

RF EXPOSURE REPORT



Applicant: Raytac Corporation
5F., No.3, Jiankang Road, Zhonghe District, New Taipei City
23586, Taiwan

Product Name: Bluetooth Module

Brand Name: Raytac Corporation

Model No.: MDBT53, MDBT53-P, MDBT53-U

Model Difference: Difference antenna type

Report Number: E2/2021/A0102

FCC ID SH6MDBT53

IC: 8017A-MDBT53

Issue Date: November 10, 2021

Date of EUT Received: October 14, 2021

Approved By

John Yeh

We hereby certify that:

The above equipment was evaluate by SGS Taiwan Ltd. The evaluation in this report is in compliance with FCC Rule Part §2.1093 and RSS-102.

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By
E2/2021/A0102	00	Original.	November 10, 2021	Yuri Tsai

Note:

- 1、Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received and are assessed as identical in hardware and firmware to each other.

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Contents

1	DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	4
2	RF EXPOSURE EVALUATION FOR PORTABLE CONDITIONS	6
3	RF EXPOSURE EVALUATION FOR MOBILE CONDITIONS	8

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 Product Description

Product Name:	Bluetooth Module
Brand Name:	Raytac Corporation
Model No.:	MDBT53, MDBT53-P, MDBT53-U
Model Difference:	Difference antenna type
Hardware Version:	1
Firmware Version:	1
EUT Series No.:	Conducted: PJ219154018 Radiated: MDBT53: PJ219154019, MDBT53-P: PJ219154022, MDBT53-U: PJ219154024
Power Supply:	3.3Vdc

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1.2 Antenna Information:

1.2.1 BLE

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	ISED RF exposure conditions
Embedded (Chip)	Raytac	MDBT53	2.4GHz	-0.39	Portable
Embedded (PCB)	Raytac	MDBT53-P	2.4GHz	-2.32	Portable
External	YAGEO	ANTX100ETHAB24553	2.4GHz	2.00	Portable
External	ARISTOTLE	RFA-02-5-F17H170100B	2.4GHz	5.00	Mobile
PCB	YAGEO	ANTX100P011B24003	2.4GHz	2.20	Portable
PCB	YAGEO	ANTX100P111B24003	2.4GHz	3.30	Mobile

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2 RF EXPOSURE EVALUATION FOR PORTABLE CONDITIONS

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.

As per KDB 447498 D01 4.3.1,

Step a: For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot \sqrt{f(\text{GHz})} \leq 3.0$ for 1-g Head & Body SAR and ≤ 7.5 for 10-g extremity Hand SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as numeric thresholds in **step b)** below

Step b: For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B):

- 1) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)]\}$ mW, for 100 MHz to 1500 MHz
- 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW, for > 1500 MHz and ≤ 6 GHz

2.2 Measurement Result:

This is a portable device and the max. output power including tune-up tolerance is 2.244 (mW), lower than the threshold given and derived as formula given above, where

$$= 2.244(\text{mW})/5(\text{mm}) \cdot \sqrt{2.48(\text{GHz})} = 0.707 < 3.0$$

Frequency (MHz)	Max. output power including tune-up tolerance(dBm)	Max. output power including tune-up tolerance(mW)	Distance (mm)	Result
2480	3.51	2.244	5	0.707

As the result of calculation result indicates, the RF exposure generating from given transmitter (transmitter employed digital modulation) can be excluded from SAR measurement, and is deemed compliant with RF exposure as per FCC.

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2.3 ISED Standard Applicable

As per RSS-102 Issue 5 March 19, 2015, any transmitter shall be compliant with applicable RF exposure prior to being market. In §2.5.1, SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power.

For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

2.4 Evaluation Result:

Freq. (MHz)	Max. output power including tune-up tolerance(dBm)	Peak Gain (dBi)	Max Conducted Output Power (mW)	e.i.r.p (mW)	Exemption Limit (mW)
2480	3.51	2.2	2.244	3.724	4

1. The e.i.r.p is 3.724mW when the device operates at the separation distance below or equals to 5mm. It is below the SAR exemption limit 4mW.
2. The evaluation of Portable conditions is only applicable when the device using below antennas.

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	ISED RF exposure conditions
Embedded (Chip)	Raytac	MDBT53	2.4GHz	-0.39	Portable
Embedded (PCB)	Raytac	MDBT53-P	2.4GHz	-2.32	Portable
External	YAGEO	ANTX100ETHAB24553	2.4GHz	2.00	Portable
PCB	YAGEO	ANTX100P011B24003	2.4GHz	2.20	Portable

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3 RF EXPOSURE EVALUATION FOR MOBILE CONDITIONS

3.1 ISED Standard Applicable

According to RSS-102 issue 5 §2.5.2 RF Exposure 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 $22.48/f_{0.5}W$ (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 $1.31 \times 10^{-2} f_{0.6834} W$ (adjusted for tune-up tolerance), where f is in MHz;

This is a Mobile device, at which separation distance between the user and the device's antenna is 20cm. Therefore, section 2.5.2 shall be complied with.

3.2 Power Density Calculation (Worst Case)

Operation Mode	Evaluation Frequency (MHz)	Max. output Power include Tolerance (dBm)	Antenna Gain (dBi)	Max. EIRP (W)	Limit (W)
BT	2402.00	3.51	5.00	0.01	2.676

~ End of Report ~

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