



### Engineering Test Report No. 2101888-01

Report Date	February 1, 2022	
Manufacturer Name	Star Microelectronic Systems	
Manufacturer Address		
Product Name Brand/Model No.	LED Dimmable Light Bulb 1000 Lumens SMSA002	
Date Received	January 27, 2022	
Test Dates	January 28, 2022	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B Innovation, Science, and Economic Development Canada, ICES-003	
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	<i>Nathaniel Bouchie</i>	
Tested by	Nathaniel Bouchie	
Signature	<i>Raymond J. Klouda</i>	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	CC	

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## 1. Report Revision History

Revision	Date	Description
–	01 FEB 2022	Initial Release of Engineering Test Report No. 2101888-01



## 2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on one (1) LED Dimmable Light Bulb 1000 Lumens (hereinafter referred to as the Equipment Under Test (EUT)).

The EUT was identified as follows:

EUT Identification	
Description	LED Dimmable Light Bulb 1000 Lumens
Model/Part No.	SMSA002
Serial No.	N/a
Software/Firmware Version	N/a
Size of EUT	4 in x 4 in x 5.25 in
Number of Interconnection Wires	None
Type of Interconnection Wires	N/a
Highest Internal Frequency of the EUT	95kHz

The EUT listed above was used throughout the test series.

## 3. Power Input

The EUT was powered by 120VAC 60Hz from a twisted pair, 1-meter, harness.

## 4. Grounding

The EUT was connected to ground through the third wire of its input power cord.

## 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 the test mode described below. See the specific test section for the applicable test modes.

### 8.1. On, 1000 Lumens

This mode was achieved by applying power to the device.

## 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, Chapter I, Subchapter A, Part 15, Subpart B
- ICES-003, Issue 7, October 15, 2020, "Information Technology Equipment (including Digital Apparatus)"

- 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"

## 10. Test Plan

No test plan was provided. Instructions were provided by personnel from Star Microelectronic Systems and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B, Innovation, Science, and Economic Development Canada, ICES-003, 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	22.9°C
Relative Humidity	17%
Atmospheric Pressure	1020.1mb

## 13. Summary

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

Test Description	Test Requirements	Test Methods	Equipment Class	EUT S/N	Results
RF Conducted Emissions (AC Mains)	FCC 15B 15.107 ISED ICES-003, Section 3.2.1	ANSI C63.4:2014	B	N/a	Conforms
RF Radiated Emissions	FCC 15B 15.109 ISED ICES-003, Section 3.2.2	ANSI C63.4:2014	B	N/a	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).

$$\text{Formula 1: } VL \text{ (dB}\mu\text{V)} = \text{MTR (dB}\mu\text{V)} + \text{CF (dB)}.$$

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.

$$\text{Formula 1: } FS \text{ (dB}\mu\text{V/m)} = \text{MTR (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CF (dB)} + (-PA \text{ (dB)}) + \text{DC (dB)}$$

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

$$\text{Formula 2: } FS \text{ (}\mu\text{V/m)} = \text{AntiLog} [(FS \text{ (dB}\mu\text{V/m)})/20]$$

## 15. Statement of Conformity

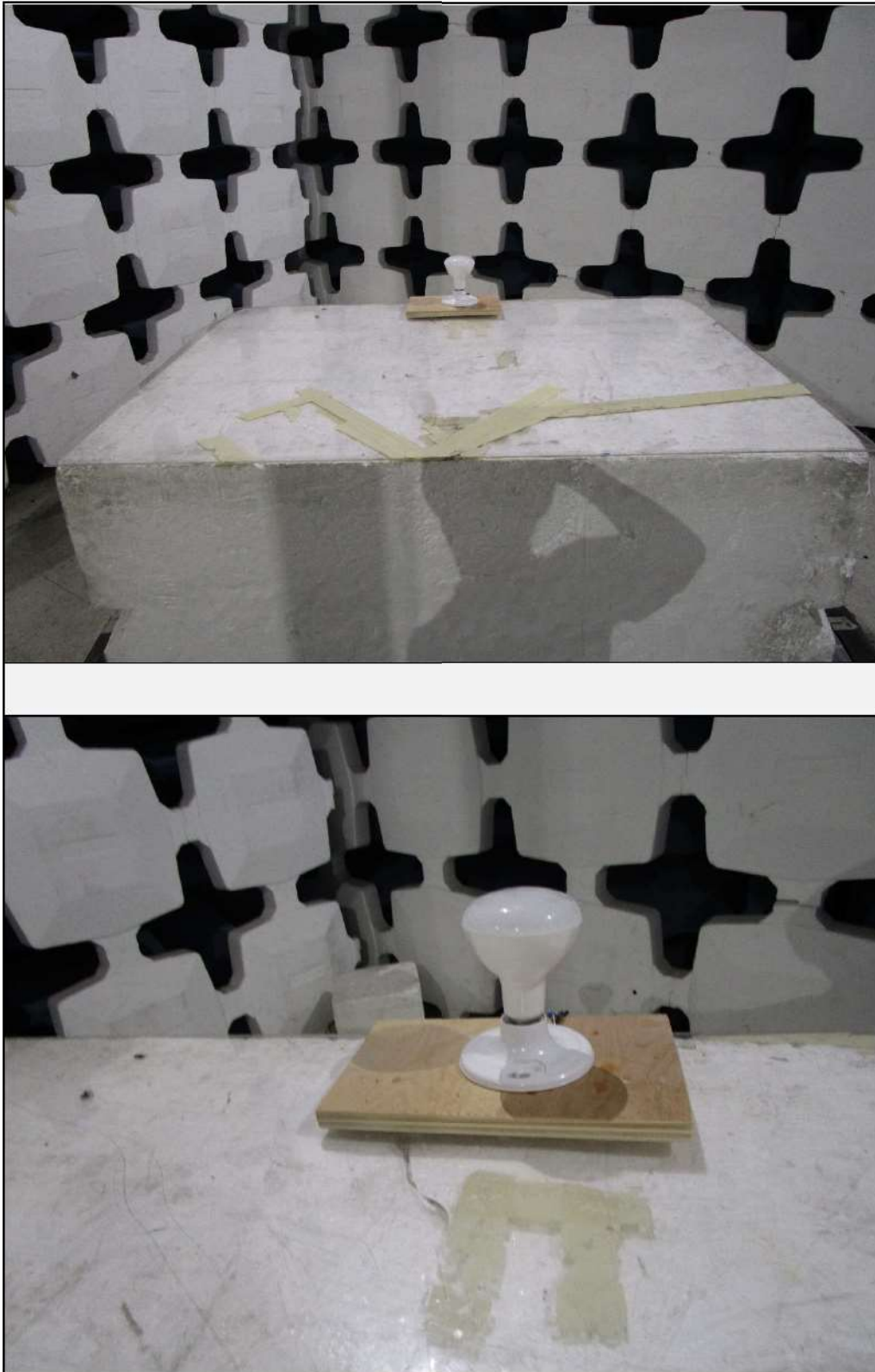
The Star Microelectronic Systems LED Dimmable Light Bulb 1000 Lumens, Model No. SMSA002, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B and Innovation, Science, and Economic Development Canada, ICES-003.

## 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 B and Innovation, Science, and Economic Development Canada, ICES-003 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
CDZ4	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GRB0	1MHZ, LISN SIGNAL CHECKER	ELITE	LISNCHKR1M	1	1MHZ	6/17/2021	6/17/2023
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	10/5/2020	10/5/2022
PLF1	CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	4/8/2021	4/8/2022
PLF3	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	4/8/2021	4/8/2022
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	7/12/2021	7/12/2022
T1ED	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	BN2320	DC-18GHZ	1/6/2022	1/6/2024
VBR8	CISPR EN FCC CE VOLTAGE.exe					N/A	
VBV2	CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	—	—	N/A	
XLT20	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-199 N M		DC-18 GHZ	6/8/2021	6/8/2023

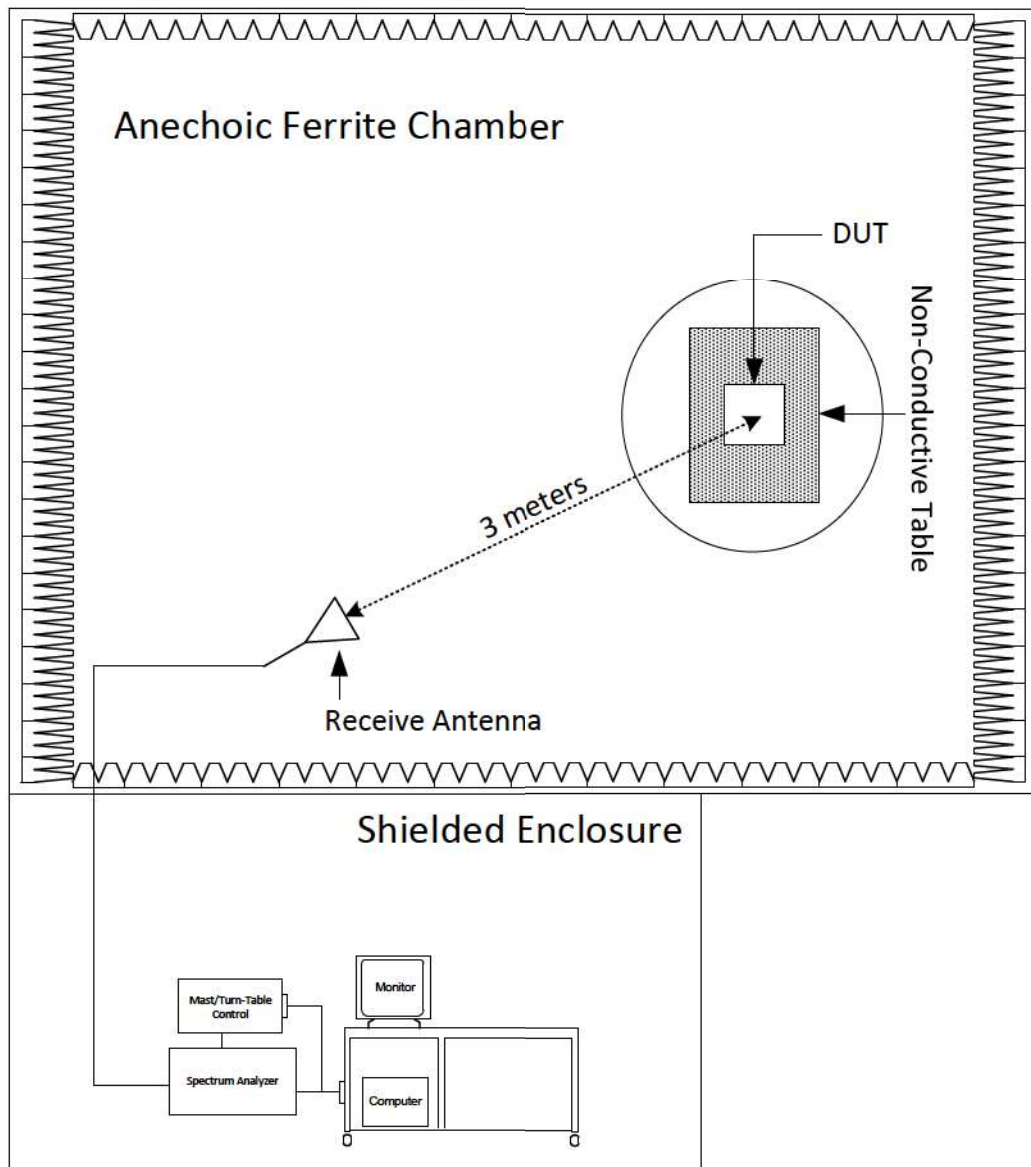
N/A: Not Applicable

I/O: Initial Only

CNR: Calibration Not Required

NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

## 19. Block Diagram of Test Setup



Radiated Measurements Test Setup

## 20. RF Conducted Emissions (AC Mains)

EUT Information	
Manufacturer	Star Microelectronic Systems
Product	LED Dimmable Light Bulb 1000 Lumens
Model No.	SMSA002
Serial No.	N/a
Mode	On, 1000 Lumens

Test Site Information	
Setup Format	Tabletop
Height of Support	N/a
Type of Test Site	Semi-Anechoic
Test Site Used	Room 21
Note	N/A

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

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

Conducted Emissions Class B Limits		
Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-Peak	Average
0.15 – 0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 – 5	56	46
5 – 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the EUT is considered to have met both requirements and measurements do not need to be performed using the Average detector.



**Procedure**

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

- 1) The EUT was operated in the On, 1000 Lumens mode.
- 2) Measurements were first made on the 120VAC 60Hz high line.
- 3) The frequency range from 150kHz to 30MHz was broken up into smaller frequency sub-bands.
- 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
- 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
- 6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

$$\text{Formula 1: VL (dB}\mu\text{V)} = \text{MTR (dB}\mu\text{V)} + \text{CF (dB)}$$

- 7) Steps (3) through (6) were repeated on the 120VAC 60Hz return line.



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)





Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)



## FCC Part 15 Subpart B Conducted Emissions Test

### Significant Emissions Data

VBR8 05/14/2020

Manufacturer : Star Microelectronics Systems  
 Model : SMSA002  
 DUT Revision :  
 Serial Number : ---  
 DUT Mode :  
 Line Tested : High  
 Scan Step Time [ms] : 30  
 Meas. Threshold [dB] : -10  
 Notes :  
 Test Engineer : N. Bouchie  
 Limit : Class B  
 Test Date : Jan 28, 2022 02:53:03 PM  
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

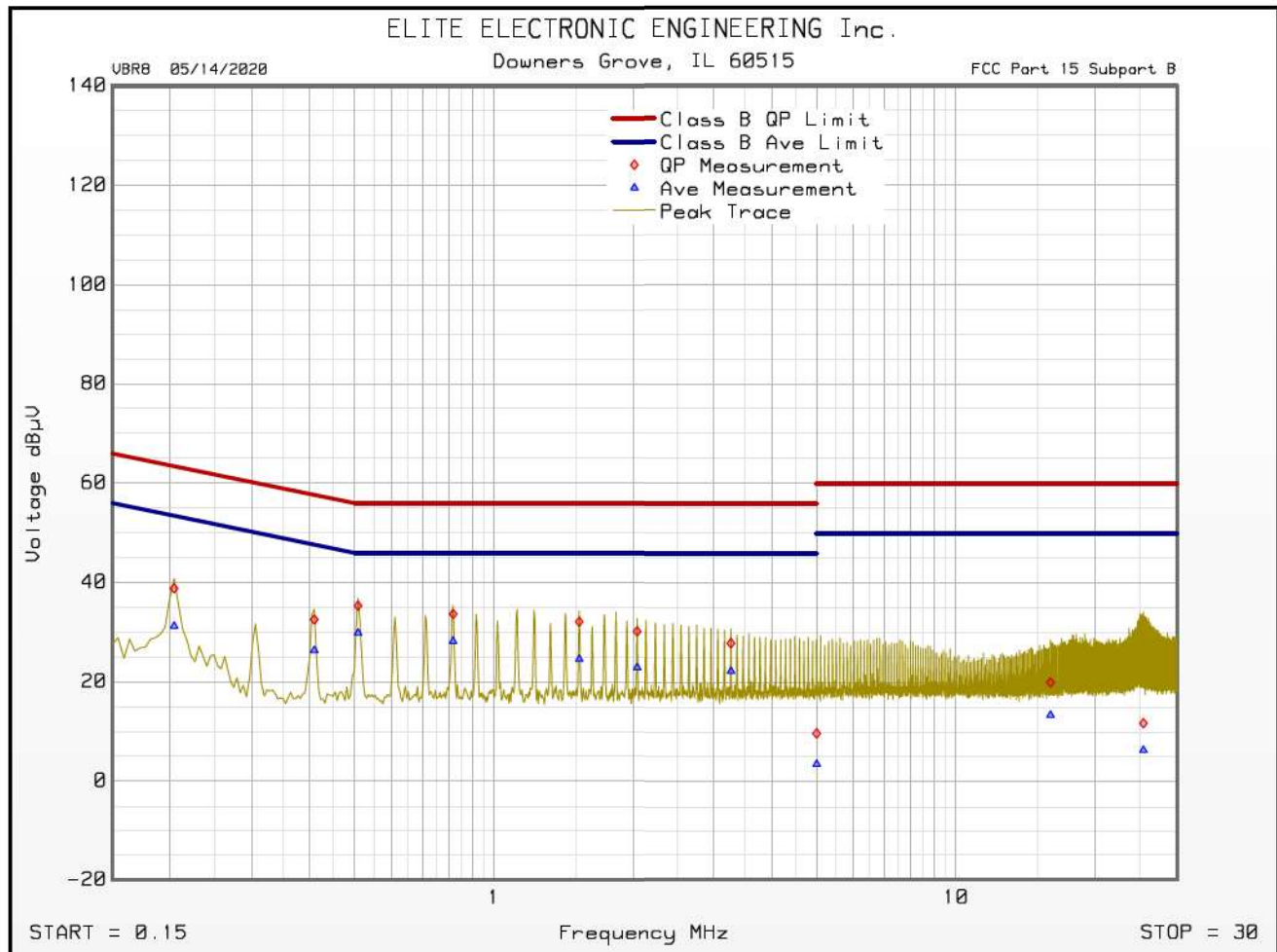
Freq MHz	Quasi-peak Level dBμV	Quasi-peak Limit dBμV	Excessive Quasi-peak Emissions	Average Level dBμV	Average Limit dBμV	Excessive Average Emissions
0.204	38.8	63.4		31.3	53.4	
0.410	32.5	57.7		26.3	47.7	
0.509	35.3	56.0		29.8	46.0	
0.817	33.7	56.0		28.2	46.0	
1.529	32.1	56.0		24.6	46.0	
2.039	30.2	56.0		22.9	46.0	
3.266	27.9	56.0		22.3	46.0	
5.000	9.7	56.0		3.5	46.0	
15.980	20.0	60.0		13.4	50.0	
25.367	11.8	60.0		6.4	50.0	

## FCC Part 15 Subpart B Conducted Emissions Test

### Cumulative Data

VBR8 05/14/2020

Manufacturer : Star Microelectronics Systems  
 Model : SMSA002  
 DUT Revision :  
 Serial Number : ---  
 DUT Mode :  
 Line Tested : High  
 Scan Step Time [ms] : 30  
 Meas. Threshold [dB] : -10  
 Notes :  
 Test Engineer : N. Bouchie  
 Limit : Class B  
 Test Date : Jan 28, 2022 02:53:03 PM



Emissions Meet QP Limit  
 Emissions Meet Ave Limit

## FCC Part 15 Subpart B Conducted Emissions Test

### Significant Emissions Data

VBR8 05/14/2020

Manufacturer : Star Microelectronics Systems  
 Model : SMSA002  
 DUT Revision :  
 Serial Number : ---  
 DUT Mode :  
 Line Tested : Neutral  
 Scan Step Time [ms] : 30  
 Meas. Threshold [dB] : -10  
 Notes :  
 Test Engineer : N. Bouchie  
 Limit : Class B  
 Test Date : Jan 28, 2022 02:45:59 PM  
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

Freq MHz	Quasi-peak Level dBμV	Quasi-peak Limit dBμV	Excessive Quasi-peak Emissions	Average Level dBμV	Average Limit dBμV	Excessive Average Emissions
0.168	20.0	65.1		8.9	55.1	
0.500	32.2	56.0		28.0	46.0	
0.500	31.9	56.0		27.9	46.0	
0.799	30.0	56.0		25.3	46.0	
1.696	28.4	56.0		20.3	46.0	
2.196	26.9	56.0		19.2	46.0	
4.292	24.3	56.0		16.0	46.0	
6.094	17.7	60.0		10.2	50.0	
16.137	22.7	60.0		18.0	50.0	
24.535	14.0	60.0		8.3	50.0	

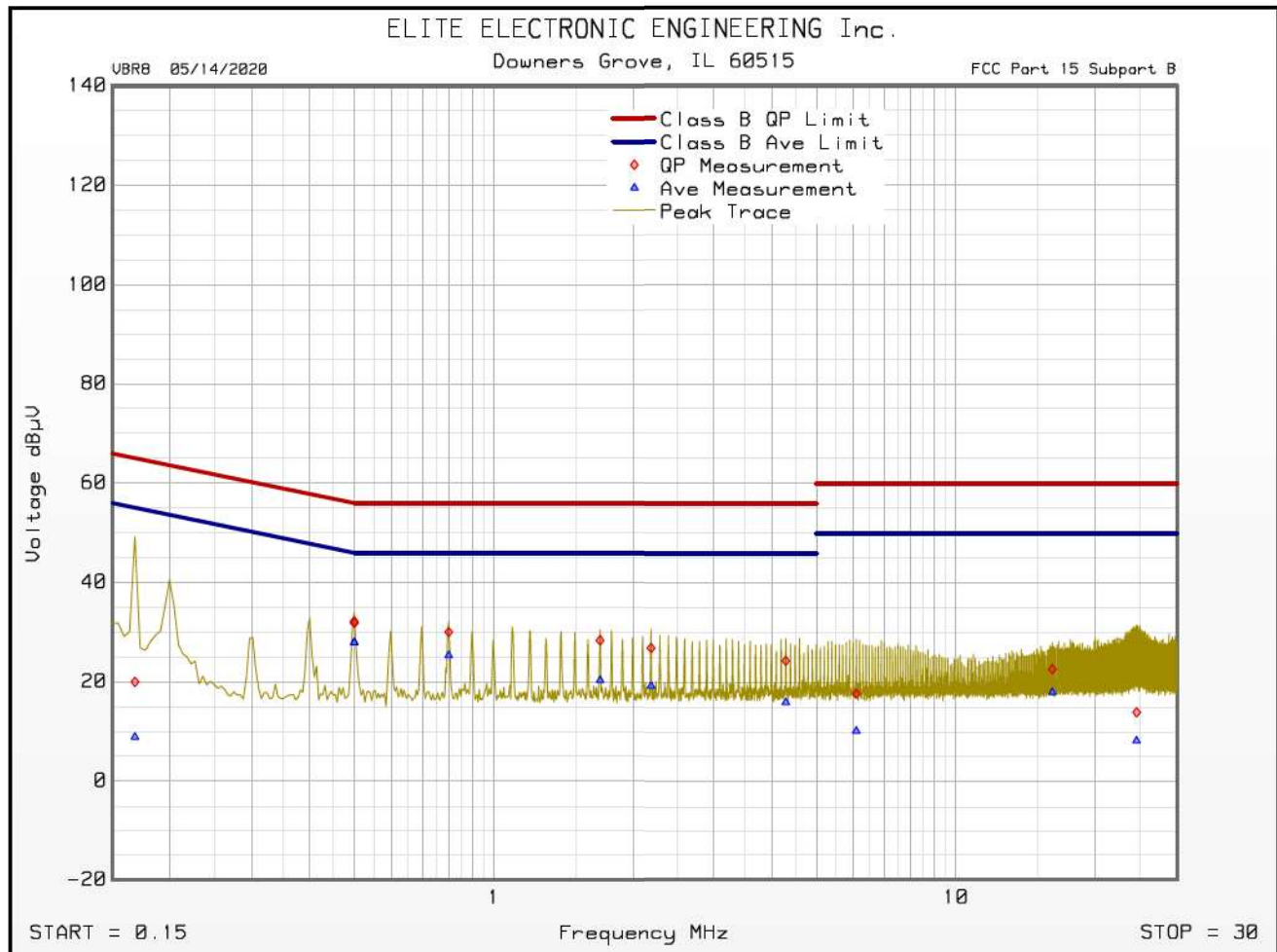


## FCC Part 15 Subpart B Conducted Emissions Test

### Cumulative Data

VBR8 05/14/2020

Manufacturer : Star Microelectronics Systems  
 Model : SMSA002  
 DUT Revision :  
 Serial Number : ---  
 DUT Mode :  
 Line Tested : Neutral  
 Scan Step Time [ms] : 30  
 Meas. Threshold [dB] : -10  
 Notes :  
 Test Engineer : N. Bouchie  
 Limit : Class B  
 Test Date : Jan 28, 2022 02:45:59 PM



Emissions Meet QP Limit  
 Emissions Meet Ave Limit

## 21. RF Radiated Emissions

EUT Information	
Manufacturer	Star Microelectronic Systems
Product	LED Dimmable Light Bulb 1000 Lumens
Model No.	SMSA002
Serial No.	N/a
Mode	On, 1000 Lumens

Test Site Information	
Setup Format	Tabletop
Height of Support	N/a
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room 21
Type of Antennas Used	Below 1GHz: Bilog (or equivalent)
Highest Internal Frequency	95kHz
Highest Measurement Frequency	1GHz
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
The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the values in the following tables.

FCC Part 15 Class B Radiated Emissions Limits (30MHz to 1GHz)		
Frequency of Emission (MHz)	Field Strength ( $\mu\text{V/m}$ )	Field Strength ( $\text{dB}\mu\text{V/m}$ )
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
Above 960	500	54
FCC Part 15 Class B Radiated Emissions Limits (Above 1GHz)		
Frequency of Emission (MHz)	Peak Limit ( $\text{dB}\mu\text{V/m}$ )	Average Limit ( $\text{dB}\mu\text{V/m}$ )
Above 1000	74	54

ICES-003 Class B Radiated Emissions Limits (30MHz to 1GHz)		
Frequency Range (MHz)	Field Strength at 3 meters ( $\text{dB}\mu\text{V/m}$ )	Field Strength at 10 meters ( $\text{dB}\mu\text{V/m}$ )
30 – 88	40	30
88 – 216	43.5	33.1
216 – 230	46	35.6
230 – 960	47	37
960 – 1000	54	43.5
ICES-003 Class B Radiated Emissions Limits (At and Above 1GHz)		
Frequency Range (GHz)	Average ( $\text{dB}\mu\text{V/m}$ )	Peak ( $\text{dB}\mu\text{V/m}$ )
1 – $F_M$	54	74
$F_M$ = highest measurement frequency		



#### Procedure

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: 30MHz to 1GHz, Horizontal Polarization



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

## FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 11/20/2021

Manufacturer : Star Microelectronic Systems  
 Model : SMSA002  
 Serial Number :  
 DUT Mode : 1000 Lumens  
 Turntable Step Angle (°): 45  
 Mast Positions (cm) : 120, 200, 340  
 Scan Type : Stepped Scan  
 Test RBW : 120 kHz  
 Prelim Dwell Time (s) : 0.0001  
 Notes :  
 Test Engineer : N. Bouchie  
 Test Date : Jan 28, 2022 11:55:54 AM

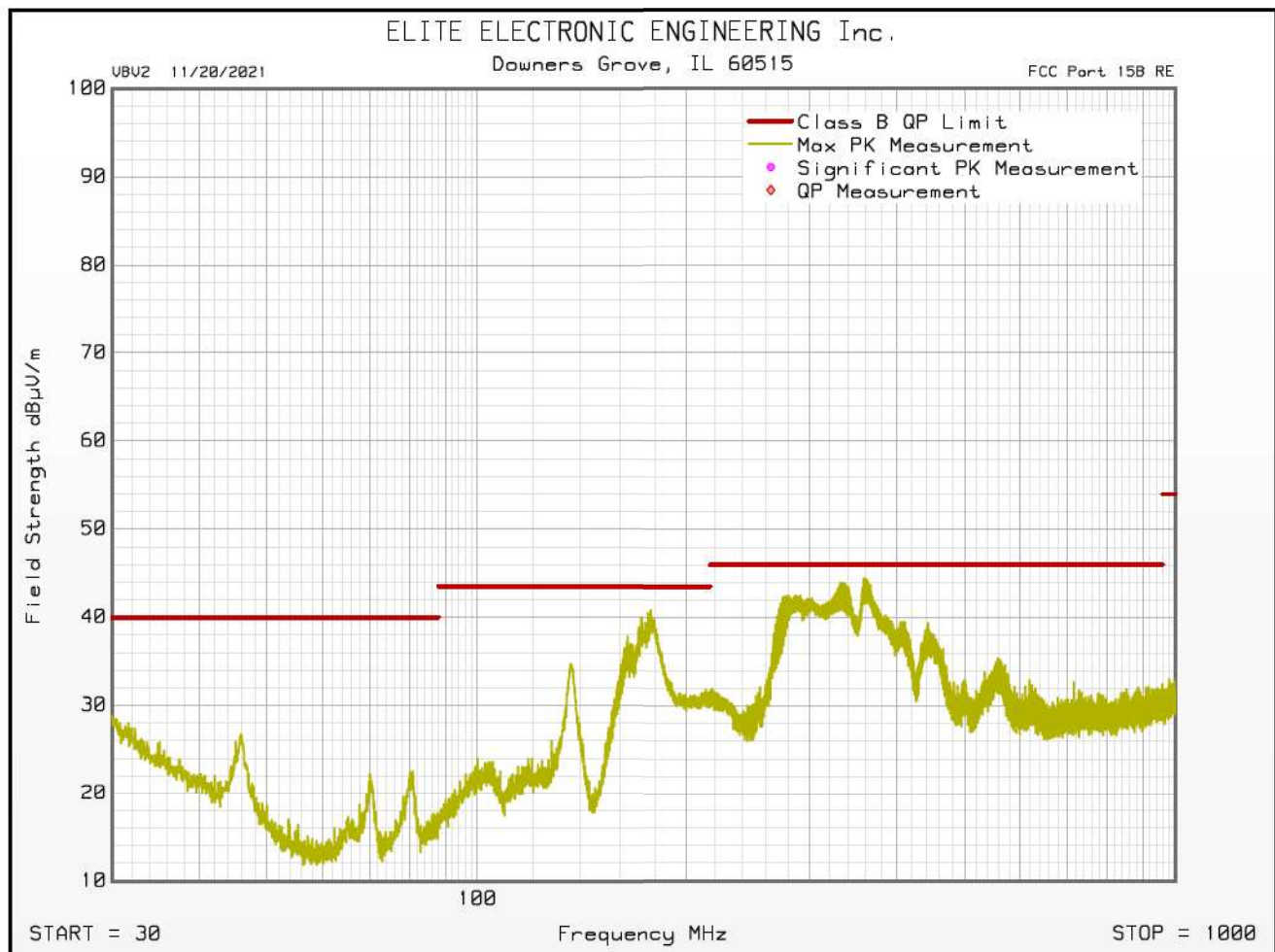
Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBuV/m	QP Total dBuV/m	QP Limit dBuV/m	QP Lim Mrq dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
45.840	25.3	16.7	16.7	0.0	0.5	0.0	42.5	33.9	40.0	-6.1	Vertical	120	180	
70.380	21.5	19.6	12.6	0.0	0.5	0.0	34.6	32.8	40.0	-7.2	Vertical	200	315	
79.980	17.6	13.4	13.3	0.0	0.5	0.0	31.4	27.2	40.0	-12.8	Vertical	120	180	
104.800	17.2	5.0	17.3	0.0	0.5	0.0	35.0	22.8	43.5	-20.7	Vertical	120	0	
135.820	19.3	17.2	17.5	0.0	0.7	0.0	37.5	35.4	43.5	-8.1	Vertical	340	315	
164.740	28.0	18.2	16.8	0.0	0.9	0.0	45.6	35.9	43.5	-7.7	Vertical	120	0	
275.580	31.0	24.9	18.5	0.0	1.0	0.0	50.5	44.4	46.0	-1.6	Vertical	120	270	
336.900	29.2	18.0	19.8	0.0	1.2	0.0	50.2	39.0	46.0	-7.0	Vertical	120	180	
396.180	27.3	12.9	21.8	0.0	1.5	0.0	50.5	36.2	46.0	-9.8	Vertical	120	180	
489.600	16.6	10.3	23.9	0.0	1.5	0.0	42.0	35.7	46.0	-10.3	Vertical	120	0	
599.700	10.6	-0.3	24.7	0.0	1.5	0.0	36.8	25.9	46.0	-20.1	Vertical	120	0	
671.460	24.0	-5.2	24.8	0.0	1.7	0.0	50.5	21.3	46.0	-24.7	Vertical	340	45	
685.020	11.7	-6.7	24.9	0.0	1.7	0.0	38.3	19.9	46.0	-26.1	Vertical	340	45	



## FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 11/20/2021

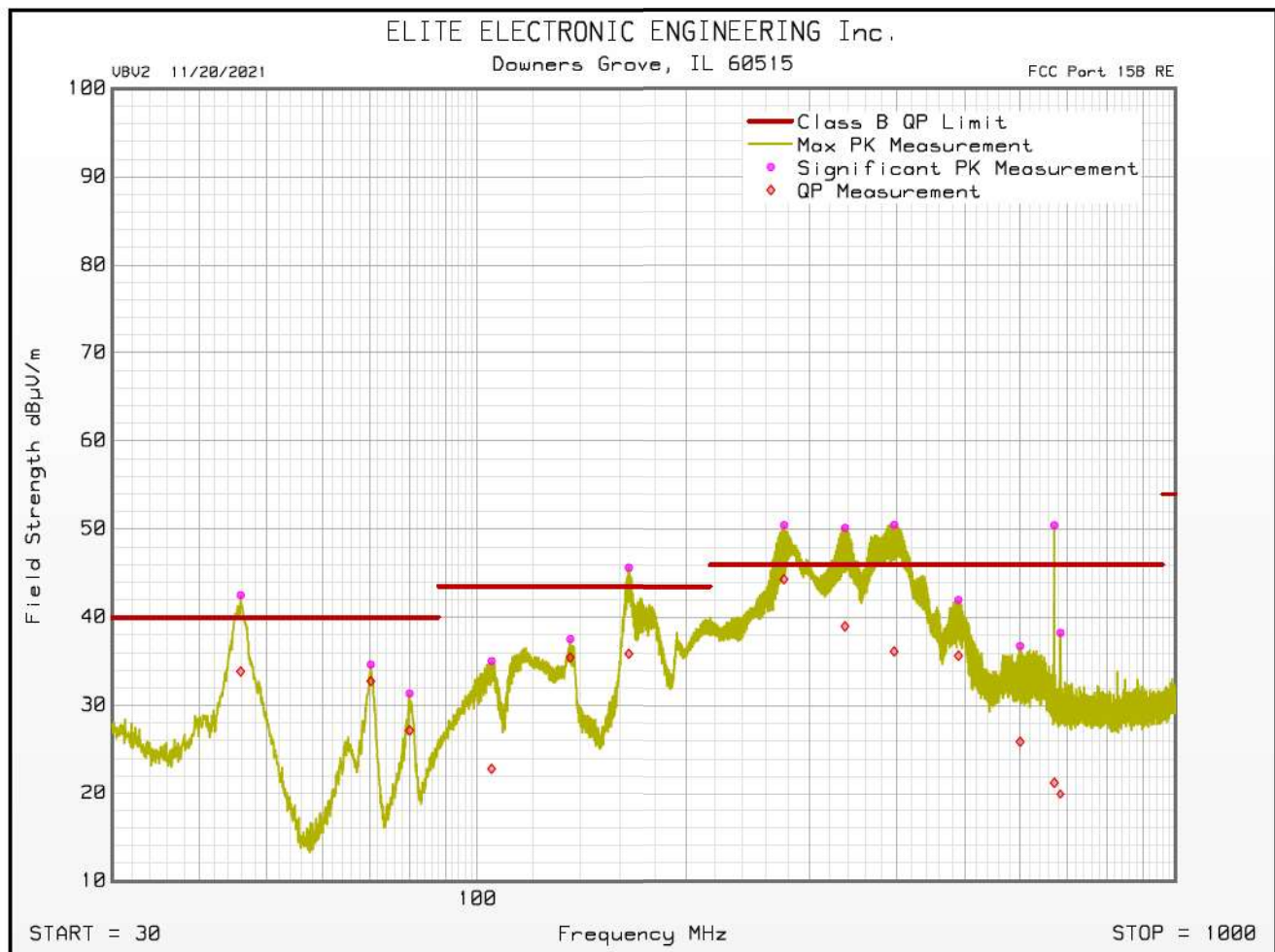
Manufacturer : Star Microelectronic Systems  
 Model : SMSA002  
 Serial Number :  
 DUT Mode : 1000 Lumens  
 Turntable Step Angle (°): 45  
 Mast Positions (cm) : 120, 200, 340  
 Antenna Polarization : Horizontal  
 Scan Type : Stepped Scan  
 Test RBW : 120 kHz  
 Prelim Dwell Time (s) : 0.0001  
 Notes :  
 Test Engineer : N. Bouchie  
 Test Date : Jan 28, 2022 11:55:54 AM



## FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 11/20/2021

Manufacturer : Star Microelectronic Systems  
 Model : SMSA002  
 Serial Number :  
 DUT Mode : 1000 Lumens  
 Turntable Step Angle (°): 45  
 Mast Positions (cm) : 120, 200, 340  
 Antenna Polarization : Vertical  
 Scan Type : Stepped Scan  
 Test RBW : 120 kHz  
 Prelim Dwell Time (s) : 0.0001  
 Notes :  
 Test Engineer : N. Bouchie  
 Test Date : Jan 28, 2022 11:55:54 AM



## 22. Scope of Accreditation



### SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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Valid To: June 30, 2023

ELECTRICAL

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) <sup>1</sup>:

##### *Transient Immunity*

ISO 7637-2 (including emissions); ISO 7637-3;  
ISO 16750-2:2012, Sections 4.6.3 and 4.6.4;  
CS-11979, Section 6.4; CS.00054, Section 5.9;  
EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222);  
GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12;  
ECE Regulation 10.06 Annex 10

##### *Electrostatic Discharge (ESD)*

ISO 10605 (2001, 2008);  
CS-11979 Section 7.0; CS.00054, Section 5.10;  
EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13;  
GMW 3097 Section 3.6

##### *Conducted Emissions*

CISPR 25 (2002, 2008), Sections 6.2 and 6.3;  
CISPR 25 (2016), Sections 6.3 and 6.4;  
CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2;  
GMW 3097, Section 3.3.2;  
EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)

##### *Radiated Emissions Anechoic*

CISPR 25 (2002, 2008), Section 6.4;  
CISPR 25 (2016), Section 6.5;  
CS-11979, Section 5.3; CS.00054, Section 5.6.3;  
GMW 3097, Section 3.3.1;  
EMC-CS-2009.1 (RE 310); FMC1278 (RE310);  
ECE Regulation 10.06 Annex 7 (Broadband)  
ECE Regulation 10.06 Annex 8 (Narrowband)

(A2LA Cert. No. 1786.01) Revised 06/24/2021



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



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

**Test Technology:**
**Test Method(s) <sup>1</sup>:**
**Emissions (cont'd)**

Current Harmonics

IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2;  
KS C 9610-3-2; ECE Regulation 10.06 Annex 11

Flicker and Fluctuations

IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3;  
KS C 9610-3-3; ECE Regulation 10.06 Annex 12

**Immunity**

Electrostatic Discharge

IEC 61000-4-2, Ed. 1.2 (2001);  
IEC 61000-4-2 (1995) + A1(1998) + A2(2000);  
EN 61000-4-2 (1995); EN 61000-4-2 (2009-05);  
KN 61000-4-2 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2;  
KS C 9610-4-2; IEEE C37.90.3 2001

Radiated Immunity

IEC 61000-4-3 (1995) + A1(1998) + A2(2000);  
IEC 61000-4-3, Ed. 3.0 (2006-02);  
IEC 61000-4-3, Ed. 3.2 (2010);  
KN 61000-4-3 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3;  
KS C 9610-4-3; IEEE C37.90.2 2004

Electrical Fast Transient/Burst

IEC 61000-4-4, Ed. 2.0 (2004-07);  
IEC 61000-4-4, Ed. 2.1 (2011);  
IEC 61000-4-4 (1995) + A1(2000) + A2(2001);  
KN 61000-4-4 (2008-5);  
RRL Notice No. 2008-5 (May 20, 2008);  
IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4;  
KS C 9610-4-4; ECE Regulation 10.06 Annex 15

Surge

IEC 61000-4-5 (1995) + A1(2000);  
IEC 61000-4-5, Ed 1.1 (2005-11);  
EN 61000-4-5 (1995) + A1(2001);  
KN 61000-4-5 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5;  
KS C 9610-4-5;  
IEEE C37.90.1 2012; IEEE STD C62.41.2 2002;  
ECE Regulation 10.06 Annex 16

Conducted Immunity

IEC 61000-4-6 (1996) + A1(2000);  
IEC 61000-4-6, Ed 2.0 (2006-05);  
IEC 61000-4-6 Ed. 3.0 (2008);  
KN 61000-4-6 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6;  
EN 61000-4-6; KN 61000-4-6; KS C 9610-4-6

**Test Technology:**
**Test Method(s) <sup>1</sup>:**
**Immunity (cont'd)**

Power Frequency Magnetic Field  
Immunity (*Down to 3 A/m*)

IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009);  
EN 61000-4-8 (1994) + A1(2000);  
KN 61000-4-8 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-8, EN 61000-4-8, KN 61000-4-8, KS C 9610-4-8

Voltage Dips, Short Interrupts, and Line  
Voltage Variations

IEC 61000-4-11, Ed. 2 (2004-03);  
KN 61000-4-11 (2008-5);  
RRL Notice No. 2008-4 (May 20, 2008);  
IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11;  
KS C 9610-4-11

Ring Wave

IEC 61000-4-12, Ed. 2 (2006-09);  
EN 61000-4-12:2006;  
IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12;  
IEEE STD C62.41.2 2002

Generic and Product Specific EMC  
Standards

IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1;  
KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2;  
KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3;  
AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3;  
IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4;  
KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2;  
EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3;  
EN 55015; EN 60730-1; EN 60945; IEC 60533;  
EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2;  
AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2;  
IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24;  
IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35;  
KS C 9835; IEC 60601-1-2; JIS T0601-1-2

***TxRx EMC Requirements***

EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17;  
EN 301 489-19; EN 301 489-20

***European Radio Test Standards***

ETSI EN 300 086-1; ETSI EN 300 086-2;  
ETSI EN 300 113-1; ETSI EN 300 113-2;  
ETSI EN 300 220-1; ETSI EN 300 220-2;  
ETSI EN 300 220-3-1; ETSI EN 300 220-3-2;  
ETSI EN 300 330-1; ETSI EN 300 330-2;  
ETSI EN 300 440-1; ETSI EN 300 440-2;  
ETSI EN 300 422-1; ETSI EN 300 422-2;  
ETSI EN 300 328; ETSI EN 301 893;  
ETSI EN 301 511; ETSI EN 301 908-1;  
ETSI EN 908-2; ETSI EN 908-13;  
ETSI EN 303 413; ETSI EN 302 502;  
EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4



<u>Test Technology:</u>	<u>Test Method(s) <sup>1</sup>:</u>
<i>Canadian Radio Tests</i>	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
<i>Mexico Radio Tests</i>	IFT-008-2015; NOM-208-SCFI-2016
<i>Japan Radio Tests</i>	Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18
<i>Taiwan Radio Tests</i>	LP-0002 (July 15, 2020)
<i>Australia/New Zealand Radio Tests</i>	AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)
<i>Hong Kong Radio Tests</i>	HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073
<i>Korean Radio Test Standards</i>	KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52; KS X 3124; KS X 3125; KS X 3130; KS X 3126; KS X 3129
<i>Vietnam Radio Test Standards</i>	QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT; QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT; QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT; QCVN 112:2017/BTTTT; QCVN 117:2020/BTTTT
<i>Vietnam EMC Test Standards</i>	QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT; QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT
<i>Unlicensed Radio Frequency Devices (3 Meter Semi-Anechoic Room)</i>	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))
<i>Licensed Radio Service Equipment</i>	47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E, ANSI C63.26:2015)

**Test Technology:**

***OIA (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

**Test Method(s) <sup>1</sup>:**

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

***Electrical Measurements and Simulation***
**AC Voltage / Current**

(1mV to 5kV) 60 Hz  
(0.1V to 250V) up to 500 MHz  
(1μA to 150A) 60 Hz

FAA AC 150/5345-10H  
FAA AC 150/5345-43J  
FAA AC 150/5345-44K

**DC Voltage / Current**

(1mV to 15-kV) / (1μA to 10A)

FAA AC 150/5345-46E

**Power Factor / Efficiency / Crest Factor**

(Power to 30kW)

FAA AC 150/5345-47C

FAA EB 67D

**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

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

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

**Rule Subpart/Technology**
**Test Method**
**Maximum  
Frequency  
(MHz)**

Unintentional Radiators  
Part 15B

ANSI C63.4:2014

40000

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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<sup>2</sup>

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



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

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

<sup>2</sup> 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 19<sup>th</sup> day of May 2021.



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

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