

TEST REPORT

Application No.: GZCR2305000524AT
Applicant: Flexlink Telecom Ltd
Address of Applicant: No. 12, Dinghu 3rd St., Guishan Dist., Taoyuan City 333, Taiwan
Manufacturer: Flexlink Telecom Ltd
Address of Manufacturer: No. 12, Dinghu 3rd St., Guishan Dist., Taoyuan City 333, Taiwan
Equipment Under Test (EUT):
EUT Name: Band 5 4T4R High Power Remote Radio Head
Model No.: RRH-440-05-50
Trade Mark: Parallel Wireless
Standard(s) : 47 CFR Part 2
47 CFR Part 22
Date of Receipt: 2023-05-20
Date of Test: 2023-06-02 to 2023-06-08
Date of Issue: 2023-06-13

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



Ricky Liu
Manager



SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch Testing Center EEC Laboratory

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

EMC-TRF-01 Rev 1.1

Report No.: GZCR230500052402

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Revision Record			
Version	Chapter	Date	Remark
01	GZCR230500052402	2023-06-13	Original

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

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2 Test Summary

Item	Standard	Method	Requirement	Result
Effective Radiated Power (ERP)	47 CFR Part 2 47 CFR Part 22	ANSI C63.26-2015 Clause 5.2	Part 2.1046 Part 22.913	Pass
Peak-to-average ratio (PAR)	47 CFR Part 22	ANSI C63.26-2015 Clause 5.2	Part 22.913	Pass
Occupied Bandwidth	47 CFR Part 2	ANSI C63.26-2015 Clause 5.4	Part 2.1049	Pass
Spurious emissions at antenna terminals	47 CFR Part 22	ANSI C63.26-2015 Clause 5.7	Part 22.917	Pass
Radiated spurious emissions	47 CFR Part 22	ANSI C63.26-2015 Clause 5.5	Part 22.917	Pass
Frequency stability	47 CFR Part 2 47 CFR Part 22	ANSI C63.26-2015 Clause 5.6	Part 2.1055 Part 22.355	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:	DC -57.6V~ -36.0V
Test Voltage:	DC -48V
Operating Temperature:	-40 to +55 °C
Operating Humidity:	≤95%
Frequency Range:	869-894MHz
Radio System Type:	Single Radio Access Technology (Single-RAT): LTE Multi-Standard Radio (MSR): GSM & LTE
Capacity:	1 LTE carrier (5MHz, 10MHz, 15MHz, 20MHz)
(per antenna port)	2 LTE carriers (5MHz+5MHz, 5MHz+10MHz, 10MHz+10MHz) 1 GSM carrier+1 LTE carrier (5MHz, 10MHz) 2 GSM carriers+1 LTE carrier (5MHz, 10MHz)
Modulation Type:	GSM: GMSK, 8PSK LTE: QPSK/ 64QAM/256QAM
MIMO:	4T4R
Normal Output Power:	46dBm
(per antenna port)	
Interface:	TX & RX Port 4x 4.3-10-Female, ANT1~ ANT4 GPS Port 1x N-Female Power Port 1x 2-pin socket Optical Port 2x SFP+ Debug Port 1x Mini-USB
Antenna Type:	External Dedicated Antenna
Permission Antenna Gain:	5dBi or less
(declared from manufacturer)	



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4.2 Test Configuration

EUT Conf.	LTE carrier BW (MHz)	Modulation	Test Frequency (MHz)			Conf. code
			Bottom	Middle	Top	
1 LTE	5	QPSK	871.5	881.5	891.5	TC00
	5	64QAM	871.5	881.5	891.5	TC01
	5	256QAM	871.5	881.5	891.5	TC02
	10	QPSK	874	881.5	889	TC03
	10	64QAM	874	881.5	889	TC04
	10	256QAM	874	881.5	889	TC05
	15	QPSK	876.5	881.5	886.5	TC06
	15	64QAM	876.5	881.5	886.5	TC07
	15	256QAM	876.5	881.5	886.5	TC08
	20	QPSK	879	881.5	884	TC09
	20	64QAM	879	881.5	884	TC10
	20	256QAM	879	881.5	884	TC11
2 LTE	5+5	QPSK	871.5+876.5	879+884	886.5+891.5	TC12
	5+5	64QAM	871.5+876.5	879+884	886.5+891.5	TC13
	5+5	256QAM	871.5+876.5	879+884	886.5+891.5	TC14
	5+5	QPSK		871.5+891.5		TC15
	5+5	64QAM		871.5+891.5		TC16
	5+5	256QAM		871.5+891.5		TC17
	5+10	QPSK	871.5+879	879+886.5	881.5+889	TC18
	5+10	64QAM	871.5+879	879+886.5	881.5+889	TC19
	5+10	256QAM	871.5+879	879+886.5	881.5+889	TC20
	5+10	QPSK		871.5+889		TC21
	5+10	64QAM		871.5+889		TC22
	5+10	256QAM		871.5+889		TC23
	10+10	QPSK	874+884	876.5+886.5	879+889	TC24
	10+10	64QAM	874+884	876.5+886.5	879+889	TC25
	10+10	256QAM	874+884	876.5+886.5	879+889	TC26

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EUT Conf.	LTE carrier BW (MHz)	Modulation	Test Frequency (MHz)			Conf. code
			Bottom	Middle	Top	
2 LTE	10+10	QPSK		874+889		TC27
	10+10	64QAM		874+889		TC28
	10+10	256QAM		874+889		TC29
1 GSM+ 1 LTE	5	GMSK+QPSK		874+891.5		TC30
	5	8PSK+QPSK		874+891.5		TC31
	5	GMSK+64QAM		874+891.5		TC32
	5	8PSK+64QAM		874+891.5		TC33
	5	GMSK+256QAM		874+891.5		TC34
	5	8PSK+256QAM		874+891.5		TC35
	5	QPSK+GMSK		871.5+889		TC36
	5	QPSK+8PSK		871.5+889		TC37
	5	64QAM+GMSK		871.5+889		TC38
	5	64QAM+8PSK		871.5+889		TC39
	5	256QAM+GMSK		871.5+889		TC40
	5	256QAM+8PSK		871.5+889		TC41
	10	GMSK+QPSK		874+889		TC42
	10	8PSK+QPSK		874+889		TC43
	10	GMSK+64QAM		874+889		TC44
	10	8PSK+64QAM		874+889		TC45
	10	GMSK+256QAM		874+889		TC46
	10	8PSK+256QAM		874+889		TC47
	10	QPSK+GMSK		874+889		TC48
	10	QPSK+8PSK		874+889		TC49
	10	64QAM+GMSK		874+889		TC50
	10	64QAM+8PSK		874+889		TC51
	10	256QAM+GMSK		874+889		TC52
	10	256QAM+8PSK		874+889		TC53

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EUT Conf.	LTE carrier BW (MHz)	Modulation	Test Frequency (MHz)			Conf. code
			Bottom	Middle	Top	
2 GSM+ 1 LTE	5	GMSK+QPSK	869.5+878.5+891.5			TC54
	5	8PSK+QPSK	869.5+878.5+891.5			TC55
	5	GMSK+64QAM	869.5+878.5+891.5			TC56
	5	8PSK+64QAM	869.5+878.5+891.5			TC57
	5	GMSK+256QAM	869.5+878.5+891.5			TC58
	5	8PSK+256QAM	869.5+878.5+891.5			TC59
	5	QPSK+GMSK	871.5+884.5+893.5			TC60
	5	QPSK+8PSK	871.5+884.5+893.5			TC61
	5	64QAM+GMSK	871.5+884.5+893.5			TC62
	5	64QAM+8PSK	871.5+884.5+893.5			TC63
	5	256QAM+GMSK	871.5+884.5+893.5			TC64
	5	256QAM+8PSK	871.5+884.5+893.5			TC65
	10	GMSK+QPSK	869.5+878.5+889			TC66
	10	8PSK+QPSK	869.5+878.5+889			TC67
	10	GMSK+64QAM	869.5+878.5+889			TC68
	10	8PSK+64QAM	869.5+878.5+889			TC69
	10	GMSK+256QAM	869.5+878.5+889			TC70
	10	8PSK+256QAM	869.5+878.5+889			TC71
	10	QPSK+GMSK	874+884.5+893.5			TC72
	10	QPSK+8PSK	874+884.5+893.5			TC73
	10	64QAM+GMSK	874+884.5+893.5			TC74
	10	64QAM+8PSK	874+884.5+893.5			TC75
	10	256QAM+GMSK	874+884.5+893.5			TC76
	10	256QAM+8PSK	874+884.5+893.5			TC77

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4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	LENOVO	Lenovo Xiaoxinchao 5000	PF0TNMG8
DC Power	XANTREX	XFR 60-20	N/A
BBU	Supplied by client	E403-6	SYS-E403-9D-14CN-FN13TP
Matched load and Attenuator	Supplied by client	/	/

4.4 Test Environment

Environment Parameter	Selected Values During Test	
Ralative Humidity	Ambient	
Value	Temperature (°C)	Voltage (V)
TNVN	Asmbient	DC 48
TLVL	-30	DC 40.8
TLVH	-30	DC 55.2
THVL	+50	DC 40.8
THVH	+50	DC 55.2

VN: Normal Voltage, TN: Normal Teperature

VL: Lower Extreme Voltege, VH: Higher Extreme Voltage

TL: Lower Extreme Teperature, TH: Higher Extreme Teperature

4.5 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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4.6 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Scientech 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, IEC60068-2-27 and Rules of procedure IEC60068-2-27, and the relevant IEC60068-2-27 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	2023/3/20	2024/3/19
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
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	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	2020-06-28	2023-06-27
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 Effective Radiated Power (ERP)

Test Requirement: 47 CFR Part 2.1046, Part 22.913

Test Method: ANSI C63.26-2015 clause 5.2

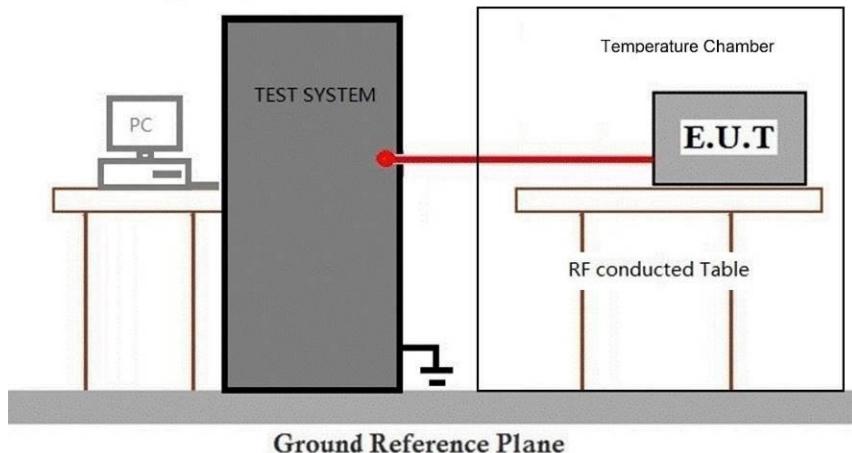
Limit: The ERP of base stations and repeaters must not exceed 500 watts per emission.

6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68 % RH Atmospheric Pressure: 1015 mbar

6.1.2 Test Setup



6.1.3 Measure Data

Please refer to Appendix - Test Data and Result for report GZCR230500052402.



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6.2 Peak-to-average ratio (PAR)

Test Requirement: 47 CFR Part 22.913

Test Method: ANSI C63.26-2015 clause 5.2

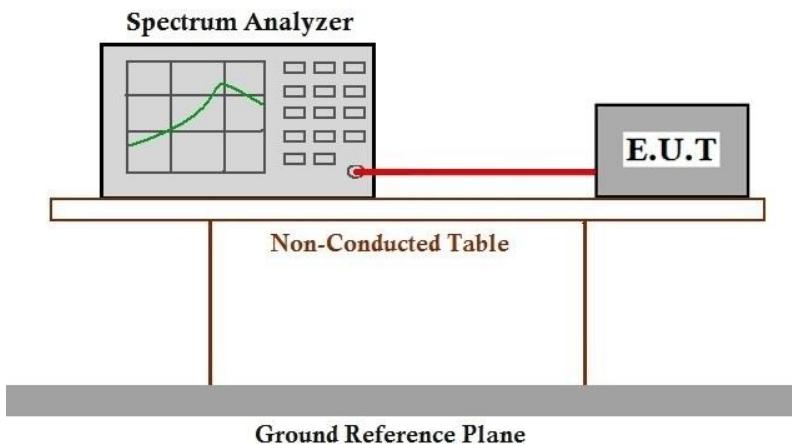
Limit: The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68 % RH Atmospheric Pressure: 1015 mbar

6.2.2 Test Setup



6.2.3 Measure Data

Please refer to Appendix - Test Data and Result for report GZCR230500052402.



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6.3 Occupied Bandwidth

Test Requirement: 47 CFR Part 2.1049

Test Method: ANSI C63.26-2015 clause 5.4

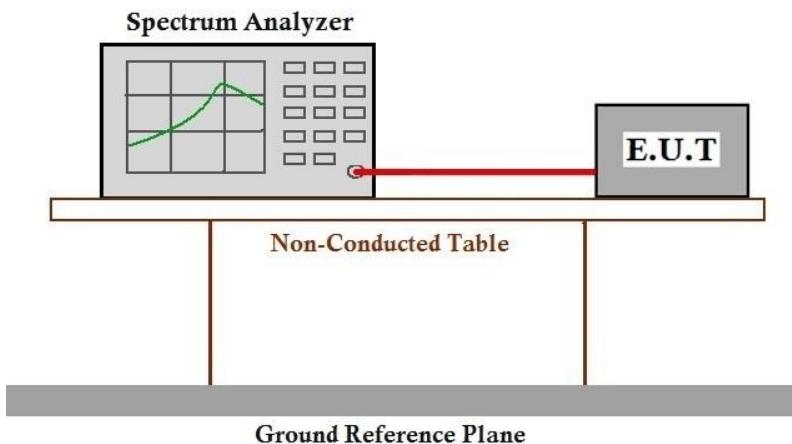
Limit: No limit

6.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68 % RH Atmospheric Pressure: 1015 mbar

6.3.2 Test Setup



6.3.3 Measure Data

Please refer to Appendix - Test Data and Result for report GZCR230500052402.



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6.4 Spurious emissions at antenna terminals

Test Requirement: 47 CFR Part 22.917

Test Method: ANSI C63.26-2015 clause 5.7

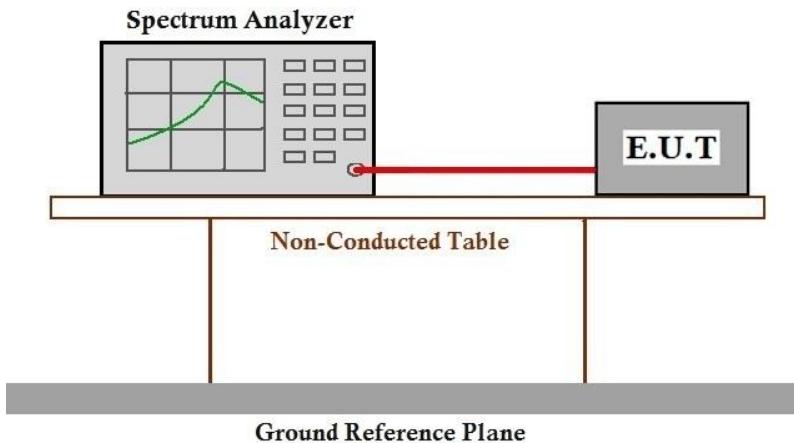
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

6.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68 % RH Atmospheric Pressure: 1015 mbar

6.4.2 Test Setup



6.4.3 Measure Data

Please refer to Appendix - Test Data and Result for report GZCR230500052402.



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6.5 Radiated Spurious emission

Test Requirement: 47 CFR Part 22.917

Test Method: ANSI C63.26-2015 clause 5.6

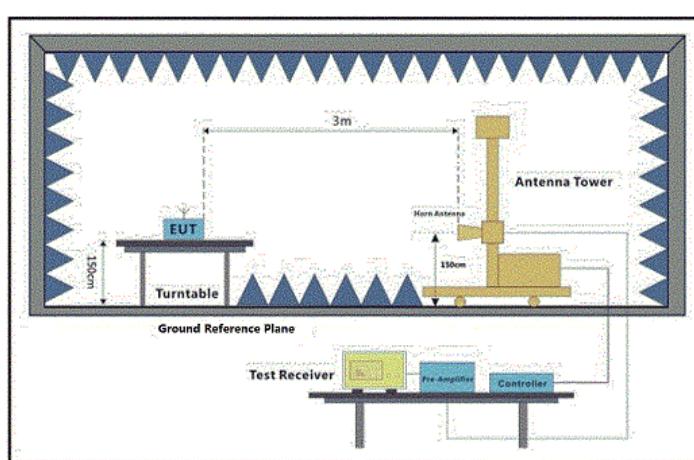
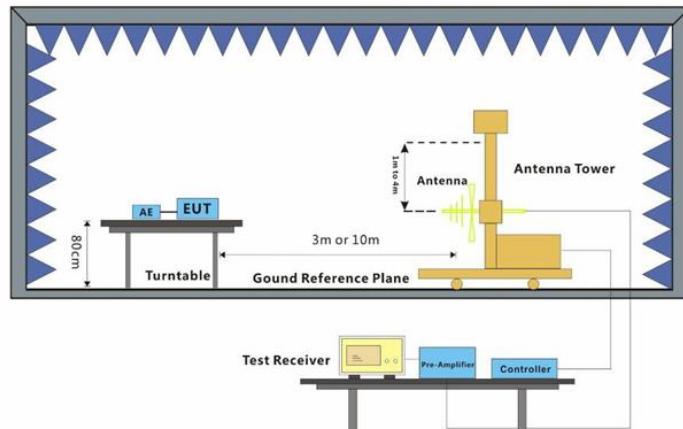
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

6.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.6 °C Humidity: 60 % RH Atmospheric Pressure: 1010 mbar

6.5.2 Test Setup



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6.5.3 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)

6.5.4 Measurement Data

Please refer to Appendix - Test Data and Result for report GZCR230500052402.



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6.6 Frequency Stability

Test Requirement: 47 CFR Part 2.1055, Part 22.355

Test Method: ANSI C63.26-2015 clause 5.6

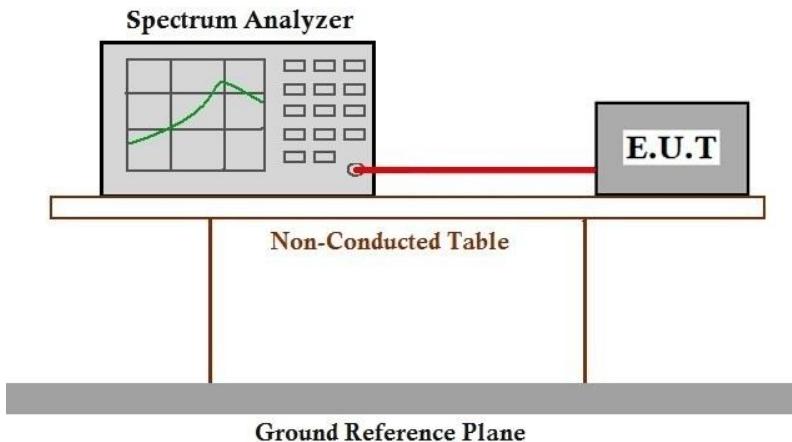
Limit: Fundamental emission must be maintained within the tolerance 1.5ppm.

6.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68 % RH Atmospheric Pressure: 1015 mbar

6.6.2 Test Setup



6.6.3 Measure Data

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7 Test Setup Photographs

Refer to Appendix - Test Setup Photos for GZCR2305000524AT.

8 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2305000524AT.

- End of the Report -



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