



TTE Technology, Inc.

Application
For
Certification
FCC ID: W8U28S305

LCD TV

Model: 28S305
Additional Models: 28S301, 28S303, 28S307, 28S301-MX, 28S303-MX, 28S305-MX, 28S307-MX

Brand Name: TCL

Computer Peripheral

Report No.: 161201002SZN-001

Prepared and Checked by:

Approved by:

Sign on file

Jenner Liu
Engineer

Kidd Yang
Senior Project Engineer
Date: December 19, 2016

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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TRF No.: FCC 15C_PC_b

INTERTEK TESTING SERVICES

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MEASUREMENT / TECHNICAL REPORT

TTE Technology, Inc.

MODEL: 28S305

**Additional Models: 28S301, 28S303, 28S307, 28S301-MX, 28S303-MX,
28S305-MX, 28S307-MX**

FCC ID: W8U28S305

This report concerns (check one): Original Grant Class II 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 [10-01-15 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

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EXHIBIT 1

GENERAL DESCRIPTION

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1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a LCD TV. The device can be used to connect PC by HDMI port. The EUT is powered by AC 120V, 60Hz, 40W. 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 and 802.11n (20MHz, 40MHz, 80MHz) modes.

The Model: 28S301, 28S303, 28S307, 28S301-MX, 28S303-MX, 28S305-MX, 28S307-MX are the same as the Model: 28S305 in hardware and electrical 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: 161201002SZN-002.

The host contains a WIFI module, which is pending with the FCC under the FCC ID: 2AC23-WC0FR2601.

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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 shield room used to collect the conducted data is **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

The Semi-anechoic chamber used to collect the radiated data is **EMTEK (Shenzhen) Co., Ltd.** and located at Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, 518052, China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 406365).

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EXHIBIT 2
SYSTEM TEST CONFIGURATION

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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. 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. Kejiyuan Branch.

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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	HP	ProBook 5220m
Laptop	LENOVO	X1
Hard Disk	Smart.drive	HD-003
RJ45 Cable	N/A	Unshielded, Length 450cm
USB Cable	Smart.drive	Unshielded, Length 155cm
USB Memory	TOSHIBA	UHYBS-004G-BL
Dummy Load	N/A	N/A
HDMI Cable*3	N/A	UnShielded, Length 180cm
AV Cable	N/A	Unshielded, Length 120cm
Headphone	N/A	Unshielded, Length 120cm
Tuner Resister	N/A	75ohm
Remote controller	TCL	N/A

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EXHIBIT 3
EMISSION RESULTS

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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.

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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:

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

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3.1 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.

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

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

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

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

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

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

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3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
At
593.402MHz (HDMI In Mode)

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

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3.3 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 Mode)

TEST PERSONNEL:

Sign on file

Jenner Liu, Engineer
Typed/Printed Name

December 16, 2016
Date

INTERTEK TESTING SERVICES

Company: TTE Technology, Inc.
Date of Test: December 16, 2016
Model: 28S305
Operating Mode: HDMI In

Table 1

Radiated Emissions

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	124.560	46.8	20.0	10.5	37.3	43.5	-6.2
Horizontal	148.320	47.6	20.0	11.6	39.2	43.5	-4.3
Horizontal	741.780	35.3	20.0	27.0	42.3	46.0	-3.7
Horizontal	1800.040	31.8	20.0	28.2	40.0	54.0	-14.0
Horizontal	4000.000	30.0	20.0	32.5	42.5	54.0	-11.5
Horizontal	4998.000	33.3	20.0	35.5	48.8	54.0	-5.2
Horizontal	10000.000	31.0	20.0	38.9	49.9	54.0	-4.1
Horizontal	11998.000	28.0	20.0	42.1	50.1	54.0	-3.9
Vertical	148.340	45.2	20.0	11.7	36.9	43.5	-6.6
Vertical	593.402	38.1	20.0	24.3	42.4	46.0	-3.6
Vertical	740.437	33.4	20.0	27.0	40.4	46.0	-5.6
Vertical	1800.020	32.6	20.0	27.7	40.3	46.0	-5.7
Vertical	3998.000	30.5	20.0	31.9	42.4	54.0	-11.6
Vertical	4999.000	33.1	20.0	35.0	48.1	54.0	-5.9
Vertical	8998.000	32.9	20.0	36.8	49.7	54.0	-4.3
Vertical	11996.000	28.6	20.0	41.6	50.2	54.0	-3.8

NOTES:

1. Quasi-Peak detector is used for frequency up to 1GHz and Peak detector is used for frequency from 1-29.125GHz.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. All emissions up to 1GHz are below the QP limit and all emissions between 1-29.125GHz are below the AV limit.

Test Engineer: Jenner Liu

TRF No.: FCC 15C_PC_b
FCC ID: W8U28S305
Report No.: 161201002SZN-001

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3.4 Conducted Emission at Mains Terminal

3.5 Conducted Emission Configuration Photograph

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

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

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3.6 Conducted Emission Data

Judgement: Passed by 5.5 dB margin(HDMI In Mode)

TEST PERSONNEL:

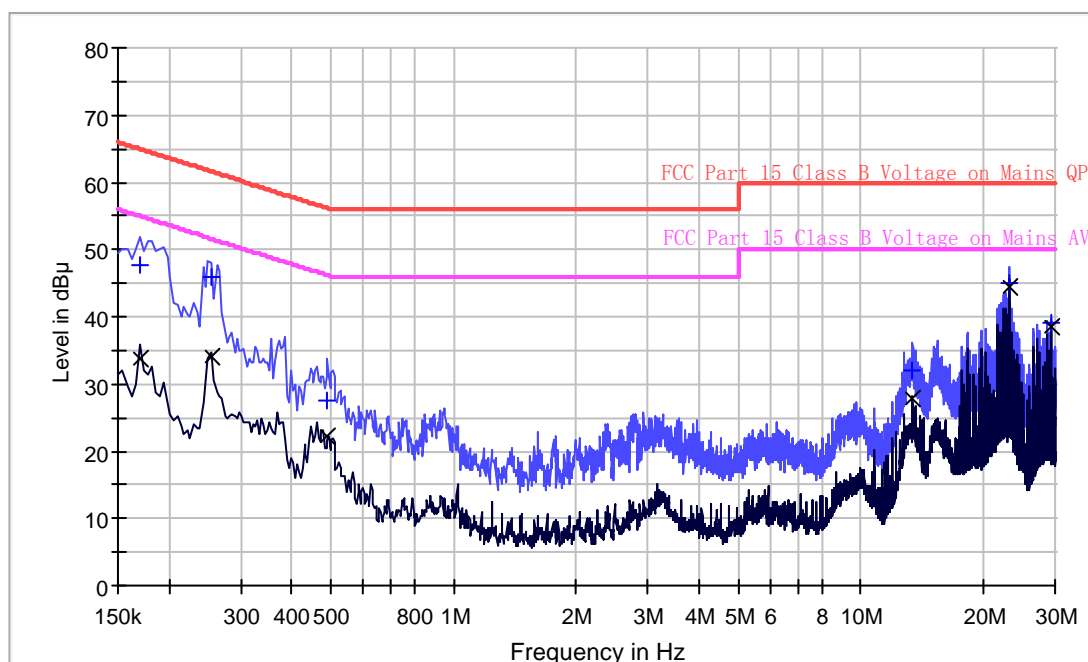
Sign on file

Jenner Liu, Engineer
Typed/Printed Name

December 16, 2016
Date

INTERTEK TESTING SERVICES

Company: TTE Technology, Inc.
 Date of Test: December 16, 2016
 Model: 28S305
 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)
0.170	47.8	L1	9.6	17.2	65.0
0.254	45.8	L1	9.7	15.8	61.6
0.490	27.5	L1	9.7	28.7	56.2
13.358	32.0	L1	10.0	28.0	60.0
23.129	45.0	L1	10.6	15.0	60.0
29.234	39.2	L1	10.7	20.8	60.0

Result Table AV

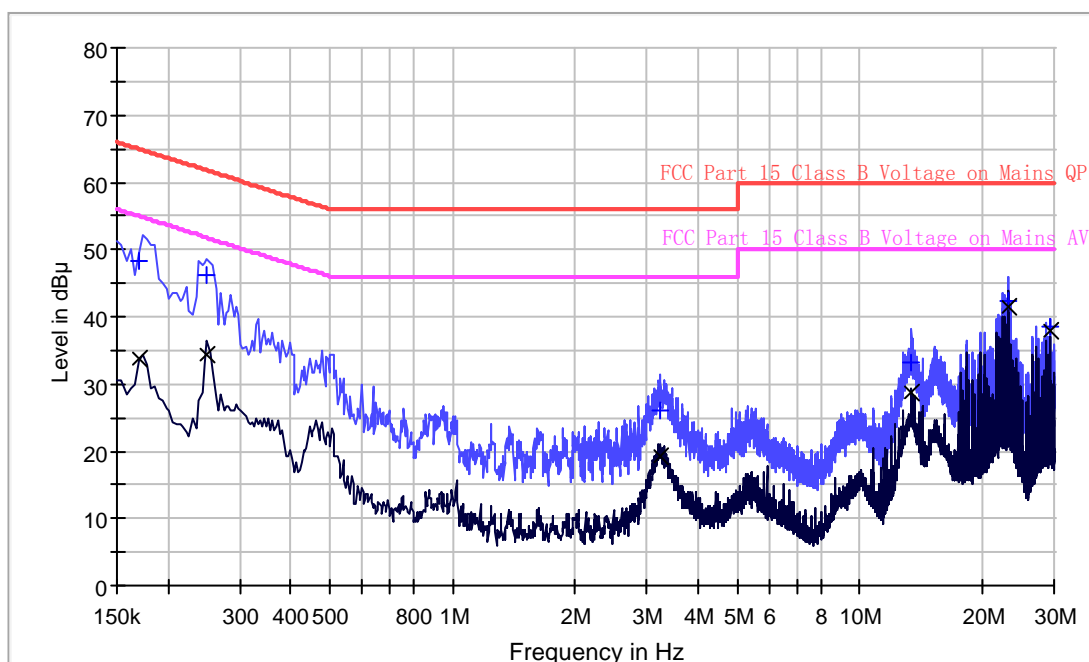
Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.170	33.7	L1	9.6	21.3	55.0
0.254	34.2	L1	9.7	17.4	51.6
0.490	22.1	L1	9.7	24.1	46.2
13.358	27.7	L1	10.0	22.3	50.0
23.129	44.5	L1	10.6	5.5	50.0
29.234	38.6	L1	10.7	11.4	50.0

Test Engineer: Jenner Liu

TRF No.: FCC 15C_PC_b
 FCC ID: W8U28S305
 Report No.: 161201002SZN-001

INTERTEK TESTING SERVICES

Company: TTE Technology, Inc.
 Date of Test: December 16, 2016
 Model: 28S305
 Operating Mode: HDMI In
 Phase: Neutral
Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.170	48.4	N	9.6	16.6	65.0
0.250	46.3	N	9.7	15.5	61.8
3.234	26.0	N	9.8	30.0	56.0
13.418	33.3	N	10.0	26.7	60.0
23.130	42.4	N	10.5	17.6	60.0
29.234	38.6	N	10.9	21.4	60.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.170	33.9	N	9.6	21.1	55.0
0.250	34.4	N	9.7	17.4	51.8
3.234	19.2	N	9.8	26.8	46.0
13.418	28.7	N	10.0	21.3	50.0
23.130	41.6	N	10.5	8.4	50.0
29.234	38.0	N	10.9	12.0	50.0

Test Engineer: Jenner Liu

TRF No.: FCC 15C_PC_b
 FCC ID: W8U28S305
 Report No.: 161201002SZN-001

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EXHIBIT 4
EQUIPMENT PHOTOGRAPHS

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4.0 Equipment Photographs

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

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EXHIBIT 5
PRODUCT LABELLING

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5.0 Product Labelling

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

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EXHIBIT 6
TECHNICAL SPECIFICATIONS

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6.0 Technical Specifications

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

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EXHIBIT 7
INSTRUCTION MANUAL

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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.

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EXHIBIT 8

MISCELLANEOUS INFORMATION

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8.0 Miscellaneous Information

This miscellaneous information includes emission measuring procedure.

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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.

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8.1 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.

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EXHIBIT 9
TEST EQUIPMENT LIST

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9.0 Test Equipment List

For Radiated Emission test

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
EE089	EMI Test Receiver	Rohde & Schwarz	ESU	1302.600 5.26	17-May-2016	17-May-2017
EE040	Pre-Amplifier	HP	8447F	2944A07 999	17-May-2016	17-May-2017
EE043	Bilog Antenna	Schwarzbeck	VULB916 3	142	17-May-2016	17-May-2017
EE147	Cable	Schwarzbeck	AK9513	ACRX1	17-May-2016	17-May-2017
EE169	Cable	Rosenberger	N/A	FP2RX2	17-May-2016	17-May-2017
EE168	Cable	Schwarzbeck	AK9513	CRPX1	29-May-2016	29-May-2017
EE170	Cable	Schwarzbeck	AK9513	CRRX2	29-May-2016	29-May-2017
EE096	Pre-Amplifier	A.H.	PAM- 0126	1415261	17-May-2016	17-May-2017
EE094	Horn Antenna	Schwarzbeck	BBHA 9120	707	29-May-2016	29-May-2017
EE097	Cable	H+B	0.5M SF104- 26.5	289147/4	29-May-2016	29-May-2017
EE100	Cable	H+B	3M SF104- 26.5	295838/4	29-May-2016	29-May-2017
EE101	Cable	H+B	6M SF104- 26.5	295840/4	29-May-2016	29-May-2017
EE095	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA917 0399	17-May-2016	17-May-2017
EE343	EMI Test Receiver	Rohde & Schwarz	FSV40	132.1- 3008K39- 100967- AP	29-May-2016	29-May-2017
EE240	Pre-Amplifier	Lunar EM	LNA26G4 0-40	J1013131 028001	17-May-2016	17-May-2017
EE234	Horn Antenna	AHS/USA	SAS-573	184	17-May-2016	17-May-2017
EE312	Cable	A.H	SAC- 40G-1	414	17-May-2016	17-May-2017
EE313	Cable	A.H	SAC- 40G-1	413	17-May-2016	17-May-2017

TRF No.: FCC 15C_PC_b
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9.0 Test Equipment List (cont'd)

For Conducted Emission test

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	01-Nov-2016	01-Nov-2017
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	01-Nov-2016	01-Nov-2017
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	01-Jul-2016	01-Jul-2017
SZ188-03	Shielding Room	ETS	RFD-100	4100	17-Aug-2016	17-Aug-2018