RADIO TEST REPORT

For

APPLE TREE Co., Ltd.

3D Printer

Test Model: Adventurer 4

Prepared for	:	APPLE TREE Co., Ltd.
Address	:	Nihonbashi 4-5-9, Naniwa-Ku, Osaka, Japan
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	August 24, 2021
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	August 24, 2021 ~ September 06, 2021
Date of Report	:	September 06, 2021

RADIO TEST REPORT
MIC Notice No.88 Appendix No. 43
Second-Generation Low-Power Data Communication System/Wireless LAN System

Report Reference No.	**: LCS210819018AEA**
Date of Issue	: September 06, 2021
Testing Laboratory Name.........	**: Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure........	: Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.......................	**: APPLE TREE Co., Ltd.**
Address	: Nihonbashi 4-5-9, Naniwa-Ku, Osaka, Japan

Test Specification

Standard	: MIC Notice No.88 Appendix No.43
Test Report Form No.................	**:** LCSEMC-1.0
TRF Originator	: Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF..................................	: Dated 2019-03

Test Item Description.	**: 3D Printer**
Trade Mark	: N/A
Test Model...................................	: Adventurer 4
Ratings	: AC 100-240V 50/60Hz 4.5A 350W
Result	: **Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Lh Li	*Jin Wang*	*Gavin Liang*
Lh Li/ Administrators	Jin Wang/ Technique principal	Gavin Liang/ Manager

RADIO -- TEST REPORT

Test Report No. : LCS210819018AEA	September 06, 2021
	Date of issue

Test Model..............................	: Adventurer 4
EUT...	: 3D Printer

Applicant..............................	**: APPLE TREE Co., Ltd.**
Address...................................	: Nihonbashi 4-5-9, Naniwa-Ku, Osaka, Japan
Telephone...............................	: /
Fax..	: /

Manufacturer.......................	**: Zhejiang Flashforge 3D Technology Co., Ltd.**
Address...................................	: 2/F, No. 518 Xianyuan Road, Jinhua, China
Telephone...............................	: /
Fax..	: /

Factory..................................	**: Zhejiang Flashforge 3D Technology Co., Ltd.**
Address...................................	: 2/F, No. 518 Xianyuan Road, Jinhua, 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	September 06, 2021	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	3D Printer
Test Model	:	Adventurer 4
Model Number	:	Adventurer 4
Hardware Version	:	FFP0187_Main_Board_V1.0.2
Software Version	:	/
Power Supply	:	AC 100-240V 50/60Hz 4.5A 350W

WIFI (2.4G Band)

Frequency Range	:	2412-2472MHz for 802.11b/g/n(HT20)
		2422-2462MHz for 802.11n(HT40)
Channel Spacing	:	5MHz
Channel Number	:	13 Channel for 802.11b/g/n(HT20)(2412~2472MHz)
		9 channels for 802.11n(HT40) (2422~2462MHz)
Modulation Type	:	802.11b: DSSS; 802.11g/n: OFDM
Declared Antenna	:	802.11b: 5mW/MHz
Power		802.11g: 5mW/MHz
		802.11n(HT20): 5mW/MHz
		802.11n(HT40): 5mW/MHz
Antenna Description	:	Internal Antenna, 2.5 dBi(Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
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1.3. External I/O Cable

I/O Port Description	Quantity	Cable
AC IN	1	N/A
USB Port	1	N/A
LAN Port	1	N/A

1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.

1.5. Test Conditions

Temperature Range	:	21-25℃
Humidity Range	:	45-85%
Pressure Range	:	86-106kPa

1.6. Frequency of Channels

802.11b/g/n (HT20)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442	--	--

802.11n (HT40)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
--	--	7	2442
--	--	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	--	--

2. TEST METHODOLOGY

2.1. EUT Exercise

The EUT was tested while in a continuous transmitter/receiver mode.

The EUT was tuned to a low, middle, and high channel for the purpose of the measurements.

For all test case pre/scans were completed in all Modes to determine worst case levels.

According to its specifications, the EUT must comply with the requirements of MIC Notice No.88 Appendix No. 43.

2.2. Measurement Uncertainty

Test Item		MU	Remark
Bandwidth	:	+/- 0.2 E-6	/
Antenna Power	:	+/-0.33dB	/
Frequency Tolerance	:	+/- 0.3 E-6	/
Conducted spurious emission	:	+/-0.13dB	/
DC Power	:	+/-1%	/

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

2.3. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters:

Test Software Version	MP_Kit_RTL11n_8188FTV_USB_v1.25_20170609(BETA)		
Frequency	2412MHz	2442MHz	2472MHz
802.11b (20MHz)	Default	Default	Default
802.11g (20MHz)	Default	Default	Default
802.11n (20MHz)	Default	Default	Default
Frequency	2422MHz	2442MHz	2462MHz
802.11n (40MHz)	Default	Default	Default

2.4. Description of Test Modes

Tested mode, channel, and data rate information				
Mode	**Preliminary Test Data Rate (Mbps)**	**Final Test Data Rate (Mbps) (see Note)**	**Channel**	**Frequency (MHz)**
802.11b	11/1	11	Low :CH1	2412
	11/1	11	Middle: CH7	2442
	11/1	11	High: CH13	2472
802.11g	54/6	6	Low :CH1	2412
	54/6	6	Middle: CH7	2442
	54/6	6	High: CH13	2472
802.11n HT20	65.0/6.5	6.5	Low :CH1	2412
	65.0/6.5	6.5	Middle: CH7	2442
	65.0/6.5	6.5	High: CH13	2472
802.11n HT40	135.0/13.5	13.5	Low :CH3	2422
	135.0/13.5	13.5	Middle: CH7	2442
	135.0/13.5	13.5	High: CH11	2462
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.				

2.5. Test Voltage

Environment	Input Voltage(AC)
-10%	AC 90V
Normal	AC 100V
+10%	AC 110V

POWER SUPPLY VOLTAGE FLUCTUATION TEST

Voltage Fluctuation Test	Normal Voltage	High Voltage +10% of Normal Voltage	Low Voltage -10% of Normal Voltage
Input To EUT	AC 100V	AC 110V	AC 90V
Output To RF Module	DC 3.3V	DC 3.3V	DC 3.3V
Voltage Variation (%)	--	--	--

Note:

As declared by the manufacturer, the EUT uses a built-in switching power supply(A-350FKD-24P-00) to convert AC mains AC100V into DC 24V, and the **MP1584EN and AMS1117** regulates the DC 24V power to be DC 3.3V and supply to the RF module.

Voltage Variation (%)

= (Output high or Low Voltage - Output Normal Voltage)/ Output Normal Voltage* 100

During the input supply voltage to the EUT from the external power source is varied by +/-10%, if output voltage had been confirmed that the fluctuation of power supply to the RF circuit of EUT (excluding power source) is equal to or less than +/-1%. Exempt extremely high and low supply voltage condition test, EUT only operated in nominal voltage to test all regulations.

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a engineering mode.

3.2. EUT Exercise Software

N/A.

3.3. Special Accessories

N/A.

3.4. Block Diagram/Schematics

Please refer to the report.

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

4. SUMMARY OF TEST RESULTS

MIC Notice No.88 Appendix No.43 Article 2 Paragraph 1 Item 19		
Clause	Description of Test (Transmitter Parameters)	Result
6	Antenna Power	PASS
6	Tolerances for Antenna Power	PASS
3	Frequency Tolerance	PASS
4	Transmission Rate	PASS
4	Occupied Frequency Bandwidth	PASS
4	Spread Bandwidth	PASS
13	Dwell Time	N/A
5	Spurious Emissions	PASS
10	Transmission Antenna Gain (EIRP Antenna Power)	PASS
11	Transmission Radiated Angle Width (3dB Beam width)	N/A
12	Interference prevention function	PASS
8	Carrier Sensing function	N/A
Receiver Parameters		
7	Secondary Radiated Emissions	PASS
Note: (1) N/A is an abbreviation for Not Applicable.		
(2) N/T means this test item is not tested.		

5. TEST RESULT

5.1. Antenna Power

5.1.1. Standard Applicable

Type	Limit
DTS	10mW
OFDM OBW<26MHz, DS	10mW/MHz
OFDM OBW 26-40MHz	5mW/MHz
Tolerance	+20%,-80%

Upper Limit of EIRP for Modulation Systems

Modulation System	Frequency band used	Antenna power (max)	EIRP (max)	
			Omnidirectional case	Directional case
DS, OFDM	2,400-2,483.5 MHz	10 mW/MHz	12.14 dBm/MHz	22.14 dBm/MHz
FH, DS-FH FH-OFDM	2,400-2,483.5 MHz	3 mW/MHz	6.91 dBm/MHz	16.91 dBm/MHz
	Excluding 2,427-2,470.75 MHz	10 mW/MHz	12.14 dBm/MHz	22.14 dBm/MHz
Other than the above	2,400-2,483.5 MHz	10 mW/MHz	12.14 dBm	22.14 dBm

5.1.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

5.1.2. Test Procedures

a. EUT have transmitted continuous maximum power

b. Antenna Power Error is definition that actual measure antenna power tolerance between +20% to -80% power range that base on manufacturer declare the conducted power density.

5.1.3. Test Setup

Power Meter   **EUT**
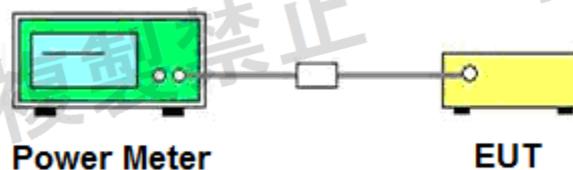
5.1.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.5. Test Result

Please refer to Appendix A.1(Appendix A_for RF test data-2.4G WIFI-DTS-MIC).

5.2. Frequency Tolerance

5.2.1. Standard Applicable

Tolerance of frequency shall be $\pm 50 \times 10^{-6}$.

5.2.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

   Centre Frequency: The centre frequency of the channel under test.

   Resolution BW: 10 KHz.

   Video BW: 10 KHz.

   Span: Auto.

   Detector: Peak.

   Trace Mode: Max Hold.

c. When the trace is complete, find the peak value of the power envelope and record.

5.2.3. Test Setup Layout

Spectrum Analyzer   **EUT**
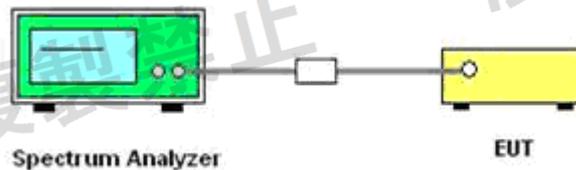
5.2.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.5. Test Result

Please refer to Appendix A.2(Appendix A_for RF test data-2.4G WIFI-DTS-MIC).

5.3. Occupied Frequency Bandwidth

5.3.1. Standard Applicable

Permissible value for occupied bandwidth using the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems shall be 83.5 MHz or less, while necessary bandwidth (minimum occupied bandwidth sufficient to ensure information transmission of required quality at a required transmission rate for the system used under specified conditions for a given emission type) using a system other than any of the above shall be 26 MHz or less.

5.3.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

  Centre Frequency: The centre frequency of the channel under test.

  RBW/VBW= 300 KHz/300KHz

 Span: Wide enough to cover the complete power envelope of the signal of the EUT.

  Sweep mode: Continuous sweeping.

  Detector: Peak.

  Trace Mode: Max Hold.

c. When the trace is complete, measure the occupied bandwidth (99% bandwidth) with spectrum analyzer's bandwidth measure function.

5.3.3. Test Setup Layout

Spectrum Analyzer   EUT
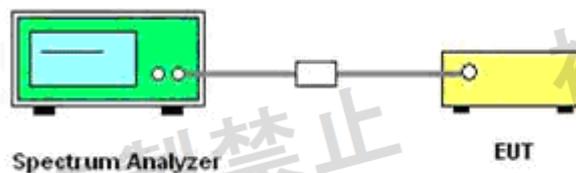
5.3.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.5. Test Result of 99% Spectrum Bandwidth

Please refer to Appendix A.3(Appendix A_for RF test data-2.4G WIFI-DTS-MIC).

5.4. Spread Bandwidth

5.4.1. Standard Applicable

In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5 % of the total mean power radiated; this also applies hereafter) shall be 500 kHz or more.

5.4.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

    Centre Frequency: The centre frequency of the channel under test.

    RBW/VBW= 300 KHz/300KHz

    Span: Wide enough to cover the complete power envelope of the signal of the EUT.

    Detector: Peak.

    Trace Mode: Max Hold.

c. When the trace is complete, measure the occupied bandwidth (90% bandwidth) with spectrum analyzer's bandwidth measure function.

5.4.3. Test Setup Layout

Spectrum Analyzer   **EUT**
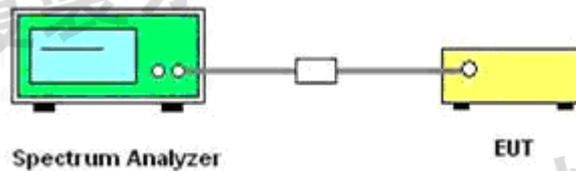
5.4.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.5. Test Result of 90% Occupied Bandwidth.

Please refer to Appendix A.4(Appendix A_for RF test data-2.4G WIFI-DTS-MIC).

5.5. Transmitter Spurious Emissions (conducted)

5.5.1. Standard Applicable

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

a. 2,387MHz ≤ f ≤ 2,400MHz and 2,483.5MHz < f ≤ 2,496.5MHz   25 µW or less

b. 2,387MHz > f and 2,496.5MHz < f   2.5 µW or less

5.5.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

   Below 1GHz: RBW/VBW= 100kHz / 100kHz.

   Above 1GHz: RBW/VBW= 1MHz / 1MHz.

   Detector: Peak.

   Trace Mode: Max Hold.

c. All the emissions from 30MHz to 13GHz were measured and record.

5.5.3. Test Setup Layout

Spectrum Analyzer   EUT
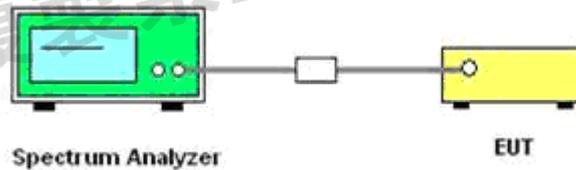
5.5.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.5.5. Test Results

Please refer to Appendix A.5(Appendix A_for RF test data-2.4G WIFI-DTS-MIC).

5.6. Carrier sensing function

5.6.1. Standard Applicable

| Item	Limits
Carrier Sense	Good － EUT stop RF transmission signal after carrier inject to EUT. (On 22.79+Gr-20*log (f)[dBm] (Gr: dBi; f: MHz) or 100mV/m)

5.6.2. Instruments Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Span	0 MHz
Sweep	Continuous
Detector	Peak
Trigger mode	Video

5.6.3. Test Procedures

1. SSG adjusted the frequency as same as the EUT transmitted signal and emitted the absence of modulation from SSG and power level is (On 22.79+Gr-20*log(f)[dBm] (Gr: dBi; f: MHz). Then turn off the RF signal of SSG.

2. EUT have transmitted the maximum modulation signal and fixed channelize.

3. Setting of SA is following as: RB: 1MHz / VB: 1MHz / SPAN: 50MHz / AT: 10dB /Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak.

4. SSG RF Signal On.

5. EUT shall be stop the transmitted any signal and SSG RF Signal Off. Then EUT will be continuous transmitted signal.

5.6.4. Test Setup Layout
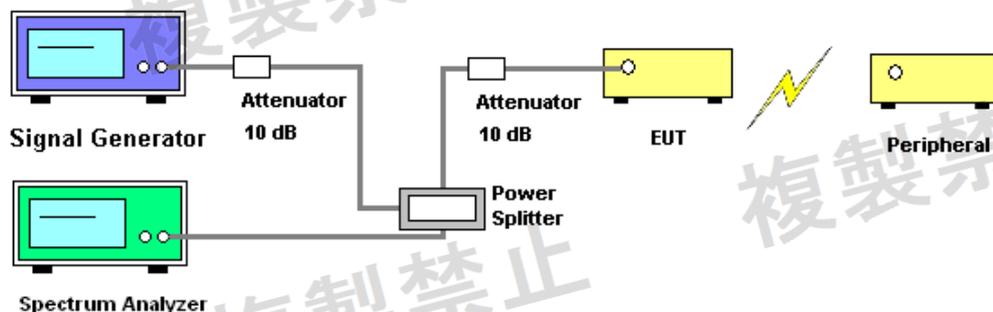
5.6.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

5.6.6. Test Result

Good.

Note: The carrier sense value is -65dBm.

Mode	Carrier number
802.11 n(HT40)	99

5.7. Interference prevention function

5.7.1. Standard Applicable

Item	Limits
Identification code	$\geqq$ 48 bits

5.7.2. Measuring ID Code Software

PC with NetTool	Setting
MAC IP List	MAC Scan

5.7.3. Test Procedures

1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes from EUT. b. Check the transmitted identification codes with the demodulator.

2. In the case of receiving the identification code: a. Transmit the predetermined identification codes from the counterpart. b . Check if communication is normal. c. Transmit the other signals than predetermined ID codes from the counterpart. d. check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

5.7.4. Test Setup Layout
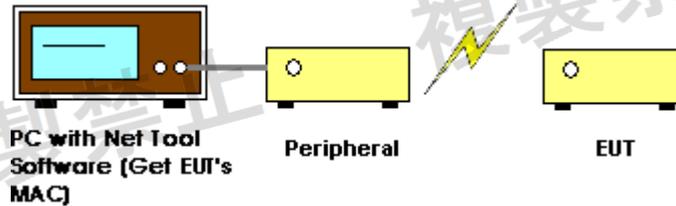
5.7.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

5.7.6. Test Result

EUT ID	Performance index
FC:DE:73:98:37:53	Good

5.8. Secondary Radiated Emissions

5.8.1. Standard Applicable

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4nW or less at a frequency below 1 GHz and 20 nW or less at a frequency of 1 GHz or higher as measured using the circuit

5.8.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Resolution BW: 100 KHz for frequency below 1GHz and

1MHz for frequency above 1GHz

Video BW: 100 KHz for frequency below 1GHz and

1MHz for frequency above 1GHz

Detector: Peak.

Trace Mode: Max Hold.

c. All the emissions from 30MHz to 13GHz were measured and record.

5.8.3. Test Setup

Spectrum Analyzer   EUT
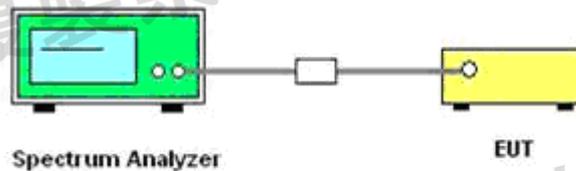
5.8.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.8.5. Test Results

Please refer to Appendix A.5(Appendix A_for RF test data-2.4G WIFI-DTS-MIC).

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Meter	R&S	NRVS	100444	2021-06-22	2022-06-21
2	Power Sensor	R&S	NRV-Z81	100458	2021-06-22	2022-06-21
3	Power Sensor	R&S	NRV-Z32	10057	2021-06-22	2022-06-21
4	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2020-11-22	2021-11-21
5	DC Power Supply	Agilent	E3642A	N/A	2020-11-14	2021-11-13
Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.						

7. PHOTOGRAPHS OF TEST SETUP

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

8. EXTERNAL PHOTOGRAPHS OF THE EUT

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

9. INTERNAL PHOTOGRAPHS OF THE EUT

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

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