

TEST REPORT

Application No.: GZCR2306000568AT
Applicant: Corning Optical Communication LLC
Address of Applicant: 6 Concord Road, Shrewsbury, Massachusetts 01545 United States
Manufacturer: Comba Network Systems Company Limited
Address of Manufacturer: No. 10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R.China

Equipment Under Test (EUT):

EUT Name: digital Medium-power Remote Unit
Model No.: dMRU-G2-1719
Trade Mark: Corning
Standard(s) : 47 CFR Part 2
47 CFR Part 20
47 CFR Part 27

Date of Receipt: 2023-06-08
Date of Test: 2023-06-15 to 2023-06-29
Date of Issue: 2023-06-30

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	Remark
01	GZCR230600056802	2023-06-30	Original

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



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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 27	KDB935210 D05 v01r04 clause 3.5	Part 27.50(d)(2) Part 27.50(d)(5)	Pass
Out-of-band/out-of-block(including intermodulation) emissions		KDB935210 D05 v01r04 clause 3.6	Part 27.53(h)(1)	Pass
Conducted spurious emissions		KDB935210 D05 v01r04 clause 3.6	Part 27.53(h)(1)	Pass
Frequency stability		47 CFR Part 2.1055 KDB935210 D05 v01r04 clause 3.7 ANSI C63.26-2015 Clause 5.6	Part 27.54	Pass
Radiated spurious emissions		KDB935210 D05 v01r04 clause 3.8 ANSI C63.26-2015 Clause 5.5	Part 27.53(h)(1)	Pass

The EUT is a remote unit of DAS which can be capable of multi-band operation (details refer to clause 4.1 of this report). It receives base-station downlink via fiber-optic or coaxial cable from host unit, transmits via antenna to handset, and returns handset uplink via fiber-optic or coaxial cable to host unit.

Only test for AWS-1&-2&-3&-4 band downlink in this report.

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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For AWS-4 band (2000-2020MHz), based on TCB Workshop November 2017 guidance:

- 2000-2020 MHz downlink transmitters (e.g., base station, booster/DAS coverage unit)
 - Where DA-13-2409* qualifies:
 - 27.50(d)(1) (low density) or 27.50(d)(2) power limits are applicable, rather than 27.50(d)(7) (max. 5 mW EIRP in 2000-2005 MHz; 2 W EIRP in 2005-2020 MHz)
 - 27.53(h)(1) emission limit is applicable $[43 + 10\log(P)]$, rather than 27.53(h)(2)(ii) $\{[70 + 10\log(P)]\}$ for f below 2000 MHz

Discussion in docket No. DA 13-2409 action 47 :

the requirements specified in sections 27.50(d) and 27.53(h)(1) should be followed for downlink operation in the lower AWS-4 band (2000-2020MHz), the technical rules 27.53(h)(2)(ii) and 27.50(d)(7) can be waived.



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4 General Information

4.1 Details of EUT

Power Supply:	AC 100-240V, 50/60Hz		
Test Voltage:	AC 110V		
Cable:	AC mains (4m, unshielded)		
Operating Temperature:	-40 to +55 °C		
Operating Humidity:	≤95%		
Frequency Range:	AWS-1&-3&-4	Uplink: 1710-1755MHz Downlink: 2110-2200MHz	
	Broadband PCS	Uplink: 1850-1915MHz Downlink: 1930-1995MHz	
	AWS-2&-4	Uplink: 1915-1920MHz Downlink: 1995-2020MHz	
	Support Technology:	LTE 5G NR	
	Support Channel BW:	LTE	10MHz/20MHz
		5G NR	10MHz/20MHz/40MHz/50MHz/60MHz/80MHz/90MHz
Interface:	Antenna Port	2 (4.3-10 Female)	
	CPRI Port	1 (SFP+)	
	Debug Port	1 (RJ-45)	
Normal Output Power: (per antenna port, downlink)	AWS-1&-3&-4	37dBm	
	Broadband PCS	37dBm	
	AWS-2&-4	37dBm	
Normal System Gain:	UL	-2dB	
	DL	14dB	
EUT MIMO property:	2X2 MIMO		
Antenna Type:	External Dedicated Antenna		
Permission Antenna Gain:	10dBi or less		
Software Version:	V01.00.00.04		



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4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	LENOVO	Lenovo Xiaoxinchao 5000	PF0TNMG8
RIU supplied by the client	Corning	RIU-G2-17	/
		RIU-G2-19	/
DCU supplied by the client		DCU-G2	/
DEU supplied by the client		DEU-G2	/
Mathced load and attenuator supplied by the client	/	/	/

4.3 Test Environment

Environment Parameter	Selected Values During Test	
Ralative Humidity	Ambient	
Value	Temperature (°C)	Voltage (V)
TNVN	Asmbient	AC 110
TLVL	-30	AC 93.5
TLVH	-30	AC 126.5
THVL	+50	AC 93.5
THVH	+50	AC 126.5

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%



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4.5 Test Signals and Test Channels

DL 2110-2200MHz			
Test Channel	Test Frequency (MHz)	Test Signal	Stimulus Condition
LCH	2112.5	4.1MHz AWGN	a single test signal
MCH	2155		
HCH	2197.5		
LCH	2112.5, 2117.5		two adjacent test signals
HCH	2192.5, 2197.5		
LCH	2160	100MHz AWGN	a single test signal
MCH	2155		
HCH	2150		
LCH	2160, 2260		two adjacent test signals
HCH	2050, 2150		
LCH	2110.4	GSM-TDMA	a single test signal
MCH	2155		
HCH	2199.6		
LCH	2110.4, 2110.8		two adjacent test signals
HCH	2199.2, 2199.6		



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DL 1995-2020MHz			
Test Channel	Test Frequency (MHz)	Test Signal	Stimulus Condition
LCH	1997.5	4.1MHz AWGN	a single test signal
MCH	2007.5		
HCH	2017.5		
LCH	1997.5, 2002.5	4.1MHz AWGN	two adjacent test signals
HCH	2012.5, 2017.5		
LCH	2045	100MHz AWGN	a single test signal
MCH	2007.5		
HCH	1970		
LCH	2045, 2145		
HCH	1870, 1970		
LCH	1995.4	GSM-TDMA	a single test signal
MCH	2007.5		
HCH	2019.6		
LCH	1995.4, 1995.8		
HCH	2019.2, 2019.6		
LCH	1995.4, 1995.8	GSM-TDMA	two adjacent test signals
HCH	2019.2, 2019.6		



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4.6 Test Location

All tests 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

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	2022-07-04	2023-07-03
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
MXA Signal Analyzer (10Hz-50GHz)	KEYSIGHT	N9020B	SEM004-24	2023-03-20	2024-03-19
4X4 Power Sensor Unit	TST	TSPS2023R	EMC2257	2022-09-08	2023-09-07
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
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2022-10-16	2025-10-15
Chamber cable	HangTianXing	N/A	EMC0542	2022-08-24	2023-08-23
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2023-06-14	2024-06-13
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2023-05-19	2024-05-18
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Trilog Broadband Antenna (25MHz-1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	EMC2174	2022-06-19	2025-06-18
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 Pre-amplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2022-08-24	2023-08-23
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2022-12-16	2023-12-15
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
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	2023-09-06
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	2024-7-10
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

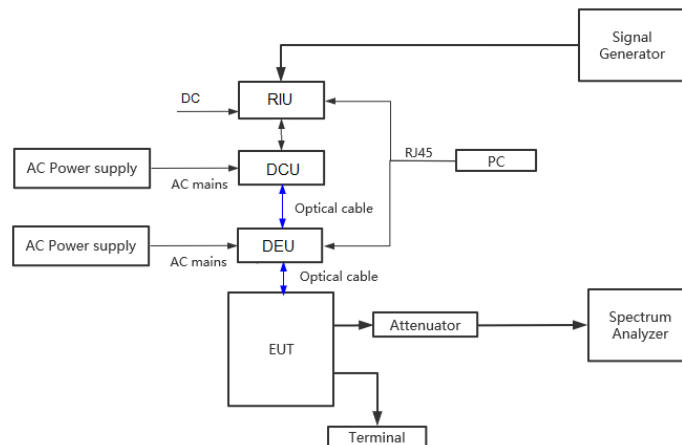
6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.5 °C Humidity: 61 % RH Atmospheric Pressure: 1010 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 GZCR230600056802.



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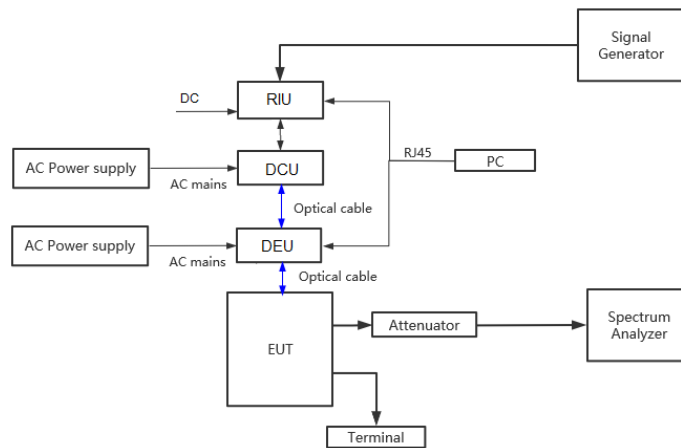
6.2 Input versus output comparison

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: 22.5 °C Humidity: 61 % RH Atmospheric Pressure: 1010 mbar
 EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.2.2 Test Setup



6.2.3 Measurement Record

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6.3 Mean output power and amplifier/booster gain

Test Requirement: 47 CFR Part 27.50(d)(2), 27.50(d)(5)

Test Method: KDB 935210 D05 clause 3.5

Limit: An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less.
An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

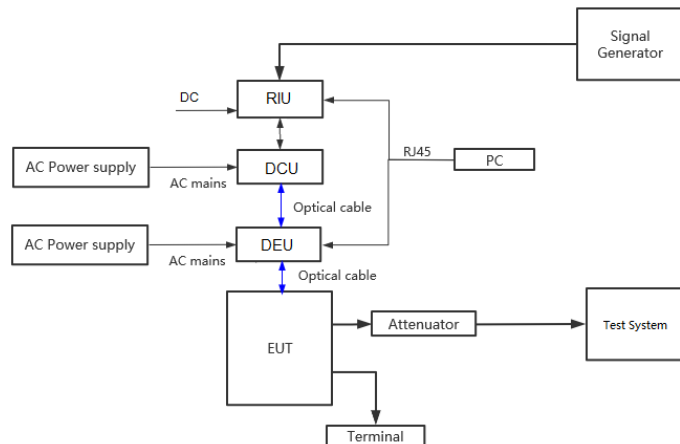
6.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.5 °C Humidity: 61 % RH Atmospheric Pressure: 1010 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 GZCR230600056802.



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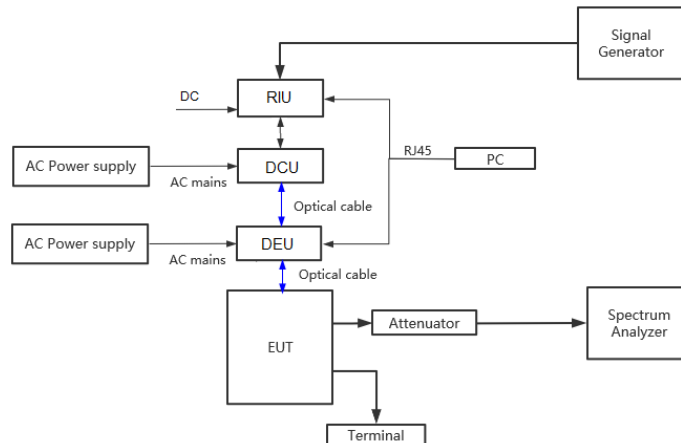
6.4 Out-of-band/out-of-block(including intermodulation) emissions

Test Requirement: 47 CFR Part 27.53(h)(1)
 Test Method: KDB 935210 D05 clause 3.6
 Limit: the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

6.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.5 °C Humidity: 61 % RH Atmospheric Pressure: 1010 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 GZCR230600056802.



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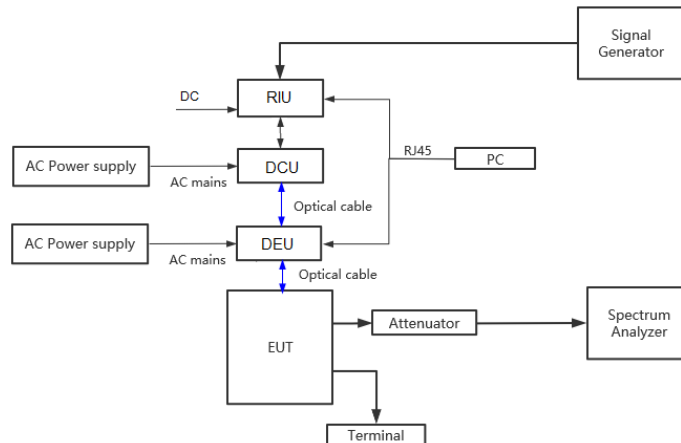
6.5 Conducted Spurious emissions

Test Requirement: 47 CFR Part 27.53(h)(1)
 Test Method: KDB 935210 D05 clause 3.6
 Limit: the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

6.5.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.5 °C Humidity: 61 % RH Atmospheric Pressure: 1010 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 GZCR230600056802.



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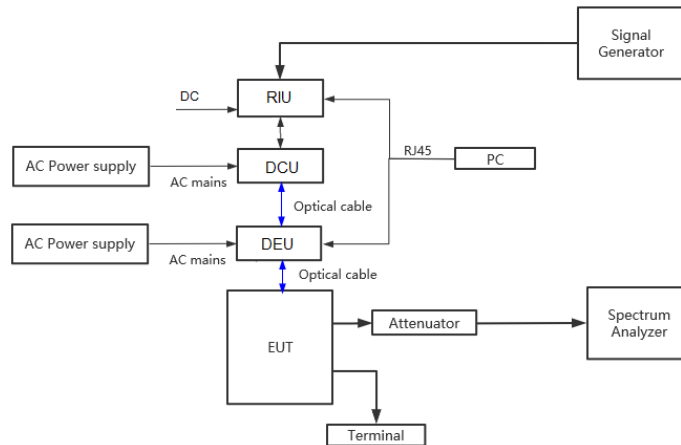
6.6 Frequency Stability

Test Requirement: 47 CFR Part 27.54
 Test Method: 47 CFR Part 2.1055
 KDB 935210 D05 clause 3.7
 ANSI C63.26-2015 clause 5.6
 Limit: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

6.6.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.5 °C Humidity: 61 % RH Atmospheric Pressure: 1010 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 GZCR230600056802.



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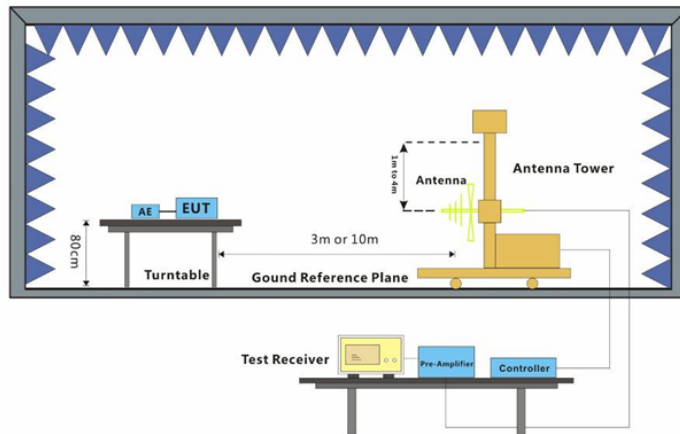
6.7 Radiated Spurious emission

Test Requirement: 47 CFR Part 27.53(h)(1)
 Test Method: KDB 935210 D05 clause 3.8
 ANSI C63.26-2015 clause 5.5
 Limit: the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

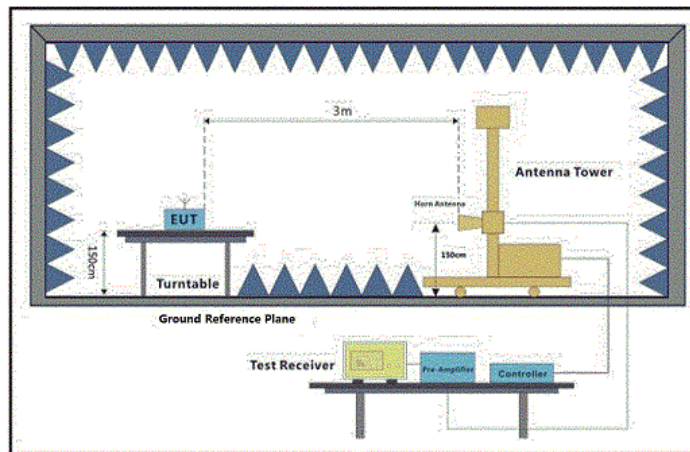
6.7.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.5 °C Humidity: 59 % RH Atmospheric Pressure: 1015 mbar
 EUT Operation: Drive the EUT to the maximum output power at maximum gain.

6.7.2 Test Setup



30MHz-1GHz



Above 1GHz



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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 GZCR230600056802.



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7 Test Setup Photographs

Refer to Appendix - Test Setup Photos for GZCR2306000568AT.

8 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2306000568AT.

- End of the Report -



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