

Report No.: SET2021-11641

EMC TEST REPORT

Report No.: SET2021-11641

Product Name: CRANE-M3

FCC ID: 2AIHFZYSM115

Model No.: SM115

Applicant: Guilin Zhishen Information Technology Co., Ltd.

09 Huangtong Road, Tieshan Industrial Zone, Qixing District, Guilin,

Address:

Guangxi, China.

Dates of Testing: 2021.08.23-2021.09.06

Issued by: CCIC Southern Testing Co., Ltd.

Electronic Testing Building, No. 43 Shahe Road, Xili Street,

Lab Location:

Nanshan District, Shenzhen, Guangdong, China.

Tel: 86 755 26627338 Fax: 86 755 26627238

This test report consists of **21** pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CCIC-SET. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CCIC-SET within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.





Test Report

Product Name..... CRANE-M3

Model No. SM115

Trade name ZHIYUN

Brand name ZHIYUN

Applicant...... Guilin Zhishen Information Technology Co., Ltd.

Manufacturer Guilin Zhishen Information Technology Co., Ltd.

09 Huangtong Road, Tieshan Industrial Zone, Qixing District, Guilin, Manufacturer Address Guangxi, China

Test Standards...... 47 CFR Part 15 Subpart B

Test Result..... PASS

Tested by Ruihong Xie

Ruihong Xie Test Engineer 2021.09.06

Reviewed by Chris You

Chris You Senior Engineer 2021.09.06

Approved by Shuangwan Zhang

2021.09.06

Shuangwen Zhang, Manager



TABLE OF CONTENTS GENERAL INFORMATION4 1. EUT Description4 1.1 1.2 Test Standards and Results......5 1.3 Facilities and Accreditations 6 1.3.1 Facilities 6 1.3.2 1.3.3 2. TEST CONDITIONS SETTING7 2.1 2.2 2.3 Test Mode 2.4 Test Setup and Equipments List......7 2.4.1 2.4.2 **3.** 47 CFR PART 15B REQUIREMENTS11 3.1 3.1.1 3.1.2 3.1.3 3.2 3.2.1 3.2.2 3.2.3 APPENDIX II: PHOTOGRAPHS OF EMC TEST CONFIGURATION20 **Change History** Reason for change Issue Date 1.0 2021.09.06 First edition





1. GENERAL INFORMATION

1.1 EUT Description

EUT Name CRANE-M3

Trade Name : Infiray
Brand Name : Infiray
Hardware Version : N/A
Software Version : N/A

Note1: The EUT is a CRANE-M3;

Note 2:For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 4 of 21



Report No.: SET2021-11641

1.2 Test Standards and Results

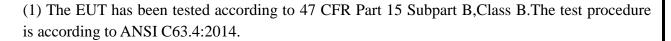
The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices
	Subpart B	

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.107	Conducted Emission	PASS
2	15.109	Radiated Emission	PASS

NOTE:



CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 5 of 21



Report No.: SET2021-11641

1.3 Facilities and Accreditations

1.3.1 Facilities

FCC-Registration No.: CN1283

CCIC Southern Testing Co., Ltd EMC Laboratory has been registered 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: CN1283, valid time is until April 19th, 2023.

ISED Registration: 11185A-1

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until April 19th, 2023.

A2LA Code: 5721.01

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17 025. The accreditation certificate number is 5721.01.

1.3.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

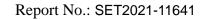
Temperature ($^{\circ}$):	15 ℃ - 35 ℃
Relative Humidity (%):	25% -75%
Atmospheric Pressure (kPa):	86kPa-106kPa

1.3.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:	Uc = 2.6 dB (k=2)
Uncertainty of Radiated Emission:	Uc = 3.91 dB (k=2)
(30MHz~1GHz)	
Uncertainty of Radiated Emission:	Uc = 4.5 dB (k=2)
(1~18GHz)	
Uncertainty of Radiated Emission:	Uc = 4.9 dB (k=2)
(18~40GHz)	

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 6 of 21





2. TEST CONDITIONS SETTING

2.1 Test Peripherals

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Support Equipment:

Description	Brand name	Model	Serial No.	FCCID
Ac Adapter	ZTE	STC-A51D-	N/A	N/A

Support Cable:

Description	Shield Type	Ferrite Core	Length	
Antenna Cable	Un- shielding	No	1.2m	

2.2 Use of Software Checklist

Software	Version number	Manufacturer	Use the project	
ES-K1	V1.73	ROHDE&SCHWARZ	Radiated Emissions below 1GHz	
TS+	JS32-RE 2.5.2.0	Tonsceng	Radiated Emissions above 1GHz	
EMC32	Version 10.35.10	ROHDE&SCHWARZ	Conducted Emission	

2.3 Test Mode

The EUT have the following typical setups during the test:

Setup1: EUT +Charger working.

Note: only worst-case mode setup 1 mode data provide at the report

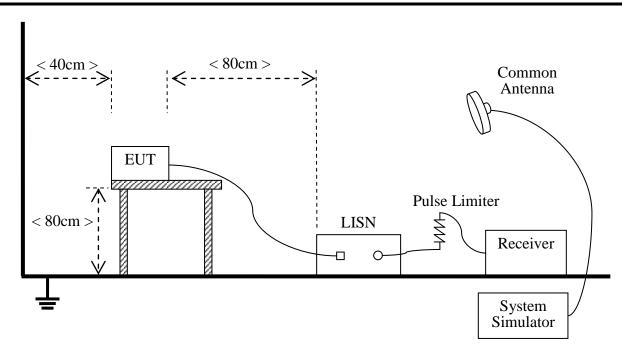
2.4 Test Setup and Equipments List

2.4.1 Conducted Emission

A. Test Setup:

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 7 of 21





The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\,\mu\text{H}$ of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

B. Equipments List:

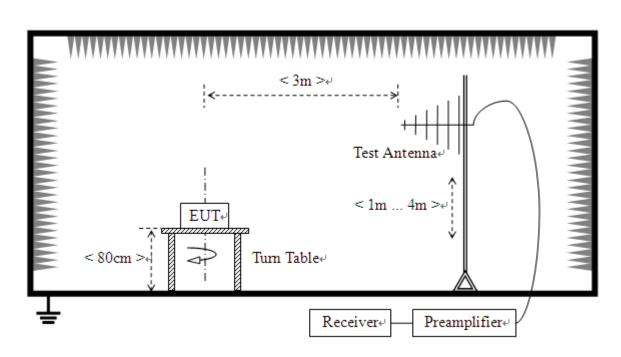
Description	cription Manufacturer		Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	KEYSIGHT	N9038A	A141202036	2020.11.21	2021.09.20
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2020.11.21	2021.09.21
Cable	MATCHING PAD	W7	/	2021.08.01	2022.08.02

2.4.2 Radiated Emission

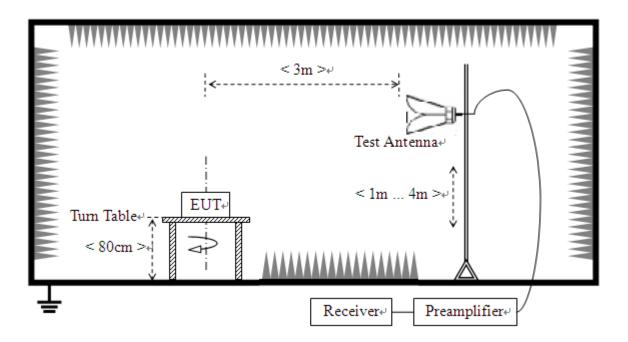
A. Test Setup:

1) For radiated emissions from 30MHz to1GHz





2) For radiated emissions above 1GHz



B. Test Procedure

The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a





variable-height antenna master tower.

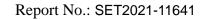
For the test Antenna:

1) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

C. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration	Calibration	
Description	Manufacturer	Wiodei	Scriai 140.	Date	Due. Date	
Test Receiver	KEYSIGHT	N9038A	A141202036	2020.11.21	2021.09.20	
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2020.11.21	2021.09.21	
Cl.:-14 Doom	Visite Electronics	L7300*W4500	A 191002226	2019 00 06	2021 00 05	
Shield Room	Xinju Electronics	*H3100	A181003226	2018.09.06	2021.09.05	
EMI Test Receiver	ROHDE&SCHWARZ	ESIB7	A0501375	2021.06.23	2022.05.23	
Broadband Ant.	2786	ETC	A150402239	2018.09.17	2021.09.16	
3M Anechoic	A 11- atmoss	SAC-3MAC	10412275	2010 02 26	2022 02 25	
Chamber	Albatross	9*6*6m	A0412375	2019.03.26	2023.03.25	
EMI Test Receiver	ROHDE&SCHWARZ	ESW26	A180502935	2021.08.12	2022.08.01	
System Simulator	ROHDE&SCHWARZ	CMW500	A150802214	2021.08.06	2022.08.02	
5M Anechoic	A 11 4	SAC-5MAC	A 0204210	2010.02.25	2022.02.24	
Chamber	Albatross	12.8x6.8x6.4m	A0304210	2019.03.25	2023.03.24	
EMI Horn Ant.	ROHDE&SCHWARZ	HF906	A0304225	2019.04.17	2022.04.17	

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 10 of 21





3. 47 CFR PART 15B REQUIREMENTS

3.1 Conducted Emission

3.1.1 Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a $50\,\mu\text{H}/50\Omega$ line impedance stabilization network (LISN).

Eraguanay ranga (MUz)	Conducted Limit (dB μV)				
Frequency range (MHz)	Quasi-peak	Average			
0.15 - 0.50	66 to 56	56 to 46			
0.50 - 5	56	46			
5 - 30	60	50			

Note:

- a) The limit subjects to the Class B digital device.
- b) The lower limit shall apply at the band edges.
- c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 0.50MHz.

3.1.2 Test Description

See section 2.4.1 of this report.

3.1.3 Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

Note:

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a Nominal 120V AC,50/60Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

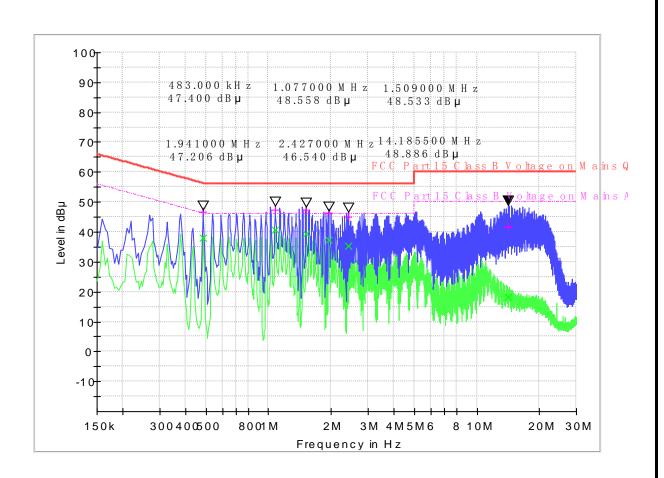
- -Level(dBuv)=Read Level(dBuv)+Correction Factor(dB)
- -Margin= Read Level(dBuv)-Limit Line(dBuv)
- -Correction factor= LISN Factor(dB)+Cable Loss(dB)+ attenuation factor(dB)

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 11 of 21



Test voltage and frequency

A. Mains terminal disturbance voltage, L phase



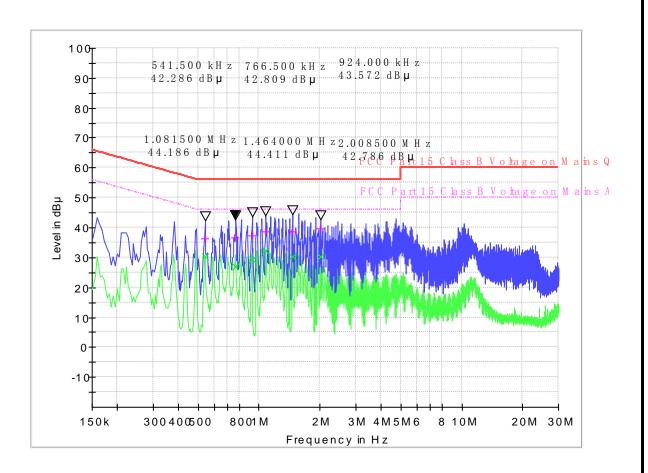
(Plot A: L Phase)

Frequency	QuasiPeak	CAverage	Cabel Loss	Corr.	Margin -	Limit -	Margin -	Limit - AV
(MHz)	(dB μ V)	(dB µ V)	(dB)	(dB)	QPK	QPK	AV	(dB µ V)
0.483000	46.56	39.55	0.1	10.2	9.73	56.3	8.33	46.3
1.077000	47.36	35.35	0.1	10.2	8.64	56.0	5.45	46.0
1.509000	47.40	25.20	0.1	10.2	8.60	56.0	6.55	46.0
1.941000	46.32	20.64	0.1	10.2	9.68	56.0	8.57	46.0
2.427000	45.12	14.52	0.2	10.2	10.88	56.0	10.57	46.0
14.18550 0	41.73	27.62	0.2	10.9	18.27	60.0	31.88	50.0



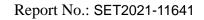


B. Mains terminal disturbance voltage, N phase



(Plot B: N Phase)

Frequency	QuasiPeak	CAverage	Cabel Loss	Corr.	Margin -	Limit -	Margin -	Limit - AV
(MHz)	(dB μ V)	(dB µ V)	(dB)	(dB)	QPK	QPK	AV	(dB μ V)
0.541500	36.33	30.24	0.1	10.2	19.67	56.0	15.76	46.0
0.766500	36.52	27.01	0.1	10.2	19.48	56.0	18.99	46.0
0.924000	37.31	29.37	0.2	10.2	18.69	56.0	16.63	46.0
1.081500	38.81	32.31	0.2	10.2	17.19	56.0	13.69	46.0
1.464000	38.69	30.34	0.2	10.2	17.31	56.0	15.66	46.0
2.008500	39.77	30.12	0.2	10.2	16.23	56.0	15.88	46.0





Radiated Emission

3.1.4 Requirement

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency	quency Field Strength		Field Strength Limitation	th Limitation at 3m Measurement Dist			
range (MHz)	range (MHz) μV/m		(uV/m)	(dBuV/m)			
0.009 - 0.490	2400/F(kHz)	300m	10000* 2400/F(kHz)	$20\log 2400/F(kHz) + 80$			
0.490 - 1.705	2400/F(kHz)	30m	100* 2400/F(kHz)	$20\log 2400/F(kHz) + 40$			
1.705 - 30.00	30	30m	100*30	20log 30 + 40			
30.0 - 88.0	100	3m	100	20log 100			
88.0 - 216.0	150	3m	150	20log 150			
216.0 - 960.0	200	3m	200	20log 200			
Above 960.0	500	3m	500	20log 500			

- a) As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.
- b) Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.
- c) For below 1G:QP detector RBW 120kHz, VBW 300kHz.
- d) For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;AV detector RBW 1MHz, VBW 10Hz for AV value.

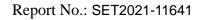
Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).
- 3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of Ld1 = Ld2 * $(d2/d1)^{2}$.

Example:

F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as $Ld1 = L1 = 30uV/m * (10)^2 = 100 * 30uV/m$.

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 14 of 21





3.1.5 Test Description

See section 2.3.2 of this report.

3.1.6 Test Result

The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

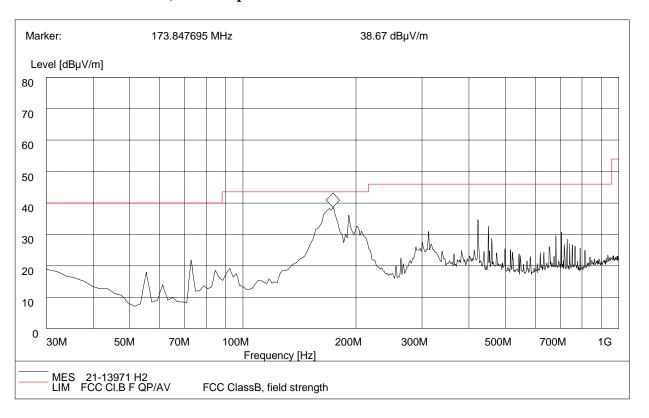
- -Emission Level(dBuV/m)= 20log Emission Level(uV/m)
- -Corrected Reading=Antenna factor+Cable Loss+Read Level-Preamp Factor= Level

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 15 of 21





A.Radiation disturbances, antenna polarization: Vertical



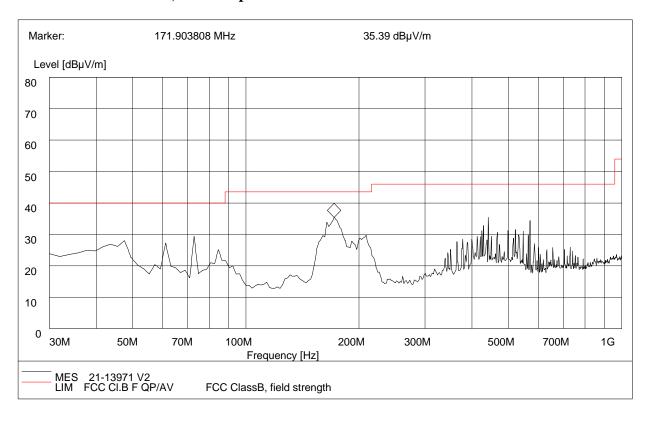
(Plot C: Test Antenna Vertical 30M - 1G)

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
47.58	28.02	120.000	100	40.0	21.50	Horizont	0.4	26.3	Pass
61.23	26.82	120.000	120	40.0	18.17	Horizont	0.6	26.3	Pass
72.56	29.30	120.000	100	43.5	6.12	Horizont	0.4	26.3	Pass
171.53	34.82	120.000	132	43.5	7.68	Horizont	0.7	29.0	Pass
208.83	27.83	120.000	100	46.0	17.38	Horizont	0.5	29.0	Pass
442.10	34.20	120.000	100	46.0	14.80	Horizont	0.8	29.0	Pass





B.Radiation disturbances, antenna polarization: Horizontal



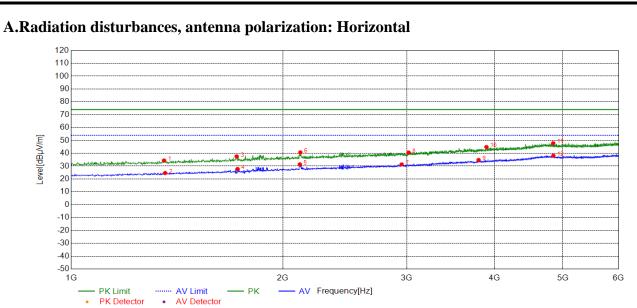
(Plot D: Test Antenna Horizontal 30M - 1G)

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
47.58	28.02	120.000	123	40.0	11.98	Vertical	0.5	26.3	Pass
61.23	26.82	120.000	156	40.0	13.18	Vertical	0.5	27.4	Pass
72.56	29.30	120.000	221	40.0	10.70	Vertical	0.6	29.0	Pass
171.53	34.82	120.000	172	43.5	8.68	Vertical	0.5	28.3	Pass
208.83	27.83	120.000	135	43.5	15.67	Vertical	0.4	29.4	Pass
442.10	34.20	120.000	146	46.0	11.80	Vertical	1.0	28.9	Pass

Test Result: PASS







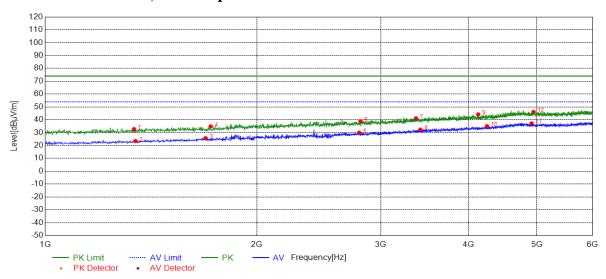
(Plot E: Test Antenna Horizontal 1G – 18G)

NO	Freq.	Level	Factor	Limit	Margin	Troop	Height	Angle	Dolority
NO.	[MHz]	[dBµV/m]	[dB]	[dBµV/m]	[dB]	Trace	[cm]	[°]	Polarity
1	1355.08	34.38	-14.17	74.00	39.62	PK	100	50	Horizontal
2	1360.09	24.66	-14.15	54.00	29.34	AV	100	30	Horizontal
3	1718.92	37.57	-12.49	74.00	36.43	PK	100	120	Horizontal
4	1723.93	27.77	-12.46	54.00	26.23	AV	100	100	Horizontal
5	2114.02	31.42	-10.66	54.00	22.58	AV	100	140	Horizontal
6	2117.77	40.67	-10.64	74.00	33.33	PK	100	20	Horizontal
7	2950.48	31.36	-7.54	54.00	22.64	AV	100	70	Horizontal
8	3018.00	40.58	-7.31	74.00	33.42	PK	100	20	Horizontal
9	3795.69	34.81	-4.04	54.00	19.19	AV	100	80	Horizontal
10	3894.47	44.86	-3.65	74.00	29.14	PK	100	140	Horizontal
11	4845.96	47.82	0.25	74.00	26.18	PK	100	90	Horizontal
12	4848.46	38.10	0.24	54.00	15.90	AV	100	40	Horizontal









(Plot F: Test Antenna Vertical 1G – 18G)

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angl e [°]	Polarity
1	1337.58	32.82	-14.26	74.00	41.18	PK	100	20	Vertical
2	1343.83	23.50	-14.23	54.00	30.50	AV	100	10	Vertical
3	1690.17	25.72	-12.64	54.00	28.28	AV	100	10	Vertical
4	1718.92	34.86	-12.49	74.00	39.14	PK	100	20	Vertical
5	2795.44	29.99	-8.31	54.00	24.01	AV	100	10	Vertical
6	2807.95	38.87	-8.26	74.00	35.13	PK	100	20	Vertical
7	3366.84	41.12	-5.50	74.00	32.88	PK	100	20	Vertical
8	3415.60	32.34	-5.28	54.00	21.66	AV	100	10	Vertical
9	4128.28	44.21	-2.78	74.00	29.79	PK	100	10	Vertical
10	4248.31	35.06	-2.46	54.00	18.94	AV	100	10	Vertical
11	4915.97	37.23	-0.05	54.00	16.77	AV	100	10	Vertical
12	4947.23	46.11	-0.04	74.00	27.89	PK	100	20	Vertical

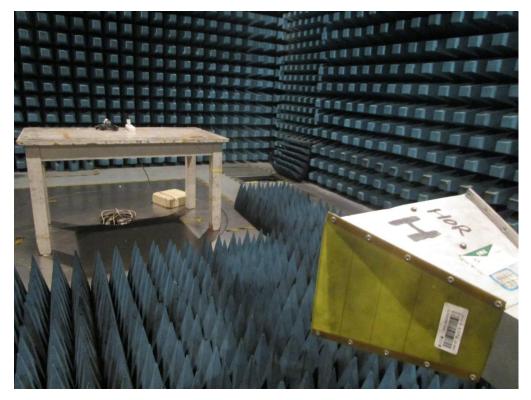


Appendix II: Photographs of EMC Test Configuration

1. Radiated Emission Measurement below 1GHz



2. Radiated Emission Measurement above 1GHz





3. Conducted emission at AC mains input/output port Measurement



----End of Report-----

CCIC-SET/TRF: GJ-EMC-E (2020-01-09) Page 21 of 21