Nemko USA, Inc.
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San Diego, CA 92121-1024
Phone (858) 755-5525 Fax (858) 452-1810

CERTIFICATION TEST REPORT

PART 15.247, SUBPART C

RSS-210, ISSUE 6 - LOW POWER LICENSE EXEMPT RADIO-COMMUNICATION DEVICES (ALL FREQUENCY BANDS)

DECLARATION OF CONFORMANCE PROCEDURES
TEST REPORT

For The **LR-WPAN Module**
Model: Product Family "ZB-01" (PAN802154HAR00, PAN802154HARI0, PAN802154HAX00,PAN802154HAXI0, PAN802154XAR00, PAN802154XARI0, PAN802154XAX00, PAN802154XAXI0)

FCC ID: ACJ8GL- PAN802154
IC: 216A-PN802154

PREPARED FOR:

Panasonic Electronic Devices Corporation of America
7625 Panasonic Way
San Diego, CA 92154

PREPARED ON **8-30-05**
REPORT NUMBER: **2005 080471-FCC**
PROJECT NUMBER: **25-471-PAN**

Total Pages: 31

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	8-30-05	Prepared By: A. LAUDANI
-	8-30-05	Initial Release: F. Fleury

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on March 11, 2004. Testing was performed on the unit described in this report on March 11, 2004 to March 16, 2004.
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

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CERTIFICATION

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4-2003 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 15). The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample.

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.

Test Supervisor: *Chip Fleury*

Chip Fleury, Frontline Manager Nemko USA, Inc.

ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT: **Panasonic Electronic Devices Corporation of America**
7625 Panasonic Way
San Diego, CA 92154

CONTACT: Francisco Cardenas

DATE (S) OF TEST: August 29 to August 30, 2005

EQUIPMENT UNDER TEST (EUT): **LR-WPAN Module**

FCCID# ACJ8GL- PAN802154

Model: Product Family "ZB-01" (PAN802154HAR00, PAN802154HARI0, PAN802154HAX00,PAN802154HAXI0, PAN802154XAR00, PAN802154XARI0, PAN802154XAX00, PAN802154XAXI0)

Condition Upon Receipt Suitable for Test

TEST SPECIFICATION: FCC, Part 15.247, Subpart C, Spread Spectrum Direct Sequence

1.2. Test Summary

Specification	***Frequency Range***	***Compliance Status***
FCC CFR 47, §15.247 Plus Bandedge	2405-2480 MHz	PASS
RSS-210 - Low Power License Exempt Radio-communication Devices (All Frequency Bands)	2400-2483.5 MHz	PASS

Refer to the test results section for further details.

2. SYSTEM CONFIGURATION

The ENWC6101A is a **LR-WPAN Module. Its** function is a data transmitter. The EUT was exercised external command to select frequencies and modes (cw and digitally modulated) for testing.

2.1. System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - **LR-WPAN Module**	**Panasonic Electronic Devices Corporation of America** Model #: Product Family "ZB-01": PAN802154HAR00, PAN802154HARI0, PAN802154HAX00, PAN802154HAXI0, PAN802154XAR00, PAN802154XARI0, PAN802154XAX00, PAN802154XAXI0 Serial #: NA	N/A – Battery powered.

2.2. Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
No connections	

3. DESCRIPTION OF TEST SITE AND EQUIPMENT

3.1. Description of Test Site

The test site is located at 11696 Sorrento Valley Road, Suite F, San Diego, CA 92121. The site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications. The three and ten-meter Open Area Test Site (OATS) is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN 55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-2003 documents. The OATS normalized site attenuation characteristics are verified for compliance every year.

4. DESCRIPTION OF TESTING METHODS

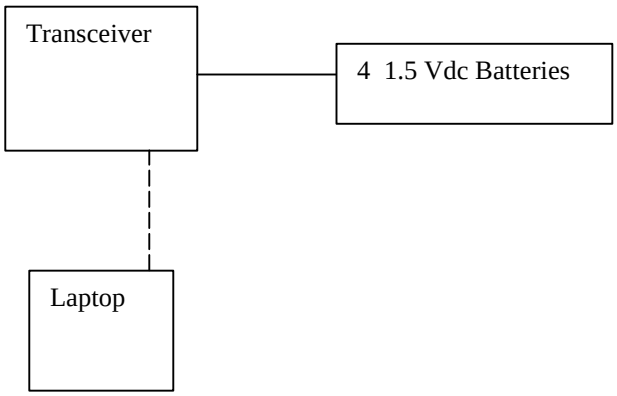
4.1. Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document C63.4-2003, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on the following page.

Digital devices sold in Canada are required to comply with the Interference Causing Equipment Standard for Digital Apparatus, ICES-003. These test methods and limits are specified in the Canadian Standards Association's (CSA) Standard C108.8-M1983 (1-1-94 version) and are "essentially equivalent" with FCC, Part 15 and CISPR 22 (EN55022) rules for unintentional radiators per EMCAB-3, Issue 3 (May 1998). No further testing is required for compliance to ICES-003.

Figure 1. General EUT Test Setup Diagram



NOT TO SCALE

Laptop used to set individual channels and modes for testing, and then removed from test setup.

4.2. Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Next, the EUT and associated system are placed on a turntable on a ten meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten meters from the EUT.

The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. All significant radiated emissions are recorded when maximum radiation on each frequency is observed, in accordance with part 8 of ANSI C63.4-2003 and Section 15.33 of the FCC Rules. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance.

The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/M
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dBm-1

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dBm-1 (antenna factor @ frequency)
36.9 dBuV/M Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

5. CFR 47 Part 15c §15.247 Test Results

15.247 (a)(2) Digital modulation techniques operating in the 2400-2483.5 MHz band. …The minimum 6 dB bandwidth shall be at least 500kHz.
EUT Complies

15.247(b)(3) For systems using Digital modulation techniques operating in the 2400-2483.5 MHz band. 1Watt.
EUT Complies. Radiated measurement of 102.3 dBuV/m at 3m or 7.04 dBm or 5.1 mW
Bandwidth correction factor due to bandwidth of 1.46 MHz so
1.46/1 X 0.0051 = 0.007 mW

$10^{[(\text{Field Strength in dBuV/m} - 120)/20]}$ = Field Strength in V/m
[(Field Strength in V/m x 3m)/5.48]^2 = Power in Watts 0.007 W
10 x log (Power in Wattts) + 30 = dBm
0.007 W >> 8.45 dBm

15.247(c) In any 100 kHz bandwidth outside the frequency band…the radio frequency power … shall be at least 20 dB below that … which contains the highest level of the desired power based on a radiated measurement. …Radiated emissions which fall in the restricted bands as defined in 15.205(a) must also comply with the radiated emission limits specified in 15.209(a).
EUT complies.

Emissions searched between 1000 MHz and 10 x Transmit frequencies 2405 to 2480 MHz or 24800 MHz. Varying the input voltage from 2.55 to 3.45 Volts doesn't affect RF output power.

5.1. Radiated Power, Spurious Emissions and Peak Power Density

Product Family "ZB-01" (PAN802154HAR00, PAN802154HARI0, PAN802154HAX00,PAN802154HAXI0, PAN802154XAR00, PAN802154XARI0, PAN802154XAX00, PAN802154XAXI0)

Working Model number was PAN802154.

Radiated emissions based on Duty Cycle Factor

Radiated Emissions Data

Complete	YES			Job # : 25-471-PAN	Test # : 1
Preliminary				Page 1	of 1
Client Name :	Panasonic Electronic Devices of America				
EUT Name :	LR-WPAN Module				
EUT Model # :	PAN802154				
EUT ANTENNA Part # :					
EUT Serial # :					
EUT Config. :	Transmit OPSK				
	Emissions were searched for between 1000 MHz and 24.4835 GHz. Emissions found below reported.				
Specification :	FCC Part 15.247C, 15.209, 15.205(a)			Reference :	
Rod. Ant. #:	NA	Temp. (deg. C) :	31	Date :	Aug. 29, 2005
Bicon Ant.#:	NA	Humidity (%) :	45	Staff :	A. Laudani
Log Ant.#:	na	EUT Voltage :	3 Vdc		
DRG Ant. #	529	EUT Frequency :	na		
Dipole Ant.#:	NA	Phase:	na	Peak Res Bandwidth:	1 MHz
Cable#:	60ft	Location:	SOATS	Peak Video Bandwidth	1 MHz
Preamp#:	842	Distance:	3M		
Spec An.#:	835	Duty cycle factor	-20		
QP #:	NA				
PreSelect#:	NA				

Meas. Freq. (MHz)	Vertical (dBuV) pk	Vertical (dBuV) av	Horizontal (dBuV) pk	Horizontal (dBuV) av	CF (db)	Max Level (dBuV/m) pk	Max Level (dBuV/m) av	Spec. Limit (dBuV/m) pk	Spec. Limit (dBuV/m) av	Margin dB pk	Margin dB av	EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
2405.0	66.7		57.4		35.6	102.3		116.2		-13.9		30	1.2	Pass	
4810.0	55.6	35.6	56.3	36.3	-0.8	55.5	35.5	74.0	54.0	-18.5	-18.5	30	1.2	Pass	
7215.0	58.8	38.8	51.8	31.8	6.0	64.8	44.8	82.3	62.3	-17.5	-17.5	30	1.2	Pass	
9620.0	36.6	16.6	36.6	16.6	14.8	51.4	31.4	74.0	54.0	-22.6	-22.6	30	1.2	Pass	
2439.97	65.6		56.2		35.6	101.2		116.2		-15.0		90	1.1	Pass	
4879.94	58.2	38.2	57.8	37.8	-0.8	57.4	37.4	74.0	54.0	-16.6	-16.6	30	1.3	Pass	
7319.91	58.9	38.9	52.2	32.2	6.0	64.9	44.9	74.0	54.0	-9.1	-9.1	30	1.2	Pass	
9759.88	39.2	19.2	35.7	15.7	14.8	54.0	34.0	81.2	61.2	-27.2	-27.2	30	1.2	Pass	
12199.85	35.6	15.6	36.7	16.7	22.5	59.2	39.2	74.0	54.0	-14.8	-14.8	30	1.2	Pass	
2480.0	62.3		57.4		35.6	97.9		116.2		-18.3		90	1.1	Pass	
4960.0	67.7	47.7	62.3	42.3	-0.8	66.9	46.9	74.0	54.0	-7.1	-7.1	30	1.3	Pass	
7440.0	52.7	32.7	45.5	25.5	6.0	58.7	38.7	74.0	54.0	-15.3	-15.3	30	1.2	Pass	
9920.0	38.9	18.9	37.8	17.8	14.8	53.7	33.7	77.9	57.9	-24.2	-24.2	30	1.2	Pass	

Radiated emissions based on continuous RF envelope using OPSK

15.247(d) The peak power density *conducte*d from the intentional radiated to the antenna shall not be greater than 8 dBm. This is not possible to measure as the antenna is integral with the module. Radiated results shown. After maximizing with the turntable and antenna height at the RBW of 1 MHz, the resolution bandwidth was reset to 3 kHz and analyzer set to zero span. Frequency and amplitude were determined. dBuV/m were changed to dBm via the EIRP formula (above). EUT Complies

Radiated Emissions Data

Complete: YES
Preliminary:
Job # : 25-471-PAN Test # : 1
Page 1 of 1

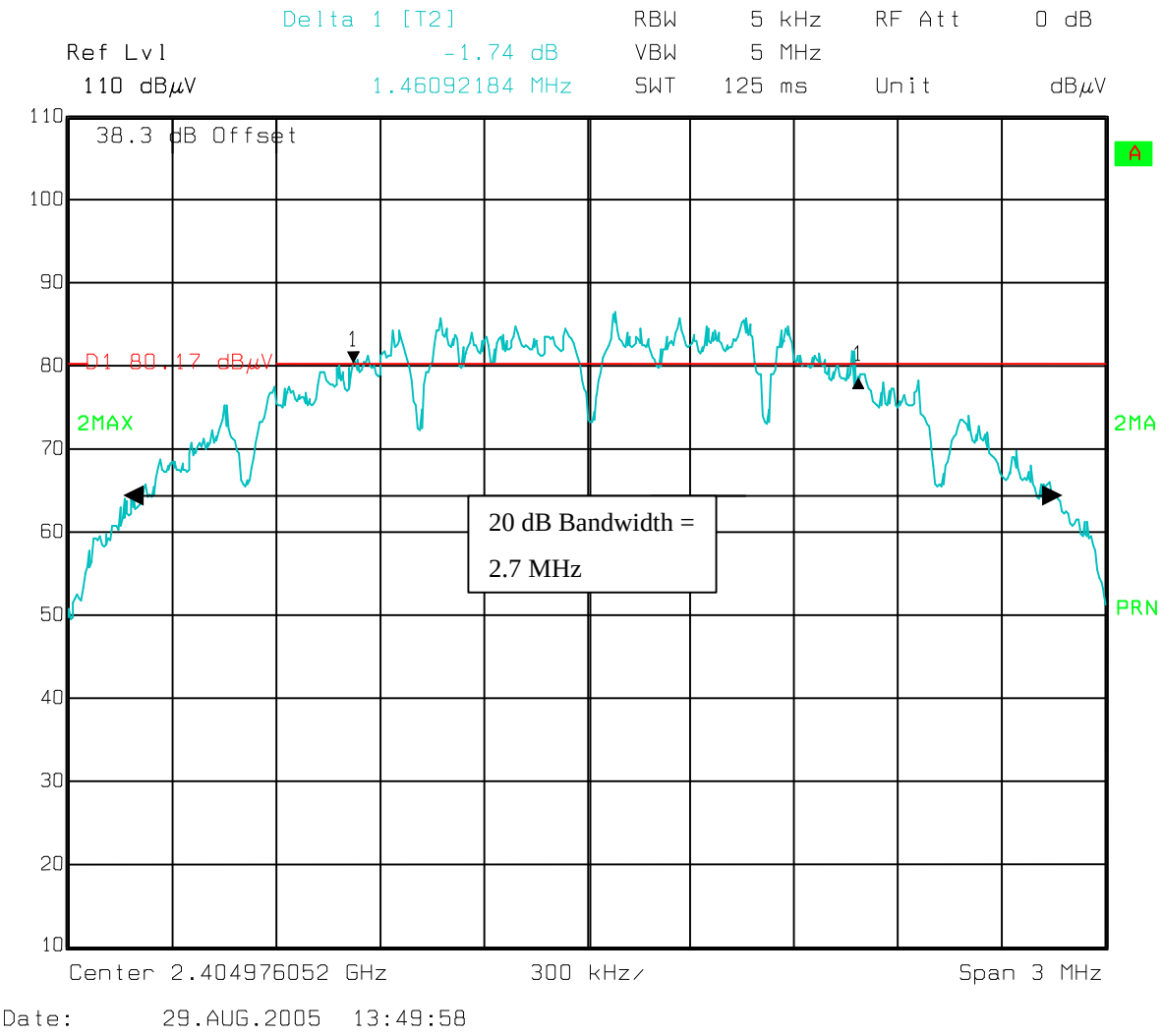
Client Name : Panasonic Electronic Devices of America
EUT Name : LR-WPAN Module
EUT Model # : PAN802154
EUT ANTENNA Part # :
EUT Serial # :
EUT Config. : Transmit OPSK
Emissions were searched for between 1000 MHz and 24.4835 GHz. Emissions found below reported.
Specification : FCC Part 15.247C, 15.209, 15.205(a)
Reference :
Rod. Ant. #: NA
Bicon Ant.#: NA
Log Ant.#: na
DRG Ant. # 529
Dipole Ant.#: NA
Cable#: 60ft
Preamp#: 842
Spec An.#: 835
QP #: NA
PreSelect#: NA
Temp. (deg. C) : 31
Humidity (%) : 45
EUT Voltage : 3 Vdc
EUT Frequency : na
Phase: na
Location: SOATS
Distance: 3M
Date : Aug. 29, 2005
Staff : A. Laudani
Peak Res Bandwidth: 1 MHz
Peak Video Bandwidth 1 MHz
AVE Res Bandwidth: 1 MHz
AVE Video Bandwidth 10 Hz

Meas. Freq. (MHz)	Vertical (dBuV) pk	Vertical (dBuV) av	Horizontal (dBuV) pk	Horizontal (dBuV) av	CF (db)	Max Level (dBuV/m) pk	Max Level (dBuV/m) av	Spec. Limit (dBuV/m) pk	Spec. Limit (dBuV/m) av	Margin dB pk	Margin dB av	EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
2405.0	66.7		57.4		35.6	102.3		116.2		-13.9		30	1.2	Pass	
4810.0	55.6	35.6	56.3	36.3	-0.8	55.5	35.5	74.0	54.0	-18.5	-18.5	30	1.2	Pass	
7215.0	58.8	38.8	51.8	31.8	6.0	64.8	44.8	82.3	62.3	-17.5	-17.5	30	1.2	Pass	
9620.0	36.6	16.6	36.6	16.6	14.8	51.4	31.4	74.0	54.0	-22.6	-22.6	30	1.2	Pass	
2439.97	65.6		56.2		35.6	101.2		116.2		-15.0		90	1.1	Pass	
4879.94	58.2	38.2	57.8	37.8	-0.8	57.4	37.4	74.0	54.0	-16.6	-16.6	30	1.3	Pass	
7319.91	58.9	38.9	52.2	32.2	6.0	64.9	44.9	74.0	54.0	-9.1	-9.1	30	1.2	Pass	
9759.88	39.2	19.2	35.7	15.7	14.8	54.0	34.0	81.2	61.2	-27.2	-27.2	30	1.2	Pass	
12199.85	35.6	15.6	36.7	16.7	22.5	59.2	39.2	74.0	54.0	-14.8	-14.8	30	1.2	Pass	
2480.0	62.3		57.4		35.6	97.9		116.2		-18.3		90	1.1	Pass	
4960.0	67.7	47.7	62.3	42.3	-0.8	66.9	46.9	74.0	54.0	-7.1	-7.1	30	1.3	Pass	
7440.0	52.7	32.7	45.5	25.5	6.0	58.7	38.7	74.0	54.0	-15.3	-15.3	30	1.2	Pass	
9920.0	38.9	18.9	37.8	17.8	14.8	53.7	33.7	77.9	57.9	-24.2	-24.2	30	1.2	Pass	
						dBm									3 kHz peak power density
2405.2	54.4		45.9		35.6	-5.3		8.0		-13.3		90	1.1	Pass	
2439.4	53.4		48.7		35.6	-6.3		8.0		-14.3		90	1.1	Pass	
2480.2	49.8		45.5		35.6	-9.9		8.0		-17.9		90	1.1	Pass	

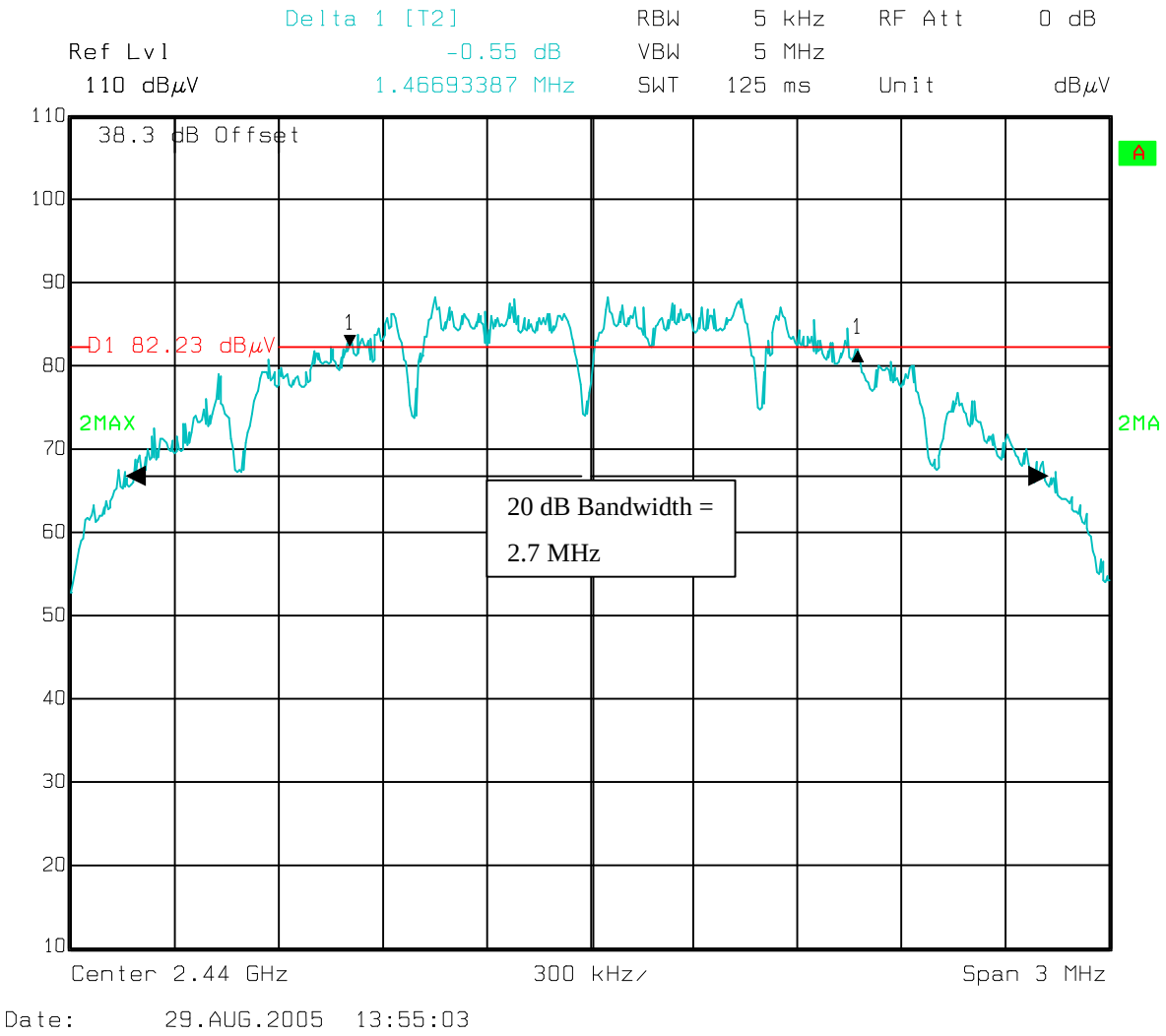
5.2. Plots for 6 dB Bandwidth

15.247 (a)(2) Digital modulation techniques operating in the 2400-2483.5 MHz band. …The minimum 6 dB bandwidth shall be at least 500kHz.

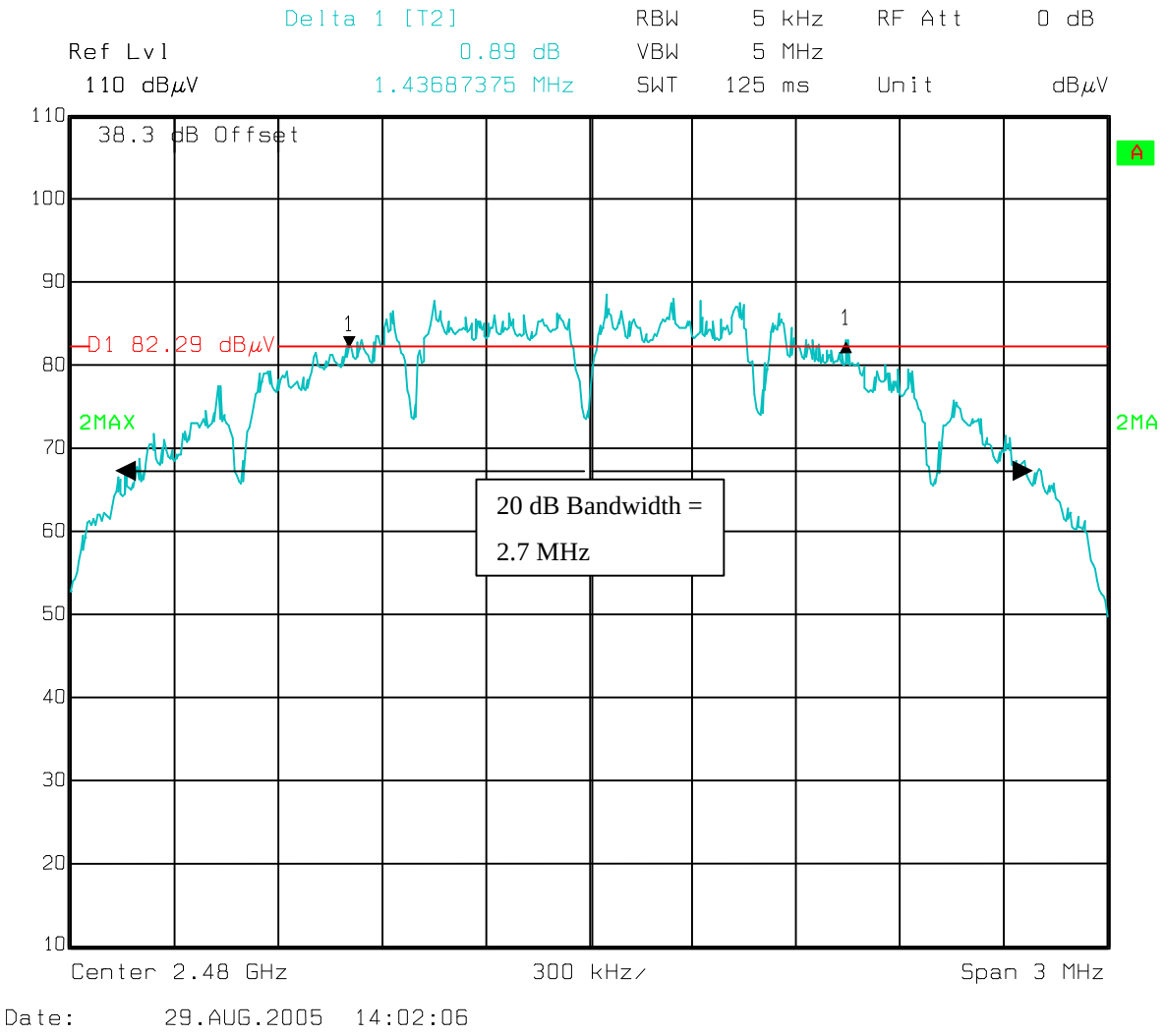
6 dB Bandwidth Low Channel



6 dB Bandwidth Mid Channel



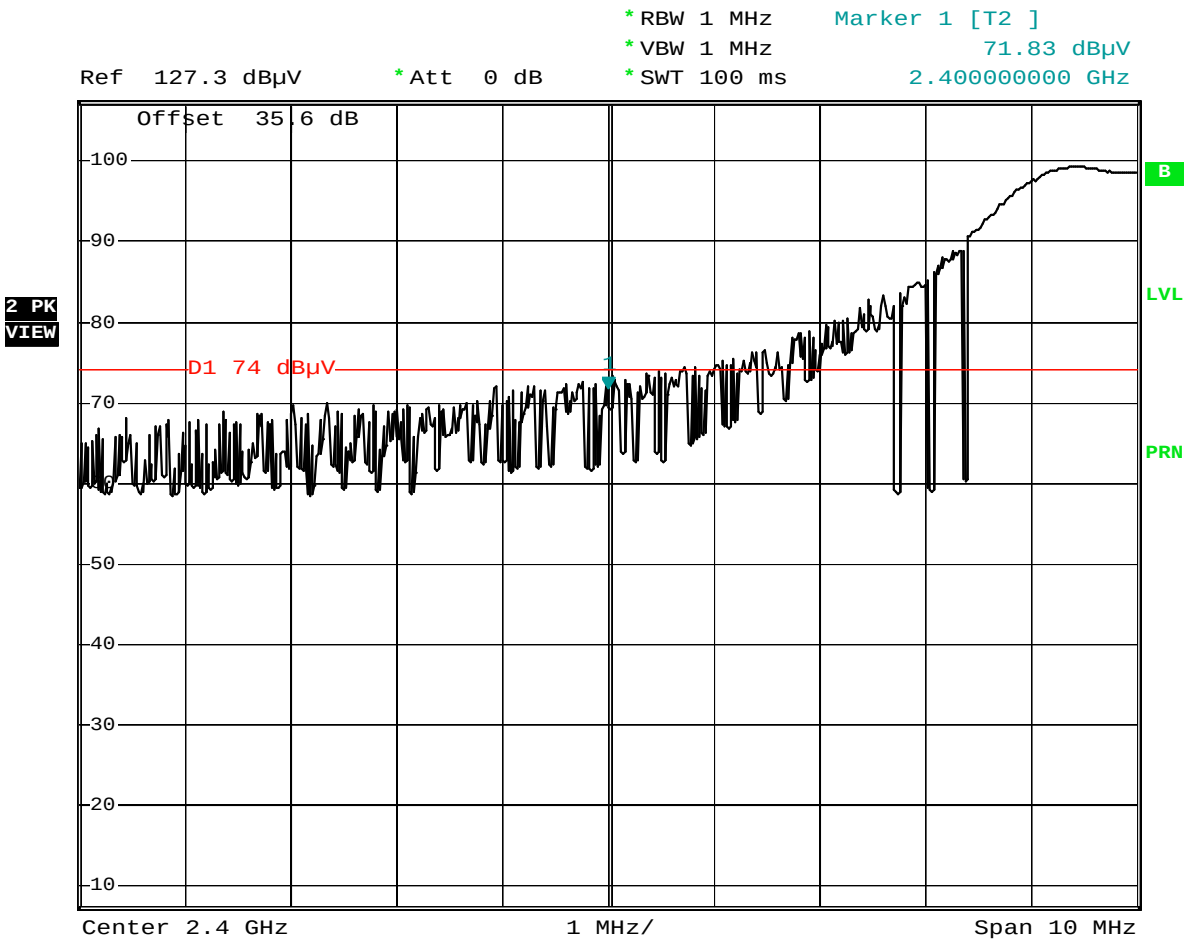
6 dB Bandwidth High Channel



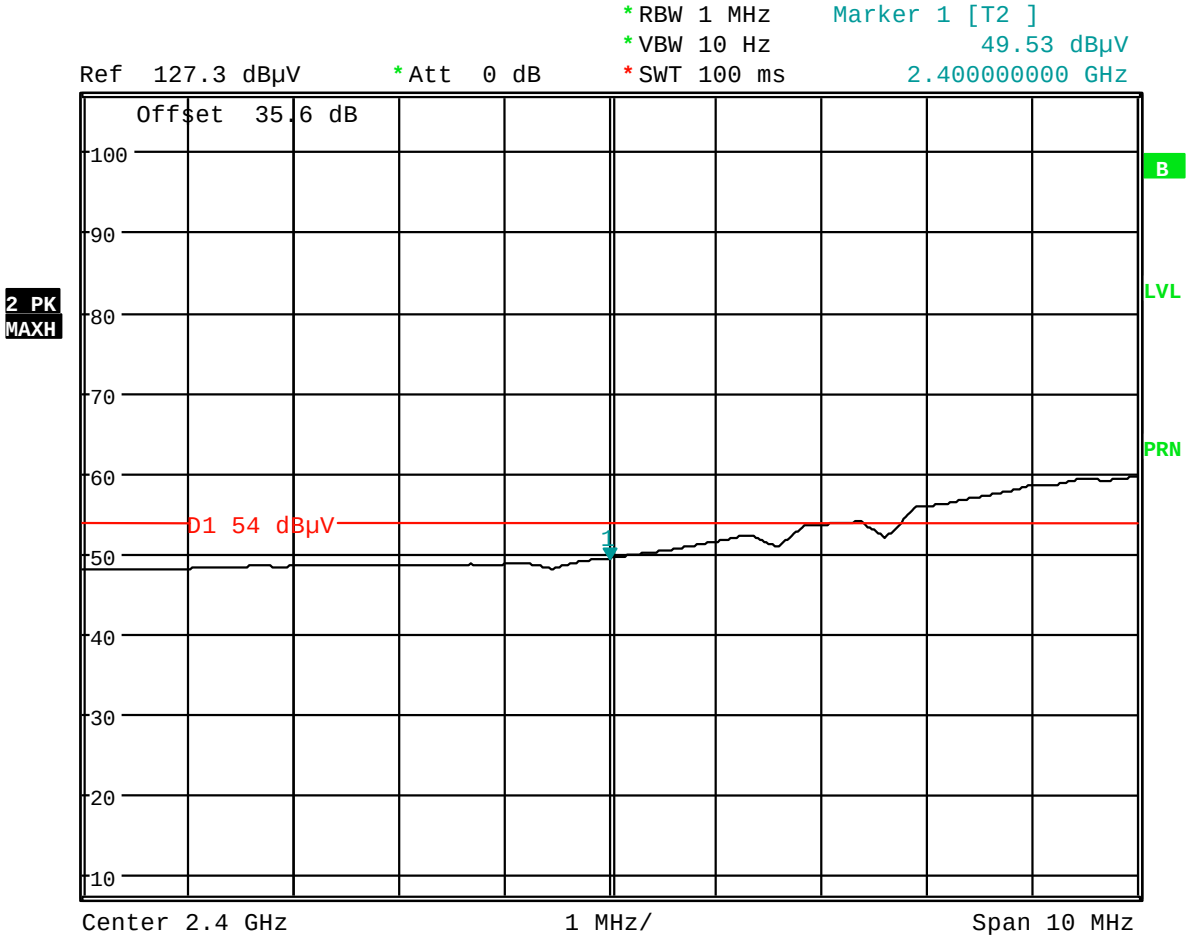
5.3. Plots for Band-edge Compliance

Due to bandedge frequency is more than 2 bandwidths away from nearest channel frequency, direct measurements were made at plots shown below.

Peak – Lower band edge.

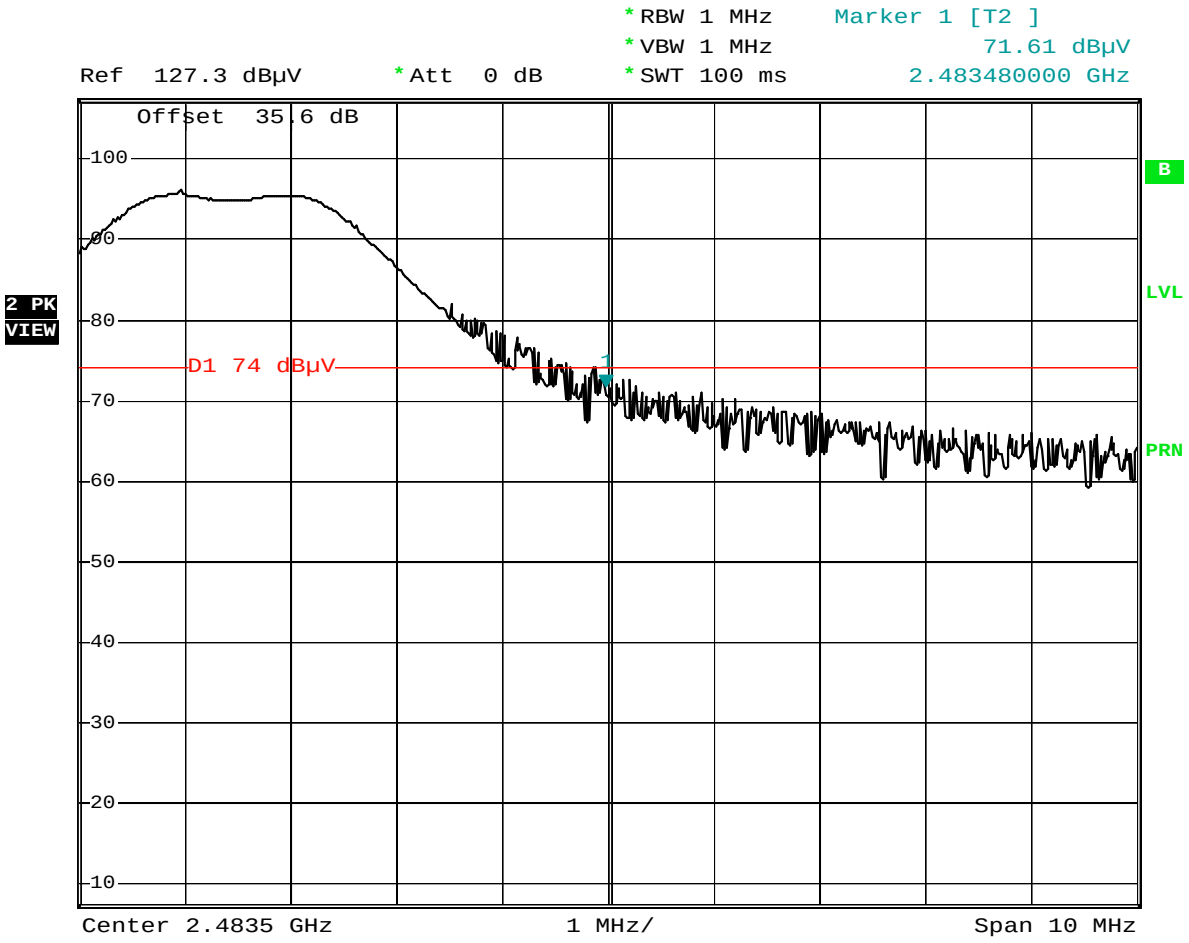


Average – Lower band edge.



Date: 1.SEP.2005 15:06:14

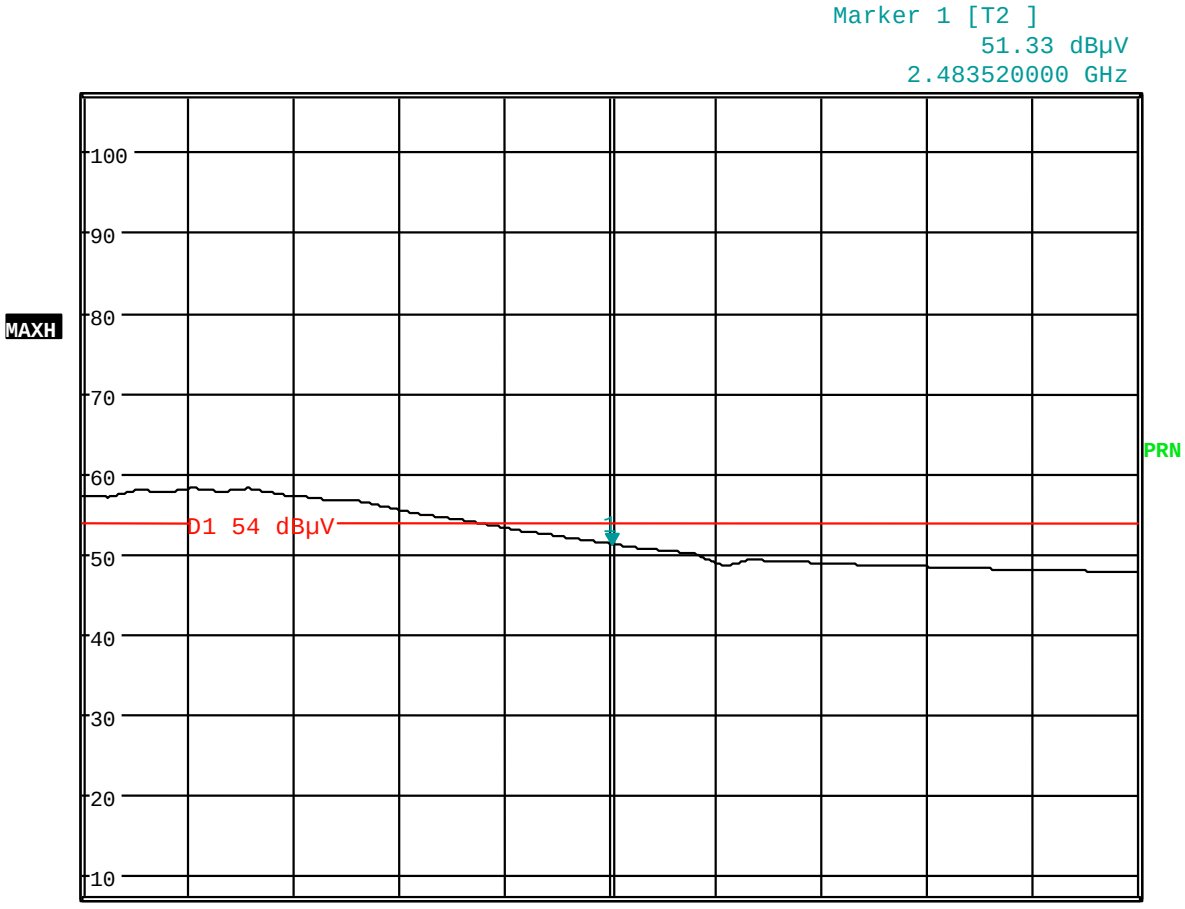
Peak – Upper band edge.



Date: 1.SEP.2005 14:49:42

Average – Upper band edge

Average with Duty Cycle Factor: 71.61 – 20 = 51.61 < 54, EUT Complies

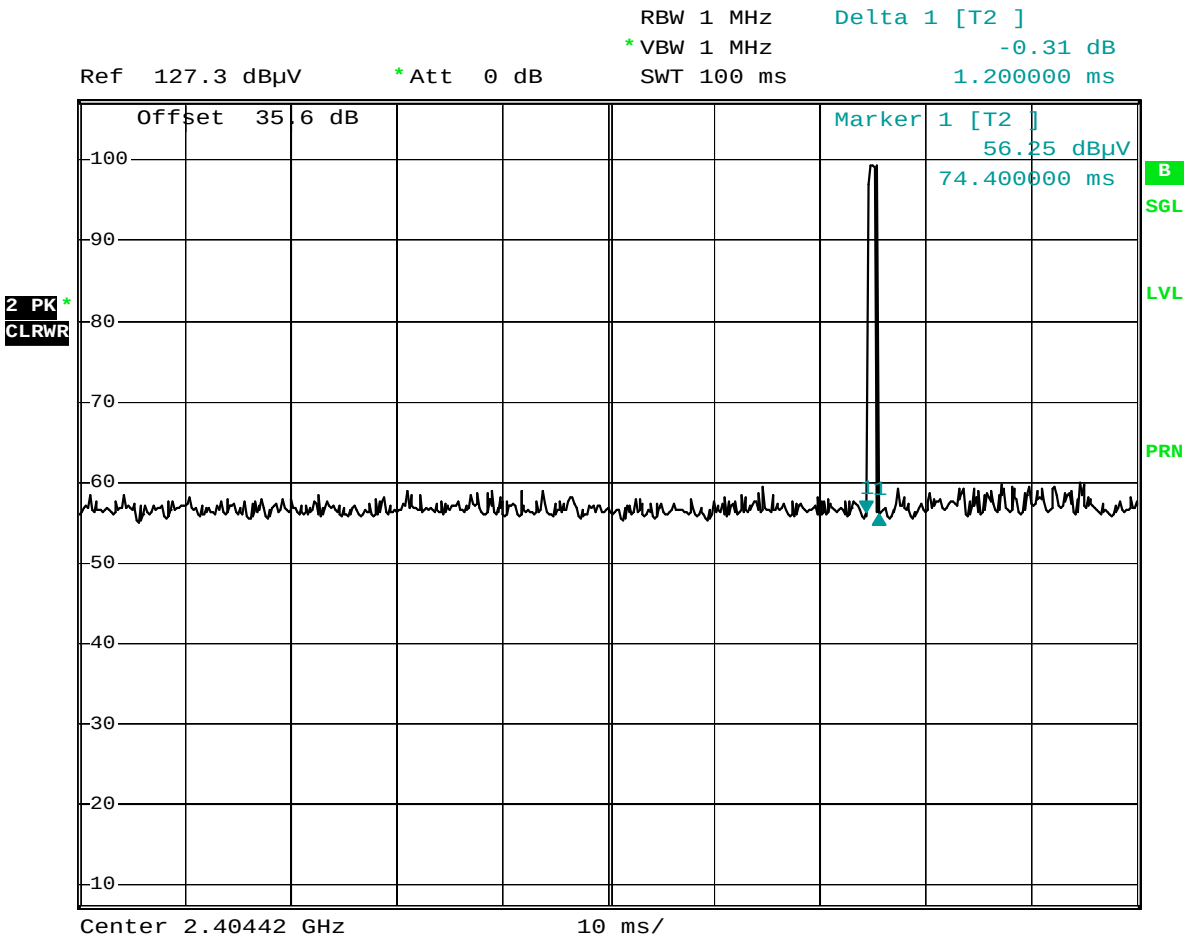


Date: 1.SEP.2005 14:51:01

5.4. Plot for Duty Cycle -- OPSK constant RF envelope

Duty cycle = 1.2 % = 1.2 ms/100ms

Duty cycle factor = 20 x log (0.012) = -38.4 dB, but we are limited to -20 dB by FCC rule.



Date: 1.SEP.2005 14:58:22

5.5. Radiated Emissions 30 MHz to 1000 MHz.

Transmit mode

Radiated Emissions Data

Complete x — Job # : 25-471-PAN — Test # : 1
Preliminary — Page 1 — of 1

Client Name : Panasonic Electronic Devices of America
EUT Name : LR-WPAN Module
EUT Model # : ENWC6101A
EUT Part # :
EUT Serial # :
EUT Config. : transmit mid frequency

Specification : CFR47 Part 15, Subpart B, Class B — Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	21	Date :	9/1/2005
Bicon Ant.#:	115	Humidity (%) :	75	Time :	
Log Ant.#:	112	EUT Voltage :	battery	Staff :	A. Laudani
DRG Ant. #	NA	EUT Frequency :	na	Photo ID:	
Dipole Ant.#:	NA	Phase:	na	Peak Bandwidth:	100 kHz
Cable#:	noats	Location:	NOATS	Video Bandwidth	100 kHz
Preamp#:	827	Distance:	3m		
Spec An.#:	897				
QP #:	897				
PreSelect#:	NA				

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
47.4	v	0	40	11.7	1.0	32.6	20.1	40.0	-19.9	Pass	
120	v	0	32.6	14.1	2.0	32.6	16.1	43.5	-27.4	Pass	
177	v	0	31.4	16.4	2.1	32.7	17.2	43.5	-26.3	Pass	
384	h	0	28.8	14.6	3.5	33.0	13.9	46.0	-32.1	Pass	
416	h	0	38.4	14.9	3.6	32.9	24.0	46.0	-22.0	Pass	
448	h	0	43.8	15.9	3.9	33.0	30.6	46.0	-15.4	Pass	

Receive mode

Radiated Emissions Data

Complete x — Job # : 25-471-PAN — Test # : 1
Preliminary — Page 1 of 1

Client Name : Panasonic Electronic Devices of America
EUT Name : LR-WPAN Module
EUT Model # : ENWC6101A
EUT Part # :
EUT Serial # :
EUT Config. : Receive mid frequency

Specification : CFR47 Part 15, Subpart B, Class B — Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	21	Date :	9/1/2005
Bicon Ant.#:	115	Humidity (%) :	75	Time :	
Log Ant.#:	112	EUT Voltage :	battery	Staff :	A. Laudani
DRG Ant. #	NA	EUT Frequency :	na	Photo ID:	
Dipole Ant.#:	NA	Phase:	na	Peak Bandwidth:	100 kHz
Cable#:	noats	Location:	NOATS	Video Bandwidth	100 kHz
Preamp#:	827	Distance:	3m		
Spec An.#:	897				
QP #:	897				
PreSelect#:	NA				

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
47.4	v	0	40	11.7	1.0	32.6	20.1	40.0	-19.9	Pass	
120	v	0	32.6	14.1	2.0	32.6	16.1	43.5	-27.4	Pass	
177	v	0	31.4	16.4	2.1	32.7	17.2	43.5	-26.3	Pass	
384	h	0	28.8	14.6	3.5	33.0	13.9	46.0	-32.1	Pass	
416	h	0	38.4	14.9	3.6	32.9	24.0	46.0	-22.0	Pass	
448	h	0	43.8	15.9	3.9	33.0	30.6	46.0	-15.4	Pass	

Transmit normal with serial data connected to laptop computer.

Radiated Emissions Data

Complete x — Job # : 25-471-PAN — Test # : 3
Preliminary — Page 1 of 1

Client Name : Panasonic Electronic Devices of America
EUT Name : LR-WPAN Module
EUT Model # : ENWC6101A
EUT Part # :
EUT Serial # :
EUT Config. : transmit mid frequency
Serial Cable and power brick
Specification : CFR47 Part 15, Subpart B, Class B — Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	21	Date :	10/14/2005
Bicon Ant.#:	115	Humidity (%) :	75	Time :	
Log Ant.#:	110	EUT Voltage :	120 Vac	Staff :	A. Laudani
DRG Ant. #	NA	EUT Frequency :	60 Hz	Photo ID:	
Dipole Ant.#:	NA	Phase:	1	Peak Bandwidth:	100 kHz
Cable#:	SOATS	Location:	SOATS	Video Bandwidth	100 kHz
Preamp#:	826	Distance:	3m		
Spec An.#:	897				
QP #:	897				
PreSelect#:	NA				

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
47.9	h	0	12	11.7	1.9	0.0	25.6	40.0	-14.4	Pass	
80	v	0	17.3	6.8	2.5	0.0	26.6	40.0	-13.4	Pass	
144	v	0	15.6	12.1	3.5	0.0	31.2	43.5	-12.3	Pass	
325	v	0	37.0	14.6	5.5	32.9	24.2	46.0	-21.8	Pass	
480	h	0	36.5	17.5	6.8	32.8	28.0	46.0	-18.0	Pass	
781	v	0	29.1	21.5	8.9	32.5	27.0	46.0	-19.0	Pass	

Emissions Test Equipment

Client	**Panasonic Electronic Devices Corporation of America**	EUT Name	**LR-WPAN Module**
PAN #	25-471-PAN	EUT Model	**ENWC6101A**

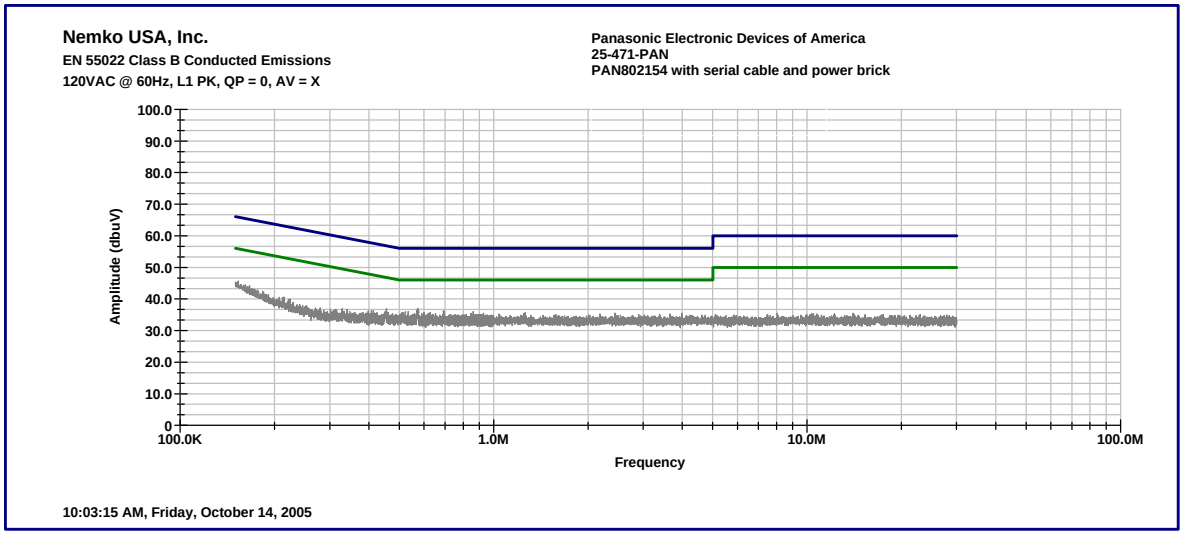
Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
835	Spectrum Analyzer, Rhode & Schwartz	RHDFSEK	829058/005	12/30/04	12/30/05
752	Antenna, DRWG, EMCO	3115	4943	12/29/04	12/29/05
842	Preamp	Nemko	na	5/19/05	verified
827	Preamplifier, Com-Power	PA-103	161032	10/22/04	10/22/05
897	Rohde & Schwartz, Spectrum Analyzer	FSP7	837620/009	4/18/05	4/18/06
529	Antenna, DRWG, EMCO	3115	2505	4/13/05	4/13/06
115	Antenna, Bicon, EMCO	3104	3020	2/3/05	2/3/06
112	Antenna, LPA, EMCO	3146	9101-2988	10/28/04	10/28/05
110	Antenna, LPA, Electrometrics	LPA-25	1217	10/4/04	10/4/05
826	Preamplifier, Com-Power	PA-103	161031	10/22/04	10/22/05
897	Rohde & Schwartz, Spectrum Analyzer	FSP7	837620/009	4/18/05	4/18/06

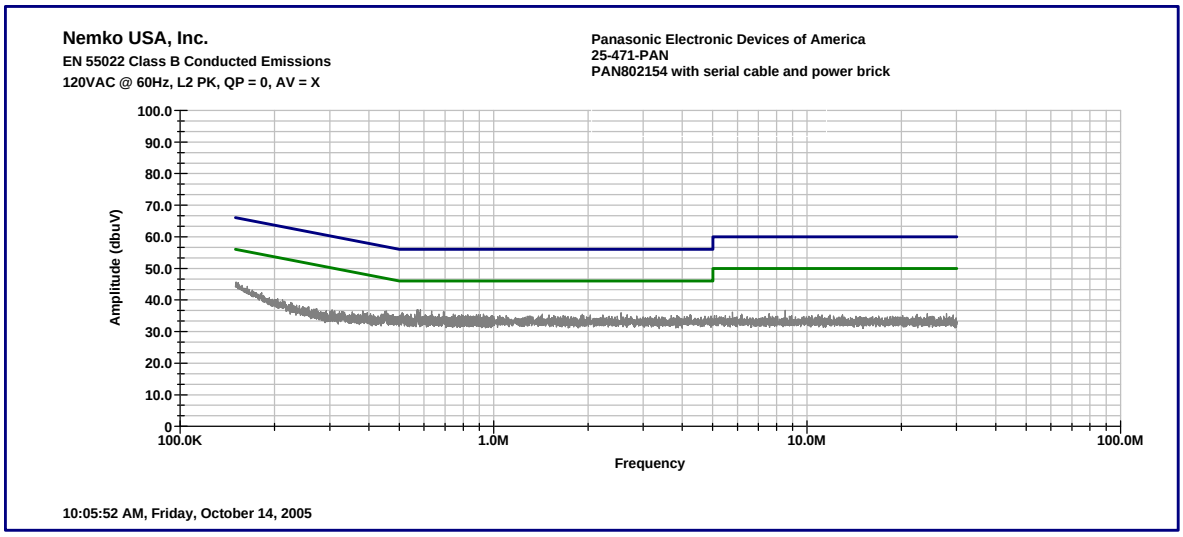
APPENDIX A

CONDUCTED EMISSIONS 15.207

when powered by a 3 V /120 Vac "Brick"

Power Supply: Radio Shack pn 273-1753 3V-500mA





72°F, 52% R.H.
Mode: Normal transmit with serial data link via a laptop computer.
Tested by A. Laudani

Conducted Test Equipment

Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
384	LISN, Solar	9348-50-R-24-BNC	941716	2/22/05	2/22/06
559	High Pass Filter, Solar	8310-1.0	844823	1/6/05	1/6/06
674	Spectrum Analyzer, HP	8568B	2007A00910	4/12/05	10/12/05
675	Spectrum Analyzer Display, HP	85662A	2005A01282	4/12/05	10/12/05
676	Quasi-Peak Adapter, HP	85650A	2430A00576	4/12/05	10/12/05
681	Transient Limiter, HP	11947A	3107A02634	5/25/05	5/25/06

APPENDIX B

B Conducted & Radiated Emissions Measurement Uncertainties

1. Introduction

ISO Standard 17025 and ANSI/NCSL Z540-1(1994) require that all measurements contained in a test report be "traceable". "Traceability" is defined in the *International Vocabulary of Basic and General Terms in Metrology* (ISO: 1993) as: "the property of the result of a measurement... whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, *all having stated uncertainties*".

The purposes of this Appendix are to "state the *Measurement Uncertainties*" of the conducted emissions and radiated emissions measurements contained in Section 5 of this Test Report, and to provide a practical explanation of the meaning of these measurement uncertainties.

2. Statement of the Worst-Case Measurement Uncertainties for the Conducted and Radiated Emissions Measurements Contained in This Test Report

Table 1: Worst-Case Expanded Uncertainty "U" of Measurement for a k=2 Coverage Factor

Conducted Emissions Measurement Detection Systems	**Applicable Frequency Range**	**"U" for a k=2 Coverage Factor**
HP8568B Spectrum Analyzer with QPA and HP8447F Preamplifier	150 kHz - 30 MHz	+/- 3.0 dB
HP8566B Spectrum Analyzer with QPA and Preselector	9 kHz - 30 MHz	+/- 2.9 dB
Radiated Emissions Measurement Detection Systems	**Applicable Frequency Range**	**"U" for a k=2 Coverage Factor**
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	30 MHz - 200 MHz	+4.0 dB, -4.1 dB
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	200 MHz-1000 MHz	+/- 3.5 dB
HP8566B Spectrum Analyzer with QPA & Preselector	30 MHz - 200 MHz	+3.9 dB, -4.0 dB
HP8566B Spectrum Analyzer with QPA & Preselector	200 MHz-1000 MHz	+/- 3.4 dB
HP8566B Spectrum Analyzer with QPA & HP 8449A Preamplifier	1 GHz - 18 GHz	+2.5 dB, -2.6 dB
HP8566B Spectrum Analyzer with QPA & HP8449A Preamplifier	18 GHz - 40 GHz	+/- 3.4 dB

NOTES:
1. Applies to 3 and 10 meter measurement distances
2. Applies to all valid combinations of Transducers (i.e. LISNs, Line Voltage Probes, and Antennas, as appropriate)
3. Excludes the Repeatability of the EUT

3. Practical Explanation of the Meaning of the Conducted and Radiated Emissions Measurement Uncertainties

In general, a "Statement of Measurement Uncertainty" means that with a certain (specified) confidence level, the "true" value of a measurand will be between a (stated) upper bound and a (stated) lower bound.

In the specific case of EMC Measurements in this test report, the measurement uncertainties of the conducted emissions measurements and the radiated emissions measurements have been calculated in accordance with the method detailed in the following documents:

- *ISO Guide to the Expression of Uncertainty in Measurement* (ISO, 1993)
- NIS 81:1994, *The Treatment of Uncertainty in EMC Measurements* (NAMAS, 1994)
- NIST Technical Note 1297(1994), *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (NIST, 1994)

The calculation method used in these documents requires that the stated uncertainty of the measurements be expressed as *an "expanded uncertainty", U, with a k=2 coverage factor*. The practical interpretation of this method of expressing measurement uncertainty is shown in the following example:

EXAMPLE: Assume that at 39.51 MHz, the (measured) radiated emissions level was equal to +26.5 dBuV/m, and that the +/- 2 standard deviations (i.e. 95% confidence level) measurement uncertainty was +/- 3.4 dB.

In the example above, the phrase "k = 2 Coverage Factor" simply means that the measurement uncertainty is stated to cover +/-2 standard deviations (i.e. a 95% confidence interval) about the measurand. The measurand is the radiated emissions measurement of +26.5 dBuV/m at 39.51 MHz, and the 95% bounds for the uncertainty are –3.4 dB to + 3.4 dB. One can thus be 95% confident that the "true" value of the radiated emissions measurement is between +23.1 dBuV/m and +29.5 dBuV/m. *In effect, this means that in the above example there is only a 2.5% chance that the "true" radiated emissions value exceeds +29.5 dBuV/m.*

APPENDIX C
Nemko USA, Inc.'s Test Equipment & Facilities Calibration Program

Nemko USA, Inc. operates a comprehensive Periodic Calibration Program in order to ensure the validity of all test data. Nemko USA's Periodic Calibration Program is fully compliant to the requirements of NVLAP Policy Guide PG-1-1988, ANSI/NCSL Z540-1 (1994), ISO 10012-1 (1993-05-01), ISO Standard 17025, ISO-9000 and EN 45001. Nemko USA, Inc.'s calibrations program therefore meets or exceed the US national commercial and military requirements [N.B. ANSI/NCSL Z540-1 (1994) replaces MIL-STD-45662A].

Specifically, all of Nemko USA's *primary reference standard devices* (e.g. vector voltmeters, multimeters, attenuators and terminations, RF power meters and their detector heads, oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, field-strength meters and their detector heads, etc.) and certain *secondary standard devices* (e.g. RF Preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are periodically recalibrated by:

- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratories by NIST; or,
- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratory by another accreditation body (such as A2LA) that is mutually recognized by NIST; or,
- A manufacturer of Measurement and Test Equipment (M&TE), if the manufacturer uses NIST-traceable standards and is ISO Guide 25-accredited as calibration laboratory either by NIST or by another accreditation body (such as A2LA) that is mutually recognized by NIST; or
- A manufacturer of M&TE (or by a Nemko USA-approved independent third party metrology laboratory) that is not ISO Guide 25-accredited. (In these cases, Nemko USA conducts an annual audit of the manufacturer or metrology laboratory for the purposes of proving traceabilty to NIST, ensuring that adequate and repeatable calibration procedures are being applied, and verifying conformity with the other requirements of ISO Guide 25).

In all cases, the entity performing the Calibration is required to furnish Nemko USA with a calibration test report and/or certificate of calibration, and a "calibration sticker" on each item of M&TE that is successfully calibrated.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval (e.g. the HP 8568B Spectrum Analyzer is recalibrated every six months) or if US Government directives or client requirements demand a shorter interval. Items of instrumentation/related equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either in-house [if minor] or by a Nemko USA-approved independent [third party] metrology laboratory, or by the manufacturer of the item of M&TE).

Each antenna used for CISPR 11 and CISPR 22 and FCC Part 15 and Part 18 radiated emissions testing (and for testing to the equivalent European Norms) is calibrated annually by either a NIST (or A2LA) ISO Standard 17025-Accredited third-party Antenna Calibration Laboratory or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory. The antenna calibrations are performed using the methods specified in Annex G.5 of CISPR 16-1(1993) or ANSI C63.5-1991, including the "Three-Antenna Method". Certain other kinds of antennas (e.g. magnetic-shielded loop antennas) are calibrated annually by either a NIST (or A2LA) ISO Standard 17025-accredited third-party antenna calibration laboratory, or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory using the procedures specified in the latest version of SAE ARP-958.

In accordance with FCC and other regulations, Nemko USA recalibrates its suite of antennas used for radiated emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko USA's Open Area Test Site. Nemko USA, Inc. uses the procedures given in both Subclause 16.6 and Annex G.2 of CISPR 16-1 (1993), and, ANSI C63.4-2003 when performing the normalized site attenuation measurements.