

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-202-RWD-028
AGR No. : A202A-006
Applicant : AMOSENSE
Address : 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea
Manufacturer : AMOSENSE
Address : 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea
Type of Equipment : ATOZ
FCC ID. : 2AS9T-SB52SW2
Model Name : SB52-SW
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 9 pages (including this page)
Date of Incoming : February 03, 2020
Date of issue : February 13, 2020

SUMMARY

The equipment complies with the regulation; ***FCC CFR 47 PART 15 SUBPART C Section 15.225 and FCC PART 15 SUBPART C Section 15.247***

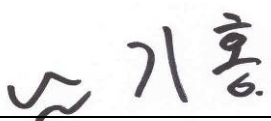
This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:


 Tae-Ho, Kim / Senior Manager
 ONETECH Corp.

Approved by:


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 ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	4
2. GENERAL INFORMATION.....	5
2.1 PRODUCT DESCRIPTION.....	5
2.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	6
3. EUT MODIFICATIONS.....	6
4. MAXIMUM PERMISSIBLE EXPOSURE.....	7
4.1 APPLICABLE STANDARD	7
4.2 TEST RESULT FOR BLUETOOTH LE	8
4.3 TEST RESULT FOR WLAN 2.4 GHz.....	9

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-202-RWD-028	February 13, 2020	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : AMOSENSE
 Address : 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea
 Manufacturer : AMOSENSE
 Address : 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea
 Factory : AMO VINA CO.,LTD
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 Telephone No. : +82-010-4948-5676
 FCC ID : 2AS9T-SB52SW2
 Model Name : SB52-SW
 Brand Name : -
 Serial Number : N/A
 Date : February 13, 2020

EQUIPMENT CLASS	DXX – Low Power Communication Device Transmitter DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	ATOZ
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.225 FCC PART 15 SUBPART C Section 15.247 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The AMOSENSE, Model SB52-SW (referred to as the EUT in this report) is an ATOZ, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	ATOZ	
Temperature Range	-20 °C ~ 60 °C	
OPERATING FREQUENCY	NFC	13.56 MHz
	Sig Fox	902.137 5 MHz ~ 904.662 5 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
MODULATION TYPE	NFC	ASK
	Sig Fox	DBPSK
	Bluetooth LE	GFSK
	WLAN 2.4 GHz	802.11b: DSSS Modulation (DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation (BPSK/QPSK/16QAM/64QAM)
RF OUTPUT POWER'	NFC	39.11 dBμV/m at 3 m
	Sig Fox	21.59 dBm
	Bluetooth LE	-1.37 dBm
	WLAN 2.4 GHz	-1.17 dBm(802.11b) -3.02 dBm(802.11g) -3.25 dBm(802.11n_HT20)
ANTENNA TYPE	NFC: FPCB Antenna Sig Fox: Chip Antenna Bluetooth LE: Chip Antenna WLAN 2.4 GHz: Chip Antenna	
ANTENNA GAIN	Sig Fox: 1.66 dBi Bluetooth LE / WLAN 2.4 GHz: 2.36 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 MHz, 32 MHz, 50 MHz	

2.2 Alternative type(s)/model(s); also covered by this test report.

-, None

3. EUT MODIFICATIONS

-, None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Portable device with its physical nature to be used nearby, the distance between radiating structure and human is less than 20 cm.

As per KDB 447498 D01, The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{Max. Power of channel, including tune-up tolerance, mW}) / (\text{Min. test separation distance, mm})] \times [\sqrt{f(\text{GHz})}]$
 < 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

F(GHz) is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation

The result is rounded to one decimal place for comparison.

Kind of EUT	ATOZ
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ☒ Others
Exposure Evaluation Applied	☒ MPE ☐ SAR ☐ N/A


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4.2 Test Result for Bluetooth LE

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	Bluetooth LE	-1.5 ± 0.5	-1.00	0.79	2.36	1.72	0.33	0.000 3	1.00

According to above table, for 2 402 MHz ~ 2 480 MHz Band, safe distance,

$$D = 0.282 * \sqrt{(0.79 * 1.72) / 1.00} = 0.33 \text{ cm}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 0.79 * 1.72 / (4 * 3.14 * 20^2) = 0.000 3$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna



Tested by: Hyung-Kwon, Oh / Manager

4.3 Test Result for WLAN 2.4 GHz

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
2 400 ~ 2 483.5	802.11b	-1.5 ± 1.0	-0.50	0.89	2.36	1.72	0.35	0.000 3	1.00
	802.11g	-3.5 ± 1.0	-2.50	0.56			0.28	0.000 2	
	802.11n_ HT20	-3.5 ± 1.0	-2.50	0.56			0.28	0.000 2	

According to above table, for 2 400 ~ 2 483.5 MHz Band(802.11b), safe distance,

$$D = 0.282 * \sqrt{(0.89 * 1.72)/1.00} = 0.35 \text{ cm}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 0.89 * 1.72 / (4 * 3.14 * 20^2) = 0.000 3$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna



Tested by: Hyung-Kwon, Oh / Manager