

RF EXPOSURE REPORT



Applicant: Murata Manufacturing Co., Ltd.
1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan

Manufacturer: Murata Manufacturing Co., Ltd.
1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan

Product Name: Communication Module

Brand Name: muRata

Model No.: LBEE5WV2GF

Report Number: TESA2404000197E5

FCC ID VPYLBEE5WV2GF

IC: 772C-LBEE5WV2GF

Date of EUT Received: Feb. 21, 2024

Issue Date: May 31, 2024

Approved By

John Teh

John Yeh

We hereby certify that:

The above equipment was evaluated by SGS Taiwan Ltd. The evaluation in this report is in compliance with FCC KDB447498D01v06 and RSS-102 Issue 5.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TESA2404000197E5	00	Original	May 31, 2024	Kimmy Chiou	

Note:

- The remark "*" indicates modification of the report upon requests from certification body.

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Contents

1	DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	4
1.1	PRODUCT DESCRIPTION.....	4
1.2	EVALUATION SITE.....	4
1.3	ANTENNA INFORMATION:	5
1.4	RATED POWER.....	6
2	FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE)	8
2.1	FCC STANDARD APPLICABLE	8
2.2	ISED STANDARD APPLICABLE	9
2.3	POWER DENSITY CALCULATION (WORST CASE)	10

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 Product Description

Product Name:	Communication Module
Brand Name:	muRata
Model No.:	LBEE5WV2GF

1.2 Evaluation site

Laboratory	Site Address		FCC Designation number	ISED Company Number	CAB Identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	<input type="checkbox"/>	No. 134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, 24803, Taiwan.	TW0027	4620A	TW3702
	<input checked="" type="checkbox"/>	No. 2, Keji 1st Rd., Guishan Township, Taoyuan County, 333 Taiwan.	TW0028	4620E	
	<input type="checkbox"/>	1F, No. 8, Alley 15, Lane 120, Sec. 1, Nei Hu Road, Neihu District, Taipei City, 222 Taiwan.	TW0029	23862	

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SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路 134 號

1.3 Antenna Information:

BT / WLAN 2.4GHz

Antenna Type	Supplier	Main / Aux	Freq. (MHz)	Peak Antenna Gain (dBi)
monopole	Murata	Main	2.4GHz	0.90

WLAN 5GHz

Antenna Type	Supplier	Main / Aux	Note
monopole	Murata	Main	Ant 1

Operating Frequency (MHz)			Ant 1 Peak Gain (dBi)
5150.0	~	5250.0	2.00
5250.0	~	5350.0	2.00
5470.0	~	5725.0	2.00
5725.0	~	5850.0	2.00

The antenna information is provided by the applicant.

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1.4 Rated Power

Bluetooth / WLAN 2.4GHz

Mode	Freq. Range (MHz)	Channels	Modulation Technology	Max Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Worst Case
BR+EDR	2402-2480	78	GFSK + $\pi/4$ DQPSK + 8DPSK	13	0.90	13.90	
BLE	2402-2480	39	GFSK	9	0.90	9.90	
802.11b/g/n_HT20	2412-2462	6	DSSS & OFDM	19	0.90	19.90	V
Modulation type:		CCK, DQPSK, DBPSK for DSSS					
		64QAM, 16QAM, QPSK, BPSK for OFDM					

WLAN 5GHz(FCC)

802.11	Freq. Range (MHz)	Modulation Technology	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Worst Case
a	5150~5250	OFDM	18.00	2.00	20.00	V
	5250~5350	OFDM	18.00	2.00	20.00	V
	5470~5725	OFDM	18.00	2.00	20.00	V
	5725~5850	OFDM	18.00	2.00	20.00	V
n HT20 ac VHT20	5150~5250	OFDM	18.00	2.00	20.00	V
	5250~5350	OFDM	18.00	2.00	20.00	V
	5470~5725	OFDM	18.00	2.00	20.00	V
	5725~5850	OFDM	18.00	2.00	20.00	V

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WLAN 5GHz(ISED)

802.11	Freq. Range (MHz)	Modulation Technology	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Power Density / Limit	Worst Case
a	5180 ~ 5240	OFDM	18.00	2.00	20.00	0.199	9.047	0.022	V
	5260 ~ 5320	OFDM	18.00	2.00	20.00	0.199	9.142	0.022	V
	5500 ~ 5580	OFDM	18.00	2.00	20.00	0.199	9.425	0.021	
	5660 ~ 5700	OFDM	18.00	2.00	20.00	0.199	9.612	0.021	
	5745 ~ 5825	OFDM	18.00	2.00	20.00	0.199	9.710	0.020	
n HT20 ac VHT20	5180 ~ 5240	OFDM	18.00	2.00	20.00	0.199	9.047	0.022	V
	5260 ~ 5320	OFDM	18.00	2.00	20.00	0.199	9.142	0.022	V
	5500 ~ 5580	OFDM	18.00	2.00	20.00	0.199	9.425	0.021	
	5660 ~ 5700	OFDM	18.00	2.00	20.00	0.199	9.612	0.021	
	5745 ~ 5825	OFDM	18.00	2.00	20.00	0.199	9.710	0.020	

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2 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 FCC Standard Applicable

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 Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equipment power density

Prediction of MPE limit at a given distance

$$S = PG / 4\pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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2.2 ISED Standard Applicable

This submittal(s) (test report) is intended to comply with RSS-102 issue 5 Radio frequency Radiation Exposure requirement.

This is a Mobile device, the MPE is required.

Limits for Maximum Permissible Exposure (MPE)

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field Strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

F = frequency in MHz

* = Based on nerve stimulation (NS).

** = Based on specific absorption rate (SAR)

Maximum Permissible Exposure (MPE) Evaluation

Prediction of MPE limit at a given distance

$$S = PG / 4\pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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2.3 Power Density Calculation (Worst Case)

FCC Standalone MPE

Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	Max. EIRP (mW)	Power Density (PD) (mW/cm ²)	Limit (mW/cm ²)	Pass / Fail	Power Density / Limit
BT	2480.00	20	13	0.90	24.55	0.0049	1.000	Pass	0.005
WLAN 2.4G	2437.00	20	19	0.90	97.72	0.019	1.000	Pass	0.019
WLAN 5G	5150.00	20	18	2.00	100.00	0.020	1.000	Pass	0.020

ISED Standalone MPE

Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	Max. EIRP (mW)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Pass / Fail	Power Density / Limit
BT	2480.00	20	13.5	0.90	27.54	0.055	5.469	Pass	0.010
WLAN 2.4G	2437.00	20	19	0.9	97.72	0.195	5.404	Pass	0.036
WLAN 5G	5580.00	20	18	2	100.00	0.199	9.519	Pass	0.021

Note: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

~ End of Report ~

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