



# PCTEST ENGINEERING LABORATORY, INC.

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## CERTIFICATE OF COMPLIANCE FCC PART 15.407 Certification

**Applicant Name:**

Panasonic Corporation of North America  
One Panasonic Way, 4B-8  
Secaucus, NJ 07094  
United States

**Date of Testing:**

October 16, 2006

**Test Site/Location:**

PCTEST Lab, Columbia, MD, USA

**Test Report Serial No.:**

0608220707

**FCC ID:**

ACJ9TGCF-302

**APPLICANT:**

Panasonic Corporation of North America

**Model(s):**

CF-30

**EUT Type:**

Toughbook Model: CF-30

**Max. RF Output Power:**

13.09 dBm Conducted (UNII Low Band)

**Frequency Range:**

5180MHz – 5240MHz (UNII Low Band)

**FCC Classification:**

Unlicensed National Information Infrastructure (UNII)

**FCC Rule Part(s):**

Part 15.407

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C-63.4-2003.



I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

**Grant Conditions:** Listed output power is conducted. This device is restricted to indoor use for the 5.15 – 5.25GHz range.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

  
Randy Ortanez  
President



FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
Test Report S/N: 0608220707	Test Dates: October 16, 2006	EUT Type: Toughbook Model: CF-30		Page 1 of 33

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# MEASUREMENT REPORT



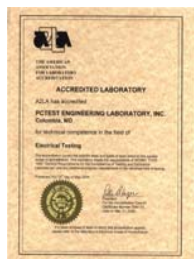
## FCC Part 15.407

### A. § 2.1033 General Information



**APPLICANT:** Panasonic Corporation of North America  
**APPLICANT ADDRESS:** One Panasonic Way, 4B-8  
 Secaucus, NJ 07094  
**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.  
**TEST SITE ADDRESS:** 6660-B Dobbin Road, Columbia, MD 21045 USA  
**FCC RULE PART(S):** Part 15.407  
**MODEL NAME:** CF-30  
**FCC ID:** ACJ9TGCF-302  
**Test Device Serial No.:** N/A ☐ Production ☒ Pre-Production ☐ Engineering  
**FCC CLASSIFICATION:** Unlicensed National Information Infrastructure (UNII)  
**DATE(S) OF TEST:** October 16, 2006  
**TEST REPORT S/N:** 0608220707

### A.1 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC-2451).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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## 1.0 INTRODUCTION

### 1.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) and FCC Public Notice DA 02-2138 dated August 30, 2002 entitled "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands" were used in the measurement of **Panasonic Toughbook Model: CF-30 FCC ID: ACJ9TGCF-302**.

Deviation from measurement procedure.....None

### 1.2 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

### 1.3 PCTEST Test Location

The map at the right shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity are, the Baltimore-Washington Intern'tl (BWI) airport, the city of Baltimore and the Washington, DC area. (see Figure 1.3-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 and Industry Canada on January 27, 2006.

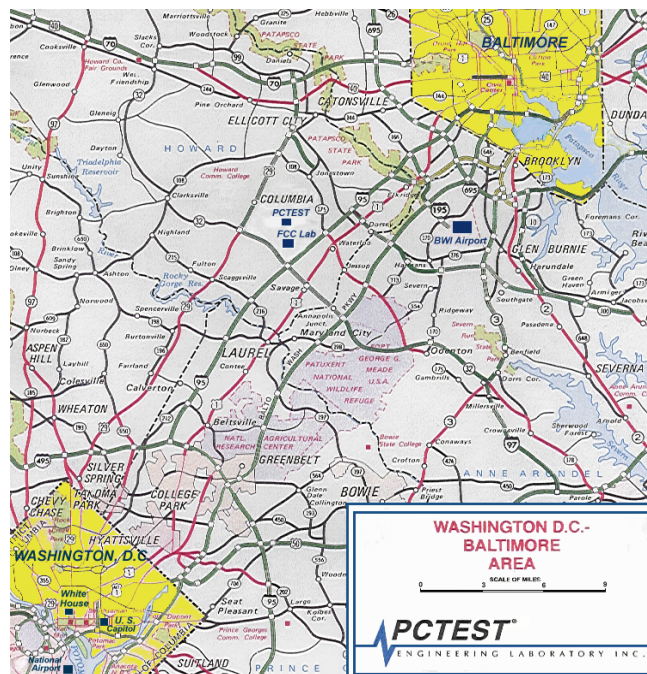




Figure 1.3-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Panasonic Toughbook Model: CF-30 FCC ID: ACJ9TGCF-302**. The EUT consisted of the following component(s):

Manufacturer / Description	FCC ID	Model
Panasonic Toughbook Model: CF-30	ACJ9TGCF-302	CF-30
Intel PRO/Wireless Network Module	PD9WM3945ABG	WM3945ABG
Taiyo Yuden Bluetooth Module	N/A	EYSF1CSMX
Express Mini-PCI USB Wireless CDMA Modem Module	N7N-MC5725	MC5725

Table 2-1. EUT Equipment Description



802.11 Band Mode	FCC Rule Part	Frequency [MHz]	Notes
b	15.247	2412 – 2462	Filed under separate report.
g	15.247	2412 – 2462	Filed under separate report.
a (UNII)	15.407	5180 - 5240	This report contains data pertaining only to the UNII low band.
a (5.8GHz)	15.247	5745 – 5825	Filed under separate report.

Table 2-2. Supported Bands in WLAN Transmitter

### 2.2 EMI Suppression Device(s)/Modifications

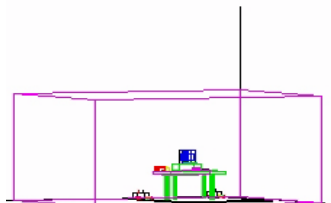
EMI suppression device(s) added and/or modifications made during testing.

- None

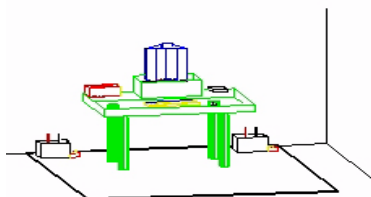
FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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## 3.0 DESCRIPTION OF TEST

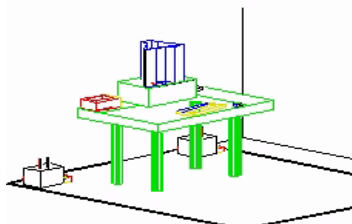
### 3.1 Conducted Emissions



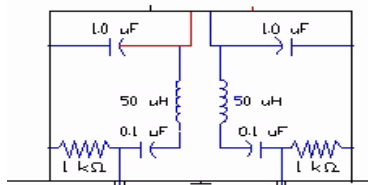
**Figure 3.1-1. Shielded Enclosure Line-Conducted Test Facility**



**Figure 3.1-2. Line Conducted Emission Test Set-Up**





**Figure 3.1-3. Wooden Table & Bonded LISNs**



**Figure 3.1-4. LISN Schematic Diagram**

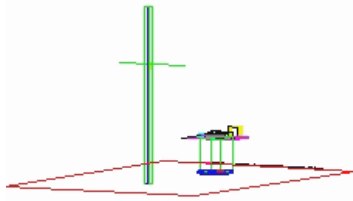
The line-conducted facility is located inside a 16'x20'x10' shielded enclosure, manufactured by Ray Proof Series 81 (see Figure 3.1-1). The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the sidewall of the shielded room (see Figure 3.1-2). Solar Electronics and EMCO Model 3725/2 (10kHz-30MHz) 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room (See Figure 3.1-3). The EUT is powered from the Solar LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Ray Proof power line filter (100dB 14Hz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with an inner diameter of ½". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the Solar LISN. The LISN schematic diagram is shown (See Figure 3.1-4). All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150kHz to 30Mhz with a spectrum analyzer. The frequencies producing the maximum level were re-examined using an EMI/Field Intensity Meter and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak and average mode. The bandwidth of the receiver was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Exhibit B. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator.

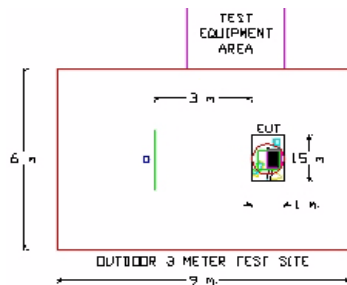
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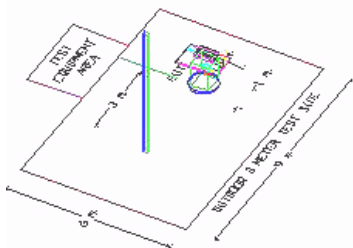
## 3.2 Radiated Emissions



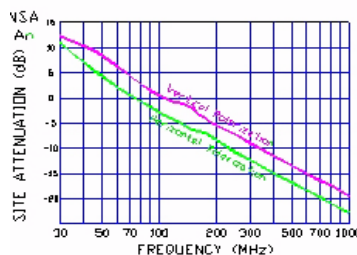
**Figure 3.2-1. 3-Meter Test Site**



**Figure 3.2-2. Dimensions of Outdoor Test Site**



**Figure 3.2-3. Turntable and System Setup**





**Figure 3.2-4. Normalized Site Attenuation Curves (H&V)**

Preliminary measurements were made indoors at 1-meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, and turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 200 MHz using a bi-conical antenna and from 200 to 1000 MHz using a log-spiral antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using Roberts<sup>TM</sup> Dipole antennas or horn antennas (see Figure 3.2-1). The test equipment was placed on a wooden and plastic bench situated on a 1.5m x 2m area adjacent to the measurement area (see Figure 3.2-2). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter and Quasi-Peak Adapter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1MHz depending on the frequency or type of signal. Above 1GHz the detector function was set to CISPR average mode (RBW = 1MHz, VBW = 10Hz).

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table (see Figure 3.2-3). The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Exhibit B. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator. The Theoretical Normalized Site Attenuation Curves for both horizontal and vertical polarization are shown in Figure 3.2-4.

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## 4.0 ANTENNA REQUIREMENTS

### Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antennas of the Toughbook Model: CF-30 are **permanently attached**.
- There are provisions for connection to an external antenna. Please refer to Panasonic's application cover letter for details.



### Conclusion:

The **Panasonic Toughbook Model: CF-30 FCC ID: ACJ9TGCF-302** unit complies with the requirement of §15.203.

### UNII Low Band

Ch.	Frequency (MHz)
36	5180
:	:
44	5220
:	:
48	5240

Table 4.1 Frequency / Channel Operations

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

TYPE	MODEL	CAL. DUE DATE	CAL. INTERVAL	SERIAL No.
Microwave Spectrum Analyzer	Agilent E4448A (3Hz-50GHz)	09/22/07	Annual	US42510244
Spectrum Analyzer	HP 8566B (100Hz-22GHz)	12/22/06	Annual	3638A08713
PSG Signal Generator	Agilent E8257D (250kHz-20GHz)	02/11/07	Annual	MY45470194
Universal Power Meter	Gigatronics 8651A (50MHz-18GHz)	07/28/07	Annual	1834052
Power Sensor	Gigatronics 80701A	04/11/07	Annual	1833460
Quasi-Peak Adapter	HP 85650A	12/22/06	Annual	2043A00301
Preamplifier	HP 8449B (1-26.5GHz)	12/22/06	Annual	3008A00985
Attenuation/Switch Driver	HP 11713A	12/22/06	Annual	N/A
Preselector	HP 85685A (20Hz-2GHz)	12/22/06	Annual	N/A
Horn Antenna	EMCO Model 3115 (1-18GHz)	08/25/07	Bi-Annual	9704-5182
Horn Antenna	EMCO Model 3116 (18-40GHz)	08/25/07	Bi-Annual	9203-2178
Roberts Dipoles	Compliance Design (1 set) A100	08/31/07	Bi-Annual	5118
EMCO Dipoles (2)	N/A	09/20/08	Bi-Annual	00023951
SOLAR LISN (2)	8012-50	11/18/07	Bi-Annual	0313233, 0310234
Microwave Cables	MicroCoax (1.0-26.5GHz)	02/26/07	Annual	N/A

**Table 5-1. Annual Test Equipment Calibration Schedule**

FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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## 6.0 TEST RESULTS

### Summary



The intentional radiator has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards. The radio was transmitting at full power on the specified channels and at the data rate(s) specified below. The channels tested are high, middle and low of the allocated bands. Final system data was gathered in a mode that tended to maximize emissions by varying the orientation of the EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization. This unit was tested with all possible data rate and transmission mode combinations and the worst case is reported with the unit transmitting at 6Mbps.

Method/System: Unlicensed National Information Infrastructure (UNII)

Data Rate(s) Tested: 6, 9, 12, 18, 24, 36, 48, 54Mbps

FCC Part Section(s)	RSS Section	Test Description	Test Limit	Test Condition	Test Result
<b>TRANSMITTER MODE (TX)</b>					
15.407	RSS-210	26 dB Bandwidth	Reference for power limit only	Conducted	PASS
15.407 (a)(1)	RSS-210 [A9.2 (1)]	Maximum Conducted Output Power	$< 4 + 10\log_{10}(BW)$ dBm (5150-5250) (IC: $< 10 + 10\log_{10}(B)$ dBm)		PASS
15.407 (a)(1), (5)	RSS-210 [A9.2 (1)]	Peak Power Spectral Density	$< 4$ dBm/MHz (5150-5250) (IC: $< 10$ dBm)		PASS
15.407(a)(6)	N/A	Peak Excursion	$< 13$ dB/MHz maximum difference		PASS
15.407(b)(1), (6)	RSS-210 [A9.3 (1)]	Undesirable Emissions	-27 dBm/MHz EIRP (5150-5250)	Radiated	PASS
15.205, 15.407(b)(1), (5), (6)	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	$< FCC 15.209$ limits or $< RSS-210$ table 3 limits (Emissions in restricted bands must meet the radiated limits detailed in 15.209)		PASS
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	$< FCC 15.207$ limits or $< RSS-Gen$ table 2 limits	Line Conducted	PASS
<b>RECEIVER MODE (RX)</b>					
15.107	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	$< FCC 15.207$ limits or $< RSS-Gen$ table 2 limits	Line Conducted	PASS
15.109	RSS-Gen [7.2.3.2]	General Field Strength Limits (Restricted Bands and Radiated Emissions Limits)	$< FCC 15.209$ limits or $< RSS-210$ table 3 limits	Radiated (30MHz-1GHz) (1-25 GHz)	PASS
<b>RF EXPOSURE (SAR OR MPE)</b>					
15.407(f), 2.1093/2.1091	RSS-102	SAR Test or MPE	1.6 W/kg (SAR Limit) 1 mW/cm <sup>2</sup> (MPE Limit)	3 Channels	PASS

Table 6-1. Summary of Test Results

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## 6.1 26dB Bandwidth Measurement

### RSS-210 [A8.2(1)]

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. **The 26dB bandwidth should be at least 500 kHz.**

The spectrum analyzer is set to:

RBW = 30 kHz (10 dB/div)  
 VBW = 300 kHz  
 Span = 30 MHz  
 Ref. Level = Please See Plots  
 Sweep = 30.8 ms

Frequency [MHz]	Channel No.	26dB Bandwidth Test Results	
		Level [MHz]	Pass/Fail
5180	36	16.454	Pass
5220	44	16.460	Pass
5240	48	16.469	Pass

Table 6-2. Conducted Bandwidth Measurements

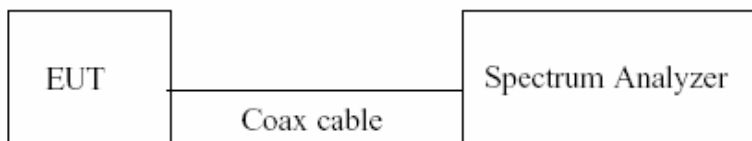
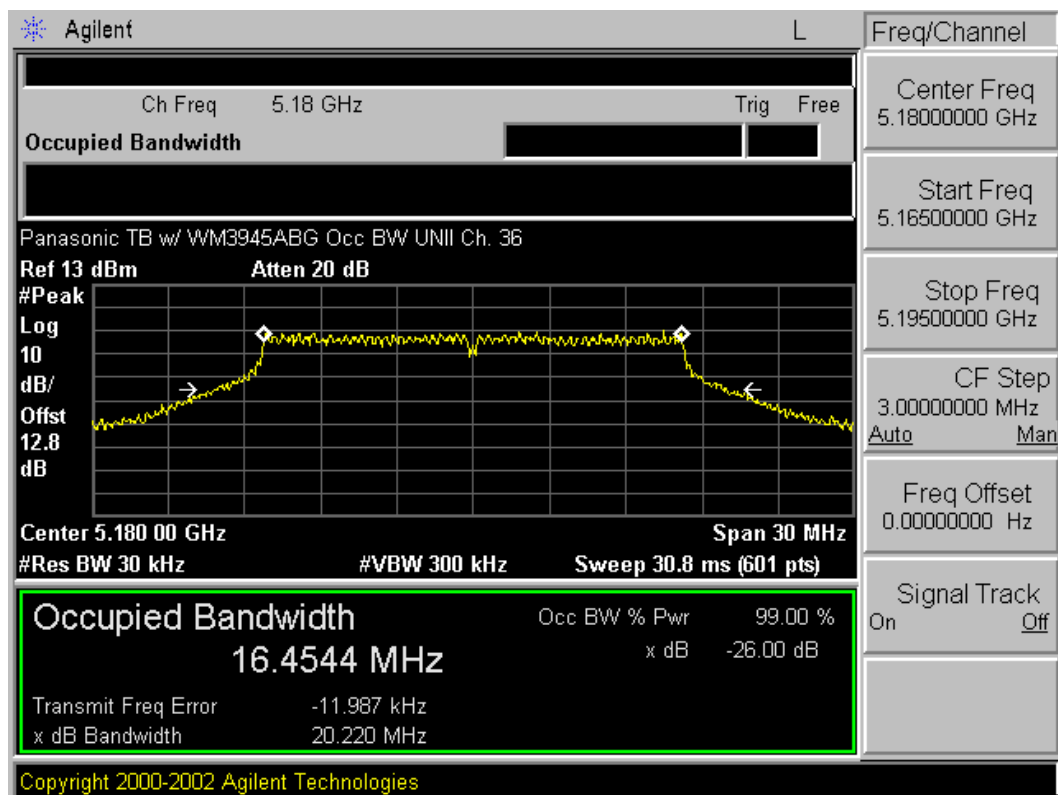
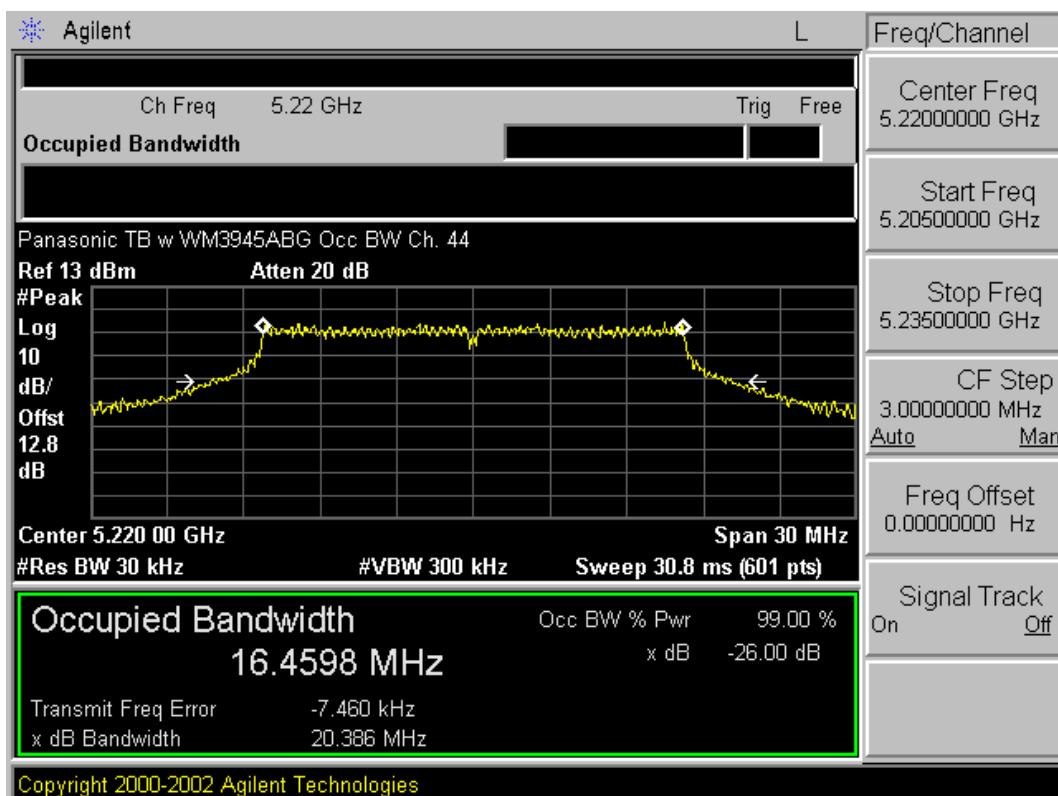




Figure 6-1. Test Instrument & Measurement Setup

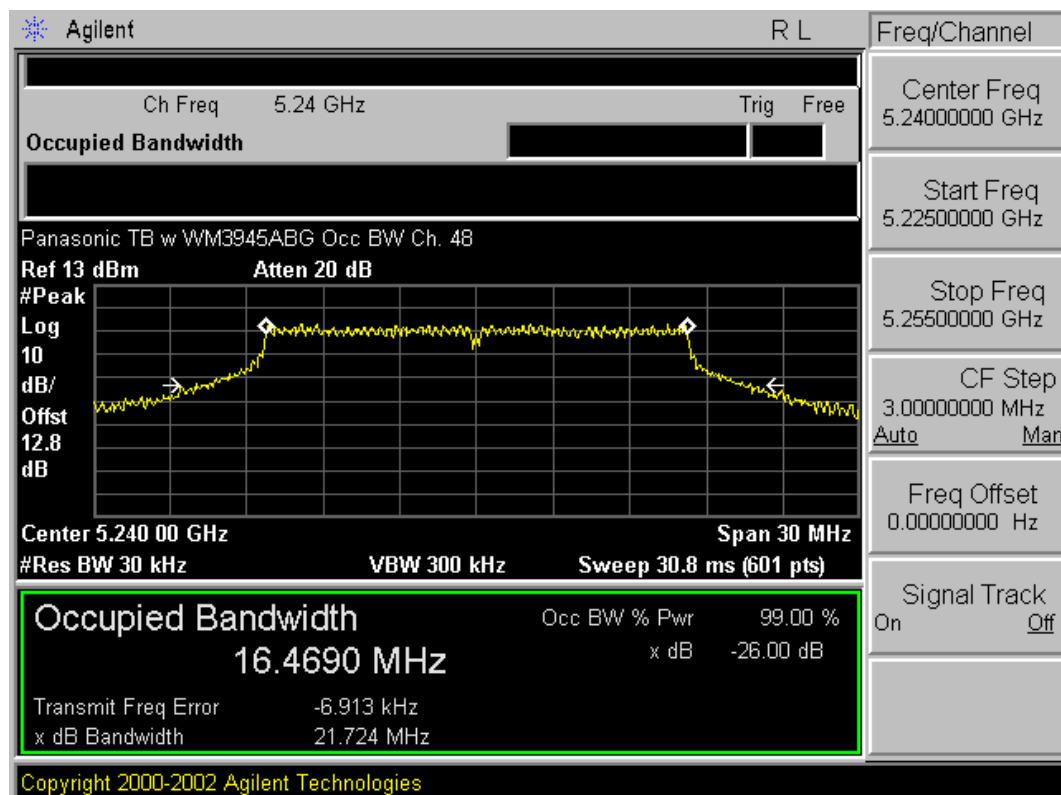


Plot 6-1. 26dB Bandwidth Plot (802.11a (UNII) – Ch. 36)





Plot 6-2. 26dB Bandwidth Plot (802.11a (UNII) – Ch. 44)

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Plot 6-3. 26dB Bandwidth Plot (802.11a (UNII) – Ch. 48)

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## 6.2 Output Power Measurement – UNII (Low Band)

§15.407 (a)(1); RSS-210 [A9.2(1)]

A transmitter antenna terminal of EUT is connected to the input of a RF power sensor. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. **The maximum permissible conducted output power is  $4 \text{ dBm} + 10\log_{10}(26\text{dB BW}) = 16.167 \text{ dBm}$ .**

Freq [MHz]	Channel	Data Rate [Mbps]	Main Ant. Measured Power [dBm]	Aux Ant. Measured Power [dBm]
5180	36	6	11.94	11.25
		9	11.75	11.56
		12	11.49	11.13
		18	11.19	11.03
		24	10.83	10.54
		36	10.13	10.34
		48	9.62	9.63
		54	8.87	8.72
5220	44	6	12.46	12.44
		9	12.28	12.71
		12	12.15	12.14
		18	11.83	11.79
		24	11.38	11.43
		36	10.84	11.29
		48	10.38	10.96
		54	9.15	9.57

Freq [MHz]	Channel	Data Rate [Mbps]	Main Ant. Measured Power [dBm]	Aux. Ant. Measured Power [dBm]
5240	48	6	12.86	<b>13.09</b>
		9	12.71	12.92
		12	12.38	12.75
		18	12.30	11.89
		24	11.75	11.97
		36	11.06	11.41
		48	10.69	10.98
		54	9.24	9.83

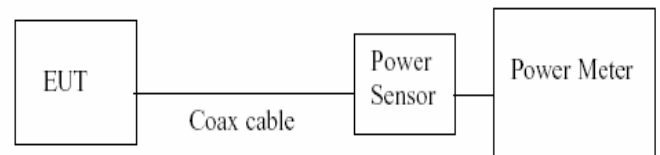


Figure 6-2. Test Instrument & Measurement Setup

Table 6-3. Conducted Output Power Measurements



### 6.3 Peak Power Spectral Density

#### §15.407 (a)(1),(5); RSS-210 [A9.2(1)]

The spectrum analyzer was connected to the antenna terminal while the EUT was operating in a continuous transmission mode at the appropriate center frequencies. ***The maximum permissible peak power spectral density is 4 dBm/MHz in the 5.15GHz – 5.25GHz band (10dBm/MHz for Industry Canada).***

The spectrum analyzer was set to: RBW=1 MHz, VBW=3MHz, mode=Sample “on” for FCC (Measurement Method 2 from FCC Public Notice DA 02-2138).

The spectrum analyzer is set to:

RBW	1 MHz (10dB/div)
VBW	3 MHz
Span	20 MHz
Ref. Level	Please See Plots
Sweep	1 ms
Detector	Sampling with power averaging (100 sweeps)

Frequency [MHz]	Channel No.	Power Density Test Results	
		Level [dBm]	Pass/Fail
5180	36	-2.490	Pass
5220	44	1.756	Pass
5240	48	1.259	Pass

Table 6-5. Power Density Measurements

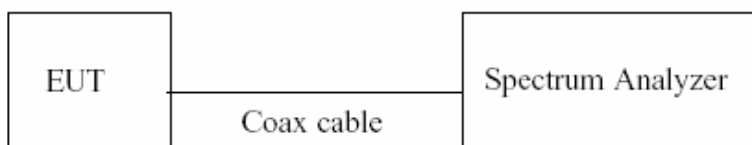
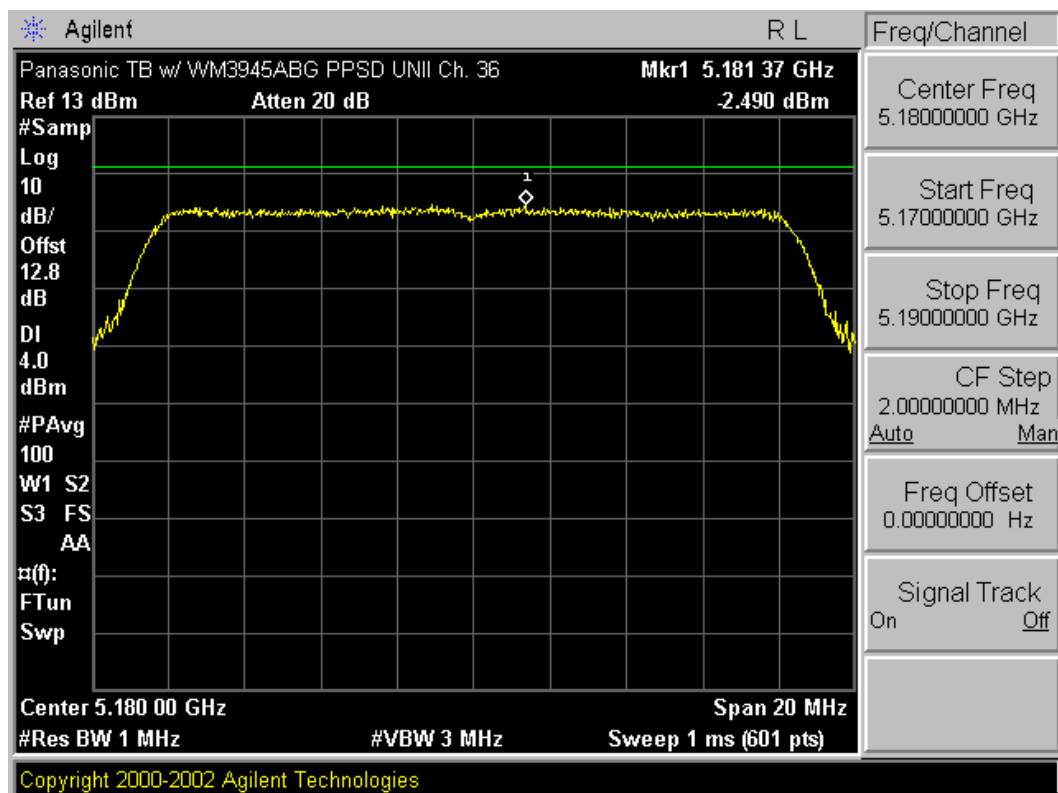
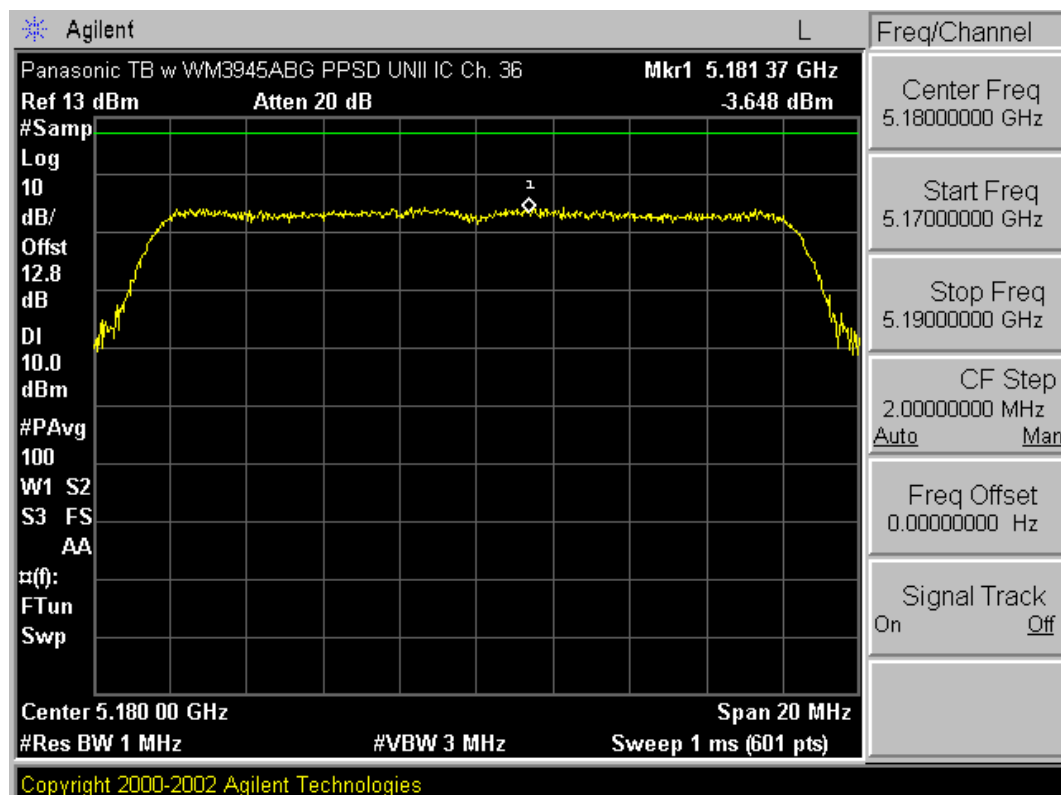




Figure 6-4. Test Instrument & Measurement Setup

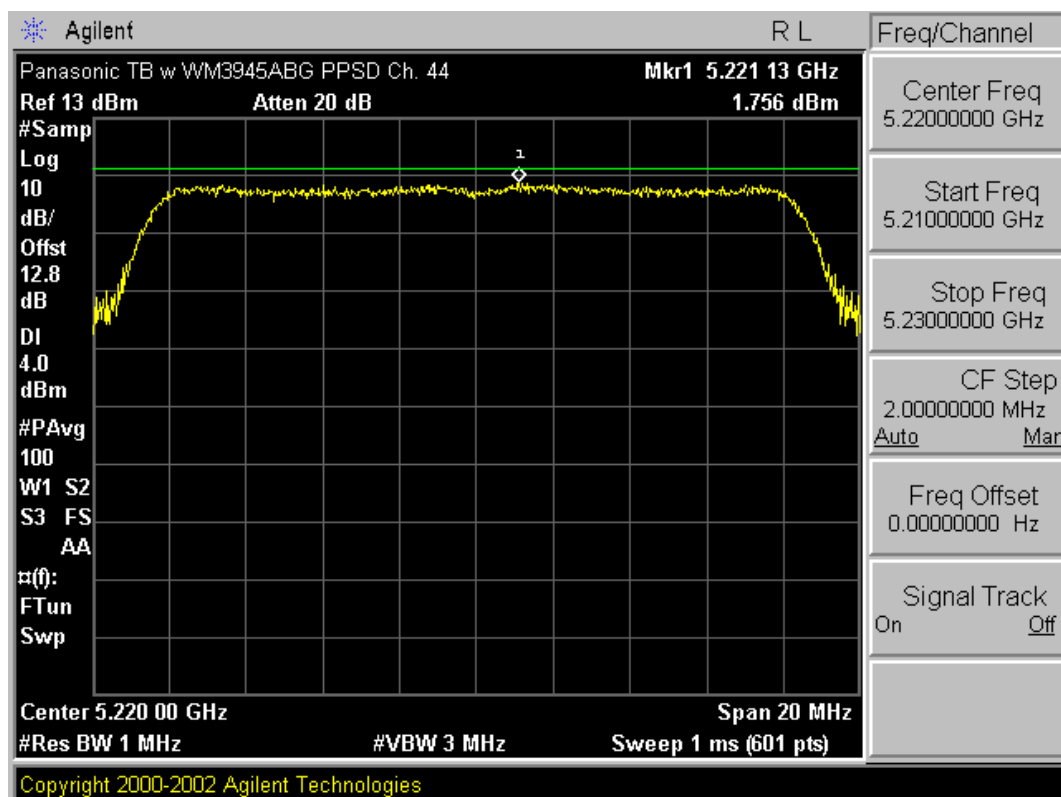


Plot 6-4. Peak Power Spectral Density Plot (802.11a (UNII) – Ch. 36)

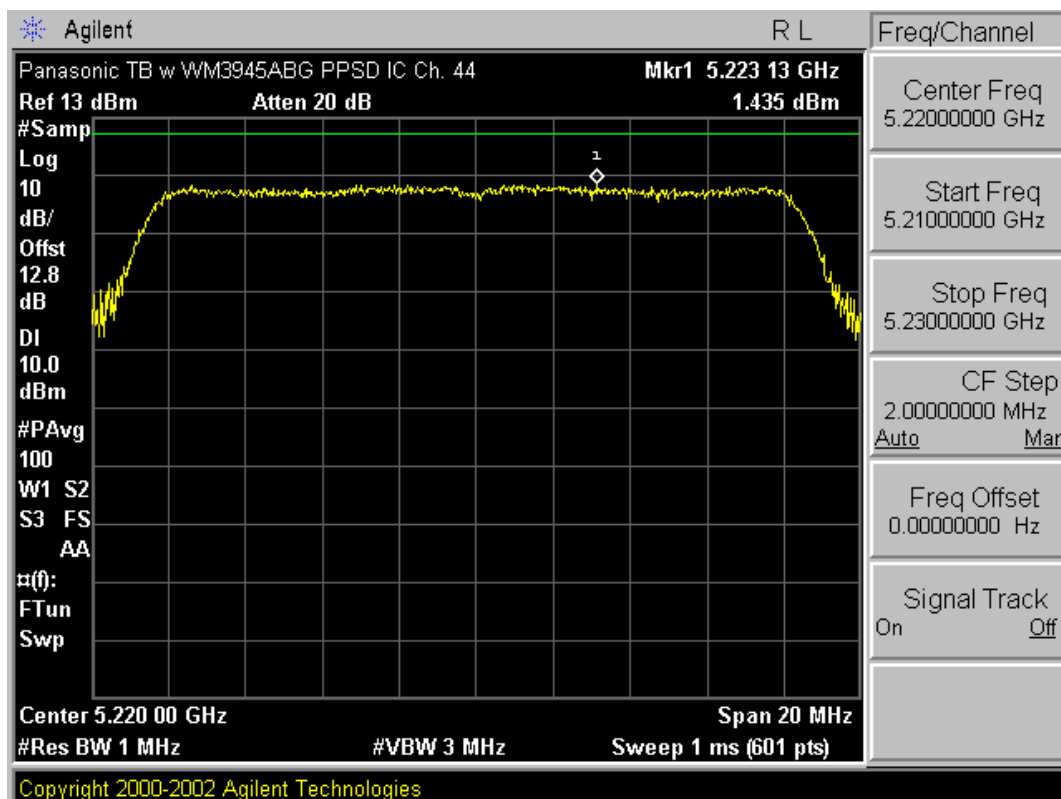


Plot 6-5. Peak Power Spectral Density Plot [Industry Canada] (802.11a (UNII) – Ch. 36)



FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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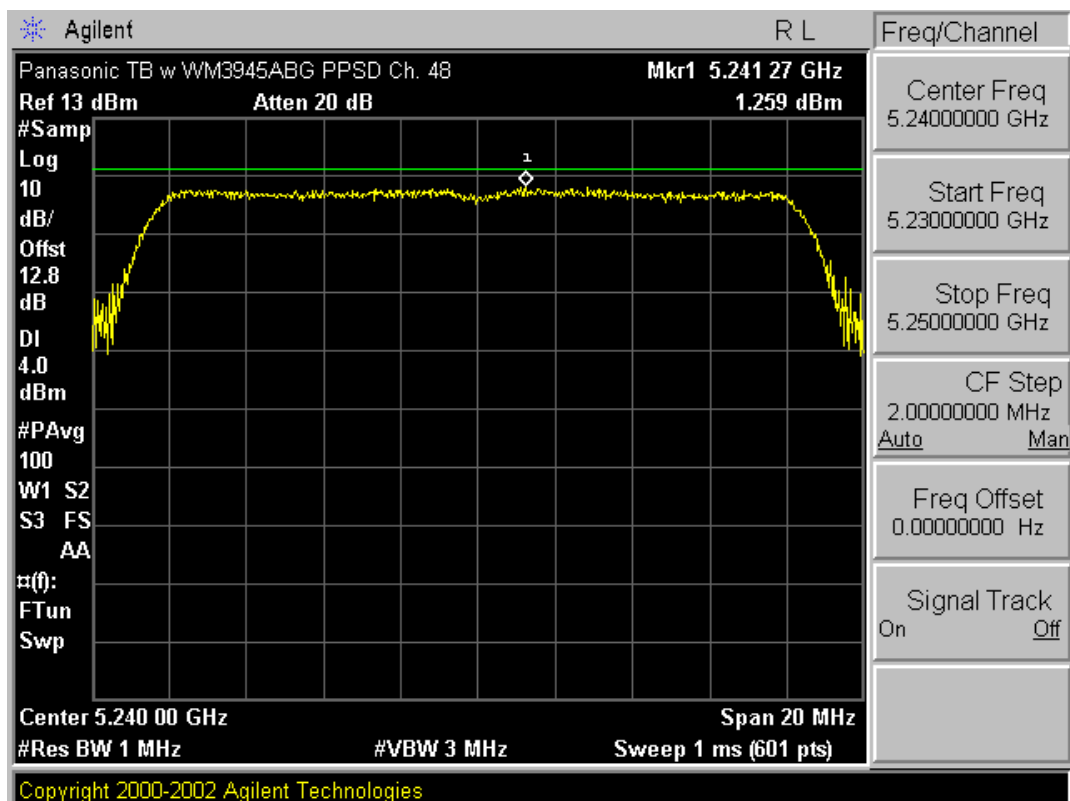


Plot 6-6. Peak Power Spectral Density Plot (802.11a (UNII) – Ch. 44)

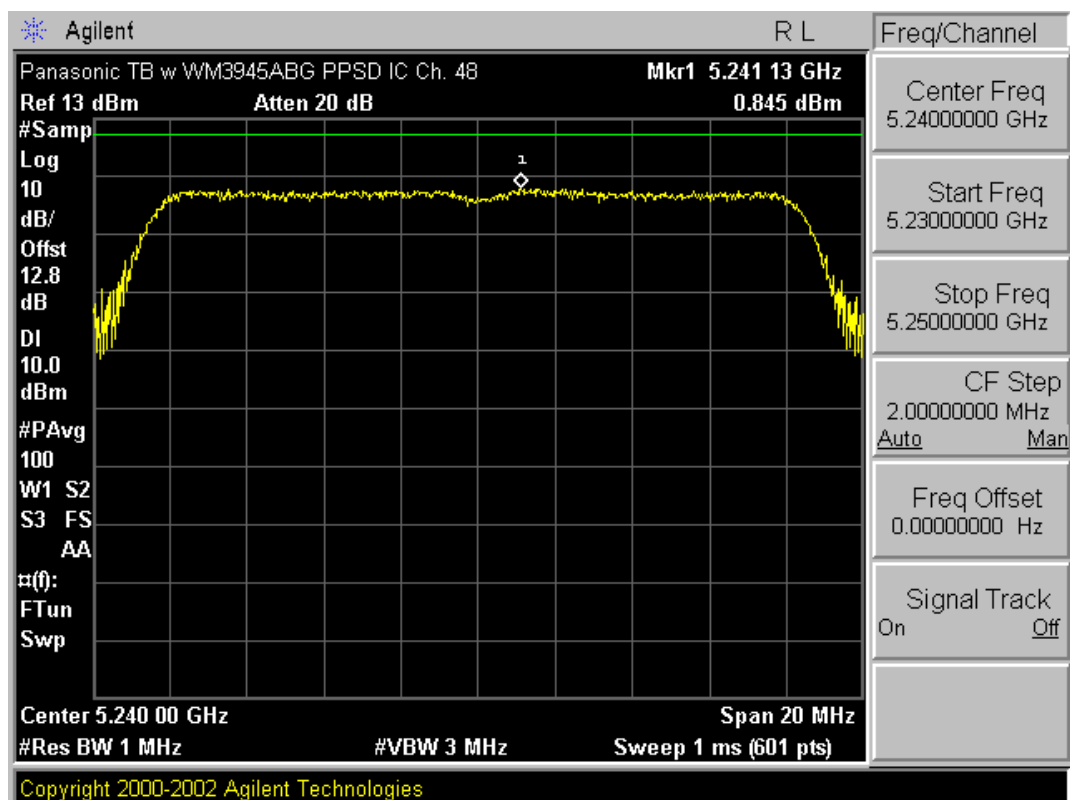


Plot 6-7. Peak Power Spectral Density Plot [Industry Canada] (802.11a (UNII) – Ch. 44)



FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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Plot 6-8. Peak Power Spectral Density Plot (802.11a (UNII) – Ch. 48)



Plot 6-9. Peak Power Spectral Density Plot [Industry Canada] (802.11a (UNII) – Ch. 48)

FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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## 6.4 Peak Excursion Ratio

### §15.407(a)(6)

The spectrum analyzer was connected to the antenna terminal while the EUT was operating in the continuous transmission mode at the appropriate center frequencies. **The largest permissible difference (Peak Excursion) between the following two specified traces is 13 dBm/MHz.**

The spectrum analyzer is set to:

#### 1st Trace:

The spectrum analyzer was set to: RBW = 1 MHz, VBW = 3 MHz, mode = peak detector and max hold.

#### 2nd Trace:

The spectrum analyzer was set to: RBW = 1 MHz, VBW = 1 MHz, trigger=free run, mode=sample detector "on" using 100 sweeps of power averaging (settings tend to present similar results compared to the power meter).

Frequency [MHz]	Channel No.	Peak Excursion Ratio Test Results	
		Ratio [dBm]	Pass/Fail
5180	36	10.71	Pass
5220	44	9.58	Pass
5240	48	10.23	Pass

Table 6-6. Peak Excursion Ratio Measurements

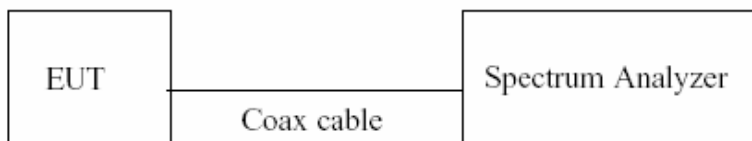
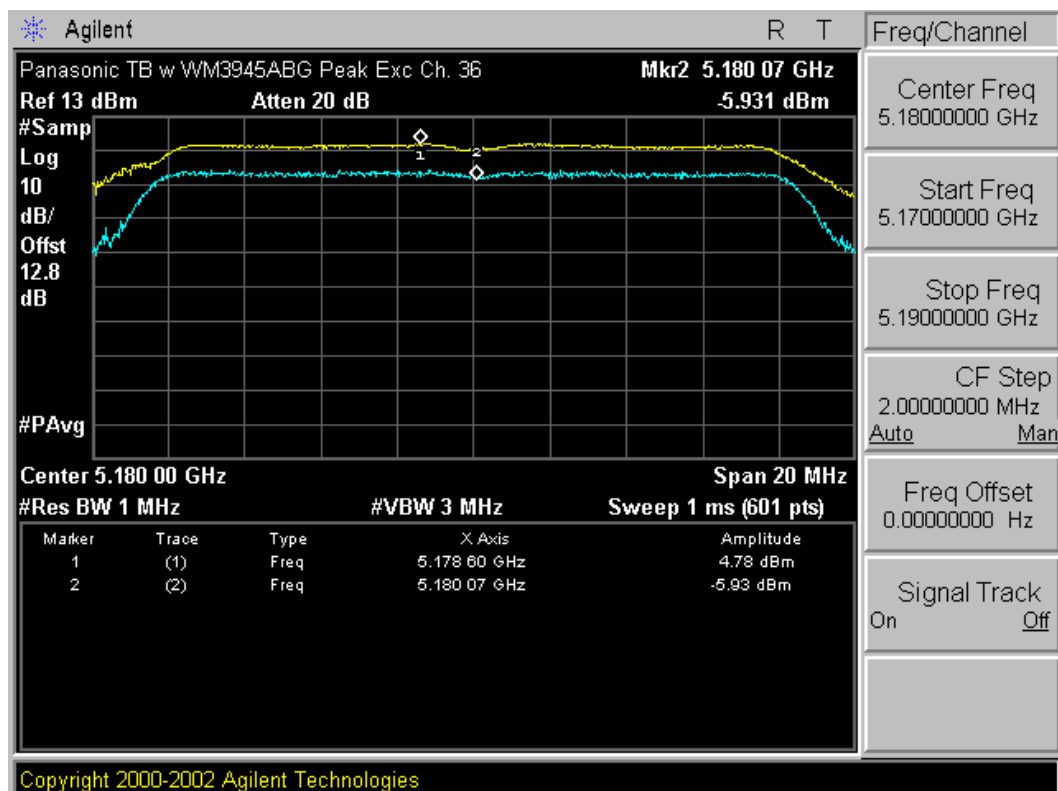
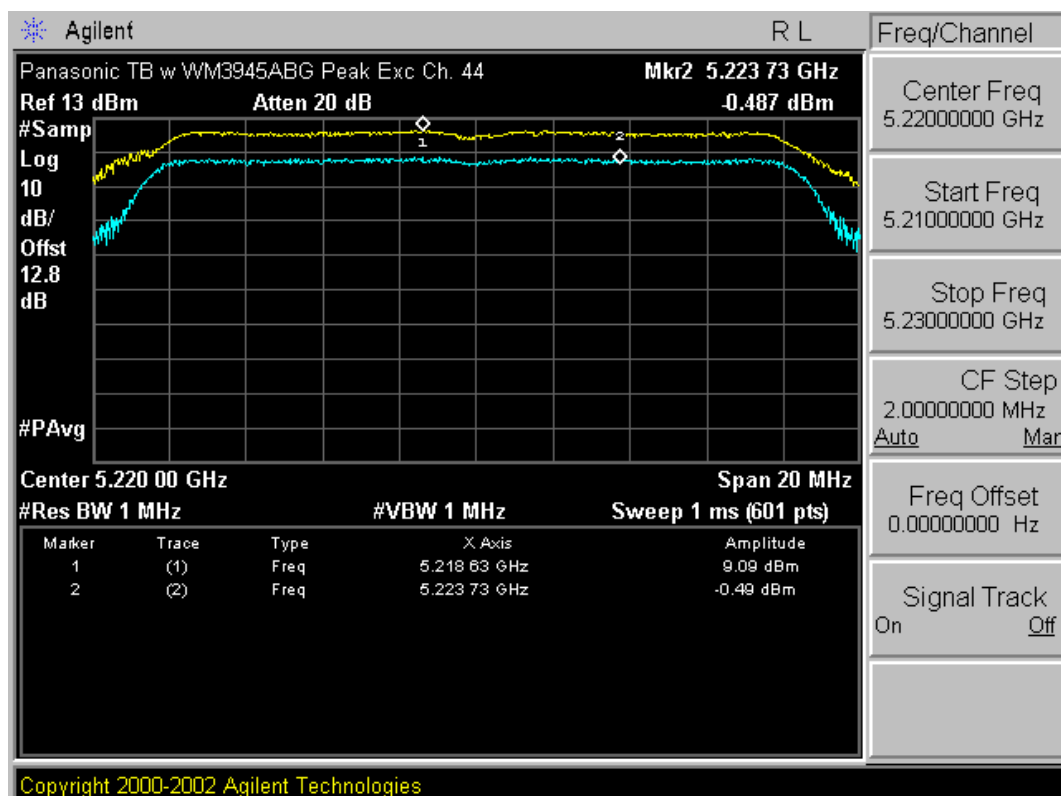




Figure 6-5. Test Instrument & Measurement Setup



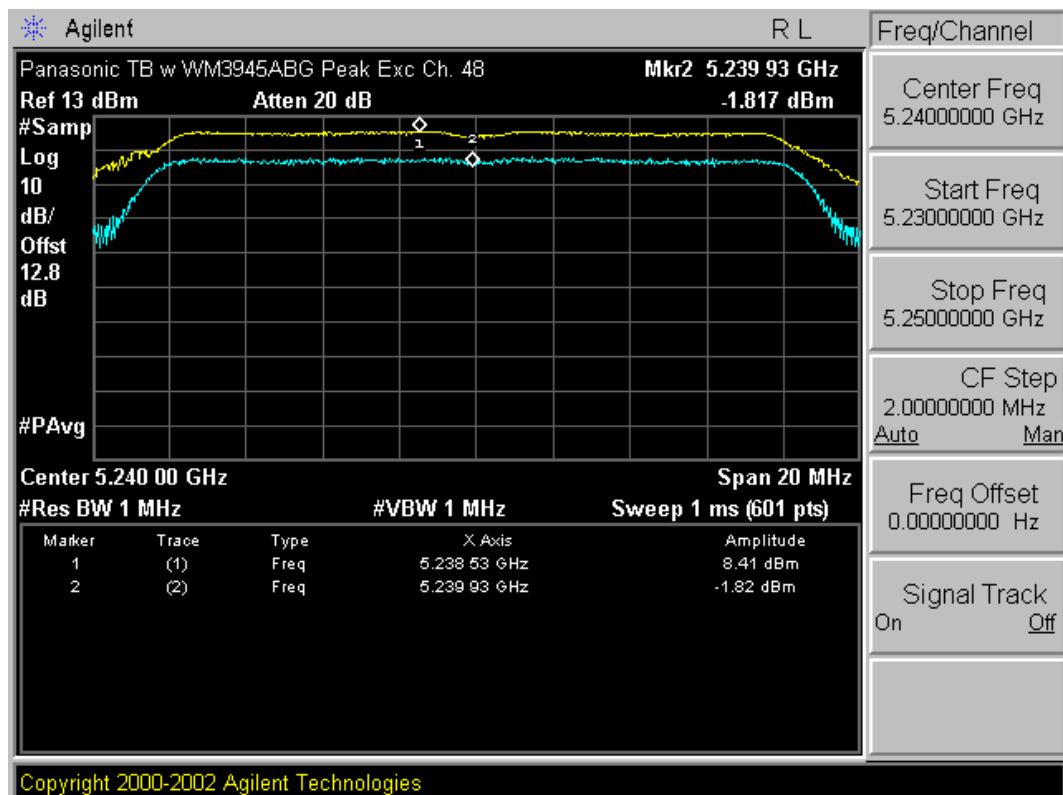
Plot 6-10. Peak Excursion Ratio Plot (802.11a (UNII) – Ch. 36)



Plot 6-11. Peak Excursion Ratio Plot (802.11a (UNII) – Ch. 44)

FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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Plot 6-12. Peak Excursion Ratio Plot (802.11a (UNII) – Ch. 48)

## 6.5 Radiated Measurements

**§15.407(b)(1), (6), §15.205, §15.209; RSS-210 [A8.5]**

The EUT was tested from 9kHz to the tenth harmonic of the fundamental frequency of the transmitter. Below 1GHz a CISPR quasi peak detector was used. Above 1 GHz average measurements were taken, using RBW= 1MHz, VBW= 10Hz, and linearly polarized horn antennas. In addition, peak measurements (RBW= 1MHz, VBW= 1MHz) were taken to ensure that the peak levels are not more than 20dB above the average limit. No harmonics/spurs peak emissions are more than 20dB above the average limit. Special attention is taken for the EUT's harmonic and spurious radiated emissions in the restricted bands of operations, as defined in Section 15.205.

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

**Table 6-7. Radiated Limits**

## Radiated Measurements (Cont.)

§15.407(b)(1), (6), §15.205, §15.209; RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 5180MHz

Channel: 36

Frequency [MHz]	Level [dBm]	AFCL [dB]	Pol. [H/V]	Field Strength [dB $\mu$ V/m]	Field Strength [ $\mu$ V/m]	Margin [dB]
10360.00	-110.40	40.6	V	41.5	118.6	-20.12
* 15540.00	-116.10	45.8	V	47.9	248.9	-6.06
* 20720.00	-135.00	49.6	V	21.6	12.0	-32.38
25900.00	-135.00	52.1	V	24.1	16.0	-37.50

Table 6-8. Radiated Measurements @ 3 meters

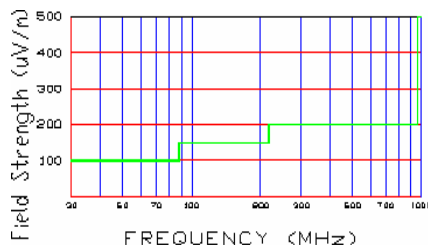




Figure 6-6. Radiated limits at 3 meters.

### NOTES:

1. The limit listed in Section 15.407(b) is -27 dBm/MHz EIRP. This is equivalent to a field strength of 68.24 dB $\mu$ V/m @ 3m. All harmonics in the restricted bands specified in §15.205 are below the limit shown in Table 6-7. (Note: \* = Restricted Band measured frequency)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
5. The antenna is manipulated through typical positions, polarity and length during the tests.
6. The EUT is supplied with nominal AC voltage or/and a new/fully-recharged battery.
7. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
8. < - 135 dBm are below the analyzer floor level.
9. Above 1 GHz, the limit is 500  $\mu$ V/m (54dB $\mu$ V/m) at 3 meters radiated.

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## Radiated Measurements (Cont.)

§15.407(b)(1), (6), §15.205, §15.209; RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 5220MHz

Channel: 44

Frequency [MHz]	Level [dBm]	AFCL [dB]	Pol. [H/V]	Field Strength [dBμV/m]	Field Strength [μV/m]	Margin [dB]
10440.00	-102.90	40.50	V	49.46	297.2	-13.09
* 15660.00	-114.00	47.30	V	51.77	387.7	-2.21
* 20880.00	-135.00	50.05	V	22.05	12.7	-31.93
26100.00	-135.00	52.50	V	24.50	16.8	-38.05

Table 6-9. Radiated Measurements @ 3 meters

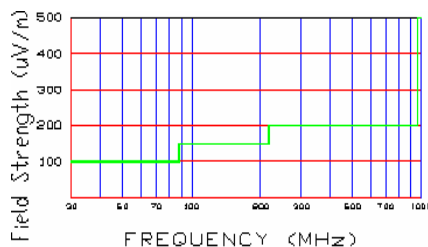




Figure 6-7. Radiated limits at 3 meters.

### NOTES:

1. The limit listed in Section 15.407(b) is -27 dBm/MHz EIRP. This is equivalent to a field strength of 68.24 dBuV/m @ 3m. All harmonics in the restricted bands specified in §15.205 are below the limit shown in Table 6-7. (Note: \* = Restricted Band measured frequency)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
5. The antenna is manipulated through typical positions, polarity and length during the tests.
6. The EUT is supplied with nominal AC voltage or/and a new/fully-recharged battery.
7. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
8. < - 135 dBm are below the analyzer floor level.
9. Above 1 GHz, the limit is 500 μV/m (54dBμV/m) at 3 meters radiated.

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## Radiated Measurements (Cont.)

§15.407(b)(1), (6), §15.205, §15.209; RSS-210 [A8.5]

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 5240MHz

Channel: 48

Frequency [MHz]	Level [dBm]	AFCL [dB]	Pol. [H/V]	Field Strength [dB $\mu$ V/m]	Field Strength [ $\mu$ V/m]	Margin [dB]
10480.00	-108.90	40.60	V	43.75	154.0	-18.55
* 15720.00	-114.40	45.90	V	50.21	324.0	-3.77
* 20960.00	-135.00	49.39	V	21.39	11.7	-32.59
26200.00	-135.00	53.35	V	25.35	18.5	-36.95

Table 6-10. Radiated Measurements @ 3 meters

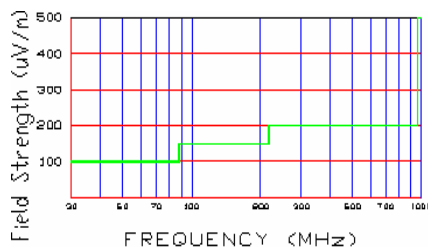




Figure 6-8. Radiated limits at 3 meters.

### NOTES:

1. The limit listed in Section 15.407(b) is -27 dBm/MHz EIRP. This is equivalent to a field strength of 68.24 dB $\mu$ V/m @ 3m. All harmonics in the restricted bands specified in §15.205 are below the limit shown in Table 6-7. (Note: \* = Restricted Band measured frequency)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
5. The antenna is manipulated through typical positions, polarity and length during the tests.
6. The EUT is supplied with nominal AC voltage or/and a new/fully-recharged battery.
7. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
8. < - 135 dBm are below the analyzer floor level.
9. Above 1 GHz, the limit is 500  $\mu$ V/m (54dB $\mu$ V/m) at 3 meters radiated.

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## 6.6 Radiated Restricted Band Measurements

§15.407(b)(1), (6), §15.205, §15.209; RSS-210 [A8.5]

**Note:**

Special attention is made for the EUT's harmonic and spurious radiated emission in the restricted bands of operation.

Mode: 802.11a

Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 5180MHz

Channel: 36

Frequency [MHz]	Level [dBm]	AFCL [dB]	Pol. [H/V]	Field Strength [dB $\mu$ V/m]	Field Strength [ $\mu$ V/m]	Margin [dB]
5143.42	-114.5	40.11	V	32.61	42.71	-21.37
5144.78	-113.5	40.13	V	33.63	48.00	-20.35
5147.93	-113.9	40.14	V	33.23	45.87	-20.75
5148.24	-113.4	40.16	V	33.75	48.67	-20.23
5149.41	-113.0	40.18	V	34.16	51.05	-19.82
5149.98	-112.5	40.19	V	34.67	54.11	-19.31

**Table 6-11. Radiated Restricted Band Measurements at 3-meters**

**NOTES:**

1. The antenna is manipulated through typical positions, polarity and length during the testing.
2. The EUT is supplied with the minimal AC voltage or/and a new/fully re-charged battery.
3. The spectrum is measured from 9 kHz up to the 10<sup>th</sup> harmonic and the worst-case emissions are reported.
4. Above 1 GHz the limit is 500 $\mu$ V/m.
5. < -135 dBm is below the analyzer measurement floor level.
6. The data in the table are Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
7. The peak emissions above 1 GHz are not more than 20 dB above the average limit.



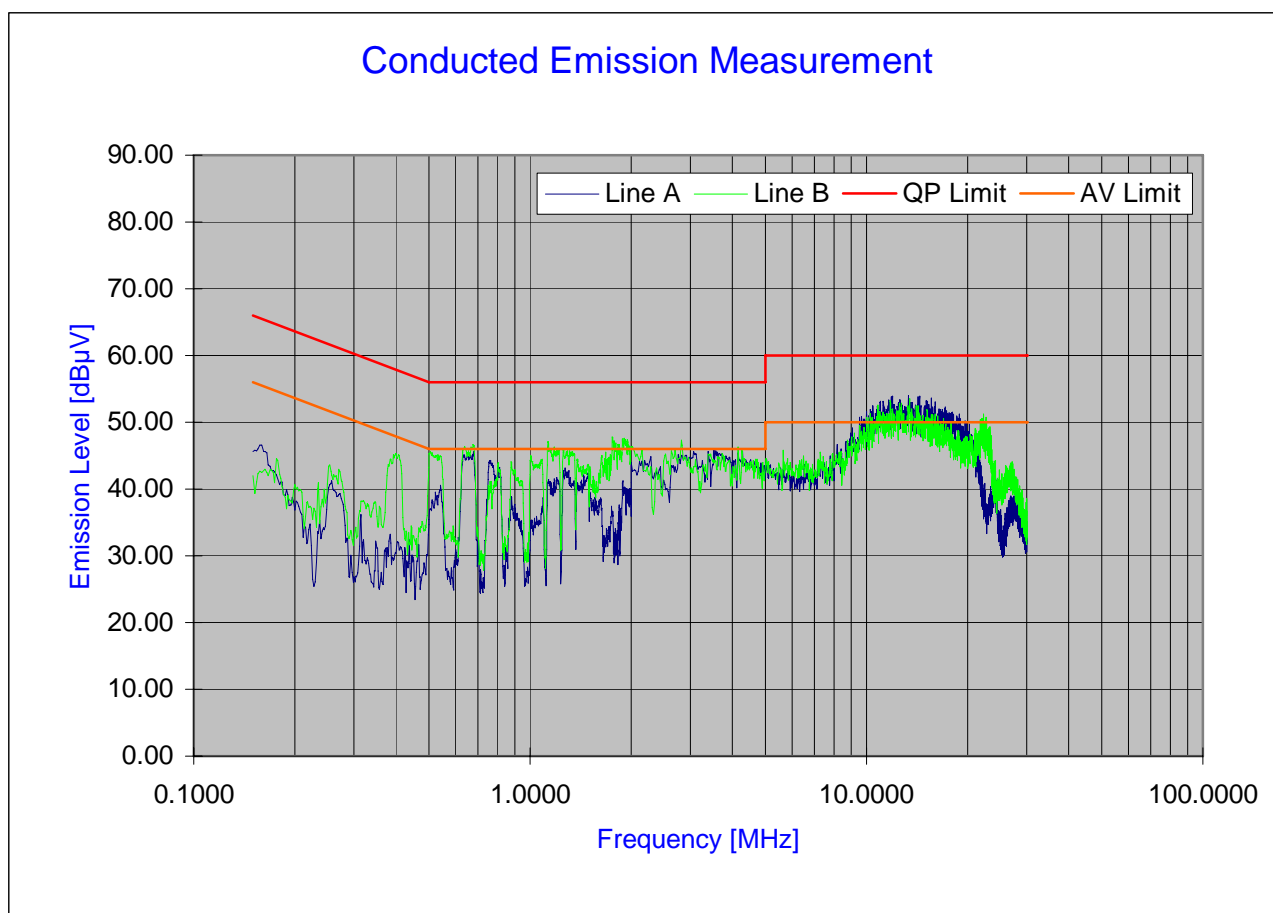
## 6.7 Line-Conducted Test Data

§15.207; RSS-Gen(7.2.2)

# PCTEST Engineering Laboratory Inc.

Company : Panasonic Corporation  
 Model Number : CF-30  
 FCC ID Code : ACJ9TGCF-302  
 Standard : FCC Part 15B class B

Power Source : AC120V/60Hz  
 Tested Date : 10/16/2006  
 Note : Tested with WLAN a ON





Ver.1.1 ©PCTEST 2006.08

**Plot 6-13. Line Conducted Plot with 802.11a (UNII Low Band)**

### Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are Specified in EN55022.
3. Line A = Phase; Line B = Neutral
4. Deviations to the Specifications: None.

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# Line-Conducted Test Data (Cont'd)



§15.207; RSS-Gen(7.2.2)

Nb.	Line	Frequency [MHz]	Factor [dB]	QP [dBμV]	Limit [dBμV]	Margin [dB]	Average [dBμV]	Limit [dBμV]	Margin [dB]
1	A	10.948	7.66	49.32	60.00	-10.68	34.12	50.00	-15.88
2	A	11.142	7.67	49.15	60.00	-10.85	35.92	50.00	-14.08
3	A	11.898	7.72	50.32	60.00	-9.68	37.26	50.00	-12.74
4	A	12.571	7.76	50.06	60.00	-9.94	36.82	50.00	-13.18
5	A	13.271	7.79	50.01	60.00	-9.99	35.55	50.00	-14.45
6	A	14.148	7.84	48.94	60.00	-11.06	37.25	50.00	-12.75
7	A	14.457	7.85	47.60	60.00	-12.40	37.26	50.00	-12.74
8	A	15.139	7.88	48.78	60.00	-11.22	35.31	50.00	-14.69
9	A	15.519	7.90	47.98	60.00	-12.02	36.46	50.00	-13.54
10	A	16.081	7.93	48.09	60.00	-11.91	36.14	50.00	-13.86
11	B	1.756	7.37	45.79	56.00	-10.21	33.70	46.00	-12.30
12	B	10.804	7.65	47.73	60.00	-12.27	33.06	50.00	-16.94
13	B	10.940	7.66	47.76	60.00	-12.24	33.45	50.00	-16.55
14	B	11.751	7.71	48.78	60.00	-11.22	33.81	50.00	-16.19
15	B	12.520	7.75	49.08	60.00	-10.92	36.06	50.00	-13.94
16	B	13.269	7.79	48.67	60.00	-11.33	35.54	50.00	-14.46
17	B	13.371	7.80	48.66	60.00	-11.34	34.40	50.00	-15.60
18	B	13.642	7.81	46.30	60.00	-13.70	35.80	50.00	-14.20
19	B	14.145	7.84	47.91	60.00	-12.09	35.64	50.00	-14.36
20	B	15.130	7.88	45.88	60.00	-14.12	33.95	50.00	-16.05

Table 6-13. Line Conducted Data with 802.11a (UNII Low Band)



## Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are Specified in EN55022.
3. Line A = Phase; Line B = Neutral
4. Deviations to the Specifications: None.

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## 7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Panasonic Toughbook Model: CF-30** **FCC ID: ACJ9TGCF-302** is in compliance with Part 15E of the FCC Rules. Measurement uncertainty was not taken into account in this determination.

FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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## EXHIBIT A – LABELING REQUIREMENTS

### Sample Label & Location

New Labeling Requirements:

Per 2.1074 & 15.19; Docket 95-19

The sample label shown below shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name, FCC ID, and the FCC logo must be displayed on the device per Section 15.19(b)(2).

**Note:** The FCC ID shown will be readily visible at the time of purchase.

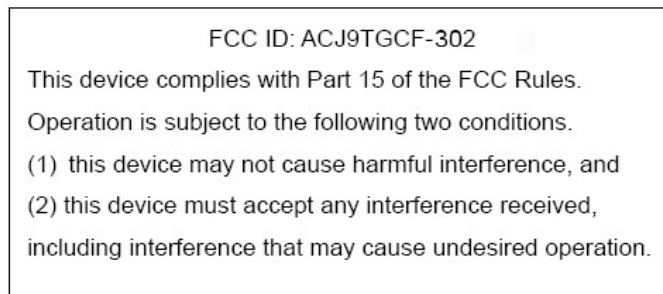


Figure A-1. FCC ID Label

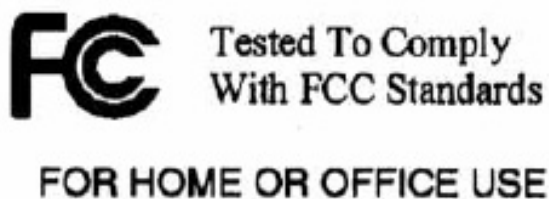


Figure A-2. FCC DoC Label

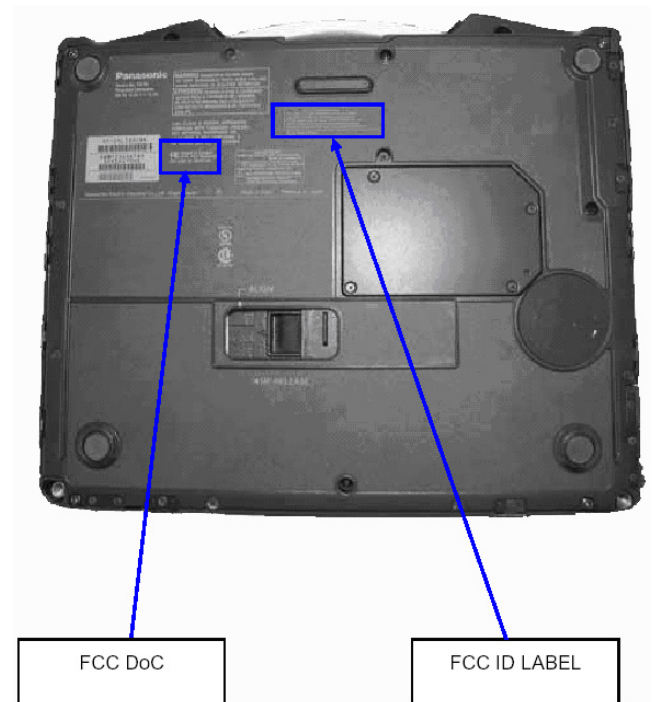






Figure A-3. FCC ID Label Location



FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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## EXHIBIT B – TEST SETUP PHOTOGRAPHS

The Line-Conducted and Radiated Test Pictures show the worst-case configuration and cable placement with a minimum margin to the specifications.

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## EXHIBIT C – EUT EXTERNAL/INTERNAL PHOTOGRAPHS

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## EXHIBIT D – USER’S MANUAL

FCC ID: ACJ9TGCF-302		FCC Pt. 15.407 CERTIFICATION TEST REPORT (WLAN 802.11a UNII (LOW BAND))		Reviewed by: Quality Manager
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