RF Exposure Evaluation Declaration

FCC ID:	HSW2832
IC:	4492A-2832
Application:	Murata Electronics North America
Application Type:	C2PC Certification
Product:	Bluetooth Low Energy Module
Model No.:	MBN52832
Brand Name:	Murata
FCC Rule Part(s):	KDB 447498 D01 General RF Exposure Guidance v06
ISED Rule Part(s):	RSS-102 Issue 5
Test Date:	April 01, 2020

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Revision History

Report No.	Version	Description	Issue Date	Note
2003RSU067-U2	Rev. 01	Initial Report	06-08-2020	Valid

Note：This C2PC certification is for changing antenna, the antenna type is PCB Flipper Antenna, original antenna type is Printed Trace Antenna, antenna gain from -2.5 dBi to 2.2dBi.

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name:	Bluetooth Low Energy Module
Model No.:	MBN52832
Brand Name:	Muruta
Bluetooth Specification:	V5.0
Operating Temperature:	-40 ~ 85°C
Power Type:	Coin Cell Battery: 3Vdc External Power Supply: 5Vdc Universal Serial Bus: 5Vdc

1.2. Product Specification Subjective

Frequency Range:	2402~2480MHz
Number of Channels:	40
Channel Spacing:	2MHz
Type of Modulation:	GFSK
Data Rate:	1Mbps, 2Mbps

1.3. Description of Available Antenna

Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)
Flipper Antenna	2.4 ~ 2.5	2.2

2. RF Exposure Evaluation

2.1. Limits for FCC:

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of 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)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $Pd = (Pout*G)/(4*pi*r^2)$

Where
Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
r = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, $1mW/cm^2$. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Limits for IC:

According to RSS-102: Exemption Limits for Routine Evaluation – RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

• below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of

the device is equal to or less than 22.48/f0.5 W (adjusted for tune-up tolerance), where f is in MHz;
• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 f0.6834 W (adjusted for tune-up tolerance), where f is in MHz;
• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

2.3. Test Result of RF Exposure Evaluation for FCC and IC

Product	Bluetooth Low Energy Module
Test Item	RF Exposure Evaluation

FCC:

Test Mode	Frequency Band (MHz)	Maximum Output Power (dBm)	E.I.R.P (dBm)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)
Bluetooth-LE 1M	2402 ~ 2480	2.88	5.08	0.00064	1
Bluetooth-LE 2M	2402 ~ 2480	2.89	5.09	0.00064	1

IC:

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Tune-up (dBm)	Maximum EIRP (W)	Limit (W)
Bluetooth-LE 1M	2402 ~ 2480	5.08	6.08	0.00406	2.6764
Bluetooth-LE 2M	2402 ~ 2480	5.09	6.09	0.00406	2.6764

CONCLUSION:

The Max Power Density at R (20 cm) =0.00064 < 1mW/cm^2.

The device is excluded for SAR test and complies with the IC exposure requirements since the maximum conducted peak output power is lower than the SAR test exclusion thresholds.
So the EUT complies with RF Exposure requirement.

The End

Appendix - EUT Photograph

Refer to “2003RSU067-UE” file.