

#### **Chuango Security Technology Corporation**

Application For Certification

FCC ID: RJY-SR1000

wireless signal repeater

Model: SR1000

**Brand Name: smanos** 

Report No.: 160419028SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-14]

Prepared and Checked by: Approved by:

Sign on file

Leo Lai Senior Project Engineer Kidd Yang Senior Project Engineer

Date: June 15, 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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- For Terms And Conditions of the services, it can be provided upon request.
- The evaluation data of the report will be kept for 3 years from the date of issuance.

TRF No.: FCC 15C\_TX\_b

#### LIST OF EXHIBITS

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#### MEASUREMENT/TECHNICAL REPORT

Chuango Security Technology Corporation Model: SR1000 wireless signal repeater

FCC ID: RJY-SR1000

This report concerns (check one:)	Original Grant <u>X</u>	Class II Change						
Equipment Type: DXT - Part 15 Low Power Transceiver, Rx Verified								
Deferred grant requested per 47 CFR 0.4	57(d)(1)(ii)? Yes							
	If yes, defer until	:date						
Company Name agrees to notify the Com	mission by:							
of the intended date of announcement of date.	the product so that the	date grant can be issued on that						
Transition Rules Request per 15.37?	Yes	. No <u>X</u>						
If no, assumed Part 15, Subpart C for Edition] provision.	intentional radiator -	the new 47 CFR [10-1-14						
Report prepared by:								
	Leo Lai Intertek Testing Servic Kejiyuan Branch 6F, Block D, Huahan I Nanshan District, She Phone: (86 755) 860 Fax: (86 755) 860	Building, Langshan Road, nzhen, P. R. China 1 6288						

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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
Test Report	20dB BW Plot	bw.pdf
Test Report	Timing Plot	af.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 GENERAL DESCRIPTION

TRF No.: FCC 15C\_TX\_b FCC ID: RJY-SR1000

#### 1.0 **General Description**

#### 1.1 Product Description

The equipment under test (EUT) is a wireless signal repeater. The EUT was powered by AC 110V-240V, 50/60Hz and operating at 915MHz. For more detail information please refer to the user manual.

Antenna Type: Integral antenna

Modulation Type: ASK

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

#### 1.2 Related Submittal(s) Grants

This is an application of certification for a transmitter of the wireless signal repeater, and there is no corresponding unit for certification.

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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 C63.10 (2013). 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

#### 1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. 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 testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The EUT was powered by AC 120V 60Hz during the test. Only the worst case data was reported.

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. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.

The unit was operated standalone and placed in the centre of the turntable.

The rear of unit was flushed with the rear of the table with 0.8m height when powered by adapter up to 1GHz and placed in the centre of 1.5 m turntable above 1GHz.

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 a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

# 2.2 EUT Exercising Software N/A.

#### 2.3 Special Accessories

N/A

#### 2.4 Equipment Modification

Any modifications installed previous to testing by Chuango Security Technology Corporation 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

Description	Manufacturer	Model No.	
N/A	N/A	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).

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#### 3.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

#### 3.1.1 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.

Where  $FS = Field Strength in dB\mu V/m$ 

RA = Receiver Amplitude (including preamplifier) in dBµV

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB 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:

Assume a receiver reading of 62.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The net field strength for comparison to the appropriate emission limit is 42 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

 $RA = 62.0 dB\mu V$ 

AF = 7.4 dB

CF = 1.6 dB

 $AG = 29.0 \, dB$ 

 $FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 \, dB\mu V/m$ 

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

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#### 3.1.2 Radiated Emission Configuration Photograph

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

#### 3.1.3 Radiated Emissions

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.

Worst Case Radiated Emission at 915.000 MHz

Judgement: Passed by 2.7 dB

#### **TEST PERSONNEL:**

Sign on file

<u>Leo Lai Engineer</u> Typed/Printed Name

May 8, 2016
Date

Applicant: Chuango Security Technology Corporation

Date of Test: May 8, 2016

Model: SR1000 Sample: 1/1

Worst Case Operating Mode: Transmitting

Table 1

#### **Radiated Emissions**

Polarization	Frequency	Reading	Pre-	Antenna	Net	Limit	Margin
	(MHz)	(dBµV)	Amp	Factor	at 3m	at 3m	(dB)
			Gain	(dB)	(dBµV/m)	(dBµV/m)	
			(dB)				
Horizontal	30.169	25.7	20.0	18.1	23.8	40.0	-16.2
Horizontal	55.862	30.3	20.0	8.8	19.1	40.0	-20.9
Horizontal	915.000	81.7	20.0	29.6	91.3	94.0	-2.7
Vertical	37.475	32.1	20.0	13.8	25.9	40.0	-14.1
Vertical	52.923	41.9	20.0	8.9	30.8	40.0	-9.2
Vertical	83.741	36.7	20.0	9.5	26.2	40.0	-13.8

NOTES: 1. Quasi-Peak detector is used except for others stated.

- 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 are below the QP limit.

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#### 3.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission at 3660.000 MHz

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

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 15.7 dB

#### **TEST PERSONNEL:**

Sign on file

Leo Lai Engineer
Typed/Printed Name

May 8, 2016

Date

Applicant: Chuango Security Technology Corporation

Date of Test: May 8, 2016

Model: SR1000 Sample: 1/1

Mode: Transmitting (915MHz)

# Table 2 Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	1830.000	51.9	37.2	30.9	45.6	74.0	-28.4
Horizontal	2745.000	46.9	37.2	32.6	42.3	74.0	-31.7
Horizontal	3660.000	52.8	37.1	32.5	48.2	74.0	-25.8

Polarization	Frequency	Reading	Pre-	Antenna	Average	Net	Average Limit	Margin
	(MHz)	(dBµV)	Amp	Factor	Factor	at 3m	at 3m	(dB)
			Gain	(dB)	(-dB)	(dBµV/m)	(dBµV/m)	
			(dB)					
Horizontal	1830.000	51.9	37.2	30.9	9.9	35.7	54.0	-18.3
Horizontal	2745.000	46.9	37.2	32.6	9.9	32.4	54.0	-21.6
Horizontal	3660.000	52.8	37.1	32.5	9.9	38.3	54.0	-15.7

Notes: 1. Peak detector is used except for others stated.

- 2. All measurements were made at 3 meters. Radiated 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 radiated 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. Horn antenna used for the emission over 1000MHz.

Test Engineer: Leo Lai

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- 3.2 Conducted Emission at Mains Terminal
- 3.2.1 Conducted Emissions Configuration Photograph

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

3.2.2 Conducted Emissions

Worst Case Live-Conducted Configuration At

0.490 MHz

Judgement: Passed by 9.3 dB margin

#### **TEST PERSONNEL:**

Sign on file

Leo Lai, Engineer
Typed/Printed Name

May 8, 2016

Date

Applicant: Chuango Security Technology Corporation

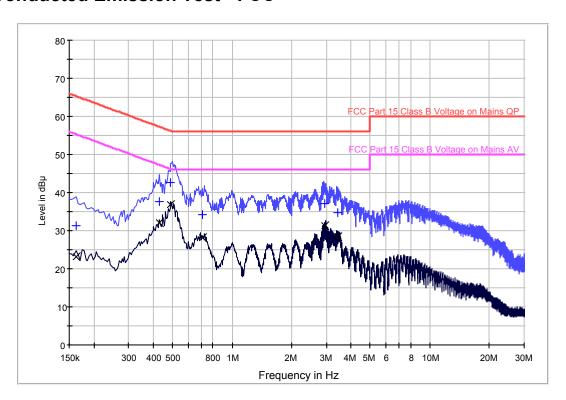
Date of Test: May 8, 2016

Model: SR1000 Sample: 1/1

Worst Case Operating Mode: Transmitting (915MHz)

Phase: Live

### **Conducted Emission Test - FCC**



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	31.4	L1	9.5	33.9	65.3
0.430000	37.7	L1	9.6	19.6	57.3
0.490000	42.5	L1	9.6	13.7	56.2
0.706000	34.2	L1	9.6	21.8	56.0
2.938000	37.2	L1	9.6	18.8	56.0
3.414000	34.7	L1	9.6	21.3	56.0

Limit and Margin AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	23.2	L1	9.5	32.1	55.3
0.430000	32.1	L1	9.6	15.2	47.3
0.490000	36.9	L1	9.6	9.3	46.2
0.706000	28.2	L1	9.6	17.8	46.0
2.938000	31.2	L1	9.6	14.8	46.0
3.414000	28.3	L1	9.6	17.7	46.0

Applicant: Chuango Security Technology Corporation

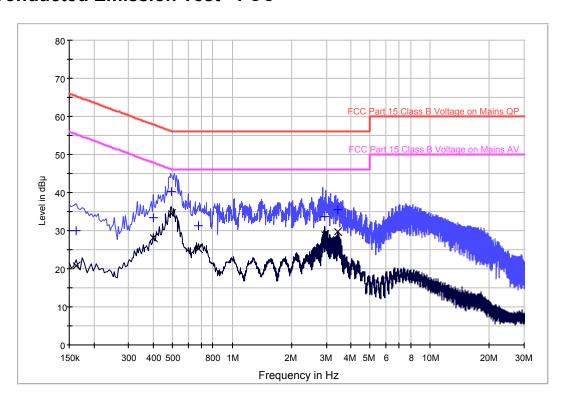
Date of Test: May 8, 2016

Model: SR1000 Sample: 1/1

Worst Case Operating Mode: Transmitting (915MHz)

Phase: Neutral

#### **Conducted Emission Test - FCC**



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	30.0	N	9.6	35.3	65.3
0.398000	33.4	N	9.6	24.5	57.9
0.494000	40.1	N	9.6	16.0	56.1
0.674000	31.2	N	9.6	24.8	56.0
2.938000	33.7	N	9.6	22.3	56.0
3.434000	35.6	N	9.6	20.4	56.0

Limit and Margin AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	20.9	N	9.6	34.4	55.3
0.398000	28.0	N	9.6	19.9	47.9
0.494000	34.6	N	9.6	11.5	46.1
0.674000	25.4	N	9.6	20.6	46.0
2.938000	29.0	N	9.6	17.0	46.0
3.434000	29.7	N	9.6	16.3	46.0

# EXHIBIT 4 EQUIPMENT PHOTOGRAPHS

TRF No.: FCC 15C\_TX\_b FCC ID: RJY-SR1000

# 4.0 **Equipment Photographs**

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

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# **EXHIBIT 5**

# **PRODUCT LABELLING**

TRF No.: FCC 15C\_TX\_b FCC ID: RJY-SR1000

# 5.0 **Product Labelling**

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

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# EXHIBIT 6 TECHNICAL SPECIFICATIONS

TRF No.: FCC 15C\_TX\_b FCC ID: RJY-SR1000

### 6.0 <u>Technical Specifications</u>

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

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# **EXHIBIT 7**

# **INSTRUCTION MANUAL**

TRF No.: FCC 15C\_TX\_b FCC ID: RJY-SR1000

### 7.0 <u>Instruction Manual</u>

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 <u>Miscellaneous Information</u>

This miscellaneous information includes details of the measured bandedge, the test procedure and calculation of factor such as pulse desensitization.

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#### 8.1 Bandedge Plot

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Figure 8.1 Bandwidth

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### 8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. With a resolution bandwidth (3dB) of 1MHz, the pulse desensitivity factor is 0dB.

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#### 8.3 Calculation of Average Factor

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner are saved with filename: af.pdf

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 70.290ms Effective period of the cycle = 1.594 ms x 10 + 0.435 ms x 15 = 22.465 ms

DC = 22.465 ms / 70.290ms = 0.320 or 32.0%

Therefore, the averaging factor is found by  $20 \log_{10} 0.320 = -9.9 \text{ dB}$ 

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#### 8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a polyethylene turntable which is four feet in diameter above the ground plane and approximately 0.8 meter in height for emission up to 1GHz and 1.5 meter above 1GHz. 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 EUT is adjust through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.

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#### 8.4 Emissions Test Procedures (cont'd)

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

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.10 - 2013.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

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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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# EXHIBIT10 TEST EQUIPMENT LIST

TRF No.: FCC 15C\_TX\_b FCC ID: RJY-SR1000

# 10.0 **Test Equipment List**

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	15-Sep-15	15-Sep-16
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	29-Mar-16	29-Mar-17
SZ061-08	Horn Antenna	ETS	3115	00092346	17-Oct-15	17-Oct-16
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	11-May-15	11-May-16
SZ056-06	Signal Analyzer	R&S	FSV40	Oct-76	8-Jul-15	8-Jul-16
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	23-Jan-16	23-Jan-17
SZ188-01	Anechoic Chamber	ETS	RFD-F/A- 100	4102	16-Apr-16	16-Apr-18
SZ062-02	RF Cable	RADIALL	RG 213U	Jan-00	30-Dec-15	30-Jun-16
SZ062-05	RF Cable	RADIALL	0.04- 26.5GHz	0833254	6-Apr-16	6-Oct-16
SZ062-12	RF Cable	RADIALL	0.04- 26.5GHz	083387	6-Apr-16	6-Oct-16
SZ067-11	Highpass Filter	Wainwright	WHKX1.0/ 15G-10SS	16	15-Jun-15	15-Jun-16
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	03-Nov-2015	03-Nov-2016
SZ187-01	Two-Line V- Network	R&S	ENV216	100072	03-Nov-2015	03-Nov-2016
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2014	23-Aug-2016

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