

Electromagnetic Emission FCC MEASUREMENT REPORT

PRODUCT : Smoke Detector
MODEL/TYPE NO. : SSD-100
FCC ID : 2AN5B-SSD-100
TRADE NAME : **SEMES**
SEMES
APPLICANT : 77, 4sandan 5-gil, Jiksan-eup, Seobuk-gu, Cheonan-si, Chungcheongnam-do, Republic of Korea
FCC CLASSIFICATION : Class A Digital Device
FCC RULE PART(S) : FCC Part 15 Subpart B
FCC PROCEDURE : Certification
DATES OF TEST : June 29, 2022
DATES OF ISSUE : July 20, 2022
TEST REPORT No. : BWS-22-EF-0012-R1
TEST LAB. : BWS TECH Inc. (Designation Number : KR0017)

This Smoke Detector(SSD-100) has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic emission limits specified in FCC Rule Part15 Subpart B Section15.107 and 15.109. I attest to the accuracy of data. All measurement herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by:



Seul Gi, Kim / EMC Engineer
BWS TECH INC.

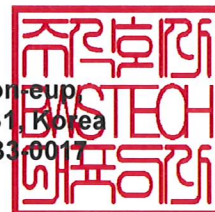
Reviewed by:



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*This test report is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.

*The authenticity of this test report can be confirmed in the Android app "DOCUQR" or www.docuqr.com

TABLE OF CONTENTS

Description of Version	3
1. General Information.....	4
2. Description of Test Facility	5
3. Product Information	6
4. Description of Tests	7
5. Test Condition	9
6. Test Results	12
7. Test Equipment List	15

Description of Version

Edition No.	Data of Revision	Revision Summary	Report No.
0	July 06, 2022	Original Report	BWS-22-EF-0012
1	July 20, 2022	Change of standard test contents	BWS-22-EF-0012-R1

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FCC TEST REPORT

Scope – Measurement and determination of electromagnetic emission (EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission (FCC)

1. General Information

1.1 Applicant Information

Company Name : SEMES
Company Address : 77, 4sandan 5-gil, Jiksan-eup, Seobuk-gu, Cheonan-si,
Chungcheongnam-do, Republic of Korea
Tel / Fax : Tel No. : 82-41-620-0437 Fax No. : 82-41-620-5099

1.2 Manufacturer Information

Company Name : IGS Co., Ltd.
Company Address : B307, B308, 67, Sabitgongwon-ro, Gwangmyeong-si, Gyeonggi-do
(Iljik-dong, Gwangmyeong Station Zai Tower)
Tel / Fax : Tel No. : 02-6299-7356 Fax No. : 02-6299-7538

- **EUT Type** : Smoke Detector
- **Model Number** : SSD-100
- **Test Voltage** : DC 24 V
- **Program Version** : Hardware 1.0 Version / Software : R10V1 Version
- **FCC Rule Part(s)** : FCC Part 15 Subpart B
- **Test Procedure** : ANSI C63.4-2014
- **Dates of Tests** : June 29, 2022
- **Place of Tests** : BWS TECH Inc.
EMC Testing Lab (NRRRA Designation Number : KR0017)
23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si,
Gyeonggi-do 17031, Korea
TEL: +82 31 333 5997 FAX: +82 31 333 0017
- **Test Report No.** : BWS-22-EF-0012-R1

2. Description of Test Facility

The measurement for radiated emission test were practiced at the 10 m Semi-Anechoic Chamber of BWS TECH Inc. Measurement for conducted emission test were practiced at the EMC shielded room of BWS TECH Inc. facility located at **23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, Korea.**

The site is constructed in conformance with the requirements of the ANSI C63.4-2014 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2014 and registered to the Federal Communications Commission.

Accredited by RRA(National Radio Research Agency), Jul 18,2017 (The Designation Number is KR0017).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014) was used in determining radiated and conducted emissions from the Smoke Detector(Model: SSD-100) of SEMES

3. Product Information

3.1 Variations covered by this report

- N/A

3.2 Additional Information Related to Testing

Test results apply only to the particular sample tested and functionality described in this test report. This report may be reproduced in full. Partial reproduction may only be made with the written permission of the BWS TECH Inc.

3.3 Derived Models

- N/A

4. Description of Tests

4.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The Frequency range from 150 kHz to 30 MHz was searched.

4.1.1 Conducted Limits [§15.107 (a)_CLASS B]

Frequency of emission (MHz)	Resolution Bandwidth (kHz)	Conducted limit (dB μ V)	
		Quasi-Peak	Average
0.15 to 0.5	9	66 to 56*	56 to 46*
0.5 to 5	9	56	46
5 to 30	9	60	50

4.1.2 Conducted Limits [§15.107 (b)_CLASS A]

Frequency of emission (MHz)	Resolution Bandwidth (kHz)	Conducted limit (dB μ V)	
		Quasi-Peak	Average
0.15 to 0.5	9	79	66
0.5 to 30	9	73	60

* Decreases with the logarithm of the frequency.

4.2 §15.109 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi anechoic chamber. The Table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m or 10 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied form 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented fir maximum response. (1 GHz to 40 GHz)

4.2.1 Radiated Emission Limits [§15.109 (a)_CLASS B]

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}\mu\text{V/m}$)
30 to 88	3	100	40.00
88 to 216	3	150	43.52
216 to 960	3	200	46.02
Above 960	3	500	53.98
Frequency of emission (MHz)	Antenna Distance (m)	Peak ($\text{dB}\mu\text{V/m}$)	Average ($\text{dB}\mu\text{V/m}$)
Above 1000	3	74	54

4.2.2 Radiated Emission Limits [§15.109 (b)_CLASS A]

The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}\mu\text{V/m}$)
30 to 88	10	90	39.08
88 to 216	10	150	43.52
216 to 960	10	210	46.44
Above 960	10	300	49.54
Frequency of emission (MHz)	Antenna Distance (m)	Peak ($\text{dB}\mu\text{V/m}$)	Average ($\text{dB}\mu\text{V/m}$)
Above 1000	3	80	60

4.2.3 Frequency Range of Radiated Measurements [§15.33]

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)	Test frequency marking
Below 1.705	30	<input type="checkbox"/>
1.705 to 108	1 000	<input checked="" type="checkbox"/>
108 to 500	2 000	<input type="checkbox"/>
500 to 1 000	5 000	<input type="checkbox"/>
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower	<input type="checkbox"/>

* EUT is maximum internal clock frequency 8MHz. (8 MHz Crystal (NC))

5. Test Condition

5.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipment were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

Radiated Emission Test

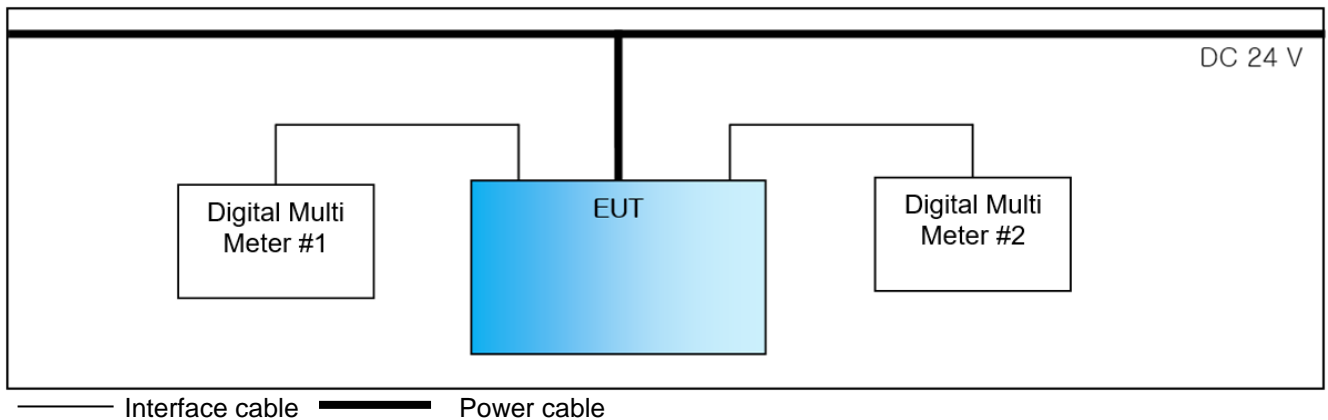
Preliminary radiated emission tests were conducted using the procedure in ANSI C63.4/2014 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were conducted at 10 m Semi-Anechoic Chamber.

5.2 EUT operation

EUT was tested according to the following operation modes provided by the specifications given by the manufacturer

Operation Modes	The environment(s) in which the equipment is intended to be used.
Smoke Detection	<p>As per manufacturer's request After arranging the equipment under test as shown in the layout diagram. Tester was Check to smoke detection mode standby status by tested.</p> <ul style="list-style-type: none"> - EUT has supply with DC 24 V power by connecting DC distribution network to the DC IN port. - EUT connects a Digital Multi Meter #1 to the relay port and checks the connection status of the B-contact relay through a Beep alarm sound. - EUT connects a Digital Multimeter #2 to the temperature sensor port and checks the internal resistor value. <p>- Program Version (Hardware : 1.0 Version / Software : R10V1 Version)</p>

5.3 Test System layout on EUT and peripherals



5.4 System configuration

Description	Model Name	Serial No.	Manufacturer	Remarks
-	-	-	-	-

5.5 Peripherals / Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

5.5.1 Type of Peripheral Equipment Used

Description	Model Name	Serial No. (Authentication number)	Manufacturer	Remarks
Digital Multi Meter #1	101	N/A	Fluke	Peripheral
Digital Multi Meter #2	101	N/A	Fluke	Peripheral

5.5.2 Type of Cables Used

Device from	I/O Port	Device to	I/O Port	Length(m)	Type of Shield
EUT	DC IN	DC POWER	DC OUT	1.5	Unshielded
	Relay (2 PIN)	Digital Multi Meter #1	V/COM	3.0	Unshielded
	temperature Sensor (2 PIN)	Digital Multi Meter #2	V/COM	3.0	Unshielded

6. Test Results

6.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and photos showing the maximum emission of the EUT are reported.

Standard	Clause	Test description	Result
FCC Part 15, Subpart B	15.107	Conducted Emissions limits (AC mains)	N/A #Note ¹⁾
FCC Part 15, Subpart B	15.109	Radiated Emissions limits (Below 1 GHz)	Passed by – 13.93 dB
FCC Part 15, Subpart B	15.109	Radiated Emissions limits (Above 1 GHz)	N/A #Note ²⁾

#Note

- 1) Excluded from the test because DC power is used.
- 2) Tests above 1 GHz were excluded because the maximum frequency of the equipment was 8 MHz (8 MHz Crystal (NC))

The data collected shows that the Smoke Detector (Model: SSD-100) of SEMES complies with technical requirements of the Part 15.109 of the FCC Rules.

6.2 Radiated Emissions

The Test results of radiated emission provide the following information:

Rule Part / Standard	:	15.109 (b)
Detector	:	Quasi-Peak
Bandwidth	:	120 kHz (6 dB)
Operation Mode	:	Smoke Detection (See page 10 for details.)
Kind of Test Site	:	10 m chamber
Measurement Distance	:	10 meters
Temperature	:	+22 °C
Relative Humidity	:	50 %
Test Date	:	June 29, 2022

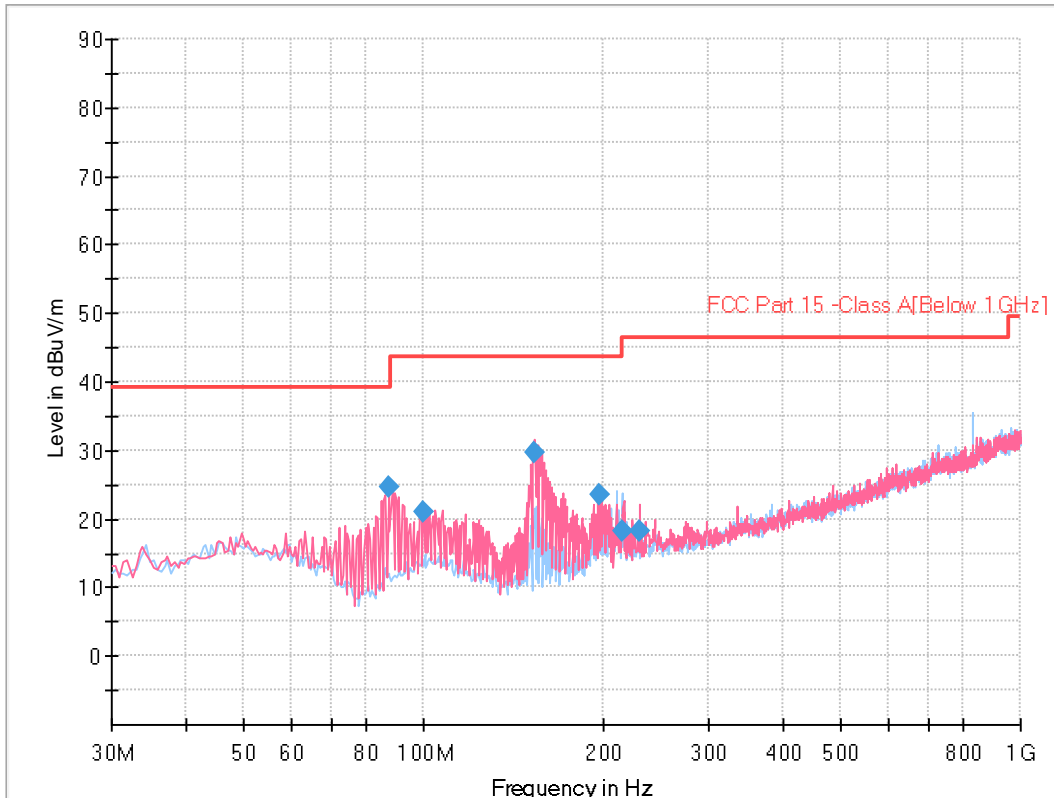
✳ **Calculation Formula:**

1. POL. H: Horizontal, POL. V: Vertical
2. Quasi Peak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss – Amplifier Gain
4. Margin = Limit – Quasi Peak

Radiated Emission Test Data Below 1 GHz

Common Information

Order Number: BWS-22-TA-0419
 Test Engineer: KIM_SEUL_GI
 Test Mode: Smoke Detection
 Test Date: 2022-06-29



Final Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
87.505000	24.58	39.08	14.50	15000.0	120.000	125.0	V	6.0	-23.6
100.140000	21.10	43.52	22.42	15000.0	120.000	125.0	V	20.0	-21.1
153.735000	29.59	43.52	13.93	15000.0	120.000	125.0	V	0.0	-24.0
197.625000	23.66	43.52	19.86	15000.0	120.000	105.0	V	309.0	-20.0
215.085000	18.28	43.52	25.24	15000.0	120.000	398.0	H	242.0	-20.7
229.920000	18.28	46.44	28.16	15000.0	120.000	119.0	V	54.0	-19.6

7. Test Equipment List

The listing below denotes the test equipment utilized for the test(s).

Equipment Type	Model	Manufacturer	Serial No	Cal Due Date	Use
EMI Test Receiver	ESR	ROHDE & SCHWARZ	101450	2023-01-17	<input checked="" type="checkbox"/>
TRILOG Broadband Antenna	VULB9163	SCHWARZBECK	01063	2022-11-25	<input checked="" type="checkbox"/>
RF Amplifier	MPA-10-40	RF Bay, Inc.	21163921	2023-01-18	<input checked="" type="checkbox"/>
Maturo control unit	459	maturo GmbH	17240915	N/A	<input checked="" type="checkbox"/>
Antenna Mast (4.0 m)	225	maturo GmbH	17240915	N/A	<input checked="" type="checkbox"/>
Software	EMC 32	ROHDE & SCHWARZ	10.20.01 Version	N/A	<input checked="" type="checkbox"/>

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