

SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

EMC-TRF-03 Rev 1.1

Report No.: GZCR241100135111

Page: 1 of 13

FCC ID: PX8CFNG-MRU

RF EXPOSURE EVALUATION REPORT

Application No.:	GZCR2411001351AT
Applicant:	Comba Telecom Network Systems Limited
Address of Applicant:	Flat/Rm 10, 3/F, Bio-Informatics Ctr, 2 Science Park West Avenue, HK Science Park, Pak Shek Kok, N.T. Hong Kong
Manufacturer:	Comba Network Systems Company Limited
Address of Manufacturer:	No. 10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R. China
Factory:	Comba Telecom Technology (Guangzhou) Ltd.
Address of Factory:	No. 6 Jinbi Road, Economics and Technology Development District, Guangzhou, Guangdong, China
Product Name:	Comflex NG
Model No.:	MRU-78517192537-AC, MRU-78517192537-DC *
♣	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Trade Mark:	Comba
Standard(s) :	47 CFR Part 2.1091 47 CFR Part 1.1310, Part 1.1307
Date of Receipt:	2024-11-13
Date of Evaluation:	2024-12-13
Date of Issue:	2024-12-20

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Jerry Chan
Manager



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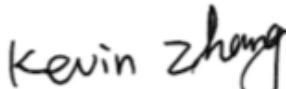
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Revision Record			
Version	Report No.	Date	Remark
01	GZCR241100135111	2024-12-20	Original

Authorized for issue by:			
	 _____ Kevin Zhang/Project Engineer		
	 _____ Ricky Liu/Reviewer		

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2 Evaluation Summary

Radio Spectrum Technical Requirement

Item	Standard	Requirement	Method	Result
RF Exposure	47 CFR Part 2.1091 47 CFR Part 1.1310 47 CFR Part 1.1307	47 CFR Part 1.1310	47 CFR Part 1.1310	PASS

* Declaration of EUT Family Grouping:

Model No.: MRU-78517192537-AC, MRU-78517192537-DC

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on power supply module.

Therefore, only one model MRU-78517192537-AC was evaluated in this report.



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4 General Information

4.1 Details of E.U.T.

Power Supply:	AC 100-240V, 50-60Hz	
Test Voltage:	AC 120V	
Cable:	AC mains (4m, unshielded)	
Operating Temperature:	-20 to +55 °C	
Operating Humidity:	≤95%	
Frequency Range:	Lower & Upper 700MHz	Uplink: 710-788MHz Downlink: 728-758MHz
	FirstNet	Uplink: 788-798MHz Downlink: 758-768MHz
	ESMR	Uplink: 817-824MHz Downlink: 862-869MHz
	Cellular	Uplink: 824-849MHz Downlink: 869-894MHz
	Broadband PCS	Uplink: 1850-1915MHz Downlink: 1930-1995MHz
	AWS-2	Uplink: 1915-1920MHz Downlink: 1995-2000MHz
	EAWS	Uplink: 1695-1780MHz Downlink: 2110-2200MHz
	BRS/EBS	Uplink: 2496-2690MHz Downlink: 2496-2690MHz
	3.45GHz Service band	Uplink: 3450-3550MHz Downlink: 3450-3550MHz
	3.7GHz Service band	Uplink: 3700-3980MHz Downlink: 3700-3980MHz
Support Technology:	LTE	
	5G NR	
Interface:	Antenna Port	1 (4.3-10 Female)
	Optical Port	1 (SC-APC)
	OMT Port	1 (RJ-45)

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Normal Output Power: (per antenna port, only downlink)	Lower & Upper 700MHz	30dBm
	FirstNet	30dBm
	ESMR	30dBm
	Cellular	30dBm
	Broadband PCS	33dBm
	AWS-2	33dBm
	EAWS	33dBm
	BRS/EBS	37dBm
	3.45GHz Service band	37dBm
	3.7GHz Service band	37dBm
Normal System Gain: (only downlink)	Lower & Upper 700MHz	15dB
	FirstNet	15dB
	ESMR	15dB
	Cellular	15dB
	Broadband PCS	18dB
	AWS-2	18dB
	EAWS	18dB
	BRS/EBS	22dB
	3.45GHz Service band	22dB
	3.7GHz Service band	22dB
Antenna Type:	External Dedicated Antenna	
Permission Antenna Gain:	5dBi or less	
Software Version:	V01.00.00.04	
Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.		



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4.2 Evaluated Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou,
Guangdong, China 510663

Tel: +86 20 82155555

4.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

- **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IEC600 01 and Rules of procedure IEC600 02, and the relevant IEC600 CB-Scheme Operational documents.

4.4 Deviation from Standards

None

4.5 Abnormalities from Standard Conditions

None



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5 Radio Spectrum Technical Requirement

5.1 RF Exposure

5.1.1 Requirement

In accordance with 47 CFR FCC Part 2.1091, this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

According to 47 CFR FCC Part 1310, the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in Part 1.1307(b).

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				
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

f = frequency in MHz. * = Plane-wave equivalent power density

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5.1.2 Method

According to IEEE C95.3:2002 section 5.5.1.1, the power density S at a point on the axis at a distance d from a transmitting antenna is given by the Friis free-space transmission formula:

$$S = \frac{PG}{4\pi d^2}$$

S = power density (mW/cm^2)
 P = the net power delivered to the antenna (mW)
 G = gain of the antenna in linear scale
 d = distance between observation point and center of the radiator (cm)

From the maximum EUT RF output power, as well as the gain of the used antenna, according to the RF power density limit stated in above table, the minimum distance between the antenna and human body will be calculated.

5.1.3 Conclusion**For Lower & Upper 700MHz Band (728-758MHz, downlink)**

1. According to the the test report GZCR241100135102, the tested maximum conducted power was within the tune up power range (30 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum tune up tolerance power is 32 dBm= 1.59W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.
4. The limit of Power Density (S) (mW/cm^2)= $f/1500= 0.49mW/cm^2= 4.9W/m^2$ ($f=728$ MHz for worst-case).

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit1}) (W/m^2)	Power Density (S_1) (W/m^2)
3.162	1.59	4.9	$0.41/d^2$

For FirstNet Band (758-768MHz, downlink)

1. According to the the test report GZCR241100135103, the tested maximum conducted power was within the tune up power range (30 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum total tune up tolerance power is 32 dBm= 1.59W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.
4. The limit of Power Density (S) (mW/cm^2)= $f/1500= 0.51mW/cm^2= 5.1W/m^2$ ($f=758$ MHz for worst-case).

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit2}) (W/m^2)	Power Density (S_2) (W/m^2)
3.162	1.59	5.1	$0.41/d^2$

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For ESMR Band (862-869MHz, downlink)

1. According to the the test report GZCR241100135104, the tested maximum conducted power was within the tune up power range (30 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum tune up tolerance power is 32 dBm= 1.59W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.
4. The limit of Power Density (S) (mW/cm^2)= $f/1500= 0.57\text{mW/cm}^2= 5.7\text{W/m}^2$ ($f=862\text{MHz}$ for worst-case).

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit3}) (W/m^2)	Power Density (S_3) (W/m^2)
3.162	1.59	5.7	0.41/d ²

For Cellular Band (869-894MHz, downlink)

1. According to the the test report GZCR241100135105, the tested maximum conducted power was within the tune up power range (30 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum total tune up tolerance power is 32 dBm= 1.59W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.
4. The limit of Power Density (S) (mW/cm^2)= $f/1500= 0.58\text{mW/cm}^2= 5.8\text{W/m}^2$ ($f=869\text{MHz}$ for worst-case).

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit4}) (W/m^2)	Power Density (S_4) (W/m^2)
3.162	1.59	5.8	0.41/d ²

For Broad PCS Band (1930-1995MHz, downlink)

1. According to the the test report GZCR241100135106, the tested maximum conducted power was within the tune up power range (33 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum total tune up tolerance power is 35 dBm= 3.17W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit5}) (W/m^2)	Power Density (S_5) (W/m^2)
3.162	3.17	10	0.80/d ²

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For AWS-2 Band (1995-2000MHz, downlink)

1. According to the the test report GZCR241100135107, the tested maximum conducted power was within the tune up power range (33 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum total tune up tolerance power is 35 dBm= 3.17W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit6}) (W/m ²)	Power Density (S_6) (W/m ²)
3.162	3.17	10	0.80/d ²

For EAWS Band (2110-2200MHz, downlink)

1. According to the the test report GZCR241100135107, the tested maximum conducted power was within the tune up power range (33 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum total tune up tolerance power is 35 dBm= 3.17W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit7}) (W/m ²)	Power Density (S_7) (W/m ²)
3.162	3.17	10	0.80/d ²

For BRS/EBS Band (2496-2690MHz, downlink)

1. According to the the test report GZCR241100135108, the tested maximum conducted power was within the tune up power range (37 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum tune up tolerance power is 39 dBm= 7.95W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit8}) (W/m ²)	Power Density (S_8) (W/m ²)
3.162	7.95	10	2.01/d ²

For 3.45GHz Service Band (3450-3550MHz, downlink)

4. According to the the test report GZCR241100135109, the tested maximum conducted power was within the tune up power range (37 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
5. The maximum tune up tolerance power is 39 dBm= 7.95W.
6. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit9}) (W/m ²)	Power Density (S_9) (W/m ²)
3.162	7.95	10	2.01/d ²



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For 3.7GHz Service Band (3700-3980MHz, downlink)

1. According to the test report GZCR241100135110, the tested maximum conducted power was within the tune up power range (37 ± 2 dBm) and the maximum tune up power was utilized as worst case for RF exposure evaluation.
2. The maximum total tune up tolerance power is 39 dBm = 7.95W.
3. According to the declaration from the applicant, the permitted maximum antenna gain is 5dBi.

Maximum Antenna Gain (Numeric)	Max. tune up tolerance power (W)	Limit of Power Density (S_{limit10}) (W/m ²)	Power Density (S_{10}) (W/m ²)
3.162	7.95	10	$2.01/d^2$

For multiple simultaneous transmission sources, the calculated Power Density should comply with:

$$(S_1/S_{\text{limit1}}) + (S_2/S_{\text{limit2}}) + (S_3/S_{\text{limit3}}) + (S_4/S_{\text{limit4}}) + (S_5/S_{\text{limit5}}) + (S_6/S_{\text{limit6}}) + (S_7/S_{\text{limit7}}) + (S_8/S_{\text{limit8}}) + (S_9/S_{\text{limit9}}) + (S_{10}/S_{\text{limit10}}) \leq 1$$
$$(0.41/d^2) + (0.41/d^2) + (0.41/d^2) + (0.41/d^2) + (0.80/d^2) + (0.80/d^2) + (0.80/d^2) + (2.01/d^2) + (2.01/d^2) + (2.01/d^2) \leq 1$$
$$d \geq 3.2$$

So the permitted use distance away from EUT external antenna is larger than 3.2m.



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5.2 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2411001351AT.

- End of the Report -



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