

Huawei Technologies Co.,Ltd

Application
For
Certification

FCC ID: QISWS880

802.11ac Wireless Router

Model: WS880

Class B Personal Computer Peripherals

Report No.: 150108020SZN-001

Prepared and Checked by:

Approved by:

Sign on file

Lin Lin
Senior Project Engineer

Andy Yan
Senior Project Engineer
Date: 2 February 2015

- 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

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INTERTEK TESTING SERVICES

LIST OF EXHIBITS

INTRODUCTION

<i>EXHIBIT 1:</i>	General Description
<i>EXHIBIT 2:</i>	System Test Configuration
<i>EXHIBIT 3:</i>	Emission Results
<i>EXHIBIT 4:</i>	Equipment Photographs
<i>EXHIBIT 5:</i>	Product Labeling
<i>EXHIBIT 6:</i>	Technical Specifications
<i>EXHIBIT 7:</i>	Instruction Manual
<i>EXHIBIT 8:</i>	Miscellaneous Information
<i>EXHIBIT 9:</i>	Confidentiality Request
<i>EXHIBIT 10:</i>	Test Equipment List

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MEASUREMENT / TECHNICAL REPORT

Huawei Technologies Co.,Ltd

MODEL: WS880

FCC ID: QISWS880

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

Equipment Type: JBP-Part 15 Class B Computing Device/Peripherals

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 C for intentional radiator – the new 47 CFR [10-01-13 Edition] provision.

Report prepared by:

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Table of Contents

1.0	<u>General Description</u>	2
1.1	Product Description.....	2
1.2	Related Submittal(s) Grants.....	2
1.3	Test Methodology.....	2
1.4	Test Facility.....	2
2.0	<u>System Test Configuration</u>	4
2.1	Justification.....	4
2.2	EUT Exercising Software.....	4
2.3	Special Accessories.....	4
2.4	Equipment Modification.....	4
2.5	Measurement Uncertainty.....	5
2.6	Support Equipment List and Description.....	5
3.0	<u>Emission Results</u>	7
3.1	Field Strength Calculation.....	8
3.2	Radiated Emission Configuration Photograph.....	9
3.3	Radiated Emission Data.....	9
3.4	Conducted Emission Configuration Photograph.....	11
3.5	Conducted Emission Data.....	11
4.0	<u>Equipment Photographs</u>	15
5.0	<u>Product Labelling</u>	17
6.0	<u>Technical Specifications</u>	19
7.0	<u>Instruction Manual</u>	21
8.0	<u>Miscellaneous Information</u>	23
8.1	Emissions Test Procedures.....	23
9.0	<u>Confidentiality Request</u>	26
10.0	<u>Test Equipment List</u>	28

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List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	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	Confidentiality 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 802.11ac Wireless Router, It is powered by AC/DC Adapter. The personal computers can through this router to connect with internet for personal use. For more detailed features description, please refer to the user's manual.

1.2 Related Submittal(s) Grants

This is an application for certification of a computer peripherals.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). 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 Test Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, D Block, 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).

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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 Test in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2009).

The device was powered by AC Adapter through 120V/60Hz during the test. 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 Test in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The frequency range from 30MHz to 5GHz (EUT highest frequency is 800MHz, so according to 15.33, the test range is update to 5GHz) 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

The EUT exercise program (provided by client) used during radiated and conducted Test was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified Test.

2.3 Special Accessories

N/A

2.4 Equipment Modification

Any modifications installed previous to Test by Huawei Technologies Co.,Ltd Will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Test Services Shenzhen Ltd.

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Kejiyuan 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
USB Cable	Smart.drive	Unshielded, Length 155cm
1394 Cable	Smart.drive	Unshielded, Length 180cm
LAN Cable*5	N/A	Unshielded, Length: 200cm
AC Adapter	Huawei	HW-120300U6W Input:100-240V 50/60Hz Output: 12Vdc, 3A
USB Disk	Sandisk	USB 3.0 / 16GB
Router*4	TP-LINK	TL-MR11U

Note: this production including two AC/DC Adapter suppliers, and had been arranged testing separately, the worst-case was recorded in this report.

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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.

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

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

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor 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:

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

Example

Assume a receiver reading of 62.0dB μ V is obtained. The antenna factor of 7.4dB and cable factor of 1.6dB is added. The amplifier gain of 29dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0dB, and the resultant average factor was -10dB. The net field strength for comparison to the appropriate emission limit is 32dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

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

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

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

$$PD = 0\text{dB}$$

$$AV = -10\text{dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32\text{dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8\mu\text{V/m}$$

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3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
At
755.568MHz (Data transfer Mode)

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

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 6.9dB margin (Data transfer Mode)

TEST PERSONNEL:

Sign on file

Lin Lin Senior Project Engineer
Typed/Printed Name

23 January 2015
Date

INTERTEK TESTING SERVICES

Applicant: Huawei Technologies Co.,Ltd

Model: WS880

Worst case operating Mode: Data transfer (AC/DC Adapter: UE)

Radiated Emissions (30MHz~5GHz)

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	151.735	43.6	20.0	9.1	32.7	43.5	-10.8
Horizontal	375.305	43.2	20.0	13.0	36.2	46.0	-9.8
Horizontal	599.390	39.6	20.0	18.3	37.9	46.0	-8.1
Vertical	85.325	42.5	20.0	8.4	30.9	40.0	-9.1
Vertical	599.390	39.6	20.0	18.3	37.9	46.0	-8.1
Vertical	755.568	39.9	20.0	19.2	39.1	46.0	-6.9
Vertical	1802.493	33.8	20.0	29.9	43.7	54.0	-10.3

NOTES:

1. Quasi-Peak detector is used for frequency up to 1GHz and PEAK detector is used for frequency from 1-5GHz.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3 meter distances 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. All emissions up to 1GHz are below the QP limit and all emissions between 1-5GHz are below the AV limit.

TRF No.: FCC 15C_PC_b

FCC ID: QISWS880

Report No.: 150108020SZN-001

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3.4 Conducted Emission Configuration Photograph

Worst Case Neutral-Conducted Configuration
at
0.414 MHz (Data transfer Mode)

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

3.5 Conducted Emission Data

Judgement: Passed by 4.9 dB margin (Data transfer Mode)

TEST PERSONNEL:

Sign on file

Lin Lin Senior Project Engineer
Typed/Printed Name

23 January 2015
Date

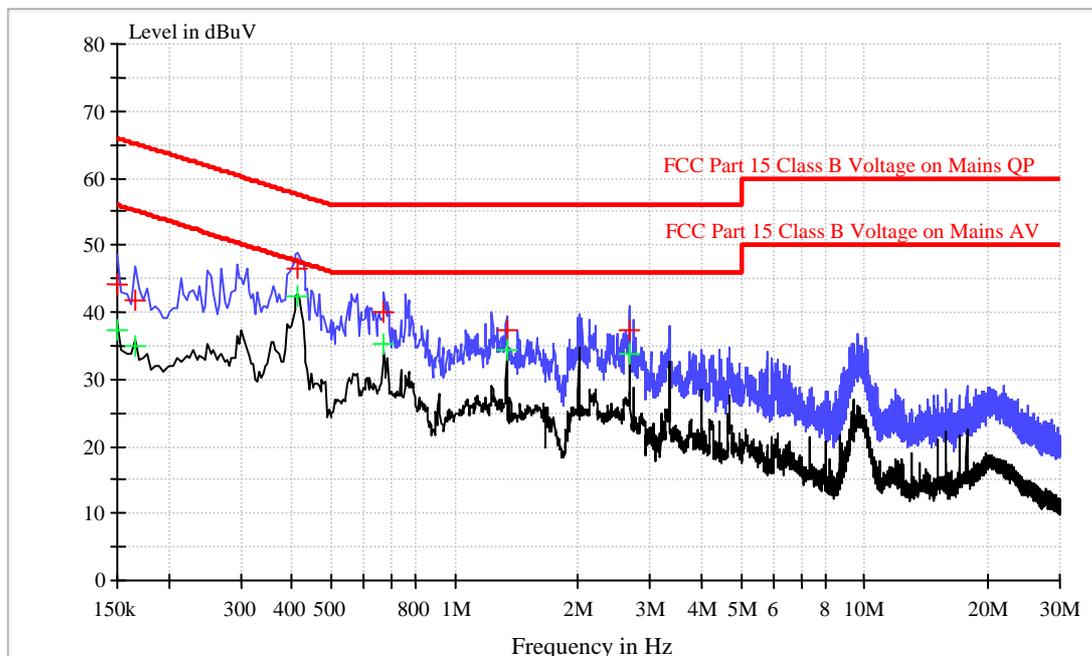
INTERTEK TESTING SERVICES

Applicant: Huawei Technologies Co.,Ltd

Model: WS880

Worst case operating Mode: Data transfer (AC/DC Adapter: UE)

Conducted Emission Test – FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150	44.1	L1	9.8	21.9	66.0
0.166	41.8	L1	9.8	23.4	65.2
0.414	46.5	L1	9.8	11.1	57.6
0.670	39.9	L1	10.0	16.1	56.0
1.338	37.4	L1	9.9	18.6	56.0
2.678	37.4	L1	9.9	18.6	56.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150	37.5	L1	9.8	18.5	56.0
0.166	35.0	L1	9.8	20.2	55.2
0.414	42.5	L1	9.8	5.1	47.6
0.670	35.3	L1	10.0	10.7	46.0
1.338	34.4	L1	9.9	11.6	46.0
2.678	33.8	L1	9.9	12.2	46.0

TRF No.: FCC 15C_PC_b

FCC ID: QISWS880

Report No.: 150108020SZN-001

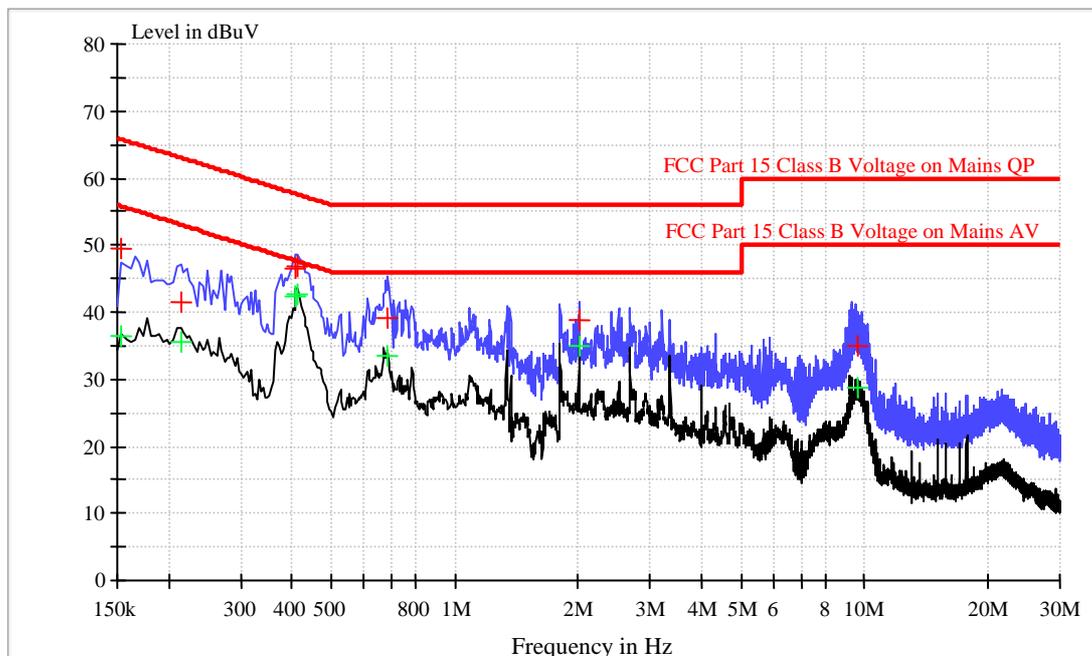
INTERTEK TESTING SERVICES

Applicant: Huawei Technologies Co.,Ltd

Model: WS880

Worst case operating Mode: Data transfer (AC/DC Adapter: UE)

Conducted Emission Test – FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154	49.5	N	10.0	16.3	65.8
0.214	41.6	N	10.1	21.4	63.0
0.410	46.6	N	10.1	11.0	57.6
0.414	46.9	N	10.1	10.7	57.6
0.686	39.1	N	10.2	16.9	56.0
2.010	38.8	N	10.3	17.2	56.0
9.678	34.9	N	10.4	25.1	60.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154	36.4	N	10.0	19.4	55.8
0.214	35.7	N	10.1	17.3	53.0
0.410	42.5	N	10.1	5.1	47.6
0.414	42.7	N	10.1	4.9	47.6
0.686	33.4	N	10.2	12.6	46.0
2.010	35.0	N	10.3	11.0	46.0
9.678	28.7	N	10.4	21.3	50.0

TRF No.: FCC 15C_PC_b

FCC ID: QISWS880

Report No.: 150108020SZN-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.

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.

8.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Test 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 - 2009.

The computer equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one 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 Test 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. Detector function for radiated emissions are in PK&AV mode from the frequency band above 1GHz 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 5GHz. For line-conducted emissions, the range scanned is 150kHz to 30MHz.

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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 - 2009.

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EXHIBIT 9
CONFIDENTIALITY REQUEST

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9.0 **Confidentiality Request**

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

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EXHIBIT 10 TEST EQUIPMENT LIST

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10.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	Biconilog Antenna	ETS	3142C	00066460	28-Jun-2014	28-Jun-2015
SZ061-08	Horn Antenna	ETS	3115	00092346	19-Oct-2014	19-Oct-2015
EM031-03	EXA Spectrum Analyzer	R&S	FSV40	101506	09-Jun-2014	09-Jun-2015
SZ181-04	Preamplifier	Agilent	8449B	3008A02 474	10-Mar-2014	10-Mar-2015
SZ185-01	EMI Receiver	R & S	ESCI	100547	10-Mar-2014	10-Mar-2015
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	19-Apr-2014	19-Apr-2015
SZ062-02	RF Cable	RADIALL	RG 213U	--	09-Oct-2014	09-Apr-2015
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	09-Oct-2014	09-Apr-2015
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	09-Oct-2014	09-Apr-2015
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	01-Nov-2014	01-Nov-2015
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	01-Nov-2014	01-Nov-2015
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	16-Jun-2014	16-Jun-2015
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2014	23-Aug-2015