

TTE Technology, Inc.

TEST REPORT

SCOPE OF WORK

FCC TESTING—55S405, 55S401, 55S403, 55S407, 55S405-MX, 55S401-MX, 55S403-MX, 55S407-MX, 55S405-CA, 55S407-CA, 55S40 FOLLOWED BY ONE CHARACTER; FOLLOWED BY -MX, FOLLOWED BY-CA

REPORT NUMBER

180222002SZN-001

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[-----]

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TTE Technology, Inc.

Application
For
Certification
FCC ID: W8U55S401

LED TV**Model: 55S405**

Additional Models: 55S401, 55S403, 55S407, 55S405-MX, 55S401-MX, 55S403-MX, 55S407-MX, 55S405-CA, 55S407-CA, 55S40 followed by one character; followed by -MX, followed by-CA

Brand Name: TCL

Computer Peripheral

Report No.: 180222002SZN-001

Prepared and Checked by:

Approved by:

Leo Li
Engineer

Kidd Yang
Technical Supervisor
Date: March 07, 2018

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MEASUREMENT / TECHNICAL REPORT

TTE Technology, Inc.

MODEL: 55S405

Additional Models: 55S401, 55S403, 55S407, 55S405-MX, 55S401-MX, 55S403-MX, 55S407-MX, 55S405-CA, 55S407-CA, 55S40 followed by one character; followed by - MX, followed by-CA

FCC ID: W8U55S401

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

Equipment Type: JBP-Class B Computing Device Peripheral

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 B for unintentional radiator – the new 47 CFR [10-01-16 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 photos	radiated photos.pdf
Test Setup Photo	Conducted photos	conducted photos.pdf
External Photo	External Photos	external photos.pdf
Internal Photo	Internal Photos	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
ID Label / Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidential 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 LED TV. The device can be used to connect PC by HDMI port. The EUT is powered by AC 120V, 60Hz.

The EUT contains a module which can be operated in the frequency band of 2412MHz to 2462MHz in 802.11b, 802.11g and 802.11n-HT20 modes, 2422MHz to 2452MHz in 802.11n-HT40 mode, and 5180MHz to 5240MHz, 5745MHz to 5825MHz in 802.11a, 802.11n (20MHz, 40MHz) and 11ac (80MHz) modes.

The LED TV, Model: 55S405 has two different mainboards (Mainboard Model: MST10S or Mainboard Model: MST10C), their only difference in the main chip for marketing purpose. All tests are required to both designing schemes after evaluation.

The Model: 55S401, 55S403, 55S407, 55S405-MX, 55S401-MX, 55S403-MX, 55S407-MX, 55S405-CA, 55S407-CA, 55S40 followed by one character; followed by -MX, followed by-CA are the same as the Model: 55S405 in hardware aspect. The models are difference in packaging and marketing purpose only.

1.2 Related Submittal(s) Grants

This is an application for certification of a computer peripheral. Other digital functions were reported in the verification report: 180222002SZN-002.

The host contains a WIFI module, which has been granted under the FCC ID: 2AC23-WC0HR2601.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2014). 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.

1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 1F/2F, Building B, QiaoAn Scientific Technology Park, Shangkeng 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 C63.4 (2014).

The device was powered by AC 120V/60Hz during the test. The host device contains a WiFi module which was installed and operating during the test. Both mainboards were tested with the EuT, and only the worst case data was reported in this report.

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. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be 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 turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The frequency range from 30MHz to 29.125GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

2.2 EUT Exercising Software

N/A

2.3 Special Accessories

N/A

2.4 Equipment Modification

Any modifications installed previous to testing by TTE Technology, Inc. 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

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
Laptop	Lenovo	T420
Hard Disk	Smart.drive	HD-003
RJ45 Cable	N/A	Unshielded, Length 450cm
USB Cable	Smart.drive	Unshielded, Length 155cm
USB Memory	SanDisk	SDCZ36-002G-P36
Dummy Load	N/A	N/A
HDMI Cable*3	N/A	UnShielded, Length 180cm
AV Cable*3	N/A	Unshielded, Length 120cm
Tuner Resister	N/A	75ohm
Remote controller	TCL	N/A
Headphone	Sony	Unshielded, Length 110cm
Coaxial cable	/	Shielded, Length 500cm
Optical cable	/	Unshielded, Length 130cm

EXHIBIT 3

EMISSION RESULTS

3.0 Emission Results

Data is included 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.

3.1 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.

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

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB/m

AG = Amplifier Gain 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:

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

3.2 Field Strength Calculation (cont'd)

Example

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

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

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

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

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

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

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

3.3 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
At
891.0MHz (HDMI In-4K Mode)

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

3.4 Radiated Emission Data

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 3.0dB margin (HDMI In-4K Mode)

TEST PERSONNEL:

Sign on file

Leo Li, Engineer
Typed/Printed Name

March 05, 2018
Date

Applicant: TTE Technology, Inc.

Date of Test: March 05, 2018

Worst Case Operating Mode:

Model: 55S405 (with MST10S)

HDMI In (4K)

Table 1

Radiated Emissions

Below 1G

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	192.0	47.5	20.0	8.3	35.8	43.5	-7.7
Horizontal	296.8	44.0	20.0	12.5	36.5	46.0	-9.5
Horizontal	891.0	36.9	20.0	26.1	43.0	46.0	-3.0
Vertical	55.0	42.2	20.0	8.6	30.8	40.0	-9.2
Vertical	297.0	40.6	20.0	15.4	36.0	46.0	-10.0
Vertical	893.0	31.3	20.0	26.1	37.4	46.0	-8.6

Above 1G

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)	Detector
Horizontal	1485.8	66.5	36.8	26.9	56.6	74.0	-17.4	PK
Horizontal	2989.0	57.3	36.3	31.9	52.9	74.0	-21.1	PK
Horizontal	4455.3	57.7	36.5	36.7	57.9	74.0	-16.1	PK
Horizontal	1485.8	57.9	36.8	26.9	48.0	54.0	-6.0	AV
Horizontal	2989.0	51.3	36.3	31.9	46.9	54.0	-7.1	AV
Horizontal	4455.3	48.6	36.5	36.7	48.8	54.0	-5.2	AV
Vertical	1187.8	61.5	36.3	26.9	52.1	74.0	-21.9	PK
Vertical	1485.3	68.6	36.3	26.7	59.0	74.0	-15.0	PK
Vertical	4459.0	50.4	36.4	36.7	50.7	74.0	-23.3	PK
Vertical	1187.8	57.3	36.3	26.9	47.9	54.0	-6.1	AV
Vertical	1485.3	59.0	36.3	26.7	49.4	54.0	-4.6	AV
Vertical	4459.0	45.8	36.4	36.7	46.1	54.0	-7.9	AV

NOTES:

1. Quasi-Peak detector is used for frequency up to 1GHz, Peak detector and Average detector are used for frequency from 1GHz to 29.125GHz.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. All other emissions were at least 20 dB below the applicable limits.

Test Engineer: Leo Li

Applicant: TTE Technology, Inc.

Date of Test: March 05, 2018

Worst Case Operating Mode:

Model: 55S405 (with MST10C)

HDMI In (4K)

Table 1

Radiated Emissions

Below 1G

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	138.2	41.3	20.0	9.8	31.1	43.5	-12.4
Horizontal	296.8	45.1	20.0	15.4	40.5	46.0	-5.5
Horizontal	891.0	35.8	20.0	26.1	41.9	46.0	-4.1
Vertical	45.0	42.9	20.0	10.7	33.6	40.0	-6.4
Vertical	296.8	46.8	20.0	15.4	42.2	46.0	-3.8
Vertical	891.0	36.9	20.0	26.1	43.0	46.0	-3.0

Above 1G

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)	Detector
Horizontal	1782.0	61.4	36.8	26.7	51.3	74.0	-22.7	PK
Horizontal	4455.0	56.4	36.3	35.3	55.4	74.0	-18.6	PK
Horizontal	8030.0	54.7	36.5	40.9	59.1	74.0	-14.9	PK
Horizontal	1782.0	56.7	36.8	26.7	46.6	54.0	-7.4	AV
Horizontal	4455.0	51.8	36.3	35.3	50.8	54.0	-3.2	AV
Horizontal	8030.0	46.6	36.5	40.9	51.0	54.0	-3.0	AV
Vertical	1196.4	54.5	36.3	26.9	45.1	74.0	-28.9	PK
Vertical	1518.6	50.7	36.3	26.7	41.1	74.0	-32.9	PK
Vertical	4647.2	52.3	36.4	36.7	52.6	74.0	-21.4	PK
Vertical	1196.4	39.2	36.3	26.9	29.8	54.0	-24.2	AV
Vertical	1518.6	37.8	36.3	26.7	28.2	54.0	-25.8	AV
Vertical	4647.2	34.4	36.4	36.7	34.7	54.0	-19.3	AV

NOTES:

1. Quasi-Peak detector is used for frequency up to 1GHz, Peak detector and Average detector are used for frequency from 1GHz to 29.125GHz.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. All other emissions were at least 20 dB below the applicable limits.

Test Engineer: Leo Li

3.5 Conducted Emission at Mains Terminal

3.5.1 Conducted Emission Configuration Photograph

Worst Case Conducted Configuration
at
0.746 MHz (HDMI In Mode)

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

3.6 Conducted Emission Data

Judgement: Passed by 3.7 dB margin(HDMI In Mode)

TEST PERSONNEL:

Sign on file

Leo Li, Engineer
Typed/Printed Name

March 05, 2018
Date

Company: TTE Technology, Inc.

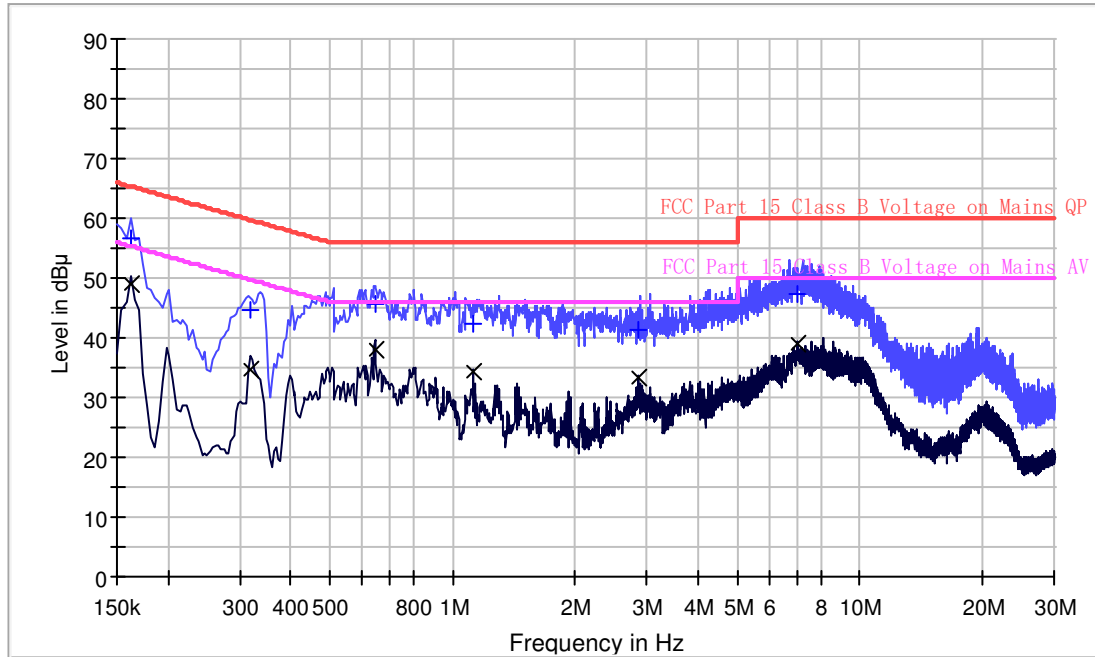
Date of Test: March 05, 2018

Model: 55S405 (with MST10S)

Operating Mode: HDMI in with antenna grounded

Phase: Live

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.162000	56.7	L1	9.6	8.7	65.4
0.318000	44.7	L1	9.7	15.1	59.8
0.646000	45.6	L1	9.7	10.4	56.0
1.122000	42.4	L1	9.7	13.6	56.0
2.862000	41.4	L1	9.7	14.6	56.0
7.054000	47.2	L1	9.9	12.8	60.0

Result Table AV

Frequency (MHz)	Average (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.162000	48.9	L1	9.6	6.5	55.4
0.318000	34.7	L1	9.7	15.1	49.8
0.646000	38.1	L1	9.7	7.9	46.0
1.122000	34.3	L1	9.7	11.7	46.0
2.862000	33.2	L1	9.7	12.8	46.0
7.054000	39.0	L1	9.9	11.0	50.0

Test Engineer: Leo Li

Company: TTE Technology, Inc.

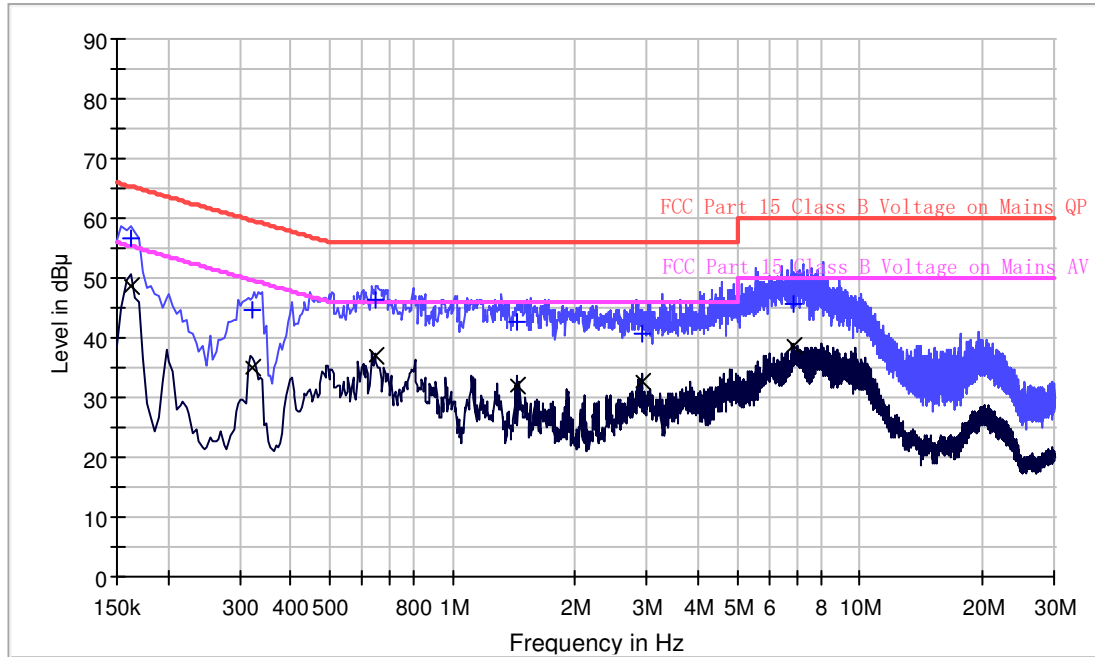
Date of Test: March 05, 2018

Model: 55S405 (with MST10S)

Operating Mode: HDMI In with antenna grounded

Phase: Neutral

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.162000	56.7	N	9.6	8.7	65.4
0.322000	44.6	N	9.7	15.1	59.7
0.646000	46.5	N	9.7	9.5	56.0
1.434000	42.7	N	9.7	13.3	56.0
2.922000	40.7	N	9.8	15.3	56.0
6.910000	45.8	N	9.9	14.2	60.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.162000	48.6	N	9.6	6.8	55.4
0.322000	35.0	N	9.7	14.7	49.7
0.646000	36.9	N	9.7	9.1	46.0
1.434000	32.1	N	9.7	13.9	46.0
2.922000	32.8	N	9.8	13.2	46.0
6.910000	38.6	N	9.9	11.4	50.0

Test Engineer: Leo Li

Company: TTE Technology, Inc.

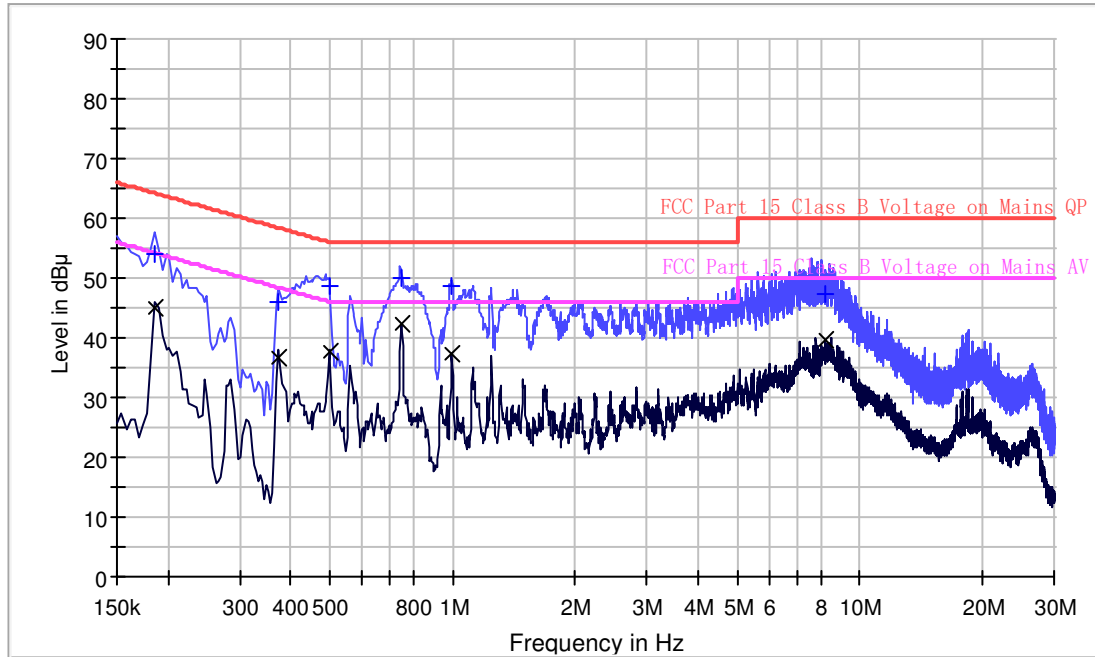
Date of Test: March 05, 2018

Model: 55S405 (with MST10C)

Operating Mode: HDMI in with antenna grounded

Phase: Live

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.186000	54.1	L1	9.7	10.1	64.2
0.374000	46.0	L1	9.7	12.4	58.4
0.498000	48.6	L1	9.7	7.4	56.0
0.746000	49.9	L1	9.7	6.1	56.0
0.994000	48.7	L1	9.7	7.3	56.0
8.218000	47.3	L1	9.9	12.7	60.0

Result Table AV

Frequency (MHz)	Average (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.186000	45.0	L1	9.7	9.2	54.2
0.374000	36.5	L1	9.7	11.9	48.4
0.498000	37.5	L1	9.7	8.5	46.0
0.746000	42.3	L1	9.7	3.7	46.0
0.994000	37.4	L1	9.7	8.6	46.0
8.218000	39.6	L1	9.9	10.4	50.0

Test Engineer: Leo Li

Company: TTE Technology, Inc.

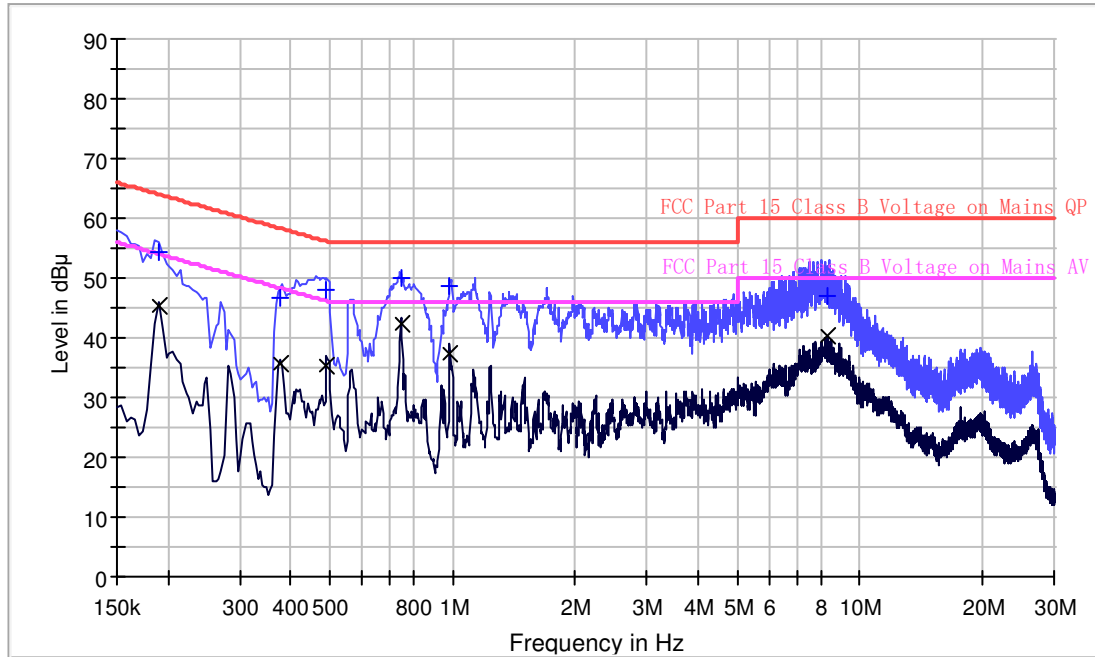
Date of Test: March 05, 2018

Model: 55S405 (with MST10C)

Operating Mode: HDMI In with antenna grounded

Phase: Neutral

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	54.2	N	9.7	9.8	64.0
0.378000	46.8	N	9.7	11.5	58.3
0.490000	47.9	N	9.7	8.3	56.2
0.746000	50.0	N	9.7	6.0	56.0
0.986000	48.7	N	9.7	7.3	56.0
8.354000	46.9	N	9.9	13.1	60.0

Result Table AV

Frequency (MHz)	Average (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	45.3	N	9.7	8.7	54.0
0.378000	35.6	N	9.7	12.7	48.3
0.490000	35.4	N	9.7	10.8	46.2
0.746000	42.2	N	9.7	3.8	46.0
0.986000	37.3	N	9.7	8.7	46.0
8.354000	40.5	N	9.9	9.5	50.0

Test Engineer: Leo Li

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 Equipment Photographs

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

EXHIBIT 5

PRODUCT LABELLING

5.0 Product Labelling

For electronics 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 of the tested EUT is saved with filename: block.pdf.

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 emission measuring procedure.

8.1 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 – 2014.

The computer peripheral equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter 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 antenna height and polarization are varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions are in QP mode from the frequency band 30MHz to 1GHz with RBW setting 120kHz and in PK & AV mode from frequency band 1GHz to 29.125GHz with RBW setting 1MHz. Detector function for conducted emissions are in QP & AV mode and IFBW setting is 9kHz from the frequency band 150kHz to 30MHz.

For radiated emission, the frequency range scanned is 30MHz to 29.125GHz. For line-conducted emissions, the range scanned is 150kHz to 30MHz with RBW setting 9KHz.

8.2 Emissions Test Procedures (cont'd)

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

Conducted measurements are made as described in ANSI C63.4 – 2014.

EXHIBIT 9

TEST EQUIPMENT LIST

9.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-04	Biconilog Antenna	ETS	3142C	00078828	17-Oct-2017	17-Oct-2018
SZ061-08	Horn Antenna	ETS	3115	00092346	20-Sep-2017	20-Sep-2018
SZ056-03	Spectrum Analyzer	R&S	FSP30	101148	1-Jun-2017	1-Jun-2018
SZ185-01	EMI Receiver	R & S	ESCI	100547	24-Jan-2018	24-Jan-2019
SZ181-04	Preamplifier	Agilent	8449B	3008A02 474	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	--	05-Jan-2018	05-Jul-2018
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	11-Sep-2017	11-Mar-2018
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	11-Sep-2017	11-Mar-2018
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	30-Oct-2017	30-Oct-2018
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	30-Oct-2017	30-Oct-2018
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	12-Jul-2017	12-Jul-2018
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2017	16-Jan-2019