TEST REPORT

Application No.:	SZCR2504001472AT
Applicant:	Shenzhen RAKwireless Technology Co.,Ltd.
Address of Applicant:	Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	WisLink LPWAN Concentrator
Model No.:	RAK5146
Trade Mark:	RAK
FCC ID:	2AF6B-RAK5146
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2025-04-14
Date of Test:	2025-05-07 to 2025-05-07
Date of Issue:	2025-06-02
Test Result:	**Pass***

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

Keny Xu
EMC Laboratory Manager

No.1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057 t (86-755) 26012053 f (86-755) 26710594 www.sgsgroup.com.cn
中国·广东·深圳市南山区科技园中区M-10栋1号厂房 邮编: 518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2025-06-02		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**
Radiated Spurious Emissions Above 1GHz	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Charging adapter information Model: RP025-4800500YG Input: 100-240VAC, 50/60Hz 0.7A Max Output: 48.0Vdc, 0.5A, 24.0W
Cable(s):	AC cable of adapter:155cm unshielded
Lora module:	
Technical Specification of Lora DTS	
Operating Frequency:	923.3 - 927.5MHz
Type of Modulation:	LoRa
Data Rate:	SF7 - SF12 / DR8 – DR13,
Channel Number:	8Channels
Channel Separation:	600KHz
Occupied Bandwidth:	500KHz
Technical Specification of Lora Hybrid	
Operating Frequency:	903.9 - 905.3MHz
Type of Modulation:	LoRa
Data Rate:	SF7 - SF10 / DR0 –DR3,
Channel Number:	8 Channels (DSS & DTS)
Channel Separation:	200KHz
Occupied Bandwidth:	125KHz
Antenna Gain:	Fiberglass Antenna 1: RAKARG14: 5.8dBi; Fiberglass Antenna 2: RAKARG15: 8dBi; Fiberglass Antenna 3: RAKARG19: 5.1dBi;
The Fiberglass Antenna 1 and 3 have the same type and RF characteristics as equivalent antenna, so, only pre-scan the Fiberglass Antenna 1(High antenna gain) and antenna 2 and found the worst case of Fiberglass antenna 1 was recorded in the report.	
(2.4G Wi-Fi module) FCC ID:	2ABCB-RPICM4
(LTE module) FCC ID:	XMR201807EG95NA
Remark: The host is configured as follows: Host 1: Model No.: RAK7393C: lora US915 16ch/8ch* with GPS（RAK5146）+ 2.4G Wi-Fi （CM4）+LTE （EG95-NA） power by POE or DC source 9-36V Host 2: Model No.: RAK7393: lora US915 16ch/8ch* with GPS（RAK5146）+ 2.4G Wi-Fi （CM4）power by POE or DC source 9-36V *16ch: 2pcs Lora module in the host.; 8ch: 1pcs Lora module in the host.	

Lora:

RF Channel and Frequency of Lora DTS

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
/	/	1	923.9	3	925.1	5	926.3
0	923.3	2	924.5	44	925.7	6	926.9
7	927.5						

RF Channel and Frequency of Lora Hybrid

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	903.9	2	904.3	4	904.7	6	905.1
1	904.1	3	904.5	5	904.9	7	905.3

DR	Configure	Indicative physical bit rate [bit/sec]
0	LoRa Modulation: SF10 / Bandwidth 125 kHz	980
1	LoRa Modulation: SF9 / Bandwidth 125 kHz	1760
2	LoRa Modulation: SF8 / Bandwidth 125 kHz	3125
3	LoRa Modulation: SF7 / Bandwidth 125 kHz	5470
8	LoRa Modulation: SF12 / Bandwidth 500 kHz	980
9	LoRa Modulation: SF11 / Bandwidth 500 kHz	1760
10	LoRa Modulation: SF10 / Bandwidth 500 kHz	3900
11	LoRa Modulation: SF9 / Bandwidth 500 kHz	7000
12	LoRa Modulation: SF8 / Bandwidth 500 kHz	12500
13	LoRa Modulation: SF7 / Bandwidth 500 kHz	21900

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
Radiated Spurious Emissions Above 1GHz	± 4.6dB (1-18GHz);± 4.8dB (18-40GHz)
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

Radiated Spurious Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 1G-18GHz	Tonscend	TAP01018050	SZ-WRG-M-051	2025-01-07	2026-01-06
Low Noise Amplifier 18G-40GHz	Tonscend	TAP18040048	SZ-WRG-M-052	2025-01-08	2026-01-07
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
SHF-EHF Horn 15GHz-40GHz	SCHWARZBECK	BBHA 9170	SZ-WRG-M-056	2023-12-25	2025-12-24
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2024-07-24	2025-07-23

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	2025-03-03	2026-03-02

6 Radio Spectrum Matter Test Results

6.1 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.6
Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

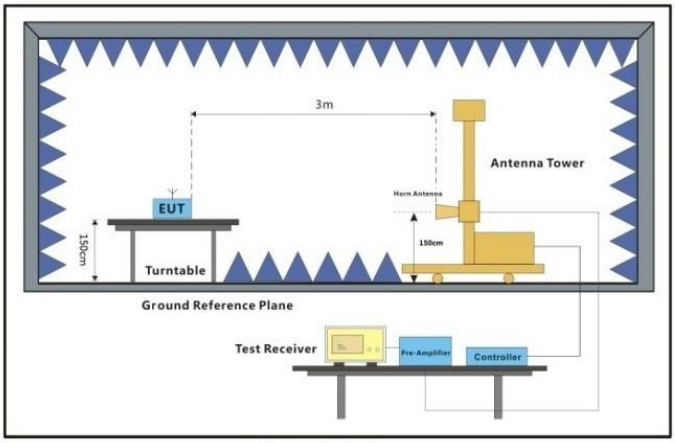
6.1.1 E.U.T. Operation

Operating Environment:
Temperature: 21.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1020 mbar

6.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the HOST in continuously transmitting mode.

6.1.3 Test Setup Diagram



Above 1GHz

6.1.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 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 peak or average 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. Scan from 1GHz to 25GHz, the disturbance above 18GHz 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.

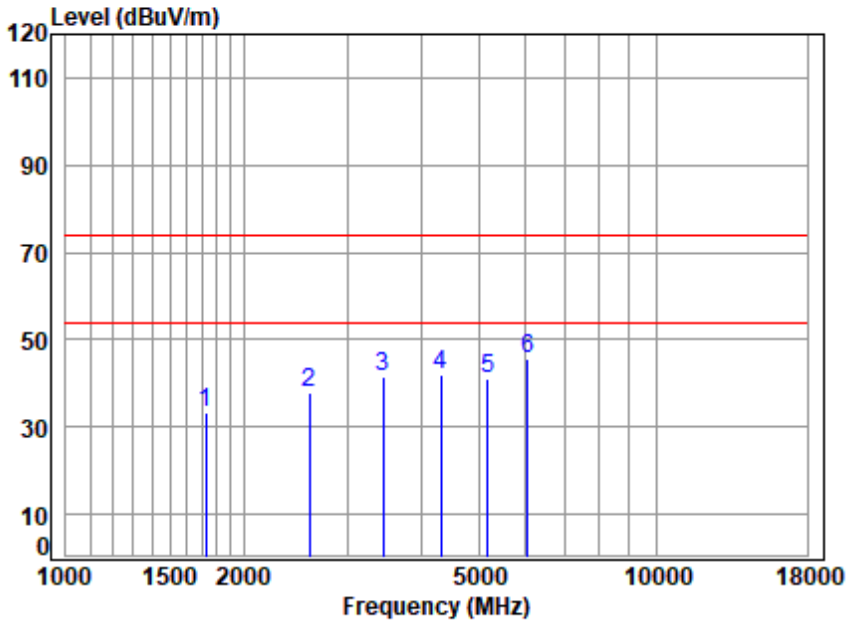
3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.

5:For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥1/T (Duty cycle＜98%) or 10Hz (Duty cycle≥98%) for Average detection (AV) at frequency above 1GHz.

Remark:
The Host 1 supports three wireless technologies, namely Lora, 2.4g Wi-Fi, and WCDMA&LTE, and can transmit synchronously.
The Host 2 supports two wireless technologies, namely Lora and 2.4g Wi-Fi, and can transmit synchronously.
Each combination has been pre-tested and only the worst data of Host 1 (Lora 1 of DTS of antenna 1 + Lora 2 of Hybrid of antenna of antenna 1+2.4G Wi Fi 802.11b+LTE Band 13) is recorded in the report

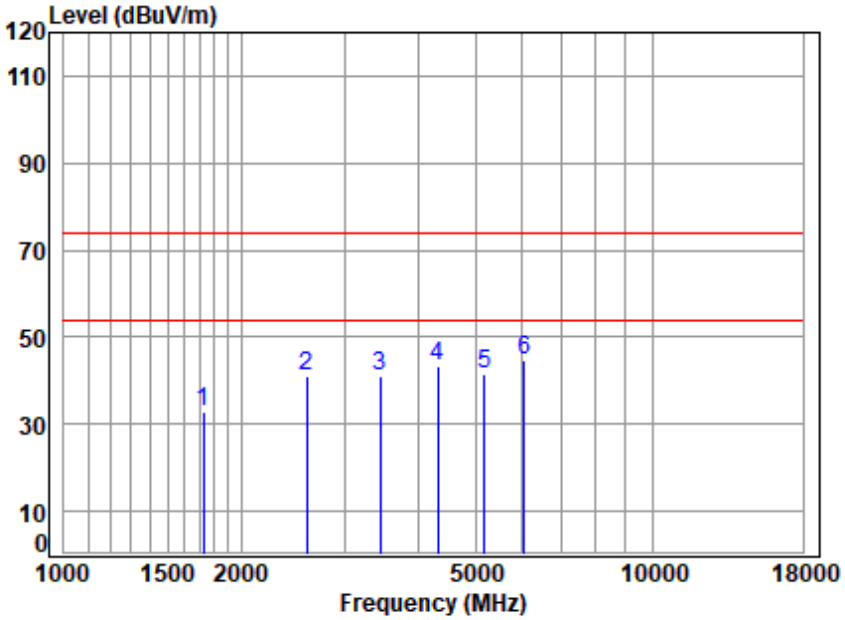
Test mode: 02; Polarity: Horizontal; Channel: Lora +2.4g Wi-Fi 802.11b +LTE Band 13: lowest channel



Condition: 3m HORIZONTAL
Job No : 01472AT/01500AT
Mode : TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1726.200	7.23	25.20	54.70	55.71	33.44	74.00	-40.56	peak
2	2589.300	6.75	27.96	54.88	58.14	37.97	74.00	-36.03	peak
3	3452.400	7.45	29.41	55.27	59.93	41.52	74.00	-32.48	peak
4	4315.500	8.39	31.30	55.82	57.98	41.85	74.00	-32.15	peak
5	5178.600	9.44	32.46	56.41	55.59	41.08	74.00	-32.92	peak
6 pp	6041.700	10.15	33.88	56.89	58.60	45.74	74.00	-28.26	peak

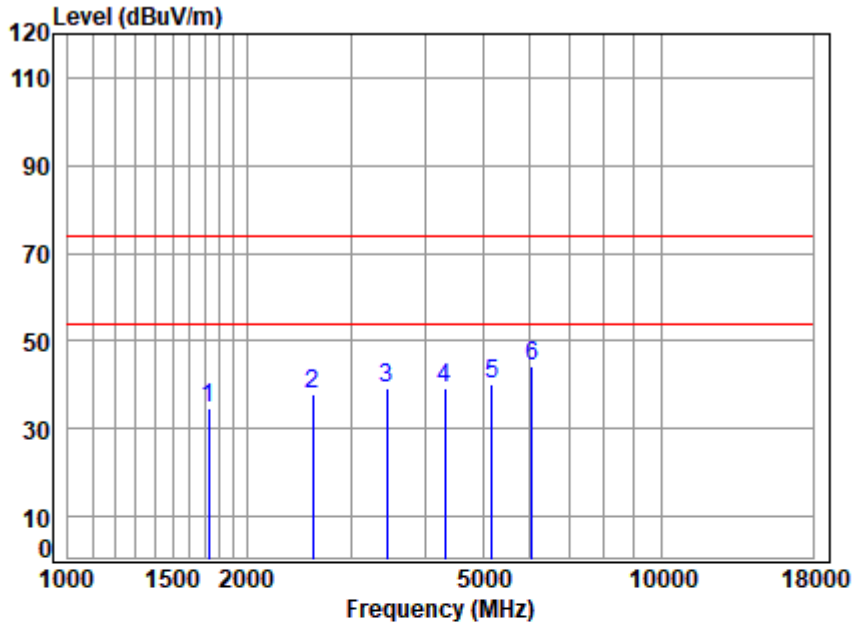
Test mode: 02; Polarity: Vertical; Channel: Lora +2.4g Wi-Fi 802.11b +LTE Band 13: lowest channel



Condition: 3m VERTICAL
Job No : 01472AT/01500AT
Mode : TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1726.200	7.23	25.20	54.70	55.26	32.99	74.00	-41.01	peak
2	2589.300	6.75	27.96	54.88	61.45	41.28	74.00	-32.72	peak
3	3452.400	7.45	29.41	55.27	59.69	41.28	74.00	-32.72	peak
4	4315.500	8.39	31.30	55.82	59.48	43.35	74.00	-30.65	peak
5	5178.600	9.44	32.46	56.41	56.07	41.56	74.00	-32.44	peak
6 pp	6041.700	10.15	33.88	56.89	57.38	44.52	74.00	-29.48	peak

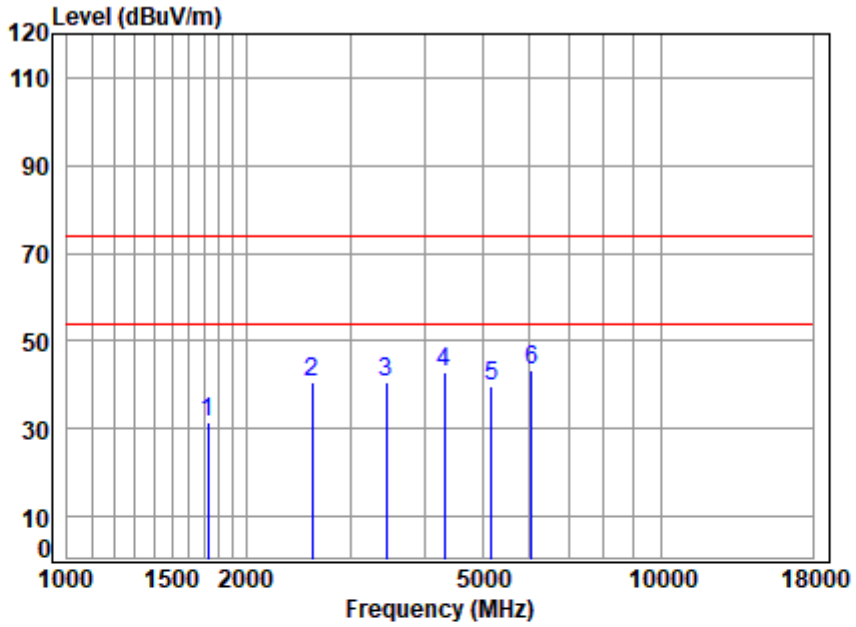
Test mode: 02; Polarity: Horizontal; Channel: Lora +2.4g Wi-Fi 802.11b +LTE Band 13: Middle channel



Condition: 3m HORIZONTAL
Job No : 01472AT/01500AT
Mode : TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1726.200	7.23	25.20	54.70	56.78	34.51	74.00	-39.49	peak
2	2589.300	6.75	27.96	54.88	58.13	37.96	74.00	-36.04	peak
3	3452.400	7.45	29.41	55.27	57.47	39.06	74.00	-34.94	peak
4	4315.500	8.39	31.30	55.82	55.48	39.35	74.00	-34.65	peak
5	5178.600	9.44	32.46	56.41	54.61	40.10	74.00	-33.90	peak
6 pp	6041.700	10.15	33.88	56.89	56.91	44.05	74.00	-29.95	peak

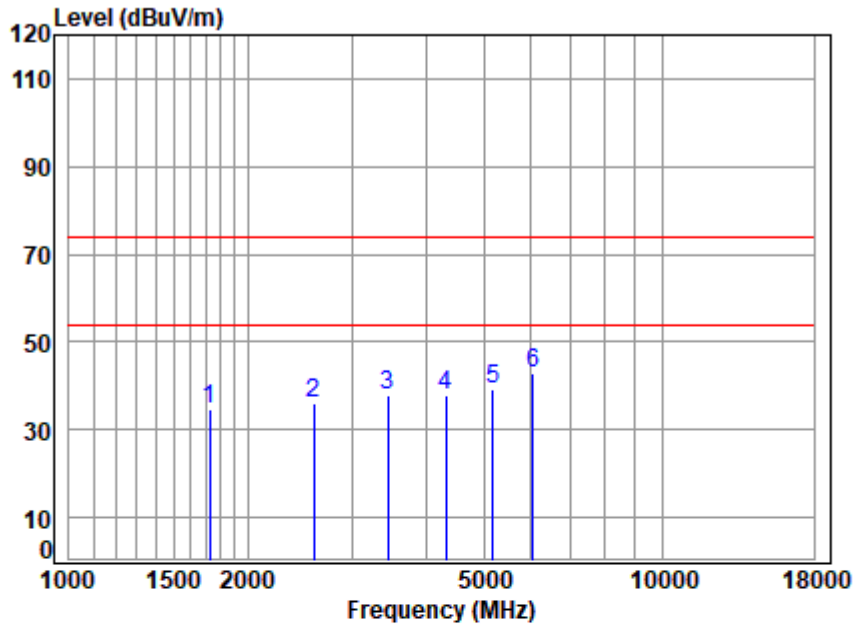
Test mode: 02; Polarity: Vertical; Channel: Lora +2.4g Wi-Fi 802.11b +LTE Band 13: Middle channel



Condition: 3m VERTICAL
Job No : 01472AT/01500AT
Mode : TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1726.200	7.23	25.20	54.70	53.82	31.55	74.00	-42.45	peak
2	2589.300	6.75	27.96	54.88	60.62	40.45	74.00	-33.55	peak
3	3452.400	7.45	29.41	55.27	58.86	40.45	74.00	-33.55	peak
4	4315.500	8.39	31.30	55.82	59.18	43.05	74.00	-30.95	peak
5	5178.600	9.44	32.46	56.41	54.37	39.86	74.00	-34.14	peak
6 pp	6041.700	10.15	33.88	56.89	56.31	43.45	74.00	-30.55	peak

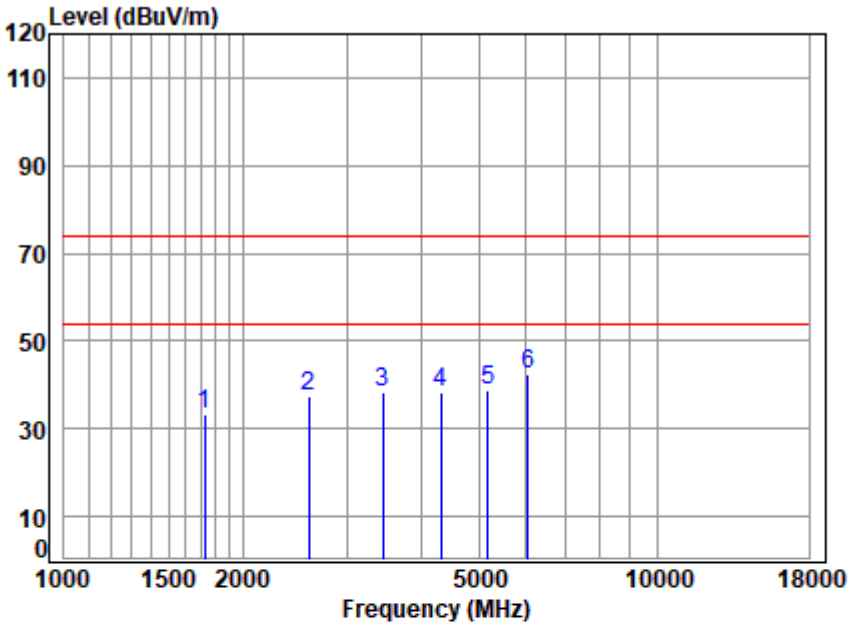
Test mode: 02; Polarity: Horizontal; Channel: Lora +2.4g Wi-Fi 802.11b +LTE Band 13: Highest channel



Condition: 3m HORIZONTAL
Job No : 01472AT/01500AT
Mode : TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1726.200	7.23	25.20	54.70	56.75	34.48	74.00	-39.52	peak
2	2589.300	6.75	27.96	54.88	56.30	36.13	74.00	-37.87	peak
3	3452.400	7.45	29.41	55.27	56.23	37.82	74.00	-36.18	peak
4	4315.500	8.39	31.30	55.82	54.05	37.92	74.00	-36.08	peak
5	5178.600	9.44	32.46	56.41	53.62	39.11	74.00	-34.89	peak
6 pp	6041.700	10.15	33.88	56.89	55.58	42.72	74.00	-31.28	peak

Test mode: 02; Polarity: Vertical; Channel: Lora +2.4g Wi-Fi 802.11b +LTE Band 13: Highest channel



Condition: 3m VERTICAL
Job No : 01472AT/01500AT
Mode : TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1726.200	7.23	25.20	54.70	55.54	33.27	74.00	-40.73	peak
2	2589.300	6.75	27.96	54.88	57.40	37.23	74.00	-36.77	peak
3	3452.400	7.45	29.41	55.27	56.58	38.17	74.00	-35.83	peak
4	4315.500	8.39	31.30	55.82	54.45	38.32	74.00	-35.68	peak
5	5178.600	9.44	32.46	56.41	53.18	38.67	74.00	-35.33	peak
6 pp	6041.700	10.15	33.88	56.89	55.09	42.23	74.00	-31.77	peak

7 Test Setup Photo

Refer to Appendix – Test Setup Photos for SZCR2504001472AT.

8 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal photos for SZCR2504001472AT

- End of the Report -