TEST REPORT

Application No.:	SZCR2411004362TL
Applicant:	GL Technologies (Hong Kong) Limited
Address of Applicant:	Unit 601, Building 5W, Hong Kong Science Park, Shatin, N.T., Hong Kong
Manufacturer:	GL Technologies (Hong Kong) Limited
Address of Manufacturer:	Unit 601, Building 5W, Hong Kong Science Park, Shatin, N.T., Hong Kong
Factory:	Shenzhen Guanglian Zhitong Technology Co., LTD
Address of Factory:	Room 305-306, Skyworth Digital Building, Shiyan Street, Baoan District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	4G LTE Wi-Fi 6 Router
Model No.:	GL-X2000
Trade Mark:	GL.iNET
FCC ID:	2AFIW-X2000
Standard(s) :	47 CFR Part 15, Subpart E 15.407
Date of Receipt:	2024-11-21
Date of Test:	2024-12-04 to 2024-12-10
Date of Issue:	2024-12-18
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2024-12-18		Original

Authorized for issue by:				
		Benson Wang		
		Benson Wang/Project Engineer		
		Eric Fu		
		Eric Fu/Reviewer		

2 Test Summary

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart E 15.407	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207 & Subpart E 15.407 b(9)	Pass
Radiated Emissions (Below 1GHz)		KDB 789033 D02 II G	47 CFR Part 15, Subpart C 15.209 & Subpart E 15.407(b)	Pass

Remark:

Model No.: GL-X2000

This test report (Ref. No.: SZCR241100436203) is only valid with the original test report (Ref. No.: SZCR240800332903).

Review this report and original report, this report just changed the product name, model No. and FCC ID.

According to the declaration from the applicant, the models in this report and models in original report were identical, only difference as follows :

Original Model: GL-XE2000	New model: GL-X2000
Have Battery	Not Battery
Top layer of the PCBA: Different power circuit design due to different power supply logic Different USB circuits due to different USB power supply logic	
Bottom layer for PCBA: due to the different power supply logic, GL-XE2000 with battery charge and discharge management due to the different power supply logic, GL-XE2000 with MCU circuit design	
LED layer for PCBA: due to the different power supply logic, GL-XE2000 with battery power LED	
The appearance color and shell design are different, but the antenna inside the shell is the same as the board Due to the built-in battery pack, the GL-XE2000 have a thicker appearance	

Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.

Therefore in this report Conducted Emissions at AC Power Line (150kHz-30MHz) and Radiated Emissions (Below 1GHz) were fully retested on model and shown the data in this report, other tests please refer to original report SZCR240800332903.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Adapter model: GQ24-120250-AX Input: 100-240V, 50/60Hz 1.0A Max output: DC 12V,2.5A
Cable(s):	cable of adapter: 185cm unshielded cable of Network: 82cm unshielded
Cable Loss (for RF conducted test):	0.5dB
Operation Frequency/Number of channels (20MHz):	5180-5240MHz (4 Channels); U-NII-2A: 5260-5320MHz (4 Channels); U-NII-2C: 5500-5700MHz (11 Channels); U-NII-3: 5745-5825MHz (5 Channels)
Operation Frequency/Number of channels/(40MHz):	5190-5230MHz (2 Channels); U-NII-2A: 5270-5310MHz (2 Channels); U-NII-2C: 5510-5670MHz (5 Channels); U-NII-3: 5755-5795MHz (2 Channels)
Operation Frequency/Number of channels (80MHz):	5210MHz (1 Channel); U-NII-2A: 5290MHz (1 Channels); U-NII-2C: 5530-5610MHz (2 Channels); U-NII-3: 5775MHz (1 Channel)
Operation Frequency/Number of channels (160MHz):	5250MHz/5570MHz
Modulation Type:	OFDM (64QAM, 16QAM, QPSK, BPSK); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM); 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024-QAM)
Channel Spacing:	802.11a/n/ac/ax 20: 20MHz; 802.11n/ac/ax 40: 40MHz; 802.11ac/ax 80: 80MHz; 802.11ac/ax 160: 160MHz
DFS Function:	Master
TPC Function:	Support TPC function
Antenna Type:	Dipole Antenna
Antenna Gain:	Antenna 1&2: 2.86dBi; dircetion gain: 5.87dBi
Remark:	Two antennas can simultaneous transmission

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
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The EUT has been tested as an independent unit.			

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	± 3.1dB
Radiated Emissions (Below 1GHz)	± 6.0dB for 3m; ± 5.0dB for 10m
Remark: The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so 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.	

4.4 Test Location

All tests were performed at:

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

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2022-05-14	2025-05-13
EMI Test Receiver	Rohde&Schwarz	ESR	SZ-WRG-M-047	2024-01-30	2025-01-29
Matching Pad	N/A	N/A	SEM021-23	2024-03-20	2025-03-19
Matching Pad	N/A	N/A	SEM021-24	2024-03-20	2025-03-19
Measurement Software	AUDIX	e3 V8.2014-6-27a	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2024-07-06	2025-07-05
LISN	Rohde&Schwarz	ENV216	SEM007-01	2024-08-15	2025-08-14
LISN	ETS-LINDGREN	3816/2	SEM007-02	2024-03-14	2025-03-13

Radiated Emissions (Below 1GHz)					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2023-11-20	2025-11-19
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2023-06-19	2026-06-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2024-08-14	2025-08-13
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2023-09-16	2025-09-15
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2024-03-14	2025-03-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2024-07-06	2025-07-05

General used equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2024-07-24	2025-07-23
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2024-07-24	2025-07-23
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2024-03-18	2025-03-17

6 Radio Spectrum Matter Test Results

6.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207 & Subpart E 15.407 b(9)

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

6.1.1 E.U.T. Operation

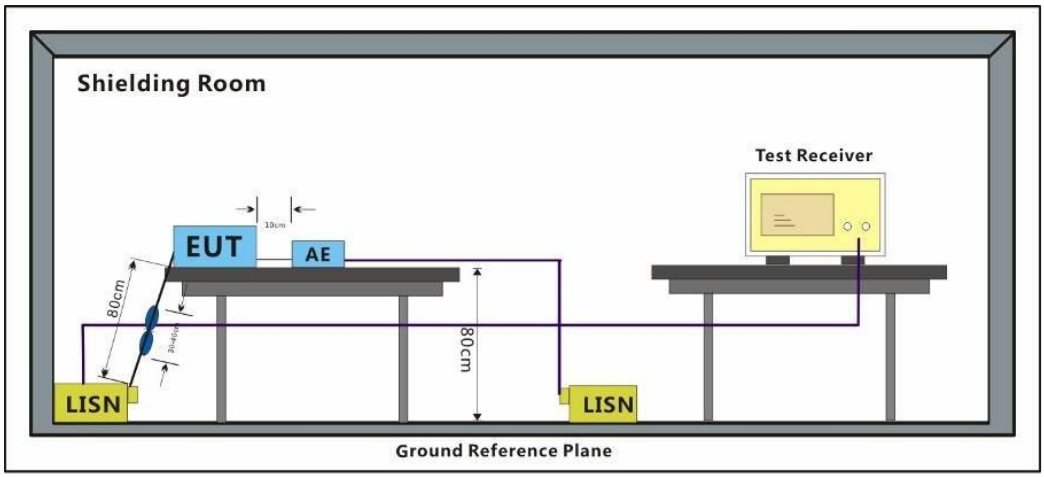
Operating Environment:

Temperature: 22.5 °C Humidity: 44.5 % RH Atmospheric Pressure: 1020 mbar

6.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode (U-NII-1)_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.
Pre-scan	03	TX mode (U-NII-2A) _Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.
Pre-scan	04	TX mode (U-NII-2C) _Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.
Pre-scan	05	TX mode (U-NII-3) _Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.

6.1.3 Test Setup Diagram



6.1.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

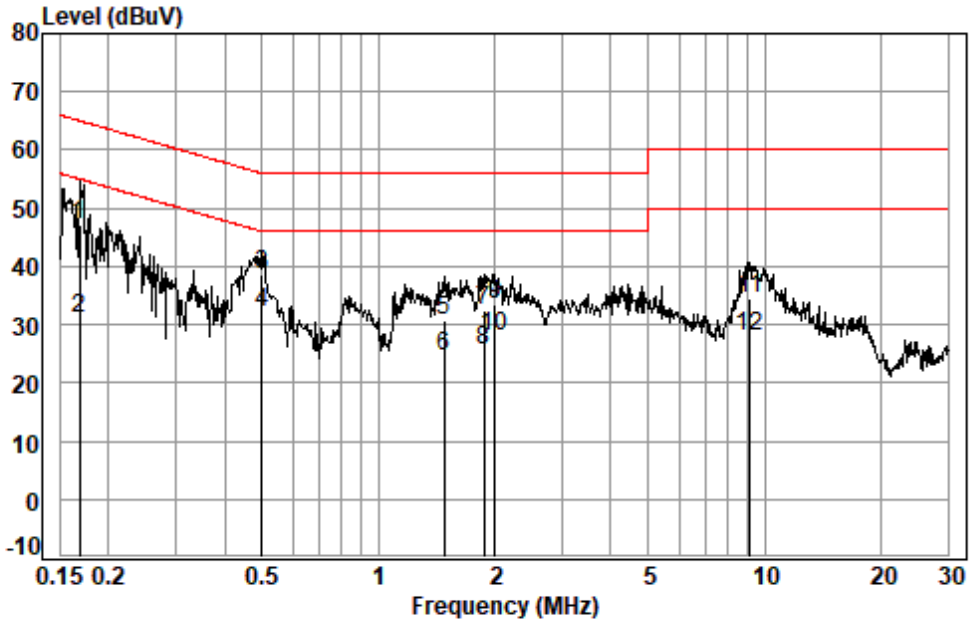
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Level=Read Level+ Cable Loss+ LISN Factor

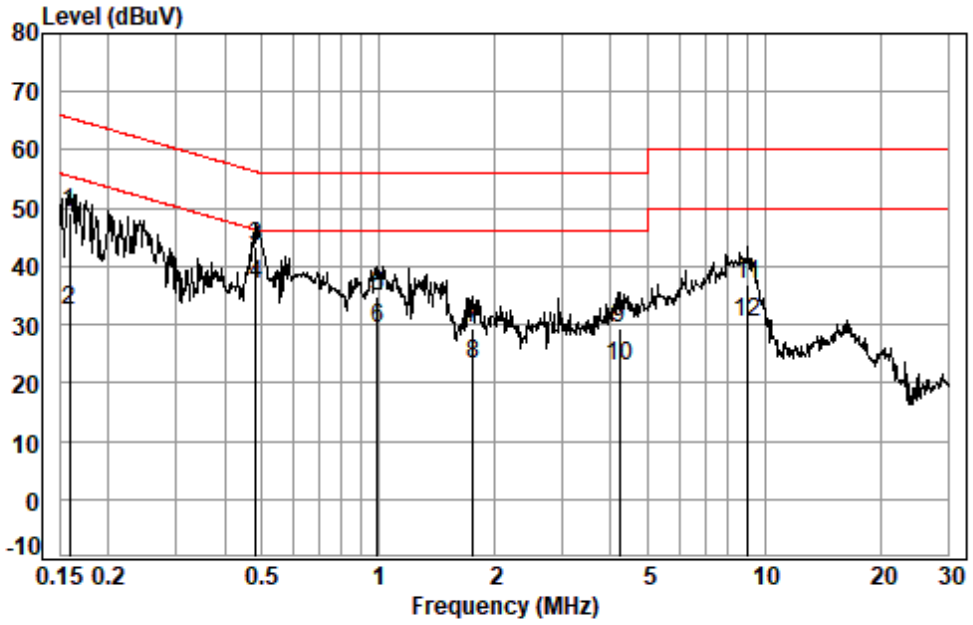
Test Mode: 02; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 04363TL
Test mode: 02

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.1685	0.06	10.16	37.00	47.22	65.03	-17.81	QP
2		0.1685	0.06	10.16	20.92	31.14	55.03	-23.89	Average
3	*	0.4994	0.08	9.54	28.86	38.48	56.01	-17.53	QP
4	*	0.4994	0.08	9.54	22.35	31.97	46.01	-14.04	Average
5		1.4796	0.10	9.58	20.87	30.55	56.00	-25.45	QP
6		1.4796	0.10	9.58	14.90	24.58	46.00	-21.42	Average
7		1.8779	0.10	9.58	22.59	32.27	56.00	-23.73	QP
8		1.8779	0.10	9.58	15.80	25.48	46.00	-20.52	Average
9		2.0012	0.10	9.58	23.75	33.43	56.00	-22.57	QP
10		2.0012	0.10	9.58	18.45	28.13	46.00	-17.87	Average
11		9.1557	0.19	9.69	24.57	34.45	60.00	-25.55	QP
12		9.1557	0.19	9.69	18.07	27.95	50.00	-22.05	Average

Test Mode: 02; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 04363TL
Test mode: 02

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.1590	0.06	10.14	38.86	49.06	65.52	-16.46	QP
2		0.1590	0.06	10.14	22.35	32.55	55.52	-22.97	Average
3	*	0.4812	0.08	9.71	33.65	43.44	56.32	-12.88	QP
4	*	0.4812	0.08	9.71	27.03	36.82	46.32	-9.50	Average
5		0.9944	0.09	9.54	25.16	34.79	56.00	-21.21	QP
6		0.9944	0.09	9.54	19.65	29.28	46.00	-16.72	Average
7		1.7623	0.10	9.55	19.55	29.20	56.00	-26.80	QP
8		1.7623	0.10	9.55	13.43	23.08	46.00	-22.92	Average
9		4.2242	0.12	9.55	19.56	29.23	56.00	-26.77	QP
10		4.2242	0.12	9.55	13.05	22.72	46.00	-23.28	Average
11		9.0592	0.19	9.60	27.21	37.00	60.00	-23.00	QP
12		9.0592	0.19	9.60	20.55	30.34	50.00	-19.66	Average

6.2 Radiated Emissions (Below 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.209 & Subpart E 15.407(b)
Test Method: KDB 789033 D02 II G
Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

6.2.1 E.U.T. Operation

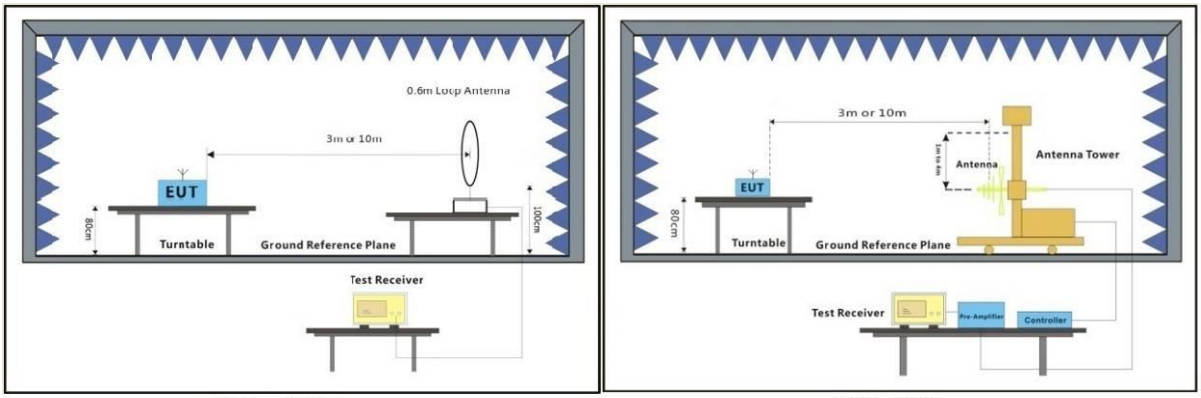
Operating Environment:
Temperature: 20.2 °C Humidity: 45.2 % RH Atmospheric Pressure: 1020 mbar

6.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode (U-NII-1)_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.
Pre-scan	03	TX mode (U-NII-2A) _Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.
Pre-scan	04	TX mode (U-NII-2C) _Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.

Pre-scan	05	TX mode (U-NII-3) _Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 6Mbps is the worst case of IEEE 802.11a; data rate @ MCS0 is the worst case of IEEE 802.11n/ac/ax 20/40/80/160, Only the data of worst case is recorded in the report.

6.2.3 Test Setup Diagram



Below 30MHz　　30MHz-1GHz

6.2.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

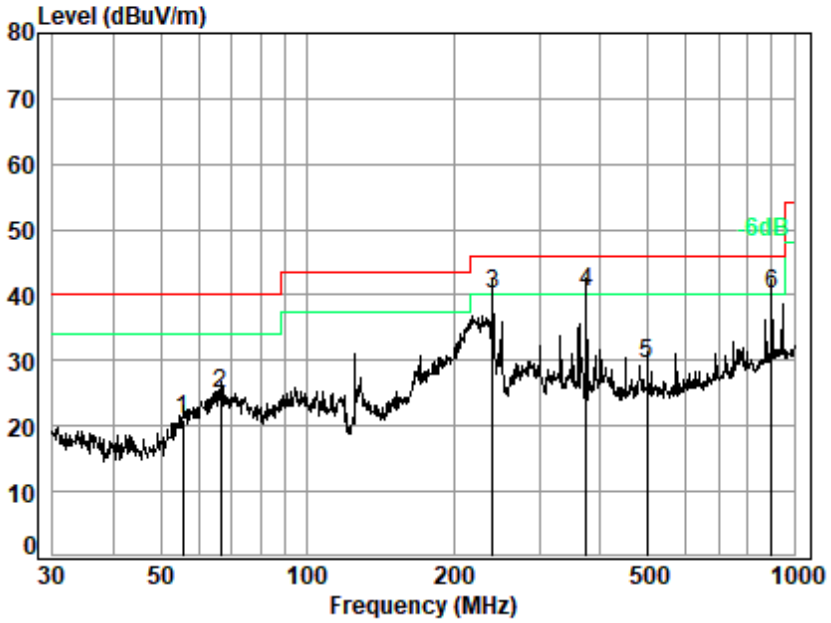
1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. For emission below 1GHz, through the pre-scan found the worst case is the lowest channel of 802.11a. Only the worst case is recorded in the report.

3. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

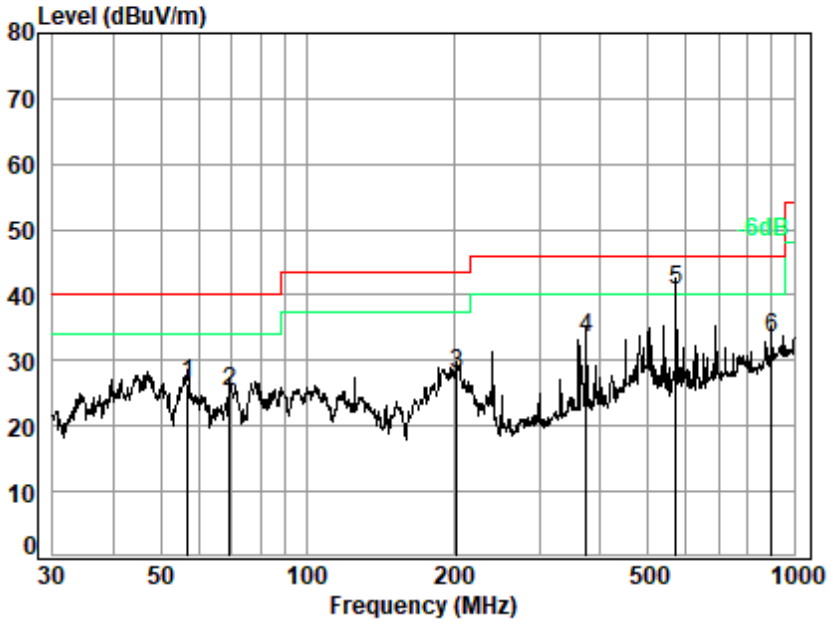
Test Mode: 02; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 04362TL/04363TL
Test Mode: 02

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	55.415	11.91	0.88	27.72	35.93	21.00	40.00	-19.00	QP
2	66.266	10.90	0.96	27.69	40.63	24.80	40.00	-15.20	QP
3	240.830	17.08	1.91	27.00	48.31	40.30	46.00	-5.70	QP
4 q	374.623	20.68	2.45	27.05	44.50	40.58	46.00	-5.42	QP
5	499.425	22.90	2.89	27.56	31.19	29.42	46.00	-16.58	QP
6	900.147	27.82	4.09	26.76	35.11	40.26	46.00	-5.74	QP

Test Mode: 02; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 04362TL/04363TL
Test Mode: 02

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	56.792	11.77	0.89	27.71	41.65	26.60	40.00	-13.40	QP
2	69.357	10.64	0.99	27.68	41.37	25.32	40.00	-14.68	QP
3	202.810	14.35	1.74	27.16	38.96	27.89	43.50	-15.61	QP
4	374.623	20.68	2.45	27.05	37.28	33.36	46.00	-12.64	QP
5 q	572.614	23.73	3.12	27.86	41.71	40.70	46.00	-5.30	QP
6	896.997	27.93	4.08	26.79	28.13	33.35	46.00	-12.65	QP

7 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2411004362TL

8 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for SZCR2411004362TL

- End of the Report -