MERCHSOURCE.LLC

TEST REPORT

SCOPE OF WORK
FCC TESTING–SI TWS

REPORT NUMBER
200418010SZN-002

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TEST REPORT

Intertek Report No.: 200418010SZN-002

MERCHSOURCE.LLC

Application
For
Certification

FCC ID: 2AEVM1012482

Earbuds True Wireless In Ear with Qi Charging

Model: SI TWS

Report No.: 200418010SZN-002

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 18,
mention 47 CFR [10-1-18]

Prepared and Checked by:

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Technical Supervisor
Date: 30 April 2020

LIST OF EXHIBITS

INTRODUCTION

EXHIBIT 1: Summary of Tests

EXHIBIT 2: General Description

EXHIBIT 3: System Test Configuration

EXHIBIT 4: Measurement Results

EXHIBIT 5: Equipment Photographs

EXHIBIT 6: Product Labeling

EXHIBIT 7: Technical Specifications

EXHIBIT 8: Instruction Manual

EXHIBIT 9: Confidentiality Request

EXHIBIT 10: Miscellaneous Information

EXHIBIT 11: Test Equipment List

GENERAL INFORMATION

Applicant / Company:	MERCHSOURCE.LLC 7755 Irvine Center Drive, Suite 100, Irvine, CA 92618, USA.
Equipment Under Test (EUT):	
Product Description:	Earbuds True Wireless In Ear with Qi Charging
Model:	SI TWS
Brand Name:	SHARPER IMAGE
Nominal operating frequency	110-205 kHz
Maximum RF energy generated	2.5 W
Sample Receipt Date:	18 April 2020
Test Conducted Date:	18 April 2020 to 27 April 2020
Issue Date:	30 April 2020
Test Site and Location:	Intertek Testing Services Shenzhen Ltd. Longhua Branch 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China
Environmental Conditions:	Temperature: 15 to 35 °C Humidity: 10 to 90%

Table of Contents

1.0 Summary of Test results 7
2.0 General Description 9
2.1 Product Description 9
2.2 Related Submittal(s) Grants 9
2.3 Test Methodology 9
2.4 Test Facility 9
3.0 System Test Configuration 11
3.1 Justification 11
3.2 EUT Exercising Software 11
3.3 Special Accessories 11
3.4 Measurement Uncertainty 11
3.5 Equipment Modification 11
3.6 Support Equipment List and Description 12
4.0 Measurement Results 14
4.1 Field Strength Calculation 14
4.2 Radiated Emission Configuration Photograph 15
4.3 Radiated Spurious Emission 15
4.4 Conducted Emission Configuration Photograph 17
4.5 Conducted Emission 17
5.0 Equipment Photographs 21
6.0 Product Labelling 23
7.0 Technical Specifications 25
8.0 Instruction Manual 27
9.0 Miscellaneous Information 29
9.1 Emissions Test Procedures 29
9.2 Radiated Emissions Test Setup 30
9.3 Conducted Emissions Test Configuration 30
9.4 Conducted Emissions Test Setup 30
10.0 Confidentiality Request 32
11.0 Test Equipment List 34

List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
Test Setup Photo	Radiated Emission	radiated photos.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

SUMMARY OF TEST RESULTS

1.0 Summary of Test results

Earbuds True Wireless In Ear with Qi Charging

Model: SI TWS

FCC ID: 2AEVM1012482

TEST ITEM	REFERENCE	RESULTS
Field Strength Limit	18.305	Pass
Conduction Limit	18.307	Pass

EXHIBIT 2

GENERAL DESCRIPTION

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Earbuds True Wireless In Ear with Qi Charging operating at 110-205 kHz. The EUT is powered by DC 5V through wireless charging Pad or USB port. For more detailed features description, please refer to the user's manual.

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 wireless charging box. And related report for FCC SDOC is subjected to report number: 200418010SZN-001.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the FCC procedures in MP-5, "Methods of Measurements of Radio Noise Emissions from Industrial, Scientific and Medical equipment (February 1986)", 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 shield 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.

EXHIBIT 3

SYSTEM TEST CONFIGURATION

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 MP5-1986.

The EUT was powered by DC 5V through wireless charging Pad or USB port during the test. Only the worst- case data was shown in the report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 2 meters above the ground, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data report in Exhibit 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 mounted to a plastic stand if necessary and placed on the styrene turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

3.2 EUT Exercising Software

N/A.

3.3 Special Accessories

There are no special accessories necessary for compliance of this product.

3.4 Measurement Uncertainty

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

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by MERCHSOURCE.LLC 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

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Detail
USB Cable	Gotek	Unshielded, Length 20cm
Wireless charging Pad	Onn.	Model: ONB18WI701 Input: 5V 2A Output: 10W (Max)
Adapter	XIAOMI	Input: 100-240Vac 50/60Hz Output: 5Vdc 2.5A (Max)

EXHIBIT 4

MEASUREMENT RESULTS

4.0 Measurement Results

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.

4.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

4.2 Radiated Emission Configuration Photograph

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

4.3 Radiated Spurious Emission

Worst Case Radiated Spurious Emission
at
0.011MHz

Judgement: Passed by 9.0dB margin

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

Applicant: MERCHSOURCE.LLC
Date of Test: 27 April 2020 Model: SI TWS
Worst Case Operating Mode: Charging and power transfer

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	0.011	32.6	0.0	21.9	54.5	63.5	-9.0
Horizontal	0.013	30.2	0.0	21.8	52.0	63.5	-11.5
Horizontal	0.204	32.1	0.0	18.1	50.2	63.5	-13.3
Horizontal	0.247	31.0	0.0	18.4	49.4	63.5	-14.1
Horizontal	0.307	33.7	0.0	18.8	52.5	63.5	-11.0
Horizontal	1.393	26.0	0.0	16.0	42.0	63.5	-21.5
Horizontal	2.010	27.8	0.0	14.7	42.5	63.5	-21.0

Notes:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. 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. Loop antenna is used for the emission under 30MHz.
5. Limits at 3 meters for radiated emissions below 30 MHz is converted from the Limits at 300 meter according to the Formula:
   $\text{Limits}_{\text{at 3 meter (dBµV/m)}} = \text{Limits}_{\text{at 30 meter (dBµV/m)}} + 20 \log (300/3)$
6. Other emissions more than 20dB below the limit are not reported.
7. The measurement uncertainty is ±4.8dB at a level of confidence of 95%.

4.4 Conducted Emission Configuration Photograph

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

4.5 Conducted Emission

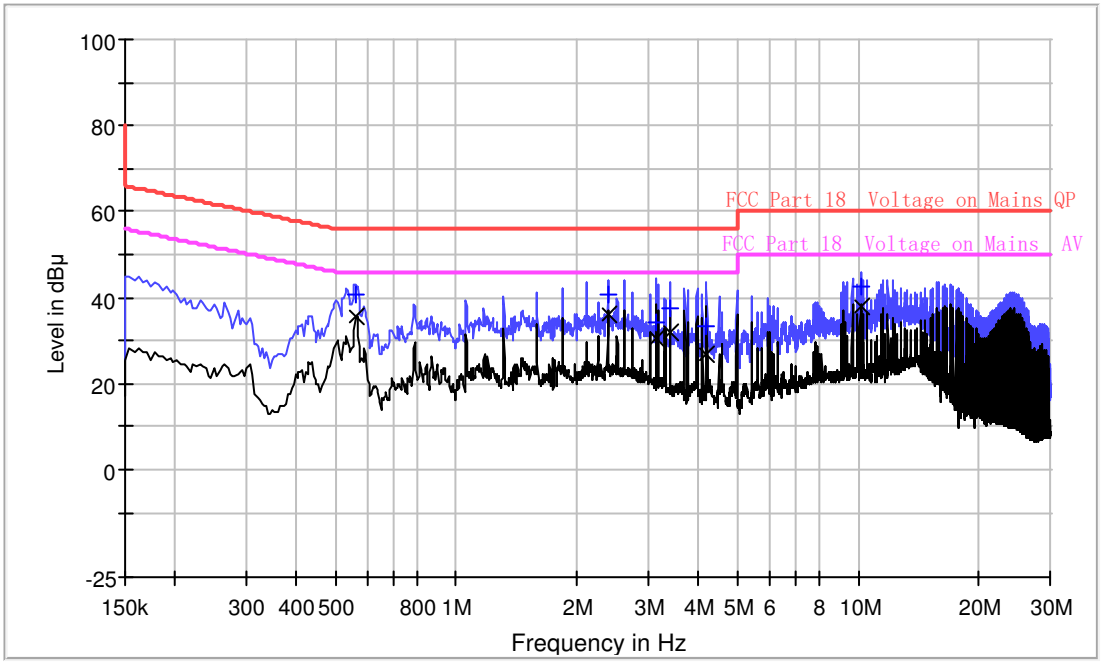
Worst Case Conducted Configuration
at
2.382MHz

Judgement: Passed by 9.9dB margin

Applicant: MERCHSOURCE.LLC
Date of Test: 27 April 2020 Model: SI TWS
Worst Case Operating Mode: Charging and power transfer
Phase: Live

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 18.307: Emissions Requirement



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.562000	40.6	9.000	L1	9.7	15.4	56.0
2.382000	40.9	9.000	L1	9.7	15.1	56.0
3.150000	34.4	9.000	L1	9.8	21.6	56.0
3.414000	37.3	9.000	L1	9.8	18.7	56.0
4.198000	33.4	9.000	L1	9.8	22.6	56.0
10.190000	42.5	9.000	L1	9.9	17.5	60.0

Limit and Margin AV

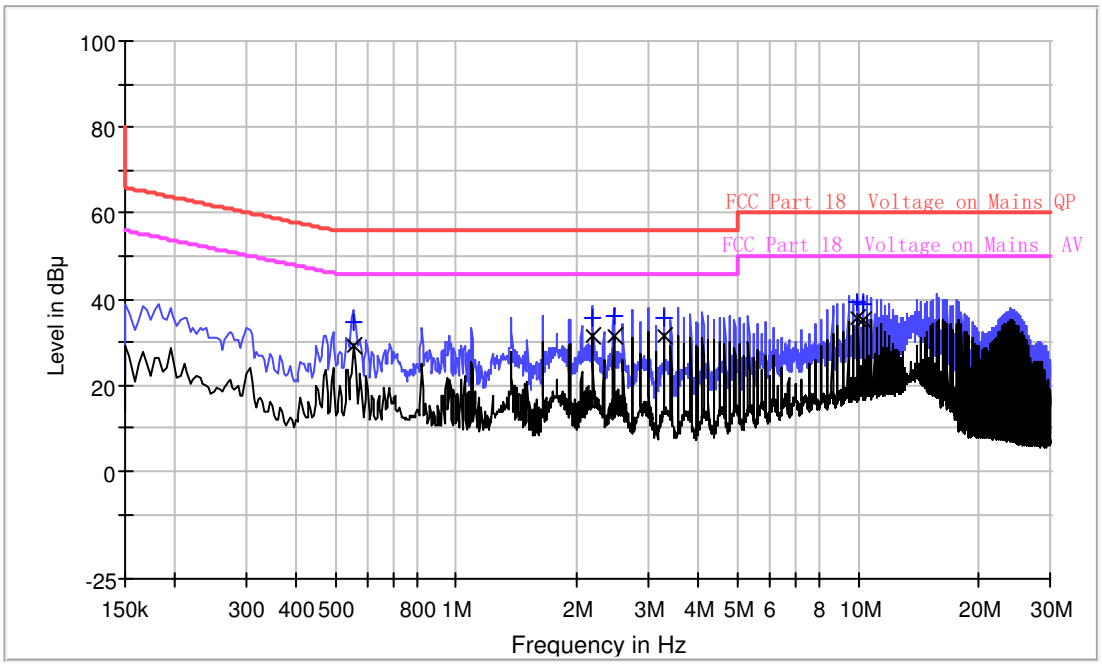
Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.562000	35.6	9.000	L1	9.7	10.4	46.0
2.382000	36.1	9.000	L1	9.7	9.9	46.0
3.150000	30.5	9.000	L1	9.8	15.5	46.0
3.414000	31.7	9.000	L1	9.8	14.3	46.0
4.198000	26.8	9.000	L1	9.8	19.2	46.0
10.190000	38.2	9.000	L1	9.9	11.8	50.0

Note: The measurement uncertainty is ±3.6dB at a level of confidence of 95%.

Applicant: MERCHSOURCE.LLC
Date of Test: 27 April 2020 Model: SI TWS
Worst Case Operating Mode: Charging and power transfer
Phase: N

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 18.307: Emissions Requirement



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.558000	34.8	9.000	N	9.7	21.2	56.0
2.190000	35.7	9.000	N	9.8	20.3	56.0
2.462000	36.0	9.000	N	9.8	20.0	56.0
3.286000	35.5	9.000	N	9.8	20.5	56.0
9.990000	39.1	9.000	N	10.0	20.9	60.0
10.262000	38.9	9.000	N	10.0	21.1	60.0

Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.558000	29.4	9.000	N	9.7	16.6	46.0
2.190000	31.5	9.000	N	9.8	14.5	46.0
2.462000	31.7	9.000	N	9.8	14.3	46.0
3.286000	31.6	9.000	N	9.8	14.4	46.0
9.990000	35.6	9.000	N	10.0	14.4	50.0
10.262000	35.4	9.000	N	10.0	14.6	50.0

Note: The measurement uncertainty is ±3.6dB at a level of confidence of 95%.

EXHIBIT 5

EQUIPMENT PHOTOGRAPHS

5.0 Equipment Photographs

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

EXHIBIT 6

PRODUCT LABELLING

6.0 Product Labeling

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

EXHIBIT 7

TECHNICAL SPECIFICATIONS

7.0 Technical Specifications

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

EXHIBIT 8

INSTRUCTION MANUAL

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.

EXHIBIT 9

MISCELLANEOUS INFORMATION

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 Industrial, Scientific and Medical equipment operating under FCC methods of measurements of radio noise emissions from Industrial, Scientific and Medical equipment.

The test set-up and procedures described below are designed to meet the requirements of FCC/OST MP-5(1986).

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 2 meter above the ground, and the antenna polarization was changed.

Loop antenna was used as receiving antenna. In order to find the maximum emission, all of the interface cables were manipulated according to FCC OST/MP-5 requirement during radiated test.

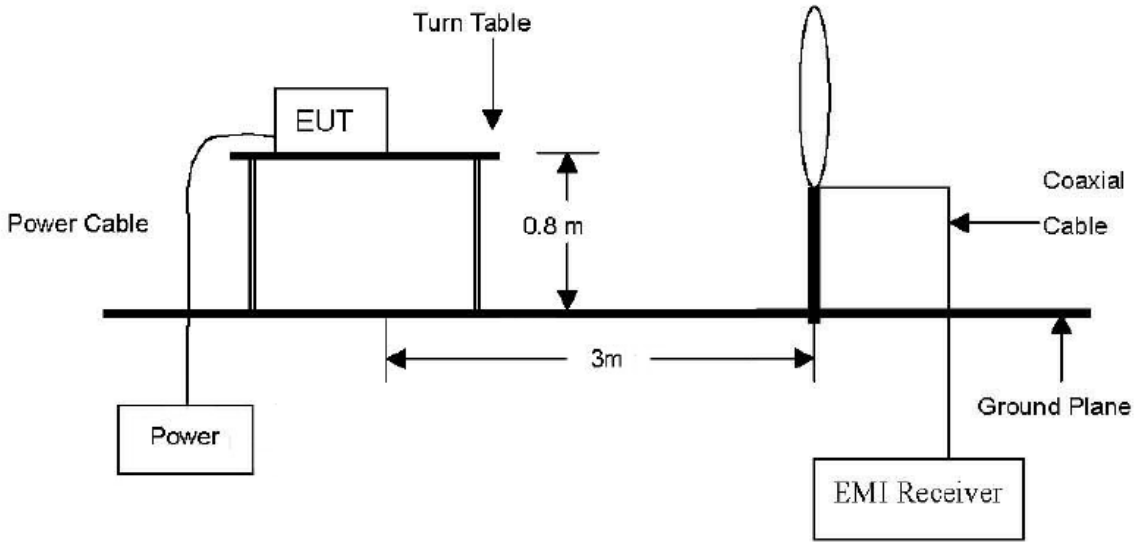
The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz.

The frequency range scanned is from the lowest radio frequency signal generated in the device, but not lower than 9kHz to the highest frequency of 30MHz.

For conducted powerline measurements, the frequency range over which the limits are specified will be scanned.

9.2 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



9.3 Conducted Emission Test Configuration

Conducted emissions test

Measurements of powerline conducted radio noise shall be expressed as the voltage developed across the 50-ohm port terminated by a 50-ohm measuring instrument. All voltage measurement shall be made at the plug end of the EUT power cord, e.g., by the use of mating plugs and receptacles on the EUT and LISN.

9.4 Conducted Emission Test Setup

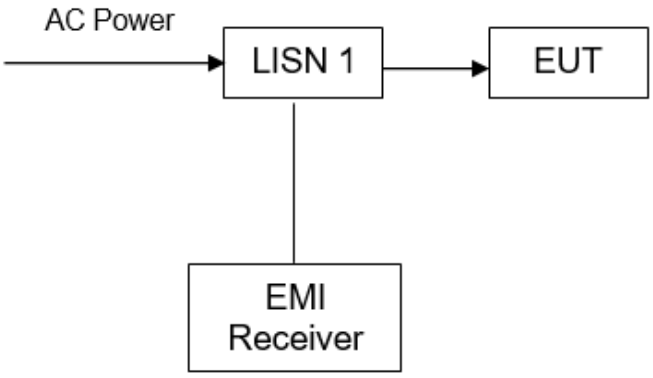


EXHIBIT 10

CONFIDENTIALITY REQUEST

10.0 Confidentiality Request

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

EXHIBIT 11

TEST EQUIPMENT LIST

11.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ185-01	EMI Receiver	R&S	ESCI	100547	24-Dec-2019	24-Dec-2020
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	24-May-2019	24-May-2020
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	28-May-2019	28-May-2020
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	05-Jul-2019	05-Jul-2020
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2020
SZ062-02	RF Cable	RADIALL	RG 213U	--	16-Dec-2019	16-Jun-2020
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	26-Feb-2019	26-Aug-2020
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	26-Feb-2019	26-Aug-2020
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	29-Oct-2019	29-Oct-2020
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	29-Oct-2019	29-Oct-2020
SZ188-03	Shielding Room	ETS	RFD-100	4100	07-Jan-2020	07-Jan-2022
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	30-Oct-2019	30-Oct-2020