FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Wireless LAN module built in Notebook PC

Brand Name: Compal; acer

Model Number: CL51

FCC ID: GKRWM3BAB51

Report No: B30811202-RP

Issue Date: September 9, 2003

Prepared for

Compal Electronics Inc.
No. 581, Jui Kuang Rd., Neihu,
Taipei, (114) Taiwan, R.O.C.

Prepared by

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1. TEST RESULT CERTIFICATION

Applicant:	COMPAL ELECTRONICS, INC. No. 581, Jui Kuang Rd., Neihu, Taipei (114), Taiwan, R.O.C.
Equipment Under Test:	Wireless LAN module built in Notebook PC
Trade Name:	Compal; acer
Model:	CL51
Model Difference:	N/A
Report Number:	B30811202-RP
Date of Test:	August 20 ~ 21, 2003

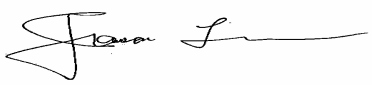
APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC Part 15 Subpart C	No non-compliance noted

We hereby certify that:

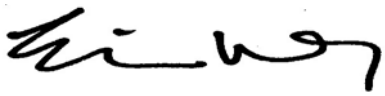
The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (1992) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Approved by: ***Reviewed by:***



Jonson Lee
Director of Linkou Laboratory
Compliance Certification Services Inc.



Eric Wong
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Wireless LAN module built in Notebook PC
Trade Name	Compal; acer
Model	CL51
Model Discrepancy	N/A
FCC ID	GKRWM3BAB51
Module Trade Name	Intel
Module Model	WM3A2100A
Power Rating	Input: 100-240Vac, 60Hz, 1.6A Output: +18.5 Vdc, 3.5A
Frequency Range	802.11a: 5.15 ~ 5.35GHz 802.11b: 2.4 ~ 2.497GHz
Modulation Technique	802.11a: OFDM 802.11b: DSSS (DBPSK, DQPSK, CCK)
Transmitting Speed	802.11a: 54, 48, 36, 24, 18, 12, 9, 6Mbps 802.11b: 11, 5.5, 2, 1Mbps
Transmit Power	802.11a: 17.32 dBm 802.11b: 16.60 dBm
Number of Channels	802.11a: 8 CH 802.11b: 11 CH
Antenna Designation	Two PIFA anteenas

Note: *This submittal(s) (test report) is intended for FCC ID: GKRWM3BAB51 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.*

Note: *The 2.4GHz bands are applicable to this report; another band of operation (5.2 GHz) is documented in a separate report*

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and 15.247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT (Wireless LAN module built in Notebook PC) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.247 under the FCC Rules Part 15 Subpart C. The composite system (Digital device) is compliance with the Subpart B is authorized under the DoC procedure.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

Radiated Emissions

The EUT is a placed on as turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Peak Output Power was tested for both Antenna ports J5 and J6. The port J5 is higher than J6. The other test items of worst case at Antenna port A.

Channel 1 (2412MHz), Channel 6 (2437MHz) and Channel 11 (2462MHz) with 11Mbps highest data rate are chosen for the final testing.

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No. 81-1, Lane 210, Pa-de 2nd Road, Luchu Hsiang, Taoyuan Hsien, Taiwan

☐ No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200600-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: 93105 and 90471).

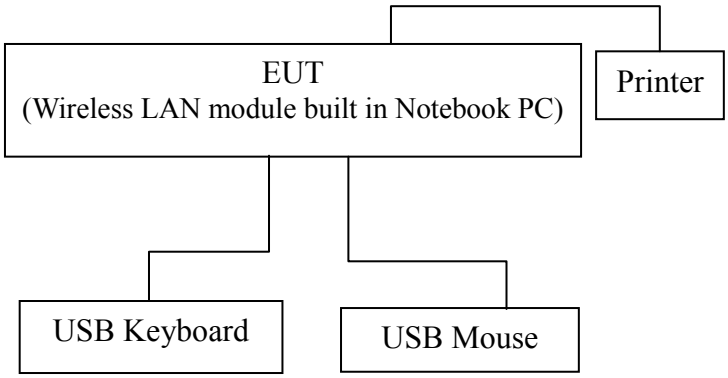
5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS 3548IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	200600-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	93105, 90471
Japan	VCCI	4 3/10 meter Open Area Test Sites to perform conducted/radiated measurements	R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328-2, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	ELA 124a ELA 124b ELA 124c
Taiwan	CNLA	EN 300 328-1, EN 300 328-2, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS 3548, CNS 13022-1, IEC 1000-4-3/4/5/6/8/11, CNS 13022-2/3	0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	IC 3991-3 IC 3991-4

** No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.*

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT



6.2 SUPPORT EQUIPMENT

Device Type	Brand	Model	FCC ID	Series No.	Data Cable	Power Cord
USB Keyboard	Logitech	M-MM43	FCC DoC	LZE94052771	Shielded, 1.8m	N/A
USB Mouse	Logitech	M-CAA43	FCC DoC	PHB02400489	Shielded, 1.8m	N/A
Printer	HP	3137S01428	FCC DoC	DSI6XU2225	Unshielded, 1.8m	Unshielded, 1.8m

Notes:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

7. FCC PART 15.247 REQUIREMENTS

7.1. 6DB BANDWIDTH

LIMIT

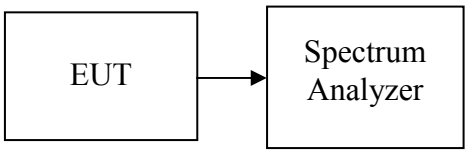
For the direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	4/27/2004
Low Loss RF Cable	Huber + Suhner	Sucoflex 104	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=100KHz, VBW = RBW, Span = 20MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

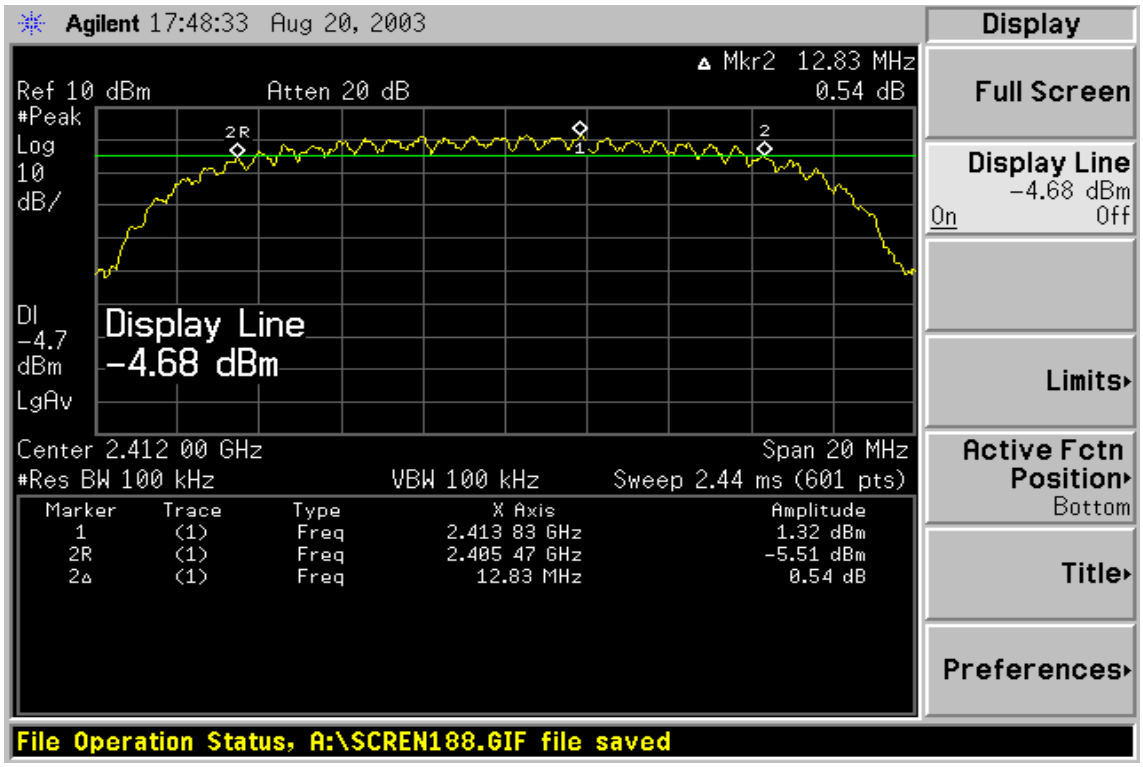
No non-compliance noted

TEST DATA

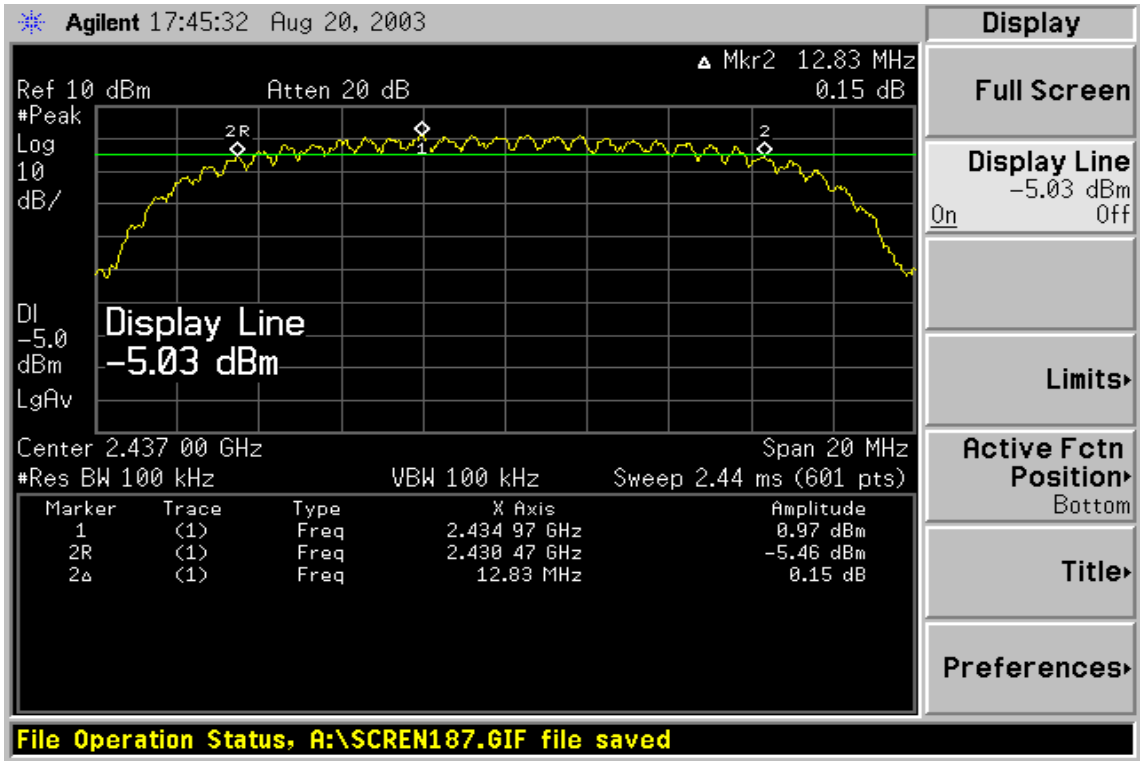
Channel	Frequency (MHz)	6dB BW (kHz)	Limit (kHz)	Margin (kHz)
Low	2412	12830	500	-12330
Mid	2437	12830	500	-12330
High	2462	12900	500	-12400

Test Data Plot

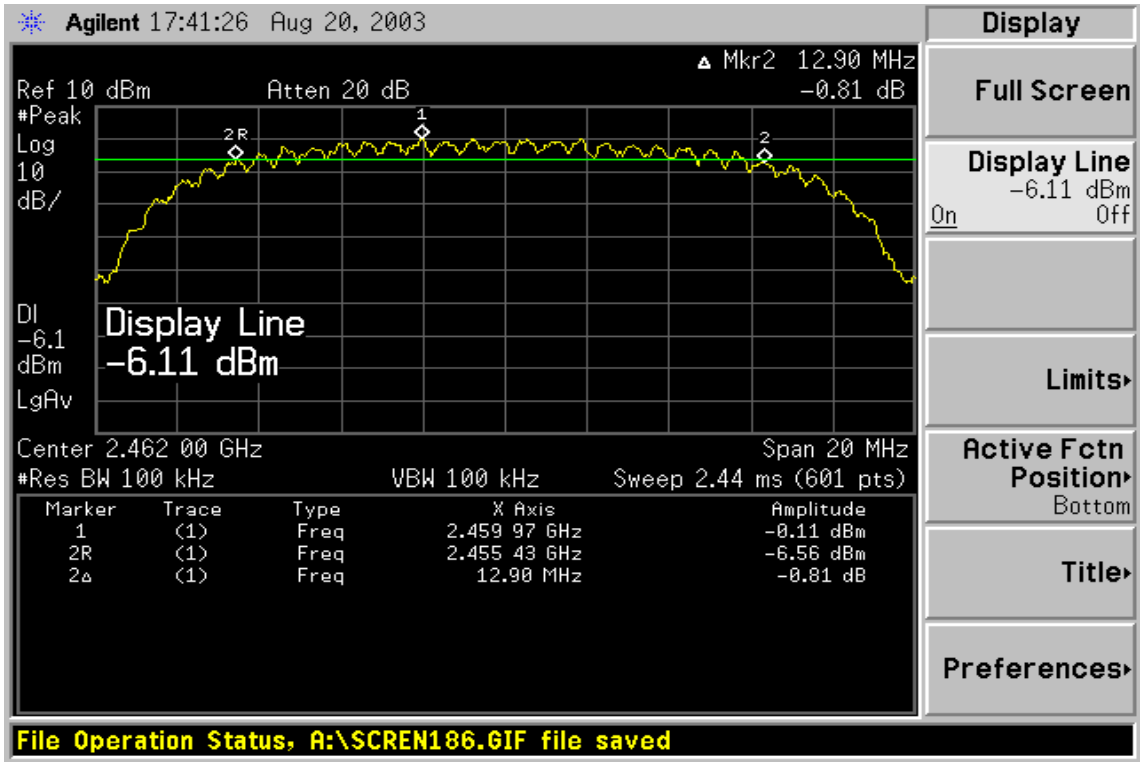
Ch Low



Ch Mid



Ch High


Agilent 17:41:26 Aug 20, 2003
Display
Mkr2 12.90 MHz
-0.81 dB
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
2R
1
2
Dl
-6.1
dBm
LgAv
Display Line
-6.11 dBm
Center 2.462 00 GHz
Span 20 MHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 2.44 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.459 97 GHz -0.11 dBm
2R (1) Freq 2.455 43 GHz -6.56 dBm
2Δ (1) Freq 12.90 MHz -0.81 dB
Full Screen
Display Line
-6.11 dBm
On Off
Limits
Active Fctn
Position
Bottom
Title
Preferences
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7.2. PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

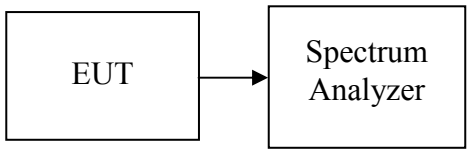
1. For systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	4/27/2004
Low Loss RF Cable	Huber + Suhner	Sucoflex 104	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST PROCEDURE



1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=1MHz, VBW = 3MHz, Span = 27MHz, Sweep = auto.
4..Select the frequency to be investigate and measure the peak power by the pre-define function in the spectrum analyzer.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

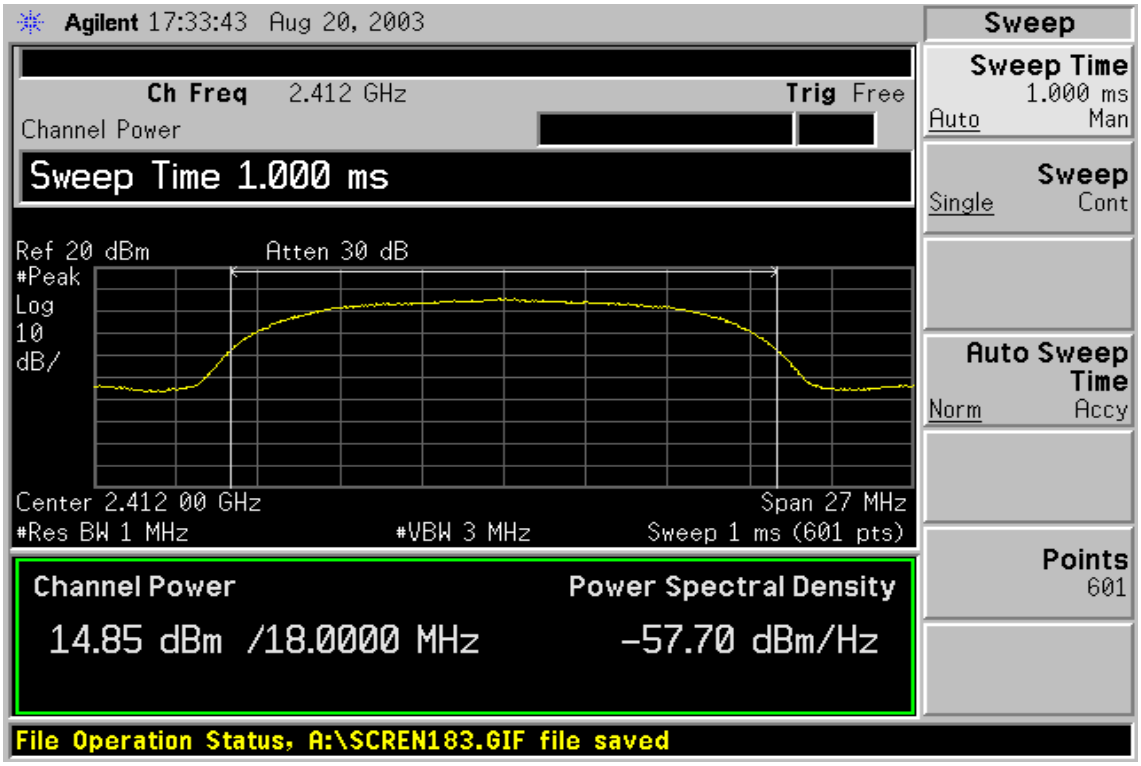
No non-compliance noted

TEST DATA

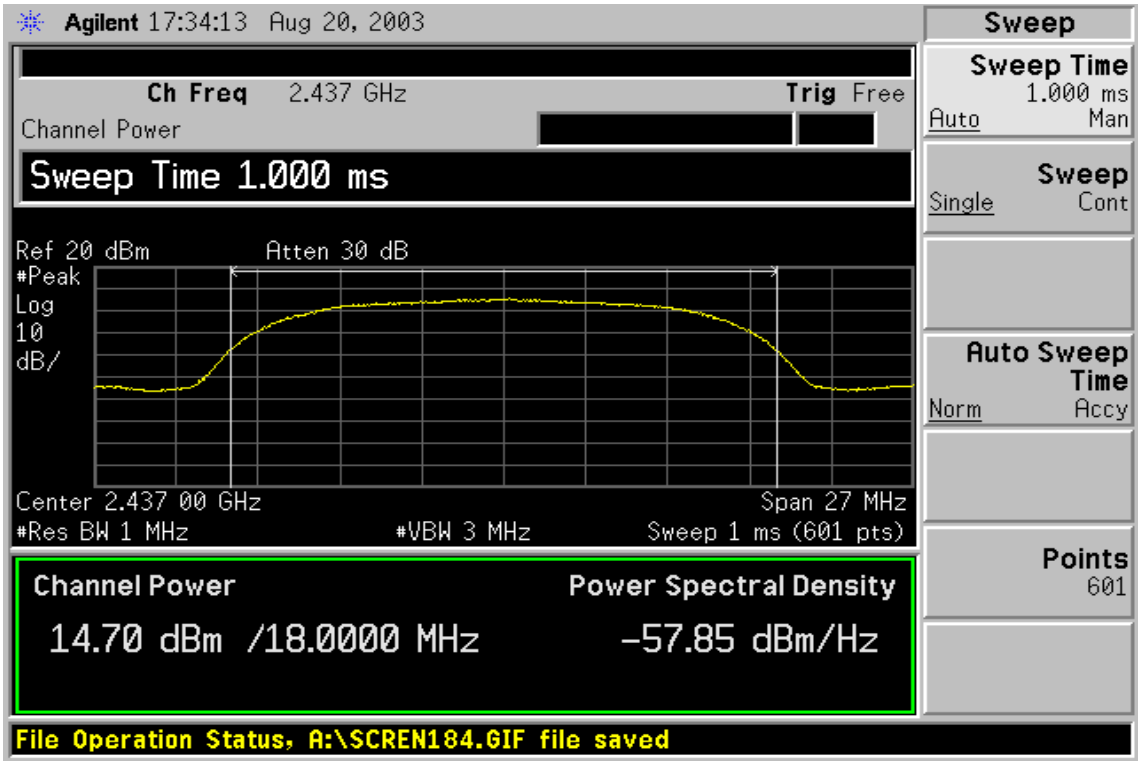
Channel	Reading Power (dBm)	Cable Loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	14.85	1.75	16.60	0.04571	1	PASS
Mid	14.70	1.75	16.45	0.04416	1	PASS
High	13.83	1.75	15.58	0.03614	1	PASS

Test Plot

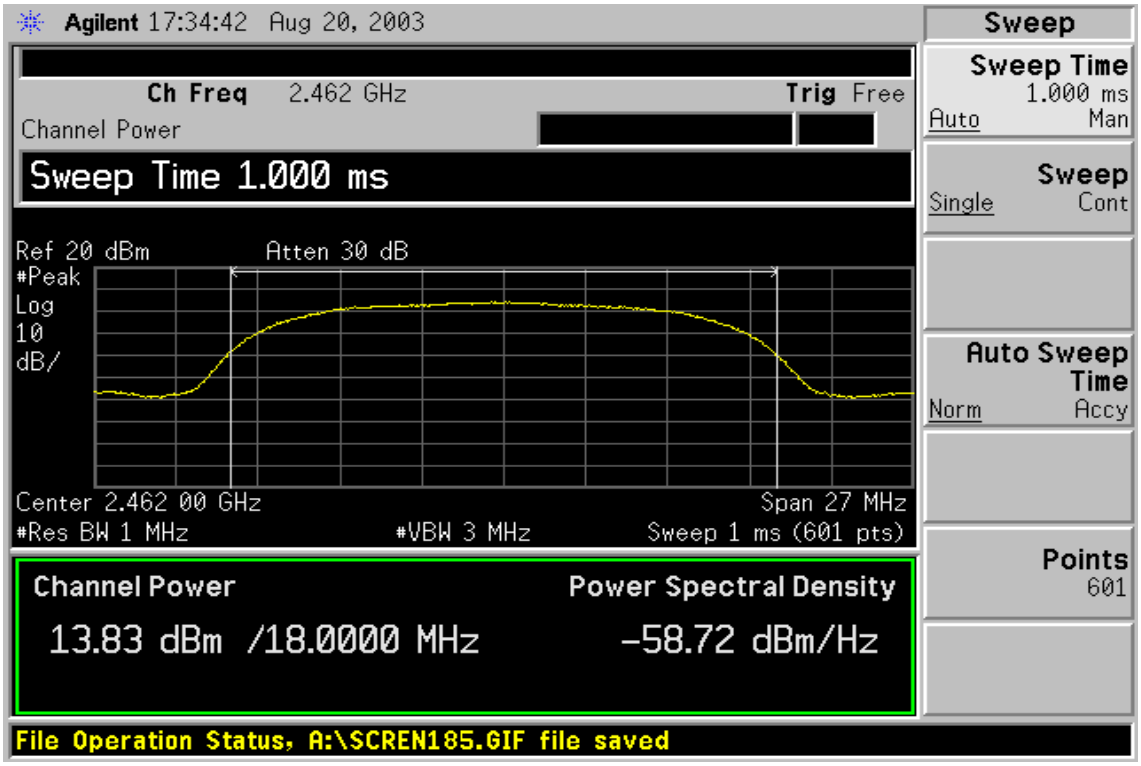
Peak power - Ch Low



Peak power - Ch Mid



Peak power - Ch High



7.3. BAND EDGES MEASUREMENT

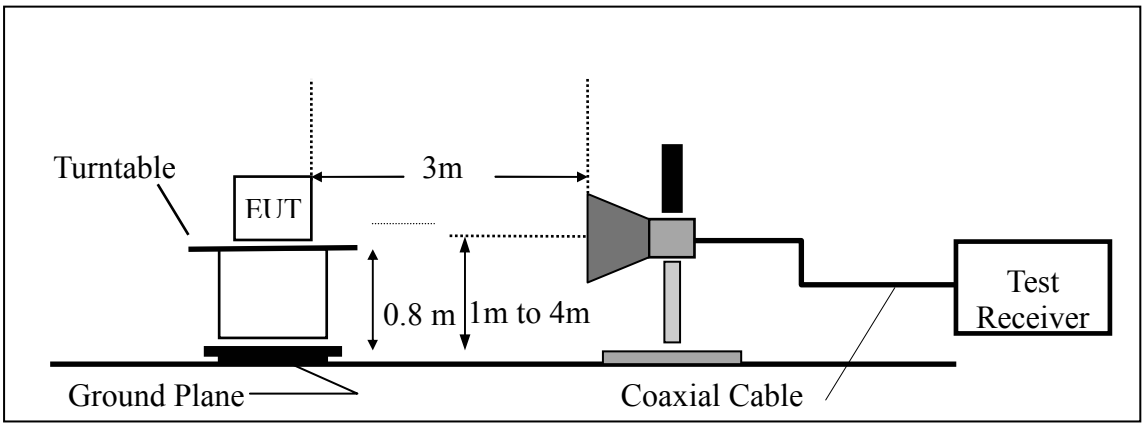
LIMIT

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	Model No.	Serial No.	Cal. Due.
Spectrum Analyzer	Agilent	E4446A	US42510252	4/27/2004
Spectrum Analyzer	R&S	FSP30	1093.4495.30	7/22/2004
Low Loss Cable	Huber + Suhner	Sucoflex 104	N/A	N/A
Horn Antenna	EMCO	3115	N/A	2/24/2004

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

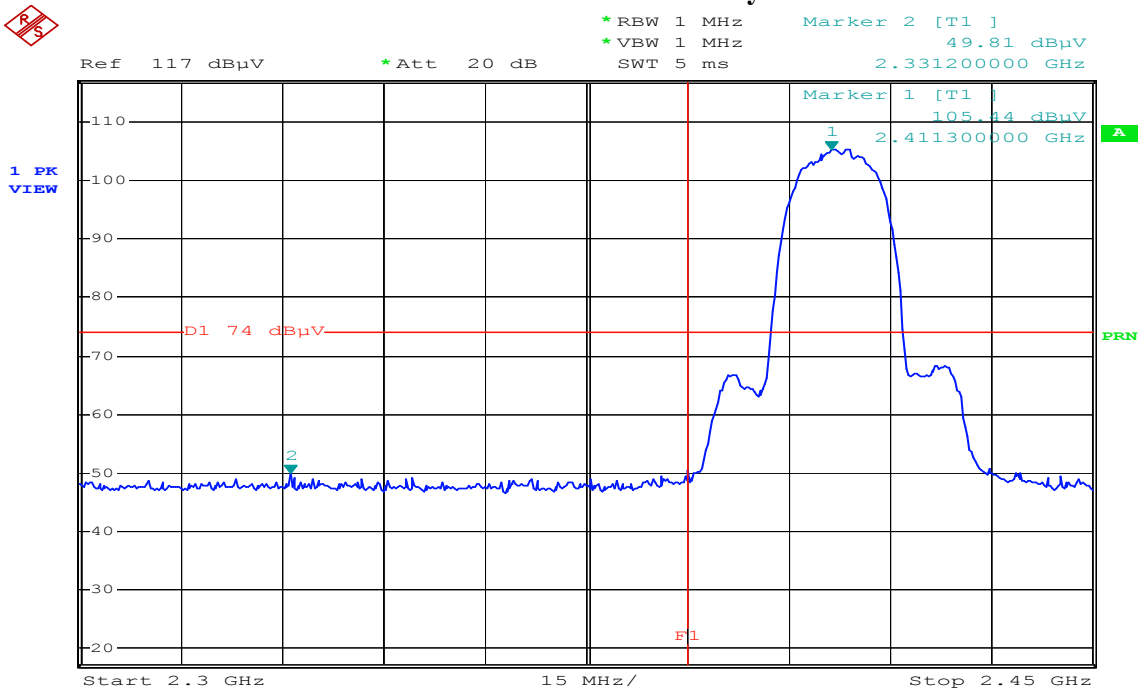
TEST RESULTS

Refer to attach spectrum analyzer data chart.

Band Edges Test Data CH-Low

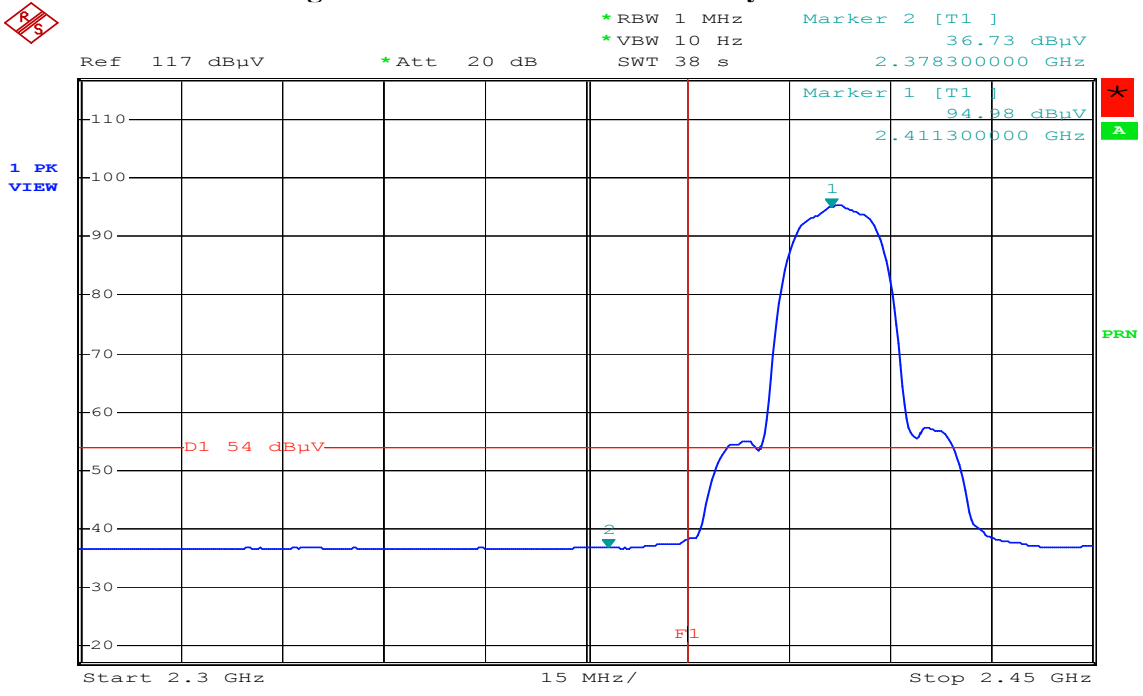
Detector mode: Peak

Polarity: Vertical

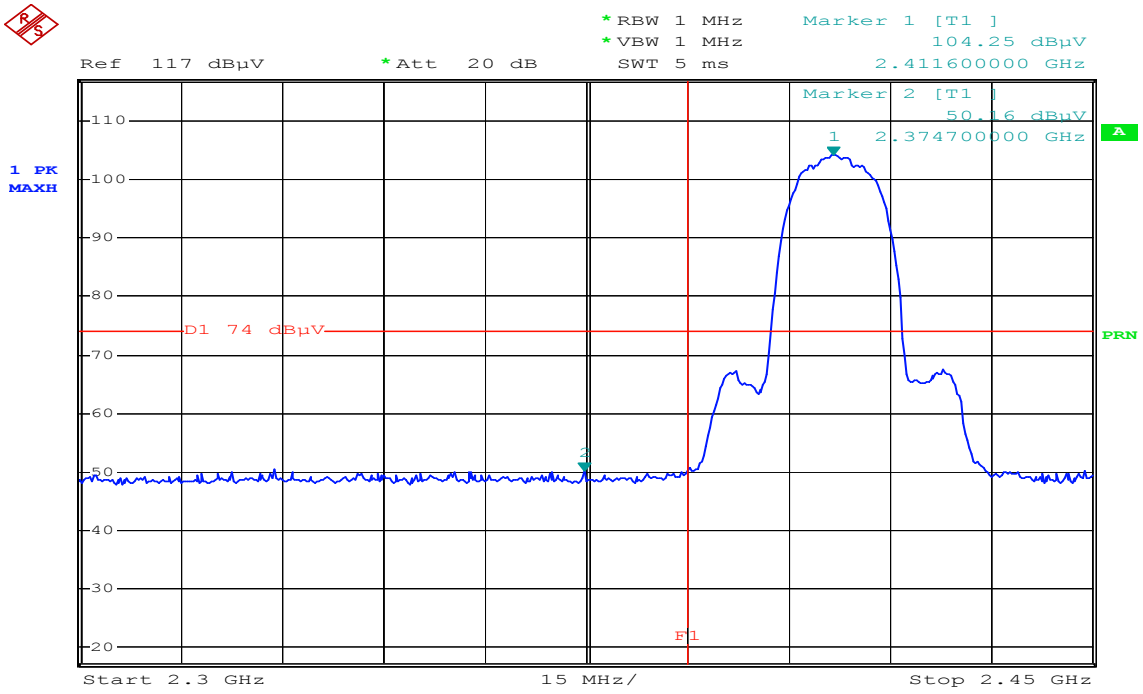


Detector mode: Average

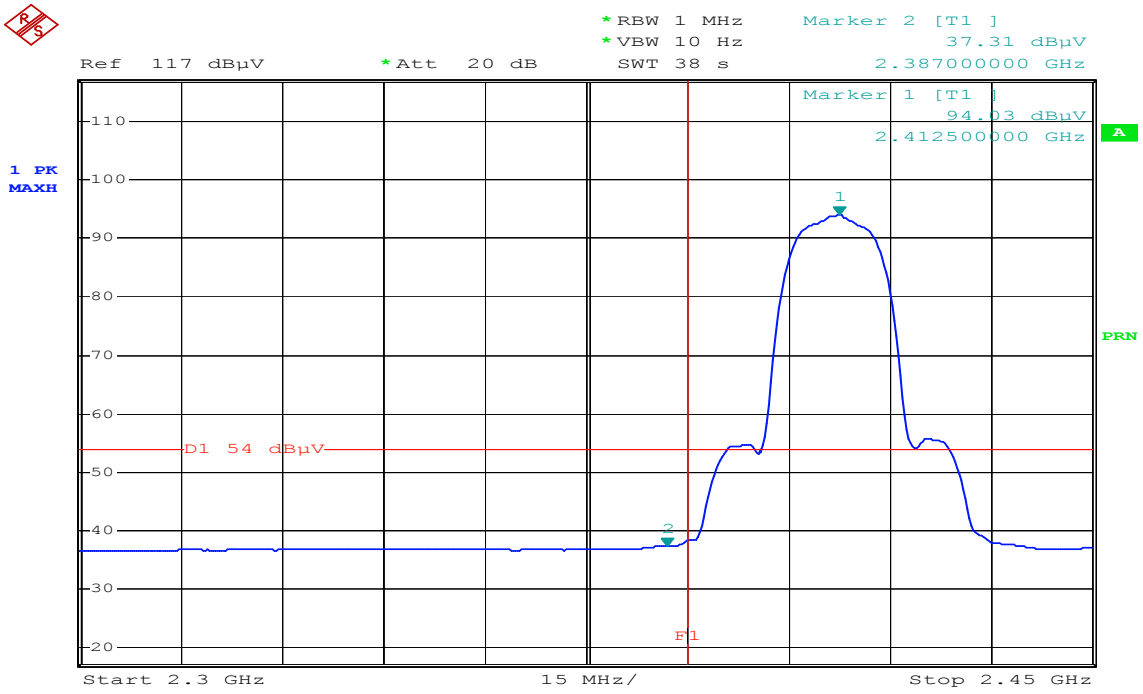
Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

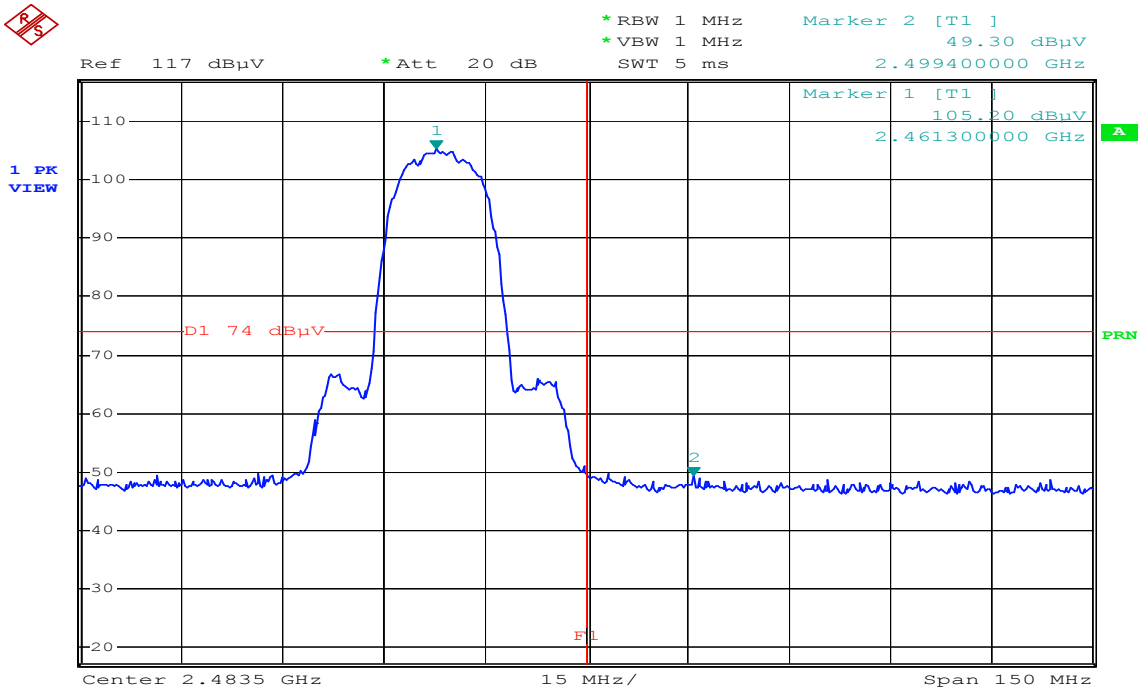


Detector mode: Average **Polarity: Horizontal**



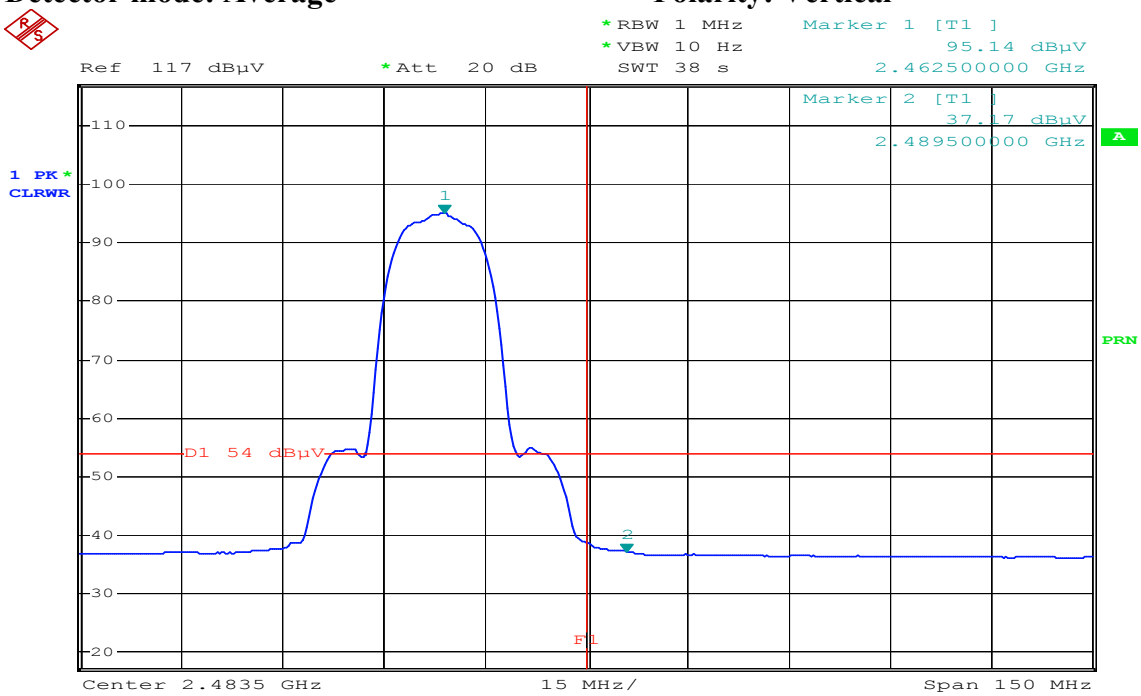
Band Edges Test Data CH-High

Detector mode: Peak Polarity: Vertical



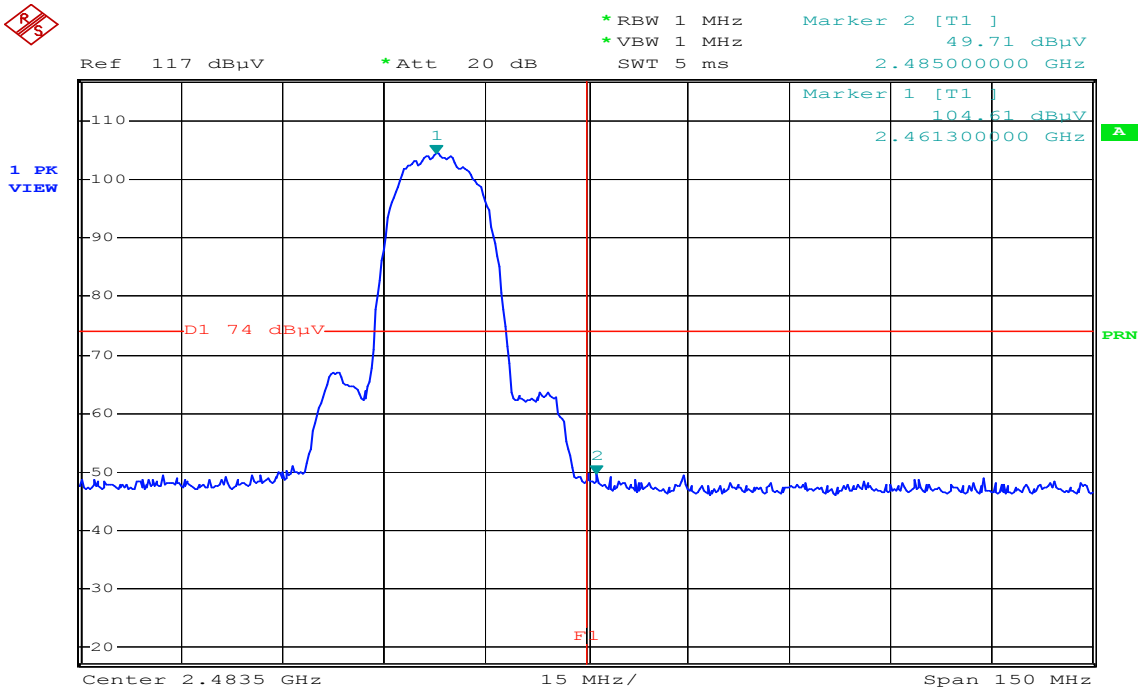
Date: 21.AUG.2003 14:09:54

Detector mode: Average Polarity: Vertical



Date: 21.AUG.2003 14:08:30

Detector mode: Peak **Polarity: Horizontal**



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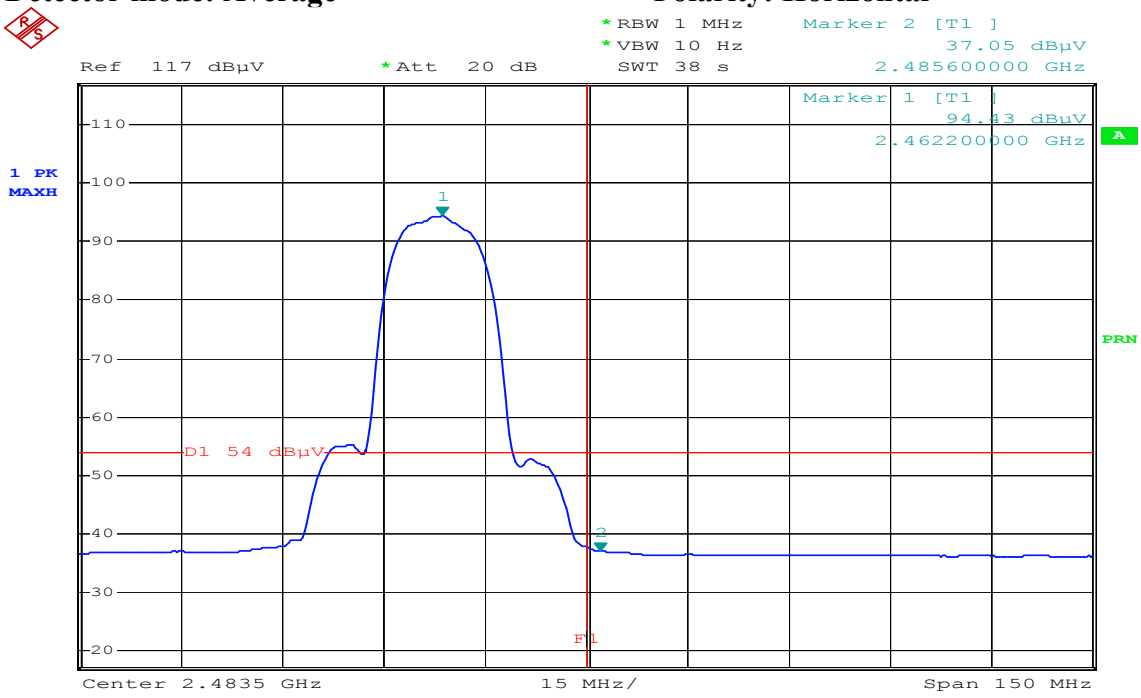
Detector mode: Average **Polarity: Horizontal**



Date: 21.AUG.2003 14:15:18

7.4. PEAK POWER SPECTRAL DENSITY

LIMIT

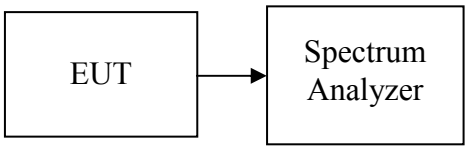
1. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
2. The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	4/27/2004
Low Loss RF Cable	Huber + Suhner	Sucoflex 104	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 3KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat the above procedure until the measurements for all frequencies are complete.

TEST RESULTS

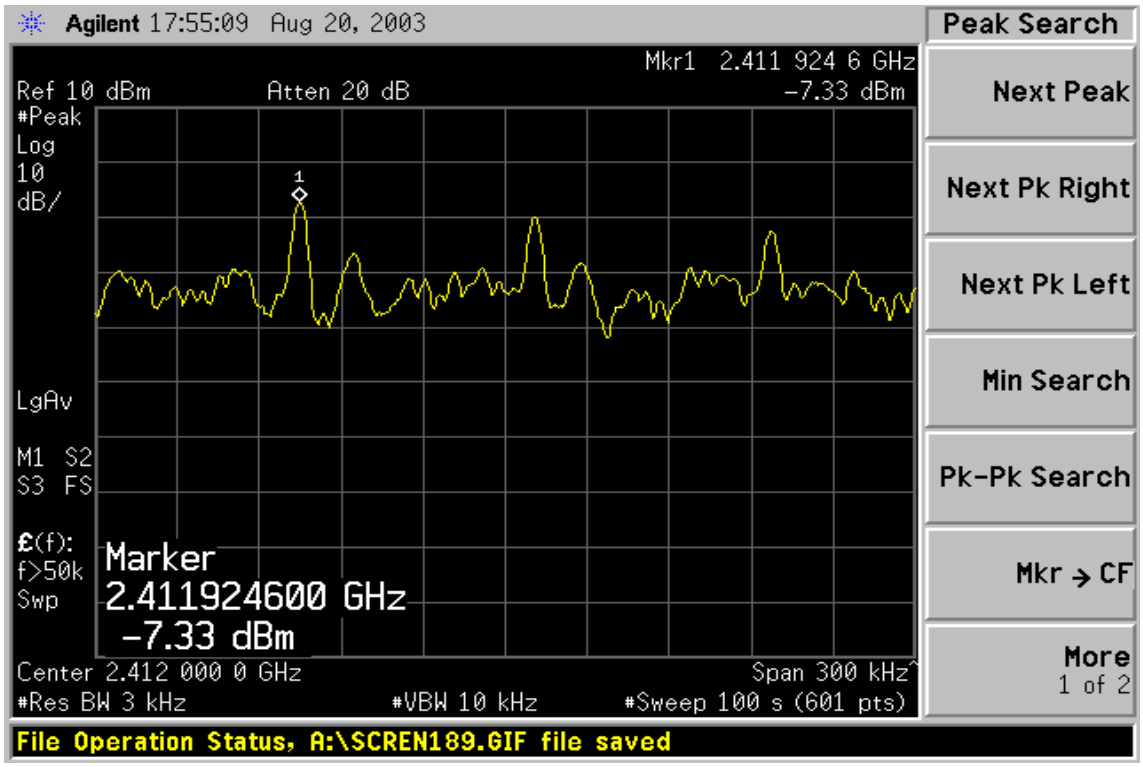
No non-compliance noted

TEST DATA

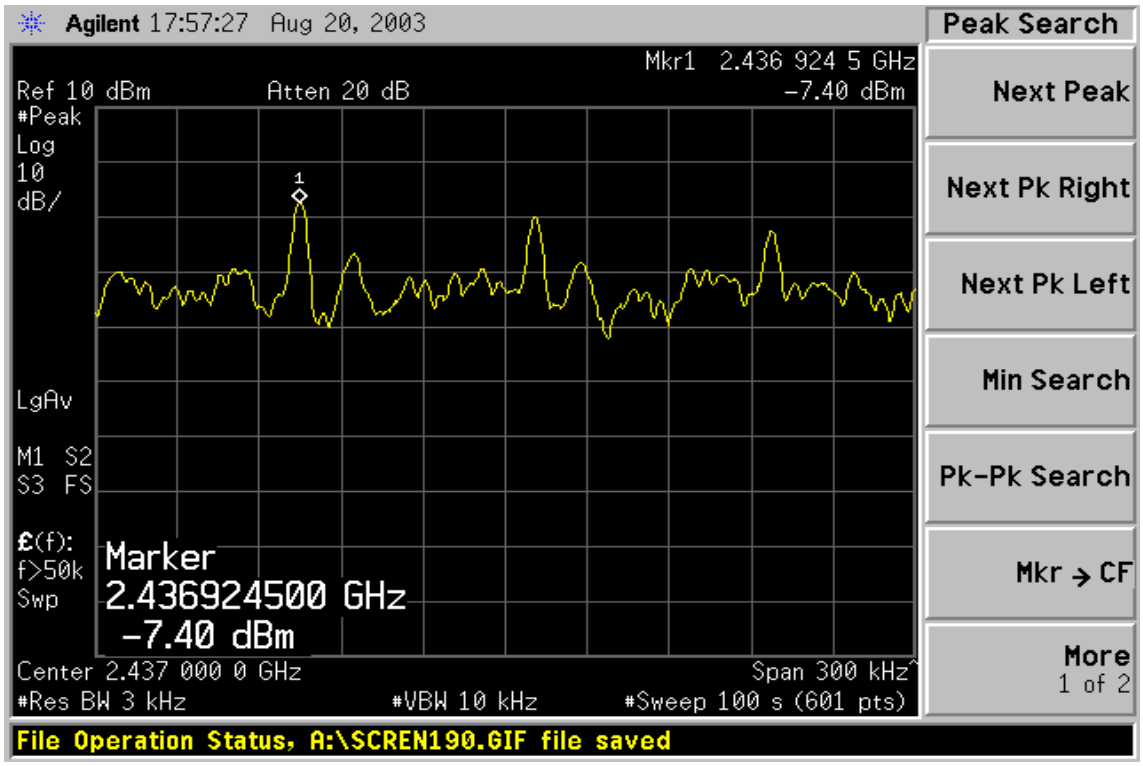
Channel	Reading (dBm)	Cable Loss (dB)	PPSD (dBm)	Limit (dBm)	Result
Low	-7.33	1.75	-5.58	8.00	PASS
Mid	-7.40	1.75	-5.65		PASS
High	-8.53	1.75	-6.78		PASS

Test Plot

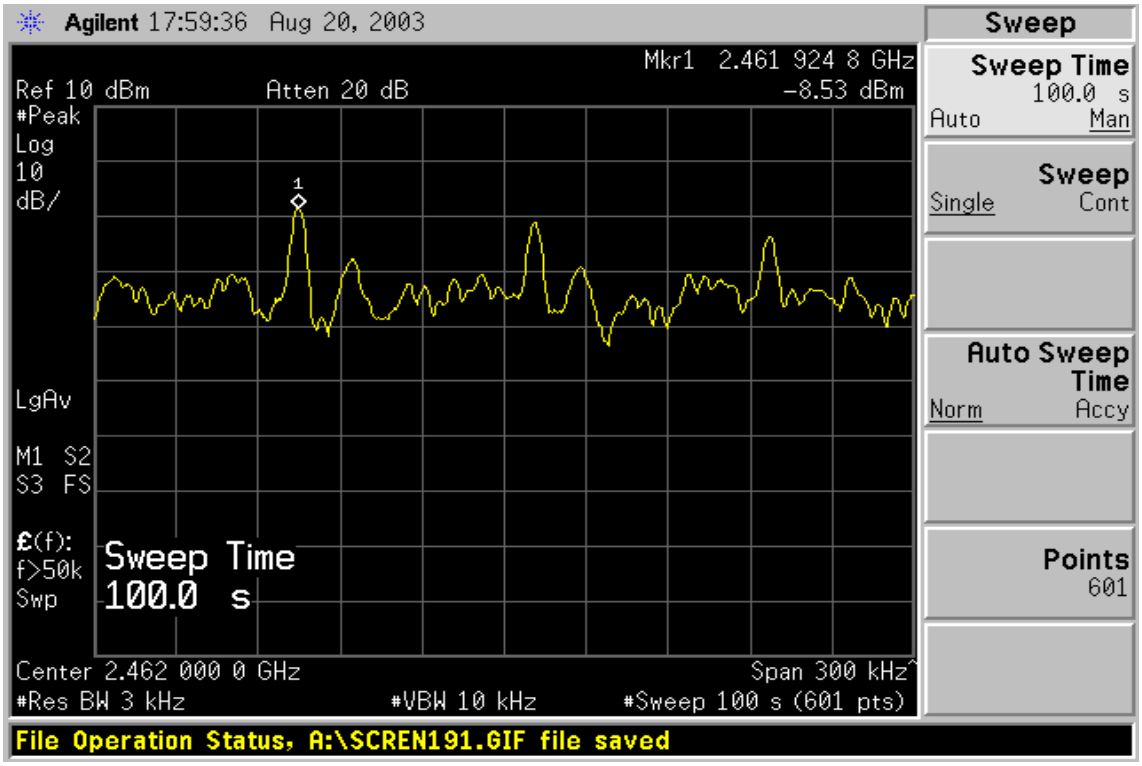
PPSD – Ch Low



PPSD – Ch Mid



PPSD – Ch High


Agilent 17:59:36 Aug 20, 2003
Mkr1 2.461 924 8 GHz
Ref 10 dBm
Atten 20 dB
-8.53 dBm
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FS
£(f):
f>50k
Swp
Sweep Time
100.0 s
Center 2.462 000 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)
Sweep
Sweep Time
100.0 s
Auto
Man
Sweep
Single
Cont
Auto Sweep Time
Norm
Accy
Points
601
File Operation Status, A:\SCREN191.GIF file saved

7.5. RADIO FREQUENCY EXPOSURE

LIMIT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §15.247(b)(4) and §1.1307(b)(1) of this chapter.

EUT Specification

EUT	Wireless LAN module built in Notebook PC
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5825GHz ☐ Others _____
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others _____
Exposure classification	☐ Occupational/Controlled exposure *(S = 5mW/cm^2)* ☒ General Population/Uncontrolled exposure *(S=1mW/cm^2)*
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Max. output power	16.60 dBm (45.71mW)
Antenna gain (Max)	3.28 dBi (Numeric gain: 2.13)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Note:

1. **The maximum output power is 16.60dBm(45.71mW) at 2412MHz, which is lower than general population low threshold 120/F (120 /2.347=49.24mW).*
2. *For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.*

TEST RESULTS

No non-compliance noted

Calculation

Given $E = \sqrt{\frac{30 \times P \times G}{d}}$ & $S = \frac{E^2}{3770}$

Where *E = Field Strength in Volts / meter*
P = Power in Watts
G=Numeric antenna gain
d=Distance in meters
S=Power Density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{\frac{30 \times P \times G}{3770 \times S}}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

*d (cm) =100 * d (m)*

Yields

$$d = 100 \times \sqrt{\frac{30 \times (P/1000) \times G}{3770 \times S}} = 0.282 \times \sqrt{\frac{P \times G}{S}}$$

Where *d = distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW / cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and

G (numeric) = 10 ^ (G (dBi) / 10)

Yields

$$d = 0.282 \times \frac{10^{(P+G)/20}}{\sqrt{20}}$$ ***Equation 1***

Where *d = MPE safe distance in cm*
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW / cm^2

Maximum Permissible Exposure

EUT output power = 45.71 mW

Antenna Gain = 2.13

S = 1.0 mW / cm^2 from 1.1310 Table 1

Substituting these parameters into the above Equation 1:

→ *MPE Safe Distance = 2.78 cm*

(For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.)

7.6. SPURIOUS EMIISSIONS

7.6.1. Conducted Emission

LIMIT

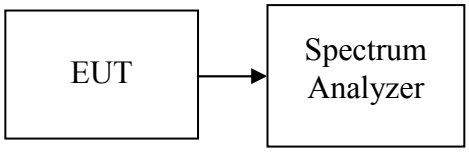
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	04/28/2004

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 100 KHz.

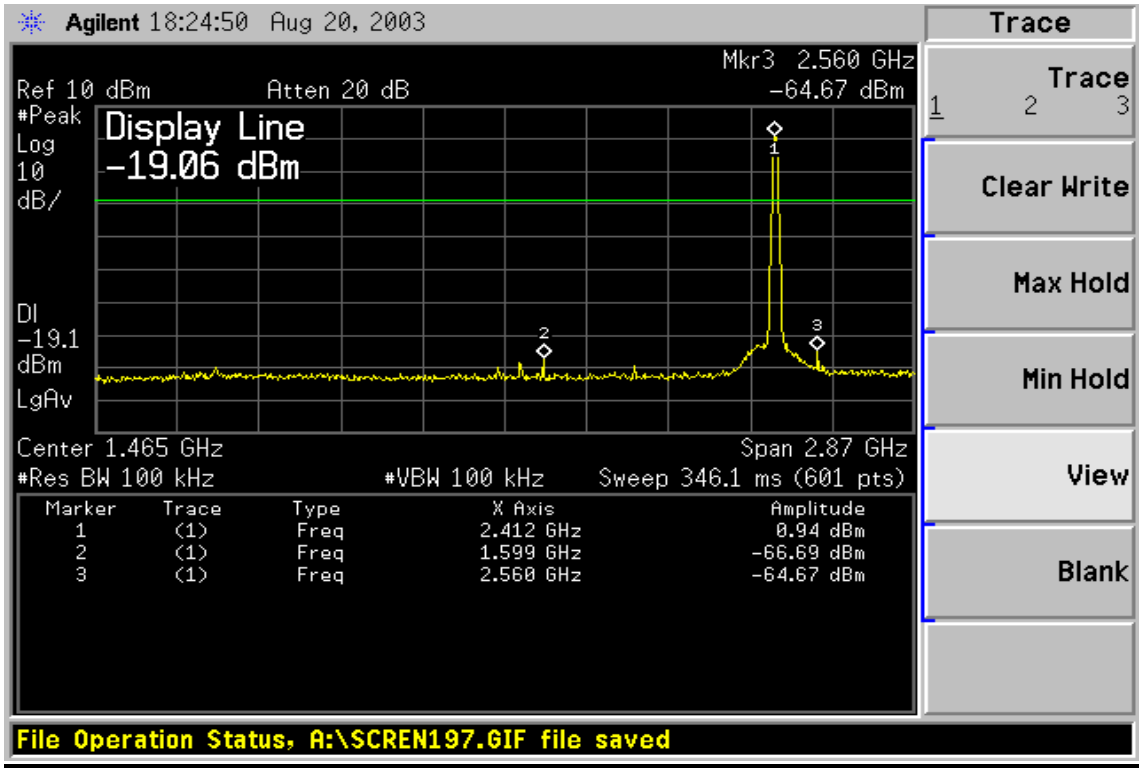
Measurements are made over the 30MHz to 26GHzrange with the transmitter set to the lowest, middle, and highest channels.

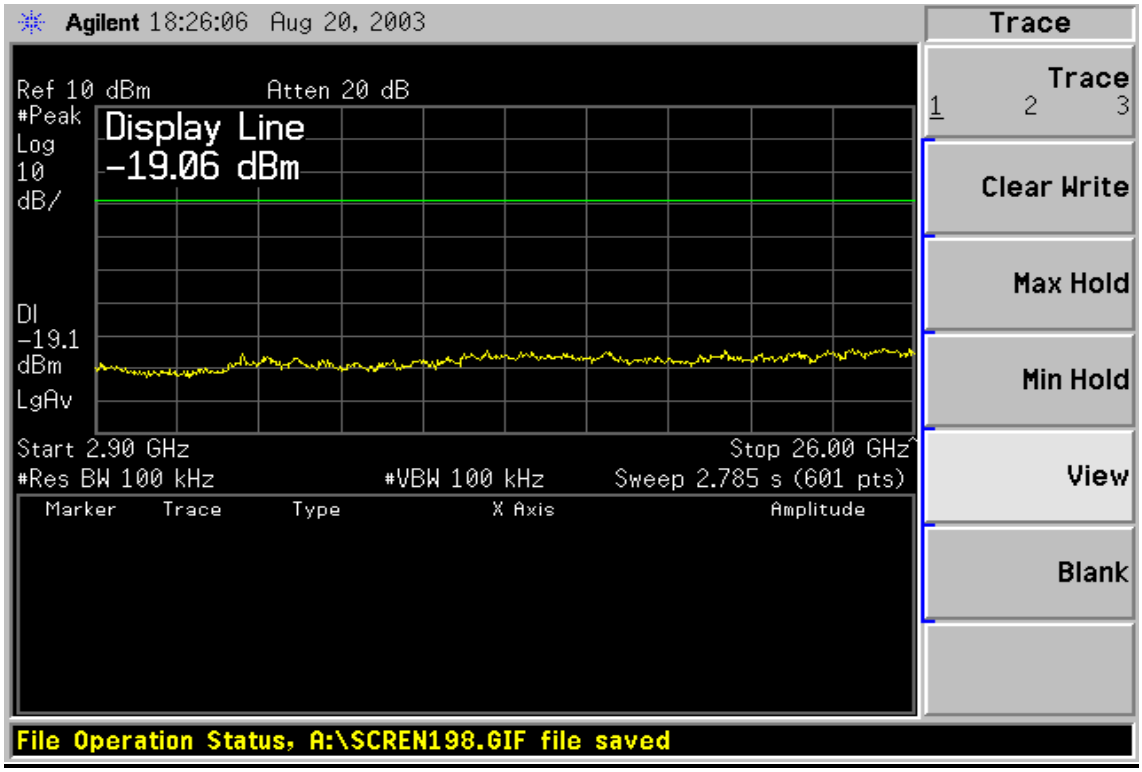
TEST RESULTS

No non-compliance noted

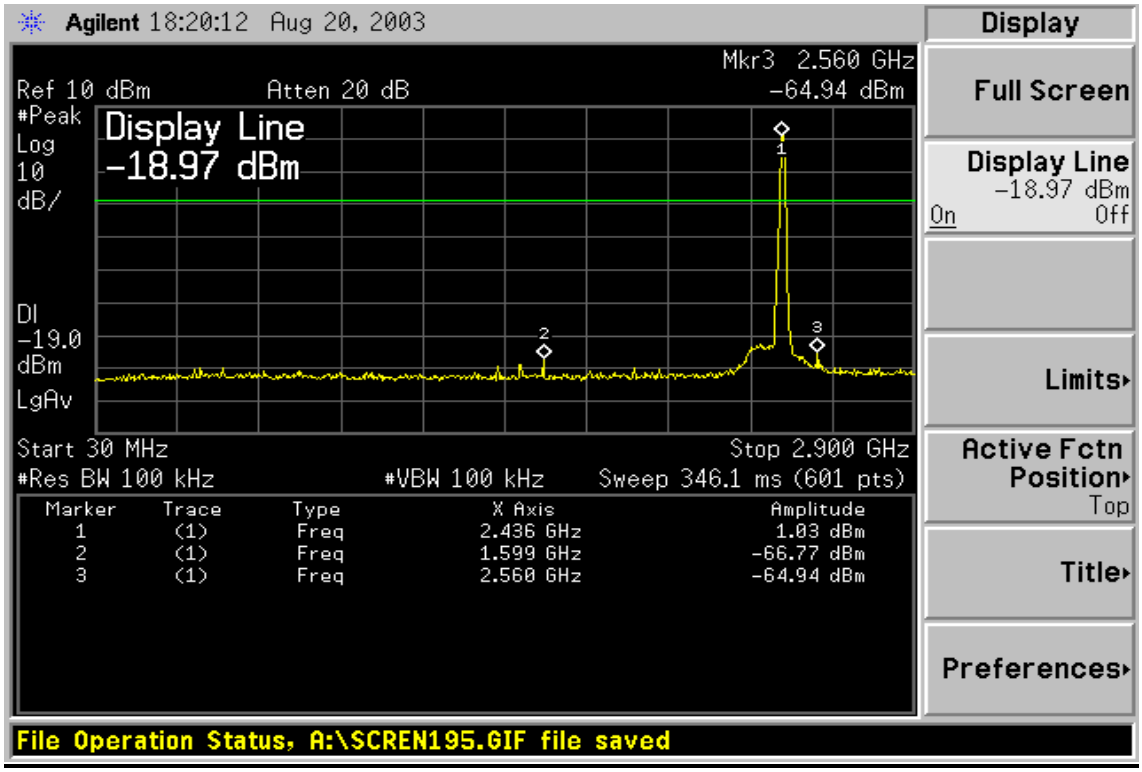
Test Plot

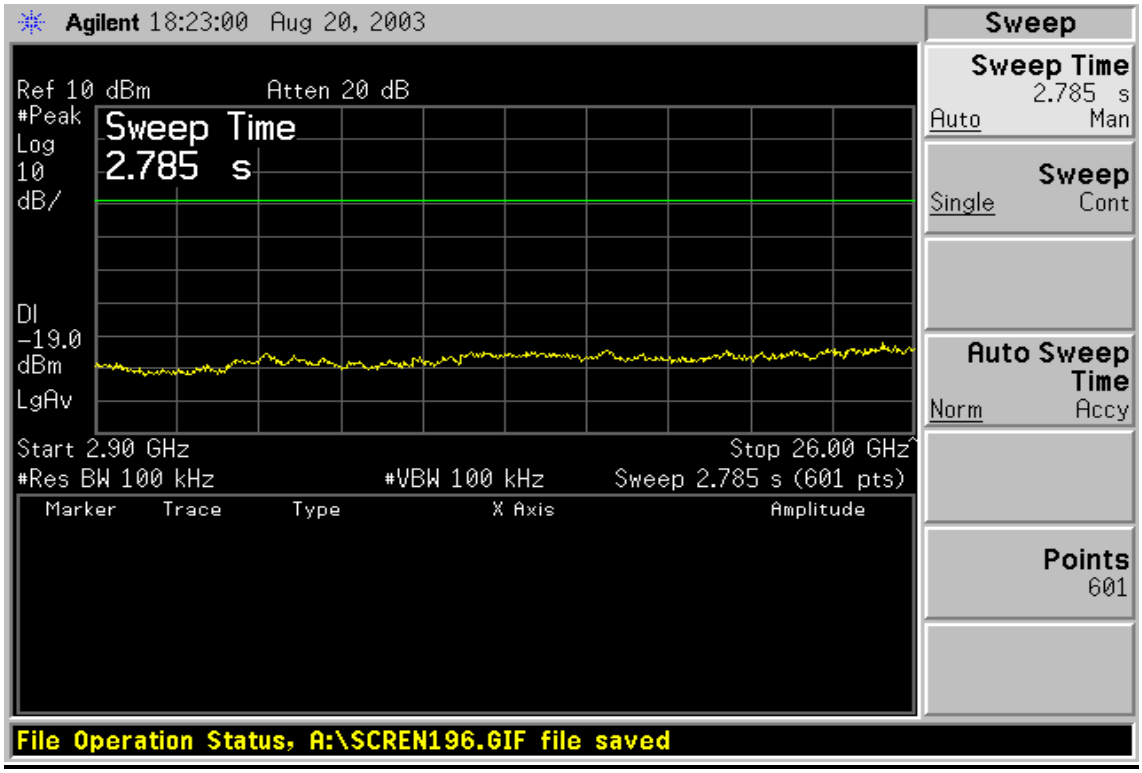
CH Low



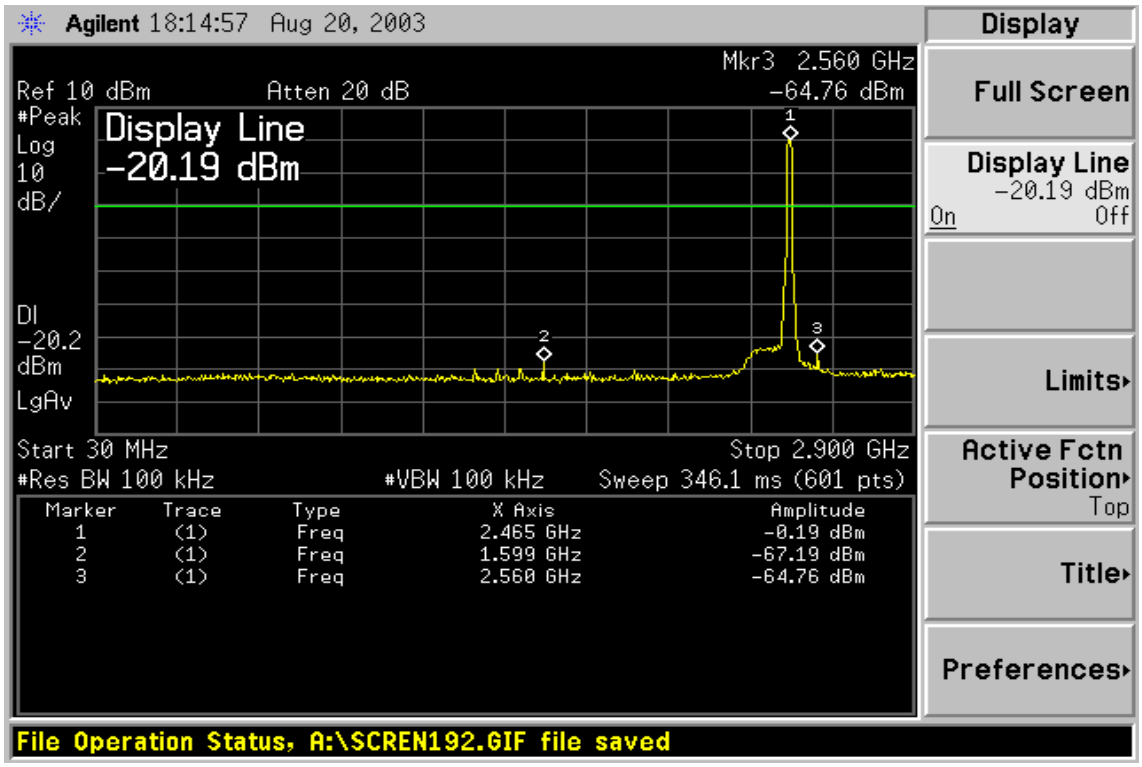


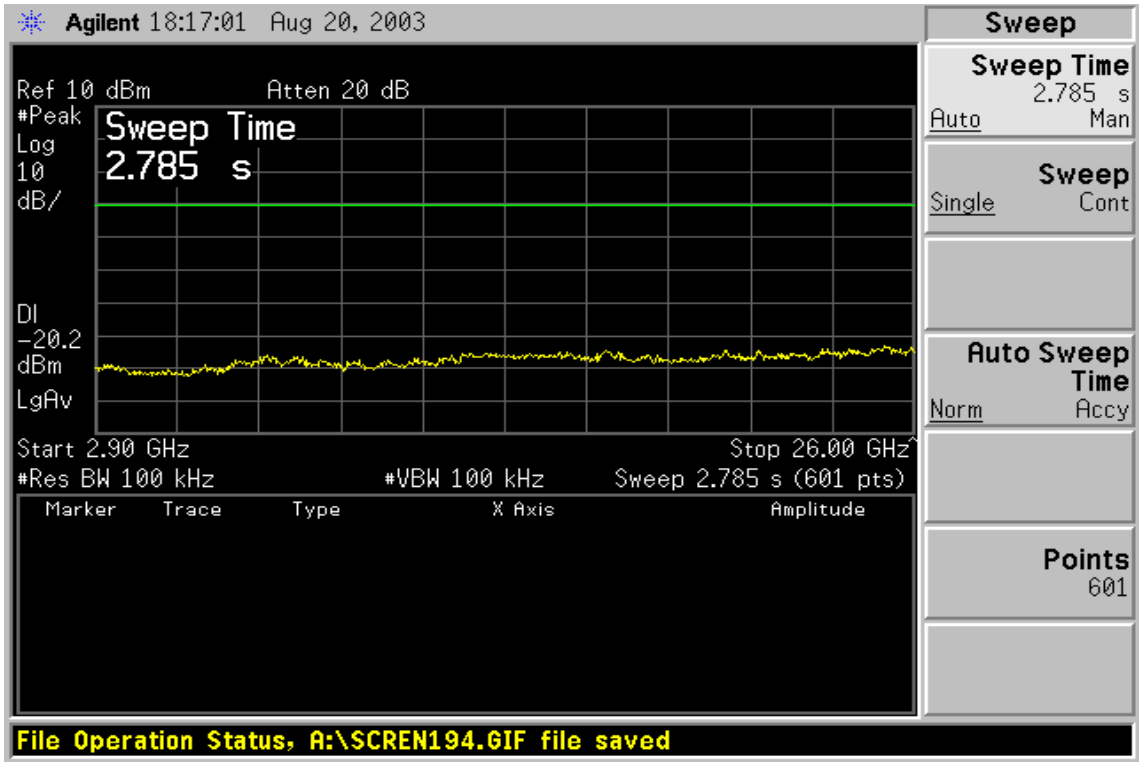
CH Mid


Agilent 18:20:12 Aug 20, 2003
Ref 10 dBm
Atten 20 dB
Mkr3 2.560 GHz
-64.94 dBm
#Peak
Log
10
dB/
Display Line
-18.97 dBm
DI
-19.0
dBm
LgAv
Start 30 MHz
Stop 2.900 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 346.1 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.436 GHz 1.03 dBm
2 (1) Freq 1.599 GHz -66.77 dBm
3 (1) Freq 2.560 GHz -64.94 dBm
Display
Full Screen
Display Line
-18.97 dBm
On Off
Limits
Active Fctn
Position
Top
Title
Preferences
File Operation Status, A:\SCREN195.GIF file saved


Agilent 18:23:00 Aug 20, 2003
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Sweep Time
2.785 s
DI
-19.0
dBm
LgAv
Start 2.90 GHz
Stop 26.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 2.785 s (601 pts)
Marker Trace Type X Axis Amplitude
Sweep
Sweep Time
2.785 s
Auto Man
Sweep
Single Cont
Auto Sweep
Time
Norm Accy
Points
601
File Operation Status, A:\SCREN196.GIF file saved

CH High


Agilent 18:14:57 Aug 20, 2003
Mkr3 2.560 GHz
Ref 10 dBm
Atten 20 dB
-64.76 dBm
#Peak
Log
10
dB/
Display Line
-20.19 dBm
Dl
-20.2
dBm
LgAv
Start 30 MHz
Stop 2.900 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 346.1 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.465 GHz -0.19 dBm
2 (1) Freq 1.599 GHz -67.19 dBm
3 (1) Freq 2.560 GHz -64.76 dBm
Display
Full Screen
Display Line
-20.19 dBm
On Off
Limits
Active Fctn
Position
Top
Title
Preferences
File Operation Status, A:\SCREN192.GIF file saved


Agilent 18:17:01 Aug 20, 2003
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Sweep Time
2.785 s
Dl
-20.2
dBm
LgAv
Start 2.90 GHz
Stop 26.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 2.785 s (601 pts)
Marker Trace Type X Axis Amplitude
Sweep
Sweep Time
2.785 s
Auto Man
Sweep
Single Cont
Auto Sweep
Time
Norm Accy
Points
601
File Operation Status, A:\SCREN194.GIF file saved

7.6.2. Radiated Emissions

LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Note: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

2. In the above emission table, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

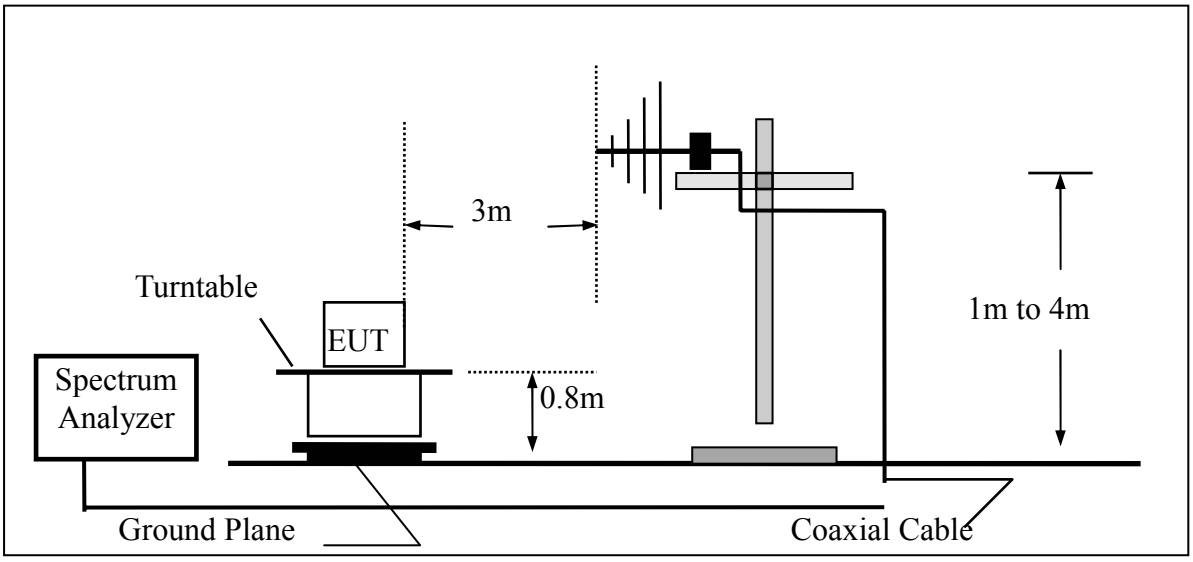
MEASUREMENT EQUIPMENT USED

Open Area Test Site # 3				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	ADVANTEST	R3261A	N/A	03/18/2004
EMI Test Receiver	R&S	ESVS20	838804/004	01/04/2004
Pre-Amplifier	HP	8447D	2944A09173	03/03/2004
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/05/2004
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R
Site NSA	C&C	N/A	N/A	09/06/2004
Horn antenna	Schwarzbeck	BBHA 9120	D210	02/23/2004
Loop Antenna	EMCO	6502	2356	07/10/2004
Pre-Amplifier	HP	8449B	3008B00965	10/02/2003

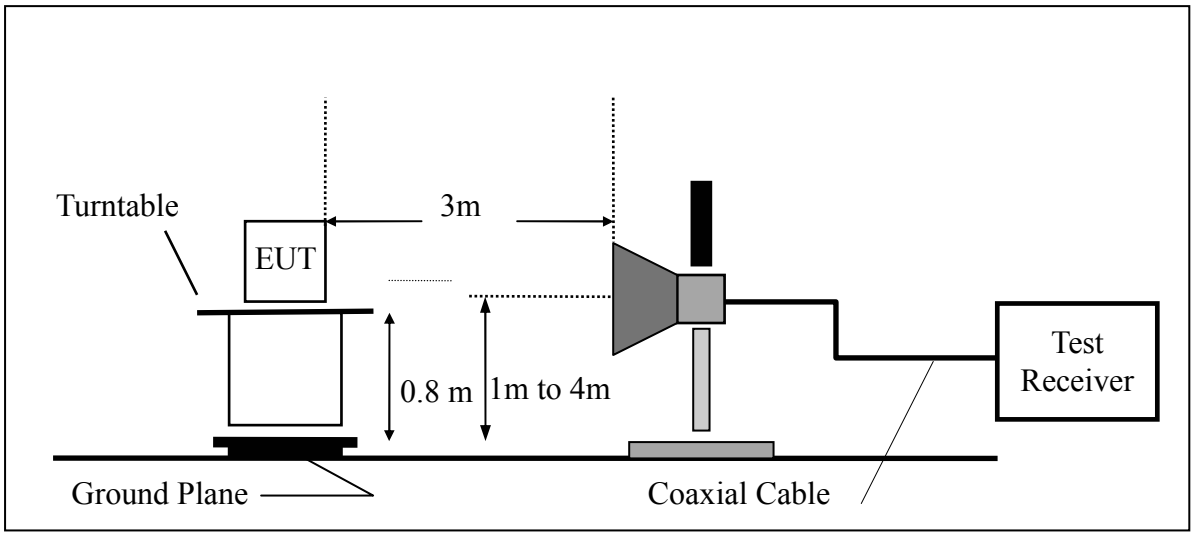
Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

For Frequencies Below 1 GHz



For Frequencies Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

For Frequency Below 1 GHz

Operation Mode:	Tx CH Low Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
322.40	V	Peak	15.60	17.28	32.88	46.00	-13.12
388.20	V	Peak	14.46	20.09	34.55	46.00	-11.45
431.60	V	Peak	11.69	20.37	32.06	46.00	-13.94
452.60	V	Peak	12.20	20.29	32.49	46.00	-13.51
519.80	V	Peak	16.93	23.21	40.14	46.00	-5.86
648.60	V	Peak	8.85	24.89	33.74	46.00	-12.26
84.00	H	Peak	15.54	10.54	26.08	40.00	-13.92
322.40	H	Peak	12.95	17.28	30.23	46.00	-15.77
388.20	H	Peak	15.01	20.09	35.10	46.00	-10.90
398.00	H	Peak	11.92	20.61	32.53	46.00	-13.47
517.00	H	Peak	8.35	23.11	31.46	46.00	-14.54
777.40	H	Peak	4.29	26.02	30.31	46.00	-15.69

Notes:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
4. *The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.*

Operation Mode:	Tx CH Mid Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
86.16	V	Peak	11.10	11.10	22.20	40.00	-17.80
388.20	V	Peak	13.91	20.09	34.00	46.00	-12.00
452.60	V	Peak	12.03	20.29	32.32	46.00	-13.68
518.40	V	Peak	17.28	23.16	40.44	46.00	-5.56
648.60	V	Peak	8.62	24.89	33.51	46.00	-12.49
666.80	V	Peak	7.36	25.18	32.54	46.00	-13.46
80.22	H	Peak	16.08	9.57	25.65	40.00	-14.35
259.50	H	Peak	15.38	16.08	31.46	46.00	-14.54
323.80	H	Peak	14.71	17.32	32.03	46.00	-13.97
388.20	H	Peak	14.89	20.09	34.98	46.00	-11.02
399.40	H	Peak	11.08	20.69	31.77	46.00	-14.23
519.80	H	Peak	7.88	23.21	31.09	46.00	-14.91

Notes:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
4. *The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.*

Operation Mode:	Tx CH High Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Devin
Humidity:	58 % RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
399.40	V	Peak	11.13	20.69	31.82	46.00	-14.18
489.00	V	Peak	17.24	22.00	39.24	46.00	-6.76
503.00	V	Peak	18.31	22.62	40.93	46.00	-5.07
664.00	V	Peak	5.66	25.13	30.79	46.00	-15.21
799.80	V	Peak	3.39	26.14	29.53	46.00	-16.47
899.20	V	Peak	1.64	28.14	29.78	46.00	-16.22
399.40	H	Peak	7.68	20.69	28.37	46.00	-17.63
498.80	H	Peak	13.02	22.45	35.47	46.00	-10.53
664.00	H	Peak	8.10	25.13	33.23	46.00	-12.77
799.80	H	Peak	6.34	26.14	32.48	46.00	-13.52
867.00	H	Peak	2.84	27.58	30.42	46.00	-15.58
899.20	H	Peak	1.69	28.14	29.83	46.00	-16.17

Notes:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
4. *The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.*

For Frequency Above 1 GHz

Operation Mode:	TX CH Low Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58% RH	**Polarity:**	Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	Actual FS AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2412.00	100.75	---	-3.04	97.71	---	---	---	---	Fundamental
4824.00	---	---	---	---	---	74.00	54.00	---	---
7236.00	---	---	---	---	---	74.00	54.00	---	---
9648.00	---	---	---	---	---	74.00	54.00	---	---
12060.00	---	---	---	---	---	74.00	54.00	---	---
14472.00	---	---	---	---	---	74.00	54.00	---	---
16884.00	---	---	---	---	---	74.00	54.00	---	---
19296.00	---	---	---	---	---	74.00	54.00	---	---
21708.00	---	---	---	---	---	74.00	54.00	---	---
24120.00	---	---	---	---	---	74.00	54.00	---	---

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.

5. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms

Operation Mode:	TX CH Low Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	Actual FS AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2416.00	99.97	---	-3.02	96.95	---	---	---	---	Fundamental
4824.00	---	---	---	---	---	74.00	54.00	---	---
7236.00	---	---	---	---	---	74.00	54.00	---	---
9648.00	---	---	---	---	---	74.00	54.00	---	---
12060.00	---	---	---	---	---	74.00	54.00	---	---
14472.00	---	---	---	---	---	74.00	54.00	---	---
16884.00	---	---	---	---	---	74.00	54.00	---	---
19296.00	---	---	---	---	---	74.00	54.00	---	---
21708.00	---	---	---	---	---	74.00	54.00	---	---
24120.00	---	---	---	---	---	74.00	54.00	---	---

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.

5. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms

Operation Mode:	TX CH Mid Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	Actual FS AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2436.00	100.67	---	-2.96	97.71	---	---	---	---	Fundamental
4874.00	---	---	---	---	---	74.00	54.00	---	---
7311.00	---	---	---	---	---	74.00	54.00	---	---
9748.00	---	---	---	---	---	74.00	54.00	---	---
12185.00	---	---	---	---	---	74.00	54.00	---	---
14622.00	---	---	---	---	---	74.00	54.00	---	---
17059.00	---	---	---	---	---	74.00	54.00	---	---
19496.00	---	---	---	---	---	74.00	54.00	---	---
21933.00	---	---	---	---	---	74.00	54.00	---	---
24370.00	---	---	---	---	---	74.00	54.00	---	---

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.

5. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms

Operation Mode:	TX CH Mid Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	Actual FS AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2436.00	100.60	---	-2.96	97.64	---	---	---	---	Fundamental
4874.00	---	---	---	---	---	74.00	54.00	---	---
7311.00	---	---	---	---	---	74.00	54.00	---	---
9748.00	---	---	---	---	---	74.00	54.00	---	---
12185.00	---	---	---	---	---	74.00	54.00	---	---
14622.00	---	---	---	---	---	74.00	54.00	---	---
17059.00	---	---	---	---	---	74.00	54.00	---	---
19496.00	---	---	---	---	---	74.00	54.00	---	---
21933.00	---	---	---	---	---	74.00	54.00	---	---
24370.00	---	---	---	---	---	74.00	54.00	---	---

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.

5. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms

Operation Mode:	TX CH High Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	Actual FS AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2464.00	100.16	---	-2.87	97.29	---	---	---	---	Fundamental
4924.00	---	---	---	---	---	74.00	54.00	---	---
7386.00	---	---	---	---	---	74.00	54.00	---	---
9848.00	---	---	---	---	---	74.00	54.00	---	---
12310.00	---	---	---	---	---	74.00	54.00	---	---
14772.00	---	---	---	---	---	74.00	54.00	---	---
17234.00	---	---	---	---	---	74.00	54.00	---	---
19696.00	---	---	---	---	---	74.00	54.00	---	---
22158.00	---	---	---	---	---	74.00	54.00	---	---
24620.00	---	---	---	---	---	74.00	54.00	---	---

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.

5. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms

Operation Mode:	TX CH High Mode	**Test Date:**	August 21, 2003
Temperature:	30°C	**Tested by:**	Roy Cheng
Humidity:	58 % RH	**Polarity:**	Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	Actual FS AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2468.00	98.86	---	-2.85	96.01	---	---	---	---	Fundamental
4924.00	---	---	---	---	---	74.00	54.00	---	---
7386.00	---	---	---	---	---	74.00	54.00	---	---
9848.00	---	---	---	---	---	74.00	54.00	---	---
12310.00	---	---	---	---	---	74.00	54.00	---	---
14772.00	---	---	---	---	---	74.00	54.00	---	---
17234.00	---	---	---	---	---	74.00	54.00	---	---
19696.00	---	---	---	---	---	74.00	54.00	---	---
22158.00	---	---	---	---	---	74.00	54.00	---	---
24620.00	---	---	---	---	---	74.00	54.00	---	---

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.

5. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms

7.7. POWERLINE CONDUCTED EMISSIONS

LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

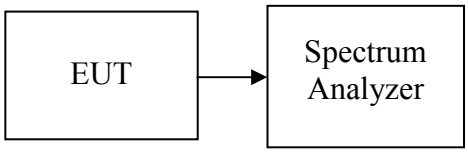
Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	847793/012	12/20/2003
LISN	R&S	ESH2-Z5	843285/010	12/15/2003
LISN	EMCO	3825/2	9003-1628	07/25/2004

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-1992.
2. The EUT was plug-in the host PC via USB port. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 110Vac/60Hz power source.

The EUT is set to transmit in a continuous mode.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Operation Mode:	Tx + Rx mode	**Test Date:**	August 21, 2003
Temperature:	25°C	**Tested by:**	Roy Cheng
Humidity:	70 % RH		

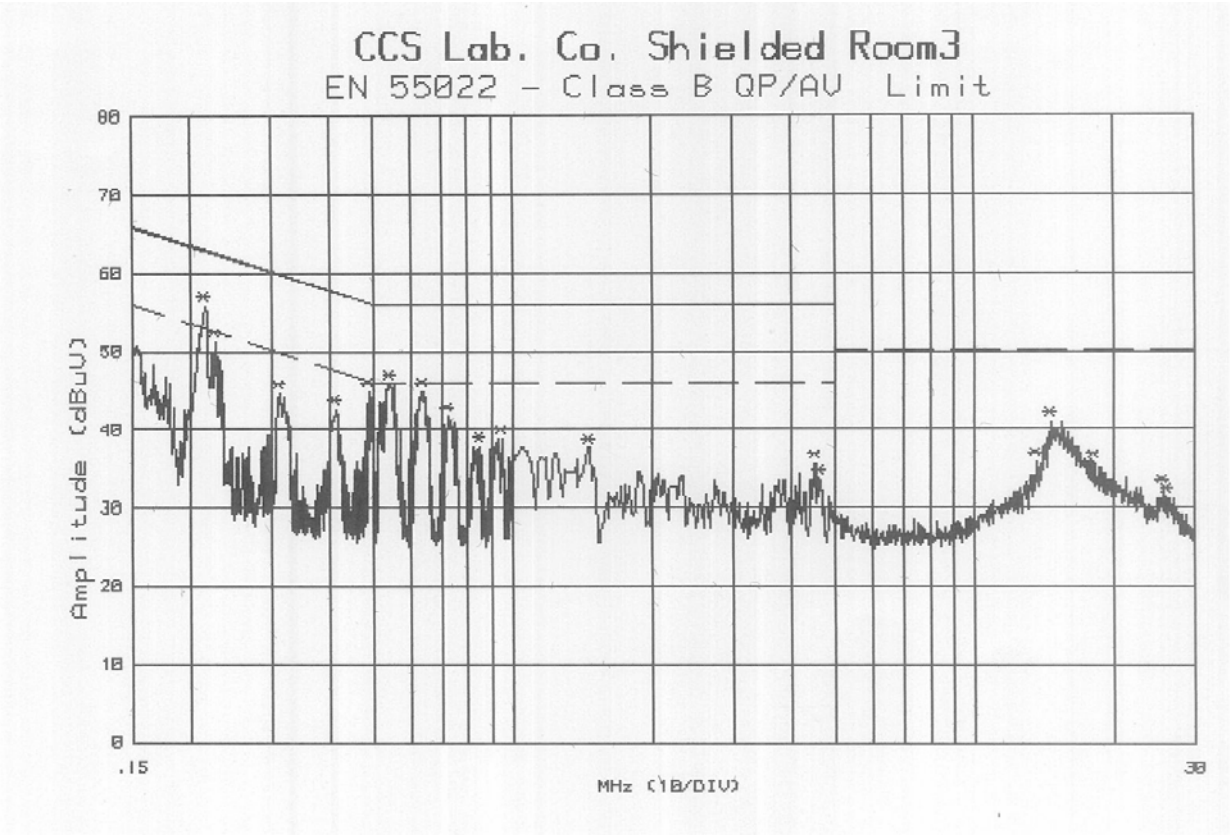
FREQ MHz	Q.P. Raw dBuV	AVG Raw dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.215	52.60	41.10	63.01	53.01	-10.41	-11.91	L1
0.220	50.60	---	62.82	52.82	-12.22	---	L1
0.500	43.80	---	56.00	46.00	-12.20	---	L1
0.545	43.80	---	56.00	46.00	-12.20	---	L1
0.639	43.80	---	56.00	46.00	-12.20	---	L1
0.731	42.00	---	56.00	46.00	-14.00	---	L1
0.216	52.90	43.50	62.97	52.97	-10.07	-9.47	L2
0.228	52.10	43.70	62.52	52.52	-10.42	-8.82	L2
0.490	43.50	---	56.17	46.17	-12.67	---	L2
0.545	43.00	---	56.00	46.00	-13.00	---	L2
0.641	43.50	---	56.00	46.00	-12.50	---	L2
0.726	41.60	---	56.00	46.00	-14.40	---	L2

Note:

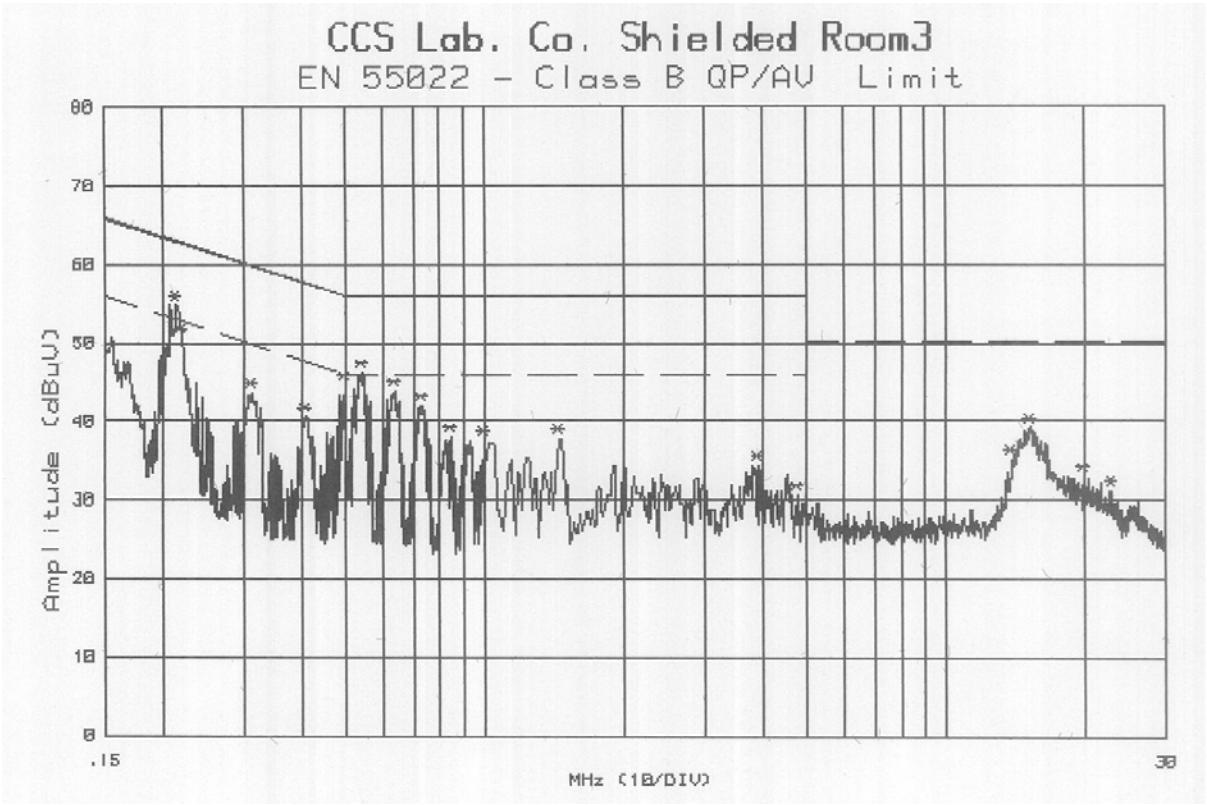
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *"---" denotes the emission level was or more than 2dB below the Average limit*
4. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;*
5. *L1 = Line One (Live line) / L2 = Line Two (Neutral Line)*

Test Data Plots

Conducted emissions (Line 1)

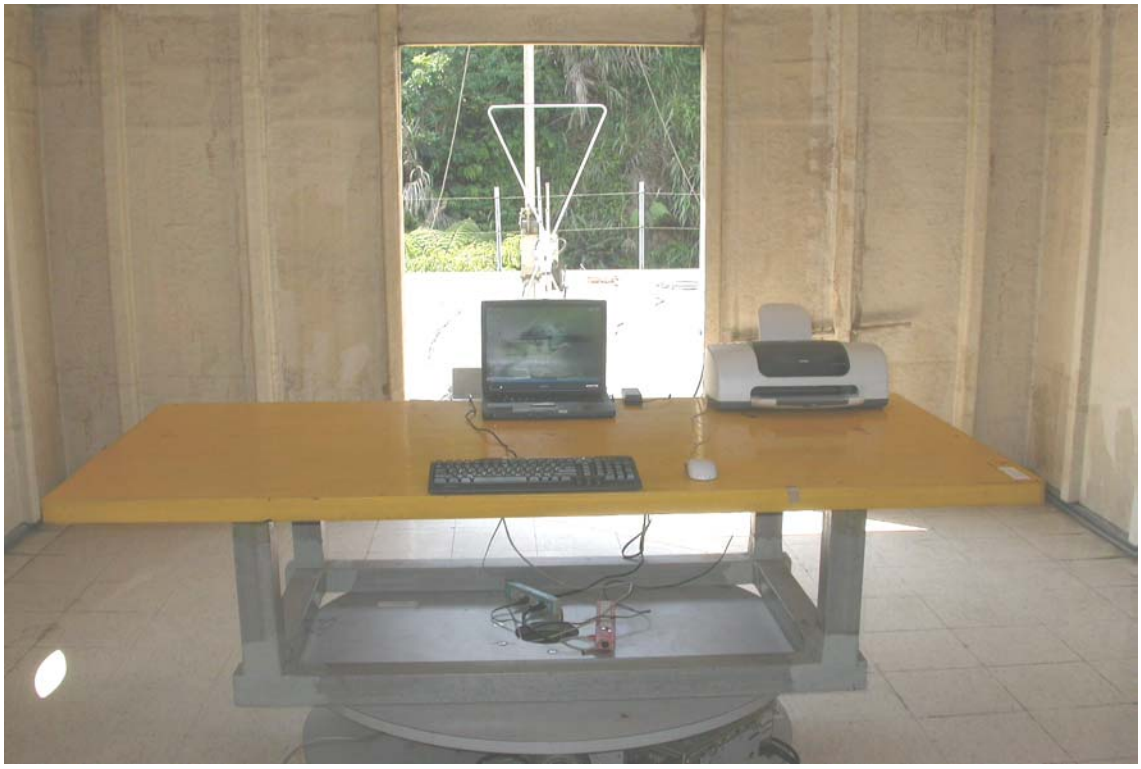


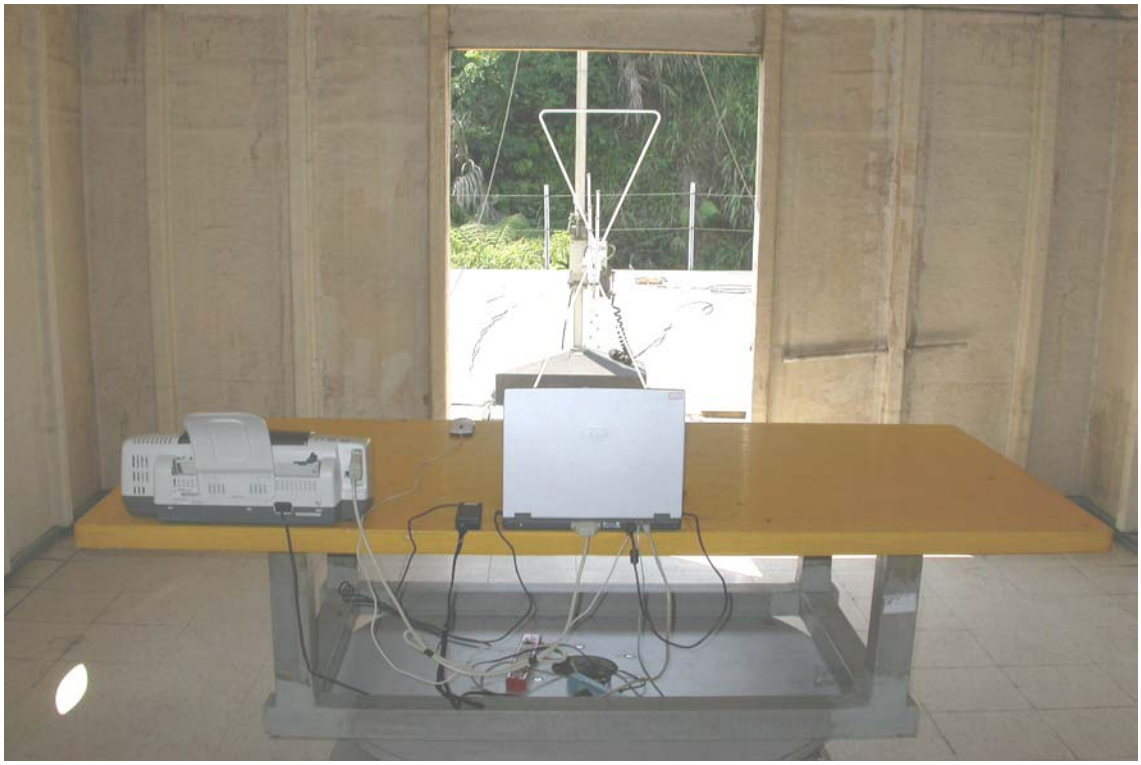
Conducted emissions (Line 2)



APPENDIX 1
PHOTOGRPHS OF TEST SETUP

Radiated Emission Set up Photos





Conducted Emission Set Up Photos

APPENDIX 2
EXTERNAL PHOTOGRPHS OF EUT

Front view of EUT

Back view of EUT

Left view of EUT

Right view of EUT

Open view of EUT

Bottom view of EUT

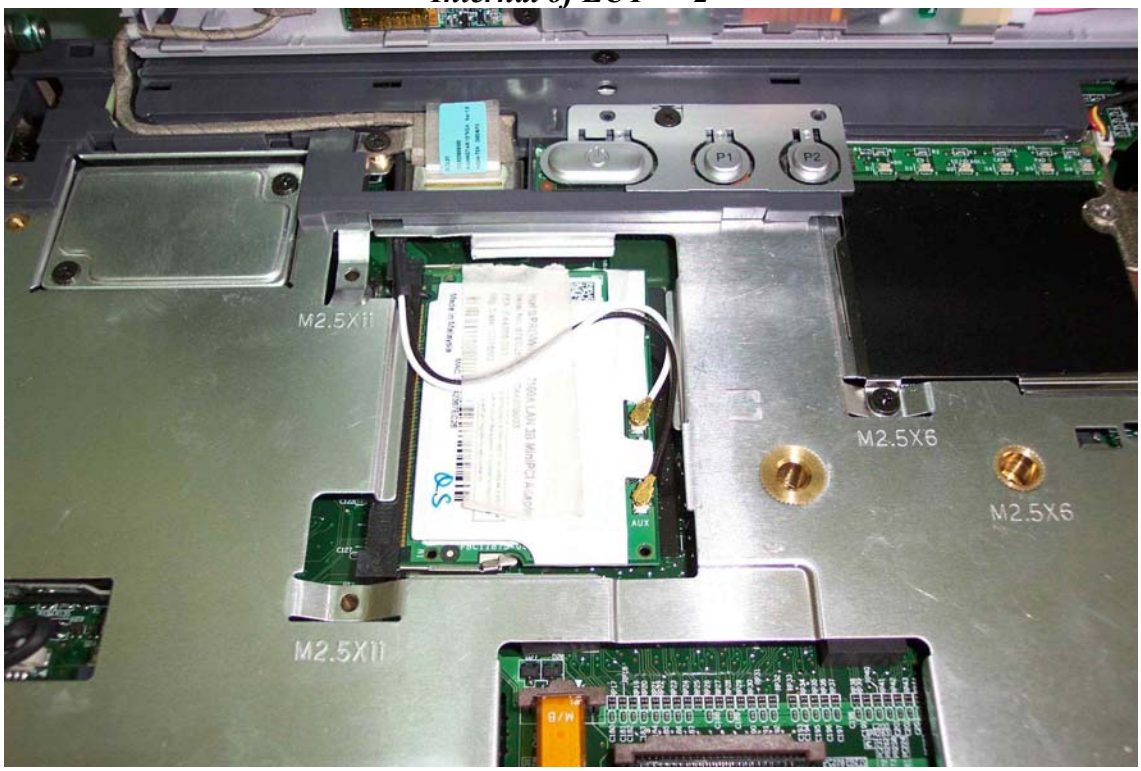
Front view of Power Adapter

Back view of Power Adapter

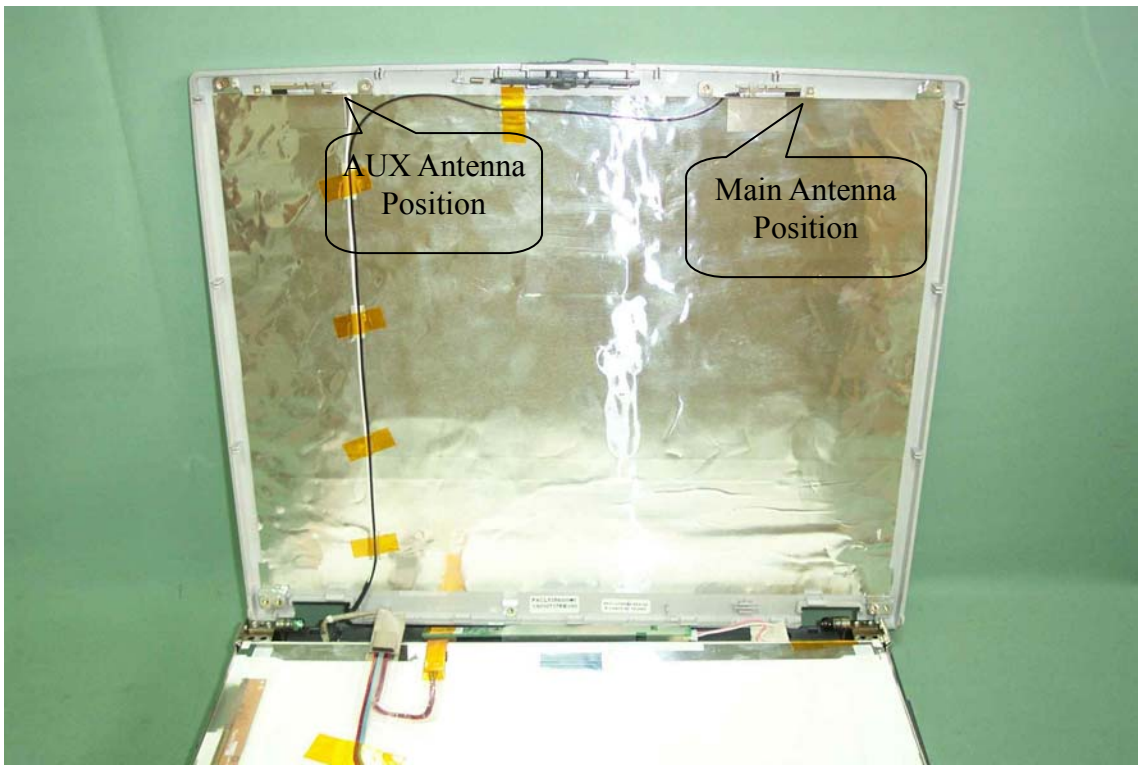
APPENDIX 3
INTERNAL PHOTOGRPHS OF EUT

Internal of EUT --- 1

Internal of EUT --- 2



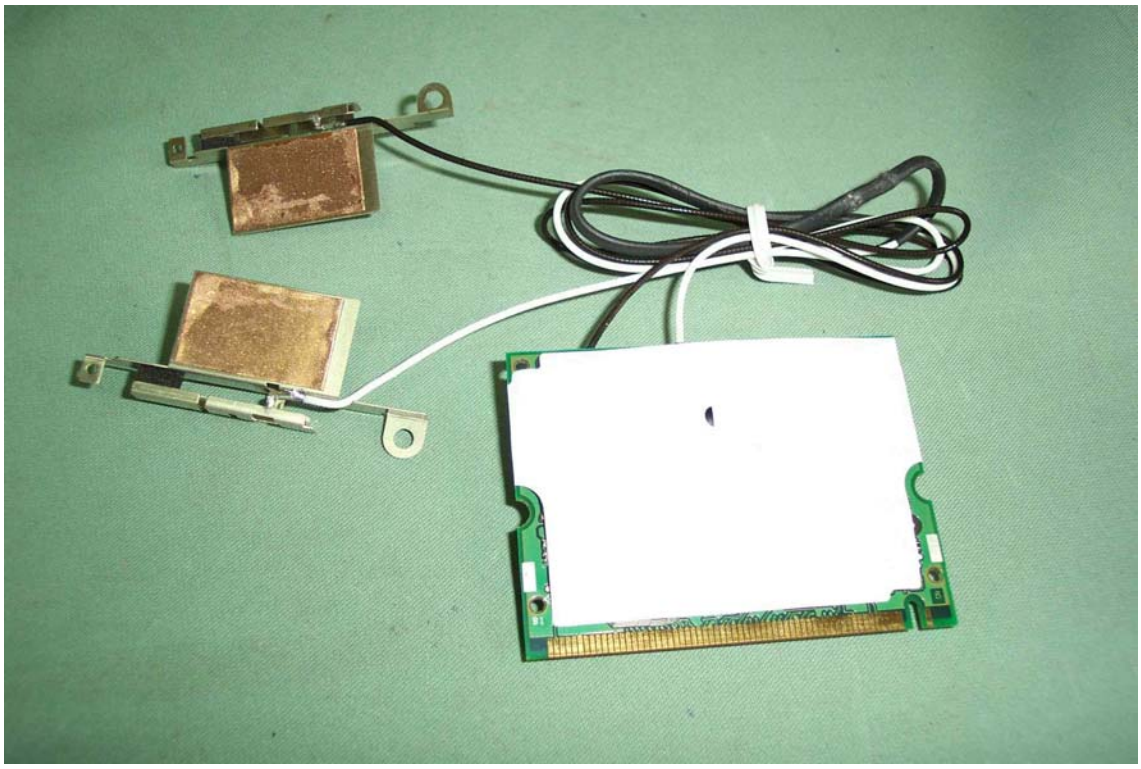
Internal of EUT --- 3



Internal of EUT --- 4

Internal of EUT --- 5

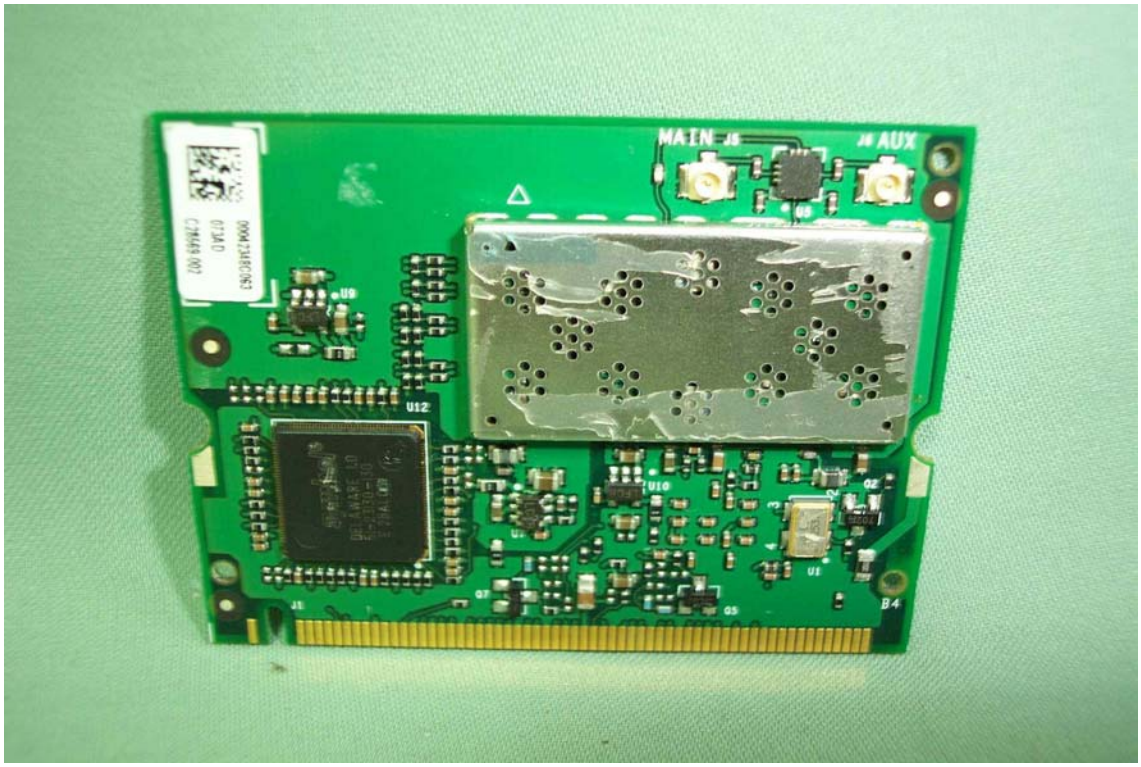
Internal of EUT --- 6



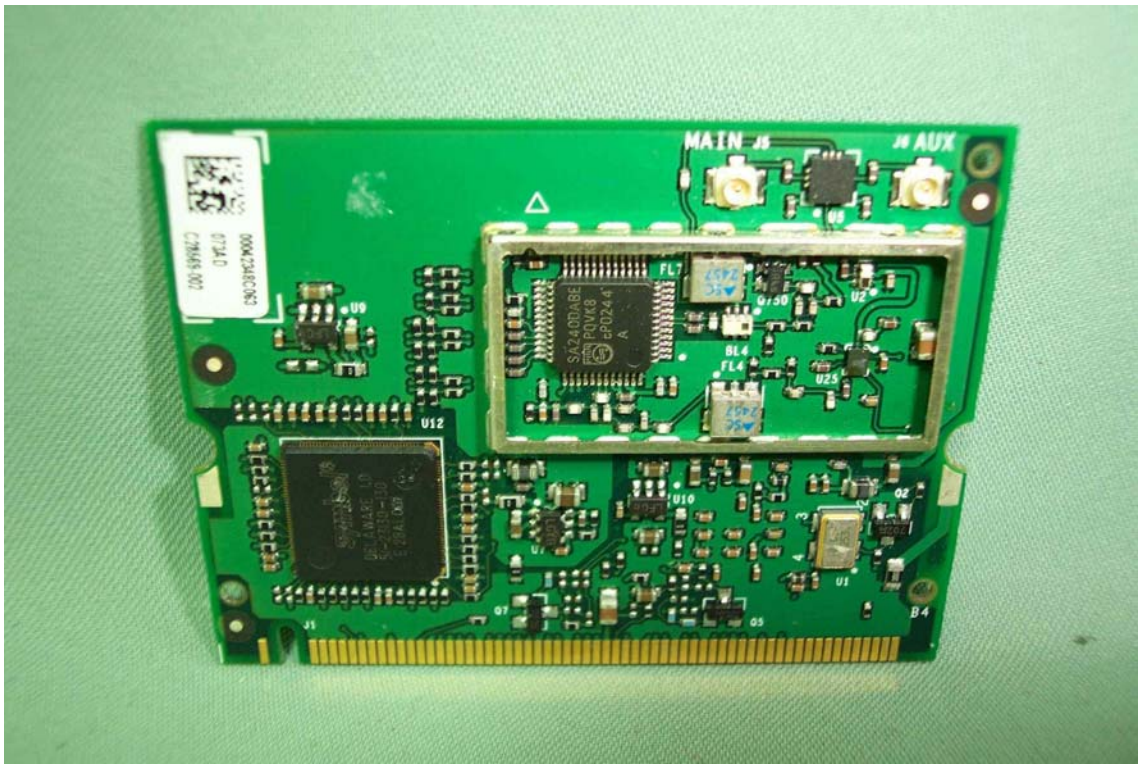
Internal of EUT --- 7

Internal of EUT --- 8

Internal of EUT --- 9



Internal of EUT --- 10



Internal of EUT --- 11