# INTELICIS CORPORATION

# ENTERPRISE DUAL RADIO ACCESS POINT / BRIDGE

## Model : CEDAR 880AG

30 October 2007
Report No.: SL07082702-INT-002(15.407)
(This report supersedes NONE)


**Modifications made to the product : None**

| This Test Report is Issued Under the Authority of: | |
|---|---|
| Kent KiM | |
| **Kent Kim**<br>**Test Engineer** | **Leslie Bai**<br>**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 15.407
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®

# 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*

NVLAP-01C (REV. 2005-05-19)

## 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

Industry Canada Industrie Canada

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.vcci.or.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.vcci.or.jp

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

Their address, phone and fax number are absolutly 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@vcci.or.jp

Enclosure

情報処理装置等電波障害自主規制協議会（略称VCCI）
〒106-0041 東京都港区麻布台2-3-5 ノア ビルディング（NOAビル）7階 Tel:03-5575-3138 Fax:03-5575-3137

**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 Kegami
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

# 시 험 기 관 지 정 서
# 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(EMI) : 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)

전 파 연 구 소 장
*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<br>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<br>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 20899

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,

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

cc: Jogindar Dhillon

NIST

## 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 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 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 ingles 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.

Cuitlahuac 71
Hipódromo Condesa
06100 México, D.F.
Tel: 5264-0000 con 12 líneas
Fax 5264 9444
www.canieti.org

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

OFTA
電訊管理局

Your Ref 來函檔號 :
Our Ref 本局檔號 : D23/16 V

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.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
http://www.ofta.gov.hk
電訊管理局
香港灣仔皇后大道東 213 號胡忠大廈 29 字樓

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# 1 Executive Summary & EUT information

The purpose of this test programme was to demonstrate compliance of the Intelicis Corporation Enterprise Dual Radio Access Point / Bridge, against the current Stipulated Standards. The Enterprise Dual Radio Access Point / Bridge have demonstrated compliance with the FCC 15.407 2007.

## EUT Information

| | | |
|---|---|---|
| EUT Description | : | Intelicis Cedar 880AG Access Points is a high-performance access points that supports a wide range of enterprise applications. It provides data communications system to extend the capability of the existing wired network to provide connectivity for wireless devices. It connects wireless communication devices. It is usually connected to a wired network on one end, and relays data to the wireless network on the other end. As part of the Intelicis Wireless Infrastructure product families, Cedar Access Points work seamlessly with other Intelicis products such as Cypress Wireless Switches and Redwood Mobility Management Centers to provide a comprehensive solution for wired and wireless LAN integration of enterprise networks. |
| Model No | : | CEDAR 880AG |
| Serial No | : | CD880AG070304 |
| Input Power | : | 100~240 Vac |
| Classification Per Stipulated Test Standard | : | Spread Spectrum System / device |

# 2 TECHNICAL DETAILS

| | |
|---|---|
| Purpose | Compliance testing of Enterprise Dual Radio Access Point / Bridge with stipulated standard |
| Applicant / Client | Intelicis Corporation |
| Manufacturer | Intelicis Corporation<br>4633 Old Ironsides Drive, Suite 150<br>Santa Clara, CA 95054 |
| Laboratory performing the tests | SIEMIC Laboratories |
| Test report reference number | SL07082702-INT-002(15.407) |
| Date EUT received | 28 September 2007 |
| Standard applied | FCC 15.407 2007 |
| Dates of test (from – to) | 01 October 2007 - 26 October 2007 |
| No of Units: | N/A |
| Equipment Category: | DSS |
| Trade Name: | Intelicis Corporation |
| Model : | CEDAR 880AG |
| RF Operating Frequency (ies) | 5180~5220MHz |
| Number of Channels : | 3 (802.11a Low band) |
| Modulation : | DSSS/OFDM |
| FCC ID : | U3HCEDAR880AG |
| IC ID : | None |

# 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 |
|---|---|---|---|
| 47 CFR Part 15 Subpart E | RSS 210 Issue 6 | | |
| 15.205 | RSS210(A8.5) | Restricted Band of Operation | |
| 15.207 | RSSGen(7.2.2) | Conducted Emissions Voltage | |
| 15.209 | | Radiated Emissions Limits; General Requirements | |
| 15.407(a)(2) | RSS210(A9.2)(2) | Occupied Bandwidth | Pass |
| 15.407(a)(2) | RSS210(A9.2)(2) | Peak Output Power | Pass |
| 15.407(a)(2) | RSS210(A9.2)(2) | Peak Power Spectral Density | Pass |
| 15.407(a)(2) | | Power Reduction (antenna gain > 6dBi) | N/A |
| 15.407(a)(6) | | Peak Excursion Ratio | Pass |
| 15.407(b)(6) | RSSGen(7.2.2) | AC Conducted Emissions | Pass |
| 15.407(b)(2) | RSS210(A9.3)(2) | Radiated Spurious Emissions > 1GHz | Pass |
| 15.407(b)(6) | RSS210(A9.3)(2) | Radiated Spurious Emissions < 1GHz | Pass |
| 15.407(f) | RSSGen(5.5) | RF Exposure (MPE) | Pass |
| 15.407(g) | RSS210(A9.5)(e) | Frequency Stability | N/A* |
| | RSS210(A9.5)(g) | User Manual | Pass |

ANSI C63.4: 2003

* Manufacturer will made self declaration

PS: All measurement uncertainty 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 antenna has its own unique type of connector which meets the requirement. The antenna coax uses reverse TNC connector. Antenna gain is 2dBi for 2.4Ghz, 3dBi for 5.8GHz.

## 5.2 Conducted Emissions Voltage

| Frequency of emission (MHz) | Conducted limit (dBµV) | |
|---|---|---|
| | 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.

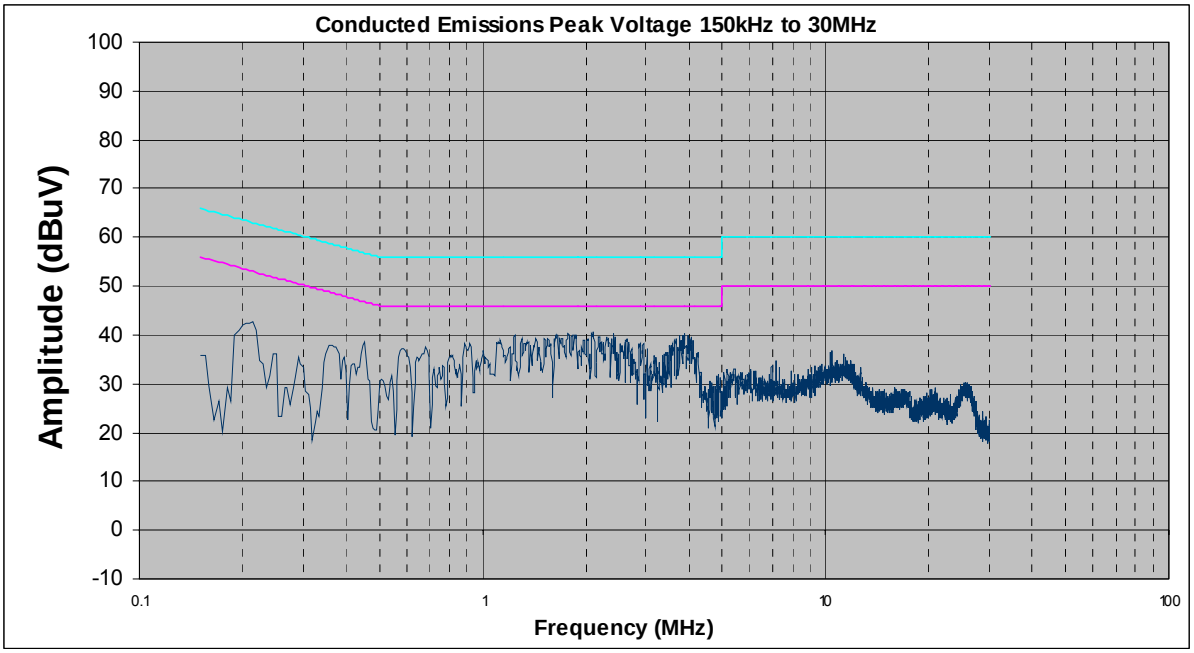
**Procedures:**

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 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions

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

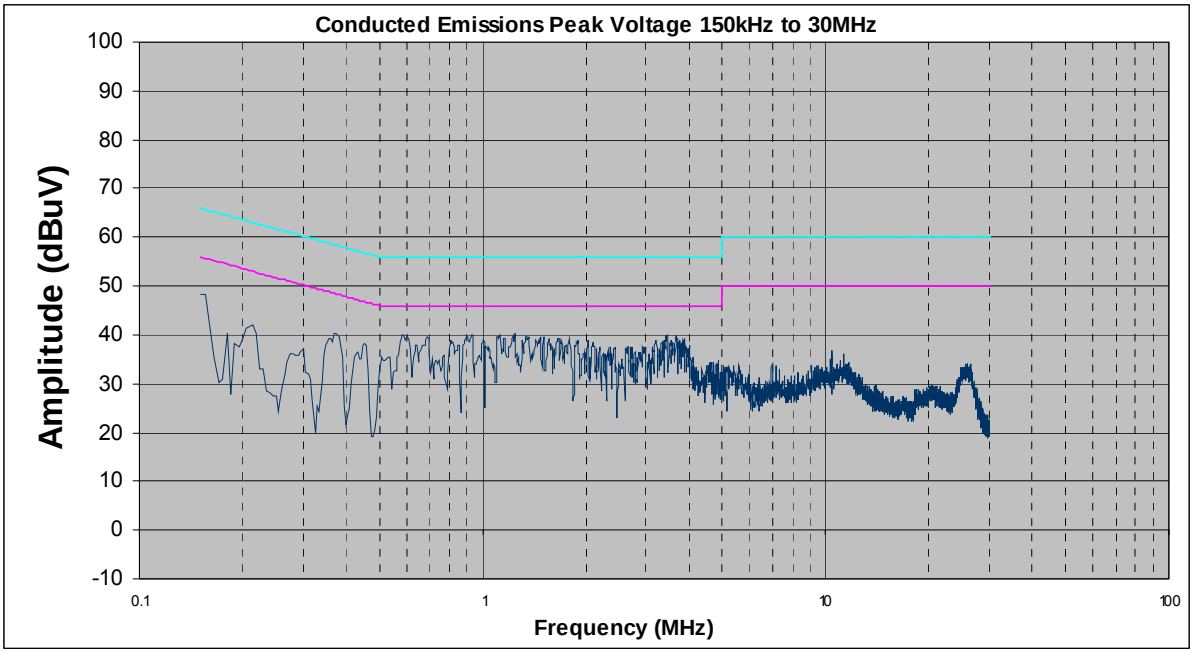
Test Date : October 01 2007
Tested By : Kent Kim

**Results:** **Note –** Average Limit Quasi-Peak Limit




**Phase Line Plot at 120Vac, 60Hz**

| Line Under Test | Freq. (MHz) | Corrected Amplitude (dBuV) QP | Limit (dBuV) QP | Margin (dB) QP | Corrected Amplitude (dBuV) AVG | Limit (dBuV) AVG | Margin (dB) AVG |
|---|---|---|---|---|---|---|---|
| Neutral | 0.22 | 42.60 | 62.82 | -20.22 | 35.50 | 52.82 | -17.32 |
| Neutral | 0.46 | 38.50 | 56.69 | -18.19 | 33.10 | 46.69 | -13.59 |
| Neutral | 1.82 | 30.30 | 56.00 | -25.70 | 27.60 | 46.00 | -18.40 |
| Neutral | 3.88 | 39.90 | 56.00 | -16.10 | 34.40 | 46.00 | -11.60 |
| Neutral | 1.25 | 38.90 | 56.00 | -17.10 | 33.50 | 46.00 | -12.50 |




**Neutral Line Plot at 120Vac, 60Hz**

| Line Under Test | Freq. (MHz) | Corrected Amplitude (dBuV) QP | Limit (dBuV) QP | Margin (dB) QP | Corrected Amplitude (dBuV) AVG | Limit (dBuV) AVG | Margin (dB) AVG |
|---|---|---|---|---|---|---|---|
| Line | 0.22 | 43.1 | 62.82 | -19.72 | 35.60 | 52.82 | -17.22 |
| Line | 0.46 | 39.9 | 56.69 | -16.79 | 35.60 | 46.69 | -11.09 |
| Line | 1.82 | 41.2 | 56.00 | -14.80 | 34.10 | 46.00 | -11.90 |
| Line | 3.88 | 42.1 | 56.00 | -13.90 | 35.40 | 46.00 | -10.60 |
| Line | 1.25 | 42.6 | 56.00 | -13.40 | 33.70 | 46.00 | -12.30 |

# 5.3 Occupied Bandwidth

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. 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 – 40GHz is ±1.5dB.
3. Environmental Conditions

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

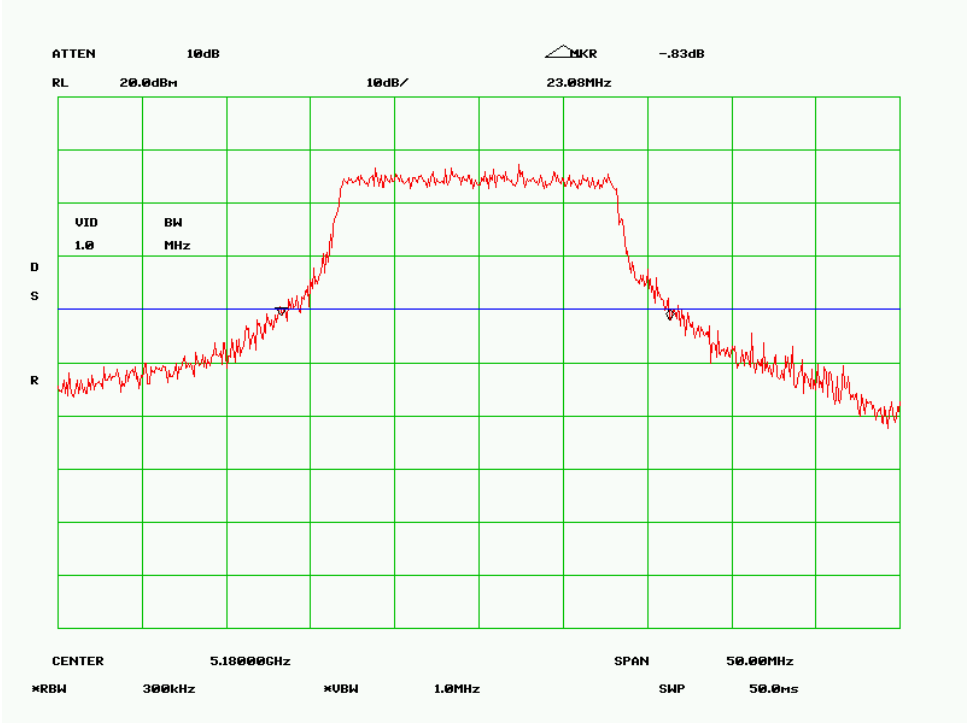
4. Test Date : October 02 2007
   Tested By : Kent Kim

**Requirement(s):** The 26dB bandwidths were measured at the antenna terminal using a spectrum analyzer. 26 dB BW spectrum analyzer setting: RBW = approximately 1% of the emission BW and VBW = approximately 3 times RBW.

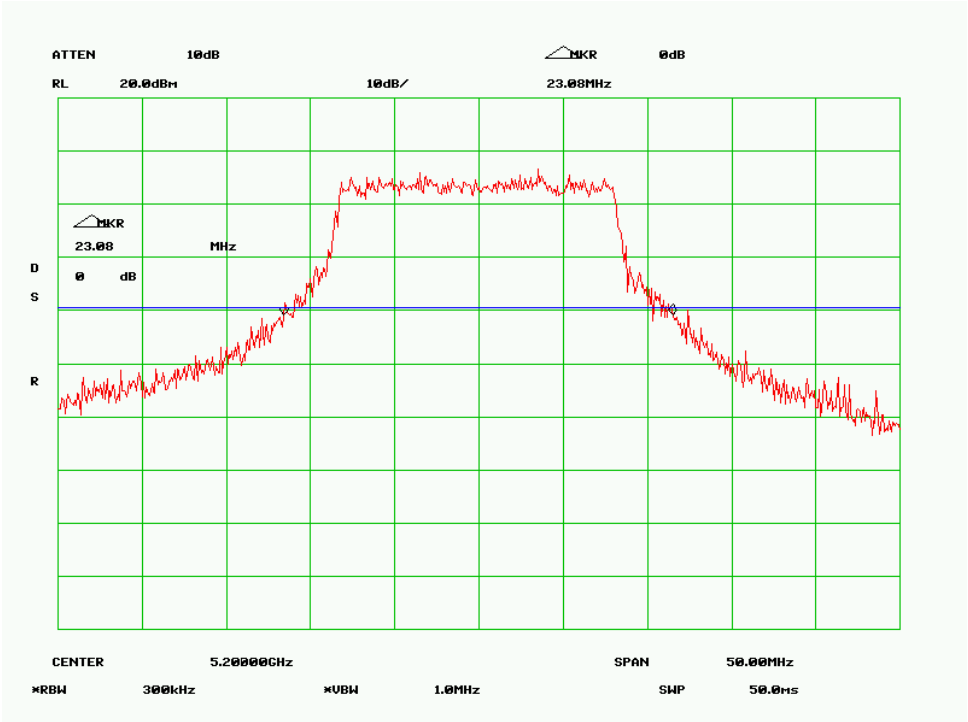
**Test Result :**

| Frequency (MHz) | Channel | Measured 26dB Bandwidth (MHz) |
|---|---|---|
| 5180 | Low | 23.08 |
| 5200 | Mid | 23.08 |
| 5220 | Hi | 23.08 |

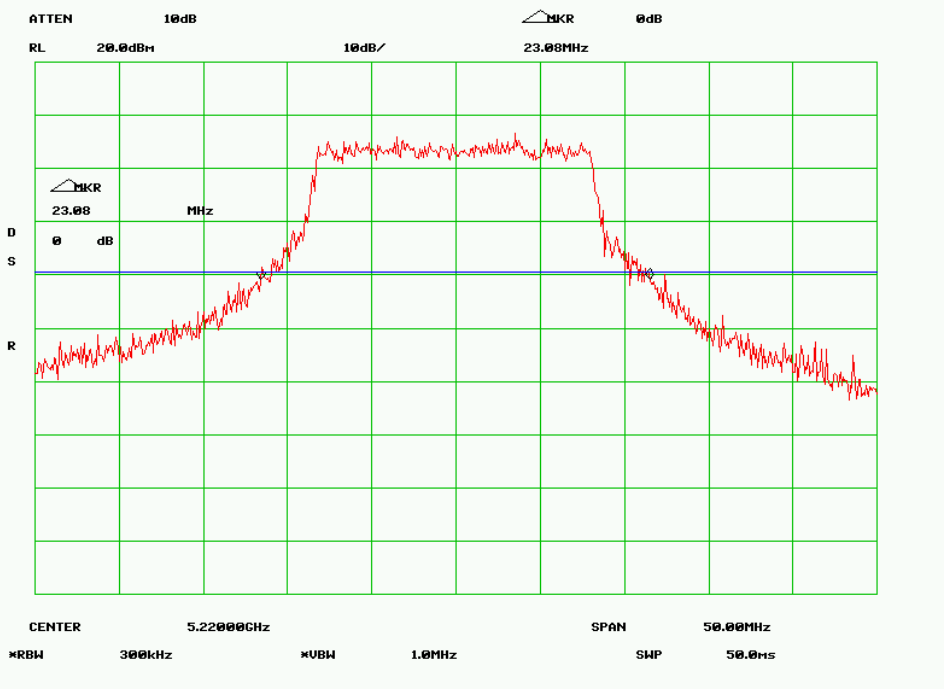
Refer to the attached plots.




**26 dB Bandwidth - Low Channel (802.11a)**




**26 dB Bandwidth - Mid Channel (802.11a)**




**26 dB Bandwidth - High Channel (802.11a)**

## 5.1 Peak Power Spectral Density

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. 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 – 40GHz is ±1.5dB.
3. Environmental Conditions

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

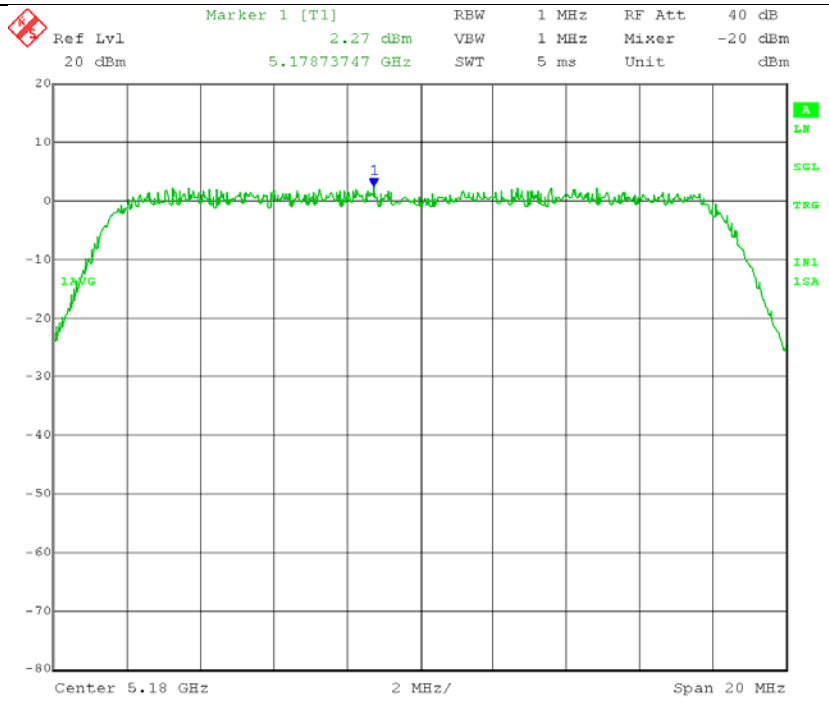
4. Test Date : October 02 2007
   Tested By : Kent Kim

**Requirement(s):** 47 CFR §15.407(a)(2)

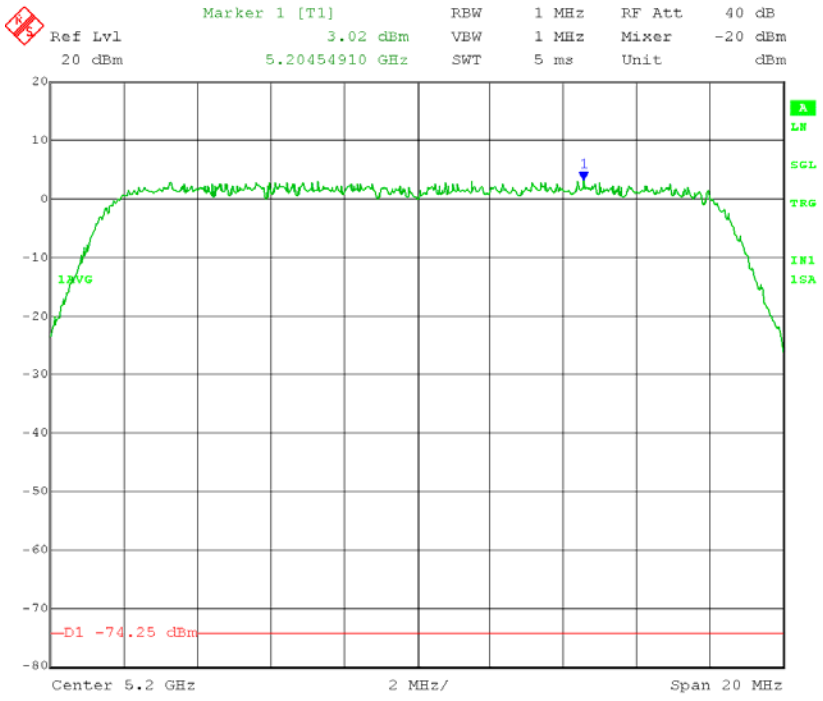
**Procedures:** The peak power spectral density measured at the antenna terminal using a spectrum analyzer. RBW=1MHz, VBW=3MHz, sample Detector with power averaging. Peak power spectral density limit is 4 dBm in any 1 MHz band.

**Test Result :**

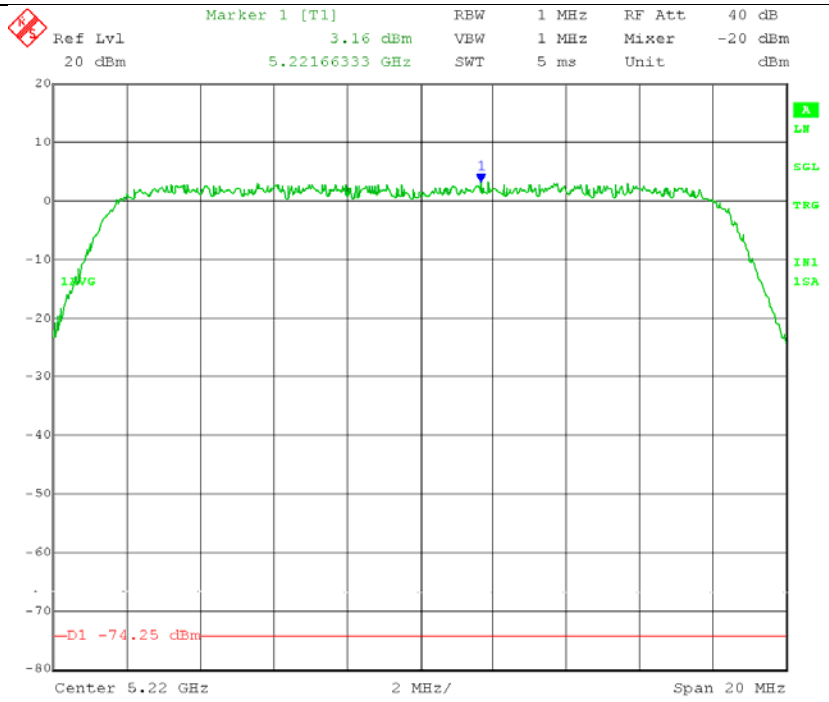
| Protocol | Channel | Channel Frequency (MHz) | Peak Spectral Density Limit (dBm/MHz) | Peak Spectral Density (dBm/MHz) |
|---|---|---|---|---|
| 802.11a | Low | 5180 | 4 | 2.27 |
| 802.11a | Mid | 5200 | 4 | 3.02 |
| 802.11a | High | 5220 | 4 | 3.16 |




PPSD Low Channel (802.11a)




PPSD Mid Channel (802.11a)




PPSD High Channel (802.11a)

## 5.2 Peak Output Power

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. 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 – 40GHz is ±1.5dB.
3. Environmental Conditions

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

4. Test Date : October 26 2007
   Tested By : Kent Kim

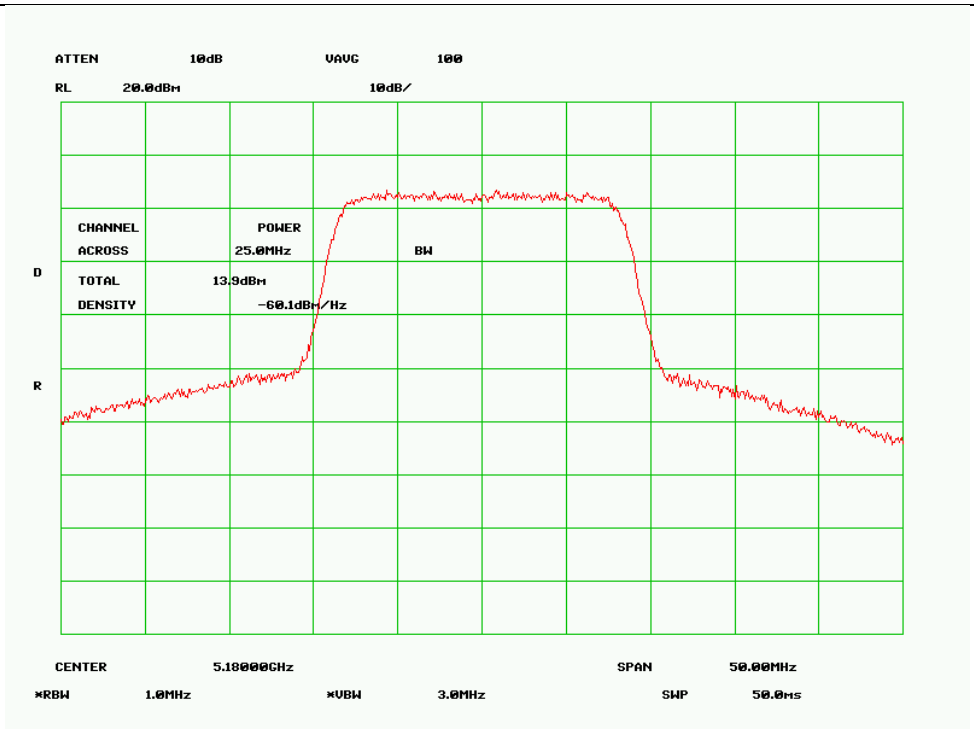
**Requirement(s):** 47 CFR §15.407(a)(2)

**Procedures:** The peak output power was measured at the antenna terminal using Acceptable Procedures: Peak conducted transmit output power outlined in FCC DA 02-2138 Appendix A. 100KHz VBW was determined, where T = ∞ μsec.

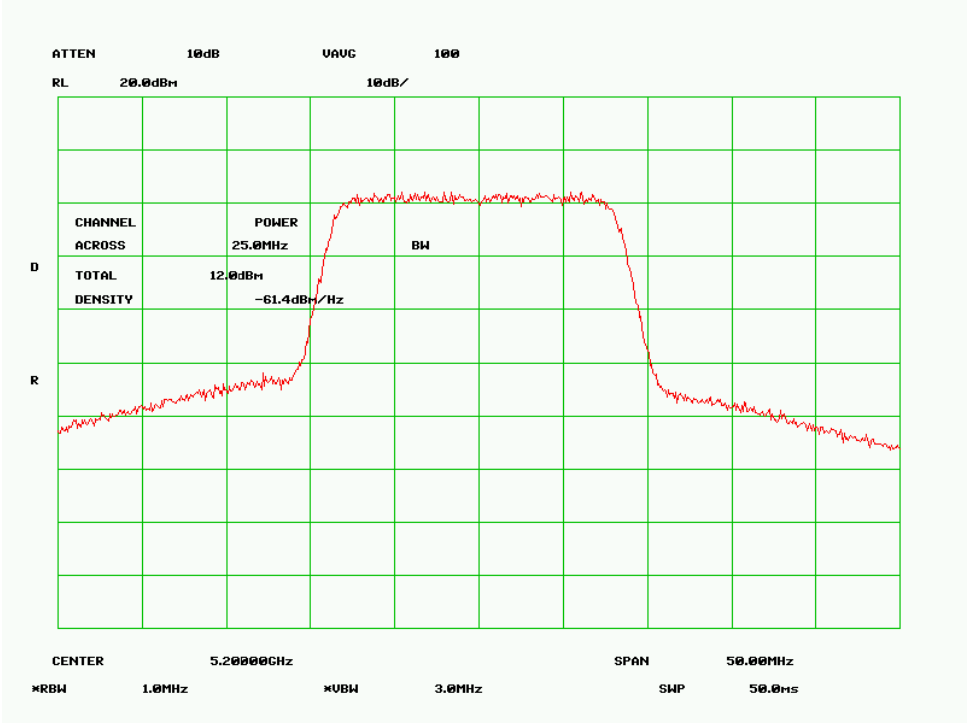
Conducted Peak Power Limit is 50mW (17 dBm).

**Test Result :**

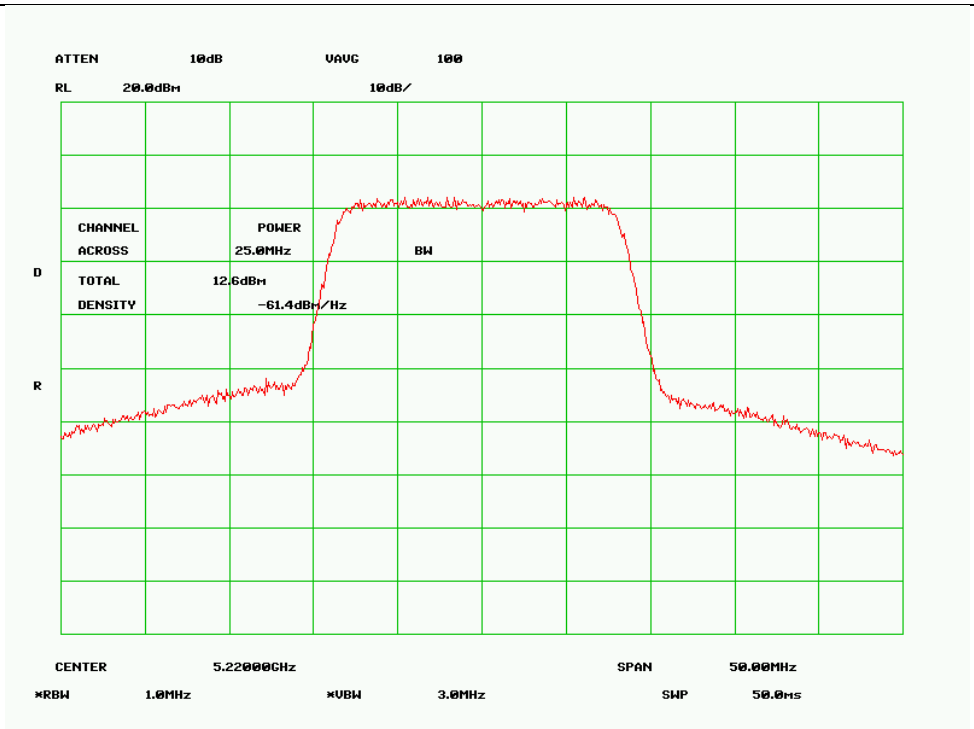
| Protocol | Channel | Channel Frequency (MHz) | Peak Output Power Limit (dBm) | Measured Output Power(dBm) |
|---|---|---|---|---|
| 802.11a | Low | 5180 | 17 | 13.9 |
| 802.11a | Mid | 5200 | 17 | 12.0 |
| 802.11a | High | 5220 | 17 | 12.6 |




Output Power Low Channel (802.11a)




Output Power Mid Channel (802.11a)




Output Power High Channel (802.11a)

# 5.3 Band Edge & Antenna Port Emission

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. 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 – 40GHz is ±1.5dB.
3. Environmental Conditions

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

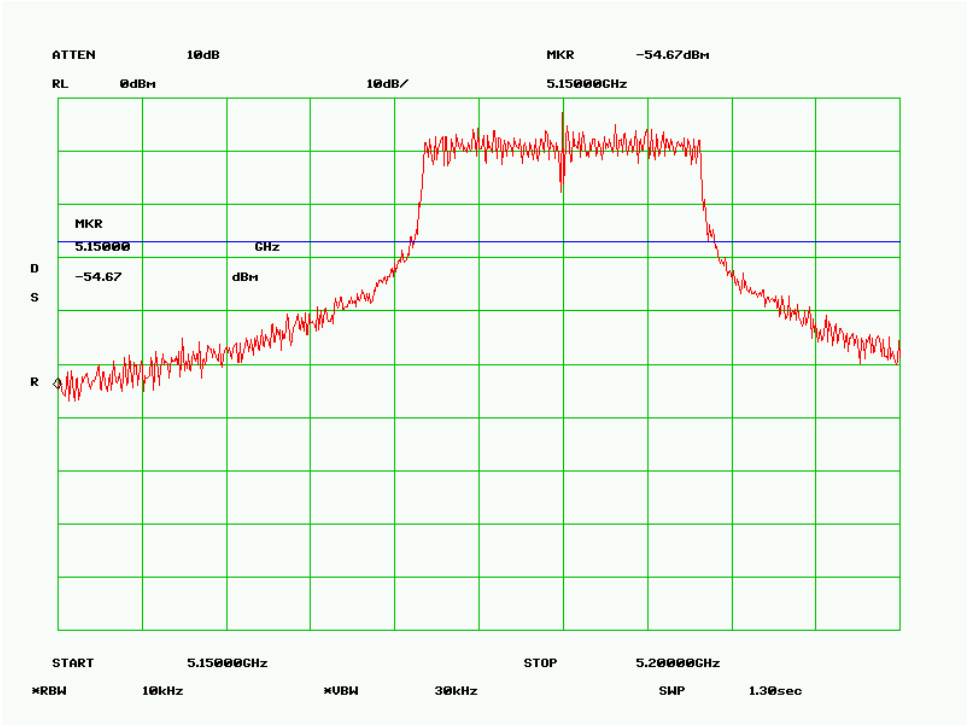
4. Test Date : October 10 2007
   Tested By : Kent Kim

**Requirement(s):** 47 CFR §15.407(b)(2)

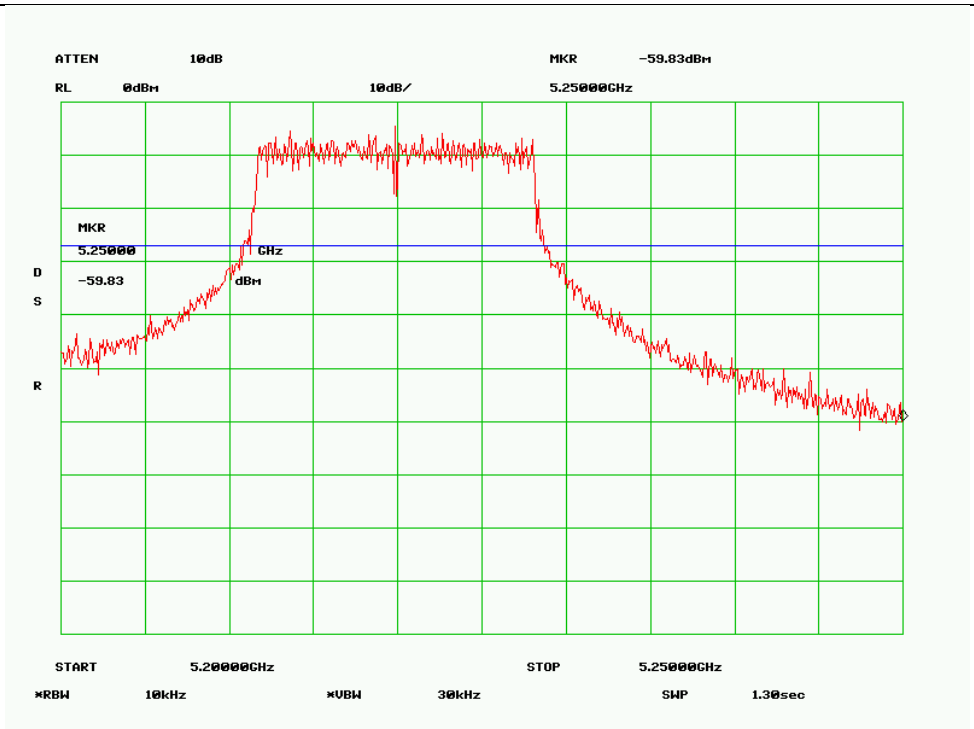
**Procedures:** The spurious emissions was measured at the antenna terminal using a spectrum analyzer. bandwidths at hi and low channels with the highest output power.

Out of Band Emission Limit: -27 dBm / MHz (EIRP)

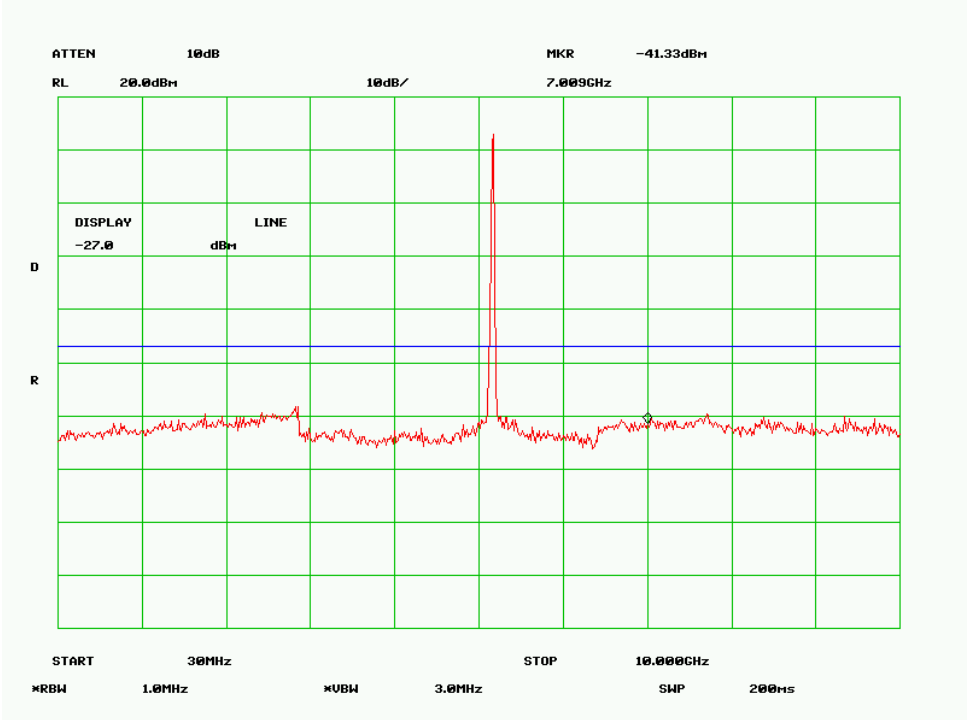
**Test Result:**



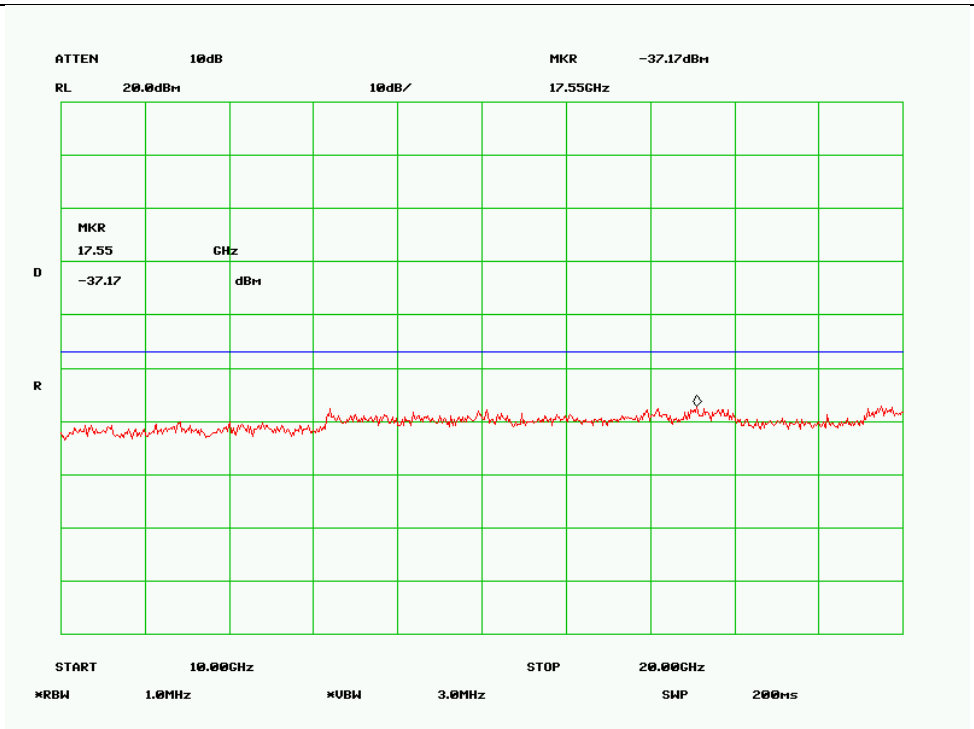

Band Edge LC



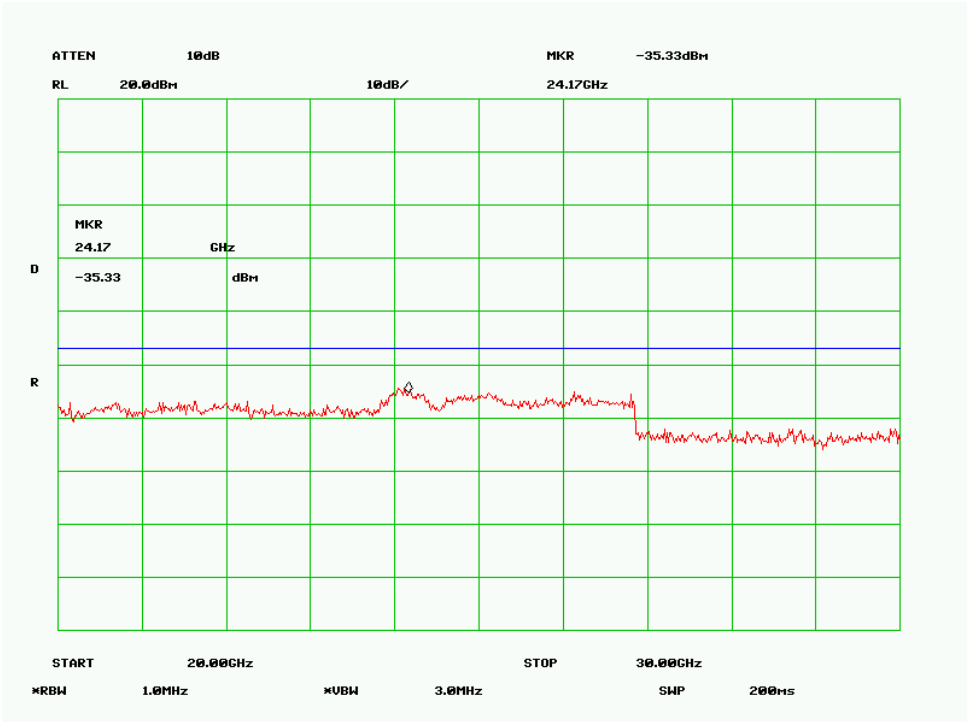

Band Edge HC



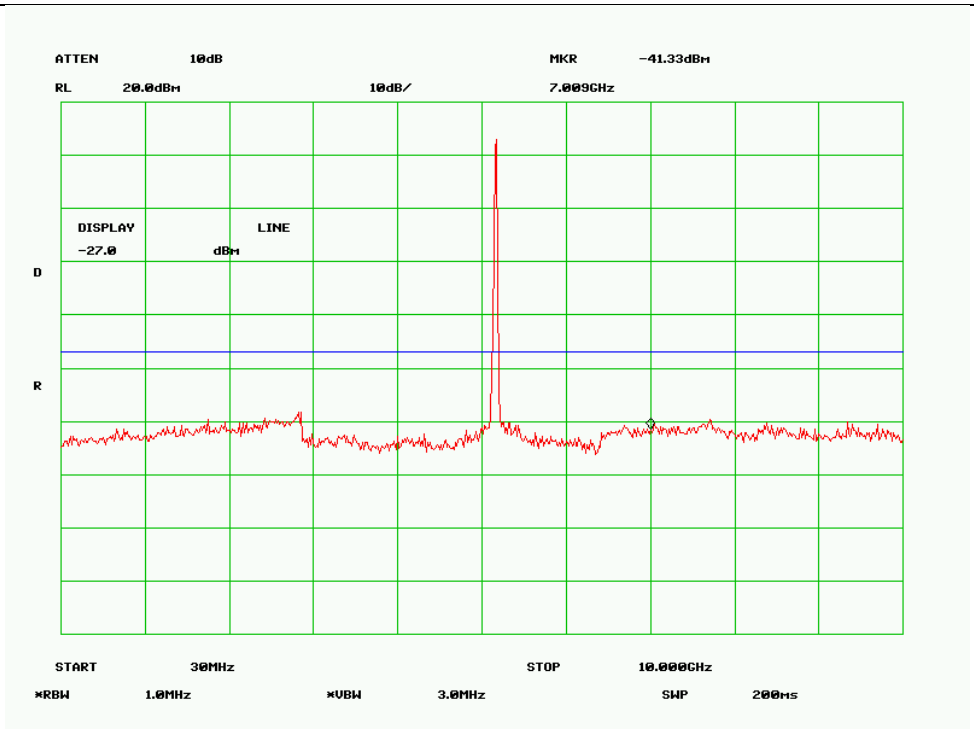

802.11a Low Channel -1



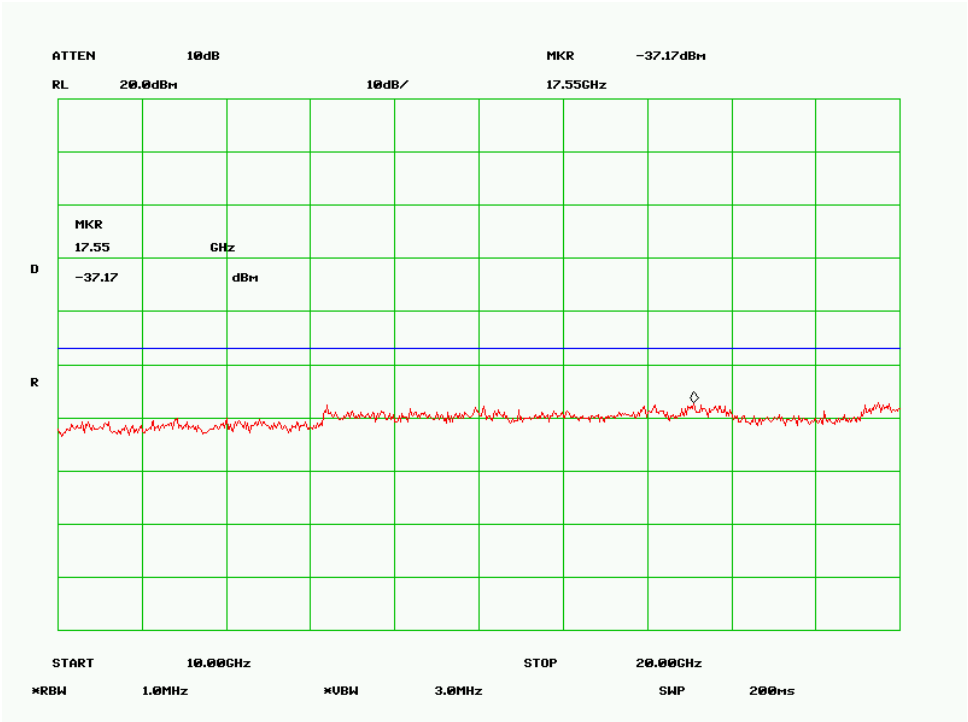

802.11a Low Channel -2



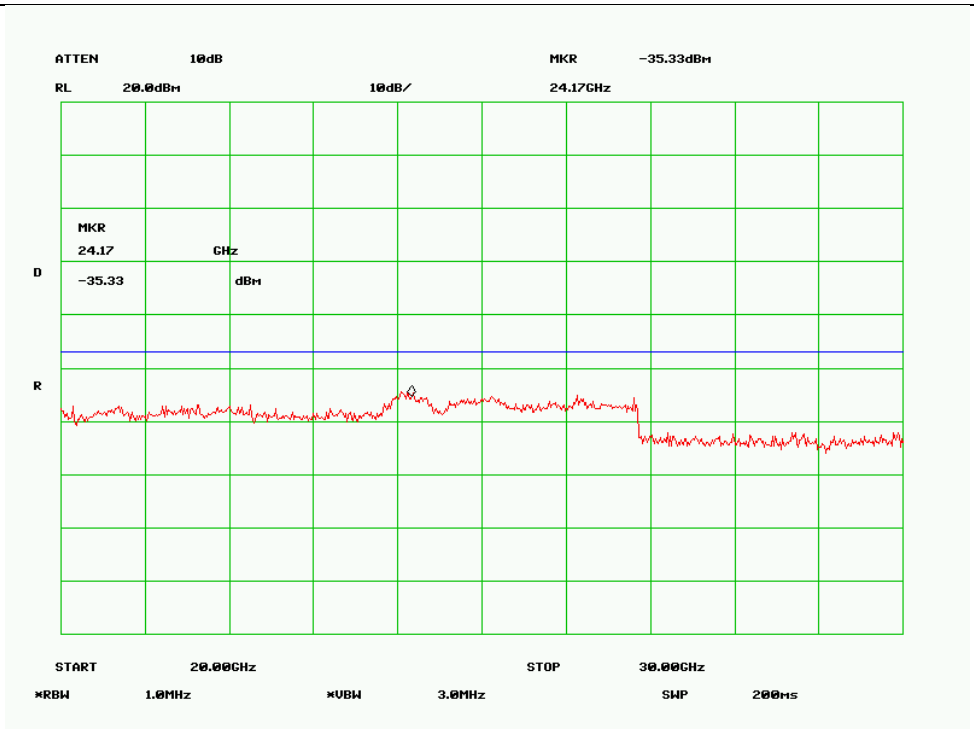

802.11a Low Channel -3



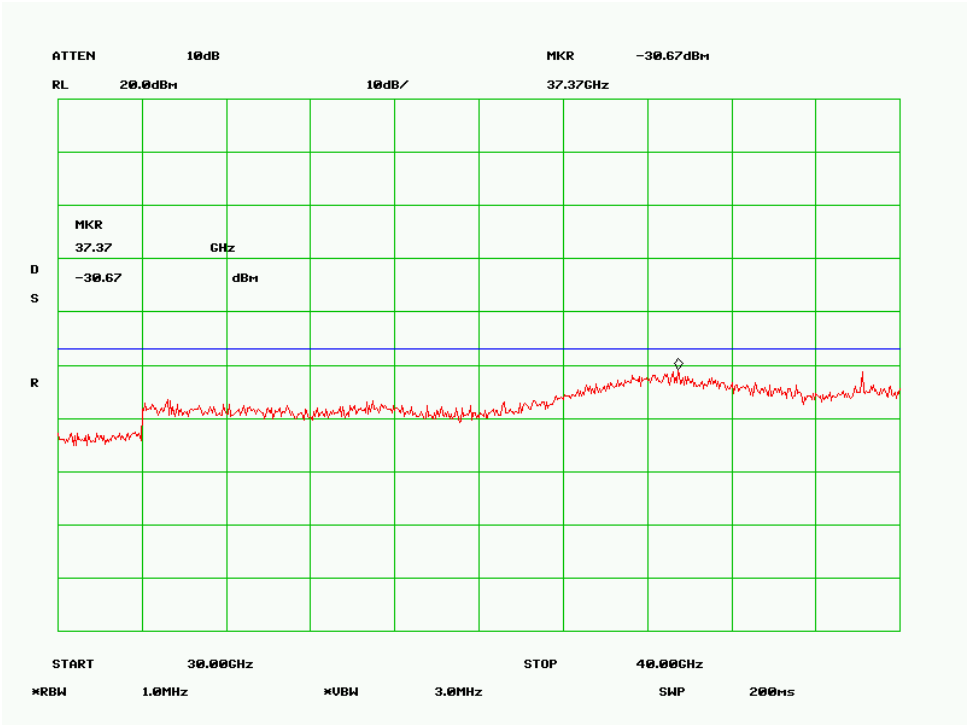

802.11a Mid Channel -1



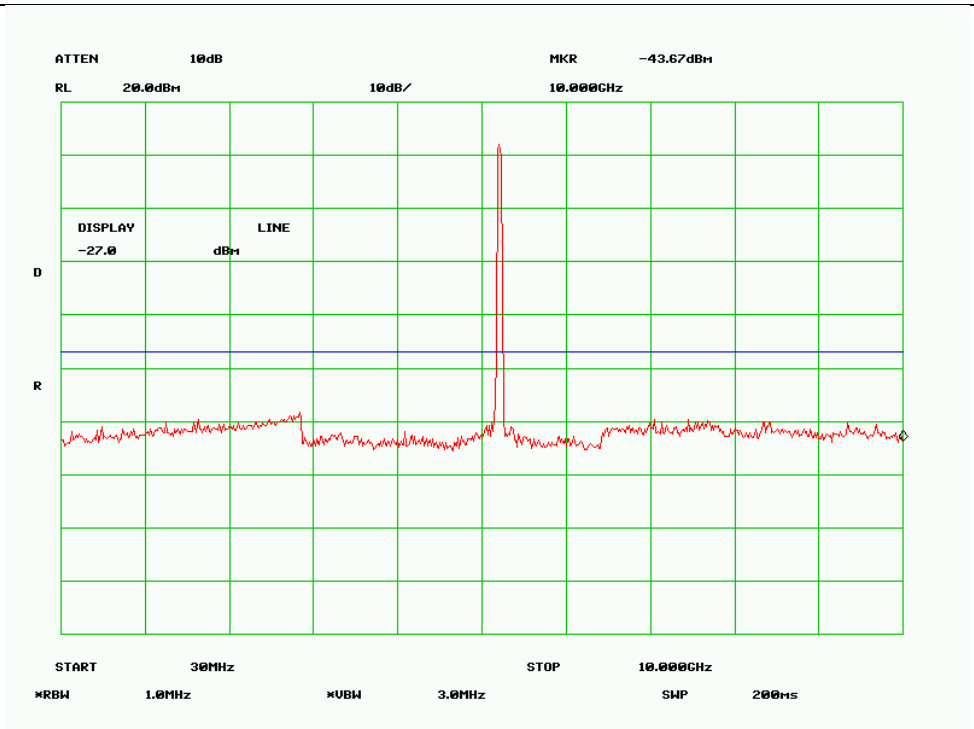

802.11a Mid Channel -2



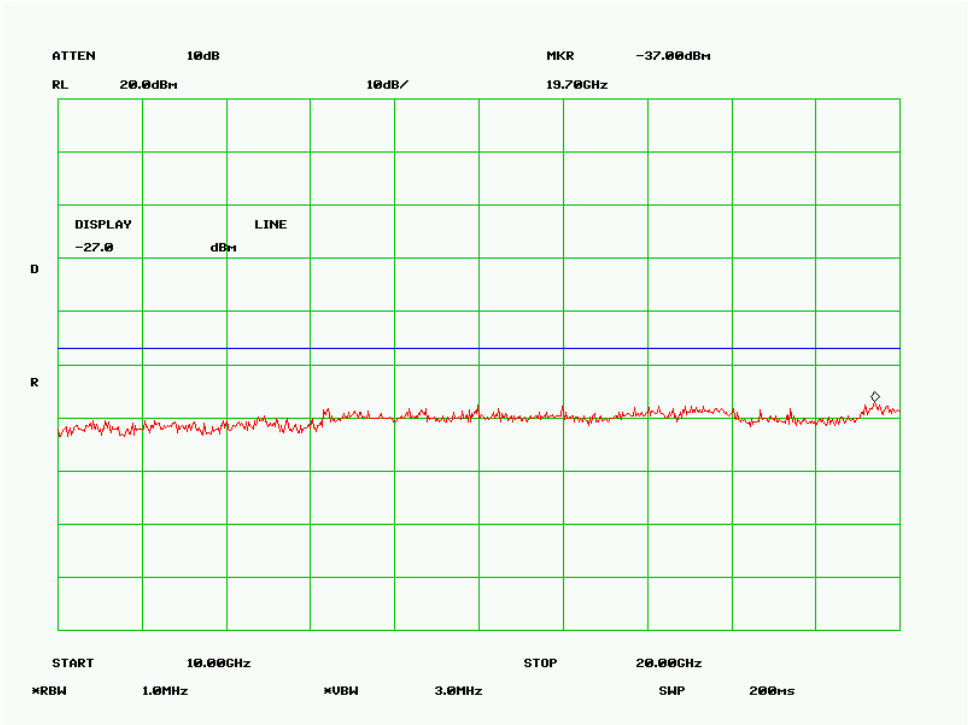

802.11a Mid Channel -3



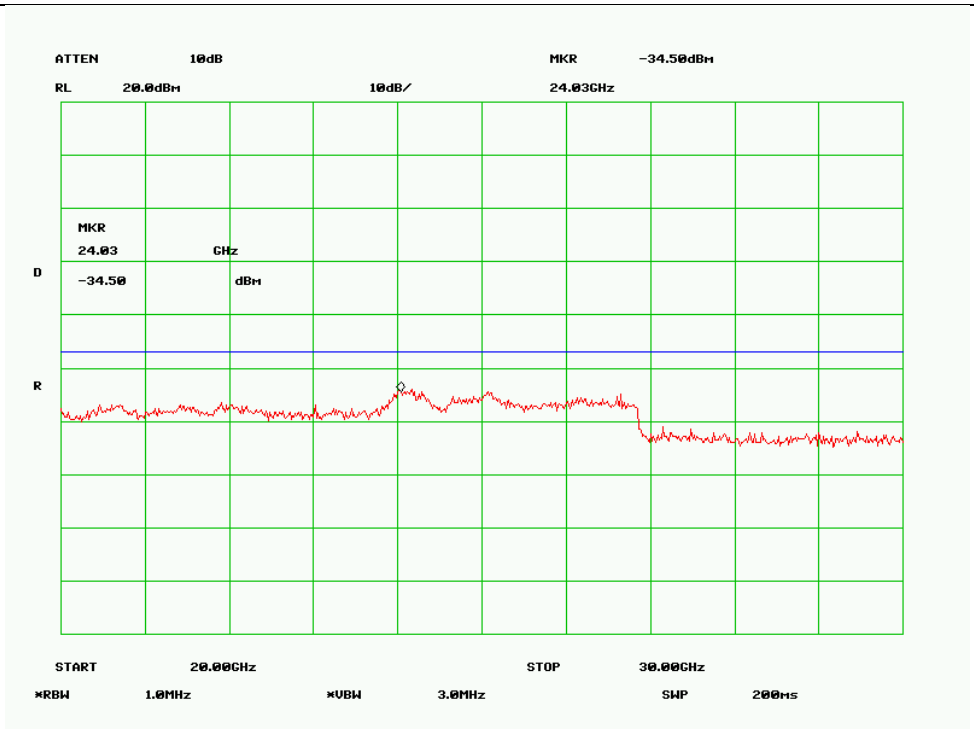

802.11a Low Channel -4



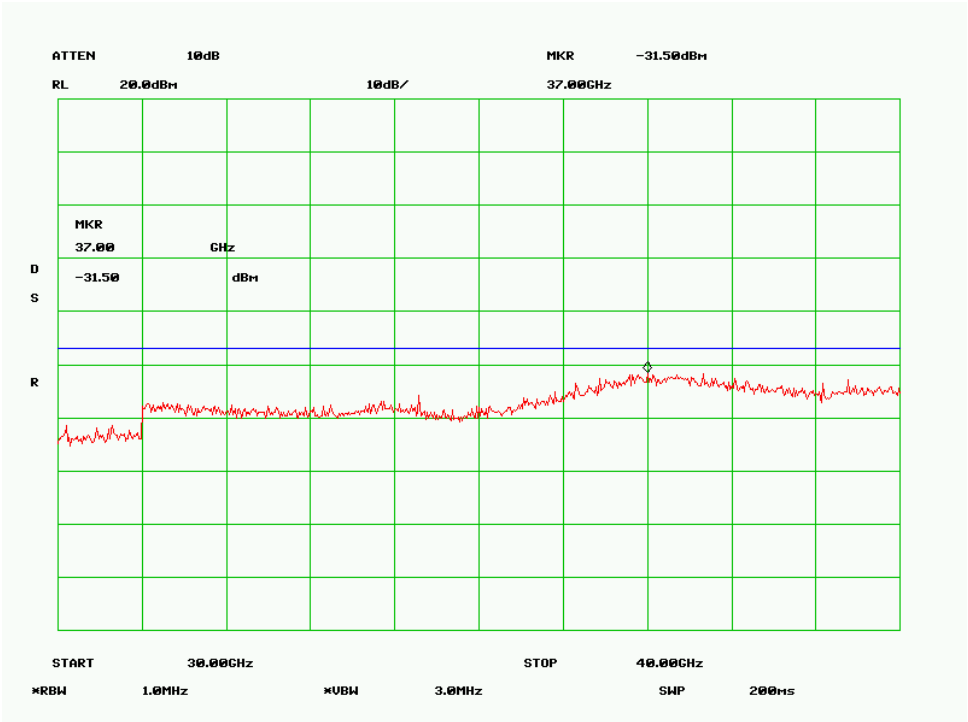

802.11a High Channel -1




802.11a High Channel -2




802.11a High Channel -3




802.11a High Channel -4

## 5.4 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 & 10m) is +5.6dB/-4.5dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

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

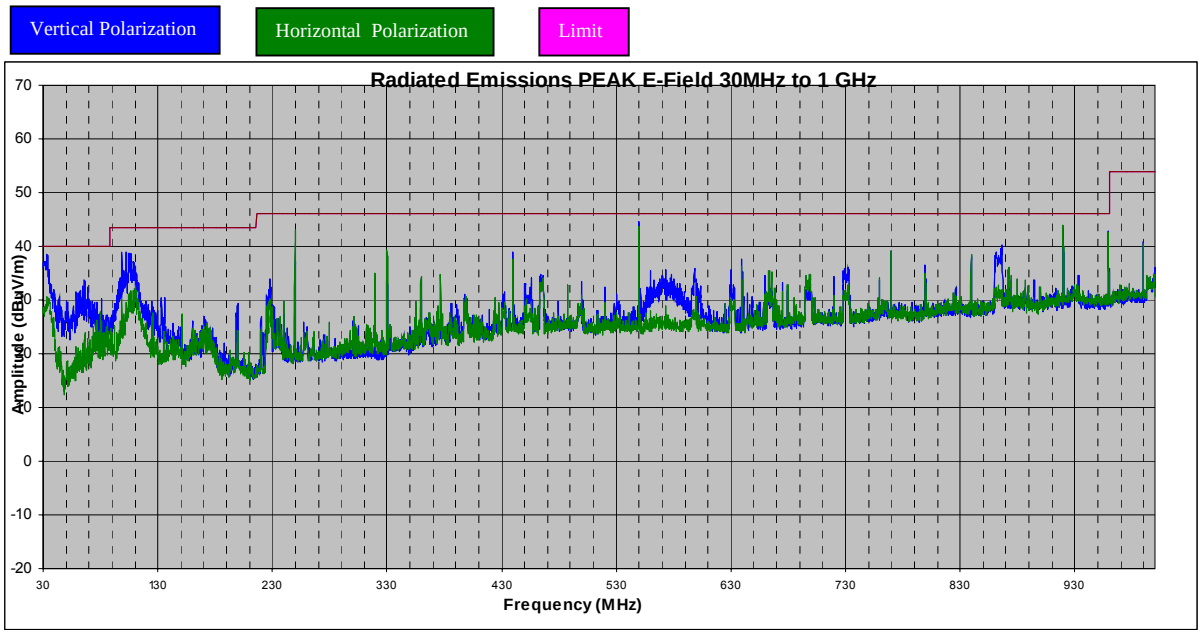
Test date : Oct 03 2007
Tested By : Kent Kim

**Requirement(s):** 47 CFR §15.407(b)(6)/15.209

**Procedures:** Radiated emissions were measured according to ANSI C63.4. Equipment was tested at low, mid and hi channel with different channel bandwidth and reported the worse case.

Sample Calculation: Corrected Amplitude = Raw Amplitude + Antenna Factor + Cable Loss

**Test Result:**




**Radiated Emission Plot (Transmit Mode)**

## Radiated Emissions Data (Transmit Mode)

| Frequency | Azimuth | Measure | Antenna Polarity | Antenna Height | Raw Amplitude @ 3m | ACF | CBL loss | Corrected Amplitude @ 3m | Limit @3m | Delta |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (degrees) | (Avg/QP) | (H/V) | (m) | (dBuV/m) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) |
| 33.78 | 0 | QP | V | 1 | 18.00 | 18.2 | 0.7 | 36.9 | 40 | -3.10 |
| 106.90 | 0 | QP | H | 1 | 26.10 | 11.7 | 0.9 | 38.7 | 43.5 | -4.80 |
| 250.00 | 180 | QP | V | 1 | 29.70 | 12.4 | 1 | 43.1 | 46 | -2.90 |
| 550.00 | 0 | QP | V | 1 | 24.30 | 18.5 | 1.8 | 44.6 | 46 | -1.40 |
| 920.00 | 270 | QP | V | 1 | 18.60 | 22.6 | 2.4 | 43.6 | 46 | -2.40 |
| 960.00 | 0 | QP | V | 1 | 17.20 | 23 | 2.4 | 42.6 | 46 | -3.40 |

## 5.5 Radiated Spurious Emissions > 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 1GHz – 40GH is +5.6dB/-4.5dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

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

Test date : Oct 26 2007
Tested By : Kent Kim

**Requirement(s):** 47 CFR §15.407(b)(2)

**Procedures:** Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 1MHz resolution bandwidth and a 10Hz video bandwidth was used. The EUT was tested at low and high with the highest output power. Emissions were investigated up to 40 GHz.

- 27 dBm = 68.2 dBμV/m at 3 meter distance.

Sample Calculation: EUT Field Strength = Raw Amplitude – Amplifier Gain + Antenna Factor + Cable Loss + Filter Attenuation (if used)

**Test Result:**

## 802.11a @ 5180MHz @1 Meter

| Frequency (GHz) | Azimuth (Degrees) | Antenna Polarity (H/V) | Height (m) | Raw Amp. @ 1m (dBuV) | Ant.Corr. Factor (dB) | Cable Loss (dB) | Dist.Corr. Factor (dB) | EUT Final Field Strength (dBuV/m) | Limit @ 3m (dBuV/m) | Delta (dBuV/m) | Detector (pk/avg) | **Remark** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.46 | 0 | H | 1.3 | 29.09 | 25.40 | 1.51 | 9.54 | 46.46 | 68.20 | -21.74 | PK | |
| 1.46 | 90 | V | 1 | 31.92 | 25.40 | 1.51 | 9.54 | 49.29 | 68.20 | -18.91 | PK | |
| 1.194 | 90 | H | 1.3 | 29.29 | 25.40 | 1.51 | 9.54 | 46.66 | 68.20 | -21.54 | PK | |
| 1.194 | 90 | V | 1 | 33.63 | 25.40 | 1.51 | 9.54 | 51.00 | 68.20 | -17.20 | PK | |
| 11.49 | 0 | H | 1.3 | 27.3 | 40.80 | 5.81 | 9.54 | 64.37 | 68.20 | -3.83 | PK | NOISE FLOOR |
| 11.49 | 90 | V | 1 | 30.1 | 40.80 | 5.81 | 9.54 | 67.17 | 68.20 | -1.03 | PK | NOISE FLOOR |

Emission was scanned up to 40GHz.

## 802.11a @ 5200MHz @1 Meter

| Frequency (GHz) | Azimuth (Degrees) | Antenna Polarity (H/V) | Height (m) | Raw Amp. @ 1m (dBuV) | Ant.Corr. Factor (dB) | Cable Loss (dB) | Dist.Corr. Factor (dB) | EUT Final Field Strength (dBuV/m) | Limit @ 3m (dBuV/m) | Delta (dBuV/m) | Detector (pk/avg) | **Remark** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.46 | 0 | H | 1.3 | 29.07 | 25.40 | 1.51 | 9.54 | 46.44 | 68.20 | -21.76 | PK | |
| 1.46 | 90 | V | 1 | 31.11 | 25.40 | 1.51 | 9.54 | 48.48 | 68.20 | -19.72 | PK | |
| 1.194 | 90 | H | 1.3 | 29.68 | 25.40 | 1.51 | 9.54 | 47.05 | 68.20 | -21.15 | PK | |
| 1.194 | 90 | V | 1 | 33.76 | 25.40 | 1.51 | 9.54 | 51.13 | 68.20 | -17.07 | PK | |
| 10.44 | 0 | H | 1.3 | 27.1 | 40.50 | 5.54 | 9.54 | 63.60 | 68.20 | -4.60 | PK | NOISE FLOOR |
| 10.44 | 90 | V | 1 | 30.6 | 40.50 | 5.54 | 9.54 | 67.10 | 68.20 | -1.10 | PK | NOISE FLOOR |

Emission was scanned up to 40GHz.

## 802.11a @ 5220MHz @1 Meter

| Frequency (GHz) | Azimuth (Degrees) | Antenna Polarity (H/V) | Height (m) | Raw Amp. @ 1m (dBuV) | Ant.Corr. Factor (dB) | Cable Loss (dB) | Dist.Corr. Factor (dB) | EUT Final Field Strength (dBuV/m) | Limit @ 3m (dBuV/m) | Delta (dBuV/m) | Detector (pk/avg) | **Remark** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.46 | 0 | H | 1.3 | 29.07 | 25.40 | 1.51 | 9.54 | 46.44 | 68.20 | -21.76 | PK | |
| 1.46 | 90 | V | 1 | 31.11 | 25.40 | 1.51 | 9.54 | 48.48 | 68.20 | -19.72 | PK | |
| 1.194 | 90 | H | 1.3 | 29.68 | 25.40 | 1.51 | 9.54 | 47.05 | 68.20 | -21.15 | PK | |
| 1.194 | 90 | V | 1 | 33.76 | 25.40 | 1.51 | 9.54 | 51.13 | 68.20 | -17.07 | PK | |
| 10.44 | 0 | H | 1.3 | 27.1 | 40.50 | 5.54 | 9.54 | 63.60 | 68.20 | -4.60 | PK | NOISE FLOOR |
| 10.44 | 90 | V | 1 | 30.6 | 40.50 | 5.54 | 9.54 | 67.10 | 68.20 | -1.10 | PK | NOISE FLOOR |

Emission was scanned up to 40GHz.

## 5.6 Peak Excursion Ratio

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. 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 – 40GHz is ±1.5dB.
3. Environmental Conditions

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

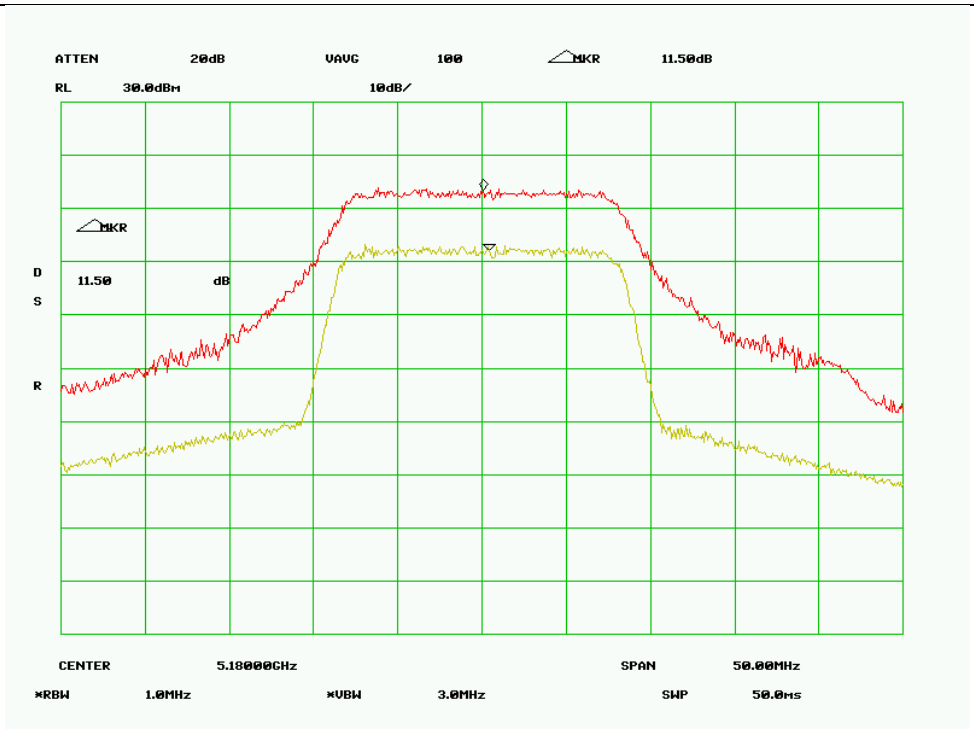
4. Test Date : October 20 2007
   Tested By : Kent Kim

**Requirement(s):** 47 CFR §15.407(a)(6)

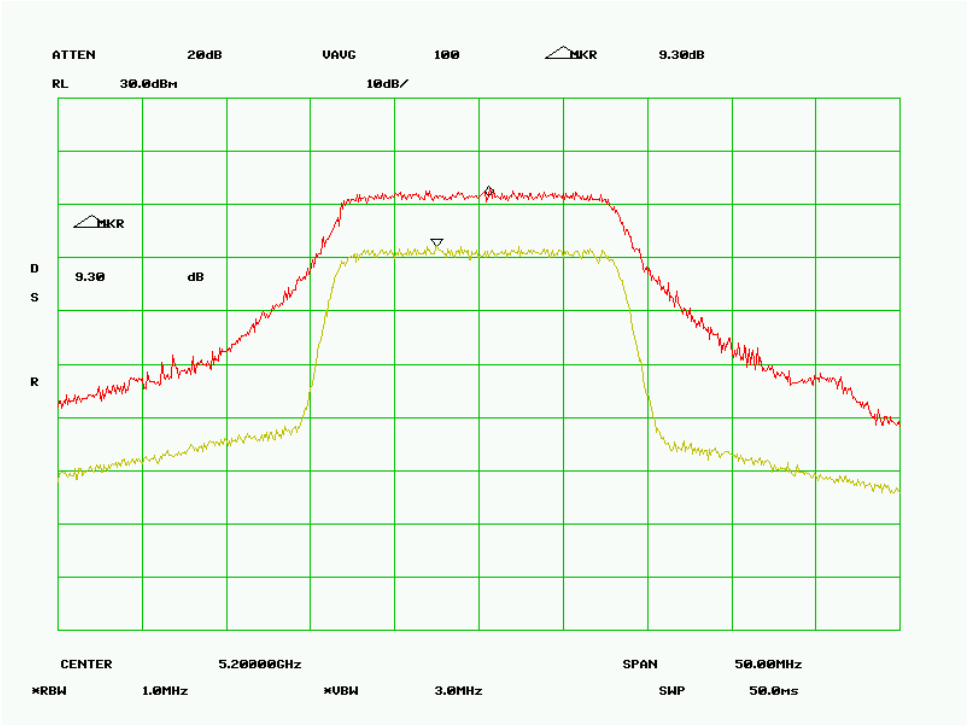
**Procedures:** The peak excursion ratio was measured at the antenna terminal using a spectrum analyzer. Trace A setting: RBW = VBW = 1 MHz (peak detector). Trace B setting: RBW = 1 MHz and VBW = 1MHz (sample detector).

**Test Result :**

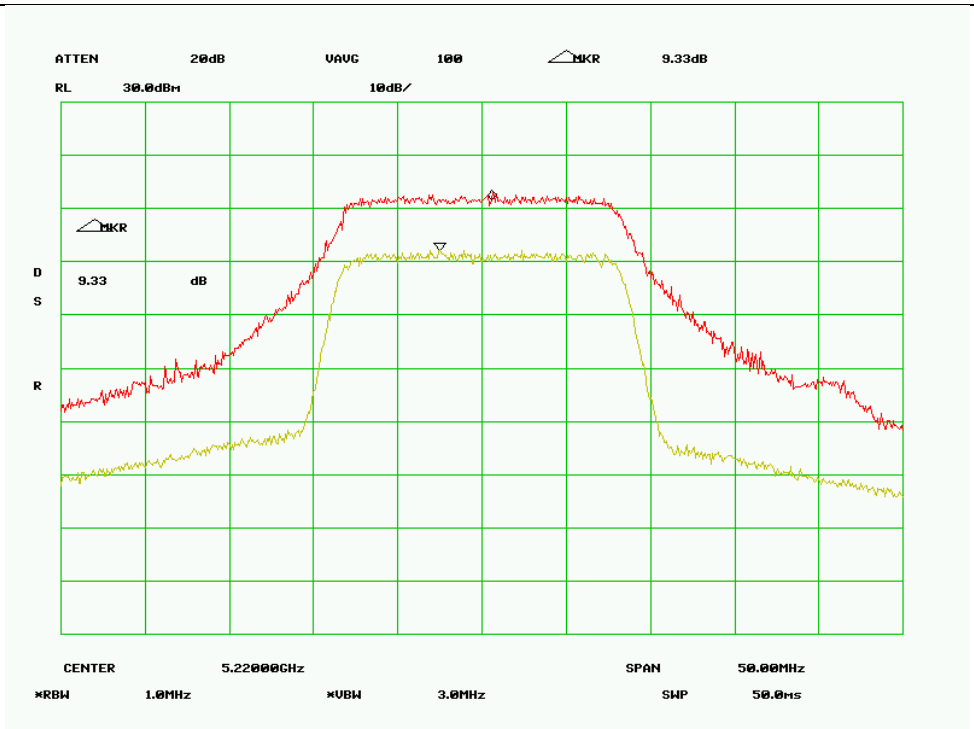
| Protocol | Channel | Channel Frequency (MHz) | Peak Excursion Ratio Limit (dB) | Measured Peak Excursion ratio (dB) |
|---|---|---|---|---|
| 802.11a | Low | 5180 | 13 | 11.50 |
| 802.11a | Mid | 5220 | 13 | 9.30 |
| 802.11a | High | 5220 | 13 | 9.33 |




Peak Excursion ratio , 802.11a Low Channel




Peak Excursion ratio , 802.11a Mid Channel




Peak Excursion ratio , 802.11a High Channel

# Annex A. TEST INSTRUMENT & METHOD

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

| 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 |
| R&S LISN | R&S | ESH2-Z5 | 04/27/2008 |
| CHASE LISN | Chase | MN2050B | 04/26/2008 |
| Antenna(1 ~18GHz) | Emco | 3115 | 08/17/2008 |
| Antenna (30MHz~2GHz) | Sunol Sciences | JB1 | 10/04/2008 |
| Chamber | Lingren | 3m | 09/28/2008 |
| Pre-Amplifier(1 ~ 26GHz) | HP | 8449 | 05/01/2008 |
| DMM | Fluke | 73III | 05/01/2008 |
| Variac | KRM | AEEC-2090 | See Note |
| DMM | Fluke | 51II | See Note |
| Horn Antenna (18~40GHz) | Com Power | AH-840 | 5/21/2008 |
| Microwave Pre-Amp (18~40GHz) | Com Power | PA-840 | 5/21/2008 |

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. **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.

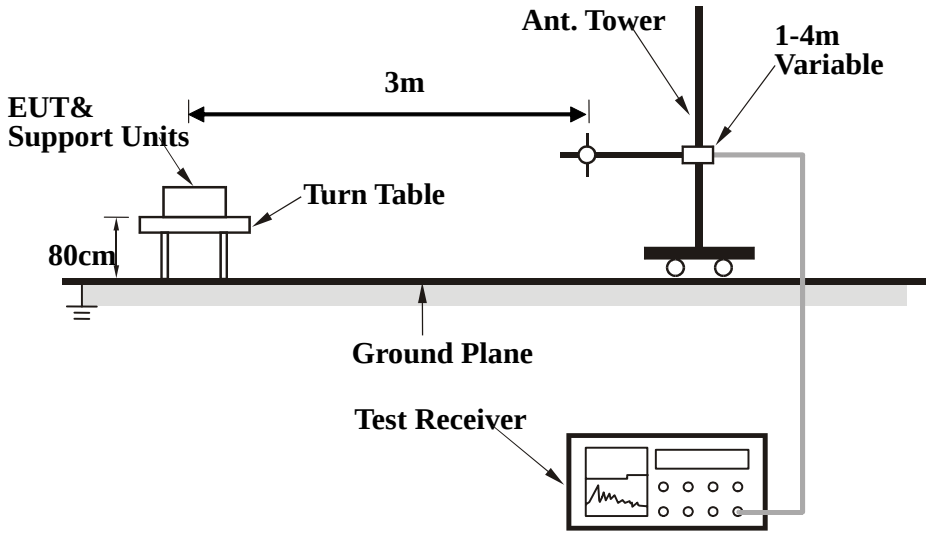
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable 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。 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:

Peak = Reading + Corrected Factor

where
Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)
And the average value is

Average = Peak Value + Duty Factor or
Set RBW = 1MHz, VBW = 10Hz.

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

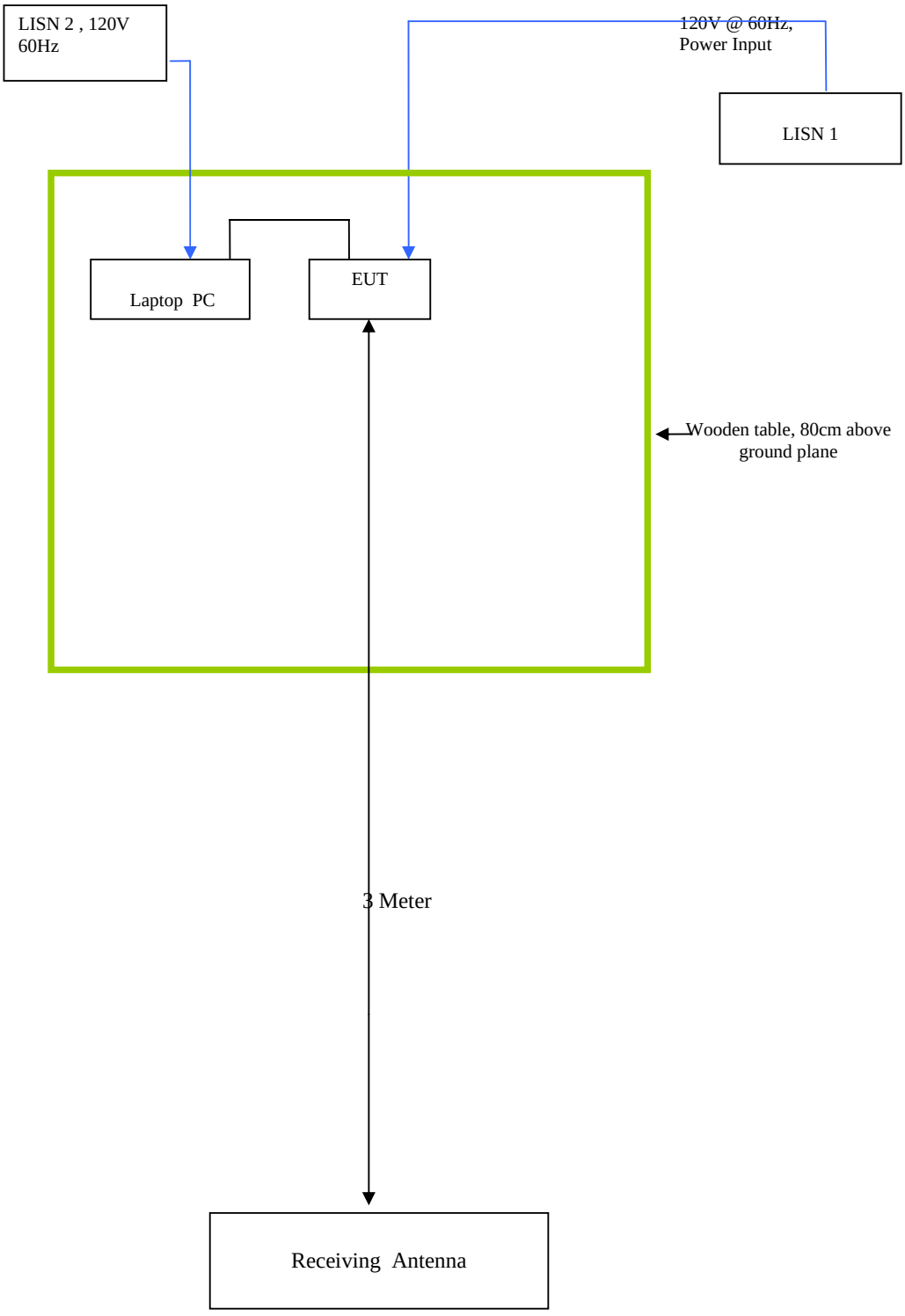
## EUT TEST CONDITIONS

## Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

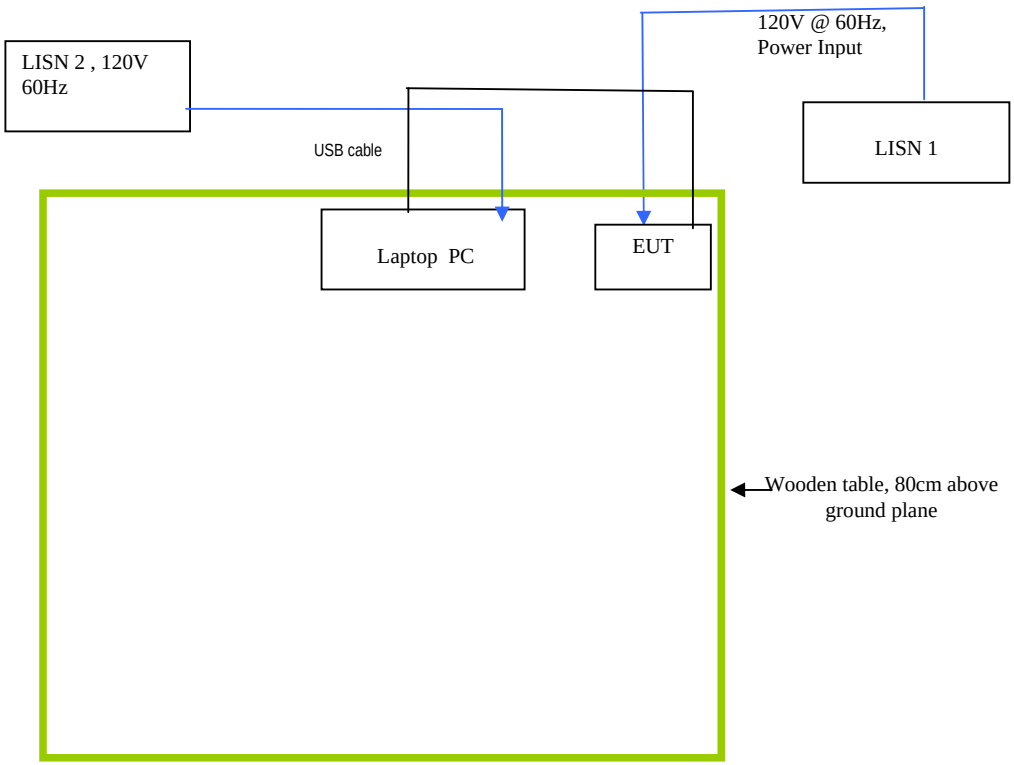
The following is a description of supporting equipment and details of cables used with the EUT.

| Equipment Description (Including Brand Name) | Model & Serial Number | Cable Description (List Length, Type & Purpose) |
|---|---|---|
| Laptop PC | Compaq 2100 | RJ45 Cable : 20 cm. |

## Block Configuration Diagram for Radiated Emission



## Block Configuration Diagram for Conducted 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 Testing**<br><br>**Others Testing** | The EUT was controlled via PC Using ART Program.<br><br>Target Power is set at 17 dBm during testing. |

# Annex D USER MANUAL, BLOCK & CIRCUIT DIAGRAM

**Please see attachment**