



Maximum Permissible Exposure Report

Guangzhou BDE Technology Inc.

BDE Multi-Band & Multi-Protocol Wireless Module

Test Model: BDE-MB1354R10UA32

Additional Model No.: Please Refer to Page 2

Prepared for : Guangzhou BDE Technology Inc.

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Date of receipt of test sample : May 09, 2024

Number of tested samples : 2

Sample No. : A240508051-1, A240508051-2

Serial number : Prototype

Date of Test : May 09, 2024 ~ February 20, 2025

Date of Report : February 20, 2025



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1. Product Information

FCC ID	2ABRU-MB13R
Product name	BDE Multi-Band & Multi-Protocol Wireless Module
Test Model	BDE-MB1354R10UA32
Additional Model No.	BDE-MB1354R10NA32, BDE-MB1354R10UU32, BDE-MB1354R10NU32, BDE-MB1354R10UN32, BDE-MB1354R10NN32, BDE-MB1354R10UA32-IN, BDE-MB1354R10NA32-IN, BDE-MB1354R10UU32-IN, BDE-MB1354R10NU32-IN, BDE-MB1354R10UN32-IN, BDE-MB1354R10NN32-IN, BDE-MB1354R10UA0, BDE-MB1354R10NA0, BDE-MB1354R10UU0, BDE-MB1354R10NU0, BDE-MB1354R10UN0, BDE-MB1354R10NN0, BDE-MB1354R10UA0-IN, BDE-MB1354R10NA0-IN, BDE-MB1354R10UU0-IN, BDE-MB1354R10NU0-IN, BDE-MB1354R10UN0-IN, BDE-MB1354R10NN0-IN, BDE-MB1352RUA32, BDE-MB1352RNA32, BDE-MB1352RNU32, BDE-MB1352RUN32, BDE-MB1352RNN32, BDE-MB1352RUA32-IN, BDE-MB1352RNA32-IN, BDE-MB1352RNU32-IN, BDE-MB1352RUN32-IN, BDE-MB1352RNN32-IN, BDE-MB1352RUA0, BDE-MB1352RNA0, BDE-MB1352RUU0, BDE-MB1352RNU0, BDE-MB1352RUN0, BDE-MB1352RNN0, BDE-MB1352RUA0-IN, BDE-MB1352RNA0-IN, BDE-MB1352RUU0-IN, BDE-MB1352RNU0-IN, BDE-MB1352RUN0-IN, BDE-MB1352RNN0-IN
Ratings	Input: DC 3.3V
Hardware version	V1
Software version	7.40.00
Bluetooth	
Frequency Range	2402MHz~2480MHz
Channel Number	40 channels for Bluetooth V5.3 (DTS)
Channel Spacing	2MHz for Bluetooth V5.3 (DTS)
Modulation Type	GFSK for Bluetooth V5.3 (DTS)
Bluetooth Version	V5.3
Antenna Description	For PCB Trace Antenna: Integrated PCB trace antenna, 0.8dBi(Max.) For ANT: Whip Antenna, 3.0dBi(Max.) For U.FL Connector: Whip Antenna, 3.0dBi(Max.)
Zigbee	
Frequency Range	2405MHz-2480MHz
Channel Spacing	5MHz
Channel Number	16 Channels
Modulation Type	O-QPSK
Antenna Description	For PCB Trace Antenna: Integrated PCB trace antenna, 0.8dBi(Max.) For ANT: Whip Antenna, 3.0dBi(Max.)





	For U.FL Connector: Whip Antenna, 3.0dBi(Max.)
915 MHz	
Frequency Range	50Kbps, 100Kbps: 902.2MHz ~ 927.8MHz 150Kbps, 200Kbps: 902.4MHz ~ 927.6MHz
Channel Number	129 Channels (50Kbps, 100Kbps) 64 Channels (150Kbps, 200Kbps)
Modulation Type	2-GFSK
Antenna Description	For U.FL Connector: Whip Antenna, 3.8dBi(Max.) For ANT Pin: Whip Antenna, 3.8dBi(Max.)
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Devices



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2. Evaluation Method and Limit

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Refer Evaluation Method

3. 1 Refer Evaluation Method

[ANSI C95.1-2019](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices.

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Uncontrolled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density



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3.3 Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

ISED Designation Number is 9642A.

4. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

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

5. Antenna Information

EUT can only use antennas certificated as follows provided by manufacturer;

Internal/External Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Internal	PCB trace antenna	2400MHz ~ 2500MHz	0.8dBi
External	Whip antenna	2400MHz ~ 2500MHz	3.0dBi
	Whip antenna	902MHz ~ 928MHz	3.8dBi

6. Conducted Power

[BT LE]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
BLE 1M	0	2402	2.20
	19	2440	2.31
	39	2480	2.11
BLE 2M	0	2402	2.29
	19	2440	2.35
	39	2480	2.17
BLE 125Kbps	0	2402	2.77
	19	2440	2.81
	39	2480	2.64
BLE 500Kbps	0	2402	2.73
	19	2440	2.77
	39	2480	2.62





[Zigbee]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
O-QPSK	0	2405	3.34
	7	2440	3.42
	15	2480	3.20

< 900MHz Max. Conducted Power >

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)
50Kbps	0	902.2	13.505
	64	915.0	13.401
	128	927.8	13.255
100Kbps	0	902.2	13.544
	64	915.0	13.432
	128	927.8	13.271
150Kbps	0	902.4	13.548
	32	915.2	13.463
	63	927.6	13.323
200Kbps	0	902.4	13.600
	32	915.2	13.488
	63	927.6	13.334

7. Manufacturing Tolerance

BLE 1M(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	3.0	3.0	3.0
Tolerance \pm (dB)	1.0	1.0	1.0

BLE 2M(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	3.0	3.0	3.0
Tolerance \pm (dB)	1.0	1.0	1.0

BLE 125Kbps(Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	3.0	3.0	3.0
Tolerance \pm (dB)	1.0	1.0	1.0

BLE 500Kbps (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	3.0	3.0	3.0
Tolerance \pm (dB)	1.0	1.0	1.0





[Zigbee]

O-QPSK (Peak)			
Channel	Channel 0	Channel 7	Channel 15
Target (dBm)	3.0	3.0	3.0
Tolerance \pm (dB)	1.0	1.0	1.0

< 900MHz >

GFSK 50Kbps (Peak)			
Channel	Channel 0	Channel 64	Channel 128
Target (dBm)	13.0	13.0	13.0
Tolerance \pm (dB)	1.0	1.0	1.0
GFSK 100Kbps(Peak)			
Channel	Channel 0	Channel 64	Channel 128
Target (dBm)	13.0	13.0	13.0
Tolerance \pm (dB)	1.0	1.0	1.0
GFSK 150Kbps(Peak)			
Channel	Channel 0	Channel 32	Channel 63
Target (dBm)	13.0	13.0	13.0
Tolerance \pm (dB)	1.0	1.0	1.0
GFSK 200Kbps(Peak)			
Channel	Channel 0	Channel 32	Channel 63
Target (dBm)	13.0	13.0	13.0
Tolerance \pm (dB)	1.0	1.0	1.0

8. Measurement Results

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[BT LE]

Modulation Type	Output power		Max. Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
BLE 1M	4.0	2.5119	3.0	1.9953	0.0010	1.0000
BLE 2M	4.0	2.5119	3.0	1.9953	0.0010	1.0000
BLE 125Kbps	4.0	2.5119	3.0	1.9953	0.0010	1.0000
BLE 500Kbps	4.0	2.5119	3.0	1.9953	0.0010	1.0000

[Zigbee]

Modulation Type	Output power		Max. Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
O-QPSK	4.0	2.5119	3.0	1.9953	0.0010	1.0000





[900MHz]

Modulation Type	Output power		Max. Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
50Kbps	14.0	25.1189	3.8	2.4547	0.0120	1.0000
100Kbps	14.0	25.1189	3.8	2.4547	0.0120	1.0000
150Kbps	14.0	25.1189	3.8	2.4547	0.0120	1.0000
200Kbps	14.0	25.1189	3.8	2.4547	0.0120	1.0000

7.2 Simultaneous Transmission MPE

The EUT has one Sub-1G band and other one 2.4G band. So no need consider simultaneous transmission. According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations; \sum of MPE ratios ≤ 1.0

Simultaneous Transmission				
Sub-1G band antenna Max. MPE ratios	2.4G band antenna Max. MPE ratios	\sum MPE ratios	Limit	Results
0.0120	0.0010	0.0130	1.0	Pass

Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate is assessed based on the maximum antenna gain value(worst case)
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----THE END OF REPORT-----

