

RADIO TEST REPORT

S I S

Report No: STS1612211F01

Issued for

Hangzhou Wistar Mechanical & Electric Technology Co., Ltd.

NO.290 Renliang Road, Renhe, Yuhang District, Hangzhou China

| Product Name: | Emitter | |
|----------------|-----------------|--|
| Brand Name: | WISTAR | |
| Model Name: | WSRS005 | |
| Series Model: | N/A | |
| FCC ID: | XFCWISTAR-RS005 | |
| Test Standard: | FCC Part 15.231 | |

Any reproduction of this document must be done in full. No single part of this document may be permission from STS, All Test Data Presented in this report is only applicable to presented a A





Page 2 of 30

Report No.: STS1612211F01

TEST REPORT CERTIFICATION

Applicant's nameHangzhou Wistar Mechanical & Electric Technology Co., Ltd.AddressNO.290 Renliang Road, Renhe, Yuhang District, Hangzhou
ChinaManufacture's NameHangzhou Wistar Mechanical & Electric Technology Co., Ltd.AddressNO.290 Renliang Road, Renhe, Yuhang District, Hangzhou
ChinaAddressNO.290 Renliang Road, Renhe, Yuhang District, Hangzhou
ChinaProduct descriptionEmitterBrand nameWISTARModel and/or type referenceWSRS005StandardsFCC Part 15.231Test procedureANSI C63.10-2013

This device described above has been tested by STS, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of STS, this document may be altered or revised by STS, personal only, and shall be noted in the revision of the document.

Date of Test.....

Date of performance of tests 25 Dec. 2016 ~03 Jan. 2017

Date of Issue..... 04 Jan. 2017

Test Result..... Pass

| Testing Engineer | : | Sean She | |
|----------------------|----|-------------|-------------------|
| | | (Sean she) | ESTING · CONSEL |
| Technical Manager | : | Jula | APPROVAL S |
| | | (Tony liu) | Pullen . CERTIFIC |
| Authorized Signatory | /: | Boney Yuney | |

(Bovey Yang)

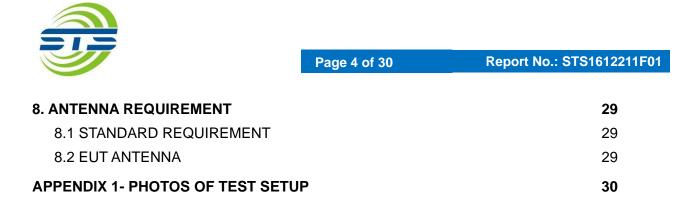
Shenzhen STS Test Services Co., Ltd.





TABLE OF CONTENTS

| 1. SUMMARY OF TEST RESULTS | 6 |
|---|----|
| 1.1 TEST FACTORY | 6 |
| 1.2 MEASUREMENT UNCERTAINTY | 6 |
| 2. GENERAL INFORMATION | 7 |
| 2.1 GENERAL DESCRIPTION OF EUT | 7 |
| 2.2 DESCRIPTION OF TEST MODES | 8 |
| 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED | 8 |
| 2.4 DESCRIPTION OF SUPPORT UNITS | 9 |
| 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS | 10 |
| 3. EMC EMISSION TEST | 11 |
| 3.1 CONDUCTED EMISSION MEASUREMENT | 11 |
| 3.2 TEST PROCEDURE | 12 |
| 3.3 TEST SETUP | 12 |
| 3.4 EUT OPERATING CONDITIONS | 12 |
| 3.5 TEST RESULTS | 13 |
| 4. RADIATED EMISSION MEASUREMENT | 14 |
| 4.1 RADIATED EMISSION LIMITS | 14 |
| 4.2 TEST PROCEDURE | 15 |
| 4.3 DEVIATION FROM TEST STANDARD | 15 |
| 5. BANDWIDTH TEST | 22 |
| 5.1 APPLIED PROCEDURES / LIMIT | 22 |
| 5.2 TEST REQUIREMENTS | 22 |
| 5.3 TEST PROCEDURE | 22 |
| 5.4 TEST SETUP | 22 |
| 5.5 EUT OPERATION CONDITIONS | 22 |
| 5.6 TEST RESULTS | 23 |
| 6. DUTY CYCLE | 24 |
| 6.1 TEST PROCEDURE | 24 |
| 6.2 TEST SETUP | 24 |
| 6.3 EUT OPERATION CONDITIONS | 24 |
| 6.4 TEST RESULTS | 25 |
| 7. AUTOMATICALLY DEACTIVATE | 27 |
| 7.1 STANDARD REQUIREMENT | 27 |
| 7.2 TEST PROCEDURE | 27 |





Shenzhen STS Test Services Co., Ltd.



Page 5 of 30

Report No.: STS1612211F01

Revision History

| Rev. | Issue Date | Report NO. | Effect Page | Contents |
|------|--------------|---------------|-------------|---------------|
| 00 | 04 Jan. 2017 | STS1612211F01 | ALL | Initial Issue |
| | | | | |



Shenzhen STS Test Services Co., Ltd.



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part 15.231,Subpart C | | | | | |
|---------------------------------|----------------------------|----------|--------|--|--|
| Standard Section | Test Item | Judgment | Remark | | |
| 15.207 | Conducted Emission | N/A | | | |
| 15.205(a)/15.209/ 15.231.(b) | Radiated Spurious Emission | PASS | | | |
| 15.231(a)(2)/ 15.231(b) | Transmission requirement | PASS | | | |
| 15.231(C) | 20 dB Bandwidth | PASS | | | |
| 15.203 | Antenna Requirement | PASS | | | |

NOTE: (1)"N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd. 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China FCC Registration No.: 842334; IC Registration No.: 12108A-1

1.2 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 | Uncertainty |
|-----|--|-------------|
| 1 | Conducted Emission (9KHz-150KHz) | ±2.88dB |
| 2 | Conducted Emission (150KHz-30MHz) | ±2.67dB |
| 3 | RF power,conducted | ±0.70dB |
| 4 | Spurious emissions, conducted | ±1.19dB |
| 5 | All emissions,radiated(<1G) 30MHz-200MHz | ±2.83dB |
| 6 | All emissions,radiated(<1G) 200MHz-1000MHz | ±2.94dB |
| 8 | All emissions,radiated(>1G) | ±3.03dB |
| 9 | Temperature | ±0.5°C |
| 10 | Humidity | ±2% |



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| Equipment | Emitter |
|-------------------------|-----------------------------------|
| Trade Name | WISTAR |
| Model Name | WSRS005 |
| Series Model | N/A |
| Model Difference | N/A |
| Frequency band | 433.92MHz |
| Modulation Type | ASK |
| Antenna Type | PCB Antenna |
| Antenna Gain | 2dBi |
| Battery | DC 3V |
| Hardware version number | V1.0 |
| Software version number | V1.0 |
| Connecting I/O Port(s) | Please refer to the User's Manual |

Note:

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

2. Table for filed Antenna

| An | t. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | NOTE |
|----|----|--------|------------|--------------|-----------|------------|---------|
| 1 | | WISTAR | WSRS005 | РСВ | N/A | 2 | Antenna |

The EUT antenna is PCB Antenna. No antenna other than that furnished by the responsible party shall be used with the device.



Page 8 of 30

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode | Description |
|--------------|-------------|
| Mode 1 | TX Mode |

| | For Radiated Emission | | |
|-----------------|-----------------------|--|--|
| Final Test Mode | Description | | |
| Mode 1 | TX Mode | | |

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During test, Keep EUT is in continuous transmission mode New battery is used during all test.

E-1 EUT

Page 9 of 30



2.4 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.

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| E-1 | Emitter | WISTAR | WSRS005 | N/A | EUT |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
| N/A | N/A | N/A | N/A | N/A |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in ^CLength₂ column.





Report No.: STS1612211F01

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|--|--------------|-------------------------------|------------|------------------|------------------|
| Spectrum Analyzer | Agilent | E4407B | MY50140340 | 2016.10.23 | 2017.10.22 |
| Test Receiver | R&S | ESCI | 101427 | 2016.10.23 | 2017.10.22 |
| Bilog Antenna | TESEQ | CBL6111D | 34678 | 2014.11.24 | 2017.11.23 |
| Horn Antenna | Schwarzbeck | BBHA 9120D(1201) 1G-18G | 9120D-1343 | 2015.03.05 | 2018.03.04 |
| 50Ω Coaxial Switch | Anritsu | MP59B | 6200264416 | 2016.06.06 | 2017.06.05 |
| PreAmplifier | Agilent | 8449B | 60538 | 2016.10.23 | 2017.10.22 |
| Loop Antenna | EMCO | 6502 | 9003-2485 | 2016.03.06 | 2019.03.05 |
| Spectrum Analyzer | Agilent | E4407B | MY50140340 | 2016.10.23 | 2017.10.22 |
| Low frequency cable (9KHz-1GHz) | SCHWARZBECK | R01 | N/A | 2016.10.23 | 2017.10.22 |
| High frequency cable (1GHz-5GHz) | SCHWARZBECK | R02 | N/A | 2016.10.23 | 2017.10.22 |
| Temporary Antenna Connector | N/A | P9MSP9MS | N/A | 2016.10.23 | 2017.10.22 |
| RF Cable | Murrata | MXHS83QE300 0 | 2085751 | 2016.10.23 | 2017.10.22 |
| EMI Test Receiver | R&S | ESPI | 102086 | 2016.10.23 | 2017.10.22 |
| LISN | R&S | ENV216 | 101242 | 2016.10.23 | 2017.10.22 |
| LISN | EMCO | 3810/2NM | 000-23625 | 2016.10.23 | 2017.10.22 |
| Conduction Cable (150KHz-30MHz) | EM | C01 | N/A | 2016.10.23 | 2017.10.22 |

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

operating frequency band. In case the emission fall within the restricted band specified on Part 15. 207(a) limit in the table below has to be followed.

| | Class B | Standard | |
|-----------------|------------|-----------|----------|
| FREQUENCY (MHz) | Quasi-peak | Average | Standard |
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * | CISPR |
| 0.50 -5.0 | 56.00 | 46.00 | CISPR |
| 5.0 -30.0 | 60.00 | 50.00 | CISPR |

| 0.15 -0.5 | 66 - 56 * | 56 - 46 * | FCC |
|-----------|-----------|-----------|-----|
| 0.50 -5.0 | 56.00 | 46.00 | FCC |
| 5.0 -30.0 | 60.00 | 50.00 | FCC |

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.

The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---------------------|----------|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

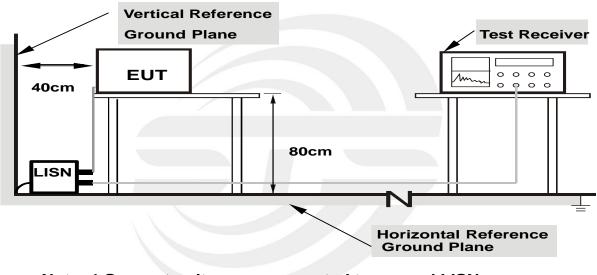
Page 12 of 30



3.3 TEST SETUP

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 equipments 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.



Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.5 TEST RESULTS

| Temperature: | 26 °C | Relative Humidity: | 54% |
|--------------|---------|--------------------|-----|
| Pressure: | 1010hPa | Phase : | L/N |
| Test Mode: | N/A | | |

Note: This device is a battery power supply equipment, AC conducted emission is not applicable.



Shenzhen STS Test Services Co., Ltd.



4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

In case the emission fall within the restricted band specified on Part 15.205(a), then the Part 15.209(a) and Part 15.231(b) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

| Frequencies | Field Strength | Measurement Distance |
|-------------|--------------------|----------------------|
| (MHz) | (micorvolts/meter) | (meters) |
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~40.66 | 100 | 3 |
| 40.70~70 | 100 | 3 |

| Fundamental Frequency (MHz) | Field Strength of fundamental (microvolts/meter) | Field Strength of Unwanted Emissions (microvolts/meter) |
|--------------------------------|--|---|
| 40.66~40.70 | 2,250 | 225 |
| 70~130 | 1,250 | 125 |
| 130~174 | 1,250 to 3,750** | 125 to 375** |
| 174~260 | 3750 | 375 |
| 260~470 | 3,750 to 12,500** | 375 to 1,250** |
| Above 470 | 12,500 | 1,250 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| | Class B (dBuV/m) (at 3M) | | |
|-----------------|--------------------------|---------|--|
| FREQUENCY (MHz) | PEAK | AVERAGE | |
| Above 1000 | 74 | 54 | |

NOTE:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)Emission level (dBuV/m)=20log Emission level (uV/m).



Page 15 of 30

Report No.: STS1612211F01

| Spectrum Parameter | Setting |
|---------------------------------------|-----------------------|
| Detector | Peak |
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz |

| Receiver Parameter | Setting |
|------------------------|--------------------------------------|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

4.2 TEST PROCEDURE

a. The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

During test, The table was rotated 360 degrees to determine the position of the highest radiation.

- b. In the frequency range of 9KHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- c. In the frequency range 30MHz-1GHz, Bi-Log Test Antenna used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.
- d. In the frequency above 1GHz, Place the measurement antenna 3m away from the EUT for each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- f. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

h. For the actual test configuration, please refer to the related Item –EUT Test Photos. Both horizontal and vertical antenna polarities and performed pretest to three orthogonal axis were tested. The worst case emissions were reported

4.3 DEVIATION FROM TEST STANDARD

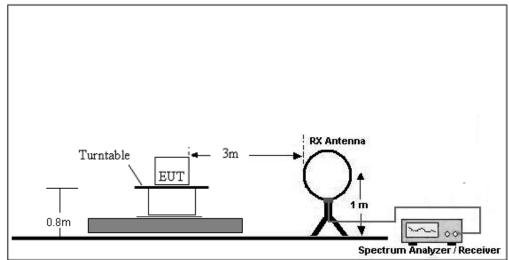
No deviation

Shenzhen STS Test Services Co., Ltd.

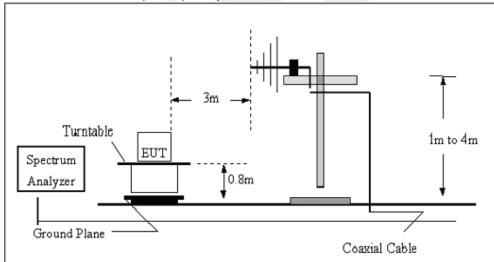


4.4 TEST SETUP

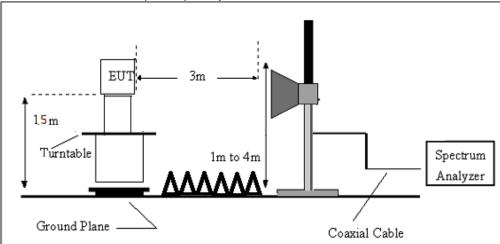
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



4.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Shenzhen STS Test Services Co., Ltd.

Page 17 of 30



4.6 TEST RESULTS

INTRODUCTION TO PDCF

reference: (§15.35 Measurement detector functions and bandwidths.)

a. Part 15 of the FCC Rules provides for the operation of low power communication devices without an individual license (e.g., intrusion detectors, pulsed water tank level gauges, etc.), subject to certain requirements. Some of these devices use extremely narrow pulses to generate wideband emissions, which are measured to determine compliance with the rules. These measurements are typically performed with a receiver or spectrum analyzer. Depending on a number of factors (e.g., resolution bandwidth, pulsewidth, etc.), the spectrum analyzer may not always display the true peak value of the measured emission. This effect, called "pulse desensitization," relates to the capabilities of the measuring instrument. For the measurement and reporting of the true peak of pulsed emissions, it may be necessary to apply a "pulse desensitization correction factor" (PDCF) to the measured value, pursuant to 47 CFR



Periodic Square Pulse

Frequency Spectrum of Periodic Square Pulse

If using spectrum analyzer to measure pulse signal, it have to make sure the RBW use is at least 2/PW.

•When RBW is less than 2/PW , you are able to measure the true peak level of the pulse signal. If this is the case , PDCF is required to compensate to determine true peak value.

Pulse desensitization:

PW =44870usec,Period=100000usec, Level=A RBW>2/PW=0.00004K , 1/T=0.01K

NOTE: 2 / PW < RBW, first don't need

b. For the actual test, please refer to the ANSI C63.10,Annex C refer to section 5 for more detail

Page 18 of 30



4.7 TEST RESULTS

(Radiated Emission<30MHz (9KHz-30MHz, H-field))

| Freq. | Reading | Limit | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| | | | | PASS |
| | | | | PASS |

Note:The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB); Limit line = specific limits(dBuv) + distance extrapolation factor.



Shenzhen STS Test Services Co., Ltd.



Between 30MHz - 5000 MHz

| Tempe | erature: | 26 °C | | Relative Humidity: | | 54% | | |
|--------|--------------------|---------------------|-------------|---------------------|--------------|-------|----------------|----------|
| Pressu | re: | 1010hPa Pha | | Phase: Horizo | | ontal | | |
| Test M | Test Mode: Mode 1 | | | | | | | |
| No. | Frequency (MHz) | r Reading (dBuV) | Factor (dB) | Results (dBuV/m) | Lin (dBu' | | Margin (dB) | Detector |
| 1 | 19 9420 | 12.95 | 20.80 | 22.06 | 40 | 00 | 17.04 | OP |

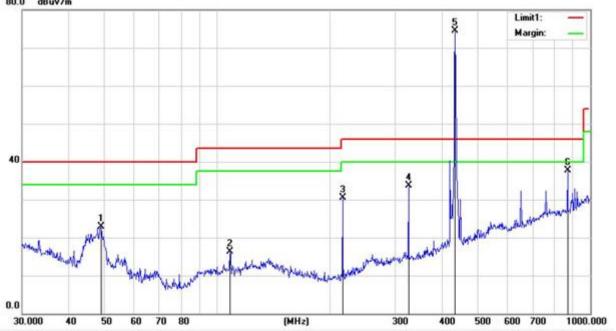
| I | 40.0430 | 43.65 | -20.69 | 22.90 | 40.00 | -17.04 | QF |
|---|----------|-------|--------|-------|--------|--------|----|
| 2 | 108.2667 | 34.77 | -18.49 | 16.28 | 43.50 | -27.22 | QP |
| 3 | 216.7828 | 49.79 | -19.32 | 30.47 | 46.00 | -15.53 | QP |
| 4 | 325.5958 | 47.90 | -14.12 | 33.78 | 46.00 | -12.22 | QP |
| 5 | 433.9200 | 85.35 | -10.9 | 74.45 | 100.83 | -26.38 | PK |

Δ\/

| AV | | | | | | | |
|-----|--------------------|--------------------|---------------------------|---------------------|-------------------|----------------|----------|
| No. | Frequency (MHz) | PK level (dBuV) | Duty cycle Factor(dBm) | Results (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 7 | 433.9200 | 74.45 | -6.96 | 67.49 | 80.83 | -13.34 | AV |

Remark:

- All readings are Quasi-Peak and Average values.
 Margin = Result (Result =Reading + Factor)–Limit 80.0 dBuW/m



Page 20 of 30

Report No.: STS1612211F01



| Temperature: | 26 ℃ | Relative Humidity: | 54% |
|--------------|-------------|--------------------|----------|
| Pressure: | 1010hPa | Phase: | Vertical |
| Test Mode: | Mode 1 | | |

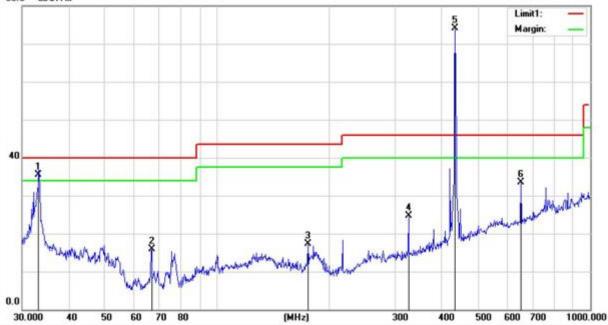
| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Results (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|--------------------|-------------------|-------------|---------------------|-------------------|----------------|----------|
| 1 | 33.2112 | 48.30 | -12.84 | 35.46 | 40.00 | -4.54 | QP |
| 2 | 66.7325 | 39.99 | -24.18 | 15.81 | 40.00 | -24.19 | QP |
| 3 | 175.0368 | 36.74 | -19.38 | 17.36 | 43.50 | -26.14 | QP |
| 4 | 325.5958 | 38.91 | -14.12 | 24.79 | 46.00 | -21.21 | QP |
| 5 | 433.9200 | 85.09 | -10.90 | 74.19 | 100.83 | -26.64 | PK |
| 6 | 651.9417 | 39.87 | -6.29 | 33.58 | 46.00 | -12.42 | QP |

AV

| No | Frequency (MHz) | PK level (dBuV) | Duty cycle Factor(dBm) | Results (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|----|--------------------|--------------------|---------------------------|---------------------|-------------------|----------------|----------|
| 7 | 433.9200 | 74.19 | -6.96 | 67.23 | 80.83 | -13.60 | AV |

Remark:

2. Margin = Result (Result = Reading + Factor)-Limit 80.0 dBuV/m



^{1.} All readings are Quasi-Peak and Average values.

Page 21 of 30



PEAK Radiated Emission:

| Frequency | Meter Reading | Detector | Amplifier | Loss | Antenna Factor | Orrected Factor | PK LEVEL Result | FCC F 15.231/15. Limit | | RX Antenna Polar |
|-----------|------------------|------------|---------------|---------------|-------------------|--------------------|-----------------------|------------------------------|--------|------------------------|
| (MHz) | (dBµV/m) | (PK/QP/AV) | (dB) | (dB) | (dB/m) | (dB) | (dBµV/m) | (dBµV/m) | (dB) | (H/V) |
| 867.84 | 35.01 | PK | | 3.3 | 23 | 26.30 | 61.31 | 80.83 | -19.52 | Н |
| 867.84 | 35.42 | PK | | 3.3 | 23 | 26.30 | 61.72 | 80.83 | -19.11 | V |
| 1301.76 | 64.23 | PK | 45.1 | 4.0 | 25.1 | -16.00 | 48.23 | 74 | -25.77 | Н |
| 1301.76 | 64.52 | PK | 45.1 | 4.0 | 25.1 | -16.00 | 48.52 | 74 | -25.48 | V |
| 1735.68 | 62.11 | PK | 44.1 | 5.3 | 25 | -13.80 | 48.31 | 74 | -25.69 | Н |
| 1735.68 | 62.67 | PK | 44.1 | 5.3 | 25 | -13.80 | 48.87 | 74 | -25.13 | V |
| 2169.6 | 60.12 | PK | 43.8 | 5.4 | 25.9 | -12.47 | 47.65 | 74 | -26.35 | н |
| 2169.6 | 60.39 | PK | 43.8 | 5.4 | 25.9 | -12.47 | 47.92 | 74 | -26.08 | V |
| 2603.3 | 56.17 | PK | 44.4 | 6.0 | 27.6 | -10.77 | 45.40 | 74 | -28.60 | Н |
| 2603.3 | 56.24 | PK | 44.4 | 6.0 | 27.6 | -10.77 | 45.47 | 74 | -28.53 | V |

Note: Above 2.6 GHz The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Result = Reading +Orrected factor; Orrected factor=Ant factor +loss-Amp factor

AV Radiated Emission:

AV = Peak +20Log10(duty cycle) =PK+(-6.96) [refer to section 5 for more detail]

| Frequency | PK Reading | Duty cycle Factor | Corrected | | 31/15.209/205 | RX Antenna |
|-----------|------------|-------------------|-----------|----------|---------------|------------|
| | | | Amplitude | | Margin | Polar |
| (MHz) | (dBµV/m) | (dB) | (dBµV/m) | (dBµV/m) | (dB) | (H/V) |
| 867.84 | 61.31 | -6.96 | 54.35 | 60.83 | -6.48 | Н |
| 867.84 | 61.72 | -6.96 | 54.76 | 60.83 | -6.07 | V |
| 1301.76 | 48.23 | -6.96 | 41.27 | 54 | -12.73 | Н |
| 1301.76 | 48.52 | -6.96 | 41.56 | 54 | -12.44 | V |
| 1735.68 | 48.31 | -6.96 | 41.35 | 54 | -12.65 | Н |
| 1735.68 | 48.87 | -6.96 | 41.91 | 54 | -12.09 | V |
| 2169.6 | 47.65 | -6.96 | 40.69 | 54 | -13.31 | Н |
| 2169.6 | 47.92 | -6.96 | 40.96 | 54 | -13.04 | V |
| 2603.3 | 45.4 | -6.96 | 38.44 | 54 | -15.56 | Н |
| 2603.3 | 45.47 | -6.96 | 38.51 | 54 | -15.49 | V |



5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

| | FCC Part 15.231,Subpart C | | | | | | | |
|-----------|---------------------------|---|--------------------------|--------|--|--|--|--|
| Section | Test Item | Limit | Frequency Range (MHz) | Result | | | | |
| 15.231(C) | 20 Bandwidth | The 20dB bandwidth of the emissions shall not exceed 0.25% of the center frequency | 433.92 | PASS | | | | |

| Spectrum Parameter | Setting | | | |
|--------------------|-------------------------|--|--|--|
| Attenuation | Auto | | | |
| Span Frequency | > Measurement Bandwidth | | | |
| RB | 10 kHz (20dB Bandwidth) | | | |
| VB | 30 kHz (20dB Bandwidth) | | | |
| Detector | Peak | | | |
| Trace | Max Hold | | | |
| Sweep Time | Auto | | | |

5.2 TEST REQUIREMENTS

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.3 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= 10KHz, VBW=30KHz, Sweep time = Auto.

5.4 TEST SETUP

| EUT | SPECTRUM |
|-----|----------|
| | ANALYZER |

5.5 EUT OPERATION CONDITIONS

TX mode.



5.6 TEST RESULTS

| Centre | | Measurement | | | | | |
|------------|-------------------------|-------------|-----------------------|--|--|--|--|
| Frequency | 20dB Bandwidth (KHz) | Limit(kHz) | Frequency Range (MHz) | | | | |
| 433.92 MHz | 50.5 | 1084.8 | PASS | | | | |

CH00 -1Mbps

| RF 50 Ω AC | | SENSE:INT | ALI | GNAUTO | | 07:45:4 | 10 PM Dec 28, 21 |
|---------------------------------|--|--|----------|--|-----|---|---|
| ker 1 Δ 50.500000 kHz | er 1 ∆ 50.500000 kHz PNO: Wide ♀ Trig: Free Ru IFGain:Low Atten: 20 dB | | Run B | Avg Type: Log-Pwr Avg Hold:>100/100 | | TRACE 1 2 3 4 5 TYPE MWWWWW DET P N N N N | |
| B/div Ref 10.00 dBm | | | | | | | 50.5 kl -0.009 d |
| | | | | | | | |
| | | | \wedge | | | | |
| | | | | | | | |
| | | ×2 | | 2 | | | -25.41 |
| | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | - Contraction of the second se | <u>\</u> | m | ~ | | |
| www.www.wv | har and | | | | m | home | $\sim \sim $ |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| ter 433.9200 MHz s BW 10 kHz | #V | /BW 30 kHz | | | Swe | Spaı ep 4.80 m | n 500.0 k s (1001 p |
| | | | | STATUS | | | |

Shenzhen STS Test Services Co., Ltd.

Page 24 of 30



6. DUTY CYCLE

6.1 TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

The Duty Cycle Was Determined By The Following Equation: To Calculate The Actual Field Intensity, The Duty Cycle Correction Factor In Decibel Is Needed For Later Use And Can Be Obtained From Following Conversion

Duty Cycle(%)=Total On Interval In A Complete Pulse Train/ Length Of A Complete Pulse Train * %

Duty Cycle Correction Factor(Db)=20 * Log10(Duty Cycle(%)

6.2 TEST SETUP



6.3 EUT OPERATION CONDITIONS

TX mode.



Shenzhen STS Test Services Co., Ltd.

Page 25 of 30

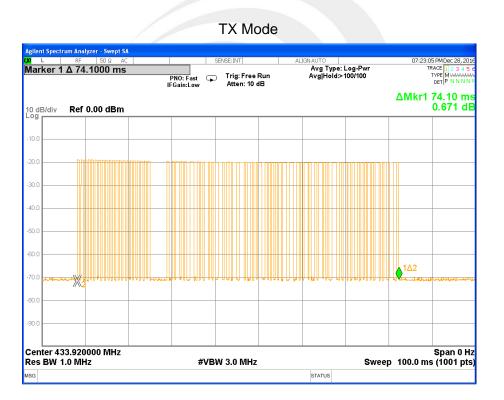


6.4 TEST RESULTS

| FCC Part 15.231(a) | | | | | |
|--|-------------------------------------|--|--|--|--|
| Total On interval in a complete pulse train(ms) | (0.55*21)+(0.56*21)+(0.98*22)=44.87 | | | | |
| Length of a complete pulse train(ms) | 100 | | | | |
| Duty Cycle(%) | 44.87% | | | | |
| Duty Cycle Correction Factor(dB): 20Log10(duty cycle) | -6.96 | | | | |

Refer to the duty cycle plot (as below), This device meets the FCC requirement. Length of a complete pulse train

Remark:FCC part15.35(c) required that a complete pulse train is more than 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.



Page 26 of 30



TX Mode







7. AUTOMATICALLY DEACTIVATE

7.1 STANDARD REQUIREMENT

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

7.2 TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

Spectrum Setting : RBW= 1MHz, VBW=3MHz, Sweep time = 10s

7.3 TEST SETUP

| EUT | SPECTRUM |
|-----|----------|
| | ANALYZER |

7.4 TEST RESULTS

| Activation time | Limit(Sec) | Result |
|-----------------|------------|--------|
| 0.04 s | 5 s | Pass |

Shenzhen STS Test Services Co., Ltd.



Page 28 of 30

Report No.: STS1612211F01

| | nalyzer - Swept SA | | | | | | | | |
|--|-----------------------|------------------------------|-----------------------|---|--------------------|--|----------------------|---------------------------------|---|
| arker 3 1.7 | RF 50.Ω AC 71000 s | | PNO: Fast Gain:Low | ENSE:INT Trig: Free Ru Atten: 10 dE | ın | IGN AUTO Avg Type: | Log-Pwr | TF | 4 PM Dec 28, RACE 1 2 3 4 TYPE WWWWW DET P NNN |
| | ef 0.00 dBm | | | | | | | Mkr -72 | 3 1.710 2.32 dE |
| 9 0.0 | | | | | | | | | |
| 0.0 | | | | | | | | | |
| 0.0 | | | | | | | | | |
| 0.0 | | | | | | | | | |
| 0.0 | | | | | | | | | |
| 0.0 | /13 | | | | | | | | |
|).0 | materim deter America | and a start of the start and | negasturrangereranger | มาโปร้างสุดุการปลางการสับส | nvaryty-Lay, Anfri | and the second | Milliongrycondoption | ale the properties and a second | have the stands |
| 0.0 | | | | | | | | | |
| 0.0 | | | | | | | | | |
| enter 433.9: es BW 1.0 N | 20000 MHz | | #\/B) | N 3.0 MHz | | 1 | Swa | ep 10.00 s | Span 0 |
| R NODE TRO SO | | | #VD1 | FUNCTI | ON FUNCT | ION WIDTH | | | . (1001) |
| IN 1 t 2 N 1 t | | 1.620 s 1.670 s | (Δ) -72.13 -16.52 | | | | | | |
| | | | | | | | | | |
| 3 N 1 t | (Δ) | 1.710 s | (Δ) -72.32 (| авти | | | | | |
| 3 N 1 t 4 5 | (Δ) | 1.710 \$ | (Δ) -72.32 | abiii | | | | | |
| B N 1 t 4 5 | (Δ) | 1.710 \$ | (Δ) -72.32 (| | | | | | |
| 8 N 1 t 4 5 7 8 | (Δ) | 1.710 \$ | (Δ) - <i>12.32</i> (| in a | | | | | |
| 3 N 1 t 4 5 7 8 9 9 | | 1.710 \$ | (Δ) -12.32 | | | | | | |
| 8 N 1 t 4 5 7 8 9 | | 1.710 s | (Δ) -12.32 (| | | | | | |

Activation time= Mark 3- Mark 2=1.710-1.620=0.09 s

Shenzhen STS Test Services Co., Ltd.



8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

According to the FCC Part 15 Paragraph 15.203, 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.

8.2 EUT ANTENNA

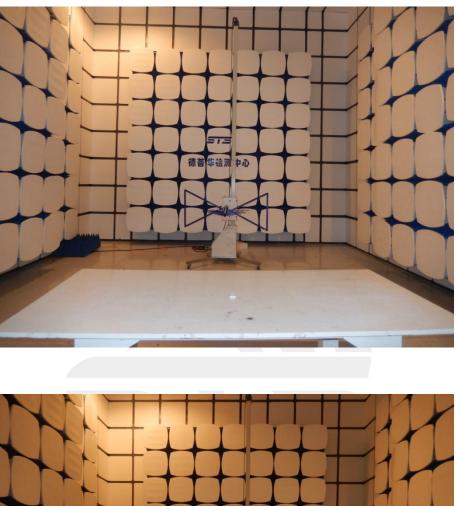
The EUT antenna is Internal PCB Antenna. It conforms to the standard requirements.



Shenzhen STS Test Services Co., Ltd.



APPENDIX 1- PHOTOS OF TEST SETUP



Radiated Measurement Photos



Shenzhen STS Test Services Co., Ltd.