

EN 62311 Report

Report No.: MECDBM-WTW-P22060902

Test Model: MGM240S22A

Series Model: BGM240S22A (refer to item 3.1 for more details)

Received Date: Jul. 06, 2022

Test Date: Jul. 13, 2022 ~ Aug. 01, 2022

Issued Date: Oct. 04, 2022

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Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 General Information	5
2.1 General Description of EUT	5
2.2 Measurement Uncertainty	7
3 RF Exposure Measurement.....	7
3.1 Introduction.....	7
3.2 Limits	7
3.3 Normative Reference Classification of The Assessment Methods	8
3.4 Test Results.....	9

Release Control Record

Issue No.	Description	Date Issued
MECDBM-WTW-P22060902	Original Release	Oct. 04, 2022

1 Certificate of Conformity

Product: Bluetooth Low Energy and 802.15.4 wireless radio module
Brand: SILICON LABS
Test Model: MGM240S22A
Series Model: BGM240S22A (refer to item 3.1 for more details)
Sample Status: Engineering sample fully representing the production models
Applicant: Silicon Laboratories Finland Oy
Test Date: Jul. 13, 2022 ~ Aug. 01, 2022
Standards: EN IEC 62311:2020

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Lena Wang , **Date:** Oct. 04, 2022
Lena Wang / Specialist

Approved by : Jeremy Lin , **Date:** Oct. 04, 2022
Jeremy Lin / Project Engineer

2 General Information

2.1 General Description of EUT

Product	Bluetooth Low Energy and 802.15.4 wireless radio module	
Brand	SILICON LABS	
Test Model	MGM240S22A	
Series Model	BGM240S22A	
Model Difference	Refer to note	
Status of EUT	Engineering sample fully representing the production models	
Power Supply Rating	1.8Vdc to 3.8Vdc (from host equipment)	
Typical Nominal Supply Voltage	3.0Vdc	
Normal Testing Voltage	3.3Vdc	
Temperature Operating Range	-40~105℃	
Modulation Type	Bluetooth LE	GFSK
	802.15.4	O-QPSK
Transfer Rate	Bluetooth LE	1MBaud with 1Mbps transfer rate 1MBaud with coded 125Kbps transfer rate 1MBaud with coded 500Kbps transfer rate 2MBaud with 2Mbps transfer rate
	802.15.4	250kbps
Operating Frequency	Bluetooth LE	2402 ~ 2480MHz
	802.15.4	2405 ~ 2480MHz
Number of Channel	Bluetooth LE	40
	802.15.4	16
EIRP Power (Measured Max. Average)	Bluetooth LE	Mode A : 11.03dBm Mode B : 11.04dBm
	802.15.4	Mode A : 11.94dBm Mode B : 11.96dBm
Antenna Type	Bluetooth LE	Refer to note
	802.15.4	
Antenna Connector	Refer to note	
Accessory Device	NA	
Data Cable Supplied	NA	

Note:

1. All models are listed as below. Model MGM240S22A is the representative for final test.

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Product Spec.	Model			
	Main Model: MGM240S22A		Series Model: BGM240S22A	
	Power rating: Low-Power Wireless protocols: BLE and 802.15.4		Power rating: Low-Power Wireless protocols: BLE	
Test mode	To be tested as DTS for both 802.15.4 and BLE In the case of BLE, three PHYs to test: 2Mbps , 1Mbps and 125Kbps		Testing of the Main Model will cover this Series Model / In fact, the hardware and software are exactly the same, except for one single software-related difference: the 802.15.4 protocol is disabled in the factory for marketing differentiation	
RF nominal max TX output power	10dBm			
Antenna type	Integral antenna	RF pin	Integral antenna	RF pin
Hardware	<p>Hardware-wise, the main model and the first series model are identical. Supply voltage range: 1V8 to 3V8 (nominal 3V0) / Fully internally regulated, including the RF PA. Temperature range: -40C to +105C.</p> <p>The BLE wireless protocol is identical in all the models. The 802.15.4 wireless protocol is made available only for the main model.</p> <p>The module's RF OUT pin exposes the 50Ω-matched RF port of the embedded radio chipset. Conducted measurements are taken at the module's RF OUT pin.</p> <p>The RF OUT pin can be further connected either to the adjacent RF ANT IN pin (using a 0Ω resistor), so that the integral antenna can be used, or directly to an external antenna. All radiated tests are taken both with a sample using the integral antenna, and with a sample where the RF signal from the RF OUT pin is routed instead to an external reference dipole antenna.</p>			

2. The antenna information is listed as below.

No.	Type	Connector	Gain (dBi)	Remark
1	Integral antenna	NA	1.48	For model: MGM240S22A, BGM240S22A
2	External reference dipole antenna**	RP-SMA	2.80	For model: MGM240S22A, BGM240S22A

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

** The dipole antenna is not sold with the EUT, but is used during testing as a reference antenna for radiated measurements of the parts making use of the RF pin.

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Parameter	Uncertainty
RF output power, conducted (EN 300 328)	$\pm 1.371\text{dB}$

3 RF Exposure Measurement

3.1 Introduction

This International Standard applies to electronic and electrical equipment for which no dedicated product- or product family standard regarding human exposure to electromagnetic fields applies.

The frequency range covered is 0 Hz to 300 GHz.

The object of this generic standard is to provide assessment methods and criteria to evaluate such equipment against basic restrictions or reference levels on exposure of the general public related to electric, magnetic and electromagnetic fields and induced and contact current.

3.2 Limits

According to EN 62311:2008, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified 1999/519/EC.

Frequency Range	E-Field Strength (V/m)	H-Field Strength (A/m)	B-Field (μT)	Equivalent Plane Wave Power Density S_{eq} (W/m^2)
0-1 Hz	—	3.2×10^4	4×10^4	—
1-8 Hz	10 000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—
0.025-0.8 kHz	$250/f$	$4/f$	$5/f$	—
0.8-3 kHz	$250/f$	5	6.25	—
3-150 kHz	87	5	6.25	—
0.15-1 MHz	87	$0.73/f$	$0.92/f$	—
1-10 MHz	$87/f^{1/2}$	$0.73/f$	$0.92/f$	—
10-400 MHz	28	0.073	0.092	2
400-2 000 MHz	$1.375 f^{1/2}$	$0.0037 f^{1/2}$	$0.0046 f^{1/2}$	$f/200$
2 ~ 300 GHz	61	0.16	0.20	10

3.3 Normative Reference Classification of The Assessment Methods

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \eta_0 H = \frac{\sqrt{30PG(\theta, \phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
 θ, ϕ = elevation and azimuth angles to point of investigation
r = distance from observation point to the antenna
 η_0 = Characteristic impedance of free space

3.4 Test Results

Calculation for Maximum E.I.R.P.

Mode	Frequency Band (MHz)	Output Power E.I.R.P. (dBm)	Output Power E.I.R.P. (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	Pass / Fail
Bluetooth LE						
A	2402 ~ 2480	11.03	12.677	3.083	61	Pass
B		11.04	12.706	3.087	61	Pass
802.15.4						
A	2405 ~ 2480	11.94	15.631	3.424	61	Pass
B		11.96	15.704	3.432	61	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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