

FCC TEST REPORT
FOR
Vision Automotive Technology
Low Frequency Tool
Test Model: LF-1

Prepared for : Vision Automotive Technology
Address : 600 Waterdale Road, Heidelberg West, Melbourne, Australia

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : May 11, 2018
Number of tested samples : 1
Serial number : Prototype
Date of Test : June 06, 2018~ June 13, 2018
Date of Report : July 24, 2018

**FCC TEST REPORT
FCC CFR 47 PART 15 C (15.209)**

Report Reference No. : **LCS180511050AEA**

Date of Issue..... : July 24, 2018

Testing Laboratory Name..... : **Shenzhen LCS Compliance Testing Laboratory Ltd.**

Address..... : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

Testing Location/ Procedure : Full application of Harmonised standards
 Partial application of Harmonised standards
 Other standard testing method

Applicant's Name..... : **Vision Automotive Technology**

Address..... : 600 Waterdale Road, Heidelberg West, Melbourne, Australia

Test Specification

Standard : FCC CFR 47 PART 15 C (15.209)

Test Report Form No. : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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Test Item Description. : **Low Frequency Tool**

Trade Mark : N/A

Test Model..... : LF-1

Ratings..... : DC 3.0V by battery

Result : **Positive**

Compiled by:

Peter Xiao

Supervised by:

Calvin Weng

Approved by:

Gavin Liang

Peter Xiao / File administrators

Calvin Weng / Technique principal

Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS180511050AEA	<u>July 24, 2018</u> Date of issue
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Test Model.....	: LF-1
EUT.....	: Low Frequency Tool
Applicant.....	: Vision Automotive Technology
Address.....	: 600 Waterdale Road, Heidelberg West, Melbourne, Australia
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Gobiz Electronics Limited
Address.....	: Rm 201, 2/F, Hi-Tech Centre, 9 Choi Yuen Road, Sheung Shui, N.T., Hong Kong, China
Telephone.....	: /
Fax.....	: /
Factory.....	: Gobiz Electronics Limited
Address.....	: Rm 201, 2/F, Hi-Tech Centre, 9 Choi Yuen Road, Sheung Shui, N.T., Hong Kong, China
Telephone.....	: /
Fax.....	: /

Test Result	Positive
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The test report merely corresponds to the test sample.
 It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	July 24, 2018	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT : Low Frequency Tool
 Test Model : LF-1
 Hardware Version : V1
 Software Version : V1.0
 Power Supply : DC 3.0V by battery
 Transmitting Frequency : 125KHz
 Modulation Type : /
 Antenna Description : Internal Antenna, 0dBi (Max.)

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
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1.3 External I/O

I/O Port Description	Quantity	Cable
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1.4 Description of Test Facility

FCC Registration Number. is 254912.
 Industry Canada Registration Number. is 9642A-1.
 ESMD Registration Number. is ARCB0108.
 UL Registration Number. is 100571-492.
 TUV SUD Registration Number. is SCN1081.
 TUV RH Registration Number. is UA 50296516-001
 NVLAP Registration Code is 600167-0

1.5 Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiation Uncertainty	9KHz~30MHz	±3.10dB	(1)
	30MHz~200MHz	±2.96dB	(1)
	200MHz~1000MHz	±3.10dB	(1)
	1GHz~26.5GHz	±3.80dB	(1)
	26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	150kHz~30MHz	±1.63dB	(1)
Power disturbance	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7 Description Of Test Modes

The EUT was set to transmit at 100% duty cycle for testing and the worst case was record.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR PART 15C 15.209.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.209 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions (N/A)

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable shall rotate LF-1 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013

3. SYSTEM TEST CONFIGURATION

3.1 Justification

N/A.

3.2 EUT Exercise Software

N/A.

3.3 Special Accessories

N/A.

3.4 Block Diagram/Schematics

Please refer to the report.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

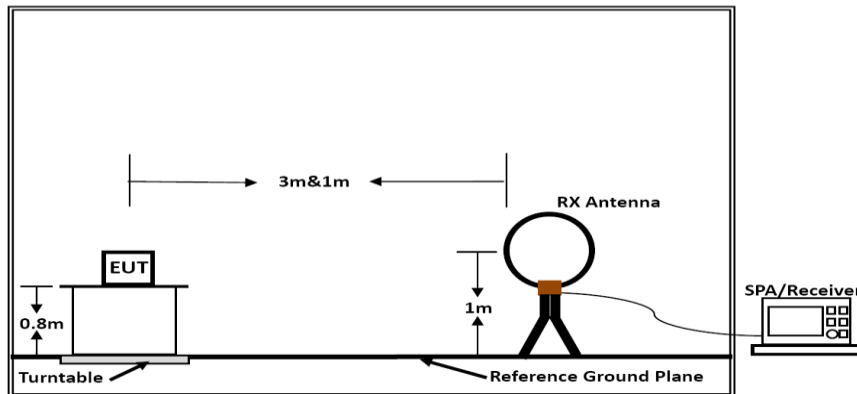
Please refer to the test setup photo.

4. SUMMARY OF TEST RESULT

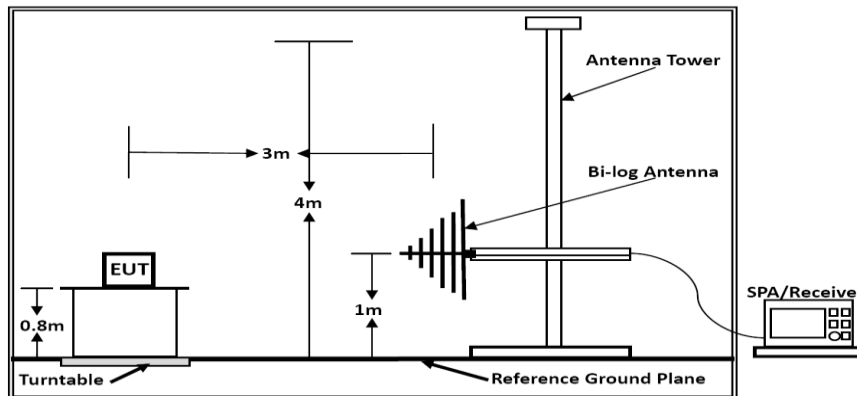
FCC Rules	Test Items	Result
15.207	Power-line Conducted Emissions	N/A
15.205 & 15.209	Radiated Emissions	PASS
15.215	20dB Bandwidth	PASS
15.203	Antenna Requirement	PASS

5. RADIATED MEASUREMENT

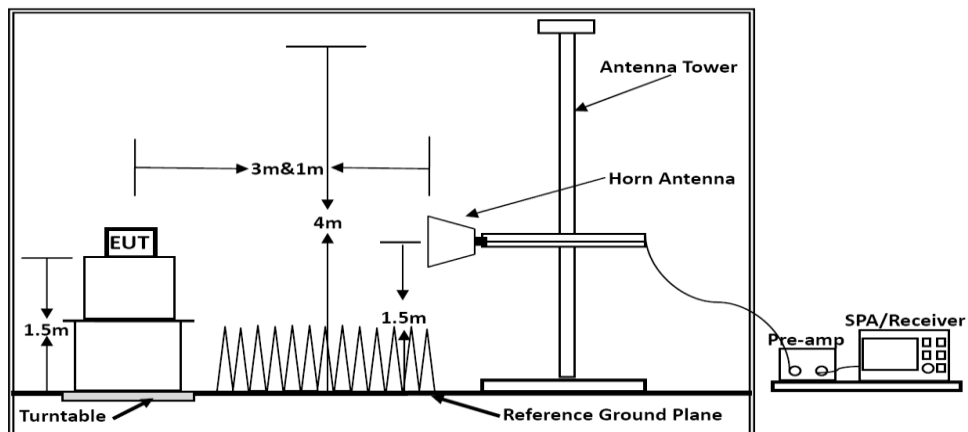
5.1 Block Diagram of Test Setup



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log(\text{specific distance [3m]} / \text{test distance [1.5m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.2 Radiated Emission Limit

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	LF-10-4400	(\2)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Limit calculation and transfer to 3m distance as showed in the following table:

Frequency (MHz)	Limit (dBuV/m)	Distance (m)
0.009-0.490	20log(2400/F(KHz))+40log(300/3)	3
0.490-1.705	20log(2400/F(KHz))+40log(30/3)	3
1.705-30.0	69.5	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

5.3 Test Results

PASS.

The test data please refer to following page:

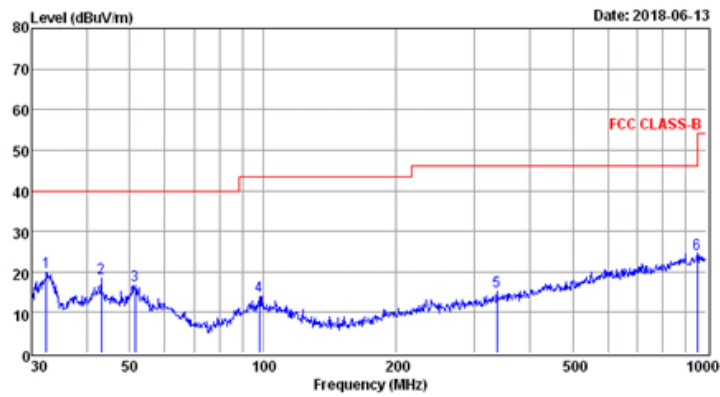
9KHz ~ 30MHz (TX-125KHz)

Freq. MHz	Reading dBuV	Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark
0.125	60.17	12.01	72.18	105.67	33.49	Peak
0.250	31.24	12.00	43.24	99.65	56.41	Peak
0.375	30.56	11.89	42.45	96.12	53.67	Peak
0.500	29.54	11.81	41.35	68.76	27.41	Peak
2.542	25.32	11.77	37.09	69.50	32.41	Peak
4.689	26.87	11.71	38.58	69.50	30.92	Peak
10.332	29.64	11.04	40.68	69.50	28.82	Peak
14.625	30.51	10.54	41.05	69.50	28.45	Peak
22.364	30.15	9.60	39.75	69.50	29.75	Peak
27.625	31.26	8.91	40.17	69.50	29.33	Peak

*****Note:**

- 1). *Factor= Antenna Factor + Cable Loss – Amplifier Gain.*
- 2). *The EUT was configured as normal. The measurement antenna was positioned with its plane perpendicular to the ground at the specified distances (Antenna Position: Horizontal). Only record the worst test data in this report.*

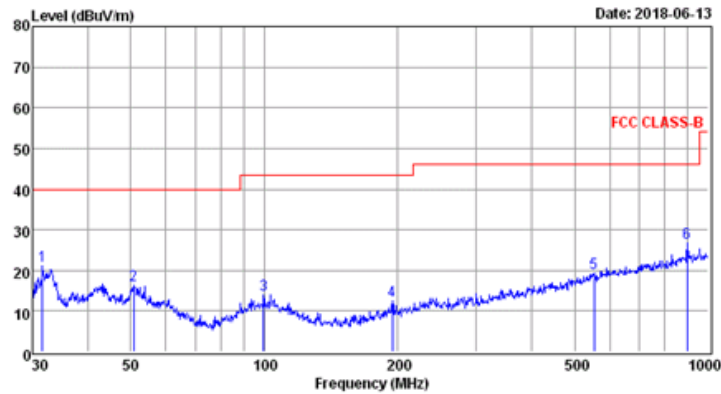
30MHz ~ 1GHz (TX-125KHz)



Env./Ins: 23.5°C/53.4%
 pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	32.41	7.29	0.37	12.32	19.98	40.00	-20.02	QP
2	43.05	4.25	0.50	13.56	18.31	40.00	-21.69	QP
3	51.30	3.00	0.54	13.19	16.73	40.00	-23.27	QP
4	98.14	0.40	0.61	13.04	14.05	43.50	-29.45	QP
5	337.22	0.04	1.09	14.01	15.14	46.00	-30.86	QP
6	955.44	1.13	1.89	21.45	24.47	46.00	-21.53	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that ate 20db below the official limit are not reported



Env./Ins: 23.5°C/53.4%
 pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	31.62	8.39	0.37	12.32	21.08	40.00	-18.92	QP
2	50.76	2.60	0.54	13.21	16.35	40.00	-23.65	QP
3	99.53	0.26	0.61	13.13	14.00	43.50	-29.50	QP
4	194.45	1.04	0.76	10.56	12.36	43.50	-31.14	QP
5	552.88	0.17	1.46	17.57	19.20	46.00	-26.80	QP
6	897.00	3.60	1.97	21.06	26.63	46.00	-19.37	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that ate 20db below the official limit are not reported

6. BANDWIDTH OF THE OPERATING FREQUENCY

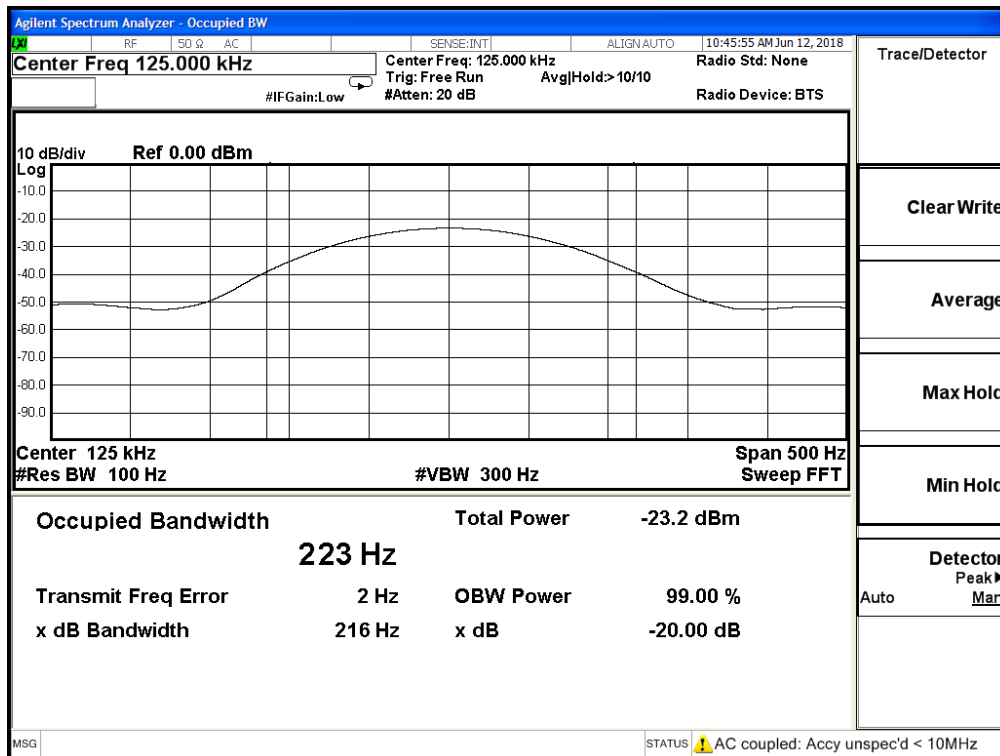
6.1 Standard Applicable

According to its specifications, the EUT must comply with the 20dB Bandwidth measurement of the Section 15.215 under the FCC Rules Part 15 Subpart C.

6.2 Test Result

EUT	Low Frequency Tool	
RBW	100Hz	
VBW	300Hz	
SPAN	500Hz	
Carrier Freq. (KHz)	20dB Bandwidth (KHz)	Limit (KHz)
125	216	None

Please refer to the test plot:



7. ANTENNA REQUIREMENT

7.1 Standard Applicable

According to § 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

7.2 Antenna Connected Construction

The antenna used for transmitting is permanently attached and no consideration of replacement. Please see EUT photo for details.

8. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

9. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

10. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

11. LIST OF MEASURING EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Meter	R&S	NRVS	100444	2017-06-17	2018-06-16
2	Power Sensor	R&S	NRV-Z81	100458	2017-06-17	2018-06-16
3	Power Sensor	R&S	NRV-Z32	10057	2017-06-17	2018-06-16
4	EPM Series Power Meter	Agilent	E4419B	MY45104493	2017-06-17	2018-06-16
5	E-SERIES AVG POWER SENSOR	Agilent	E9301H	MY41495234	2017-06-17	2018-06-16
6	ESA-E SERIES SPECTRUM ANALYZER	Agilent	E4407B	MY41440754	2017-11-17	2018-11-16
7	MXA Signal Analyzer	Agilent	N9020A	MY49100040	2017-06-17	2018-06-16
8	SPECTRUM ANALYZER	R&S	FSP	100503	2017-06-17	2018-06-16
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17	2018-06-16
10	Positioning Controller	MF	MF-7082	/	2017-06-17	2018-06-16
11	EMI Test Software	AUDIX	E3	/	N/A	N/A
12	EMI Test Receiver	R&S	ESR 7	101181	2017-06-17	2018-06-16
13	AMPLIFIER	QuieTek	QTK-A2525G	CHM10809065	2017-11-17	2018-11-16
14	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2017-06-23	2018-06-22
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-05-01	2019-04-30
16	Horn Antenna	EMCO	3115	6741	2017-06-23	2018-06-22
17	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2017-09-21	2018-09-20
18	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-025	2017-09-21	2018-09-20
19	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-17	2018-06-16
20	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-17	2018-06-16
21	TEST RECEIVER	R&S	ESCI	101142	2017-06-17	2018-06-16
22	RF Cable-CON	UTIFLEX	3102-26886-4	CB049	2017-06-17	2018-06-16
23	10dB Attenuator	SCHWARZBECK	MTS-IMP136	261115-001-0032	2017-06-17	2018-06-16
24	Artificial Mains	R&S	ENV216	101288	2017-06-17	2018-06-16
25	RF Control Unit	JS Tonscend Corporation	JS0806-2	178060073	2017-10-28	2018-10-27
26	JS1120-3 BT/WIFI Test Software	JS Tonscend Corporation	JS1120-3	/	N/A	N/A

Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.

-----THE END OF REPORT-----