

# **TEST REPORT**

FCC ID: 2ACJAPLT8990

**Product: TABLET PC** 

Model No.: PLT8990

Additional Model: N/A

Trade Mark: N/A

Report No.: TCT151022E009

Issued Date: Nov. 04, 2015

Issued for:

ShenZhen Harmony Technology Co., Ltd

Block 2, Jiayuan Industrial Zone, Heping Community high-tech Park, No 2
Fuyuan Road, Fuyong, Bao'an, Shenzhen, China

Issued By:

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. Test Certification

_		4.6.		
	TES	TING CENTRE	TECHNOLOGY	Report No.: TCT151022E009

Product:	TABLET PC
Model No.:	PLT8990
Additional Model:	N/A
Applicant:	ShenZhen Harmony Technology Co.,Ltd
Address:	Block 2, Jiayuan Industrial Zone, Heping Community high-tech Park, No 2 Fuyuan Road, Fuyong, Bao'an, Shenzhen, China
Manufacturer:	ShenZhen Harmony Technology Co.,Ltd
Address:	Block 2, Jiayuan Industrial Zone, Heping Community high-tech Park, No 2 Fuyuan Road, Fuyong, Bao'an, Shenzhen, China
Date of Test:	Oct. 22 –Nov. 03, 2015
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Beryl Zhao

Beryl Zhao

Reviewed By:

Date: Nov. 03, 2015

Date: Nov. 04, 2015

Joe Zhou

Approved By:

Date: Nov. 04, 2015

**Tomsin** 



# 2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1)	PASS
20dB Occupied Bandwidth	§15.247 (a)(1)	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209	PASS
Band Edge	§15.247(d)	PASS

#### Note:

- 1. PASS: Test item meets the requirement.
- 2. Fail: Test item does not meet the requirement.
- 3. N/A: Test case does not apply to the test object.
- 4. The test result judgment is decided by the limit of test standard.
- 5. All test are according to ANSI C63.4-2014 and ANSI C63.10-2013



# 3. EUT Description

Product Name:	TABLET PC
Model :	PLT8990
Additional Model:	N/A
Trade Mark:	N/A
Operation Frequency:	2402MHz~2480MHz
Transfer Rate:	1/2/3 Mbits/s
Number of Channel:	79
Modulation Type:	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology:	FHSS
Antenna Type:	Internal Antenna
Antenna Gain:	2dBi
Power Supply:	Adapter Information: MODEL: HJ-050200U INPUT: AC100-240V~ 50/60Hz 0.6A Max OUTPUT: 5V, 2A

Operation Frequency each of channel for GFSK, π/4-DQPSK, 8DPSK

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
							<u></u>
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
_,		-,					
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		_

Remark: Channel 0, 39 &78 have been tested for GFSK, π/4-DQPSK, 8DPSK modulation mode.



## 4. Genera Information

## 4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations

The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

# 4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
1 (6)	1	(ci) 1	<u>(4)</u> /	(6)

#### Note:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
- 3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

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5. Facilities and Accreditations

### 5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

• FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

• IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

CNAS - Registration No.: CNAS L6165
 Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005
 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

# 5.2. Location

Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

Tel: 86-755-36638142

# 5.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1G)	±3.92dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

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# 6. Test Results and Measurement Data

# 6.1. Antenna requirement

# Standard requirement:

FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

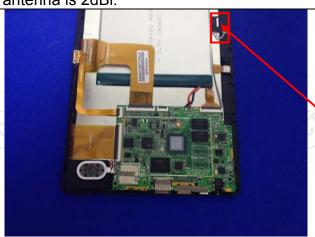
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

### E.U.T Antenna:

The Bluetooth antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 2dBi.



Antenna

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# 6.2. Conducted Emission

# 6.2.1. Test Specification

A) / A)							
Test Requirement:	FCC Part15 C Section 15.207						
Test Method:	ANSI C63.4:2014						
Frequency Range:	150 kHz to 30 MHz	<u>(^)</u>					
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto						
	Frequency range (MHz)	Limit ( Quasi-peak	dBuV) Average				
Limits:	0.15-0.5	66 to 56*	56 to 46*				
	0.5-5	56	46				
	5-30	60	50				
	Reference	e Plane	.20				
Test Setup:	Test table/Insulation plane  Remark: E.U.T AC power  Remark: E.U.T. Equipment Under Test LISN: Line Impedence Stabilization New Test table height=0.8m	EMI Receiver	— AC power				
Test Mode:	Reference to item 4.1						
Test Procedure:	<ol> <li>The E.U.T and simulation power through a line (L.I.S.N.). This proimpedance for the magnetic power through a LI coupling impedance refer to the block photographs).</li> <li>Both sides of A.C. conducted interferer emission, the relative the interface cables ANSI C63.4: 2014 or</li> </ol>	e impedance stable impedance stable vides a 50 ohm leasuring equipm les are also connects. With 50 ohm term diagram of the line are checked ince. In order to fine positions of equipments are change in must be change.	oilization network of 1/50uH coupling ent. ected to the main is a 50ohm/50uH nination. (Please test setup and ed for maximum of the maximum ipment and all of led according to				
Test Result:	PASS						



# 6.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)										
Equipment	Calibration Due									
EMI Test Receiver	R&S	ESCS30	100139	Sep. 11, 2016						
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 16, 2016						
Coax cable	TCT	CE-05	N/A	Sep. 11, 2016						
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A						

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

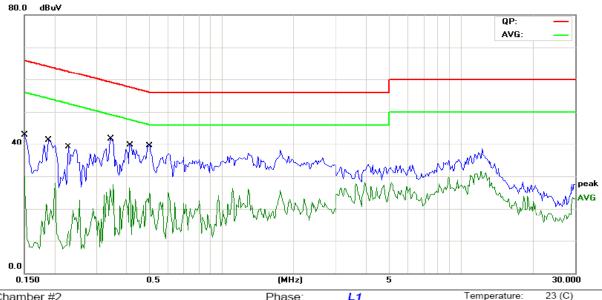




6.2.3. Test data

# Please refer to following diagram for individual

# Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: L1 Temperature: 2
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBu∀	dB	Detector	Comment
1		0.1500	31.10	11.49	42.59	65.99	-23.40	QP	
2		0.1500	13.26	11.49	24.75	55.99	-31.24	AVG	
3		0.1891	25.55	11.47	37.02	64.07	-27.05	QP	
4		0.1891	6.46	11.47	17.93	54.07	-36.14	AVG	
5		0.2281	21.23	11.45	32.68	62.52	-29.84	QP	
6		0.2281	3.06	11.45	14.51	52.52	-38.01	AVG	
7		0.3465	26.80	11.39	38.19	59.04	-20.85	QP	
8		0.3465	12.95	11.39	24.34	49.04	-24.70	AVG	
9		0.4170	24.47	11.34	35.81	57.51	-21.70	QP	
10		0.4170	10.04	11.34	21.38	47.51	-26.13	AVG	
11	*	0.5016	24.94	11.30	36.24	56.00	-19.76	QP	
12		0.5016	11.61	11.30	22.91	46.00	-23.09	AVG	

#### Note:

Freq. = Emission frequency in MHz

Reading level ( $dB\mu V$ ) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement ( $dB\mu V$ ) = Reading level ( $dB\mu V$ ) + Corr. Factor (dB)

 $Limit (dB\mu V) = Limit stated in standard$ 

Margin (dB) = Measurement (dB $\mu$ V) – Limits (dB $\mu$ V)

Q.P. =Quasi-Peak

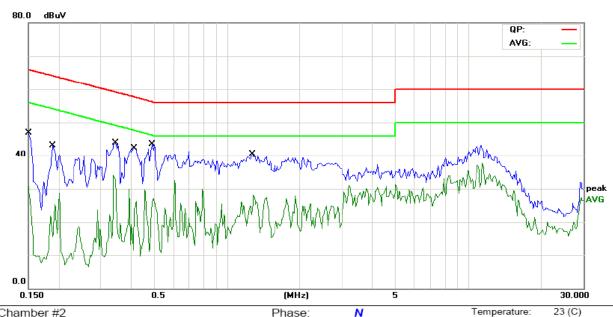
AVG =average

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<sup>\*</sup> is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz



## Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: N Temperature: 23 (C)
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBu∀	dB	Detector	Comment
1		0.1500	32.40	11.52	43.92	65.99	-22.07	QP	
2		0.1500	14.17	11.52	25.69	55.99	-30.30	AVG	
3		0.1891	27.02	11.49	38.51	64.07	-25.56	QP	
4		0.1891	7.74	11.49	19.23	54.07	-34.84	AVG	
5		0.3453	29.24	11.41	40.65	59.07	-18.42	QP	
6		0.3453	13.14	11.41	24.55	49.07	-24.52	AVG	
7		0.4117	27.41	11.35	38.76	57.61	-18.85	QP	
8		0.4117	10.46	11.35	21.81	47.61	-25.80	AVG	
9	*	0.4898	28.41	11.31	39.72	56.17	-16.45	QP	
10		0.4898	10.87	11.31	22.18	46.17	-23.99	AVG	
11		1.2711	23.39	11.32	34.71	56.00	-21.29	QP	
12		1.2711	8.44	11.32	19.76	46.00	-26.24	AVG	

#### Note1:

Freq. = Emission frequency in MHz

Reading level ( $dB\mu V$ ) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement ( $dB\mu V$ ) = Reading level ( $dB\mu V$ ) + Corr. Factor (dB)

Limit (dBµV) = Limit stated in standard

 $Margin (dB) = Measurement (dB\mu V) - Limits (dB\mu V)$ 

Q.P. =Quasi-Peak AVG =average

\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

**Note2:** Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (Highest channel and GFSK) was submitted only.



# 6.3. Conducted Output Power

# 6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)			
Test Method:	ANSI C63.10:2013 and DA00-705			
Limit:	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.			
Test Setup:	Spectrum Analyzer EUT			
Test Mode:	Transmitting mode with modulation			
Test Procedure:	Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.			
Test Result:	PASS			

# 6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
RF Cable	TCT	RE-06	N/A	Sep. 12, 2016
Antenna Connector	TCT	RFC-01	N/A	Sep. 12, 2016

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



# 6.3.3. Test Data

GFSK mode							
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result				
Lowest	7.461	21.00	PASS				
Middle	6.979	21.00	PASS				
Highest	6.506	21.00	PASS				

Pi/4DQPSK mode	Pi/4DQPSK mode						
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result				
Lowest	8.473	21.00	PASS				
Middle	8.099	21.00	PASS				
Highest	7.211	21.00	PASS				

8DPSK mode							
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result				
Lowest	8.655	21.00	PASS				
Middle	8.300	21.00	PASS				
Highest	7.530	21.00	PASS				

### Test plots as follows:



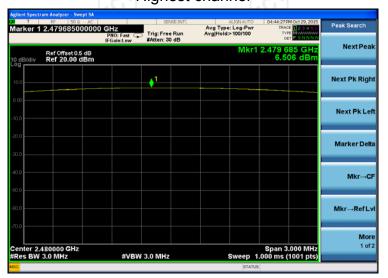


### Lowest channel



### Middle channel







### Lowest channel



### Middle channel







### Lowest channel



### Middle channel







# 6.4. 20dB Occupy Bandwidth

# 6.4.1. Test Specification

FCC Part15 C Section 15.247 (a)(1)				
ANSI C63.10:2013 and DA00-705				
N/A				
Spectrum Analyzer EUT				
Transmitting mode with modulation				
<ol> <li>The testing follows FCC Public Notice DA 00-705         Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum         analyzer by RF cable and attenuator. The path loss         was compensated to the results for each         measurement.</li> <li>Set to the maximum power setting and enable the         EUT transmit continuously.</li> <li>Use the following spectrum analyzer settings for 20dB         Bandwidth measurement.         Span = approximately 2 to 3 times the 20 dB         bandwidth, centered on a         hopping channel; RBW≥1% of the 20 dB bandwidth;         VBW≥RBW;         Sweep = auto; Detector function = peak; Trace = max         hold.</li> <li>Measure and record the results in the test report.</li> </ol>				
PASS				

# 6.4.2. Test Instruments

RF Test Room						
Equipment	Manufacturer	Model	Serial Number	Calibration Due		
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016		
RF cable	TCT	RE-06	N/A	Sep. 12, 2016		
Antenna Connector	тст	RFC-01	N/A	Sep. 12, 2016		

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

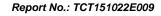


# 6.4.3. Test data

Toot obannol	20dB Occupy Bandwidth (kHz)				
Test channel	GFSK	π/4-DQPSK	8DPSK	Conclusion	
Lowest	921.9	1226	1262	PASS	
Middle	899.6	1208	1261	PASS	
Highest	903.3	1218	1210	PASS	

## Test plots as follows:







### Lowest channel



#### Middle channel







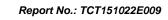
#### Lowest channel



#### Middle channel







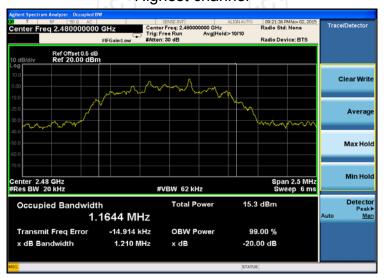


### Lowest channel



#### Middle channel







# 6.5. Carrier Frequencies Separation

# 6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)				
Test Method:	ANSI C63.10:2013 and DA00-705				
Limit:	Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.				
Test Setup:	Spectrum Analyzer EUT				
Test Mode:	Hopping mode				
Test Procedure:	<ol> <li>The testing follows FCC Public Notice DA 00-705         Measurement Guidelines.</li> <li>The RF output of EUT was connected to the         spectrum analyzer by RF cable and attenuator. The         path loss was compensated to the results for each         measurement.</li> <li>Set to the maximum power setting and enable the         EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>Use the following spectrum analyzer settings:         Span = wide enough to capture the peaks of two         adjacent channels;         RBW≥1% of the span; VBW≥RBW; Sweep = auto;         Detector function = peak; Trace = max hold.</li> <li>Measure and record the results in the test report.</li> </ol>				
Test Result:	PASS				

# 6.5.2. Test Instruments

RF Test Room						
Equipment Manufacturer Model Serial Number Calibration Du						
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016		
RF cable	TCT	RE-06	N/A	Sep. 12, 2016		
Antenna Connector	тст	RFC-01	N/A	Sep. 12, 2016		

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



# 6.5.3. Test data

	GFSK mode						
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result				
Lowest	1002.5	614.6	PASS				
Middle	1002.5	614.6	PASS				
Highest	1002.5	614.6	PASS				

Pi/4 DQPSK mode				
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result	
Lowest	1002.5	817.33	PASS	
Middle	1007.5	817.33	PASS	
Highest	1002.5	817.33	PASS	

8DPSK mode				
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result	
Lowest	997.5	841.33	PASS	
Middle	1000.0	841.33	PASS	
Highest	1000.0	841.33	PASS	

Note: According to section 6.4

Note. According to section 0.4		X
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	921.9	614.6
π/4-DQPSK	1226	817.33
8DPSK	1262	841.33

Test plots as follows:





### Lowest channel



### Middle channel



