RF Exposure Evaluation Report

Product	:	WM1110
Trade mark	:	Seeed Studio
Model/Type reference	:	WM1110-A,WM1110-S
Serial Number	:	N/A
Report Number	:	EED32O80763102
FCC ID	:	Z4T-WM1110
Date of Issue	:	Jun. 29, 2022
Test Standards	:	47 CFR Part 1.1307 47 CFR Part 2.1091 KDB447498D01 General RF Exposure Guidance v06
Test result	:	PASS

Prepared for:

Seeed Technology Co., Ltd.
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Zhongshanyuan Road,Nanshan District,
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Prepared by:

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CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. CTI Report Seal

2 Version

Version No.	Date	Description
00	Jun. 29, 2022	Original

3 Contents

4 General Information

4.1 Client Information

Applicant:	Seeed Technology Co., Ltd.
Address of Applicant:	9F,G3 Building,TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Manufacturer:	SeeedTechnology Co., Ltd.
Address of Manufacturer:	9F,G3 Building,TCLInternational E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Factory:	Shenzhen Xinxian Technology Co, Limited
Address of Factory:	F5, Building B17, Hengfeng Industrial City, No.739 Zhoushi Rd, Baoan District, Shenzhen,Guangdong, P.R.C.F5, Building B17, Hengfeng Industrial City, No.739 Zhoushi Rd,Baoan District, Shenzhen, Guangdong, P.R.C.

4.2 General Description of EUT

Product Name:	WM1110
Model No.:	WM1110-A,WM1110-S
Test Model No.:	WM1110-S
Trade mark:	Seeed Studio

4.3 Product Specification subjective to this standard

Frequency Range:	BLE: 2402MHz to 2480MHz FHSS/DTS LORA: 902MHz~928MHz
Modulation Type:	BLE: GFSK FHSS/DTS: LORA Chirp Spread Spectrum
Test Power Grade:	Default
Antenna Type	BLE: Chip Antenna LORA: Spring Antenna
Antenna Gain	BLE: 3 dBi FHSS/DTS: 3.17 dBi
Power Supply:	DC 3.3V
Max Conducted Peak Output Power:	BLE: 6.12 dBm, FHSS: 20.24dBm, DTS: 20.33dBm
	The Max Conducted Peak Output Power data refer to the report EED32O80763101, EED32O80763103 and EED32O80763104.
Sample Received Date:	May 30, 2022
Sample tested Date:	May 30, 2022 to Jun. 22, 2022

Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

Model No.:WM1110-A,WM1110-S

Only the model WM1110-S was tested, Their electrical circuit design, layout, components used and internal wiring are identical, the difference is whether it contains an authentication chip or not.

WM1110-S has two different models of encryption chips,WM1110-S will use either of these two encryption chips and the other parts will be exactly the same.

4.4 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.5 Deviation from Standards

None.

4.6 Abnormalities from Standard Conditions

None.

4.7 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ **Equation 1**

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm^2

5.2 Maximum Permissible Exposure

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm^2

TABLE 1 TO §1.1310(E)(1)—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 (minutes)
(i) 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
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) 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
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

1) For BLE

Measurement Data:

BLE_1M:

GFSK mode(Worst)				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	5.55	5.5±1	6.5	4.467
Middle(2440MHz)	5.81	5.5±1	6.5	4.467
Highest(2480MHz)	6.12	5.5±1	6.5	4.467

FHSS:

LORA mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(902.3MHz)	20.24	20±1	21	125.893
Middle(908.5MHz)	20.2	20±1	21	125.893
Highest(914.9MHz)	19.97	20±1	21	125.893

DTS: 500K

LORA mode(Worst)				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(903MHz)	20.33	20±1	21	125.893
Middle(907.8MHz)	20.2	20±1	21	125.893
Highest(914.2MHz)	20.12	20±1	21	125.893

BLE:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm	Limit (mW/cm^2)
39	2480	4.467	1.995	20	0.0018	1

FHSS:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
1	902.3	125.893	2.075	20	0.0520	0.6

DTS:500K

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
1	903	125.893	2.075	20	0.0520	0.6

Note: 1. Refer to report No. EED32O80763101, EED32O80763103, EED32O80763104.

2. BLE and Rola that simultaneous transmission is not possible

*** End of Report ***