



FCC RF Test Report

APPLICANT : Guangdong OPPO Mobile Telecommunications Corp., Ltd.
EQUIPMENT : Mobile Phone
BRAND NAME : OPPO
MODEL NAME : CPH2135
FCC ID : R9C-CPH2135
STANDARD : FCC Part 15 Subpart C §15.225
CLASSIFICATION : (DXX) Low Power Communication Device Transmitter

The product was received on Jun. 12, 2020 and testing was completed on Jul. 17, 2020. We, Sporton International (ShenZhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (ShenZhen) Inc., the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager



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People's Republic of China



TABLE OF CONTENTS

TABLE OF CONTENTS	2
REVISION HISTORY	3
SUMMARY OF THE TEST RESULT	4
1. GENERAL DESCRIPTION	5
1.1 Applicant	5
1.2 Manufacturer	5
1.3 Product Feature of Equipment Under Test	5
1.4 Product Specification of Equipment Under Test	6
1.5 Modification of EUT	6
1.6 Testing Location	6
1.7 Test Software	7
1.8 Applicable Standards	7
2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1 Descriptions of Test Mode	8
2.2 Connection Diagram of Test System	9
2.3 Table for Supporting Units	10
2.4 EUT Operation Test Setup	10
3. TEST RESULTS	11
3.1 AC Power Line Conducted Emissions Measurement	11
3.2 20dB and 99% OBW Spectrum Bandwidth Measurement	13
3.3 Frequency Stability Measurement	14
3.4 Field Strength of Fundamental Emissions and Mask Measurement	15
3.5 Radiated Emissions Measurement	17
3.6 Antenna Requirements	20
4. LIST OF MEASURING EQUIPMENT	21
5. UNCERTAINTY OF EVALUATION	22
APPENDIX A. TEST RESULTS OF CONDUCTED EMISSION TEST	
APPENDIX B. TEST RESULTS OF CONDUCTED TEST ITEMS	
B1. Test Result of 20dB Spectrum Bandwidth	
B2. Test Result of Frequency Stability	
APPENDIX C. TEST RESULTS OF RADIATED TEST ITEMS	
C1. Test Result of Field Strength of Fundamental Emissions	
C2. Results of Radiated Emissions (9 kHz~30MHz)	
C3. Results of Radiated Emissions (30MHz~1GHz)	
APPENDIX D. SETUP PHOTOGRAPHS	



REVISION HISTORY



SUMMARY OF THE TEST RESULT

Report Section	FCC Rule	Description of Test	Result	Remark
3.1	15.207	AC Power Line Conducted Emissions	Complies	Under limit 12.74 dB at 0.450MHz
3.2	15.215(c)	20dB Spectrum Bandwidth	Complies	-
	-	99% OBW Spectrum Bandwidth	Complies	-
3.3	15.225(e)	Frequency Stability	Complies	-
3.4	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Complies	Max level 59.30 dB μ V/m at 13.560 MHz
3.5	15.225(d) & 15.209	Radiated Spurious Emissions	Complies	Under limit 9.37 dB at 52.310MHz
3.6	15.203	Antenna Requirements	Complies	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1. General Description

1.1 Applicant

Guangdong OPPO Mobile Telecommunications Corp., Ltd.

NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City,GuangDong,China

1.2 Manufacturer

Guangdong OPPO Mobile Telecommunications Corp., Ltd.

NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City,GuangDong,China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	OPPO
Model Name	CPH2135
FCC ID	R9C-CPH2135
EUT supports Radios application	GSM/WCDMA/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR / EDR / LE FM Receiver / GNSS
IMEI Code	Conducted: N/A Conduction: 867522050019533/867522050019525 Radiation: 867522050019632/867522050019624
HW Version	11
SW Version	ColorOS V7.2
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	13.553 ~ 13.567MHz
Channel Number	1
20dBW	2.576 KHz
99%OBW	2.200 KHz
Antenna Type	Loop Antenna
Type of Modulation	ASK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sportun International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Site	Sportun International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sportun Site No.	FCC Designation No.	FCC Test Firm Registration No.
	TH01-SZ	CO01-SZ	
Test Engineer	Chen Hong	DaLin Liu	
Temperature	22~24°C	22~25°C	CN1256
Relative Humidity	53~55%	50~55%	421272

Test Site	Sportun International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
Test Site No.	Sportun Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH01-SZ		
Test Engineer	Feiyan Zhang		
Temperature	23~25°C	CN1256	421272
Relative Humidity	48~52%		



1.7 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.225
- ANSI C63.10-2013



2. Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Investigation has been done on all the possible configurations.

The following table is a list of the test modes shown in this test report.

Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

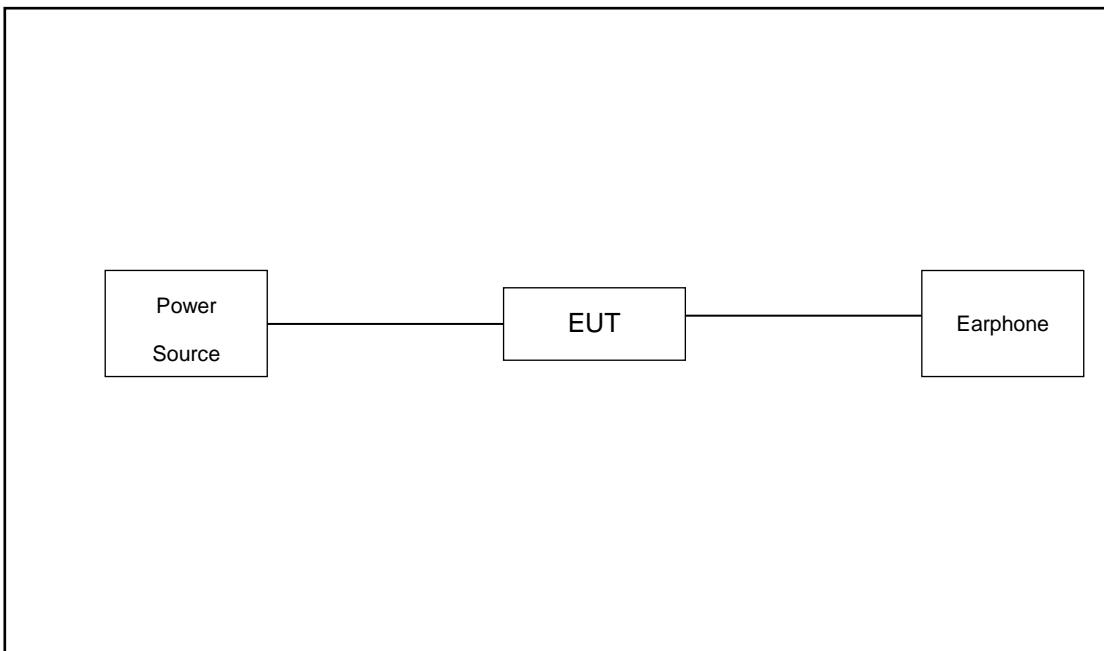
The EUT pre-scanned in four NFC type, A, B. The worst type (type A) was recorded in this report.

Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Y plane as worst plane) from all possible combinations.

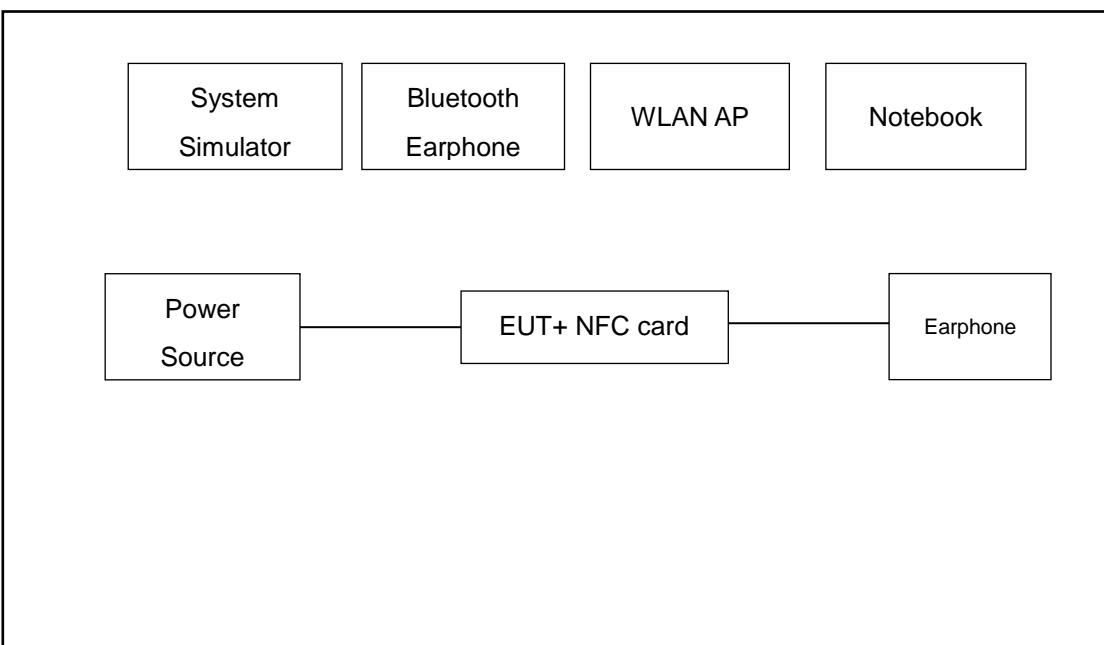
Test Cases	
AC Conducted Emission	Mode 1: WCDMA Band II Idle + Bluetooth Link + WLAN(2.4G)Link + NFC Tx + Battery 1 + Earphone + USB Cable(Charging from Adapter 1)
Remark: For Radiated Test Cases, The tests were performance with Adapter 1, Battery 1, Earphone and USB Cable	

2.2 Connection Diagram of Test System

For Radiation



For Conducted Emission





2.3 Table for Supporting Units

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8m
2.	WLAN AP	D-link	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	SD Card	N/A	MicroSD HC	FCC DoC	N/A	N/A
5.	Earphone	apple	DCAY1V-A9007ZJW3-00	N/A	N/A	N/A
6.	IPod	Apple	MC69029/A	N/A	N/A	N/A
7.	NFC Card	N/A	N/A	N/A	N/A	N/A

2.4 EUT Operation Test Setup

The EUT was programmed to be in continuously transmitting mode.

The ancillary equipment, NFC card, is used to make the EUT (NFC) continuously transmit at 13.56MHz and is placed around 3 cm gap to the EUT.



3. Test Results

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit of AC Conducted Emission

For equipment that 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 the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

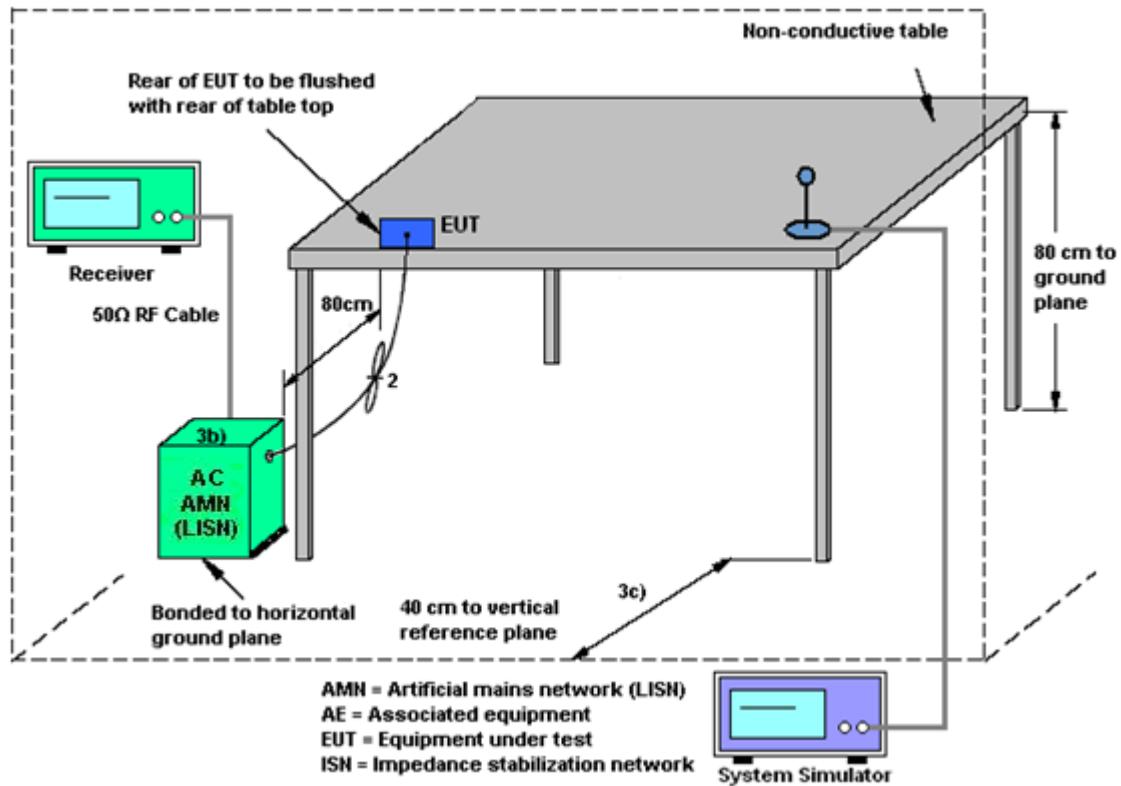
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.1.4 Test setup



3.1.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

3.2 20dB and 99% OBW Spectrum Bandwidth Measurement

3.2.1 Limit

Intentional radiators must be designed to ensure that the 20dB and 99% emission bandwidth in the specific band 13.553~13.567MHz.

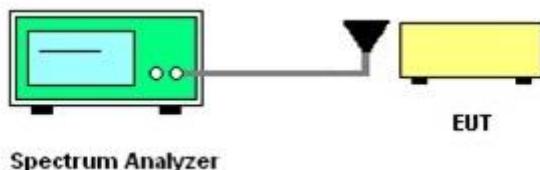
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max hold mode.
2. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the 99% OBW.

3.2.4 Test Setup



3.2.5 Test Result of Conducted Test Items

Please refer to Appendix B.

3.3 Frequency Stability Measurement

3.3.1 Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

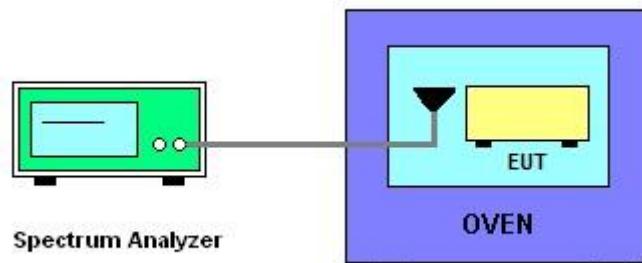
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT.
2. EUT have transmitted signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire emissions bandwidth.
4. Set RBW = 1 kHz, VBW = 3 kHz with peak detector and maxhold settings.
5. The fc is declaring of channel frequency. Then the frequency error formula is $(fc-f)/fc \times 10^6$ ppm and the limit is less than ± 100 ppm.
6. Extreme temperature rule is -20°C~50°C.

3.3.4 Test Setup



3.3.5 Test Result of Conducted Test Items

Please refer to Appendix B.



3.4 Field Strength of Fundamental Emissions and Mask Measurement

3.4.1 Limit

Rules and specifications	FCC CFR 47 Part 15 section 15.225			
Description	Compliance with the spectrum mask is tested with RBW set to 9kHz.			
Freq. of Emission (MHz)	Field Strength (μ V/m) at 30m	Field Strength (dB μ V/m) at 30m	Field Strength (dB μ V/m) at 10m	Field Strength (dB μ V/m) at 3m
1.705~13.110	30	29.5	48.58	69.5
13.110~13.410	106	40.5	59.58	80.5
13.410~13.553	334	50.5	69.58	90.5
13.553~13.567	15848	84.0	103.08	124.0
13.567~13.710	334	50.5	69.58	90.5
13.710~14.010	106	40.5	59.58	80.5
14.010~30.000	30	29.5	48.58	69.5

3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

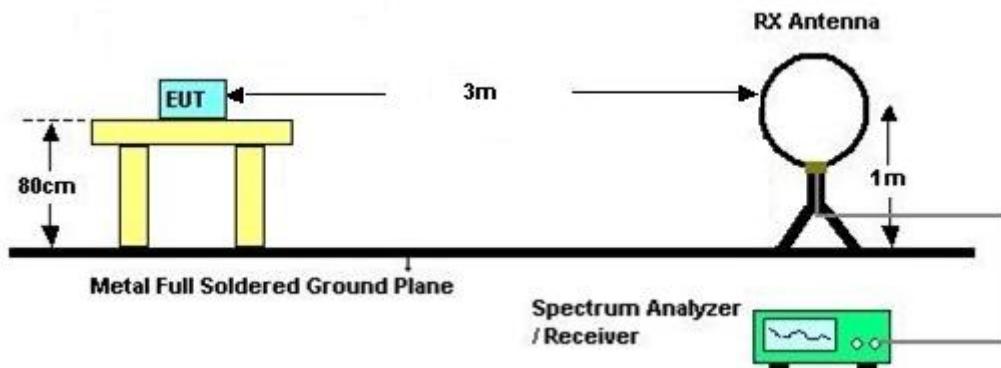
3.4.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure QP reading.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
6. Compliance with the spectrum mask is tested with RBW set to 9kHz.

Note: Emission level (dB μ V/m) = 20 log Emission level (μ V/m).

3.4.4 Test Setup

For radiated emissions below 30MHz



3.4.5 Test Result of Field Strength of Fundamental Emissions and Mask

Please refer to Appendix C.



3.5 Radiated Emissions Measurement

3.5.1 Limit

The field strength of any emissions which appear outside of 13.110 ~14.010MHz band shall not exceed the general radiated emissions limits.

Frequencies (MHz)	Field Strength (μ V/m)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Measuring Instrument Setting

The following table is the setting of receiver.

Receiver Parameter	Setting
Attenuation	Auto
Frequency Range: 9kHz~150kHz	RBW 200Hz for QP
Frequency Range: 150kHz~30MHz	RBW 9kHz for QP
Frequency Range: 30MHz~1000MHz	RBW 120kHz for Peak

Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

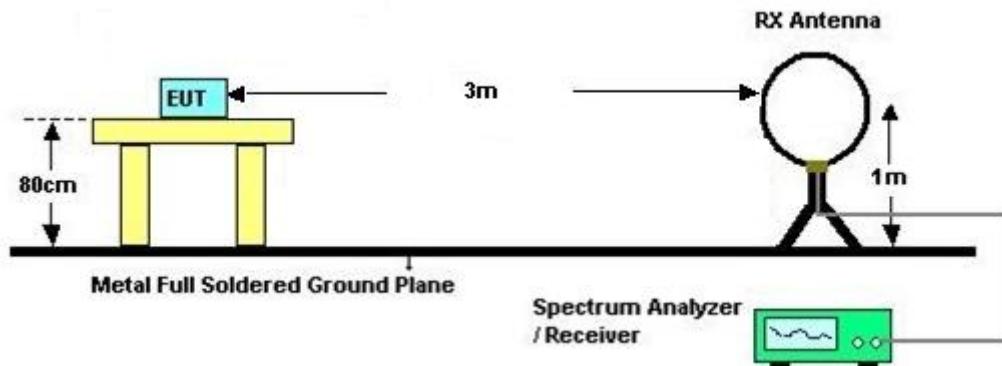


3.5.4 Test Procedures

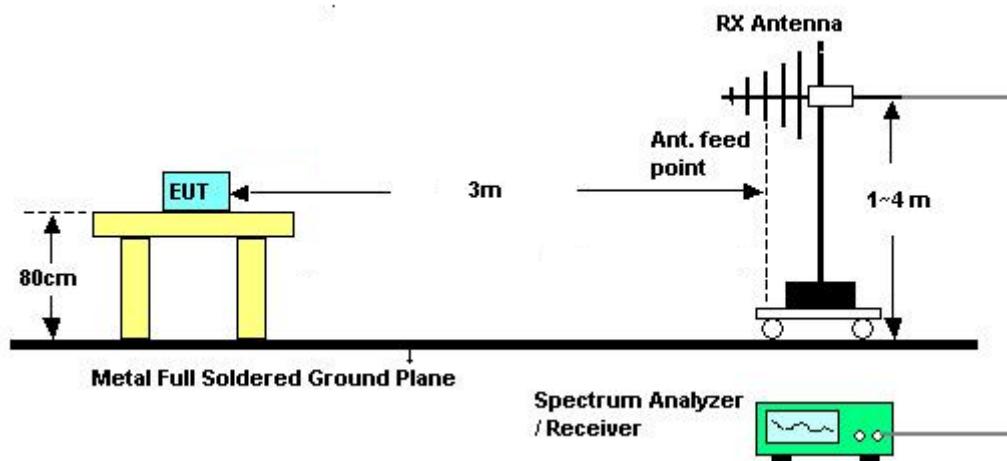
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. Antenna Requirements

3.5.5 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.5.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix C.

Remark: There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.



3.6 Antenna Requirements

3.6.1 Standard Applicable

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 16, 2010	Jul. 17, 2020	Apr. 15, 2021	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081 803	-40~+150°C	Dec. 26, 2019	Jul. 17, 2020	Dec. 25, 2020	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent	N9038A	MY522601 85	20Hz~26.5GHz	Jul. 22, 2019	Jul. 10, 2020	Jul. 21, 2020	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 28, 2020	Jul. 10, 2020	May 27, 2022	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Jul. 19, 2019	Jul. 10, 2020	Jul. 18, 2020	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 17, 2020	Jul. 10, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001 985	N/A	NCR	Jul. 10, 2020	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jul. 10, 2020	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jul. 10, 2020	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 26, 2018	Jun. 29, 2020~ Jul. 01, 2020	Dec. 25, 2020	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Oct. 17, 2019	Jun. 29, 2020~ Jul. 01, 2020	Oct. 16, 2020	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2019	Jun. 29, 2020~ Jul. 01, 2020	Oct. 16, 2020	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000 891	100Vac~250Vac	Jul. 23, 2019	Jun. 29, 2020~ Jul. 01, 2020	Jul. 22, 2020	Conduction (CO01-SZ)

NCR: No Calibration Required



5. Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.7dB
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Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.7dB
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Appendix A. Test Results of Conducted Emission Test

Test Engineer :	DaLin Liu	Temperature :		22~25°C																																																																																																																																											
		Relative Humidity :		50~55%																																																																																																																																											
Test Voltage :	120Vac / 60Hz	Phase :		Line																																																																																																																																											
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.																																																																																																																																														
<p>Date: 2020-06-29</p> <p>Site : CO01-SZ Condition: FCC 15C QP LISN 20190719 L LINE</p>																																																																																																																																															
<table border="1"> <thead> <tr> <th rowspan="2">Freq</th> <th rowspan="2">Level</th> <th>Over</th> <th>Limit</th> <th>Read</th> <th>LISN</th> <th>Cable</th> </tr> <tr> <th>Line</th> <th>dBuV</th> <th>Level</th> <th>Factor</th> <th>Loss</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.18</td> <td>32.44</td> <td>-21.93</td> <td>54.37</td> <td>22.40</td> <td>0.03</td> <td>10.01</td> <td>Average</td> </tr> <tr> <td>2</td> <td>0.18</td> <td>43.54</td> <td>-20.83</td> <td>64.37</td> <td>33.50</td> <td>0.03</td> <td>10.01</td> <td>QP</td> </tr> <tr> <td>3</td> <td>0.27</td> <td>32.04</td> <td>-18.99</td> <td>51.03</td> <td>22.00</td> <td>0.03</td> <td>10.01</td> <td>Average</td> </tr> <tr> <td>4</td> <td>0.27</td> <td>40.04</td> <td>-20.99</td> <td>61.03</td> <td>30.00</td> <td>0.03</td> <td>10.01</td> <td>QP</td> </tr> <tr> <td>5</td> <td>0.31</td> <td>30.94</td> <td>-18.90</td> <td>49.84</td> <td>20.90</td> <td>0.03</td> <td>10.01</td> <td>Average</td> </tr> <tr> <td>6</td> <td>0.31</td> <td>38.34</td> <td>-21.50</td> <td>59.84</td> <td>28.30</td> <td>0.03</td> <td>10.01</td> <td>QP</td> </tr> <tr> <td>7</td> <td>0.40</td> <td>33.64</td> <td>-14.17</td> <td>47.81</td> <td>23.60</td> <td>0.03</td> <td>10.01</td> <td>Average</td> </tr> <tr> <td>8</td> <td>0.40</td> <td>40.04</td> <td>-17.77</td> <td>57.81</td> <td>30.00</td> <td>0.03</td> <td>10.01</td> <td>QP</td> </tr> <tr> <td>9</td> <td>0.45</td> <td>29.36</td> <td>-17.53</td> <td>46.89</td> <td>19.30</td> <td>0.02</td> <td>10.04</td> <td>Average</td> </tr> <tr> <td>10</td> <td>0.45</td> <td>35.76</td> <td>-21.13</td> <td>56.89</td> <td>25.70</td> <td>0.02</td> <td>10.04</td> <td>QP</td> </tr> <tr> <td>11</td> <td>0.49</td> <td>26.78</td> <td>-19.41</td> <td>46.19</td> <td>16.70</td> <td>0.02</td> <td>10.06</td> <td>Average</td> </tr> <tr> <td>12</td> <td>0.49</td> <td>36.38</td> <td>-19.81</td> <td>56.19</td> <td>26.30</td> <td>0.02</td> <td>10.06</td> <td>QP</td> </tr> <tr> <td>13 *</td> <td>13.56</td> <td>62.65</td> <td>12.65</td> <td>50.00</td> <td>51.90</td> <td>0.47</td> <td>10.28</td> <td>Average</td> </tr> <tr> <td>14 !</td> <td>13.56</td> <td>64.85</td> <td>4.85</td> <td>60.00</td> <td>54.10</td> <td>0.47</td> <td>10.28</td> <td>QP</td> </tr> </tbody> </table>					Freq	Level	Over	Limit	Read	LISN	Cable	Line	dBuV	Level	Factor	Loss	Remark	1	0.18	32.44	-21.93	54.37	22.40	0.03	10.01	Average	2	0.18	43.54	-20.83	64.37	33.50	0.03	10.01	QP	3	0.27	32.04	-18.99	51.03	22.00	0.03	10.01	Average	4	0.27	40.04	-20.99	61.03	30.00	0.03	10.01	QP	5	0.31	30.94	-18.90	49.84	20.90	0.03	10.01	Average	6	0.31	38.34	-21.50	59.84	28.30	0.03	10.01	QP	7	0.40	33.64	-14.17	47.81	23.60	0.03	10.01	Average	8	0.40	40.04	-17.77	57.81	30.00	0.03	10.01	QP	9	0.45	29.36	-17.53	46.89	19.30	0.02	10.04	Average	10	0.45	35.76	-21.13	56.89	25.70	0.02	10.04	QP	11	0.49	26.78	-19.41	46.19	16.70	0.02	10.06	Average	12	0.49	36.38	-19.81	56.19	26.30	0.02	10.06	QP	13 *	13.56	62.65	12.65	50.00	51.90	0.47	10.28	Average	14 !	13.56	64.85	4.85	60.00	54.10	0.47	10.28	QP
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(1) with antenna

Remark: 13.560MHz is the NFC RF fundamental signal.



Test Engineer :	DaLin Liu		Temperature :	22~25°C
Test Voltage :	120Vac / 60Hz		Relative Humidity :	50~55%
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.			

Level (dBuV) Date: 2020-06-29

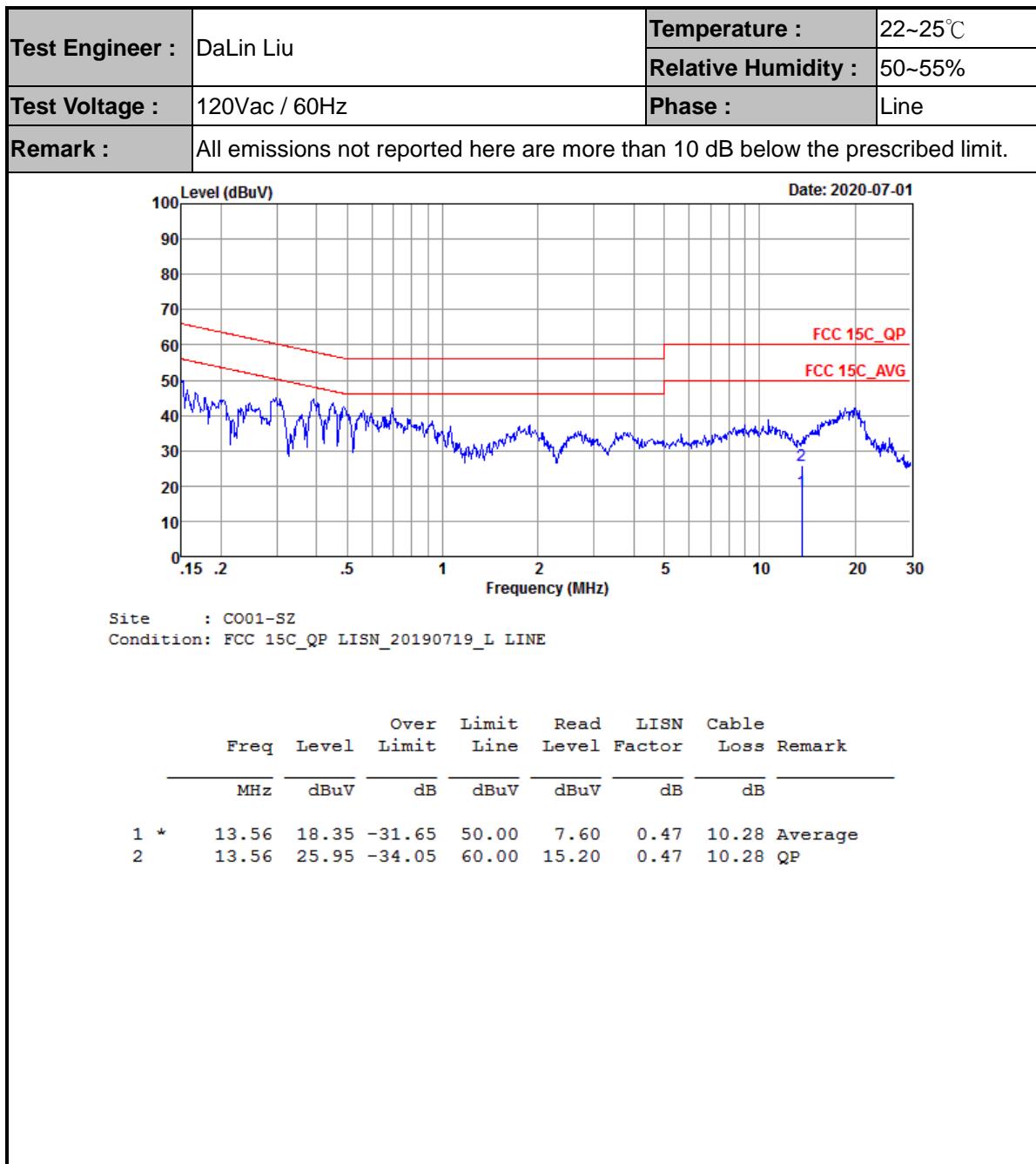
Frequency (MHz)

Site : CO01-SZ
 Condition: FCC 15C_QP LISN_20190719_N NEUTRAL

Freq	Level	Over	Limit	Read	LISN	Cable	
		Limit	Line	Level	Factor	Loss	Remark
MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18	31.74	-22.63	54.37	21.70	0.03	10.01 Average
2	0.18	43.14	-21.23	64.37	33.10	0.03	10.01 QP
3	0.22	25.64	-27.02	52.66	15.60	0.03	10.01 Average
4	0.22	36.74	-25.92	62.66	26.70	0.03	10.01 QP
5	0.27	30.04	-21.21	51.25	20.00	0.03	10.01 Average
6	0.27	36.64	-24.61	61.25	26.60	0.03	10.01 QP
7	0.37	31.13	-17.48	48.61	21.10	0.02	10.01 Average
8	0.37	38.63	-19.98	58.61	28.60	0.02	10.01 QP
9	0.40	31.33	-16.53	47.86	21.30	0.02	10.01 Average
10	0.40	39.03	-18.83	57.86	29.00	0.02	10.01 QP
11	0.45	34.06	-12.74	46.80	24.00	0.02	10.04 Average
12	0.45	39.16	-17.64	56.80	29.10	0.02	10.04 QP
13 *	13.55	62.27	12.27	50.00	51.70	0.29	10.28 Average
14 !	13.55	64.27	4.27	60.00	53.70	0.29	10.28 QP

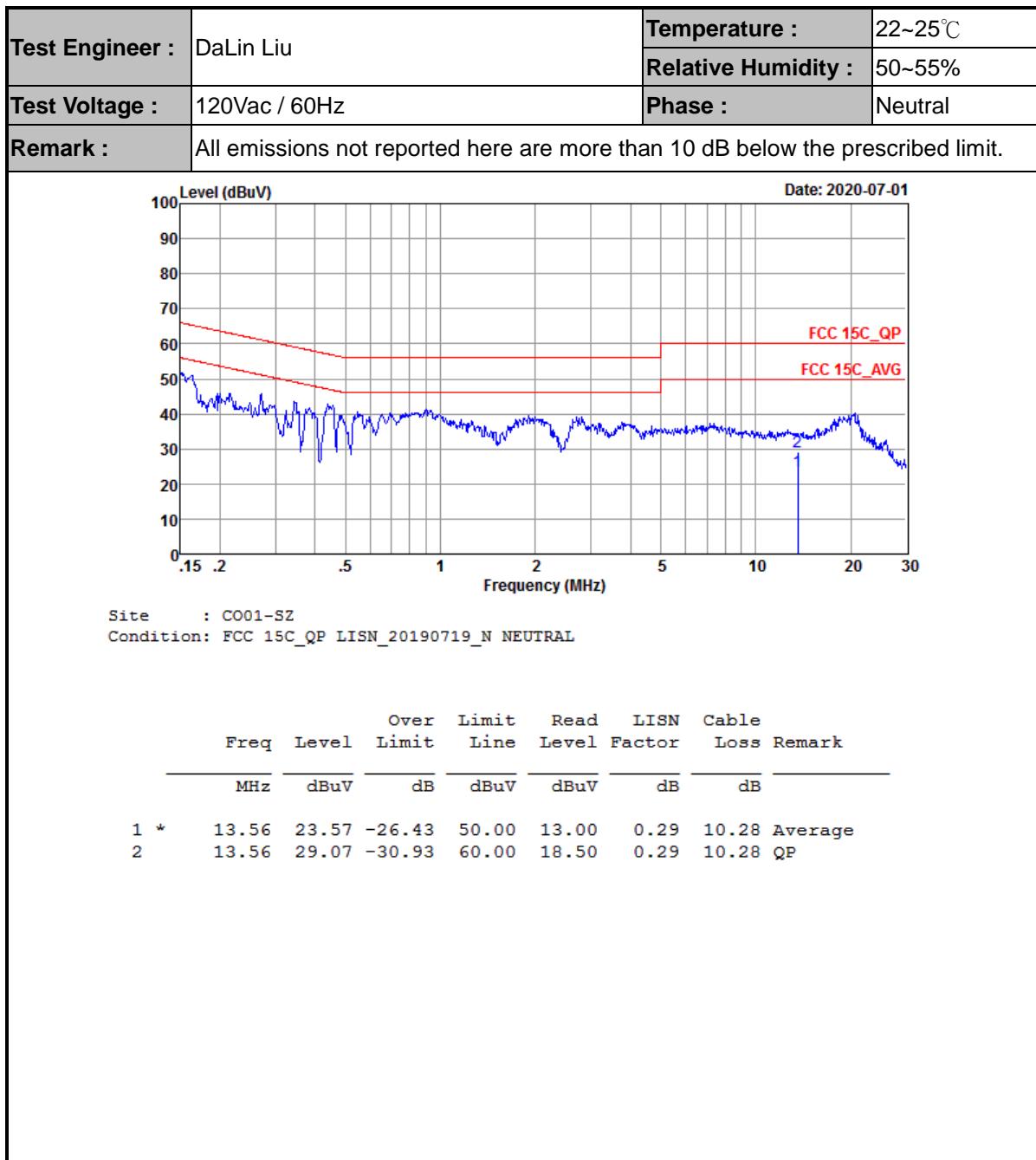
(1) with antenna

Remark: 13.560MHz is the NFC RF fundamental signal.



(2) With dummy load

Remark: Only the fundamental NFC signal needs to be retested per KDB 174176.



(2) With dummy load

Remark: Only the fundamental NFC signal needs to be retested per KDB 174176.

Note:

1. Level(dB μ V) = Read Level(dB μ V) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dB μ V) – Limit Line(dB μ V)



Appendix B. Test Results of Conducted Test Items

B1. Test Result of 20dB Spectrum Bandwidth

Test mode	NFC Tx	Test Frequency (MHz)	13.56																																																								
	<p>Ref Level 20.00 dBm Att 40 dB SWT 10 ms RBW 1 kHz SGL 3 kHz Mode Sweep SGL</p> <table border="1"> <thead> <tr> <th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr> </thead> <tbody> <tr> <td>M1</td><td>1</td><td>13.559928 MHz</td><td>8.20 dBm</td><td>ndB down</td><td>2.576 kHz</td><td></td></tr> <tr> <td>T1</td><td>1</td><td>13.55864 MHz</td><td>-11.67 dBm</td><td>ndB</td><td>20.00 dB</td><td></td></tr> <tr> <td>T2</td><td>1</td><td>13.561216 MHz</td><td>-11.69 dBm</td><td>Q factor</td><td>5264.0</td><td></td></tr> </tbody> </table> <p>Date: 17.JUL.2020 13:45:02</p>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	13.559928 MHz	8.20 dBm	ndB down	2.576 kHz		T1	1	13.55864 MHz	-11.67 dBm	ndB	20.00 dB		T2	1	13.561216 MHz	-11.69 dBm	Q factor	5264.0		<p>Ref Level 20.00 dBm Att 35 dB SWT 10 ms RBW 1 kHz SGL 3 kHz Mode Sweep SGL</p> <table border="1"> <thead> <tr> <th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr> </thead> <tbody> <tr> <td>M1</td><td>1</td><td>13.559928 MHz</td><td>8.34 dBm</td><td>ndB</td><td>2.199710564 kHz</td><td></td></tr> <tr> <td>T1</td><td>1</td><td>13.558278 MHz</td><td>-11.65 dBm</td><td>ndB</td><td>2.199710564 kHz</td><td></td></tr> <tr> <td>T2</td><td>1</td><td>13.5610275 MHz</td><td>-11.67 dBm</td><td>Q factor</td><td>2.199710564 kHz</td><td></td></tr> </tbody> </table> <p>Date: 17.JUL.2020 14:15:22</p>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	13.559928 MHz	8.34 dBm	ndB	2.199710564 kHz		T1	1	13.558278 MHz	-11.65 dBm	ndB	2.199710564 kHz		T2	1	13.5610275 MHz	-11.67 dBm	Q factor	2.199710564 kHz		
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Frequency range (MHz)	f_L > 13.553 f_H < 13.567	13.55864	Test Result																																																								
		13.561216	Complies																																																								

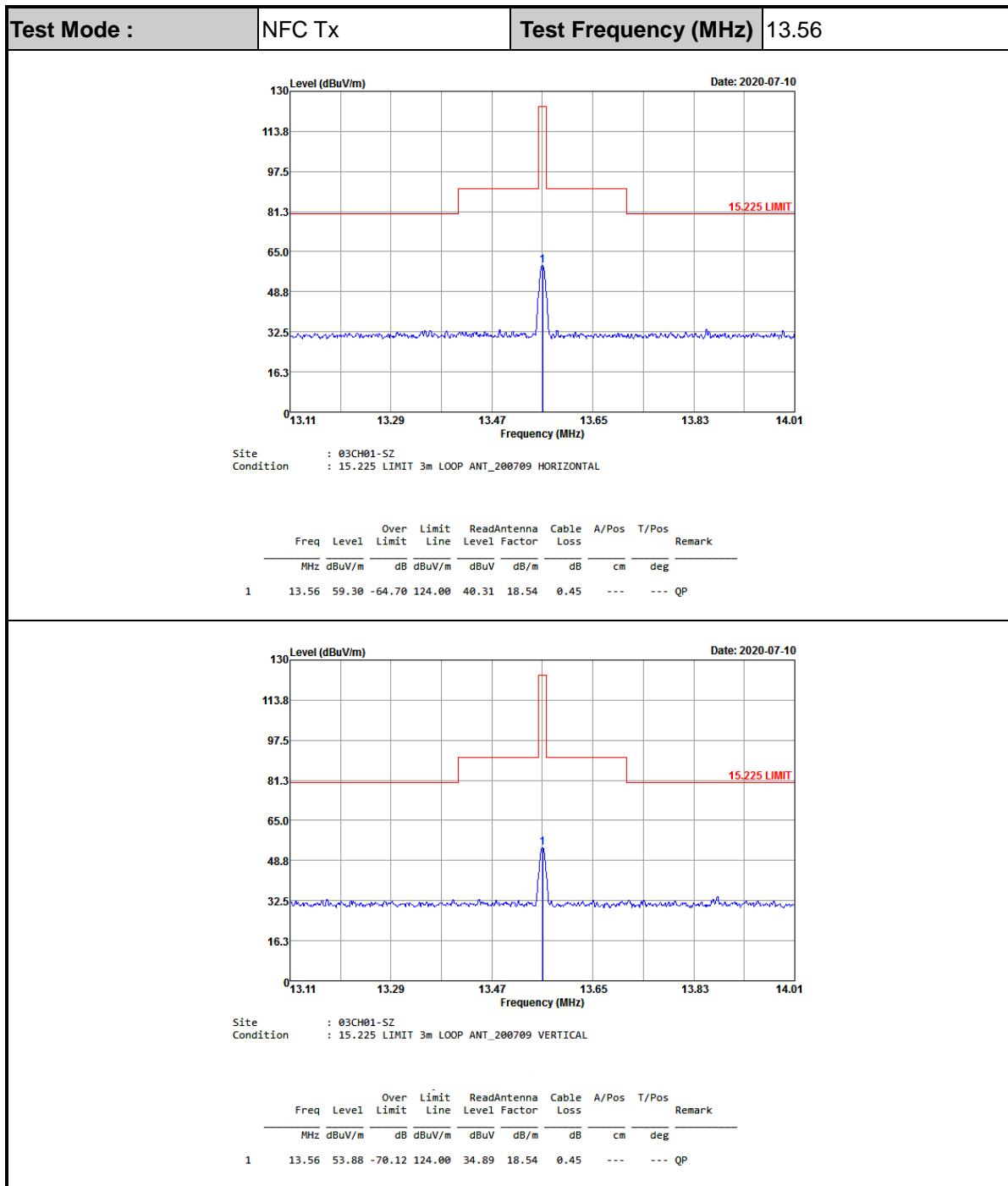
Remark: Because the measured signal is CW adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

**B2. Test Result of Frequency Stability**

B3. Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vdc)	Measurement Frequency (MHz)	Temperature (°C)	Measurement Frequency (MHz)
4.45	13.559928	-20	13.559928
3.87	13.559928	-10	13.559942
3.45	13.559928	0	13.559928
		10	13.559935
		20	13.559928
		30	13.559928
		40	13.559928
		50	13.559928
Max.Deviation (MHz)	-0.000072	Max.Deviation (MHz)	-0.000072
Max.Deviation (ppm)	-5.3097	Max.Deviation (ppm)	-5.3097
Limit	FS < ±100 ppm	Limit	FS < ±100 ppm
Test Result	PASS	Test Result	PASS

Appendix C. Test Results of Radiated Test Items

C1. Test Result of Field Strength of Fundamental Emissions



Note:

1. Level(dB μ V/m) = Read Level(dB μ V) + Antenna Factor(dB/m) + Cable Loss(dB)
2. Over Limit(dB) = Level(dB μ V/m) – Limit Line(dB μ V/m)



C2. Results of Radiated Spurious Emissions (9 kHz~30MHz)

Test Mode :		NFC Tx		Polarization :		Horizontal			
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.00971	56.34	-71.52	127.86	37.22	19.07	0.05	-	-	Average
0.07674	56.76	-53.14	109.9	37.83	18.87	0.06	-	-	Average
0.11511	52.68	-53.7	106.38	33.79	18.81	0.08	-	-	Average
0.141	46.23	-58.39	104.62	27.34	18.81	0.08	-	-	Average
1.686	36.21	-26.86	63.07	17.2	18.85	0.16	-	-	QP
2.072	35.91	-34.09	70	16.84	18.89	0.18	-	-	QP
10.816	34.61	-35.39	70	15.43	18.78	0.4	-	-	QP
22.507	35.09	-34.91	70	15.44	19.09	0.56	-	-	QP
27	34.87	-35.13	70	15.17	19.07	0.63	-	-	QP

Test Mode :		NFC Tx		Polarization :		Vertical			
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.00936	53.26	-74.92	128.18	34.14	19.07	0.05	-	-	Average
0.07683	52.46	-57.43	109.89	33.53	18.87	0.06	-	-	Average
0.11505	51.65	-54.74	106.39	32.76	18.81	0.08	-	-	Average
0.141	46.18	-58.44	104.62	27.29	18.81	0.08	-	-	Average
1.697	35.93	-27.08	63.01	16.92	18.85	0.16	-	-	QP
2.27	35.61	-34.39	70	16.52	18.9	0.19	-	-	QP
12.68	35.25	-34.75	70	16.22	18.6	0.43	-	-	QP
20.878	35.3	-34.7	70	15.62	19.14	0.54	-	-	QP
29.5	35.63	-34.37	70	16.15	18.81	0.67	-	-	QP

Note:

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
3. Limit line = specific limits (dB μ V) + distance extrapolation factor.



C3. Results of Radiated Spurious Emissions (30MHz~1GHz)

Test Mode :		NFC Tx			Polarization :			Horizontal			
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark	
30.97	24.79	-15.21	40	30.71	24.35	1.03	31.3	-	-	Peak	
99.84	31.44	-12.06	43.5	44.11	17.1	1.83	31.6	100	169	Peak	
177.44	24.23	-19.27	43.5	37.61	15.54	2.42	31.34	-	-	Peak	
336.52	22.11	-23.89	46	30.05	20.09	3.3	31.33	-	-	Peak	
638.19	30.98	-15.02	46	32.58	25.3	4.55	31.45	-	-	Peak	
999.03	31.81	-22.19	54	29.76	27.59	5.67	31.21	-	-	Peak	

Test Mode :		NFC Tx			Polarization :			Vertical			
Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark	
52.31	30.63	-9.37	40	47.51	13.4	1.32	31.6	100	169	Peak	
100.81	29.71	-13.79	43.5	42.29	17.18	1.84	31.6	-	-	Peak	
156.1	29.83	-13.67	43.5	42.51	16.44	2.27	31.39	-	-	Peak	
344.28	22.56	-23.44	46	30.17	20.36	3.34	31.31	-	-	Peak	
638.19	32.32	-13.68	46	33.92	25.3	4.55	31.45	-	-	Peak	
980.6	31.36	-22.64	54	29.66	27.31	5.63	31.24	-	-	Peak	

Note:

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.