

RF EXPOSURE EVALUATION REPORT

Application No.: GZCR2303000220AT
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

Equipment Under Test (EUT):
EUT Name: Comflex NGc
Model No.: ARU-6B-Internal (ARU)
Comflex NGc MU (MU)
Trade Mark: Comba
Standard(s) : 47 CFR Part 2.1091
47 CFR Part 1.1310, Part 1.1307
Date of Receipt: 2023-03-01
Date of Evaluation: 2023-07-25
Date of Issue: 2023-08-08

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





Ricky Liu
Manager



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Revision Record			
Version	Chapter	Date	Modifier Remark
01	GZCR230300022003	2023-08-08	Original

Authorized for issue by:			
			
	Kevin Zhang /Project Engineer		
			
	Jerry Chan /Reviewer		



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2 Evaluation Summary

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

Note:

E.U.T./ EUT means Equipment Under Test

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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4 General Information

4.1 Details of EUT

Power Supply:	MU: AC 100-240V, 50/60Hz ARU: DC 48V
Operating Temperature:	MU: 0 to +45 °C ARU: -20 to +55 °C
Operating Humidity:	≤85%
Frequency Range:	Lower 700MHz: Uplink: 698-716MHz Downlink: 728-746MHz Upper 700MHz: Uplink: 777-787MHz Downlink: 746-756MHz Cellular: Uplink: 824-849MHz Downlink: 869-894MHz AWS: Uplink: 1710-1755MHz Downlink: 2110-2155MHz Broadband PCS: Uplink: 1850-1915MHz Downlink: 1930-1995MHz
Interface:	MU Input Port 1 (4.3-10-Female) Debug Port 1 (RJ45) ARU Input Port 2 (N-Female ,1 port for Rx only, 1 port for Tx only) Debug Port 1 (Type-c)
Radio System Type:	MU WCDMA, LTE ARU WCDMA, LTE
Minimum Bandwidth:	5MHz
Normal Output Power: (conducted)	Uplink 19dBm (conducted) Downlink 10dBm/5MHz (EIRP)
Normal System Gain:	Uplink 80dB Downlink 80dB
Antenna Type:	MU External dedicated antenna ARU Integral antenna
Permission Antenna Gain:	MU 10dBi or less declared from the manufacturer
Antenna Gain:	ARU 4dBi declared from the manufacturer
Antenna Frequency:	ARU Ant 1: 728-756MHz, 1930-1995MHz Ant 2: 824-894MHz, 1850-1915MHz Ant 3: 698-716MHz, 777-787MHz, 1710-1755MHz, 2110-2155MHz
Software Version:	MU ChassisOAMV0100.01c ARU ARUFGAV0100.01c



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4.2 Evaluated Location

All evaluation were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

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, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE 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 Part1.1307(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/cm²)
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

Normal use condition for Distance between antenna and body: $\geq 30\text{cm}$ declared by the manufacturer, the worst case 30cm used for exposure calculation.

Antenna Gain: For uplink, 10 dBi or less, the worst case 10dBi used for exposure calculation.
For downlink, 4dBi

RF exposure evaluation for UL and DL simultaneous emission: Product manual request the min cable length for both connect donor antenna to booster and server antenna to booster is 5 meters, So the exposure evaluation only the UL and DL single transmission be concerned in this report even if the product UL and DL simultaneous emission during operation.

For downlink: the max tune up conducted power 6dBm as worst case used for exposure evaluation.

Band	Max. Antenna Gain (Numeric)	Max. tune up tolerance power (dBm)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Result
Lower 700MHz	2.512	6	0.00089	0.4853	Complies
Upper 700MHz	2.512	6	0.00089	0.4973	Complies
Cellular	2.512	6	0.00089	0.5793	Complies
AWS-1	2.512	6	0.00089	1	Complies
Broadband PCS	2.512	6	0.00089	1	Complies

Remark:
 For Lower 700MHz band, the limit is $f/1500 = 728/1500 = 0.4853 \text{ mW/cm}^2$ for the stringent limit.
 For Upper 700MHz band, the limit is $f/1500 = 746/1500 = 0.4973 \text{ mW/cm}^2$ for the stringent limit.
 For Cellular band, the limit is $f/1500 = 869/1500 = 0.57933 \text{ mW/cm}^2$ for the stringent limit.



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For uplink: the max tune up conducted power 20dBm as worst case used for exposure evaluation

Band	Max. Antenna Gain (Numeric)	Max. tune up tolerance power (dBm)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Result
Lower 700MHz	10	20	0.0223	0.4653	Complies
Upper 700MHz	10	20	0.0223	0.518	Complies
Cellular	10	20	0.0223	0.5493	Complies
AWS-1	10	20	0.0223	1	Complies
Broadband PCS	10	20	0.0223	1	Complies

Remark:

For Lower 700MHz band, the limit is $f/1500 = 698/1500 = 0.4653$ mW/cm² for the stringent limit.

For Upper 700MHz band, the limit is $f/1500 = 777/1500 = 0.518$ mW/cm² for the stringent limit.

For Cellular band, the limit is $f/1500 = 824/1500 = 0.5493$ mW/cm² for the stringent limit.

For uplink, all bands can simultaneous transmitting, the maximum rate of MPE is

$$(0.0223/0.4653) + (0.0223/0.518) + (0.0223/0.5493) + (0.0223/1) + (0.0223/1) = 0.176 \leq 1.0$$

For downlink, all bands can simultaneous transmitting, the maximum rate of MPE is

$$(0.00089/0.4853) + (0.00089/0.4973) + (0.00089/0.5793) + (0.00089/1) + (0.00089/1) = 0.0069 \leq 1.0$$

So SAR report is not required.

Remark:

The donor antenna and service antenna must maintain sufficient distance to ensure isolation, otherwise the EUT will be shut down due to oscillation.

Therefore, the exposure evaluation only the UL and DL single transmission was concerned in this report even if the product UL and DL simultaneous emission during operation.



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6 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2303000220AT.

- End of the Report -



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