

Radio Test Report

Report No.: STS2312337H01

Issued for

PLUM Sp. z o.o.

ul. Wspolna 19, Ignatki, 16-001 Kleosin, Poland

Product Name: MacBAT 5

Brand Name: 

Model Name: 4GC14A0

Series Model(s): N/A

FCC ID: 2BECF-4GC14A0

Test Standard: FCC 47CFR §2.1091

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the ShenZhen STS Test Services Co., Ltd.

**TEST REPORT****Applicant's Name** : PLUM Sp. z o.o.

Address..... : ul. Wspolna 19, Ignatki, 16-001 Kleosin, Poland

Manufacturer's Name : PLUM Sp. z o.o.

Address..... : ul. Wspolna 19, Ignatki, 16-001 Kleosin, Poland

Product Description

Product Name : MacBAT 5

Brand Name..... : 

Model Name..... : 4GC14A0

Series Model(s)..... : N/A

Test Standards : FCC 47CFR §2.1091

447498 D01 Interim General RF Exposure Guidance v06

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the ShenZhen STS Test Services Co., Ltd.

Date of Test

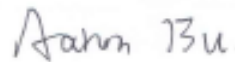
Date of receipt of test item: 11 Dec. 2023

Date (s) of performance of tests.....: 11 Dec. 2023 ~ 29 Dec. 2023

Date of Issue: 29 Dec. 2023

Test Result.....: **Pass**

Testing Engineer :



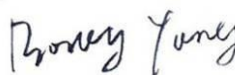
(Aaron Bu)

Technical Manager :



(Chris Chen)

Authorized Signatory :



(Bovey Yang)





TABLE OF CONTENTS

1. GENERAL INFORMATION	5
1.1 GENERAL DESCRIPTION OF THE EUT	5
1.2 TEST FACTORY	6
2. FCC 47CFR §2.1091 REQUIREMENT	7
2.1 TEST STANDARDS	7
2.2 LIMIT	7
2.3 TEST RESULT	8



Revision History

Rev.	Issue Date	Report No.	Effect Page	Contents
00	29 Dec. 2023	STS2312337H01	ALL	Initial Issue

1. GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF THE EUT

Product Name	MacBAT 5	
Brand Name		
Model Name	4GC14A0	
Series Model(s)	N/A	
Model Difference	N/A	
Product Description	The EUT is MacBAT 5	
	Operation Frequency:	NFC: 13.56MHz GSM850:824-849 MHz GSM900:880-915 MHz GSM1800:1710 ~ 1785 MHz GSM1900:1850-1910 MHz LTE Band 2:1850~1910MHz LTE Band 4:1710~1755MHz LTE Band 5:824~849MHz LTE Band 7:2500-2570MHz LTE Band 66:1710-1780 MHz
	Modulation Type:	NFC: ASK GMSK for GPRS LTE: QPSK /16QAM
	Antenna gain:	NFC:0 dBi GSM 850/900: 1.2dBi GSM 1800/1900: 5.2dBi LTE Band 5: 1.2dBi LTE Band 2/4/7/66: 5.2dBi
	Antenna Designation:	NFC: Coil GSM/LTE:PIFA
Rating	Input: 3.6 VDC (MacBAT5 lithium battery) 5.7 VDC (MacBAT5 external power) 12.0 VDC (INT-S3 interface)	
Hardware version number	H1.8.0	
Software version number	F01	



1.2 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : 101, Building B, Zhuoke Science Park, No.190 Chongqing Road, ZhanChengShequ, Fuhai Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01



2. FCC 47CFR §2.1091 REQUIREMENT

2.1 TEST STANDARDS

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The gain of the antennas used in the product is extracted from the Antenna data sheets provided and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis Transmission formula is far field assumption, the calculated result of that is an over-prediction for near field power density. It is taken as worst case to specify the safety range.

2.2 LIMIT

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)
Limits for Occupational / controlled Exposures			
300 - 1500	--	--	F/300
1500 – 100000	--	--	5.0
Limits for General population / Uncontrolled Exposure			
300 - 1500	--	--	F/1500
1500 – 100000	--	--	1.0

F= Frequency in MHz

Friss Formula

Friss Transmission Formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = Distance between observation point and the center of radiator in cm

If we know the maximum gain of the antenna and the total output power to the antenna, through calculation, we will know MPE value at distance 20cm.



2.3 TEST RESULT

Turn up

Mode	Detector	Turn up Power
NFC	AV	-61±1dBm
GPRS 850	AV	31±1dBm
GPRS 1900	AV	28±1dBm
LTE Band 2	AV	24±1dBm
LTE Band 4	AV	24±1dBm
LTE Band 5	AV	24±1dBm
LTE Band 7	AV	24±1dBm
LTE Band 66	AV	24±1dBm

Protocol	Fre. (MHz)	Separation distance (cm)	Max Turn up power (dBm)	ANT Gain (dBi)	Max EIRP (dBm)	Max EIRP (mW)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Ratio	Result
NFC	13.56	20	-60	0	-60	0.000001	0.000000002	1	0.000000002	Pass
GPRS 850	824	20	32.00	1.2	27.18	522.4	0.104	0.549	0.1892	Pass
GPRS 1900	1850	20	29.00	5.2	28.18	657.66	0.131	1	0.1308	Pass
LTE Band 2	1850	20	25.00	5.2	30.20	1047.1	0.208	1	0.2083	Pass
LTE Band 4	1710	20	25.00	5.2	30.20	1047.1	0.208	1	0.2083	Pass
LTE Band 5	824	20	25.00	1.2	26.20	416.87	0.083	0.549	0.1510	Pass
LTE Band 7	2500	20	25.00	5.2	30.20	1047.1	0.208	1	0.2083	Pass
LTE Band 66	1710	20	25.00	5.2	30.20	1047.1	0.208	1	0.2083	Pass

Multiple transmission:
$$\text{NFC} + \text{LTE Band 2} = 0.000000002 + 0.2083 = 0.2083000002 < 1$$

Note: 1. The Maximum power is less than the limit, complies with the exemption requirements.

2. ERP = EIRP - 2.15



3.

Function	Duty cycle	Duty cycle fator
GSM	12.50%	-9.03
GPRS(1slot)	12.50%	-9.03
GPRS(2slot)	25.00%	-6.02
GPRS(3slot)	37.50%	-4.26
GPRS(4slot)	50.00%	-3.01
WCDMA/HSPA	100%	0.00
FDD-LTE	100%	0.00
TDD-LTE	63.30%	-1.99

*****END OF THE REPORT*****