

## SAVI NETWORKS LLC

### SAVI NETWORKS EV-LSE-01 ISO CONTAINER DOOR TAG WITH GPS/GPRS AND SENSORS

Model: EV-LSE-01

16 January 2009

Report No.: SL08120801-SAV-009 (15.231 (a/e))  
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

Dan Corona Compliance Engineer	Leslie Bai Director of Certification

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

**FCC Test Report**

To: FCC Part 15.231 (a/e)

**SIEMIC, INC.**  
Accessing global markets



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





## SIEMIC ACCREDITATION DETAILS: FCC Registration No. 783147

### FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

September 12, 2008

Registration Number: 783147

SIEMIC Laboratories  
2206 Ringwood Avenue,  
San Jose, CA 95131

Attention: Leslie Bai

Re: Measurement facility located at San Jose  
Anechoic chamber (3 meters)  
Date of Listing: February 10, 2004

Dear Sir or Madam:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification for 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. Please also note that this registration does not recognize the measurement facility to perform testing for products authorized under the Declaration of Conformity (DoC) process. In order to test products subject to DoC authorization process, a measurement facility must be accredited and recognized by the FCC.

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,

Katie Hawkins  
Electronics Engineer

## SIEMIC ACCREDITATION DETAILS: Industry of Canada Registration No. 4842-1



May 23rd, 2008

OUR FILE: 46405-4842  
 Submission No: 126429

Siemic Inc.  
 2206 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 3/10m 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-bhst.nsf/en/h\\_tt00052e.html](http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.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. Proulx  
 Test & Measurement Specialist  
 Certification and Engineering Bureau  
 3701 Carling Ave., Building 94  
 Ottawa, Ontario K2H 8S2

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



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

October 1, 2008

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

Dear Mr. Bai:

NIST is pleased to inform you that your laboratory has been recognized by the Radio Research Agency (RRA) Korea Communications Commission (KCC) under the Asia Pacific Economic Cooperation for Telecommunications Equipment 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. The pertinent information about your laboratory's designation is as follows:

CAB Name: SIEMIC, Inc.  
 Physical Location: 2206 Ringwood Avenue, San Jose, CA 95131  
 Identification No.: US0160  
 Recognized Scope: **EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI  
 KN22: Test Method for EMI  
**EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS  
 KN24, KN-61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS  
**Wireless:** RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68  
**Wired:** President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6  
 President Notice 20664, RRL Notice 2008-7 with attachment 4

You may submit test data to RRA/KCC 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.

Recognized CABs are listed on the NIST website at <http://ts.nist.gov/mra>. If you have any questions please contact Ramona Saar at (301) 975-5521 or [ramona.saar@nist.gov](mailto:ramona.saar@nist.gov).

Sincerely,

*David F. Alderman*

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

Enclosure

cc: Ramona Saar

**NIST**



## SIEMIC ACCREDITATION DETAILS: Taiwan BSMI Accreditation No. SL2-IN-E-1130R



UNITED STATES DEPARTMENT OF COMMERCE  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20889

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 301-975-5521. We appreciate your continued interest in our international conformity assessment activities.

Sincerely,

A handwritten signature in blue ink that reads "David F. Alderman".

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

cc: Joginder Dhillon

**NIST**



## SIEMIC ACCREDITATION DETAILS: Taiwan NCC CAB ID: US0160



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

November 25, 2008

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

Dear Mr. Bai:

NIST is pleased to inform you that your laboratory has been recognized by the National Communications Commission (NCC) for the requested scope expansion under the Asia Pacific Economic Cooperation for Telecommunications Equipment Mutual Recognition Arrangement (APEC Tel MRA). Your laboratory is 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, Inc.  
Physical Location: 2206 Ringwood Avenue, San Jose, CA 95131  
Identification No.: US0160  
Current Scope: LP0002  
Additional Scope: PSTN01, ADSL01, ID0002, IS6100 and CNS 14336

You may submit test data to NCC to verify that the equipment to be imported into China 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.

Recognized CABs are listed on the NIST website at <http://ts.nist.gov/mra>. If you have any questions please contact Ramona Saar at (301) 975-5521 or [ramona.saar@nist.gov](mailto:ramona.saar@nist.gov).

Sincerely,

*David F. Alderman*

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

Enclosure

cc: Ramona Saar

**NIST**

**SIEMIC ACREDITATION DETAILS: Hong Kong OFTA CAB ID: US0160**



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

December 8, 2008

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

Dear Mr. Bai:

NIST is pleased to inform you that your laboratory has been recognized by the Office of the Telecommunications Authority (OFTA) under the Asia Pacific Economic Cooperation for Telecommunications Equipment 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. The pertinent information about your laboratory's designation is as follows:

CAB Name: SIEMIC, Inc.  
 Physical Location: 2206 Ringwood Avenue, San Jose, California 95131 USA  
 Identification No.: US0160  
 Recognized Scope: **Radio:** HKTA 1002, 1007, 1008, 1010, 1015, 1016, 1020, 1022, 1026, 1027, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1039, 1041, 1042, 1043, 1044, 1046, 1047, 1048, 1049, 1051  
**Telecom:** HKTA 2011, 2012, 2013, 2014, 2017, 2018, 2022, 2024, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033

You may submit test data to OFTA to verify that the equipment to be imported into Hong Kong 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.

Recognized CABs are listed on the NIST website at <http://ts.nist.gov/mra>. If you have any questions please contact Ramona Saar at (301) 975-5521 or [ramona.saar@nist.gov](mailto:ramona.saar@nist.gov).

Sincerely,

*David F. Alderman*

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

Enclosure

cc: Ramona Saar

**NIST**



## SIEMIC ACCREDITATION DETAILS: Australia ACMA CAB ID: US0160



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

November 20, 2008

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

Dear Mr. Bai:

NIST is pleased to inform you that your laboratory has been recognized by the Australian Communications and Media Authority (ACMA) under the Asia Pacific Economic Cooperation for Telecommunications Equipment 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. The pertinent information about your laboratory's designation is as follows:

CAB Name: Siemic, Inc.  
Physical Location: 2206 Ringwood Avenue, San Jose, CA 95131  
Identification No.: US0160  
Recognized Scope: EMC: AS/NZS 4251.1 (until 5/31/2009), AS/NZS 4251.2 (until 5/31/2009), AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR 22, AS/NZS 61000.6.3, AS/NZS 61000.6.4  
Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771  
Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06, AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/NZS 60950.1

You may submit test data to ACMA to verify that the equipment to be imported into Australia 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. Recognized CABs are listed on the NIST website at <http://ts.nist.gov/mra>. Please contact Ms. Ramona Saar, at (301) 975-5521 or [ramona.saar@nist.gov](mailto:ramona.saar@nist.gov) if you have questions.

Sincerely,

A handwritten signature in black ink that reads "David F. Alderman".

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

Enclosure

cc: Snell Leong, Siemic, Inc.; Ramona Saar, NIST

The NIST logo, consisting of the letters "NIST" in a bold, sans-serif font.

## SIEMIC ACCREDITATION DETAILS: Australia NATA Recognition



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

November 4, 2008

Under Australian government legislation, the Australian Communications and Media Authority (ACMA) has determined the National Association of Testing Authorities, Australia (NATA) as an accreditation body as per Section 409(1) of the Telecommunications Act 1997 (Cth). Pursuant to Section 409(2) of the Telecommunications Act 1997 (Cth), I am pleased to advise that your laboratory has been determined as a Recognised Testing Authority (RTA).

This determination has been made on the basis of your accreditation by A2LA accreditation no. 2742.01 and the Mutual Recognition Agreement between NATA and A2LA. It is effective from 11 July 2008. RTA status applies only to the following standards and is contingent upon their continued inclusion in your laboratory's scope of accreditation.

**AS/ACIF S002, AS/ACIF S003, AS/ACIF S004,  
 AS/ACIF S006, AS/ACIF S016, AS/ACIF S031,  
 AS/ACIF S038, AS/ACIF S041 and  
 AS/ACIF S043.2**

As an RTA, your laboratory has the following obligations:

1. the laboratory shall continue to meet all of the accreditation criteria of A2LA;
2. the authorised representative of the laboratory shall notify NATA of changes to the staff or operations of the laboratory which would affect the performance of the tests for which the laboratory has been determined;
3. compliance of equipment shall be reported on test reports bearing the A2LA logo/endorsement.

Current information on the Australian Communications and Media Authority and regulatory requirements for telecommunications products within Australia can be obtained from the ACMA's web-site at "<http://www.acma.gov.au>". Further information about NATA may be gained by visiting "<http://www.nata.asn.au>".

Please note that AS/ACIF S040 and New Zealand standards do not form part of the RTA scheme.

Your RTA listing will appear on the NATA website shortly.

Kind Regards

Chris Norton,  
 Senior Scientific Officer  
 Measurement Science and Technology  
 National Association of Testing Authorities (NATA)  
 71-73 Flemington Road  
 North Melbourne Vic 3051  
 Australia  
 Ph: +61 3 9329 1633 Fx: +61 3 9326 5148  
 E-Mail: [Christopher.Norton@nata.asn.au](mailto:Christopher.Norton@nata.asn.au)  
 Internet: [www.nata.asn.au](http://www.nata.asn.au)



**SIEMIC, INC.**  
Accessing global markets

Title: FCC RF Test Report of Savi Networks LLC  
Model : EV-LSE-01  
To 47 CFR FCC 15.231 (a)(e) : 2009

Serial# SL08120801-SAV-009 (15.231 (a/e)  
Issue Date 16 January 2009  
Page 11 of 37  
www.siemic.com

## SIEMIC ACREDITATION DETAILS: Mexico NOM Recognition



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 prellenado 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 mencionarte que nuestro intermediario gestor será la empresa Isatell 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 Bóquez González  
Gerente Técnico del Laboratorio de  
CANIETI.

Culiacán 71  
Hacienda Condessa  
C.P. 1200 México, D.F.  
Tel. 5264-0308 con 12 líneas  
Fax 5264-0488  
www.canieti.org



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## 1 Executive Summary & EUT information

The purpose of this test programme was to demonstrate compliance of the Savi Networks LLC Savi Networks EV-LSE-01 ISO Container Door Tag with GPS/GPRS and Sensors, against the current Stipulated Standards. The Savi Networks EV-LSE-01 ISO Container Door Tag with GPS/GPRS and Sensors have demonstrated compliance with the 47 CFR FCC 15.231 (a)(e) : 2009.

### EUT Information

**EUT Description :** Savi Networks® EV-LSE-01 ISO Container Door Tag with GPS/GPRS and Sensors is a high performance active RFID tag that works with Savitrak software to track and monitor the security status of containers as they move through the global supply chain. This device is fully compatible with fixed and portable Savi readers and features up to 300 feet (91.44 meters) of omni-directional line-of-sight range. In addition, EV-LSE-01 Tag utilizes GPS receiver to report and recorded asset location using GSM/GPRS cellular network.

Rechargeable Lithium Ion battery life is typically 90 days between the charges. The EV-LSE-01 tag is available with 128K of programmable memory. It includes a door clamp and external antennas. Using the door clamp, you affix the tag to the left door of an ISO-compliant container.

The tag is designed to operate from internal batteries. An external AC-DC adapter can be connected to the device to charge these internal batteries. When the external DC source is connected the transceiver functions are disabled so all testing under the scope of this test report was performed with the AC-DC adapter disconnected.

**Model No :** EV-LSE-01  
**Serial No :** 6593003  
**Input Power :** 3.7VDC Li-Ion Rechargeable Batteries  
**Classification Per Stipulated Test Standard :** Low Power Transceiver

## 2 TECHNICAL DETAILS

<b>Purpose</b>	Compliance testing of Savi Networks EV-LSE-01 ISO Container Door Tag with GPS/GPRS and Sensors with stipulated standard
<b>Applicant / Client</b>	Savi Networks LLC
<b>Manufacturer</b>	Savi Networks LLC 351 E. Evelyn Avenue Mountain View, CA 94041
<b>Laboratory performing the tests</b>	SIEMIC Laboratories
<b>Test report reference number</b>	SL08120801-SAV-009 (15.231 (a/e)
<b>Date EUT received</b>	07-Jan -2009
<b>Standard applied</b>	47 CFR FCC 15.231 (a)(e) : 2009
<b>Dates of test (from – to)</b>	08 - 13 Jan 2009
<b>No of Units:</b>	# 3
<b>Equipment Category:</b>	DXT
<b>Trade Name:</b>	Savi Networks LLC
<b>Model :</b>	EV-LSE-01
<b>RF Operating Frequency (ies)</b>	433.92MHz
<b>Number of Channels :</b>	1
<b>Modulation :</b>	FSK
<b>FCC ID :</b>	WXK-EVLSE01-V1
<b>IC ID :</b>	--



### **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:**

**Low Power Transceiver**

### Test Results Summary

Test Standard		Description	Pass / Fail			
47 CFR Part 15.231: 2009	RSS 210 Issue 7: 2007					
15.203		Antenna Requirement	Pass			
15.207		Conducted Emission Voltage	N/A			
15.231 (a)(1) & (2)		Manually and Automatically Deactivation (note 1)	Pass			
15.231 (b) / 15..209		Fundamental & Radiated Spurious Emission Limits	Pass			
15.231 (c)		20 dB Bandwidth	Pass			
15.231 (e)		Duration of transmissions (note 1)	Pass			
15.231 (e)		Period between transmissions (note 1)	Pass			
15.231 (e) / 15.209		Fundamental & Radiated Spurious Emission Limits	Pass			
15.231 (c)		20 dB Bandwidth	Pass			
Note 1	Refer to the operational description included with this application for detailed description timing diagrams for transmission duration.					
Note 2	The product is also provided with a Siemens AG GPRS/GPS Transceiver; FCC ID: QIPTC65 and Nemerix GPS Receiver.					
ANSI C63.4: 2003/ RSS-Gen Issue 2: 2007						
PS: All measurement uncertainties are not taken into consideration for all presented test result.						

## 5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

### 5.1 Antenna Requirement

#### Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

- a) Antenna must be permanently attached to the device.
- b) Antenna must use a unique type of connector to attach to the device.
- c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The EUT is using integral antenna attached permanently to the device which meets the requirement.

## 5.2 AC Line Conducted Emission Test Result

Requirement:

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

\*Decreases with the logarithm of the frequency.

### Procedures:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average 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. Conducted 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 150kHz – 30MHz (Average & Quasi-peak) is  $\pm 3.5$ dB.
4. Environmental Conditions
 

Temperature	23°C - 25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date :

Tested By : Dan Corona

### Results:

N/A

Note: EUT is Solely Battery Operated.

Although the device may be connected to an AC adapter to charge the internal battery, when the AC-DC adapter is connected the device's transceiver functions are disabled.

## 5.3 20dB Occupied Bandwidth

### 1. Conducted Measurement

EUT was set with modulated mode and highest RF output power.  
 The spectrum analyzer was connected to the antenna terminal.

### 2 Environmental Conditions

Temperature	23°C - 25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

### 3 Conducted 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 – 20GHz is  $\pm 1.5$ dB.

### 4 Test Date : January 08 to 13, 2009

Tested By : Dan Corona

**Requirement(s):** 47 CFR §15.231 (c)

**Procedures:** The 20dB bandwidths were measured conducted using a spectrum analyzer.

**Test Result:** Pass

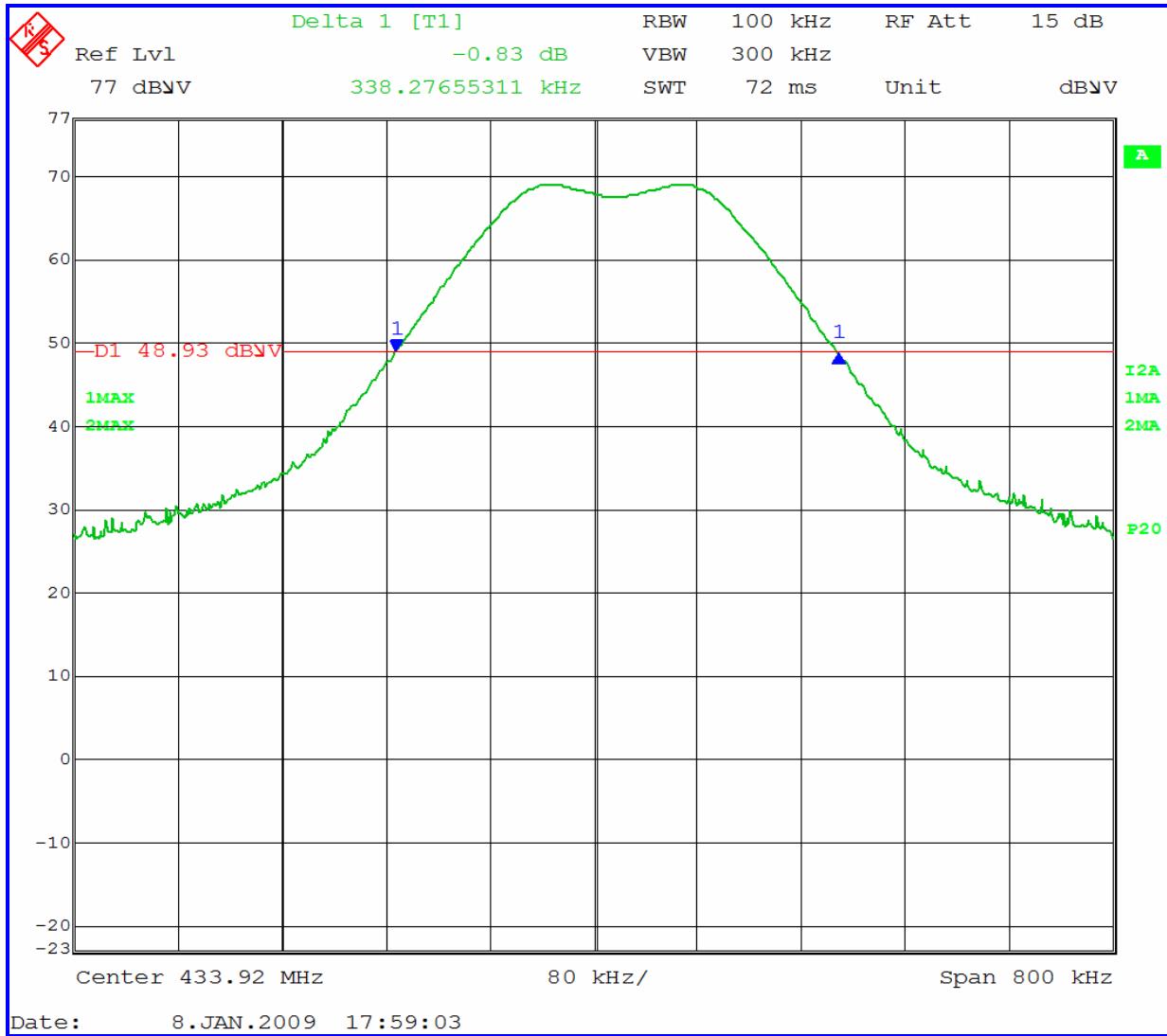
Fundamental Frequency (MHz)	Measured Bandwidth (KHz)	20 dB	FCC 15.231(a) Limit (KHz)	Result
433.92		338.28	1084.8	Pass

Fundamental Frequency (MHz)	Measured Bandwidth (KHz)	20 dB	FCC 15.231(e) Limit (KHz)	Result
433.92		338.28	1084.8	Pass

Refer to the attached plots.

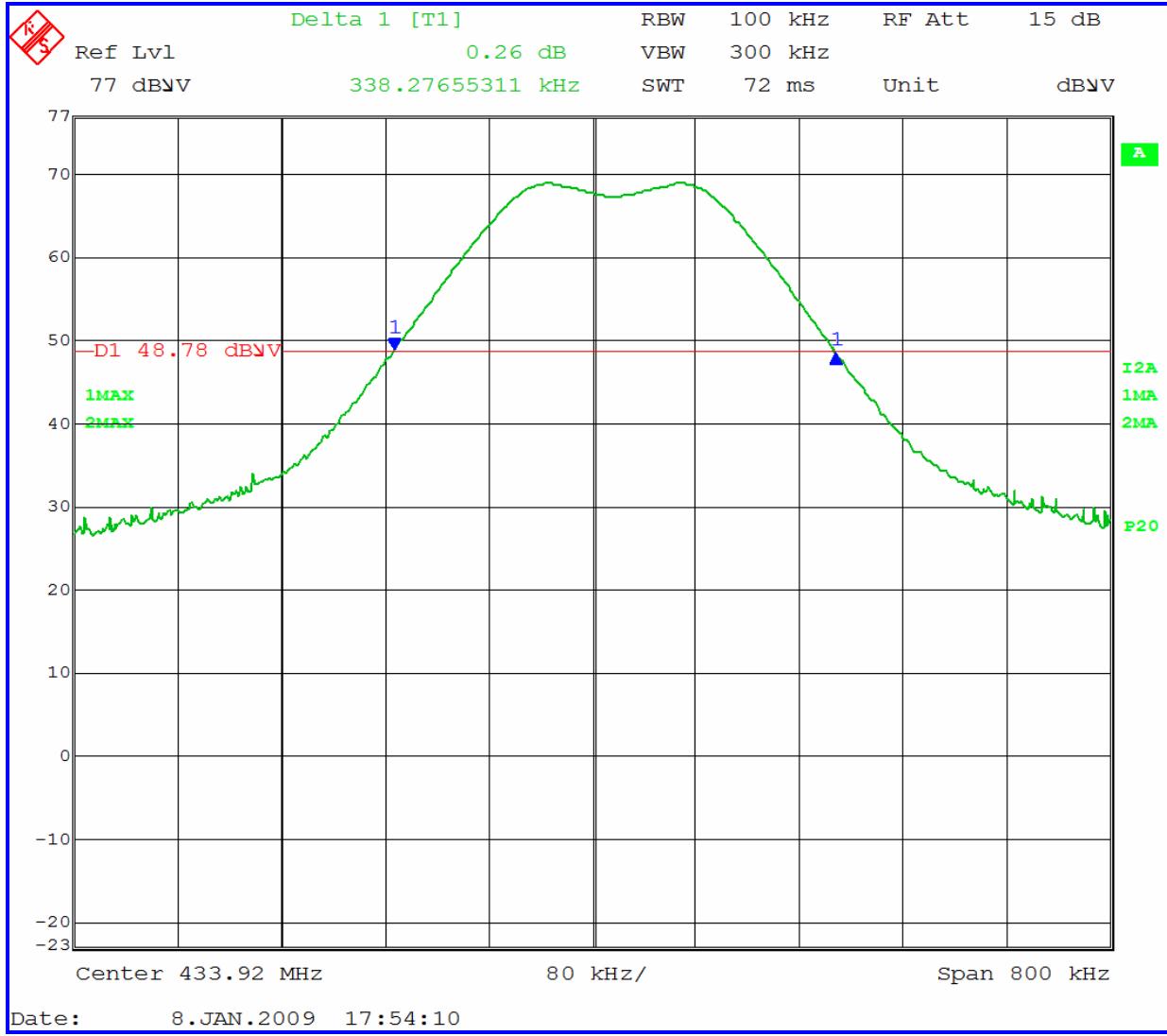


20dB Bandwidth (15.231 (a))





20dB Bandwidth (15.231 (e))



## 5.4 Radiated Fundamental and Spurious Emission

1. Radiated emissions were measured according to ANSI C63.4. The EUT was set 3 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10kHz, All possible modes of operation were investigated. Only the worst case emissions measured, 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. Sample Calculation: Corrected Amplitude = Raw Amplitude (dB $\mu$ V/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor.  
 Sample Calculation:  
 1) Corrected Amplitude = Raw Amplitude(dB $\mu$ V/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor  
 2) Pulse average reading = Peak reading + 20 log ( Duty cycle ).
4. 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 & 10m) is +5.6dB/-4.5dB (for EUTs < 0.5m X 0.5m X 0.5m). In range of 1-40Ghz is  $\pm$ 3.6dB
5. Environmental Conditions
 

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test date : January 08 to 13 2009

Tested By : Dan Corona

### Standard Requirements:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66–40.70	1,000	100
70–130	500	50
130–174	500 to 1,500 <sup>1</sup>	50 to 150 <sup>1</sup>
174–260	1,500	150
260–470	1,500 to 5,000 <sup>1</sup>	150 to 500 <sup>1</sup>
Above 470	5,000	500

<sup>1</sup>Linear interpolations.

**Test Result:** Pass

### Fundamental Measurement @ 433.92MHz @ 3 Meter [FCC 15.231(a)]

Frequency (MHz)	Reading (dBuV/m)	Azimuth	Polarity	Height (m)	Factors (dB)	FCC 15.231(a) Limit (dBuV)	Margin (dB)	Comments
433.921	88.10	52.00	V	1.00	18.79	100.83	-12.73	Peak
433.921	76.10	52.00	V	1.00	--	80.83	-4.73	Ave
433.921	90.32	179.00	H	2.00	18.79	100.83	-10.51	Peak
433.921	78.32	179.00	H	2.00	--	80.83	-2.51	Ave

**Note:** Duty cycle is 25%. A-12dB correction was used to determine the average level from the peak reading.

### Fundamental Measurement @ 433.92MHz @ 3 Meter [FCC 15.231(e)]

Frequency (MHz)	Reading (dBuV/m)	Azimuth	Polarity	Height (m)	Factors (dB)	FCC 15.231(e) Limit (dBuV)	Margin (dB)	Comments
433.921	88.10	161.00	V	2.01	18.79	92.87	-4.77	Peak
433.921	68.10	161.00	V	2.01	--	72.87	-4.77	Ave
433.921	90.32	214.00	H	2.01	18.79	92.87	-2.55	Peak
433.921	70.32	214.00	H	2.01	--	72.87	-2.55	Ave

**Note:** Duty cycle is 10%. A-20dB correction was used to determine the average level from the peak reading.

**Additional note:** 15.231(e) duty cycle calculations; please refer to the operational description included with this application for detailed description timing diagrams for transmission duration.

### Spurious Emissions (<1GHz) Measurement @ 3 Meter [FCC 15.231(a/e)]

Frequency (MHz)	Corrected Reading (dBuV/m)	Azimuth	Polarity	Height (m)	Factors (dB)	FCC 15.231 Limit (dBuV)	Margin (dB)	Comments
824.43	31.24	215.00	V	1.00	24.90	46.00	-14.76	QP
824.43	37.40	360.00	H	2.00	24.90	46.00	-8.61	QP



### Spurious Emissions (>1GHz) Measurement @ 3 Meter [FCC 15.231(a)]

Frequency GHz	Reading dBuV/m	Direction Degree	Height Meter	Polar H/V	Antenna Loss (dB)	Cable loss (dB)	Amplifier (dB)	Corrected Reading (dBuV/m)	FCC 15.231(a) Limit (dBuV)	Margin (dB)	Comments
1.302	53.48	184.00	1.10	v	25.2	1.82	31.99	48.51	74.00	-25.49	Peak
1.302	49.71	217.00	1.00	h	25.2	1.82	31.99	44.74	74.00	-29.26	Peak
1.754	42.43	320.00	1.00	v	26.4	2.16	31.98	39.01	74.00	-34.99	Peak
1.754	40.87	242.00	1.26	h	26.4	2.16	31.98	37.45	74.00	-36.55	Peak
2.170	45.63	160.00	1.00	v	28.7	2.5	32.04	44.79	74.00	-29.21	Peak
2.170	43.64	350.00	1.10	h	28.7	2.5	32.04	42.80	74.00	-31.20	Peak
2.604	43.73	157.00	1.00	v	29.8	2.72	32.08	44.17	74.00	-29.83	Peak
2.604	42.43	123.00	1.00	h	29.8	2.72	32.08	42.87	74.00	-31.13	Peak
3.037	43.48	252.00	1.00	v	31.6	2.94	32.34	45.68	74.00	-28.32	Peak
3.037	43.00	88.00	1.50	h	31.6	2.94	32.34	45.20	74.00	-28.80	Peak
3.471	41.60	164.00	1.00	v	31.6	2.94	32.34	43.80	74.00	-30.20	Peak
3.471	40.84	264.00	1.90	h	31.6	2.94	32.34	43.04	74.00	-30.96	Peak
3.905	42.62	267.00	1.10	v	32.5	3.43	32.37	46.18	74.00	-27.82	Peak
3.905	41.37	280.00	1.20	h	32.5	3.43	32.37	44.93	74.00	-29.07	Peak
4.339	39.99	147.00	1.00	v	33.4	3.93	32.38	44.94	74.00	-29.06	Peak
4.339	39.21	237.00	1.30	h	33.4	3.93	32.38	44.16	74.00	-29.84	Peak
1.302	41.48	184.00	1.10	v	25.2	1.82	31.99	--	54.00	-12.52	Ave
1.302	37.71	217.00	1.00	h	25.2	1.82	31.99	--	54.00	-16.29	Ave
1.754	30.43	320.00	1.00	v	26.4	2.16	31.98	--	54.00	-23.57	Ave
1.754	28.87	242.00	1.26	h	26.4	2.16	31.98	--	54.00	-25.13	Ave
2.170	33.63	160.00	1.00	v	28.7	2.5	32.04	--	54.00	-20.37	Ave
2.170	31.64	350.00	1.10	h	28.7	2.5	32.04	--	54.00	-22.36	Ave
2.604	31.73	157.00	1.00	v	29.8	2.72	32.08	--	54.00	-22.27	Ave
2.604	30.43	123.00	1.00	h	29.8	2.72	32.08	--	54.00	-23.57	Ave
3.037	31.48	252.00	1.00	v	31.6	2.94	32.34	--	54.00	-22.52	Ave
3.037	31.00	88.00	1.50	h	31.6	2.94	32.34	--	54.00	-23.00	Ave
3.471	29.60	164.00	1.00	v	31.6	2.94	32.34	--	54.00	-24.40	Ave
3.471	28.84	264.00	1.90	h	31.6	2.94	32.34	--	54.00	-25.16	Ave
3.905	30.62	267.00	1.10	v	32.5	3.43	32.37	--	54.00	-23.38	Ave
3.905	29.37	280.00	1.20	h	32.5	3.43	32.37	--	54.00	-24.63	Ave
4.339	27.99	147.00	1.00	v	33.4	3.93	32.38	--	54.00	-26.01	Ave
4.339	27.21	237.00	1.30	h	33.4	3.93	32.38	--	54.00	-26.79	Ave

**Note:** Duty cycle is 25%. A-12dB correction was used to determine the average level from the peak reading.

\* Average Value is not taken into consideration, because peak value is well below average limit.



### Spurious Emissions (>1GHz) Measurement @ 3 Meter [FCC 15.231(e)]

Frequency GHz	Reading dBuV/m	Direction Degree	Height Meter	Polar H/V	Antenna Loss (dB)	Cable loss (dB)	Amplifier (dB)	Corrected Reading (dBuV/m)	FCC 15.231(e) Limit (dBuV)	Margin (dB)	Comments
1.302	50.48	184.00	1.10	v	25.2	1.82	31.99	45.51	74.00	-28.49	Peak
1.302	48.88	217.00	1.00	h	25.2	1.82	31.99	43.91	74.00	-30.09	Peak
1.754	40.43	320.00	1.00	v	26.4	2.16	31.98	37.01	74.00	-36.99	Peak
1.754	39.97	242.00	1.26	h	26.4	2.16	31.98	36.55	74.00	-37.45	Peak
2.170	42.63	160.00	1.00	v	28.7	2.5	32.04	41.79	74.00	-32.21	Peak
2.170	42.41	350.00	1.10	h	28.7	2.5	32.04	41.57	74.00	-32.43	Peak
2.604	42.33	157.00	1.00	v	29.8	2.72	32.08	42.77	74.00	-31.23	Peak
2.604	40.68	123.00	1.00	h	29.8	2.72	32.08	41.12	74.00	-32.88	Peak
3.037	40.35	252.00	1.00	v	31.6	2.94	32.34	42.55	74.00	-31.45	Peak
3.037	42.12	88.00	1.50	h	31.6	2.94	32.34	44.32	74.00	-29.68	Peak
3.471	40.68	164.00	1.00	v	31.6	2.94	32.34	42.88	74.00	-31.12	Peak
3.471	39.57	264.00	1.90	h	31.6	2.94	32.34	41.77	74.00	-32.23	Peak
3.905	42.62	267.00	1.10	v	32.5	3.43	32.37	46.18	74.00	-27.82	Peak
3.905	41.37	280.00	1.20	h	32.5	3.43	32.37	44.93	74.00	-29.07	Peak
4.339	39.99	147.00	1.00	v	33.4	3.93	32.38	44.94	74.00	-29.06	Peak
4.339	39.21	237.00	1.30	h	33.4	3.93	32.38	44.16	74.00	-29.84	Peak
1.302	30.48	184.00	1.10	v	25.2	1.82	31.99	--	54.00	-23.52	Ave
1.302	28.88	217.00	1.00	h	25.2	1.82	31.99	--	54.00	-25.12	Ave
1.754	20.43	320.00	1.00	v	26.4	2.16	31.98	--	54.00	-33.57	Ave
1.754	19.97	242.00	1.26	h	26.4	2.16	31.98	--	54.00	-34.03	Ave
2.170	22.63	160.00	1.00	v	28.7	2.5	32.04	--	54.00	-31.37	Ave
2.170	22.41	350.00	1.10	h	28.7	2.5	32.04	--	54.00	-31.59	Ave
2.604	22.33	157.00	1.00	v	29.8	2.72	32.08	--	54.00	-31.67	Ave
2.604	20.68	123.00	1.00	h	29.8	2.72	32.08	--	54.00	-33.32	Ave
3.037	20.35	252.00	1.00	v	31.6	2.94	32.34	--	54.00	-33.65	Ave
3.037	22.12	88.00	1.50	h	31.6	2.94	32.34	--	54.00	-31.88	Ave
3.471	20.68	164.00	1.00	v	31.6	2.94	32.34	--	54.00	-33.32	Ave
3.471	19.57	264.00	1.90	h	31.6	2.94	32.34	--	54.00	-34.43	Ave
3.905	22.62	267.00	1.10	v	32.5	3.43	32.37	--	54.00	-31.38	Ave
3.905	21.37	280.00	1.20	h	32.5	3.43	32.37	--	54.00	-32.63	Ave
4.339	19.99	147.00	1.00	v	33.4	3.93	32.38	--	54.00	-34.01	Ave
4.339	19.21	237.00	1.30	h	33.4	3.93	32.38	--	54.00	-34.79	Ave

**Note:** Duty cycle is 10%. A-20dB correction was used to determine the average level from the peak reading.

\* Average Value is not taken into consideration, because peak value is well below average limit.

## Annex A. TEST INSTRUMENT & METHOD

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

Instrument	Manufacturer	Model	CAL Due Date
Spectrum Analyzer	HP	8564E	04/26/2009
EMI Receiver	Rohde & Schwarz	ESIB40	04/25/2009
R&S LISN	R&S	ESH2-Z5	04/24/2009
CHASE LISN	Chase	MN2050B	04/24/2009
Antenna (1-18GHz)	EMCO	3115	04/01/2009
Antenna (30MHz~2GHz)	Sunol Scienics	JB1	04/01/2009
Horn Antenna (18~40GHz)	COM Power	AH-840	05/21/2009
Pre-Amplifier (1~26GHz)	HP	8449	04/24/2009
Microwave Pre-Amp (18-40GHz)	COM Power	PA-840	05/21/2009
Chamber	Lingren	3m	04/18/2009

Note: Functional Verification

## Annex A.ii. AC LINE 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  $50\Omega/50\mu\text{H}$  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 =  $250 \mu\text{V} = 47.96 \text{ dB}\mu\text{V}$

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver =  $40.00 \text{ dB}\mu\text{V}$   
 (Calibrated for system losses)

Therefore, Q-P margin =  $47.96 - 40.00 = 7.96$

i.e. **7.96 dB below limit**

### Annex A. iii RADIATED EMISSIONS TEST DESCRIPTION

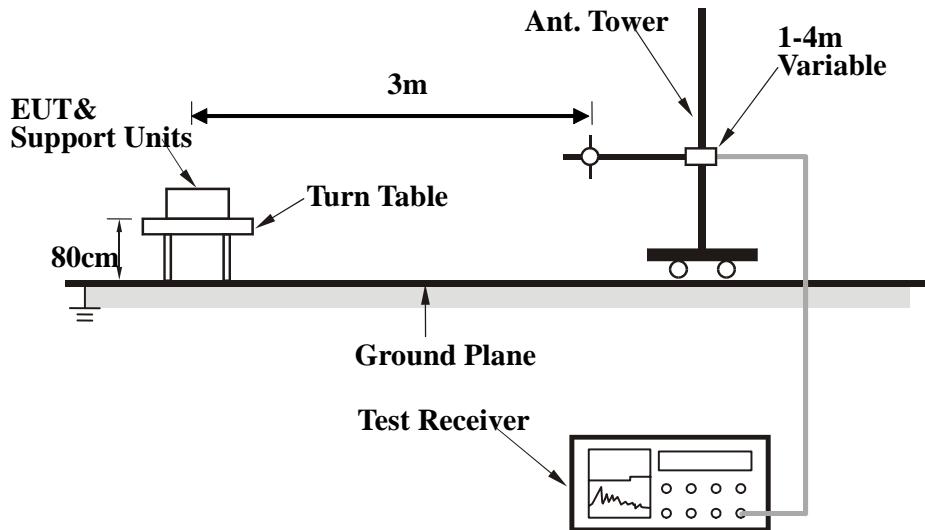
#### EUT Characterisation

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
Below 30Mhz	QP/Ave	10KHz	10KHz
30 to 1000	QP	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

$$\text{Average} = \text{Peak Value} + \text{Duty Factor} \text{ or measurement with above setting.}$$

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**

See Attachment.



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

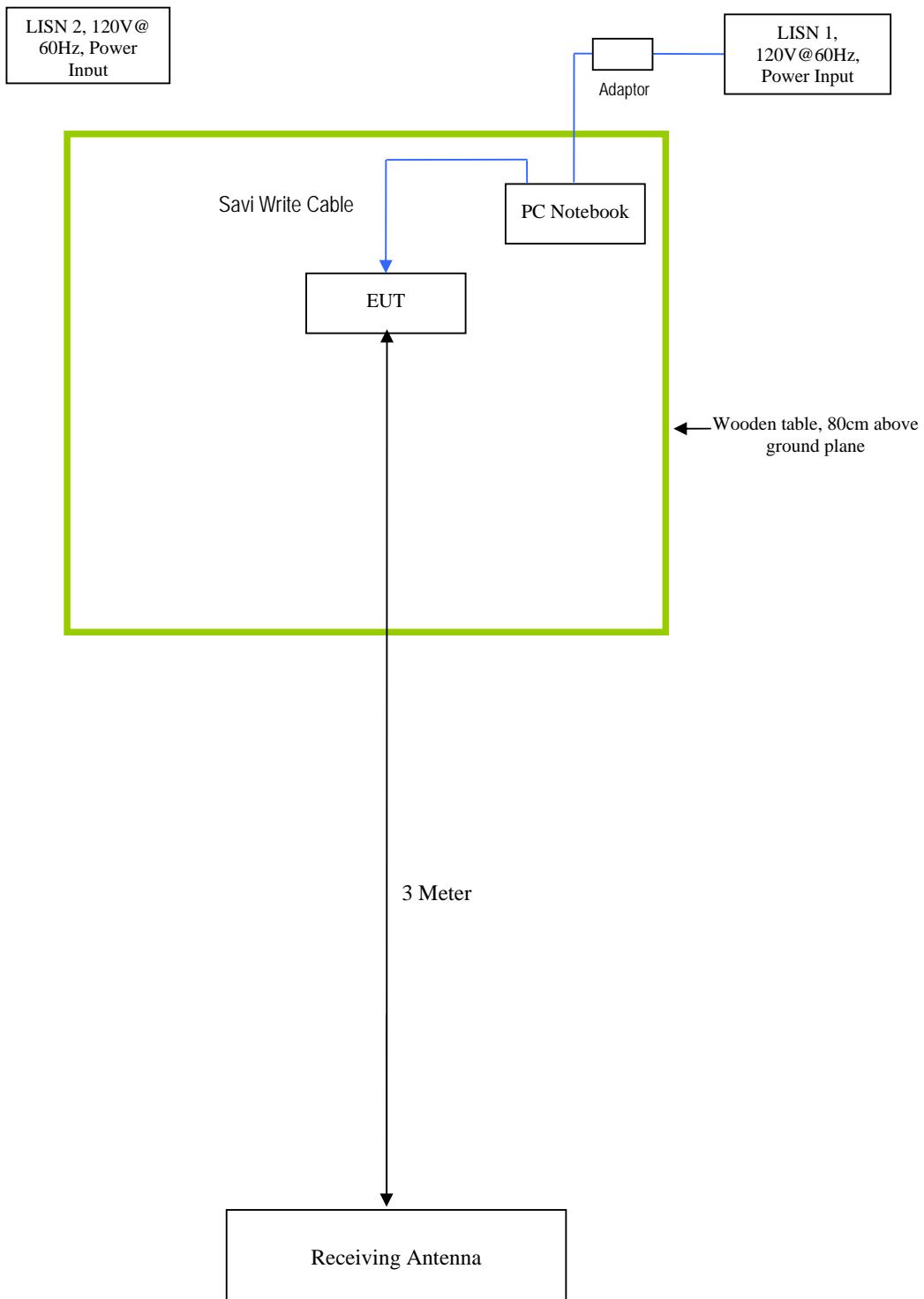
### **EUT TEST CONDITIONS**

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

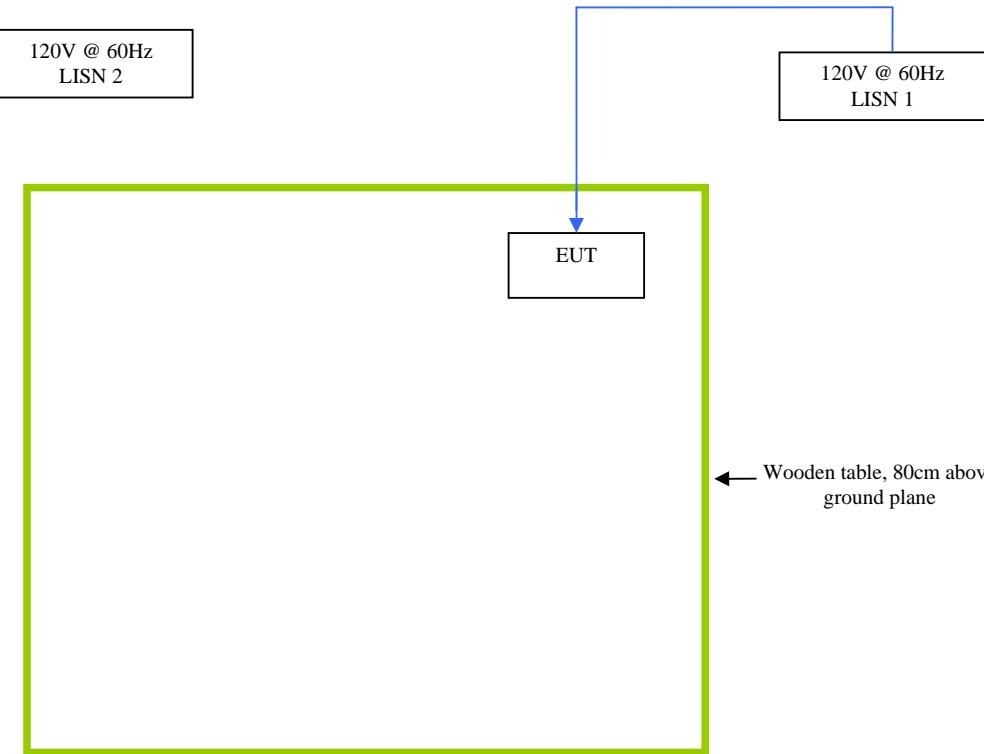
The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
DELL Notebook	Latitude D600	Savi Write Cable 1.5 meter EUT to PC Notebook

## Block Configuration Diagram for Radiated Emission



## Block Configuration Diagram for Conducted Emission



**NOTE:** Not applicable EUT is using internal battery



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

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

Test	Description Of Operation
<b>Emissions</b>	EUT is configured using the manufacturer software for continuous TX operating mode.



## Annex D USER MANUAL, BLOCK & CIRCUIT DIAGRAM

**Please see attachment**