

# WHERE NET CORP

WHERECALL III & WHERECALL III PLC

Model: TFF-1610

30 October 2008

Report No.: SL08101305-ZBR-067 (15.247)(WhereNet)  
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

	
<b>Choon Sian Ooi</b> Test Engineer	<b>Leslie Bai</b> Engineering Reviewer

This test report may be reproduced in full only.  
Test result presented in this test report is applicable to the representative sample only.

# EMC Test Report

To: FCC Part 15.247 & IC RSS210

**SIEMIC, INC.**  
Accessing global markets



**SIEMIC ACREDITATION DETAILS: NVLAP Lab Code: 200729-0**

United States Department of Commerce  
National Institute of Standards and Technology

**NVLAP<sup>®</sup>**

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**Certificate of Accreditation to ISO/IEC 17025:2005**

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NVLAP LAB CODE: 200729-0

**SIEMIC Laboratories**  
San Jose, CA

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).*

2008-01-01 through 2008-12-31  
*Effective dates*



*Sally J. Bruce*  
For the National Institute of Standards and Technology

**SIEMIC ACREDITATION DETAILS: A2LA Certificate Number: 2742.01**



**THE AMERICAN ASSOCIATION FOR  
LABORATORY ACCREDITATION**

**ACCREDITED LABORATORY**

A2LA has accredited

**SIEMIC LABORATORIES**  
San Jose, CA

for technical competence in the field of

**Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 11th day of July 2008.



\_\_\_\_\_  
President  
For the Accreditation Council  
Certificate Number 2742.01  
Valid to September 30, 2010



For the tests or types of tests to which this accreditation applies,  
please refer to the laboratory's Electrical Scope of Accreditation.

**SIEMIC ACREDITATION DETAILS: FCC Registration No. 783147**

**FEDERAL COMMUNICATIONS COMMISSION**

**Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046**

December 20, 2007

Registration Number: 783147

SIEMIC Laboratories  
2206 Ringwood Avenue,  
San Jose, CA 95131

Attention: Leslie Bai

Re: Measurement facility located at San Jose  
3 & 10 meter site  
Date of Renewal: December 20, 2007

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish  
Industry Analyst

**SIEMIC ACREDITATION DETAILS: Industry of Canada Registration No. 4842-1**



May 23rd, 2008

OUR FILE: 46405-4842  
Submission No: 126429

Siemic Inc.  
2205 Ringwood Ave.  
San Jose CA 95131  
USA

Attention: Leslie Bai

Dear Sir/Madame:

The Bureau has received your application for the registration / renewal of a 310m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought (**4842A-1**). Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please be informed that the Bureau is now utilizing a **new site numbering scheme** in order to simplify the electronic filing process. Our goal is to reduce the number of secondary codes associated to one particular company. The following changes have been made to your record.

- Your primary code is: **4842**
- The company number associated to the site(s) located at the above address is: **4842A**
- The table below is a summary of the changes made to the unique site registration number(s):

New Site Number	Obsolete Site Number	Description of Site	Expiry Date (YYYY-MM-DD)
4842A-1	4842-1	3m Chamber	2010-05-23

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 meter OATS or 3 meter chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed two years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL:  
[http://strategis.ic.gc.ca/epic/internet/inceb-mst.nsf/ewh\\_000052e.html](http://strategis.ic.gc.ca/epic/internet/inceb-mst.nsf/ewh_000052e.html).

If you have any questions, you may contact the Bureau by e-mail at [certification.bureau@ic.gc.ca](mailto:certification.bureau@ic.gc.ca). Please reference our file and submission number above for all correspondence.

Yours sincerely,



S. Pouly  
Test & Measurement Specialist  
Certification and Engineering Bureau  
3700 Conlon Ave. Building 94  
Mississauga, Ontario L4W 1S2



**SIEMIC, Inc.**  
Accessing global markets

Title: RF Test Report WhereNet Corp.Model : TFF-1610  
To: FCC 15.247 2008, RSS 210 Issue 7: 2007

Serial# SL08101305-ZBR-067 (15.247)(WhereNet)  
Issue Date 30 October 2008  
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www.siemec.com

**SIEMIC ACREDITATION DETAILS: Japan VCCI Registration No. 2195**



Voluntary Control Council for Interference  
by Information Technology Equipment  
7F NDA Bldg. 2-3-5, Azabudai,  
Minato-Ku, Tokyo, Japan, 108-0041  
Tel:+81-3-5575-3138  
Fax:+81-3-5575-3137  
<http://www.vccior.jp>

February 12, 2004

**TO: SIEMIC, INC.**

**Membership NO: 2195**

We confirmed your payment for annual membership fee and admission fee. Thank you very much for your remitting.

Please find enclosed VCCI documents. As admission fee and annual membership fee were confirmed, your company registered as VCCI official member.

From now on, it is possible for your company to submit conformity verification report or/and application for registration of measurement facilities.

Please find necessary forms for your submission from VCCI web-site.  
[www.vccior.jp](http://www.vccior.jp)

When you submit conformity verification report, please submit to Ms. Yoko Inagaki / [inagaki@vccior.jp](mailto:inagaki@vccior.jp) and application for registration of measurement facilities, please submit to Mr. Masaru Denda / [denda@vccior.jp](mailto:denda@vccior.jp)

Their address, phone and fax number are absolutely same as I. Please refer address indicated on top right-hand corner of this page.

If you have any other questions regarding membership, feel free to contact me. Thank you very much.

Best Regards,

Naoko Hori (Ms.)  
VCCI  
[hori@vccior.jp](mailto:hori@vccior.jp)

Enclosure

**SIEMIC ACREDITATION DETAILS: Japan RF Technologies Accreditation No. MRF050927**

**RFT**

## Certificate

This is to certify that the  
Quality Management System  
of

**SIEMIC , Inc.**  
2206 Ringwood Avenue  
San Jose, California 95131 U.S.A

has been authorized to carry out Japan Specified Radio Equipment test by  
order and under supervision of RF Technologies Co., Ltd. according to  
Notification No.88 of Radio Law.

An assessment of the laboratory was conducted according to the "Procedure and  
Conditions for Appointments of 2.4GHz Band Low power data communications system  
that Bluetooth and Wireless LAN test with reference to ISO/IEC 17025  
by an RF Technologies Co., Ltd. auditor.

**Audit Report No. MRF050927**

 Kazuyuki Sarashina Auditor RF Technologies Co., Ltd.	 Toshihiro Ikegami President RF Technologies Co., Ltd.
Audit Date September 27th, 2005	Issued Date October 5th, 2005

This Certificate is valid until **September 26<sup>th</sup> 2006 or next schedule audit.**

No:006 Registered Certification Body  
RF Technologies Co., Ltd.  
472, Nippa-cho,Kohoku-ku, Yokohama, 223-0057, Japan





**SIEMIC ACREDITATION DETAILS: Korea MIC Lab Code: KR0032**

# 시험기관지정서

## Certificate

of Designated Testing Laboratory

지정번호(No.) : KR0032

시험기관명 : (주)현대교정인증기술원  
(Name of Lab.) (Hyundai Calibration & Certification Technologies Co., Ltd)

주 소 : 경기도 이천시 부발읍 아미리 산136-1  
(Address) (136-1, Ami-ri, Bubal-eup, Icheon-si, Kyunggi-Do, Korea)  
2206 Ringwood Avenue San Jose, CA, USA.

시험분야 및 범위 : 유선(Telecommunication Part)  
(Area & Category) 무선(Radio Communication Part)  
전자파장해(EMD) : 미국지사 포함  
전자파내성(EMS) : 미국지사 포함  
전기안전(Safety)  
전자파흡수율(SAR)

위 기관을 정보통신기기시험기관지정및관리등에관한규칙에  
의해 정보통신기기시험기관으로 지정합니다.

*This is to certify that  
the above mentioned laboratory is designated  
as the testing laboratory in accordance with  
the Regulations on Designation of Testing Laboratory  
for Information and Communication Equipment.*

2005년(Year) 7월(Month) 5일(Date)

**전파연구소장**

Director General of Radio Research Laboratory  
Ministry of Information and Communication  
Republic of Korea







**SIEMIC, Inc.**  
Accessing global markets

Title: RF Test Report WhereNet Corp.Model : TFF-1610  
To: FCC 15.247 2008, RSS 210 Issue 7: 2007

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www.siemic.com

**SIEMIC ACREDITATION DETAILS: Korea CAB ID: US0160**



**UNITED STATES DEPARTMENT OF COMMERCE**  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20899

April 17, 2006

Mr. Leslie Bai  
SIEMIC Laboratories  
2206 Ringwood Avenue  
San Jose, CA 95131

Dear Mr. Bai:

I am pleased to inform you that your laboratory has been recognized by the Ministry of Information and Communication's Radio Research Laboratory (RRL) under the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement (MRA). Your laboratory is now designated to act as a Conformity Assessment Body (CAB) under Appendix B, **Phase I** Procedures, of the APEC Tel MRA. The pertinent information about your laboratory's designation is as follows:

CAB Name: **SIEMIC Laboratories**  
Identification No.: **US0160**  
Scope:

Coverage	Standards	Date of Recognition
Electro Magnetic Interference	1. RRL Notice No. 2005-82: Technical Requirements for Electromagnetic Interference 2. Annex 8(KN-22), RRL Notice No. 2005-131: Conformity Assessment Procedure for Electromagnetic Interference	April 13, 2006
Electro Magnetic Susceptibility	1. RRL Notice No. 2005-130: Technical Requirements for Electromagnetic Susceptibility 2. Annex 1-7(KN-61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11), RRL Notice No. 2005-132: Conformity Assessment Procedure for Electromagnetic Susceptibility	April 13, 2006

You may submit test data to RRL to verify that the equipment to be imported into Korea satisfies the applicable requirements. The designation of your organization will remain in force as long as its accreditation for the designated scope remains valid and comply with the designation requirements.

The names of all recognized CABs will be posted on the NIST website at <http://ts.nist.gov/mra>. If you have any questions please contact Mr. Jogindar (Joe) Dhillon at (301) 975-5521. We appreciate your continued interest in our international conformity assessment activities.

Sincerely,

David F. Alderman  
Group Leader, Standards Coordination and Conformity Group

cc: Jogindar Dhillon

**NIST**



**SIEMIC ACREDITATION DETAILS: Taiwan BSMI Accreditation No. SL2-IN-E-1130R**



**UNITED STATES DEPARTMENT OF COMMERCE**  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20885

May 3, 2006

Mr. Leslie Bai  
SIEMIC Laboratories  
2206 Ringwood Avenue  
San Jose, CA 95131

Dear Mr. Bai:

I am pleased to inform you that your laboratory has been recognized by the Chinese Taipei's Bureau of Standards, Metrology, and Inspection (BSMI) under the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement (MRA). Your laboratory is now designated to act as a Conformity Assessment Body (CAB) under Appendix B, **Phase I** Procedures, of the APEC Tel MRA. You may submit test data to BSMI to verify that the equipment to be imported into Chinese Taipei satisfies the applicable requirements. The designation of your organization will remain in force as long as its accreditation for the designated scope remains valid and comply with the designation requirements. The pertinent designation information is as follows:

- BSMI number: **SL2-IN-E-1130R** (Must be applied to the test reports)
- U.S. Identification No: **US0160**
- Scope of Designation: **CNS 13438**
- Authorized signatory: **Mr. Leslie Bai**

The names of all recognized CABs will be posted on the NIST website at <http://ts.nist.gov/mra>. If you have any questions, please contact Mr. Dhillon at 301-975-5321. We appreciate your continued interest in our international conformity assessment activities.

Sincerely,

David F. Alderman  
Group Leader, Standards Coordination and Conformity Group

cc: Jogindar Dhillon



**SIEMIC, Inc.**  
Accessing global markets

Title: RF Test Report WhereNet Corp.Model : TFF-1610  
To: FCC 15.247 2008, RSS 210 Issue 7: 2007

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**SIEMIC ACREDITATION DETAILS: Taiwan NCC CAB ID: US0160**



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Institute of Standards and Technology**  
Gaithersburg, Maryland 20899

August 8, 2006

Mr. Leslie Bai  
SIEMIC Laboratories  
2206 Ringwood Avenue  
San Jose, CA 95131

Dear Mr. Bai:

I am pleased to inform you that SIEMIC Laboratories has been recognized by the Chinese Taipei's National Communications Commission (NCC) under the Asia Pacific Economic Cooperation for Telecommunications and Information, Mutual Recognition Arrangement (APEC Tel MRA). Your laboratory is now designated to act as a Conformity Assessment Body (CAB) under Appendix B, **Phase I** Procedures, of the APEC Tel MRA.

You may submit test data to NCC to verify that the equipment to be imported into Chinese Taipei satisfies their applicable requirements using the following guidelines:

- Your laboratory's assigned 6-digit U.S. identification number is **US0160**. You should reference this number in your correspondence.
- The scope of designation is limited to **LP0002**. Your designation will remain in force as long as your accreditation remains valid for the scope of designation.

If you have any questions please contact Mr. Jogindar Dhillon via email at [dhillon@nist.gov](mailto:dhillon@nist.gov) or via fax at 301-975-5414. The names of all recognized laboratories will be posted on the NIST website at <http://ts.nist.gov/mra>. We appreciate your continued interest in our international conformity assessment activities.

Sincerely,

David F. Alderman  
Group Leader, Standards Coordination and Conformity Group

cc: Jogindar Dhillon

**NIST**

**SIEMIC ACREDITATION DETAILS: Mexico NOM Recognition**



**CANIETI**  
CAMARA NACIONAL  
DE LA INDUSTRIA  
ELECTRONICA, DE  
TELECOMUNICACIONES  
E INFORMATICA

## Laboratorio Valentín V. Rivero

México D.F. a 16 de octubre de 2006.

**LESLIE BAI  
DIRECTOR OF CERTIFICATION  
SIEMIC LABORATORIES, INC.  
ACCESSING GLOBAL MARKETS  
P R E S E N T E**

En contestación a su escrito de fecha 5 de septiembre del año en curso, le comento que estamos muy interesados en su intención de firmar un Acuerdo de Reconocimiento Mutuo, para lo cual adjunto a este escrito encontrara el Acuerdo en idioma inglés y español prefrenado de los cuales le pido sea revisado y en su caso corregido, para que si esta de acuerdo poder firmarlo para mandarlo con las autoridades Mexicanas para su visto bueno y así poder ejercer dicho acuerdo.

Aprovecho este escrito para mencionarle que nuestro intermediario gestor será la empresa Isabel de México, S. A. de C. V., empresa que ha colaborado durante mucho tiempo con nosotros en lo relacionado a la evaluación de la conformidad y que cuenta con amplia experiencia en la gestoría de la certificación de cumplimiento con Normas Oficiales Mexicanas de producto en México.

Me despido de usted enviándole un cordial saludo y esperando sus comentarios al Acuerdo que nos ocupa.

Atentamente:



**Ing. Faustino Sotelo González  
Gerente Técnico del Laboratorio de  
CANIETI.**

Callejón 77  
Hidráulico Condésa  
06100 México, D.F.  
Tel. 5264-0908 con 12 líneas  
Fax 5264-0488  
www.canieti.org



**SIEMIC ACREDITATION DETAILS: Hong Kong OFTA Recognition No. D23/16V**



Your Ref 來函編號 : D23/16 V  
Our Ref 本局編號 :

Telephone 電話 : (852) 2961 6320  
Fax No 圖文傳真 : (852) 2838 5004  
E-mail 電郵地址 : 20 July 2005

Mr. Leslie Bai  
Director of Certification,  
SIEMIC Laboratories  
2206 Ringwood Avenue  
San Jose, California 95131  
USA

Dear Mr. Bai,

**Application of Recognised Testing Agency (RTA)**

Referring your submission of 28 June 2005 in relation to the application of RTA, I am pleased to inform you that OFTA has appointed SIEMIC Laboratories (SIEMIC) as a Recognised Testing Agency (RTA) :

Please note that, under the Hong Kong Telecommunications Equipment Evaluation and Certification (HKTEC) Scheme, SIEMIC is authorized to conduct evaluation tests on telecommunications equipment against the following HKTA specifications :

Scope of recognition (HKTA Specifications) :

1001, 1002, 1004, 1006, 1007, 1008  
1010, 1015, 1016  
1022, 1026, 1027, 1029  
1030, 1031, 1032, 1033, 1034, 1035, 1039  
1041, 1042, 1043, 1045, 1047, 1048  
2001

You are requested to refer to and comply with the code of practice and guidelines for RTA as given in the Information Note OFTA I 411 "Recognised Testing Agency (RTA) for Conducting Evaluation Test of Telecommunications Equipment", which can be downloaded from OFTA's homepage at <http://www.ofa.gov.hk/tec/information-notes.html>.

If you have any queries, please do not hesitate to contact me.

Yours sincerely,

(K K Sin)  
for Director-General  
of Telecommunications

Office of the Telecommunications Authority  
29/F Wu Chung House 213 Queen's Road East Wan Chai Hong Kong  
電訊管理局  
香港灣仔皇后大道東 213 號胡忠大廈 29 字樓

<http://www.ofa.gov.hk>

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## 1 Executive Summary & EUT information

The purpose of this test programme was PCII application and to demonstrate compliance of the WhereNet Corp, WhereCall III & WhereCall III PLC Model: TFF-1610 against the current Stipulated Standards. The WhereCall III & WhereCall III PLC have demonstrated compliance with the FCC 15.247 2008 and RSS 210 Issue 7 2007.

### EUT Information

**EUT Description :** The WhereCall III & WhereCall III PLC is a key component of the WhereNet Real Time Locating System (RTL5). It is a small device that can be attached to assets of many kinds, such as forklifts, containers, ULDs, hospital and test equipment as well as trailers and container chassis's. It is used to manage those assets by allowing them to be identified and located by the system. The WhereCall III & WhereCall III PLC "blinks" an RF transmission at pre-programmed rates ranging from 5 seconds to one hour between blinks. The WhereNet RTL5 infrastructure receives these blinks and use sophisticated Differential Time Of Arrival, (DTOA), algorithms to determine the location of the tag. Accuracy of this determined location can be as low as 2 meters and is nominally within 3 meters in most installations. The WhereCall III & WhereCall III PLC complies with the ANSI 371.1 RTL5 standard. It operates in the globally accepted 2.4GHz frequency band and transmits spread spectrum signals in accordance with the standard. The use of spread spectrum technology provides extremely long range; in excess of 1,000 meter read range, and 300 meter locate range outdoors. This is accomplished at a miniscule power output of less than 2 mW. The combination of low power output and cutting edge battery technology allow the WhereCall III & WhereCall III PLC to operate for long periods of time without any maintenance. Battery life can be as long as 7 years depending upon blink rate. A receiver is also built into the WhereCall III & WhereCall III PLC . The tag can receive low frequency magnetic signals from an exciter called a WherePort. The WherePort transmissions can be read at distances ranging from 1 to 6 meters. The WherePort can modify the pre-programmed blink rate of a WhereCall III & WhereCall III PLC and also identity a particular location "zone". Designed to operate in a wide range of applications, the WhereCall III & WhereCall III PLC is fully sealed and will function in both indoor and outdoor environments. The tag's case is also resistant to oils, solvents and hydraulic fluids.

Model No : TFF-1610  
Serial No : Test sample without serial number  
Input Power : 3.6VDC

## 2 TECHNICAL DETAILS

Purpose	Compliance testing of DSSS Radio Module with stipulated standard
Applicant / Client	WhereNet Corp
Manufacturer	WhereNet Corp 2858 De La Cruz Blvd. Santa Clara, CA 95050
Laboratory performing the tests	SIEMIC Laboratories
Test report reference number	SL08101305-ZBR-067 (15.247)(WhereNet)
Date EUT received	October 23 2008
Standard applied	47 CFR §15.247 (2008) and RSS 210 Issue 7: 2007
Dates of test (from – to)	October 24 & 29 2008
No of Units:	1
Equipment Category:	DSSS
Trade Name:	WhereNet Corp
Model :	TFF-1610
RF Operating Frequency (ies)	2441.75 MHz for DSSS; 2446.5 MHz for OOK
Number of Channels :	N/A
Modulation :	CW, OOK
FCC ID :	NSQTFF-1011L
IC ID :	3586B-TFF1011L

### 3 MODIFICATION

**NONE**

## 4 TEST SUMMARY

The product was tested in accordance with the following specifications. All Testing has been performed according to below product classification:  
Spread Spectrum System / Device

### Test Results Summary

Test Standard		Description	Pass / Fail
CFR 47 Part 15.247: 2007	RSS 210 Issue 7: 2007	-	-
15.203		Antenna Requirement	Pass - Refer to Limited Modular Approval FCC ID: NSQTF-1011LReport
15.205	RSS210(A8.5)	Restricted Band of Operation	Pass
15.207(a)	RSSGen(7.2.2)	Conducted Emissions Voltage	N/A
15.247(a)(1)	RSS210(A8.1)	Channel Separation	N/A
15.247(a)(1)	RSS210(A8.1)	Occupied Bandwidth	Pass - Refer to Limited Modular Approval FCC ID: NSQTF-1011LReport
15.247(a)(2)	RSS210 (A8.2)	Bandwidth	Pass - Refer to Limited Modular Approval FCC ID: NSQTF-1011LReport
15.247(a)(1)	RSS210(A8.1)	Number of Hopping Channels	N/A
15.247(a)(1)	RSS210(A8.1)	Time of Occupancy	N/A
15.247(b)	RSS210(A8.4)	Output Power	Pass - Refer to Limited Modular Approval FCC ID: NSQTF-1011LReport
15.247(c)	RSS210(A8.4)	Antenna Gain > 6 dBi	N/A
15.247(d)	RSS210(A8.5)	Conducted Spurious Emissions	N/A
15.209; 15.247(d)	RSS210(A8.5)	Radiated Spurious Emissions	Pass
15.247(e)	RSS210(A8.3)	Power Spectral Density	N/A
15.247(f)	RSS210(A8.3)	Hybrid System Requirement	N/A
15.247(g)	RSS210(A8.1)	Hopping Capability	N/A
15.247(h)	RSS210(A8.1)	Hopping Coordination Requirement	N/A
15.247(i)	RSSGen(5.5)	RF Exposure requirement	Pass
	RSSGen(4.8)	Receiver Spurious Emissions	Pass

ANSI C63.4: 2003/ RSS-Gen Issue 2: 2008

PS: All measurement uncertainties are not taken into consideration for all presented test result.

## 5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

### 5.10 Radiated Spurious Emission < 1GHz

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (QP only @ 3m) is ±6.0dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions
 

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : October 24 & 29 2008  
Tested By :Choon Sian Ooi

**Standard Requirement:** 47 CFR §15.247(d)

**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 to transmit at mid channel. Note that setting the channel other than mid, the spurious emissions are the same.

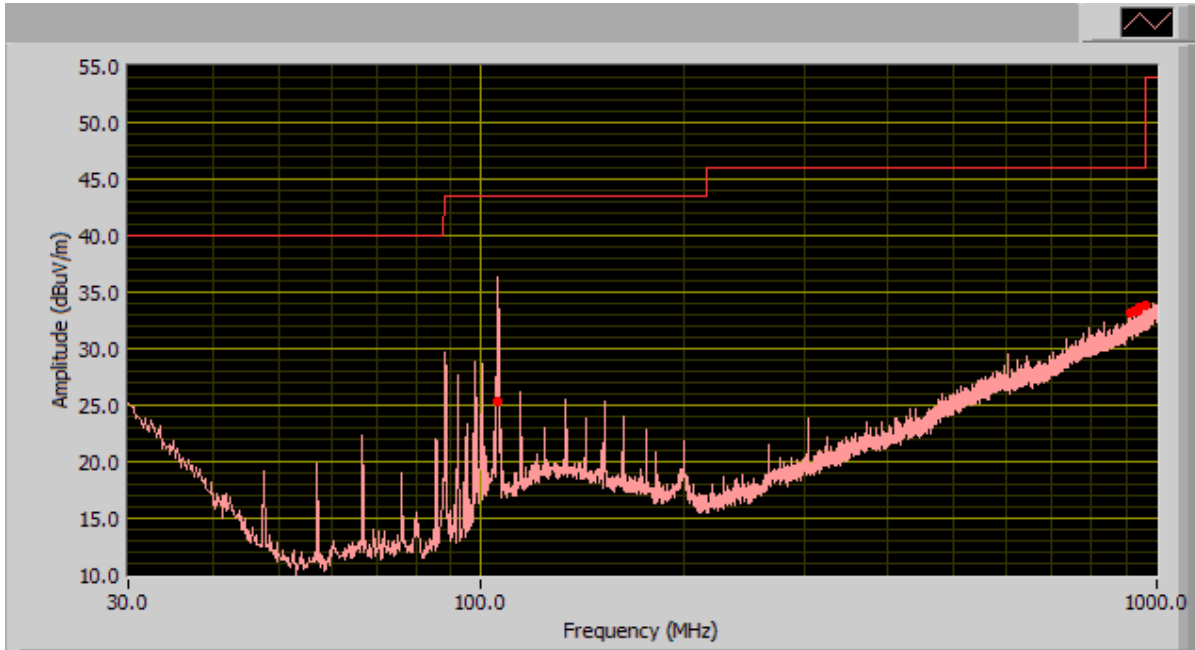
The limit is converted from microvolts/meter to decibel microvolts/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dBµV/m) + ACF(dB) + Cable Loss(dB)

**Test Result:**

### Radiated Emission Plot (Transmit Mode-DSSS CW)

#### Test Data



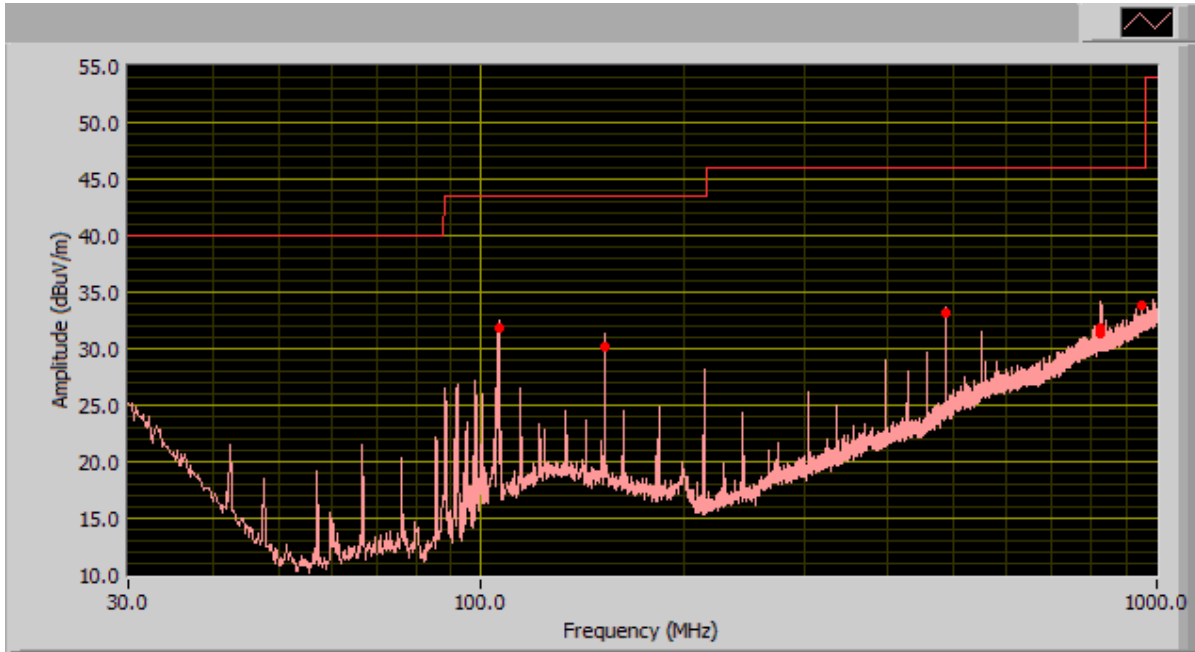
Limit

#### Test Data

Frequency (MHz)	Quasi-Peak (dBµV/m) @ 3m	Antenna height (cm)	Turntable position (deg)	Polarity	Limit (dBµV/m)	Margin (dB)
105.71	25.30	103.00	234.00	V	43.50	-18.20
959.68	33.88	325.00	39.00	H	46.00	-12.12
913.67	33.16	395.00	30.00	H	46.00	-12.84
944.82	33.61	107.00	241.00	H	46.00	-12.39
928.40	33.39	254.00	107.00	H	46.00	-12.61
937.25	33.32	149.00	264.00	H	46.00	-12.68

### Radiated Emission Plot (Transmit Mode-DSSS OOK)

#### Test Data



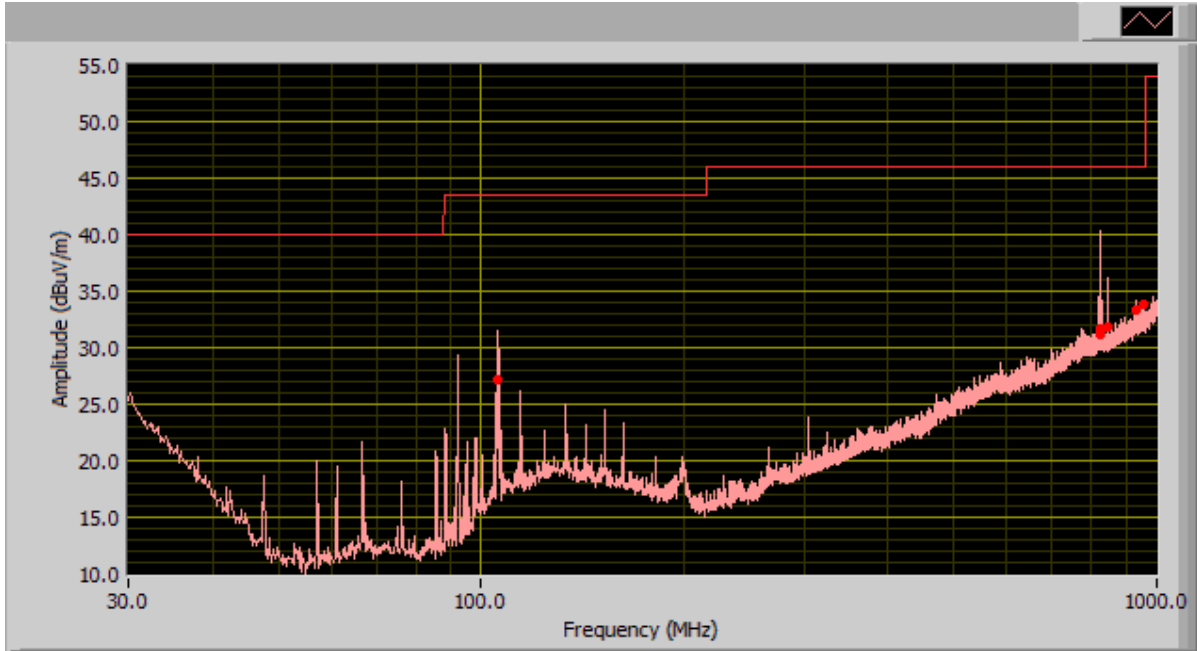
Limit

#### Test Data

Frequency (MHz)	Quasi-Peak (dBuV/m) @ 3m	Antenna height (cm)	Turntable position (deg)	Polarity	Limit (dBuV/m)	Margin (dB)
106.51	31.82	108.00	272.00	V	43.50	-11.68
824.50	31.34	164.00	72.00	V	46.00	-14.66
152.61	30.15	101.00	170.00	V	43.50	-13.35
827.31	31.79	331.00	359.00	H	46.00	-14.21
951.30	33.84	313.00	140.00	H	46.00	-12.16
488.35	33.18	115.00	127.00	V	46.00	-12.82

### Radiated Emission Plot (Receive Mode)

#### Test Data



Limit

#### Test Data

Frequency (MHz)	Quasi-Peak (dBµV/m) @ 3m	Antenna height (cm)	Turntable position (deg)	Polarity	Limit (dBµV/m)	Margin (dB)
825.02	31.81	383.00	214.00	H	46.00	-14.19
825.01	31.74	336.00	148.00	H	46.00	-14.26
827.29	31.12	328.00	268.00	V	46.00	-14.88
845.19	31.79	302.00	216.00	H	46.00	-14.21
931.20	33.31	174.00	180.00	H	46.00	-12.69
105.70	27.19	294.00	202.00	V	43.50	-16.31



## **5.10 Radiated Spurious Emissions > 1GHz & Band Edge**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GH is +6.0dB (for EUTs < 0.5m X 0.5m).
4. Environmental Conditions
 

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : October 24 & 29 2008  
Tested By : Choon Sian Ooi

Standard Requirement: 47 CFR §15.247(d)

**Procedures:** Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 10Hz video bandwidth. The EUT was tested at low, mid and high with the highest output power. Investigated up to 10<sup>th</sup> harmonic of the operating frequency.

Sample Calculation:

EUT Field Strength = Raw Amplitude(dBμV/m) – Amplifier Gain(dB) + Antenna Factor(dB) + Cable Loss(dB)  
+ Filter Attenuation(dB, if used)

**Test Result:**

### Transmit-Mode-DSSS CW

Frequency	Reading	Direction	Height	Polar	Antenna Loss	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	(dBuV/m)	Degree	Meter	H / V	(dB)	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.88	45.53	160.00	1.00	v	33.00	4.13	32.49	50.17	74.00	-23.84	Peak
4.88	48.45	178.00	1.30	h	33.00	4.13	32.49	53.09	74.00	-20.92	Peak
4.88	36.99	160.00	1.00	v	33.00	4.13	32.49	41.63	54.00	-12.38	Ave
4.88	43.31	178.00	1.30	h	33.00	4.13	32.49	47.95	54.00	-6.06	Ave
7.33	44.25	140.00	1.00	v	35.50	5.22	32.39	52.58	74.00	-21.42	Peak
7.33	45.30	143.00	1.00	h	35.50	5.22	32.39	53.63	74.00	-20.37	Peak
7.33	31.25	140.00	1.00	v	35.50	5.22	32.39	39.58	54.00	-14.42	Ave
7.33	31.15	143.00	1.30	h	35.50	5.22	32.39	39.48	54.00	-14.52	Ave

Emission was scanned up to 25GHz.

### Transmit Mode-DSSS OOK

Frequency	Reading	Direction	Height	Polar	Antenna Loss	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	(dBuV/m)	Degree	Meter	H / V	(dB)	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.89	47.08	200.00	1.00	v	33.00	4.13	32.49	51.72	74.00	-22.29	Peak
4.89	47.02	187.00	1.20	h	33.00	4.13	32.49	51.66	74.00	-22.35	Peak
4.89	35.93	200.00	1.00	v	33.00	4.13	32.49	40.57	54.00	-13.44	Ave
4.89	35.49	187.00	1.20	h	33.00	4.13	32.49	40.13	54.00	-13.88	Ave
7.34	43.09	271.00	1.00	v	35.50	5.22	32.39	51.42	74.00	-22.58	Peak
7.34	42.65	159.00	1.00	h	35.50	5.22	32.39	50.98	74.00	-23.02	Peak
7.34	32.10	271.00	1.30	v	35.50	5.22	32.39	40.43	54.00	-13.57	Ave
7.34	30.91	159.00	1.40	h	35.50	5.22	32.39	39.24	54.00	-14.76	Ave

Emission was scanned up to 25GHz.

**Annex A. TEST INSTRUMENT & METHOD**

**Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES**

Instrument	Model	Serial #	Calibration Due
<b>AC Conducted Emissions</b>			
R&S EMI Test Receiver	ESIB40	100179	04/25/2009
R&S LISN	ESH2-Z5	861741/013	04/24/2009
CHASE LISN	MN2050B	1018	04/24/2009
<b>Radiated Emissions</b>			
R&S EMI Test Receiver	ESIB40	100179	04/25/2009
Com Power Corp Horn Antenna (18GHz to 40GHz)	AH-840	101013	03/19/2010
EMCO Horn Antenna (1-18GHz)	3115	10SL0059	01/04/2009
Sunol Sciences, Inc. antenna (30MHz~2GHz)	JB1	A030702	10/04/2009
Wiltron Signal Generator (10MHz to 40GHz)	68169B	973407	04/25/2009
Com Power Preamplicifier (18GHz to 40GHz)	PA-840	181250	05/21/2009
HP Preamplicifier (1-18GHz)	8449B	3008A00715	04/24/2009
HP Preamplicifier (0.1-1300MHz)	8447F	1937A01160	04/24/2009
Millitech, External Mixer	MHB-06-RD3A0	9259	N/A
MILITECH, External Mixer (Above 40GHz)	MHB-06-RD3A0	9259	N/A
MILITGECH, Horn Antenna (above 40GHz)	WT-KaD	WT28-6	N/A

Note: No calibration required.

## Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

### Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipments were powered separately from another main supply.

### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 KHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

### Sample Calculation Example

At 20 MHz	limit = 250 μV = 47.96 dBμV
Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB	
Q-P reading obtained directly from EMI Receiver = 40.00 dBμV (Calibrated for system losses)	
Therefore, Q-P margin = 47.96 – 40.00 = 7.96	i.e. <b>7.96 dB below limit</b>

**Annex A. iii RADIATED EMISSIONS TEST DESCRIPTION**

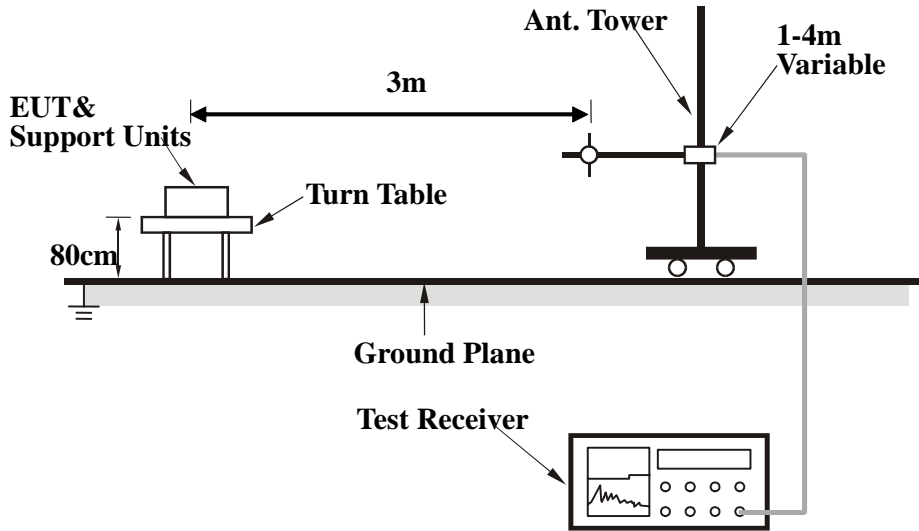
**EUT Characterisation**

EUT characterisation, over the frequency range from 30MHz to 10<sup>th</sup> Harmonic, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS).

**Test Set-up**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



**Test Method**

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

**Final Radiated Emission Measurement**

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

**Sample Calculation Example**

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain (if any)}$$

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor or}$$

$$\text{Set RBW} = 1\text{MHz, VBW} = 10\text{Hz.}$$

Note :

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

**Annex B EUT AND TEST SETUP PHOTOGRAPHS**

**Please see the attachment**

**Annex C. TEST SETUP AND SUPPORTING EQUIPMENT**

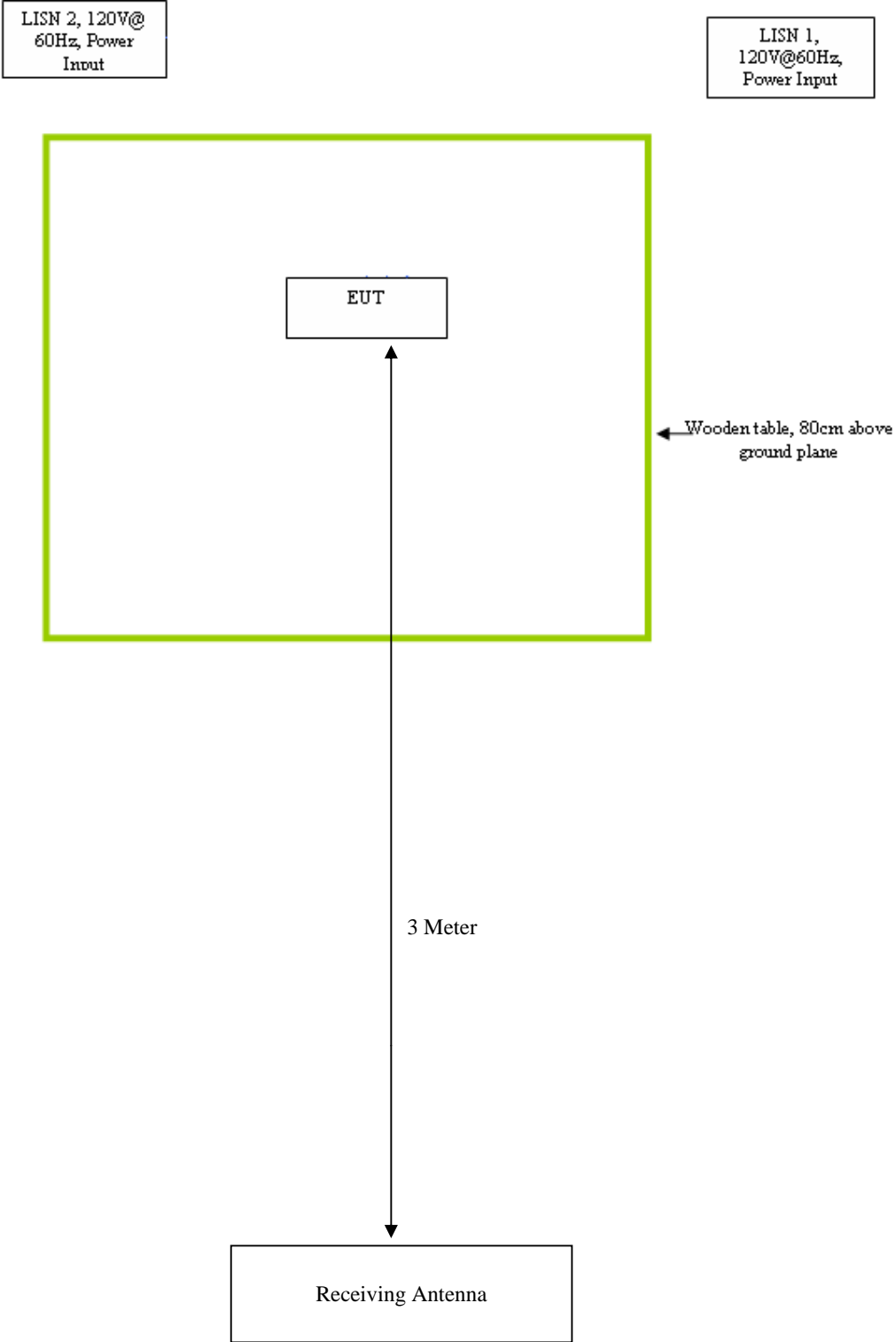
**EUT TEST CONDITIONS**

**Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION**

The following is a description of supporting equipment and details of cables used with the EUT.

<b>Equipment Description (Including Brand Name)</b>	<b>Model &amp; Serial Number</b>	<b>Cable Description (List Length, Type &amp; Purpose)</b>
N/A	N/A	N/A

### Block Configuration Diagram for Radiated Emission





## Block Configuration Diagram for Conducted Emission

N/A

**Annex C.ii. EUT OPERATING CONDITIONS**

The following is the description of how the EUT was exercised during testing.

Test	Description Of Operation
<p><b>Emissions Testing</b></p>	<p>The EUT was configured using manufacturer's program to simulate the worst case.</p>
<p><b>Others Testing</b></p>	<p>The EUT was configured using manufacturer's program to simulate the worst case.</p>

## **Annex D USER MANUAL, BLOCK & CIRCUIT DIAGRAM**

**Please see attachment**