Engineering Test Report No. 2103898-01		
Report Date	February 3, 2022	
Manufacturer Name	JR Automation	
Manufacturer Address	1000 Brown Rd Auburn Hills, MI 48326	
Product Name Brand/Model No.	Handheld Verifier, Model Number: TPM-HH-700-00	
Date Received	December 28, 2021	
Test Dates	January 17, 2022 and January 18, 2022	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.209 Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-102	
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 Longinotti	
Signature	Raymond J Klouda	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	423749-0510	

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 15.209 and Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-102 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
–	7 FEB 2022	Initial Release of Engineering Test Report No. 2103898-01

2. Introduction

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

The EUT was identified as follows:

EUT Identification	
EUT #1	
Description	Handheld Verifier
Model/Part No.	TPM-HH-700-00
Software/Firmware Version	Test Firmware
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Highest Internal Frequency of the EUT	< 108MHz

The EUT listed above was used throughout the test series.

3. Power Input

The EUT was powered by 12VDC from internal batteries.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

No support equipment was used during the tests.

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. See the specific test section for the applicable test modes.

8.1. Transmit at 125kHz, CW (unmodulated)

This mode was achieved by turning on the EUT and programming it to transmit at 125kHz, CW (unmodulated).

8.2. Transmit at 125kHz, Modulated

This mode was achieved by turning on the EUT and programming it to transmit at 125kHz, Modulated.

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
- RSS-Gen, Issue 5, February 2021, Amendment 2, “General Requirements for Compliance of Radio Apparatus”

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

- RSS-102, Issue 5, March 2015, with Amendment 1, February 2021, “Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”

- SPR-002, Issue 1, September 2016, Supplementary Procedures for Assessing Compliance with RSSS-102 Nerve Stimulation Exposure Limits”

10. Test Plan

No test plan was provided. Instructions were provided by personnel from JR Automation and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.209, Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-102, and ANSI C63.4-2014 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	22°C
Relative Humidity	17%
Atmospheric Pressure	1005mb

13. Summary

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

Test Description	Test Requirements	Test Methods	Results
Radiated Emissions	FCC 15C, 15.209 RSS-Gen, Section 8.9	ANSI C63.10:2014	Conforms
99% Bandwidth Test	RSS-Gen, Section 6.7	RSS-Gen	N/A
Radio Frequency Exposure Test	RSS-102, Section 4	SPR-002	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 JR Automation Handheld Verifier, Model No. TPM-HH-700-00, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.209 and Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-102.

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 15.209 and Innovation, Science, and Economic Development Canada, RSS-Gen and RSS-102 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.

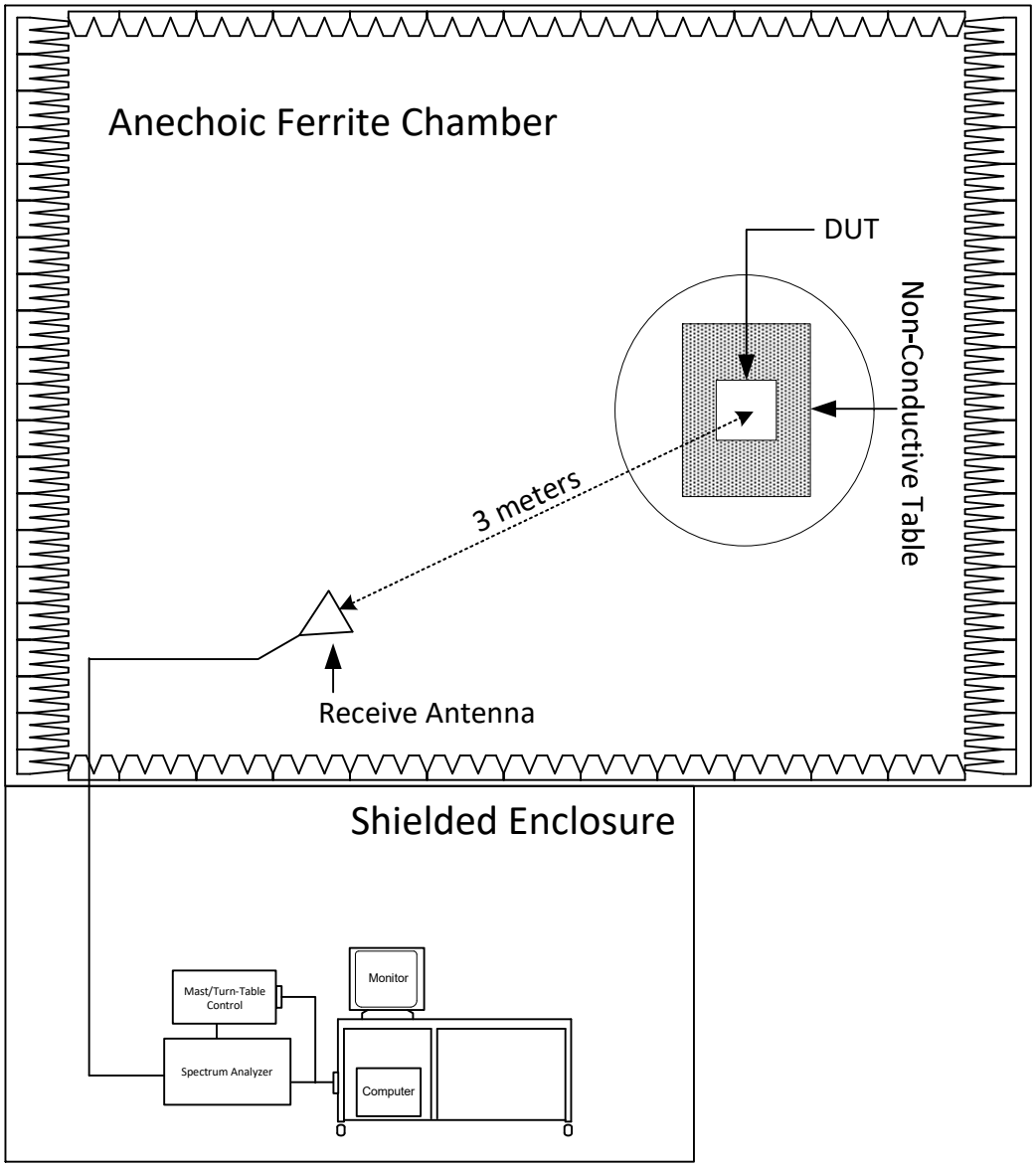
17. Photographs of EUT

18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
NLS0	24" ACTIVE LOOP ANTENNA	EMCO	6502	89979	10KHZ-30MHZ	9/11/2020	9/11/2022
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/20/2020	10/20/2022
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/11/2021	3/11/2022
RESS0	EM FIELD METER/ISOTROPIC PROBE	WAVECONTROL	SMP2/WPF3-HP	21SN1576/21WP030398	---	4/27/2021	4/27/2022
T1EP	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	CD6792	DC-18GHZ	1/21/2022	1/21/2024
VBV2	CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	---	---	N/A	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	

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. Radiated Emissions

EUT Information	
Manufacturer	JR Automation
Product	Handheld Verifier
Model No.	TPM-HH-700-00
Mode	Transmit at 125kHz, CW (unmodulated) Transmit at 125kHz, Modulated

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 30MHz: Active Loop 30MHz to1GHz: 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 FCC 15.209(a), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	2400/F (kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 -960	200	3
Above 960	500	3

Per RSS-Gen, Section 8.9, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following tables:

Frequency	Magnetic Field Strength (H-Field (microamps/meter)	Measurement Distance (meters)
9 – 490 kHz	6.37/F (kHz)	300
490 – 1705 kHz	63.7/F (kHz)	30
1.705 – 30 MHz	0.08	30

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 -960	200	3
Above 960	500	3

Procedures

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

The 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.

Radiated emissions from the test item were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector.

Radiated Emissions below 30MHz:

The broadband measuring antenna was positioned at a 3 meter distance from the test item. The frequency range from 100kHz to 30MHz was investigated using a peak detector function with the active loop antenna in both the horizontal and vertical polarization.

The maximum levels for each antenna polarization were plotted.

Final radiated emissions were performed at a test distance of 3 meters on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

1) Measurements from 100kHz to 150kHz were made using a peak detector, a 200Hz bandwidth, and an active loop antenna. Measurements from 150kHz to 30MHz were made using a peak detector, a 9kHz bandwidth, and an active loop antenna. (15.35(a) allows for the use of a peak detector to show compliance with the emissions limits as long as the correct bandwidth is used.)

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

    a) The test item was rotated so that all of its sides were exposed to the receiving antenna.

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

    c) For measurements made in the vertical polarization, the measuring antenna was rotated 360 degrees about its vertical axis.

    d) 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 pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

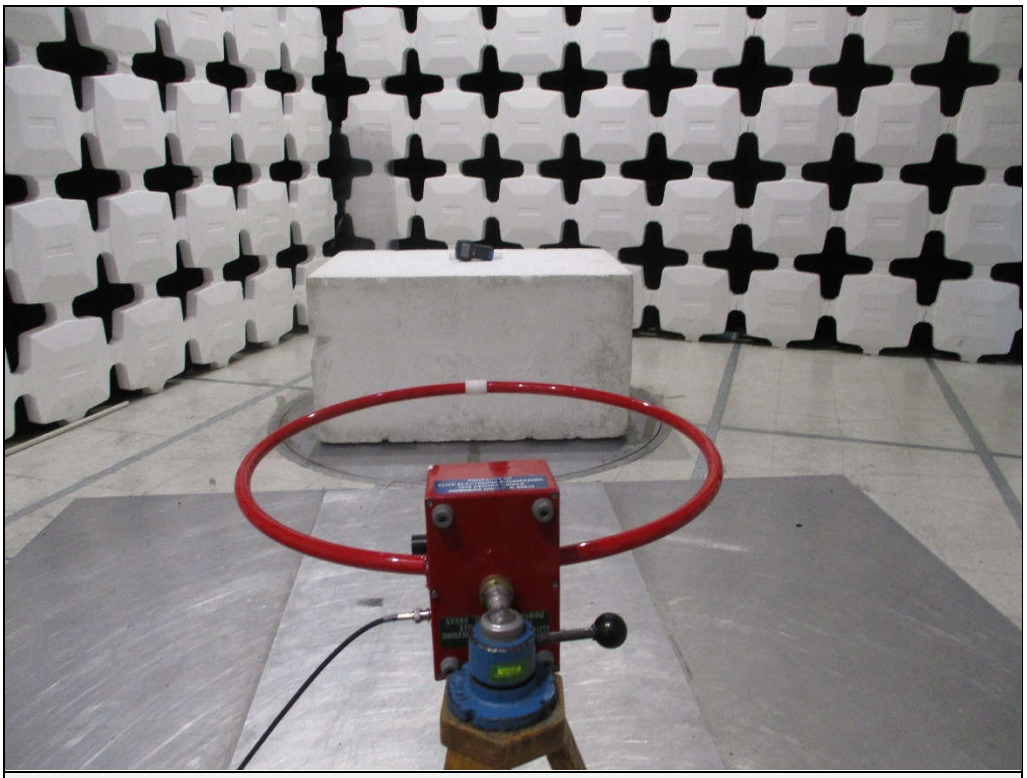
    e) Per 15.31(f)(2), for frequencies below 30MHz, measurements may be performed at a distance closer than that specified in the regulations. When performing measurements at a closer distance that specified, the results shall be extrapolated to the specified distance by using the square of the inverse linear distance extrapolation factor (40dB/decade).

Radiated Emissions above 30MHz:

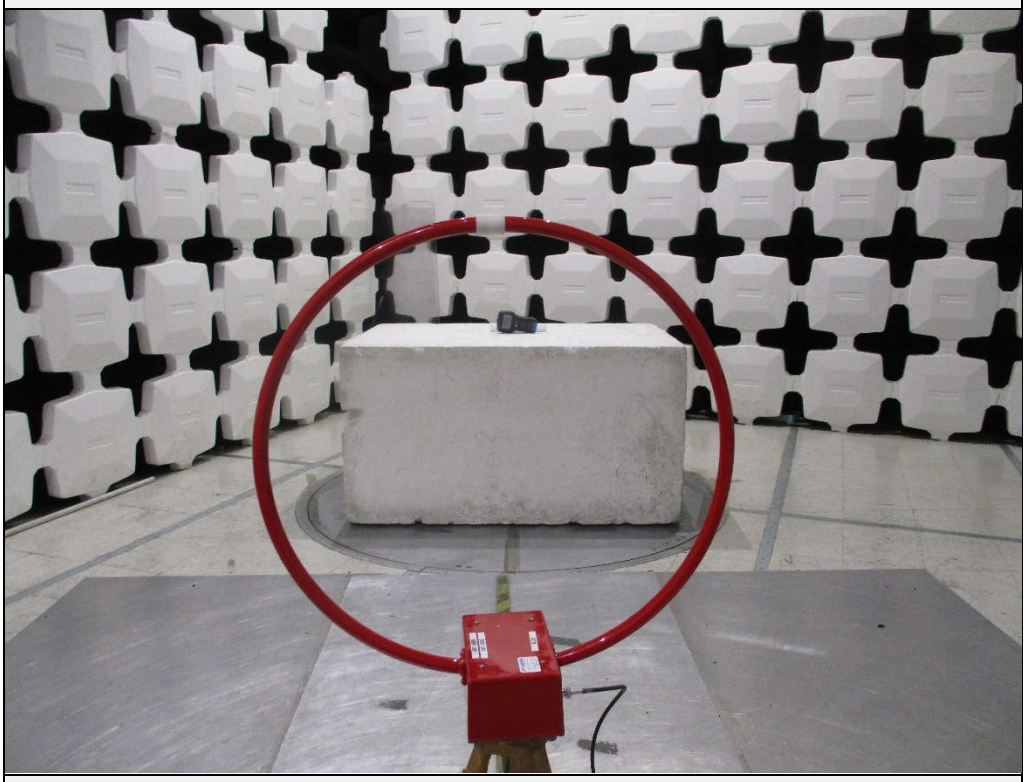
Since a quasi-peak detector requires long integration times, it is not practical to automatically sweep through the quasi-peak levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector.

The EUT and all peripheral equipment were placed on an 80cm high non-conductive stand. The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted.
Final radiated emissions were performed on all significant broadband and narrowband emissions found in the exploratory sweeps using the following methods:

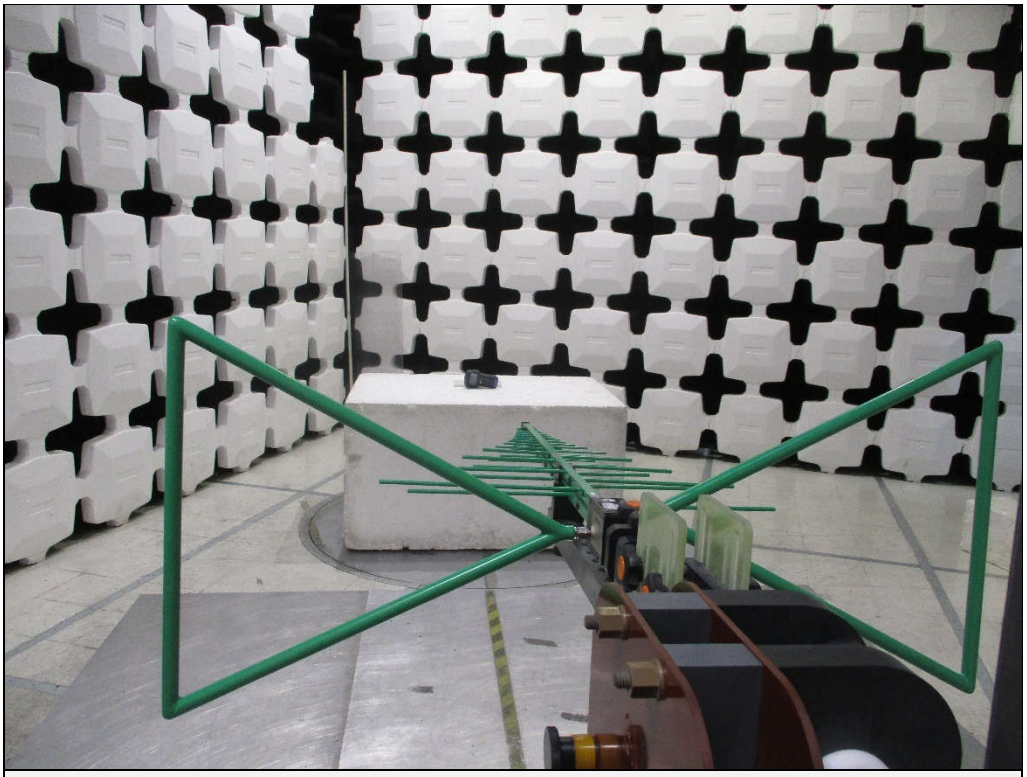
1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna.
2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:
    a) The EUT was rotated so that all sides were exposed to the receiving antenna.
    b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
    c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
    d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.



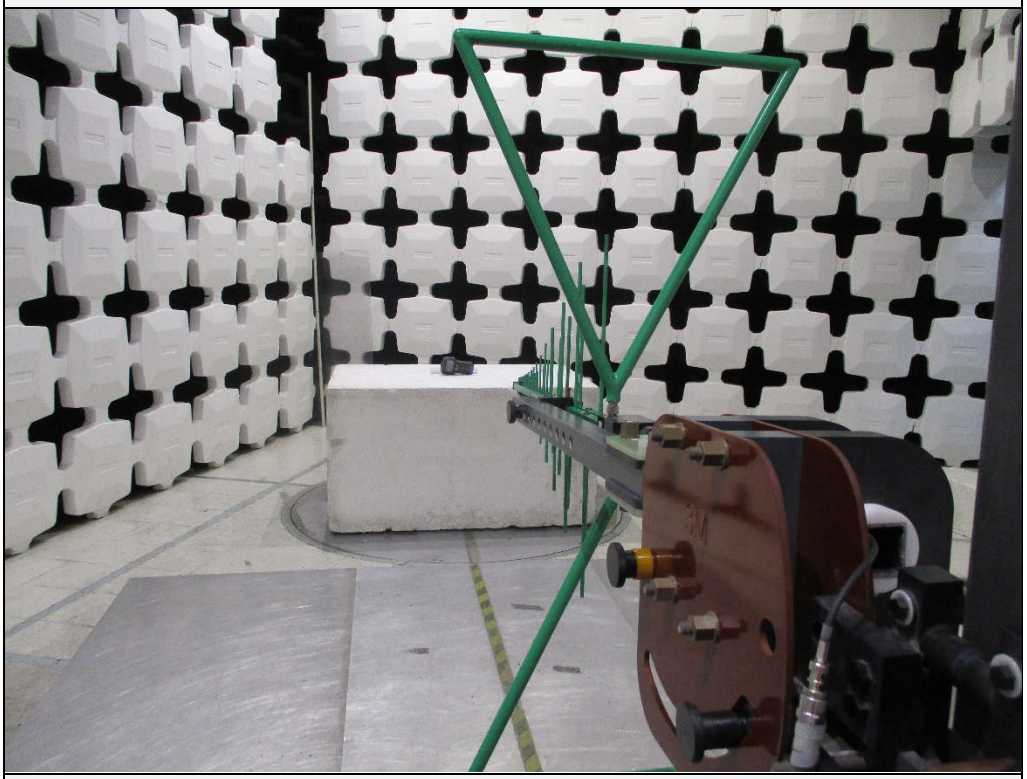
Test Setup for Radiated Emissions: 100kHz to 30MHz, Horizontal Polarization



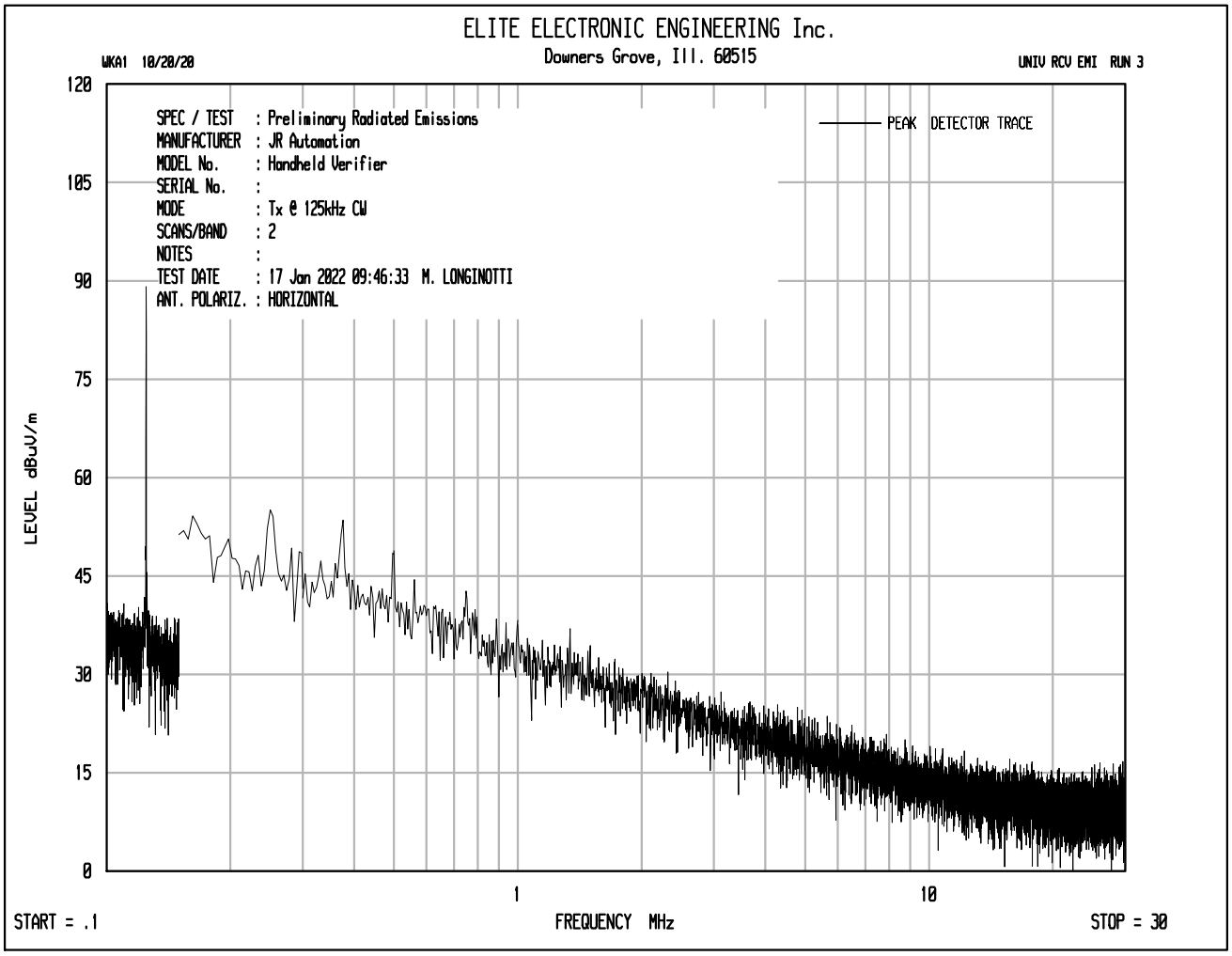
Test Setup for Radiated Emissions: 150kHz to 30MHz, Vertical Polarization

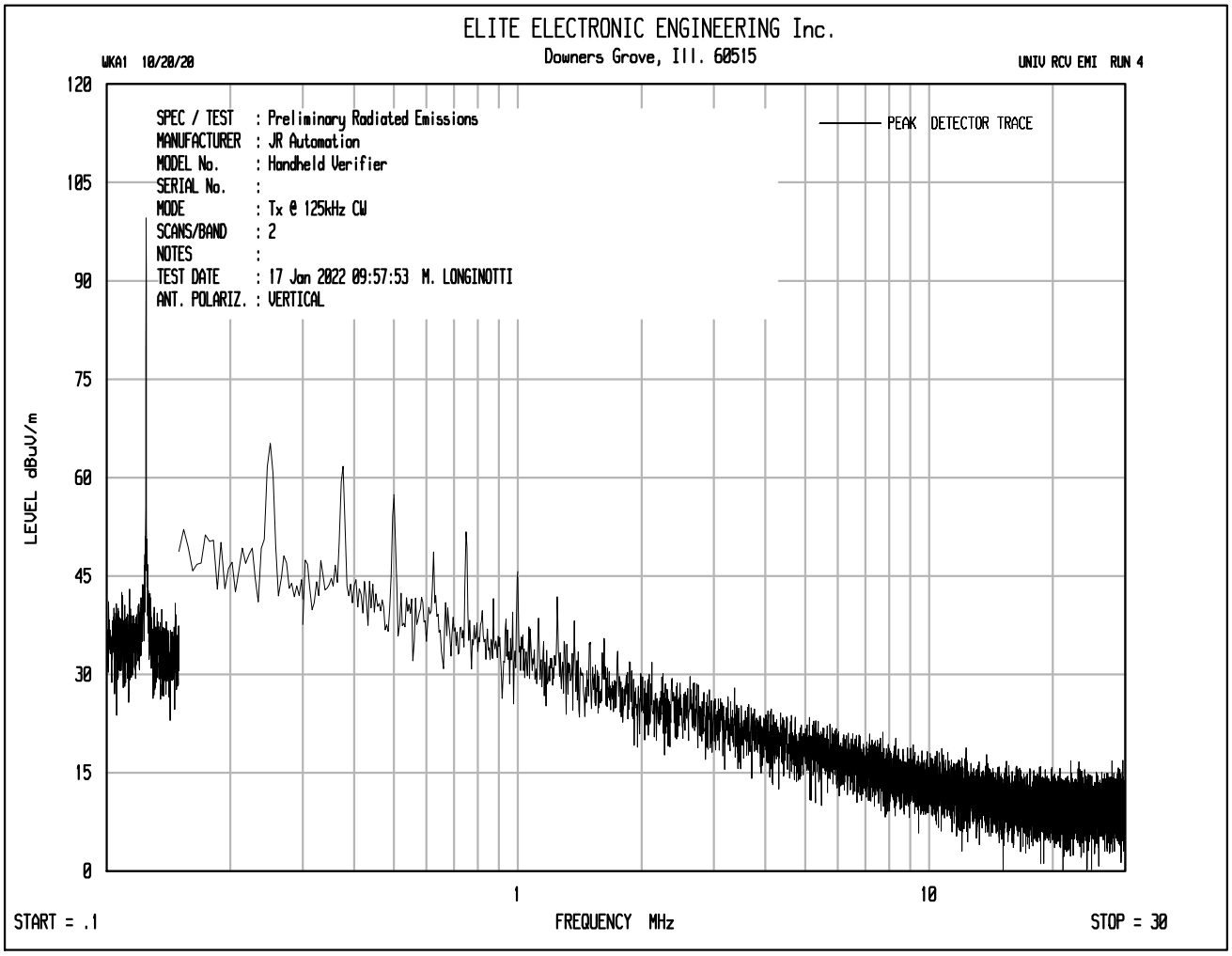


Test Setup for Radiated Emissions: 30MHz to 1GHz, Horizontal Polarization



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

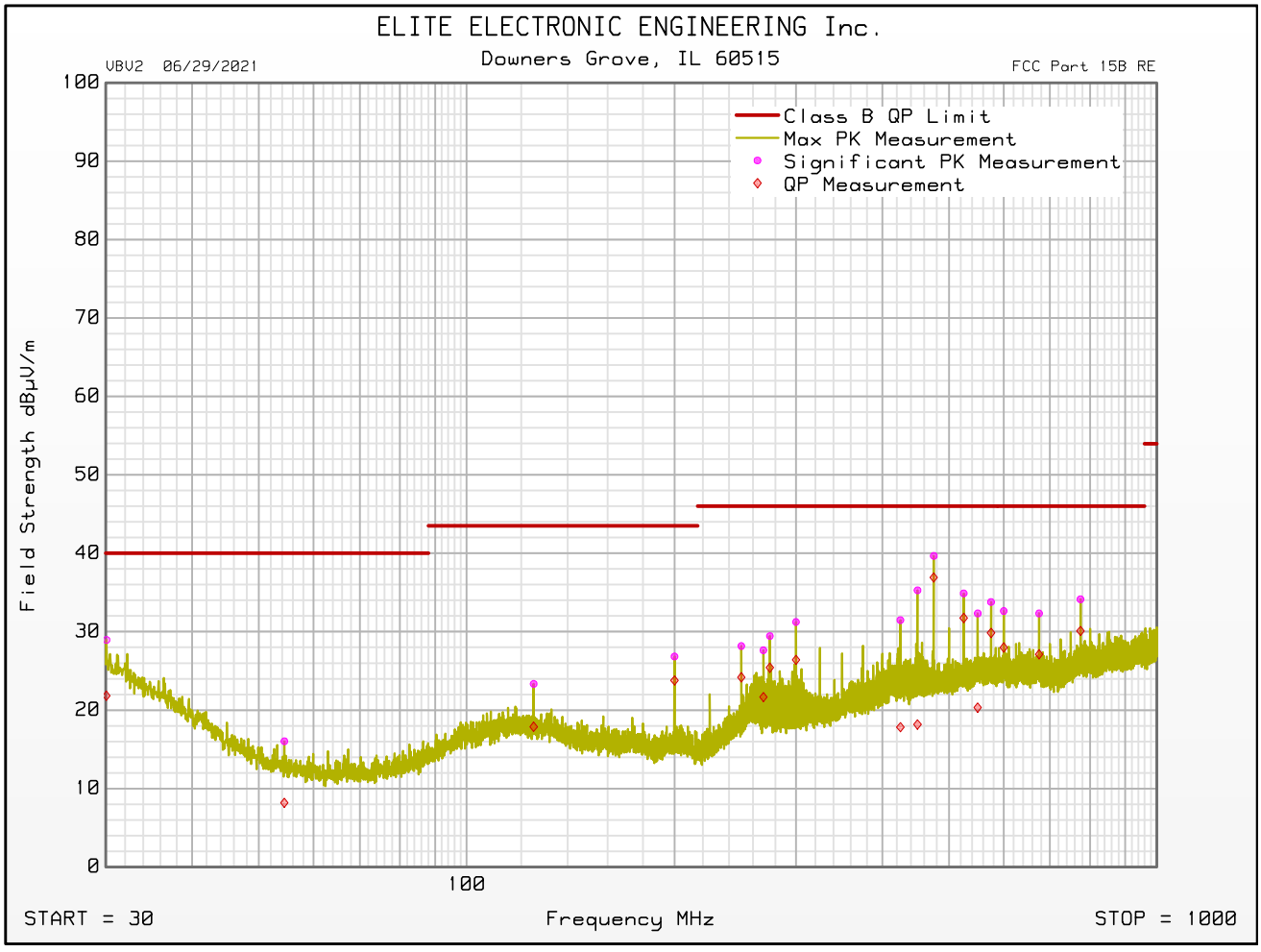

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 3
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : JR Automation
MODEL No. : Handheld Verifier
SERIAL No. :
MODE : Tx @ 125kHz CW
SCANS/BAND : 2
NOTES :
TEST DATE : 17 Jan 2022 09:46:33 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
1
10
START = .1
FREQUENCY MHz
STOP = 30


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 4
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : JR Automation
MODEL No. : Handheld Verifier
SERIAL No. :
MODE : Tx @ 125kHz CW
SCANS/BAND : 2
NOTES :
TEST DATE : 17 Jan 2022 09:57:53 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
1
10
START = .1
FREQUENCY MHz
STOP = 30

FCC Part 15C Section 15.209
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

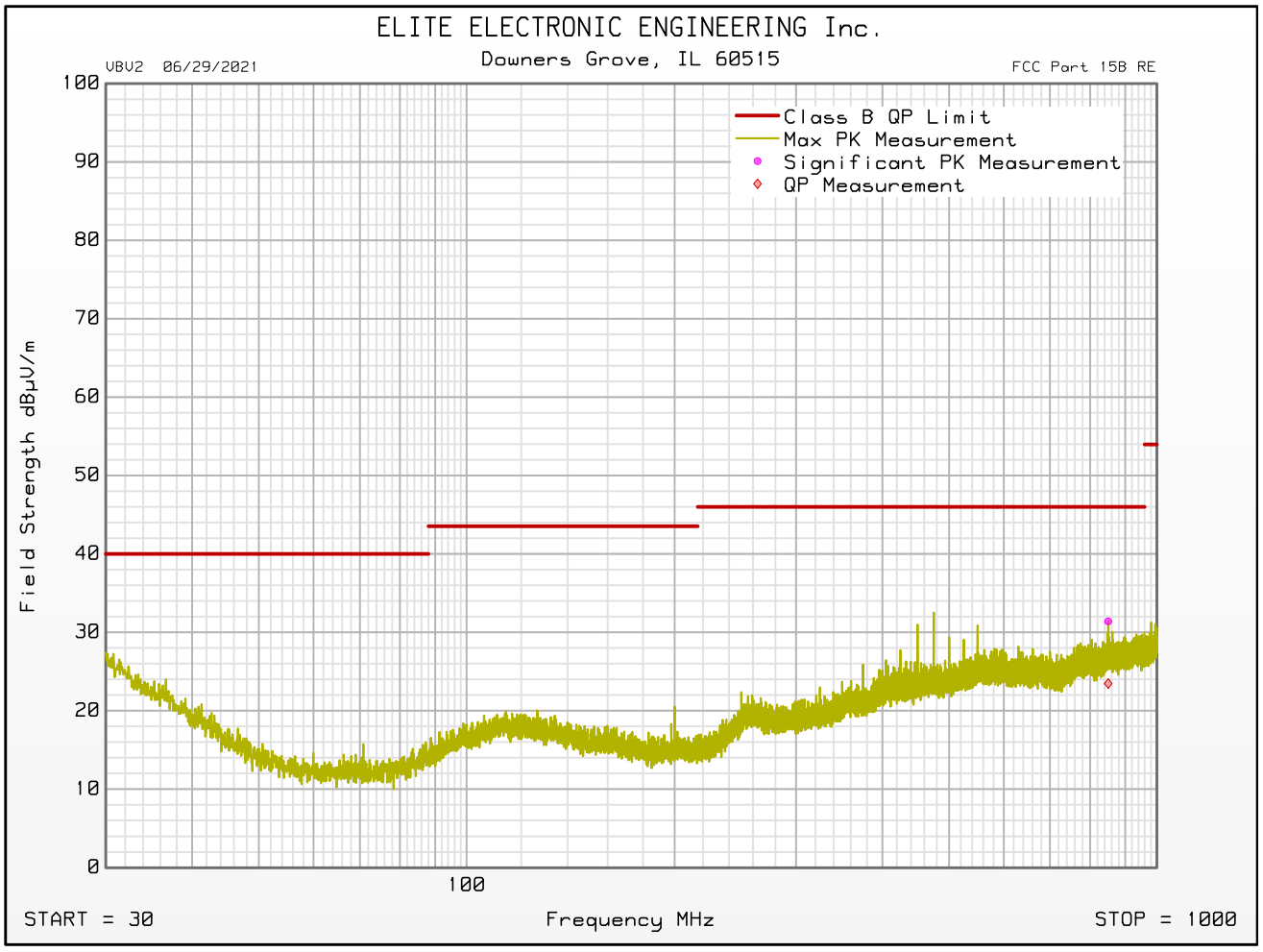
Manufacturer	:	JR Automation
Test Item	:	Handheld Verifier
Model Number	:	TPM-HH-700-00
DUT Mode	:	Tx @ 125kHz CW
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Jan 18, 2022 08:49:28 AM



FCC Part 15C Section 15.209
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer	:	JR Automation
Test Item	:	Handheld Verifier
Model Number	:	TPM-HH-700-00
DUT Mode	:	Tx @ 125kHz CW
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Jan 18, 2022 08:49:28 AM



Test Details	
Manufacturer	JR Automation
Test Item	Handheld Verifier
Model No.	TPM-HH-700-00
Test	Radiated Emissions
Mode	CW (unmodulated)
Frequency Tested	125kHz
Notes	FCC 15.209, Tested at 3 meters
Date Tested	January 17 and January 18, 2022

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
0.125	H	80.7		0.0	10.7	0.0	-80.0	11.4	3.7	19.2	300.0	-14.3
0.125	V	90.5		0.0	10.7	0.0	-80.0	21.2	11.5	19.2	300.0	-4.5
0.250	H	50.3		0.0	10.6	0.0	-80.0	-19.1	0.1	9.6	300.0	-38.7
0.250	V	54.6		0.0	10.6	0.0	-80.0	-14.8	0.2	9.6	300.0	-34.4
0.374	H	46.5		0.0	10.7	0.0	-80.0	-22.8	0.1	6.4	300.0	-38.9
0.374	V	51.7		0.0	10.7	0.0	-80.0	-17.6	0.1	6.4	300.0	-33.7
0.499	H	42.6		0.0	10.7	0.0	-40.0	13.3	4.6	48.1	30.0	-20.3
0.499	V	48.2		0.0	10.7	0.0	-40.0	18.9	8.8	48.1	30.0	-14.7
0.624	H	38.0	Ambient	0.0	10.7	0.0	-40.0	8.7	2.7	38.5	30.0	-23.0
0.624	V	40.0		0.0	10.7	0.0	-40.0	10.7	3.4	38.5	30.0	-21.0
0.749	H	37.6	Ambient	0.0	10.7	0.0	-40.0	8.3	2.6	32.1	30.0	-21.8
0.749	V	42.3		0.0	10.7	0.0	-40.0	13.0	4.5	32.1	30.0	-17.1
0.874	H	33.7	Ambient	0.0	10.7	0.0	-40.0	4.4	1.7	27.5	30.0	-24.3
0.874	V	34.6	Ambient	0.0	10.7	0.0	-40.0	5.3	1.8	27.5	30.0	-23.4
0.998	H	34.3	Ambient	0.0	10.8	0.0	-40.0	5.1	1.8	24.0	30.0	-22.6
0.998	V	37.6		0.0	10.8	0.0	-40.0	8.4	2.6	24.0	30.0	-19.3
1.123	H	31.5	Ambient	0.0	10.8	0.0	-40.0	2.3	1.3	21.4	30.0	-24.3
1.123	V	33.7	Ambient	0.0	10.8	0.0	-40.0	4.5	1.7	21.4	30.0	-22.1
1.248	H	30.9	Ambient	0.0	10.8	0.0	-40.0	1.7	1.2	19.2	30.0	-24.0
1.248	V	34.1	Ambient	0.0	10.8	0.0	-40.0	4.9	1.8	19.2	30.0	-20.8

Test Details	
Manufacturer	JR Automation
Test Item	Handheld Verifier
Model No.	TPM-HH-700-00
Test	Radiated Emissions
Mode	CW (unmodulated)
Frequency Tested	125kHz
Notes	RSS-Gen Section 8.9, Tested at 3 meters
Date Tested	January 17 and January 18, 2022

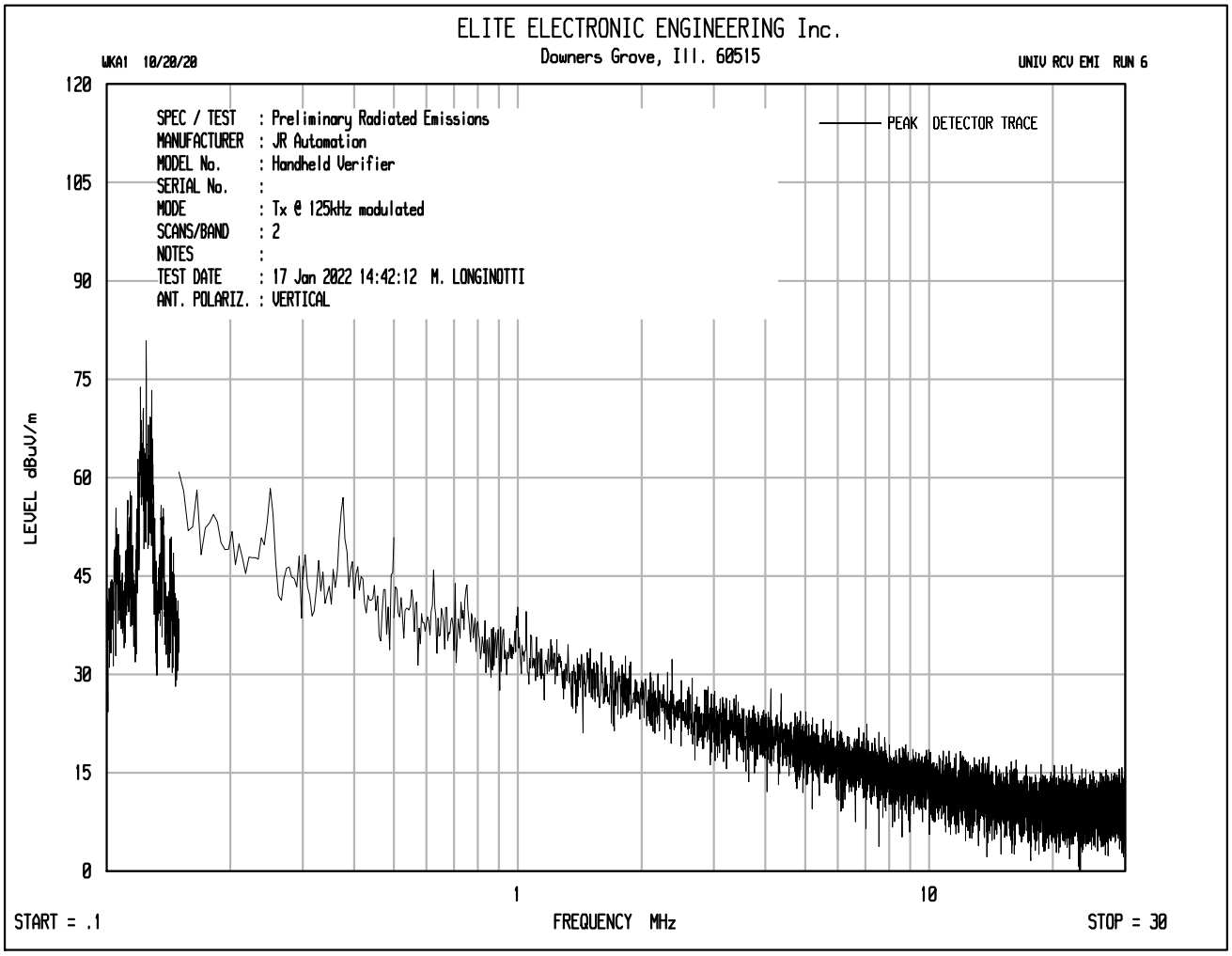
Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dBS/m)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuA/m)	Total (uA/m)	Limit (uA/m)	Specified Test Distance (meters)	Margin (dB)
0.125	H	80.7		0.0	-40.8	0.0	-80.0	-40.1	0.010	0.051	300.0	-14.3
0.125	V	90.5		0.0	-40.8	0.0	-80.0	-30.3	0.030	0.051	300.0	-4.5
0.250	H	50.3		0.0	-40.9	0.0	-80.0	-70.6	0.000	0.025	300.0	-38.7
0.250	V	54.6		0.0	-40.9	0.0	-80.0	-66.3	0.000	0.025	300.0	-34.4
0.375	H	46.5		0.0	-40.8	0.0	-80.0	-74.3	0.000	0.017	300.0	-38.9
0.375	V	51.7		0.0	-40.8	0.0	-80.0	-69.1	0.000	0.017	300.0	-33.7
0.500	H	42.6		0.0	-40.8	0.0	-40.0	-38.2	0.012	0.127	30.0	-20.3
0.500	V	48.2		0.0	-40.8	0.0	-40.0	-32.6	0.024	0.127	30.0	-14.7
0.625	H	38	Ambient	0.0	-40.8	0.0	-40.0	-42.8	0.007	0.102	30.0	-22.9
0.625	V	40		0.0	-40.8	0.0	-40.0	-40.8	0.009	0.102	30.0	-20.9
0.750	H	37.6	Ambient	0.0	-40.8	0.0	-40.0	-43.2	0.007	0.085	30.0	-21.8
0.750	V	42.3		0.0	-40.8	0.0	-40.0	-38.5	0.012	0.085	30.0	-17.1
0.875	H	33.7	Ambient	0.0	-40.8	0.0	-40.0	-47.1	0.004	0.073	30.0	-24.3
0.875	V	34.6	Ambient	0.0	-40.8	0.0	-40.0	-46.2	0.005	0.073	30.0	-23.4
1.000	H	34.3	Ambient	0.0	-40.7	0.0	-40.0	-46.4	0.005	0.064	30.0	-22.5
1.000	V	37.6		0.0	-40.7	0.0	-40.0	-43.1	0.007	0.064	30.0	-19.2
1.125	H	31.5	Ambient	0.0	-40.7	0.0	-40.0	-49.2	0.003	0.057	30.0	-24.3
1.125	V	33.7	Ambient	0.0	-40.7	0.0	-40.0	-47.0	0.004	0.057	30.0	-22.1
1.250	H	30.9	Ambient	0.0	-40.7	0.0	-40.0	-49.8	0.003	0.051	30.0	-23.9
1.250	V	34.1	Ambient	0.0	-40.7	0.0	-40.0	-46.6	0.005	0.051	30.0	-20.7

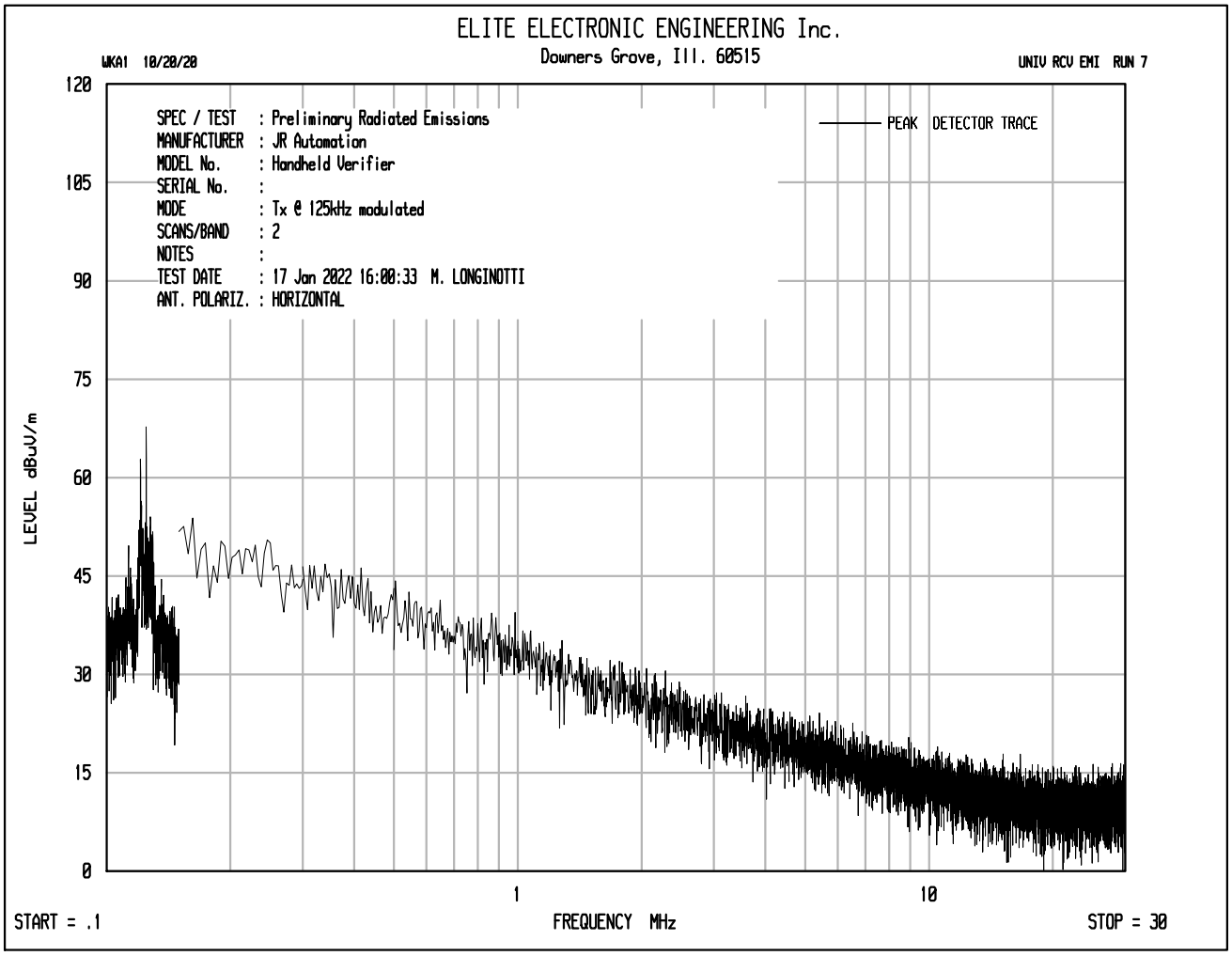
FCC Part 15C Section 15.209
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer : JR Automation
Test Item : Handheld Verifier
Model Number : TPM-HH-700-00
DUT Mode : Tx @ 125kHz CW
Scan Type : Stepped Scan
Test RBW : 120 kHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : M. Longinotti
Test Date : Jan 18, 2022 08:49:28 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
30.060	4.5	-2.7	24.5	0.0	0.0	0.0	29.0	21.8	40.0	-18.2	Horizontal	200	135	
54.420	3.0	-4.9	13.0	0.0	0.0	0.0	16.0	8.2	40.0	-31.8	Horizontal	200	135	
125.020	5.2	-0.2	18.1	0.0	0.0	0.0	23.3	17.9	43.5	-25.6	Horizontal	340	0	
200.020	11.5	8.4	15.4	0.0	0.0	0.0	26.8	23.8	43.5	-19.7	Horizontal	120	315	
249.960	9.7	5.7	18.5	0.0	0.0	0.0	28.2	24.2	46.0	-21.8	Horizontal	120	0	
269.100	9.0	3.1	18.6	0.0	0.0	0.0	27.6	21.7	46.0	-24.3	Horizontal	120	225	
274.980	10.9	6.8	18.6	0.0	0.0	0.0	29.5	25.4	46.0	-20.6	Horizontal	120	180	
300.000	12.3	7.4	19.0	0.0	0.0	0.0	31.2	26.4	46.0	-19.6	Horizontal	120	225	
424.980	9.3	-4.4	22.2	0.0	0.0	0.0	31.5	17.8	46.0	-28.2	Horizontal	200	315	
450.000	12.7	-4.4	22.5	0.0	0.0	0.0	35.3	18.2	46.0	-27.8	Horizontal	200	315	
475.020	16.5	13.7	23.2	0.0	0.0	0.0	39.7	36.9	46.0	-9.1	Horizontal	200	0	
525.000	11.2	8.1	23.7	0.0	0.0	0.0	34.9	31.8	46.0	-14.2	Horizontal	200	0	
550.020	7.6	-4.4	24.7	0.0	0.0	0.0	32.3	20.3	46.0	-25.7	Horizontal	340	315	
575.040	9.2	5.2	24.6	0.0	0.0	0.0	33.8	29.8	46.0	-16.2	Horizontal	340	0	
600.000	8.2	3.5	24.5	0.0	0.0	0.0	32.6	28.0	46.0	-18.0	Horizontal	120	0	
675.060	7.3	2.1	25.1	0.0	0.0	0.0	32.3	27.1	46.0	-18.9	Horizontal	120	0	
775.020	8.2	4.1	25.9	0.0	0.0	0.0	34.1	30.1	46.0	-15.9	Horizontal	120	225	
850.020	5.1	-2.8	26.3	0.0	0.0	0.0	31.4	23.5	46.0	-22.5	Vertical	120	0	

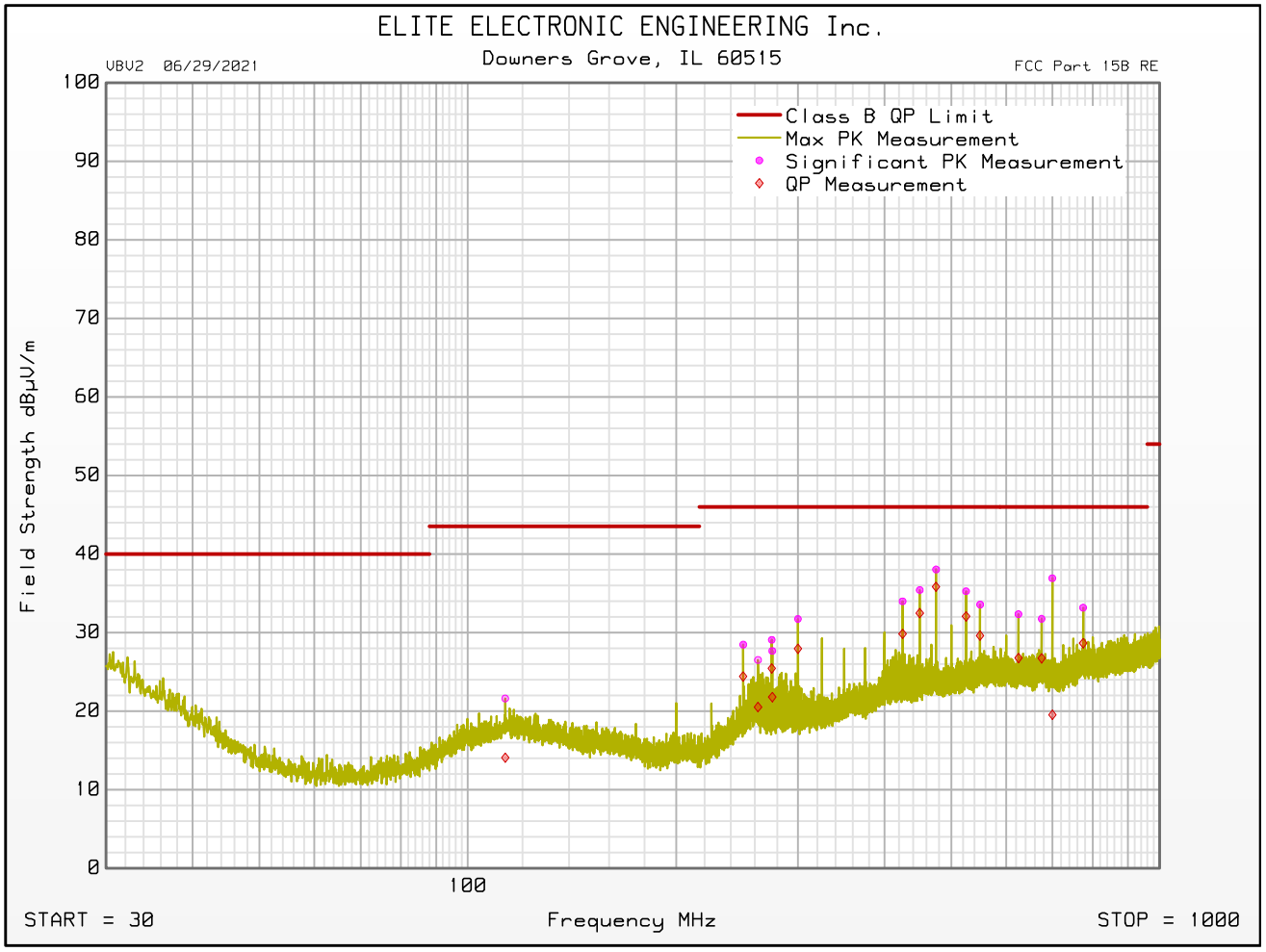

ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 6
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : JR Automation
MODEL No. : Handheld Verifier
SERIAL No. :
MODE : Tx @ 125kHz modulated
SCANS/BAND : 2
NOTES :
TEST DATE : 17 Jan 2022 14:42:12 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
1
10
START = .1
FREQUENCY MHz
STOP = 30


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 7
SPEC / TEST : Preliminary Radiated Emissions
MANUFACTURER : JR Automation
MODEL No. : Handheld Verifier
SERIAL No. :
MODE : Tx @ 125kHz modulated
SCANS/BAND : 2
NOTES :
TEST DATE : 17 Jan 2022 16:00:33 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
1
10
START = .1
FREQUENCY MHz
STOP = 30

FCC Part 15C Section 15.209
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

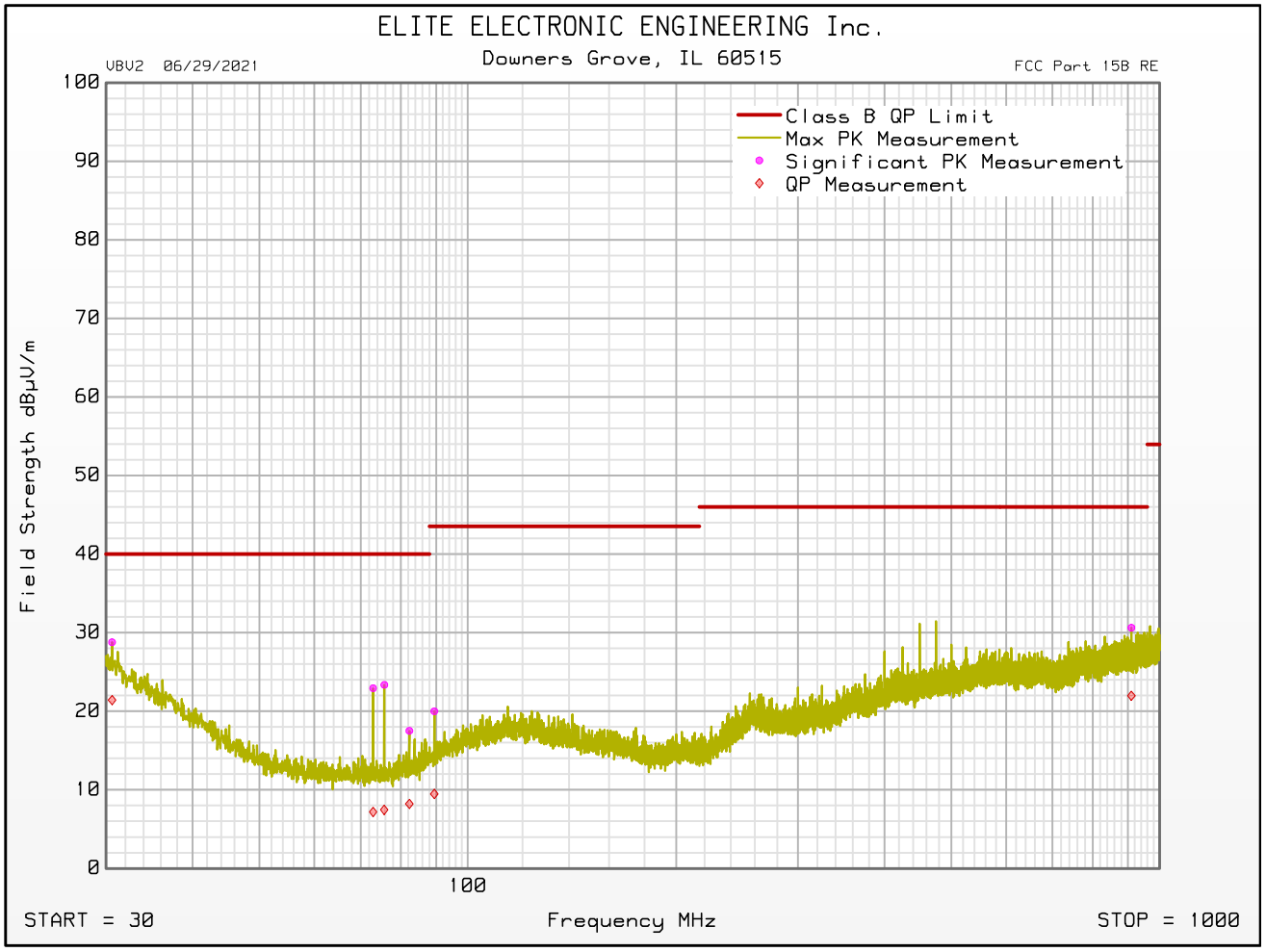
Manufacturer	:	JR Automation
Test Item	:	Handheld Verifier
Model Number	:	TPM-HH-700-00
DUT Mode	:	Tx @ 125kHz Modulated
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Jan 18, 2022 09:25:25 AM



FCC Part 15C Section 15.209
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer	:	JR Automation
Test Item	:	Handheld Verifier
Model Number	:	TPM-HH-700-00
DUT Mode	:	Tx @ 125kHz Modulated
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Jan 18, 2022 09:25:25 AM



Test Details	
Manufacturer	JR Automation
Test Item	Handheld Verifier
Model No.	TPM-HH-700-00
Test	Radiated Emissions
Mode	Modulated
Frequency Tested	125kHz
Notes	FCC 15.209, Tested at 3 meters
Date Tested	January 17 and January 18, 2022

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
0.125	H	51.9		0.0	10.7	0.0	-80.0	-17.4	0.1	19.2	300.0	-43.1
0.125	V	73.5		0.0	10.7	0.0	-80.0	4.2	1.6	19.2	300.0	-21.5
0.250	H	36.9		0.0	10.6	0.0	-80.0	-32.5	0.0	9.6	300.0	-52.1
0.250	V	53.0		0.0	10.6	0.0	-80.0	-16.4	0.2	9.6	300.0	-36.0
0.374	H	34.3		0.0	10.7	0.0	-80.0	-35.0	0.0	6.4	300.0	-51.1
0.374	V	50.8		0.0	10.7	0.0	-80.0	-18.5	0.1	6.4	300.0	-34.6
0.499	H	30.1		0.0	10.7	0.0	-40.0	0.8	1.1	48.1	30.0	-32.8
0.499	V	44.7		0.0	10.7	0.0	-40.0	15.4	5.9	48.1	30.0	-18.2
0.624	H	27.7	Ambient	0.0	10.7	0.0	-40.0	-1.6	0.8	38.5	30.0	-33.3
0.624	V	41.3		0.0	10.7	0.0	-40.0	12.0	4.0	38.5	30.0	-19.7
0.749	H	25.8	Ambient	0.0	10.7	0.0	-40.0	-3.5	0.7	32.1	30.0	-33.6
0.749	V	40.0		0.0	10.7	0.0	-40.0	10.7	3.4	32.1	30.0	-19.4
0.874	H	24.0	Ambient	0.0	10.7	0.0	-40.0	-5.3	0.5	27.5	30.0	-34.0
0.874	V	34.2	Ambient	0.0	10.7	0.0	-40.0	4.9	1.8	27.5	30.0	-23.8
0.998	H	23.2	Ambient	0.0	10.8	0.0	-40.0	-6.0	0.5	24.0	30.0	-33.7
0.998	V	36.6		0.0	10.8	0.0	-40.0	7.4	2.3	24.0	30.0	-20.3
1.123	H	21.0	Ambient	0.0	10.8	0.0	-40.0	-8.2	0.4	21.4	30.0	-34.8
1.123	V	32.1	Ambient	0.0	10.8	0.0	-40.0	2.9	1.4	21.4	30.0	-23.7
1.248	H	20.0	Ambient	0.0	10.8	0.0	-40.0	-9.2	0.3	19.2	30.0	-34.9
1.248	V	33.3	Ambient	0.0	10.8	0.0	-40.0	4.1	1.6	19.2	30.0	-21.6

Test Details	
Manufacturer	JR Automation
Test Item	Handheld Verifier
Model No.	TPM-HH-700-00
Test	Radiated Emissions
Mode	Modulated
Frequency Tested	125kHz
Notes	RSS-Gen Section 8.9, Tested at 3 meters
Date Tested	January 17 and January 18, 2022

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dBS/m)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuA/m)	Total (uA/m)	Limit (uA/m)	Specified Test Distance (meters)	Margin (dB)
0.125	H	51.9		0.0	-40.8	0.0	-80.0	-68.9	0.000	0.051	300.0	-43.1
0.125	V	73.5		0.0	-40.8	0.0	-80.0	-47.3	0.004	0.051	300.0	-21.5
0.250	H	36.9		0.0	-40.9	0.0	-80.0	-84.0	0.000	0.025	300.0	-52.1
0.250	V	53		0.0	-40.9	0.0	-80.0	-67.9	0.000	0.025	300.0	-36.0
0.375	H	34.3		0.0	-40.8	0.0	-80.0	-86.5	0.000	0.017	300.0	-51.1
0.375	V	50.8		0.0	-40.8	0.0	-80.0	-70.0	0.000	0.017	300.0	-34.6
0.500	H	30.1		0.0	-40.8	0.0	-40.0	-50.7	0.003	0.127	30.0	-32.8
0.500	V	44.7		0.0	-40.8	0.0	-40.0	-36.1	0.016	0.127	30.0	-18.2
0.625	H	27.7	Ambient	0.0	-40.8	0.0	-40.0	-53.1	0.002	0.102	30.0	-33.2
0.625	V	41.3		0.0	-40.8	0.0	-40.0	-39.5	0.011	0.102	30.0	-19.6
0.750	H	25.8	Ambient	0.0	-40.8	0.0	-40.0	-55.0	0.002	0.085	30.0	-33.6
0.750	V	40		0.0	-40.8	0.0	-40.0	-40.8	0.009	0.085	30.0	-19.4
0.875	H	24	Ambient	0.0	-40.8	0.0	-40.0	-56.8	0.001	0.073	30.0	-34.0
0.875	V	34.2	Ambient	0.0	-40.8	0.0	-40.0	-46.6	0.005	0.073	30.0	-23.8
1.000	H	23.2	Ambient	0.0	-40.7	0.0	-40.0	-57.5	0.001	0.064	30.0	-33.6
1.000	V	36.6		0.0	-40.7	0.0	-40.0	-44.1	0.006	0.064	30.0	-20.2
1.125	H	21	Ambient	0.0	-40.7	0.0	-40.0	-59.7	0.001	0.057	30.0	-34.8
1.125	V	32.1	Ambient	0.0	-40.7	0.0	-40.0	-48.6	0.004	0.057	30.0	-23.7
1.250	H	20	Ambient	0.0	-40.7	0.0	-40.0	-60.7	0.001	0.051	30.0	-34.8
1.250	V	33.3	Ambient	0.0	-40.7	0.0	-40.0	-47.4	0.004	0.051	30.0	-21.5

FCC Part 15C Section 15.209
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer : JR Automation
Test Item : Handheld Verifier
Model Number : TPM-HH-700-00
DUT Mode : Tx @ 125kHz Modulated
Scan Type : Stepped Scan
Test RBW : 120 kHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : M. Longinotti
Test Date : Jan 18, 2022 09:25:25 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
30.600	4.7	-2.7	24.1	0.0	0.0	0.0	28.8	21.4	40.0	-18.6	Vertical	200	135	
72.960	10.6	-5.1	12.3	0.0	0.0	0.0	22.9	7.2	40.0	-32.8	Vertical	120	0	
75.720	10.8	-5.1	12.6	0.0	0.0	0.0	23.4	7.5	40.0	-32.5	Vertical	120	0	
82.320	4.2	-5.1	13.3	0.0	0.0	0.0	17.5	8.2	40.0	-31.8	Vertical	120	0	
89.440	5.3	-5.3	14.7	0.0	0.0	0.0	20.0	9.5	43.5	-34.0	Vertical	120	315	
113.260	3.3	-4.2	18.3	0.0	0.0	0.0	21.6	14.1	43.5	-29.4	Horizontal	340	225	
250.020	10.0	5.9	18.5	0.0	0.0	0.0	28.5	24.4	46.0	-21.6	Horizontal	120	225	
262.680	7.2	1.3	19.3	0.0	0.0	0.0	26.5	20.5	46.0	-25.5	Horizontal	120	225	
274.980	10.5	6.9	18.6	0.0	0.0	0.0	29.1	25.4	46.0	-20.6	Horizontal	120	225	
275.460	9.1	3.2	18.6	0.0	0.0	0.0	27.7	21.8	46.0	-24.2	Horizontal	120	225	
300.000	12.8	9.0	19.0	0.0	0.0	0.0	31.7	27.9	46.0	-18.1	Horizontal	120	180	
424.980	11.8	7.6	22.2	0.0	0.0	0.0	34.0	29.8	46.0	-16.2	Horizontal	200	0	
450.000	12.9	9.9	22.5	0.0	0.0	0.0	35.4	32.5	46.0	-13.5	Horizontal	200	180	
475.020	14.8	12.6	23.2	0.0	0.0	0.0	38.0	35.8	46.0	-10.2	Horizontal	200	315	
525.000	11.6	8.4	23.7	0.0	0.0	0.0	35.3	32.1	46.0	-13.9	Horizontal	200	0	
550.020	8.8	4.9	24.7	0.0	0.0	0.0	33.6	29.6	46.0	-16.4	Horizontal	200	0	
625.020	7.6	2.1	24.7	0.0	0.0	0.0	32.3	26.8	46.0	-19.2	Horizontal	120	315	
675.060	6.7	1.7	25.1	0.0	0.0	0.0	31.8	26.7	46.0	-19.3	Horizontal	120	0	
699.600	11.9	-5.5	25.0	0.0	0.0	0.0	36.9	19.5	46.0	-26.5	Horizontal	200	315	
775.020	7.2	2.7	25.9	0.0	0.0	0.0	33.2	28.7	46.0	-17.3	Horizontal	120	0	
910.140	4.2	-4.4	26.4	0.0	0.0	0.0	30.6	22.0	46.0	-24.0	Vertical	120	225	

21. 99% Bandwidth Test

Test Information	
Manufacturer	JR Automation
Product	Handheld Verifier
Model	TPM-HH-700-00
Mode	Transmit at 125kHz, CW (unmodulated) Transmit at 125kHz, Modulated

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	Active Loop Antenna
Notes	None

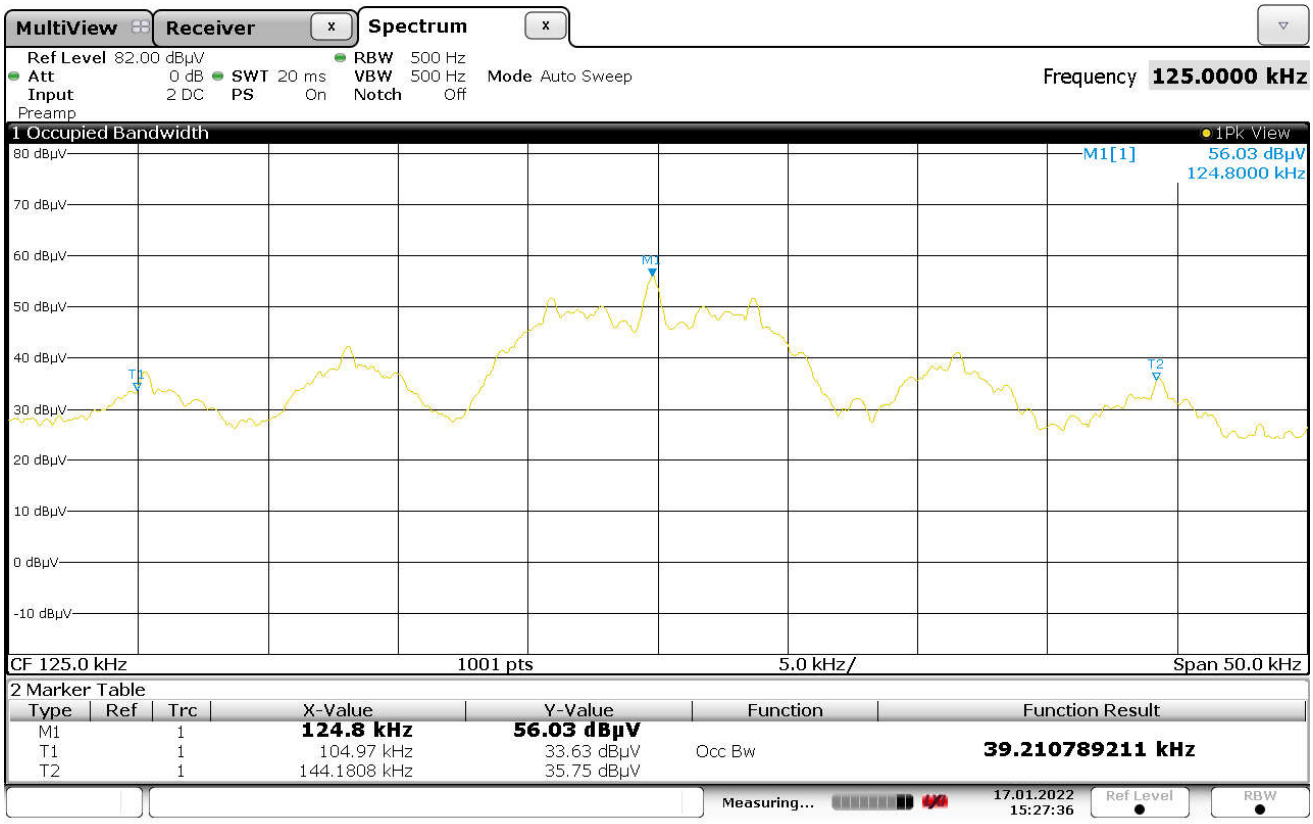
Procedures
The EUT was setup inside the chamber. The EUT was allowed to transmit continuously. The resolution bandwidth (RBW) was set to 1% to 5% of the actual occupied / x dB bandwidth, the video bandwidth (VBW) was set 3 times greater than the RBW, and the span was set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's 99% bandwidth function was utilized. The analyzer's display was plotted.

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 Details	
Manufacturer	JR Automation
Model	TPM-HH-700-00
Mode	Transmit at 125kHz, CW (unmodulated)
Carrier Frequency	125kHz
Parameters	OBW = 233.8 Hz
Notes	None

Date: 18.JAN.2022 08:06:46

Test Details	
Manufacturer	JR Automation
Model	TPM-HH-700-00
Mode	Transmit at 125kHz, Modulated
Carrier Frequency	125kHz
Parameters	OBW = 39.2kHz
Notes	None



Date: 17.JAN.2022 15:27:36

22. Radio Frequency Exposure Test

Manufacturer	JR Automation
Product	Handheld Verifier
Model	TPM-HH-700-00
Mode	Transmit at 125kHz, CW (unmodulated) Transmit at 125kHz, Modulated

Information	
Field Strength Limit	170 V/m rms (controlled environment
Distance Limit	0 cm
Positions Measured	Left Right Back Keypad
Operating conditions of EUT	Transmit at 125kHz, CW (unmodulated) Transmit at 125kHz, Modulated

Requirements
Per RSS-Gen, licensed and license-exempt radio apparatus must meet the radio frequency exposure compliance requirements of RSS-102. Per Table 6 of RSS-102, the RF field strength limits for transmitter operating in the frequency range of 9kHz to 10MHz and in a controlled use environment shall not exceed 170V/m rms based on nerve stimulus.

Procedures
a) Per section 6.1.1 of SPR-002, the direct measurement against the RSS-102 nerve stimulation limits method was used. The maximum measured field strength was located and compared to the limits of RSS-102. b) The guidance of Annex C of SPR-002 for hand-held devices used to scan an object were used. c) The measurement probe was mounted at a height of 100 cm. d) The EUT was scanned over the probe with orientation focused on the area where the hand would be placed. This shall be considered the compliance distance. e) The maximum measured fiend strength readings were recorded and compared to the limits of RSS-102.

Test Setup for Radio Frequency Exposure Test (Back)

Test Setup for Radio Frequency Exposure Test (Left)

Test Setup for Radio Frequency Exposure Test (Keypad)

Test Setup for Radio Frequency Exposure Test (Right)

Manufacturer	JR Automation
Product	Handheld Verifier
Model	TPM-HH-700-00
Mode	Transmit at 125kHz, CW (unmodulated)
Date Tested	January 19, 2022

Face Tested	Field Strength Limit (Controlled Environment) (V/m rms)	Test Distance (cm)	Measured Maximum Field Strength (V/m rms)	Notes
Back	170	0	19.7	---
Left	170	0	13.6	---
Keypad	170	0	14.9	---
Right	170	0	15.1	---
The EUT conforms				
Tested by: Mark Longinotti				

Manufacturer	JR Automation
Product	Handheld Verifier
Model	TPM-HH-700-00
Mode	Transmit at 125kHz, Modulated
Date Tested	January 19, 2022

Face Tested	Field Strength Limit (V/m rms)	Test Distance (cm)	Measured Maximum Field Strength (V/m rms)	Notes
Back	170	0	0.53	---
Left	170	0	0.00	---
Keypad	170	0	0.46	---
Right	170	0	0.11	---
The EUT conforms				
Tested by: Mark Longinotti				

23. 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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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.