NVLAP Testing
NVLAP Lab Code 200087-0

ROGERS LABS, INC.

4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

Engineering Test Report for Grant of Certification Application 47CFR, Part 15B 15.109, 15.111, & 15.121 Industry Canada RSS-135 Issue 2

Model: RT-400

Scanning Receiver 118-470 MHz

FCC ID: 2ASLJRT400
IC: 24836-RT400

RHOTHETA International Inc.

8201 Peters Road, Suite 1000
Fort Lauderdale, FL 33324

FCC Designation: US5305
IC Test Site Registration: 3041A-1

Test Report Number: 190211

Test Date: February 13, 2019

Certifying Engineer: Scot D Rogers

Scot D. Rogers
Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
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Revisions

Revision 1 Issued February 11, 2020

Foreword

The following information is submitted for consideration in obtaining Equipment Grant of Certification for Scanning Receiver operating under 47CFR Paragraph 15B (15.121) and Industry Canada RSS-135 Issue 2, and RSS-GEN Issue 5. The receiver provides operational capability in segmented and defined frequency bands between 118-470 MHz.

Name of Applicant: RHOTHETA International Inc. FRN: 0028275022
8201 Peters Road, Suite 1000
Fort Lauderdale, FL 33324

Model: RT-400

FCC ID: 2ASLJRT400 IC: 24836-RT400

Frequency Range: 118-470 MHz

Opinion / Interpretation of Results

Tests Performed	Margin (dB)	Results
AC Line Emissions 15.107 and RSS-GEN 7.2	-10.1	Complies
Radiated Emissions 15.109 and RSS-GEN 7.2	-7.6	Complies

Equipment Tested, Function, and Configuration

Equipment Tested

Equipment	Model	Serial Number
Portable	RT-400	00014
Tablet	Samsung SM-T825	R52K50VRTCH

Test results in this report relate only to the items tested.

System Revision 03.05

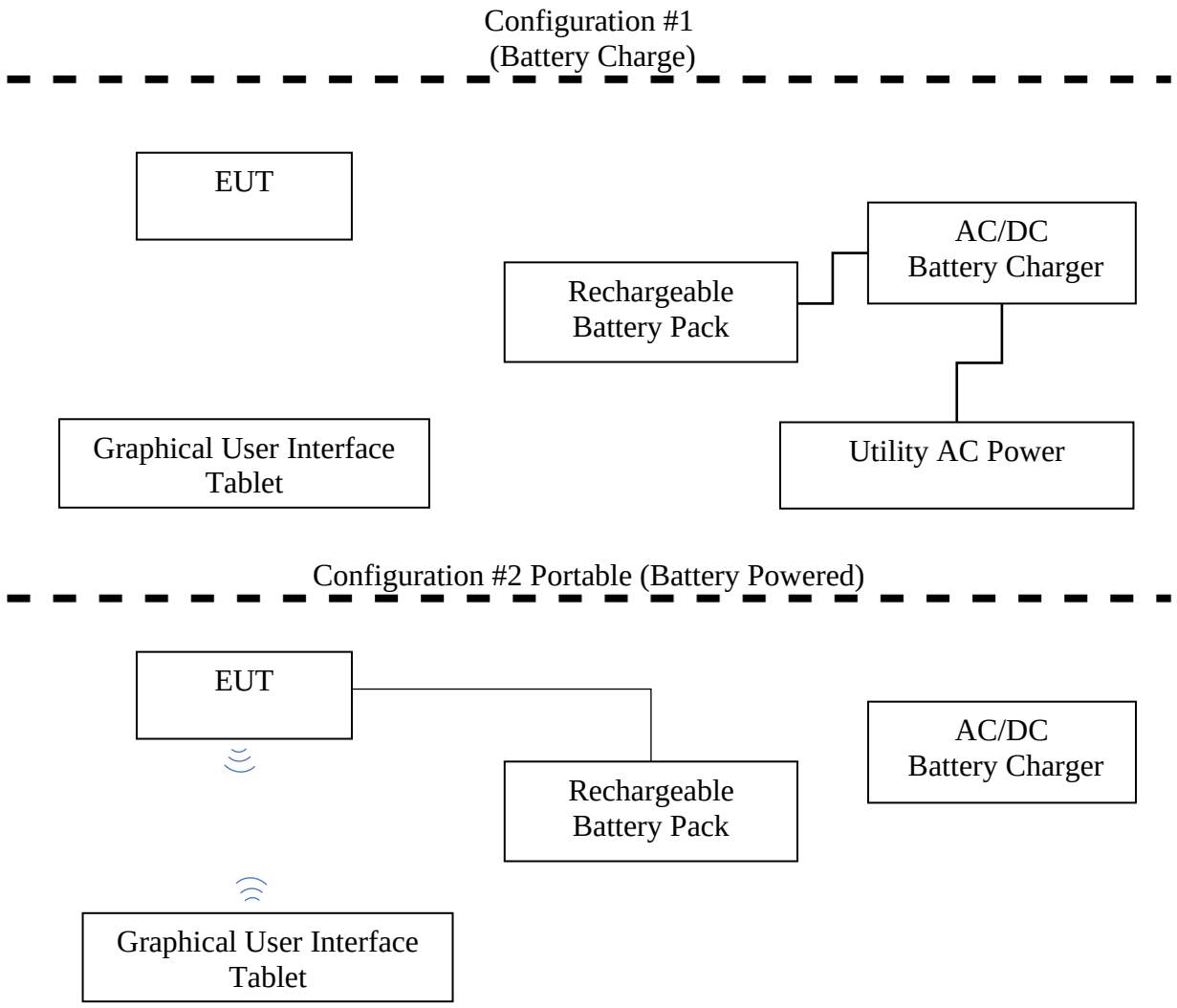
Equipment Function

The RT-400 is a portable advanced multi-band radio direction finder system. The system is designed to aid Search and Rescuer operations in tracking missing craft or active distress beacons. The design provides Search and Rescue directional information of the received signal to the graphical user interface (GUI). The system is used to rapidly detect and localize an aircraft, individual or vessel equipped with a Distress Beacon (ELT, PLB, EPIRB, MOB). The system calculates bearing of received radio signals in the following VHF and UHF ranges:

Frequency Ranges:	Standard-Version			Optional extended Frequency Range		
VHF air band	118,000 MHz	-	123,975 MHz	118,000 MHz	-	136,992 MHz
VHF marine band	154,000 MHz	-	162,995 MHz	137,000 MHz	-	224,995 MHz
Maritime channels	Channel 00 (Ship / Coast)	-	Channel 88 (Ship / Coast)			
UHF air band	240,000 MHz	-	245,975 MHz	225,000 MHz	-	399,975 MHz
Cospas-Sarsat	400,000 MHz	-	406,092 MHz			
UHF FM band	406,100 MHz	-	410,000 MHz	406,100 MHz	-	470,000 MHz

The design offers operation as single frequency or multiple frequency (scanning mode) receiver. The single frequency operation is useful when the frequency is known by the responding personnel. The scanning operation is useful when specific frequency is unknown by responding search personnel. The RT-400 works using the Doppler principle and achieves highest precision through the high clockwise / counterclockwise rotation of the directional receiving antenna and compensates running time errors. The system is watertight (protection IP 67) and may be used under extreme and rough conditions. The system operates from a direct current source as the rechargeable battery pack which is part of the system and offers no provision to interface with utility power system. The portable configuration of the RT-400 is not operational during battery recharge. The battery pack must be disconnected from receiver system during charging. The design incorporates a wireless transceiver module (FCC ID: Z64-CC3220MOD, IC: 451I-CC3220MOD) used to interface with Graphical User Interface (GUI). A tablet computer was provided for testing. The system is controlled by the tablet and transfers operational information such as receive Audio, COSPAS-SARSAT receive data and Directional Information to the tablet through the integrated transmitter module. As requested by the manufacturer the receiver system was tested for emissions compliance using provided configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

Equipment Configuration



Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to demonstrate compliance with the 47CFR Part 15B, Industry Canada RSS-135 Issue 2, and RSS-Gen Issue 5 emissions requirements. There were no deviations or modifications to the specifications.

Applicant Company information

Applicants Company	RHOTHETA International Inc.
Applicants Address	8201 Peters Road, Suite 1000, Fort Lauderdale, FL 33324
FCC Identifier	2ASLJRT400
Industry Canada Identifier	24836-RT400

Equipment information

Product Marketing Name (PMN): The PMN is the name or model number under which the product will be marketed/offered for sale in Canada. If the product has PMN, it must be provided.	RT-400
Unique Product Number (UPN): The applicant made up of a maximum of 11 alphanumeric characters (A-Z, 0-9), assigns the UPN.	RT-400
Hardware Version Identification Number (HVIN): The HVIN identifies hardware specifications of a product version. The HVIN replaces the ISED Model Number in the legacy E-filing System. An HVIN is required for all products for certification applications.	RT-400
Host Marketing Name (HMN) (if applicable): The HMN is the name or model number of a final product, which contains a certified radio module.	
Test Rule Part(s)	47CFR 15B, 15.109, 15.121, RSS-135, RSS-GEN
Test Frequency Range	118-470 MHz
Project Number	190211
Submission Type	FCC

Product Details

Items	Description
Product Type	Scanning Receiver
Radio Type	Receiver
Power Type	Direct current only provided by rechargeable battery
Antenna	Commutated Integral Dipole

Application for Certification, 47CFR 2.1033 (b)

(1) Manufacturer: RHOTHETA International Inc.
8201 Peters Road, Suite 1000
Fort Lauderdale, FL 33324

(2) Identification: Model: RT-400

FCC ID: 2ASLJRT400 IC: 24836-RT400

(3) Instruction Book: Refer to Exhibit for Instruction Manual.

(4) Description of Circuit Functions: Refer to Exhibit of Operational Description.

(5) Block Diagram with Frequencies: Refer to Exhibit of Operational Description.

(6) Report of Measurements: Report of measurements follows in this Report.

(7) Photographs: Construction, Component Placement, etc.: Refer to Exhibit for photographs of equipment.

(8) List of Peripheral Equipment Necessary for operation. The equipment operates from direct current power received from portable rechargeable battery pack. The EUT provides serial interface to wireless module for communications with Graphical User Interface equipment. During testing, the EUT was powered from direct current power fully charged battery.

(9) Transition Provisions of 47CFR 15.37 are not requested

(10) Applications for the certification of scanning receivers shall include a statement describing the methods used to comply with the design requirements of all parts of §15.121 of this chapter. The application must specifically include a statement assessing the vulnerability of the equipment to possible modification and describing the design features that prevent the modification of the equipment by the user to receive transmissions from the Cellular Radiotelephone Service. The application must also demonstrate compliance with the signal rejection requirement of §15.121 of this chapter, including details on the measurement procedures used to demonstrate compliance. The required attestation statements are provided in other exhibits.

(11) Not Applicable. The EUT does not operate in the 59 – 64 GHz frequency band.

(12) The equipment is not software defined and this section is not applicable.

(13) Not Applicable. The equipment does not operate as U-NII device.

(14) Contain at least one drawing or photograph showing the test set-up for each of the required types of tests applicable to the device for which certification is requested. These drawings or photographs must show enough detail to confirm other information contained in the test report. Any photographs used must be focused originals without glare or dark spots and must clearly show the test configuration used. This information is provided in this report and Test Setup Exhibits provided with the application filing.

Applicable Standards & Test Procedures

The following information is submitted in accordance with e-CFR dated February 11, 2019, Part 2, Subpart J, Part 15, Subpart 15B, Industry Canada RSS-GEN Issue 5, and RSS-135 Issue 2. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in ANSI C63.4-2014, 47CFR 15.31, 15.33. 15.35, RSS-135 Issue 2, and RSS-GEN Issue 5.

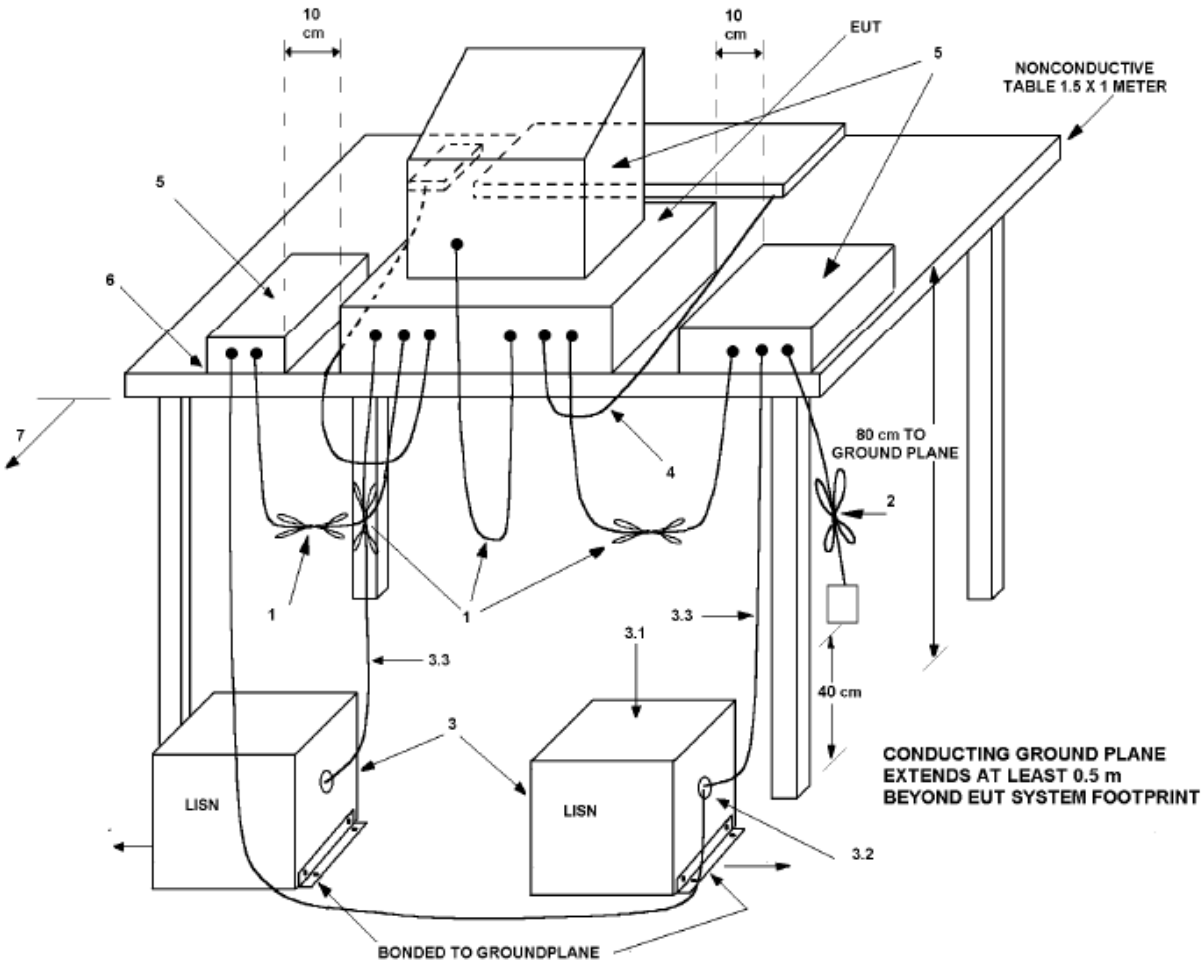
Equipment Testing Procedures

AC Line Conducted Emission Test Procedure

The EUT operates on direct current power only provided by the battery pack. A battery charging system is available to recharge the battery pack used in the portable configuration. The Battery Charge system was tested for compliance with AC Power Line Conducted emission requirements. Testing for the AC line-conducted emissions was performed as defined in ANSI C63.4-2014. The test setup, including the battery charge system, was arranged in the test configuration. The test configuration was placed on a 1 x 1.5-meter bench, 0.8 meters high located in a screen room. The power lines of the system were isolated from the power source using a standard LISN with a 50-µHy choke. EMI was coupled to the spectrum analyzer through a 0.1 µF capacitor internal to the LISN. The LISN was positioned on the floor beneath the wooden bench supporting the EUT. The power lines and cables were draped over the back edge of the table. Refer to diagram one showing typical test arrangement and photographs in exhibits for EUT placement used during testing.

Radiated Emission Test Procedure

Radiated emission testing was performed as required on a CISPR 16-1-4 compliant OATS and as specified in ANSI C63.4-2014 and applicable KDB documents. The EUT was placed on a rotating 0.9 x 1.2-meter platform, elevated as required above the ground plane at a 3 meters distance from the FSM antenna. The table permitted orientation of the EUT in each of three orthogonal axis positions as necessary. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken using a spectrum analyzer. The frequency spectrum from 9 kHz to 5,000 MHz was searched for during preliminary investigation. Refer to diagrams two and three showing typical test arrangement and photographs in the test setup exhibits for specific EUT placement during testing.

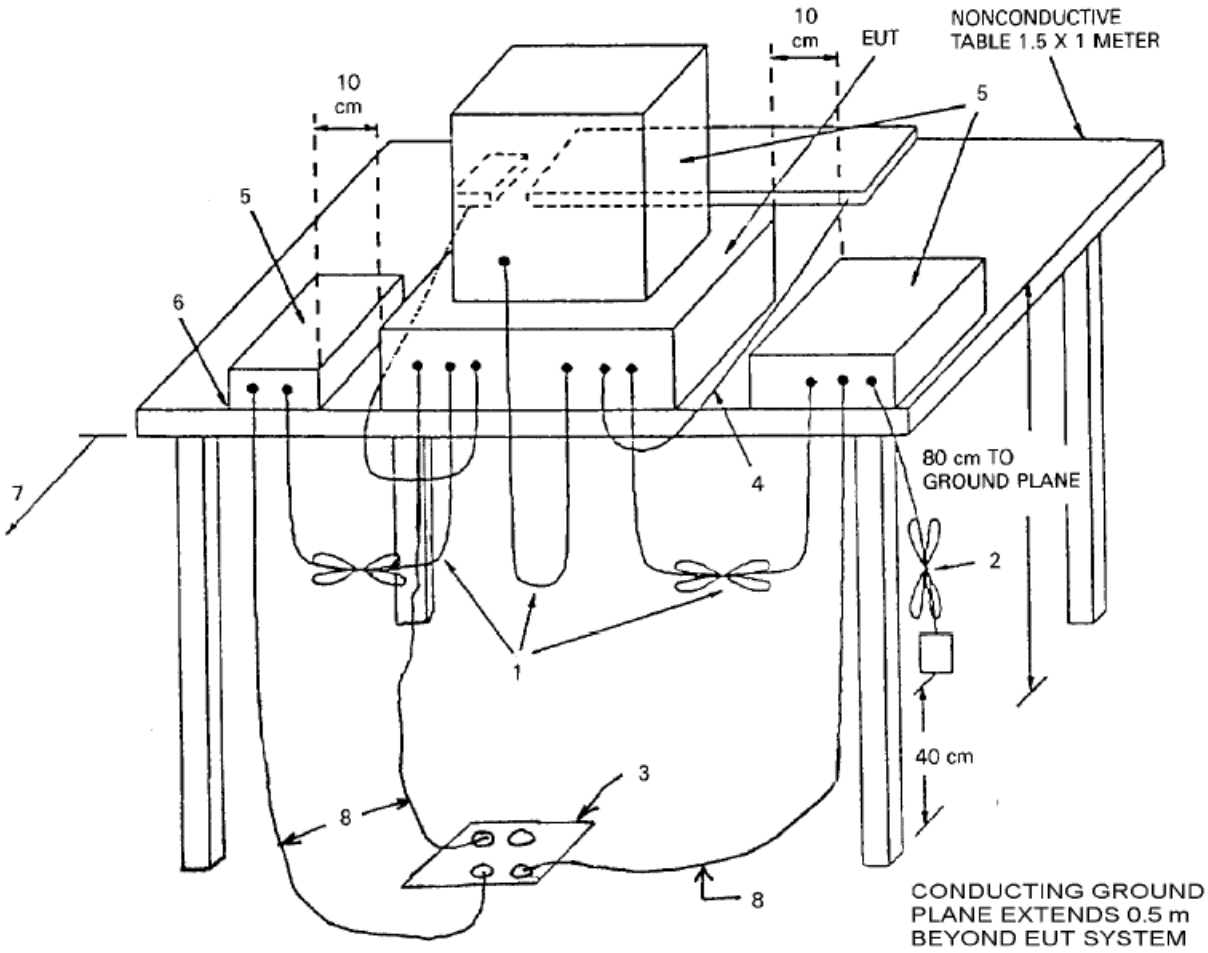


1. Interconnecting cables that hang closer than 40 cm to the ground plane were folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2. Input/output (I/O) cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3. EUT connected to one LISN. Unused LISN measuring port connectors are terminated into 50 Ω loads. LISN is placed on top of and bonded to reference ground plane.

3.1 All other equipment powered from additional LISN(s).
3.2 Multiple outlet strips can be used for multiple power cords of non-EUT equipment.
3.3 LISN is positioned at least 80 cm from nearest part of EUT chassis.

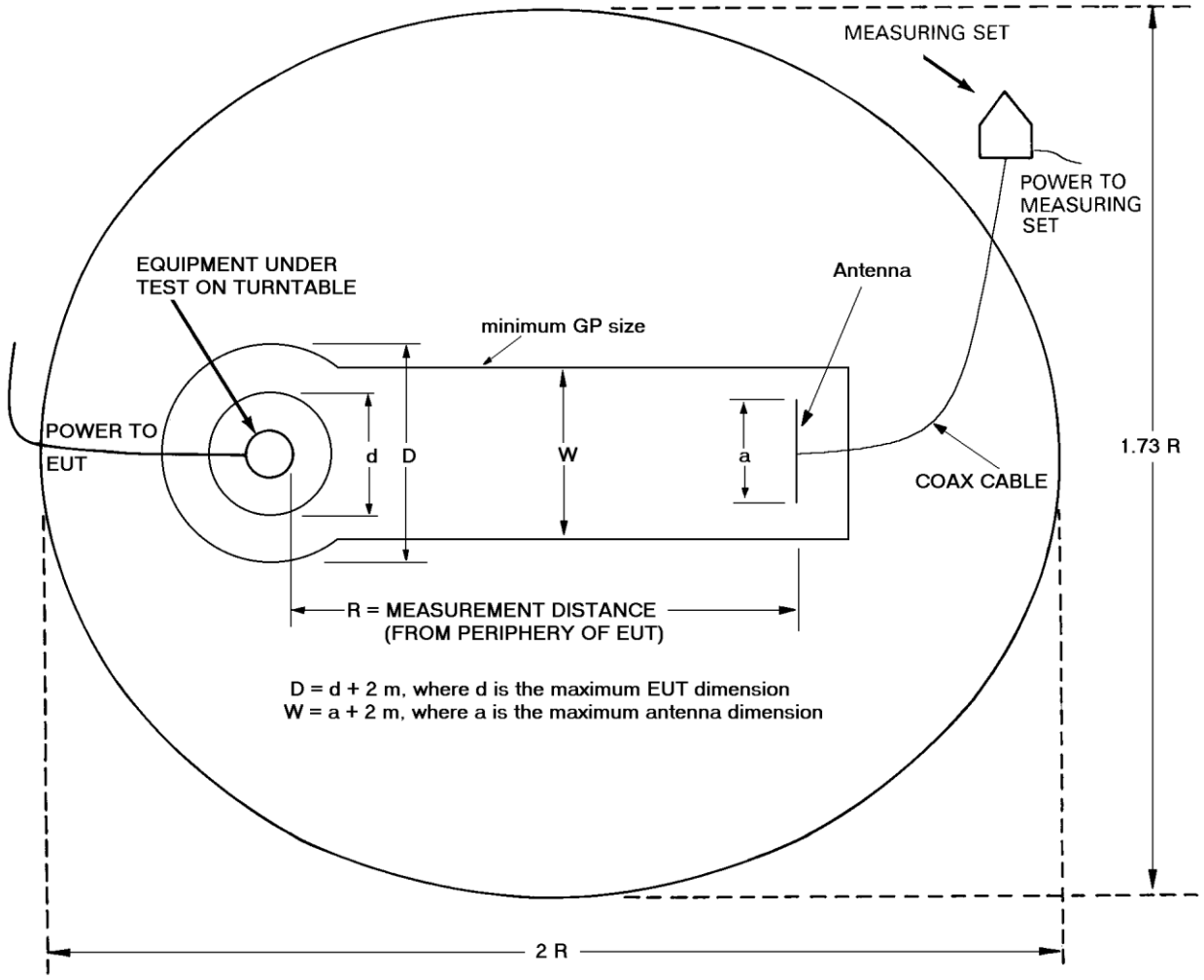
4. Cables of hand-operated devices, such as keyboards, mice, and so on, shall be placed as for normal use.
5. Non-EUT components of EUT system being tested.
6. Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
7. Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane (see 5.2.2 for options).

Diagram 1 Test arrangement for AC Line Conducted emissions



1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center, forming a bundle 30 cm to 40 cm long.
2. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m.
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mice, and so on, shall be placed as for normal use.
5. Non-EUT components of EUT system being tested.
6. Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop (possibly center of table for transmitter equipment).
7. No vertical conducting plane used.
8. Power cords drape to the floor and are routed over to receptacle.

Diagram 2 Test arrangement for Radiated emissions



AREA DIMENSIONS =	R = 3m	R = 10 m	R = 30 m
	6 m x 5.2 m	20 m x 17.3 m	60 m x 52 m

AC Line Conducted Emissions (0.150 -30 MHz)		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak / Quasi Peak
Emissions (30-1000 MHz)		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak / Quasi Peak
Emissions (Above 1000 MHz)		
RBW	Video BW	Detector Function
100 kHz	100 kHz	Peak
1 MHz	1 MHz	Peak / Average

Diagram 3 Test arrangement for Radiated emissions tested on Open Area Test Site (OATS)

Test Site Locations

Conducted EMI	**C**onducted emissions testing was performed in a shielded screen room located at Rogers Labs, Inc., 4405 West 259th Terrace, Louisburg, KS
Radiated EMI	Radiated emissions tests was performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 West 259th Terrace, Louisburg, KS
Site Registration	FCC Site Designation US5305, Industry Canada Registration: 3041A-1
Accreditation	NVLAP Accreditation Lab Code 200087-0

Units of Measurements

Conducted EMI	Data presented in dBµV; dB referenced to one microvolt
Antenna port Conducted	Data is in dBm; dB referenced to one milliwatt
Radiated EMI	Data presented in dBµV/m; dB referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured

A.F. = Receive antenna factor, Losses = attenuators/cable losses, Gain = amplification gains

RFS (dBµV/m @ 3m) = FSM (dBµV) + A.F. (dB/m) + Losses (dB) - Gain (dB)

Environmental Conditions

Ambient Temperature	20.8° C
Relative Humidity	34%
Atmospheric Pressure	1016.8 mb

List of Test Equipment

Equipment	Manufacturer	Model (SN)	Band	Cal Date(m/d/y)	Due
☒ LISN	FCC	FCC-LISN-50-25-10(1PA) (160611)	.15-30MHz	5/2/2018	5/2/2019
☒ LISN	Compliance Design	FCC-LISN-2.Mod.cd,(126)	.15-30MHz	10/16/2018	10/16/2019
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(303073)	9kHz-40 GHz	10/16/2018	10/16/2019
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303069)	9kHz-40 GHz	10/16/2018	10/16/2019
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303071)	9kHz-40 GHz	10/16/2018	10/16/2019
☒ Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	10/16/2018	10/16/2019
☒ Cable	Belden	RG-58 (L2-CAT3-11509)	9kHz-30 MHz	10/16/2018	10/16/2019
☐ Antenna	ARA	BCD-235-B (169)	20-350MHz	10/16/2018	10/16/2019
☐ Antenna	EMCO	3147 (40582)	200-1000MHz	10/16/2018	10/16/2019
☒ Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	5/2/2018	5/2/2020
☐ Antenna	Com Power	AH-118 (10110)	1-18 GHz	10/16/2018	10/24/2019
☐ Antenna	Com Power	AH-840 (101046)	18-40 GHz	5/15/2017	5/15/2019
☒ Antenna	Com Power	AL-130 (121055)	.001-30 MHz	10/16/2018	10/16/2019
☒ Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	10/16/2018	10/16/2019
☒ Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	5/2/2018	5/2/2019
☐ Analyzer	Rohde & Schwarz	ESW44 (101534)	20Hz-44GHz	1/31/2019	1/31/2020
☐ Analyzer	Rohde & Schwarz	FS-Z60, 90, 140, and 220	40GHz-220GHz	12/22/2017	12/22/2019
☒ Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	10/16/2018	10/16/2019
☒ Amplifier	Com-Power	CPPA-102 (01254)	1-1000 MHz	10/16/2018	10/16/2019
☒ Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	10/16/2018	10/16/2019
☐ Amplifier	Com-Power	PAM-840A (461328)	18-40 GHz	10/16/2018	10/16/2019
☐ Power Meter	Agilent	N1911A with N1921A	0.05-40 GHz	5/2/2018	5/2/2019
☐ Generator	Rohde & Schwarz	SMB100A6 (100150)	20Hz-6 GHz	5/2/2018	5/2/2019
☐ Generator	Rohde & Schwarz	SMBV100A6 (260771)	20Hz-6 GHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	BRC50722 (009).9G notch	30-1800 MHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	HPM50114 (017)1.5G HPF	30-18000 MHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	HPM50117 (063) 3G HPF	30-18000 MHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	HPM50105 (059) 6G HPF	30-18000 MHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	BRM50702 (172) 2G notch	30-1800 MHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	BRC50703 (G102) 5G notch	30-1800 MHz	5/2/2018	5/2/2019
☐ RF Filter	Micro-Tronics	BRC50705 (024) 5G notch	30-1800 MHz	5/2/2018	5/2/2019
☐ Attenuator	Fairview	SA6NFNF100W-14 (1625)	30-1800 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1735)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1436)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-3W2+ (14362)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1445)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-3W2+ (14452)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1438)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1736)	30-6000 MHz	5/2/2018	5/2/2019
☐ Attenuator	JFW Industries	50FH-010-10 (1)	30-18000 MHz	5/2/2018	5/2/2019
☒ Weather station	Davis	6312 (A81120N075)		10/26/2018	10/26/2019

Emission Measurements

AC Line Conducted EMI Procedure

The EUT was arranged in the Battery Charge equipment configuration #1 as offered by the manufacturer and presented above in equipment configuration. Testing was performed with the EUT placed on a 1 x 1.5-meter bench 80 cm above the conducting ground plane, floor of a screen room. The bench was positioned 40 cm away from the wall of the screen room. The LISN was positioned on the floor of the screen room 80-cm from the rear of the EUT. Testing for the AC line-conducted emissions followed the procedures of ANSI C63.4-2014. The EUT was configured as presented in the AC Line conducted configuration as directed by the manufacturer and presented above in equipment configuration. The AC/DC Battery charger for the EUT was connected to the LISN for AC line-conducted emissions testing. A second LISN was positioned on the floor of the screen room 80-cm from the rear of the supporting equipment of the test configuration. All power cords except the EUT were then powered from the second LISN. EMI was coupled to the spectrum analyzer through a 0.1 µF capacitor, internal to the LISN. Power line conducted emissions testing was carried out individually for each current carrying conductor of the AC/DC Battery Charger. The excess length of lead between the system and the LISN receptacle was folded back and forth to form a bundle not exceeding 40 cm in length. The screen room, conducting ground plane, analyzer, and LISN were bonded together to the protective earth ground. Preliminary testing was performed to identify the frequencies of each of the emissions, which demonstrated the highest amplitudes. The cables were repositioned to obtain maximum amplitude of measured EMI level. Once the worse-case configuration was identified, plots were made of the EMI from 0.15 MHz to 30 MHz and data recorded.

Refer to figures one and two showing plots of equipment configuration Battery Charge worse-case AC line conducted emissions.

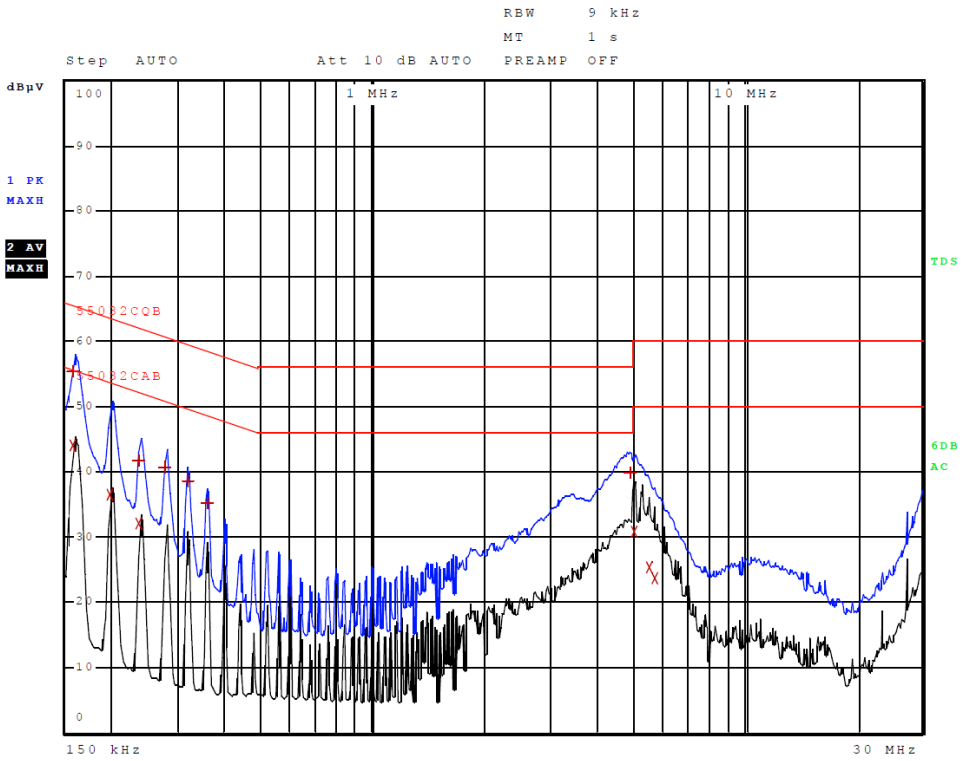


Figure 1 AC Line Conducted emissions of Battery Charging System line 1

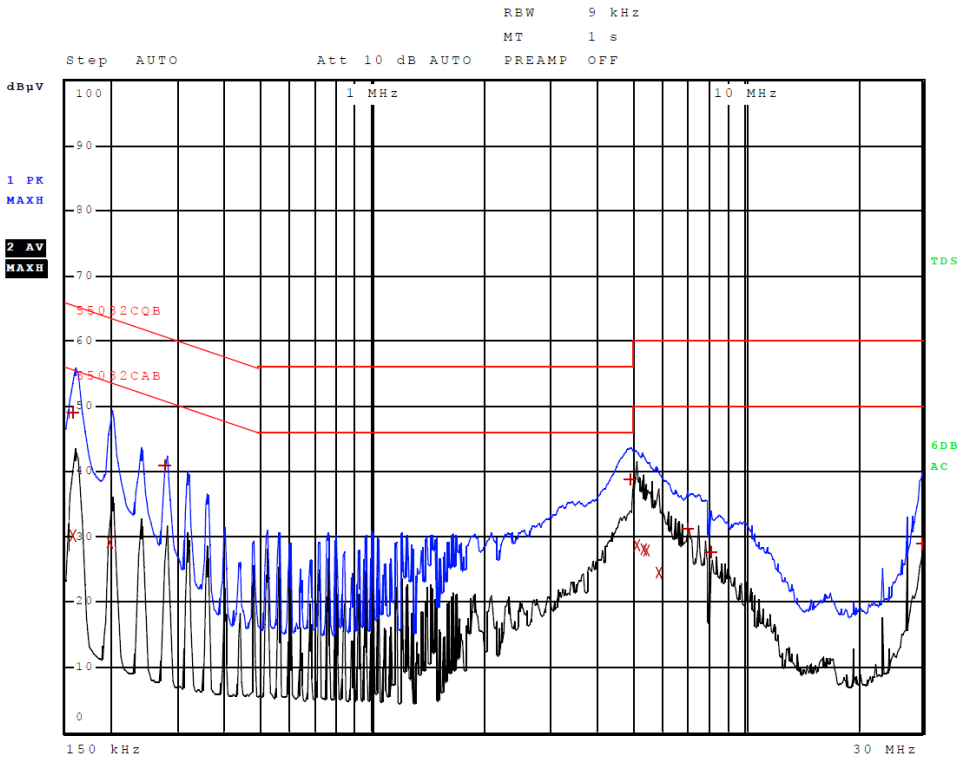


Figure 2 AC Line Conducted emissions of Battery Charging System line 2

Radiated EMI Procedure

Test procedures of ANSI C63.4-2014 were used during radiated emissions testing. For testing purposes, the EUT was arranged as presented in the applicable configurations as diagramed above and operated through manufacturer defined modes as presented. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Plots were made of the frequency spectrum during preliminary testing. The EUT and cable locations were noted and reconfigured at the Open Area Test Site (OATS). The radiated emissions were then maximized at the OATS location before final radiated emission measurements were performed. Final data was taken with the EUT located at the OATS at distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 9 kHz to 5,000 MHz was searched for radiated emissions. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Loop, Biconical, Broadband Biconilog, Log Periodic, and Double Ridge or Pyramidal Horns and mixers above 1 GHz.

Refer to figures three through six showing plots of equipment configuration #1 Battery Charge worse-case Radiated emissions. Refer to figures seven through ten showing plots of equipment configuration #2 Portable Battery Operated worse-case Radiated emissions.

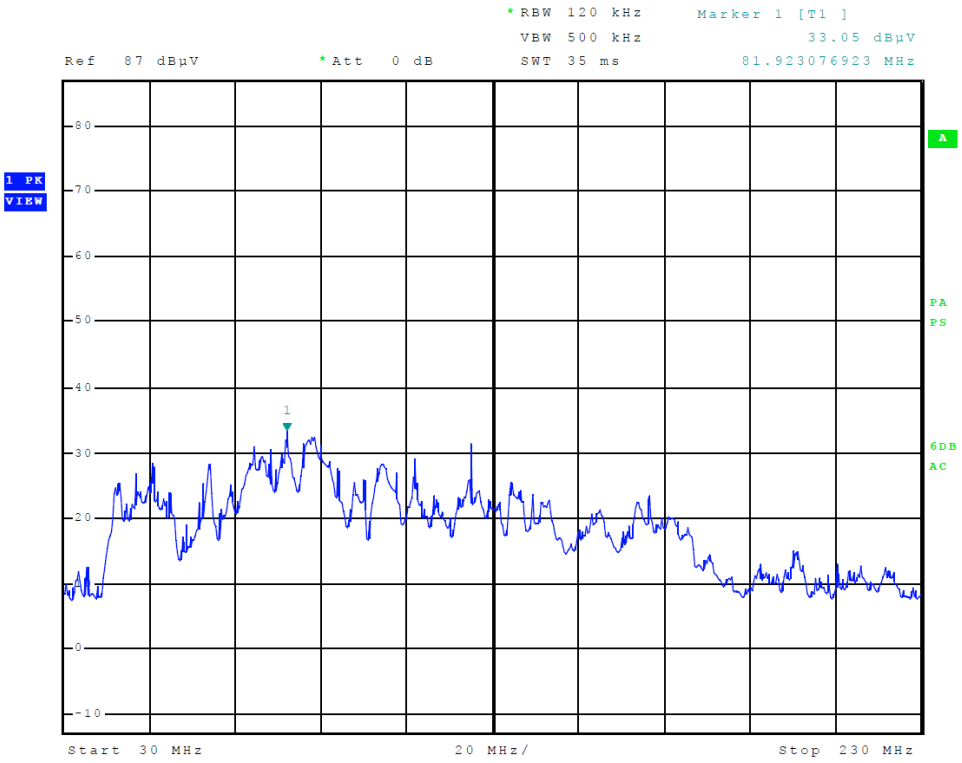


Figure 3 Radiated Emissions Plot emissions Taken in Screen Room (configuration #1)

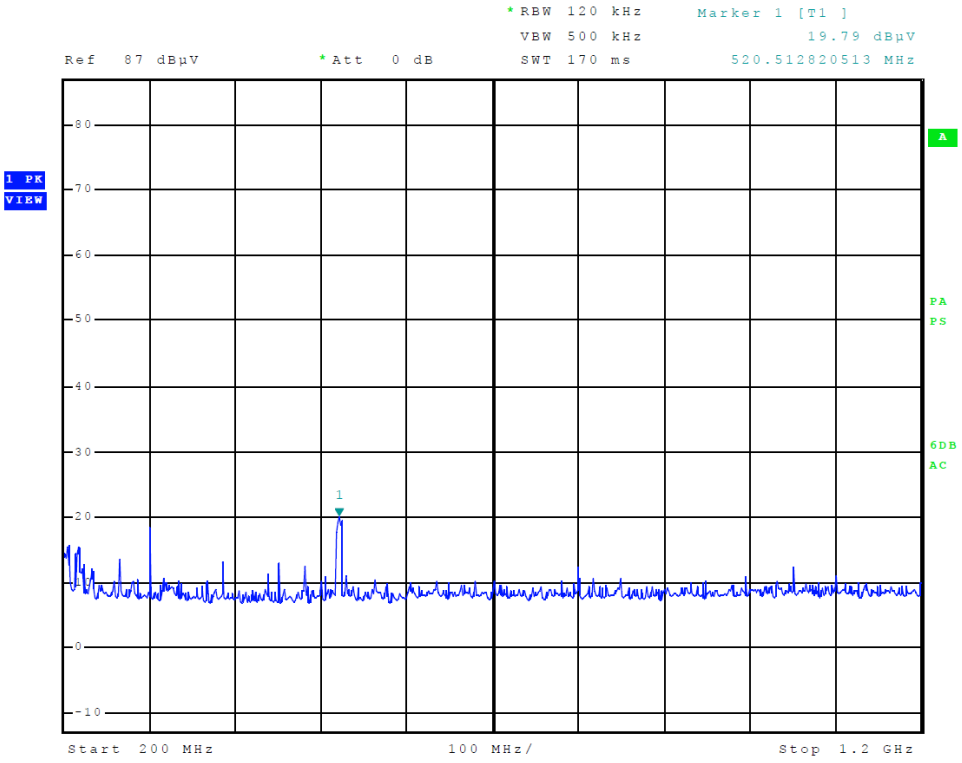


Figure 4 Radiated Emissions Plot emissions Taken in Screen Room (configuration #1)

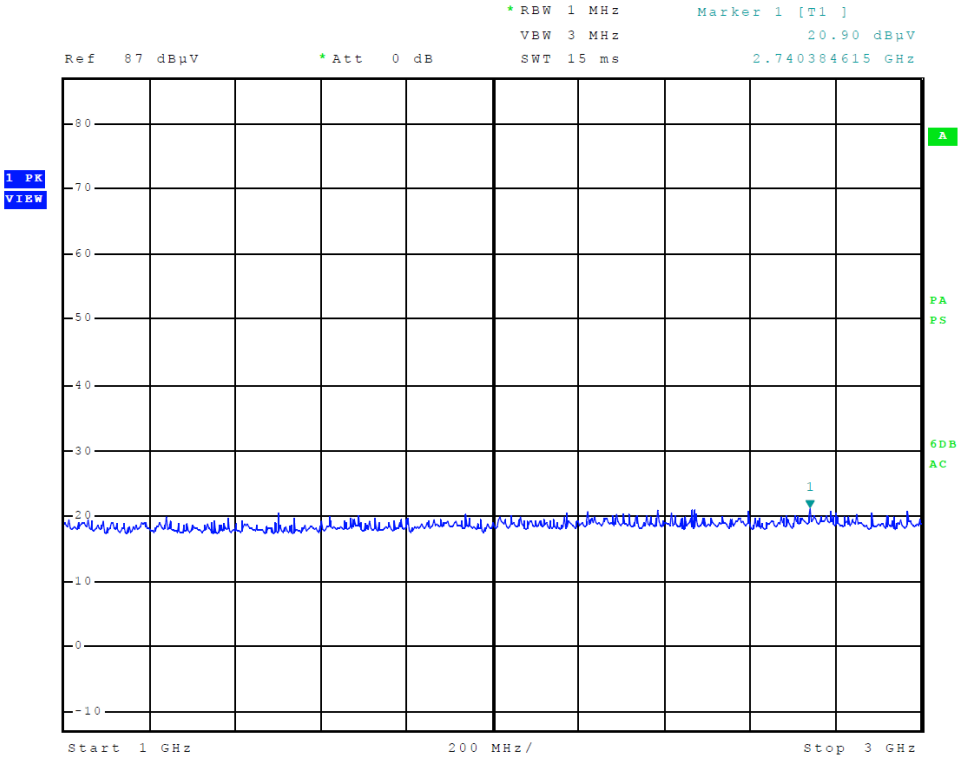


Figure 5 Radiated Emissions Plot emissions Taken in Screen Room (configuration #1)

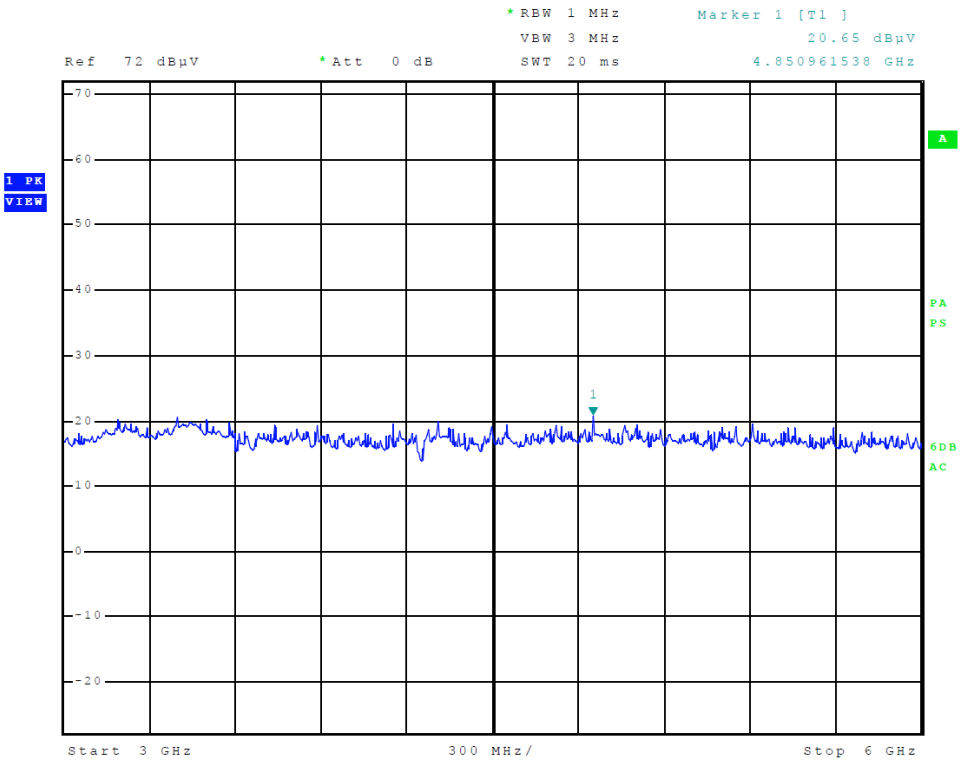


Figure 6 Radiated Emissions Plot emissions Taken in Screen Room (configuration #1)

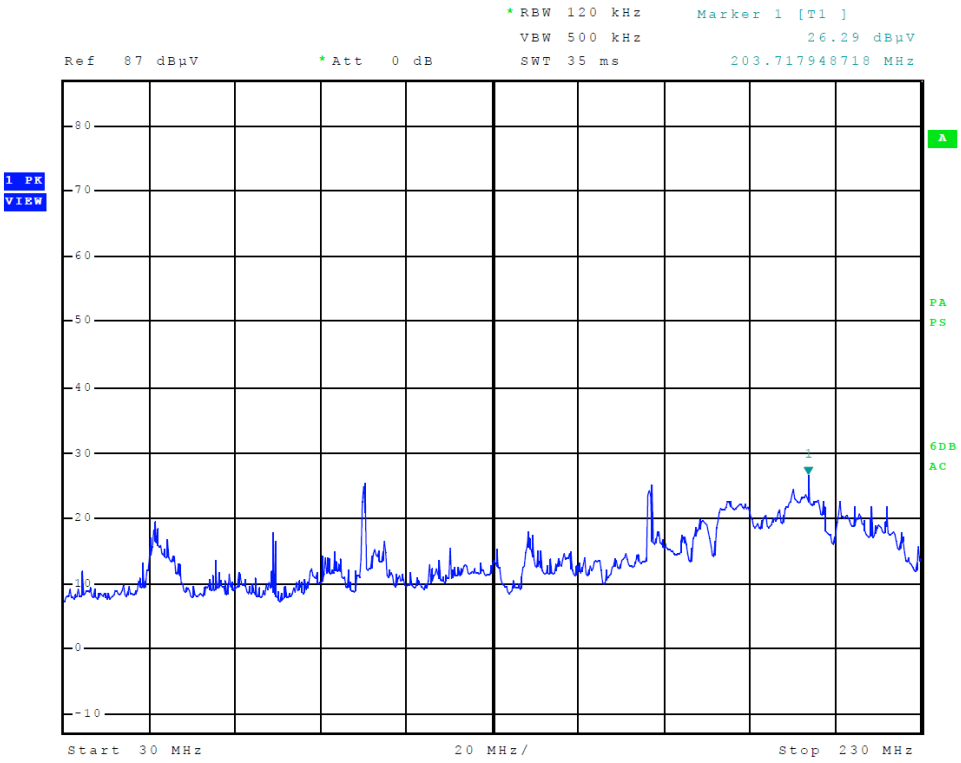


Figure 7 Radiated Emissions Plot emissions Taken in Screen Room (configuration #2)

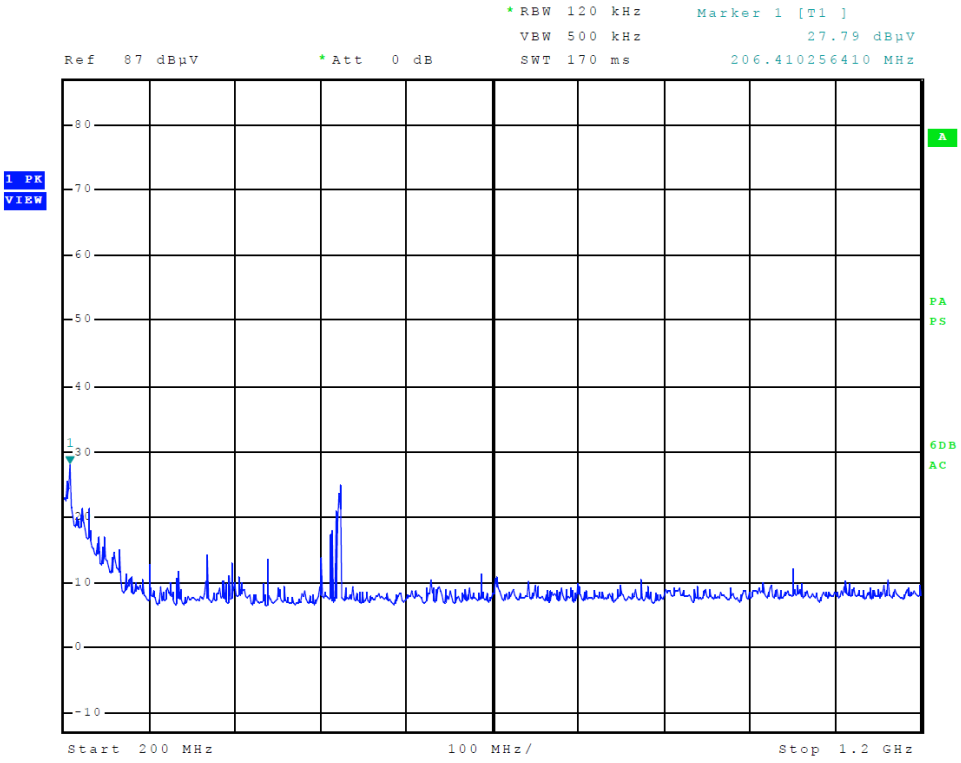


Figure 8 Radiated Emissions Plot emissions Taken in Screen Room (configuration #2)

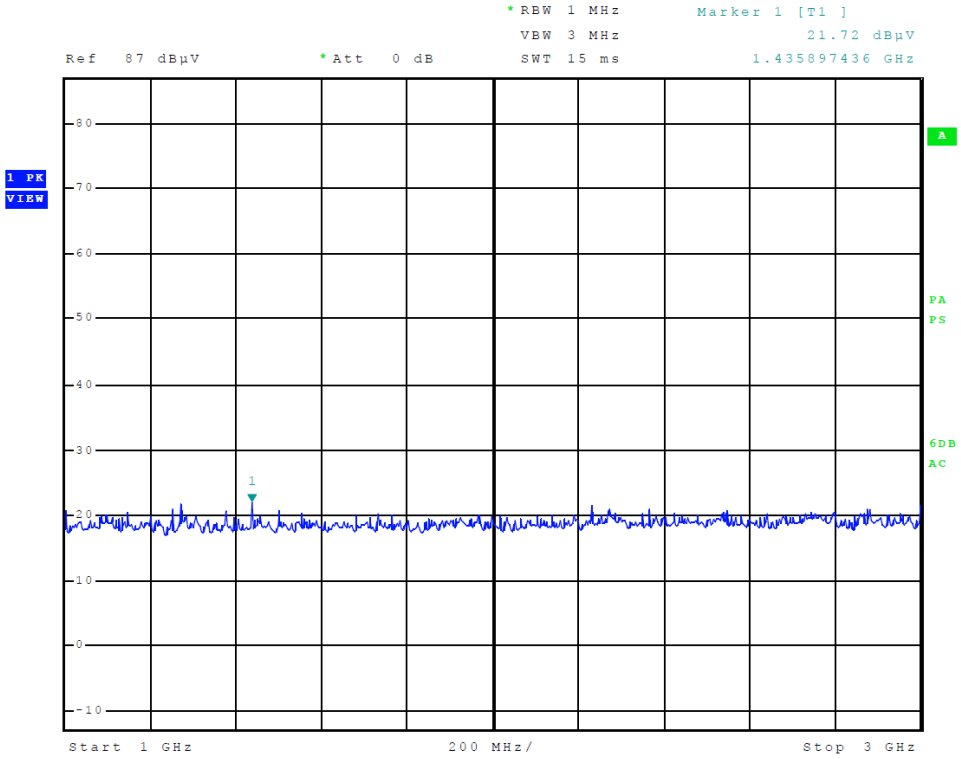


Figure 9 Radiated Emissions Plot emissions Taken in Screen Room (configuration #2)

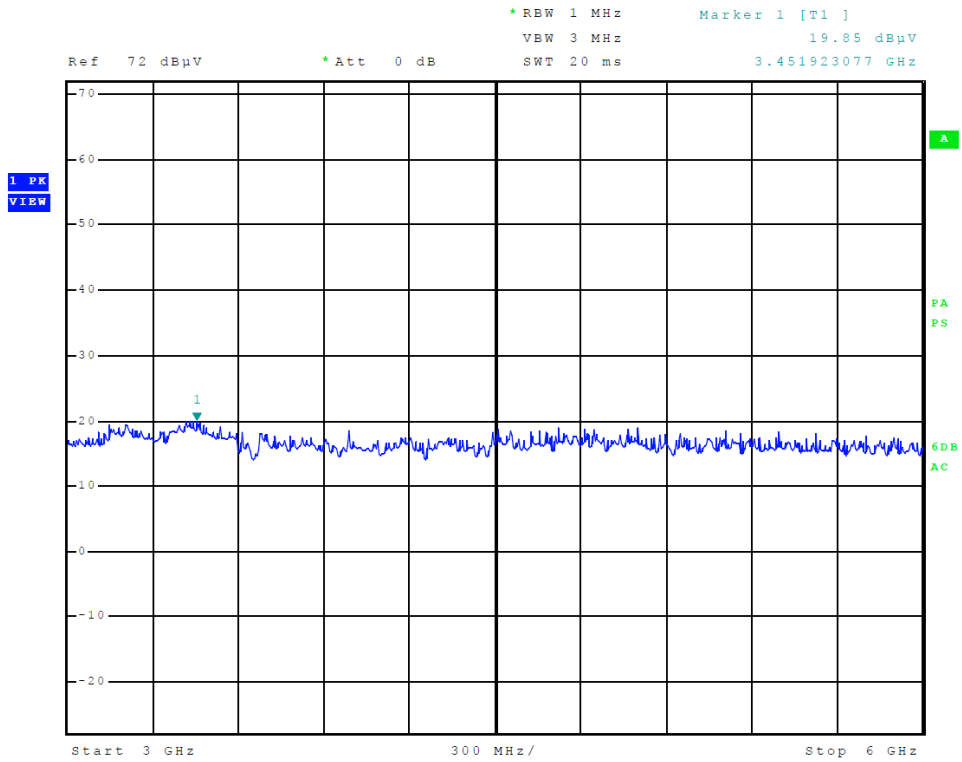


Figure 10 Radiated Emissions Plot emissions Taken in Screen Room (configuration #2)

Emissions Test Data

Table 1 AC Line Conducted Emissions Configuration #1 Battery Charging System L1

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	158.000000000 kHz	55.44	Quasi Peak	-10.13
2	158.000000000 kHz	43.91	Average	-11.66
2	198.000000000 kHz	36.46	Average	-17.24
1	238.000000000 kHz	41.66	Quasi Peak	-20.51
2	238.000000000 kHz	32.10	Average	-20.07
1	278.000000000 kHz	40.65	Quasi Peak	-20.22
1	318.000000000 kHz	38.53	Quasi Peak	-21.23
1	358.000000000 kHz	35.21	Quasi Peak	-23.57
1	4.930000000 MHz	39.89	Quasi Peak	-16.11
2	5.032000000 MHz	30.75	Average	-19.25
2	5.528000000 MHz	25.33	Average	-24.67
2	5.728000000 MHz	23.58	Average	-26.42

Other emissions present had amplitudes at least 20 dB below the limit.

Table 2 AC Line Conducted Configuration #1 Battery Charging System L2

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	158.000000000 kHz	48.96	Quasi Peak	-16.61
2	158.000000000 kHz	30.12	Average	-25.44
2	198.000000000 kHz	29.01	Average	-24.69
1	278.000000000 kHz	40.91	Quasi Peak	-19.96
1	4.926000000 MHz	38.80	Quasi Peak	-17.20
2	5.124000000 MHz	28.61	Average	-21.39
2	5.360000000 MHz	28.04	Average	-21.96
2	5.444000000 MHz	27.85	Average	-22.15
2	5.884000000 MHz	24.56	Average	-25.44
1	7.048000000 MHz	31.27	Quasi Peak	-28.73
1	8.104000000 MHz	27.70	Quasi Peak	-32.30
1	29.968000000 MHz	28.97	Quasi Peak	-31.03

Other emissions present had amplitudes at least 20 dB below the limit.

Table 3 Radiated Emissions from EUT Data (Configuration #1)

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
50.7	31.2	24.6	N/A	33.4	28.5	N/A	40.0
74.2	29.5	25.0	N/A	27.6	23.1	N/A	40.0
80.0	32.5	25.7	N/A	37.2	31.4	N/A	40.0
82.8	30.2	25.1	N/A	38.4	32.4	N/A	40.0
112.0	29.1	17.9	N/A	27.3	19.6	N/A	40.0
124.5	28.6	23.9	N/A	29.6	21.0	N/A	40.0

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded above for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded above for frequency range above 1000 MHz.

Table 4 Radiated Emissions from EUT Data (Configuration #2)

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
184.9	23.2	11.1	N/A	27.2	21.8	N/A	40.0
200.0	27.1	15.0	N/A	30.7	20.1	N/A	40.0
203.7	23.3	8.9	N/A	30.5	21.1	N/A	40.0
207.3	23.8	7.5	N/A	30.6	19.4	N/A	40.0
210.9	24.4	5.9	N/A	30.8	19.0	N/A	40.0
218.0	27.5	5.6	N/A	31.2	20.1	N/A	40.0
221.8	23.3	11.2	N/A	31.3	19.6	N/A	40.0

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded above for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded above for frequency range above 1000 MHz.

Summary of Results

AC Line Conducted Emissions Results

The EUT demonstrated compliance with the AC Line Conducted Emissions requirements of 47CFR Part 15B, RSS-GEN Issue 5, and other applicable Class B emissions requirements. The EUT AC interfaced configuration worse-case configuration demonstrated a minimum margin of -10.1 dB below the Class B requirement. Other emissions were present with amplitudes at least 20 dB below the limit and worse-case amplitudes recorded.

Radiated Emissions Results

The EUT demonstrated compliance with the radiated emissions requirements of 47CFR Part 15B, RSS-GEN Issue 5, and other applicable Class B emissions requirements. The worse-case EUT configuration #1 demonstrated a minimum margin of -7.6 dB below the 47CFR Part 15B and RSS-GEN Issue 5 Class B requirements. The worse-case EUT configuration #2 demonstrated a minimum margin of -18.2 dB below the 47CFR Part 15B and RSS-GEN Issue 5 Class B requirements. Other emissions were present with amplitudes at least 20 dB below the limit and worse-case amplitudes recorded.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Additional Test Equipment List
- Annex C Rogers Qualifications
- Annex D Rogers Labs Certificate of Accreditation

Annex A Measurement Uncertainty Calculations

The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16–4. Result of measurement uncertainty calculations are recorded below. Component and process variability of production devices similar to those tested may result in additional deviations. The manufacturer has the sole responsibility of continued compliance.

Measurement	Expanded Measurement Uncertainty $U_{(lab)}$
3 Meter Horizontal 0.009-1000 MHz Measurements	4.16
3 Meter Vertical 0.009-1000 MHz Measurements	4.33
3 Meter Measurements 1-18 GHz	5.14
3 Meter Measurements 18-40 GHz	5.16
10 Meter Horizontal Measurements 0.009-1000 MHz	4.15
10 Meter Vertical Measurements 0.009-1000 MHz	4.32
AC Line Conducted	1.75
Antenna Port Conducted power	1.17
Frequency Stability	1.00E-11
Temperature	1.6˚C
Humidity	3%

Annex B Additional Test Equipment List

List of Test Equipment	Calibration Date (m/d/y)	Due
Antenna: Schwarzbeck Model: BBA 9106/VHBB 9124 (9124-627)	5/2/2018	5/2/2019
Antenna: Schwarzbeck Model: VULP 9118 A (VULP 9118 A-534)	5/2/2018	5/2/2019
Antenna: EMCO 6509	10/16/2018	10/16/2020
Antenna: EMCO 3143 (9607-1277) 20-1200 MHz	5/2/2018	5/2/2019
Antenna: EMCO Dipole Set 3121C	2/23/2018	2/23/2019
Antenna: C.D. B-101	2/23/2018	2/23/2019
Antenna: Solar 9229-1 & 9230-1	2/23/2018	2/23/2019
Cable: Belden 8268 (L3)	10/16/2018	10/16/2019
Cable: Time Microwave: 4M-750HF290-750	10/16/2018	10/16/2019
Frequency Counter: Leader LDC-825 (8060153	5/2/2018	5/2/2019
Oscilloscope Scope: Tektronix 2230	2/23/2018	2/23/2019
Wattmeter: Bird 43 with Load Bird 8085	2/23/2018	2/23/2019
R.F. Generator: SMB100A6 s/n 100623	5/2/2018	5/2/2019
R.F. Generator: SBMBV100A s/n: 260771	5/2/2018	5/2/2019
R.F. Generators: HP 606A, HP 8614A, HP 8640B	2/23/2018	2/23/2019
R.F. Power Amp 65W Model: 470-A-1010	2/23/2018	2/23/2019
R.F. Power Amp 50W M185- 10-501	2/23/2018	2/23/2019
R.F. Power Amp A.R. Model: 10W 1010M7	2/23/2018	2/23/2019
R.F. Power Amp EIN Model: A301	2/23/2018	2/23/2019
LISN: Compliance Eng. Model 240/20	5/2/2018	5/2/2019
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08	5/2/2018	5/2/2019
Audio Oscillator: H.P. 201CD	2/23/2018	2/23/2019
ESD Test Set 2010i	2/23/2018	2/23/2019
Oscilloscope Scope: Tektronix MDO 4104	2/23/2018	2/23/2019
EMC Transient Generator HVT TR 3000	2/23/2018	2/23/2019
AC Power Source (Ametech, California Instruments)	2/23/2018	2/23/2019
Fast Transient Burst Generator Model: EFT/B-101	2/23/2018	2/23/2019
Field Intensity Meter: EFM-018	2/23/2018	2/23/2019
KEYTEK Ecat Surge Generator	2/23/2018	2/23/2019
ESD Simulator: MZ-15	2/23/2018	2/23/2019
Shielded Room not required		

Annex C Rogers Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has approximately 32 years' experience in the field of electronics. Engineering experience includes six years in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

Positions Held

Systems Engineer: A/C Controls Mfg. Co., Inc. 6 Years

Electrical Engineer: Rogers Consulting Labs, Inc. 5 Years

Electrical Engineer: Rogers Labs, Inc. Current

Educational Background

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.

2) Bachelor of Science Degree in Business Administration Kansas State University.

3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

Scot D Rogers
Scot D. Rogers

Annex D Rogers Labs Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200087-0

Rogers Labs, Inc.
Louisburg, KS

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-02-21 through 2019-03-31
Effective Dates

For the National Voluntary Laboratory Accreditation Program