



Certification Test Report

CFR 47 FCC Part 15, Subpart C Section 15.247 Industry Canada RSS 210, Issue 7

Energy Aware Inc
PowerPortal PPH1-L

FCC ID # W72-PTSMILP1
IC # 8253-PTSMILP1
Project Code CG-1029

Report CG-1029-RA-1-2
Revision: 2
(Replaces report CG-1029-RA-1-1)

April 16, 2009

Prepared for: Energy Aware Inc

Author: Deniz Demirci
Senior Wireless/EMC Technologist

Approved by: Nick Kobrosly
Lab Manager

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Report Summary

Test Facility:	National Technical Systems, Canada Product Integrity Laboratory 5151-47 th Street, N.E. Calgary Alberta T3J 3R2
Accreditation Numbers:	FCC 101386 IC 3978A-1 Accredited by Standards Council of Canada Accredited Laboratory No. 440 Conforms with requirements of CAN-P-4D (ISO/IEC 17025) CLIENTS SERVED: All interested parties FIELDS OF TESTING: Electrical/Electronic, Mechanical/Physical ACCREDITATION DATE:: 2008-06-17 VALID TO: 2013-03-20
Applicant:	Energy Aware Technology Inc 604-134 Abbott Street Vancouver, BC. V6B 2K4 Tel: 604-638-7763 www.energy-aware.com
Customer Representative:	Name: Lauren Kulokas Title: Vice President, Operations Phone #: (604) 282-7698 Email Address: lauren.kulokas@energy-aware.com

EUT Description

EUT Description	Manufacturer	Model	Revision	Serial Number
802.15.4 Wireless transceiver	Energy Aware Technology Inc	PPH1-L	V1.3	(Z10) A010100010023-000 (Z4) A010121010016-000

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Test Summary

Appendix	Test/Requirement Description	Deviations* from:			Pass / Fail	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts
		Base Standard	Test Basis	NTS Procedure			
A	Power line Conducted Emission	No	No	No	Pass	FCC Subpart C 15.207 (a)	RSS-Gen Issue 2 7.2.2
B	6 dB Bandwidth	No	No	No	Pass	FCC Subpart C 15.247 (a) (2)	RSS 210 Issue 7 A8.2 (a)
C	Occupied Bandwidth (99% emission bandwidth)	No	No	No	N/A	N/A	RSS-Gen Issue 2 4.6.1
D	Peak Power Output	No	No	No	Pass	FCC Subpart C 15.247 (b) (3)	RSS 210 Issue 7 A8.4 (4)
E	Power Spectral Density	No	No	No	Pass	FCC Subpart C 15.247 (e)	RSS 210 Issue 7 A8.2 (b)
F	Duty Cycle Correction Factor	No	No	No	N/A	FCC Subpart C 15.35 (c)	RSS-Gen Issue 2 4.5
G	Conducted Spurious Emissions	No	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 7 A8.5
H	Conducted Spurious Emissions Band Edge	No	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 7 A8.5
I	Radiated Spurious Emissions Band Edge	No	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 7 2.6, A8.5
J	Radiated Spurious Emissions (TX and RX)	No	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 7 2.6, A8.5

Test Result: The product presented for testing complied with test requirements as shown above.

Prepared By:

Deniz Demirci
Senior Wireless/EMC Technologist

Reviewed By:

Glen Moore
Wireless/EMC Manager

Approved By:

Alex Mathews
Quality Management Representative

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Register of revisions

Revision	Date	Description of Revisions
1	April 7, 2009	Final release
2	April 16, 2009	Minor edits after Customer and TCB review

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Canada to demonstrate compliance of the PowerPortal PPH1-L from Energy Aware Technologies Inc to FCC Part 15 Subpart C section 15.247 for DTS transmitter and the equivalent sections of Industry Canada's RSS 210, Issue 7

2.0 EUT DESCRIPTION

2.1 CONFIGURATION

	Name	Model	Revision	Serial Number
EUT	Power Portal	PPH1-L	V1.3	(Z10) A010100010023-000 (Z4) A010121010016-000
Power Supply	5Vdc PS	S003HU0500050	N/A	N/A
Device Classification	Mobile			
Antenna	Integral chip antenna (3dBi peak gain)			
Modulation	0-QPSK			
EUT Size with Enclosure (H x W x D) (in mm)	110 x 80 x 30			
EUT Weight (in grams)	300			
Channels/Frequency Range	16 channels, 2405 MHz -2480 MHz			
Functional Description	<p>The PowerTab is an in-home display designed to help the utilities industry meet their need for increased communication and feedback to their customers.</p> <p>The PowerTab receives real time electricity consumption data wirelessly from a residential smart meter using the Zigbee Smart Energy Profile. Information displayed by the Powertab includes:</p> <ul style="list-style-type: none"> • Current electricity use in \$ or kWh • Accumulated use in \$ or kWh • Text messages or alerts from the service provider <p>The PowerTab features include:</p> <ul style="list-style-type: none"> • Large font LCD with clear, uncluttered menus • Rechargeable NiMH battery with wall charger • 3 colour LED lights used to indicate TOU periods, upcoming Demand Response Events or Critical Peak Pricing • Display symbols indicating current signal strength and battery life 			

2.1.1 EUT POWERS

Voltage	AA Type battery powered and/or 5Vdc 500mA switch mode power supply powered (120Vac 60Hz)
Number of Feeds	2

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2.2 EUT CABLES

Quantity	Model/Type	Routing		Shielded / Unshielded	Description	Cable Length (m)
		From	To			
1	DC Power Cable	Power Supply	EUT	Unshielded	Power Cable	1.9

2.3 MODE OF OPERATION DURING TESTS

The PowerPortal PPH1-L was tested while in Continuous Transmit and Receive modes. The EUT was tuned to a low, middle, and high channel to perform power, occupied bandwidth and spurious/harmonic tests. For AC conducted emissions the device was prescanned to determine the worst case test mode, final results are reported in this mode. While transmitting the EUT was setup to operate at the intended maximum power output (5 dBm conducted) available to the end user. For all Radiated tests the eut was tested in 3 orthogonal planes with the worst case results reported.

For all test cases pre-scans were completed in all modes to determine worst case levels.

3.0 SUPPORT EQUIPMENT

3.1 CONFIGURATION

Ember and InSight Desktop Beta 2.0 software used for configuring the device
No support equipment or peripherals are used with this equipment during the tests

3.2 TEST BED/PERIPHERAL CABLES

NA

4.0 TEST ENVIRONMENT

4.1 NORMAL TEST CONDITIONS

Temperature:	20 – 23 °C
Relative Humidity:	28 – 35 %
Atmospheric pressure:	883 – 890 mbar
Nominal test voltage:	120 VAC 60Hz

The values are the limits registered during the test period.

APPENDICES

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APPENDIX A: POWER LINE CONDUCTED EMISSION

A.1. Base Standard & Test Basis

Base Standard	FCC PART 15.207 (a) RSS-Gen Issue 2 7.2.2
Test Basis	ANSI C63.4-2003
Test Method	CAG EMC 02, Revision 1, Emission Test Methods

A.2. Specifications

Frequency	Limit	
	Quasi-Peak	Average
MHz	dBμV	dBμV
0.150 – 0.500	66 to 56 ¹	56 to 46 ¹
0.500 – 5.00	56	46
5.00 – 30.00	60	50

Note 1: decrease with the logarithm of the frequency

A.3. Test Procedure

ANSI C63.4-2003. The EUT was pre tested in all modes including low, mid and high channel with the worst case test results being reported.

A.4. Test Results

 Product Integrity Laboratory V2.5	Project Number: CG-1029	Tester: Lixin Wang																																																																																																																				
	Model: Energy Aware SMI T1	Test ID: CE02tc-10m-1029																																																																																																																				
	Comments: Conf04:Model:SMIT1, Unit # Z4 with enclosure, Ch11 (hex B), Tx power BOOST mode, Streaming random characters with 100% duty cycle, 120Vac 60Hz (sps# S003HU0500050)																																																																																																																					
Standard: FCC15_B																																																																																																																						
<table border="1"> <thead> <tr> <th>Voltage/Line</th> <th>Frequency (MHz)</th> <th>Measurement Detector</th> <th>Measured Value (dBμV)</th> <th>Correction Factors (dB)</th> <th>Emission Level (dBμV)</th> <th>Limit Type</th> <th>Limit (dBμV)</th> <th>Margin (dB)</th> </tr> </thead> <tbody> <tr> <td>AC 120V Line1A</td><td>0.181</td><td>QP</td><td>27.87</td><td>11.92</td><td>39.79</td><td>QP</td><td>64.44</td><td>24.65</td></tr> <tr> <td>AC 120V Line1A</td><td>0.587</td><td>QP</td><td>22.84</td><td>10.78</td><td>33.62</td><td>QP</td><td>56.00</td><td>22.38</td></tr> <tr> <td>AC 120V Line1A</td><td>2.985</td><td>QP</td><td>20.32</td><td>10.91</td><td>31.23</td><td>QP</td><td>56.00</td><td>24.77</td></tr> <tr> <td>AC 120V NeutralA</td><td>0.362</td><td>QP</td><td>27.84</td><td>10.91</td><td>38.75</td><td>QP</td><td>58.68</td><td>19.93</td></tr> <tr> <td>AC 120V NeutralA</td><td>0.498</td><td>QP</td><td>26.19</td><td>10.73</td><td>36.92</td><td>QP</td><td>56.04</td><td>19.12</td></tr> <tr> <td>AC 120V NeutralA</td><td>3.147</td><td>QP</td><td>22.08</td><td>10.83</td><td>32.91</td><td>QP</td><td>56.00</td><td>23.09</td></tr> <tr> <td>AC 120V Line1A</td><td>0.463</td><td>AV</td><td>15.55</td><td>10.86</td><td>26.41</td><td>AV</td><td>46.65</td><td>20.24</td></tr> <tr> <td>AC 120V Line1A</td><td>0.596</td><td>AV</td><td>15.70</td><td>10.78</td><td>26.48</td><td>AV</td><td>46.00</td><td>19.52</td></tr> <tr> <td>AC 120V Line1A</td><td>3.226</td><td>AV</td><td>14.74</td><td>10.91</td><td>25.65</td><td>AV</td><td>46.00</td><td>20.35</td></tr> <tr> <td>AC 120V NeutralA</td><td>0.361</td><td>AV</td><td>19.56</td><td>10.91</td><td>30.47</td><td>AV</td><td>48.70</td><td>18.23</td></tr> <tr> <td>AC 120V NeutralA</td><td>0.540</td><td>AV</td><td>17.30</td><td>10.73</td><td>28.03</td><td>AV</td><td>46.00</td><td>17.97</td></tr> <tr> <td>AC 120V NeutralA</td><td>3.051</td><td>AV</td><td>16.01</td><td>10.83</td><td>26.84</td><td>AV</td><td>46.00</td><td>19.16</td></tr> </tbody> </table>		Voltage/Line	Frequency (MHz)	Measurement Detector	Measured Value (dB μ V)	Correction Factors (dB)	Emission Level (dB μ V)	Limit Type	Limit (dB μ V)	Margin (dB)	AC 120V Line1A	0.181	QP	27.87	11.92	39.79	QP	64.44	24.65	AC 120V Line1A	0.587	QP	22.84	10.78	33.62	QP	56.00	22.38	AC 120V Line1A	2.985	QP	20.32	10.91	31.23	QP	56.00	24.77	AC 120V NeutralA	0.362	QP	27.84	10.91	38.75	QP	58.68	19.93	AC 120V NeutralA	0.498	QP	26.19	10.73	36.92	QP	56.04	19.12	AC 120V NeutralA	3.147	QP	22.08	10.83	32.91	QP	56.00	23.09	AC 120V Line1A	0.463	AV	15.55	10.86	26.41	AV	46.65	20.24	AC 120V Line1A	0.596	AV	15.70	10.78	26.48	AV	46.00	19.52	AC 120V Line1A	3.226	AV	14.74	10.91	25.65	AV	46.00	20.35	AC 120V NeutralA	0.361	AV	19.56	10.91	30.47	AV	48.70	18.23	AC 120V NeutralA	0.540	AV	17.30	10.73	28.03	AV	46.00	17.97	AC 120V NeutralA	3.051	AV	16.01	10.83	26.84	AV	46.00	19.16
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The highest emission measured was 28.38 dB μ V with average detector at 540 kHz. It has 17.97 dB margin to the FCC Part 15.207 and RSS-Gen Issue 2 7.2.2 limits.

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A.5. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1;
Quality Manual.

Name: Lixin Wang
Function: EMC Technologist

A.6. Test date

March 11, 2009

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Figure 1 Conducted Emission 120 VAC Line 150 kHz – 30 MHz Quasi-peak Detector

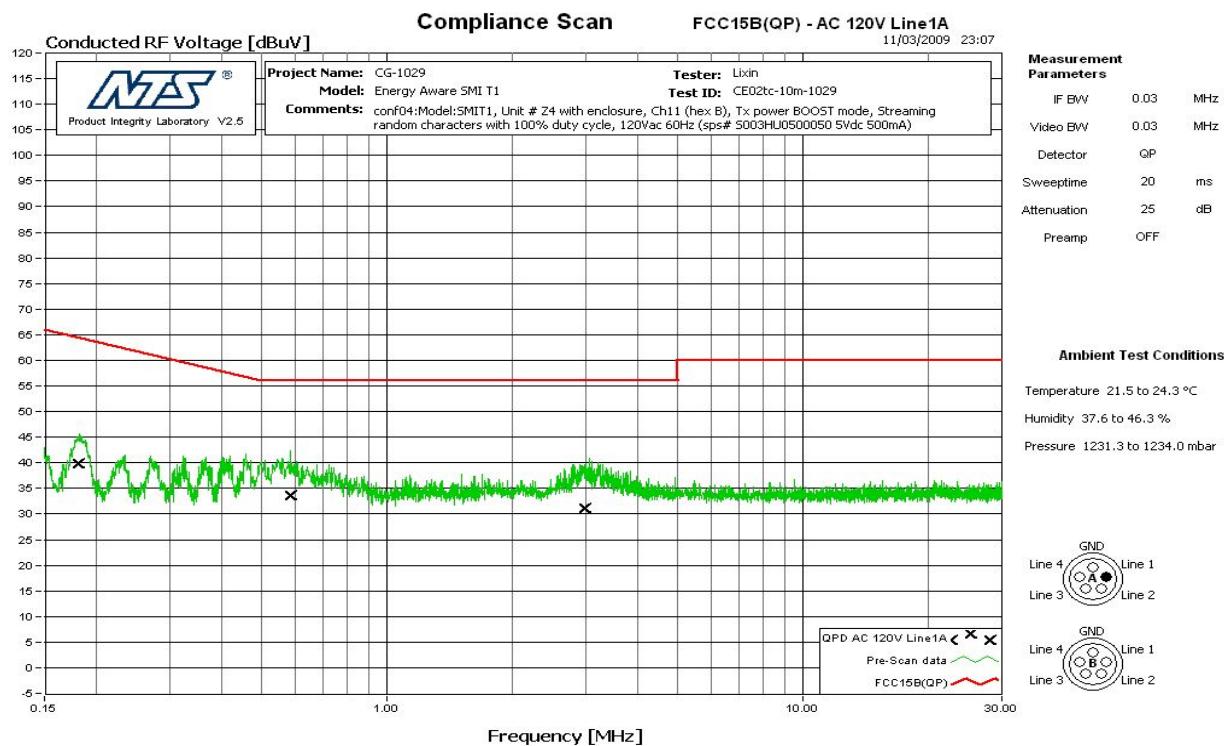
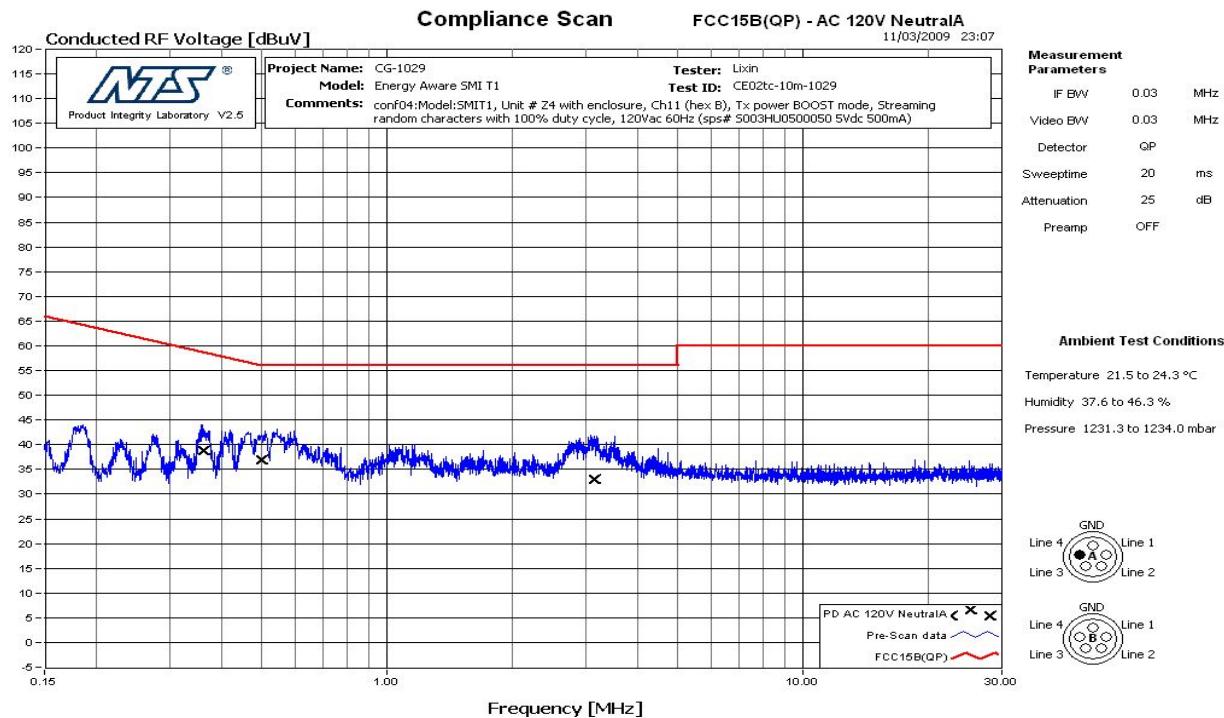


Figure 2 Conducted Emission 120 VAC Return 150 kHz – 30 MHz Quasi-peak Detector



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Figure 3 Conducted Emission 120 VAC Line 150 kHz – 30 MHz Average Detector

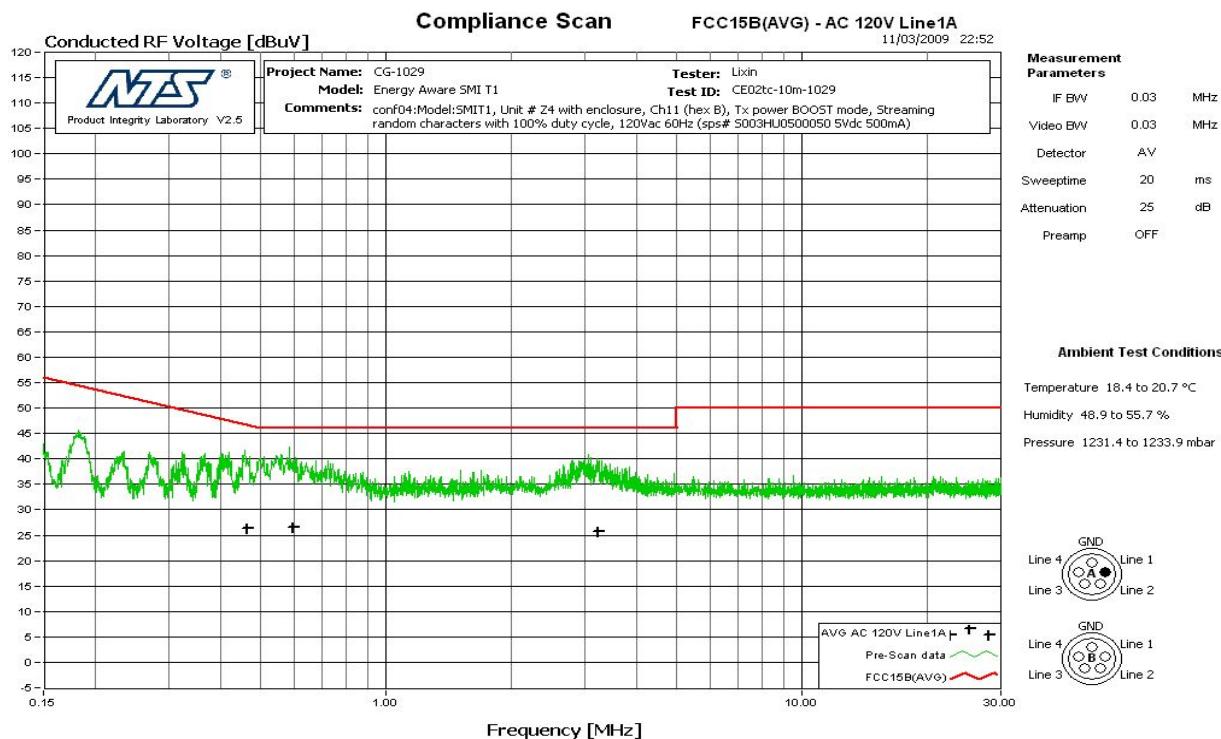
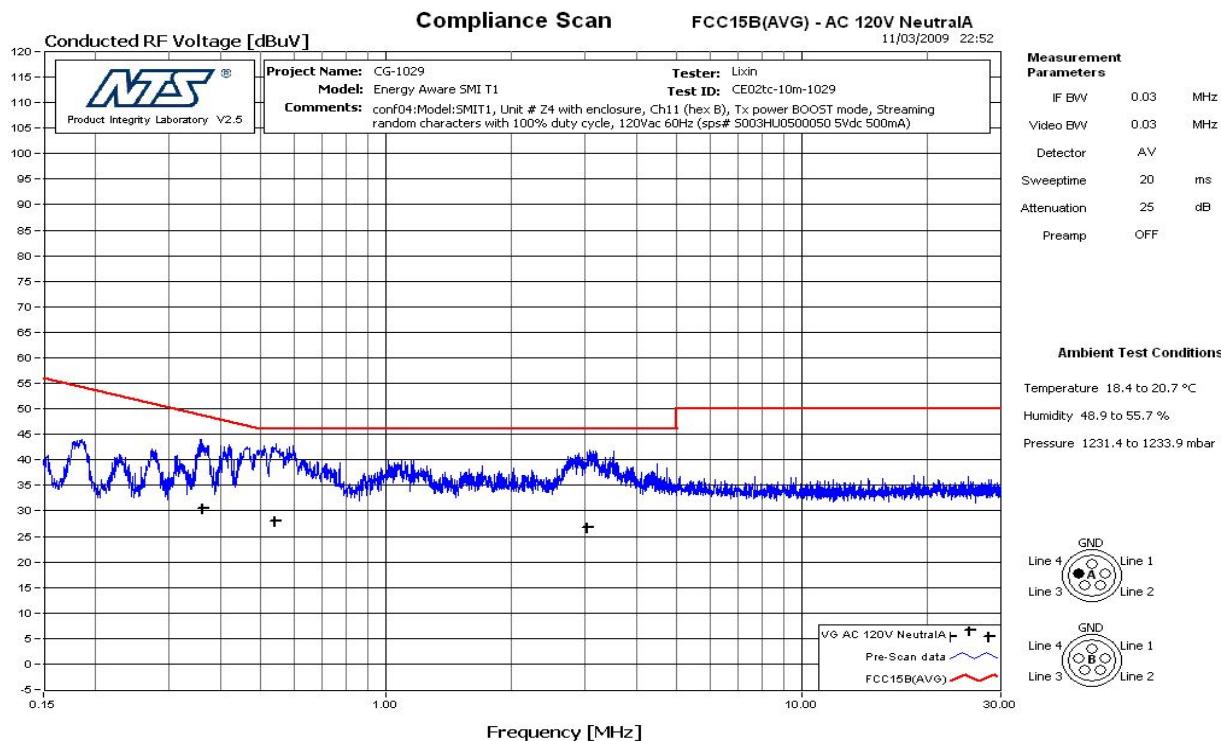


Figure 4 Conducted Emission 120 VAC Return 150 kHz – 30 MHz Average Detector



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APPENDIX B: 6 DB BANDWIDTH

B.1. Base Standard & Test Basis

Base Standard	FCC PART 15.247 (a) (2) RSS 210 Issue 7 A8.2 (a)
Test Basis	FCC Publication 558074 RSS-Gen Issue 2 4.6.2
Test Method	FCC Publication 558074 RSS 210 Issue 7 A8.2 (a)

B.2. Specifications

15.247 2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

B.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
None						

B.4. Test Procedure

FCC Publication 558074.

B.5. Test Results

The EUT is in compliance with the requirement as specified above

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
11	2405	1.643
18	2440	1.603
26	2480	1.603

All final reported values are corrected values.

B.6. Operating Mode During Test

The PowerPortal PPH1-L was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode).

B.7. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

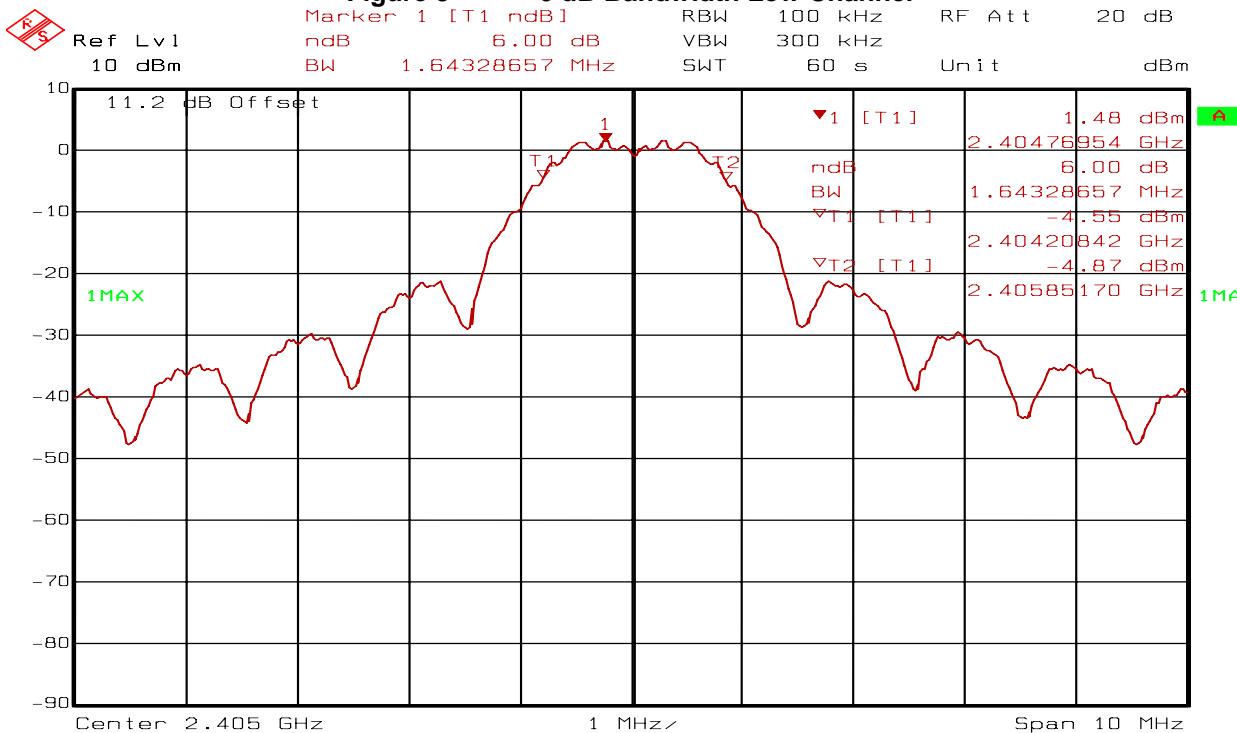
B.8. Test date

April 6, 2009

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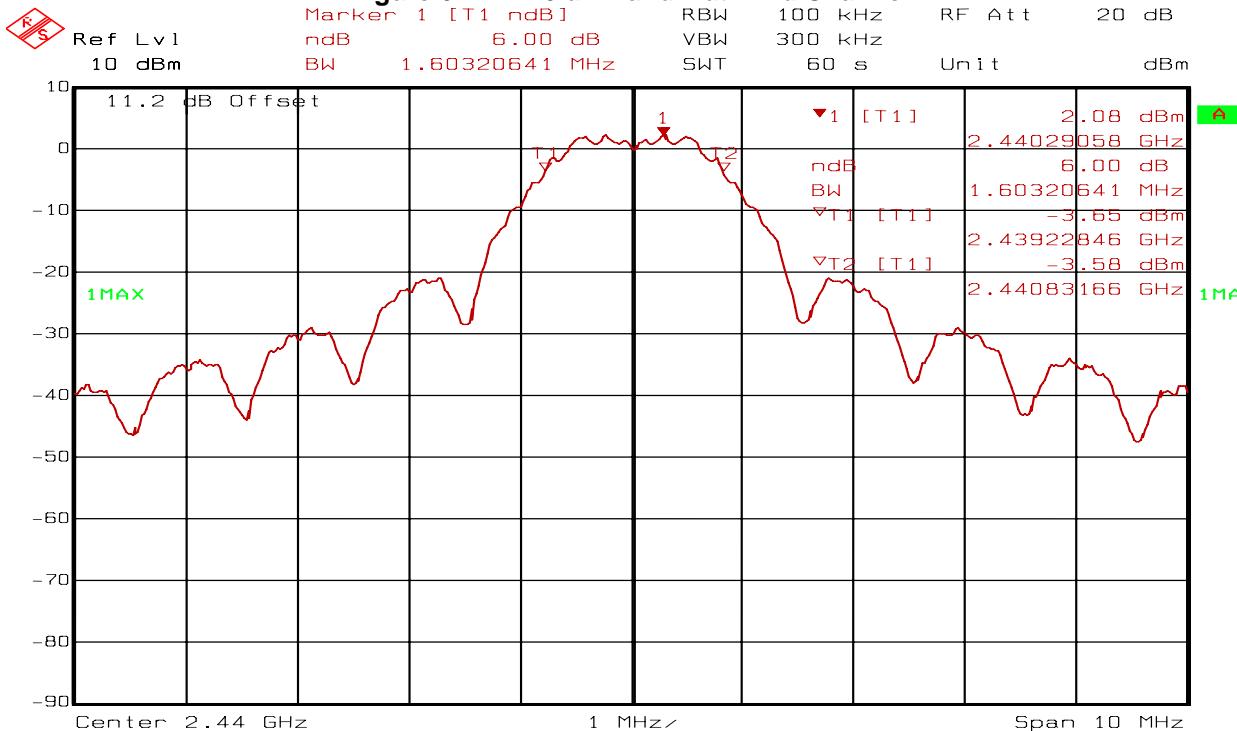
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Figure 5 6 dB Bandwidth Low Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 14:55:10

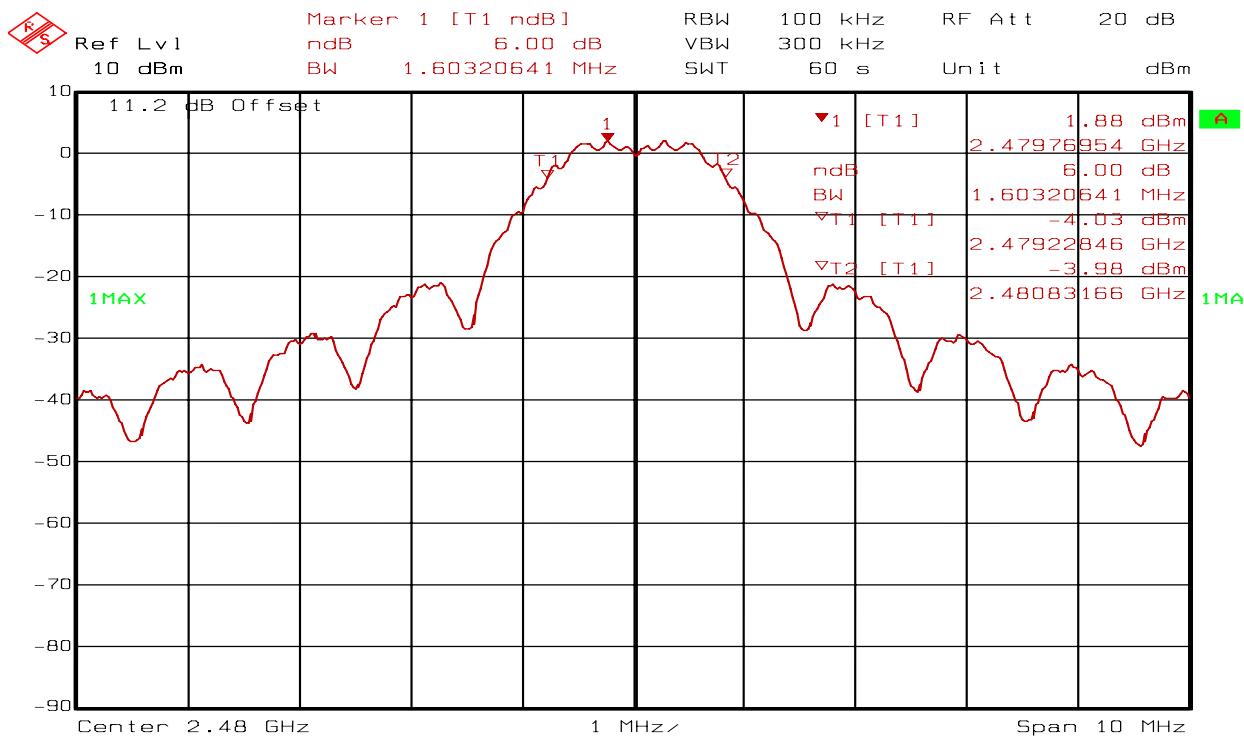
Figure 6 6 dB Bandwidth Mid Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch18, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 15:26:59

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Figure 7 6 dB Bandwidth High Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 14:35:39

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APPENDIX C: OCCUPIED BANDWIDTH

C.1. Base Standard & Test Basis

Base Standard	RSS-Gen Issue 2 4.6.1
Test Basis	RSS-Gen Issue 2 4.6.1
Test Method	RSS-Gen Issue 2 4.6.1

C.2. Specifications

4.6.1 When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

C.3. Test Procedure

RSS-Gen Issue 2

C.4. Test Results

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
11	2405	2.445
18	2440	2.405
26	2480	2.425

All final reported values are corrected values

C.5. Operating Mode During Test

The PowerPortal PPH1-L was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode).

C.6. Tested By

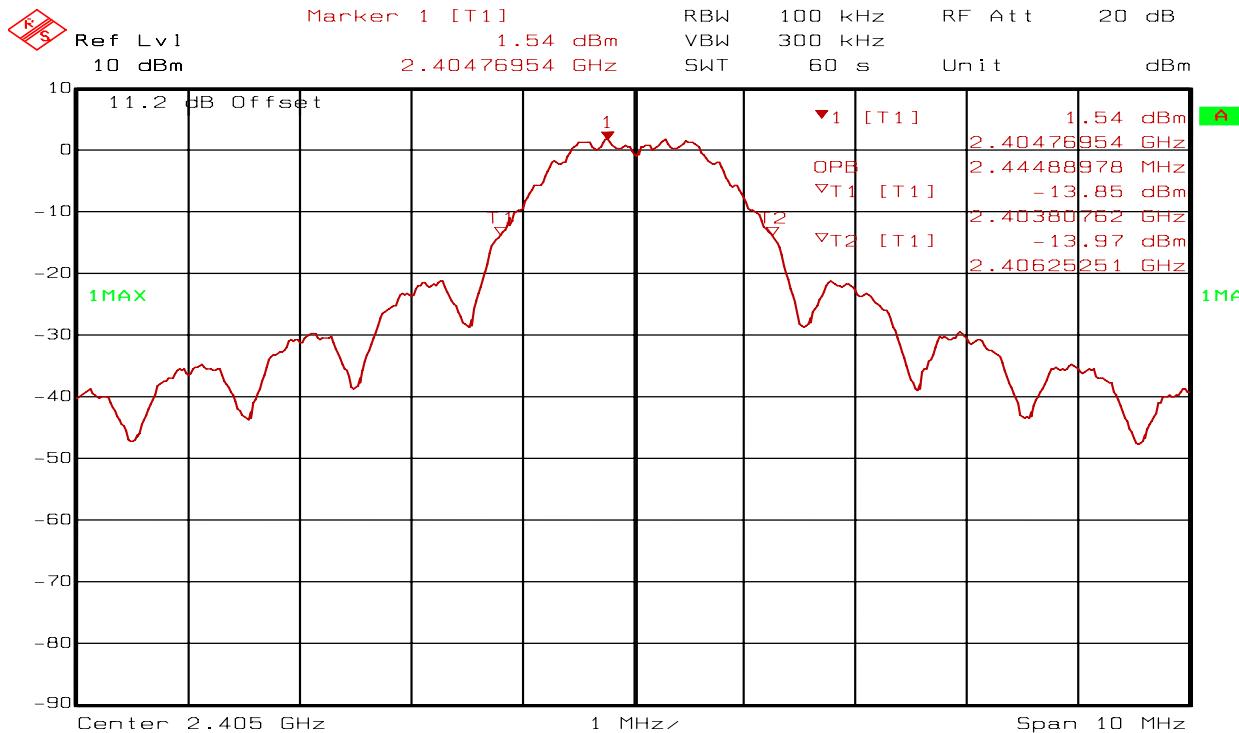
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
 Function: Senior EMC / Wireless Technologist

C.7. Test date

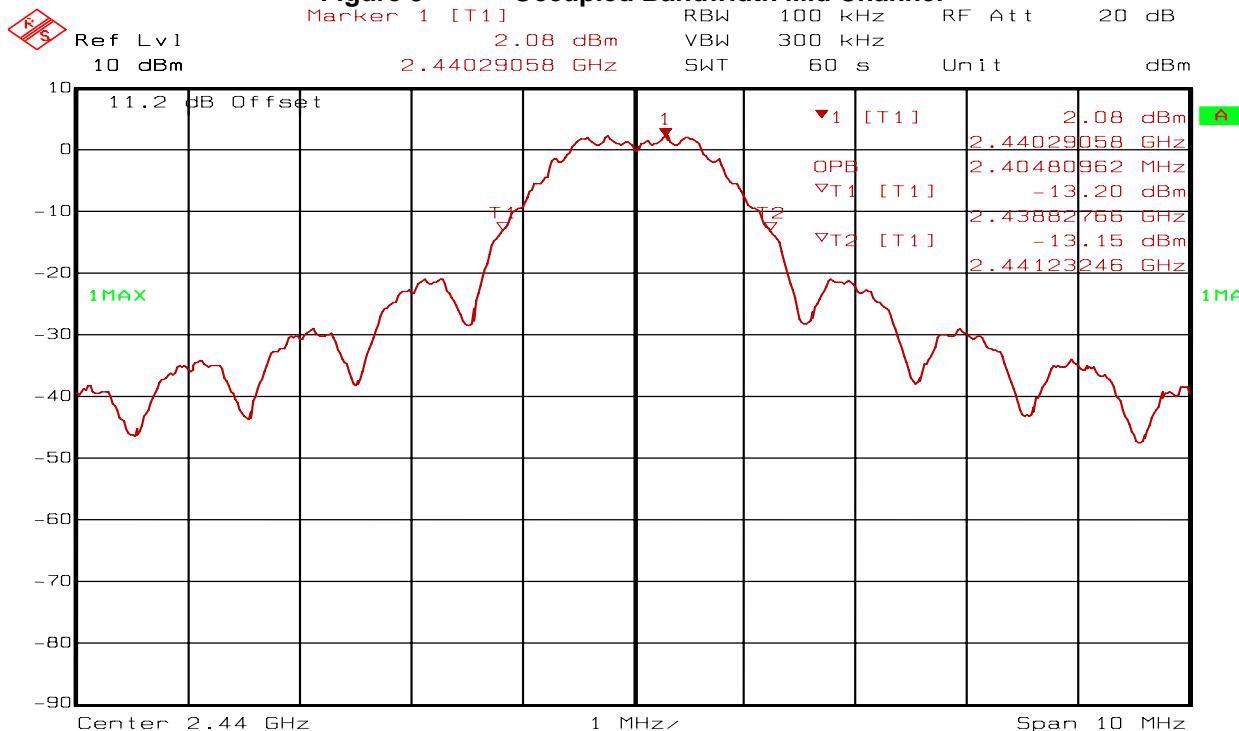
April 6, 2009

Figure 8 Occupied Bandwidth Low Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 14:55:47

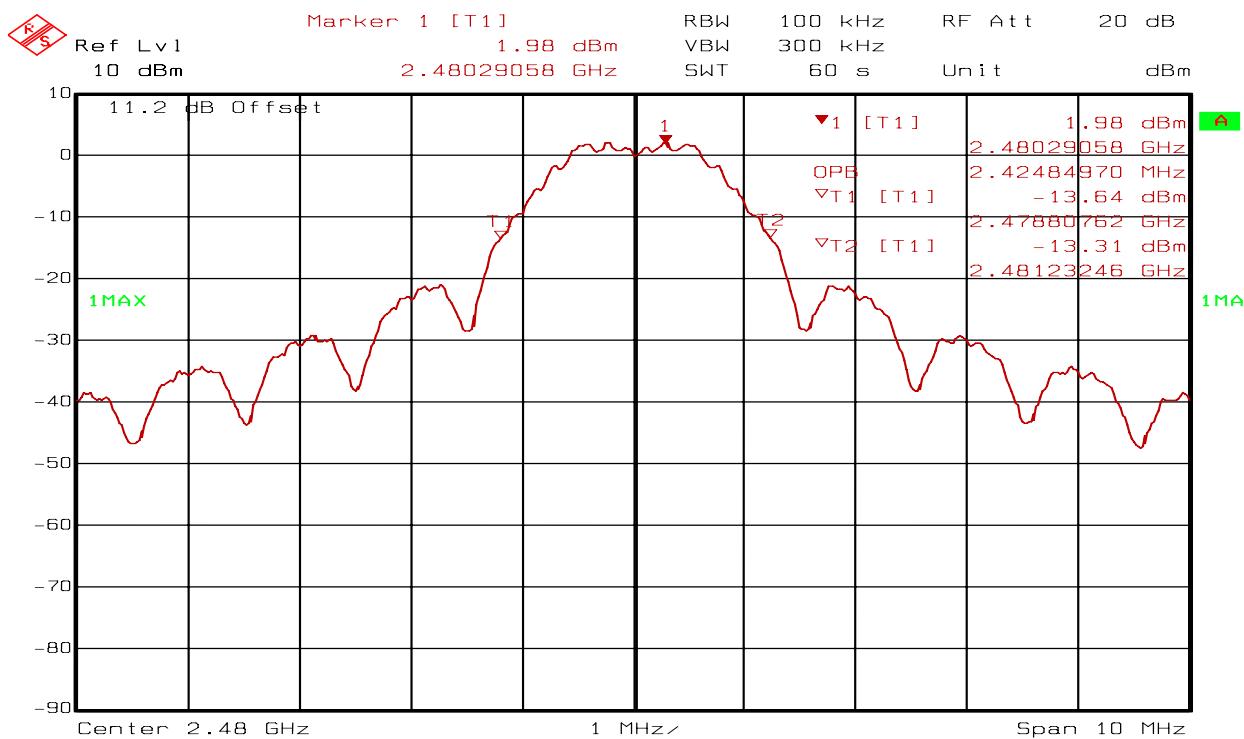
Figure 9 Occupied Bandwidth Mid Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch18, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 15:27:39

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 10 Occupied Bandwidth High Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 14:36:32

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

APPENDIX D: PEAK POWER OUTPUT

D.1. Base Standard & Test Basis

Base Standard	FCC 15.247 RSS 210 Issue 7 A8.4 (4)
Test Basis	FCC 15.247 as per FCC Publication 558074 RSS-Gen Issue 2 4.8
Test Method	FCC Publication 558074 and RSS-Gen Issue 2 4.8

D.2. Specifications

The maximum peak output power shall not exceed 30 dBm in the 2400 MHz- 2483.5 MHz band

D.3. Test Procedure

FCC Publication 558074 and RSS-Gen Issue 2 4.8

D.4. Operating Mode During Test

The PowerPortal PPH1-L was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode).

D.5. Test Results

Compliant – The maximum peak power was 5.00 dBm as measured conducted at the RF output port

D.6. Test Data Summary

Channel	Frequency (MHz)	Peak RF power (dBm)
11	2404.42	4.76
18	2439.54	5.00
26	2479.61	5.00

All final reported values are corrected values

D.7. Tested By

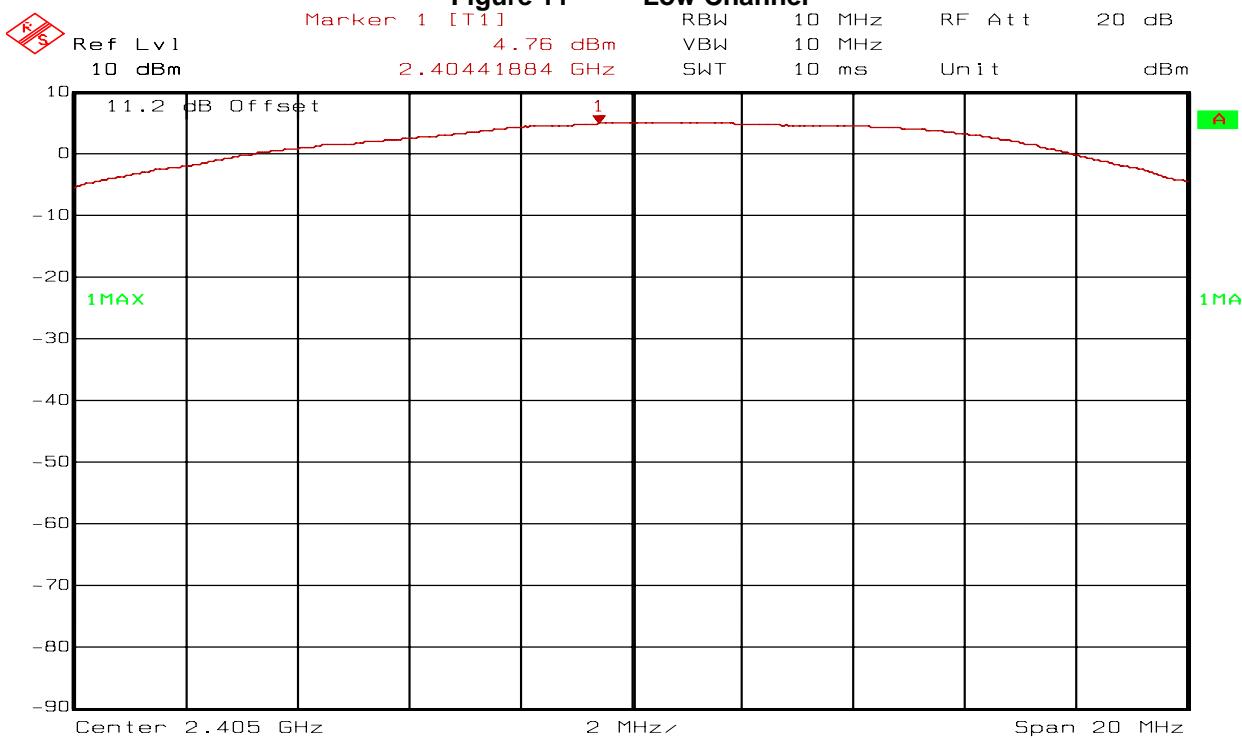
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

D.8. Test date

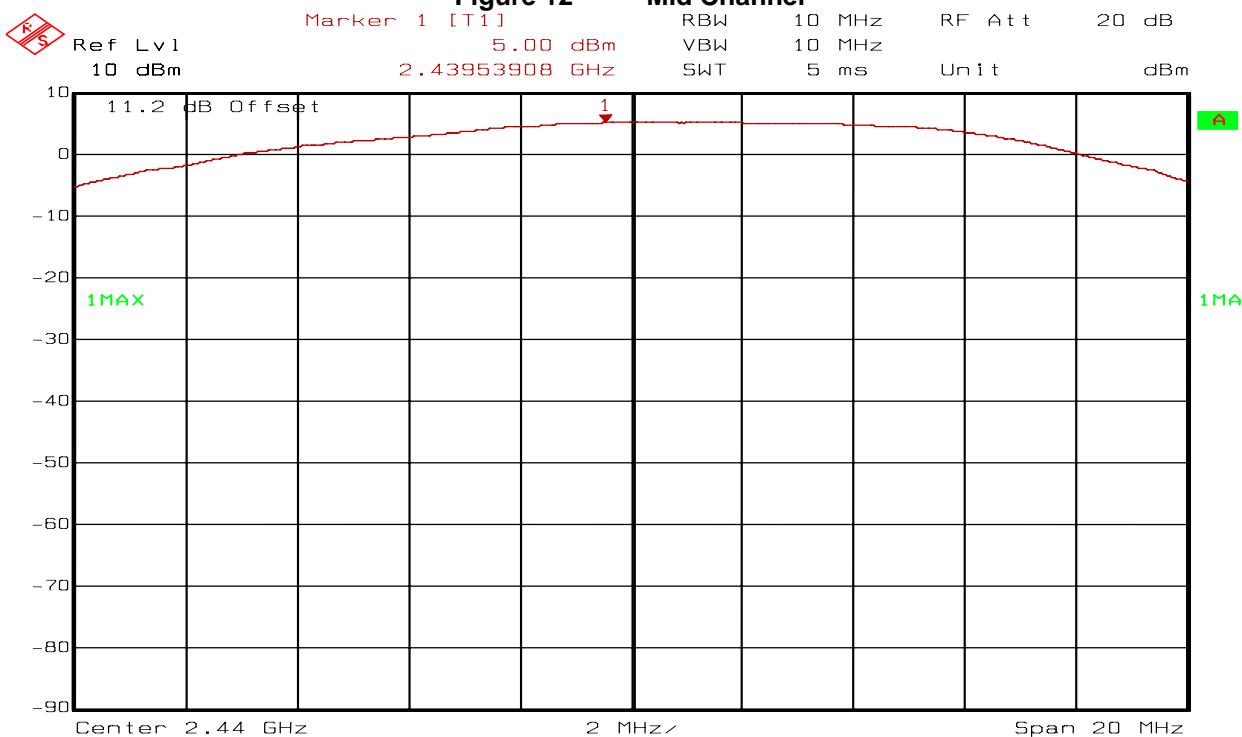
April 6, 2009

Figure 11 Low Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 14:52:49

Figure 12 Mid Channel

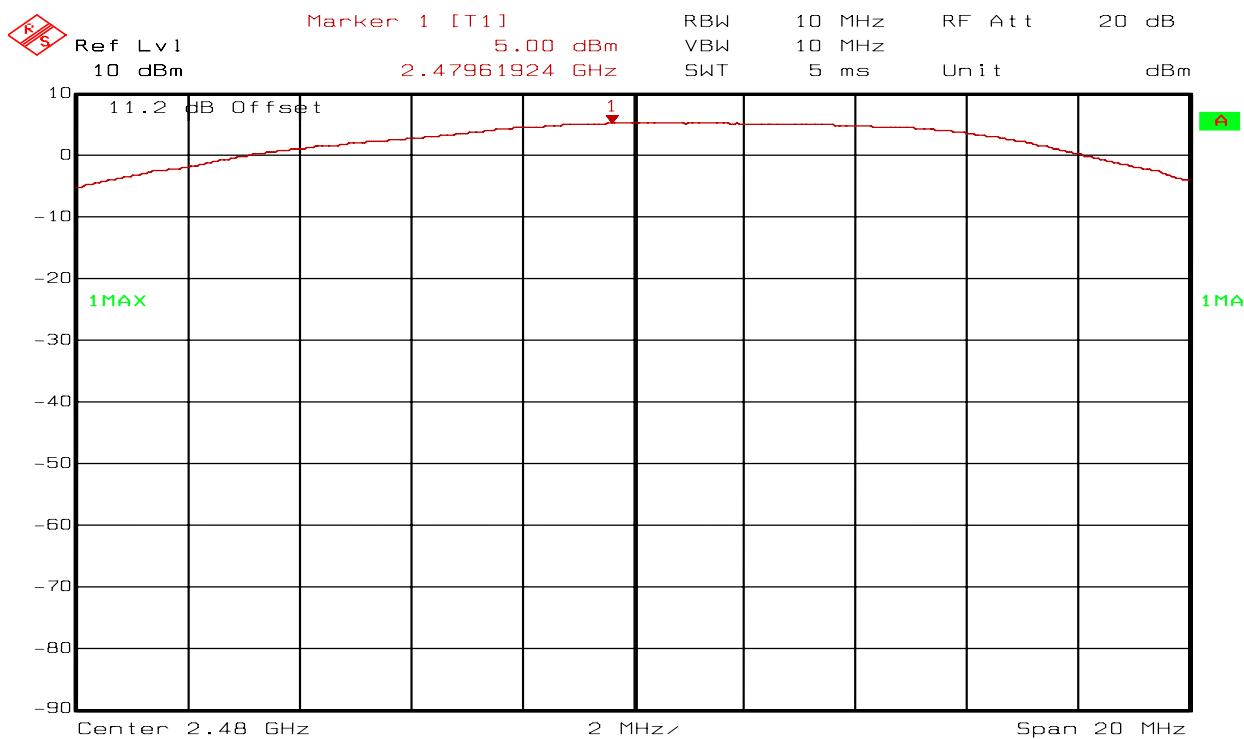


Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch18, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 15:24:45

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

NTS Product Integrity Laboratory, 5151-47th Street N.E. Tel: 403-568-6605, Fax: 403-568-6970

Figure 13 High Channel



Title: CG-1029 Energy Aware SMIT1
 Comment A: Unit#Z10, Ch26, Tx power BOOST mode with 100% duty cycle
 Date: 6.APR.2009 14:21:08

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

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APPENDIX E: POWER SPECTRAL DENSITY

E.1. Base Standard & Test Basis

Base Standard	FCC 15.247 (e) RSS 210 Issue 7 A8.2 (b)
Test Basis	FCC 15.247 as per FCC Publication 558074 RSS 210 Issue 7 A8.2 (b)
Test Method	FCC Publication 558074 and RSS 210 Issue 7 A8.2 (b)

E.2. Specifications

15.247 e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

E.3. Test Procedure

FCC Publication 558074

E.4. Operating Mode During Test

The PowerPortal PPH1-L was tuned to the low, middle and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode).

E.5. Test Results

Compliant. The maximum measured power spectral density was -8.61 dBm

E.6. Test Data Summary

Channel	Frequency (MHz)	PSD (dBm)
11	2404.59	-9.44
18	2440.12	-8.92
26	2480.18	-8.61

All final reported values are corrected values

E.7. Tested By

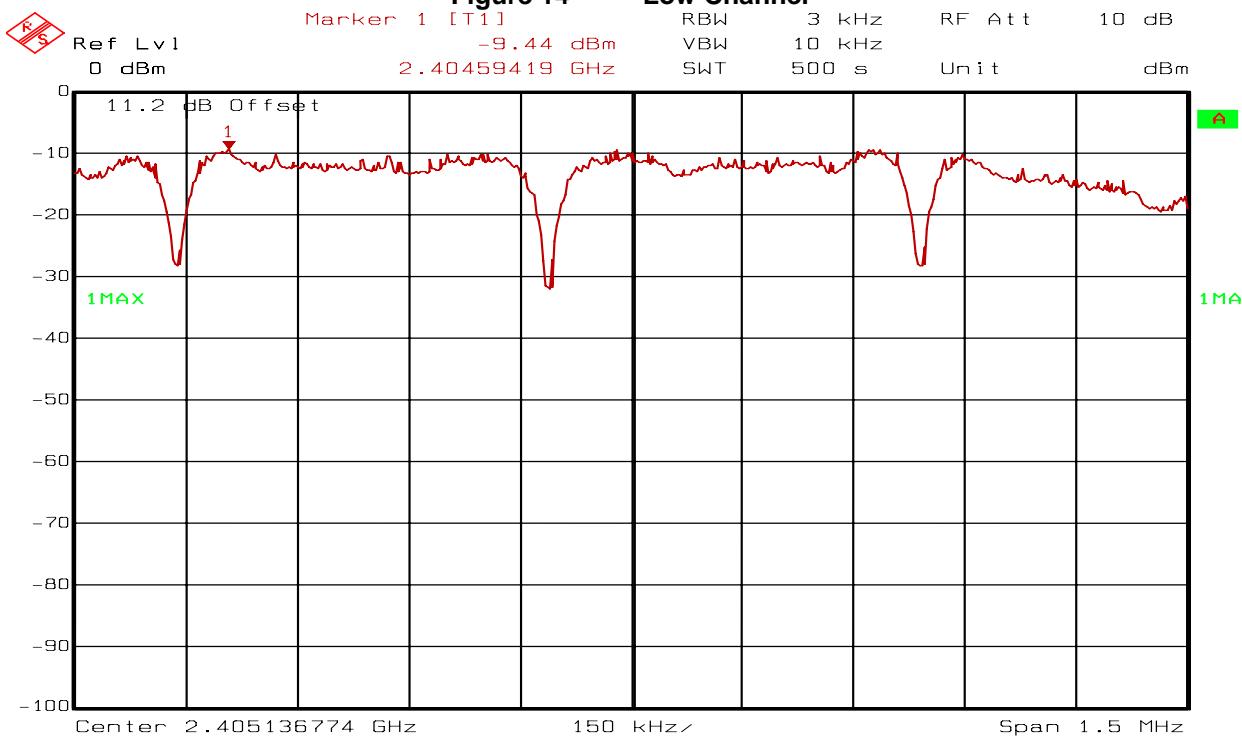
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

E.8. Test date

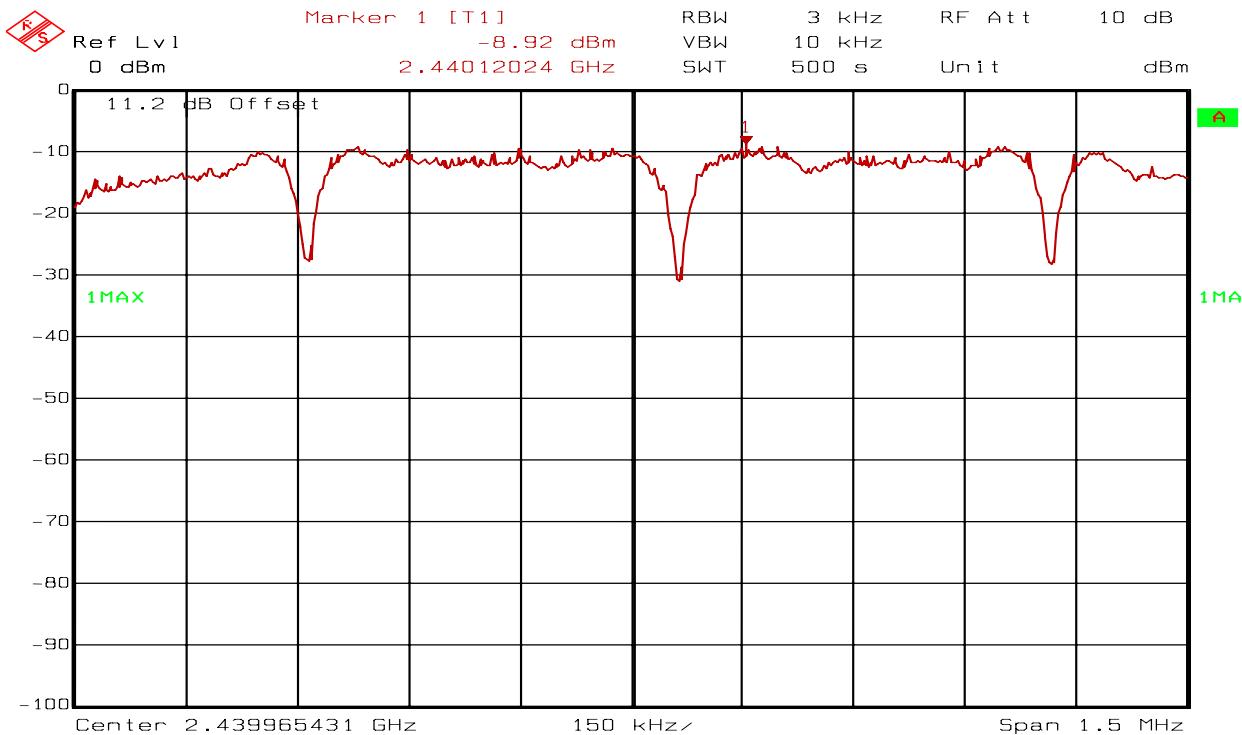
April 6, 2009

Figure 14 Low Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 15:08:36

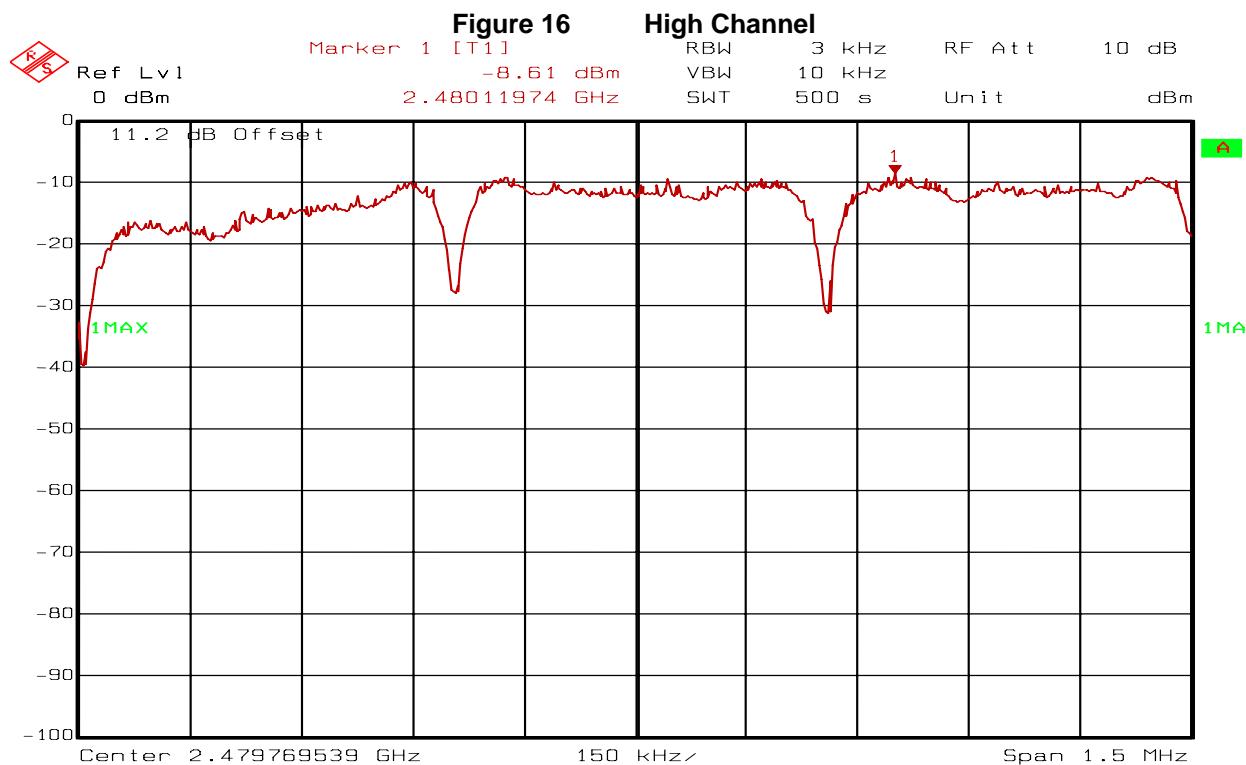
Figure 15 Mid Channel



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch18, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 15:22:49

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

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Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 14:32:23

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

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APPENDIX F: DUTY CYCLE CORRECTION FACTOR

F.1. Base Standard & Test Basis

Base Standard	FCC 15.35 (c) RSS-Gen Issue 2 4.5
Test Basis	FCC 15.35 (c) as per FCC Publication 558074 RSS-Gen Issue 2 4.5
Test Method	Zero span

F.2. Specifications

15.35 (c) Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

F.3. Test Procedure

As per FCC 15.35 with analyzer in Zero span mode.

F.4. Operating Mode During Test

The PowerPortal PPH1-L was tuned to channel 11 and set to transmit mode at maximum rated RF output power (in power boost mode). The duty cycle measured and shown here is the actual worst case device duty cycle in the end use application

F.5. Test Results

Duty cycle correction factor = $20 \times \log(0.7695/25.65) = -30.45 \text{ dB}$

Therefore the maximum allowable Duty cycle correction factor of -20 dB can be applied

F.6. Tested By

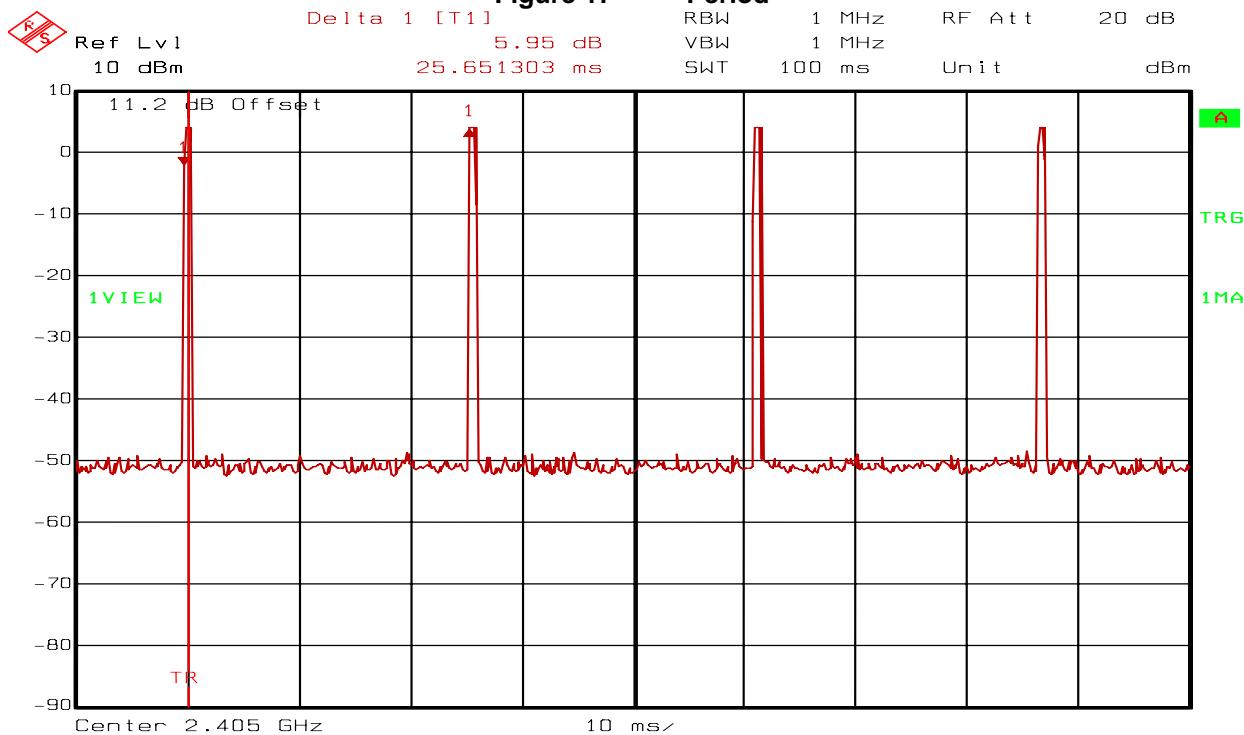
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

F.7. Test date

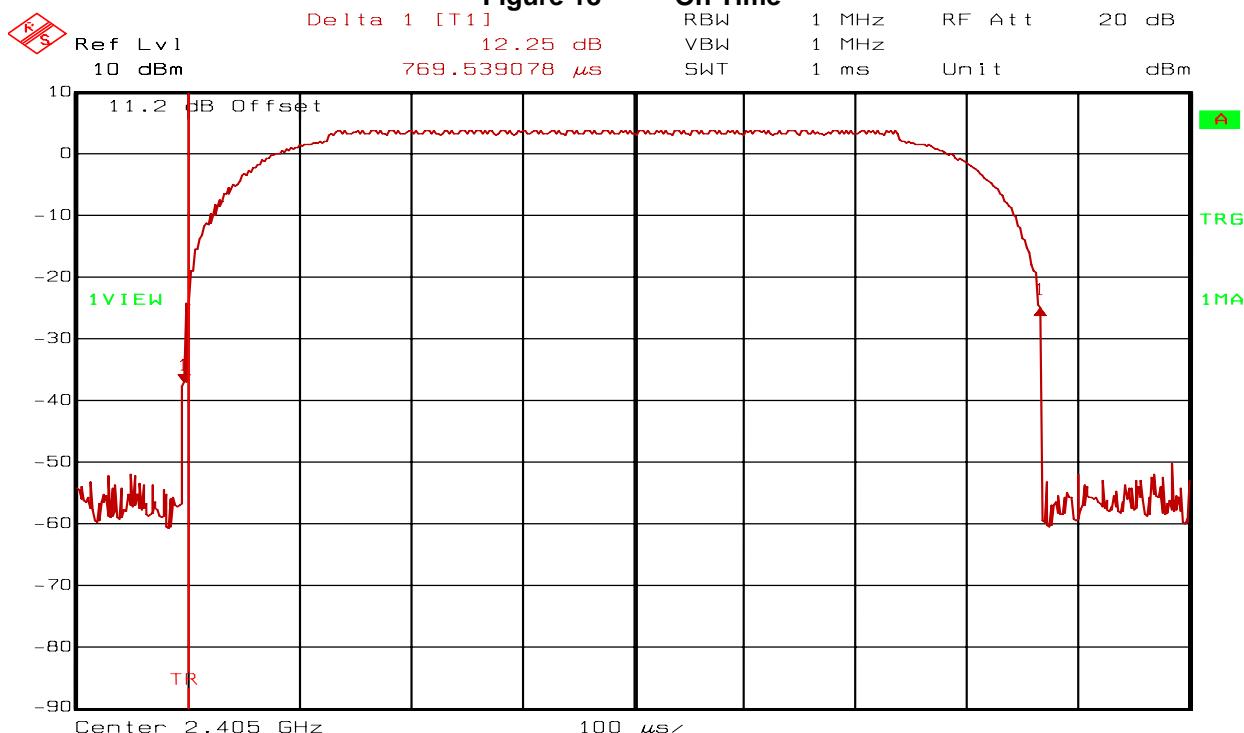
April 6, 2008

Figure 17



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, transmitting packets 25500us apart
Date: 6.APR.2009 17:07:42

Figure 18



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, transmitting packets 25500us apart
Date: 6.APR.2009 17:05:24

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

APPENDIX G: CONDUCTED SPURIOUS EMISSIONS (TX AND RX)

G.1. Base Standard & Test Basis

Base Standards	FCC CFR Title 47 – Telecommunications, Chapter I Part 15.247 (d) RSS-210 Issue 7 A8.5
Test Basis	RF conducted as per FCC Publication 558074 RSS-210 Issue 7 A8.5
Test Method	RF conducted as per FCC Publication 558074 RSS-210 Issue 7 A8.5

G.2. Specifications

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RSS-210 Table 2

General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz

30 – 88 MHz, 3 nW

88 – 216 MHz, 6.8 nW

216 – 960 MHz, 12 nW

Above 960 MHz, 75 nW

G.3. Test Procedure

FCC Publication 558074

G.4. Operating Mode During Test

The PowerPortal PPH1-L was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode).

The PowerPortal PPH1-L was tuned to the receive mode

G.5. Test Results Summary

Compliant.

Tx Channel	Worst Case Spurious Frequency (MHz)	Emission Level (dBc)
11	7212.08	-37.65
18	7326.07	-41.35
26	7420.26	-48.74

Tx mode: The worst case spurious emission was 37.65 dB below the carrier at Channel 11.

Rx Mode	Worst Case Spurious Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
	96.09	-55.15	-51.67	3.48
	119.94	-60.11	-51.67	8.44
	142.18	-54.52	-51.67	2.85
	192.16	-60.31	-51.67	8.64

Rx mode emissions were also present in EUT standby mode. Hence these emissions were not related with receiver circuitry

The worst case spurious emission was -54.52 dBm with peak detector at 142.18 MHz. It has 2.85 dB margin to the quasi-peak limit

All final reported values are corrected values

G.6. Tested By

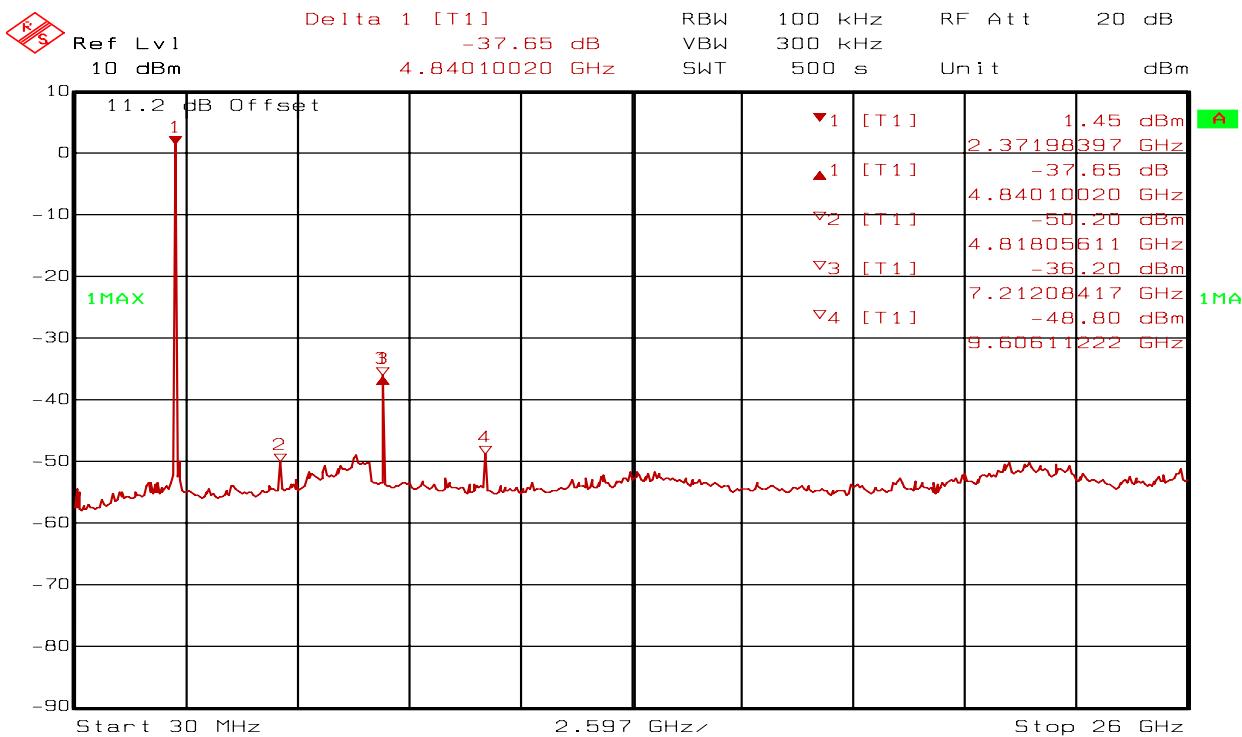
This testing was conducted in accordance with the ISO 17025: 2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
 Function: Senior EMC / Wireless Technologist

G.7. Test date

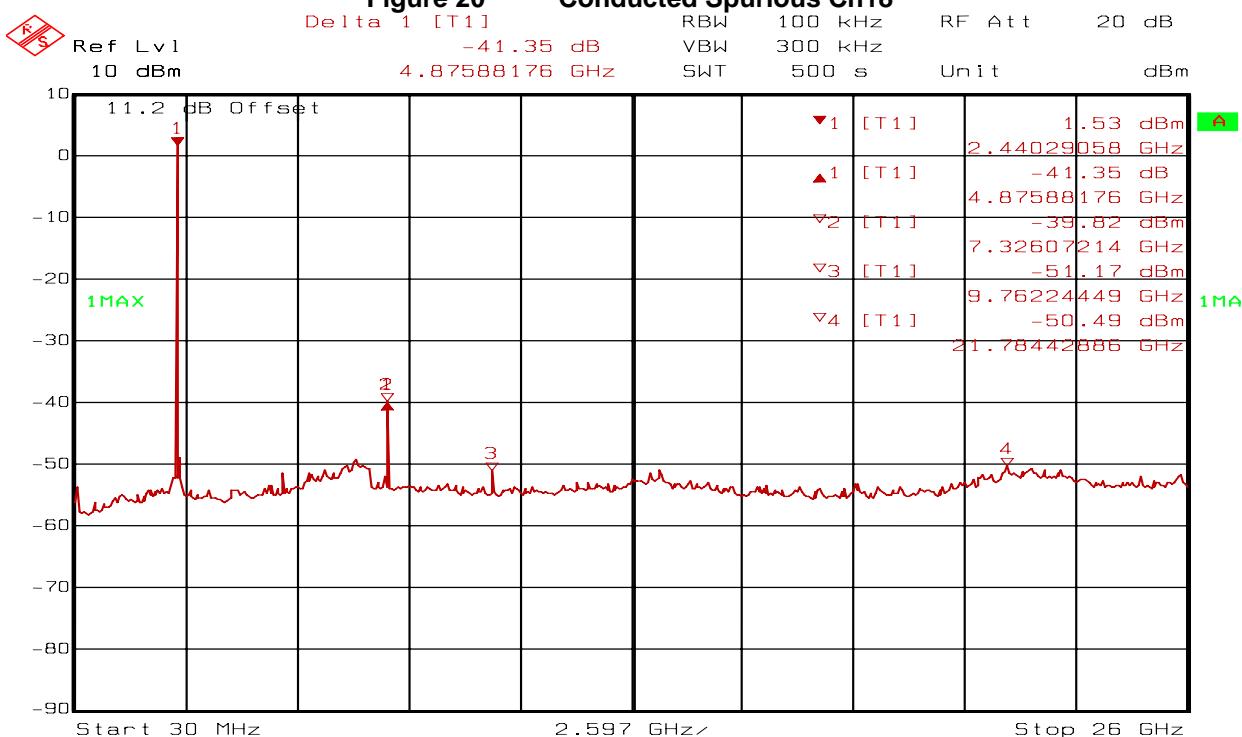
Started : April 6, 2009 Ended: April 7, 2009

Figure 19 Conducted Spurious Ch11



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 16:16:59

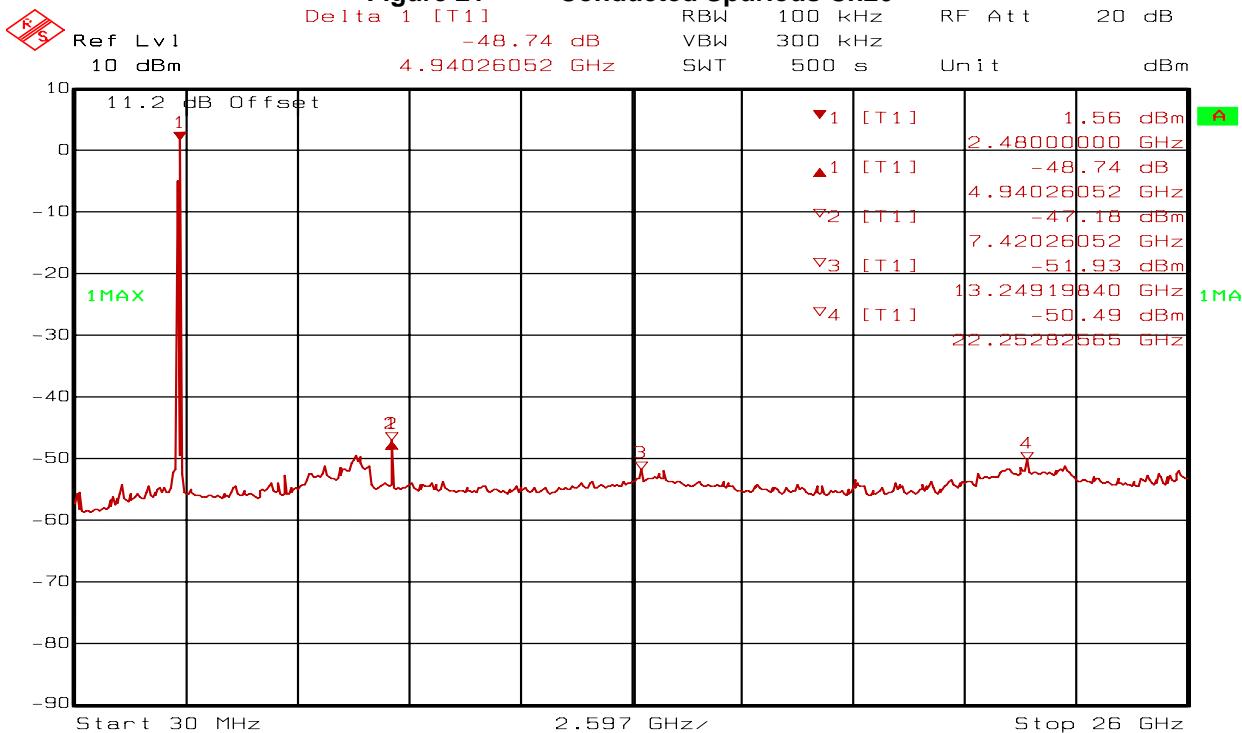
Figure 20 Conducted Spurious Ch18



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch18, Tx power BOOST mode with 100% duty cycle
Date: 6.APR.2009 15:43:06

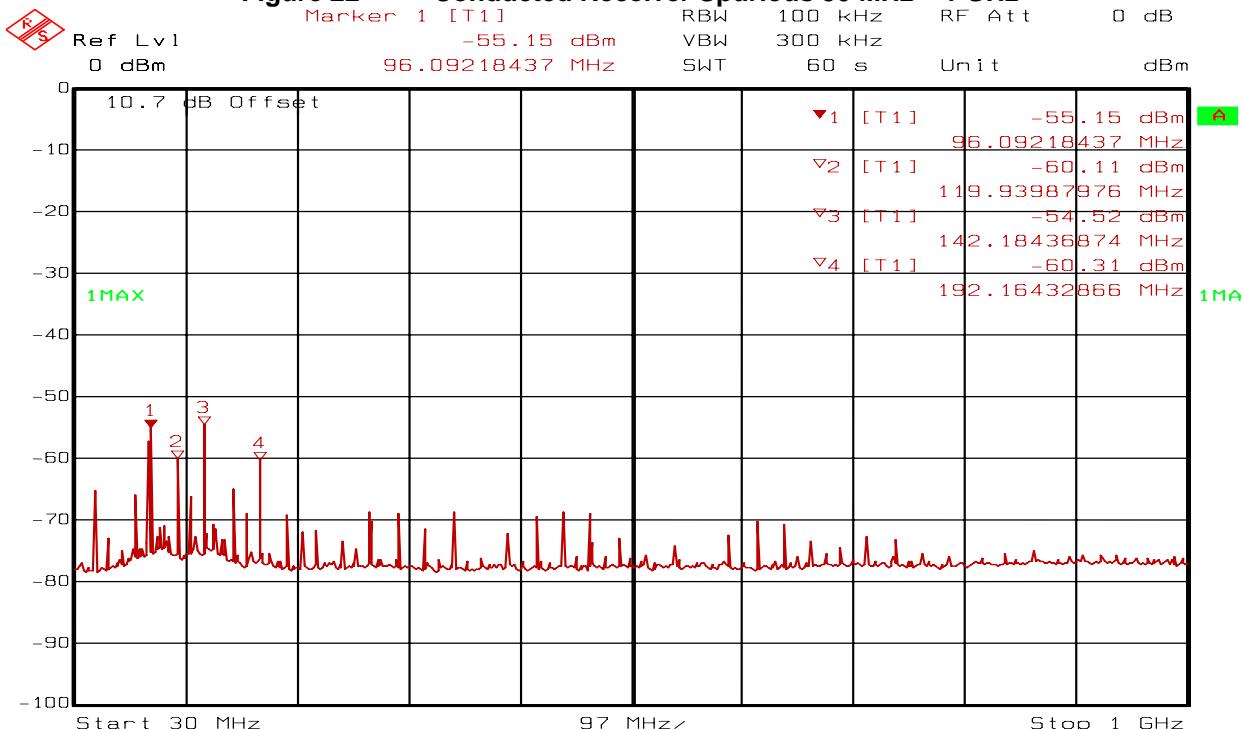
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 21 Conducted Spurious Ch26



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 7.APR.2009 17:01:01

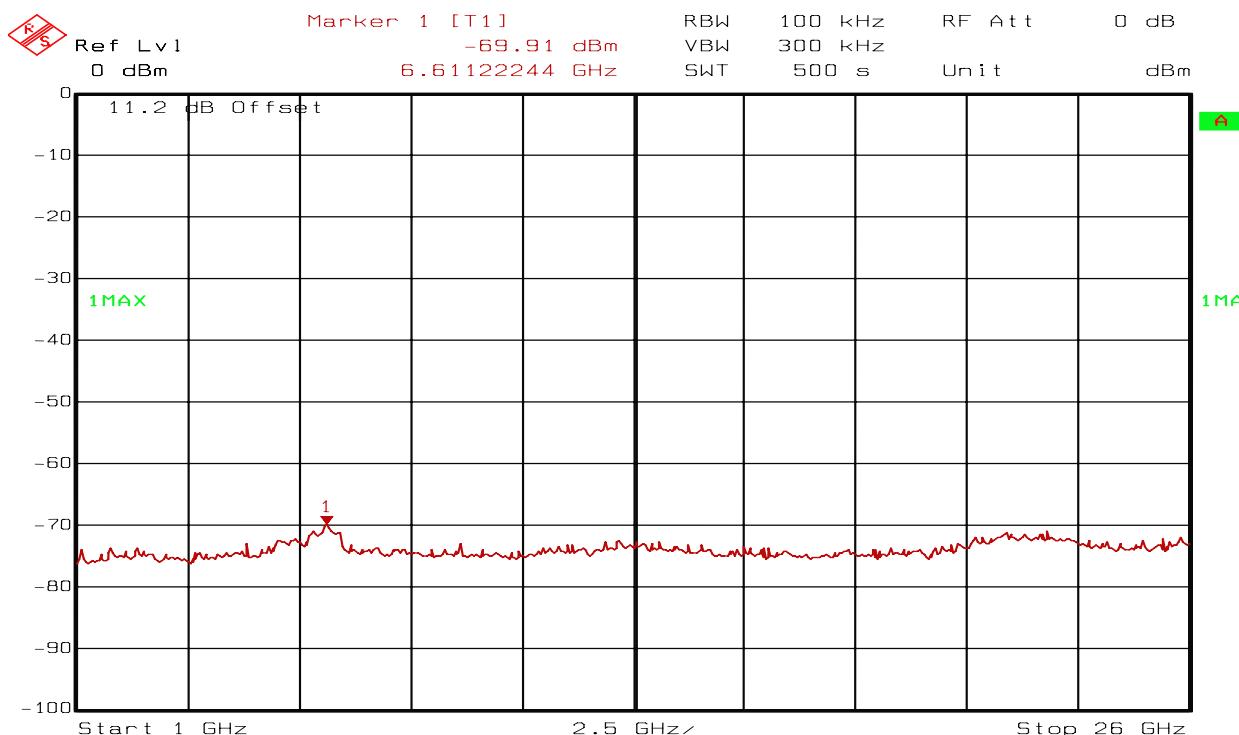
Figure 22 Conducted Receiver Spurious 30 MHz – 1 GHz



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit#Z10, Receive Mode
Date: 7.APR.2009 22:27:22

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 23 Conducted Receiver Spurious 1 GHz – 26 GHz



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APPENDIX H: CONDUCTED SPURIOUS EMISSIONS BAND EDGE

H.1. Base Standard & Test Basis

Base Standards	FCC CFR Title 47 – Telecommunications, Chapter I Part 15.247 (d) RSS-210 Issue 7 A8.5
Test Basis	RF conducted as per FCC Publication 558074 RSS-210 Issue 7 A8.5
Test Method	RF conducted as per FCC Publication 558074 RSS-210 Issue 7 A8.5

H.2. Specifications

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

H.3. Test Procedure

FCC Publication 558074

H.4. Operating Mode During Test

The PowerPortal PPH1-L was tuned to the low and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode).

H.5. Test Results

Compliant.

Channel/Measurement	Worst Case Spurious Frequency (MHz)	Emission Level (dBc)
11 (Lower band edge)	2399.99	-41.03
26 (Upper band edge)	2483.93	-36.42

Worst case spurious emission was 36.42 dB below the carrier at Channel 26

All final reported values are corrected values

H.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

H.7. Test date

April 6, 2009

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

NTS Product Integrity Laboratory, 5151-47th Street N.E. Tel: 403-568-6605, Fax: 403-568-6970

Figure 24 Conducted Band edge Measurement Ch11

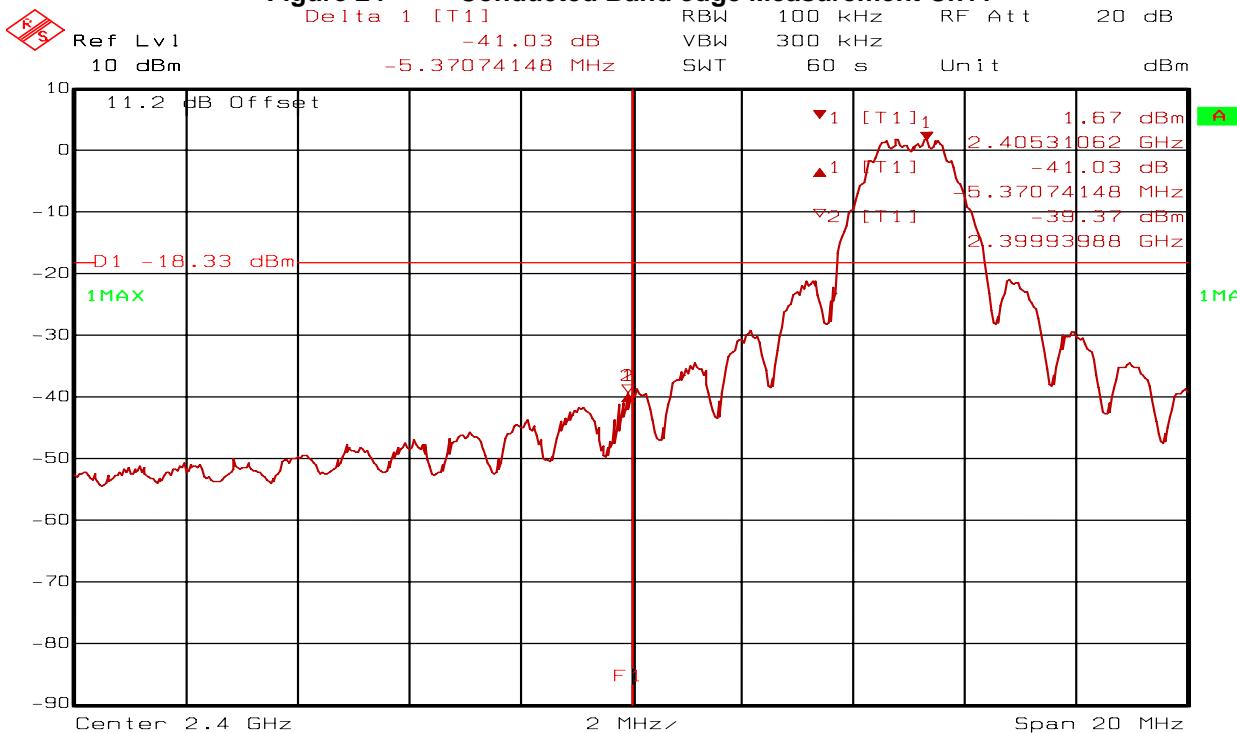
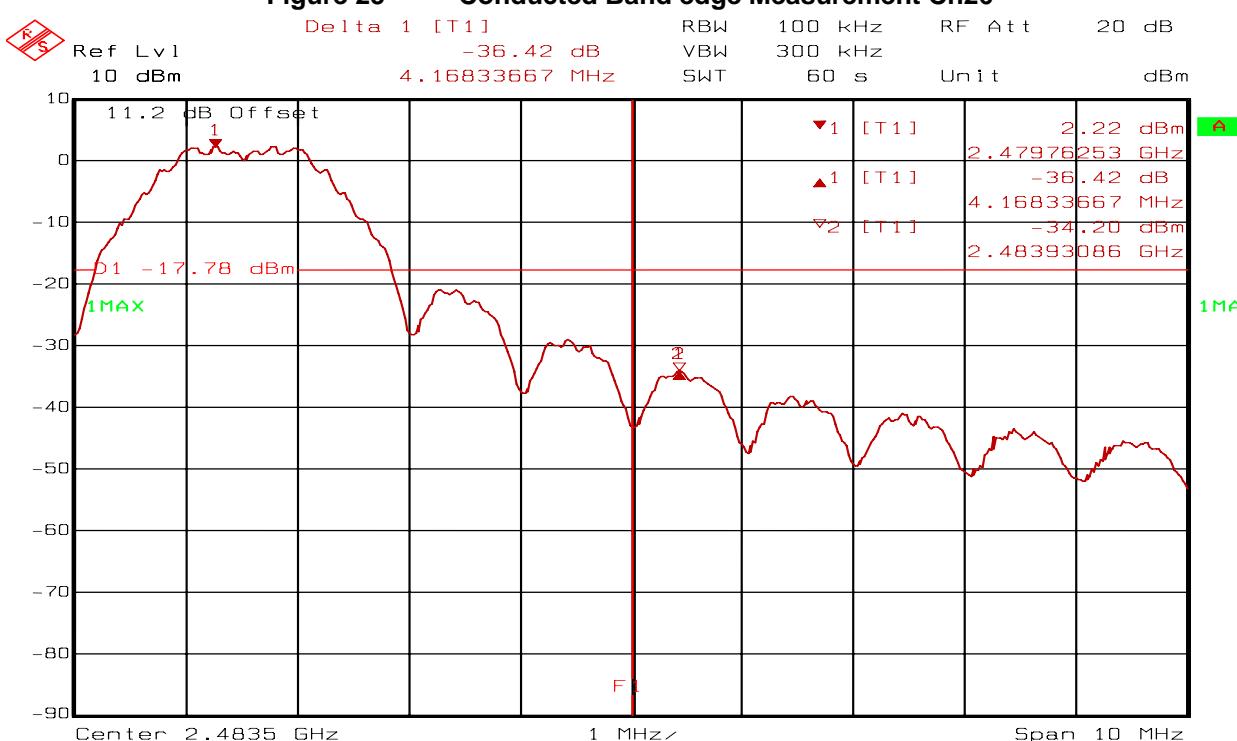


Figure 25 Conducted Band edge Measurement Ch26



The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

APPENDIX I: RADIATED SPURIOUS EMISSIONS BAND EDGE

I.1. Base Standard & Test Basis

Base Standard	FCC CFR Title 47 – Telecommunications, Chapter I Part 15.209 – Radio Frequency Devices, Part 15.205 – Restricted bands of operation RSS 210 Issue 7 A8.5
Test Basis	ANSI C63.4-2003 Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz,
Test Method	NTS Radiated Emissions Test Method SOP-CAG-EMC-01 and FCC Publication 558074 FCC Publication 913591

I.2. Specifications: FCC 15.205 and RSS 210 Issue 7 2.2 Restricted bands of operation.

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	N/A
13.36–13.41	N/A	N/A	N/A

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

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

I.3. Test Procedure

RF radiated measurement at 3 meters distance.

FCC Publication 558074:

558074 (c) (2) Radiated emission test: Applies to harmonics/spurs that fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209. A pre-amp (and possibly a high-pass filter) is necessary for this measurement.

For measurements above 1 GHz, set RBW = 1 MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation, use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

FCC Publication 913591:

In making radiated band edge measurements, there can be a problem obtaining meaningful data since a measurement instrument that is tuned to a band edge frequency may also capture some in-band signals when using the resolution bandwidth (RBW) as specified by measurement procedure ANSI C63.4-1992, unless precautions are followed. The following technique may be used for determining band edge compliance in an effort to ensure that the proper precautions are followed.

STEP 1 - Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function for the frequency being measured, as required by C63.4 and FCC Rules.

Repeat the measurement with an average detector (i.e., 1 MHz RBW with 10 Hz VBW).

STEP 2 - Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

STEP 3 - Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band edge compliance as required by Section 15.205.

STEP 4 - The above delta measurement technique may be used for measuring emissions that are up to two standard bandwidths away from the band edge, where a standard bandwidth is the bandwidth specified by C63.4 for the frequency being measured. For example, for band edge measurements in the restricted band that begins at 2483.5 MHz, C63.4 specifies a measurement bandwidth of at least 1 MHz. Therefore you may use the delta technique for measuring emissions up to 2 MHz removed from the band edge. Radiated emissions that are removed by more than two standard bandwidths must be measured in the conventional manner.

I.4. Operating Mode During Test

The PowerPortal PPH1-L was tuned to the low and high channel in continuous transmit mode at maximum rated RF output power (in power boost mode). For all Radiated tests the eut was tested in 3 orthogonal planes with the worst case results reported.

I.5. Test Results

Compliant

Channel	Frequency (MHz)	Detector	Carrier Emission Level (dB μ V/m)	Band Edge Emission Level (dB μ V/m)	Duty cycle Correction Factor (dB)	Marker Delta (dBc)	Band Edge Corrected Value (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11	2390.00	PK	100.31	62.01	N/A	-46.06	54.25	73.98	19.73
11	2390.00	AV	98.32	47.62	-20	N/A	27.62	53.98	26.36
26	2483.50	PK	101.67	73.73	N/A	-35.20	66.47	73.98	7.51
26	2483.50	AV	99.60	62.47	-20	N/A	42.47	53.98	11.51

Maximum peak measurement was 73.73 dB μ V/m at 2483.50 MHz. Carrier Emission Level was 101.67 dB μ V/m, Marker Delta Measurement with 30 kHz RBW was -35.2 dBc. Corrected value of the emission on 2483.5 MHz was 66.47 dB μ V/m. It has 7.51 dB margin to the 15.209 limits.

I.6. Sample Calculations

Part 15.209 Average Limit: $500 \mu\text{V}/\text{m} @ 3\text{m} = 20 * \text{Log} (500) = 53.98 \text{ dB}\mu\text{V}/\text{m}$, Peak limit = 73.98 dB μ V/m

Band Edge Emission Level or Carrier Emission Level (dB μ V/m) = Measured level (dB μ V) + Receive antenna factor (dB) + Receive cable loss (dB) - LNA gain (dB)

Peak Band Edge Corrected value (dB μ V/m) = Carrier emission level (dB μ V/m) - Marker Delta factor (dB)

Average Band Edge Corrected value (dB μ V/m) = Band Edge Emission Level (dB μ V/m) - Duty cycle correction factor (dB)

Note:

Marker Delta Method was used for Peak measurements per FCC Publication 913591

Duty Cycle Correction Factor was used for Average measurements per FCC Publication 558074

I.7. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

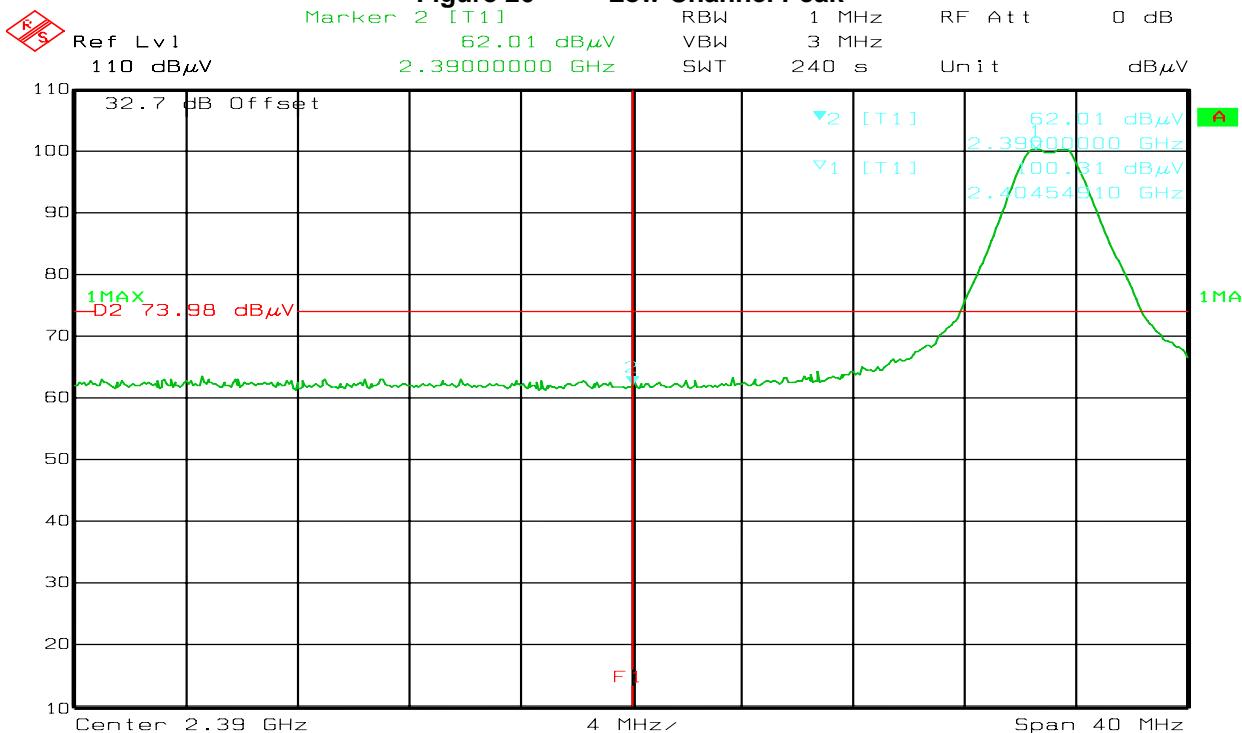
Name: Deniz Demirci
 Function: Senior EMC / Wireless Technologist

I.8. Test date

March 11, 2009

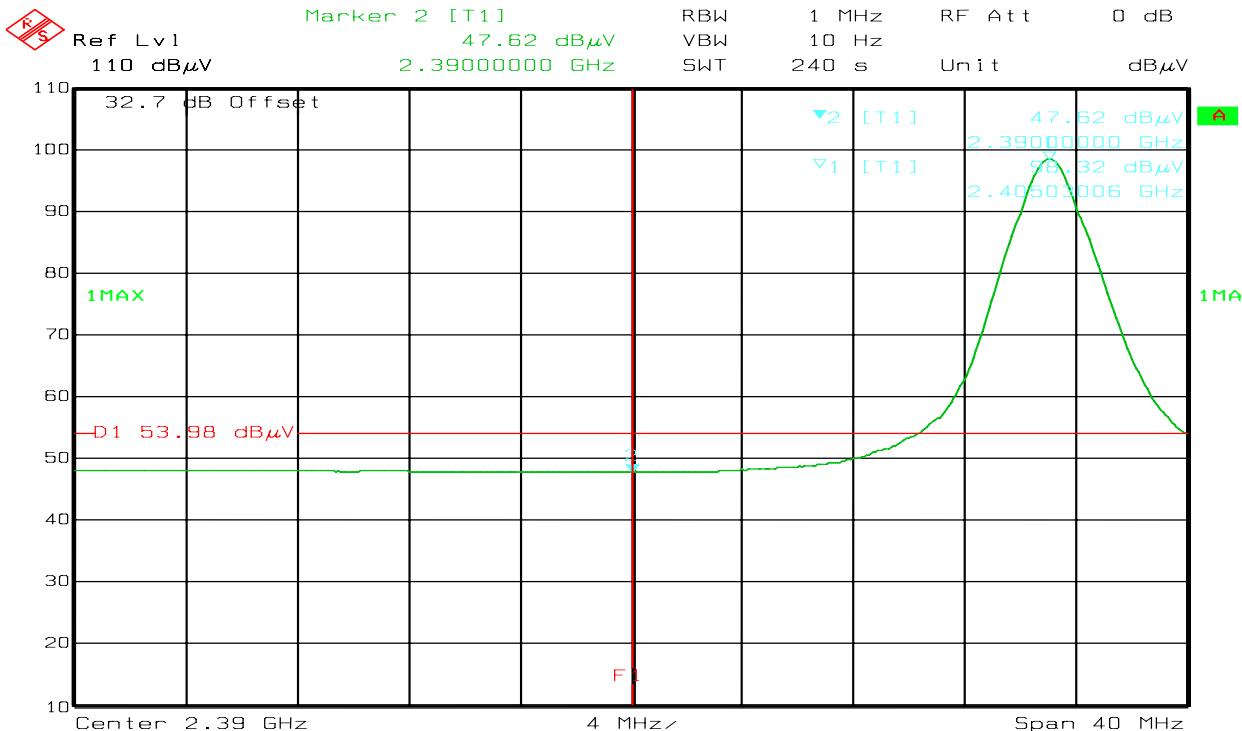
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 26 Low Channel Peak



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit# Z4, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 11.MAR.2009 21:16:30

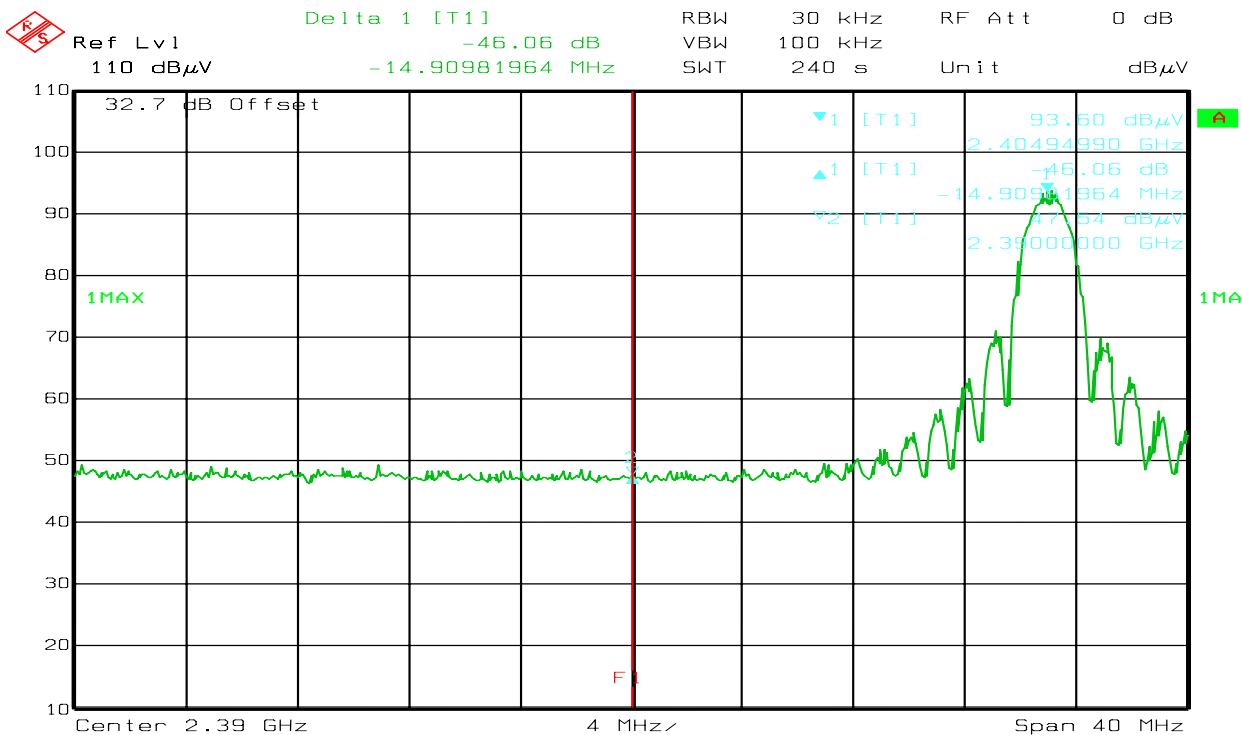
Figure 27 Low Channel Video Average



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit# Z4, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 11.MAR.2009 21:21:28

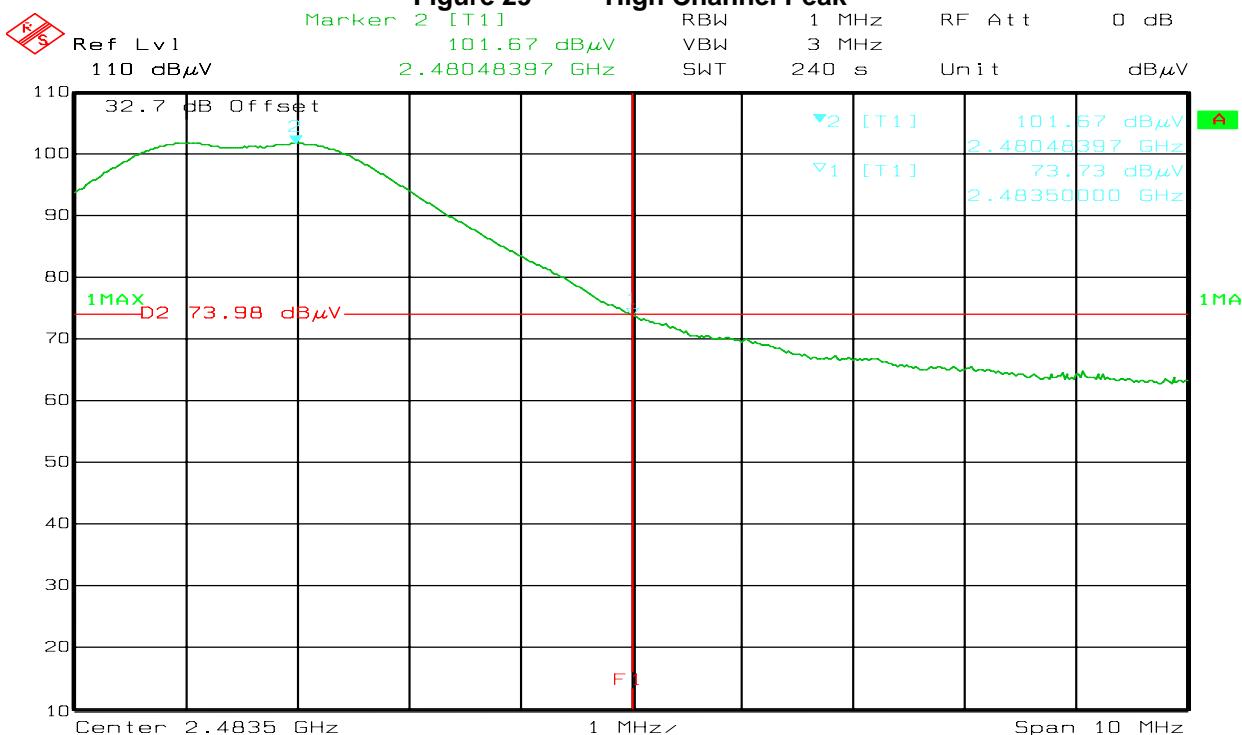
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 28 Low Channel Marker Delta



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit# Z4, Ch11, Tx power BOOST mode with 100% duty cycle
Date: 11.MAR.2009 21:26:22

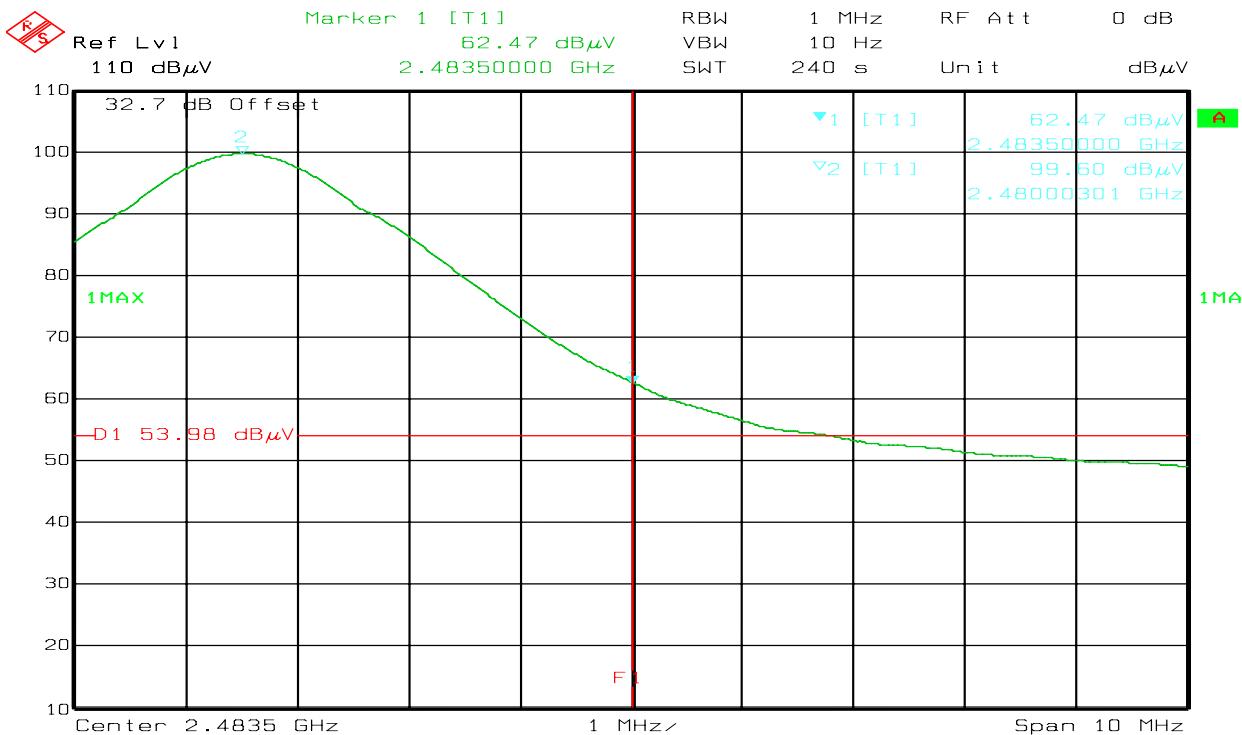
Figure 29 High Channel Peak



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit# Z4, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 11.MAR.2009 20:50:09

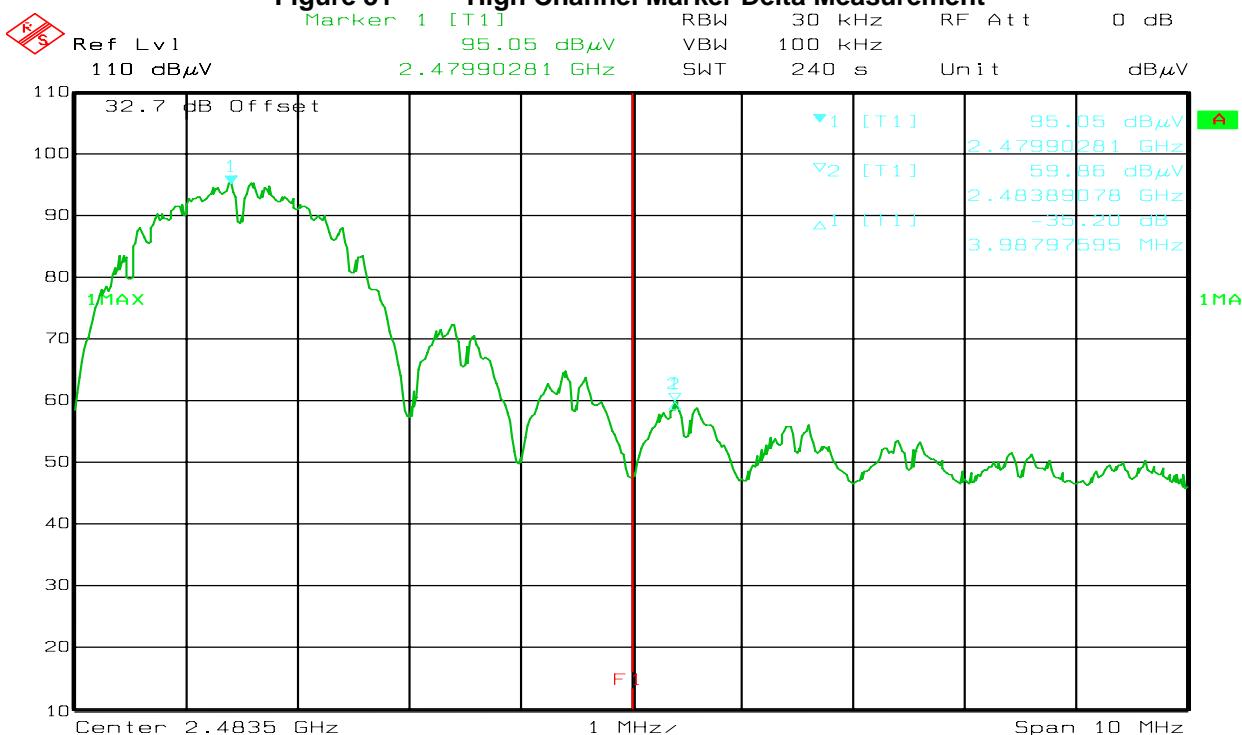
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 30 High Channel Video Average



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit# Z4, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 11.MAR.2009 20:45:13

Figure 31 High Channel Marker Delta Measurement



Title: CG-1029 Energy Aware SMIT1
Comment A: Unit# Z4, Ch26, Tx power BOOST mode with 100% duty cycle
Date: 11.MAR.2009 20:55:12

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

APPENDIX J: RADIATED SPURIOUS EMISSIONS (TX AND RX)

J.1. Base Standard & Test Basis

Base Standard	FCC CFR Title 47 – Telecommunications, Chapter I Part 15.209 – Radio Frequency Devices, Part 15.205 – Restricted bands of operation RSS 210 Issue 7 2.6 and A8.5
Test Basis	ANSI C63.4-2003 Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz, FCC Publication 558074
Test Method	NTS Radiated Emissions Test Method E001R7 and FCC Publication 558074

Specifications: FCC 15.205 and RSS 210 Issue 7 2.2 Restricted bands of operation.

(a) Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	N/A
13.36–13.41	N/A	N/A	N/A

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

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J.2. Test Procedure

FCC Publication 558074 (c) (2) Radiated emission test Applies to harmonics/spurs that fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209. For measurements above 1 GHz, set RBW = 1 MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation, use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

J.3. Operating Mode During Test

The PowerPortal PPH1-L was tuned low, mid and high channels in continuous transmit mode at maximum rated RF output power for all TX spurious emissions. For RX spurious emissions the PowerPortal PPH1-L was tuned to the receive only mode. The eut was tested in 3 orthogonal planes with the worst case results reported.

J.4. Test Results

Tx Mode

Channel	Antenna Polarization	Frequency (MHz)	Detector	Corrected Radiated emission level (dB μ V/m)	Duty Cycle Correction Factor (dB)	Corrected Level (dB μ V/m)	Limit type	Limit (dB μ V/m)	Margin (dB)
11	V-pol	59.37	QP	11.60	N/A	11.60	QP	29.54	17.94
	V-pol	117.70	QP	22.62	N/A	22.62	QP	33.07	10.45
	H-pol	4813.63	PK	68.81	N/A	68.81	PK	73.98	5.17
	H-pol	7218.44	PK	60.31	N/A	60.31	PK	73.98	13.67
	V-pol	4813.63	PK	70.26	N/A	70.26	PK	73.98	3.72
	V-pol	7218.44	PK	61.46	N/A	61.46	PK	73.98	12.52
18	H-pol	4873.75	PK	69.37	N/A	69.37	PK	73.98	4.61
	H-pol	7318.64	PK	62.80	N/A	62.80	PK	73.98	11.18
	V-pol	4873.75	PK	72.24	N/A	72.24	PK	73.98	1.74
	V-pol	7318.64	PK	67.89	N/A	67.89	PK	73.98	6.09
26	H-pol	4963.93	PK	63.60	N/A	63.60	PK	73.98	10.38
	H-pol	7448.90	PK	62.50	N/A	62.50	PK	73.98	11.48
	V-pol	4963.93	PK	65.99	N/A	65.99	PK	73.98	7.99
	V-pol	7448.90	PK	66.19	N/A	66.19	PK	73.98	7.79
11	H-pol	4813.63	PK	68.81	-20	48.81	AV	53.98	5.17
	H-pol	7218.44	PK	60.31	-20	40.31	AV	53.98	13.67
	V-pol	4813.63	PK	70.26	-20	50.26	AV	53.98	3.72
	V-pol	7218.44	PK	61.46	-20	41.46	AV	53.98	12.52
18	H-pol	4873.75	PK	69.37	-20	49.37	AV	53.98	4.61
	H-pol	7318.64	PK	62.80	-20	42.80	AV	53.98	11.18
	V-pol	4873.75	PK	72.24	-20	52.24	AV	53.98	1.74
	V-pol	7318.64	PK	67.89	-20	47.89	AV	53.98	6.09
26	H-pol	4963.93	PK	63.60	-20	43.60	AV	53.98	10.38
	H-pol	7448.90	PK	62.50	-20	42.50	AV	53.98	11.48
	V-pol	4963.93	PK	65.99	-20	45.99	AV	53.98	7.99
	V-pol	7448.90	PK	66.19	-20	46.19	AV	53.98	7.79

The Worst case spurious emission was 72.24 dB μ V/m at 4873.75 MHz vertical polarization in Channel 18. It has 1.74 dB margin to the peak and average limits

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J.4. Test Results Continued

RX Mode

Antenna Polarization	Frequency (MHz)	Detector	Radiated emission level (dB μ V/m)	Limit type	Limit (dB μ V/m)	Margin (dB)
V-pol	55.85	QP	16.75	QP	29.54	12.79
V-pol	115.71	QP	19.67	QP	33.07	13.40

Rx mode emissions were also present in EUT standby mode. Hence these emissions were not related with receiver circuitry

The worst case spurious emission was 29.54 dB μ V/m at 10m distance with quasi-peak detector at 55.85 MHz. It has 12.79 dB margin to the limits

All final reported values are corrected values

Note:

Plots were not provided in order to reduce file size

J.5. Sample Calculations

Part 15.209

Limit at 55.85 MHz for 10 m = $20 \cdot \log(100) - 20 \cdot \log(3/10) = 29.54 \text{ dB}\mu\text{V/m}$

Limit at 115.71 MHz for 10 m = $20 \cdot \log(150) - 20 \cdot \log(3/10) = 33.07 \text{ dB}\mu\text{V/m}$

Average Limit for above 960 MHz = $500 \mu\text{V/m} @ 3\text{m} = 20 \cdot \log(500) = 53.98 \text{ dB}\mu\text{V/m}$

Peak Limit for above 960 MHz = Average Limit + 20 (dB) = 73.98 dB μ V/m

Total correction factor (dB) = Receive antenna factor (dB) + Receive cable loss (dB) + High pass filter loss (dB) – LNA gain (dB)

Radiated emission level (dB μ V/m) = Measured level (dB μ V) + Total correction factor (dB)

J.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name:	Lixin Wang	Deniz Demirci
Function:	EMC Technologist	Senior EMC / Wireless Technologist

J.7. Test date

April 7, 2009

APPENDIX K: TEST EQUIPMENT LIST

Descriptions	Manufacturer	Type/Model	Serial #	Cal Due	Cal Date
Table Top LISN	EMCO	3825	CG0367	18JAN10	18JAN08
Test Receiver	Rohde & Schwarz	ESAI	CG0123 CG0124	26FEB10	26FEB09
Bilog Antenna	Teseq	CBL 6112D	CG1177	10OCT08	10OCT07
HPIB Extender	HP	37204	CG0181	N/A	N/A
Mast Controller	EMCO	2090	CG0179	N/A	N/A
Turntable Controller	EMCO	2090	CG0178	N/A	N/A
Digital Barometer / Thermometer	Cole-Parmer	1870	CG0728	30JUN09	19JUN07
Horn Antenna (Rx) 1 GHz – 18 GHz	EMCO	3115	CG0368	23AUG09	23AUG07
Standard Gain Horn (Rx) 18 GHz – 26.5 GHz	EMCO	3160-09	CG0075	N/A ⁽¹⁾	27NOV01
High pass filter $f > 1000$ MHz	MicroTronics	HPM14576	CG0963	01DEC10	01DEC08
High pass filter $f > 2800$ MHz	MicroTronics	HPM50111	CG0964	01DEC10	01DEC08
LNA 1 GHz - 18 GHz	Miteq	JSD00121	CG0317	01DEC10	01DEC08
LNA 18 GHz - 26.5 GHz	Miteq	JSD00119	CG0482	02OCT09	02OCT07
Spectrum Analyzer 9 kHz – 40 GHz	Rohde & Schwarz	FSEK-20	CG0118	01JUL09	01JUL08
Attenuator	Weinschel	10 dB	19981	30APR09	30APR07
RF cable	Sucoflex	104	115776	30APR09	30APR07
Quiet Box	EMCO	5302	96081203	N/A	N/A
LNA DC Power Supply	Xantrex	LXO 30-2	CG0493	N/A	N/A
HPIB Extender	HP	37204	CG0110	N/A	N/A
Turntable and Mast Controller	EMCO	2090	CG0161	N/A	N/A

(1): As per manufacturer recommend, this item does not require periodic calibration. Its electromagnetic performance is almost exclusively depended on the physical dimension of the horn. A thorough mechanical check is all that is needed to guarantee the antenna performance.

END OF DOCUMENT

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April 16, 2009