



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

EMC-TRF-01 Rev 1.1

Report No.: GZCR231100125702

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FCC ID: OJFDHRU-G2-17

TEST REPORT

Application No.: GZCR2311001257AT
Applicant: Corning Optical Communications LLC
Address of Applicant: 840 N McCarthy Blvd Milpitas, CA 95035
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: HRU Digital High Power Amplifier Module supporting AWS
Model No.: dHRU-G2-17
Trade Mark: Corning
Standard(s) :
47 CFR Part 2
47 CFR Part 20
47 CFR Part 27

Date of Receipt: 2021-03-09 for the original report GZCR210300001602
2023-11-29 for the report GZCR231100125702
Date of Test: 2021-03-11 to 2021-04-03 for the original report GZCR210300001602
2023-12-6 to 2023-12-10 for the report GZCR231100125702
Date of Issue: 2021-04-09 for the original report GZCR210300001602
2023-12-20 for the report GZCR231100125702

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

Ricky Liu

Ricky Liu
Manager



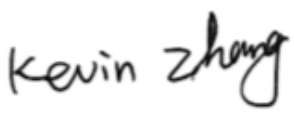

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Revision Record			
Version	Report No.	Date	Remark
01	GZCR231100125702	2023-12-20	Original

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

2 Test Summary

2.1 AWS-1 (only for downlink: 2110-2155MHz)

Item	Requirement	Method	Result
Out-of-band rejection	KDB935210 D05 v01r04 clause 3.3	KDB935210 D05 v01r04 clause 3.3	PASS
Input-versus-output signal comparison	47 CFR Part 2.1049	KDB935210 D05 v01r04 clause 3.4	PASS
Mean output power and amplifier/booster gain	47 CFR Part 27.50(d)	KDB935210 D05 v01r04 clause 3.5 ANSI C63.26-2015 Clause 5.2.3	PASS
Out-of-band/out-of-block (including intermodulation) emissions and spurious esmissions	47 CFR Part 27.53(h)	KDB935210 D05 v01r04 clause 3.6	PASS
Frequency stability	47 CFR Part 27.54	47 CFR Part 2.1055 KDB935210 D05 v01r04 clause 3.7 ANSI C63.26-2015 Clause 5.6	PASS
Radiated spurious emissions	47 CFR Part 27.53(h)	KDB935210 D05 v01r04 clause 3.8 ANSI C63.26-2015 Clause 5.5	PASS



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2.2 AWS-3 (only for downlink: 2155-2180MHz)

Item	Requirement	Method	Result
Out-of-band rejection	KDB935210 D05 v01r04 clause 3.3	KDB935210 D05 v01r04 clause 3.3	PASS
Input-versus-output signal comparison	47 CFR Part 2.1049	KDB935210 D05 v01r04 clause 3.4	PASS
Mean output power and amplifier/booster gain	47 CFR Part 27.50(d)	KDB935210 D05 v01r04 clause 3.5	PASS
Out-of-band/out-of-block (including intermodulation) emissions and spurious esmissions	47 CFR Part 27.53(h)	KDB935210 D05 v01r04 clause 3.6	PASS
Frequency stability	47 CFR Part 27.54	47 CFR Part 2.1055 KDB935210 D05 v01r04 clause 3.7 ANSI C63.26-2015 Clause 5.6	PASS
Radiated spurious emissions	47 CFR Part 27.53(h)	KDB935210 D05 v01r04 clause 3.8 ANSI C63.26-2015 Clause 5.5	PASS
Remark : Fixed stations prohibited from operating in the 1755-1780 MHz band.			

2.3 AWS-4 (only for downlink: 2180-2200MHz)

Item	Requirement	Method	Result
Out-of-band rejection	KDB935210 D05 v01r04 clause 3.3	KDB935210 D05 v01r04 clause 3.3	PASS
Input-versus-output signal comparison	47 CFR Part 2.1049	KDB935210 D05 v01r04 clause 3.4	PASS
Mean output power and amplifier/booster gain	47 CFR Part 27.50(d)	KDB935210 D05 v01r04 clause 3.5	PASS
Out-of-band/out-of-block (including intermodulation) emissions and spurious esmissions	47 CFR Part 27.53(h)(1)	KDB935210 D05 v01r04 clause 3.6	PASS
Frequency stability	47 CFR Part 27.54	47 CFR Part 2.1055 KDB935210 D05 v01r04 clause 3.7 ANSI C63.26-2015 Clause 5.6	PASS
Radiated spurious emissions	47 CFR Part 27.53(h)(1) 47 CFR Part 27.1134(e)	KDB935210 D05 v01r04 clause 3.8 ANSI C63.26-2015 Clause 5.5	PASS

Remark:

According to the declaration from the applicant, the model **dHRU-G2-17** in this report **GZCR231100125702** and model **dHRU-dHPAM-17** in report **GZCR210300001602(FCC ID: OJFDHRU-DHPAM-17)** are identical in the electrical circuit design, layout, components used and internal wiring were identical, with only difference on the Model No..

All test data in this report was copied from report **GZCR210300001602**.

Furthermore, tests using 100 MHz AWGN signal for 5GNR were supplemented 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 110V, 60Hz

Cable: AC mains (unshielded, 1.5m)

Operating Temperature: -40 to +55 °C

Operating Humidity: 5 to 95 %

Frequency Range: AWS-1 Uplink: 1710MHz to 1755MHz
Downlink: 2110MHz to 2155MHz
AWS-3 & AWS-4 Uplink: 1695MHz to 1710MHz
1755MHz to 1780MHz
Downlink: 2155MHz to 2180MHz
2180MHz to 2200MHz

Radio System Type: ☐ GSM
☒ WCDMA
☒ LTE
☒ 5G NR

Interface: RF Port: 2 (4.3-10-Female, ANT1~ANT2)
Optical Port: 1 (SFP+)

Supported Channel Bandwidth: GSM ☐ 200 kHz
WCDMA ☒ 5MHz
LTE ☐ 1.4 MHz ☐ 3 MHz ☒ 5 MHz
☒ 10 MHz ☒ 15 MHz ☒ 20 MHz
5G NR ☒ 5 MHz ☒ 10 MHz ☒ 15 MHz
☒ 20 MHz

Band	Technology	Supported Bandwidth
AWS-1	3G	5MHz
	4G/5G	5/10/15/20MHz
AWS-3 & AWS-4	3G	5MHz
	4G/5G	5/10/15/20MHz



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Output Power Max. 43dBm (Downlink)
(per antenna port):
EUT MIMO property: 2X2 MIMO
System Gain: Max. 43dB (Downlink)
Antenna Type: External Dedicated Antenna
Permission Antenna Gain: 12.5dBi or less
Software Version: V01.00.00.04

Note: 1. The EUT is a remote unit of a fiber DAS. The fiber DAS are typically comprised of three components (host unit, fiber-optic expansion unit and remote unit), which will be interconnected via fiber-optic.

The host unit connects directly to a base station via coaxial cable but cannot connect to antenna for receiving downlink and transmitting uplink, the EUT connects to antenna for transmitting downlink and receiving uplink. Therefore, only performed the test for downlink.

2. In additional, the host unit and fiber-optic expansion unit will be used as support unit for test in the report.

3. ANT1 and ANT2 are MIMO port, and the internal circuit design is identical, the intend output power for antenna ports are identical. Therefore only perform test at antenna port 1 and record the data in this report.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	IBM	T30	S/N78-3VMLX 06/01
IHU/HEU supplied by the applicant	Corning	/	/
DRU supplied by the applicant	Corning	/	/
ODU supplied by the applicant	Corning	dHRU-dHPOM	/
RIU supplied by the manufacturer	Corning	/	/
DCU supplied by the manufacturer	Corning	/	/
DEU supplied by the manufacturer	Corning	/	/



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4.3 Test Environment

Environment Parameter	Selected Values During Test	
Ralative Humidity	Ambient	
Value	Temperature (°C)	Voltage (V)
TNVN	+20	AC 110V
TLVL	-40	AC 93.5V
TLVH	-40	AC 126.5V
THVL	+50	AC 93.5V
THVH	+50	AC 126.5V

VN: Normal Voltage

TN: Normal Teperature

VL: Lower Extreme Voltege

HL: Higher Extreme Voltage

TL: Lower Extreme Teperature

TH: Higher Extreme Teperature



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4.4 Test Configuration

AWS (only for downlink: 2110-2155MHz & 2155-2180MHz & 2180-2200MHz)

RF Ch.	Test Conf.	Test Freq. (MHz)	Test Signal	Remark
B	DL_1S_B_AWGN	2112.5	AWGN (99% OBW of 4.1MHz)	a single test signal
M	DL_1S_M_AWGN	2155		
T	DL_1S_T_AWGN	2197.5		
B	DL_2S_B_AWGN	2112.5, 2117.5		two adjacent test signals
T	DL_2S_T_AWGN	2192.5, 2197.5		
B	DL_1S_B_GSM	2110.4	GSM-TDMA	a single test signal
M	DL_1S_M_GSM	2155		
T	DL_1S_T_GSM	2199.6		
B	DL_2S_B_GSM	2110.4, 2110.8		two adjacent test signals
T	DL_2S_T_GSM	2199.2, 2199.6		
B	DL_1S_B_AWGN	2160	100MHz AWGN	a single test signal
M	DL_1S_M_AWGN	2155		
T	DL_1S_T_AWGN	2150		
B	DL_2S_B_AWGN	2160, 2260		two adjacent test signals
T	DL_2S_T_AWGN	2050, 2150		

Note:

The test was performed together for AWS-1, AWS-3 and AWS-4.

4.5 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 5.5 \times 10^{-8}$
2	RF Conducted power	$\pm 0.68\text{dB}$
3	Conducted Spurious Emissions	$\pm 1.04\text{dB}$
4	RF Radiated Power	$\pm 4.5\text{dB}$ (below 1GHz)
		$\pm 4.8\text{dB}$ (above 1GHz)
5	Radiated Spurious Emission Test	$\pm 4.5\text{dB}$ (30MHz-1GHz)
		$\pm 4.8\text{dB}$ (1GHz-18GHz)
6	Temperature	$\pm 0.4^{\circ}\text{C}$
7	Humidity	$\pm 1.3\%$
8	Supply Voltages	$\pm 1.5\%$

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

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

For original test

Conducted Test					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2021-03-02	2022-03-01
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2021-03-12	2022-03-11
Signal Generator	Rohde & Schwarz	SMB100A	EMC2093	2021-01-09	2022-01-08
MXG Vector Signal Generator (9kHz-6GHz)	Keysight	N5182B	EMC2216	2020-11-04	2021-11-03
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01
Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	EMC0039	2020-07-01	2021-06-30
High-low temperature control box	GZ GongWen Co.Ltd	GDJW-100	EMC0039	2020-06-29	2021-06-28
Radiated Test					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-19	2023-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2020-11-13	2021-11-12
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



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For supplement test

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
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
MI CABLE	SGS-EMC	0.8M	EMC2136	2023-11-02	2025-11-01
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 test equipment (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
Coaxial cable	Mirco-COAX UTIFLEX	311A	EMC0540	2023-06-14	2025-06-13
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 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	2024-7-10
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 Result for AWS-1

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

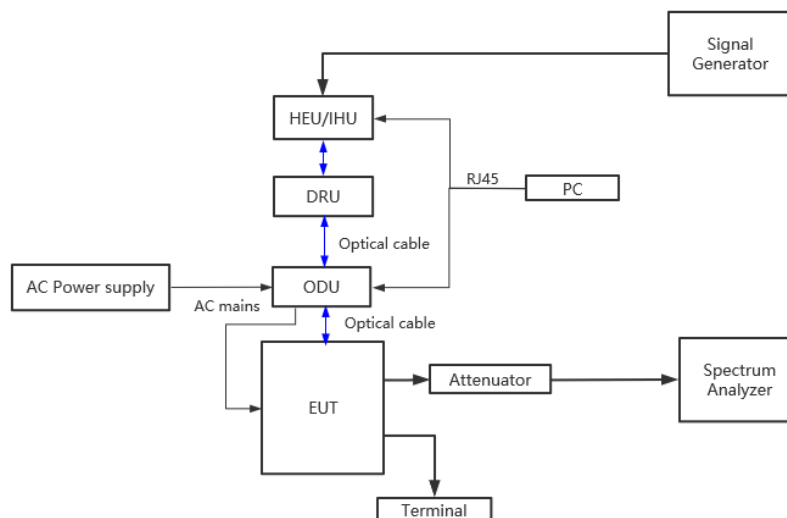
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

EUT Configuration: Refer to clause 4.4 in this report.

6.1.2 Test Setup



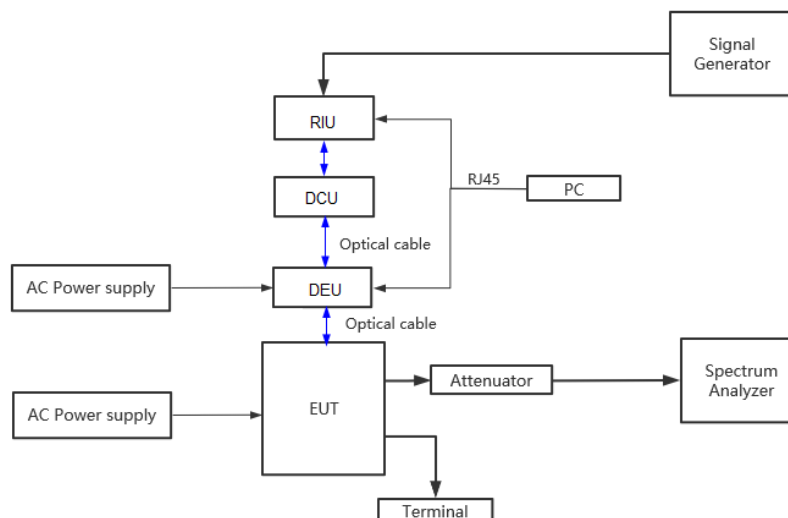
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6.1.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702

6.2 Input-versus-output signal comparison

Test Requirement: 47 CFR Part 2.1049
 Test Method: KDB 935210 D05 clause 3.4
 Limit: Compare the input signal to the output signal to affirm that they are similar

6.2.1 E.U.T. Operation

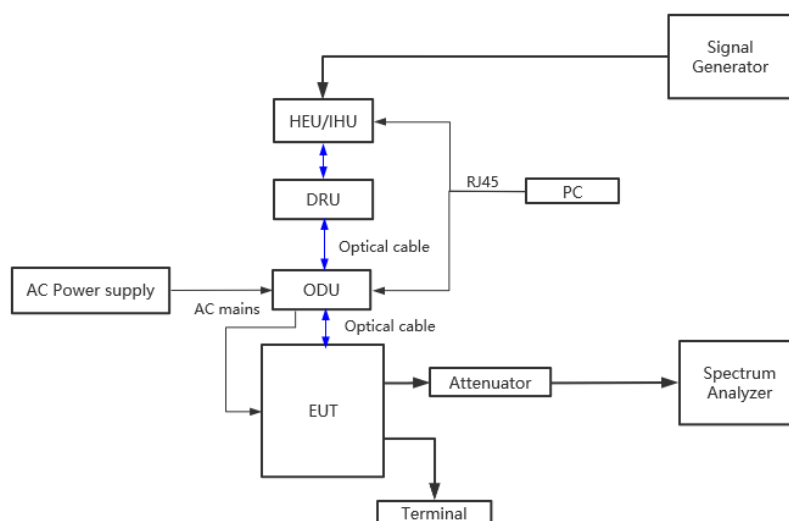
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

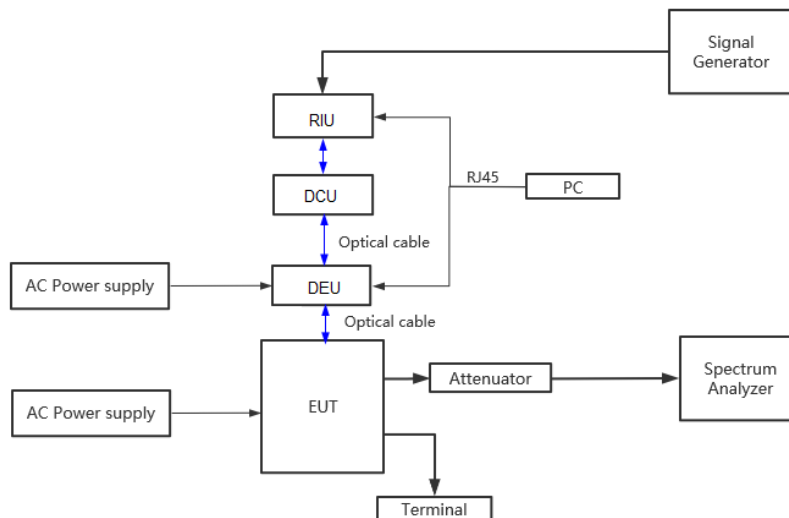
EUT Configuration: Refer to clause 4.4 in this report.

6.2.2 Test Setup



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6.2.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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6.3 Mean output power and amplifier/booster gain

Test Requirement: 47 CFR Part 27.50(d)

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

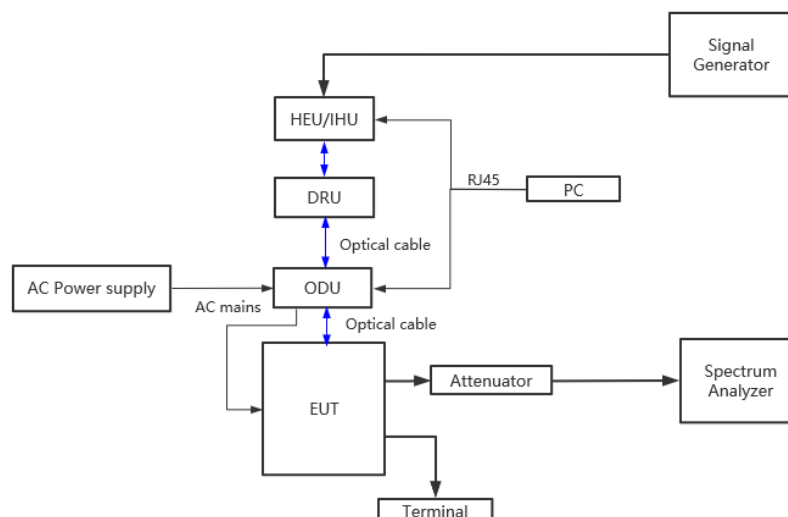
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

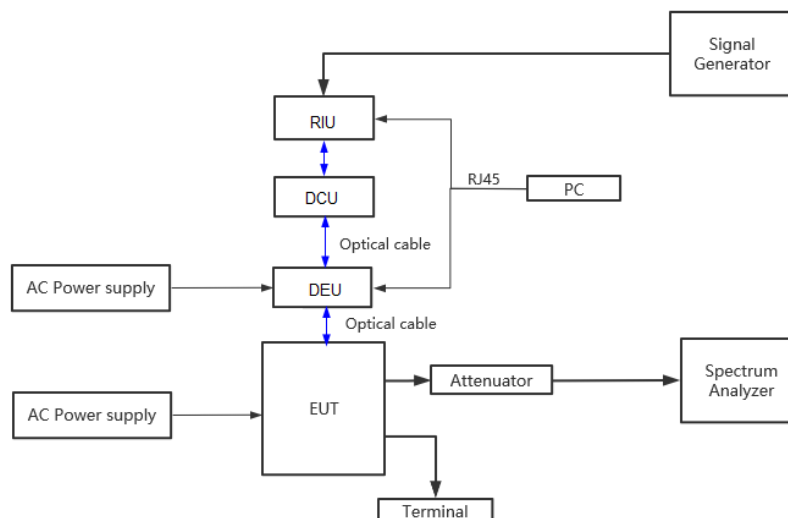
EUT Configuration: Refer to clause 4.4 in this report.

6.3.2 Test Setup



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6.3.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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

Test Requirement: 47 CFR Part 27.53(h)

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
(reduce 3.01dB when on 2×2 MIMO mode)

6.4.1 E.U.T. Operation

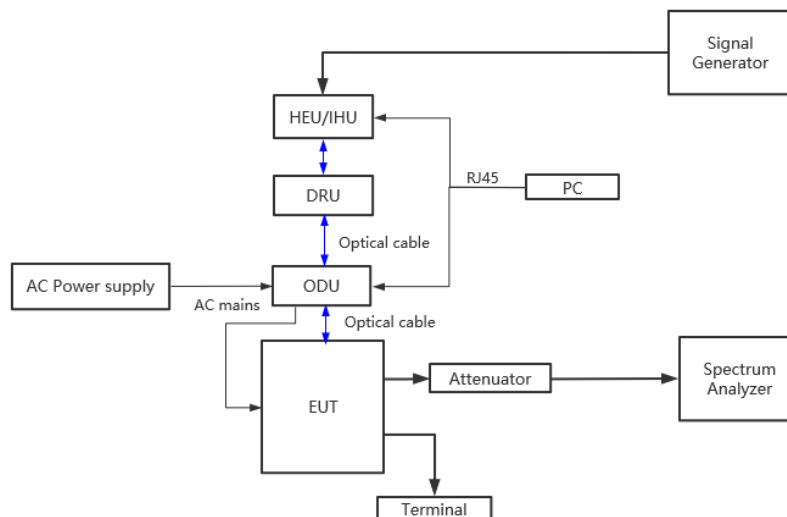
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

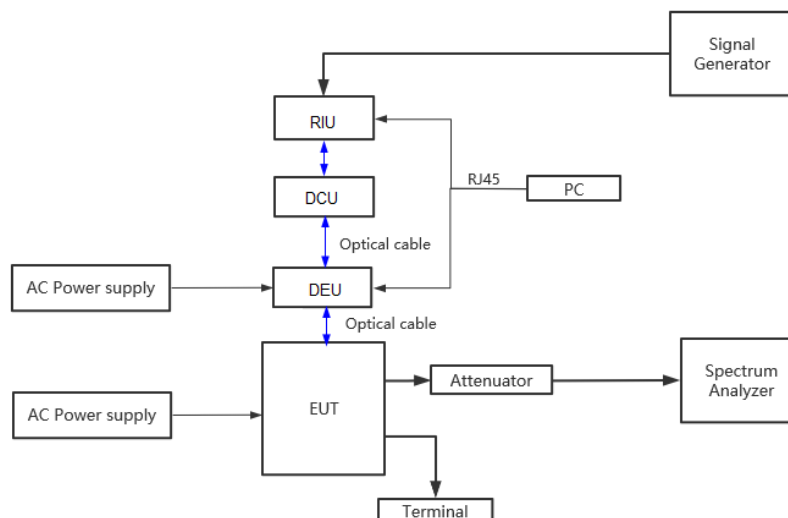
EUT Configuration: Refer to clause 4.4 in this report.

6.4.2 Test Setup



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6.4.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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6.5 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.

6.5.1 E.U.T. Operation

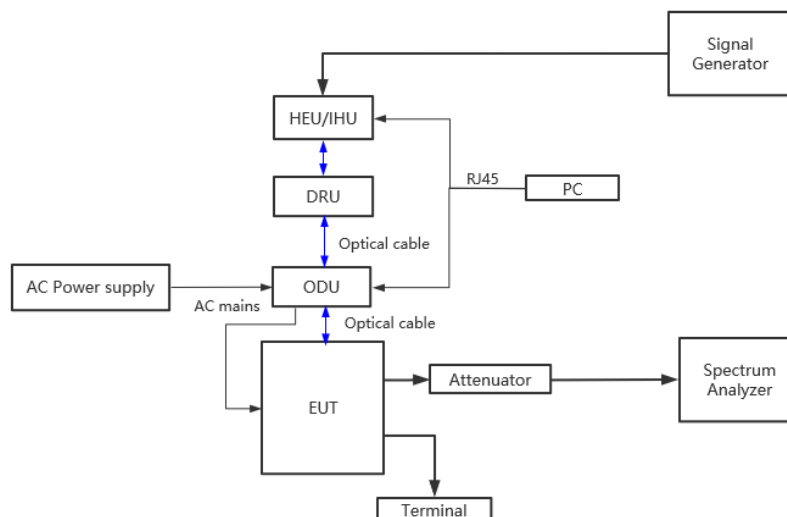
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

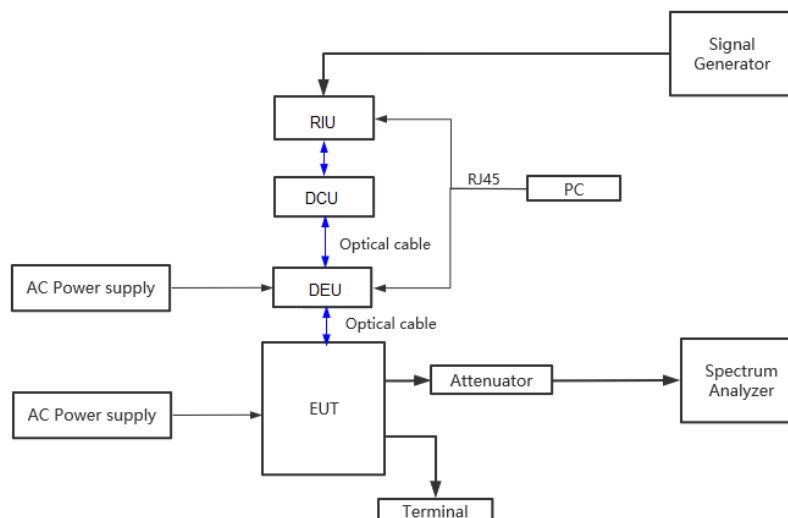
EUT Configuration: Refer to clause 4.4 in this report.

6.5.2 Test Setup



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6.5.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702

6.6 Radiated spurious emission

Test Requirement: 47 CFR Part 2.1053, 27.53(h)
Test Method: KDB 935210 D05 clause 3.8
ANSI C63.26-2015 clause 5.6
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

6.6.1 E.U.T. Operation

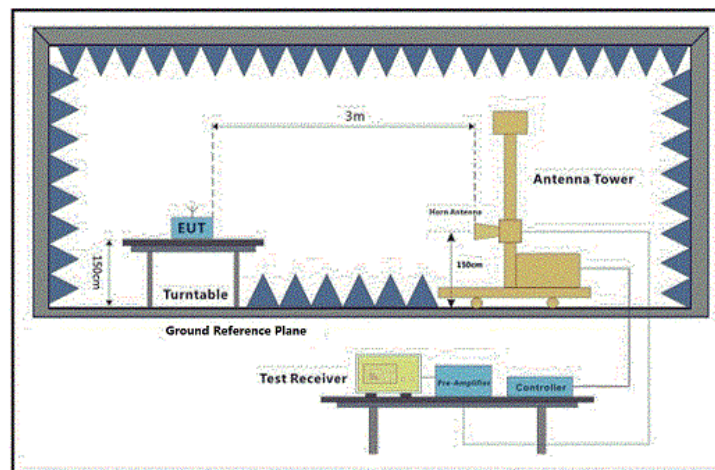
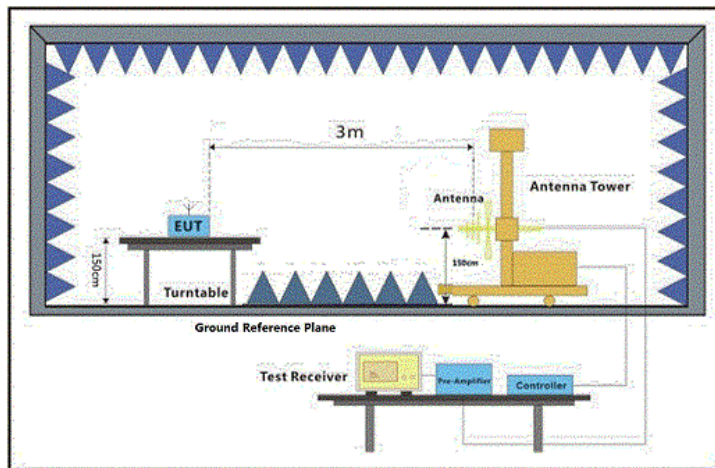
Operating Environment:
Temperature: 25.1 °C Humidity: 59 % RH Atmospheric Pressure: 1010 mbar
Test Mode: Set the EUT to maximum output power and maximum gain (activate MIMO mode simultaneously).



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6.6.2 Test Setup



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6.6.3 Test procedure

1. Scan from 30MHz to 12.75GHz, 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)

6.6.4 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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7 Radio Spectrum Matter Test Result for AWS-3

7.1 Out-of-band rejection

Test Requirement: KDB 935210 D05 clause 3.3

Test Method: KDB 935210 D05 clause 3.3

Limit: Within the passband

7.1.1 E.U.T. Operation

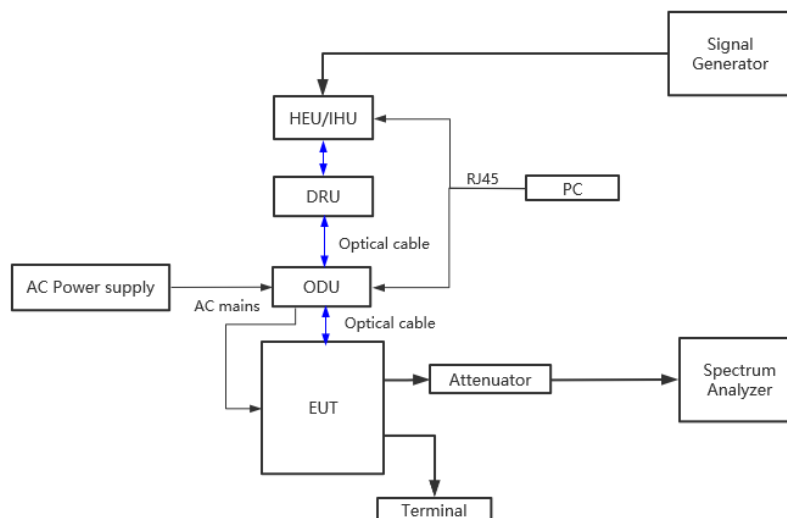
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

EUT Configuration: Refer to clause 4.4 in this report.

7.1.2 Test Setup



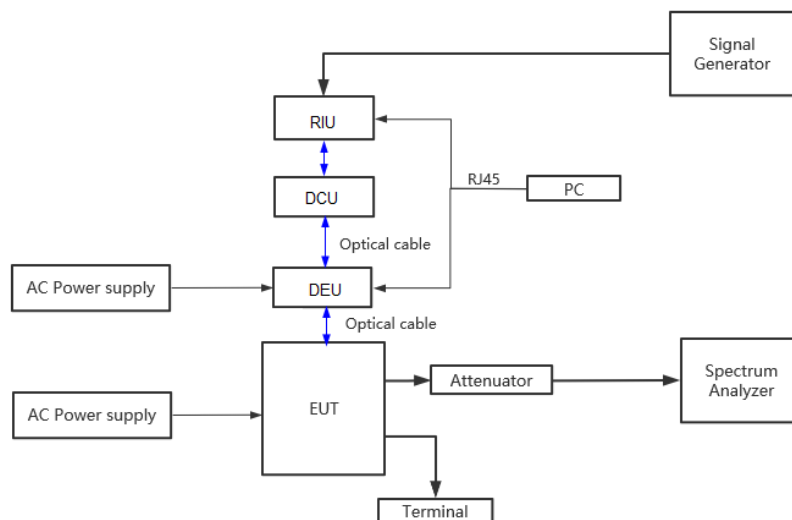
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7.1.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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7.2 Input-versus-output signal comparison

Test Requirement: 47 CFR Part 2.1049
 Test Method: KDB 935210 D05 clause 3.4
 Limit: Compare the input signal to the output signal to affirm that they are similar

7.2.1 E.U.T. Operation

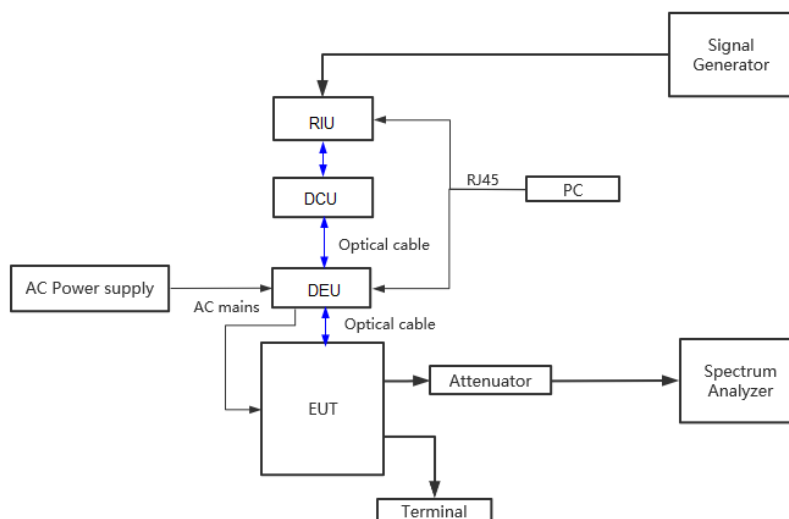
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

EUT Configuration: Refer to clause 4.4 in this report.

7.2.2 Test Setup



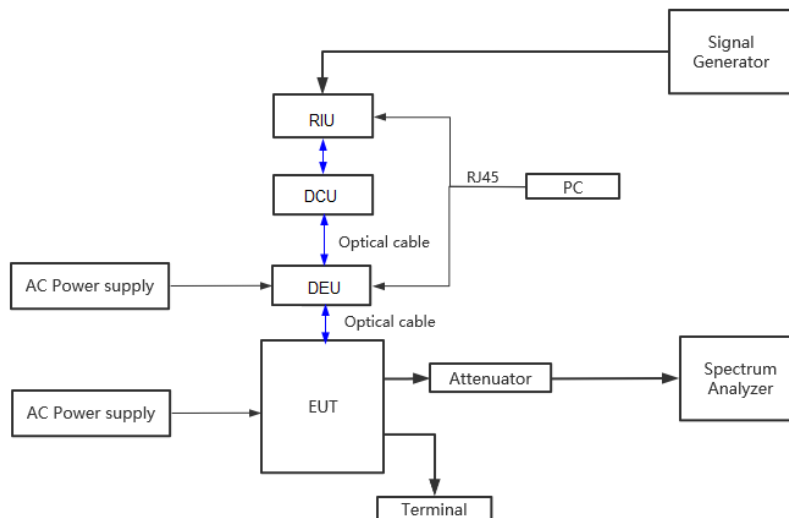
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7.2.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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7.3 Mean output power and amplifier/booster gain

Test Requirement: 47 CFR Part 27.50(d)

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.

7.3.1 E.U.T. Operation

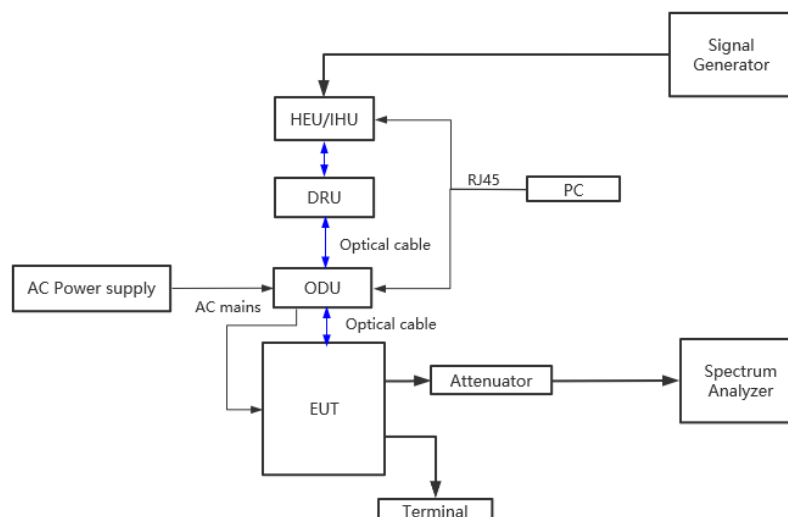
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

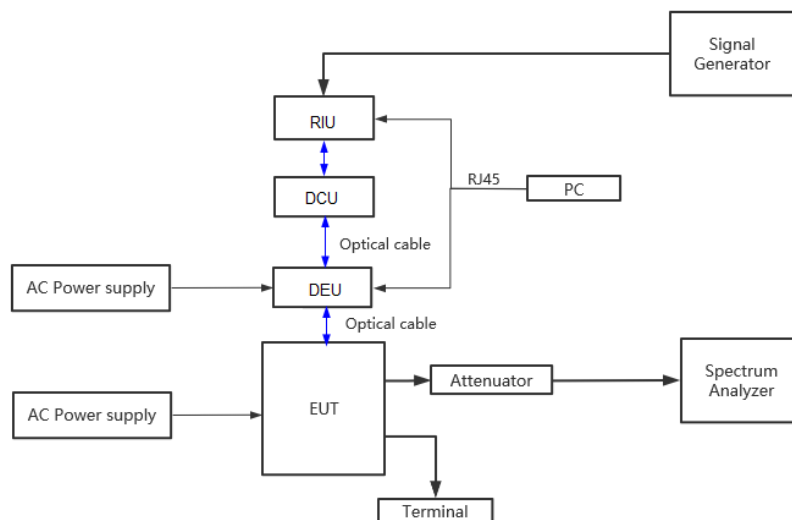
EUT Configuration: Refer to clause 4.4 in this report.

7.3.2 Test Setup



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7.3.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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7.4 Out-of-band/out-of-block (including intermodulation) emissions and spurious

Test Requirement: 47 CFR Part 27.53(h)

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
(reduce 3.01dB when on 2×2 MIMO mode)

7.4.1 E.U.T. Operation

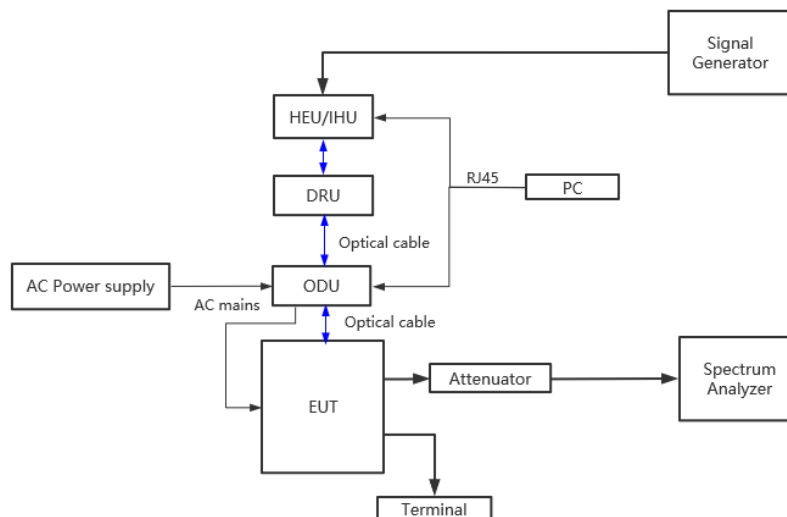
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

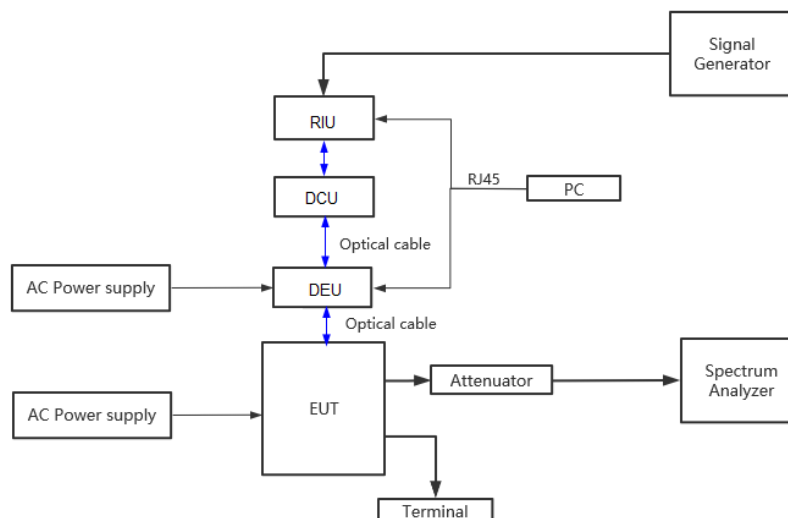
EUT Configuration: Refer to clause 4.4 in this report.

7.4.2 Test Setup



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7.4.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702

7.5 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.

7.5.1 E.U.T. Operation

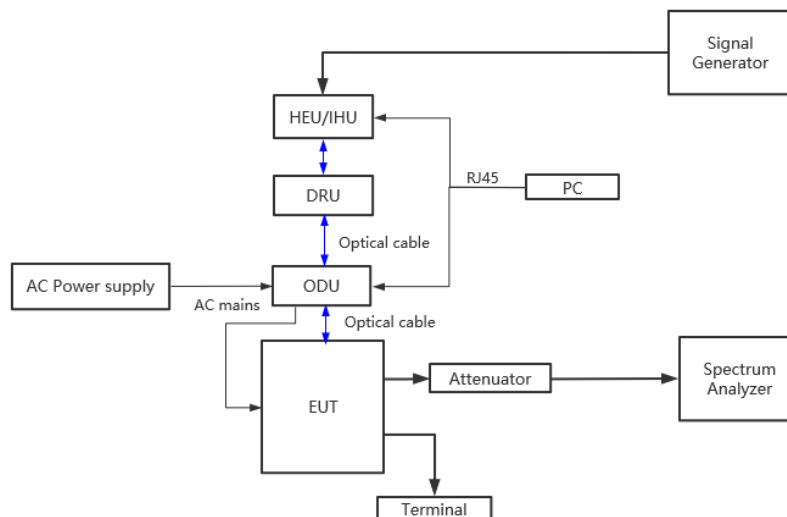
Operating Environment:

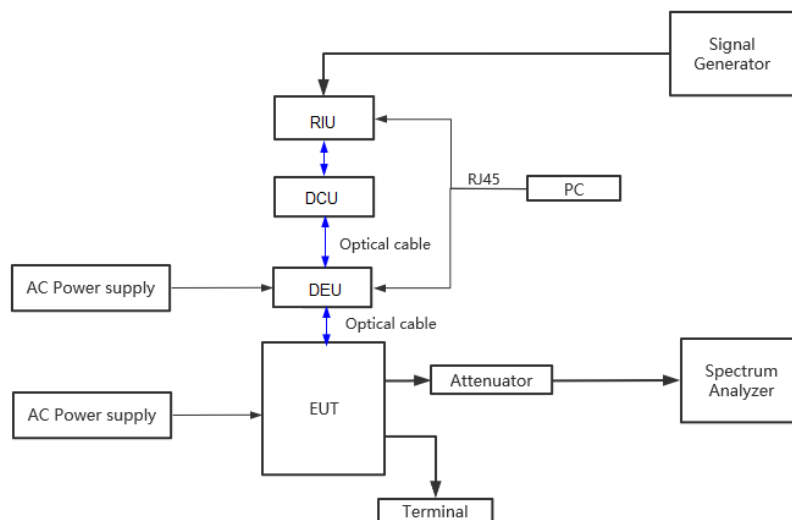
Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

EUT Configuration: Refer to clause 4.4 in this report.

7.5.2 Test Setup





7.5.3 Measure Data

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7.6 Radiated spurious emission

Test Requirement: 47 CFR Part 2.1053, 27.53(h)

Test Method: KDB 935210 D05 clause 3.8
ANSI C63.26-2015 clause 5.6

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

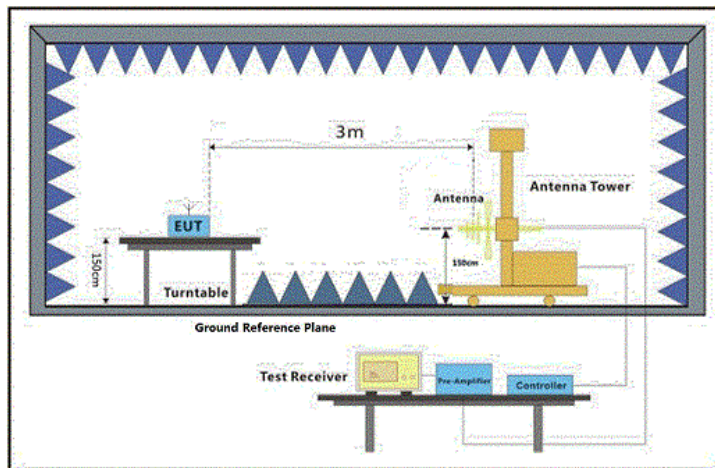
7.6.1 E.U.T. Operation

Operating Environment:

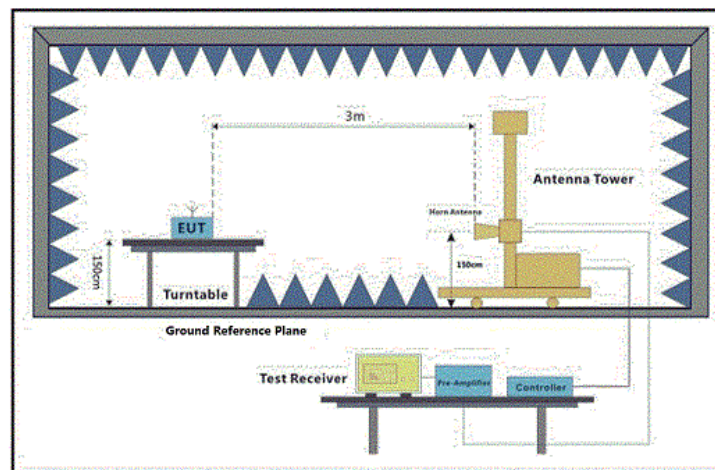
Temperature: 25.1 °C Humidity: 59 % RH Atmospheric Pressure: 1010 mbar

Test Mode: Set the EUT to maximum output power and maximum gain (activate MIMO mode simultaneously).

7.6.2 Test Setup



30MHz-1GHz



Above 1GHz



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7.6.3 Test procedure

1. Scan from 30MHz to 12.75GHz, 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)

7.6.4 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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8 Radio Spectrum Matter Test Result for AWS-4

8.1 Out-of-band rejection

Test Requirement: KDB 935210 D05 clause 3.3

Test Method: KDB 935210 D05 clause 3.3

Limit: Within the passband

8.1.1 E.U.T. Operation

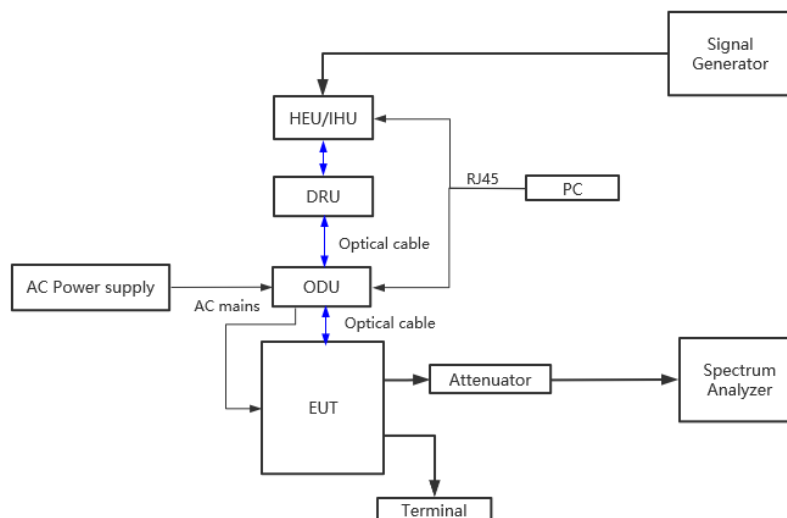
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

EUT Configuration: Refer to clause 4.4 in this report.

8.1.2 Test Setup



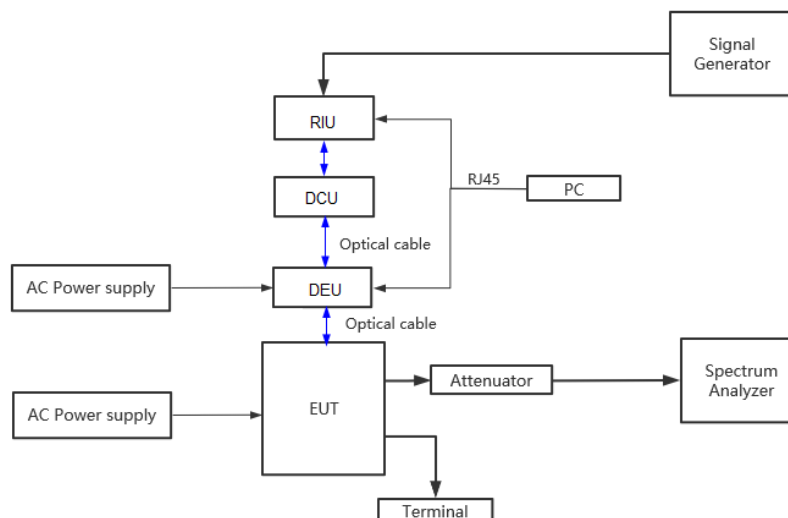
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8.1.3 Measure Data

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8.2 Input-versus-output signal comparison

Test Requirement: 47 CFR Part 2.1049
 Test Method: KDB 935210 D05 clause 3.4
 Limit: Compare the input signal to the output signal to affirm that they are similar

8.2.1 E.U.T. Operation

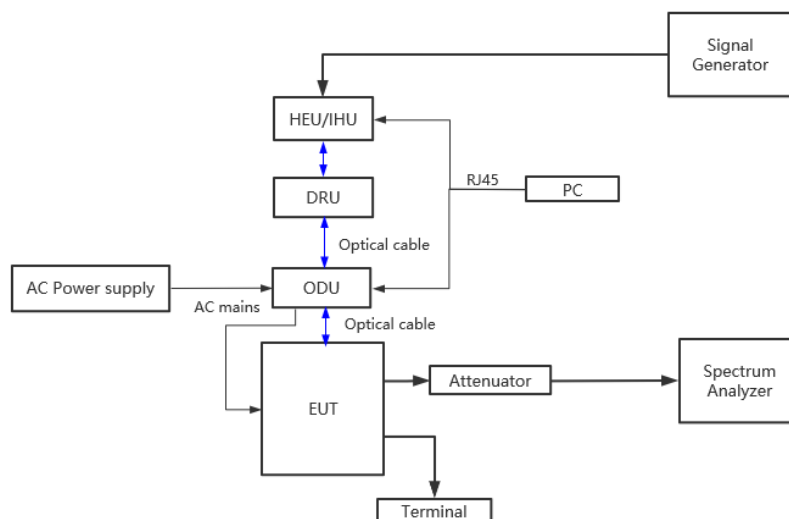
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

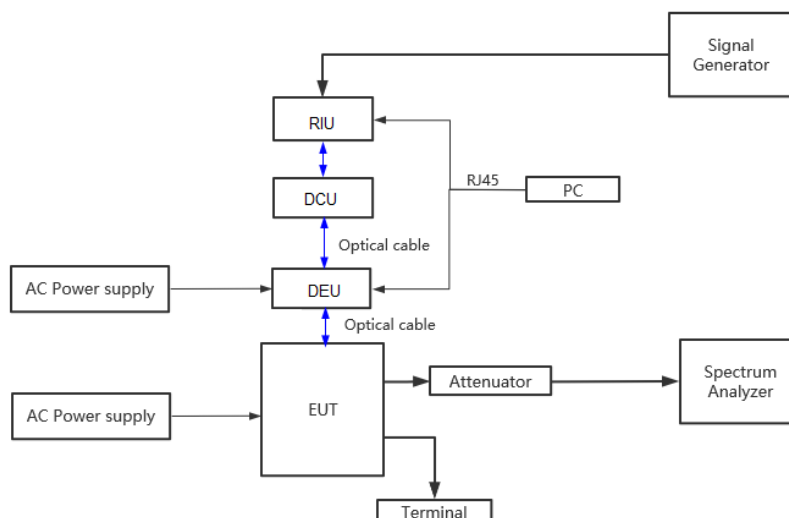
EUT Configuration: Refer to clause 4.4 in this report.

8.2.2 Test Setup



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8.2.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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8.3 Mean output power and amplifier/booster gain

Test Requirement: 47 CFR Part 27.50(d)

Test Method: KDB 935210 D05 clause 3.5

Limit: 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

8.3.1 E.U.T. Operation

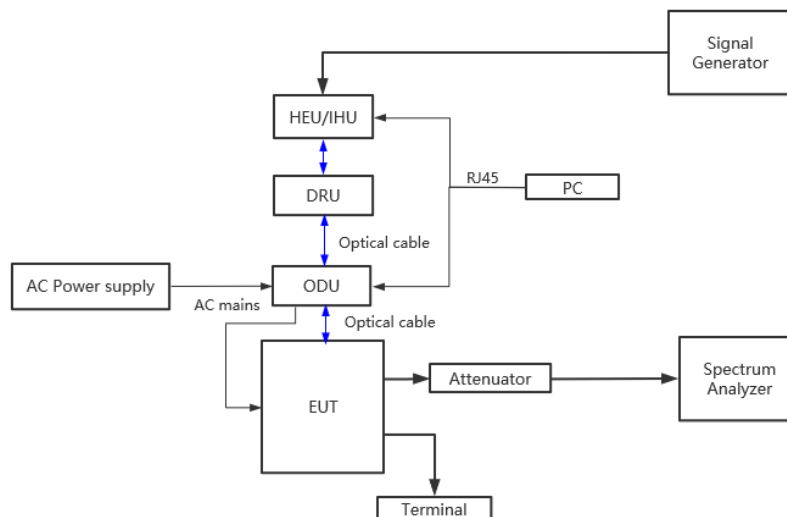
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

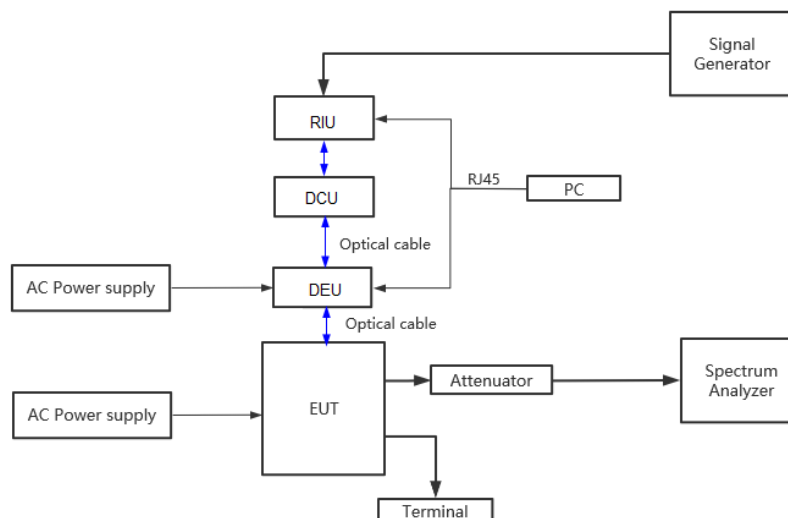
EUT Configuration: Refer to clause 4.4 in this report.

8.3.2 Test Setup



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8.3.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702

8.4 Out-of-band/out-of-block (including intermodulation) emissions and spurious

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
(reduce 3.01dB when on 2×2 MIMO mode)

8.4.1 E.U.T. Operation

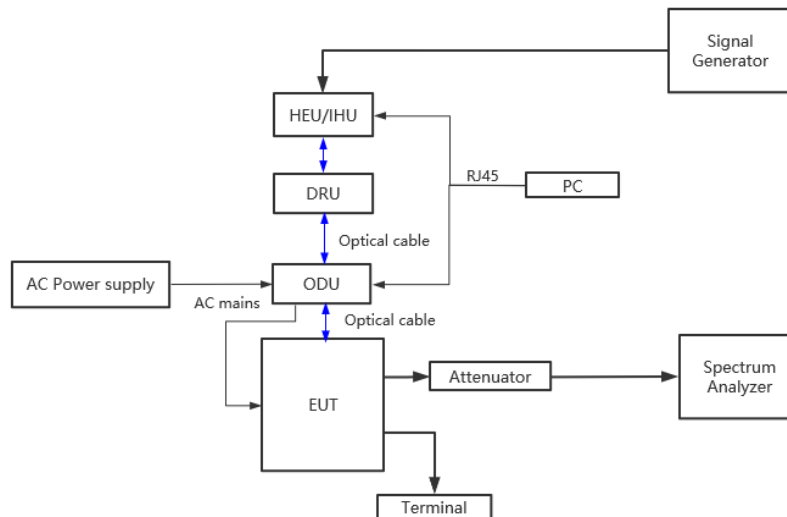
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

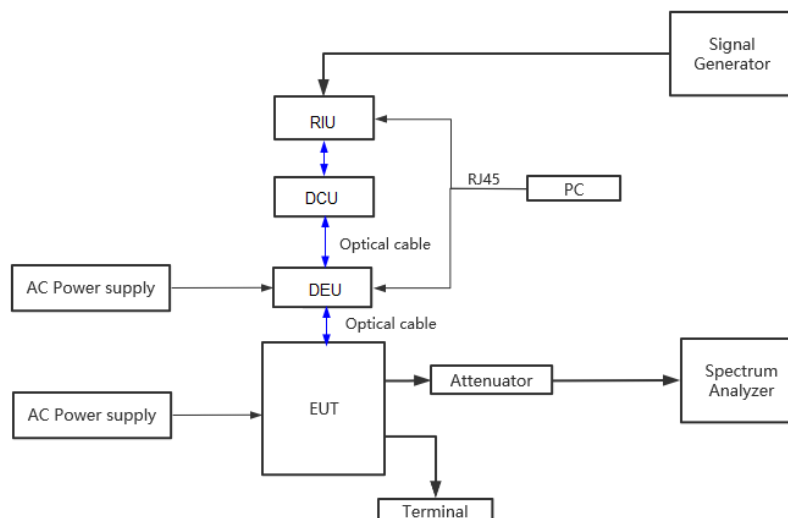
EUT Configuration: Refer to clause 4.4 in this report.

8.4.2 Test Setup



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8.4.3 Measure Data

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8.5 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.

8.5.1 E.U.T. Operation

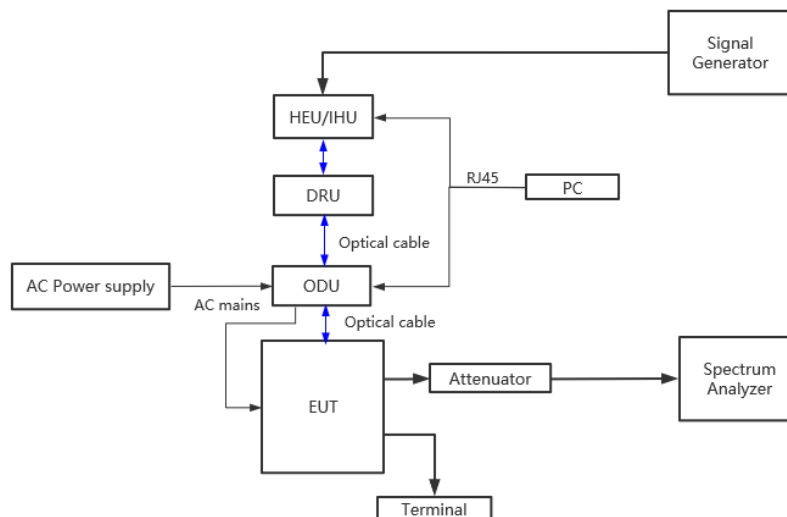
Operating Environment:

Temperature: 24.6 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: Set the EUT to maximum output power and maximum gain.

EUT Configuration: Refer to clause 4.4 in this report.

8.5.2 Test Setup



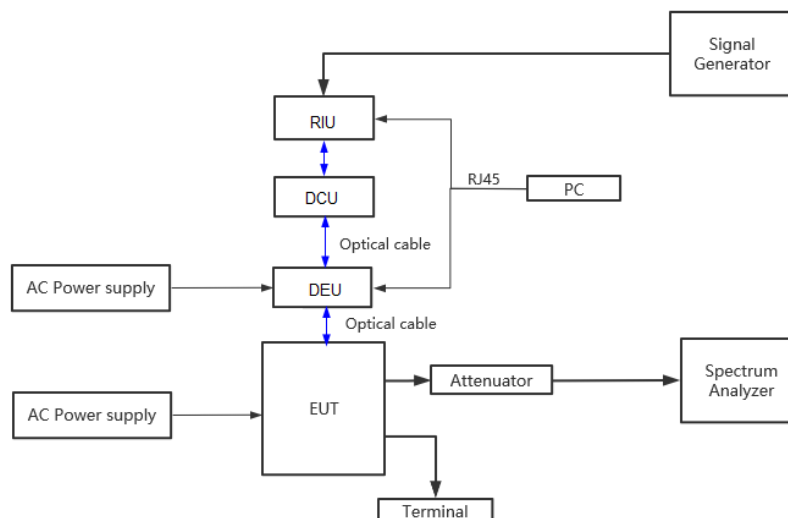
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8.5.3 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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8.6 Radiated spurious emission

Test Requirement: 47 CFR Part 2.1053, 27.53(h)(1), 27.1134(e)

Test Method: KDB 935210 D05 clause 3.8

ANSI C63.26-2015 clause 5.6

Limit: 27.53(h)(1)

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

27.1134(e)

For these AWS-4 operations in the 2180-2200 MHz band, the power of any emissions on all frequencies between 2200 and 2290 MHz shall not exceed an EIRP of -100.6 dBW/4 kHz

8.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.1 °C Humidity: 59 % RH Atmospheric Pressure: 1010 mbar

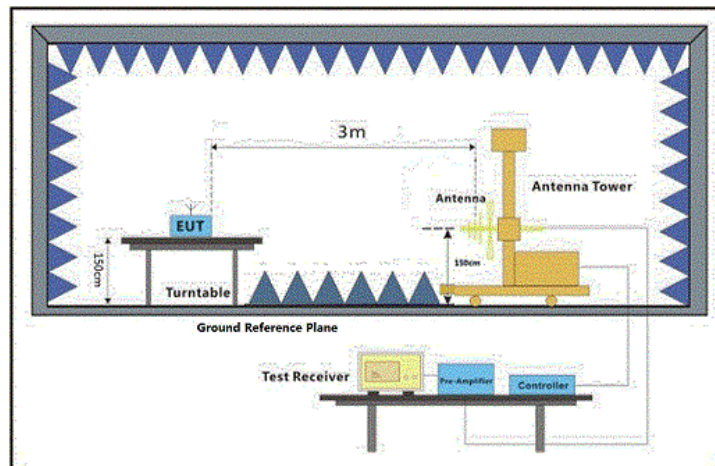
Test Mode: Set the EUT to maximum output power and maximum gain (activate MIMO mode simultaneously).



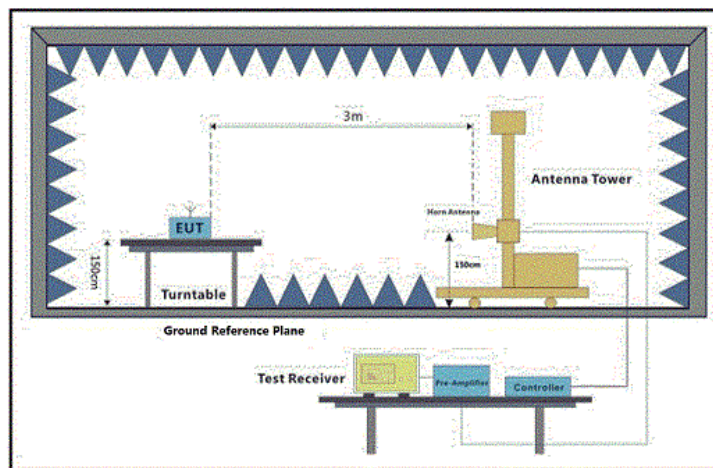
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8.6.2 Test Setup



30MHz-1GHz



Above 1GHz



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8.6.3 Test procedure

1. Scan from 30MHz to 12.75GHz, 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)

8.6.4 Measure Data

Please refer to Appendix-Test Data and Result for report GZCR231100125702



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9 Test Setup Photographs

Refer to Appendix - Test Setup Photos for GZCR2311001257AT.

10 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2311001257AT.

--Report End--



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