TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2AGEB-3503

Product: Mobile intelligent data terminal

Model No.: 3503

Additional Model No.: 3506

Trade Mark: ZKC

Report No.: TCT171225E083

Issued Date: Mar. 30, 2018

Issued for:

Shenzhen ZKC Software Technology Co., Ltd
1st Floor, No. 1 Block, Zhongkenuo Industry Park, Beiqi Road, Xixiang Town, Bao'an District, Shenzhen, China

Issued By:

Shenzhen Tongce Testing Lab.

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. Test Certification

Product:	Mobile intelligent data terminal
Model No.:	3503
Additional Model:	3506
Trade Mark:	**ZKC**
Applicant:	Shenzhen ZKC Software Technology Co., Ltd
Address:	1st Floor, No. 1 Block, Zhongkenuo Industry Park, Beiqi Road, Xixiang Town, Bao'an District, Shenzhen, China
Manufacturer:	Shenzhen ZKC Software Technology Co., Ltd
Address:	1st Floor, No. 1 Block, Zhongkenuo Industry Park, Beiqi Road, Xixiang Town, Bao'an District, Shenzhen, China
Date of Test:	Dec. 26, 2017 – Mar. 29, 2018
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.225

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:	Jin Wang	***Date:***	***Mar. 29, 2018***
	Jin Wang		
Reviewed By:	Joe Zhou	***Date:***	***Mar. 30, 2018***
	Joe Zhou		
Approved By:	Tomsin	***Date:***	***Mar. 30, 2018***
	Tomsin		

SHENZHEN TONGCE TESTING LAB TCT

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2. Test Result Summary

Requirement	CFR 47 Section IC Paragraph	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Spurious emissions	§15.225/ §15.209 §2.1053, §2.1057	PASS
Occupied Bandwidth	§15.215 (c) §2.1049	PASS
Frequency stability	§15.225 §2.1055	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.

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3. EUT Description

Product Name:	Mobile intelligent data terminal
Model :	3503
Additional Model:	3506
Trade Mark:	**ZKC**
Operation Frequency:	13.56MHz
Modulation Technology:	ASK
Antenna Type:	Internal Antenna
Antenna Gain:	1dBi
Power Supply:	Rechargeable Li-ion Battery DC3.7V
Adapter:	Adapter Information: Model: MX520U Input: 100-240V~ 50/60Hz 0.35A Output: 5V - 2A
Remark:	All models above are identical in interior structure, electrical circuits and components, and just exterior size and model names are different for the marketing requirement.

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4. Genera Information

4.1. Test Environment and Mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) 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
/	/	/	/	/

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.

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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.: 645098

  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

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. Measurement Uncertainty

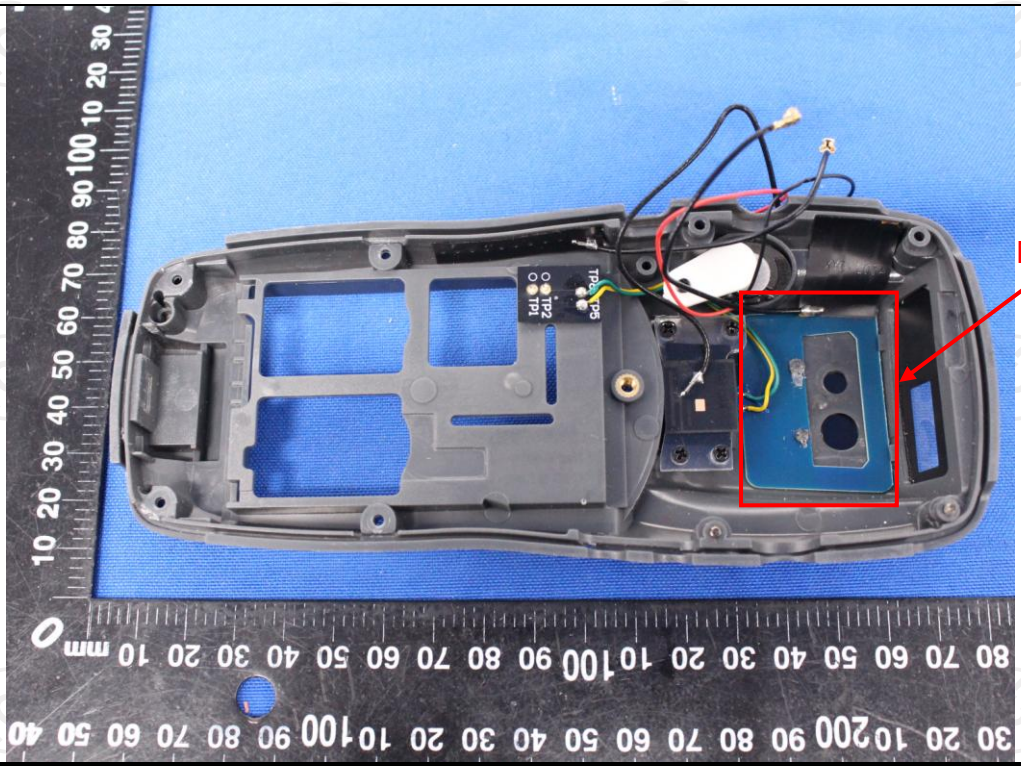
The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

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%

6. Test Results and Measurement Data

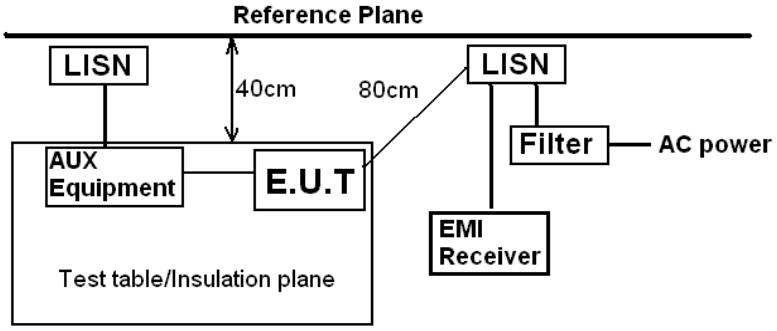
6.1. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	
E.U.T Antenna:	
The NFC antennas are internal antennas which permanently attached, and the best case gain of the antenna is 1dBi.	



6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Frequency Range:	150 kHz to 30 MHz
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
Limits:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50
Test Setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test Mode:	Refer to section 4.1 for details
Test Procedure:	1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.
Test Result:	PASS

6.2.2. Test Instruments

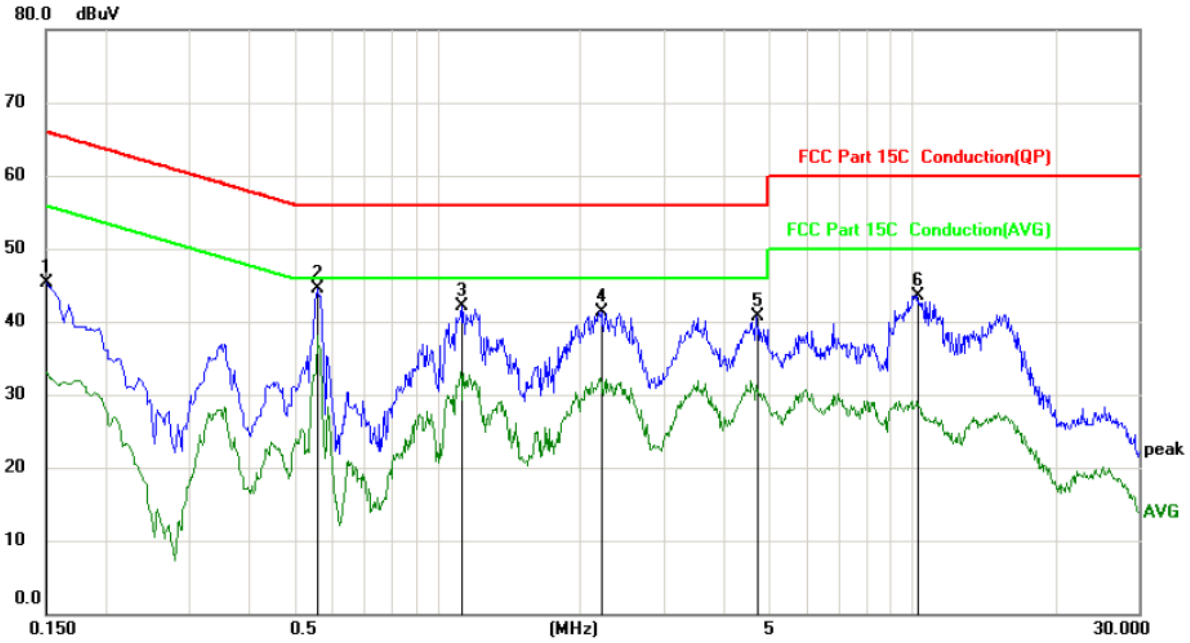
Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCS30	100139	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple 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)



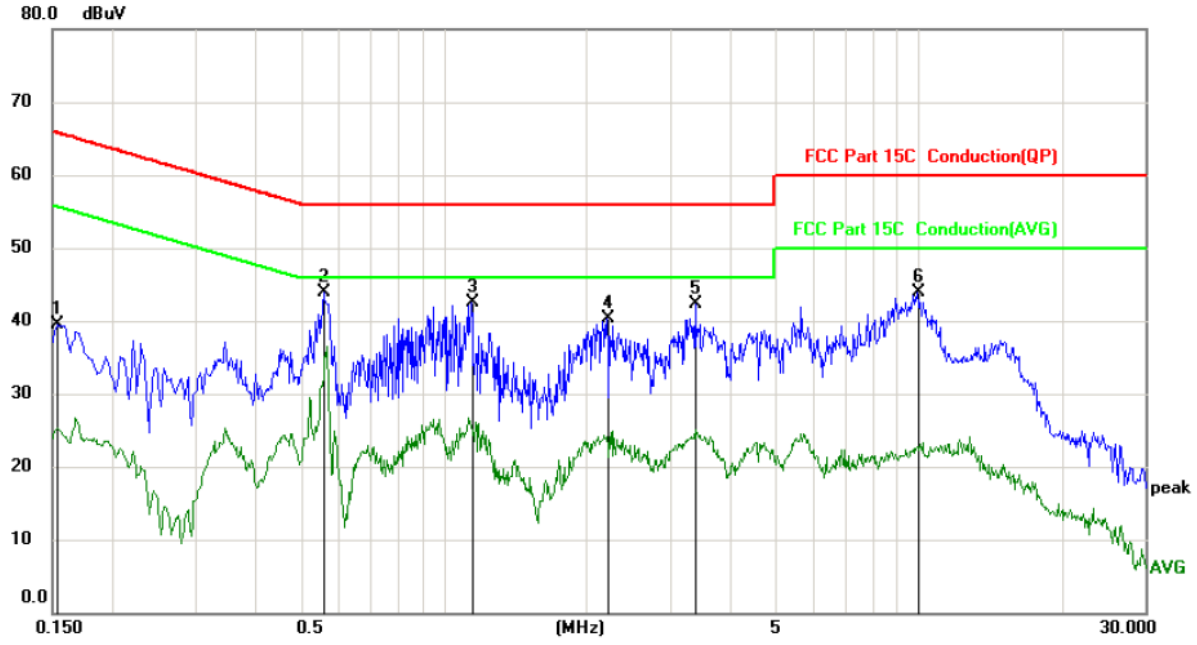
Site	Phase:	*L1*	Temperature: 25
Limit: FCC Part 15C Conduction(QP)	Power:	AC 120V/60Hz	Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	33.80	11.47	45.27	66.00	-20.73	peak	
2	*	0.5594	33.17	11.28	44.45	56.00	-11.55	peak	
3		1.1264	30.77	11.26	42.03	56.00	-13.97	peak	
4		2.2244	29.76	11.61	41.37	56.00	-14.63	peak	
5		4.7175	29.95	10.71	40.66	56.00	-15.34	peak	
6		10.2434	32.25	11.35	43.60	60.00	-16.40	peak	

Note:

Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = Antenna factor + Cable loss
Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Margin (dB) = Measurement (dBμV) – Limits (dBμV)
Q.P. =Quasi-Peak, AVG =average
** 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 | Phase: N | Temperature: 25

Limit: FCC Part 15C Conduction(QP) | Power: AC 120V/60Hz | Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1532	27.95	11.47	39.42	65.82	-26.40	peak	
2	*	0.5594	32.62	11.28	43.90	56.00	-12.10	peak	
3		1.1444	31.17	11.27	42.44	56.00	-13.56	peak	
4		2.2109	28.70	11.61	40.31	56.00	-15.69	peak	
5		3.3990	31.17	11.19	42.36	56.00	-13.64	peak	
6		9.9193	32.65	11.33	43.98	60.00	-16.02	peak	

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

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

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

Q.P. =Quasi-Peak

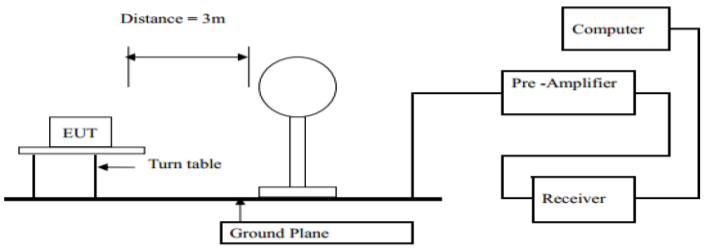
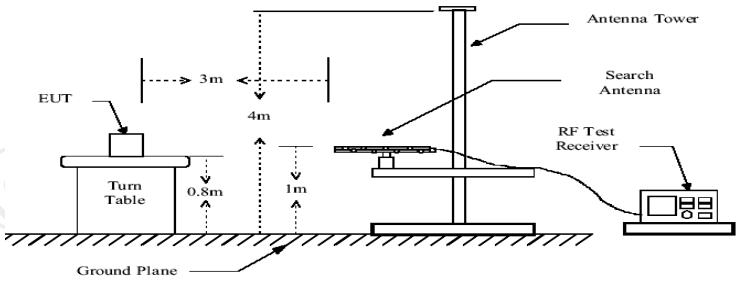
AVG =average

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

6.3. Radiated Emission Measurement

6.3.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.225</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 1000 MHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>FCC Part15 C Section 15.225
<table>
<tr><th>Frequency (MHz)</th><th>Limit (uV/m @30m)</th><th>Limit (dBuV/m @3m)</th><th>Detector</th></tr>
<tr><td>13.110-13.410</td><td>106</td><td>80.5</td><td>QP</td></tr>
<tr><td>13.410-13.553</td><td>334</td><td>90.5</td><td>QP</td></tr>
<tr><td>13.553-13.567</td><td>15848</td><td>124.0</td><td>QP</td></tr>
<tr><td>13.567-13.7110</td><td>224</td><td>90.5</td><td>QP</td></tr>
<tr><td>13.710-14.010</td><td>106</td><td>80.5</td><td>QP</td></tr>
</table>
Note: RF Voltage (dBuV) = 20 log RF Voltage (uV)
Limit (dBuV/m @3m) = 20log(Limit (uV/m @30m)) + 40
FCC Part15 C Section 15.209
<table>
<tr><th>Frequency Range (MHz)</th><th>Distance (m)</th><th>Field strength (dBμ V/m)</th><th>Detector</th></tr>
<tr><td>0.009-0.490</td><td>3</td><td>20log 2400/F (kHz) + 80</td><td>QP</td></tr>
<tr><td>0.490-1.705</td><td>3</td><td>20log 24000/F (kHz) + 40</td><td>QP</td></tr>
<tr><td>1.705-30</td><td>3</td><td>20log 30 + 40</td><td>QP</td></tr>
<tr><td>30-88</td><td>3</td><td>40.0</td><td>40.0</td></tr>
<tr><td>88-216</td><td>3</td><td>43.5</td><td>43.5</td></tr>
<tr><td>216-960</td><td>3</td><td>46.0</td><td>46.0</td></tr>
<tr><td>Above 960</td><td>3</td><td>54.0</td><td>54.0</td></tr>
</table>
Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
4. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
5. If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula Ld1 = Ld2 * (d2/d1)
</td></tr>
</table>

Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber in below 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test setup:	For radiated emissions below 30MHz  30MHz to 1GHz 
Test Mode:	Refer to section 4.1 for details
Test results:	PASS

6.3.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
ESPI Test Receiver	ROHDE&SCHWARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	N/A	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	N/A	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	N/A	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	N/A	N/A	Sep. 27, 2018
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).*

6.3.3. Test Data

Field Strength of Fundamental

Frequency (MHz)	Emission (dBuV/m)	Limits (dBuV/m)	Margin (dB)
13.56	78.50	124	-45.50

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Spurious Emissions

Frequency (MHz)	Emission Level (dBuV/m)	Horizontal /Vertical	Limit Line (dBuV/m)	Detector	Margin (dB)
5.38	26.44	V	69.54	QP	-43.10
27.12	25.68	V	69.54	QP	-43.86
40.68	28.32	H	40.00	QP	-11.68
40.68	35.37	V	40.00	QP	-4.63
54.24	32.35	H	40.00	QP	-7.65
54.24	29.46	V	40.00	QP	-10.54

Note *: 1) QP= Quasi-peak*
2) Emission Level = Reading Level + Antenna Factor + Cable Loss.

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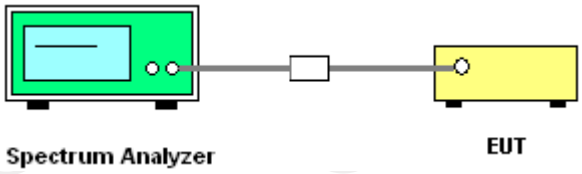
6.4. Occupied Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)
Test Method:	ANSI C63.10: 2013
Limit:	N/A
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. 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. 4. Measure and record the results in the test report.
Test setup:	
Test Mode:	Refer to section 4.1 for details
Test results:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018

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

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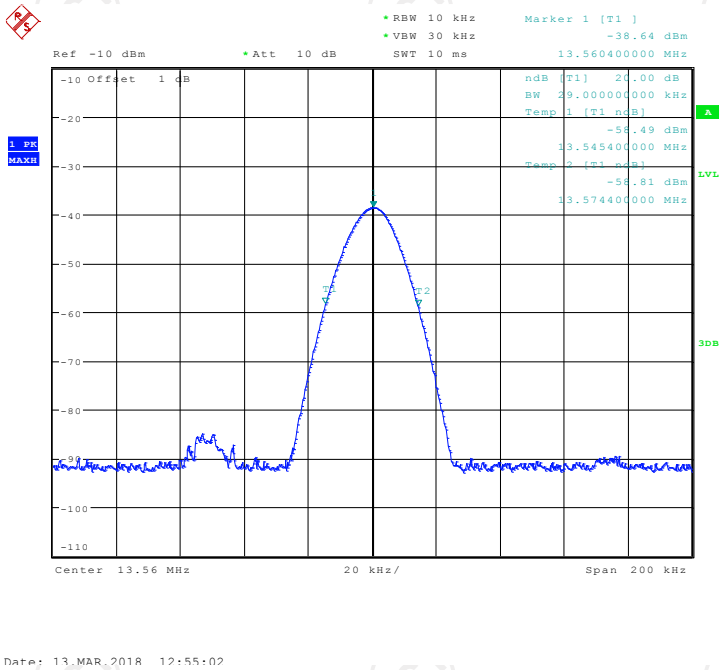
6.4.3. Test data

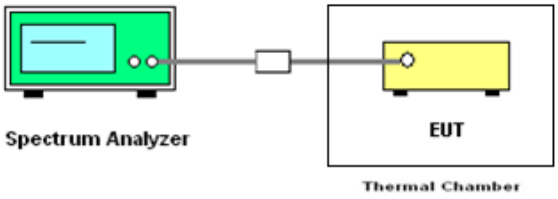
Frequency(MHz)	20dB Occupy Bandwidth (kHz)	Limit (kHz)	Conclusion
13.56	29	---	PASS

Test plots as follows:



6.5. Frequency stability

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.225
Test Method:	ANSI C63.10 : 2013
Operation mode:	Refer to item 4.1
Limit:	+/-0.01%
Test Setup:	
Test Procedure:	1. The equipment under test was connected to an external DC power supply and input rated voltage. 2. RF output was connected to a spectrum analyzer. 3. The EUT was placed inside the temperature chamber. 4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25℃ operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to 0℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10℃ increased per stage until the highest temperature of +45℃ reached.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
DC Power	GW	GPR-6030D	/	Sep. 27, 2018

6.5.3. Test Data

Voltage (Vdc)	Temperature (℃)	Frequency (MHz)	Deviation (%)	Limit (%)
7.4	0	13.560139	0.00103	+/-0.01%
7.4	10	13.56026	0.00192	
7.4	20	13.560154	0.00114	
7.4	30	13.560288	0.00212	
7.4	40	13.560203	0.00150	
7.4	45	13.560208	0.00153	
8.4	20	13.560167	0.00123	
7.1	20	13.560154	0.00114	

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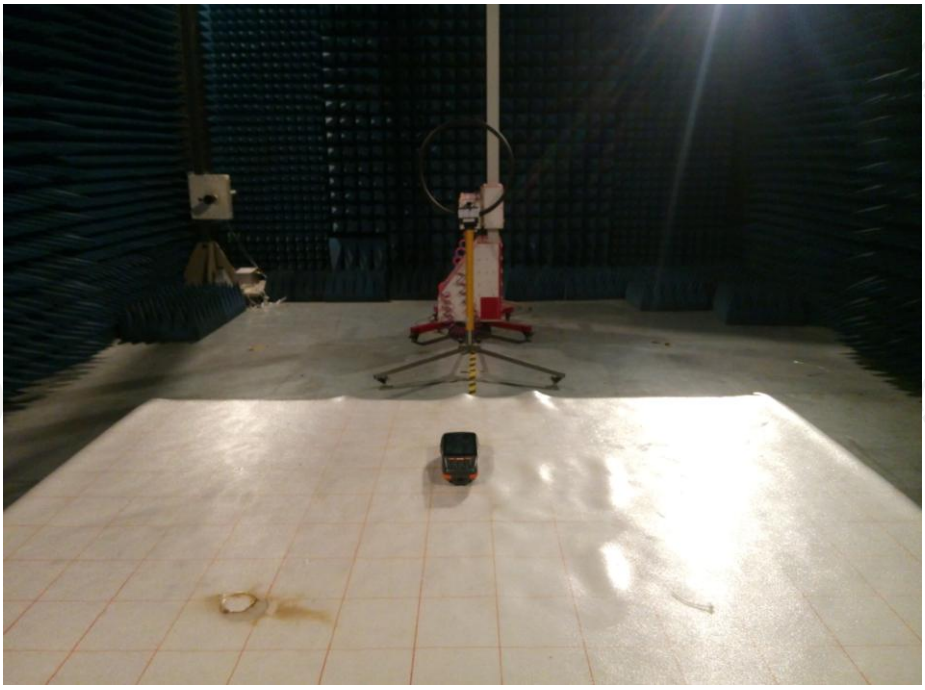
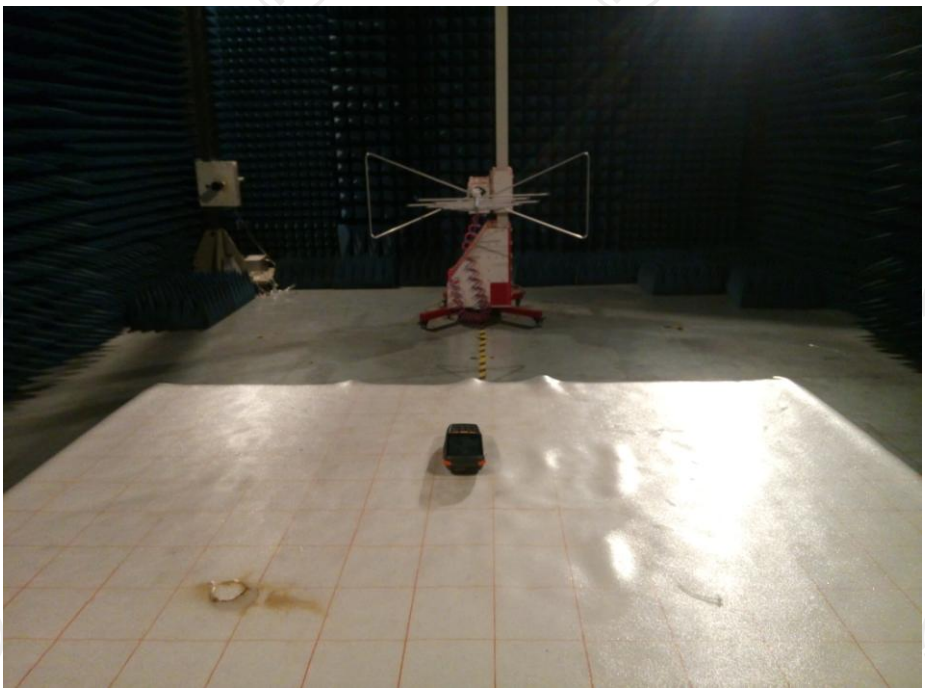
Appendix A: Photographs of Test Setup

Product: Mobile intelligent data terminal
Model: 3503
Radiated Emission





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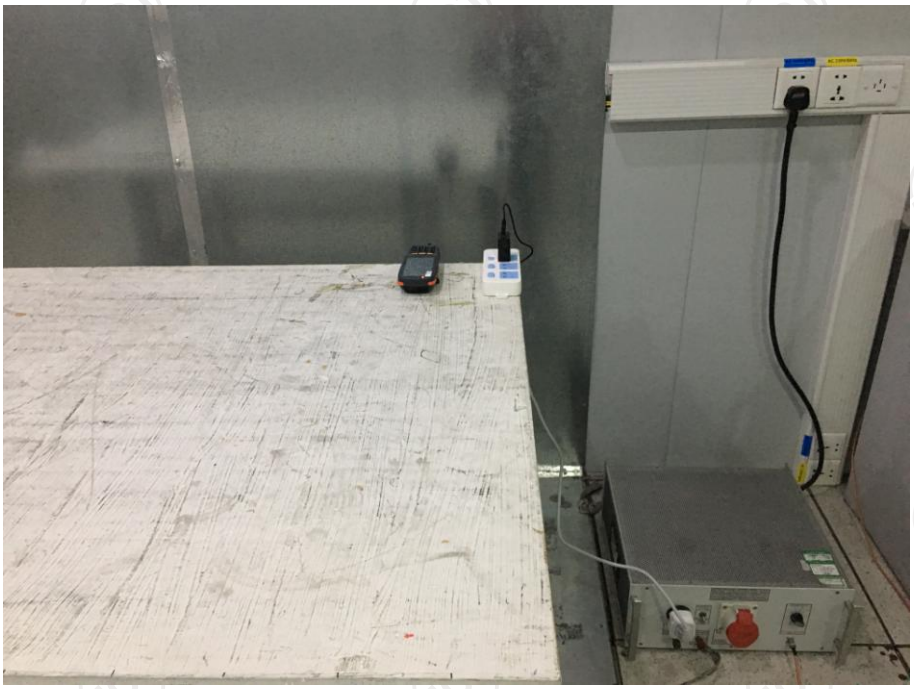

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Appendix B: Photographs of EUT

Refer to test report TCT171225E024

********END OF REPORT********