

TCL entertainment solutions limited

# TEST REPORT

**SCOPE OF WORK**

FCC TESTING–TS5000, TS5010, FS5000, FS5010

**REPORT NUMBER**

181205003SZN-002

**ISSUE DATE**

December 27, 2018

**[REVISED DATE]**

[-----]

**PAGES**

44

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**TCL entertainment solutions limited**

Application  
For  
Certification

**FCC ID: 2ARUDTS5000****Alto 5 2.0CH Soundbar, Alto 5+2.1CH Soundbar with wireless subwoofer, 2.0CH  
Soundbar, 2.1CH Soundbar with wireless subwoofer****Model: TS5000****Additional Model: TS5010, FS5000, FS5010****Brand Name: TCL**

2.4GHz Transceiver

Report No.: 181205003SZN-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 [10-1-17]

Prepared and Checked by:

Approved by:

*Damon Wang*  
Engineer

---

*Kidd Yang*  
Technical Supervisor  
Date: December 27, 2018

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

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## MEASUREMENT/TECHNICAL REPORT

TCL entertainment solutions limited

Model: TS5000

Additional Model: TS5010, FS5000, FS5010

FCC ID: 2ARUDTS5000

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

Equipment Type: DXX - Part 15 Low Power Communication Device Transmitter

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.

Transition Rules Request per 15.37?                      Yes                       No

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-17 Edition] provision.

Report prepared by:

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## List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
Test Report	Bandedge Plot	bandedge.pdf
Test Report	20dB BW Plot	bw.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

**EXHIBIT 1**

**GENERAL DESCRIPTION**

## 1.0 General Description

### 1.1 Product Description

The equipment under test (EUT) is a soundbar with BT4.2 (Single Mode) and 2.4G transmitter functions operating in 2402-2480MHz. The EUT is powered by 100-240V~50/60Hz. For more detail information pls. refer to the user manual.

Antenna Type: Integral antenna

Antenna Gain: 1 dBi

Modulation Type: GFSK

The Model: TS5010, FS5000, FS5010 are the same as the Model: TS5000 in hardware aspect (circuitry and electrical, mechanical and physical construction). The difference in function and model number serves as packaging and marketing purpose only. Details see below.

Product name	Trade name	Model no.	Description
Alto 5 2.0CH Soundbar	TCL	TS5000	<b>Function:</b> AUX / BT / Optical / USB Playback / LED Indicator
Alto 5+2.1CH Soundbar with wireless subwoofer	TCL	TS5010	<b>Function:</b> AUX / BT / Optical / USB Playback / LED Indicator / Wireless subwoofer
2.0CH Soundbar	TCL	FS5000	Function: AUX / BT / Optical / USB Playback / LED Indicator
2.1CH Soundbar with wireless subwoofer	TCL	FS5010	Function: AUX / BT / Optical / USB Playback / LED Indicator / Wireless subwoofer

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

### 1.2 Related Submittal(s) Grants

This is an application for certification of a transmitter for the soundbar which has 2.4G transmitter function. The Bluetooth function was reported in the test report: 181205003SZN-001 and the other digital functions were reported in the test report: 181205003SZN-003.



### 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shielded 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

### 1.4 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 the FCC (Registration Number: CN1188).

**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

## 2.0 System Test Configuration

### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The EUT was powered by 120V/60Hz during the test, only the worst data was reported in this report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.

The rear of unit was flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

### 2.2 EUT Exercising Software

The EUT exercise program (provided by client) used during testing was designed to exercise the various system components in a manner similar to a typical use.

### 2.3 Special Accessories

No special accessories used.

### 2.4 Equipment Modification

Any modifications installed previous to testing by TCL entertainment solutions limited 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.

## 2.5 Measurement Uncertainty

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

## 2.6 Support Equipment List and Description

Description	Manufacturer	Model No.
iPod	Apple	A1367
USB Memory	TOSHIBA	UHYBS-004G-BL
USB Memory	SanDisk	SDCZ36-002G-P36
Audio In Cable	N/A	Unshielded, Length 120cm
Detached AC power cord	Richsound	Unshielded, Length 150cm
Optical Cable with Load	N/A	Unshielded, Length 120cm
2.5mm TV's remote control receiving extension Cable	N/A	Unshielded, Length 120cm
Dummy Load	N/A	N/A

**EXHIBIT 3**

**EMISSION RESULTS**

### 3.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

## 3.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

### 3.1.1 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.

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

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
- AV = Average Factor 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:

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

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, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

RA = 62.0 dB $\mu$ V  
AF = 7.4 dB  
CF = 1.6 dB  
AG = 29.0 dB  
PD = 0 dB  
AV = -10 dB  
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dB $\mu$ V/m

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

### 3.1.2 Radiated Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

### 3.1.3 Radiated Emissions

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit. Simultaneous transmission was considered.

Worst Case Radiated Emission  
at  
135.245 MHz

Judgement: Passed by 7.6 dB

#### **TEST PERSONNEL:**

*Sign on file*

Damon Wang, Engineer  
*Typed/Printed Name*

7 December 2018  
*Date*



Applicant: TCL entertainment solutions limited

Date of Test: 7 December 2018

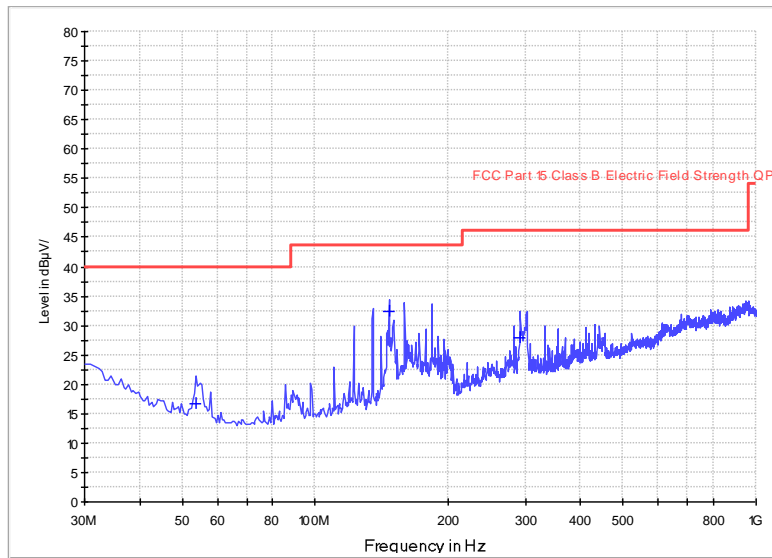
Model: TS5000

Worst Case Operating Mode:

Transmit

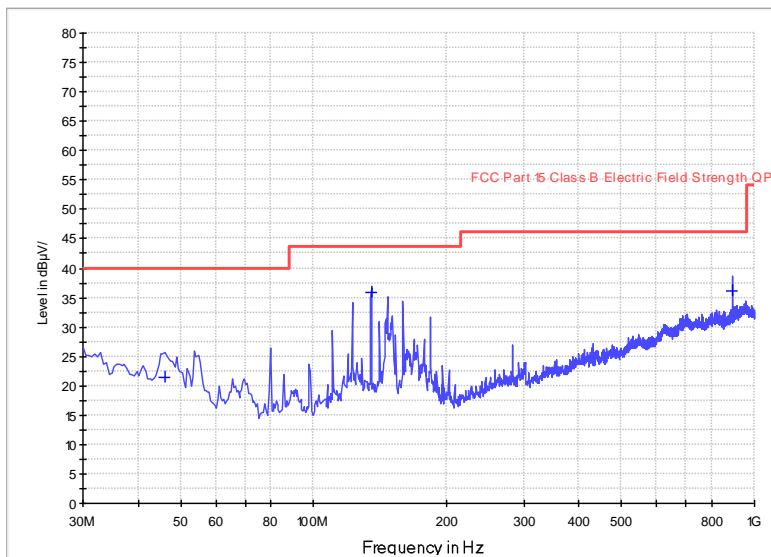
ANT Polarity: Horizontal

FCC Part 15



ANT Polarity: Vertical

FCC Part 15



Applicant: TCL entertainment solutions limited

Date of Test: 7 December 2018

Model: TS5000

Worst Case Operating Mode:

Transmit

Table 1

**Radiated Emissions**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	53.765	26.5	20.0	10.1	16.6	40.0	-23.4
Horizontal	147.370	41.2	20.0	11.3	32.5	43.5	-11.0
Horizontal	291.415	26.2	20.0	21.7	27.9	46.0	-18.1
Vertical	46.005	31.4	20.0	10.1	21.5	40.0	-18.5
Vertical	135.245	52.8	20.0	3.1	35.9	43.5	-7.6
Vertical	891.845	34.4	20.0	21.7	36.1	46.0	-9.9

- NOTES:
1. Quasi-Peak detector is used except for others stated.
  2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances 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 harmonic 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. All emissions are below the QP limit.

## 3.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission  
at  
9758.000 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 9.4 dB

**TEST PERSONNEL:**

*Sign on file*

Damon Wang, Engineer

*Typed/Printed Name*

7 December 2018

*Date*

Applicant: TCL entertainment solutions limited

Date of Test: 7 December 2018

Model: TS5000

Worst Case Operating Mode:

Transmitting

Table 2

**Radiated Emissions**

(2404.5MHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2404.500	87.4	36.7	28.1	78.8	114.0	-35.2
Vertical	4809.000	47.7	36.7	35.5	46.5	74.0	-27.5
Vertical	7213.500	51.9	36.1	36.5	52.3	74.0	-21.7
Vertical	9618.000	53.6	36.2	37.0	54.4	74.0	-19.6

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2404.500	76.5	36.7	28.1	67.9	94.0	-26.1
Vertical	4809.000	37.9	36.7	35.5	36.7	54.0	-17.3
Vertical	7213.500	42.1	36.1	36.5	42.5	54.0	-11.5
Vertical	9618.000	43.2	36.2	37.0	44.0	54.0	-10.0

Notes: 1. RBW=1MHz/VBW=3MHz was used for peak measurements and Average measurements were made with measurement instrumentation employing an average detector function using a minimum resolution bandwidth of 1 MHz.

2. All measurements were made at 3 meter. Harmonic 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 harmonic 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 is used for the emission over 1000MHz.

Test Engineer: Damon Wang

Applicant: TCL entertainment solutions limited

Date of Test: 7 December 2018

Model: TS5000

Worst Case Operating Mode:

Transmitting

Table 3

**Radiated Emissions**

(2439.5MHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2439.500	88.8	36.7	28.1	80.2	114.0	-33.8
Vertical	4879.000	49.9	36.7	35.5	48.7	74.0	-25.3
Vertical	7318.500	51.9	36.1	37.2	53.0	74.0	-21.0
Vertical	9758.000	55.0	36.2	37.0	55.8	74.0	-18.2

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2439.500	77.6	36.7	28.1	69.0	94.0	-25.0
Vertical	4879.000	38.2	36.7	35.5	37.0	54.0	-17.0
Vertical	7318.500	42.0	36.1	37.2	43.1	54.0	-10.9
Vertical	9758.000	43.8	36.2	37.0	44.6	54.0	-9.4

Notes: 1. RBW=1MHz/VBW=3MHz was used for peak measurements and Average measurements were made with measurement instrumentation employing an average detector function using a minimum resolution bandwidth of 1 MHz.

2. All measurements were made at 3 meter. Harmonic 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 harmonic 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 is used for the emission over 1000MHz.

Test Engineer: Damon Wang

Applicant: TCL entertainment solutions limited

Date of Test: 7 December 2018

Model: TS5000

Worst Case Operating Mode:

Transmitting

Table 4

**Radiated Emissions**

(2479.5MHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2479.500	90.4	36.7	28.1	81.8	114.0	-32.2
Vertical	4959.000	46.1	36.7	35.5	44.9	74.0	-29.1
Vertical	7438.500	52.6	36.1	37.2	53.7	74.0	-20.3
Vertical	9918.000	49.2	36.3	38.9	51.8	74.0	-22.2

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2479.500	78.6	36.7	28.1	70.0	94.0	-24.0
Vertical	4959.000	36.2	36.7	35.5	35.0	54.0	-19.0
Vertical	7438.500	42.0	36.1	37.2	43.1	54.0	-10.9
Vertical	9918.000	40.6	36.3	38.9	43.2	54.0	-10.8

- Notes:
1. RBW=1MHz/VBW=3MHz was used for peak measurements and Average measurements were made with measurement instrumentation employing an average detector function using a minimum resolution bandwidth of 1 MHz.
  2. All measurements were made at 3 meter. Harmonic 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 harmonic 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 is used for the emission over 1000MHz.

Test Engineer: Damon Wang

## 3.2 Conducted Emission at Mains Terminal

### 3.2.1 Conducted Emission Configuration Photograph

Worst Case Conducted Configuration  
at  
0.174 MHz (Transmit Mode)

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

### 3.2.2 Conducted Emission Data

Judgement: Passed by 4.4 dB margin(Transmit Mode)

***TEST PERSONNEL:***

*Sign on file*

Damon Wang, Engineer  
*Typed/Printed Name*

7 December 2018  
*Date*



Company: TCL entertainment solutions limited

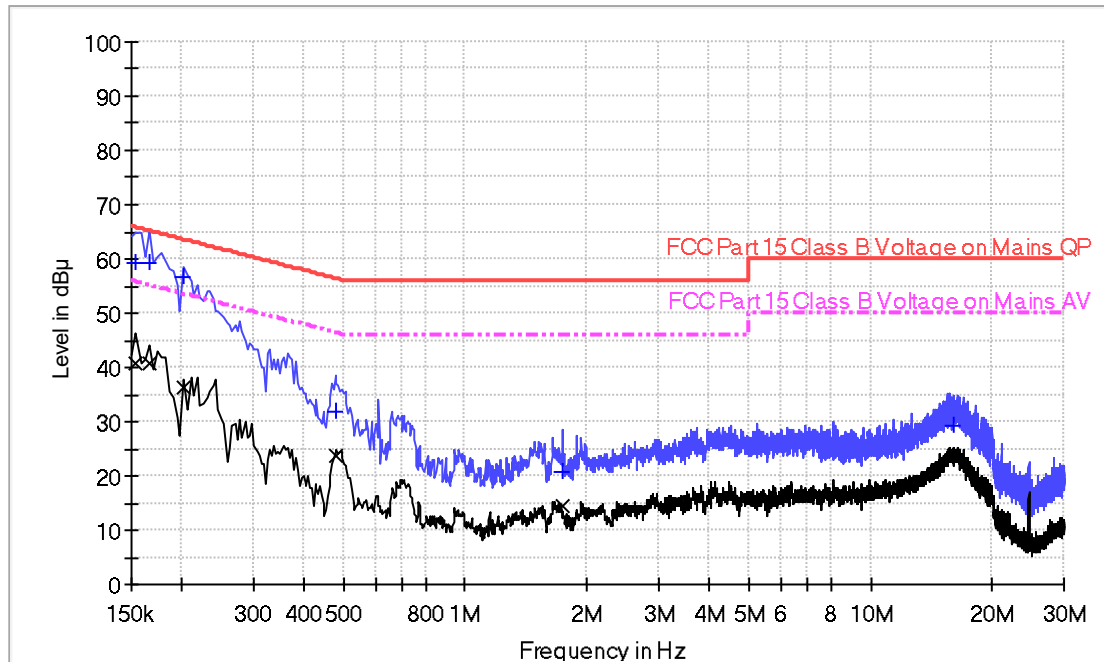
Date of Test: 7 December 2018

Model: TS5000

Operating Mode: Transmit mode

Phase: Live

## Conducted Emission Test - FCC



### Result Table QP

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.154000	59.1	9.000	L1	9.6	6.7	65.8
0.166000	59.4	9.000	L1	9.6	5.8	65.2
0.202000	56.6	9.000	L1	9.6	6.9	63.5
0.478000	32.0	9.000	L1	9.6	24.4	56.4
1.742000	20.6	9.000	L1	9.7	35.4	56.0
16.026000	29.4	9.000	L1	10.1	30.6	60.0

### Result Table AV

Frequency (MHz)	Average (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.154000	40.9	9.000	L1	9.6	14.9	55.8
0.166000	40.7	9.000	L1	9.6	14.5	55.2
0.202000	36.3	9.000	L1	9.6	17.2	53.5
0.478000	23.8	9.000	L1	9.6	22.6	46.4
1.742000	14.5	9.000	L1	9.7	31.5	46.0
16.026000	23.8	9.000	L1	10.1	26.2	50.0

Test Engineer: Damon Wang

Company: TCL entertainment solutions limited

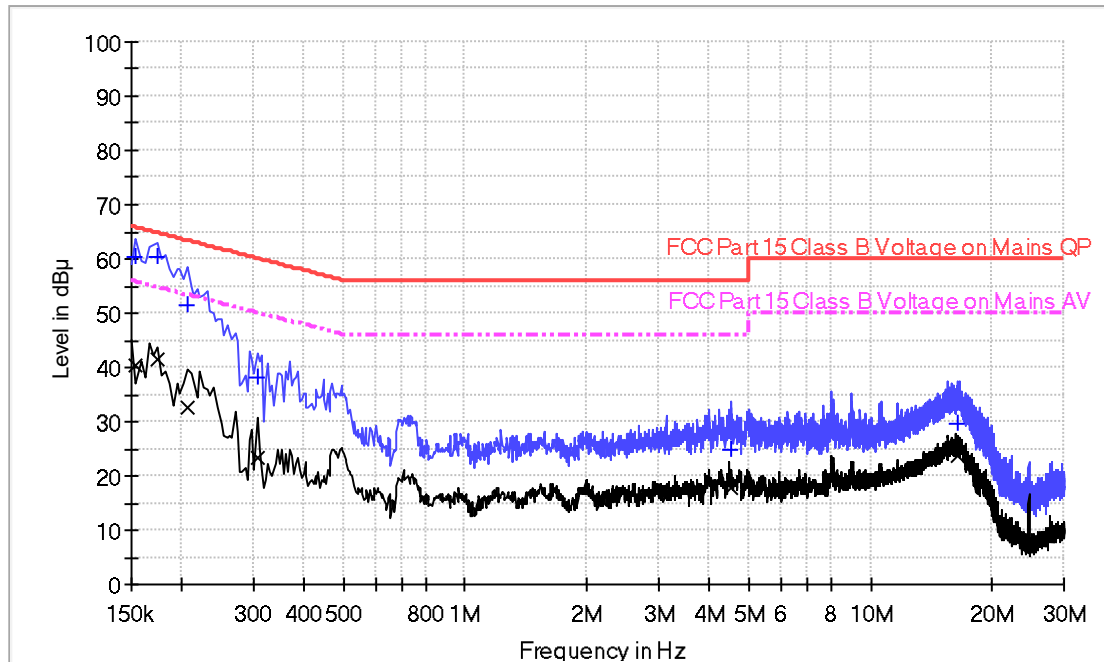
Date of Test: 7 December 2018

Model: TS5000

Operating Mode: Transmit mode

Phase: Neutral

## Conducted Emission Test - FCC



### Result Table QP

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.154000	60.2	9.000	N	9.6	5.6	65.8
0.174000	60.4	9.000	N	9.6	4.4	64.8
0.206000	51.5	9.000	N	9.6	11.9	63.4
0.306000	38.1	9.000	N	9.6	22.0	60.1
4.514000	25.0	9.000	N	9.8	31.0	56.0
16.430000	29.6	9.000	N	10.1	30.4	60.0

### Result Table AV

Frequency (MHz)	Average (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.154000	40.3	9.000	N	9.6	15.5	55.8
0.174000	41.5	9.000	N	9.6	13.3	54.8
0.206000	32.5	9.000	N	9.6	20.9	53.4
0.306000	23.3	9.000	N	9.6	26.8	50.1
4.514000	17.9	9.000	N	9.8	28.1	46.0
16.430000	23.8	9.000	N	10.1	26.2	50.0

Test Engineer: Damon Wang

**EXHIBIT 4**

**EQUIPMENT PHOTOGRAPHS**

## 4.0 Equipment Photographs

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

**EXHIBIT 5**

**PRODUCT LABELLING**

## 5.0 Product Labelling

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

**EXHIBIT 6**

**TECHNICAL SPECIFICATIONS**

## 6.0 Technical Specifications

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



**EXHIBIT 7**

**INSTRUCTION MANUAL**

## 7.0 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.

**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

## 8.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandedge, the test procedure and calculation of factor such as pulse desensitization.

## 8.1 Bandedge Plot

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bandedge.pdf. From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

### Peak Measurement

Restricted-band band-edge tests shall be performed as radiated measurements, i.e (Band-edge Plot).

#### (i) Lower channel 2404.500MHz:

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)
Vertical	2400.000	64.0	36.7	28.1	55.4	74.0	-18.6

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)
Vertical	2400.000	52.7	36.7	28.1	44.1	54.0	-9.9

#### (ii) Upper channel 2479.500MHz:

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)
Vertical	2483.500	63.1	36.8	29.1	55.4	74.0	-18.6

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)
Vertical	2483.500	51.5	36.8	29.1	43.8	54.0	-10.2

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dB $\mu$ v/m (Peak Limit) and 54dB $\mu$ v/m (Average Limit).

## 8.1 Bandedge Plot (cont'd)

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Figure 8.1 Bandwidth

## 8.2 Discussion of Pulse Desensitization

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

### 8.3 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter up to 1GHz and 1.5 meter above 1GHz in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjust through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average Measurements were made with measurement instrumentation employing an average detector function using a minimum resolution bandwidth of 1 MHz.

The frequency range scanned is from 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 40 GHz, whichever is lower.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.



#### 8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.10 - 2013.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used (RBW 3MHz used for fundamental emission).

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

**EXHIBIT 9**

**CONFIDENTIALITY REQUEST**

## 9.0 Confidentiality Request

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

**EXHIBIT 10  
TEST EQUIPMENT LIST**

**10.0 Test Equipment List**

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	14-Sep-2018	14-Sep-2019
SZ185-01	EMI Receiver	R&S	ESCI	100547	24-Jan-2018	24-Jan-2019
SZ061-08	Horn Antenna	ETS	3115	00092346	14-Sep-2018	14-Sep-2019
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	21-May-2018	21-May-2019
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	05-Jun-2018	05-Jun-2019
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	05-Jun-2018	05-Jun-2019
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	24-Jan-2018	24-Jan-2019
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	16-Jan-2017	16-Jan-2019
SZ062-02	RF Cable	RADIALL	RG 213U	--	10-Jun-2018	10-Jun-2019
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	10-Jun-2018	10-Jun-2019
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	10-Jun-2018	10-Jun-2019
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	05-Jun-2018	05-Jun-2019
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	26-Oct-2018	26-Oct-2019
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	26-Oct-2018	26-Oct-2019
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2017	16-Jan-2019

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