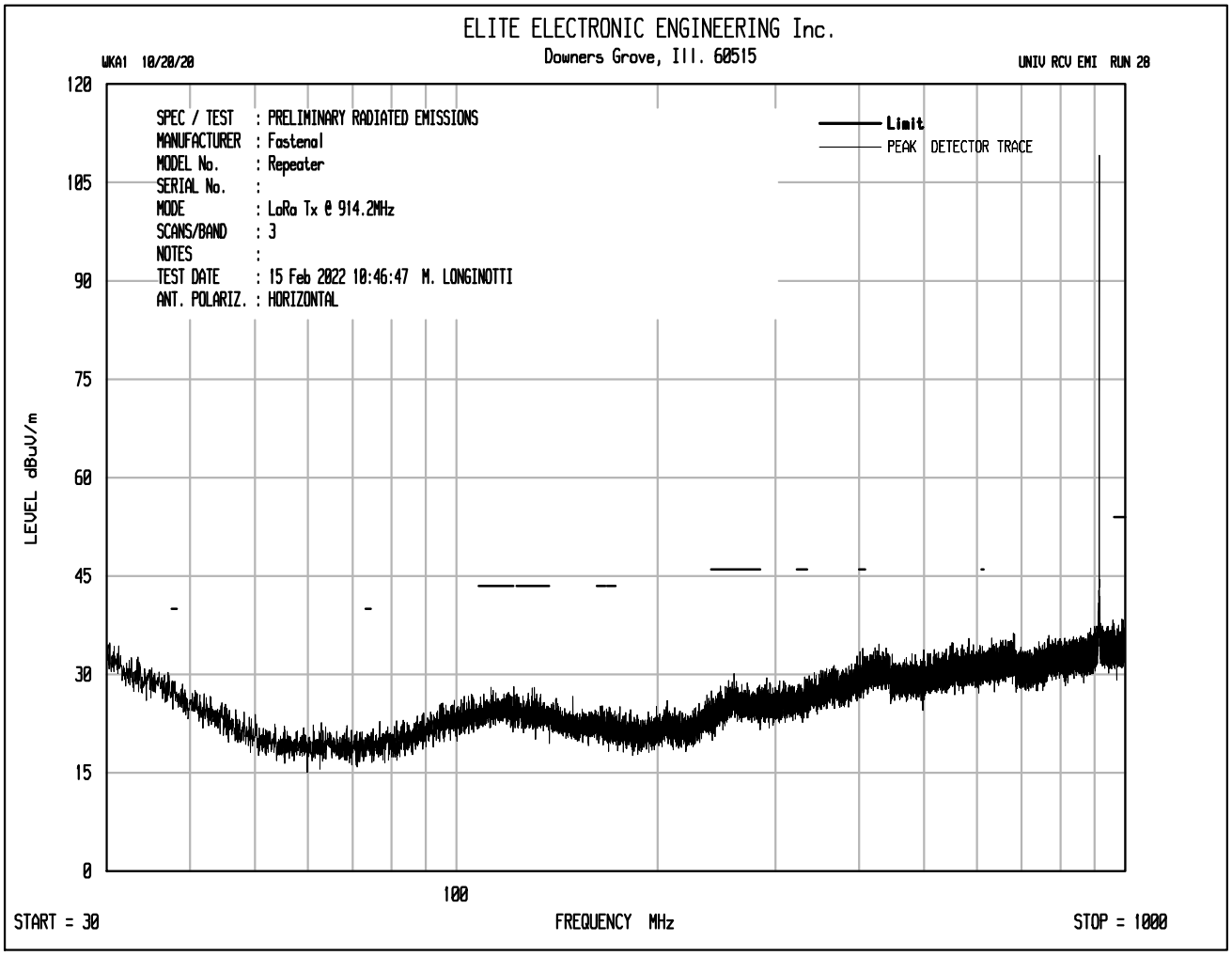
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
2723.40	H	55.0		2.8	33.3	-40.2	50.9	352.5	5000.0	-23.0
	V	55.2		2.8	33.3	-40.2	51.1	360.7	5000.0	-22.8
3631.20	H	50.0		3.2	34.8	-39.6	48.4	264.5	5000.0	-25.5
	V	49.6		3.2	34.8	-39.6	48.0	252.6	5000.0	-25.9
4539.00	H	50.7		3.6	36.2	-39.6	51.0	353.1	5000.0	-23.0
	V	50.1		3.6	36.2	-39.6	50.4	329.5	5000.0	-23.6
5446.80	H	51.6		3.9	36.6	-39.4	52.7	431.8	5000.0	-21.3
	V	50.6		3.9	36.6	-39.4	51.7	384.9	5000.0	-22.3
7262.40	H	49.0	Ambient	4.7	38.3	-39.7	52.3	411.7	5000.0	-21.7
	V	48.3	Ambient	4.7	38.3	-39.7	51.6	379.8	5000.0	-22.4
8170.20	H	47.7	Ambient	4.9	38.3	-39.6	51.4	373.1	5000.0	-22.5
	V	47.7	Ambient	4.9	38.3	-39.6	51.4	373.1	5000.0	-22.5
9078.00	H	47.6	Ambient	5.0	38.6	-39.4	51.8	389.4	5000.0	-22.2
	V	47.5	Ambient	5.0	38.6	-39.4	51.7	384.9	5000.0	-22.3

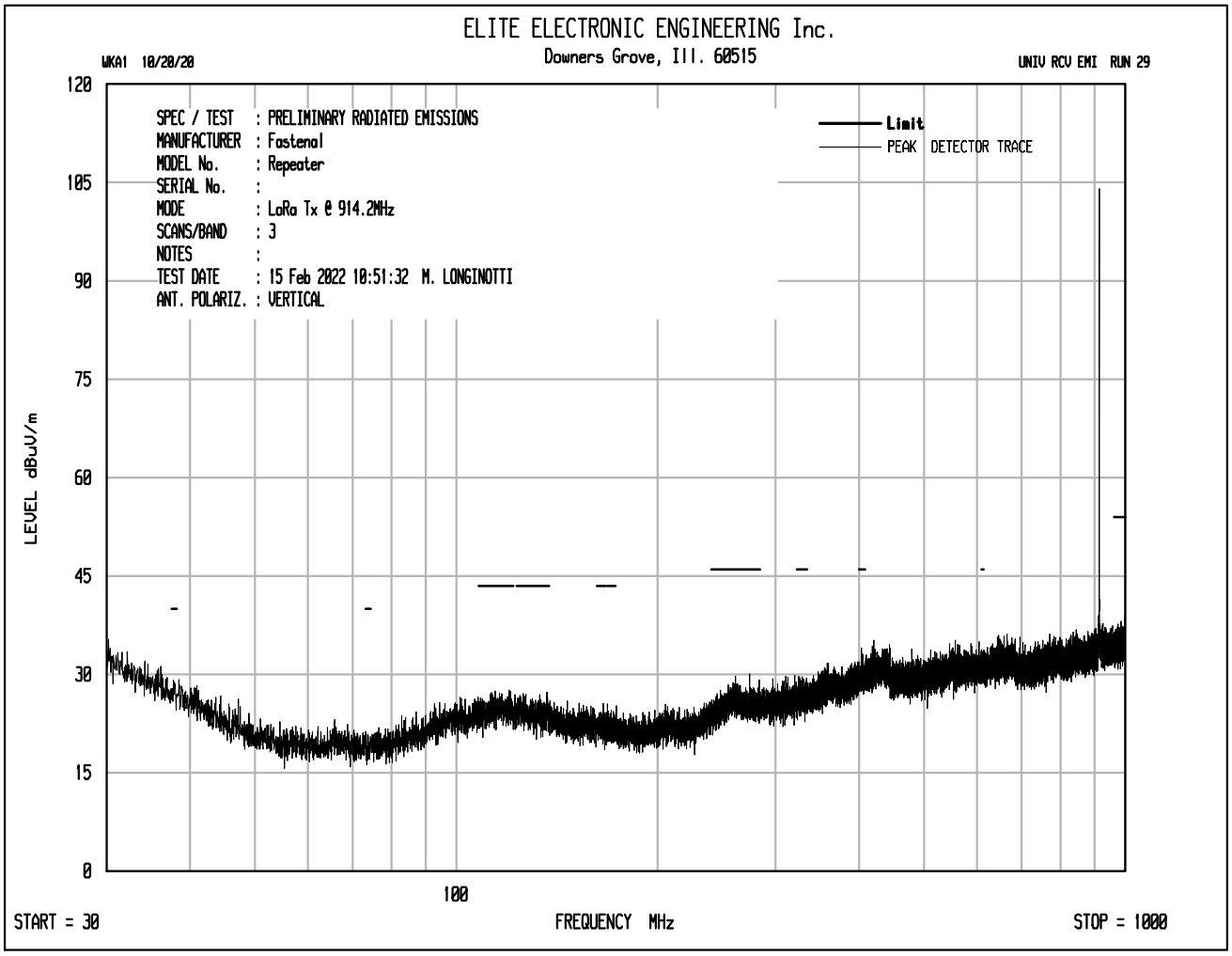
Note: Since all peak readings were below the average limit, no average readings were taken.

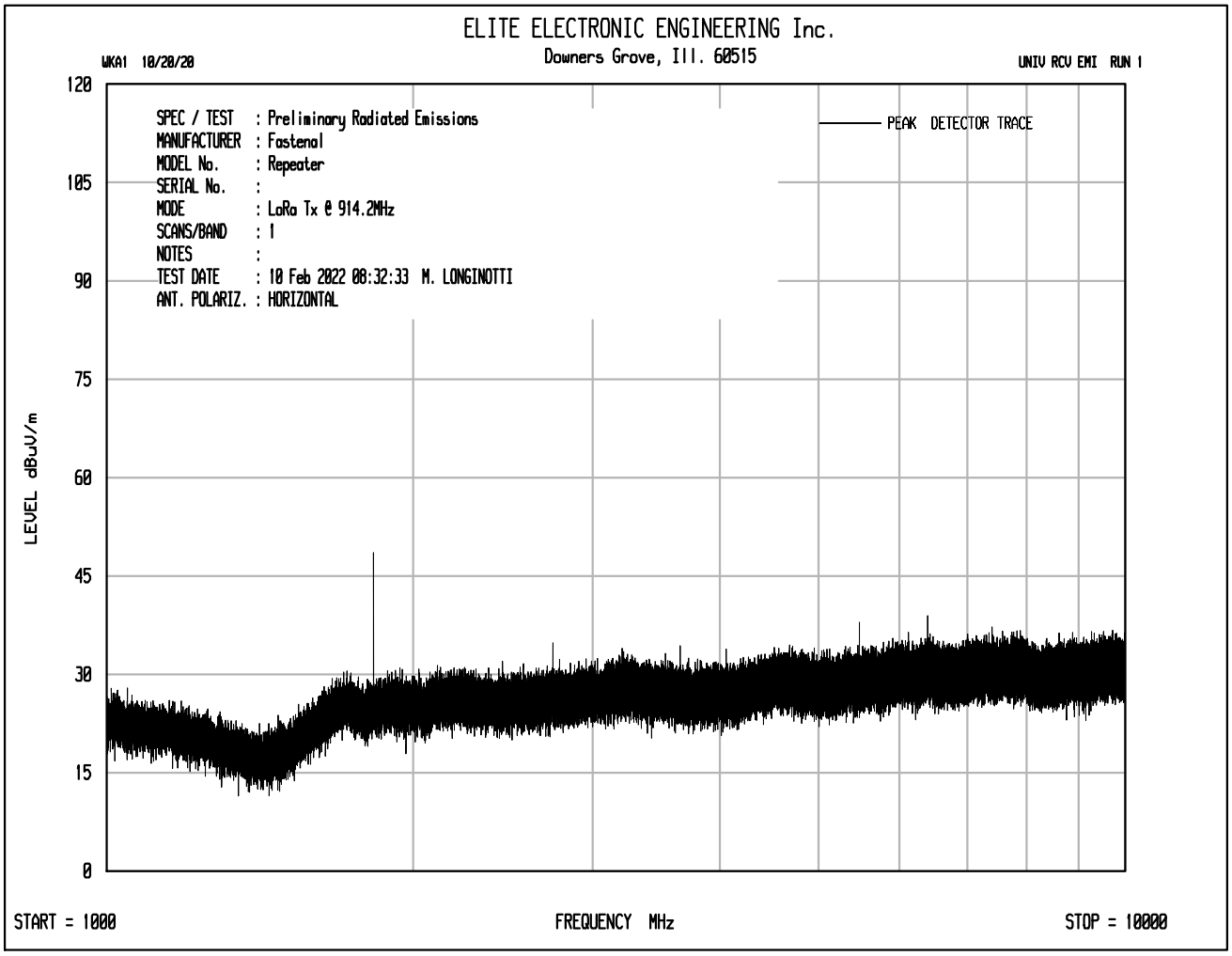
Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Case Spurious Emissions
Mode	LoRa Transmit at 907.8MHz
Frequency Tested	907.8MHz
Notes	Power Setting = 18.5dBm

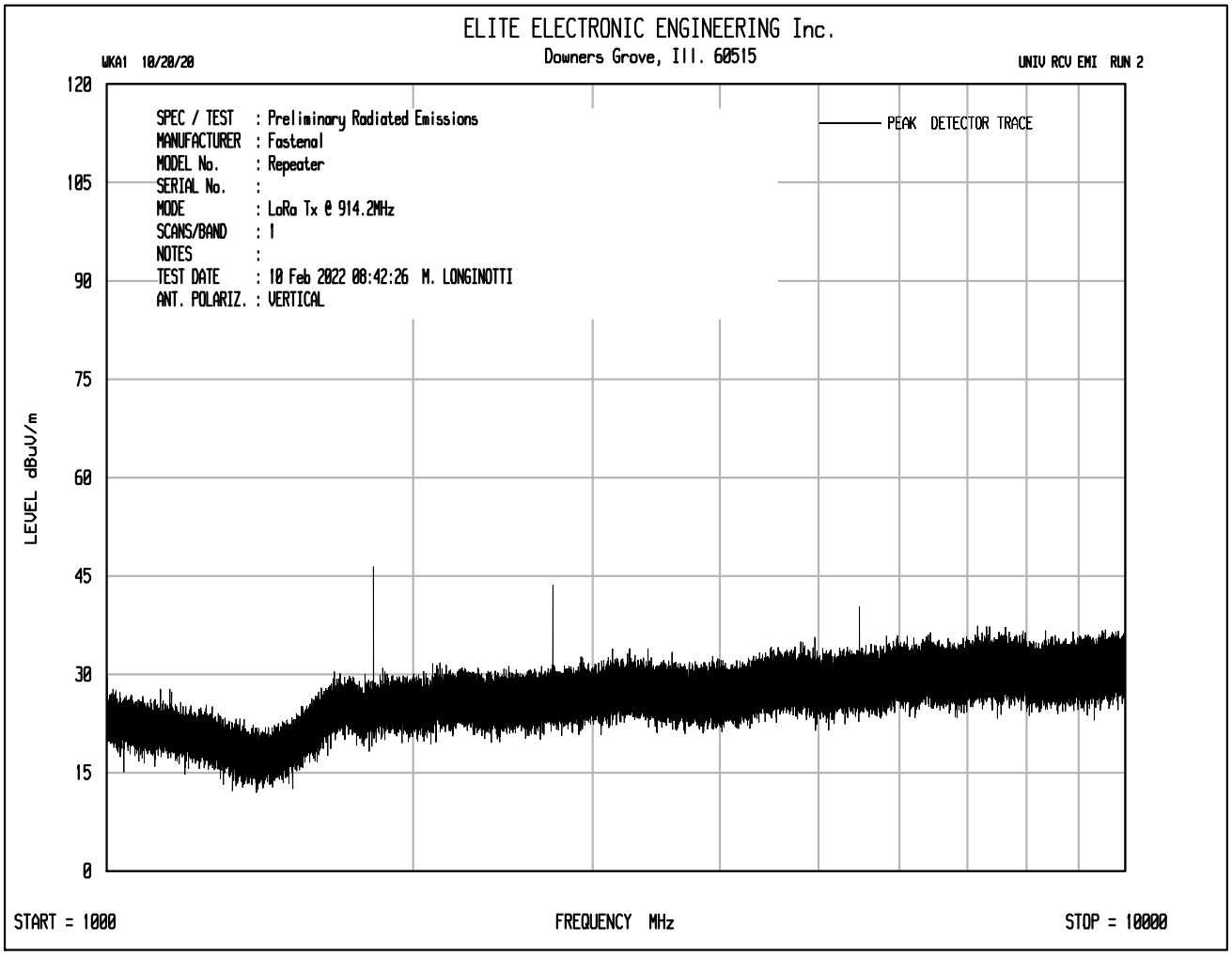
Spurious Emissions not in the Restricted Bands - Peak

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
907.80	H	81.20		1.6	26.3	0.0	109.1	285231.6	NA	NA
	V	77.10		1.6	26.3	0.0	105.0	177908.9	NA	NA
1815.60	H	55.00		2.2	31.6	-40.1	48.7	272.1	28523.2	-40.4
	V	54.90		2.2	31.6	-40.1	48.6	269.0	28523.2	-40.5
6354.60	H	42.90		4.3	38.0	-39.5	45.7	193.3	28523.2	-43.4
	V	43.80		4.3	38.0	-39.5	46.6	214.4	28523.2	-42.5


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 28
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 914.2MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 10:46:47 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 29
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 914.2MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 10:51:32 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 1
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 914.2MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Feb 2022 08:32:33 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 2
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : LoRa Tx @ 914.2MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 10 Feb 2022 08:42:26 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Peak EIRP
Mode	LoRa Transmit at 914.2MHz
Frequency Tested	914.2MHz
Notes	Power Setting = 18.5dBm

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
914.20	H	81.5	11.8	2.2	2.1	11.9	36.0	-24.1
	V	76.4	8.4	2.2	2.1	8.5	36.0	-27.5

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Case Spurious Emissions
Mode	LoRa Transmit at 914.2MHz
Frequency Tested	914.2MHz
Notes	Power Setting = 18.5dBm

Spurious Emissions in the Restricted Bands - Peak

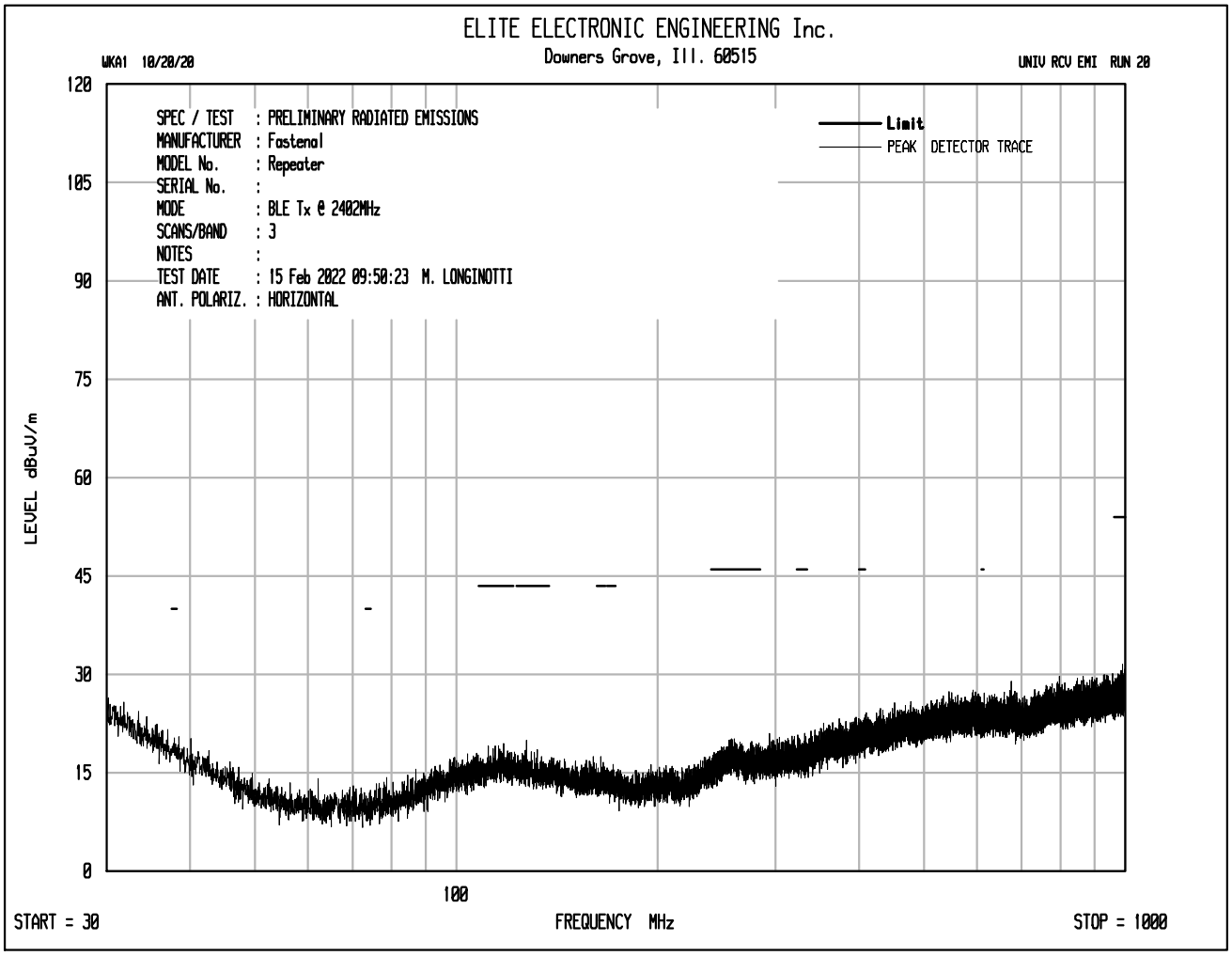
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
2742.60	H	54.9		2.8	33.2	-40.2	50.8	344.8	5000.0	-23.2
	V	54.7		2.8	33.2	-40.2	50.6	336.9	5000.0	-23.4
3656.80	H	50.3		3.3	34.8	-39.6	48.8	276.4	5000.0	-25.1
	V	49.2		3.3	34.8	-39.6	47.7	243.5	5000.0	-26.2
4571.00	H	50.9	Ambient	3.6	36.4	-39.7	51.2	362.2	5000.0	-22.8
	V	51.1	Ambient	3.6	36.4	-39.7	51.4	370.7	5000.0	-22.6
7313.60	H	49.1		4.7	38.2	-39.6	52.4	414.7	5000.0	-21.6
	V	49.1	Ambient	4.7	38.2	-39.6	52.4	414.7	5000.0	-21.6
8227.80	H	48.6	Ambient	4.9	38.4	-39.5	52.4	416.7	5000.0	-21.6
	V	47.7	Ambient	4.9	38.4	-39.5	51.5	375.7	5000.0	-22.5
9142.00	H	48.6	Ambient	5.0	38.7	-39.4	52.9	442.6	5000.0	-21.1
	V	48.2	Ambient	5.0	38.7	-39.4	52.5	422.7	5000.0	-21.5

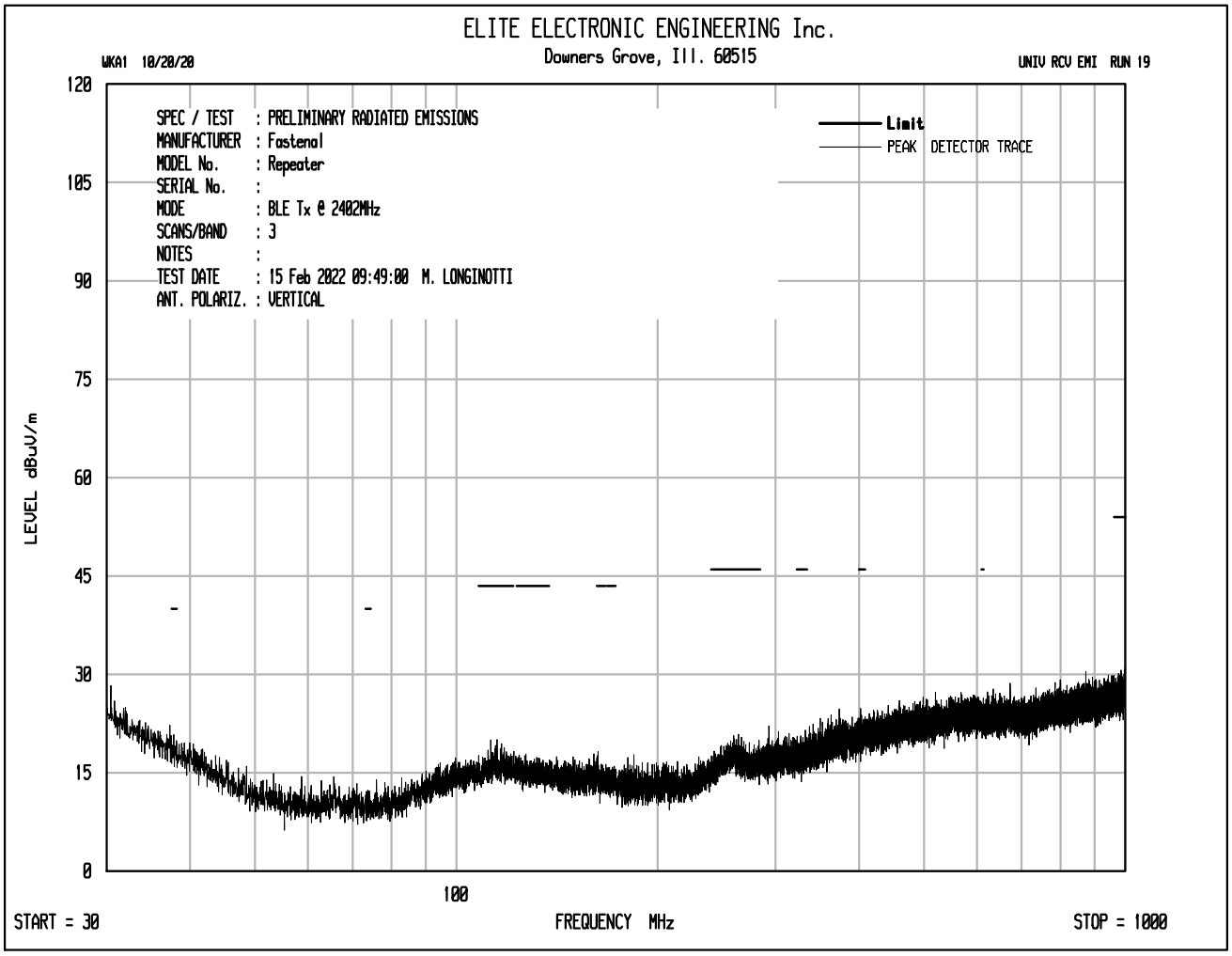
Note: Since all peak readings were below the average limit, no average readings were taken.

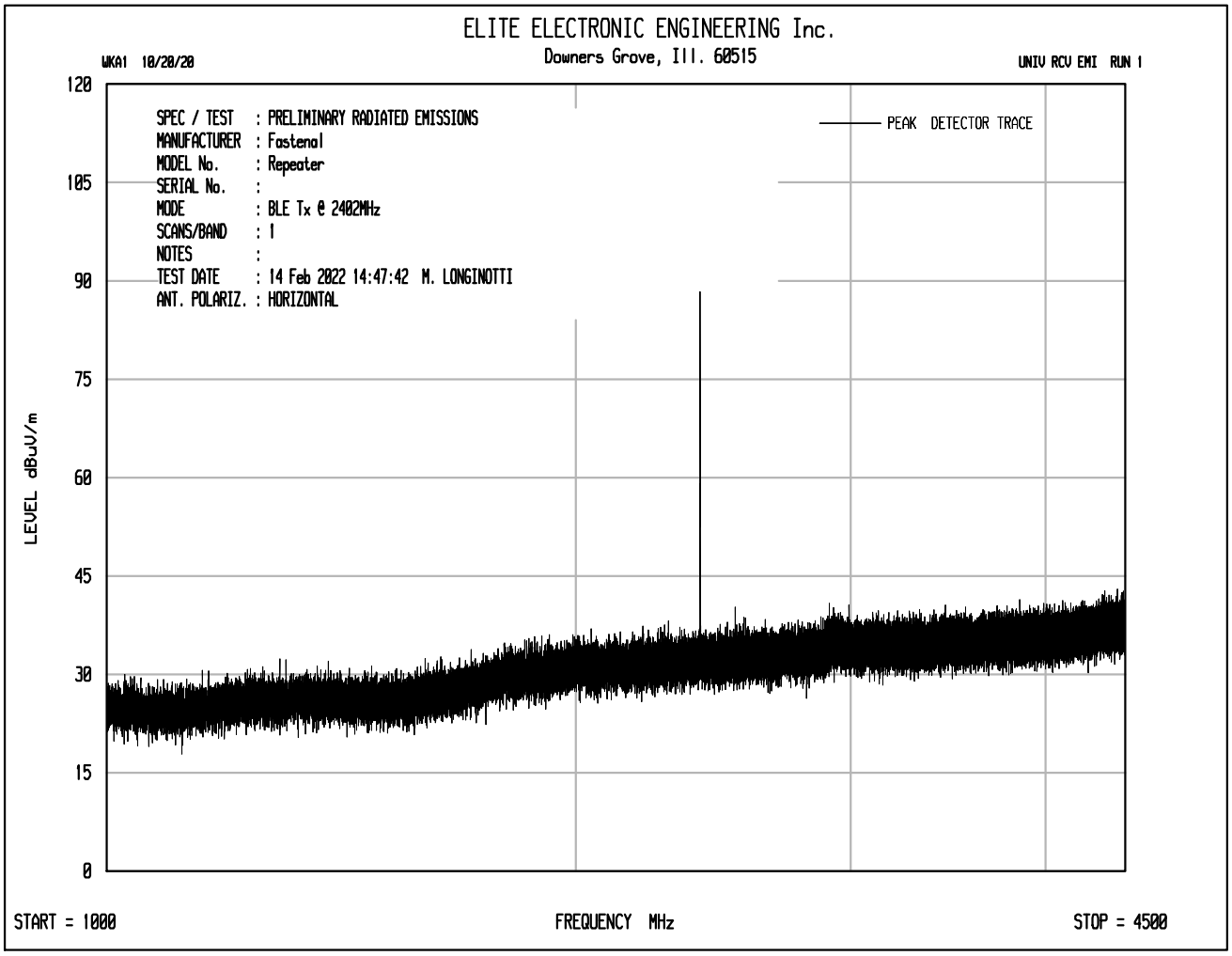
Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Serial No.	S/N1
Test	Host Product Testing – Case Spurious Emissions
Mode	LoRa Transmit at 914.2MHz
Frequency Tested	914.2MHz
Notes	Power Setting = 18.5dBm

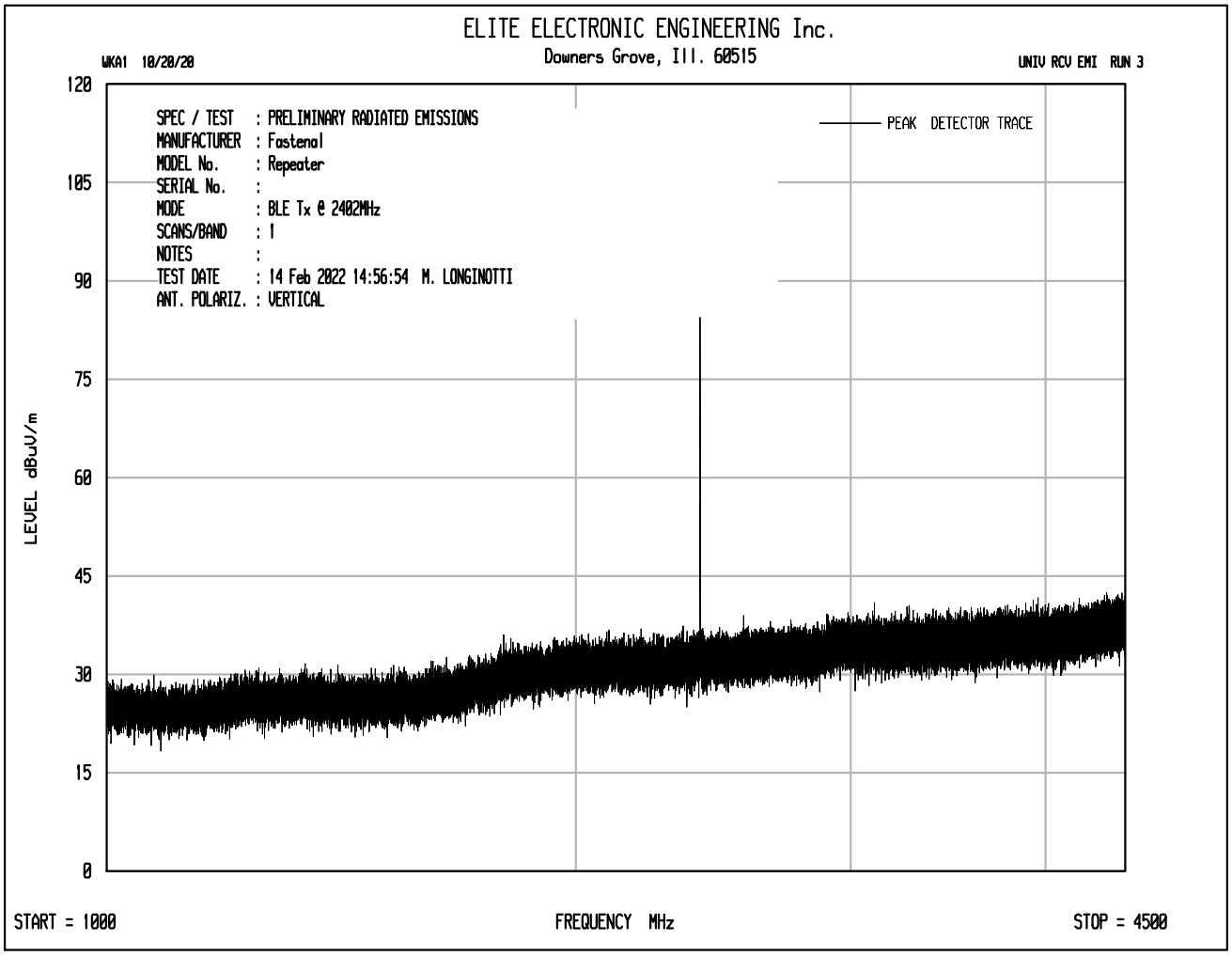
Spurious Emissions not in the Restricted Bands - Peak

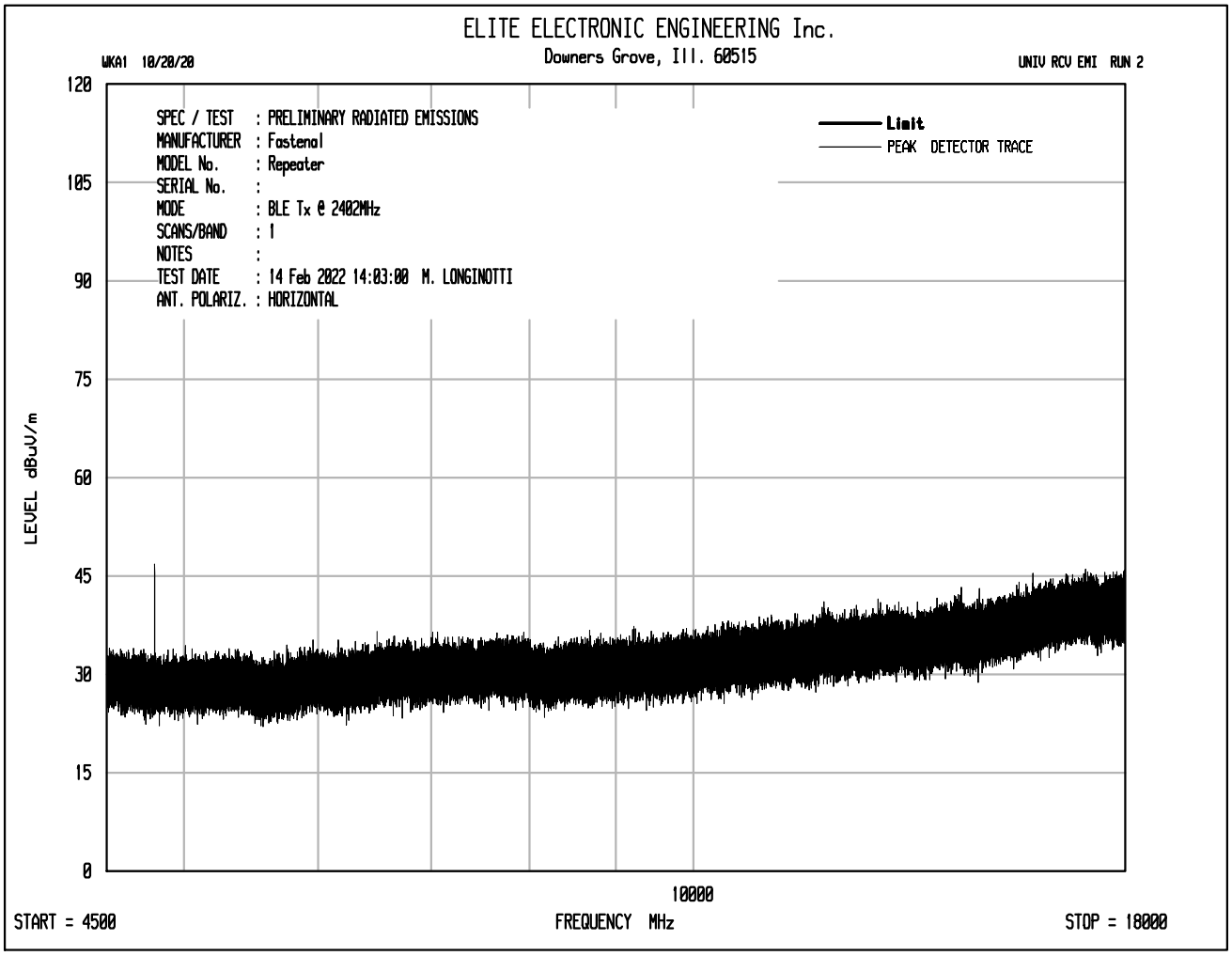
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
914.20	H	81.40		1.6	26.3	0.0	109.3	290806.5	NA	NA
	V	0.00		1.6	26.3	0.0	27.9	24.8	NA	NA
1828.40	H	56.60		2.2	31.7	-40.1	50.4	331.2	29080.7	-38.9
	V	55.20		2.2	31.7	-40.1	49.0	281.9	29080.7	-40.3
5485.20	H	43.90		3.9	36.7	-39.4	45.1	180.4	29080.7	-44.1
	V	42.60		3.9	36.7	-39.4	43.8	155.3	29080.7	-45.4
6399.40	H	41.80		4.3	38.0	-39.5	44.5	168.8	29080.7	-44.7
	V	43.40		4.3	38.0	-39.5	46.1	203.0	29080.7	-43.1

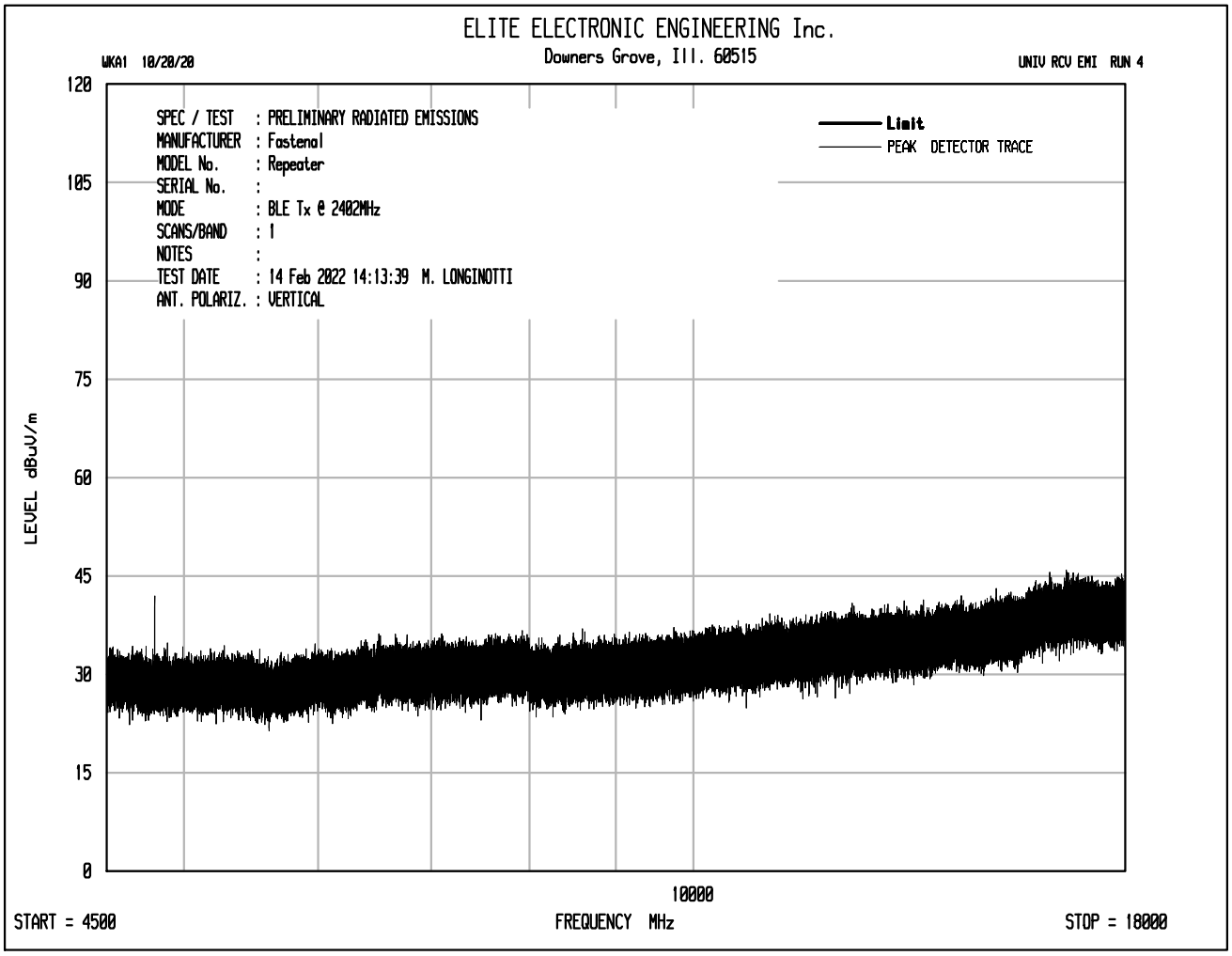

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 20
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2402MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 09:58:23 M. LONGINOTTI
ANT. POLARIZ. : 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 10/20/20
UNIV RCV EMI RUN 19
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2402MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 09:49:00 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 1
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2402MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 14:47:42 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 4500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 3
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2402MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 14:56:54 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 4500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 2
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2402MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 14:03:00 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
10000
START = 4500
FREQUENCY MHz
STOP = 18000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 4
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2402MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 14:13:39 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
10000
START = 4500
FREQUENCY MHz
STOP = 18000

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Peak EIRP
Mode	Bluetooth Transmit at 2402MHz
Frequency Tested	2402MHz
Notes	Power Setting = 0dBm

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2402.00	H	56.2	2.6	32.7	0.0	91.5	-3.8	36.0	-39.8
	V	52.8	2.6	32.7	0.0	88.1	-7.2	36.0	-43.2

EIRP (dBm) = Meter Reading (dBuV) + Cable Factor (dB) + Antenna Factor (dB/m) + Pre-Amp Gain (dB) – 95.3dB

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2402MHz
Frequency Tested	2402MHz
Notes	Power Setting = 0dBm

Spurious Emissions in the Restricted Bands - Peak

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
4804.00	H	54.7		3.7	36.1	-39.7	54.8	546.4	5000.0	-19.2
	V	52.7		3.7	36.1	-39.7	52.8	434.0	5000.0	-21.2
12010.00	H	49.2		6.1	41.5	-39.0	57.8	778.0	5000.0	-16.2
	V	48.0	Ambient	6.1	41.5	-39.0	56.6	677.6	5000.0	-17.4

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2402MHz
Frequency Tested	2402MHz
Notes	Power Setting = 0dBm

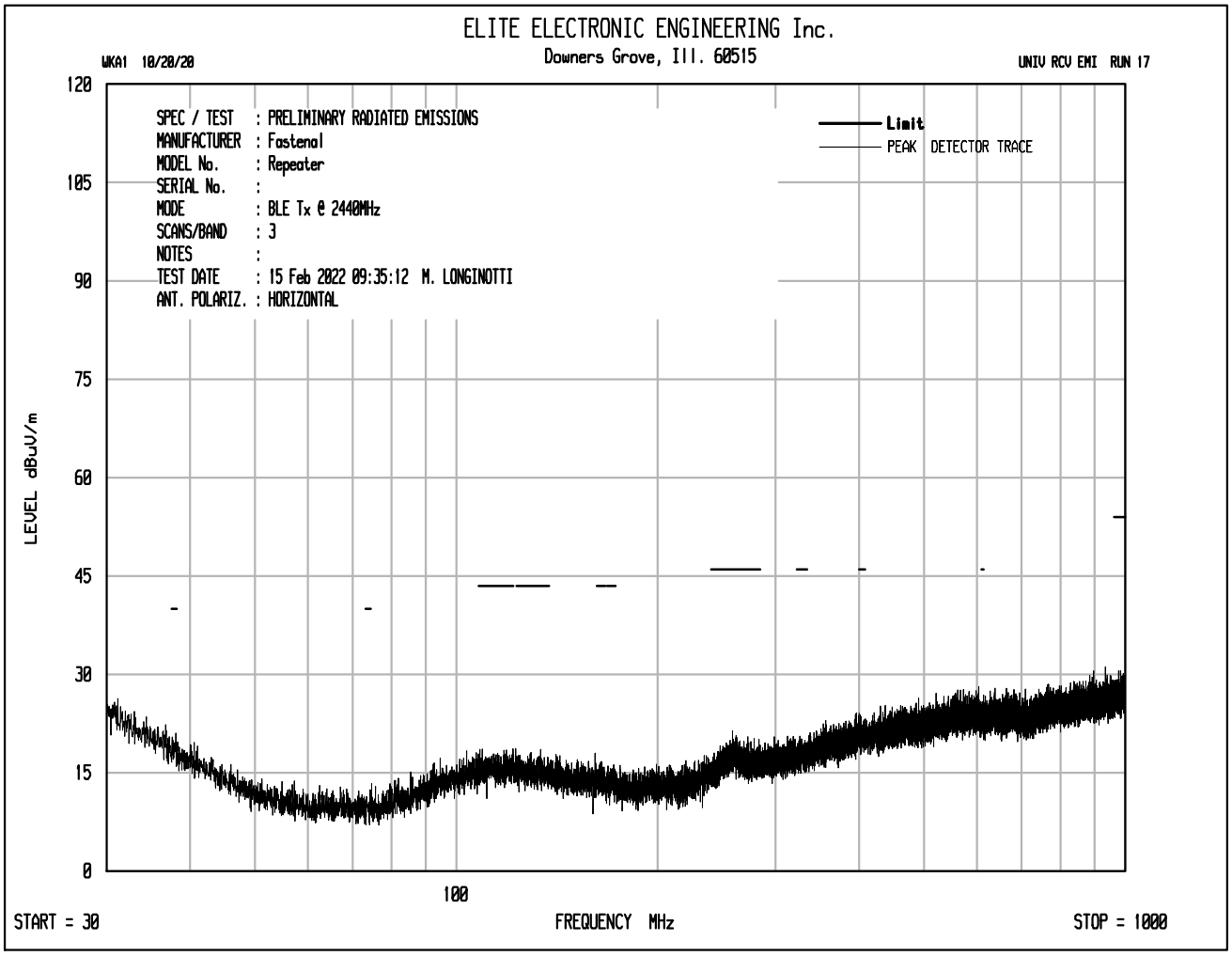
Spurious Emissions in the Restricted Bands - Average

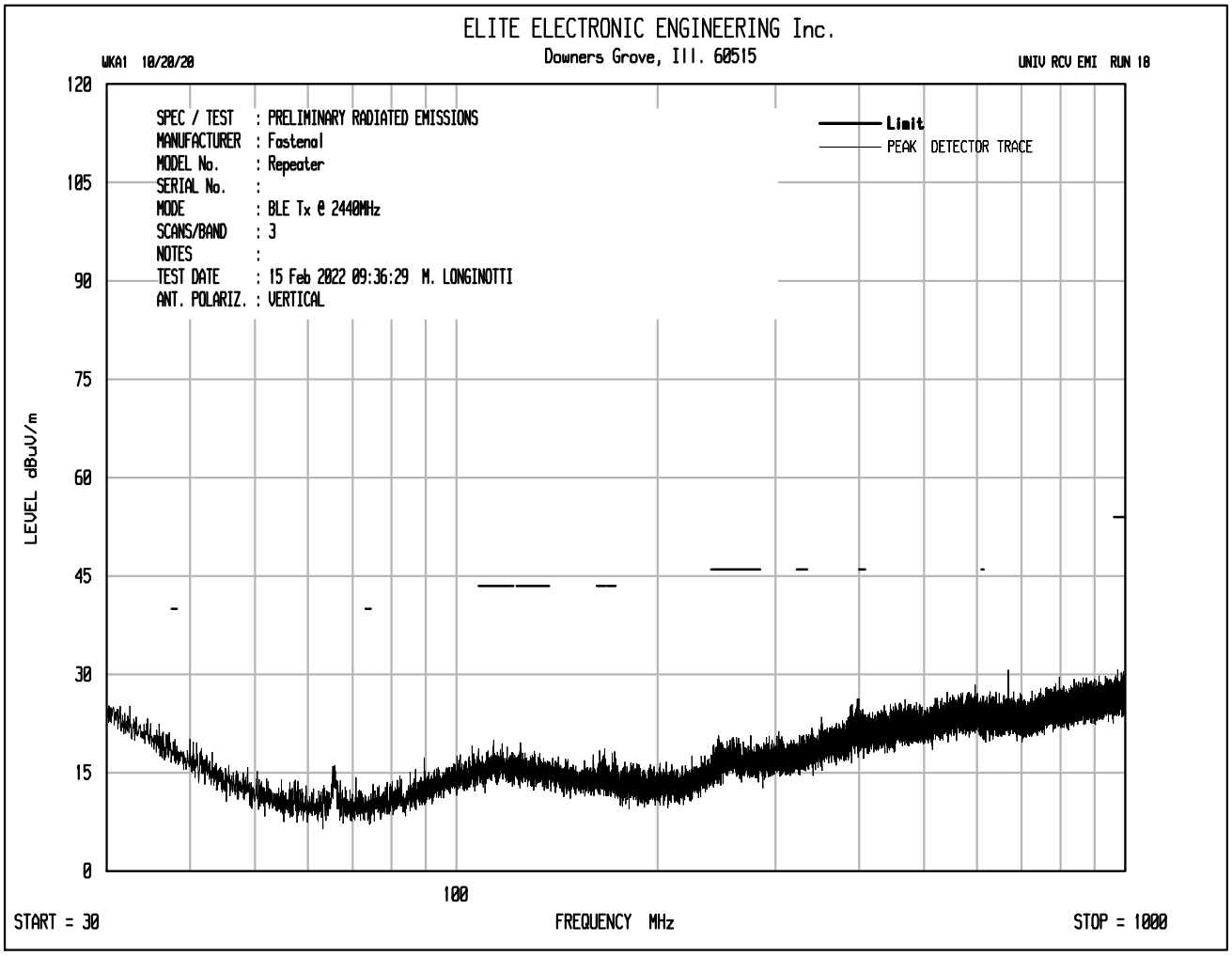
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
4804.00	H	48.10		3.7	36.1	-39.7	0.0	48.2	255.6	500.0	-5.8
	V	44.00		3.7	36.1	-39.7	0.0	44.1	159.4	500.0	-9.9
12010.00	H	35.00		6.1	41.5	-39.0	0.0	43.6	151.7	500.0	-10.4
	V	32.60	Ambient	6.1	41.5	-39.0	0.0	41.2	115.1	500.0	-12.8

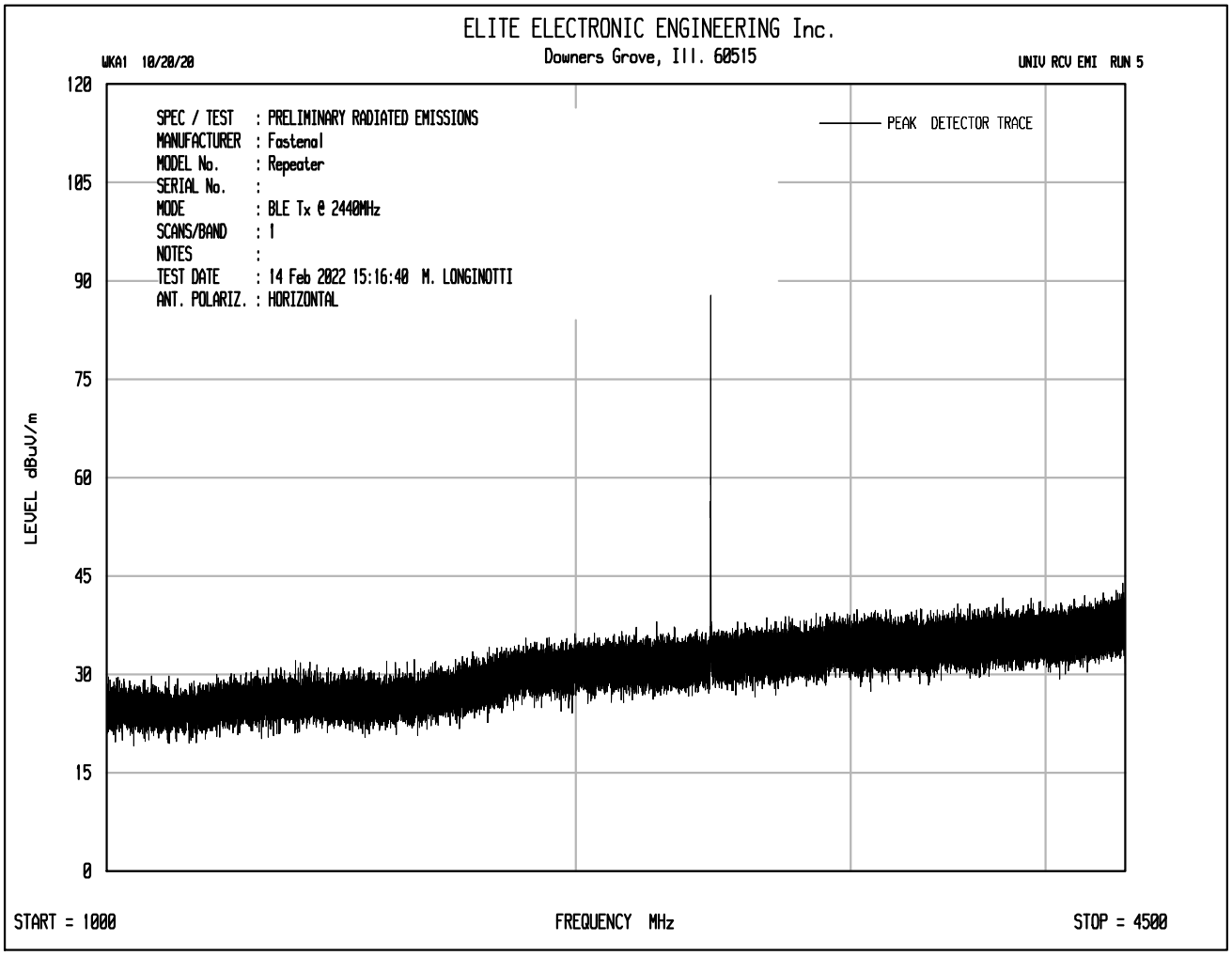
Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2402MHz
Frequency Tested	2402MHz
Notes	Power Setting = 0dBm

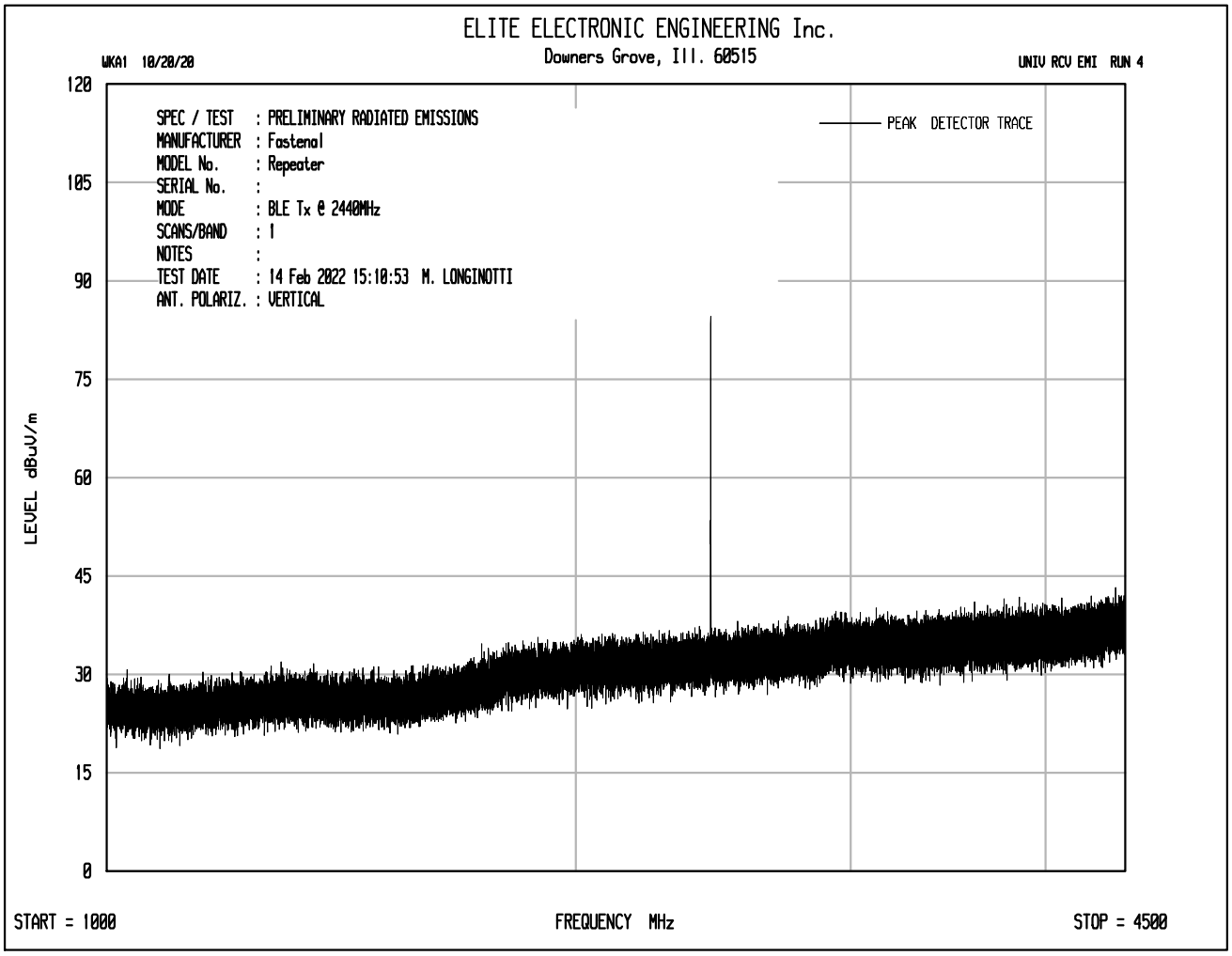
Spurious Emissions not in the Restricted Bands - Peak

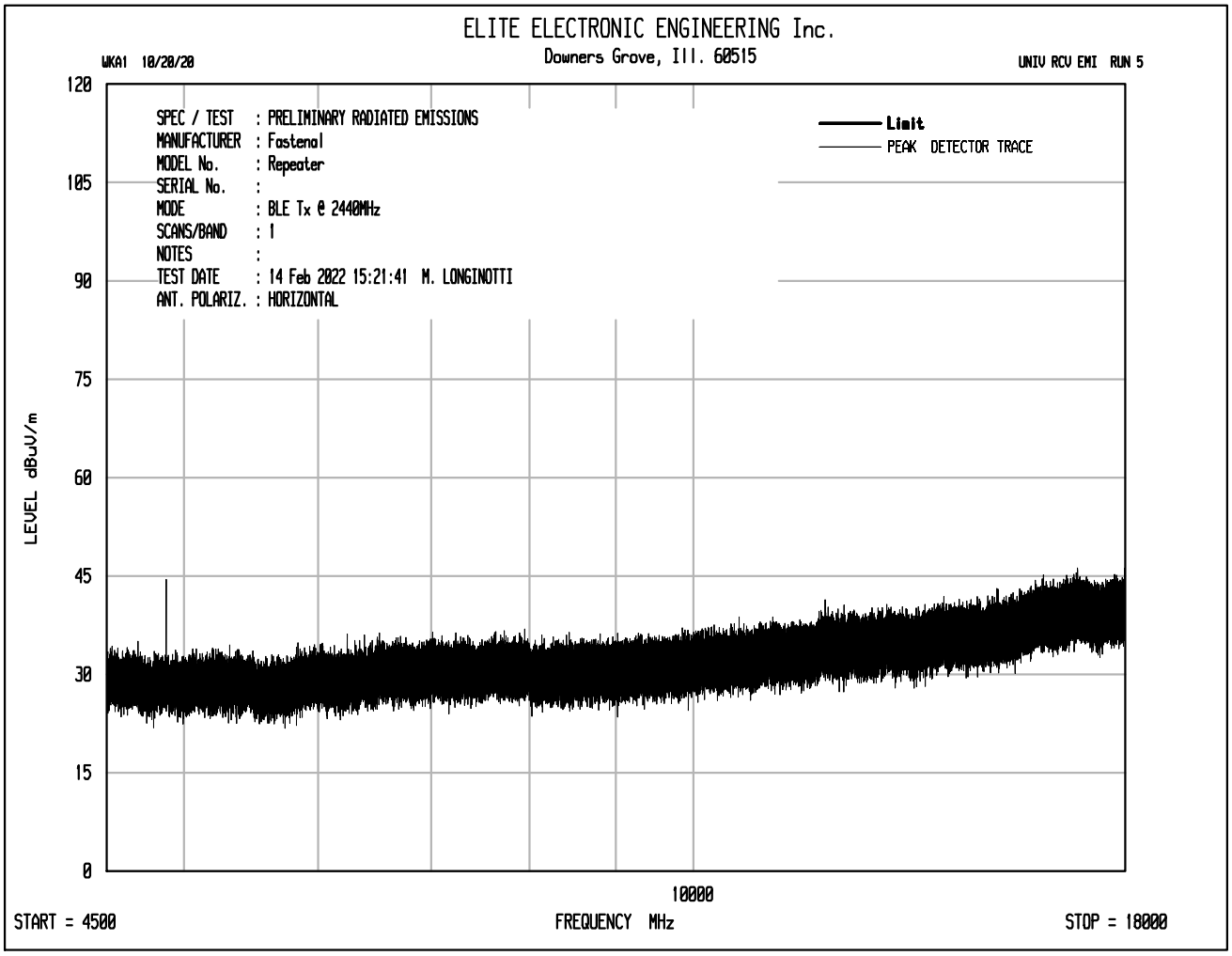
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
2402.00	H	55.70		2.6	32.7	0.0	91.0	35350.8	NA	NA
	V	52.20		2.6	32.7	0.0	87.5	23626.5	NA	NA
7206.00	H	38.80	Ambient	4.6	38.4	-39.7	42.2	128.9	3535.1	-28.8
	V	38.20	Ambient	4.6	38.4	-39.7	41.6	120.3	3535.1	-29.4
9608.00	H	36.90	Ambient	5.2	39.2	-39.3	41.9	124.9	3535.1	-29.0
	V	36.50	Ambient	5.2	39.2	-39.3	41.5	119.3	3535.1	-29.4
14412.00	H	37.00	Ambient	6.6	41.7	-38.6	46.7	216.9	3535.1	-24.2
	V	36.80	Ambient	6.6	41.7	-38.6	46.5	212.0	3535.1	-24.4
16814.00	H	37.50	Ambient	7.2	44.7	-37.4	52.0	397.8	3535.1	-19.0
	V	37.20	Ambient	7.2	44.7	-37.4	51.7	384.2	3535.1	-19.3

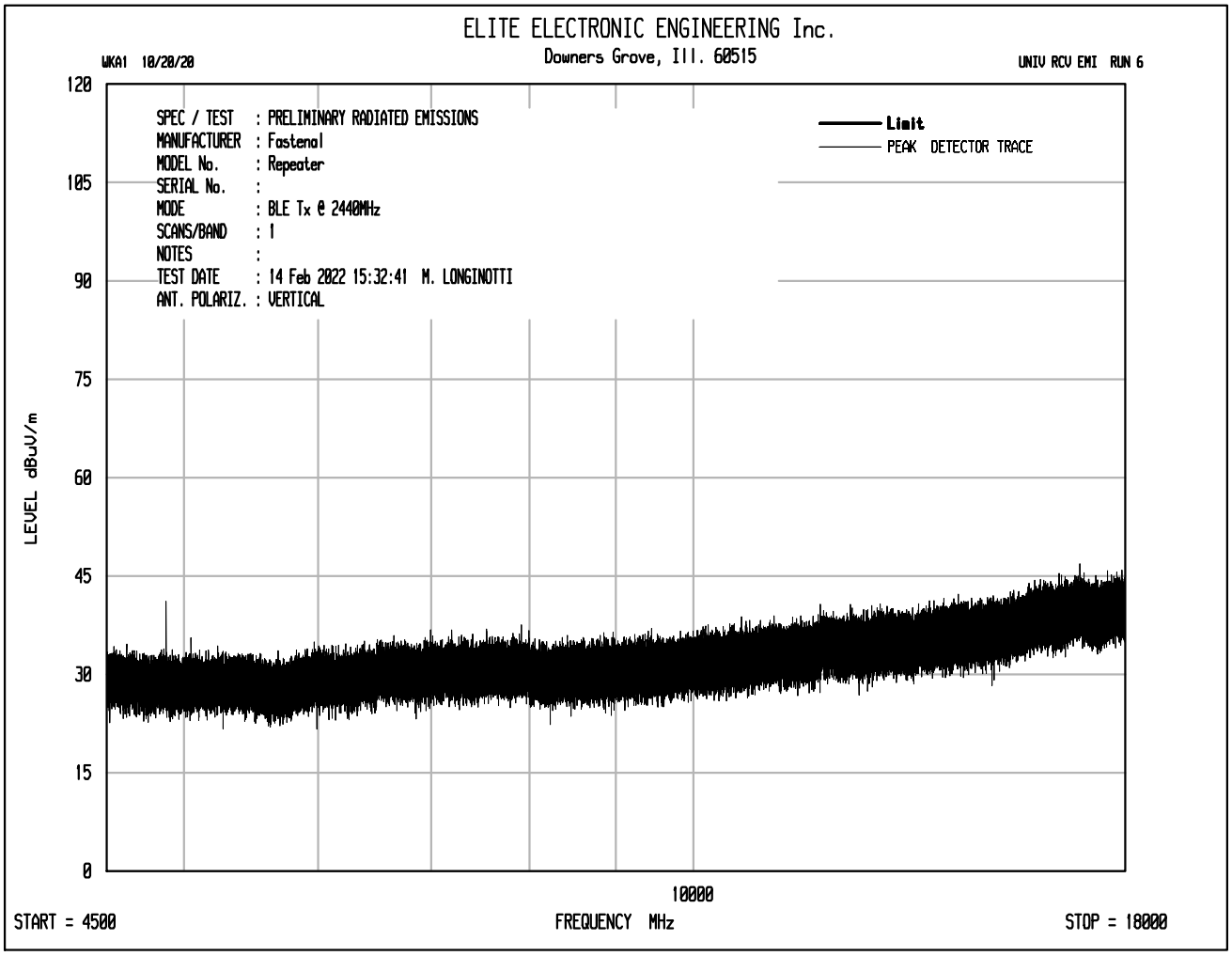

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 17
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2440MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 09:35:12 M. LONGINOTTI
ANT. POLARIZ. : 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 10/20/20
UNIV RCV EMI RUN 18
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2440MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 09:36:29 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 5
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2440MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 15:16:40 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 4500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 4
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2440MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 15:10:53 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 4500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 5
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2440MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 15:21:41 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
10000
START = 4500
FREQUENCY MHz
STOP = 18000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2440MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 15:32:41 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
10000
START = 4500
FREQUENCY MHz
STOP = 18000

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Peak EIRP
Mode	Bluetooth Transmit at 2440MHz
Frequency Tested	2440MHz
Notes	Power Setting = 0dBm

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2440.00	H	56.8	2.6	32.9	0.0	92.3	-3.0	36.0	-39.0
	V	53.2	2.6	32.9	0.0	88.7	-6.6	36.0	-42.6

EIRP (dBm) = Meter Reading (dBuV) + Cable Factor (dB) + Antenna Factor (dB/m) + Pre-Amp Gain (dB) – 95.3dB

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2440MHz
Frequency Tested	2440MHz
Notes	Power Setting = 0dBm

Spurious Emissions in the Restricted Bands - Peak

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
4880.00	H	53.7		3.7	36.2	-39.6	54.0	499.1	5000.0	-20.0
	V	51.5		3.7	36.2	-39.6	51.8	387.4	5000.0	-22.2
7320.00	H	49.2		4.7	38.2	-39.6	52.4	419.2	5000.0	-21.5
	V	49.1		4.7	38.2	-39.6	52.3	414.4	5000.0	-21.6
12200.00	H	48.0	Ambient	6.1	41.7	-38.9	56.9	696.2	5000.0	-17.1
	V	47.1	Ambient	6.1	41.7	-38.9	56.0	627.7	5000.0	-18.0

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2440MHz
Frequency Tested	2440MHz
Notes	Power Setting = 0dBm

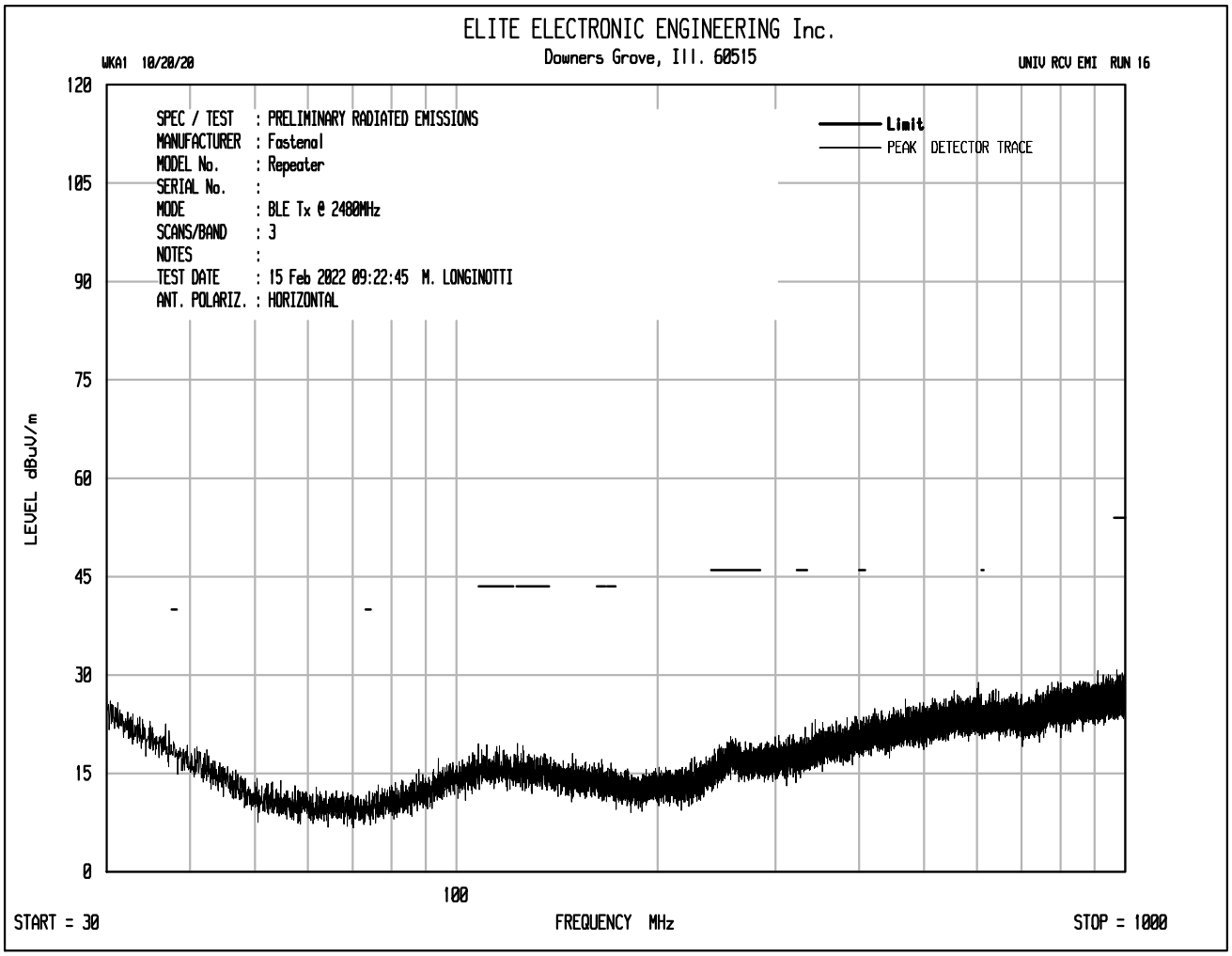
Spurious Emissions in the Restricted Bands - Average

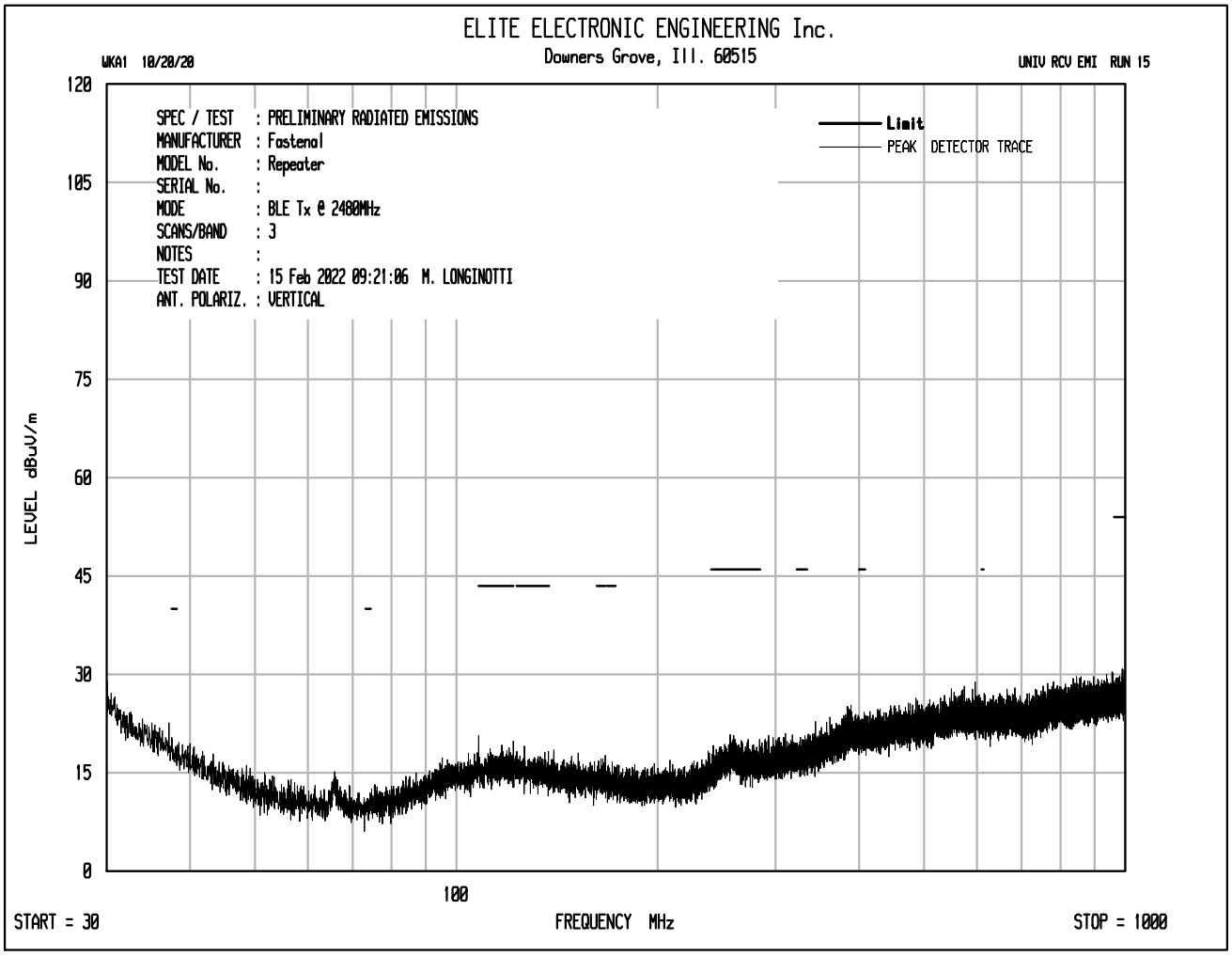
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
4880.00	H	46.80		3.7	36.2	-39.6	0.0	47.1	225.5	500.0	-6.9
	V	42.60		3.7	36.2	-39.6	0.0	42.9	139.1	500.0	-11.1
7320.00	H	33.60		4.7	38.2	-39.6	0.0	36.8	69.6	500.0	-17.1
	V	33.60		4.7	38.2	-39.6	0.0	36.8	69.6	500.0	-17.1
12200.00	H	32.30	Ambient	6.1	41.7	-38.9	0.0	41.2	114.2	500.0	-12.8
	V	32.00	Ambient	6.1	41.7	-38.9	0.0	40.9	110.3	500.0	-13.1

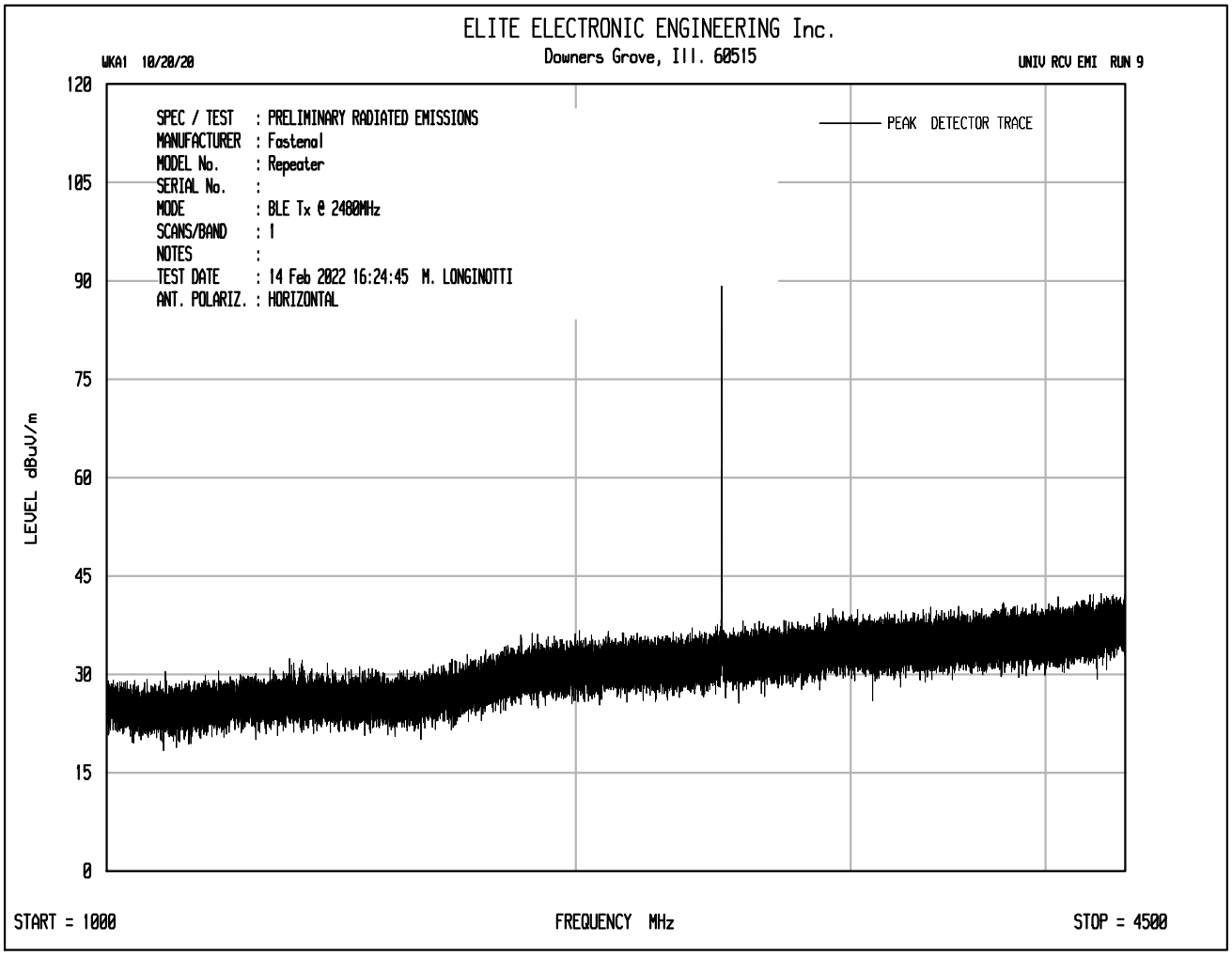
Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2440MHz
Frequency Tested	2440MHz
Notes	Power Setting = 0dBm

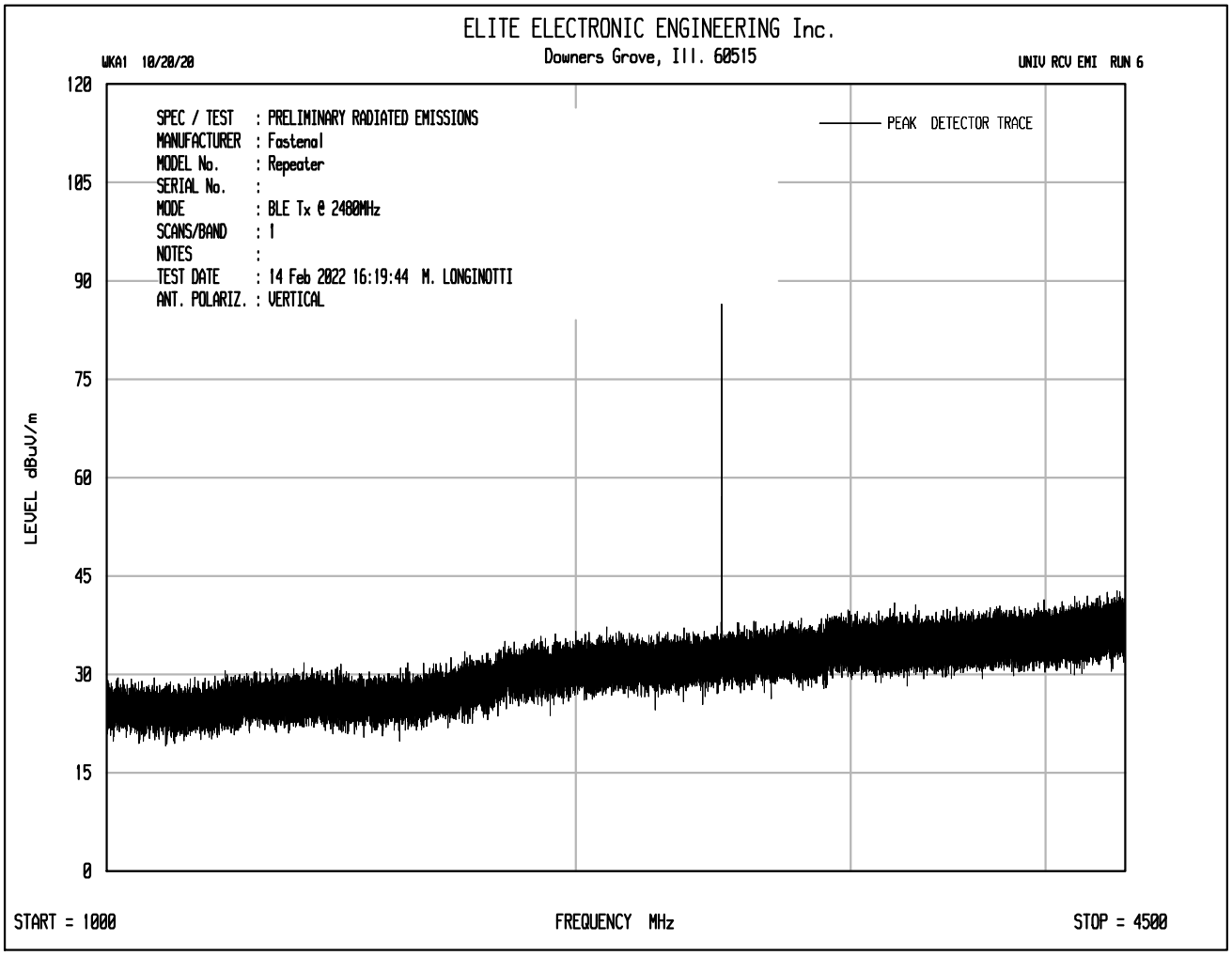
Spurious Emissions not in the Restricted Bands - Peak

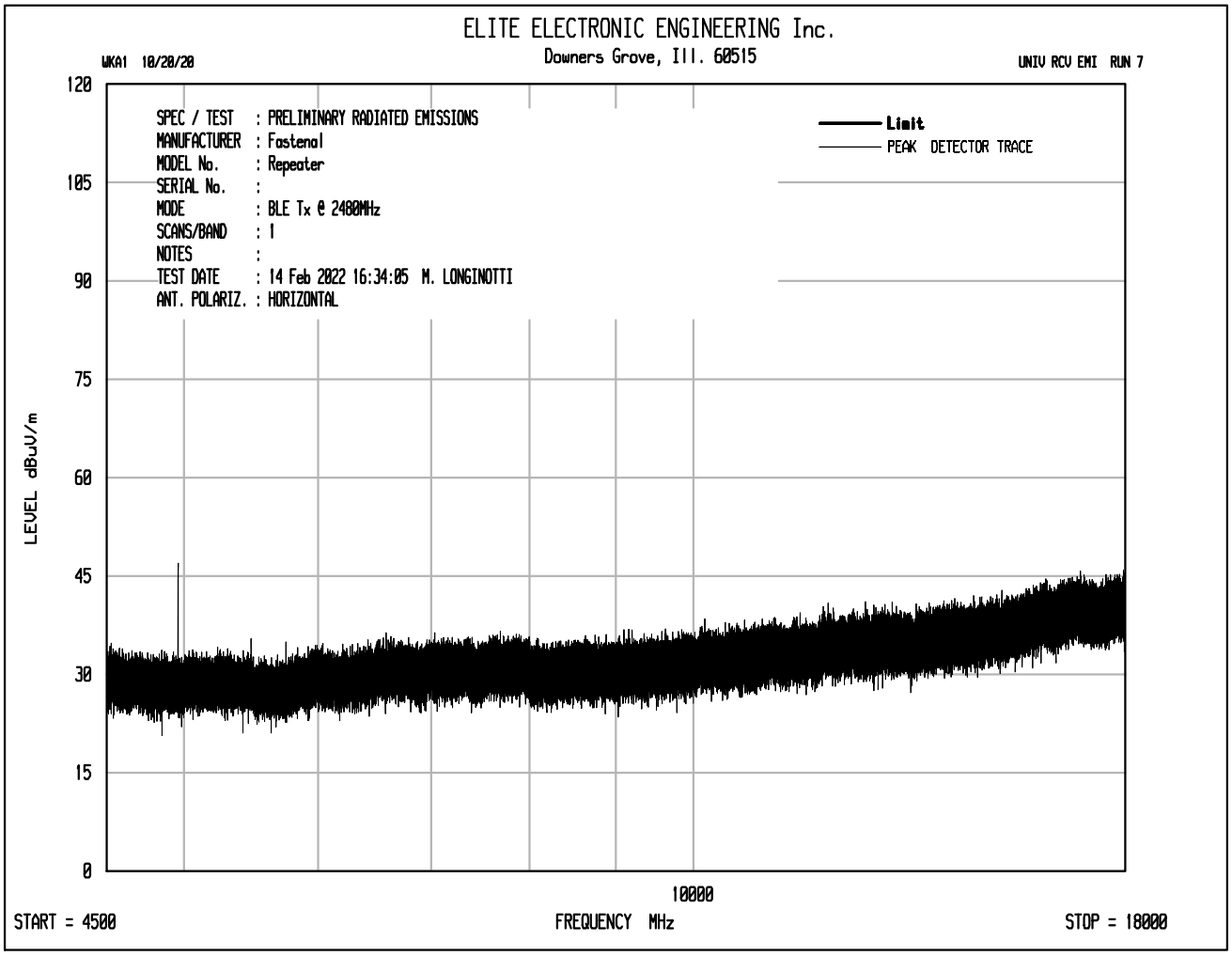
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
2440.00	H	55.20		2.6	32.9	0.0	90.7	34307.0	NA	NA
	V	50.40		2.6	32.9	0.0	85.9	19741.6	NA	NA
9760.00	H	36.60	Ambient	5.2	39.3	-39.3	41.9	124.4	3430.7	-28.8
	V	36.80	Ambient	5.2	39.3	-39.3	42.1	127.3	3430.7	-28.6
14640.00	H	37.30	Ambient	6.7	42.1	-38.6	47.4	235.6	3430.7	-23.3
	V	36.90	Ambient	6.7	42.1	-38.6	47.0	225.0	3430.7	-23.7
17080.00	H	37.50	Ambient	7.3	44.5	-37.4	51.9	391.7	3430.7	-18.8
	V	36.50	Ambient	7.3	44.5	-37.4	50.9	349.1	3430.7	-19.8

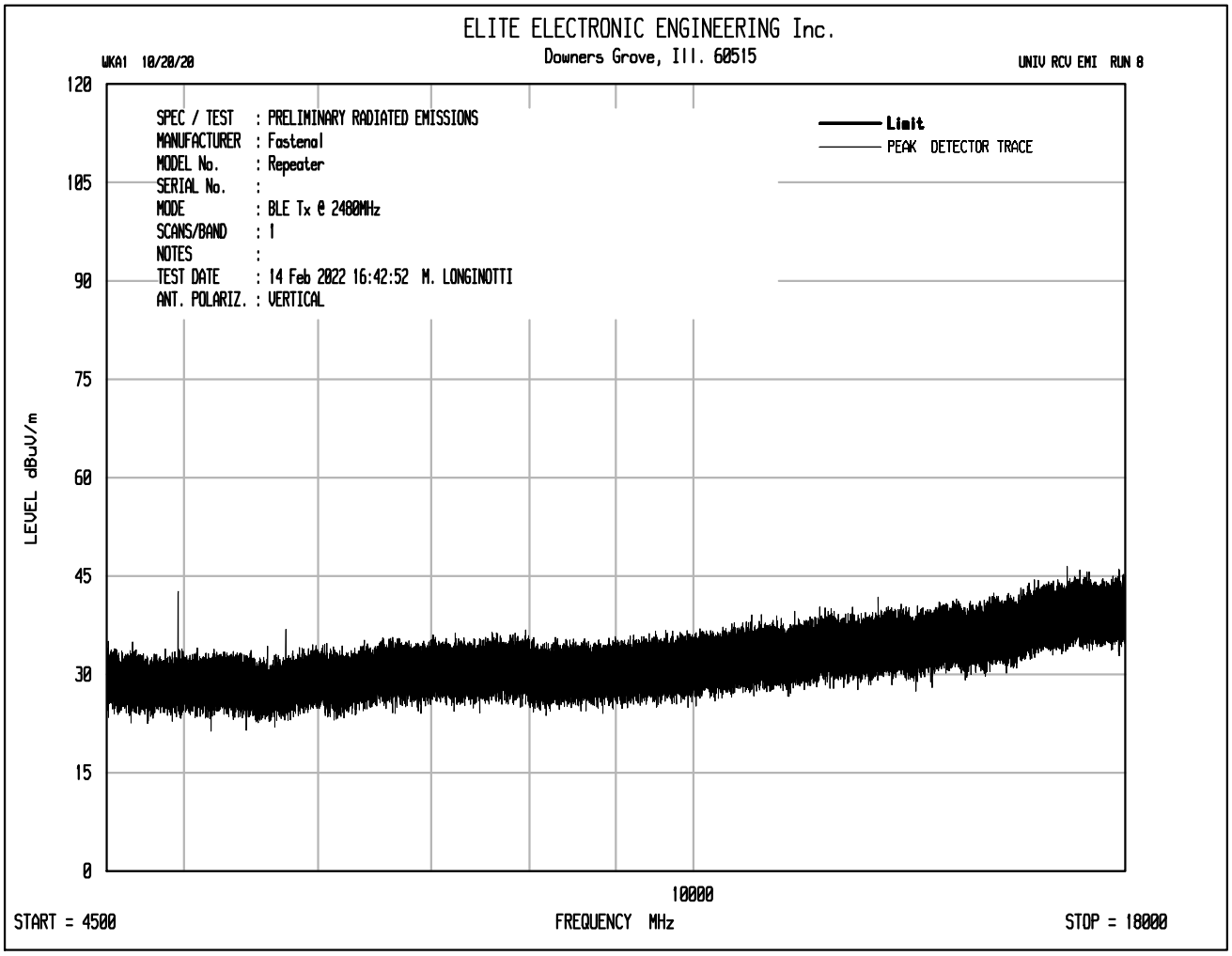

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 16
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fostenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2480MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 09:22:45 M. LONGINOTTI
ANT. POLARIZ. : 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 10/20/20
UNIV RCV EMI RUN 15
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2480MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 15 Feb 2022 09:21:06 M. LONGINOTTI
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 10/20/20
UNIV RCV EMI RUN 9
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2480MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 16:24:45 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 4500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2480MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 16:19:44 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 4500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 7
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2480MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 16:34:05 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
10000
START = 4500
FREQUENCY MHz
STOP = 18000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 8
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Fastenal
MODEL No. : Repeater
SERIAL No. :
MODE : BLE Tx @ 2480MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 14 Feb 2022 16:42:52 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
10000
START = 4500
FREQUENCY MHz
STOP = 18000

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Peak EIRP
Mode	Bluetooth Transmit at 2480MHz
Frequency Tested	2480MHz
Notes	Power Setting = 0dBm

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2480.00	H	57.7	2.7	33.1	0.0	93.4	-1.9	36.0	-37.9
	V	54.3	2.7	33.1	0.0	90.0	-5.3	36.0	-41.3

EIRP (dBm) = Meter Reading (dBuV) + Cable Factor (dB) + Antenna Factor (dB/m) + Pre-Amp Gain (dB) – 95.3dB

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2480MHz
Frequency Tested	2480MHz
Notes	Power Setting = 0dBm

Spurious Emissions in the Restricted Bands - Peak

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
4960.00	H	55.4		3.7	36.2	-39.6	55.7	609.9	5000.0	-18.3
	V	53.1		3.7	36.2	-39.6	53.4	468.0	5000.0	-20.6
7440.00	H	48.6	Ambient	4.7	38.0	-39.6	51.8	387.1	5000.0	-22.2
	V	48.4	Ambient	4.7	38.0	-39.6	51.6	378.2	5000.0	-22.4
12400.00	H	48.0	Ambient	6.1	41.6	-38.8	56.9	701.1	5000.0	-17.1
	V	47.5	Ambient	6.1	41.6	-38.8	56.4	661.9	5000.0	-17.6

Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2480MHz
Frequency Tested	2480MHz
Notes	Power Setting = 0dBm

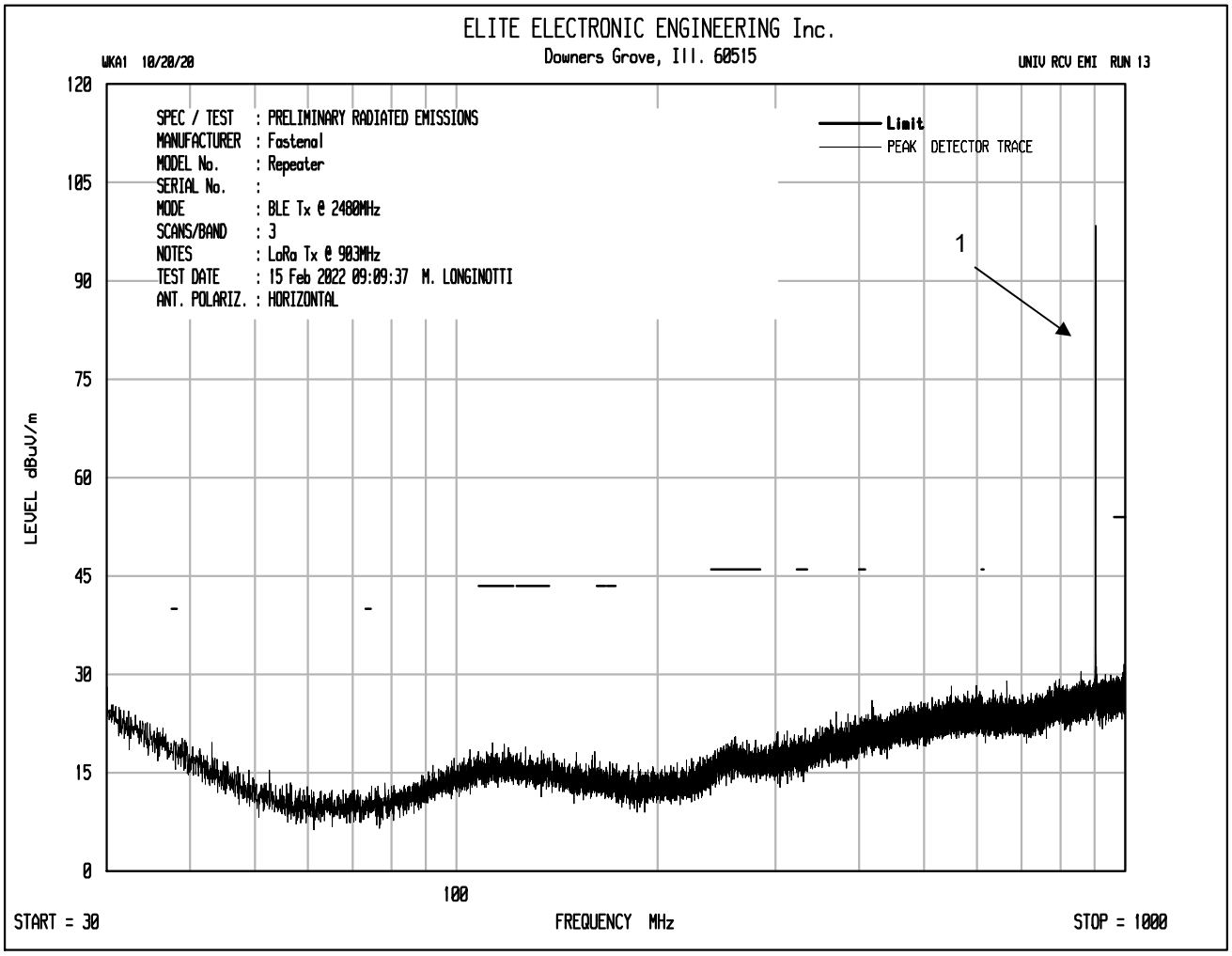
Spurious Emissions in the Restricted Bands - Average

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
4960.00	H	49.40		3.7	36.2	-39.6	0.0	49.7	305.6	500.0	-4.3
	V	45.10		3.7	36.2	-39.6	0.0	45.4	186.3	500.0	-8.6
7440.00	H	33.10	Ambient	4.7	38.0	-39.6	0.0	36.3	65.0	500.0	-17.7
	V	33.10	Ambient	4.7	38.0	-39.6	0.0	36.3	65.0	500.0	-17.7
12400.00	H	33.50	Ambient	6.1	41.6	-38.8	0.0	42.4	132.1	500.0	-11.6
	V	32.20	Ambient	6.1	41.6	-38.8	0.0	41.1	113.7	500.0	-12.9

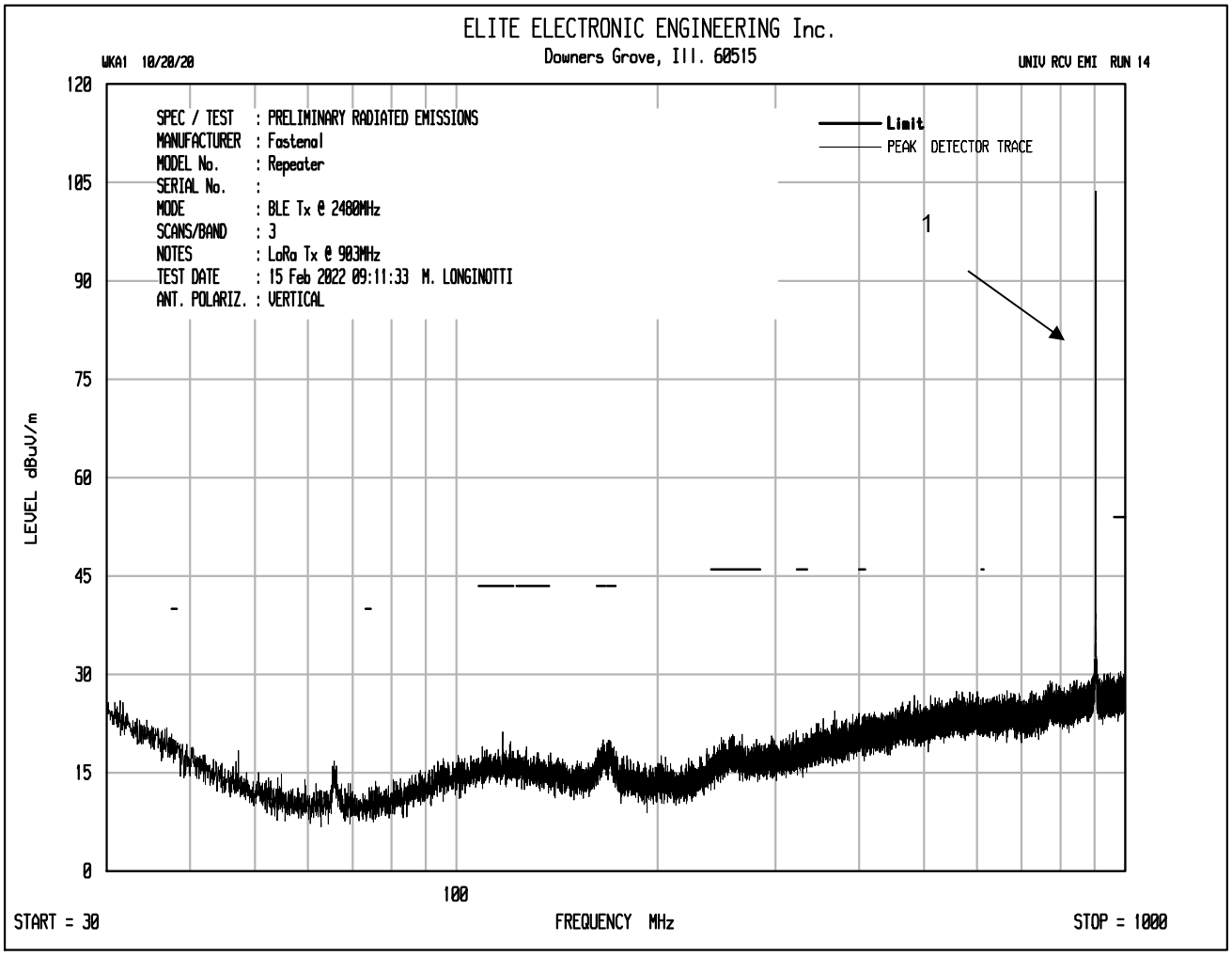
Test Details	
Manufacturer	Fastenal
Product	Repeater
Model No.	922194623
Test	Host Product Testing – Case Spurious Emissions
Mode	Bluetooth Transmit at 2480MHz
Frequency Tested	2480MHz
Notes	Power Setting = 0dBm

Spurious Emissions not in the Restricted Bands - Peak

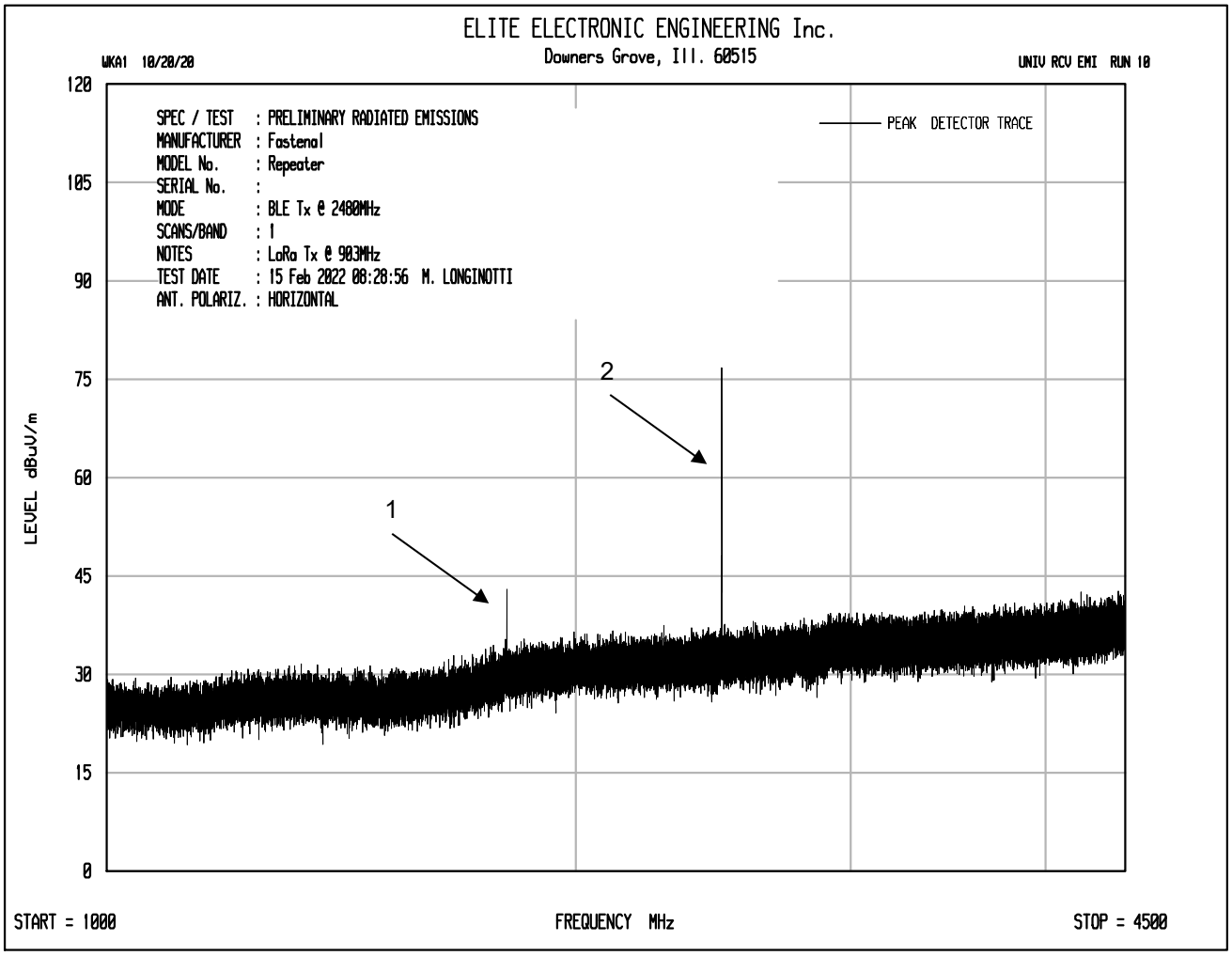
Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dBm)
2480.00	H	57.30		2.7	33.1	0.0	93.0	44856.9	NA	NA
	V	53.80		2.7	33.1	0.0	89.5	29979.8	NA	NA
9920.00	H	36.70	Ambient	5.3	39.4	-39.2	42.2	128.3	4485.7	-30.9
	V	36.40	Ambient	5.3	39.4	-39.2	41.9	123.9	4485.7	-31.2
14880.00	H	36.60	Ambient	6.8	42.4	-38.5	47.3	230.7	4485.7	-25.8
	V	36.20	Ambient	6.8	42.4	-38.5	46.9	220.3	4485.7	-26.2
17360.00	H	36.50	Ambient	7.4	43.9	-37.4	50.3	327.9	4485.7	-22.7
	V	36.50	Ambient	7.4	43.9	-37.4	50.3	327.9	4485.7	-22.7



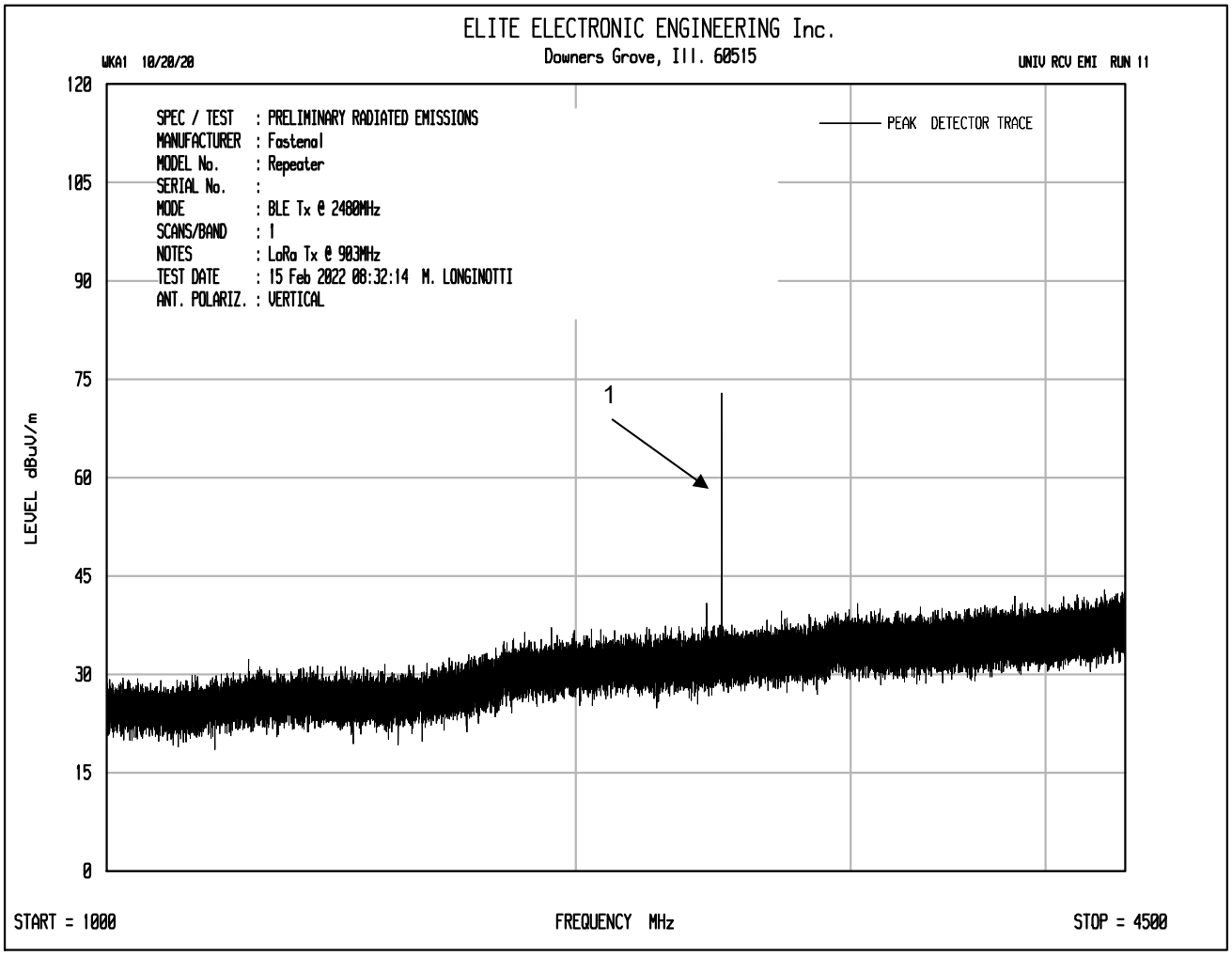
1 – LoRa Transmit at 903MHz



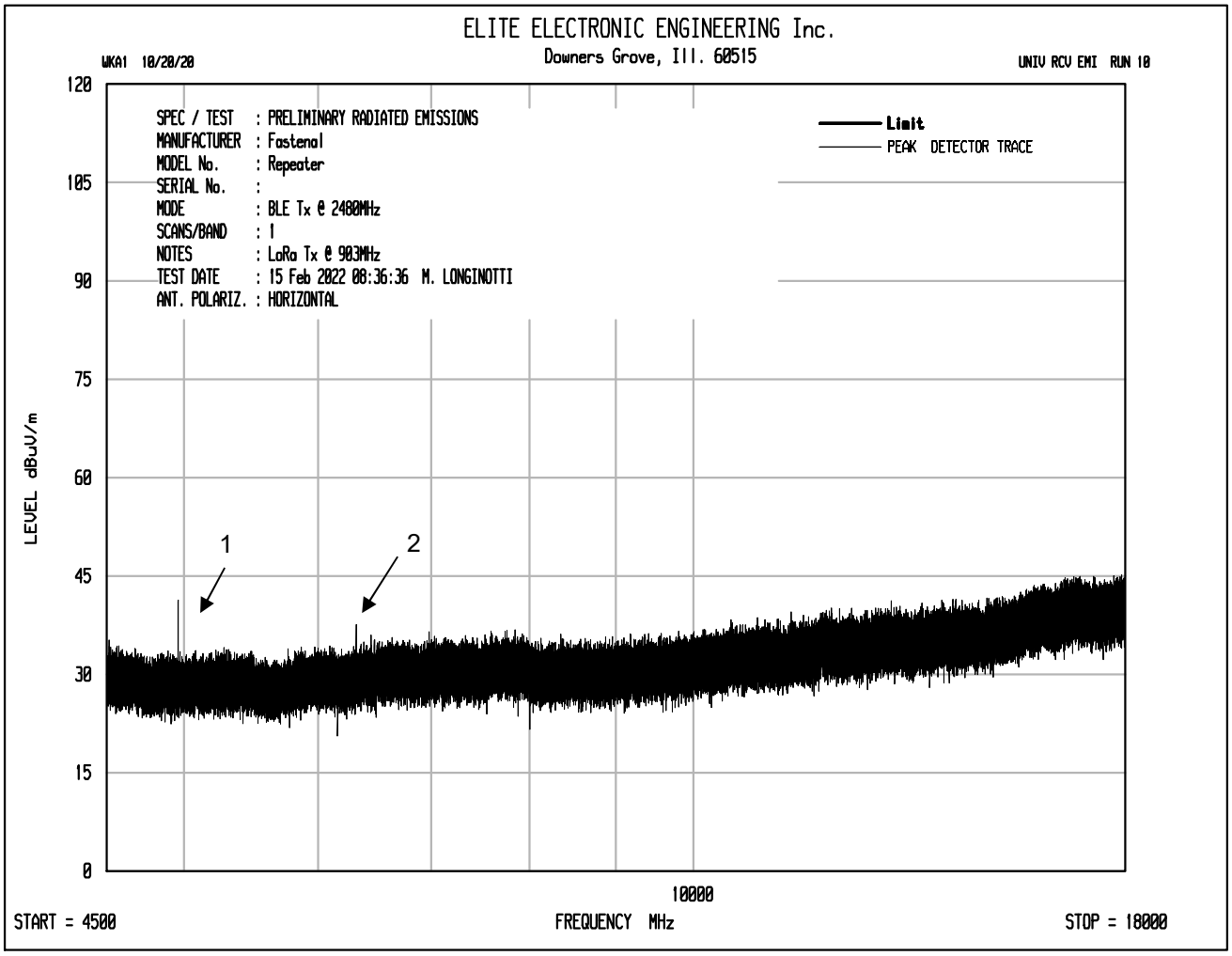
1 – LoRa Transmit at 903MHz



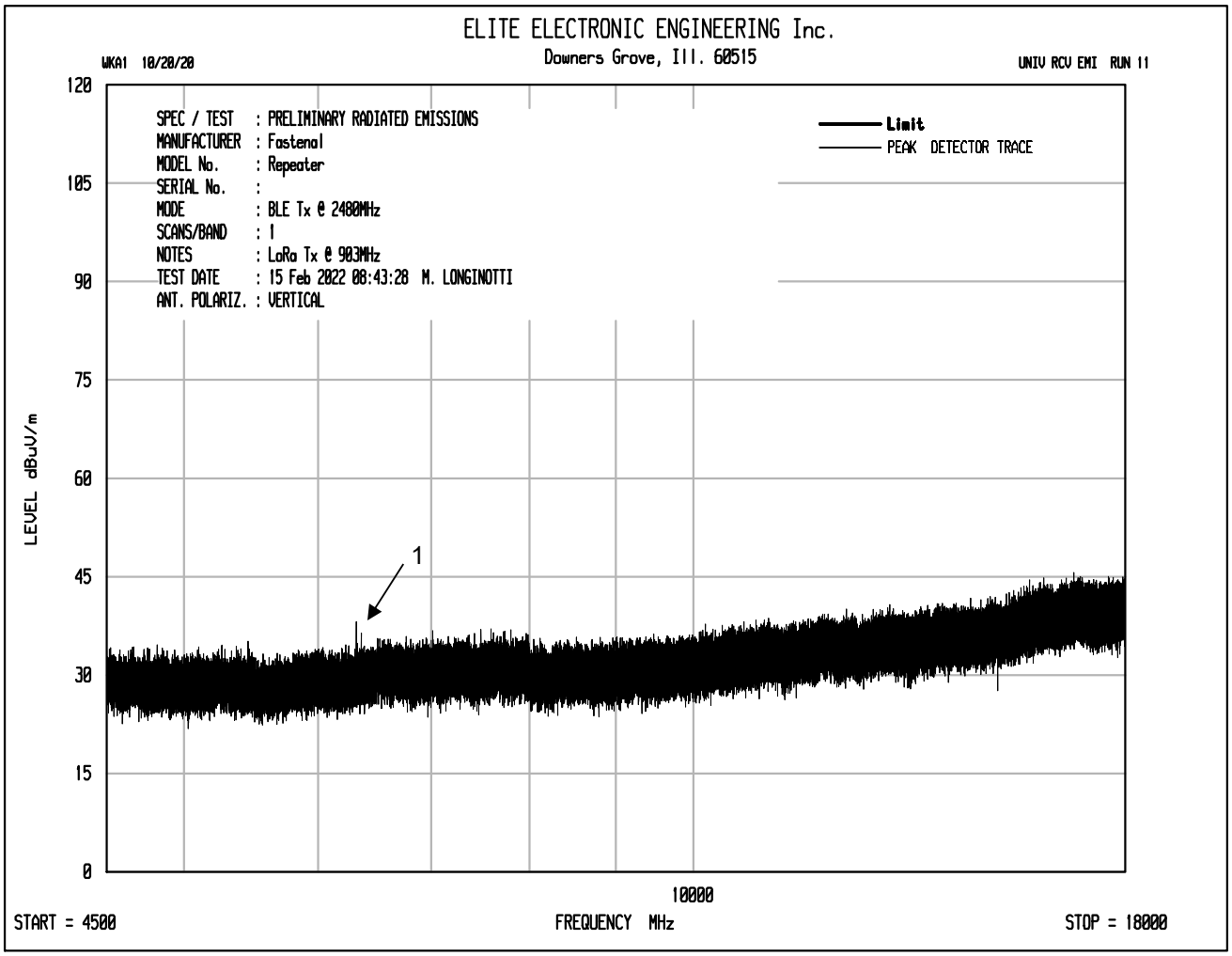
1 – 1806MHz (2nd Harmonic of LoRa Transmit at 903MHz)
2 – BLE Transmit at 2480MHz



1 – BLE Transmit at 2480MHz



1 – 4960MHz (2nd Harmonic of BLE Transmit at 2480MHz)
2 – 6321MHz (7th Harmonic of LoRa Transmit at 903MHz)



1 – 6321MHz (7th Harmonic of LoRa Transmit at 903MHz

22. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ELITE ELECTRONIC ENGINEERING, INC.
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Downers Grove, IL 60515
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Brandon Lugo (Automotive Team Leader) Phone: 630 495 9770 ext. 163
Email: blugo@elitetest.com
Richard King (FCC/Commercial Team Leader) Phone: 630 495 9770 ext. 123
Email: reking@elitetest.com
Website: www.elitetest.com

ELECTRICAL

Valid To: June 30, 2023 Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:	Test Method(s) [1]:
Transient Immunity	ISO 7637-2 (including emissions); ISO 7637-3; ISO 16750-2:2012, Sections 4.6.3 and 4.6.4; CS-11979, Section 6.4; CS.00054, Section 5.9; EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222); GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12; ECE Regulation 10.06 Annex 10
Electrostatic Discharge (ESD)	ISO 10605 (2001, 2008); CS-11979 Section 7.0; CS.00054, Section 5.10; EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13; GMW 3097 Section 3.6
Conducted Emissions	CISPR 25 (2002, 2008), Sections 6.2 and 6.3; CISPR 25 (2016), Sections 6.3 and 6.4; CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2; GMW 3097, Section 3.3.2; EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)
Radiated Emissions Anechoic	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CS-11979, Section 5.3; CS.00054, Section 5.6.3; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310); ECE Regulation 10.06 Annex 7 (Broadband) ECE Regulation 10.06 Annex 8 (Narrowband)

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

Test Technology:	Test Method(s) [1]:
Vehicle Radiated Emissions	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI)	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112); ECE Regulation 10.06 Annex 9
Radiated Immunity Anechoic *(Including Radar Pulse)*	ISO 11452-2; ISO 11452-5; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21; ECE Regulation 10.06 Annex 9
Radiated Immunity Magnetic Field	ISO 11452-8
Radiated Immunity Reverb	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Vehicle Product Specific EMC Standards	EN 14982; EN ISO 13309, ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
Electrical Loads	ISO 16750-2
Emissions Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; KS C 9814-1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KS C 9832; KN 32; ECE Regulation 10.06 Annex 14
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124

Test Technology:	Test Method(s) [1]:
Emissions (cont'd)	
Current Harmonics	IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; ECE Regulation 10.06 Annex 12
Immunity	
Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; KS C 9610-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; KS C 9610-4-3; IEEE C37.90.2 2004
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011); IEC 61000-4-4 (1995) + A1(2000) + A2(2001); KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008); IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4; KS C 9610-4-4; ECE Regulation 10.06 Annex 15
Surge	IEC 61000-4-5 (1995) + A1(2000); IEC 61000-4-5, Ed 1.1 (2005-11); EN 61000-4-5 (1995) + A1(2001); KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5; KS C 9610-4-5; IEEE C37.90.1 2012; IEEE STD C62.41.2 2002; ECE Regulation 10.06 Annex 16
Conducted Immunity	IEC 61000-4-6 (1996) + A1(2000); IEC 61000-4-6, Ed 2.0 (2006-05); IEC 61000-4-6 Ed. 3.0 (2008); KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6; EN 61000-4-6; KN 61000-4-6; KS C 9610-4-6

Test Technology:	Test Method(s) [1]:
Immunity (cont'd)	
Power Frequency Magnetic Field Immunity (*Down to 3 A/m*)	IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009); EN 61000-4-8 (1994) + A1(2000); KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8; KS C 9610-4-8
Voltage Dips, Short Interrupts, and Line Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11; KS C 9610-4-11
Ring Wave	IEC 61000-4-12, Ed. 2 (2006-09); EN 61000-4-12:2006; IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12; IEEE STD C62.41.2 2002
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2; EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3; EN 55015; EN 60730-1; EN 60945; IEC 60533; EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35; KS C 9835; IEC 60601-1-2; JIS T0601-1-2
TxRx EMC Requirements	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19; EN 301 489-20
European Radio Test Standards	ETSI EN 300 086-1; ETSI EN 300 086-2; ETSI EN 300 113-1; ETSI EN 300 113-2; ETSI EN 300 220-1; ETSI EN 300 220-2; ETSI EN 300 220-3-1; ETSI EN 300 220-3-2; ETSI EN 300 330-1; ETSI EN 300 330-2; ETSI EN 300 440-1; ETSI EN 300 440-2; ETSI EN 300 422-1; ETSI EN 300 422-2; ETSI EN 300 328; ETSI EN 301 893; ETSI EN 301 511; ETSI EN 301 908-1; ETSI EN 908-2; ETSI EN 908-13; ETSI EN 303 413; ETSI EN 302 502; EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4

Test Technology:	Test Method(s) [1]:
Canadian Radio Tests	RSS-102 (RF Exposure Evaluation only); RSS-111; RSS-112; RSS-117; RSS-119; RSS-123; RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-191; RSS-192; RSS-194; RSS-195; RSS-196; RSS-197; RSS-199; RSS-210; RSS-211; RSS-213; RSS-215; RSS-216; RSS-220; RSS-222; RSS-236; RSS-238; RSS-243; RSS-244; RSS-247; RSS-251; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN
Mexico Radio Tests	IFT-008-2015; NOM-208-SCFI-2016
Japan Radio Tests	Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18
Taiwan Radio Tests	LP-0002 (July 15, 2020)
Australia/New Zealand Radio Tests	AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)
Hong Kong Radio Tests	HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073
Korean Radio Test Standards	KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52; KS X 3124; KS X 3125; KS X 3130; KS X 3126; KS X 3129
Vietnam Radio Test Standards	QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT; QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT; QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT; QCVN 112:2017/BTTTT; QCVN 117:2020//BTTTT
Vietnam EMC Test Standards	QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT; QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT
Unlicensed Radio Frequency Devices *(3 Meter Semi-Anechoic Room)*	47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H (using ANSI C63.10:2013, ANSI C63.17:2013 and FCC KDB 905462 D02 (v02))
Licensed Radio Service Equipment	47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E, ANSI C63.26:2015)

Test Technology:	Test Method(s) [1]:
OTA (Over the Air) Performance	
GSM, GPRS, EGPRS	CTIA Test Plan for Wireless Device Over-the-Air Performance (Method for Measurement for Radiated Power and Receiver Performance) V3.8.2; CTIA Test Plan for RF Performance Evaluation of WiFi Mobile Converged Devices V2.1.0
UMTS (W-CDMA)	
LTE including CAT M1	
A-GPS for UMTS/GSM	
LTS A-GPS, A-GLONASS, SIB8/SIB16	
Large Device/Laptop/Tablet Testing	
Integrated Device Testing	
WiFi 802.11 a/b/g/n/a	
Electrical Measurements and Simulation	
AC Voltage / Current	
(1mV to 5kV) 60 Hz	FAA AC 150/5345-10H
(0.1V to 250V) up to 500 MHz	FAA AC 150/5345-43J
(1µA to 150A) 60 Hz	FAA AC 150/5345-44K
DC Voltage / Current	FAA AC 150/5345-46E
(1mV to 15-kV) / (1µA to 10A)	FAA AC 150/5345-47C
Power Factor / Efficiency / Crest Factor	FAA EB 67D
(Power to 30kW)	
Resistance	
(1mΩ to 4000MΩ)	
Surge	
(Up to 10 kV / 5 kA) (Combination Wave and Ring Wave)	

On the following products and materials:
Telecommunications Terminal Equipment (TTE), Radio Equipment, Network Equipment, Information Technology Equipment (ITE), Automotive Electronic Equipment, Automotive Hybrid Electronic Devices, Maritime Navigation and Radio Communication Equipment and Systems, Vehicles, Boats and Internal Combustion Engine Driven Devices, Automotive, Aviation, and General Lighting Products, Medical Electrical Equipment, Motors, Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment, Household Appliances, Electric Tools, Low-voltage Switchgear and Control gear, Programmable Controllers, Electrical Equipment for Measurement, Control and Laboratory Use, Base Materials, Power and Data Transmission Cables and Connectors

[1] When the date, edition, version, etc. is not identified in the scope of accreditation, laboratories may use the version that immediately precedes the current version for a period of one year from the date of publication of the standard measurement method, per part C., Section 1 of A2LA *R101 - General Requirements - Accreditation of ISO-IEC 17025 Laboratories*.

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators		
Part 15B	ANSI C63.4:2014	40000

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	40000
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
U-NII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	40000
BPL Intentional Radiators Part 15G	ANSI C63.10:2013	40000
White Space Device Intentional Radiators Part 15H	ANSI C63.10:2013	40000
Commercial Mobile Services (FCC Licensed Radio Service Equipment) Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
General Mobile Radio Services (FCC Licensed Radio Service Equipment) Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97, and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment) Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Maritime and Aviation Radio Services		
Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
Microwave and Millimeter Bands Radio Services		
Parts 25, 30, 74, 90 (above 3 GHz), 97 (above 3 GHz), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Broadcast Radio Services		
Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Signal Boosters		
Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

[2] Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

Accredited Laboratory

A2LA has accredited

ELITE ELECTRONIC ENGINEERING INC.

Downers Grove, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 19th day of May 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.