



HCT CO., LTD.

Product Compliance Division

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CERTIFICATE OF COMPLIANCE

Applicant Name:	Date of Issue:
Zephyrlock, LLC.	September 03, 2009
14 Finance Drive, Danbury, CT 06810, USA	Test Site/Location:
	HCT.CO., LTD., San 136-1 Ami-ri, Bubal-eup, Icheon-si, Kyungki-do, 467-701 Korea
	Test Report No.: HCTR0909FR03
	HCT FRN: 0005866421
	IC Recognition No.: 5944A-1

FCC ID	: XLY-2054
APPLICANT	: Zephyrlock, LLC.

Model(s):	2054
EUT Type:	RF system Locker Lock
RF Output Field Strength	5.75 dBuV/m @ 30 m
Frequency of Operation:	13.563336 MHz
Modulation type	ASK
FCC Classification:	Low Power Communication Device – Transmitter
FCC Rule Part(s):	FCC Part 15.225 Subpart C

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT.CO., LTD. Certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S. C.862

Hyo Sun Kwak

Sang Jun Lee

Report prepared by

: Hyo Sun Kwak

Test engineer of RF Team

Approved by

: Sang Jun Lee

Manager of RF Team

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1. GENERAL INFORMATION

Applicant: Zephyrlock, LLC.

Address: 14 Finance Drive, Danbury, CT 06810, USA

FCC ID: XLY-2054

EUT: RF system Locker Lock

Model: 2054

Date of Test: March 04, 2009

Contact person: Kevin Houlihan

Tel/ Fax: Tel: 203-743-2976/ Fax: 203-778-1006

2. EUT DESCRIPTION

Product	RF system Locker Lock
Model Name	2054
Power Supply	DC 6 V (AA battery 4 pcs.)
Frequency of Operation	13.563336 MHz
Transmit Power	5.75 dBuV/m @ 30 m
Modulation Type	ASK
Manufacturer	PASSTECH CO., LTD.
Antenna Specification	Manufacturer: PASSTECH CO., LTD. Antenna type: PCB Antenna

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3. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz(ANSI C63.4-2003)

3.1 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.

3.2 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 15.207, 15.209 and 15.225 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version :2003) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2003)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

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3.5 STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With
FCC Part 15.Subpart C

Regulation	Measurement standard	Range
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(a)	ANSI C63.4:2003	13.553MHz to 13.567MHz
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(d)	ANSI C63.4:2003	outside of the 13.110-14.010 MHz band
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.209	ANSI C63.4:2003	9kHz to 30MHz
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.209	ANSI C63.4:2003	30MHz to 1GHz
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.207	ANSI C63.4:2003	150kHz to 30MHz
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(e)	ANSI C63.4:2003	0.01% of nominal
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.215(c)	ANSI C63.4:2003	-

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4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, Maekok-Ri, Hobup-Myun, Ichon-Si, Kyoungki-Do, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated June 10, 2009 (Registration Number: 90661)

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of §15.203

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7. TEST SUMMARY

The results in this report apply only to sample tested

Regulation	Test Type	Range	Result
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(a)	Radiated Electric Field Emissions	13.553MHz to 13.567MHz	Pass
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(b)	Radiated Electric Field Emissions	13.410MHz to 13.553MHz and 13.567MHz to 13.710MHz	Pass
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(c)	Radiated Electric Field Emissions	13.710MHz to 14.010MHz	Pass
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.209 (d)	Radiated Electric Field Emissions	9kHz to 30MHz	Pass
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.209	Radiated Electric Field Emissions	30MHz to 1GHz	Pass
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.207	AC power conducted emissions	150kHz to 30MHz	N/A
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.225(e)	Frequency Stability	0.01% of nominal	Pass
Title 47 of the CFR:2005, Part 15 Subpart (c), Clause 15.215(c)	20 dB Bandwidth	-	Pass

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8. RADIATED EMISSION MEASUREMENT

Requirement(s): 15.209, 15.225

Except as provided elsewhere in this paragraph the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Minimum Standard: FCC Part 15.225 / 15.209

Rule Part	Frequency (MHz)	Limit
Part 15. 209	0.009 ~ 0.490	2400/F(kHz)uV/m@300
	0.490 ~1.705	24000/F(kHz)uV/m@30
	1.705 ~ 30	30 uV/m@30
	30 ~ 88	100 ** uV/m@3m
	88 ~ 216	150 ** uV/m@3m
	216 ~ 960	200 ** uV/m@3m
	Above 960	500 uV/m@3m

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

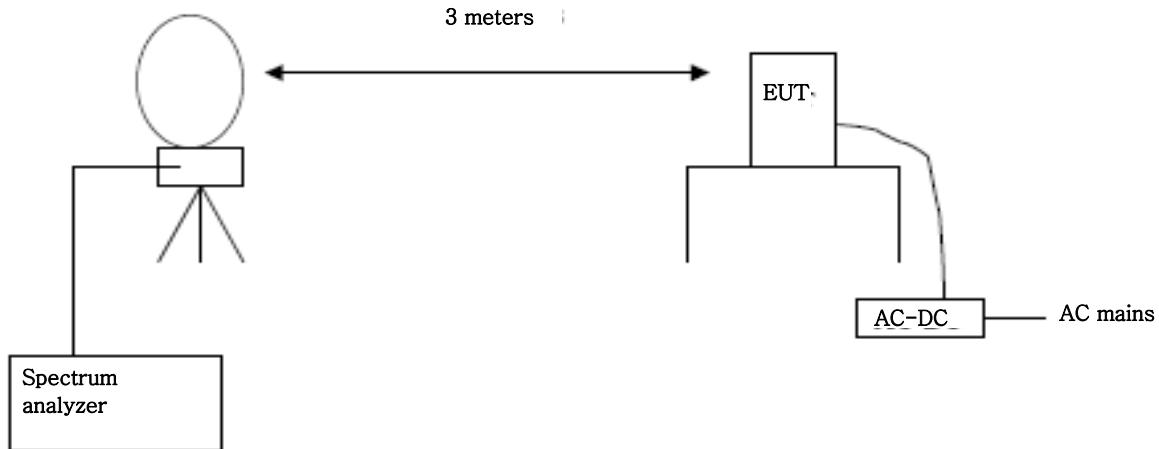
15.225 Operation within the band 13.110 – 14.010 MHz.

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter (= 84 dBuV/m) at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (=50.5dBuV/m) at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter (=40.5 dBuV/m) at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.
- (e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
- (f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.

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8.1. RADIATED EMISSION 9 kHz – 30 MHz

Test Set-up



Test Procedure

The EUT was placed on a non-conductive table located on a large open test site. The loop antenna was placed at a location 3m from the EUT. Radiated emissions were measured with the loop antenna both parallel and perpendicular to the plane of the EUT loop antenna.

The limit is converted from microvolts/meter to decibel microvolts/meter. Sample Calculation:

Corrected Amplitude = Raw Amplitude(dB μ V/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor

The spectrum analyzer is set to:

Frequency Range = 9 kHz ~ 1GHz

RBW = 9 kHz (9 kHz ~ 30MHz)
= 120 kHz (30 MHz ~ 1 GHz)

Trace Mode = max hold

Detector Mode = peak / Quasi-peak

Sweep time = auto

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Test Results

13.553-13.567 MHz						
Frequency (MHz)	Read Level (dBuV)@3m	Factor (dB)	Distance Correction (dB)	Result Level (dBuV)@30m	Limit (dBuV)@30m	Margin (dB)
13.563336	35.84	9.91	-40	5.75	84	78.25

9KHz - 14.010 MHz						
Frequency (MHz)	Read Level (dBuV)@3m	Factor (dB)	Distance Correction (dB)	Result Level (dBuV)@30m	Limit (dBuV)@30m	Margin (dB)
8.58	14.38	10.21	-40	-15.41	29.5	44.91

14.010 - 30 MHz						
Frequency (MHz)	Read Level (dBuV)@3m	Factor (dB)	Distance Correction (dB)	Result Level (dBuV)@30m	Limit (dBuV)@30m	Margin (dB)
27.28	10.96	7.91	-40	-21.07	29.5	50.57

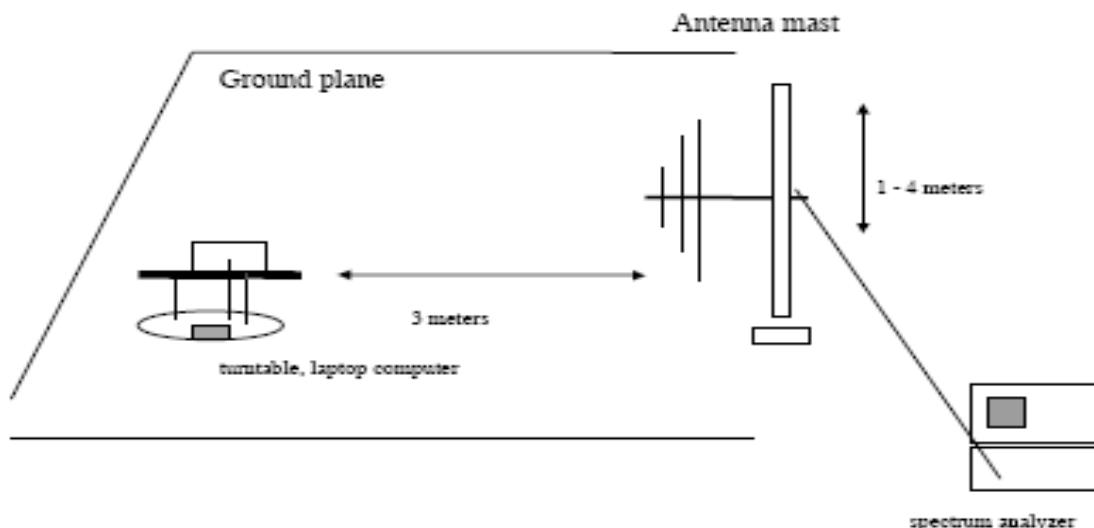
Remark :

1. Distance Correction Below 30MHz = $40\log(3m/30m) = -40$
dB Measurement Distance : 3 m (Below 30MHz)
2. Factor = Antenna Factor + Cable Loss
3. Result Level = Read Level + Factor + Distance Correction
4. Margin = Limit – Result Level

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8.2. RADIATED EMISSION 30 MHz – 1000 MHz

Test Set-up



Test Procedures: Radiated emissions were measured according to ANSI C63.4.

The EUT was set to transmit at the highest output power.

The EUT was set 3 meter away from the measuring antenna.

Frequency	Read Level	Factor	ANT POL	Result Level	Limit	Margin
MHz	dBuV	dB	(H/V)	dBuV/m	dBuV/m	dB
246	15.7	14.9	H	30.6	46.0	-15.4
273	14.9	16.0	H	30.9	46.0	-15.1
299	15.0	17.0	H	32.0	46.0	-14.0
326	16.8	17.8	H	34.6	46.0	-11.4
353	11.9	18.6	H	30.5	46.0	-15.5
707	13.3	26.7	V	40.0	46.0	-6.0

Remark

1. ANT+CL Factor = Antenna Factor + Cable Loss
2. Result Level = Read Level + (ANT+ CL Factor)
3. Margin = Limit – Result Level

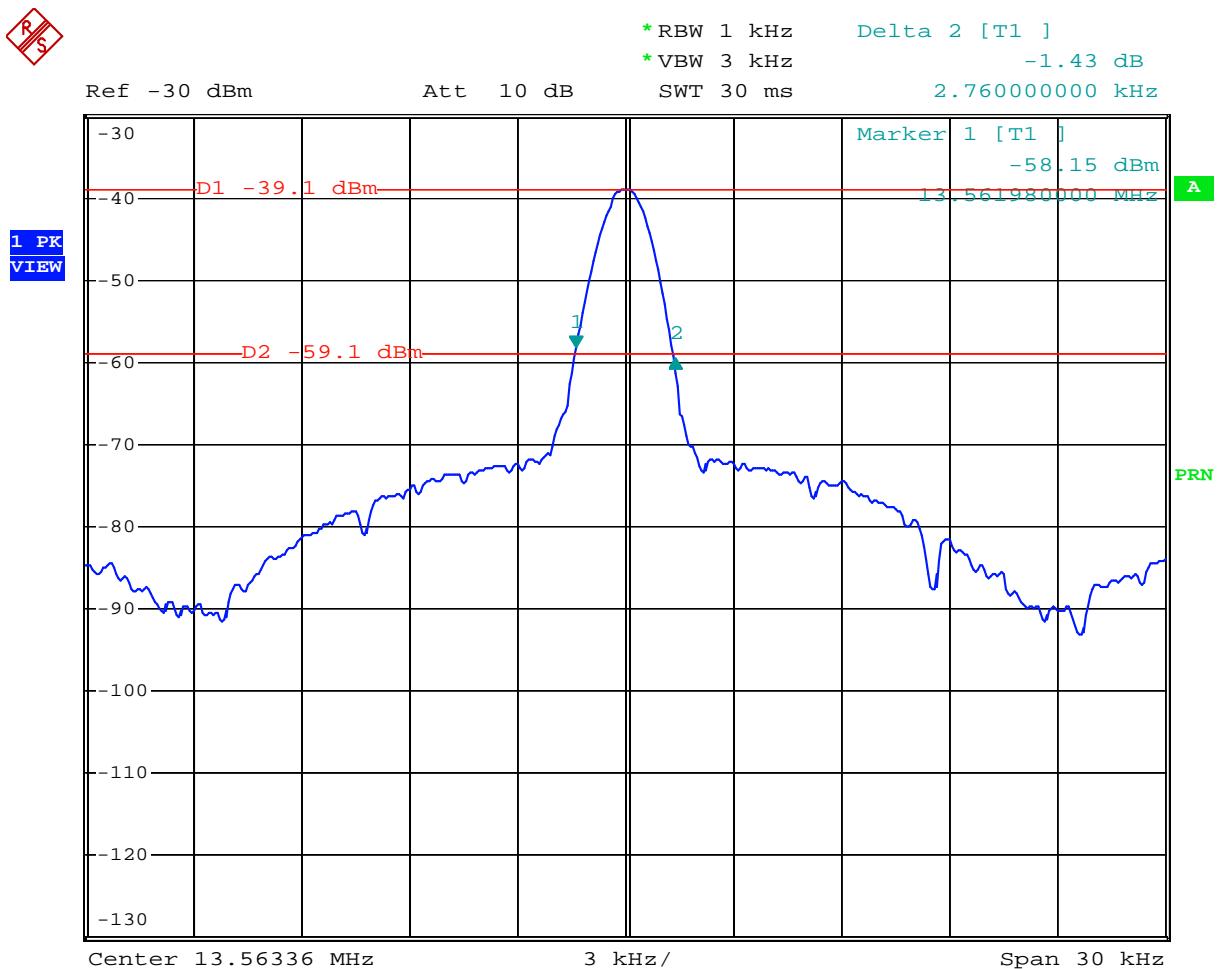
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9. EMISSION BANDWIDTH PLOT.

Requirement(s):

Test Set-up: The EUT was connected to a spectrum analyzer.

Test Procedure: The 20dB bandwidth was measured by using a spectrum analyzer.



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10. FREQUENCY TOLERANCE

Procedure: Part 15.225, ANSI 63.4

If required, the operating or transmitting frequency of an intentional radiator should be measured in accordance with the following procedure to ensure that the device operates outside certain precluded frequency bands and within the frequency range. No modulation needs to be supplied to the intentional radiator during these tests, unless modulation is required to produce an output, e.g., single-sideband suppressed carrier transmitters.

The frequency stability of the transmitter is measured by:

- Temperature: The temperature is varied from -20°C to + 50°C using an environmental chamber.
- For battery operated equipment, the equipment tests shall be performed using a new battery.

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency.

Measurement Result:

VOLTAGE (%)	POWER	Temperature (°C)	Frequency (MHz)	Deviation (ppm)
100%	6 V	-20	13.563365	0.000029
100%		-10	13.563396	0.000060
100%		0	13.563397	0.000061
100%		10	13.563369	0.000033
100%		20	13.563336	0.000000
100%		30	13.563305	-0.000031
100%		40	13.563305	-0.000031
100%		50	13.563329	-0.000007

Notes:

1. The EUT is supplied with the fully re-charged battery.

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11. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
Rohde & Schwarz	ESH2-Z5/ LISN	Annual	04/10/2010	861741/013
Rohde & Schwarz	ESH3-Z6/ LISN	Annual	06/13/2010	100329
Schwarzbeck	VULB 9160/ TRILOG Antenna	Biennial	12/18/2010	9160-3150
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	ESH3-Z2/ PULSE LIMITER	Annual	10/30/2009	375.8810.352
MITEQ	AMF-60-0010 1800-35-20P/AMP	Annual	05/20/2010	1200937
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	03/26/2010	147
Rohde & Schwarz	6502/Loop Antenna	Biennial	12/26/2009	9009-2536
Rohde & Schwarz	FSP30/Spectrum Analyzer	Annual	07/31/2010	839117/011
Agilent	E4416A /Power Meter	Annual	01/21/2010	GB41291412
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	06/29/2010	1
Hewlett Packard	11636B/Power Divider	Annual	12/24/2009	11377
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	01/07/2010	3110117
Korea Eng	KR-1005L/ Temperature and Humidity Chamber	Annual	12/31/2009	KRAC05063-3CH

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