Engineering Test Report No. 2103822-02		
Report Date	January 17, 2022	
Manufacturer Name	Otto Engineering	
Manufacturer Address	10 W Main Street Carpentersville, IL 60110	
Product Name Brand/Model No.	OTTO VL10000 Series	
Date Received	January 10, 2021	
Test Dates	January 10, 2021 and January 11, 2021	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 Innovation, Science, and Economic Development Canada, RSS-247, Innovation, Science, and Economic Development Canada, RSS-GEN	
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	PO00070642	

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, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247, Innovation, Science, and Economic Development Canada, RSS-GEN 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
–	17 JAN 2022	Initial Release of Engineering Test Report No. 2103822-02

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on twelve (12) Lynq-PRO Handheld GPS/LoRa/BT Devices (hereinafter referred to as the Equipment Under Test (EUT)).

The EUTs are equipped with the following precertified radios:

BLE radio, FCC ID: RYYEYSLSN, operating in the 2402MHz to 2480MHz frequency band.

LoRa radio, FCC ID: 2A3QJ-OTTOVL01, IC ID: 27982-OTTOVL01, operating in the frequency band 902MHz to 928MHz.

Per Otto Engineering personnel, up to twelve (12) EUTs can be placed in a Lynq Rapid Deployment Kit. When the EUTs are placed in the Lynq Rapid Deployment Kit, the EUTs can be powered up. When the EUTs are powered up and inside the Lynq Rapid Deployment Kit, the LoRa radios that are in the EUTs can transmit. All of the LoRa radios inside the EUTs can transmit when in the Lynq Rapid Deployment Kit, but only one radio can transmit in any one time period.

Also, per Otto Engineering personnel, the BLE radios inside the EUTs can NOT transmit when the EUTs are placed in the Lynq Rapid Deployment Kit.

The nature of these measurements is to ensure that the LoRa radio modules remain in compliance with the emissions requirements of the FCC and Innovation, Science, and Economic Development Canada when inserted in the Lynq Rapid Deployment Kit.

The EUTs were identified as follows:

EUT Identification	
EUT #1 through EUT #12	
Description	Lynq-PRO Handheld GPS/LoRa/BT Device
Model/Part No.	OTTO VL10000 Series
Serial No.	N/A
Software/Firmware Version	Lynq Rapid Deployment Kit: V1.0.0 Lynq Pro: Host: v1.0.1.0 Lynq Mod.: v1.1.0.1 BLE: v1.0.1 IAP: v1.0.0.0
Size of EUT	2.30” x 4.25” x 1.11”
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Highest Internal Frequency of the EUT	928MHz

The EUTs listed above were used throughout the test series.

3. Power Input

The EUTs were powered by internal batteries. The Lynq Rapid Deployment Kit obtained 115V 60Hz power via a 3 wire, unshielded power cord.

4. Grounding

The EUTs were not connected to ground. The Lynq Rapid Deployment Kit was connected to ground through its third wire of its input power cord.

5. Support Equipment

The EUTs were submitted for testing along with the Lynq Rapid Deployment Kit.

6. Interconnect Leads

No interconnect leads were used during the tests.

7. Modifications Made to the EUT

No modifications were made to the EUTs during the testing.

8. Modes of Operation

The EMC tests were performed with the EUTs operating in one or more of the test modes described below. See the specific test section for the applicable test modes.

8.1. All Radios Transmitting

This mode was achieved by applying power to the Lynq Rapid Deployment Kit. Twelve (12) EUTs were inserted in the Lynq Rapid Deployment Kit. Once inserted in the Lynq Rapid Deployment Kit, the LoRa radio modules in the EUTs began transmitting continuously, one at a time.

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, 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 Otto Engineering and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247, Innovation, Science, and Economic Development Canada, RSS-247, Innovation, Science, and Economic Development Canada, RSS-GEN, 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	17%
Atmospheric Pressure	1025mb

13. Summary

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

Test Description	Test Requirements	Test Methods	Results
Effective Isotropic Radiated Power (EIRP)	FCC 15C 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Spurious Radiated Emissions Test	FCC 15C 15.247 ISED RSS-247	ANSI C63.4:2013	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]

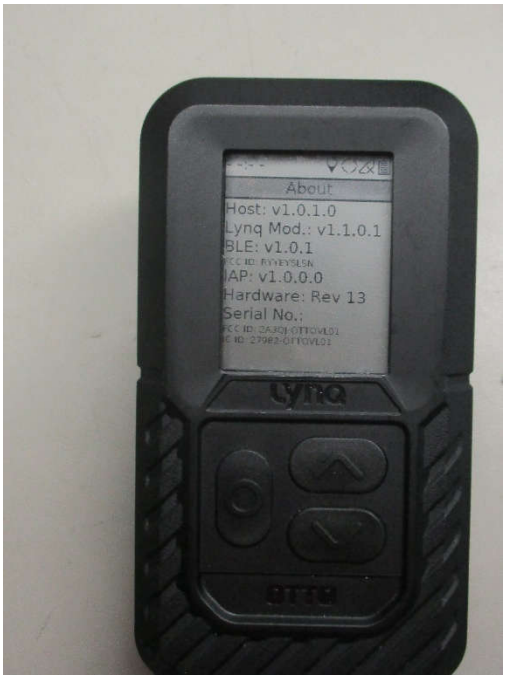
15. Statement of Conformity

The Otto Engineering Lynq-PRO Handheld GPS/LoRa/BT Device, Model No. OTTO VL10000 Series, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247, Innovation, Science, and Economic Development Canada, RSS-GEN when placed in a Lynq Rapid Deployment Kit.

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, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247, Innovation, Science, and Economic Development Canada, RSS-GEN test specifications. The data presented in this test report pertains to the EUTs on the test date specified. Any electrical or mechanical modifications made to the EUTs subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT



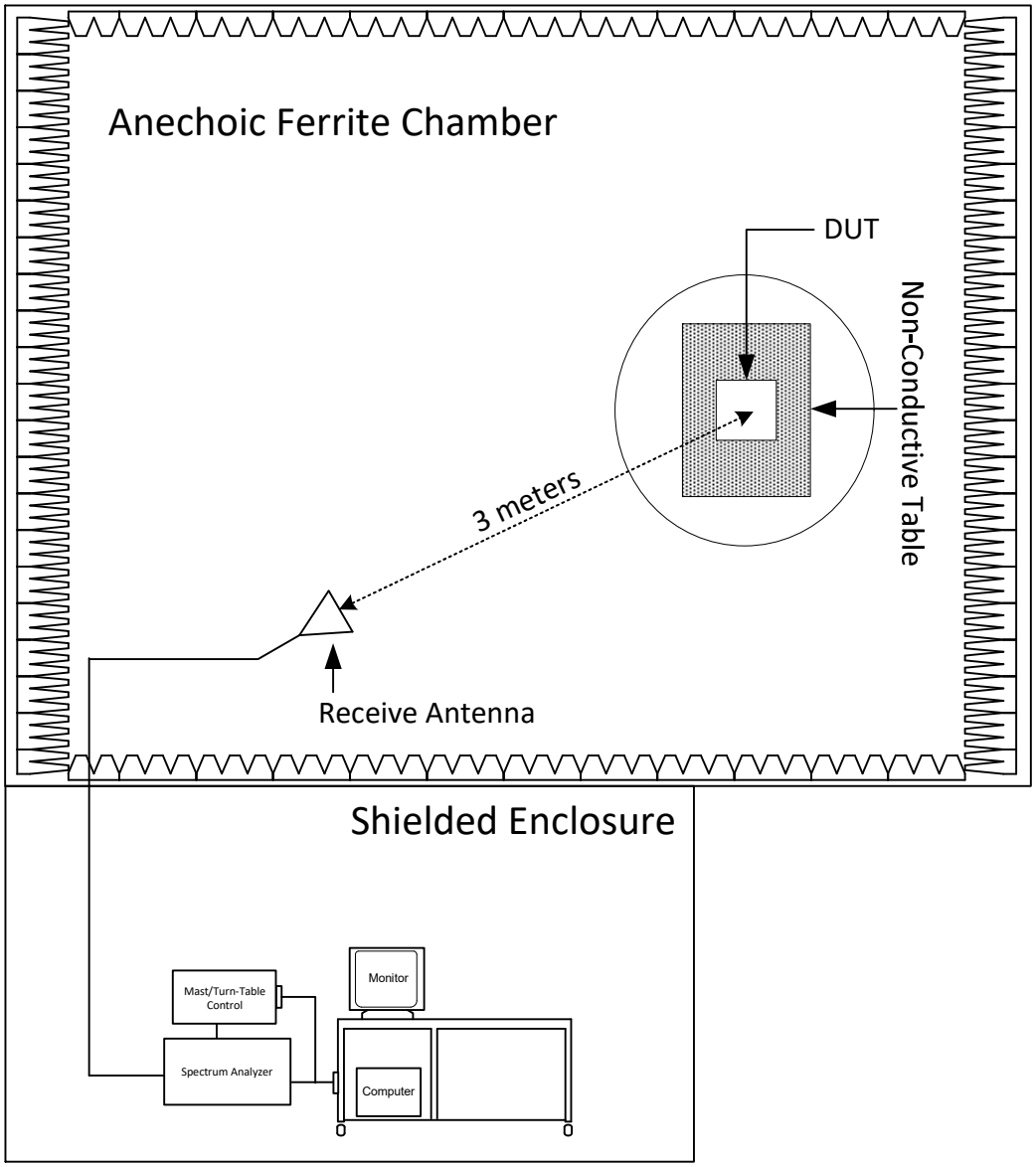
18. Equipment List

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
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/11/2021	3/11/2022
XPQ3	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	4	1.8GHZ-10GHZ	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. Effective Isotropic Radiated Power (EIRP)

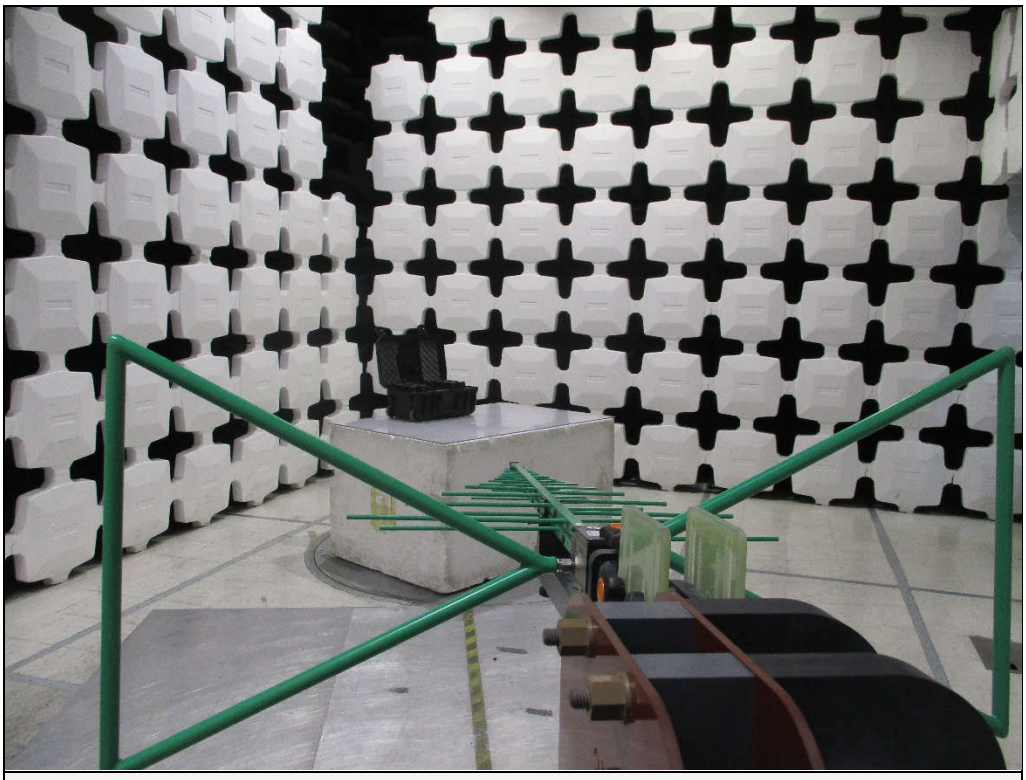
EUT Information	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	N/A
Mode	All Radios Transmitting

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent)
Notes	None

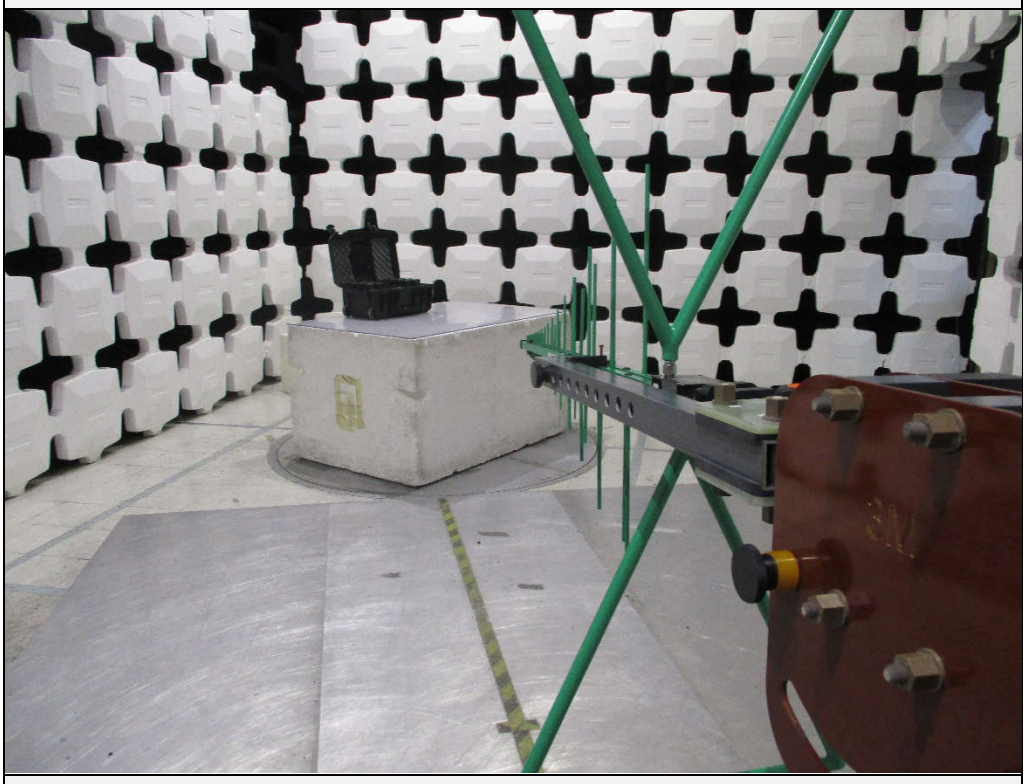
Requirements
FOR FREQUENCY HOPPING SYSTEMS IN THE 902-928 MHz, CHANNELS ≥ 50 The output power shall not exceed 4W (36dBm).

Procedures
The EUT was placed on the non-conductive stand and set to transmit. A bilog antenna was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 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 dipole antenna was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss, as required. The peak power output was calculated for low, middle, and high hopping frequencies.

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



Test Setup for EIRP Tests: Horizontal Polarization



Test Setup for EIRP Tests: Vertical Polarization

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model	OTTO VL10000 Series
S/N	N/A
Mode	All Radios Transmitting
Carrier Frequency	902.48MHz (low channel)
Parameters	EIRP = 269.2mW (24.3dBm)
Notes	None
Date Tested	January 10, 2022

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)
902.48	H	86.1	16.9	2.2	2.0	17.0	36.0	-19.0
	V	90.7	24.2	2.2	2.0	24.3	36.0	-11.7

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

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model	OTTO VL10000 Series
S/N	N/A
Mode	All Radios Transmitting
Carrier Frequency	915.075MHz (mid channel)
Parameters	EIRP = 446.7mW (26.5dBm)
Notes	None
Date Tested	January 10, 2022

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB0	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
915.08	H	87.6	18.2	2.2	2.1	18.3	36.0	-17.7
915.08	V	92.9	26.4	2.2	2.1	26.5	36.0	-9.5

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

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model	OTTO VL10000 Series
S/N	N/A
Mode	All Radios Transmitting
Carrier Frequency	926.175MHz
Parameters	EIRP = 295.1mW (24.7dBm)
Notes	None
Date Tested	January 10, 2022

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB0	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
926.18	H	83.7	14.9	2.2	2.1	15.0	36.0	-21.0
926.18	V	91.7	24.6	2.2	2.1	24.7	36.0	-11.3

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

21. Spurious Radiated Emissions Test (Spot Checks)

EUT Information	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	S/N1
Mode	All Radios Transmitting

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 996369 D04 Module Integration Guide v01: 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 radio spectrum is to be investigated with all the transmitters in the final host product functioning to determine that no emissions exceed the highest limit permitted for any one individual transmitter as required by Section 2.947(f). Radiated Emissions Not In Restricted Bands: Per FCC 15.247, Section (d), and ISED RSS-247, Section 5.5, 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. Radiated Emissions In Restricted Bands: Per 15.247, Section (d), 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). Per ISED RSS-247, Section 3.3, radiated emissions which fall in the restricted bands, as defined in ISED RSS-Gen, Section 8.10, must comply with the radiated emission limits specified in RSS-Gen, Section 8.9.

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.

FOR 15.247

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to 10.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 10.0GHz.

1) For all harmonics not in the restricted bands, the following procedure was used:

   a) The field strength of the fundamental was measured using a bilog antenna. The bilog antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on an 80cm high 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.

   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:

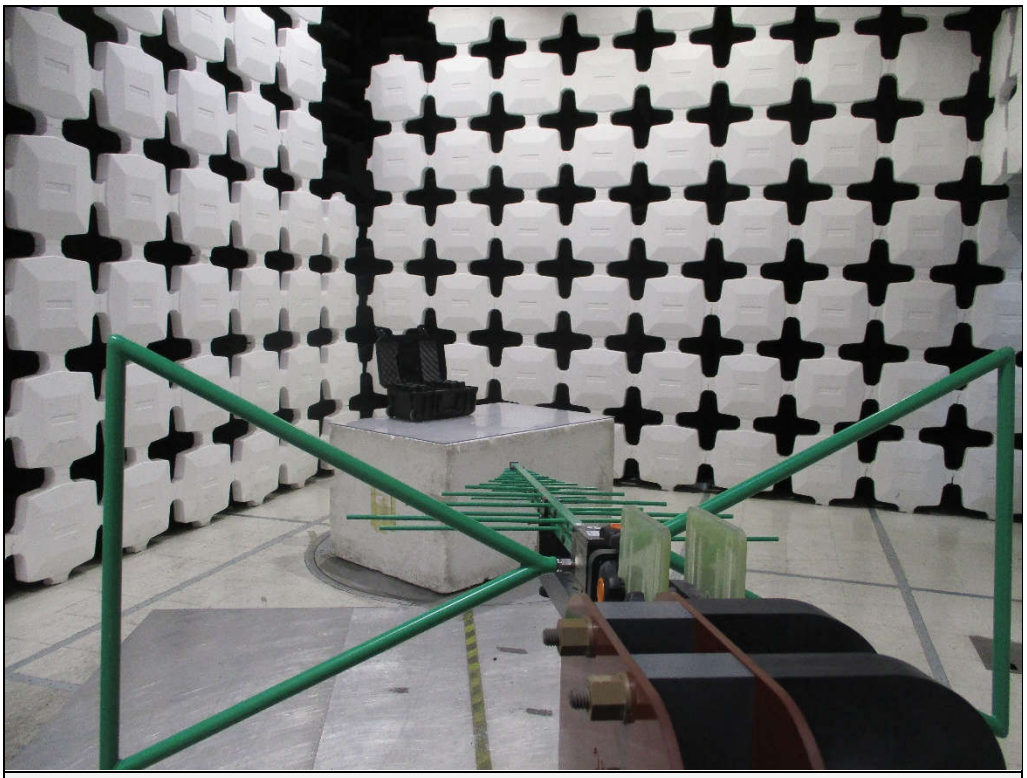
i. The EUT was rotated so that all of its sides were exposed to the receiving antenna.

ii. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

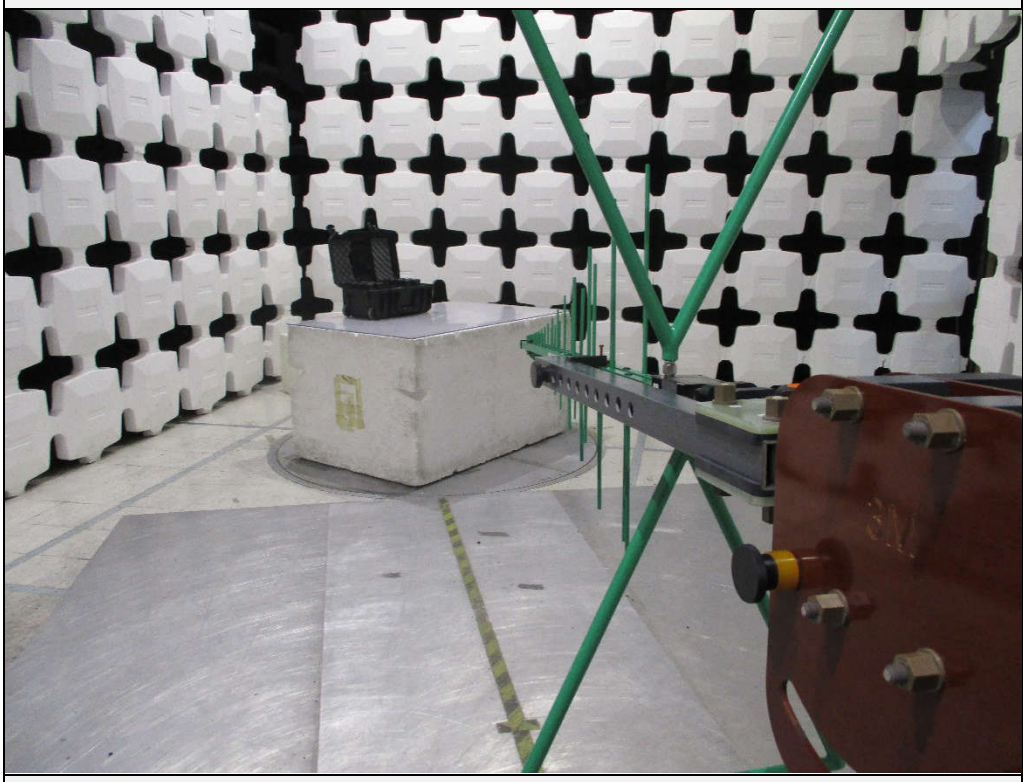
iii. The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

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.

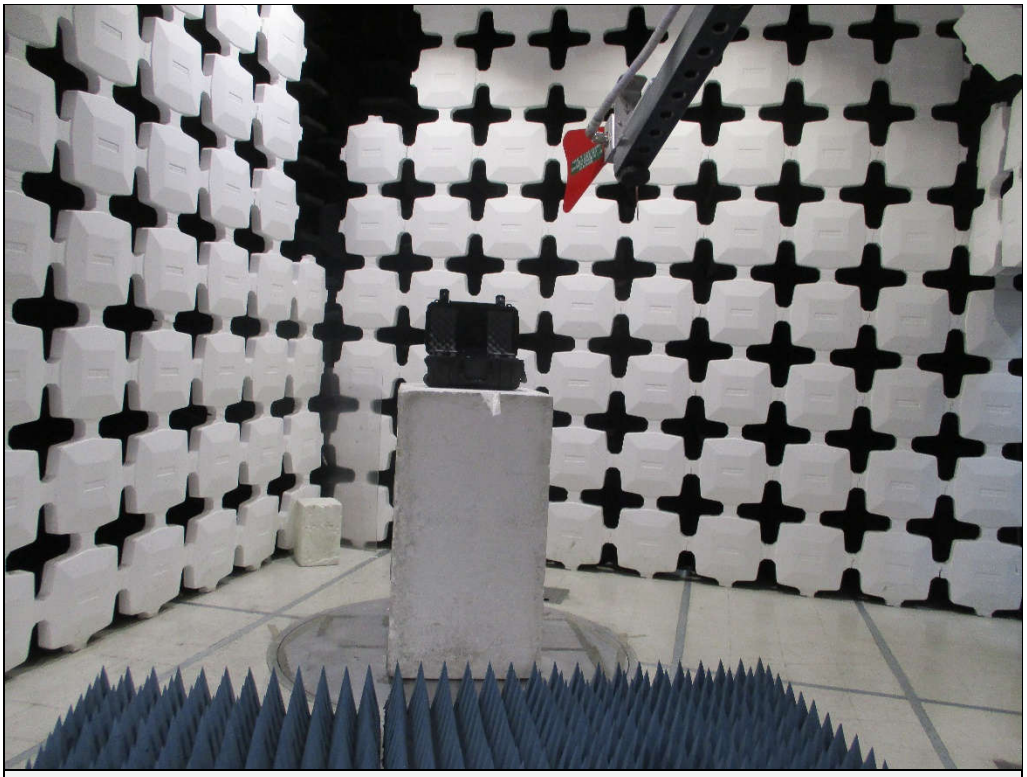
e) For all radiated emissions measurements above 1GHz, the peak readings must comply with the §15.35(b) limits. §15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions 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).



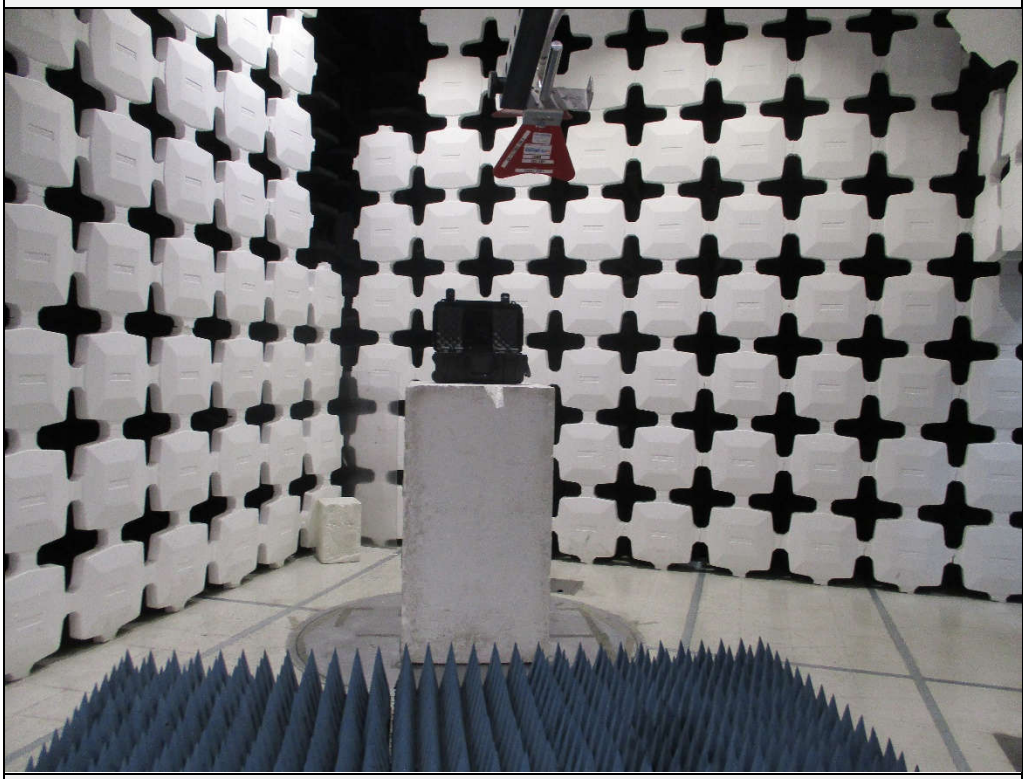
Test Setup for Spurious Emissions: 30MHz to 1GHz, Horizontal Polarization



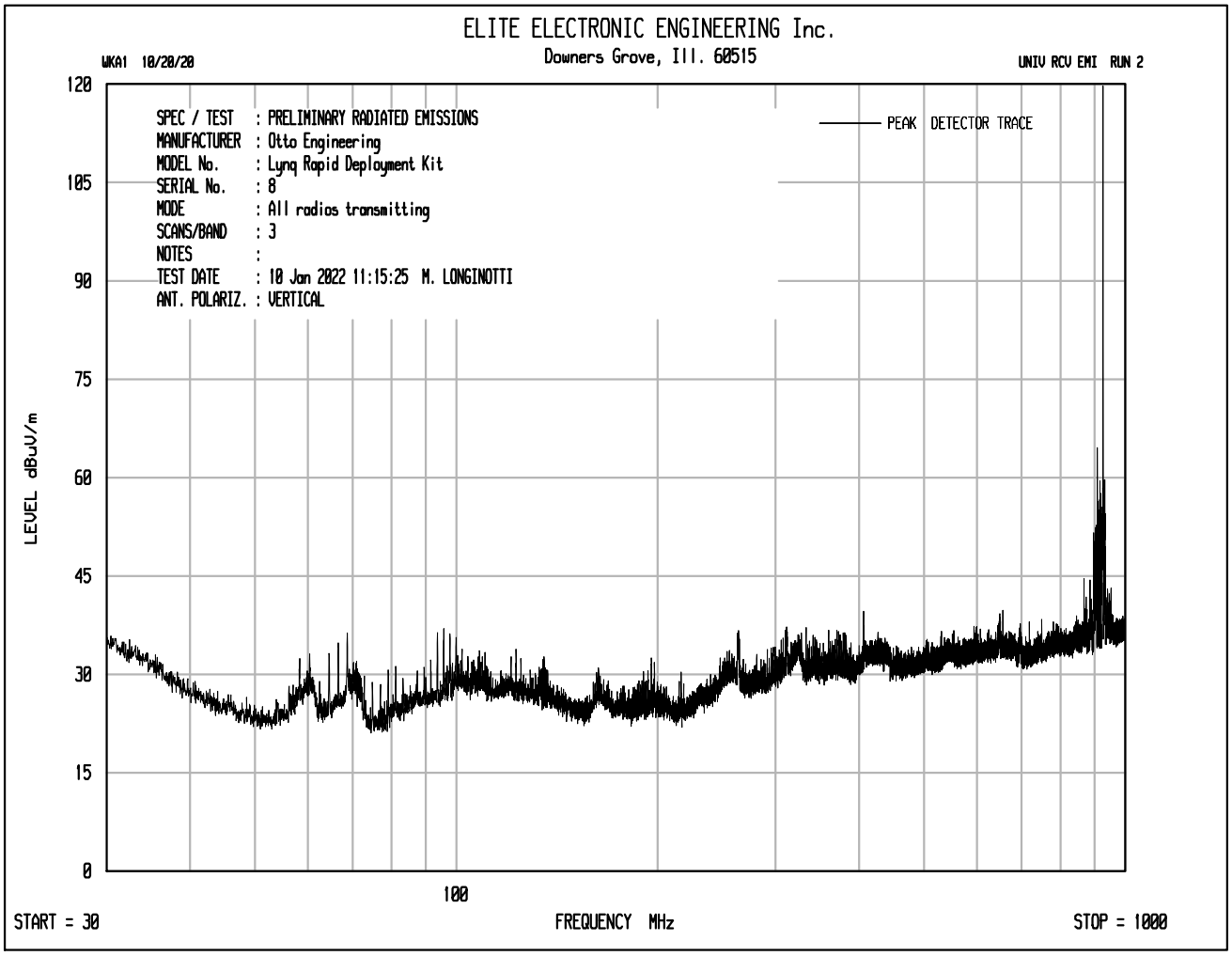
Test Setup for Spurious Emissions: 30MHz to 1GHz, Vertical Polarization

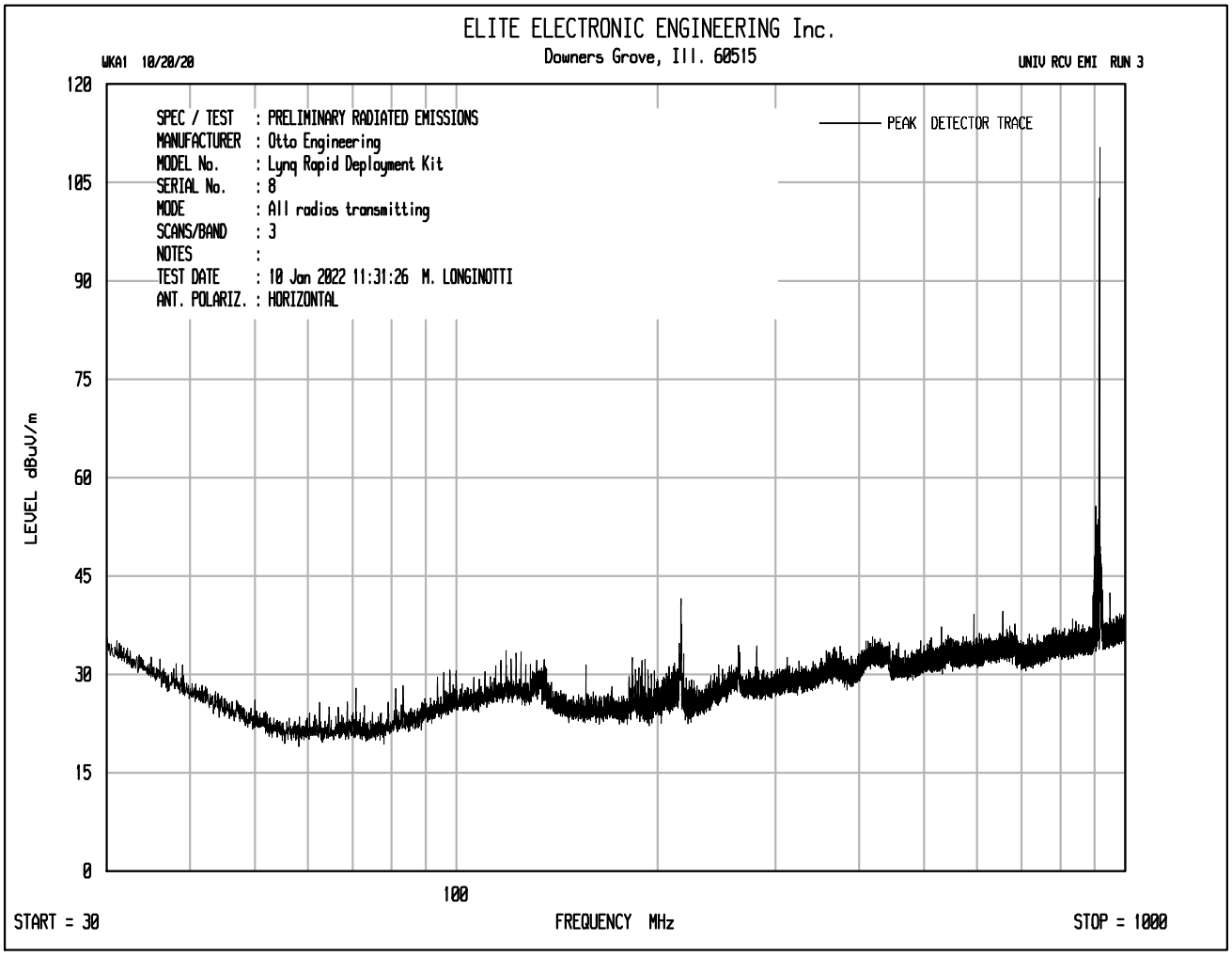


Test Setup for Spurious Emissions: Above 1GHz, Horizontal Polarization



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 2
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Otto Engineering
MODEL No. : Lynq Rapid Deployment Kit
SERIAL No. : 8
MODE : All radios transmitting
SCANS/BAND : 3
NOTES :
TEST DATE : 10 Jan 2022 11:15:25 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
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 : Otto Engineering
MODEL No. : Lynq Rapid Deployment Kit
SERIAL No. : 8
MODE : All radios transmitting
SCANS/BAND : 3
NOTES :
TEST DATE : 10 Jan 2022 11:31:26 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
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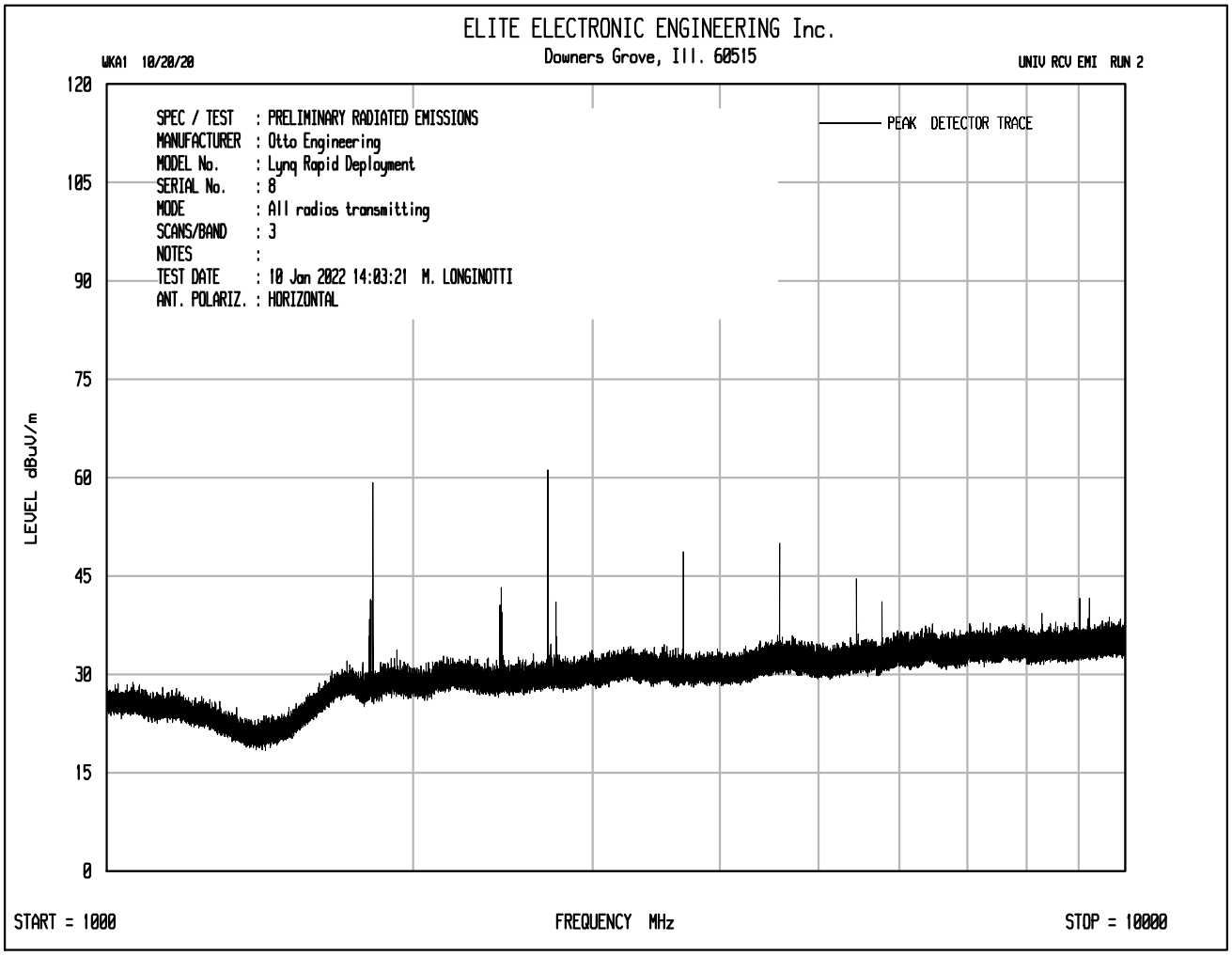
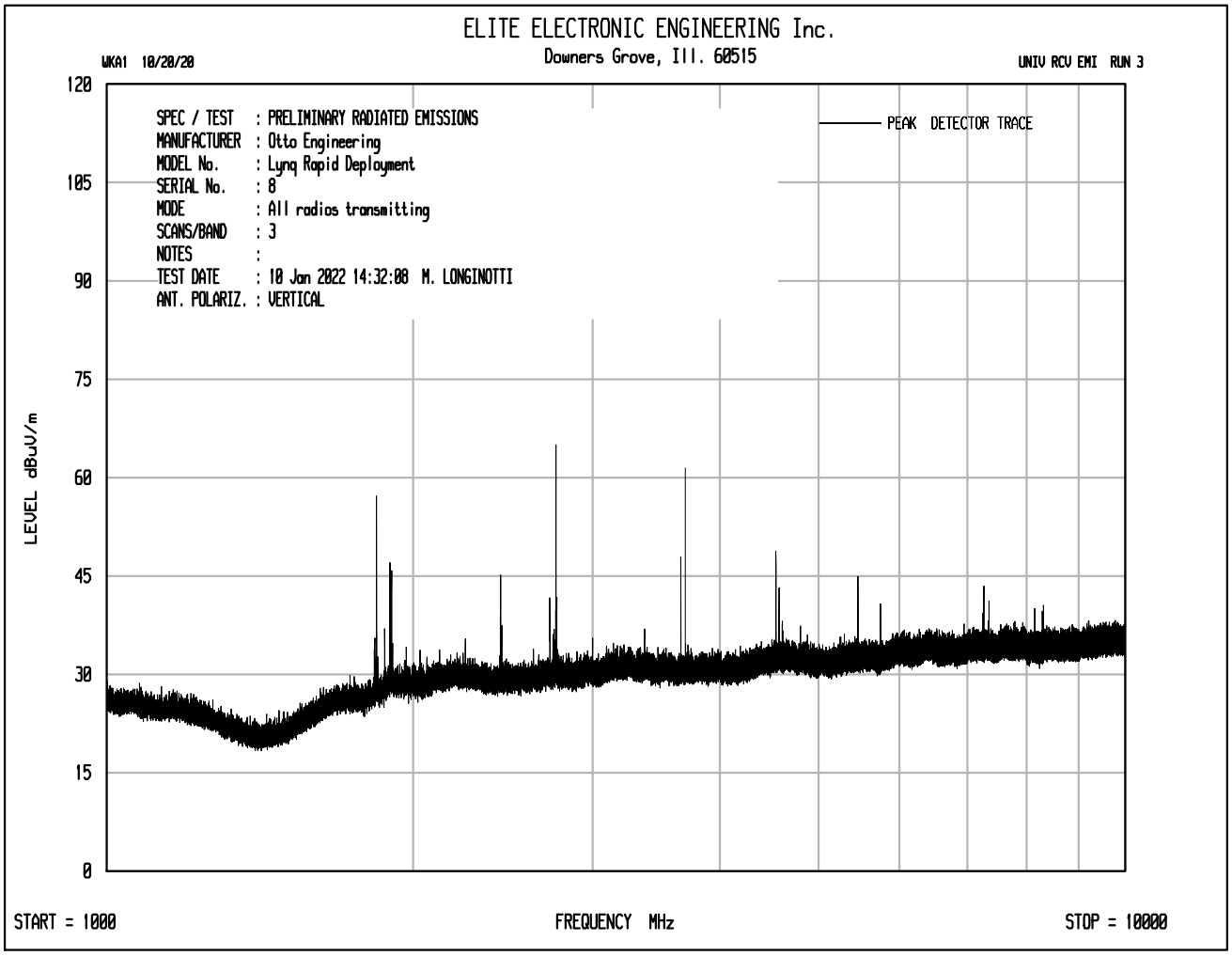
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 2
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Otto Engineering
MODEL No. : Lynq Rapid Deployment
SERIAL No. : 8
MODE : All radios transmitting
SCANS/BAND : 3
NOTES :
TEST DATE : 10 Jan 2022 14:03:21 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 3
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Otto Engineering
MODEL No. : Lynq Rapid Deployment
SERIAL No. : 8
MODE : All radios transmitting
SCANS/BAND : 3
NOTES :
TEST DATE : 10 Jan 2022 14:32:08 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	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	N/A
Test	Case Spurious Radiated Emissions - Peak Readings in Restricted Bands
Mode	All Radios Transmitting
Frequency Tested	902.475MHz
Dates Tested	January 10 and 11, 2022

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)
2707.43	H	72.5		2.8	33.4	-40.2	68.5	2667.4	5000.0	-5.5
	V	74.5		2.8	33.4	-40.2	70.5	3358.1	5000.0	-3.5
3609.90	H	70.9		3.2	34.6	-39.5	69.2	2891.9	5000.0	-4.8
	V	67.2		3.2	34.6	-39.5	65.5	1888.8	5000.0	-8.5
4512.38	H	63.9		3.6	35.9	-39.6	63.8	1552.7	5000.0	-10.2
	V	59.3		3.6	35.9	-39.6	59.2	914.3	5000.0	-14.8
5414.85	H	52.9		3.9	36.6	-39.5	53.9	496.4	5000.0	-20.1
	V	55.1		3.9	36.6	-39.5	56.1	639.5	5000.0	-17.9
8122.28	H	45.5	Ambient	4.9	38.3	-39.6	49.1	285.8	5000.0	-24.9
	V	46.3	Ambient	4.9	38.3	-39.6	49.9	313.4	5000.0	-24.1
9024.75	H	47.2		4.9	38.6	-39.4	51.4	369.9	5000.0	-22.6
	V	48.8		4.9	38.6	-39.4	53.0	444.7	5000.0	-21.0

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	N/A
Test	Case Spurious Radiated Emissions - Peak Readings Not in Restricted Bands
Mode	All Radios Transmitting
Frequency Tested	902.475MHz
Dates Tested	January 10 and 11, 2022

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)
902.48	H	85.90		1.5	26.5	0.0	113.9	496440.7	NA	NA
	V	90.50		1.5	26.5	0.0	118.5	843077.3	NA	NA
1804.95	H	83.30		2.2	31.5	-40.1	76.9	7003.3	84307.7	-21.6
	V	76.40		2.2	31.5	-40.1	70.0	3164.5	84307.7	-28.5
6317.33	H	60.10		4.3	38.1	-39.6	62.9	1397.9	84307.7	-35.6
	V	61.70		4.3	38.1	-39.6	64.5	1680.6	84307.7	-34.0
7219.80	H	50.90		4.6	38.4	-39.7	54.3	517.2	84307.7	-44.2
	V	51.90		4.6	38.4	-39.7	55.3	580.3	84307.7	-43.2

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	N/A
Test	Case Spurious Radiated Emissions - Peak Readings in Restricted Bands
Mode	All Radios Transmitting
Frequency Tested	915.075MHz
Dates Tested	January 10 and 11, 2022

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)
2745.23	H	70.1		2.8	33.2	-40.2	65.9	1981.1	5000.0	-8.0
	V	73.8		2.8	33.2	-40.2	69.6	3033.3	5000.0	-4.3
3660.30	H	67.6		3.3	34.8	-39.5	66.1	2018.9	5000.0	-7.9
	V	67.2		3.3	34.8	-39.5	65.7	1928.0	5000.0	-8.3
4575.38	H	65.9		3.6	36.4	-39.7	66.2	2034.4	5000.0	-7.8
	V	62.7		3.6	36.4	-39.7	63.0	1407.5	5000.0	-11.0
7320.60	H	48.4		4.7	38.2	-39.6	51.6	382.3	5000.0	-22.3
	V	56.6		4.7	38.2	-39.6	59.8	982.5	5000.0	-14.1
8235.68	H	46.2		4.9	38.4	-39.5	50.0	316.3	5000.0	-24.0
	V	48.8		4.9	38.4	-39.5	52.6	426.6	5000.0	-21.4
9150.75	H	46.9		5.0	38.7	-39.4	51.2	364.7	5000.0	-22.7
	V	45.8		5.0	38.7	-39.4	50.1	321.3	5000.0	-23.8

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	N/A
Test	Case Spurious Radiated Emissions - Peak Readings Not in Restricted Bands
Mode	All Radios Transmitting
Frequency Tested	915.075MHz
Dates Tested	January 10 and 11, 2022

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)
915.08	H	87.40		1.6	26.3	0.0	115.3	580373.7	NA	NA
	V	92.70		1.6	26.3	0.0	120.6	1068335.6	NA	NA
1830.15	H	85.80		2.2	31.7	-40.1	79.6	9569.2	106833.6	-21.0
	V	77.70		2.2	31.7	-40.1	71.5	3766.0	106833.6	-29.1
5490.45	H	61.00		3.9	36.7	-39.4	62.2	1294.4	106833.6	-38.3
	V	59.60		3.9	36.7	-39.4	60.8	1101.7	106833.6	-39.7
6405.53	H	53.30		4.3	38.0	-39.5	56.0	634.1	106833.6	-44.5
	V	57.80		4.3	38.0	-39.5	60.5	1064.5	106833.6	-40.0

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	N/A
Test	Case Spurious Radiated Emissions - Peak Readings in Restricted Bands
Mode	All Radios Transmitting
Frequency Tested	926.175MHz
Notes	January 10 and January 11, 2022

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)
2778.53	H	73.2		2.8	33.0	-40.1	68.8	2769.1	5000.0	-5.1
	V	74.6		2.8	33.0	-40.1	70.2	3253.4	5000.0	-3.7
3704.70	H	70.7		3.3	34.4	-39.5	68.9	2793.0	5000.0	-5.1
	V	63.6		3.3	34.4	-39.5	61.8	1233.3	5000.0	-12.2
4630.88	H	70.0		3.6	36.7	-39.6	70.7	3410.5	5000.0	-3.3
	V	69.0		3.6	36.7	-39.6	69.7	3039.6	5000.0	-4.3
7409.40	H	51.3		4.7	38.0	-39.6	54.5	528.2	5000.0	-19.5
	V	53.5		4.7	38.0	-39.6	56.7	680.4	5000.0	-17.3
8335.58	H	52.9		4.9	38.4	-39.5	56.7	686.6	5000.0	-17.2
	V	48.7		4.9	38.4	-39.5	52.5	423.3	5000.0	-21.4

Test Details	
Manufacturer	Otto Engineering
Product	Lynq-PRO Handheld GPS/LoRa/BT Device
Model No.	OTTO VL10000 Series
Serial No.	S/N1
Test	Case Spurious Radiated Emissions - Peak Readings Not in Restricted Bands
Mode	All Radios Transmitting
Frequency Tested	926.175MHz
Dates Tested	January 10 and 11, 2022

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)
926.18	H	83.50		1.6	26.6	0.0	111.7	385474.8	NA	NA
	V	91.50		1.6	26.6	0.0	119.7	968268.9	NA	NA
1852.35	H	83.10		2.3	31.9	-40.1	77.1	7182.5	96826.9	-22.6
	V	77.00		2.3	31.9	-40.1	71.0	3558.6	96826.9	-28.7
5557.05	H	57.40		4.0	37.1	-39.4	59.0	895.9	96826.9	-40.7
	V	58.00		4.0	37.1	-39.4	59.6	960.0	96826.9	-40.1
6483.23	H	52.60		4.3	38.1	-39.5	55.6	600.3	96826.9	-44.2
	V	62.50		4.3	38.1	-39.5	65.5	1876.5	96826.9	-34.3
9261.75	H	53.70		5.0	38.9	-39.4	58.2	815.5	96826.9	-41.5
	V	46.00		5.0	38.9	-39.4	50.5	336.1	96826.9	-49.2

22. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

Valid to: June 30, 2021 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)

Test Technology:	Test Method(s) [1]:
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)
Vehicle Radiated Emissions	CISPR 12; 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
Bulk Current Injections (BCI) *(Closed Loop Method)*	ISO 11452-4; SAE J1113-4
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
Electrical Loads	ISO 16750-2, Sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, and 4.12
Dielectric Withstand Voltage	MIL-STD-202, Method 301; EIA-364-20D
Insulation Resistance	MIL-STD-202, Method 302; SAE/USCAR-2, Revision 6, Section 5.5.1; EIA-364-21D
Contact Resistance	MIL-STD-202, Method 307; SAE/USCAR-2, Revision 6, Section 5.3.1; EIA-364-23C; USCAR21-3 Section 4.5.3

Test Technology:	Test Method(s) [1]:
DC Resistance	MIL-STD-202, Method 303
Contact Chatter	MIL-STD-202, Method 310; SAE/USCAR-2, Revision 6, Section 5.1.9
Voltage Drop	SAE/USCAR-2, Revision 6, Section 5.3.2; USCAR21-3 Section 4.5.6
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; KN 11; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; 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; KN 32; ECE Regulation 10.06 Annex 14
Current Harmonics	IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3; 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; 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; 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; ECE Regulation 10.06 Annex 15

Test Technology:	Test Method(s) [1]:
Immunity (cont'd)	
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; 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
Power Frequency Magnetic Field Immunity	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
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
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; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; EN 50130-4; EN 61326-1; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; 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
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 300 330-1; 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;

Test Technology:	Test Method(s) [1]:
European Radio Test Standards (cont'd)	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
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
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
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; ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015;
OTA (Over the Air) Performance GSM, GPRS, EGPRS 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	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

Test Technology:	Test Method(s) [1]:
Electrical Measurements and Simulation	
AC Voltage / Current	FAA AC 150/5345-10H
(1mV to 5kV) 60 Hz	FAA AC 150/5345-43J
(0.1V to 250V) up to 500 MHz	FAA AC 150/5345-44K
(1µA to 150A) 60 Hz	FAA AC 150/5345-46E
DC Voltage / Current	FAA AC 150/5345-47C
(1mV to 15kV) / (1µA to 10A)	FAA EB 67D
Power Factor / Efficiency / Crest Factor	
(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, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is expected to be using the current version within one year of the date of publication, 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
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

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)
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
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

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)
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 8th day of August 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2021

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