

TTE Technology, Inc.

TEST REPORT

SCOPE OF WORK

FCC TESTING—55S425, 55S421, 55S423, 55S421-CA, 55S423-CA, 55S425-CA, 55S421-MX, 55S423-MX, 55S425-MX, 55S4 followed by two character; may be followed by -MX or -CA.

REPORT NUMBER

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TTE Technology, Inc.

Application
For
Certification
FCC ID: W8U55S426

LED TV**Model: 55S425**

**Additional Models: 55S421, 55S423, 55S421-CA, 55S423-CA,
55S425-CA, 55S421-MX, 55S423-MX, 55S425-MX, 55S4 followed by
two character; may be followed by -MX or -CA.**

Brand Name: TCL

Computer Peripheral

Report No.: 190717002SZN-001

Prepared and Checked by:

Approved by:

Ryan Chen
Engineer

Peter Kang
Senior Technical Supervisor
Date: 05 August 2019

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MEASUREMENT / TECHNICAL REPORT

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 [10-01-18 Edition] provision.

Report prepared by:

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1.0 SUMMARY OF TEST RESULT

Grantee: TTE Technology, Inc.

Grantee Address: 1860 Compton Ave, Corona, California, United States.

Manufacturer: TCL King Electrical Appliances (Huizhou) Co., Ltd.

Manufacturer Address: Sec. 19, Zhong Kai Development Zone for New & High-Level Tech Industries, Huizhou, Guangdong, China

MODEL: 55S425

FCC ID: W8U55S426

Test Specification	Reference	Results
Radiated Emission	15.107	Pass
Conducted Emission	15.109	Pass

2.0 General Description

2.1 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 Model: 55S421, 55S423, 55S421-CA, 55S423-CA, 55S425-CA, 55S421-MX, 55S423-MX, 55S425-MX, 55S4 followed by two character; may be followed by -MX or -CA. are the same as the Model: 55S425 in hardware aspect. The models are difference in packaging and marketing purpose only.

The EUT has two main board schemes which are showed in the internal photos.pdf. The only differences between these two main boards are the heat sink and two internal interface which haven't been use.

2.2 Related Submittal(s) Grants

This is an application for certification of a computer peripheral. Other digital functions were reported in the verification report: 190717002SZN-002.

The host contains a WIFI module, which has been granted under the FCC ID: 2AC23-WC1KR2601.

2.3 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.

2.4 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 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).

3.0 System Test Configuration

3.1 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 Wi-Fi module which was installed and operating during the test, and only the worst-case data was reported in this report.

This EUT has two main board schemes which are showed in the internal photos.pdf. The only differences between these two main boards are the heat sink and two internal interface which haven't been use. Both two main boards have been tested and only the worse-case results are recorded 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 Section 4.0.

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 ranges from 30MHz to 29.25GHz 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.

3.2 EUT Exercising Software

N/A

3.3 Special Accessories

N/A

3.4 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.

3.5 Measurement Uncertainty

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

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Laptop	DELL	Latitude 3480
Laptop	HP	Compaq2510p
Hard Disk	Smart.drive	HD-003
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	N/A	Unshielded, Length 120cm
AV Cable Adaptor	TCL	Unshielded, Length 12cm
Tuner Resister	N/A	75ohm
Remote Controller	TCL	N/A
Headphone	Sony	Unshielded, Length 110cm
Coaxial Cable	N/A	Shielded, Length 500cm
RJ45 Cable	N/A	Shielded, Length 450cm
Optical Cable	N/A	Unshielded, Length 130cm

4.0 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.

4.1 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:

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

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.

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

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

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

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

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

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

4.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
At
296.697875MHz (HDMI In(4K) Mode)

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

4.3 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 3.6dB margin (HDMI In(4K) Mode)

TEST PERSONNEL:

Sign on file

Ryan Chen, Engineer
Typed/Printed Name

01 August 2019
Date

Applicant: TTE Technology, Inc.

Date of Test: 01 August 2019

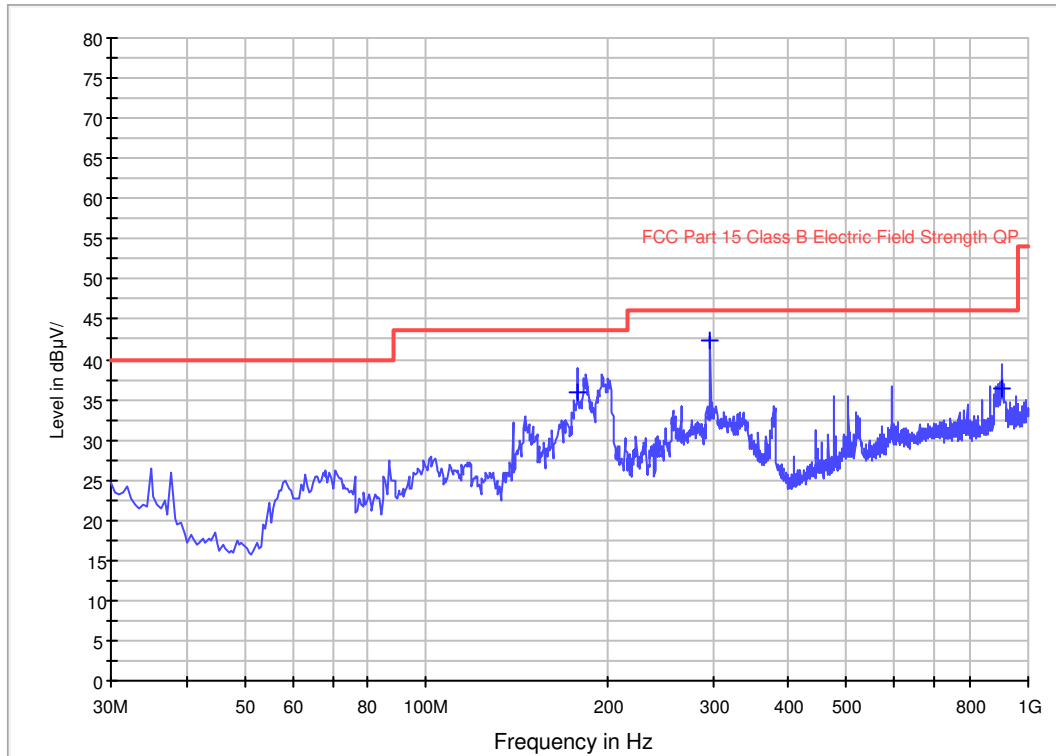
Worst Case Operating Mode:

Model: 55S425

HDMI In(4K)

Horizontal

FCC Part 15



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
178.392750	35.8	1000.0	120.000	H	11.9	7.7	43.5
296.697875	42.4	1000.0	120.000	H	16.0	3.6	46.0
903.485000	36.4	1000.0	120.000	H	27.1	9.6	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: TTE Technology, Inc.

Date of Test: 01 August 2019

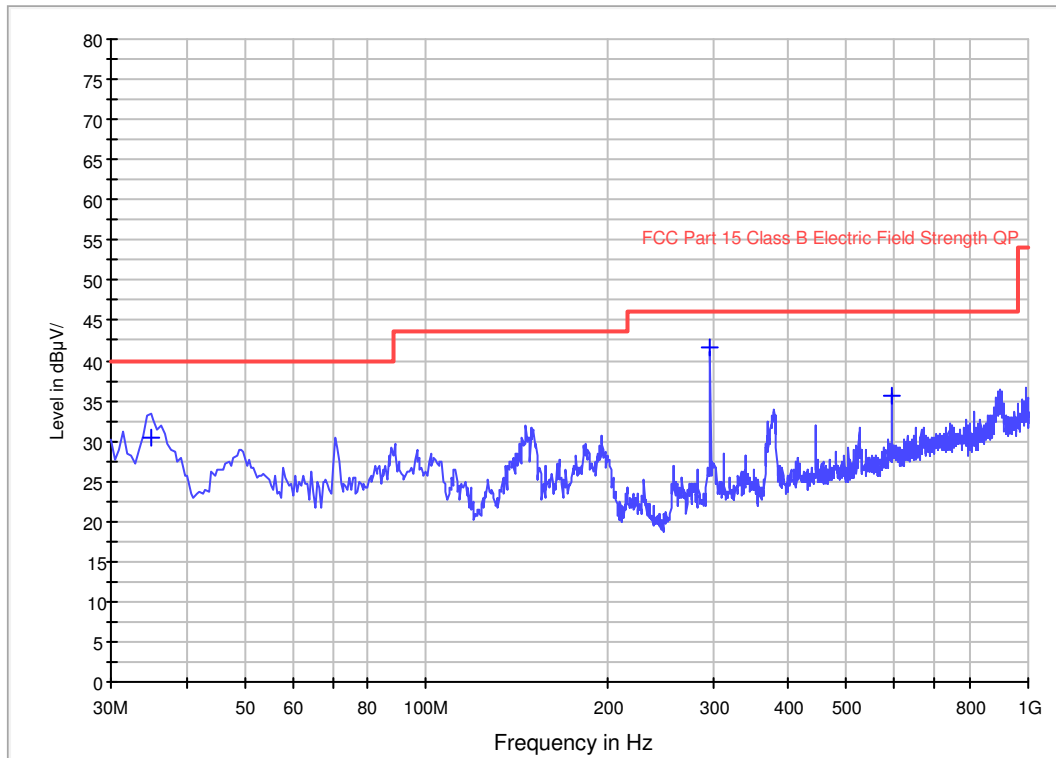
Worst Case Operating Mode:

Model: 55S425

HDMI In(4K)

Vertical

FCC Part 15



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
34.850000	30.4	1000.0	120.000	V	15.7	9.6	40.0
296.691500	41.6	1000.0	120.000	V	16.0	4.4	46.0
593.570000	35.7	1000.0	120.000	V	23.1	10.3	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: TTE Technology, Inc.
 Date of Test: 01 August 2019
 Worst Case Operating Mode:

Model: 55S425
 HDMI In(4K)

Table 1

Above 1GHz

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	1185.4	60.1	36.6	22.8	46.3	74.0	-27.7	PK
Horizontal	1823.7	65.7	36.3	24.7	54.1	74.0	-19.9	PK
Horizontal	3108.8	62.6	36.4	28.9	55.1	74.0	-18.9	PK
Horizontal	1185.4	52.3	36.6	22.8	38.5	54.0	-15.5	AV
Horizontal	1823.7	51.6	36.3	24.7	40.0	54.0	-14.0	AV
Horizontal	3108.8	49.7	36.4	28.9	42.2	54.0	-11.8	AV
Vertical	1816.5	60.1	36.3	28.3	52.1	74.0	-21.9	PK
Vertical	3105.9	63.3	36.5	28.5	55.3	74.0	-18.7	PK
Vertical	6919.2	53.4	36.4	36.5	53.5	74.0	-20.5	PK
Vertical	1816.5	46.0	36.3	28.3	38.0	54.0	-16.0	AV
Vertical	3105.9	48.5	36.5	28.5	40.5	54.0	-13.5	AV
Vertical	6919.2	39.9	36.4	36.5	40.0	54.0	-14.0	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 29.25GHz.
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.

4.4 Conducted Emission at Mains Terminal

4.4.1 Conducted Emission Configuration Photograph

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

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

4.5 Conducted Emission Data

Judgement: Passed by 8.7 dB margin(HDMI In Mode)

TEST PERSONNEL:

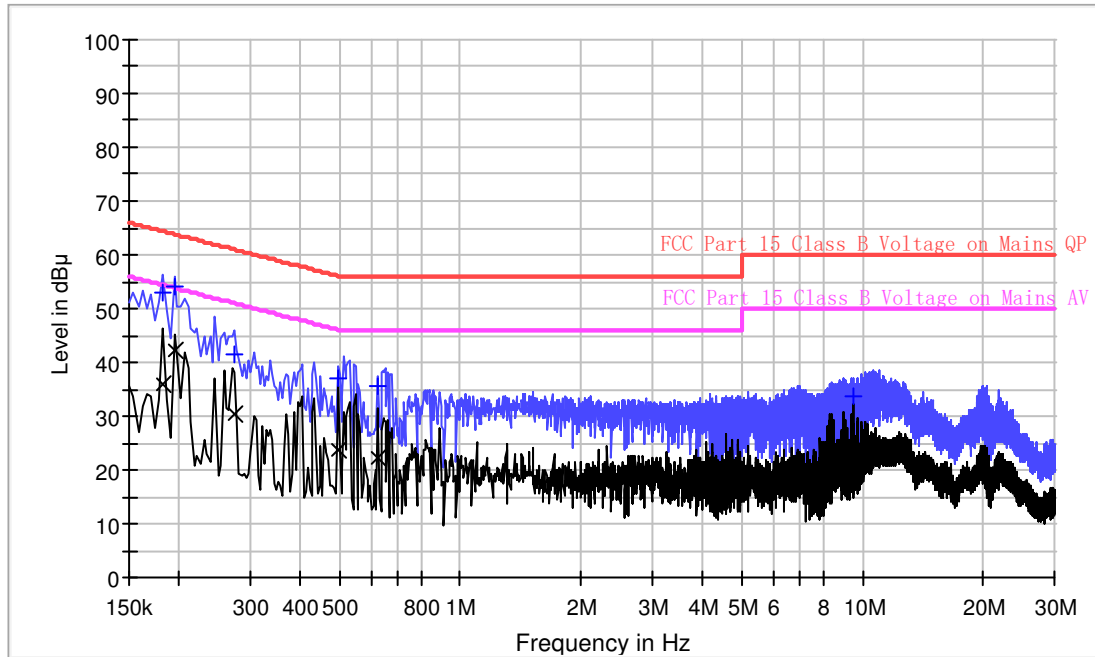
Sign on file

Ryan Chen, Engineer
Typed/Printed Name

26 July 2019
Date

Applicant: TTE Technology, Inc.
 Date of Test: 26 July 2019
 Model: 55S425
 Operating Mode: HDMI IN
 Phase: Live

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.182000	53.0	L	9.7	11.4	64.4
0.194000	54.2	L	9.7	9.7	63.9
0.274000	41.6	L	9.8	19.4	61.0
0.498000	37.0	L	9.8	19.0	56.0
0.622000	35.6	L	9.8	20.4	56.0
9.454000	33.6	L	9.9	26.4	60.0

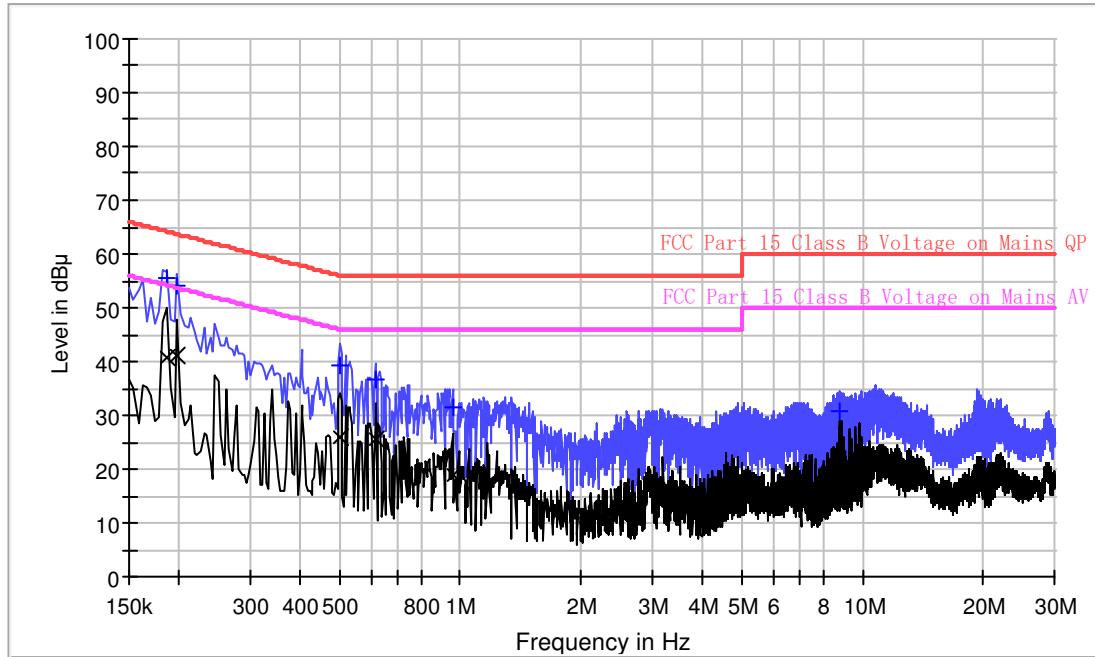
Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.182000	35.8	L	9.7	18.6	54.4
0.194000	42.3	L	9.7	11.6	53.9
0.274000	30.2	L	9.8	20.8	51.0
0.498000	23.8	L	9.8	22.2	46.0
0.622000	22.2	L	9.8	23.8	46.0
9.454000	23.8	L	9.9	26.2	50.0

Test Engineer: Ryan Chen

Applicant: TTE Technology, Inc.
 Date of Test: 26 July 2019
 Model: 55S425
 Operating Mode: HDMI IN
 Phase: Neutral

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µV)	Line	Corr. (dB)	Margin (dB)	Limit (dB µV)
0.186000	55.5	N	9.7	8.7	64.2
0.198000	54.2	N	9.7	9.5	63.7
0.502000	39.2	N	9.8	16.8	56.0
0.618000	36.5	N	9.8	19.5	56.0
0.958000	31.5	N	9.8	24.5	56.0
8.794000	30.6	N	10.0	29.4	60.0

Result Table AV

Frequency (MHz)	Average (dB µV)	Line	Corr. (dB)	Margin (dB)	Limit (dB µV)
0.186000	40.9	N	9.7	13.3	54.2
0.198000	41.2	N	9.7	12.5	53.7
0.502000	25.9	N	9.8	20.1	46.0
0.618000	25.7	N	9.8	20.3	46.0
0.958000	18.8	N	9.8	27.2	46.0
8.794000	20.0	N	10.0	30.0	50.0

Test Engineer: Ryan Chen

5.0 Equipment Photographs

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

6.0 Product Labelling

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

7.0 Technical Specifications

For electronic filing, the block diagram of the tested EUT is saved with filename: block.pdf.

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 Miscellaneous Information

This miscellaneous information includes emission measuring procedure.

9.1 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 29.25GHz 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 29.25GHz. For line-conducted emissions, the range scanned is 150kHz to 30MHz with RBW setting 9KHz.

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

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

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
SZ061-08	Double-Ridged Waveguide Horn Antenna	ETS	3115	00092346	14-Sep-2018	14-Sep-2019
SZ061-15	Double-Ridged Waveguide Horn Antenna	ETS	3116C-PA	00224718	25-Oct-2018	25-Oct-2019
SZ056-03	Spectrum Analyzer	R&S	FSP30	101148	28-May-2019	28-May-2020
SZ185-01	EMI Receiver	R & S	ESCI	100547	04-Jan-2019	04-Jan-2020
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	15-Jan-2019	15-Jan-2020
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2020
SZ062-02	RF Cable	RADIALL	RG 213U	--	19-Jun-2019	19-Dec-2019
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	23-Feb-2019	23-Aug-2019
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	23-Feb-2019	23-Aug-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
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	28-May-2019	28-May-2020
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2017	16-Jan-2020
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	--	10-Apr-2019	10-Oct-2019

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