

Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

EMC TEST REPORT

PRODUCT	4G Wireless Smart Module
BRAND	SIMCom
MODEL	SIM8905A-R2
APPLICANT	SIMCom Wireless Solutions Limited
FCC ID	2AJYU-8PSA303
ISSUE DATE	September 07, 2022
STANDARD(S)	FCC Part 15, Subpart B, ANSI C63.4-2014

Prepared by: Li Liukai

Signature



Reviewed by: Qin Yabin

Signature



Approved by: Liu Long

Signature

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1 Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard(s)	Title	Version
1	FCC Part 15, Subpart B	Radio frequency devices	2021/10/1
2	ANSI C63.4	Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
NOTE: 1. According to customer requirements, test and report using the latest version of the standard.			

1.2 Summary of Test Results

No.	Item(s)	Standard(s)	Verdicts for Single Item	Detailed Results
1	Radiated Emission	15.109(a)	Pass	See section 6.1
2	AC Conducted Emission	15.107(a)	Pass	See section 6.2
NOTE: The SIM8905A-R2, manufactured by SIMCom Wireless Solutions Limited is a variant product for testing. This project is a variant project based on the original report C21T00135-EMC01-V00. According to the product change description, we retested it all, as shown in Section 5.2, and recorded the worst case of test data in the report. Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3. Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.				

2 General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4, No. 766, Jingang Road, Pudong, Shanghai, China
Telephone	021-68866880
FCC Registration No.	958356
FCC Designation No.	CN1177

2.2 Laboratory Environmental Requirements

Temperature	15°C~35°C
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	86kPa~106kPa
Supply Voltage	120V/60Hz

2.3 Project Information

Project Manager	Xu Yuting
Test Date	August 03, 2022 to August 11, 2022

3 General Information of The Customer

3.1 Applicant

Company	SIMCom Wireless Solutions Limited
Address	8F, Bldg3 No.289 Linhong Rd, ChangNing District Shanghai, PRC China
Telephone	02131575100/15102196457

3.2 Manufacturer

Company	SIMCom Wireless Solutions Limited
Address	8F, Bldg3 No.289 Linhong Rd, ChangNing District Shanghai, PRC China
Telephone	02131575100/15102196457

3.3 Factory

Company	N/A
Address	N/A

4 General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	4G Wireless Smart Module
Model	SIM8905A-R2
Date of Receipt	August 02, 2022
EUT ID*	N01
SN/IMEI	861384050078878/861384050080916
Supported Radio Technology and Bands	LTE 2/4/5/7/12/13/17/25/26/41 GPS GLONASS BDS BLE BT EDR WLAN 802.11b,g,n
Hardware Version	V1.03
Software Version	R2148.02
NOTE1: EUT ID is the internal identification code of the laboratory. NOTE2: Photographs of EUT are shown in ANNEX A of this test report.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
EA01	PCB Board	N/A	N/A
CA01	Adapter	P-050B-050200 EU	N/A
EB01	Antenna	N/A	N/A
EC02	RF Cable	N/A	N/A
NOTE: *AE ID is the internal identification code of the laboratory.			

5 Test Configuration Information

5.1 Laboratory Environmental Conditions

5.1.1 Permanent Facilities

Semi-anechoic chamber SAC3-1 (9 m*8m*6.2m) & SAC3-2 (9.8m*6.7m*6.7m)	
Shielding effectiveness	0.014MHz ~1MHz, >60dB; 1MHz~1000MHz, >90dB.
Electrical insulation	> 2MΩ
Ground system resistance	< 4Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio (SVSWR)	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

Shielded room	
Shielding effectiveness	0.014MHz~1MHz, >60dB; 1MHz~1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4Ω

5.2 Decision of final test mode

The EUT was tested in conjunction with the accessories in Section 4.2. We tested all of the following test modes and selected the worst mode from the test results and recorded them in the report.

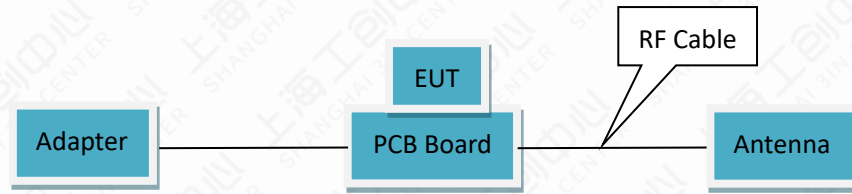
The test configuration modes are as the following:

Test Item	Test setup and operating modes
Radiated emission	30MHz-18GHz frequency range: Mode 1: LTE2 receiver mode+ CA01+ EA01+ EB01+ EC02 Mode 2: GPS mode+ CA01+ EA01+ EB01+ EC02 Mode 3: GLONASS mode+ CA01+ EA01+ EB01+ EC02 Mode 4: BDS mode+ CA01+ EA01+ EB01+ EC02 Mode 5: BT mode+ CA01+ EA01+ EB01+ EC02 Mode 6: WLAN mode+ CA01+ EA01+ EB01+ EC02
AC Conducted emission	Mode 1: LTE2 receiver mode+ CA01+ EA01+ EB01+ EC02 Mode 2: GPS mode+ CA01+ EA01+ EB01+ EC02 Mode 3: GLONASS mode+ CA01+ EA01+ EB01+ EC02 Mode 4: BDS mode+ CA01+ EA01+ EB01+ EC02 Mode 5: BT mode+ CA01+ EA01+ EB01+ EC02 Mode 6: WLAN mode+ CA01+ EA01+ EB01+ EC02
Note: 1. All test modes are performed, only the worst cases test data are recorded in this report. 2. After laboratory verification, LTE2 is the worst mode among all receiving modes of 4G and is recorded in the report. 3. EUT and GNSS simulator (SMBV100A) connection is established. 4. EUT and BT/WLAN simulator (CMW500) connection is established.	

5.3 EUT System Operation

1. Connect the EUT with AE.
2. Setup the EUT according to the standard.
3. Start testing and monitoring the function.

5.4 EUT Connection Diagram of Test System



<Figure 5.4-1> Mode 1

5.5 Test Equipment Utilized

No.	Name	Model	S/N	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMW500	104178	R&S	2021-05-10	1.5 year
2	Test Receiver	ESCI	101235	R&S	2022-02-23	1 year
3	Test Receiver	ESU40	100307	R&S	2022-02-23	1 year
4	Trilog Antenna	VULB9163	VULB9163-515	Schwarzbeck	2022-03-11	1 year
5	Double Ridged Guide Antenna	ETS-3117	00135890	ETS	2022-03-09	2 years
6	2-Line V-Network	ENV216	101380	R&S	2022-02-21	1 year
7	EMI Test Software	EMC32 V9.15	N/A	R&S	N/A	N/A
8	GNSS simulator	SMBV100A	257904	R&S	2022-02-21	1 year

5.6 Measurement Uncertainty

Item (s)	Uncertainty
Radiated Emission 30MHz-1000MHz	4.96 dB
Radiated Emission 1000MHz-18000MHz	5.18 dB
Conducted Emission	3.66 dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

6 Test Results

6.1 Radiated Emission

6.1.1 Method of Measurement

- a. For 30MHz -1000MHz, the EUT was placed on the top of a rotating 0.8m table above the ground at a semi-anechoic chamber. The distance between the EUT and the received antenna was 3 meters. The table was rotated 360 degree and the received antenna mounted on a variable-height antenna tower was varied from 1m to 4m to find the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were set during the measurement.
- b. For 1000MHz -18000MHz, the EUT was placed on the top of a 0.8m table above the ground at a 3m fully anechoic chamber. The maximal emission value was acquired by adjusting the antenna height, The table was rotated 360 degree to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were set during the measurement

6.1.2 EUT Connection Diagram of Test System

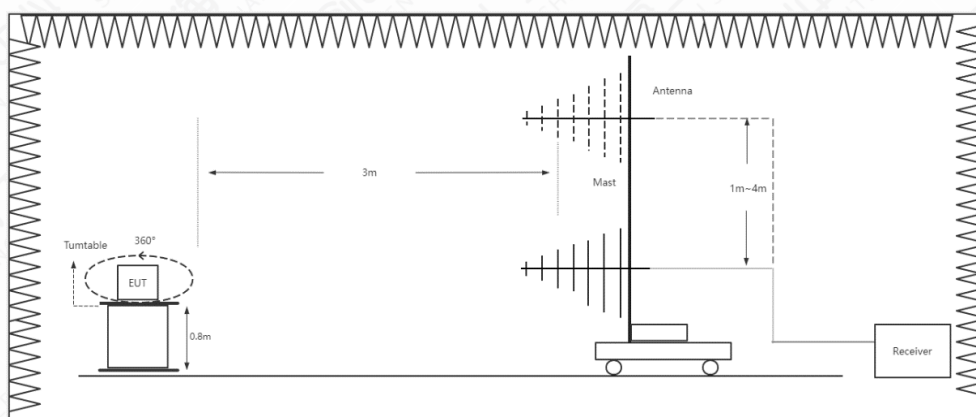


Figure 6.1.2-1 RE 30MHz-1GHz Connection Diagram

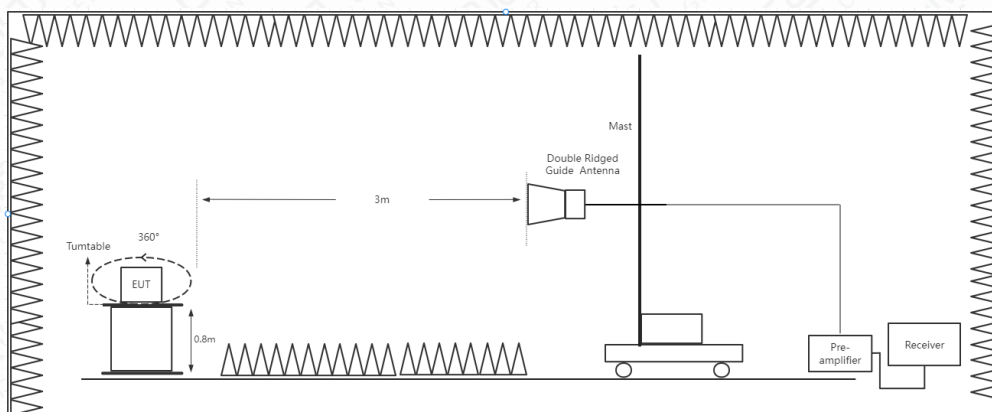


Figure 6.1.2-2 RE Above 1GHz Connection Diagram

6.1.3 Test Condition

Frequency Range (MHz)	RBW/VBW	Sweep Time (s)
30-1000	120kHz/300kHz	AUTO
1000-18000	1MHz/3MHz	AUTO

6.1.4 Limit/Criterion

Frequency Range (MHz)	Quasi-Peak (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
30-88	40	N/A	N/A
88-216	43.5	N/A	N/A
216-960	46	N/A	N/A
Above 960	54	N/A	N/A
Above 1000	N/A	74	54

6.1.5 Test environmental conditions

Temperature	24.6℃
Relative Humidity	57.9%RH
Atmospheric Pressure	101.7 kPa

6.1.6 Test Results

Mode	Frequency (MHz)	Test Results	Verdicts
Mode 2: GPS mode+ CA01+ EA01+ EB01+ EC02	30-1000	See Annex A.1-1	Pass
Mode 1: LTE2 receiver mode+ CA01+ EA01+ EB01+ EC02	1000-18000	See Annex A.1-2 & A.1-3	Pass
NOTE Abbreviations used in this clause: Pass—P; Fail—F; Not applicable—N/A			

6.2 Conducted Emission

6.2.1 Method of Measurement

The EUT was placed on a 0.8m height table with EUT being connected to the power mains through a line impedance stabilization network (LISN). Both lines of the power mains connected to the EUT were checked for maximum conducted interference. The frequency range from 150 kHz to 30 MHz was searched.

6.2.2 EUT Connection Diagram of Test System

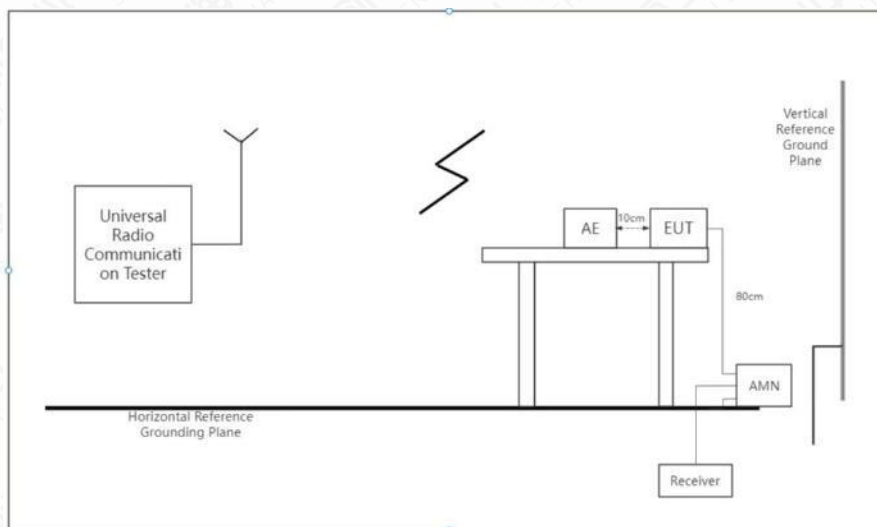


Figure 6.2.2-1 CE Connection Diagram

6.2.3 Test Condition

Test Condition in Charging Mode

Voltage (V)	Frequency (Hz)	RBW	Sweep Time (s)
120	60	9 kHz	AUTO

6.2.4 Limit

Frequency Range (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		

6.2.5 Testing environmental conditions

Temperature	25.0°C
Relative Humidity	52.1%RH
Atmospheric Pressure	101.6 kPa

6.2.6 Test Results

Mode	Frequency (MHz)	Test Results	Verdicts
Mode 1: LTE2 receiver mode+ CA01+ EA01+ EB01+ EC02	0.15-30	See Annex A.2-1	Pass
NOTE Abbreviations used in this clause: Pass—P; Fail—F; Not applicable—N/A			

Annex A: Measurement Data

A.1 Radiated Emission

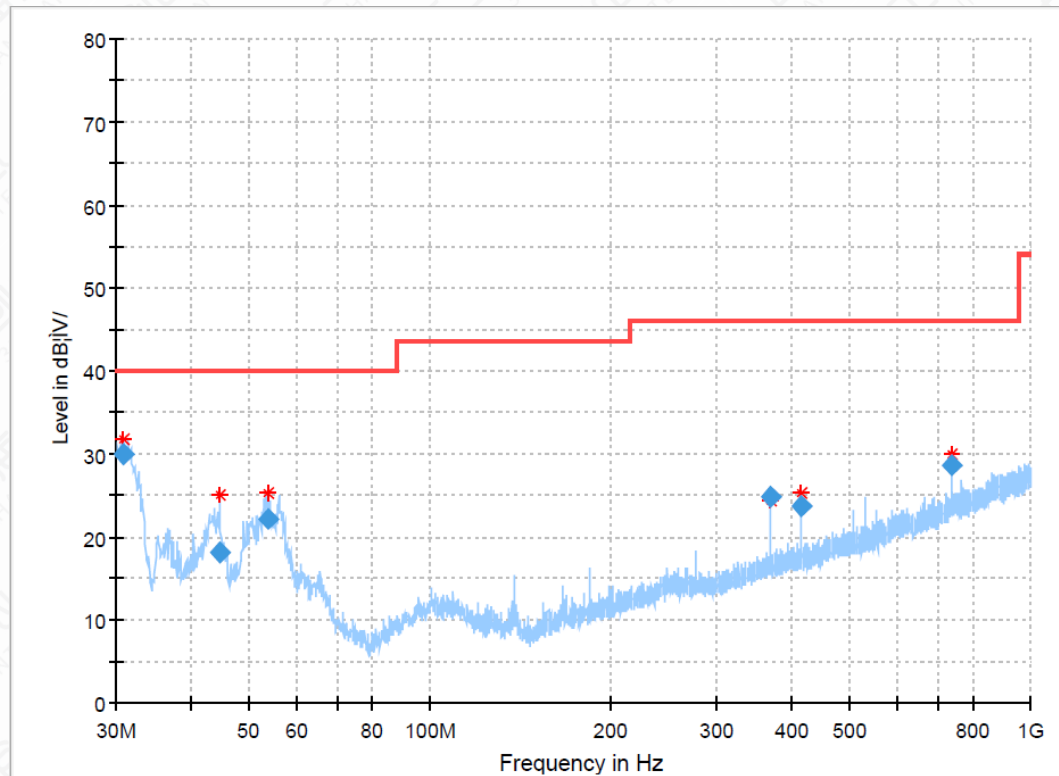


Figure A.1-1 Mode 2 (30M-1GHz)

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.917440	30.04	40.00	9.96	100.0	V	207.0	-15.2
44.742560	18.11	40.00	21.89	200.0	V	289.0	-11.9
53.814640	22.12	40.00	17.88	100.0	V	183.0	-12.1
369.359880	24.74	46.00	21.26	100.0	H	127.0	-8.0
415.527480	23.66	46.00	22.34	100.0	H	115.0	-7.1
738.704800	28.60	46.00	17.40	100.0	H	127.0	-0.8

Note:

1.Horizontal and vertical polarity is all have been tested, the result of them is synthesized in the above data diagram.

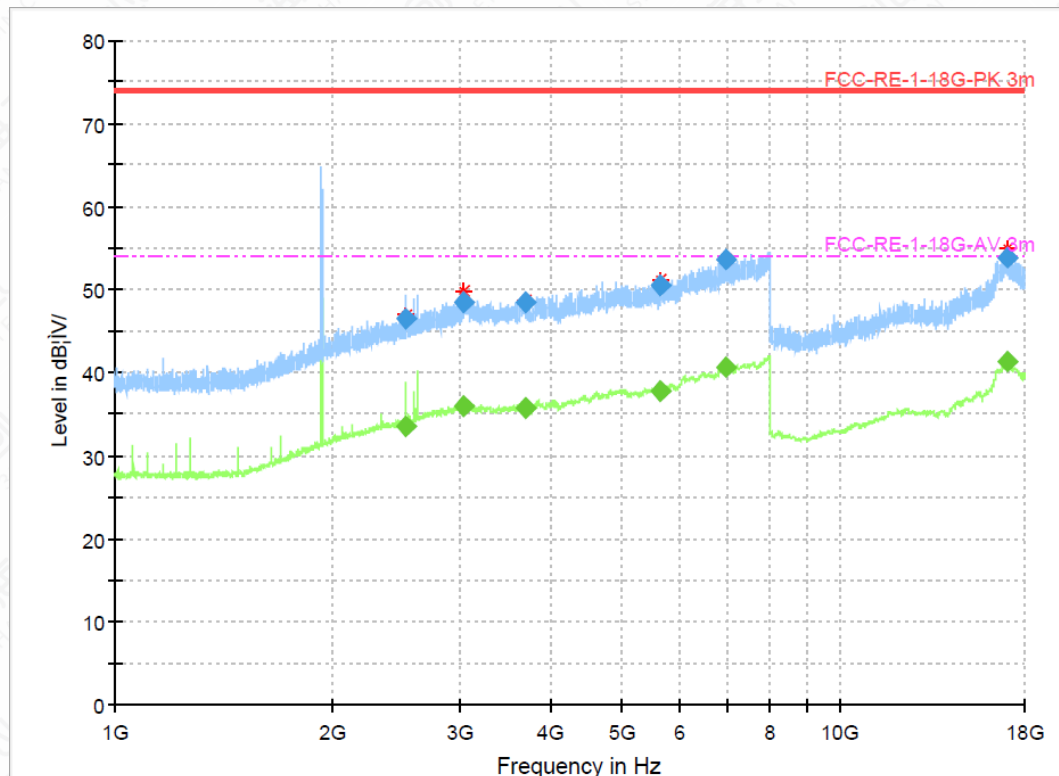


Figure A.1-2 Mode 1 (1GHz-18GHz)-H

Note: The frequency over the limits is the main frequency signal.

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2521.5512	46.49	---	74.00	27.51	500.0	1000.0	115.0	H	270.0	9.3
2521.5512	---	33.53	54.00	20.47	500.0	1000.0	115.0	H	270.0	9.3
3024.3062	---	35.97	54.00	18.03	500.0	1000.0	206.0	H	0.0	12.8
3024.3062	48.49	---	74.00	25.51	500.0	1000.0	206.0	H	0.0	12.8
3687.8375	48.54	---	74.00	25.46	500.0	1000.0	115.0	H	184.0	12.7
3687.8375	---	35.84	54.00	18.16	500.0	1000.0	115.0	H	184.0	12.7
5661.3200	50.61	---	74.00	23.39	500.0	1000.0	206.0	H	0.0	16.8
5661.3200	---	37.74	54.00	16.26	500.0	1000.0	206.0	H	0.0	16.8
6986.3850	---	40.67	54.00	13.33	500.0	1000.0	115.0	H	120.0	19.7
6986.3850	53.54	---	74.00	20.46	500.0	1000.0	115.0	H	120.0	19.7
16995.050	53.88	---	74.00	20.12	500.0	1000.0	215.0	H	0.0	22.6
16995.050	---	41.41	54.00	12.59	500.0	1000.0	215.0	H	0.0	22.6

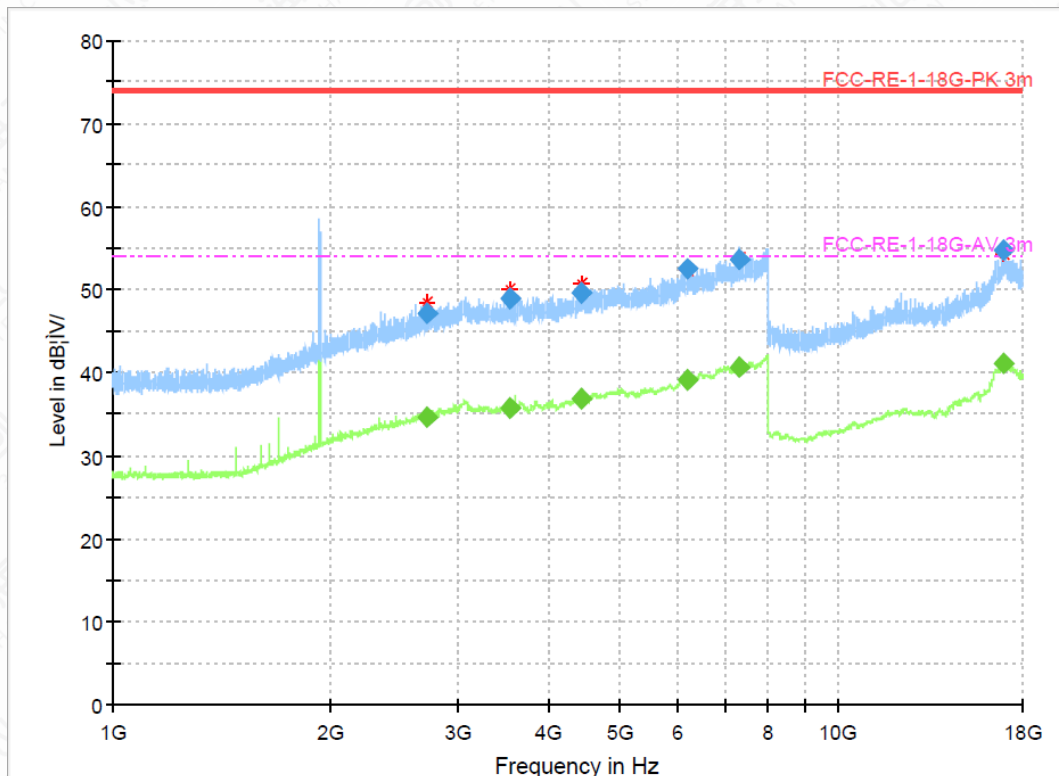


Figure A.1-3 Mode 1 (1GHz-18GHz)-V

Note: The frequency over the limits is the main frequency signal.

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2707.3550	47.14	---	74.00	26.86	500.0	1000.0	211.0	V	6.0	10.3
2707.3550	---	34.69	54.00	19.31	500.0	1000.0	211.0	V	6.0	10.3
3531.8812	---	35.81	54.00	18.19	500.0	1000.0	188.0	V	320.0	12.4
3531.8812	48.99	---	74.00	25.01	500.0	1000.0	188.0	V	320.0	12.4
4431.5350	49.57	---	74.00	24.43	500.0	1000.0	115.0	V	41.0	14.2
4431.5350	---	36.95	54.00	17.05	500.0	1000.0	115.0	V	41.0	14.2
6204.2462	52.44	---	74.00	21.56	500.0	1000.0	102.0	V	1.0	18.2
6204.2462	---	39.03	54.00	14.97	500.0	1000.0	102.0	V	1.0	18.2
7331.6012	---	40.63	54.00	13.37	500.0	1000.0	115.0	V	170.0	20.1
7331.6012	53.67	---	74.00	20.33	500.0	1000.0	115.0	V	170.0	20.1
16974.567	54.77	---	74.00	19.23	500.0	1000.0	188.0	V	237.0	22.6
16974.567	---	41.23	54.00	12.77	500.0	1000.0	188.0	V	237.0	22.6

A.2 Conducted Emission

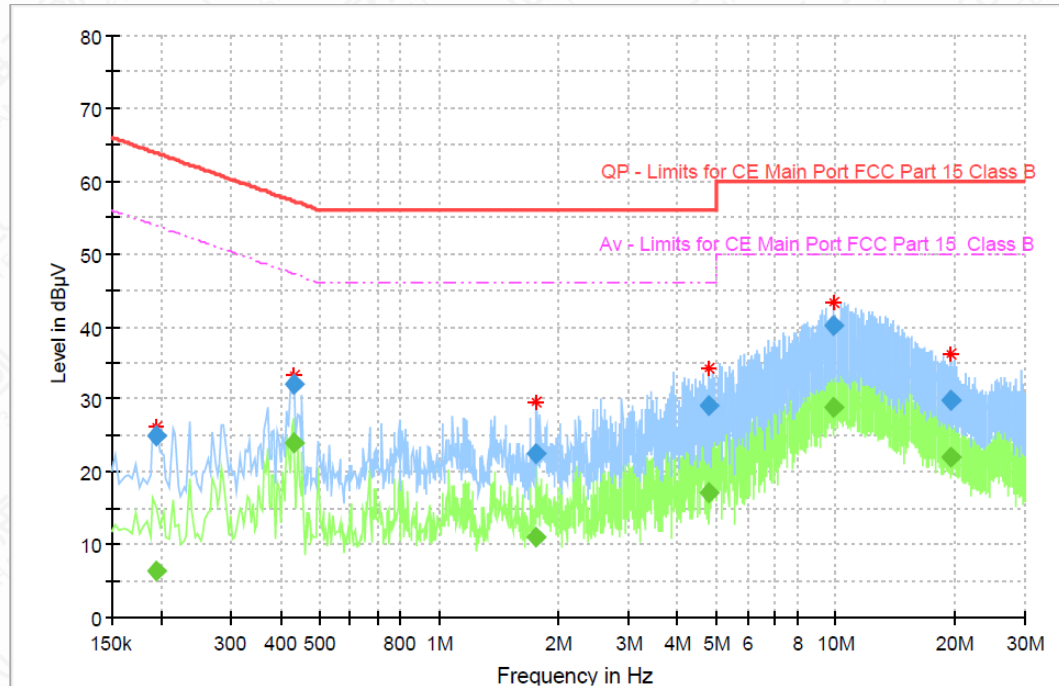


Figure A.2-1 Mode 1 (150kHz-30MHz)

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.194775	25.05	---	63.83	38.78	15000	9.000	N	ON	10.5
0.194775	---	6.45	53.83	47.38	15000	9.000	N	ON	10.5
0.433575	32.04	---	57.18	25.14	15000	9.000	L1	ON	9.9
0.433575	---	23.94	47.18	23.25	15000	9.000	L1	ON	9.9
1.765631	---	11.01	46.00	34.99	15000	9.000	N	ON	10.6
1.765631	22.55	---	56.00	33.45	15000	9.000	N	ON	10.6
4.802869	---	17.11	46.00	28.89	15000	9.000	N	ON	10.9
4.802869	29.16	---	56.00	26.84	15000	9.000	N	ON	10.9
9.843788	---	28.79	50.00	21.21	15000	9.000	N	ON	11.7
9.843788	40.02	---	60.00	19.98	15000	9.000	N	ON	11.7
19.392056	---	22.12	50.00	27.88	15000	9.000	N	ON	13.3
19.392056	29.79	---	60.00	30.21	15000	9.000	N	ON	13.3

Note: L1 and N line is all have been tested, the result of them is synthesized in the above data diagram.

Annex B: Revised History

Version	Revised Content
V00	Initial

Annex C: Accreditation Certificate





Accredited Laboratory

A2LA has accredited

**INDUSTRIAL INTERNET INNOVATION CENTER
(SHANGHAI) CO., LTD.**

Shanghai, People's Republic of China

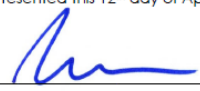
for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 12th day of April 2021.



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.