

# Shenzhen Chuangwei-RGB Electronics Co., Ltd.

## TEST REPORT

**SCOPE OF WORK**

FCC TESTING – NTUD-U23

**REPORT NUMBER**

210618043SZN-002

**ISSUE DATE**

10 August 2021

**[REVISED DATE]**

[-----]

**PAGES**

33

**DOCUMENT CONTROL NUMBER**

FCC ID 247\_b

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**Shenzhen Chuangwei-RGB Electronics Co., Ltd.**

Application  
For  
Certification

**FCC ID: 2ANM3NTUDU23****Wireless Module****Model: NTUD-U23****2.4GHz Transceiver**

Report No.: 210618043SZN-002

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-19]

**Prepared and Checked by:****Approved by:****Allen Qin  
Engineer**

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**Peter Kang  
Sr. Technical Supervisor  
Date: 10 August 2021**

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**Intertek Testing Services Shenzhen Ltd. Longhua Branch**

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**MEASUREMENT/TECHNICAL REPORT**

This report concerns (check one)      Original Grant       Class II Change

Equipment Type: DTS - Part 15 Digital Transmission Systems (Wi-Fi transmitter portion)

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Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?      Yes       No

If yes, defer until : \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

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Transition Rules Request per 15.37?      Yes       No

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-19] Edition] provision.

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Report prepared by:

**Allen Qin**  
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## 1.0 Summary of Test results

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Applicant Address: 13F-16F, Unit A, Skyworth Building, Shennan Road, Nanshan District, Shenzhen, Guangdong, China

Manufacturer: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Manufacturer Address: 13F-16F, Unit A, Skyworth Building, Shennan Road, Nanshan District, Shenzhen, Guangdong, China

Model: NTUD-U23

FCC ID: 2ANM3NTUDU23

| TEST ITEM                              | REFERENCE                        | RESULTS             |
|--|----------------------------------|---------------------|
| Max. Output power                      | 15.247(b)(3)                     | Pass                |
| 6 dB Bandwidth                         | 15.247(a)(2)                     | Pass                |
| Max. Power Density                     | 15.247(e)                        | Pass                |
| Out of Band Antenna Conducted Emission | 15.247(d)                        | Pass                |
| Radiated Emission in Restricted Bands  | 15.247(d), 15.209,<br>FCC 15.205 | Pass                |
| AC Conducted Emission                  | 15.207                           | Pass                |
| Antenna Requirement                    | 15.203                           | Pass<br>(See Notes) |

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

## 2.0 General Description

### 2.1 Product Description

The equipment under test (EUT) is a Wireless Module with Bluetooth 5.1 (dual-mode) function operating in 2402-2480MHz, 2.4G WIFI function operating in 2412-2462MHz and 5G WIFI function operating in 5150MHz~5250 MHz, 5250MHz~5350MHz, 5470MHz-5725MHZ, 5725MHz~5850MHz. The EUT is powered by DC 3.3V. For more detail information pls. refer to the user manual.

Type of Modulation: GFSK.

Antenna Type: Integral Antenna

Antenna Gain: 2.0dBi

Bluetooth Version: 5.1

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

### 2.2 Related Submittal(s) Grants

This is an application for certification of a transceiver for the Wireless Module which has BT BLE function.

For the classic Bluetooth function was tested and demonstrated in report 210618043SZN-001.

For the 2.4GHz WIFI function was tested and demonstrated in report 210618043SZN-003.

For the 5GHz WIFI function was tested and demonstrated in report 210618043SZN-004.

### 2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013) and KDB 558074 D01 v05r02. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

### 2.4 Test Facility

The Semi-anechoic chamber and shielded room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

### 3.0 System Test Configuration

#### 3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by DC 3.3V from a laptop during the test.

For maximizing emissions, the EUT was rotated through 360°, the EUT was placed on the styrene turntable with 0.8m up to 1GHz and 1.5 m above 1GHz. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

The rear of unit shall be flushed with the rear of the table.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

#### 3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:

During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Test software: WCN\_Combol\_Tool, Version: W1942

#### 3.3 Special Accessories

N/A.

### 3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

### 3.5 Equipment Modification

Any modifications installed previous to testing by Shenzhen Chuangwei-RGB Electronics Co., Ltd. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

### 3.6 Support Equipment List and Description

| Description                                     | Manufacturer          | Remark           |
|---|-----------------------|------------------|
| Laptop<br>(Provided by Intertek)                | DELL                  | Latitude 3480    |
| ComTool (with cable)<br>(Provided by Applicant) | Provided by Applicant | unshielded, 0.4m |



Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 30 June 2021

Model: NTUD-U23

## 4.0 Measurement Results

### 4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

The antenna power of the EUT was connected to the input of a broadband peak RF power meter. The power meter have a video bandwidth that is greater than DTS bandwidth and utilize a fast-responding diode detector. Power was read directly at the EUT antenna terminals with cable loss added.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

| Frequency (MHz)      | Output in dBm (Peak Reading) | Output in mWatt |
|----------------------|------------------------------|-----------------|
| Low Channel: 2402    | 4.53                         | 2.84            |
| Middle Channel: 2440 | 3.60                         | 2.29            |
| High Channel: 2480   | 3.04                         | 2.01            |

Cable loss: 1.0 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 4.53dBm

EUT max. E.I.R.P = 4.53dBm + 2dBi = 6.53dBm = 4.50mW

For RF Exposure, the information is saved with filename: RF exposure.pdf.

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Date of Test: 30 June 2021

Model: NTUD-U23

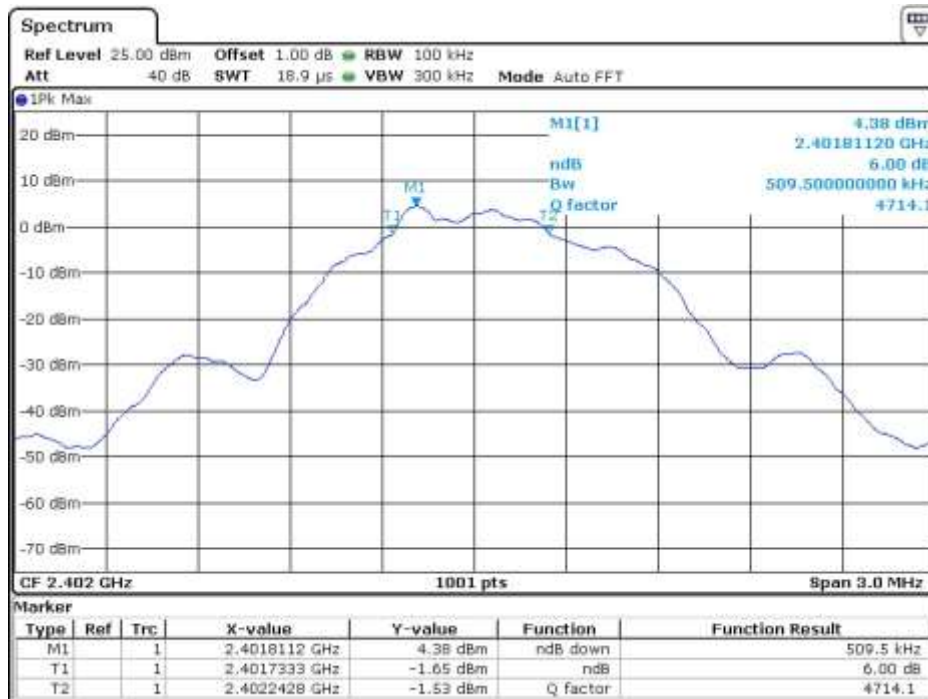
#### 4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):

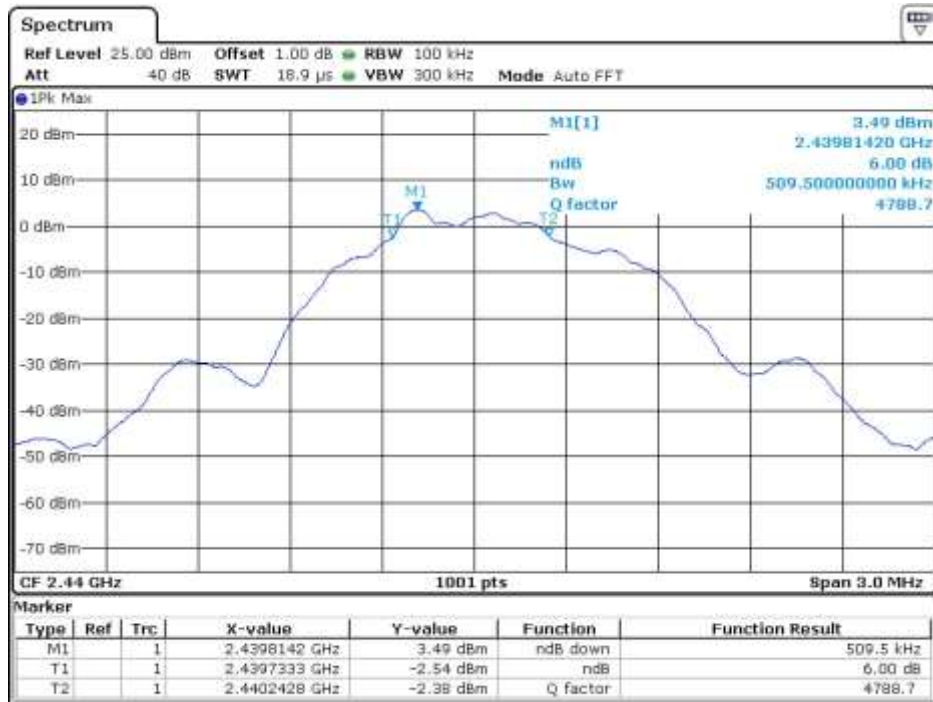
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01 v05r02. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

| Frequency (MHz) | 6 dB Bandwidth (kHz) |
|-----------------|----------------------|
| 2402            | 509.500              |
| 2440            | 509.500              |
| 2480            | 512.500              |

The test plots are attached as below.





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Date of Test: 30 June 2021

Model: NTUD-U23

#### 4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

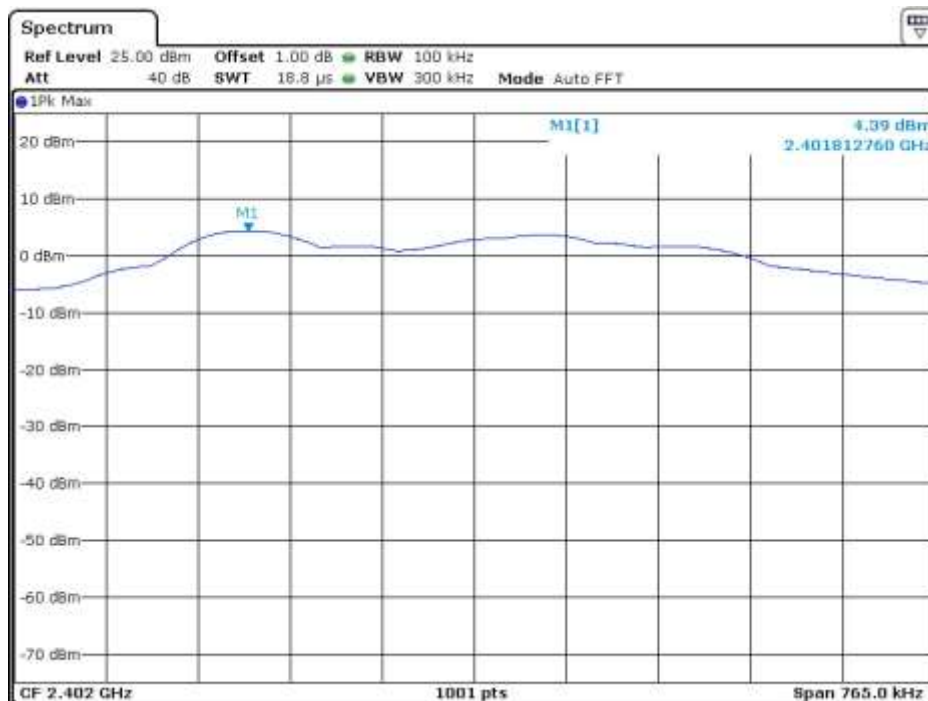
The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05r02.

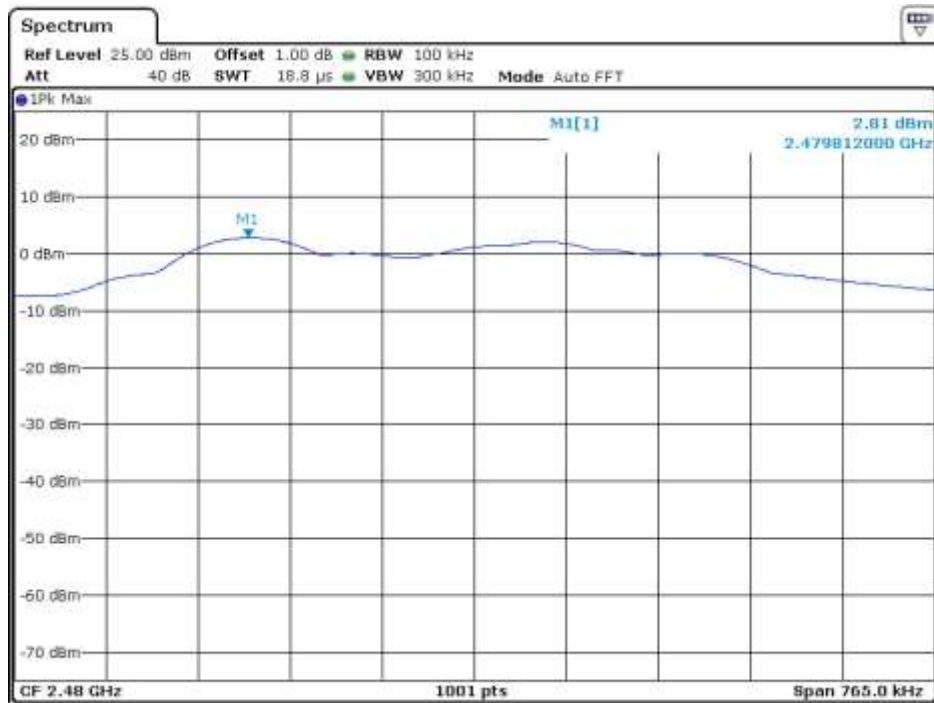
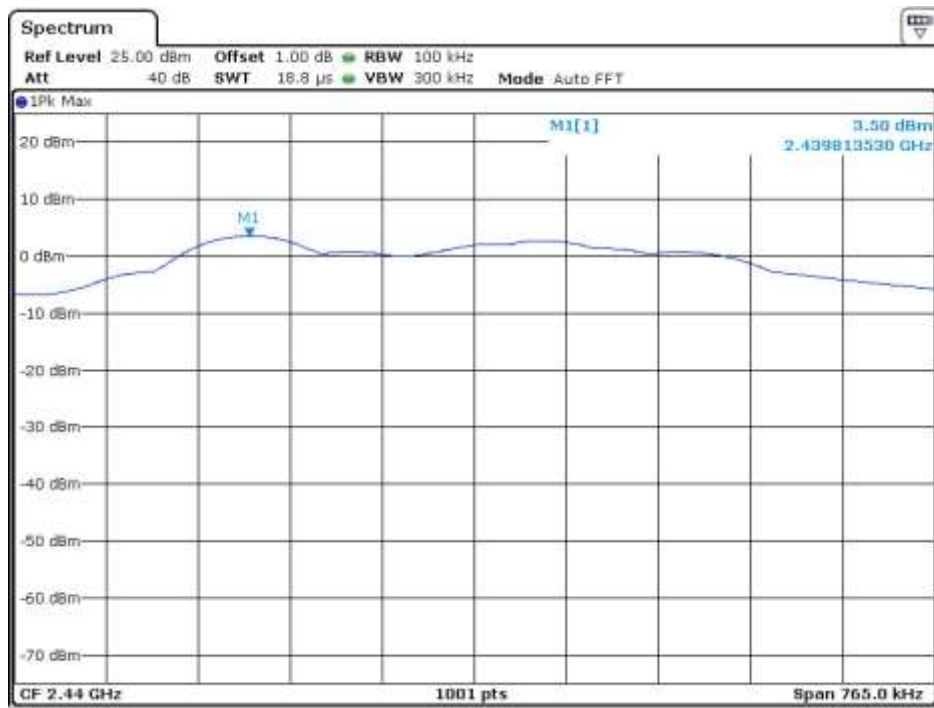
Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/100 kHz.

| Frequency (MHz) | Power Density with RBW 100KHz |
|-----------------|-------------------------------|
| 2402            | 4.39                          |
| 2440            | 3.50                          |
| 2480            | 2.81                          |

The test plots are attached as below.





Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 30 June 2021

Model: NTUD-U23

#### 4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. The Measurement Procedure was set according to the FCC KDB 558074 D01 v05r02.

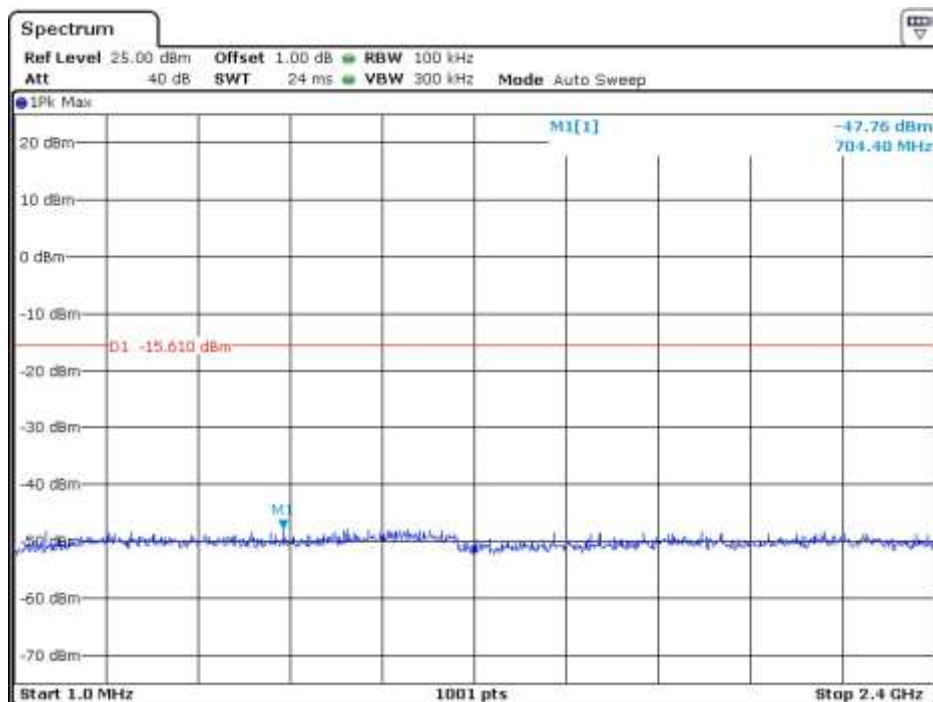
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

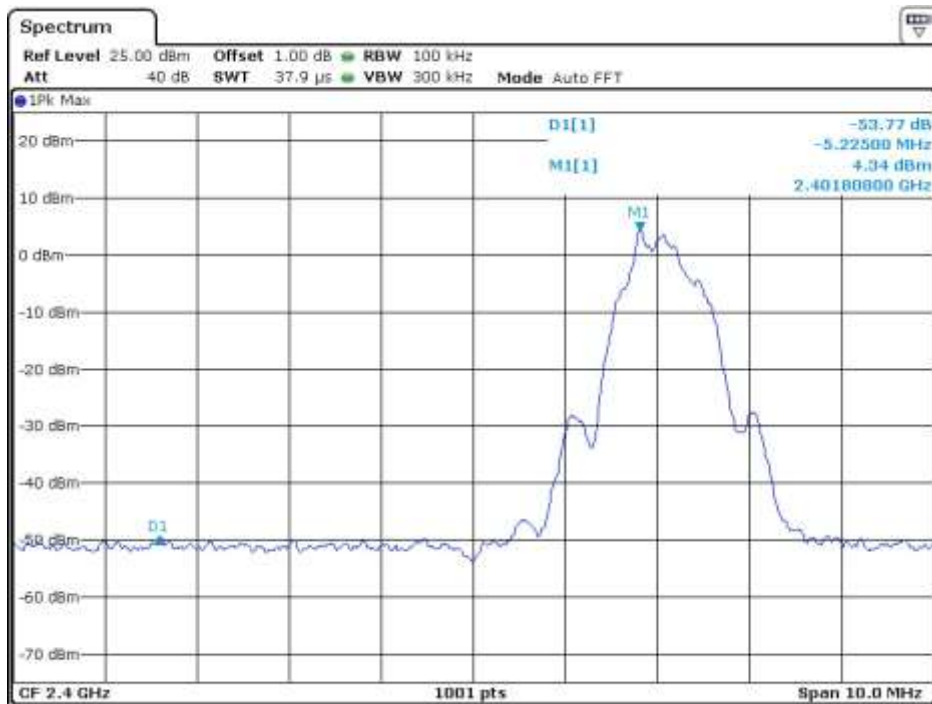
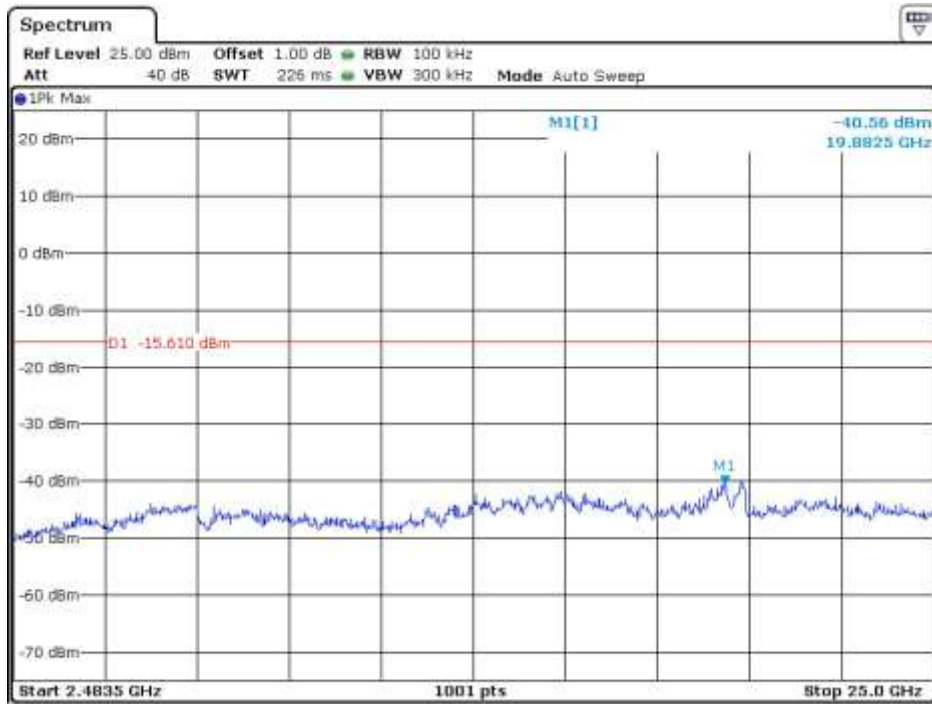
Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for BLE.

The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

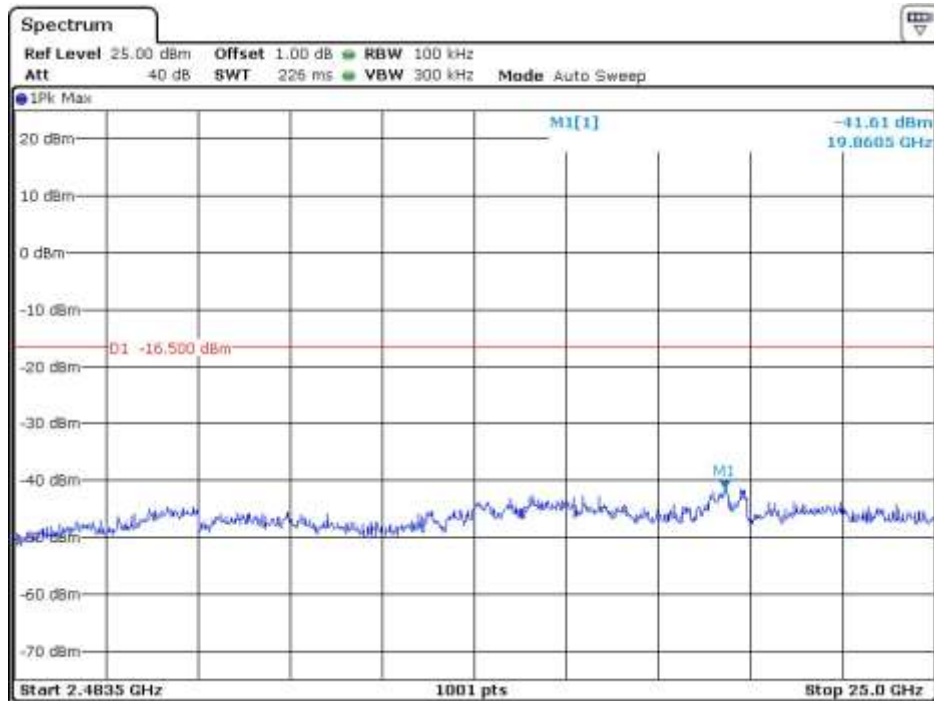
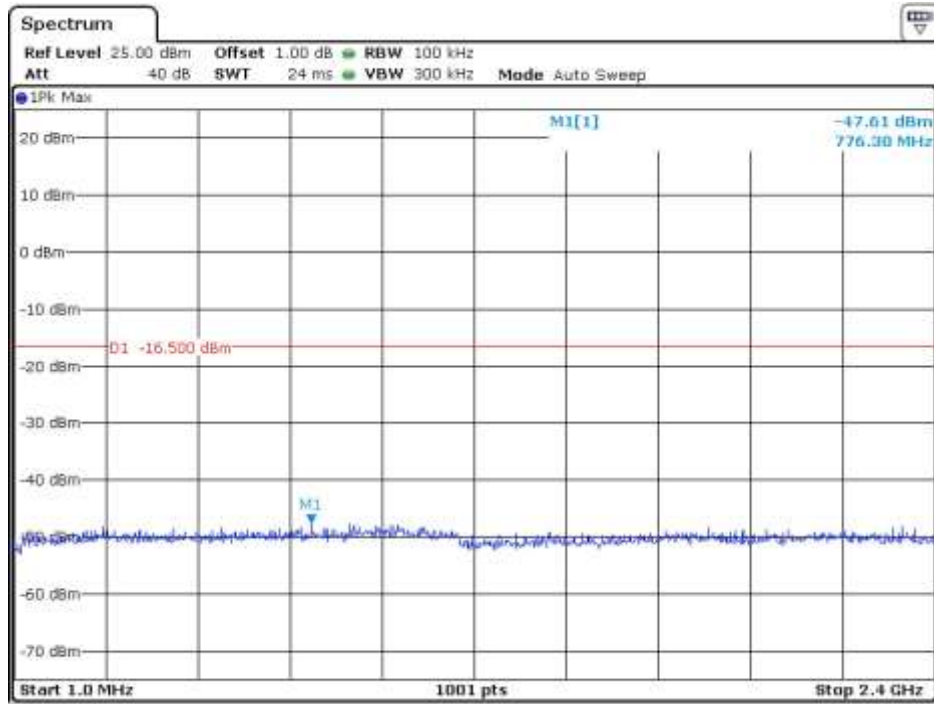
The test plots are attached as below.

Channel 00 (2402MHz) Reference Level: 4.39dBm



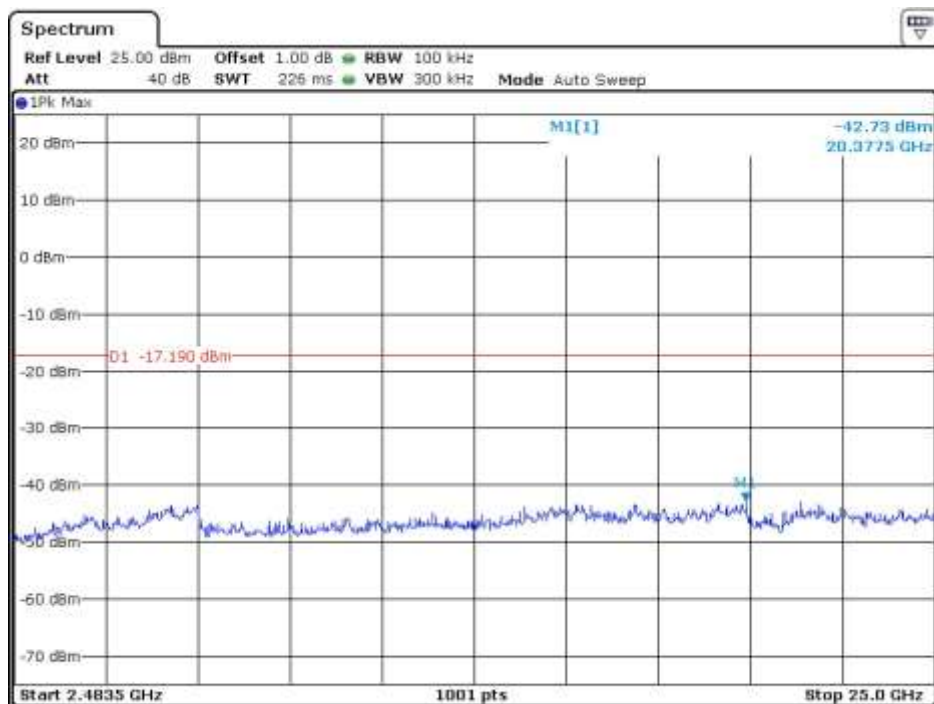
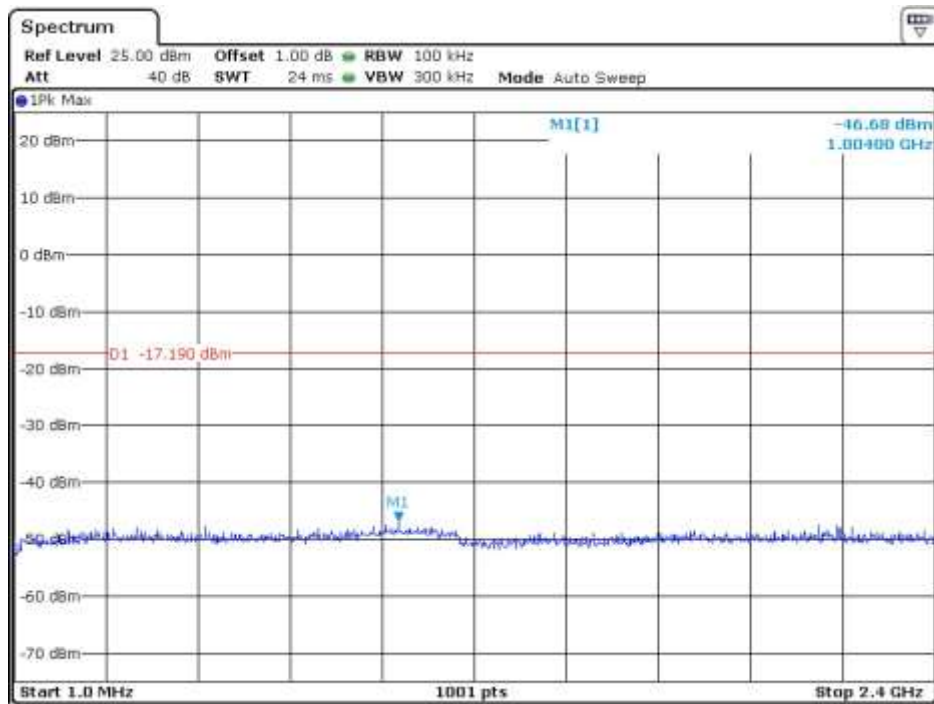


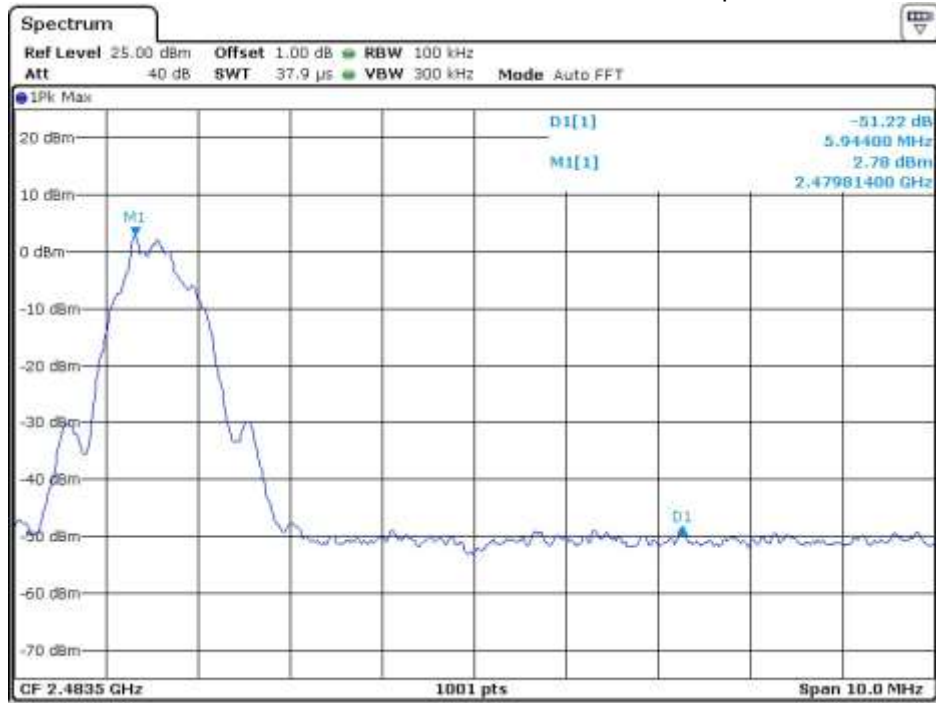
Channel 19 (2440MHz) Reference Level: 3.50dBm





Channel 39 (2480MHz) Reference Level: 2.81dBm





Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

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4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

Not required, since all emissions are more than 20dB below fundamental

See attached data sheet

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

Model: NTUD-U23

#### 4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b) (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

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#### 4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD$$

Where

- FS = Field Strength in dB $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD$$

##### Example

Assume a receiver reading of 62.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 42 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V/m}$$

$$\text{Level in mV/m} = \text{Common Antilogarithm} [(42 \text{ dB}\mu\text{V/m})/20] = 125.9 \mu\text{V/m}$$

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

Model: NTUD-U23

#### 4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission  
at 2390.000MHz  
is passed by 5.8dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf. Simultaneous transmission was considered during the test, only the worst case data is recorded in this report.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

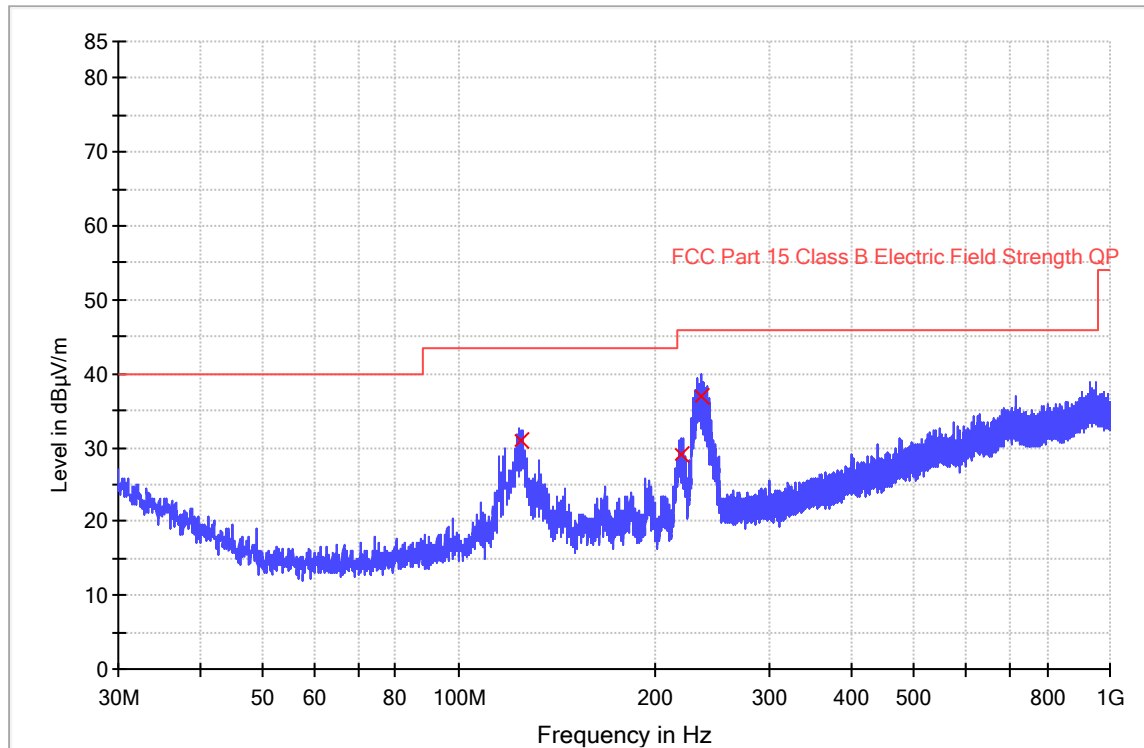
Model: NTUD-U23

Worst Case Operating Mode:

Simultaneous transmission

ANT Polarity: Horizontal

FCC Part 15



| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Polarization | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV/m) |
|-----------------|--------------------|-----------------|-----------------|--------------|------------|-------------------|----------------------|
| 124.963000      | 30.9               | 1000.0          | 120.000         | H            | 9.5        | 12.6              | 43.5                 |
| 220.023000      | 29.0               | 1000.0          | 120.000         | H            | 12.5       | 17.0              | 46.0                 |
| 235.381333      | 36.9               | 1000.0          | 120.000         | H            | 13.3       | 9.1               | 46.0                 |

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m) = Corr. (dB/m) + Read Level (dBµV)
3. Margin (dB) = Limit Line (dBµV/m) – Level (dBµV/m)

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

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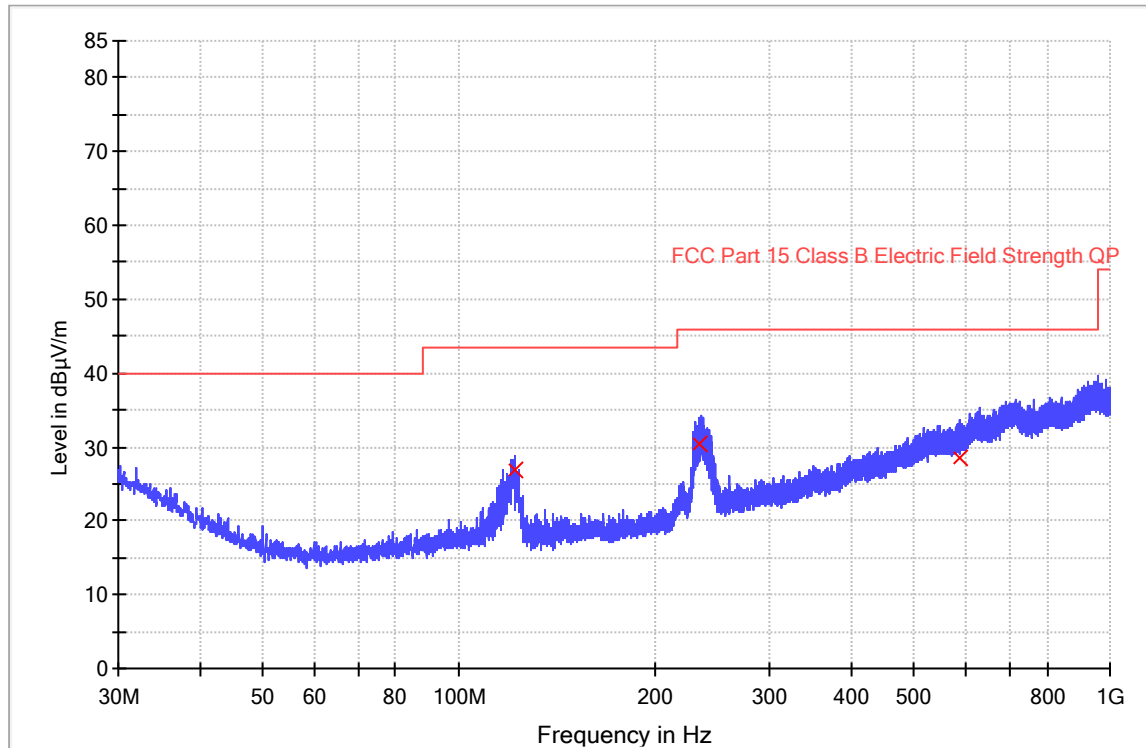
Model: NTUD-U23

Worst Case Operating Mode:

Simultaneous transmission

ANT Polarity: Vertical

FCC Part 15



| Frequency (MHz) | QuasiPeak (dBuV/m) | Meas. Time (ms) | Bandwidth (kHz) | Polarization | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV/m) |
|-----------------|--------------------|-----------------|-----------------|--------------|------------|-------------------|----------------------|
| 121.794333      | 26.8               | 1000.0          | 120.000         | V            | 9.5        | 16.7              | 43.5                 |
| 233.958667      | 30.5               | 1000.0          | 120.000         | V            | 13.2       | 15.5              | 46.0                 |
| 589.884000      | 28.6               | 1000.0          | 120.000         | V            | 22.2       | 17.4              | 46.0                 |

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m) = Corr. (dB/m) + Read Level (dBµV)
3. Margin (dB) = Limit Line (dBµV/m) – Level (dBµV/m)



Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

Model: NTUD-U23

Worst Case Operating Mode:

Transmitting (Channel 0)

### Radiated Emissions (above 1GHz)

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dB $\mu$ V/m) | Peak Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|-------------------|---------------------|--------------------------|---------------------------------|-------------|
| Horizontal   | *4804.000       | 42.9                 | 36.8              | 33.5                | 39.6                     | 74.0                            | -34.4       |
| Horizontal   | *2390.000       | 66.7                 | 36.4              | 29.1                | 59.4                     | 74.0                            | -14.6       |

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dB $\mu$ V/m) | Average Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|-------------------|---------------------|--------------------------|------------------------------------|-------------|
| Horizontal   | *4804.000       | 33.9                 | 36.8              | 33.5                | 30.6                     | 54.0                               | -23.4       |
| Horizontal   | *2390.000       | 55.5                 | 36.4              | 29.1                | 48.2                     | 54.0                               | -5.8        |

- NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.
  2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
  3. Negative value in the margin column shows emission below limit.
  4. Horn antenna used for the emission over 1000MHz.
- \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

Model: NTUD-U23

Worst Case Operating Mode:

Transmitting (Channel 19)

### Radiated Emissions (above 1GHz)

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dB $\mu$ V/m) | Peak Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|-------------------|---------------------|--------------------------|---------------------------------|-------------|
| Horizontal   | *4880.000       | 40.7                 | 36.7              | 33.4                | 37.4                     | 74.0                            | -36.6       |
| Horizontal   | *7320.000       | 42.7                 | 36.6              | 35.8                | 41.9                     | 74.0                            | -32.1       |

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dB $\mu$ V/m) | Average Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|-------------------|---------------------|--------------------------|------------------------------------|-------------|
| Horizontal   | *4880.000       | 34.9                 | 36.7              | 33.4                | 31.6                     | 54.0                               | -22.4       |
| Horizontal   | *7320.000       | 37.6                 | 36.6              | 35.8                | 36.8                     | 54.0                               | -17.2       |

- NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
  2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
  3. Negative value in the margin column shows emission below limit.
  4. Horn antenna used for the emission over 1000MHz.
- \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

Model: NTUD-U23

Worst Case Operating Mode:

Transmitting (Channel 39)

### Radiated Emissions (above 1GHz)

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dB $\mu$ V/m) | Peak Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|-------------------|---------------------|--------------------------|---------------------------------|-------------|
| Horizontal   | *4960.000       | 41.2                 | 36.8              | 33.3                | 37.7                     | 74.0                            | -36.3       |
| Horizontal   | *7440.000       | 50.4                 | 36.5              | 29.3                | 43.2                     | 74.0                            | -30.8       |

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dB $\mu$ V/m) | Average Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|-------------------|---------------------|--------------------------|------------------------------------|-------------|
| Horizontal   | *4960.000       | 35.4                 | 36.8              | 33.3                | 31.9                     | 54.0                               | -22.1       |
| Horizontal   | *7440.000       | 44.3                 | 36.5              | 29.3                | 37.1                     | 54.0                               | -16.9       |

- NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
  2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
  3. Negative value in the margin column shows emission below limit.
  4. Horn antenna used for the emission over 1000MHz.
- \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.  
Date of Test: 12 July 2021  
Model: NTUD-U23

#### 4.9 Conducted Emission

Simultaneous transmission was considered during the test, only the worst case data is recorded in this report.

Worst Case Conducted Emission  
at 0.169080MHz  
is passed by 16.5dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: conducted photos.pdf.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 12 July 2021

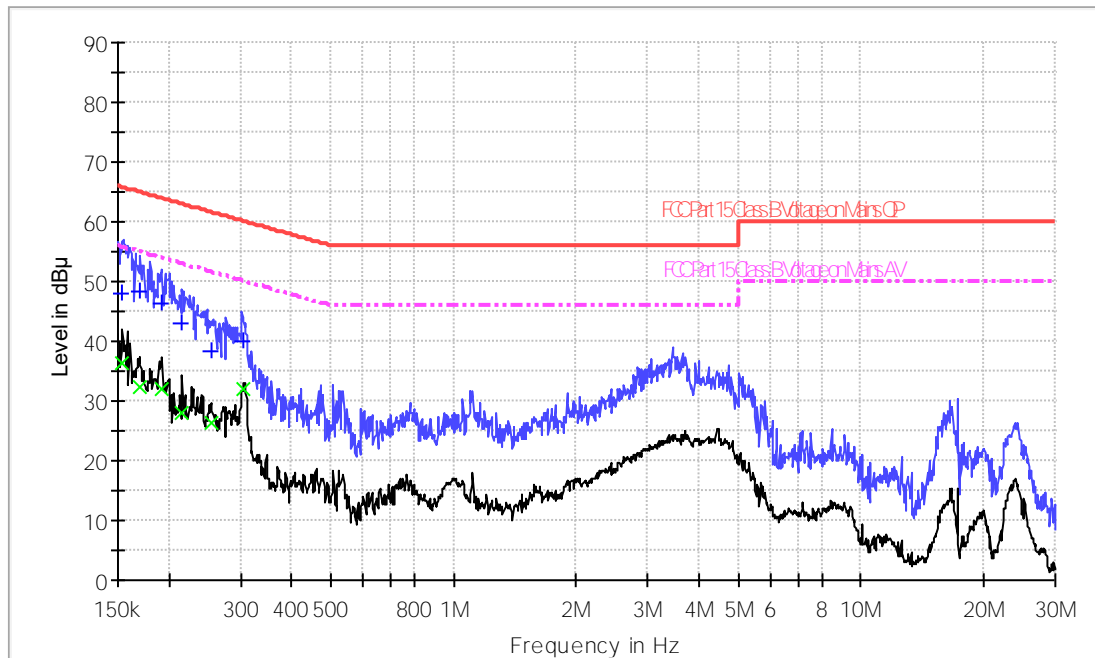
Model: NTUD-U23

Worst Case Operating Mode: Simultaneous transmission

Phase: Live

## Graphic / Data Table

### Conducted Emissions Pursuant to FCC 15.207: Emissions Requirement



#### Limit and Margin QP

| Frequency (MHz) | QuasiPeak (dBuV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBuV) |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|
| 0.154250        | 47.9             | 9.000           | L1   | 9.6        | 17.9        | 65.8         |
| 0.169080        | 48.5             | 9.000           | L1   | 9.6        | 16.5        | 65.0         |
| 0.191360        | 46.3             | 9.000           | L1   | 9.6        | 17.7        | 64.0         |
| 0.214850        | 43.1             | 9.000           | L1   | 9.6        | 19.9        | 63.0         |
| 0.255080        | 38.2             | 9.000           | L1   | 9.6        | 23.4        | 61.6         |
| 0.304060        | 40.1             | 9.000           | L1   | 9.6        | 20.0        | 60.1         |

#### Limit and Margin AV

| Frequency (MHz) | Average (dBuV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBuV) |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|
| 0.154250        | 36.3           | 9.000           | L1   | 9.6        | 19.5        | 55.8         |
| 0.169080        | 32.4           | 9.000           | L1   | 9.6        | 22.6        | 55.0         |
| 0.191360        | 31.9           | 9.000           | L1   | 9.6        | 22.1        | 54.0         |
| 0.214850        | 27.9           | 9.000           | L1   | 9.6        | 25.1        | 53.0         |
| 0.255080        | 26.3           | 9.000           | L1   | 9.6        | 25.3        | 51.6         |
| 0.304060        | 32.1           | 9.000           | L1   | 9.6        | 18.0        | 50.1         |

Remark:

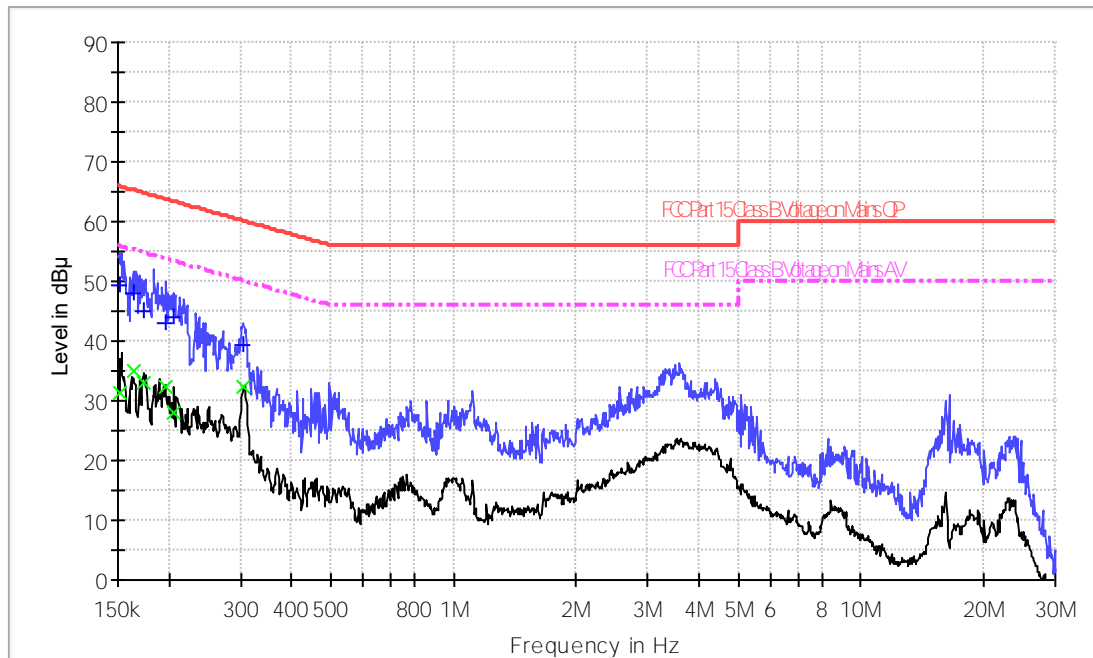
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) = Limit (dBuV) – Level (dBuV)

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.  
Date of Test: 12 July 2021  
Model: NTUD-U23  
Worst Case Operating Mode: Simultaneous transmission  
Phase: Neutral

## Graphic / Data Table

### Conducted Emissions Pursuant to FCC 15.207: Emissions Requirement



#### Limit and Margin QP

| Frequency (MHz) | QuasiPeak (dBuV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBuV) |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|
| 0.151810        | 49.4             | 9.000           | N    | 9.5        | 16.5        | 65.9         |
| 0.163770        | 48.0             | 9.000           | N    | 9.5        | 17.3        | 65.3         |
| 0.173880        | 45.0             | 9.000           | N    | 9.5        | 19.8        | 64.8         |
| 0.196000        | 43.1             | 9.000           | N    | 9.5        | 20.7        | 63.8         |
| 0.206440        | 44.2             | 9.000           | N    | 9.5        | 19.1        | 63.3         |
| 0.305280        | 39.5             | 9.000           | N    | 9.5        | 20.6        | 60.1         |

#### Limit and Margin AV

| Frequency (MHz) | Average (dBuV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBuV) |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|
| 0.151810        | 31.3           | 9.000           | N    | 9.5        | 24.6        | 55.9         |
| 0.163770        | 35.0           | 9.000           | N    | 9.5        | 20.3        | 55.3         |
| 0.173880        | 32.9           | 9.000           | N    | 9.5        | 21.9        | 54.8         |
| 0.196000        | 32.2           | 9.000           | N    | 9.5        | 21.6        | 53.8         |
| 0.206440        | 28.1           | 9.000           | N    | 9.5        | 25.2        | 53.3         |
| 0.305280        | 32.2           | 9.000           | N    | 9.5        | 17.9        | 50.1         |

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Limit (dBuV) – Level (dBuV)

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 30 June 2021

Model: NTUD-U23

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

- Not required - No digital part
- Test results are attached
- Included in the separated report.

Applicant: Shenzhen Chuangwei-RGB Electronics Co., Ltd.

Date of Test: 30 June 2021

Model: NTUD-U23

#### 4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

|   |   |
|---|---|
|   | See attached spectrum analyzer chart (s) for Transmitter timing |
|   | See Transmitter timing diagram provided by manufacturer         |
| x | Not applicable, duty cycle was not used.                        |



## 5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf & internal photos.pdf.

## 6.0 Product Labeling

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

## 7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

## 8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

## 9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.

## 10.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

**11.0 Test Equipment List**

| Equipment No. | Equipment           | Manufacturer    | Model No.    | Serial No. | Cal. Date  | Due Date   |
|---------------|---------------------|-----------------|--------------|------------|------------|------------|
| SZ182-02      | RF Power Meter      | Anritsu         | ML2496A      | 1302005    | 2021-05-10 | 2022-05-10 |
| SZ182-02-01   | Power Sensor        | Anritsu         | MA2411B      | 1207429    | 2021-05-10 | 2022-05-10 |
| SZ061-13      | BiConiLog Antenna   | ETS             | 3142E        | 00217919   | 2019-06-10 | 2022-06-10 |
| SZ185-02      | EMI Receiver        | R&S             | ESCI         | 100547     | 2020-10-27 | 2021-10-27 |
| SZ061-08      | Horn Antenna        | ETS             | 3115         | 00092346   | 2019-09-07 | 2021-09-07 |
| SZ061-06      | Active Loop Antenna | Electro-Metrics | EM-6876      | 217        | 2021-05-18 | 2023-05-18 |
| SZ056-03      | Spectrum Analyzer   | R&S             | FSP 30       | 101148     | 2021-05-10 | 2022-05-10 |
| SZ056-08      | Signal Analyzer     | R&S             | FSV 40       | 101430     | 2020-12-22 | 2021-12-22 |
| SZ181-04      | Preamplifier        | Agilent         | 8449B        | 3008A02474 | 2021-05-10 | 2022-05-10 |
| SZ188-01      | Anechoic Chamber    | ETS             | RFD-F/A-100  | 4102       | 2018-12-15 | 2021-12-15 |
| SZ062-02      | RF Cable            | RADIAL          | RG 213U      | --         | 2021-06-12 | 2021-12-12 |
| SZ062-05      | RF Cable            | RADIAL          | 0.04-26.5GHz | --         | 2021-02-24 | 2021-08-24 |
| SZ062-12      | RF Cable            | RADIAL          | 0.04-26.5GHz | --         | 2021-02-24 | 2021-08-24 |
| SZ067-04      | Notch Filter        | Micro-Tronics   | BRM50702-02  | --         | 2021-05-11 | 2022-05-11 |
| SZ187-02      | Two-Line V-Network  | R&S             | ENV216       | 100073     | 2021-05-12 | 2022-05-12 |
| SZ188-03      | Shielding Room      | ETS             | RFD-100      | 4100       | 2018-12-15 | 2021-12-15 |

\*\*\*\*\* End of Report\*\*\*\*\*