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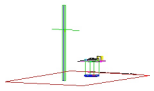

RF EXPOSURE EVALUATION
(MAXIMUM PERMISSIBLE EXPOSURE)

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

Date of Testing:
May 28, 2010
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1004160655.ACJ

FCC ID:	**ACJ9TGCF-312**
IC CERTIFICATION NO.:	**216A-CF312**
APPLICANT:	**Panasonic Corporation of North America**

EUT Type:	Toughbook Model: CF-31
Model(s):	CF-31
IC Model(s):	CF-312
FCC Rule Part(s):	FCC Part 1 (§1.1310) and Part 2 (§2.1091)
FCC Classification:	PCS Licensed Transmitter (PCB)
Test Procedure:	OET Bulletin 65

The device bearing the FCC Identifier specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in FCC OET Bulletin 65 (See Test Report). These measurements were performed with no deviation from the standards. Test results reported herein relate only to the item(s) tested.

I authorize and 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.

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

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

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1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Introduction

This document is prepared on behalf of Panasonic Corporation of North America to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations and RSS-102 of Industry Canada.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	…	…	f/300	6
1500-100,000	…	…	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

Table 1-1. Limits for Maximum Permissible Exposure (MPE)

1.2 EUT Description

The **Panasonic Toughbook Model: CF-31** is a laptop PC containing Atheros WLAN, Sierra Wireless GSM/EDGE/WCDMA/CDMA/EvDO WWAN, and Alps Bluetooth modules. This device also has a car-mounter option which allows for external antennas for use with the 2.4GHz WLAN operation and the WWAN operation. This RF exposure evaluation covers the cases in which the internal antennas are used for WWAN and WLAN operation and in which external antennas are used for WWAN and WLAN operation in the car mounter configuration.

EUT:

Model:	CF-31
Grantee:	Panasonic Corporation of North America
FCC ID:	ACJ9TGCF-312
IC Cert. No.:	216A-CF312
Internal Antennas:	-0.17dBi (Cellular Band)
	1.13dBi (PCS Band)
	1.45dBi (2.4GHz Band)
External Antenna:	5dBi gain (For use with WLAN operation only)

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1.3 MPE Requirements Overview

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.

- **Mobile Devices:** a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.

- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/ Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

- **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

The **Panasonic Toughbook Model: CF-31 FCC ID: ACJ9TGCF-312** is evaluated to the Mobile Device requirements and is considered a device to be used by the General Population/Uncontrolled Exposure.

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1.4 Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The maximum conducted output power was determined based on a worst case scenario in which a device is tuned to the maximum power level, taking into account the power tolerance, described in the operational description. For the case of GPRS850, the source-based time averaged power is determined by adding a duty cycle factor of 6dB to the maximum theoretical power given by the operational description. The duty cycle factor of 6dB is derived by assuming operation at maximum power while using 2 out of 8 available slots.

Through use of the Friis transmission formula, the power density level is calculated at a distance of 20cm using the internal antenna gains. The MPE was also calculated for the device when used in the car mounter configuration with external antennas. For the Cellular band, the highest permissible antenna gain is found by determining the highest EIRP value that makes the power density equal to the RF exposure limit. In the PCS band, the highest antenna gain is limited by the 2 Watt EIRP limit specified in Part 24.

Friis Transmission Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

P_d = Power Density (mW/cm^2) π = 3.1416
P_{out} = output power to antenna (mW) r = distance between observation point and center of the radiator (cm)
G = gain of antenna in linear scale

Calculated MPE

The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1-1.

There is no co-location between the electric fields of any two transmitters therefore following power densities are calculated for each individual transmitter by frequency at 20cm spacing:

Frequency	824.2	MHz	
Limit	0.549	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	33.80	dBm	2398.83 mW
Source-Based T-A Power (dBm)	27.78	dBm	599.71 mW
TX Ant Gain (dBi), G =	-0.17	dBi	
Power Density (S) =	**0.115**	mW/cm^2	(at 20cm)
Minimum Distance =	**9.1**	cm	

Table 1-2. Calculated MPE Data Using Internal Antenna Gains (Cellular Band)

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Frequency:	1880	MHz	
Limit:	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	25.4	dBm	346.74 mW
TX Ant Gain (dBi), G =	1.13	dBi	
Power Density (S) =	**0.0895**	mW/cm^2	(at 20cm)
Minimum Distance =	**6.0**	cm	

Table 1-3. Calculated MPE Data Using Internal Antenna Gains (PCS Band)

Frequency	2437	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	16.95	dBm	49.55 mW
TX Ant Gain (dB), G =	1.45	dBi	
Power Density (S) =	**0.014**	mW/cm^2	(at 20cm)
Minimum Distance =	**2.3**	cm	

Table 1-4. Calculated MPE Data Using Internal Antenna Gains (2.4GHz Band)

Frequency	824.2	MHz	
Limit	0.549	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	33.80	dBm	2398.83 mW
Source-Based T-A Power (dBm)	27.78	dBm	599.71 mW
TX Ant Gain (dBi), G =	6.63	dBi	
Power Density (S) =	**0.549**	mW/cm^2	(at 20cm)
Minimum Distance =	**20.0**	cm	

Table 1-5. Calculated MPE Data for External Antenna (Cellular Band)

Frequency:	1880	MHz	
Limit:	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	25.40	dBm	346.74 mW
TX Ant Gain (dBi), G =	7.60	dBi	
Power Density (S) =	**0.3969**	mW/cm^2	(at 20cm)
Minimum Distance =	**12.6**	cm	

Table 1-6. Calculated MPE Data for External Antenna (PCS Band)

Frequency	2437	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	16.95	dBm	49.55 mW
TX Ant Gain (dB), G =	5	dBi	
Power Density (S) =	**0.031**	mW/cm^2	(at 20cm)
Minimum Distance =	**3.5**	cm	

Table 1-7. Calculated MPE Data for External Antenna (2.4GHz Band)

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1.5 Summary of Results

Frequency Band [MHz]	Antenna Type	Maximum Antenna Gain [dBi]	MPE @ 20cm (mW/cm^2)	Test Result
824.2 – 848.8	Internal	-0.17	0.115	PASS
1850.2 – 1909.8	Internal	1.13	0.0895	PASS
2412 – 2462	Internal	1.45	0.014	PASS
824.2 – 848.8	External	6.63	0.549	PASS
1850.2 – 1909.8	External	7.6	0.3969	PASS
2412 – 2462	External	5	0.031	PASS

Table 1-8. Maximum Permissible Exposure Summary Table

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2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 20cm separation distance as specified in §2.1091 of the FCC Rules and Regulations and Health Canada Safety Code 6. An appropriate RF exposure compliance statement will be placed in the user's manual.

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