# FCC 47 CFR PART 15 SUBPART B TEST REPORT

SKSpruce Technologies Co., Ltd. Intelligent Multi-Service Controller

Model No.: SAC700E

Prepared for : SKSpruce Technologies Co., Ltd.

Address : A1, Tianfu Software Park, 1129 Century City Road, Hi-tech

Zone, Chengdu, Sichuan, China

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an

Avenue, Bao'an District, Shenzhen, Guangdong, China

Tel : (+86)755-82591330 Fax : (+86)755-82591332 Web : www.LCS-cert.com

Mail : webmaster@LCS-cert.com

Date of receipt of test sample : July 20, 2018

Number of tested samples : 1

Serial number : Prototype

Date of Test : July 20, 2018 ~ August 08, 2018

Date of Report : August 08, 2018

# FCC TEST REPORT FCC 47 CFR PART 15 SUBPART B

Report Reference No. .....: LCS180720001AEA

Date Of Issue.....: August 08, 2018

Testing Laboratory Name.....: Shenzhen LCS Compliance Testing Laboratory Ltd.

Bao'an District, Shenzhen, Guangdong, China

Full application of Harmonised standards

Testing Location/ Procedure ........ Partial application of Harmonised standards

Other standard testing method

Applicant's Name .....: SKSpruce Technologies Co., Ltd.

A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone,

Chengdu, Sichuan, China

**Test Specification** 

Standard ...... : FCC 47 CFR Part 15 Subpart B, ANSI C63.4 -2014

Test Report Form No.....: LCSEMC-1.0

TRF Originator.....: Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF.....: Dated 2011-03

#### SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. is acknowledged as copyright owner and source of the material. SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Item Description.....: Intelligent Multi-Service Controller

Trade Mark ...... : SKSPRUCE

Model/ Type Reference .....: SAC700E

Ratings ......: Input: AC100V~240V, 50–60Hz, 0.35A

Result .....: Positive

Compiled by: Supervised by: Approved by:

Grimo Limos

Rang Te Calvin Weng

Raing Ye / File administrators Calvin Weng / Technique principal Gavin Liang/ Manager

# **FCC -- TEST REPORT**

Test Report No.: LCS180720001AEA August 08, 2018
Date of issue

Type / Model..... : SAC700E EUT.....: Intelligent Multi-Service Controller Applicant..... : SKSpruce Technologies Co., Ltd. Address..... : A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone, Chengdu, Sichuan, China Telephone..... Fax..... Manufacturer..... : SKSpruce Technologies Co., Ltd. Address..... : A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone, Chengdu, Sichuan, China Telephone.....:: : / Fax.....: : / Factory.....: SKSpruce Technologies Co., Ltd. : A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone, Address..... Chengdu, Sichuan, China Telephone.....: : / Fax.....:: : /

Test Result	Positive
-------------	----------

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# **Revision History**

Revision	Issue Date	Revisions	Revised By
000	August 08, 2018	Initial Issue	Gavin Liang

# **TABLE OF CONTENTS**

**Test Report Description** 

Page

1	GENERAL INFORMATION	6
•		
	1.1. Description of Device (EUT)	0
	1.2. Host System Configuration List and Details      1.3. External I/O Cable	0
	1.4. Description of Test Facility	0
	Statement of the Measurement Uncertainty	/
	1.6. Measurement Uncertainty	/
	1.6. Description of Test Setup Block Diagram	7
	1.7. Description of Test Modes	8
2.	SUMMARY OF TEST RESULTS	9
3.	RADIATED EMISSION MEASUREMENT	10
4.	AC POWER LINE CONDUCTED EMISSIONS	18
5.	TEST SETUP PHOTOGRAPHS OF EUT	20
6.	EXTERIOR PHOTOGRAPHS OF EUT	
7.	INTERIOR PHOTOGRAPHS OF FUT	20

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

EUT : Intelligent Multi-Service Controller

Test Model : SAC700E

Power Supply : Input: AC100V~240V, 50–60Hz, 0.35A

Hardware Version : A0

Software Version : JadeOS 3.0

## 1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
Dell	Keyboard	L100	CN-0RH656-65890-14C-02L S REV A04	DoC
Brother	Printer	HL-2140	E65602M0J161141	DoC
Dell	Mouse	MS111-P	CN-011D3V-71581-0BM	DoC
Dell	Mainframe	XPS 8920-R1AN8S	-/-	DoC
Dell	LCD Monitor	E2014Hf	50642E20LB01H07(A)JL-3	DoC
Kingston	USB Disk	DTSE9G2	-/-	DoC
Kingston	USB Disk	DTSE9G2	-/-	DoC
TP-Link	Router	TL-WDR5620	-/-	FCC ID

#### 1.3. External I/O Cable

I/O Port Description	Quantity	Cable
USB Port	2	N/A
RJ45	9	N/A

### 1.4. Description of Test Facility

FCC Registration Number. is 254912.

Industry Canada Registration Number. is 9642A-1.

ESMD Registration Number. is ARCB0108. UL Registration Number. is 100571-492. TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

NVLAP Registration Code is 600167-0.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

## 1.5. Statement of the Measurement Uncertainty

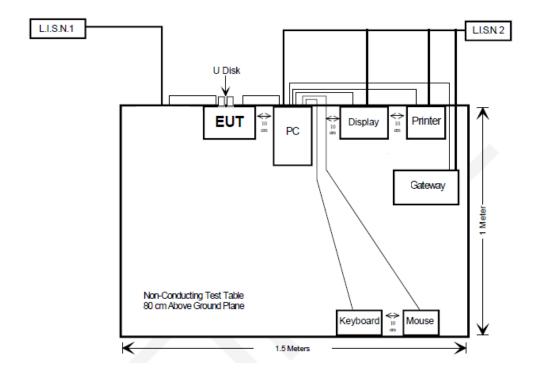
The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16-4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

# 1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
		9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
Radiation Uncertainty	:	200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

# 1.6. Description of Test Setup Block Diagram



# 1.7. Description of Test Modes

Test Configuration (TC) No.	Test Mode Description	Test Item Description	Worst Case Recorded in Test Report
TC01	EUT + PC + Display + Router + Mouse + Keyboard + Printer + USB Disk (2) + RJ45 (8 ports self-ring in pair)	AC Mains Conducted Emission	
TC02	EUT + PC + Display + Router + Mouse + Keyboard + Printer + USB Disk (2) + RJ45 (8 ports self-ring in pair)	Radiated Emission	$\boxtimes$

# 2. SUMMARY OF TEST RESULTS

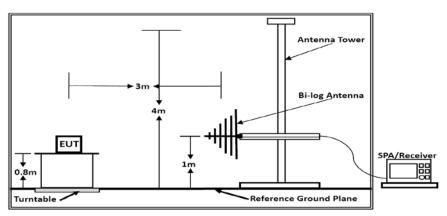
Applied Standard: FCC Part 15 Subpart B				
FCC Rules Description of Test Result Remark				
§15.107	AC Conducted Emissions	Compliant	N/A	
§15.109	Radiated Emissions	Compliant	N/A	

# 3. Radiated emission Measurement

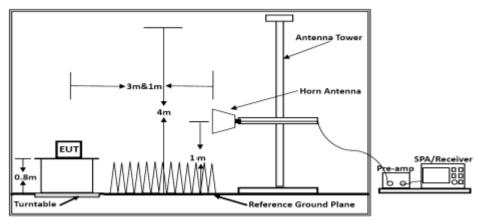
# 3.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Day	Cal. Due Day
1	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2018-06-17	2019-06-16
2	EMI Test Receiver	R&S	ESR 7	101181	2018-06-17	2019-06-16
3	Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	2018-07-16	2019-07-15
4	Log per Antenna	SCHWARZBECK	VULB9163	9163-470	2018-06-09	2019-06-08
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Positioning Controller	MF	MF-7082	/	N/A	N/A
7	RF Cable	Hubersuhner	Sucoflex104	FP2RX2	2018-06-17	2019-06-16
8	Horn Antenna	EMCO	3115	6741	2018-06-09	2019-06-08
9	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2018-06-17	2019-06-16
10	Amplifier	SCHAFFNER	COA9231A	18667	2018-06-17	2019-06-16
11	Amplifier	Agilent	8449B	3008A02120	2018-06-17	2019-06-16
12	Amplifier	MITEQ	AMF-6F-260400	9121372	2018-06-17	2019-06-16

# 3.2. Block Diagram of Test Setup



Below 1GHz



Above 1GHz

## 3.3. Radiated Emission Limit (Class B)

According to §15.109 (b): The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequencies	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

#### Remark:

- (1) Emission level (dB) $\mu$ V = 20 log Emission level  $\mu$ V/m
- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

# 3.4. EUT Configuration on Measurement

The following equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 3.5. Operating Condition of EUT

- 3.5.1. Setup the EUT as shown in Section 3.2.
- 3.5.2. Let the EUT work in test mode (ON) and measure it.

### 3.6. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	5 <sup>th</sup> highest work frequency
RB / VB	1MHz / 1MHz for Peak, 1 MHz / 10 Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

#### 3.7. Test Procedure

## 1) Sequence of testing 30 MHz to 1 GHz

#### Setup:

- --- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- --- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### **Premeasurement:**

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 3 meter.
- --- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

#### Final measurement:

- --- The final measurement will be performed with minimum the six highest peaks.
- --- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
- --- The final measurement will be done with QP detector with an EMI receiver.
- --- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

## 3) Sequence of testing 1 GHz to 18 GHz

## Setup:

- --- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- --- If the EUT is a tabletop system, a rotatable table with 1 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### **Premeasurement:**

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 4 meter.
- --- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

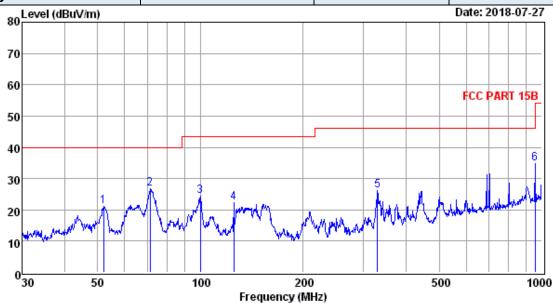
#### Final measurement:

- --- The final measurement will be performed with minimum the six highest peaks.
- --- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- --- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- --- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.
- 3.8. Radiated Emission Noise Measurement Result

#### PASS.

The scanning waveforms refer to the following page.

Model No.	SAC700E	Test Mode	TC02
Environmental Conditions	22.4°C, 52.3% RH	<b>Detector Function</b>	Quasi-peak
Pol	Vertical	Distance	3m
Test Engineer	Tom Liu		



Env./Ins: 22.4℃/52.3% EUT: 交换机

EUT: M/N:

Power Rating: AC 120V/60Hz

Test Mode: On Operator: Tom.Liu

Memo:

pol: VERTICAL

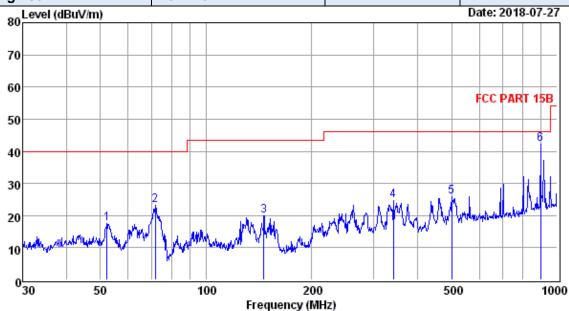
-								
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
	Freq	Reading	CabLos	Antiac	Measured	Limit	Over	Remark

1	52.03	7.48	0.54	13.16	21.18	40.00	-18.82	QP
2	71.08	17.61	0.55	8.47	26.63	40.00	-13.37	QP
3	99.88	10.50	0.60	13.15	24.25	43.50	-19.25	QP
4	125.01	11.99	0.71	9.70	22.40	43.50	-21.10	QP
5	330.19	11.28	1.17	13.73	26.18	46.00	-19.82	QP
6	955.44	11.51	1.89	21.45	34.85	46.00	-11.15	QP

Note: 1. All readings are Quasi-peak values.

- 2. Measured= Reading + Antenna Factor + Cable Loss
- 3. The emission that ate 20db blow the offficial limit are not reported

Model No.	SAC700E	Test Mode	TC02
Environmental Conditions	22.4°C, 52.3% RH	<b>Detector Function</b>	Quasi-peak
Pol	Horizontal	Distance	3m
Test Engineer	Tom Liu		



Env./Ins: 22.4℃/52.3%

EUT: 交换机

M/N:

Power Rating: AC 120V/60Hz

Test Mode: On Operator: Tom.Liu

Memo:

pol: HORIZONTAL

	Freq	Reading	CabLos	Antiac	Measured	Limit	Over	Remark
	MHz	dBuV	dВ	dB/m	dBuV/m	dBuV/m	dВ	
1	52.21	3.82	0.54	13.15	17.51	40.00	-22.49	QP
2	71.58	14.26	0.55	8.38	23.19	40.00	-16.81	QP
3	145.86	10.90	0.77	8.23	19.90	43.50	-23.60	QP
4	341.98	9.43	1.12	14.15	24.70	46.00	-21.30	QP
5	501.18	7.77	1.54	16.60	25.91	46.00	-20.09	QP
6	897.00	19.30	1.97	21.06	42.33	46.00	-3.67	QP

Note: 1. All readings are Quasi-peak values.

- 2. Measured= Reading + Antenna Factor + Cable Loss
- 3. The emission that ate 20db blow the offficial limit are not reported

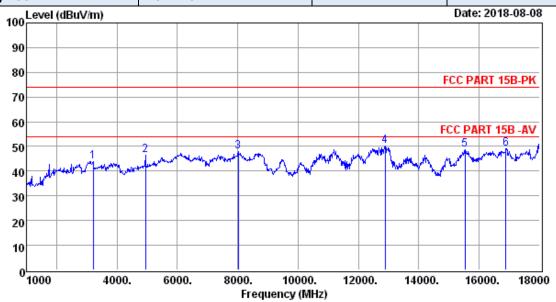
#### Note:

Pre-scan all modes and recorded the worst case results in this report.

Emission level  $(dBuV/m) = 20 \log Emission level (uV/m)$ .

Corrected Reading: Antenna Factor + Cable Loss + Read Level = Level.

Model No.	SAC700E	Test Mode	TC02
Environmental Conditions	22.4°C, 52.3% RH	<b>Detector Function</b>	Peak
Pol	Vertical	Distance	3m
Test Engineer	Tom Liu		



Env./Ins: 24.2℃/53.8%

EUT: 交换机

M/N:

Power Rating: AC 120V/60Hz

Test Mode: On

Operator: Tom.Liu

Memo:

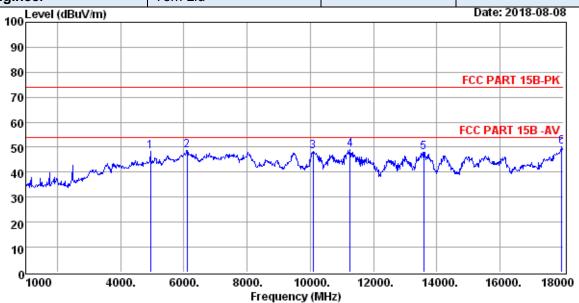
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dВ	dB/m	dBuV/m	dBuV/m	dВ	
1	3210.00	44.79	6.17	29.97	43.96	74.00	-30.04	Peak
2	4944.00	41.47	7.77	33.66	46.50	74.00	-27.50	Peak
3	8021.00	35.53	9.60	37.26	47.82	74.00	-26.18	Peak
4	12883.00	36.16	10.27	38.77	50.36	74.00	-23.64	Peak
5	15535.00	35.76	10.56	38.00	48.57	74.00	-25.43	Peak
6	16878.00	33.34	10.96	39.85	49.24	74.00	-24.76	Peak

Note: 1. All readings are Quasi-peak values.

- 2. Measured= Reading + Antenna Factor + Cable Loss
- 3. The emission that ate 20db blow the offficial limit are not reported

Model No.	SAC700E	Test Mode	TC02
Environmental Conditions	22.4°C, 52.3% RH	<b>Detector Function</b>	Peak
Pol	Horizontal	Distance	3m
Test Engineer	Tom Liu		



Env./Ins: 24.2℃/53.8%

EUT: 交换机

M/N:

Power Rating: AC 120V/60Hz

Test Mode: On

Operator: Tom.Liu

Memo:

pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dВ	dB/m	dBuV/m	dBuV/m	dВ	
1	4944.00	77.13	7.77	0.00	48.50	74.00	-25.50	Peak
2	6100.00	76.48	8.93	0.00	48.63	74.00	-25.37	Peak
3	10078.00	73.55	10.10	0.00	48.33	74.00	-25.67	Peak
4	11251.00	74.75	10.18	0.00	49.14	74.00	-24.86	Peak
5	13580.00	73.19	10.31	0.00	48.12	74.00	-25.88	Peak
6	17949.00	74.59	11.28	0.00	50.03	74.00	-23.97	Peak

Note: 1. All readings are Quasi-peak values.

- 2. Measured= Reading + Antenna Factor + Cable Loss
- 3. The emission that ate 20db blow the offficial limit are not reported

#### Notes:

- 1. Radiated emissions measured in frequency range from 9 KHz~10<sup>th</sup> harmonic were made with an instrument using Peak detector mode.
- 2. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 3. Average values no need if peak values lower than average limit.

# 4. AC Power line conducted emissions

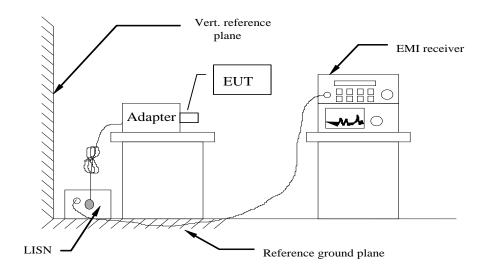
# 4.1 Standard Applicable

According to §15.107 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range	Limits (dBµV)			
(MHz)	Quasi-peak	Average		
0.15 to 0.50	66 to 56	56 to 46		
0.50 to 5	56	46		
5 to 30	60	50		

<sup>\*</sup> Decreasing linearly with the logarithm of the frequency

# 4.2 Block Diagram of Test Setup



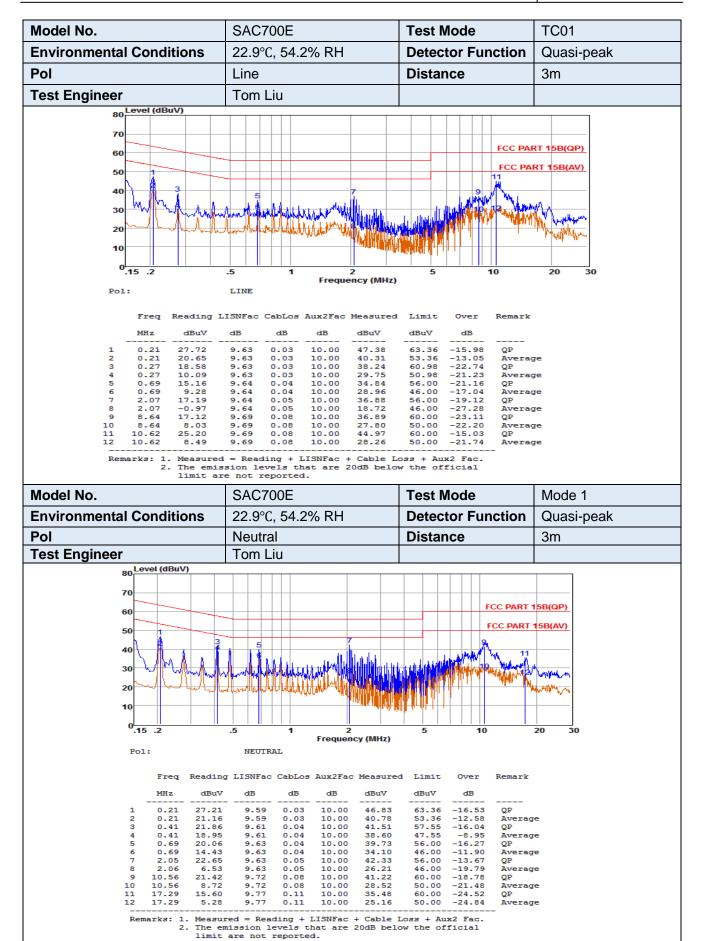
## 4.2 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Day	Cal. Due Day
1	<b>EMI Test Receiver</b>	R&S	ESR 7	101181	2018-06-17	2019-06-16
2	10dB Attenuator	SCHWARZBECK	MTS-IMP136	261115-001-0032	2018-06-17	2019-06-16
3	Artificial Mains	R&S	ENV216	101288	2018-06-17	2019-06-16
4	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
5	RF Cable	Harbour Industries	1452	N/A	2018-06-17	2019-06-16

## 4.3 Test Results

**PASS** 

The test data please refer to following page.



Note: Pre-Scan all mode, Thus record worse case mode result in this report.

# 5. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

# 6. EXTERIOR PHOTOGRAPHS OF EUT

Please refer to separated files for External Photos of the EUT.

# 7. INTERIOR PHOTOGRAPHS OF EUT

Please refer to separated files for Internal Photos of the EUT.

----- THE END OF TEST REPORT -----