



# PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA  
Tel. 410.290.6652 / Fax 410.290.6654  
http://www.pctestlab.com



## MEASUREMENT REPORT FCC Part 27 / IC RSS-199

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

**Date of Testing:**  
10/28 - 10/29/2013  
**Test Site/Location:**  
PCTEST Lab., Columbia, MD, USA  
**Test Report Serial No.:**  
0Y1310172052.ACJ

**FCC ID:** ACJ9TGWW11A  
**APPLICANT:** PANASONIC CORPORATION OF NORTH AMERICA

**Application Type:** Class II Permissive Change  
**Model(s):** FZ-G1  
**EUT Type:** TD-CDMA Module  
**FCC Classification:** Licensed Non-Broadcast Station Transmitter (TNB)  
**FCC Rule Part(s):** §2; §27(M)  
**IC Specification(s):** RSS-199 Issue 1  
**Test Procedure(s):** ANSI/TIA-603-C-2004, KDB 971168 v02r01  
**Test Device Serial No.:** *identical prototype* [S/N: 3ETSA00524]  
**Class II Permissive Change:** See FCC Change document  
**Original Grant Date:** 02/23/2012

Modulation	Channel Bandwidth	Tx Frequency (MHz)	Conducted	
			Max. Power (W)	Max. Power (dBm)
QPSK	5	2498.8 - 2687.2	0.251	24.00
16-QAM	5	2498.8 - 2687.2	0.230	23.61
64-QAM	5	2498.8 - 2687.2	0.229	23.60
QPSK	10	2501.4 - 2684.6	0.260	24.15
16-QAM	10	2501.4 - 2684.6	0.236	23.72
64-QAM	10	2501.4 - 2684.6	0.237	23.74

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 §2.947. Test results reported herein relate only to the item(s) tested.

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.



Randy Ortanez  
President



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<b>Test Report S/N:</b> 0Y1310172052.ACJ	<b>Test Dates:</b> 10/28 - 10/29/2013	<b>EUT Type:</b> TD-CDMA Module	Page 1 of 16	

# T A B L E O F C O N T E N T S

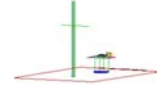
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# MEASUREMENT REPORT

## FCC Part 27



### §2.1033 General Information



**APPLICANT:** Panasonic Corporation of North America  
**APPLICANT ADDRESS:** One Panasonic Way, 4B-8  
 Secaucus, NJ 07094, United States  
**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.  
**TEST SITE ADDRESS:** 7185 Oakland Mills Road, Columbia, MD 21046 USA  
**FCC RULE PART(S):** §2; §27(M)  
**BASE MODEL:** FZ-G1  
**FCC ID:** ACJ9TGWW11A  
**FCC CLASSIFICATION:** Licensed Non-Broadcast Station Transmitter (TNB)  
**MODE:** TD-CDMA  
**FREQUENCY TOLERANCE:** ±0.00025 % (2.5 ppm)  
**Test Device Serial No.:** 3ETSA00524     Production     Pre-Production     Engineering  
**DATE(S) OF TEST:** 10/28 - 10/29/2013  
**TEST REPORT S/N:** 0Y1310172052.ACJ

### Test Facility / Accreditations

Measurements were performed at **PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.**

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) 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 (2451B-1).
- 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 (2451B-1) 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 Scope

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

## 1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.

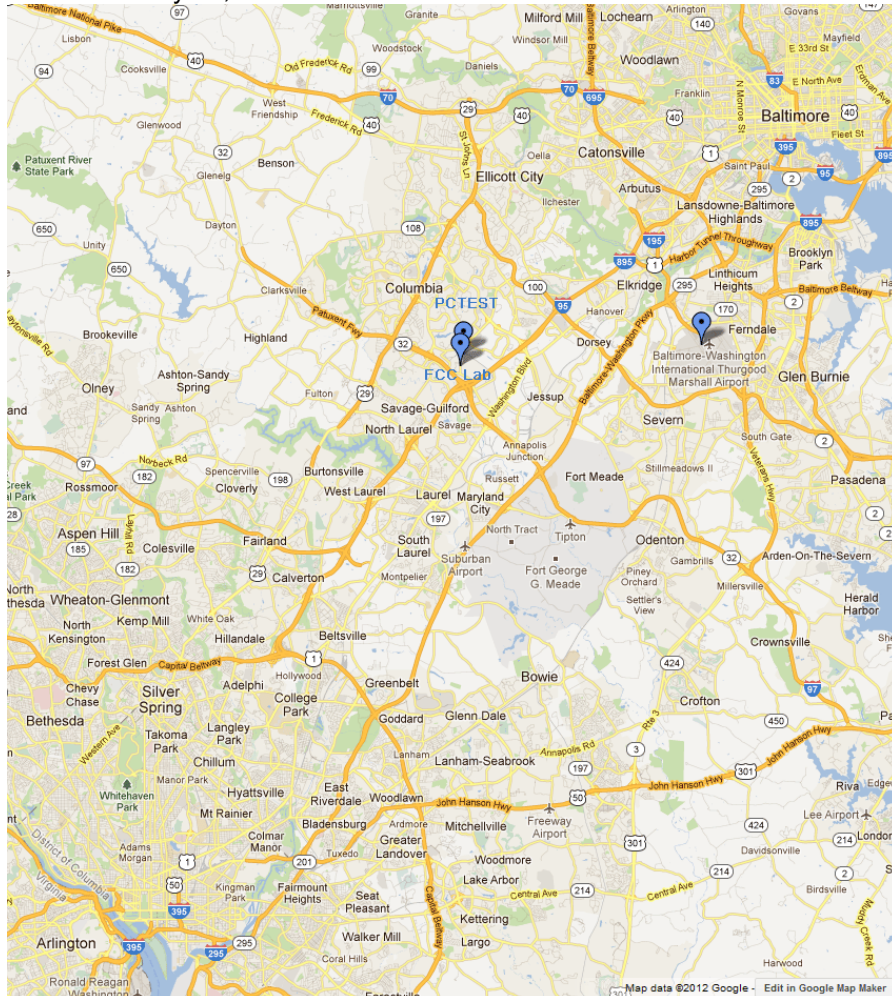




Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Panasonic TD-CDMA Module FCC ID: ACJ9TGWW11A** installed in a Panasonic Toughbook Model: FZ-G1. The test data contained in this report pertains only to the emissions due to the EUT's TD-CDMA licensed transmitter operating in the EBS/BRS band specified in 27.5(i)(2).

### 2.2 Device Capabilities



TD-CDMA operation is possible in 5MHz and 10MHz channel bandwidths. The maximum achievable duty cycles for all modes of operation were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles for all channel bandwidths and modulations was 95.79%.

### 2.3 Test Configuration

The Panasonic TD-CDMA Module FCC ID: ACJ9TGWW11A was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 v02r01. See Section 6.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

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

No EMI suppression device(s) were added and no modifications were made during testing.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-C-2004) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 v02r01) were used in the measurement of the **Panasonic TD-CDMA Module FCC ID: ACJ9TGWW11A**.

**Deviation from Measurement Procedure.....None**

### 3.2 Radiated Measurements

§2.1053, §27.50(h)(2) §27.53(m); RSS-199(4.4), RSS-199(4.5)

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A 3/4" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.



The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. For the EUT positioning, “H” is defined with the EUT lying flat on the test surface, “H2” is defined with the EUT standing up on its side, and “V” is defined with the EUT standing upright.

Per the guidance of ANSI/TIA-603-C-2004, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss} \text{ [dB]} + \text{antenna gain} \text{ [dBd/dBi]}$$

Where,  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to  $P_g \text{ [dBm]} - \text{cable loss} \text{ [dB]}$ .

Radiated power levels are investigated with the receive antenna vertically polarized while radiated spurious emissions levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-C-2004.



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## 4.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	3/29/2013	Annual	3/29/2014	N/A
-	RE2	Radiated Emissions Cable Set (VHF/UHF)	3/29/2013	Annual	3/29/2014	N/A
Agilent	8447D	Broadband Amplifier	5/31/2013	Annual	5/31/2014	2443A01900
Agilent	E8267C	Vector Signal Generator	11/10/2011	Biennial	11/10/2013	US42340152
Anritsu	MA2411B	Pulse Sensor	10/19/2012	Annual	11/19/2013	1027293
Anritsu	ML2495A	Power Meter	10/11/2012	Annual	11/11/2013	1039008
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	6/26/2013	Annual	6/26/2014	121034
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/24/2013	Biennial	7/24/2015	125518
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	5/30/2012	Biennial	5/30/2014	135427
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	11/7/2012	Biennial	11/7/2014	128338
Mini-Circuits	VHF-3100+	High Pass Filter	1/17/2013	Annual	1/17/2014	30841
Mini-Circuits	SSG-4000HP	USB Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	PWR-SENS-4RMS	USB Power Sensor	4/17/2013	Annual	4/17/2014	11210140001
Mini-Circuits	TVA-11-422	RF Power Amp	N/A			QA1303002
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	5/31/2013	Annual	5/31/2014	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/31/2013	Annual	5/31/2014	100040
Rohde & Schwarz	ESU26	EMI Test Receiver	2/25/2013	Annual	2/25/2014	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/26/2012	Biennial	1/26/2014	A051107

**Table 4-1. Test Equipment**



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## 5.0 SAMPLE CALCULATIONS

### Spurious Radiated Emission

#### **Example: Spurious emission at 3700.40 MHz**

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was  $-81.0$  dBm. The gain of the substituted antenna is  $8.1$  dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of  $-81.0$  dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is  $2.0$  dB at  $3700.40$  MHz. So  $6.1$  dB is added to the signal generator reading of  $-30.9$  dBm yielding  $-24.80$  dBm. The fundamental EIRP was  $25.50$  dBm so this harmonic was  $25.50$  dBm  $- (-24.80) = 50.3$  dBc.

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## 6.0 TEST RESULTS

### 6.1 Summary



Company Name: Panasonic Corporation of North America  
 FCC ID: ACJ9TGWW11A  
 FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)  
 Mode(s): TD-CDMA

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
<b>TRANSMITTER MODE (TX)</b>						
27.50 (h)(2)	RSS-199 (4.4)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP	RADIATED	PASS	Section 6.2
2.1053, 27.53 (m)	RSS-199 (4.5)	Radiated Spurious Emissions	> 55 + log <sub>10</sub> (P[Watts]) for all out-of-band emissions		PASS	Section 6.3

**Table 6-1. Summary of Test Results**

**Notes:**

All channel bandwidths (5MHz, 10MHz) and modulations (QPSK, 16-QAM, 64-QAM) were investigated. The test results shown in the following sections represent the worst case emissions.

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## 6.2 Radiated Power (EIRP)

### §27.50(h)(2) RSS-199 (4.4)

#### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed via calculations. The conducted output powers were measured with a power meter while the transmitter was operating at maximum power. The EIRP is determined by adding the antenna gain (dBi) to the measured conducted power.

#### Test Procedures Used

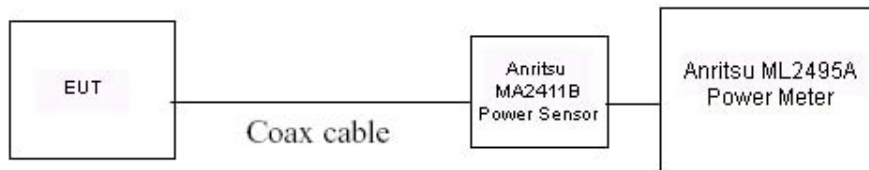
KDB 971168 v02r01 – Section 5.2.3

#### Test Settings

Power measurements are performed using a wideband RF average power meter that has gating/triggering capabilities to perform power measurements only during the transmitters' on-time.

#### Test Setup



The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 6-1. Test Instrument & Measurement Setup**



#### Test Notes

- 1) This device was tested at maximum power with QPSK, 16-QAM, and 64-QAM modulations.
- 2) This unit was tested with its standard battery.
- 3) The manufacturer declared antenna gain for this device is -2.99dBi.

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Frequency [MHz]	Modulation	Channel BW	Conducted Power [dBm]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
2498.8	QPSK	5	23.61	-2.99	20.62	0.115	33.01	-12.39
2593.0	QPSK	5	23.38	-2.99	20.39	0.109	33.01	-12.62
2687.2	QPSK	5	24.00	-2.99	<b>21.01</b>	<b>0.126</b>	33.01	-12.00
2498.8	16-QAM	5	23.58	-2.99	20.59	0.115	33.01	-12.42
2593.0	16-QAM	5	23.50	-2.99	20.51	0.112	33.01	-12.50
2687.2	16-QAM	5	23.61	-2.99	20.62	0.115	33.01	-12.39
2498.8	64-QAM	5	23.58	-2.99	20.59	0.115	33.01	-12.42
2593.0	64-QAM	5	23.48	-2.99	20.49	0.112	33.01	-12.52
2687.2	64-QAM	5	23.60	-2.99	20.61	0.115	33.01	-12.40
2501.4	QPSK	10	24.15	-2.99	<b>21.16</b>	<b>0.131</b>	33.01	-11.85
2593.0	QPSK	10	23.70	-2.99	20.71	0.118	33.01	-12.30
2684.6	QPSK	10	23.67	-2.99	20.68	0.117	33.01	-12.33
2501.4	16-QAM	10	23.70	-2.99	20.71	0.118	33.01	-12.30
2593.0	16-QAM	10	23.61	-2.99	20.62	0.115	33.01	-12.39
2684.6	16-QAM	10	23.72	-2.99	20.73	0.118	33.01	-12.28
2501.4	64-QAM	10	23.69	-2.99	20.70	0.117	33.01	-12.31
2593.0	64-QAM	10	23.74	-2.99	20.75	0.119	33.01	-12.26
2684.6	64-QAM	10	23.73	-2.99	20.74	0.119	33.01	-12.27

**Table 6-2. EIRP Calculations**

FCC ID: ACJ9TGWW11A		FCC Pt. 27 TD-CDMA MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
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## 6.3 Radiated Spurious Emissions Measurements

§2.1053, §27.53(m) RSS-199 (4.5)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 v02r01 – Section 5.8

ANSI/TIA-603-C-2004 – Section 2.2.12

### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq 3 \times$  RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq 2 \times$  span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

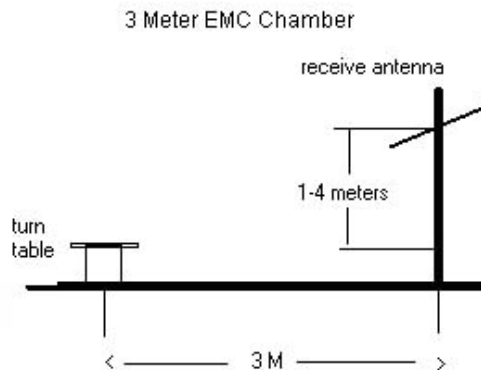






Figure 6-2. Test Instrument & Measurement Setup

FCC ID: ACJ9TGWW11A		FCC Pt. 27 TD-CDMA MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
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**Test Notes**

- 1) This device was tested at maximum power with QPSK, 16-QAM, and 64-QAM modulations.
- 2) This unit was tested with its standard battery.
- 3) The worst case test configuration was found in the EUT in the H2 position. The data reported in the table above was measured in this test setup.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 6) Peak levels at -125dBm represent the analyzer noise floor and signify that no emission was detected.

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OPERATING FREQUENCY: 2501.40 MHz  
 MEASURED OUTPUT POWER: 21.16 dBm = 0.131 W  
 MODULATION SIGNAL: QPSK  
 CHANNEL BW: 10 MHz  
 DISTANCE: 3 meters  
 LIMIT: -25.00 dBm



FREQUENCY (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	SPURIOUS EMISSION LEVEL (dBm)	EUT POL (H/V)	MARGIN (dB)
3330.50	-51.37	7.84	-43.53	H2	-18.53
5002.00	-56.51	10.04	-46.46	H2	-21.46
7503.00	-55.65	12.04	-43.61	H2	-18.61
10004.40	-77.09	13.13	-63.97	H2	-38.97
12505.80	-73.14	13.10	-60.04	H2	-35.04

**Table 6-3. Radiated Spurious Data (TD-CDMA, Low Channel)**

OPERATING FREQUENCY: 2593.00 MHz  
 MEASURED OUTPUT POWER: 20.71 dBm = 0.118 W  
 MODULATION SIGNAL: QPSK  
 CHANNEL BW: 10 MHz  
 DISTANCE: 3 meters  
 LIMIT: -25.00 dBm

FREQUENCY (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	SPURIOUS EMISSION LEVEL (dBm)	EUT POL (H/V)	MARGIN (dB)
3404.50	-49.56	8.07	-41.49	H2	-16.49
5186.00	-50.05	10.17	-39.87	H2	-14.87
7779.00	-56.13	12.25	-43.89	H2	-18.89
10372.00	-77.13	13.17	-63.97	H2	-38.97
12965.00	-73.30	13.26	-60.04	H2	-35.04



**Table 6-4. Radiated Spurious Data (TD-CDMA, Mid Channel)**

FCC ID: ACJ9TGWW11A		FCC Pt. 27 TD-CDMA MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1310172052.ACJ	Test Dates: 10/28 - 10/29/2013	EUT Type: TD-CDMA Module	Page 14 of 16	

OPERATING FREQUENCY: 2684.60 MHz  
 MEASURED OUTPUT POWER: 20.68 dBm = 0.117 W  
 MODULATION SIGNAL: QPSK  
 CHANNEL BW: 10 MHz  
 DISTANCE: 3 meters  
 LIMIT: -25.00 dBm



FREQUENCY (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	SPURIOUS EMISSION LEVEL (dBm)	EUT POL (H/V)	MARGIN (dB)
3327.50	-44.44	7.83	-36.61	H2	-11.61
5370.00	-47.21	10.31	-36.90	H2	-11.90
8055.00	-54.01	12.52	-41.49	H2	-16.49
10739.60	-76.87	12.90	-63.97	H2	-38.97
13424.20	-73.69	13.65	-60.04	H2	-35.04

Table 6-5. Radiated Spurious Data (TD-CDMA, High Channel)

FCC ID: ACJ9TGWW11A		FCC Pt. 27 TD-CDMA MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1310172052.ACJ	Test Dates: 10/28 - 10/29/2013	EUT Type: TD-CDMA Module	Page 15 of 16	

## 7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Panasonic TD-CDMA Module FCC ID: ACJ9TGWW11A** complies with all the requirements of Parts 2 and 27 of the FCC rules and RSS-199 of the Industry Canada rules.

FCC ID: ACJ9TGWW11A		<b>FCC Pt. 27 TD-CDMA MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Reviewed by:</b> Quality Manager
<b>Test Report S/N:</b> 0Y1310172052.ACJ	<b>Test Dates:</b> 10/28 - 10/29/2013	<b>EUT Type:</b> TD-CDMA Module	Page 16 of 16	