

**Maximum Permissible Exposure Report****1. Product Information**

FCC ID	: 2ACHBA100PRO
EUT	: GNSS Receiver
Test Model	: A100 Pro
Additional Model No.	: A100 Lite
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power Supply	: For Adapter: Input:100-240V~ 50/60Hz 2.0A Output: 12.0V=4.0A 48W For EUT: Input: 12.0V=4.0A
Hardware Version	: V1.1
Software Version	: V1.0.17_U
Bluetooth	
Frequency Range	: 2402MHz-2480MHz
Channel Number	: 40 channels for Bluetooth V5.1 (DTS)
Channel Spacing	: 2MHz for Bluetooth V5.1 (DTS)
Modulation Type	: GFSK for Bluetooth V5.1 (DTS)
Bluetooth Version	: V5.1
Antenna Description	: PIFA Antenna, 1.09dBi(Max.)
2G	
Support Band	: ☒ GSM 900 (EU-Band) ☒ DCS 1800 (EU-Band) ☒ GSM 850 (U.S.-Band) ☒ PCS 1900 (U.S.-Band)
Release Version	: R99
GPRS Class	: Class 12
Type Of Modulation	: GMSK for GSM/GPRS
Antenna Description	: PIFA Antenna 1.59dBi (max.) For GSM 850 1.59dBi (max.) For PCS 1900
3G	
Support Band	: ☒ WCDMA Band I (EU-Band) ☒ WCDMA Band II (U.S.-Band) ☒ WCDMA Band IV (U.S.-Band) ☒ WCDMA Band V (U.S.-Band) ☒ WCDMA Band VIII (EU-Band)
Release Version	: R11
Type Of Modulation	: QPSK, 16QAM
Antenna Description	: PIFA Antenna 1.59dBi (max.) For WCDMA Band II 1.59dBi (max.) For WCDMA Band IV 1.59dBi (max.) For WCDMA Band V
LTE	





Support Band	: ☒ E-UTRA Band 2(U.S.-Band) ☒ E-UTRA Band 4(U.S.-Band) ☒ E-UTRA Band 5(U.S.-Band) ☒ E-UTRA Band 7(U.S.-Band) ☒ E-UTRA Band 12(U.S.-Band) ☒ E-UTRA Band 13(U.S.-Band) ☒ E-UTRA Band 25(U.S.-Band) ☒ E-UTRA Band 26(U.S.-Band) ☒ E-UTRA Band 38(U.S.-Band) ☒ E-UTRA Band 41(U.S.-Band)
LTE Release Version	: R9
Type Of Modulation	: QPSK/16QAM
Antenna Description	: PIFA Antenna 1.59dBi (max.) For E-UTRA Band 2 1.59dBi (max.) For E-UTRA Band 4 1.59dBi (max.) For E-UTRA Band 5 1.59dBi (max.) For E-UTRA Band 7 1.59dBi (max.) For E-UTRA Band 12 1.59dBi (max.) For E-UTRA Band 13 1.59dBi (max.) For E-UTRA Band 25 1.59dBi (max.) For E-UTRA Band 26 1.59dBi (max.) For E-UTRA Band 38 1.59dBi (max.) For E-UTRA Band 41
Power Class	: Class 3
GPS function	: Support and only RX
Exposure category	: General population/uncontrolled environment
EUT Type	: Production Unit
Device Type	: Mobile Devices





2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3. 1 Refer Evaluation Method

[ANSI C95.1-2019](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices.





3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Uncontrolled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

4. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

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

5. Antenna Information

EUT can only use antennas certificated as follows provided by manufacturer;

Internal/External Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Internal	PIFA Antenna	2400-2500MHz	1.09dBi	BLE Antenna
Internal	PIFA Antenna	824-849MHz 1850-1910MHz 1710-1755MHz 1850-1910MHz 1710-1755MHz 824-849MHz	1.59dBi	2G/3G/LTE Antenna



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



		2500-2570MHz 699-716MHz 777-787MHz 1850-1915MHz 814-824MHz 824-849MHz 2570-2620MHz 2496-2690MHz		
--	--	--	--	--

6. Conducted Power

[BLE]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
GFSK	0	2402	1.05	1.0±1.0
	19	2440	0.68	0±1.0
	39	2480	-0.4	0±1.0

[GSM Max Average Power]

Test Mode	Channel	Frequency (MHz)	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
GSM 850	Low	824.2	31.90	32.0±1.0
	Middle	836.6	31.88	32.0±1.0
	High	848.8	31.93	32.0±1.0
GSM 1900	Low	1850.2	29.44	29.0±1.0
	Middle	1880.0	29.42	29.0±1.0
	High	1909.8	29.43	29.0±1.0

[WCDMA Max Average Power]

Test Mode	Channel	Frequency (MHz)	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
WCDMA Band II	Low	1852.4	23.23	23.0±1.0
	Middle	1880	23.52	23.0±1.0
	High	1907.6	23.11	23.0±1.0
WCDMA Band V	Low	826.4	22.86	22.0±1.0
	Middle	836.4	22.89	22.0±1.0
	High	846.6	22.70	22.0±1.0
WCDMA Band IV	Low	1712.4	23.11	23.0±1.0
	Middle	1732.6	23.40	23.0±1.0
	High	1752.6	23.22	23.0±1.0





[LTE Max Average Power]

Test Mode		Channel	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
LTE	Band 2	LCH	24.3	24.0±1.0
		MCH	24.55	24.0±1.0
		HCH	24.61	24.0±1.0
	Band 4	LCH	23.17	23.0±1.0
		MCH	23.3	23.0±1.0
		HCH	23.14	23.0±1.0
	Band 5	LCH	24.71	24.0±1.0
		MCH	24.83	24.0±1.0
		HCH	24.84	24.0±1.0
	Band 7	LCH	23.3	23.0±1.0
		MCH	23.6	23.0±1.0
		HCH	23.71	23.0±1.0
	Band 12	LCH	23.89	23.0±1.0
		MCH	23.98	23.0±1.0
		HCH	23.98	23.0±1.0
	Band 13	LCH	23.33	23.0±1.0
		MCH	23.39	23.0±1.0
		HCH	23.39	23.0±1.0
	Band 25	LCH	23.26	23.0±1.0
		MCH	23.58	23.0±1.0
		HCH	23.54	23.0±1.0
	Band 26	LCH	24.42	24.0±1.0
		MCH	24.34	24.0±1.0
		HCH	24.24	24.0±1.0
	Band 38	LCH	23.43	23.0±1.0
		MCH	23.56	23.0±1.0
		HCH	23.03	23.0±1.0
	Band 41	LCH	23.77	23.0±1.0
		MCH	23.88	23.0±1.0
		HCH	23.35	23.0±1.0





7. Measurement Results

7.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[BT LE]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
BT LE	2.0	1.5849	1.09	1.2853	0.0004	1.0000

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
GSM 850	32.0	1584.8932	1.59	1.4421	0.4549	0.5493
GSM 1900	30.0	1000.0000	1.59	1.4421	0.2870	1.0000
WCDMA Band II	24.0	251.1886	1.59	1.4421	0.0721	1.0000
WCDMA Band IV	24.0	251.1886	1.59	1.4421	0.0721	1.0000
WCDMA Band V	23.0	199.5262	1.59	1.4421	0.0573	0.5493
LTE Band 2	25.0	316.2278	1.59	1.4421	0.0908	1.0000
LTE Band 4	24.0	251.1886	1.59	1.4421	0.0721	1.0000
LTE Band 5	25.0	316.2278	1.59	1.4421	0.0908	0.5493
LTE Band 7	24.0	251.1886	1.59	1.4421	0.0721	1.0000
LTE Band 12	24.0	251.1886	1.59	1.4421	0.0721	0.4660
LTE Band 13	24.0	251.1886	1.59	1.4421	0.0721	0.5180
LTE Band 25	24.0	251.1886	1.59	1.4421	0.0721	1.0000
LTE Band 26	25.0	316.2278	1.59	1.4421	0.0908	0.5427
LTE Band 38	24.0	251.1886	1.59	1.4421	0.0721	1.0000
LTE Band 41	24.0	251.1886	1.59	1.4421	0.0721	1.0000

Remark:

1. Output power including turn-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.





8.2 Simultaneous Transmission MPE Evaluation

The sample support one BLE, another one GSM&WCDMA<E transmit antenna, so need consider simultaneous transmission;

Simultaneous transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\Sigma\Sigma$ of MPE ratios ≤ 1.0

Mode	MPE1 Max.	MPE2 Max.	Σ MPE ratios	Limit	Results
BT LE+GSM	0.0004	0.4549	0.4553	1.000	Pass
BT LE+WCDMA	0.0004	0.0721	0.0725	1.000	Pass
BT LE+LTE	0.0004	0.0908	0.0912	1.000	Pass

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----THE END OF REPORT-----



Shenzhen LCS Compliance Testing Laboratory Ltd.
Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com
Scan code to check authenticity