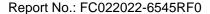


Product Name: Module	Report No: FCC022022-6545RF0
Product Model: SRT.NFC.01	Security Classification: Open
Version: V1.0	Total Page: 38

# **TIRT Testing Report**



Prepared By:	Checked By:	Approved By:	chnology Je
Stone Tang	Randy Lv	Daniel Chen	LO TRI E
Stone Tang	Randy LV	Daniel Chen	Shenzhen S





# **FCC Radio Test Report**

FCC ID: 2AFG6-NFC01

This report concerns: Original Grant

Project No. : 02022-6545 Equipment : Module

Brand Name : -

Test Model : SRT.NFC.01

Series Model : N/A

**Applicant**: Guangzhou Shirui Electronics Co.,Ltd.

Address : 192 Kezhu Road, Scientech Park, Guangzhou Economic &

Technology Development District, Guangzhou, Guangdong, China

Manufacturer : Guangzhou Shirui Electronics Co.,Ltd.

Address : 192 Kezhu Road, Scientech Park, Guangzhou Economic &

Technology Development District, Guangzhou, Guangdong, China

Date of Receipt : Dec. 29, 2022

**Date of Test** : Dec. 30, 2022~Jan. 04, 2023

**Issued Date** : Jan. 12, 2023

Report Version : V1.0

**Test Sample** : 20221229022322

Standard(s) : FCC CFR Title 47, Part 15, Subpart C

ANSI C63.10-2013

- The test result referred exclusively to the presented test model /sample.
- Without written approval of TIRT Inc. the test report shall not reproduced except in full.

Lab: Beijing TIRT Technology Service Co.,Ltd Shenzhen

Add: 101, 3 # Factory Building, Gongjin Electronics Shatin Community, Kengzi Street, Pingshan

District, Shenzhen, China

TEL: +86-0755-27087573



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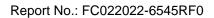
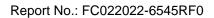




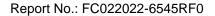
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# **REPORT ISSUED HISTORY**

Report No.	Version	Description	Issued Date	Note
FCC022022-6545RF0	V1.0	Original Report.	Jan. 12, 2023	Valid





# 1. SUMMARY OF TEST RESULTS

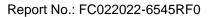
Test procedures according to the technical standard(s):

FCC CFR Title 47, Part 15, Subpart C				
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207	AC Power Line Conducted Emissions	APPENDIX A	PASS	
15.225(a)-(d) 15.205(a) 15.209(a)	Radiated Emission	APPENDIX B APPENDIX C	PASS	
15.225(e)	Frequency Tolerance	APPENDIX D	PASS	
15.215(c)	Bandwidth	APPENDIX E	PASS	
15.203	Antenna Requirement		PASS	Note(2)

#### Note:

- (1) "N/A" denotes test is not applicable in this test report
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

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#### 1.1 TEST FACILITY

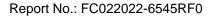
Company:	Beijing TIRT Technology Service Co.,Ltd Shenzhen
Address:	101, 3 # Factory Building, Gongjin Electronics Shatin Community, Kengzi Street, Pingshan District, Shenzhen, China
CNAS Registration Number:	CNAS L14158
A2LA Registration Number:	6049.01
FCC Accredited Lab. Designation Number:	CN1309
FCC Test Firm Registration Number:	825524
Telephone:	+86-0755-27087573

#### 1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)) The TIRT measurement uncertainty as below table:

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	±142.12kHz
RF power conducted	±0.74dB
RF power radiated	±3.25dB
Spurious emissions, conducted (9kHz~40GHz)	±1.78dB
Spurious emissions, radiated (9kHz~30MHz)	±2.8dB
Spurious emissions, radiated (30MHz~1GHz)	±4.6dB
Spurious emissions, radiated (1GHz ~ 18GHz)	±4.9dB
Spurious emissions, radiated (18GHz ~ 40GHz)	±5.54dB
Conduction Emissions(150kHz~30MHz)	±3.1dB
Humidity	±4.6%
Temperature	±0.7°C
Time	±1.25%

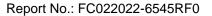
Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.





# 1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	24°C	54%	AC 120V/60Hz	Stone Tang
Radiated Emissions-9kHz to 30MHz	24°C	54%	AC 120V/60Hz	Stone Tang
Radiated Emissions-30MHz to 1000MHz	24°C	54%	AC 120V/60Hz	Stone Tang
Frequency Tolerance	Normal & Extreme	50%	Normal & Extreme	Stone Tang
Bandwidth	24°C	55%	AC 120V/60Hz	Stone Tang





# 2. GENERAL INFORMATION

#### 2.1 GENERAL DESCRIPTION OF EUT

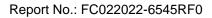
Equipment	Module
Brand Name	
Test Model	SRT.NFC.01
Series Model	N/A
Model Difference(s)	N/A
Power Source	5V
Power Rating	1.5W
Operation Frequency	13.56 MHz
Antenna Type	PCB
Host: Interactive Intelligent Panel	TB65GA, TB75GA, TB86GA, OTS-PCAP65V3T1, OTS-PCAP75V3T1, OTS-PCAP86V3T1.  The SRT.NFC.01 module will be placed inside TB65GA, TB75GA, TB86GA, OTS-PCAP65V3T1, OTS-PCAP75V3T1 and OTS-PCAP86V3T1, the six Host differences are different in size. In this certification, TB65GA was selected as the test Host.  TB65GA and OTS-PCAP65V3T1 only have different model names, and the others are identical.  TB75GA and OTS-PCAP75V3T1 only have different model names, and the others are identical.  TB86GA and OTS-PCAP86V3T1 only have different model names, and the others are identical.

#### Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

## 2. Channel List:

Test Ch nnel	Test Frequency (MHz)
01	13.56





#### 2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX Mode_13.56MHz

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

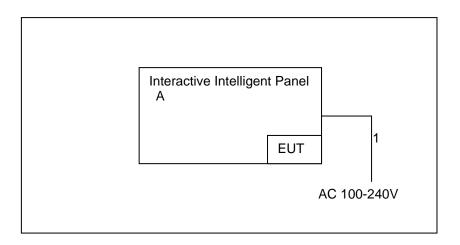
AC power line conducted emissions test		
Final Test Mode Description		
Mode 1	TX Mode_13.56MHz	

Radiated emissions test - Below 1GHz		
Final Test Mode	Description	
Mode 1	TX Mode_13.56MHz	

Conducted test		
Final Test Mode	Description	
Mode 1	TX Mode_13.56MHz	



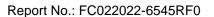
#### 2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



#### 2.4 SUPPORT UNITS

Item	Equipment	Mfr/Brand	Model	Series No.
А	Interactive Intelligent Panel	Shirui	TB65GA	40221027000868

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	AC Cable	NO	NO	1.5m





#### 3. AC POWER LINE CONDUCTED EMISSIONS

#### 3.1 LIMIT

Fraguency of Emission (MHz)	Limit (dBμV)		
Frequency of Emission (MHz)	Quasi-peak	Average	
0.15 - 0.5	66 to 56*	56 to 46*	
0.5 - 5.0	56	46	
5.0 - 30.0	60	50	

#### Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

#### 3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item EUT Test Photos.

The following table is the setting of the receiver

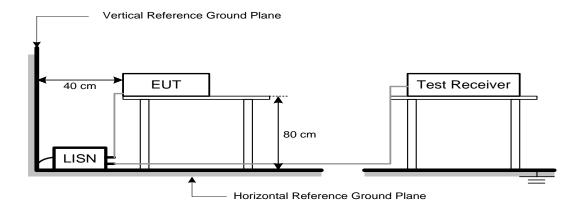
Receiver Parameter	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

#### 3.3 DEVIATION FROM TEST STANDARD

No deviation.



#### 3.4 TEST SETUP



#### 3.5 EUT OPERATING CONDITIONS

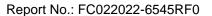
The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting data or hopping on mode.

#### 3.6 TEST RESULTS

Please refer to the APPENDIX A.

#### Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of <code>『Note』</code>. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a "\*" marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150 kHz to 30 MHz.





#### 4. RADIATED EMISSION

#### **4.1 LIMIT**

§15.225 (a)

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

§15.225 (b)

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

§15.225 (c)

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

§15.225 (d)

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

§15.209 (a)

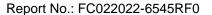
Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

#### LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

#### Note:

- (1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).





#### **4.2 TEST PROCEDURE**

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~150 kHz for RBW 200 Hz
Start ~ Stop Frequency	0.15 MHz~30 MHz for RBW 9 kHz
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz

Receiver Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

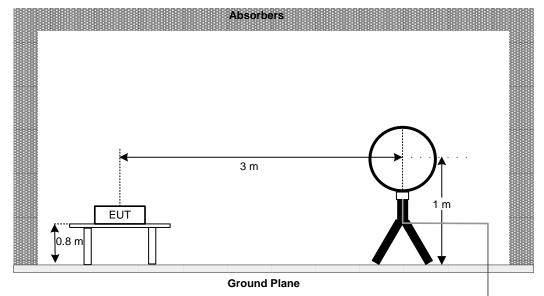
#### 4.3 DEVIATION FROM TEST STANDARD

No deviation.



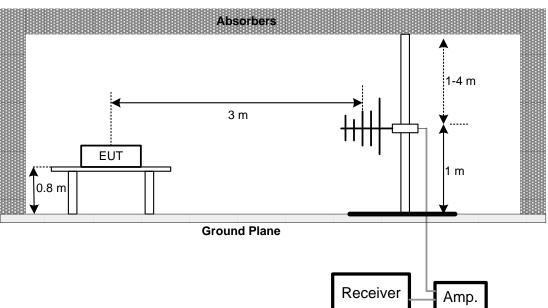
#### 4.4 TEST SETUP

#### 9 kHz to 30 MHz





#### 30 MHz to 1000 MHz





Report No.: FC022022-6545RF0

#### 4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 4.6 TEST RESULTS - 9 kHz TO 30 MHz

Please refer to the APPENDIX B.

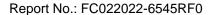
#### Remark:

- (1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

# 4.7 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

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#### 5. FREQUENCY TOLERANCE

#### **5.1 LIMIT**

Section	Test Item	Limit
FCC 15.225(e)	Frequency Tolerance	±1.356 kHz

#### **5.2 TEST PROCEDURE**

The frequency tolerance of the carrier signal shall be maintained within ±0.01% 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.

#### **5.3 DEVIATION FROM STANDARD**

No deviation.

#### **5.4 TEST SETUP**



#### **5.5 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### **5.6 TEST RESULTS**

Please refer to the APPENDIX D.



Report No.: FC022022-6545RF0

#### 6. BANDWIDTH TEST

#### 6.1 LIMIT

Section	Test Item	Limit
15.215(c)	20 dB Bandwidth	-

#### **6.2 TEST PROCEDURE**

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 100 kHz, VBW=300 kHz, Sweep time = 2.5ms.

#### **6.3 DEVIATION FROM STANDARD**

No deviation.

#### **6.4 TEST SETUP**

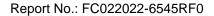
EUT	SPECTRUM
	ANALYZER

#### **6.5 EUT OPERATION CONDITIONS**

The EUT was programmed to be in continuously transmitting mode.

#### **6.6 TEST RESULTS**

Please refer to the APPENDIX E.





# 7. MEASUREMENT INSTRUMENTS LIST

No.	Equipment Manufacturer Type No		Type No.	Serial No.	Calibrated until
1	EMI Receiver	Rohde&Schwarz	ESCI	1166.5950.03	2023/10/14
2	AMN	Rohde&Schwarz	ENV216	3560.6550.05	2023/10/14
3	AMN	Schwarzbeck	NSLK8127	#829	2023/10/14
4	ECSI RF IN RF Cable	Rohde&Schwarz	RP-X1	N/A	2023/10/14
5	ECSI RF IN RF Cable	Rohde&Schwarz	Sapre sm	N/A	2023/10/14
6	EMI Receiver	Rohde&Schwarz	ESR7	102013	2023/10/14
7	Spectrum analyzer	Rohde&Schwarz	FSV30	103741	2023/10/17
8	Spectrum analyzer	KEYSIGHT	N9010A-44	MY51440158	2023/10/17
9	Log periodic antenna	Schwarzbeck	VULB 9163	VULB 9163-361	2023/10/15
10	Loop Antenna	Schwarzbeck	FMZB1519 B	00029	2023/07/03
22	EMI Receiver	Rohde&Schwarz	ESU	100184	2023/07/20
23	Temp&Humidity Recorder	Anymetre	JR900	N/A	2023/10/16
25	Temp&Humidity Chamber	ETOMA	NTH1100-3 0A	16080628	2023/10/16
29	Testing Software	Farad	EZ-EMC	N/A	N/A

Remark "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.



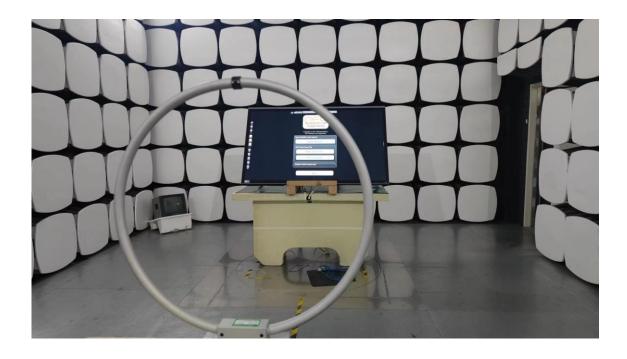
# 8. EUT TEST PHOTO

# **AC Power Line Conducted Emissions Test Photos**





# Radiated Emissions Test Photos 9 kHz to 30 MHz





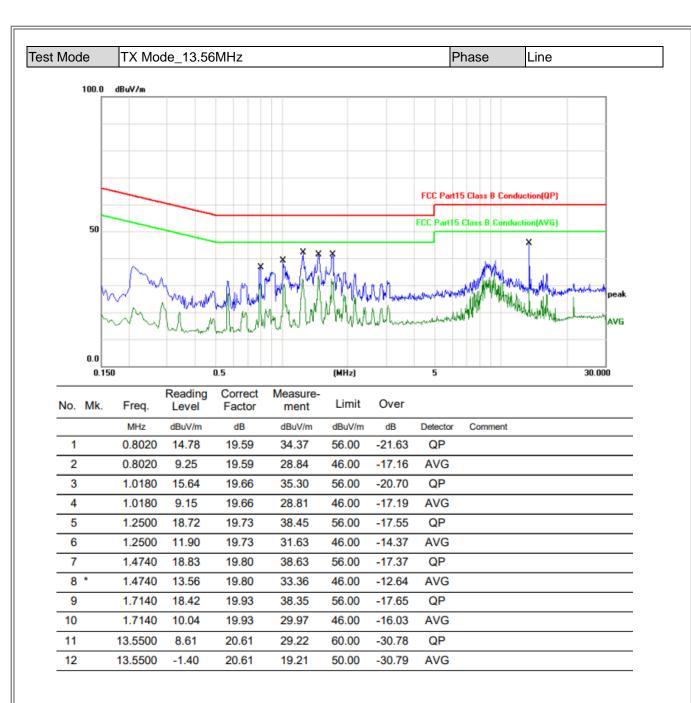
# Radiated Emissions Test Photos 30 MHz to 1000 MHz





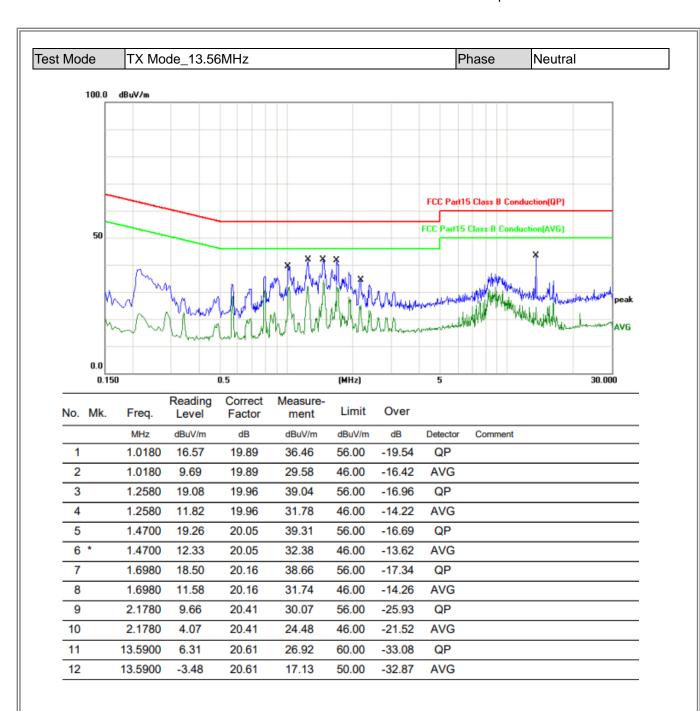
APPENDIX A - AC POW	ER LINE CONDUCTED EMISSIONS
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- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



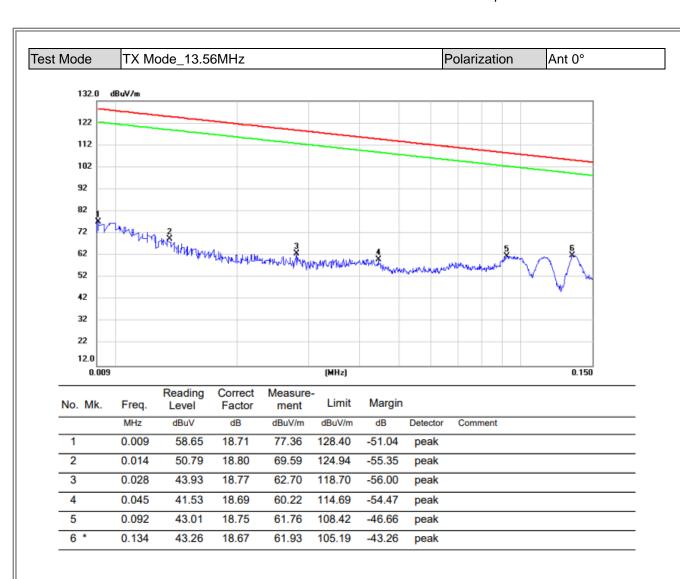


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



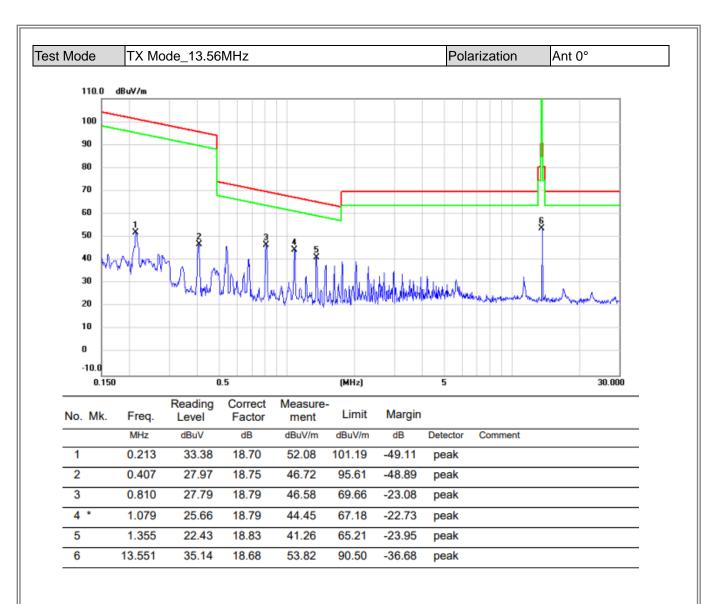
Al	PPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ
<u> </u>	Page 27 of 38





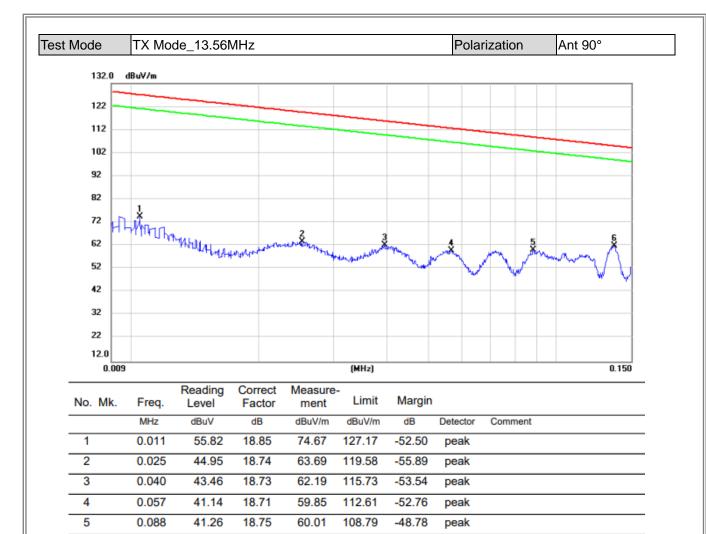
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





6 \*

0.137

(1) Measurement Value = Reading Level + Correct Factor.

43.33

18.68

62.01

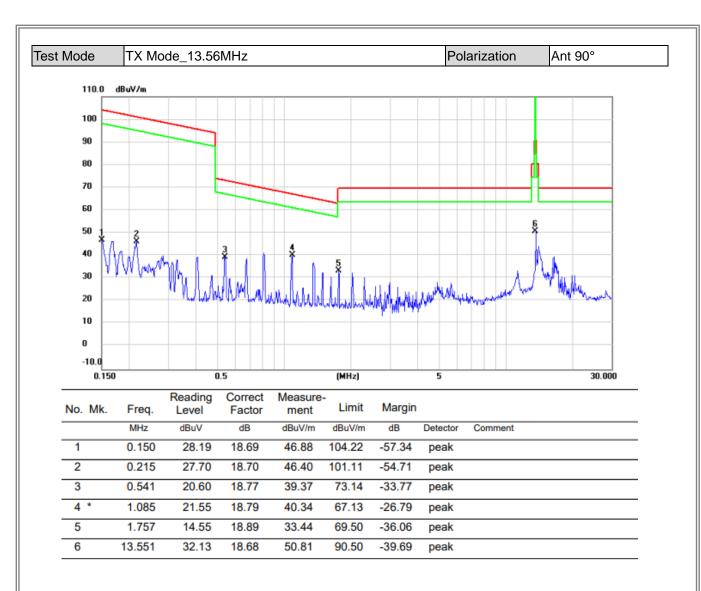
105.02

-43.01

peak

(2) Margin Level = Measurement Value - Limit Value.



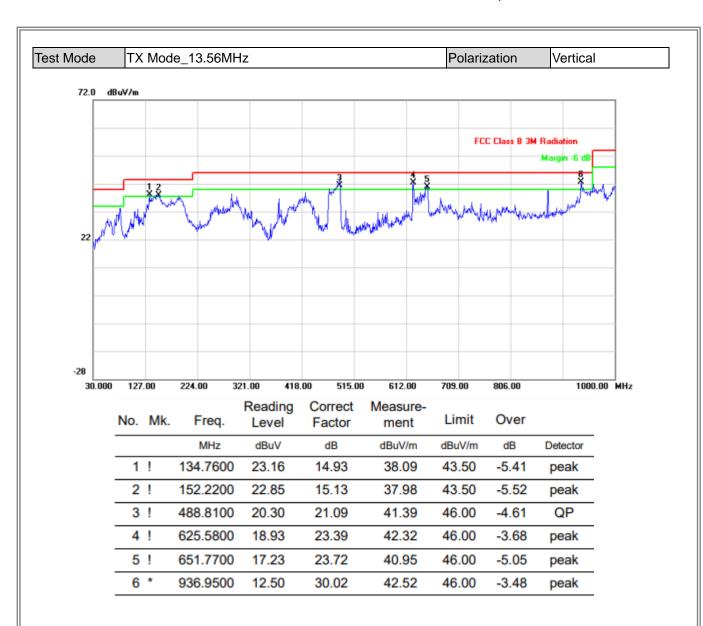


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



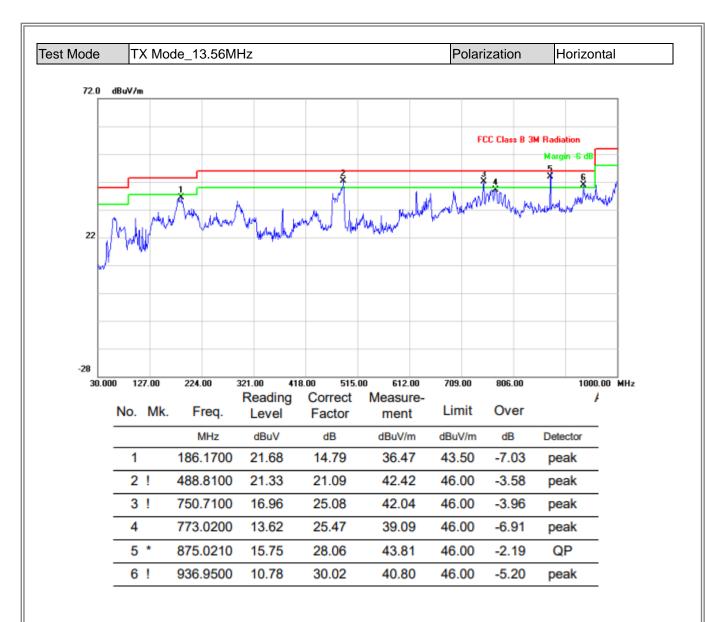
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ
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- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

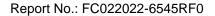




- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



APPENDIX D - FREQUENCY TOLERANCE
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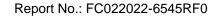


Test Mode TX Mode\_13.56MHz

Frequency Tolerance Versus Environmental Temperature							
	Temper (°C		Voltage (V)	Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
	23		120	13.5602	0.2	-	-
0 min	40		120	13.5601	0.1	+/- 1.356	PASS
	0		120	13.5603	0.3	+/- 1.356	PASS
2 min	40		120	13.5601	0.1	+/- 1.356	PASS
	0		120	13.5604	0.4	+/- 1.356	PASS
5 min	40		120	13.5598	-0.2	+/- 1.356	PASS
	0		120	13.5604	0.4	+/- 1.356	PASS
10 min	40		120	13.5997	-0.3	+/- 1.356	PASS
	0		120	13.5604	0.4	+/- 1.356	PASS
Frequency Tolerance Versus Input Voltage							
Temperature (°C)		V	/oltage (V)	Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
2	3	$V_{nom}$	120	13.5602	0.2	-	-
2	3	$V_{min}$	108	13.5603	0.3	+/- 1.356	PASS
2	3	$V_{\text{max}}$	132	13.5603	0.3	+/- 1.356	PASS



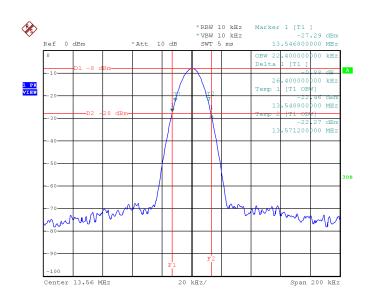
APPENDIX E - BANDWIDTH	
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Test Mode TX Mode\_13.56MHz

Frequency (MHz)	20 dB Bandwidth (MHz)	Result
13.56	0.02640	Complies



Date: 3.JAN.2023 10:16:40

**End of Test Report** 

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