

HACH COMPANY

ANATEL TOC ANALYZER

Model : PAT700

18 July 2007



Report No.: SL07062104-HAC-001

(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

| | |
|---|--|
|  |  |
| Benjamin Jing Test Engineer | Leslie Bai Engineering Reviewer |

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FCC Test Report

To: FCC Part 15.225

SIEMIC, INC.
Accessing global markets



SIEMIC ACREDITATION DETAILS: NVLAP Lab Code: 200729-0

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 200729-0

SIEMIC Laboratories
San Jose, CA

*is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in
NIST Handbook 150:2001 and all requirements of ISO/IEC 17025:1999.
Accreditation is granted for specific services, listed on the Scope of Accreditation, for:*

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

2007-01-01 through 2007-12-31
Effective dates



Sally S. Bruce
For the National Institute of Standards and Technology

SIEMIC ACREDITATION DETAILS: ISO Guide 65 for US TCB

CERTIFICATE OF ACCREDITATION

PRODUCT CERTIFICATION PROGRAM

The American National Standards Institute hereby affirms that

SIEMIC Inc.
SAN JOSE, CA

Accreditation ID #0759

meets the ANSI accreditation program requirements
and those set forth in

**ISO/IEC GUIDE 65:1996
GENERAL REQUIREMENTS FOR BODIES OPERATING
PRODUCT CERTIFICATION SYSTEMS
AND
FEDERAL COMMUNICATIONS COMMISSION REQUIREMENTS
RELATED TO TCB PROGRAMS**

for programs within the following

SCOPE OF ACCREDITATION

Radio Frequency Devices: Unlicensed (A1, A2, A3, A4)

Radio Frequency Devices: Licensed (B1, B2, B3)

ANSI Accredited Since 2007

June 14, 2009

Valid Through

Lance Hallenbeck

ANSI Vice President, Accreditation Services

June 15, 2007

Date



ANSI Accredited Program
PRODUCT CERTIFICATION

SIEMIC ACREDITATION DETAILS: FCC Registration No. 783147

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

January 27, 2005

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: January 27, 2005

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 under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,



Phyllis Parrish
Information Technician

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



April 28, 2006

OUR FILE: 46405-4842
Submission No: 114591

Siemic Inc.
2206 Ringwood Ave.,
San Jose, CA 95131

Dear Sir/Madame:

The Bureau has received your application for the Alternate Test Site and the filing is satisfactory to Industry Canada.

Please reference to the file number (4842-1) in the body of all test reports containing measurements performed on the site.

Renewal of the filing is required every two years.

If you have any questions, you may contact the Bureau at the telephone number below or by e-mail at certification.bureau@ic.gc.ca Please reference our file number above for all correspondence.

Yours sincerely,



Robert Corey
Manager Certification
Certification and Engineering Bureau
3701 Carling Ave., Building 94
Ottawa, Ontario
K2H 8S2
Tel. No. (613) 990-3869

SIEMIC ACREDITATION DETAILS: Japan VCCI Registration No. 2195



Voluntary Control Council for Interference
by Information Technology Equipment
7F NOA Bldg. 2-3-5, Azabudai,
Minato-Ku, Tokyo, Japan, 106-0041
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

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

Enclosure

SIEMIC ACREDITATION DETAILS: Japan RF Technologies Accreditation No. MRF050927

| | |
|--|--|
| RFT | |
| <h1>Certificate</h1> | |
| 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 Hiramori President RF Technologies Co., Ltd. |
| Audit Date September 27th, 2005 | Issued Date October 5th, 2005 |
| This Certificate is valid until September 26th 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

지침번호(No.) : KR0032

시험기관명 : (주)현대고정인증기술원

(Name of Lab.) (Hyundai Calibration & Certification Technologies Co., Ltd)

주 소 : 경기도 이천시 부발읍 아미리 산136-1

(Address) (137-1, Ami-ni, Bidal-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)

전자과장배(EMID) : 미국지사 포함

전자파내성(EMS) : 미국지사 포함

전기 안전 (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 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

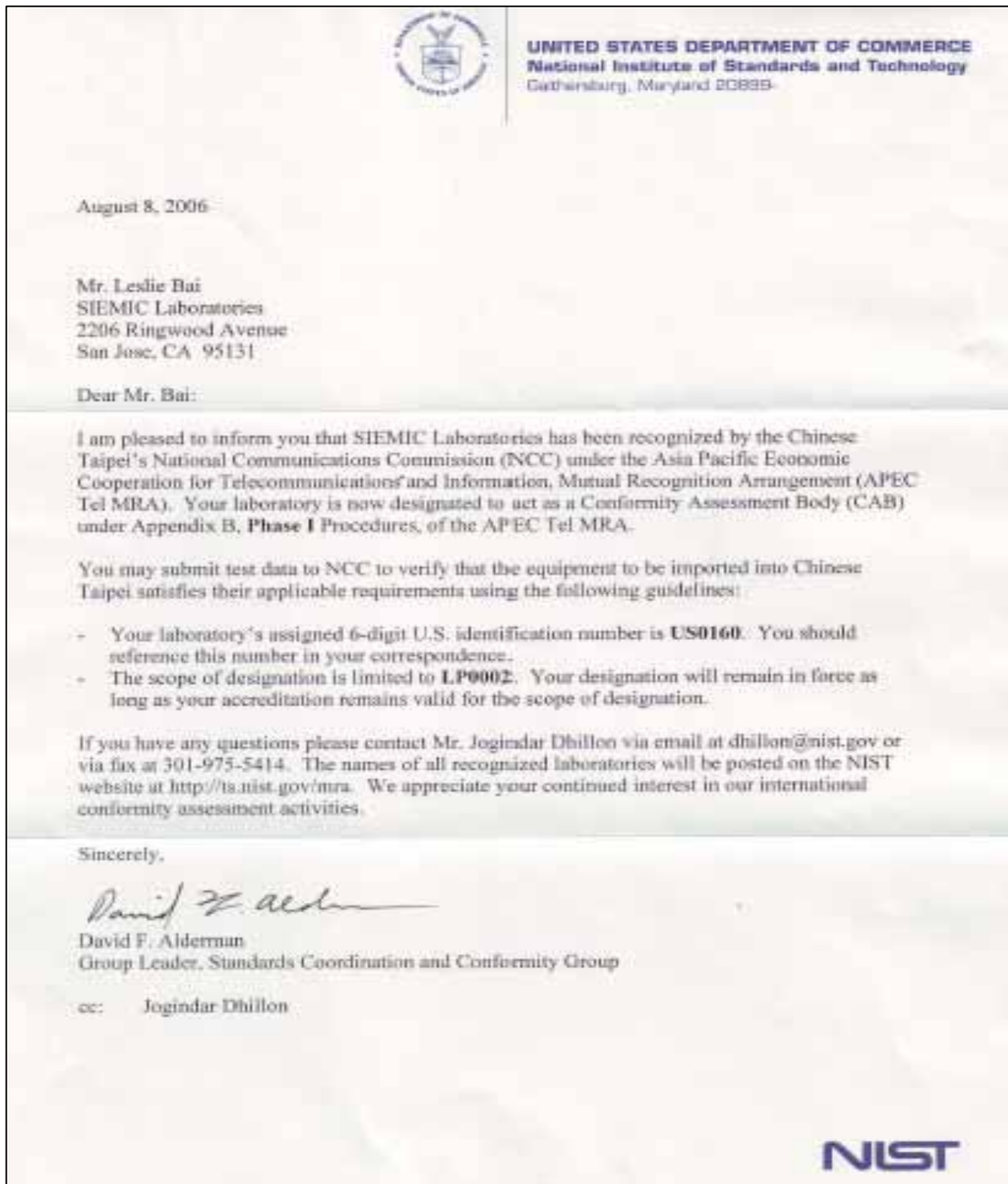
cc: Jogindar Dhillon



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 |
| <p>May 3, 2006</p> <p>Mr. Leslie Bai SIEMIC Laboratories 2206 Ringwood Avenue San Jose, CA 95131</p> <p>Dear Mr. Bai:</p> <p>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:</p> <ul style="list-style-type: none">- 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 <p>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.</p> <p>Sincerely,</p> <p></p> <p>David F. Alderman Group Leader, Standards Coordination and Conformity Group</p> <p>cc: Jogindar Dhillon</p> <p></p> | |

SIEMIC ACREDITATION DETAILS: Taiwan NCC CAB ID: US0160



SIEMIC ACREDITATION DETAILS: Mexico NOM Recognition



CAMARA NACIONAL
DE LA INDUSTRIA
ELECTRONICA, DE
TELECOMUNICACIONES
E INFORMACION

Laboratorio Valentin V. Rivero

México D.F. a 18 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 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 Gómez González
Gerente Técnico del Laboratorio de
CANIETI.

Calle 21
Hederosa Colón
06100 México, D.F.
Tel: 5246 6000 con 12 líneas
Fax 5244 9444
www.caniet.org

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

| | | |
|--|--------------------------|--------------------------------|
|  電訊管理局 | Your Ref 來函編號 : D23/16 V | Telephone 電話 : (852) 2961 6320 |
| | Our Ref 本局編號 : | 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.ofta.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.ofta.gov.hk>

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1 Executive Summary & EUT information

The purpose of this test programme was to demonstrate compliance of the Hach Company ANATEL TOC ANALYZER, against the current Stipulated Standards. The ANATEL TOC ANALYZER have demonstrated compliance with the 47 CFR FCC15.225 : 2007 & RSS - 210 Issue 7 : 2007.

EUT Information

EUT Description : EUT is a Total Organic Carbon (TOC) analyzer which provides TOC analysis for pure and ultra-pure water processing.
 The PAT700 incorporates automated standards introduction system that simplifies analyzer performance testing using standards bottles tagged with RFID technology.

CHARACTERISTICS OF DEVICE

Operating Temp. Range : 15 to 40 [59 F to 104 F]
 Power : 100 – 240 Vac, 50/60 Hz.
 RFID Frequency: 13.56 MHz.
 Size : 7.6" H x 19.25" W x 4.7" D (193mm x 489mm x 119mm)
 Weight: 14.5 lb (6.58 kg)

Model No : PAT700
Serial No : N/A
Input Power : 100 – 240 Vac
Classification Per Stipulated Test Standard : DXX

2 TECHNICAL DETAILS

| | |
|---------------------------------|---|
| Purpose | Compliance testing of ANATEL TOC ANALYZER with stipulated standard |
| Applicant / Client | Hach Company |
| Manufacturer | Hach Company 5600 Lindberg Dr., Mail Stop 6 , Bldg-2, P.O. Box 389, Loveland , CO 80539 |
| Laboratory performing the tests | SIEMIC Laboratories |
| Test report reference number | SL07062104-HAC-001 |
| Date EUT received | 11-July-2007 |
| Standard applied | 47 CFR FCC15.225 : 2007 & RSS - 210 Issue 7 : 2007 |
| Dates of test (from – to) | 12 July 2007 - 17 July 2007 |
| No of Units: | # 1 |
| Equipment Category: | DXX |
| Trade Name: | Hach Company |
| Model : | PAT700 |
| RF Operating Frequency (ies) | 13.56MHz |
| Number of Channels : | 1 |
| Modulation : | 1 |
| FCC ID : | VICPAT700TOC |
| IC ID : | 6149A-PT700TOC |

3 MODIFICATION

NONE

4 TEST SUMMARY

The product was tested in accordance with the following specifications.

All Testing has been performed according to the product classification: DXX

Test Results Summary

| Test Standard | | Description | Pass / Fail |
|--|-----------------------|--|-------------|
| 47 CFR Part 15.225: 2007 | RSS 210 Issue 7: 2007 | | |
| 15.203 | | Antenna Requirement | Pass |
| 15.207(a) | RSSGen(7.2.2) | Conducted Emissions Voltage | Pass |
| 15.225(a) | RSS210(A2.6) | Limit in the band of 13.553 – 13.567 MHz | Pass |
| 15.225(b) | RSS210(A2.6) | Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz | Pass |
| 15.225(c) | RSS210(A2.6) | Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz | Pass |
| 15.225(d) | RSS210(A2.6) | Limit outside the band of 13.110 – 14.010 MHz | Pass |
| 15.225(e) | RSS210(A2.6) | Frequency Stability | Pass |
| 15.209 | RSS210 (A2.6) & (2.7) | Radiated Emission Limits | Pass |
| ANSI C63.4: 2003 / RSS-Gen Issue 1: 2007 | | | |

*Notes: Deviations to above standards are outlined in specific test sections if applicable.
 Cable loss and external attenuation are compensated for in the measurement system when applicable.*

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 AC Line Conducted Emission Test Result

Note:

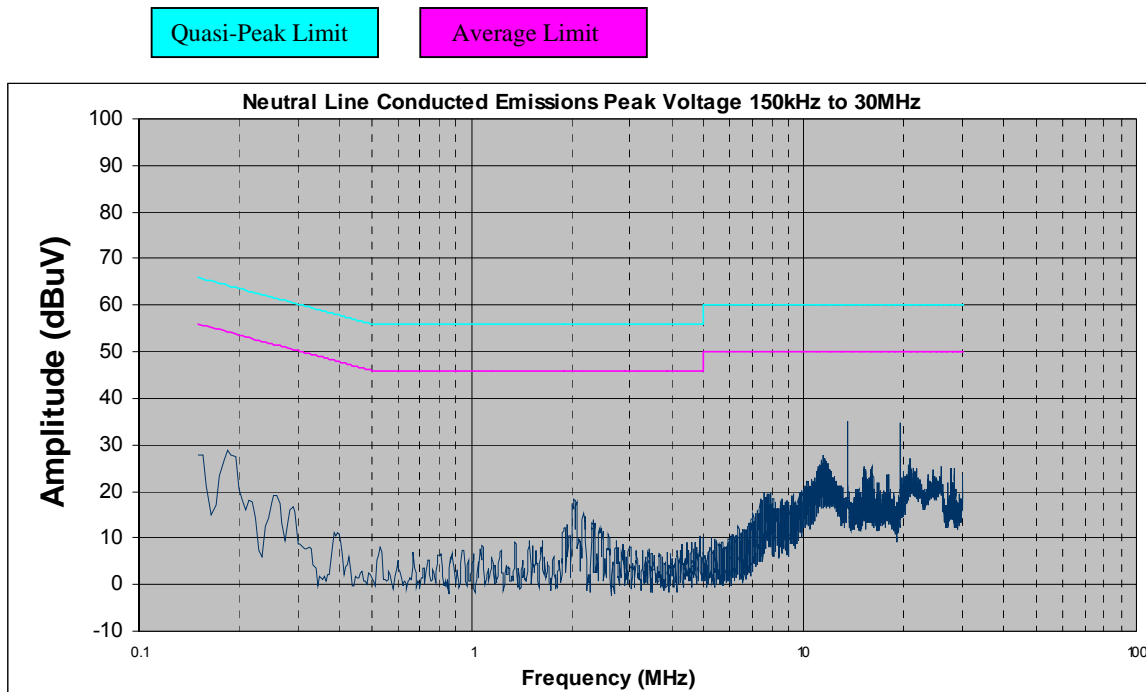
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at 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 9kHz – 30MHz (Average & Quasi-peak) is $\pm 2.64\text{dB}$.
4. Environmental Conditions Temperature 23°C
Relative Humidity 50%
Atmospheric Pressure 1019mbar

Test Date : July 13 2007
Tested By : Benjamin Jing

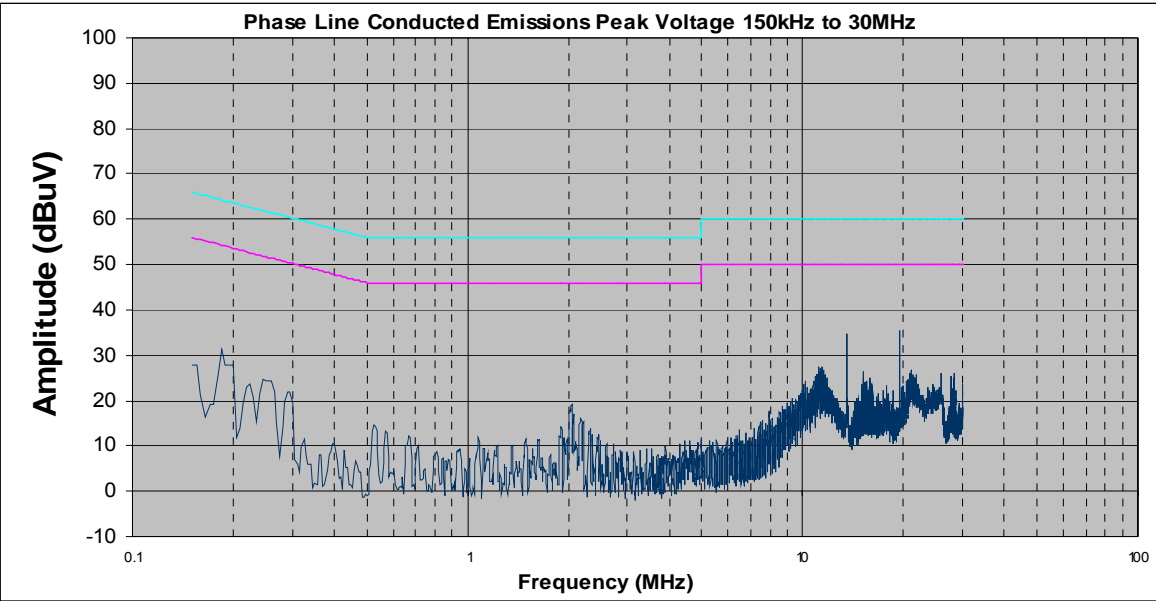
Standard Requirement :

| Frequency (MHz) | Quasi Peak (dB μ V) | Average (dB μ V) |
|-----------------|-------------------------|----------------------|
| 0.15 - 0.5 | 66-56 | 56-46 |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Test Result :



Neutral Line Conducted Emissions (120 Vac, 60 Hz)



Phase Line Conducted Emissions (120 Vac, 60 Hz)

| Conducted Emissions Data Table | | | | | | | |
|--------------------------------|------------|-------------------------------|-----------------|----------------|--------------------------------|------------------|-----------------|
| LINE | FREQ (MHz) | Corrected Amplitude (dBµV) QP | Limit (dBµV) QP | Margin (dB) QP | Corrected Amplitude (dBµV) AVG | Limit (dBµV) AVG | Margin (dB) AVG |
| Neutral | 0.19 | 26.54 | 64.04 | -37.50 | 24.31 | 54.04 | -29.73 |
| Neutral | 0.26 | 18.63 | 61.43 | -42.80 | 16.77 | 51.43 | -34.66 |
| Neutral | 2.07 | 17.05 | 56.00 | -38.95 | 15.81 | 46.00 | -30.19 |
| Neutral | 11.56 | 26.44 | 60.00 | -33.56 | 23.57 | 50.00 | -26.43 |
| Neutral | 13.56 | 33.09 | 60.00 | -26.91 | 31.62 | 50.00 | -18.38 |
| Neutral | 19.51 | 31.47 | 60.00 | -28.53 | 29.85 | 50.00 | -20.15 |
| Phase | 0.19 | 30.43 | 64.26 | -33.83 | 29.57 | 54.26 | -24.69 |
| Phase | 0.26 | 24.17 | 61.43 | -37.26 | 22.65 | 51.43 | -28.78 |
| Phase | 2.05 | 18.04 | 56.00 | -37.96 | 16.92 | 46.00 | -29.08 |
| Phase | 11.56 | 25.83 | 60.00 | -34.17 | 23.46 | 50.00 | -26.54 |
| Phase | 13.56 | 32.97 | 60.00 | -27.03 | 30.12 | 50.00 | -19.88 |
| Phase | 19.51 | 33.08 | 60.00 | -26.92 | 31.45 | 50.00 | -18.55 |

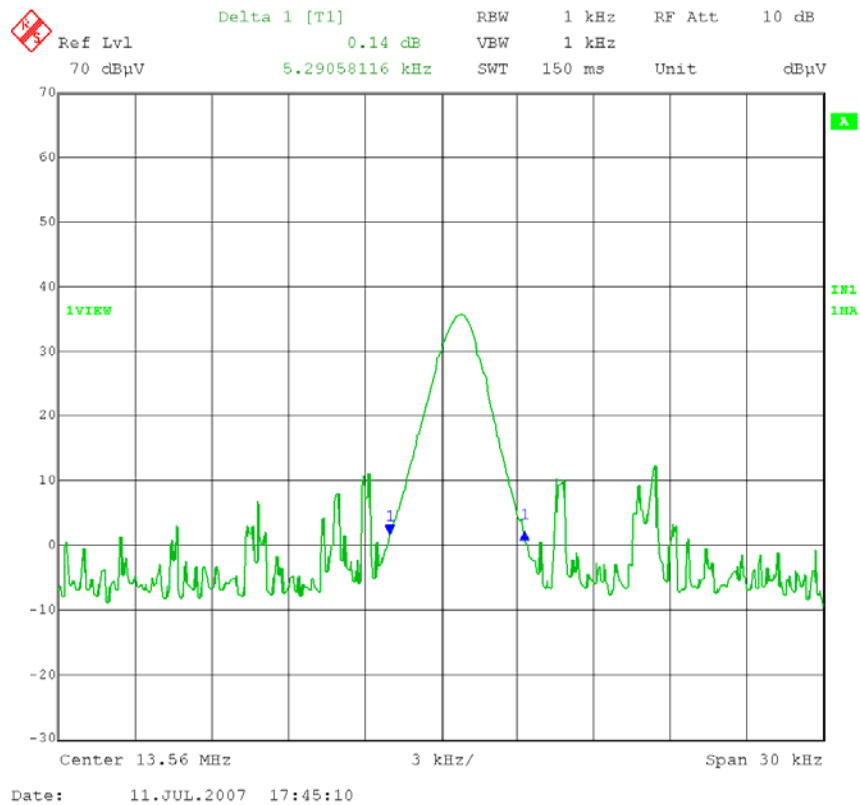
5.2 Occupied Bandwidth

1. 99 % bandwidth was measured by radiated emissions method using a spectrum analyzer
 2. Environmental Conditions

| | |
|----------------------|----------|
| Temperature | 23°C |
| Relative Humidity | 50% |
| Atmospheric Pressure | 1019mbar |
- Test Date : July 13 2007
Tested By : Benjamin Jing

Test Result :

Measured 99% occupied bandwidth is 5.29 kHz



5.3 Radiated Emissions within the Band of 13.110 – 14.010 MHz

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 10 kHz. 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(dBμV/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor.
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). In range of 1-40Ghz is ±3.6dB
5. Environmental Conditions

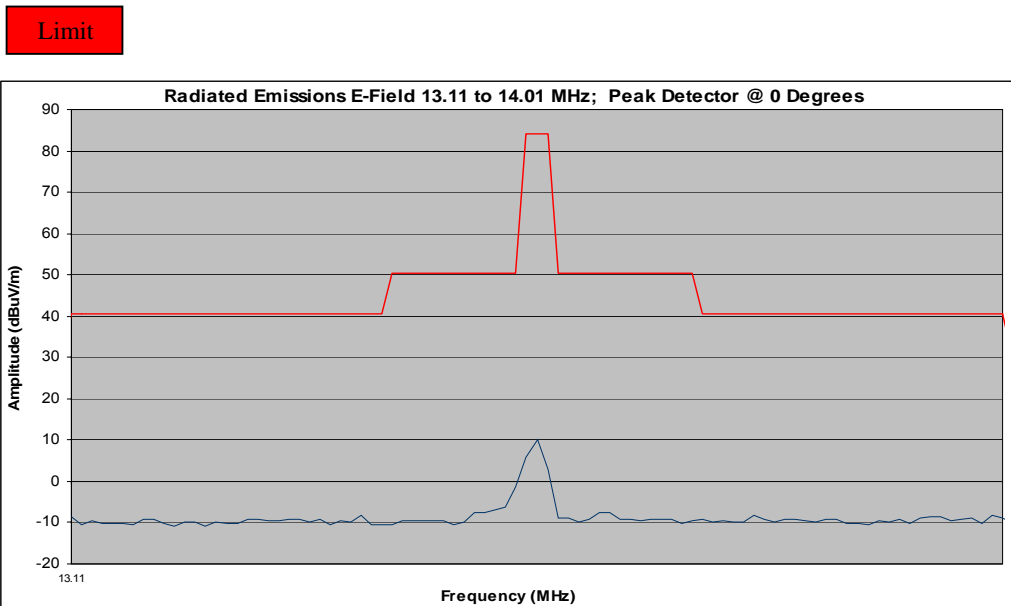
| | |
|----------------------|----------|
| Temperature | 23°C |
| Relative Humidity | 50% |
| Atmospheric Pressure | 1019mbar |

Test date : July 13 2007
Tested By : Benjamin Jing

Standard requirement : 47 CFR §15.225(a) – (c) & RSS-210 (A2.6)

Test Result :

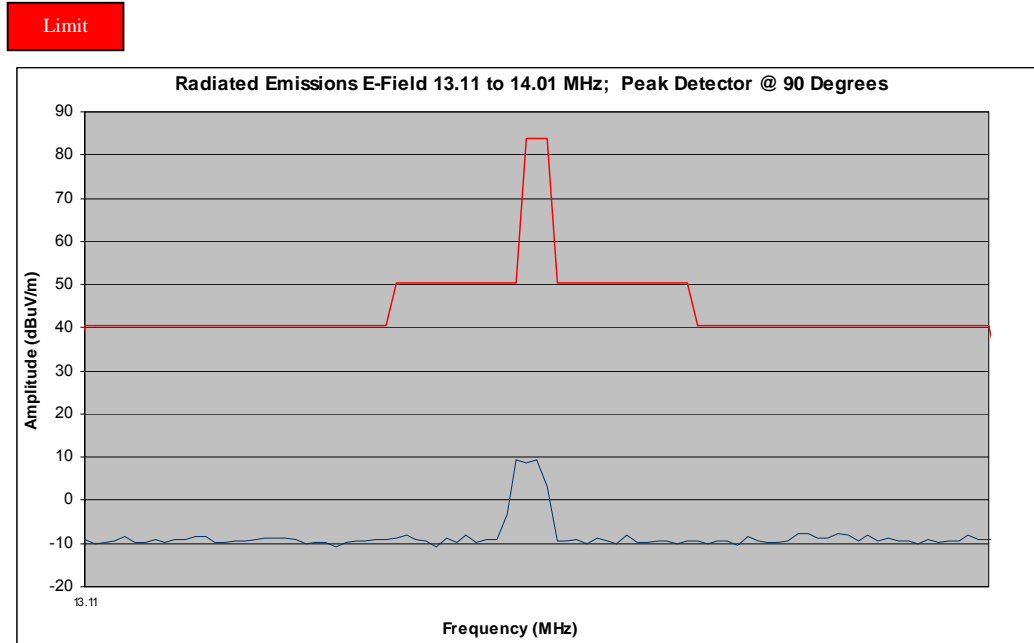
1) Loop Antenna Positioned at 0 degrees



Radiated emissions data

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 30 m | Limit @ 30 m | Margin |
|-----------|--------------------|----------------|------------|----------------------------|----------------------------|--------------|----------|
| (MHz) | (dBμV/m) | (dB) | (dB) | (dB) | (dBμV/m) | (dBμV/m) | (dBμV/m) |
| 13.56 | 14.2 | 35.62 | 0.28 | 40 | 10.1 | 84 | -73.9 |

2) Loop Antenna Positioned at 90 degrees



Radiated emissions data

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 30 m | Limit @ 30 m | Margin |
|-----------|--------------------|----------------|------------|----------------------------|----------------------------|--------------|----------|
| (MHz) | (dBμV/m) | (dB) | (dB) | (dB) | (dBμV/m) | (dBμV/m) | (dBμV/m) |
| 13.56 | 13.4 | 35.62 | 0.28 | 40 | 9.3 | 84 | -74.7 |

5.4 Radiated Emissions < 30 MHz (outside 13.11 – 14.01 MHz)

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 10 kHz.

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(dBμV/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor.
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 ±3.6dB
5. Environmental Conditions

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

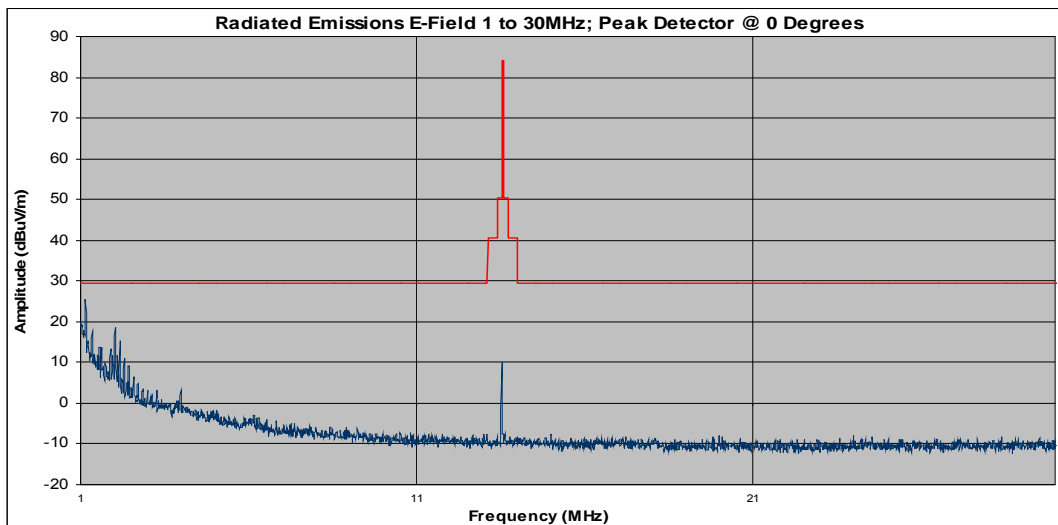
Test date : July 13 2007
Tested By : Benjamin Jing

Standard requirement : 47 CFR §15.209; 47 CFR §15.225(d) & RSS-210 (A2.6)

Test Result :

1) Loop Antenna Positioned at 0 degrees

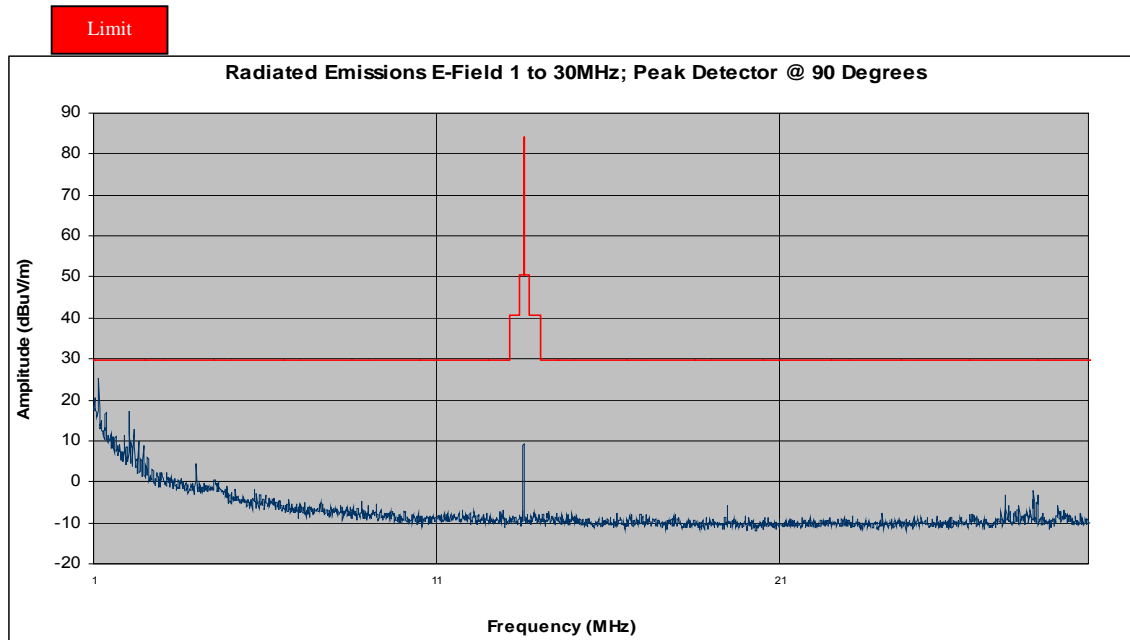
Limit



Radiated emissions data

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 30 m | Limit @ 30 m | Margin |
|-----------|--------------------|----------------|------------|----------------------------|----------------------------|--------------|----------|
| (MHz) | (dBμV/m) | (dB) | (dB) | (dB) | (dBμV/m) | (dBμV/m) | (dBμV/m) |
| 1.15 | 5.01 | 59.99 | 0.25 | 40 | 25. 24 | 29.54 | - 4.30 |
| 2.04 | 7.79 | 50.40 | 0.30 | 40 | 18.49 | 29.54 | -11.05 |

2) Loop Antenna Positioned at 90 degrees



Radiated emissions data

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 30 m | Limit @ 30 m | Margin |
|-----------|--------------------|----------------|------------|----------------------------|----------------------------|--------------|----------|
| (MHz) | (dBμV/m) | (dB) | (dB) | (dB) | (dBμV/m) | (dBμV/m) | (dBμV/m) |
| 1.16 | 4.97 | 59.99 | 0.25 | 40 | 25. 21 | 29.54 | - 4.33 |
| 2.05 | 6.54 | 50.40 | 0.30 | 40 | 17.24 | 29.54 | -12.30 |

5.5 Radiated Emissions > 30 MHz

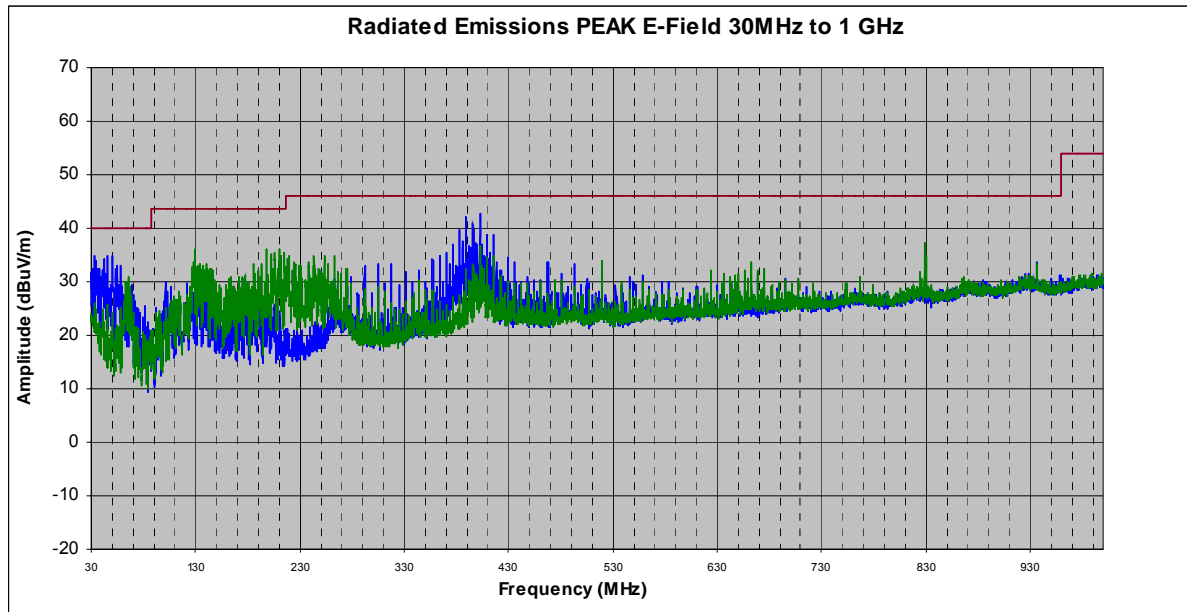
1. Radiated emissions were measured according to ANSI C63.4. The EUT was set 3 meter away from the measuring antenna. All possible modes of operation were investigated. Only the worst case emissions measured, All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Sample Calculation: Corrected Amplitude = Raw Amplitude(dBμ V/m) + ACF(dB) + Cable Loss(dB)
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 ±3.6dB
5. Environmental Conditions

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

Test date : July 13 2007
Tested By : Benjamin Jing

Standard requirement : 47 CFR §15.209; 47 CFR §15.225(d) & RSS-210 (A2.6)

Test Result :



| Frequency | Azimuth | Measure | Antenna Polarity | Antenna Height | Raw Amplitude @ 3m | ACF | CBL loss | Corrected Amplitude @ 3 m | Limit @3m | Delta |
|-----------|-----------|----------|------------------|----------------|--------------------|------|----------|---------------------------|-----------|----------|
| (MHz) | (degrees) | (Avg/QP) | (H/V) | (m) | (dBuV/m) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) |
| 35.14 | 180 | QP | V | 1.3 | 17.43 | 17 | 0.7 | 35.13 | 40 | - 4.87 |
| 45.42 | 270 | QP | V | 1.2 | 13.56 | 8.5 | 0.7 | 22.76 | 40 | -17.24 |
| 128.94 | 290 | QP | H | 1.9 | 11.62 | 14.4 | 0.9 | 26.92 | 43.5 | -16.58 |
| 211.78 | 180 | QP | H | 1.8 | 13.38 | 11.1 | 1 | 25.48 | 43.5 | -18.02 |
| 389.48 | 270 | QP | V | 1.1 | 15.29 | 15.4 | 1.5 | 32.19 | 46 | -13.81 |
| 402.48 | 300 | QP | V | 1.2 | 16.31 | 15.9 | 1.6 | 33.81 | 46 | -12.19 |

5.6 Frequency Stability

1 Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz.

A voltmeter was used to monitor when varying the voltage.

2. Environmental Conditions Temperature 23°C
 Relative Humidity 50%
 Atmospheric Pressure 1019mbar

Test Date : July 13 2007
 Tested By : Benjamin Jing

Standard requirement : 47 CFR §15.225(e) & RSS-210 (A2.6)

Limit: ±0.01% of 13.56 MHz = 1356 Hz

Test Result :

Frequency vs Temperature

Reference Frequency: measured 13.560631 MHz at 20°C

| Temperature (Celsius) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Drift (%) |
|--------------------------|-------------------------|---------------------|--------------------|
| 50 | 13.560603 | -28 | -0.00021 |
| 40 | 13.560612 | -19 | -0.00014 |
| 30 | 13.560619 | -12 | -0.00009 |
| 20 | Reference | | |
| 10 | 13.560642 | 11 | 0.00008 |
| 0 | 13.560685 | 54 | 0.00039 |
| -10 | 13.560703 | 72 | 0.00053 |
| -20 | 13.560722 | 91 | 0.00067 |
| -30 | 13.560729 | 98 | 0.00072 |

Frequency vs Voltage

Reference Frequency: measured 13.560631 MHz at 20°C with 120 Vac / 60 Hz

| Measured Voltage ±15% of nominal (AC) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Drift (%) |
|---|-------------------------|---------------------|--------------------|
| 138 | 13.560619 | -12 | -0.00009 |
| 102 | 13.560625 | -6 | -0.00004 |

5.7 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.

This EUT antenna is attached permanently to the device which meets the requirement.

Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Note: Functional Verification

| Instrument | Manufacturer | Model | CAL Due Date |
|---------------------|----------------------|-----------|--------------|
| Spectrum Analyzer | HP | 8568B | 04/26/2008 |
| Quasi-Peak Adapter | HP | 85650A | 04/26/2008 |
| RF Pre-Selector | HP | 85685A | 04/26/2008 |
| Spectrum Analyzer | HP | 8564E | 05/01/2008 |
| EMI Receiver | Rohde&Schwarz | ESIB 40 | 02/07/2008 |
| Biconlog Antenna | Sunol Sciences, Inc. | JB1 | 09/11/2008 |
| Loop Antenna | ETS-Lingren | 6512 | 05/13/2008 |
| Near Field Probe | Chase | MFP9150 | See Note |
| Chamber | Lingren | 3m | 08/21/2007 |
| DMM | Fluke | 73III | 07/04/2008 |
| Variac | KRM | AEEC-2090 | See Note |
| Environment Chamber | TestEquity | 1007H | 01/24/2009 |
| DMM | Fluke | 73III | 05/01/2008 |

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 Ω /50 μ 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 μ V = 47.96 dB μ 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 dB μ 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

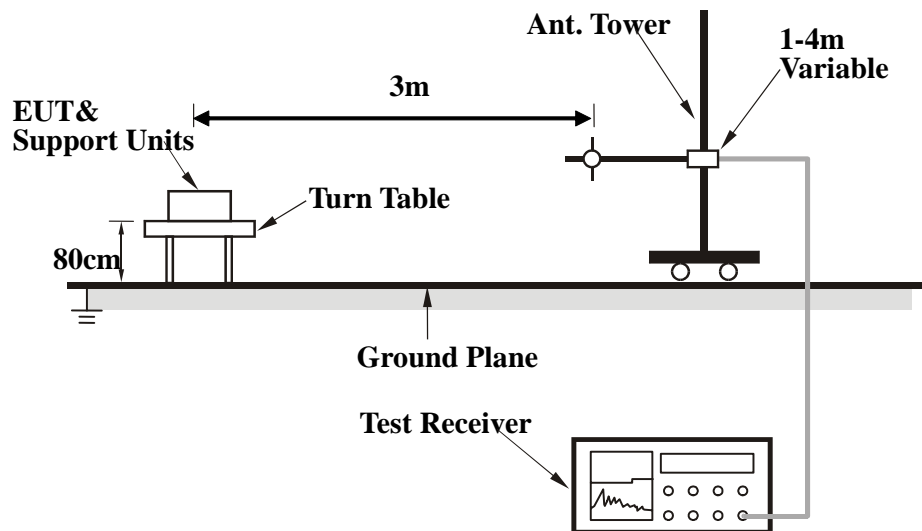
EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 10th 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_o to 360_o 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

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

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

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

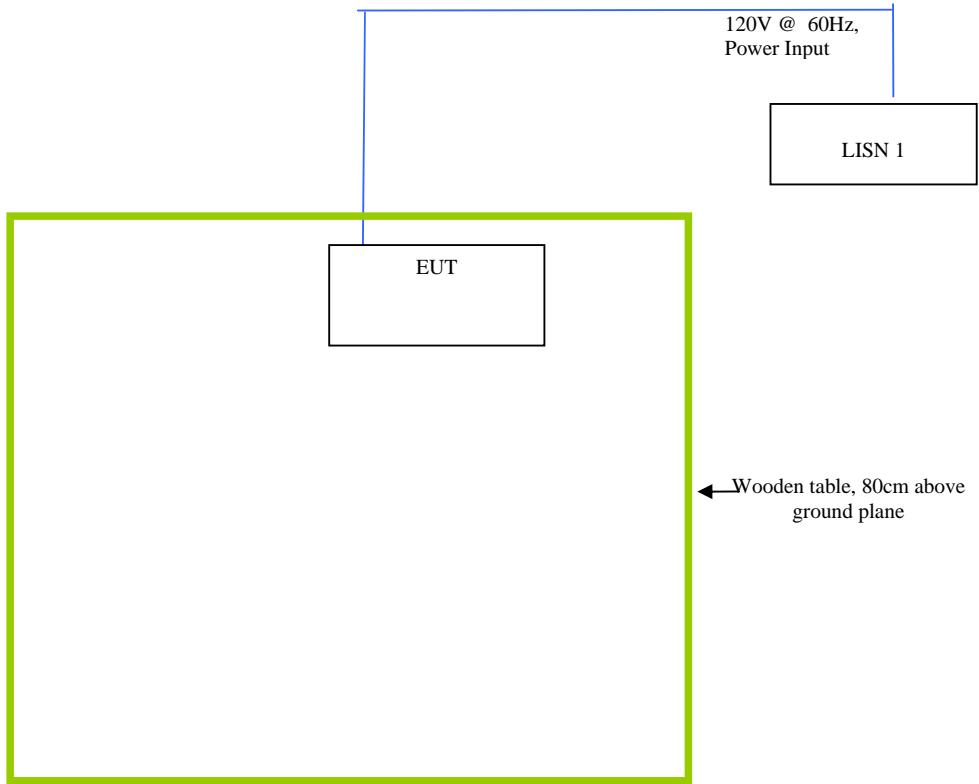
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

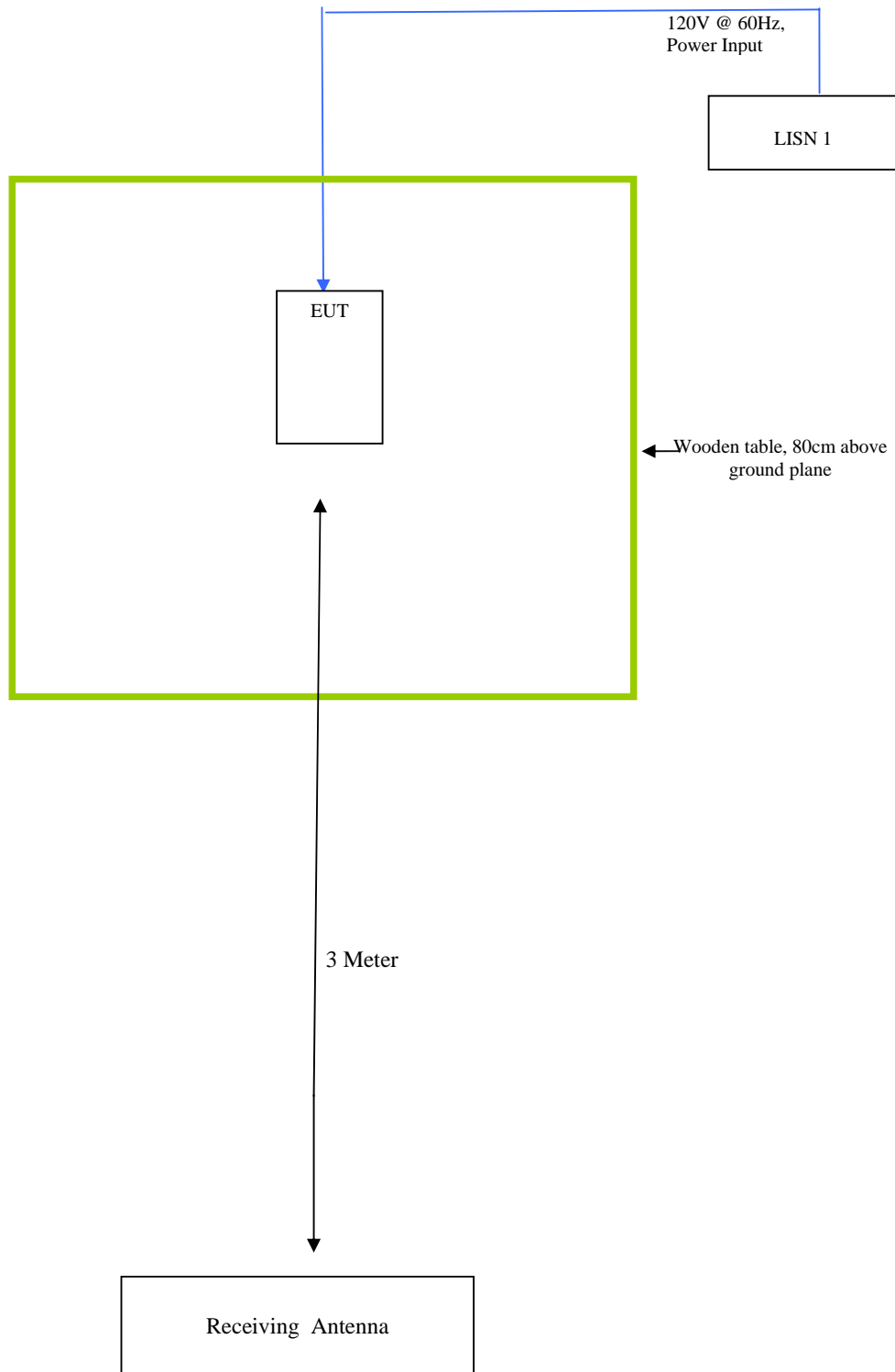
The following is a description of supporting equipment and details of cables used with the EUT.

| Equipment Description (Including Brand Name) | Model & Serial Number | Cable Description (List Length, Type & Purpose) |
|---|-----------------------|--|
| None | | None |
| | | |

Block Configuration Diagram for Conducted Emission



Block Configuration Diagram for Radiated Emission



Annex C.ii. EUT OPERATING CONDITIONS

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

| Test | Description Of Operation |
|-----------|---|
| Emissions | EUT is configured for continuous operating mode, while the RFID radio will constantly scan for tag. |

Annex D USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment