EN 62311: 2008

HUMAN EXPOSURE TO EM FIELD ANALYSIS REPORT

For

Next Thing Company

1940 Union St #32,
Oakland, CA 94607, USA

Model: HELLA1337

Report Type: Original Report		**Product Type:** C.H.I.P Computer
Prepared By	Jin Yang Test Engineer	
Report Number	R15101413-11 EMF	
Report Date	2015-12-29	
Reviewed By	Bo Li RF Supervisor	
	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732 9164	

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*"

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R15101413-EMF	Original Report	2015-12-29

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Next Thing, Co*., and their product *C.H.I.P Computer,* model: HELLA1337 or the "EUT" as referred to in this report. It is a computer, contains 2.4GHz 802.11b/g/n and Bluetooth 4.0 dual modes.

1.2 Mechanical Description of EUT

The EUT measures approximately 60 mm (L) x 41 mm (W) x 10 mm (H) and weighs 23.5 g.

The test data gathered are from typical production sample, serial number: R15101413-01 assigned by BACL.

1.3 Objective

The following type approved report is prepared on behalf *Next Thing, Co.,* in accordance with EN 300 328 V1.9.1(2015-02), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive.

The objective is to determine compliance with EN 300 328 V1.9.1 (2015-02), Electromagnetic compatibility and Radio spectrum Matters (ERM) for Bluetooth and WLAN portion.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals.

1.5 Test Methodology

N/A

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to **ISO 17025:2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:
1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing according to 1999/519/EC.

2.2 EUT Exercise Software

The test utility used is *UART Terminal (RS-232)* provided by *Next Thing, Co.*, the software was verified by *Jin Yang* to comply with the standard requirements being tested against.

2.3 Equipment Modifications

A SMA port was attached to the output signal before the antenna of the EUT to perform conducted measurements.

2.4 Special Equipment

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model No.
Acer	Laptop	ZHK

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model
Realtek Semiconductor Corp.	WIFI/BT Module	RTL8723BS
Allwinner Technology	Soc	R8

2.7 Support Equipment

Manufacturer	Description	Model
Apple	USB Power Adapter	A1357
Asian Power Devices, Inc	AC Adapter	WB-10E05FU

2.8 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	<1M	Laptop	EUT
RF Cable	<1M	EUT	PSA

3 EN 62311 Annex C & 1999/519/EC – RF Exposure Limit

3.1 Applicable Standard

According to 1999/519/EC: the reference levels listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation. Respect of all recommended reference levels will ensure respect of basic restrictions specified in ANNEX II of 1999/519/EC

Table 2 Reference Level for Electric, Magnetic and Electromagnetic Fields (0 Hz to 300 GHz, unperturbed rms values)

Table 2, ANNEX III, 1999/519/EC

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (uT)	Equivalent plane wave power density S_{cq} (W/m^2)
0-1 Hz	-	$3{,}2 \times 10^4$	4×10^4	-
1-2 Hz	10000	$3.2, \times 10^4/f^2$	$4 \times 10^4/f^2$	-
8-25 Hz	10000	4000/f	5000/f	-
0,0025-0.8 kHz	250/f	4/f	5/f	-
0,8-3 kHz	250/f	5	6,25	-
3-150 kHz	87	5	6,25	-
0,15-1 MHz	87	0,73/f	0,92/f	-
1-10 MHz	$87/f^{1/2}$	0,73/f	0,92/f	-
10-400 MHz	28	0,073	0,092	2
400-2000 MHz	$1.375/ f^{1/2}$	$0{,}0037\ f^{1/2}$	$0{,}0046\ f^{1/2}$	f/200
2-300 GHz	61	^{0,16}	^{0,20}	10

3.2 RF Exposure Evaluation

Maximum Permissible Exposure (MPE) Calculations are completed using the power density formula defined in OET65: Power Density (mW/cm^2) = (Pout * G) / ($4\pi R^2$), where:
Pout = output power to antenna (mW) 100%DutyCycle
G = gain of antenna in linear scale
R = distance between observation point and center of the radiator (cm)

Maximum Permissible Exposure (MPE) Calculations

2.4GHz WiFi:

Worst case:

Radio Mode	Antenna Gain (dBi)	Conducted Power (dBm)	Duty Cycle (%)	Power Density @ 20 cm (W/m^2)	Limit (W/m^2)	Result
802.11g	2.5	13.37	100	0.077	10	Pass

BT:

Worst case:

Radio Mode	Antenna Gain (dBi)	Total Conducted Power (dBm)	Duty Cycle (%)	Power Density @ 20 cm (W/m^2)	Limit (W/m^2)	Result
GFSK	2.5	5.96	100	0.014	10	Pass

BLE:

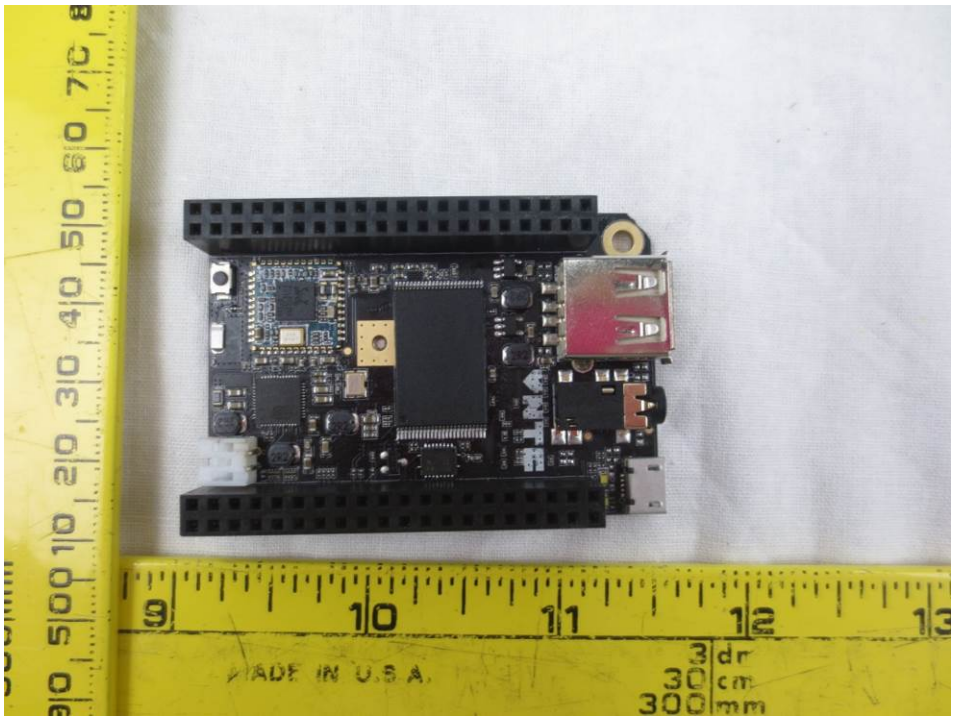
Worst case:

Radio Mode	Antenna Gain (dBi)	Total Conducted Power (dBm)	Duty Cycle (%)	Power Density @ 20 cm (W/m^2)	Limit (W/m^2)	Result
BLE	2.5	4.03	100	0.009	10	Pass

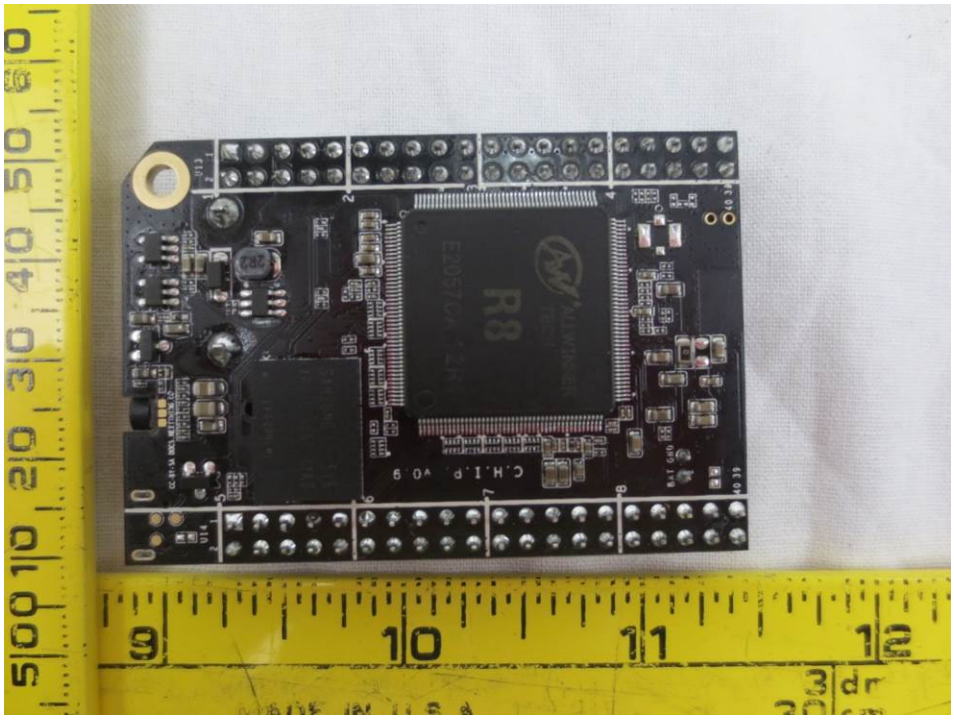
RESULT: The device complies with the MPE requirements by providing a safe separation distance of at least 20 cm.

4 Appendix B – EUT Photographs

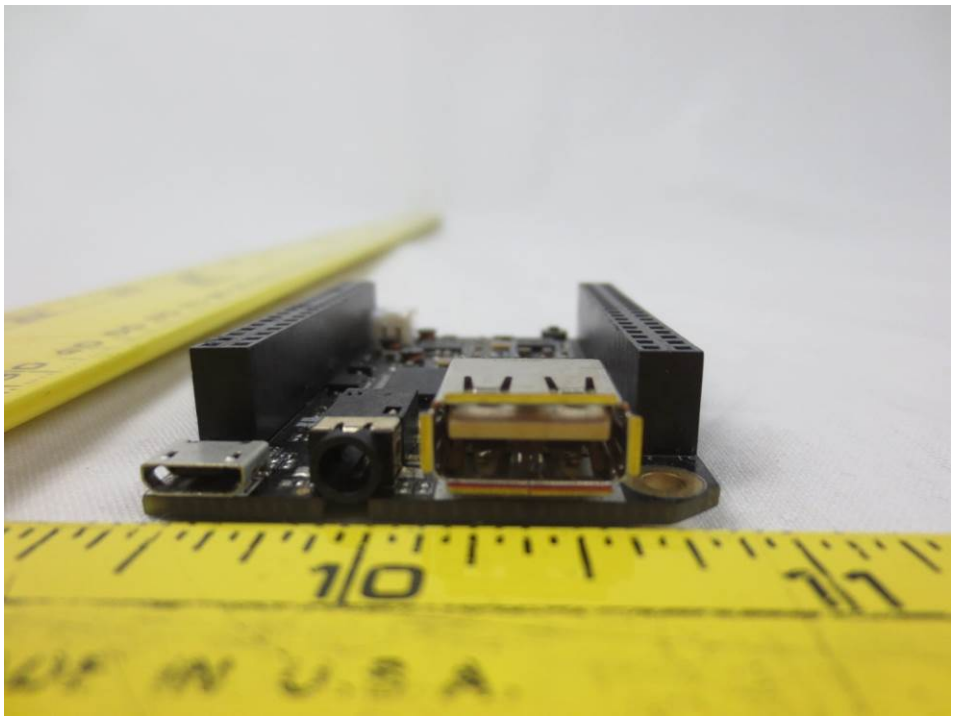
4.1 EUT Photo – Top View



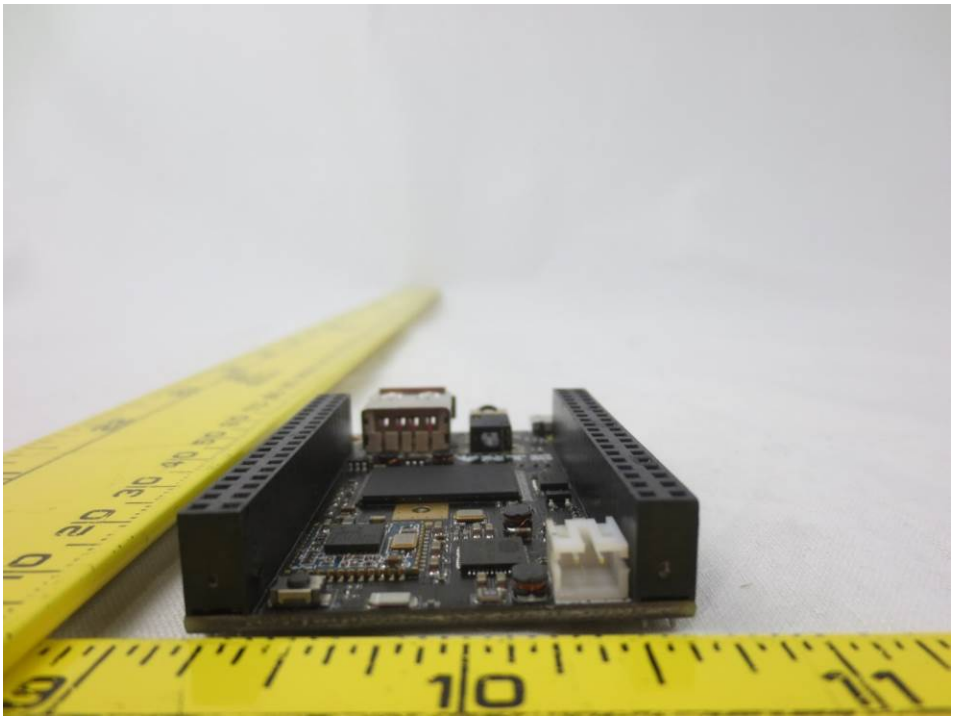
4.2 EUT Photo – Bottom View



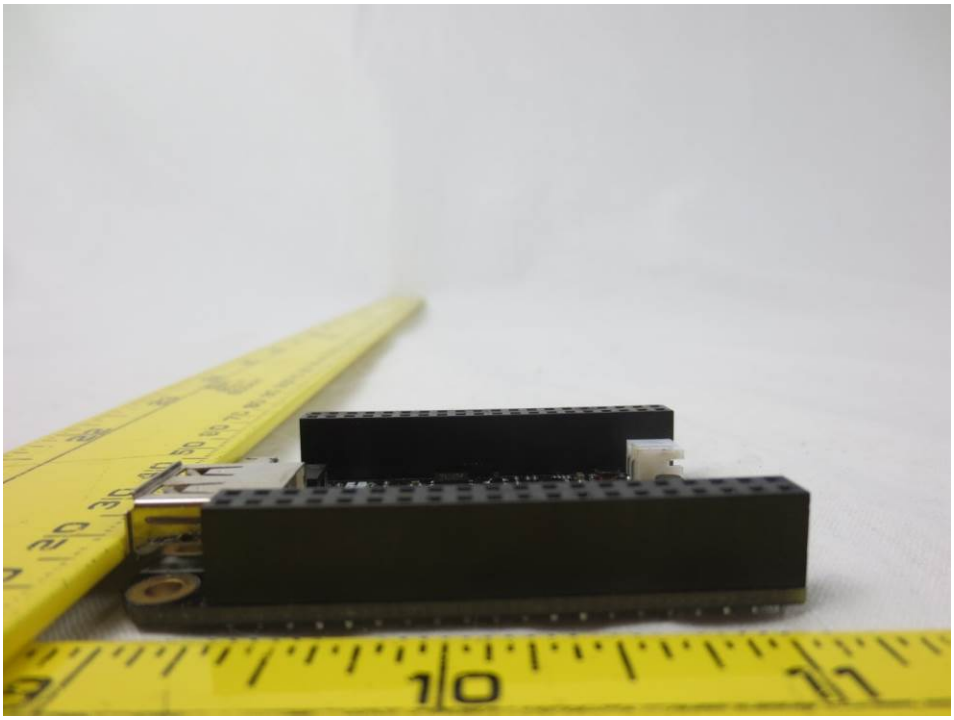
4.3 EUT Photo –Front



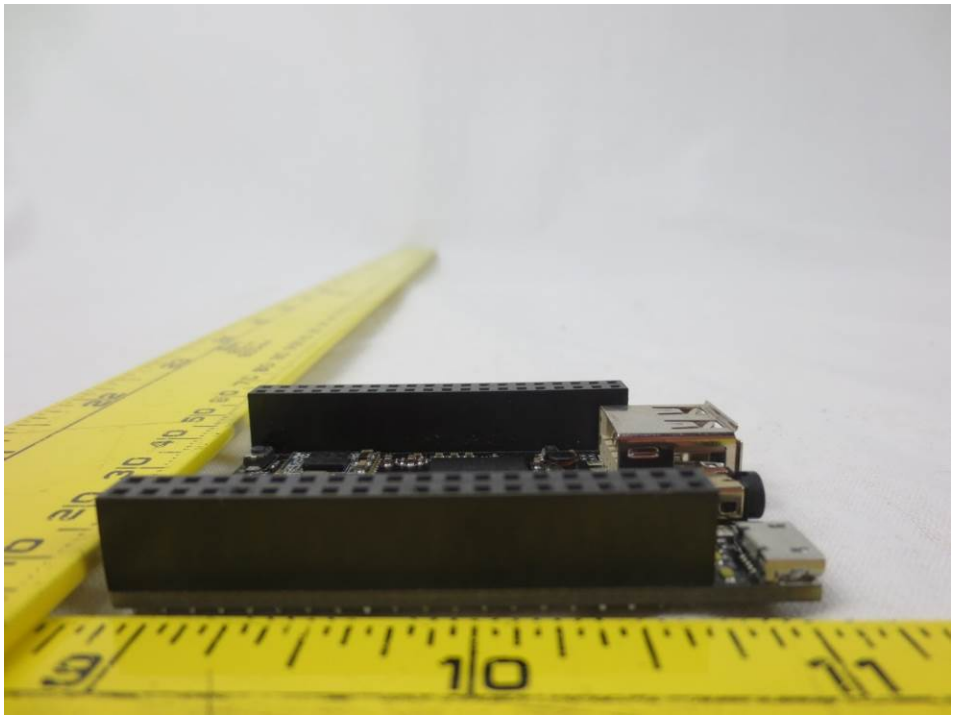
4.4 EUT Photo –Back



4.5 EUT Photo –Right Side



4.6 EUT Photo –Left Side



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