

Prüfbericht-Nr.: <i>Test report no.:</i>	CN23XR9U (ISED-MPE) 001	Auftrags-Nr.: <i>Order no.:</i>	48219811	Seite 1 von 11 Page 1 of 11
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2023-06-01	
Auftraggeber: <i>Client:</i>	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States			
Prüfgegenstand: <i>Test item:</i>	Wireless MCU module with BLE 5.2 compliant and Zigbee 3.0 Radio			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	WBZ350PE, WBZ350UE, WBZ350PC, WBZ350UC, RNBD350PE, RNBD350UE, RNBD350PC, RNBD350UC			
Auftrags-Inhalt: <i>Order content:</i>	ISED Certification			
Prüfgrundlage: <i>Test specification:</i>	RSS-102 Issue 5			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-07-10			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003513812-001~002, 07~012 A003119783-009, A003130881-021			
Prüfzeitraum: <i>Testing period:</i>	2023-07-15 - 2023-08-16			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Taipei Testing Site			
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing Laboratories			
Prüfergebnis*: <i>Test result*:</i>	Pass			
zusammengestellt von: <i>compiled by:</i>			genehmigt von: <i>authorized by:</i>	
Datum: <i>Date:</i>	2023-09-01		Ausstellungsdatum: <i>Issue date:</i>	2023-09-01
Stellung / Position:	Senior Project Manager		Stellung / Position:	Senior Project Manager
Sonstiges / Other:	The test result of output power is referred to report no. CN23XR9U (RSS247-BLE) 001 and CN23XR9U (RSS247-ZigBee) 001.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient 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. <i>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.</i>				

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.....	9
<i>4.3.1 ISED MPE Exemption Requirements from RSS-102 Section 2.5.2</i>	<i>9</i>
5 TEST RESULTS	10
5.1 MAXIMUM POWER DENSITY	10

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: CN23XR9U (ISED-MPE) 001
Test Report No.

Seite 3 von 11
Page 3 of 11

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN23XR9U (ISED-MPE) 001	Original Release	2023-09-01

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 3.0 Radio. It contains Bluetooth and ZigBee compatible 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 3.0 Radio
Type Identification	WBZ350PE, WBZ350UE, WBZ350PC, WBZ350UC, RNBD350PE, RNBD350UE, RNBD350PC, RNBD350UC
IC	20266-WBZ350
HVIN	WBZ350PE, WBZ350UE, WBZ350PC, WBZ350UC, RNBD350PE, RNBD350UE, RNBD350PC, RNBD350UC

Technical Specification of EUT

Item	EUT Information
Operating Frequency	BLE: 2402 ~ 2480 MHz ZigBee: 2405 ~ 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 2

Note:

- All models are listed as below.

Type Identification	Difference
WBZ350PE	PCB antenna without Trust and Go Chip
WBZ350UE	u.FL antenna without Trust and Go Chip
WBZ350PC	PCB antenna with Trust and Go Chip
WBZ350UC	u.FL antenna with Trust and Go Chip
RNBD350PE	same as WBZ350PE with different application software
RNBD350UE	same as WBZ350UE with different application software
RNBD350PC	same as WBZ350PC with different application software
RNBD350UC	same as WBZ350UC with different application software

2. Antenna List:

ANT No.	Brand Name	SN/Model #	Cable Length (mm)	Type	Gain (dBi)	Placement	Remark
1	Pulse	W3525B039	100	PCB	2	External	Applied to model no. WBZ350UE and WBZ350UC
2	PSA	RFDPA870915IMAB306	150	Dipole	1.82	External	
3	Laird	001-0016	100	PIFA	2.5	External	
4	LSR	001-0001	RPSMA connector	Dipole	2	External	
5	Molex	1461530100	100 (Dual Band)	PCB	3	External	
6	Linx	ANT-2.4-LPW-125	125	Dipole	2.8	External	
7	ALEAD	RFA-02-P05-D034	150	PCB	2	External	
8	ALEAD	RFA-02-P33-D034	150	PCB	2	External	
9	ABRACON	ABAR1504-S2450	250	PCB	2.28	External	
10	Microchip	WBZ350	-	PCB	2.9	Internal	Applied to model no. WBZ350PE and WBZ350PC

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 RSS-102 Issue 5. 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 all bands.

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 RSS-102 Issue 5, the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF).

Table 4: The ISED MPE limits from RSS-102 are shown in the table below

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	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}

Note: *f* is frequency in MHz.
 * Based on nerve stimulation (NS).
 ** Based on specific absorption rate (SAR)

The following formula was used to calculate the Power Density:

$$\text{Power Density: } S = PG / 4\pi R^2$$

Where:

S = power density (W/m²)

P = power input to the antenna (W)

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 (m)

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.

4.3.1 ISED MPE Exemption Requirements from RSS-102 Section 2.5.2

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 $4.49/f^{0.5}$ 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;
 - 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).
- RF exposure evaluation exempted power for BLE:
2.67 W > Maximum Measured E.I.R.P = 0.0289 W
 - RF exposure evaluation exempted power for ZigBee:
2.67 W > Maximum Measured E.I.R.P = 0.0288 W

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.

5 Test Results

5.1 Maximum Power Density

The maximum power density at a distance of 20 cm are shown as below:

Main Source							
Mode	Frequency (MHz)	Average Output Power (dBm)	Average Output Power (W)	Antenna Gain (dBi)	Power Density (W/m ²)	Limit of Power Density (W/m ²)	Pass / Fail
BLE							
1Mbps	2402	11.61	0.0145	3	0.0575	5.35	Pass
1Mbps	2440	11.59	0.0144	3	0.0572	5.41	Pass
1Mbps	2480	11.56	0.0143	3	0.0568	5.47	Pass
2Mbps	2404	11.60	0.0145	3	0.0574	5.35	Pass
2Mbps	2440	11.59	0.0144	3	0.0572	5.41	Pass
2Mbps	2478	11.55	0.0143	3	0.0567	5.47	Pass
ZigBee							
250kbps	2405	11.60	0.0145	3	0.0574	5.36	Pass
250kbps	2440	11.59	0.0144	3	0.0572	5.41	Pass
250kbps	2480	11.56	0.0143	3	0.0568	5.47	Pass
500kbps	2405	11.59	0.0144	3	0.0572	5.36	Pass
500kbps	2440	11.58	0.0144	3	0.0571	5.41	Pass
500kbps	2480	11.55	0.0143	3	0.0567	5.47	Pass
1Mbps	2405	11.60	0.0145	3	0.0574	5.36	Pass
1Mbps	2440	11.59	0.0144	3	0.0572	5.41	Pass
1Mbps	2480	11.55	0.0143	3	0.0567	5.47	Pass
2Mbps	2405	11.59	0.0144	3	0.0572	5.36	Pass
2Mbps	2440	11.58	0.0144	3	0.0571	5.41	Pass
2Mbps	2480	11.54	0.0143	3	0.0566	5.47	Pass

2 nd Source							
Mode	Frequency (MHz)	Average Output Power (dBm)	Average Output Power (W)	Antenna Gain (dBi)	Power Density (W/m ²)	Limit of Power Density (W/m ²)	Pass / Fail
BLE							
1Mbps	2402	11.47	0.0140	3	0.0557	5.35	Pass
1Mbps	2440	11.45	0.0140	3	0.0554	5.41	Pass
1Mbps	2480	11.42	0.0139	3	0.0550	5.47	Pass
2Mbps	2404	11.49	0.0141	3	0.0559	5.35	Pass
2Mbps	2440	11.46	0.0140	3	0.0556	5.41	Pass
2Mbps	2478	11.41	0.0138	3	0.0549	5.47	Pass
ZigBee							
250kbps	2405	11.50	0.0141	3	0.0561	5.36	Pass
250kbps	2440	11.48	0.0141	3	0.0558	5.41	Pass
250kbps	2480	11.45	0.0140	3	0.0554	5.47	Pass
500kbps	2405	11.49	0.0141	3	0.0559	5.36	Pass
500kbps	2440	11.47	0.0140	3	0.0557	5.41	Pass
500kbps	2480	11.44	0.0139	3	0.0553	5.47	Pass
1Mbps	2405	11.50	0.0141	3	0.0561	5.36	Pass
1Mbps	2440	11.48	0.0141	3	0.0558	5.41	Pass
1Mbps	2480	11.45	0.0140	3	0.0554	5.47	Pass
2Mbps	2405	11.49	0.0141	3	0.0559	5.36	Pass
2Mbps	2440	11.47	0.0140	3	0.0557	5.41	Pass
2Mbps	2480	11.44	0.0139	3	0.0553	5.47	Pass