

TEST REPORT

Application No.: GZCR2310001046AT
Applicant: Comba Network (Singapore) Pte Ltd
Address of Applicant: 80 Playfair Road, Kapo Factory Building, #01-18. Singapore 367998
Manufacturer: COMBA NETWORK SYSTEMS COMPANY LTD
Address of Manufacturer: No.10, Shenzhou Road, Guangzhou Science City, Guangzhou, Guangdong, P.R. China
Factory: COMBA NETWORK SYSTEMS COMPANY LTD
Address of Factory: No.10, Shenzhou Road, Guangzhou Science City, Guangzhou, Guangdong, P.R. China
Equipment Under Test (EUT):
EUT Name: LTE800 Digital Wireless Repeater
Model No.: TP-WE-WR-DSL080B220P43Q-UK-MW
Trade Mark: Comba
Standard(s) : 47 CFR Part 2
47 CFR Part 20
47 CFR Part 90
Date of Receipt: 2023-10-11
Date of Test: 2023-10-16 to 2023-11-10
Date of Issue: 2024-04-08

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

Ricky Liu

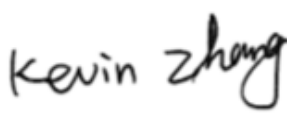
Ricky Liu
Manager



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Revision Record			
Version	Report No.	Date	Remark
01	GZCR231000104603	2024-04-08	Original

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



2 Test Summary

Item	Standard	Method	Requirement	Result
Out-of-band rejection	KDB935210 D05 v01r04	KDB935210 D05 v01r04 clause 3.3	KDB935210 D05 v01r04 clause 3.3	Pass
Input-versus-output signal comparison	47 CFR Part 2	KDB935210 D05 v01r04 clause 3.4	Part 2.1049	Pass
Mean output power and amplifier/booster gain	47 CFR Part 90	KDB935210 D05 v01r04 clause 3.5	Part 90.635	Pass
Out-of-band/out-of-block(including intermodulation) emissions		KDB935210 D05 v01r04 clause 3.6	Part 90.691	Pass
Conducted spurious emissions		KDB935210 D05 v01r04 clause 3.6	Part 90.691	Pass
Frequency stability		47 CFR Part 2.1055 KDB935210 D05 v01r04 clause 3.7 ANSI C63.26-2015 Clause 5.6	Part 90.213	Pass
Radiated spurious emissions		KDB935210 D05 v01r04 clause 3.8 ANSI C63.26-2015 Clause 5.5	Part 90.691	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.

The present report covers requirements for 817-824MHz/862-869MHz.



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4 General Information

4.1 Details of EUT

Power Supply:	AC 120V, 50~60Hz	
Test Voltage:	AC 120V	
Cable:	AC mains (1.5m, unshielded)	
Operating Temperature:	-25 to +55 °C	
Operating Humidity:	5% to 95%	
Frequency Range:	Uplink	806-817MHz & 817-824MHz
	Downlink	851-862MHz & 862-869MHz
Support Technology:	LTE	
Support Channel BW:	LTE	5MHz/10MHz
Interface:	Antenna Port	2 (4.3-10 Female)
	Debug Port	1 (RJ-45)
Normal Output Power: (per antenna port)	Uplink	27dBm
	Downlink	40dBm
Normal Gain:	Uplink	90dB
	Downlink	95dB
Declared Antenna Type:	External Dedicated Antenna	
Declared Permission	10dBi or less	
Antenna Gain:		
Software Version:	V01.00.00.00	

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	LENOVO	Lenovo Xiaoxinchao 5000	PF0TNMG8
Mathced load and attenuator supplied by the client	/	/	/



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4.3 Test Environment

Environment Parameter	Selected Values During Test	
Ralative Humidity	Ambient	
Value	Temperature (°C)	Voltage (V)
TNVN	Asmbient	AC 120
TLVL	-30	AC 102
TLVH	-30	AC 138
THVL	+50	AC 102
THVH	+50	AC 138

VN: Normal Voltage, TN: Normal Teperature

VL: Lower Extreme Voltege, VH: Higher Extreme Voltage

TL: Lower Extreme Teperature, TH: Higher Extreme Teperature

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	RF Output Power	±0.75dB
2	Transmitter unwanted emissions	±0.75dB
3	Radiated Spurious Emission	±5.06dB (30MHz-1GHz; 3m); ±4.46dB (30MHz-1GHz; 10m); ±5.08dB (1GHz-6GHz); ±5.14dB (6GHz-18GHz)
4	Occupied Channel Bandwidth	± 3%

Remark:
The test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



4.5 Test Signals and Test Channels

Downlink: 862-869MHz			
Test Channel	Test Frequency (MHz)	Test Signal	Stimulus Condition
LCH	864.5	4.1MHz AWGN	a single test signal
MCH	865.5		
HCH	866.5		
LCH	862.2	GSM-TDMA	a single test signal
MCH	865.5		
HCH	868.8		
LCH	862.6, 862.8		two adjacent test signals
HCH	868.4, 868.8		

Uplink: 817-824MHz			
Test Channel	Test Frequency (MHz)	Test Signal	Stimulus Condition
LCH	819.5	4.1MHz AWGN	a single test signal
MCH	820.5		
HCH	821.5		
LCH	817.2	GSM-TDMA	a single test signal
MCH	820.5		
HCH	823.8		
LCH	817.2, 817.6		two adjacent test signals
HCH	823.4, 823.8		

Remark:

1. The AWGN test signal that have a 4.1MHz 99% occupied bandwidth is representative of a 5MHz LTE channel.
2. The EUT cannot accommodate two simultaneous AWGN signals within the passband, it should be excluded from the Out-of-band/out-of-block emissions test with two AWGN signals input



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4.6 Test 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

No tests were sub-contracted.

4.7 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.

4.8 Deviation from Standards

None

4.9 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted test equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	EMC0039	2023-06-29	2024-06-28
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
MXA Signal Analyzer (10Hz-50GHz)	KEYSIGHT	N9020B	SEM004-24	2023-03-20	2024-03-19
4X4 Power Sensor Unit	TST	TSPS2023R	EMC2257	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-78	N/A	N/A
ESG vector signal generator (250kHz-6GHz)	Agilent Technologies	E4438C	SEM006-03	2023-02-20	2024-02-19

Radiated Emissions (30MHz-1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2229	2023-02-20	2024-02-19
966 Anechoic Chamber	Shenzhen C.R.T Technology Co., LTD	9mX6mX6m	EMC2230	2022-04-12	2025-04-11
Network Analyzer (100k-8.5GHz)	KEYSIGHT	ENA Series E5071C	EMC2191	2023-03-02	2024-03-01
Amplifier (9k-1000MHz)	SONOMA	310	EMC2237	2023-04-13	2024-04-12
TRILOG Broadband Antenna (25M-2GHz)	SCHWARZBECK	VULB 9168	EMC2238	2022-04-20	2025-04-19
Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2251	2022-08-02	2025-08-01
Coaxial Cable	Times Microwave	TMC- AMI19394A	EMC239	2022-05-18	2024-05-17
TRILOG Broadband Antenna (25M-2GHz)	SCHWARZBECK	VULB 9168	SEM003-18	2022-03-03	2025-03-02
EMI Test Receiver (1Hz- 8GHz)	Rohde & Schwarz	ESW8	EMC2220	2023-05-19	2024-05-18



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Radiated test equipment (above 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2022-12-16	2023-12-15
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2023-08-21	2024-08-20
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2022-12-16	2023-12-15
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2022-08-24	2024-08-23
Chamber Cable (Below 1GHz)	Scoflex	KMKM-8.0m	EMC0546	2022-08-24	2024-08-23
Trilog Broadband Antenna (25MHz-1GHz)	SCHWARZBECK	VULB 9160	EMC2025	2022-09-07	2025-09-06
Horn Antenna (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2022-09-21	2025-09-20
Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2251	2022-02-02	2025-08-01
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17
Broad-Band Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2021-7-11	2024-07-10
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



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6 Radio Spectrum Matter Test Results

6.1 Out-of-band rejection

Test Requirement: KDB 935210 D05 clause 3.3

Test Method: KDB 935210 D05 clause 3.3

Limit: Within the passband

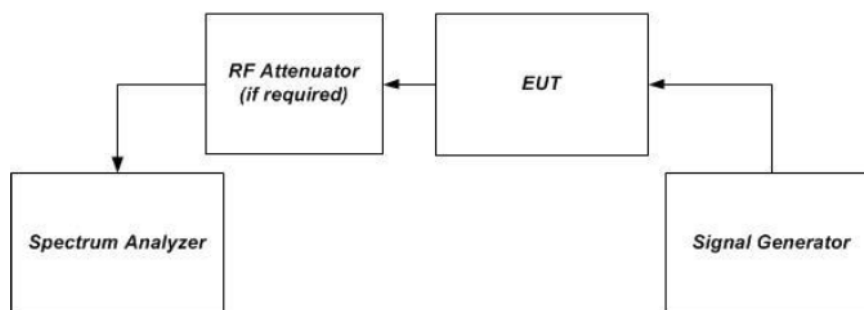
6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24.4 °C Humidity: 58 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.1.2 Test Setup



6.1.3 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



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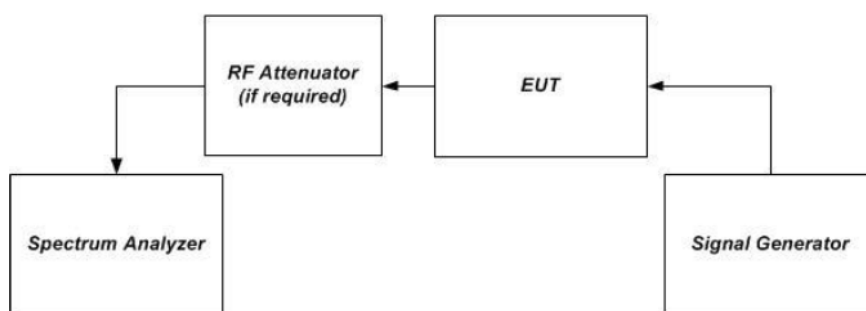
6.2 Input versus output comparison

Test Requirement: 47 CFR Part 2.1049
 Test Method: KDB 935210 D05 clause 3.4
 Limit: The spectral plots of the output signal and the input signal are similar (in passband and rolloff characteristic features and relative spectral locations).

6.2.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.4 °C Humidity: 58 % RH Atmospheric Pressure: 1008 mbar
 EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.2.2 Test Setup



6.2.3 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



6.3 Mean output power and amplifier/booster gain

Test Requirement: 47 CFR Part 90.635

Test Method: KDB 935210 D05 clause 3.5

Limit: The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

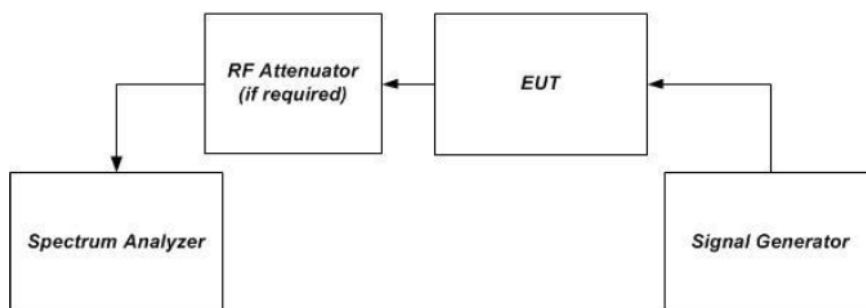
6.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.4 °C Humidity: 58 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.3.2 Test Setup



6.3.3 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



6.4 Out-of-band/out-of-block(including intermodulation) emissions

Test Requirement: 47 CFR Part 90.691

Test Method: KDB 935210 D05 clause 3.6

Limit: For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

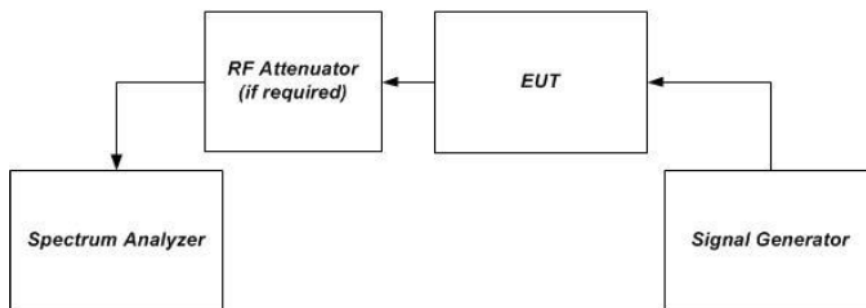
6.4.1 E.U.T. Operation

Operating Environment:

Temperature: 24.4 °C Humidity: 58 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.4.2 Test Setup



6.4.3 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



6.5 Conducted Spurious emissions

Test Requirement: 47 CFR Part 90.691

Test Method: KDB 935210 D05 clause 3.6

Limit: (a)(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(a)(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

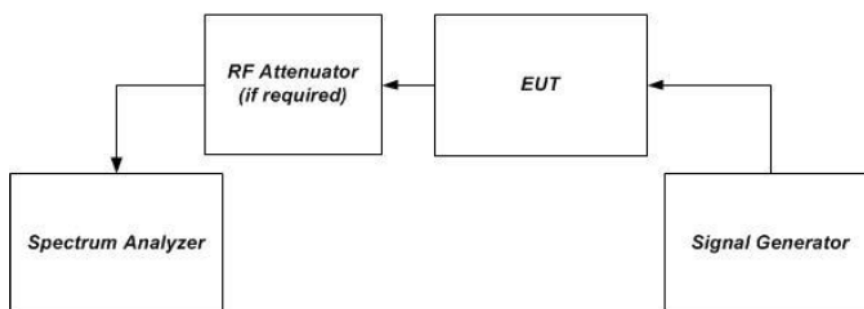
6.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24.4 °C Humidity: 58 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.5.2 Test Setup



6.5.3 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



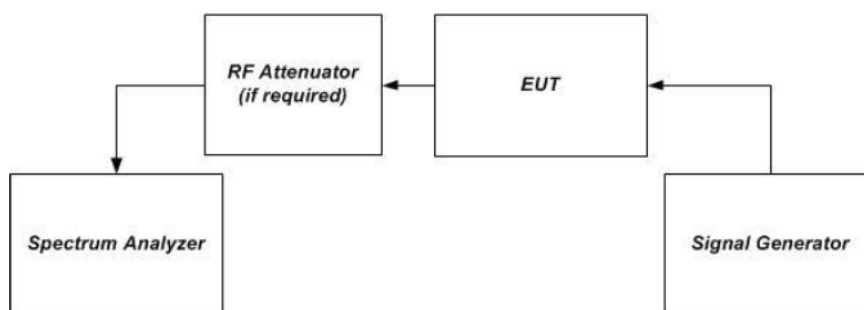
6.6 Frequency Stability

Test Requirement: 47 CFR Part 90.213
 Test Method: 47 CFR Part 2.1055
 KDB 935210 D05 clause 3.7
 ANSI C63.26-2015 clause 5.6
 Limit: ≤ 1.5 ppm

6.6.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.4 °C Humidity: 58 % RH Atmospheric Pressure: 1008 mbar
 EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.6.2 Test Setup



6.6.3 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



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6.7 Radiated Spurious emission

Test Requirement: 47 CFR Part 90.691

Test Method: KDB 935210 D05 clause 3.8
ANSI C63.26-2015 clause 5.5

Limit: For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

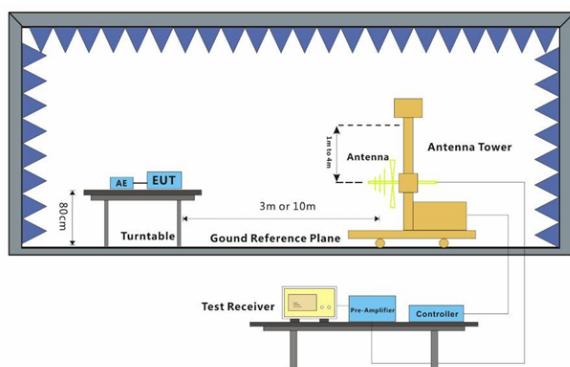
6.7.1 E.U.T. Operation

Operating Environment:

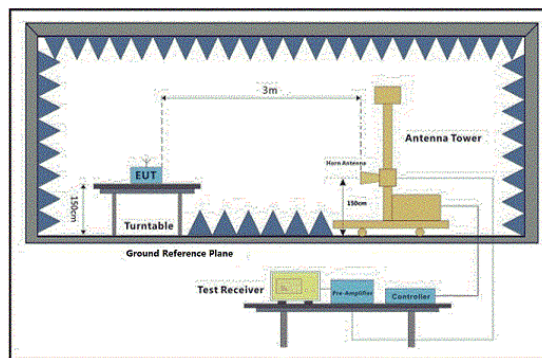
Temperature: 25.3 °C Humidity: 62 % RH Atmospheric Pressure: 1020 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.7.2 Test Setup



below 1GHz



above 1GHz



6.7.3 Test procedure

1. Scan from 30MHz to 40GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Below 1GHz test procedure as below:

- 1) The EUT was powered on and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) Rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 3) Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 4) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 5) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.
- 6) The output power into the substitution antenna was then measured.
- 7) Steps 5) and 6)were repeated with both antennas vertically polarized.
- 8) Calculate power in dBm by the following formula:

Level (dBm) = Read Level (dBm) + Correction Factor (dB)

Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.
 - 2) Calculate power in dBm by the following formula:
- Level (dBm) = Read Level (dBm) + Correction Factor (dB)

6.7.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR231000104603.



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7 Test Setup Photographs

Refer to Appendix - Test Setup Photos for report GZCR2310001046AT.

8 EUT Constructional Details (EUT Photos)

Refer to Appendix -External and Internal Photos for GZCR2310001046AT.

- End of the Report -



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