FCC RF Exposure Test Report

Report No.	:	**W7L-P23070010SA01**
Applicant	:	**Thundercomm Technology Co., Ltd.**
Address	:	**No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122**
Product	:	**Edge AI Station**
FCC ID	:	**2AOHHEB5S**
Brand	:	**Thundercomm**
Model No.	:	**EB5S**
Standards	:	**FCC Part 2 (Section 2.1091)** **KDB 447498 D01 General RF Exposure Guidance v06**
Sample Received Date	:	**Sep. 09, 2023**
Date of Testing	:	**Sep. 09, 2023 ~ Oct. 31, 2023**

CERTIFICATION: The above equipment have been tested by **Huarui 7Layers High Technology (Suzhou) Co., Ltd.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by A2LA or any government agencies.

Prepared By : Jerry Chen / Engineer

Approved By : Luke Lu / Manager

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Release Control Record

Report No.	Reason for Change	Date Issued
W7L-P23070010SA01	Initial release	Oct. 31, 2023

1. Description of Equipment Under Test

EUT Type	Edge AI Station
Brand Name	Thundercomm
Model Name	EB5S
Tx Frequency Bands (Unit: MHz)	WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band IV: 1712.4 ~ 1752.6 WCDMA Band V : 826.4 ~ 846.6 LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 7 : 2502.5 MHz ~ 2567.5 MHz LTE Band 12 : 699.7 MHz ~ 715.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 14 : 790.5 MHz ~ 795.5 MHz LTE Band 17 : 706.5 MHz ~ 713.5 MHz LTE Band 25 : 1850.7 MHz ~ 1914.3 MHz LTE Band 26 : 814.7 MHz ~ 848.3 MHz LTE Band 30 : 2307.5 MHz ~ 2312.5 MHz LTE Band 38 : 2572.5 MHz ~ 2617.5 MHz LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz LTE Band 42 : 3452.5 MHz ~ 3547.5 MHz LTE Band 43 : 3602.5 MHz ~ 3697.5 MHz LTE Band 48 : 3552.5 MHz ~ 3697.5 MHz LTE Band 66 : 1710.7 MHz ~ 1779.3 MHz LTE Band 71 : 665.5 MHz ~ 695.5 MHz LTE Band CA_5B: 825.6MHz ~ 847.4MHz LTE Band CA_2C: 1853.3MHz ~ 1906.7MHz LTE Band CA_7C: 2505.5MHz ~ 2564.7Hz LTE Band CA_38C: 2577.5MHz ~ 2612.5Hz LTE Band CA_41C: 2499.3MHz ~ 2686.7Hz LTE Band CA_42C: 3453.3MHz ~ 3546.7Hz LTE Band CA_43C: 3703.3MHz ~ 3796.7Hz LTE Band CA_48C: 3553.3MHz ~ 3696.7Hz LTE Band CA_66B: 1712.5MHz ~ 1777.5MHz LTE Band CA_66C: 1713.3MHz ~ 1776.7MHz CA:UL CA_2A-4A; UL CA_2A-5A; UL CA_2A-7A; UL CA_2A-12A; UL CA_2A-13A; UL CA_2A-30A; UL CA_2A-66A;UL CA_4A-5A; UL CA_4A-7A; UL CA_4A-12A; UL CA_4A-13A; UL CA_4A-30A; UL CA_5A-7A; UL CA_5A-30A; UL CA_5A-66A; UL CA_12A-30A; UL CA_12A-66A; UL CA_13A-66A; UL CA_14A-30A NR Band n2:1852.5MHz ~ 1907.5MHz NR Band n5:826.5MHz ~ 846.5MHz NR Band n7:2502.5MHz ~ 2567.5MHz NR Band n12:701.5MHz ~ 713.5MHz NR Band n13:779.5MHz ~ 784.5MHz NR Band n14:790.5MHz ~ 795.5MHz NR Band n25:1852.5MHz ~1912.5MHz NR Band n26:816.5MHz ~846.5MHz NR Band n30:2307.5MHz ~2312.5MHz NR Band n38/n38 HPUE:2575MHz ~2615MHz NR Band n41/n41 HPUE: 2506.02MHz ~ 2679.99MHz NR Band n48: 3555MHz ~ 3694.98MHz NR Band n66: 1712.5MHz ~ 1777.5MHz NR Band n70: 1697.5MHz ~ 1707.5MHz NR Band n71: 665.5MHz ~ 695.5MHz NR Band n77 (Part27Q): 3455.01MHz ~ 3544.98MHz NR Band n77 (Part27O): 3705MHz ~ 3975MHz NR Band n78(Part27Q): 3455.01MHz ~ 3544.98MHz NR Band n78(Part27O): 3705MHz ~ 3795MHz ENDC:DC_13A_n66A;DC_5A_n2A;DC_14A_n2A;DC_30A_n2A;DC_2A_n5A;DC_30A_n5A;DC_66A_n5A;DC_2A_n12A;DC_66A_n12A;DC_2A_n66A;DC_5A_n66A;D

	C_12A_n66A;DC_14A_n66A;DC_30A_n66A;DC_12A_n2A;DC_66A_n2A;DC_71A_n2A;DC_12A_n41A;DC_71A_n66A;DC_2A_n71A;DC_66A_n71A;DC_66A_n25A;DC_25A_n41A;DC_12A_n78A;DC_13A_n78A;DC_25A_n78A;DC_12A_n77A;DC_13A_n77A;DC_14A_n77A;DC_26A_n78A;DC_2A_n78A;DC_26A_n41A;DC_2A_n41A;DC_7A_n5A;DC_38A_n78A;DC_7A_n71A;DC_41A_n78A;DC_5A_n7A;DC_12A_n7A;DC_66A_n7A;DC_13A_n2A;DC_48A_n5A;DC_48A_n66A;DC_7A_n66A;DC_2A_n48A;DC_5A_n48A;DC_13A_n48A;DC_66A_n48A;DC_4A_n78A;DC_20A_n77A;DC_5A_n78A;DC_4A_n41A;DC_66A_n38A;DC_2A_n38A;DC_12A_n38A;DC_4A_n38A;DC_5A_n38A;DC_66A_n78A;DC_12A_n25A;DC_25A_n77A;DC_2A_n77A;DC_71A_n78A;DC_71A_n38A;DC_13A_n7A;DC_5A_n41A;DC_66A_n41A;DC_2A_n7A;DC_7A_n2A;DC_5A_n40A;DC_30A_n77A;DC_41A_n77A;DC_7A_n78A;DC_48A_n25A;DC_66A_n28A;DC_71A_n41A;DC_28A_n66A;DC_30A_n12A;DC_2A_n14A;DC_30A_n14A;DC_66A_n14A;DC_2A_n30A;DC_5A_n30A;DC_12A_n30A;DC_14A_n30A;DC_66A_n30A;DC_71A_n7A;DC_7A_n12A;DC_5A_n77A;DC_66A_n77A;DC_71A_n77A;DC_4A_n2A;DC_7A_n25A;DC_71A_n25A;DC_5A_n25A;DC_26A_n25A;DC_4A_n7A;DC_13A_n25A;DC_7A_n77A;DC_48A_n71A; DC_48A_n12A WLAN : 2412 ~ 2462, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5700, 5745 ~ 5825
Uplink Modulations	WCDMA : BPSK/QPSK LTE : QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFMA(π/2 BPSK,QPSK,16QAM,64QAM,256QAM); CP-OFMA(QPSK,16QAM,64QAM,256QAM) 802.11b : DSSS 802.11a/g/n/ac/ax : OFDM
Antenna Type	WLAN: Fixed External Antenna WWAN: Fixed External Antenna
EUT Stage	Production Unit

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

2. MPE(Maximum Permissible Exposure) Assessment

2.1 Introduction

According to 47 CFR §2.1091, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitting antenna and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 cm separation requirement. The limits to be used for MPE evaluation are specified in §1.1310. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

2.2 RF Radiation Exposure Limits

According to 47 CFR §1.1310, the criteria listed in below table shall be used to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093.

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (min)
(A) Limits for Occupational / Controlled Exposures				
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 Exposures				
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

Limits for maximum permissible exposure (MPE)

Notes:

1. f = frequency in MHz
2. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided they are made aware of the potential for exposure.
3. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in

which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

2.3 MPE Assessment Method

Calculations can be made to predict RF field strength and power density levels around typical RF sources. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the general Equations below. This equation is generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction.

$$\text{Power Density (S)} = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where
S = Power Density, unit in mW/cm^2
P = Power input to the antenna, unit in mW
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, unit in cm
EIRP = Effective isotropically radiated power

2.4 MPE Calculation for Standalone Operations

The manufacturer expects that the radiated component of this device will not close to the human body during normal usage and the warning statement was also stated in the user instruction. Since the transmitting antenna will be kept at least 20 cm away from the human body, the MPE level is calculated based on this condition and the result is listed in below table.

CALCULATION FOR MAXIMUM E.I.R.P

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (mW)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit	Result (PASS / FAIL)
2.4GHz WLAN	-2.04	21	78.705	0.016	1.000	0.016	Pass
5.2GHz WLAN	-4.13	19.50	34.435	0.007	1.000	0.007	Pass
5.3GHz WLAN	-3.98	19.50	35.645	0.007	1.000	0.007	Pass
5.5GHz WLAN	-0.68	19.50	76.208	0.015	1.000	0.015	Pass
5.8GHz WLAN	-1.42	20.50	80.910	0.016	1.000	0.016	Pass
WCDMA Band II	-0.48	25	283.139	0.056	1.000	0.056	Pass
WCDMA Band IV	-1.45	25	226.464	0.045	1.000	0.045	Pass
WCDMA Band V	-1.35	25	231.739	0.046	0.551	0.084	Pass
LTE Band 2	-0.48	25	283.139	0.056	1.000	0.056	Pass
LTE Band 4	-1.45	25	226.464	0.045	1.000	0.045	Pass
LTE Band 5	-1.35	25	231.739	0.046	0.550	0.084	Pass
LTE Band 7	-0.56	25	277.971	0.055	1.000	0.055	Pass
LTE Band 12	-5.75	25	84.140	0.017	0.466	0.036	Pass
LTE Band 13	-4.92	25	101.859	0.020	0.520	0.039	Pass
LTE Band 14	-4.46	25	113.240	0.023	0.527	0.043	Pass
LTE Band 17	-5.75	25	84.140	0.017	0.471	0.036	Pass
LTE Band 25	-0.48	25	283.139	0.056	1.000	0.056	Pass
LTE Band 26	-1.35	25	231.739	0.046	0.543	0.085	Pass
LTE Band 30	-1.95	25	201.837	0.040	1.000	0.040	Pass
LTE Band 38	0.04	28	636.796	0.127	1.000	0.127	Pass
LTE Band 41	0.28	28	672.977	0.134	1.000	0.134	Pass
LTE Band 42	-1.24	28	474.242	0.094	1.000	0.094	Pass
LTE Band 43	-2.45	28	358.922	0.071	1.000	0.071	Pass
LTE Band 48	-1.84	25	207.014	0.041	1.000	0.041	Pass
LTE Band 66	-1.45	25	226.464	0.045	1.000	0.045	Pass
LTE Band 71	-5.87	25	81.846	0.016	0.444	0.037	Pass
LTE Band CA_5B	-1.35	25	231.739	0.046	0.550	0.084	Pass
LTE Band CA_2C	-0.48	25	283.139	0.056	1.000	0.056	Pass
LTE Band CA_7C	-0.56	25	277.971	0.055	1.000	0.055	Pass
LTE Band CA_38C	0.04	28	636.796	0.127	1.000	0.127	Pass
LTE Band CA_41C	0.28	28	672.977	0.134	1.000	0.134	Pass
LTE Band CA_42C	-1.24	28	474.242	0.094	1.000	0.094	Pass
LTE Band CA_43C	-2.45	28	358.922	0.071	1.000	0.071	Pass
LTE Band CA_48C	-1.84	25	207.014	0.041	1.000	0.041	Pass
LTE Band CA_66B	-1.45	25	226.464	0.045	1.000	0.045	Pass
LTE Band CA_66C	-1.45	25	226.464	0.045	1.000	0.045	Pass
NR Band n2	-0.48	25	283.139	0.056	1.000	0.056	Pass
NR Band n5	-1.35	25	231.739	0.046	0.551	0.084	Pass
NR Band n7	-0.56	25	277.971	0.055	1.000	0.055	Pass
NR Band n12	-5.75	25	84.140	0.017	0.468	0.036	Pass
NR Band n13	-4.92	25	101.859	0.020	0.520	0.039	Pass

NR Band n14	-4.46	25	113.240	0.023	0.527	0.043	Pass
NR Band n25	-0.48	25	283.139	0.056	1.000	0.056	Pass
NR Band n26	-1.35	25	231.739	0.046	0.544	0.085	Pass
NR Band n30	-1.95	25	201.837	0.040	1.000	0.040	Pass
NR Band n38/n38 HPUE	0.04	28	636.796	0.127	1.000	0.127	Pass
NR Band n38 MIMO	3.05	28	1273.503	0.253	1.000	0.253	Pass
NR Band n41/n41 HPUE	0.28	28	672.977	0.134	1.000	0.134	Pass
NR Band n41 MIMO	3.28	28	1342.765	0.267	1.000	0.267	Pass
NR Band n48	-1.84	25	207.014	0.041	1.000	0.041	Pass
NR Band n48 MIMO	1.17	25	414.000	0.082	1.000	0.082	Pass
NR Band n66	-1.45	25	226.464	0.045	1.000	0.045	Pass
NR Band n70	-1.45	25	226.464	0.045	1.000	0.045	Pass
NR Band n71	-5.87	25	81.846	0.016	0.444	0.037	Pass
NR Band n77	-1.24	28	474.242	0.094	1.000	0.094	Pass
NR Band n77 MIMO	1.17	28	826.038	0.164	1.000	0.164	Pass
NR Band n78	-1.24	28	474.242	0.094	1.000	0.094	Pass
NR Band n78 MIMO	1.17	28	826.038	0.164	1.000	0.164	Pass

2.5 CONCLUSION OF SIMULTANEOUS TRANSMITTER

Both of the WLAN and WWAN can transmit simultaneously, the formula of calculated the MPE is:

CPD1/LPD1+CPD2/LPD2+……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Band	Antenna Gain (dBi)	Maximum Tune up Power (dBm)	Average EIRP (mW)	Power Density (mW/cm^2)	Power Density / Limit	Σ(Power Density / Limit)	Limit	Result
WWAN	1.17	28	826.038	0.164	0.164	0.18	1.000	PASS
WLAN	-2.04	21	78.705	0.016	0.016			

Summary:

Since the ERP (effective radiated power) operated at < 1.5 GHz is less than 1.5 watts and > 1.5 GHz is less than 3 watts, the routine environmental evaluation is not required, and the MPE result calculated for this device complies with the MPE limit as specified in 47 CFR §1.1310.

3. Information on the Testing Laboratories

We, Huarui 7layers High Technology (Suzhou) Co., Ltd. ,were founded in 2020 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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