Prüfbericht-Nr.: *Test report no.:*	CN22R1FG(FCC-MPE) 001	**Auftrags-Nr.:** *Order no.:*	238523042	
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2021-11-30	
Auftraggeber: *Client:*	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States			
Prüfgegenstand: *Test item:*	Wireless MCU module with BLE 5.2 compliant and Zigbee 3.1 Radio			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	WBZ450PE, WBZ450UE, WBZ450PC, WBZ450UC			
Auftrags-Inhalt: *Order content:*	FCC Certification			
Prüfgrundlage: *Test specification:*	IEEE Std C95.1 47 CFR §2.1091 47 CFR §1.1310 KDB 447498 D01			
Wareneingangsdatum: *Date of sample receipt:*	2021-09-17, 2022-04-12			
Prüfmuster-Nr.: *Test sample no:*	A003241915-001~004 A003130881-007~010			
Prüfzeitraum: *Testing period:*	2022-4-30 - 2022-7-10, 2022-7-19 - 2022-8-29			
Ort der Prüfung: *Place of testing:*	EMC/RF Taipei Testing Site			
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories			
Prüfergebnis*: *Test result*:*	Pass			

zusammengestellt von: *compiled by:*		**genehmigt von:** authorized by:	
Datum: *Date:* 2022-08-31		**Ausstellungsdatum:** *Issue date:* 2022-08-31	
Stellung / *Position:*	Ryan Chen Senior Project Manager	**Stellung** / *Position:*	Brenda Chen Senior Project Manager

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.
V05

Contents

HISTORY OF THIS TEST REPORT 3

1 GENERAL REMARKS 4
1.1 COMPLEMENTARY MATERIALS 4
1.2 DECISION RULE OF CONFORMITY 4

2 TEST SITES 5
2.1 TEST FACILITIES 5
2.2 TEST FACILITY 5

3 GENERAL PRODUCT INFORMATION 6
3.1 PRODUCT FUNCTION AND INTENDED USE 6
3.2 RATINGS AND SYSTEM DETAILS 6

4 MAXIMUM PERMISSIBLE EXPOSURE EVALUATION 8
4.1 INTRODUCTION 8
4.2 REFERENCE LEVELS 8
4.3 CLASSIFICATION OF THE ASSESSMENT METHODS 10

5 TEST RESULTS 11
5.1 MPE-BASED EXEMPTION 11

APPENDIX EP - PHOTOGRAPHS OF EUT

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN22R1FG(FCC-MPE) 001	Original Release	2022-08-31

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix EP - Photographs of EUT

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2 Test Sites

2.1 Test Facilities

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)

3 General Product Information

3.1 Product Function and Intended Use

The EUT is Wireless MCU module with BLE 5.2 compliant and Zigbee 3.1 Radio. It contains Bluetooth and ZigBee compatible chip enabling the user to communicate data through Bluetooth interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 Ratings and System Details

Basic Information of EUT

Item	EUT Information
Kind of Equipment/Test Item	Wireless MCU module with BLE 5.2 compliant and Zigbee 3.1 Radio
Type Identification	WBZ450PE, WBZ450UE, WBZ450PC, WBZ450UC
FCC ID	2ADHKWBZ450

Technical Specification of EUT

Item	EUT Information
Operating Frequency	BLE: 2402 ~ 2480 MHz ZigBee: 2405 MHz ~ 2480 MHz
Modulation	BLE: GFSK ZigBee: OQPSK
Operation Voltage	Non ECC variants: 1.9Vdc to 3.6Vdc ECC variant : 2Vdc to 3.6Vdc
Antenna Information	Refer to Note 1

Note 1: Antenna List

ANT No.	SN/Model #	Cable Length (mm)	Type	Gain (dBi)	Placement	Difference
1	W3525B039	100	PCB	2	External	Refer to chapter 5.1.1
2	001-0016	Flex PIFA antenna	PIFA	2.5	External	
3	001-0001	RPSMA connector	Dipole	2	External	
4	1461530100	100mm (Dual Band)	PCB	3	External	
5	ANT-2.4-LPW-125	125	Dipole	2.8	External	
6	RFA-02-P05-D034	150	PCB	2	External	
7	RFA-02-P33-D034	150	PCB	2	External	
8	ABAR1504-S2450	250	PCB	2.28	External	
9	WBZ450 LGA	-	PCB	4.14	Internal	

4 Maximum Permissible Exposure Evaluation

4.1 Introduction

This Standard specifies requirements for, and provides guidance on, assessing compliance with the exposure limits of radiofrequency (RF) safety standards such as IEEE Std C95.1. This includes methodologies for making an assessment (by measurement or computation) of human exposure to ambient RF fields and induced body currents in the frequency range of 0 kHz to 300 GHz.

This Standard may also be used as a guide for making low-level environmental exposure assessments in areas around RF sources listed above, as well as other sources such as Wi-Fi devices.

4.2 Reference Levels

Where appropriate, the reference levels are derived from the basic restrictions by mathematical modelling and by extrapolation from the results of laboratory investigations at specific frequencies. They are given for the condition of maximum coupling of the field to the exposed individual, thereby providing maximum protection.

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).

The FCC MPE limits from 47 CFR §1.1310 are shown in the table below

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/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 – 100000			5	6
(B) 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

NOTE –

(1) f is the frequency in MHz.

(2) Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded. For the specific case of occupational exposures at frequencies up to 100 kHz, the derived electric fields can be increased by a factor of 2 under conditions in which adverse indirect effects from contact with electrically charged conductors can be excluded.

(3) For frequencies between 100 kHz and 10 GHz, the quantities Seq, E2 and H2 are averages over any 6 minutes.

(4) For frequencies exceeding 10 GHz, Seq, the quantities E2 and H2 are averages over any 68/f 1.05 minutes (f in GHz).

4.3 Classification of the Assessment Methods

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

MPE Calculation Method according to KDB 447498 D01 General RF Exposure Guidance v07
General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 of § 1.1307(b)(1)(i)(C) to support an exemption from further evaluation from 300 kHz through 100 GHz.
The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least λ/2π. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 $R^2 f$
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R^2
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

5 Test Results

5.1 MPE-based Exemption

The Calculated at a distance of 20 cm are shown as below:

Mode	Frequency (MHz)	Average Output Power (dBm)	Average Output Power (mW)	Antenna Gain (dBi)	ERP (mW)	ERP Limit (mW)	Pass / Fail
BLE	2402	7.28	5.35	4.14	8.45	768	Pass
ZigBee	2435	6.90	4.90	4.14	25.06	768	Pass

Conclusion
The device complies with the FCC exposure requirements since the maximum transmitter power density is below the FCC limit.