
Project 20901-15

**Si-EMobility
X6 Scooter**

Wireless Certification Report

Prepared for:

Si-EMobility, LLC
3267 Bee Caves Road Suite 107-279
Austin Texas United States 78746

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

16 Aug 2019

Reviewed by



Shakil Murad
Lead EMC Engineer

Written by



Eric Lifsey
EMC Engineer

Revision History

Revision Number	Description	Date
Draft 01	For review.	16 Aug 2019
Final 01		19 Sep 2019

Errata:

All references to Max-X6-2 refer to the same device model X6.

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Compliance Certificate

FCC MRA Designation Number: US5270 NVLAP Accreditation Number: 200062-0

Applicant	Device & Test Identification
Si-EMobility, LLC 3267 Bee Caves Road Suite 107-279 Austin Texas United States 78746 Certificate Date: 13 Aug 2019	FCC ID: 2ASXR-X6IOT02 ISED ID: N/A Model(s): X6 Laboratory Project ID: 20901-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Requirement	Reference	Detail
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, <u>2400-2483.5 MHz</u> , and 5725-5850 MHz.
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

*MPE is reported separately from this document.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

1.2 EUT Description

Table 1.2.1: Equipment Under Test		
Manufacturer / Model	Serial #	Description
Si-EMobility Max-X6-02 Scooter Model: X6	none	2400-2483.5 MHz DTS transceiver; using BTLE style protocol.

Table 1.2.2: Support Equipment		
Manufacturer / Model	Serial #	Description
None		

This system is a public mobility scooter that utilizes various pre-approved radio modules and a Bluetooth Low Energy radio that is the subject of this report. The BTLE radio is used to communicate with the software application on the user's smart phone or similar device. It is powered from the scooter's main battery cells via a down-converter regulated power supply.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations. BTLE satisfies the requirements for a DTS device without need to consider or test the hopping feature.

1.4 Modifications to Equipment

None.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

1.6 Radiated Measurements

Table 1.6 1 Measurement Corrections	
Parameter	From Sums Of
Radiated Field Strength	Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gain
Conducted Antenna Port	Raw Measured Level + Attenuator Factor + Cable Losses
Conducted Mains Port	Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses

Additionally, measurement distance extrapolation factors (such as $1/d$ above 30 MHz) are applied and documented where used.

1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents	
Document	Title
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Table 1.7.2: Applicable Clauses		
Parameter	FCC Part 15 Rule Paragraphs	
Transmitter Characteristics	15.247	
Bandwidth	15.247(a)(1), 2.1049, KDB 558074 D01	
Spurious Emission	15.247, 15.209, 15.205	
Band Edge	15.247, 15.205	
Antenna Requirement	15.247, 15.203	

2.0 Fundamental Power

2.1 Test Procedure

Peak power is measured using radiated method and without modulation.

2.2 Test Criteria

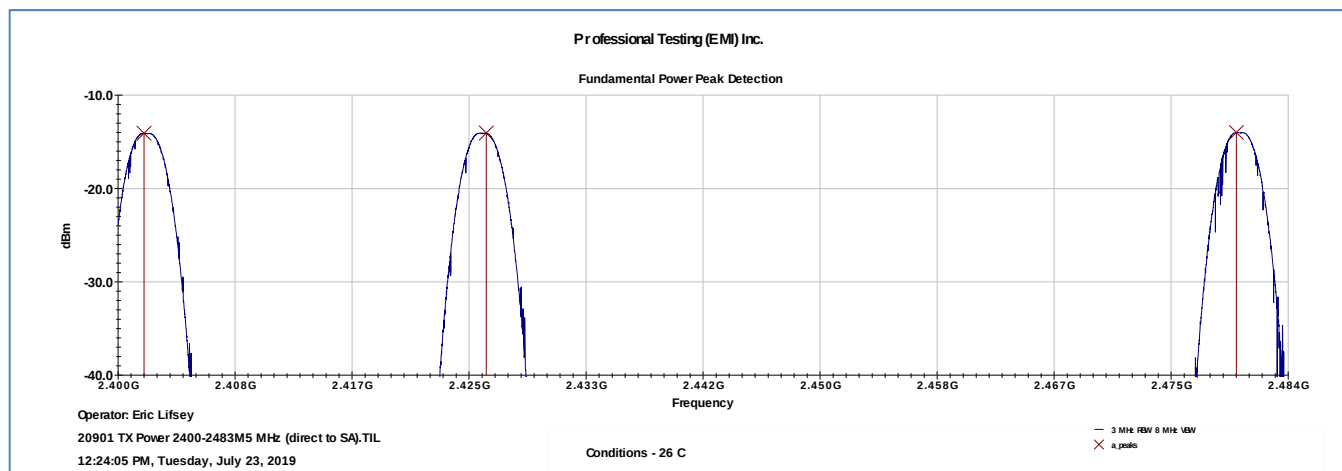
47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(a)(3) //	Fundamental Power Conducted Limits 1 W Limit Restated as Field: 125.23 dB μ V/m @ 3 m	23 Jul 2019

2.3 Test Results, Peak Power

Table 2.3.1 Power, Peak, Measured Conducted		
Frequency MHz	dBm	Restated in mW
2402	-14.1	0.039
2426	-14.1	0.039
2480	-14.0	0.040

Measured in 1 MHz RBW, 3 MHz VBW.

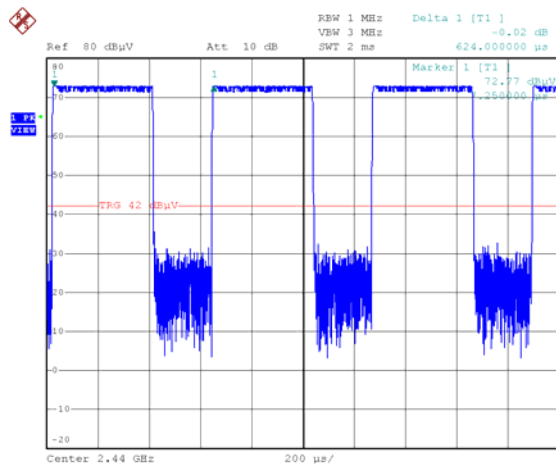
The EUT satisfied the requirement.



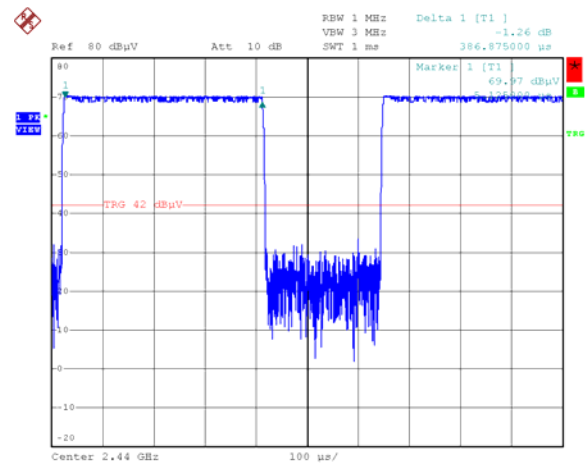
2.4 Test Results, Duty Cycle

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

As the device was operating in advertising mode a streaming worst-case high data rate example of duty cycle was applied for a conservative factor of -4.2 dB. In contrast, this device exchanges only user account information with a smart phone application and has no streaming functionality.



**Example BTLE Maximum Rate
Transmit Interval 0.624 ms**



**Example BTLE Maximum Rate
Transmit Time 0.386 ms**

$$\text{Averaging Factor} = 20\text{Log}(0.386/0.624) = -4.2 \text{ dB}$$

3.0 Power Spectral Density

3.1 Test Procedure

A spectrum analyzer is either connected directly to the EUT or used by radiated means to measure the fundamental emission. It is adjusted to measure the power spectral density in the specified resolution bandwidth.

3.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(e) //	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz Restated as field strength limit: 103.23 dB μ V/m at 3 m	N/A

3.3 Test Results

Full bandwidth unmodulated peak power measured ~22 dB lower than the power spectral density limit. This measurement was not required.

4.0 Occupied Bandwidth

4.1 Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

4.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen 4.6	Bandwidth, 6 dB, 20 dB, 99%	24 Jul 2019

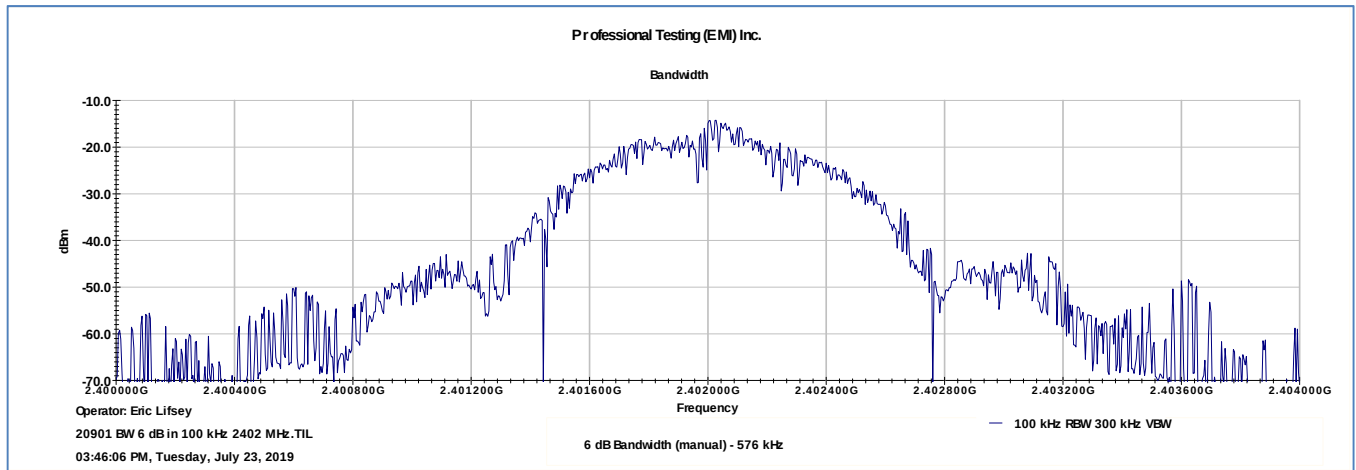
4.3 Test Results

The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

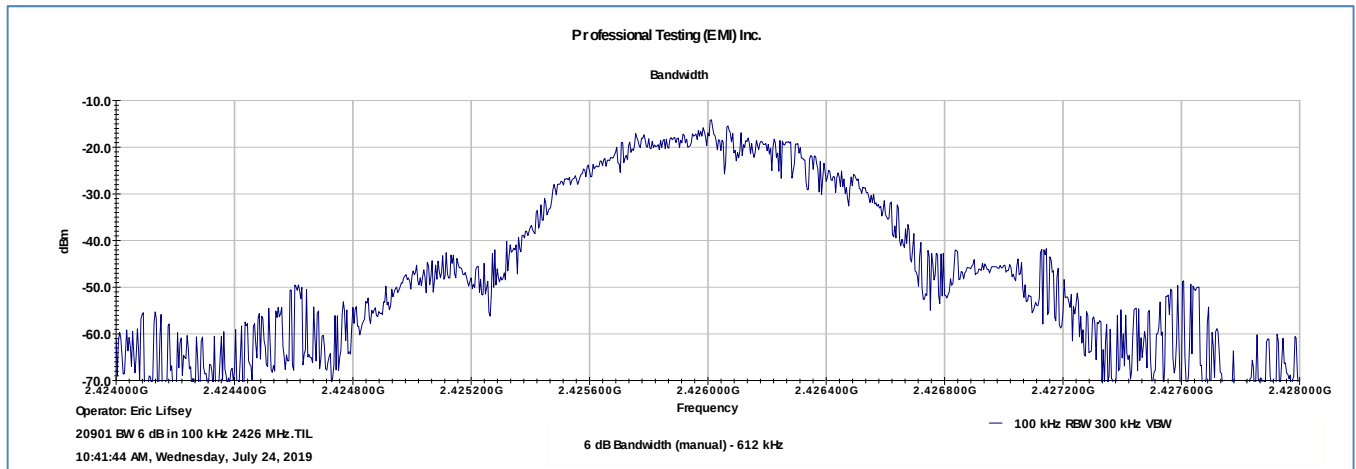
The EUT was found to be in compliance with applicable requirements.

Table 4.3.1			
Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Minimum BW (kHz)
576	612	644	576
Bandwidth 20 dB, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
1093	1082	1034	1093
Bandwidth 99%, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
1066	1066	1032	1066

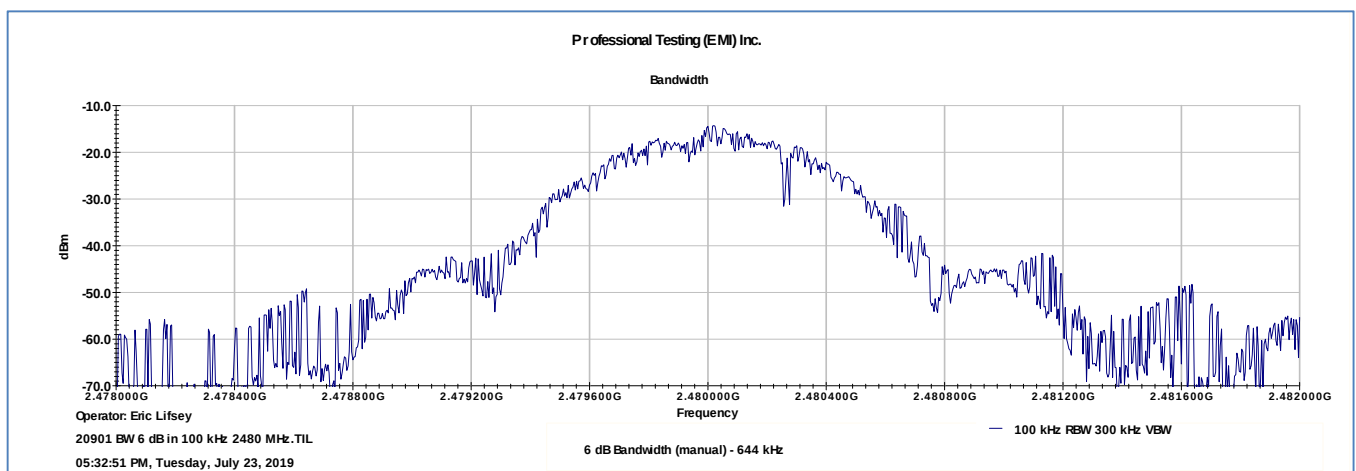
4.3.1 Bandwidth Plots, 6 dB



Bottom Channel

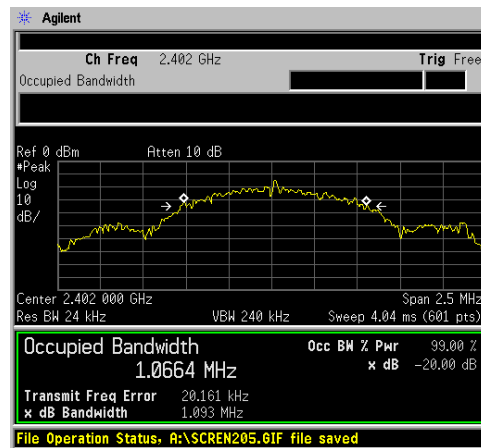


Middle Channel

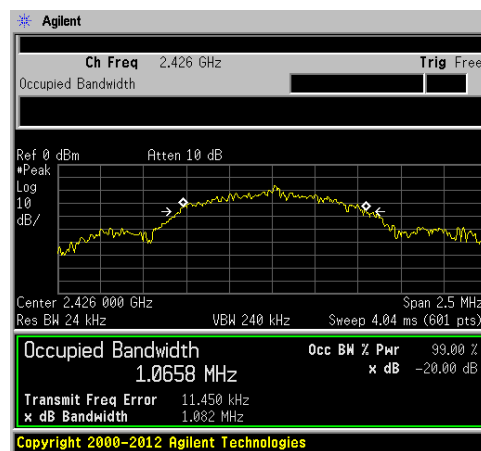


Top Channel

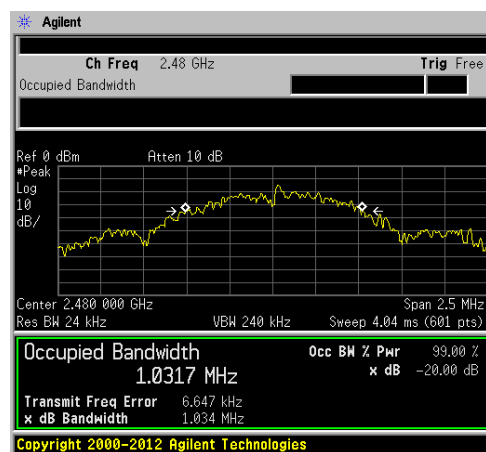
4.3.2 Bandwidth Plots, 20 dB & 99%



Bottom Channel



Middle Channel



Top Channel

5.0 Band Edge

5.1 Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is approximately centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes at least two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method is utilized.

5.2 Test Criteria

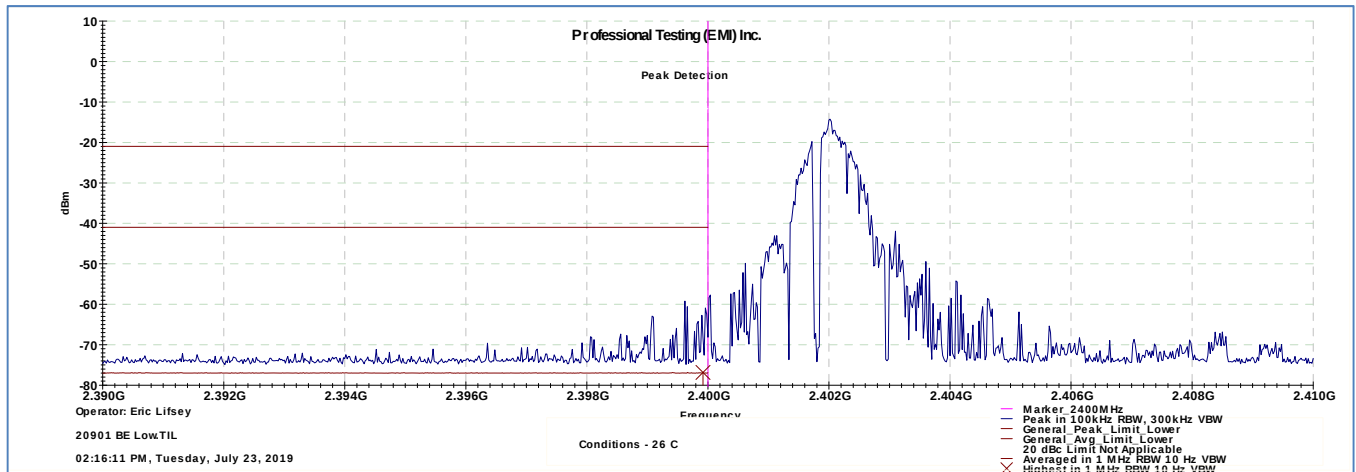
47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.205 // RSS-247 5.5, RSS-Gen 4.9	Unwanted Emissions Adjacent to Authorized Band	23 Jul 2019

5.3 Test Results

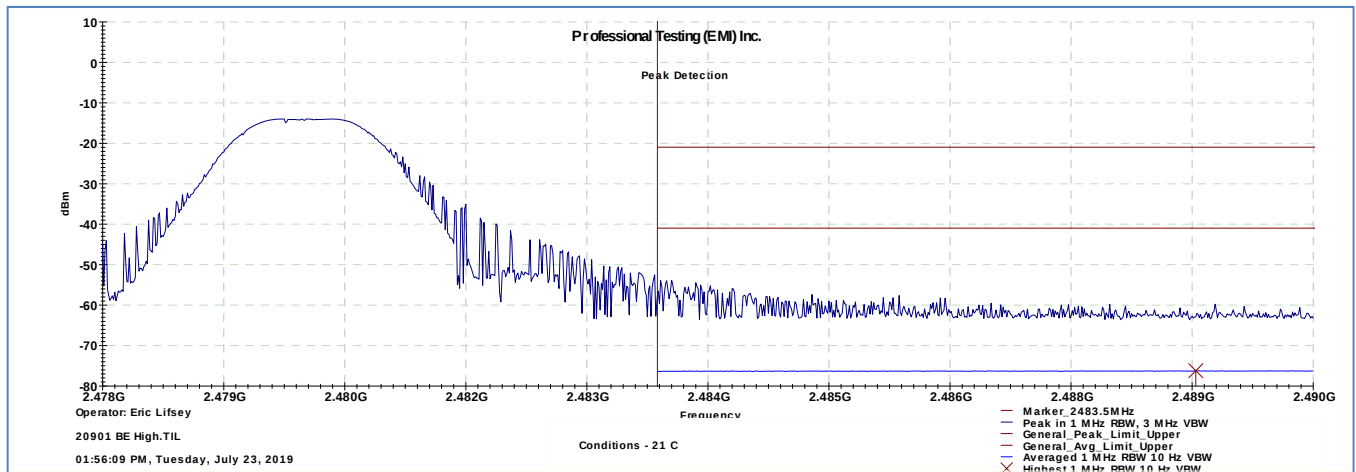
The conducted measurements included fundamental and more than 2 standard bandwidths (standard bandwidth 1 MHz) beyond the band edges to provide a clear view of the fundamental and the declining emission levels.

The EUT satisfied the criteria. Plotted results appear on the following pages.

5.3.1 Bottom Channel Band Edge



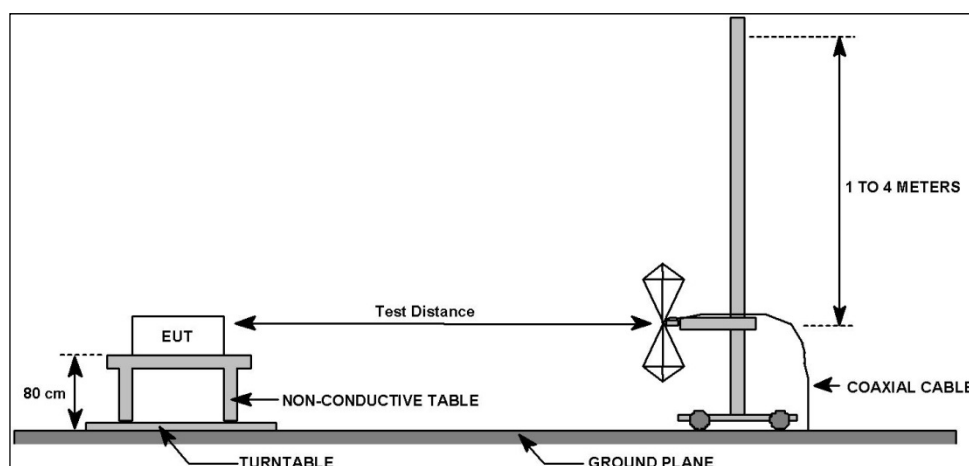
5.3.2 Top Channel Band Edge



6.0 Radiated Spurious Emissions, Transmit Mode

6.1 Test Procedure

Radiated emissions are measured with the EUT transmitting on the required frequencies.



6.1.1 Test Distance and Detection Method

30 MHz to 1 GHz	1 GHz to 18 GHz	18 GHz to 25 GHz
10 m	3 m	1 m
Quasi-peak	Peak & Average	Peak & Average

6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 //	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	18, 22 Jul 2019

6.3 Test Results

The EUT was transmitting and receiving in advertising mode on three channels.

Highest recorded peak spurious 56.8 dB μ V/m (limit 54). Applying 4.2 dB averaging factor = 52.6 dB μ V/m.

The EUT satisfied the requirement.

6.3.1 Advertising, up to 1 GHz

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz						
In accordance with:		FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits						
Section:		15.109						
Test Date(s):		7/18/2019		EUT Serial #:		16703		
Customer:		Si-Emobility LLC		EUT Part #:		Max-X6-2		
Project Number:		20901-10		Test Technician:		Sergio Gutierrez		
Purchase Order #:		N/A		Supervisor:		Shakil Murad		
Equip. Under Test:		Si-Emobility Max-X6-2		Witness' Name:		N/A		
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		36 VDC		EUT Power		0 N/A		
Antenna Orientation:		Vertical		Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:				Running				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
44.683	10	226	1.26	Quasi-peak	7.288	29.5	-22.2	Pass
46.99	10	11	3.28	Quasi-peak	6.985	29.5	-22.5	Pass
58.439	10	14	2.79	Quasi-peak	5.927	29.5	-23.6	Pass
67.389	10	4	1.22	Quasi-peak	17.693	29.5	-11.8	Pass
154.836	10	104	1.32	Quasi-peak	23.557	33.1	-9.5	Pass
959.674	10	153	1.28	Quasi-peak	26.666	35.6	-8.9	Pass
Professional Testing, EMI, Inc Radiated Emissions 30MHz - 1GHz Vertical Polarity Measured Emissions Operator: Sergio Gutierrez Current Time -04:17:56 PM, Thursday, July 18, 2019 EUT Mode: Running EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 20901-10 Client: Si-Emobility LLC								
≤ 1GHz Vertical Antenna Polarity Measured Emissions								

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz						
In accordance with:		FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits						
Section:		15.109						
Test Date(s):		7/18/2019			EUT Serial #:		16703	
Customer:		Si-Emobility LLC			EUT Part #:		Max-X6-2	
Project Number:		20901-10			Test Technician:		Sergio Gutierrez	
Purchase Order #:		N/A			Supervisor:		Shakil Murad	
Equip. Under Test:		SI-Emobility Max-X6-2			Witness' Name:		N/A	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		36 VDC			EUT Power:		0 N/A	
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz	
EUT Mode of Operation:					Running			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
467.984	10	85	1.53	Quasi-peak	24.78	35.6	-10.8	Pass
480.001	10	201	1.14	Quasi-peak	25.097	35.6	-10.5	Pass
492.009	10	177	1.53	Quasi-peak	25.525	35.6	-10.1	Pass
959.781	10	301	1.13	Quasi-peak	26.628	35.6	-9.0	Pass
959.927	10	2	1.14	Quasi-peak	26.708	35.6	-8.9	Pass
994.515	10	274	1.64	Quasi-peak	27.582	43.5	-15.9	Pass
Professional Testing, EMI, Inc Radiated Emissions 30MHz - 1GHz Horizontal Polarity Measured Emissions Peak Limit Quasi-peak Limit Average Limit Ambient Scan Pre-scan Emissions Peak Reading Quasi-peak Reading Average Reading LPFF Verification Limit Verified LPFF QP Reading Operator: Sergio Gutierrez Current Time -04:31:55 PM, Thursday, July 18, 2019 EUT Mode: Running EUT Power: 36 VDC Notes: EUT: SI-Emobility Max-X6-2 Project Number: 20901-10 Client: SI-EMobility LLC								
≤ 1GHz Horizontal Antenna Polarity Measured Emissions								

6.3.2 Bottom Channel 1 GHz to 25 GHz

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician:		Sergio Gutierrez	
Purchase Order #:		0			Supervisor:		Lisa Arndt	
Equip. Under Test:		X6			Witness' Name:		0	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power:		0 N/A	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
4804.89	3	171	3.13	Peak	54.345	74.0	-19.6	Pass
7206.36	3	3	2.1	Peak	46.736	74.0	-27.2	Pass
9610.4	3	49	1.02	Peak	47.939	74.0	-26.0	Pass
12011	3	52	1.02	Peak	49.33	74.0	-24.6	Pass
Professional Testing, EMI, Inc Radiated Emissions 1-18GHz Vertical Polarity Measured Emissions — FCC Peak Limit — FCC Average Limit — Ambient Scan — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -03:39:44 PM, Friday, July 19, 2019 EUT Mode: Charging and Trasmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Vertical Antenna Polarity Measured Emissions								

Professional Testing, EMI, Inc.

Test Method: ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

In accordance with: FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits

Section: 15.209

Test Date(s): 7/22/2019

EUT Serial #: 0

Customer: Si-Mobility

EUT Part #: 0

Project Number: 21055

Test Technician: Sergio Gutierrez

Purchase Order #: 0

Supervisor: Lisa Arndt

Equip. Under Test: X6

Witness' Name: 0

Radiated Emissions Test Results Data Sheet

EUT Line Voltage: 0 VDC

EUT Power: 0 N/A

Antenna Orientation: Horizontal

Frequency Range: Above 1GHz

EUT Mode of Operation:

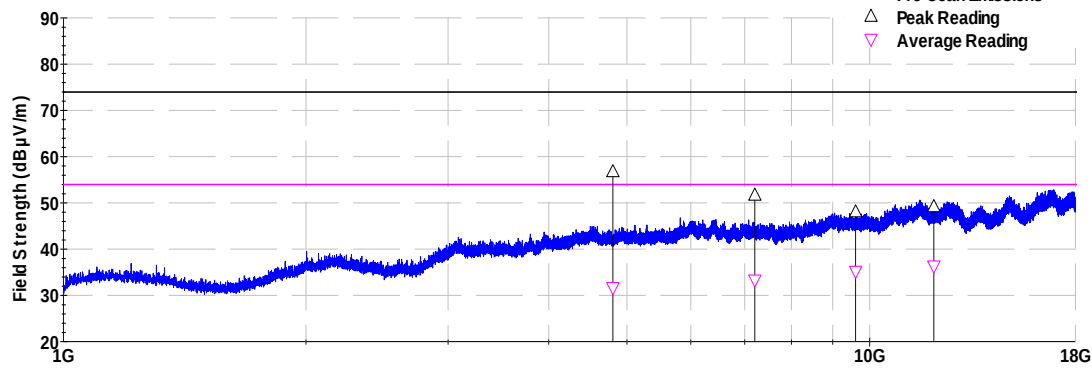
Advertising TX/RX

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
4803.52	3	345	2.24	Peak	56.747	74.0	-17.2	Pass
7205.7	3	335	1.01	Peak	51.684	74.0	-22.3	Pass
9608.5	3	105	2.61	Peak	48.068	74.0	-25.9	Pass
12012.89	3	294	3.54	Peak	49.192	74.0	-24.8	Pass

Professional Testing, EMI, Inc

Radiated Emissions

1-18GHz Horizontal Polarity Measured Emissions



Operator: Sergio Gutierrez

Current Time -03:42:51 PM, Friday, July 19, 2019

EUT Mode: Charging and Transmitting

EUT Power: 36 VDC

Notes:

EUT: Si-EMobility Max-X6-2

Project Number: 21055

Client: Si-EMobility LLC

> 1GHz Horizontal Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician: Sergio Gutierrez			
Purchase Order #:		0			Supervisor: Lisa Arndt			
Equip. Under Test:		X6			Witness' Name: 0			
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
24041.86	3	2	1	Peak	45.325	74.0	-28.6	Pass
24111.13	3	205	1	Peak	45.387	74.0	-28.6	Pass
24771.09	3	259	1	Peak	45.878	74.0	-28.1	Pass
24934.42	3	249	1	Peak	45.914	74.0	-28.0	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions — Peak Limit — Average Limit — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -02:27:45 PM, Wednesday, July 24, 2019 Frequency EUT Mode: Charging and Trasmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Vertical Antenna Polarity Measured Emissions								

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician: Sergio Gutierrez			
Purchase Order #:		0			Supervisor: Lisa Arndt			
Equip. Under Test:		X6			Witness' Name: 0			
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
23657.18	3	103	1	Peak	44.6	74.0	-29.4	Pass
24092.05	3	179	1	Peak	45.746	74.0	-28.2	Pass
24123.19	3	325	1	Peak	45.923	74.0	-28.0	Pass
24385.04	3	298	1	Peak	45.315	74.0	-28.6	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions — Peak Limit — Average Limit — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -02:18:28 PM, Wednesday, July 24, 2019 Frequency EUT Mode: Charging and Trasnmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Horizontal Antenna Polarity Measured Emissions								

6.3.3 Middle Channel, 1 GHz to 25 GHz

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician:		Sergio Gutierrez	
Purchase Order #:		0			Supervisor:		Lisa Arndt	
Equip. Under Test:		X6			Witness' Name:		0	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
4852.93	3	329	1.68	Peak	44.888	74.0	-29.1	Pass
7278.05	3	109	1.93	Peak	45.758	74.0	-28.2	Pass
9706.01	3	164	3.78	Peak	48.302	74.0	-25.7	Pass
12131.33	3	3	2.01	Peak	49.719	74.0	-24.2	Pass
Professional Testing, EMI, Inc Radiated Emissions 1-18GHz Vertical Polarity Measured Emissions — FCC Peak Limit — FCC Average Limit — Ambient Scan — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -09:23:58 AM, Monday, July 22, 2019 EUT Mode: Charging and Trasnmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Vertical Antenna Polarity Measured Emissions								

Professional Testing, EMI, Inc.

Test Method: ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

In accordance with: FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits

Section: 15.209

Test Date(s): 7/22/2019

EUT Serial #: 0

Customer: Si-Mobility

EUT Part #: 0

Project Number: 21055

Test Technician: Sergio Gutierrez

Purchase Order #: 0

Supervisor: Lisa Arndt

Equip. Under Test: X6

Witness' Name: 0

Radiated Emissions Test Results Data Sheet

EUT Line Voltage: 0 VDC

EUT Power: 0 N/A

Antenna Orientation: Horizontal

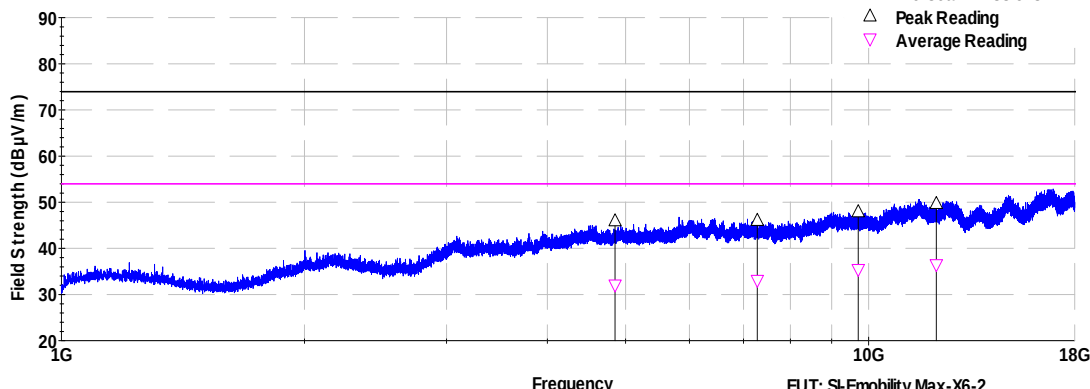
Frequency Range: Above 1GHz

EUT Mode of Operation:

Advertising TX/RX

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
4852.61	3	235	1.62	Peak	45.985	74.0	-28.0	Pass
7281.68	3	356	1.5	Peak	46.061	74.0	-27.9	Pass
9708.12	3	164	1.02	Peak	47.955	74.0	-26.0	Pass
12130.68	3	289	2.15	Peak	49.717	74.0	-24.2	Pass

Professional Testing, EMI, Inc
Radiated Emissions
1-18GHz Horizontal Polarity Measured Emissions



Operator: Sergio Gutierrez

EUT Mode: Charging and Transmitting

EUT: Si-EMobility Max-X6-2

Current Time -09:35:23 AM, Monday, July 22, 2019

EUT Power: 36 VDC

Project Number: 21055

Notes:

Client: Si-EMobility LLC

> 1GHz Horizontal Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician:		Sergio Gutierrez	
Purchase Order #:		0			Supervisor:		Lisa Arndt	
Equip. Under Test:		X6			Witness' Name:		0	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
23927.59	3	64	1	Peak	44.847	74.0	-29.1	Pass
24090.31	3	135	1	Peak	45.526	74.0	-28.4	Pass
24395.28	3	363	1	Peak	46.27	74.0	-27.7	Pass
24404.06	3	2	1	Peak	45.138	74.0	-28.8	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions — Peak Limit — Average Limit — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -02:49:49 PM, Wednesday, July 24, 2019 Frequency EUT Mode: Charging and Transmitting EUT Power: 36 VDC Notes: EUT: Si-EMobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Vertical Antenna Polarity Measured Emissions								

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician:		Sergio Gutierrez	
Purchase Order #:		0			Supervisor:		Lisa Arndt	
Equip. Under Test:		X6			Witness' Name:		0	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
23927.58	3	56	1	Peak	44.607	74.0	-29.4	Pass
24066.28	3	245	1	Peak	45.614	74.0	-28.3	Pass
24424.19	3	490	1	Peak	45.535	74.0	-28.4	Pass
24788.76	3	409	1	Peak	45.885	74.0	-28.1	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions — Peak Limit — Average Limit — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -02:43:44 PM, Wednesday, July 24, 2019 EUT Mode: Charging and Transmitting EUT Power: 36 VDC Notes: EUT: Si-EMobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Horizontal Antenna Polarity Measured Emissions								

6.3.4 Top Channel, 1 GHz to 25 GHz

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		7/22/2019			EUT Serial #:		0		
Customer:		Si-Mobility			EUT Part #:		0		
Project Number:		21055			Test Technician:		Sergio Gutierrez		
Purchase Order #:		0			Supervisor:		Lisa Arndt		
Equip. Under Test:		X6			Witness' Name:		0		
Radiated Emissions Test Results Data Sheet									
EUT Line Voltage:		0 VDC			EUT Power:		0 N/A		
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Advertising TX/RX				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results	
4956.93	3	80	1.02	Peak	45.325	74.0	-28.6	Pass	
7441.08	3	208	1.51	Peak	46.083	74.0	-27.9	Pass	
9915.79	3	318	3.15	Peak	48.123	74.0	-25.8	Pass	
12403.06	3	250	1.02	Peak	50.732	74.0	-23.2	Pass	
Professional Testing, EMI, Inc Radiated Emissions 1-18GHz Vertical Polarity Measured Emissions — FCC Peak Limit — FCC Average Limit — Ambient Scan — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -09:50:58 AM, Monday, July 22, 2019 Frequency EUT Mode: Charging and Trasnmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC									
> 1GHz Vertical Antenna Polarity Measured Emissions									

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician: Sergio Gutierrez			
Purchase Order #:		0			Supervisor: Lisa Arndt			
Equip. Under Test:		X6			Witness' Name: 0			
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
4959.46	3	357	1.02	Peak	45.328	74.0	-28.6	Pass
7441.55	3	101	3.76	Peak	45.892	74.0	-28.1	Pass
9918.73	3	26	3.54	Peak	47.95	74.0	-26.0	Pass
12401.25	3	262	1.02	Peak	50.588	74.0	-23.4	Pass
Professional Testing, EMI, Inc Radiated Emissions 1-18GHz Horizontal Polarity Measured Emissions — FCC Peak Limit — FCC Average Limit — Ambient Scan — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -10:02:38 AM, Monday, July 22, 2019 EUT Mode: Charging and Trasnmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Horizontal Antenna Polarity Measured Emissions								

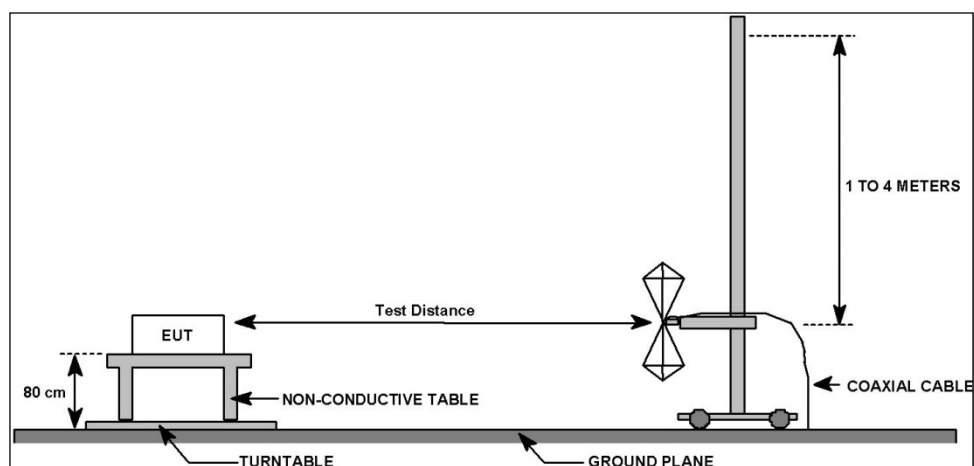
Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician:		Sergio Gutierrez	
Purchase Order #:		0			Supervisor:		Lisa Arndt	
Equip. Under Test:		X6			Witness' Name:		0	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
24205.81	3	91	1	Peak	44.4	74.0	-29.6	Pass
24263.41	3	188	1	Peak	44.89	74.0	-29.1	Pass
24394.59	3	407	1	Peak	45.095	74.0	-28.9	Pass
24793.99	3	308	1	Peak	45.994	74.0	-28.0	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions — Peak Limit — Average Limit — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -03:34:06 PM, Wednesday, July 24, 2019 Frequency EUT Mode: Charging and Trasnmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Vertical Antenna Polarity Measured Emissions								

Professional Testing, EMI, Inc.								
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices						
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits						
Section:		15.209						
Test Date(s):		7/22/2019			EUT Serial #:		0	
Customer:		Si-Mobility			EUT Part #:		0	
Project Number:		21055			Test Technician:		Sergio Gutierrez	
Purchase Order #:		0			Supervisor:		Lisa Arndt	
Equip. Under Test:		X6			Witness' Name:		0	
Radiated Emissions Test Results Data Sheet								
EUT Line Voltage:		0 VDC			EUT Power		0 N/A	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz	
EUT Mode of Operation:					Advertising TX/RX			
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
24102.54	3	83	1	Peak	45.625	74.0	-28.3	Pass
24221.34	3	229	1	Peak	44.812	74.0	-29.1	Pass
24416.68	3	571	1	Peak	45.586	74.0	-28.4	Pass
24891.08	3	67	1	Peak	45.926	74.0	-28.0	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions — Peak Limit — Average Limit — Pre-scan Emissions △ Peak Reading ▽ Average Reading Operator: Sergio Gutierrez Current Time -03:17:58 PM, Wednesday, July 24, 2019 EUT Mode: Charging and Trasnmitting EUT Power: 36 VDC Notes: EUT: Si-Emobility Max-X6-2 Project Number: 21055 Client: Si-EMobility LLC								
> 1GHz Horizontal Antenna Polarity Measured Emissions								

7.0 Radiated Spurious Emissions, Receive Mode

7.1 Test Procedure

Radiated emissions are measured with the EUT receiving on the center channel.



7.1.1 Test Distance and Detection Method

30 MHz to 1 GHz	1 GHz to 18 GHz	18 GHz to 25 GHz
10 m	3 m	1 m
Quasi-peak	Peak & Average	Peak & Average

7.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 //	Field Strength of Radiated Spurious/Harmonic Emissions Receive Mode	22 Jul 2019

7.3 Test Results

The EUT satisfied the requirement while in advertising mode.

8.0 Antenna Construction

8.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users.

8.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203, 15.247 //	Antenna Construction	16 Aug 2019

8.3 Results

Table 8.3.1 Antenna Construction Details
Manufacturer: Applicant Part Number: N/A Type: Inverted-F type antenna, radiating element shortened ~ 50%. Gain 0.0 dBi Construction: Etched on circuit board. Connector Supplied: No.

The antenna system design above satisfies the requirements of the rules.

9.0 Equipment

9.1 Radiated Emissions 30 MHz to 18 GHz

Radiated Emissions Test Equipment List					
Tile! Software Version:		Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM			
Test Profile:		2018_Radiated Emissions_TILE7_v1EL.til			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	TDK 10M	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2019
1890	HP	8447F-H64	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/10/2020
1937	Agilent	E4440A - AYZ	PSA , 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	11/8/2019
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	3/7/2019
C027D	NAD	NAD 2400	Amplifier, 100W, 3Hz-100kHz	11524464	N/A
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	TDK 10M	TDK 10M Chamber,sVSWR > 1 GHz	DAC-012915-005	11/16/2019
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/10/2020
C030	none	none	Cable Coax, N-N, 30m, 1 - 18GHz	none	9/21/2019
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	3/15/2019

9.2 Fundamental Power, Bandwidth, Duty Cycle, Band Edge

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	6 Nov 2019

9.3 Radiated Emissions 18-25 GHz

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	6 Nov 2019
1974	Agilent	83017A	Microwave Amplifier	7 Nov 2020
1542	A H Systems	SAS-572	Antenna, Horn, 18-26.5 GHz	CNR
0524	EMCO	1060	Turntable controller	CNR

10.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan				
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	1000	2	Multiple Sweeps
18000	26500	1000	2	Multiple Sweeps
*Notes: 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range. 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz. 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz. 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz. 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.				

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End of Report