



MPE Report

Report No.: STS2512133H01

Issued for

SHENZHEN MINEWSEMI CO., LTD

Room 402, Building C, Business Center, Gangzhilong
Science Park, No. 8 QingLong Road, Qinghua Community,
Longhua District, Shenzhen, China

Product Name: Bluetooth low energy module

Brand Name: MINEWSEMI

Model Name: MS88SF21

Series Model(s): MS88SF2

FCC ID: 2BDJ6-MS88SF2

Test Standard: FCC 47CFR §2.1091

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the ShenZhen STS Test Services Co., Ltd.

**TEST REPORT**

Applicant's Name.....: SHENZHEN MINEWSEMI CO., LTD
Address: Room 402, Building C, Business Center, Gangzhilong Science Park, No. 8 QingLong Road, Qinghua Community, Longhua District, Shenzhen, China
Manufacturer's Name.....: SHENZHEN MINEWSEMI CO., LTD
Address: Room 402, Building C, Business Center, Gangzhilong Science Park, No. 8 QingLong Road, Qinghua Community, Longhua District, Shenzhen, China

Product Description

Product Name.....: Bluetooth low energy module
Brand Name: MINEWSEMI
Model Name: MS88SF21
Series Model(s).....: MS88SF2

Test Standards: FCC 47CFR §2.1091
447498 D01 Interim General RF Exposure Guidance v06

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Date of Test.....:

Date of receipt of test item.....: 2025-12-12
Date (s) of performance of tests.....: 2025-12-12 to 2025-12-15
Date of Issue.....: 2025-12-15
Test Result.....: **Pass**

Testing Engineer :

Aaron Bu

(Aaron Bu)

Technical Manager :

Skylar Li

(Skylar Li)



Authorized Signatory :

Bovey Yang

(Bovey Yang)



TABLE OF CONTENTS

1. GENERAL INFORMATION	5
1.1 GENERAL DESCRIPTION OF THE EUT	5
1.2 TEST FACTORY	5
2. FCC 47CFR §2.1091 REQUIREMENT	6
2.1 TEST STANDARDS	6
2.2 LIMIT	6
2.3 TEST RESULT	7



Revision History

Rev.	Issue Date	Report No.	Effect Page	Contents
00	2025-12-15	STS2512133H01	ALL	Initial Issue



1. GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Bluetooth low energy module	
Brand Name	MINEWSEMI	
Model Name	MS88SF21	
Series Model(s)	MS88SF2	
Model Difference	Only different in model name.	
Product Description	The EUT is Bluetooth low energy module	
	Operation Frequency:	2402~2480 MHz
	Modulation Type:	GFSK
	Radio Technology:	BLE
	Bluetooth Configuration:	BLE(Support 1M, 2M)
	Number Of Channel:	40
	Antenna Type:	PCB Antenna
	Antenna Gain (dBi)	2.92
	Operation Frequency:	2405~2480 MHz
	Modulation Type:	O-QPSK
	Radio Technology:	Zigbee
	Bluetooth Configuration:	IEEE 802 15.4 (Thread, Zigbee)
	Number Of Channel:	16
	Antenna Type:	PCB Antenna
	Antenna Gain (dBi)	2.92
Power Rating	DC 3.3V	
Adapter	N/A	
Battery	N/A	
Hardware Version	N/A	
Software Version	N/A	

1.2 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : 101, Building B, Zhuoke Science Park, No.190 Chongqing Road, ZhanChengShequ, Fuhai Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01



2. FCC 47CFR §2.1091 REQUIREMENT

2.1 TEST STANDARDS

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The gain of the antennas used in the product is extracted from the Antenna data sheets provided and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis Transmission formula is far field assumption, the calculated result of that is an over-prediction for near field power density. It is taken as worst case to specify the safety range.

2.2 LIMIT

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)
Limits for Occupational / controlled Exposures			
300 - 1500	--	--	F/300
3.0-30	1842/f	4.89/f	*(900/f ²)
1500 – 100000	--	--	5.0
Limits for General population / Uncontrolled Exposure			
300 - 1500	--	--	F/1500
1.34-30	824/f	2.19/f	*(180f ²)
1500 – 100000	--	--	1.0

F= Frequency in MHz

Friss Formula

Friss Transmission Formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = Distance between observation point and the center of radiator in cm

If we know the maximum gain of the antenna and the total output power to the antenna, through calculation, we will know MPE value at distance 20cm.



2.3 TEST RESULT

Tune up

Mode	Detector	Tune up Power
GFSK	PK	8±1dBm
Zigbee	PK	6±1dBm

Protocol	Fre. (GHz)	Separati on distance (cm)	Max Tune up power (dBm)	ANT Gain (dBi)	Max EIRP (dBm)	Max EIRP (mW)	Power Density (mW/cm ²)	Limit (mW/ cm ²)	Ratio	Result
GFSK	2.480	20	9	2.92	11.92	15.560	0.0031	1	0.0031	Pass
Zigbee	2.480	20	7	2.92	9.92	9.817	0.0020	1	0.0020	Pass

Multiple transmission:

$$\text{GFSK} + \text{Zigbee} = 0.0031 + 0.0020 = 0.0051 < 1$$

Note: 1. The Maximum power is less than the limit, complies with the exemption requirements.

$$2. \text{ERP} = \text{EIRP} - 2.15$$

※※※※※END OF THE REPORT※※※※※