National Technical Systems

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Certification Test Report

CFR 47 FCC Part 15, Subpart C Section 15.247 and Industry Canada RSS 210, Issue 6

Model: NXR-MO Module
FCC ID. CWU-NXR-MO

Project Code: W6373

(Report W6373-WIRELESS-1)
Revision: 0

Prepared for: AMX Corp.
3000 Research Dr.
Richardson, TX
75082 USA

Author: Tom Tidwell

Issued: 19 December, 2006

Report Summary
NTS Plano

Accreditation Numbers: FCC: 101741
IC: 46405-4319 File # IC-4319A-1
Standards A2LA Laboratory Cert. No. 0214.19

Applicant: AMX
3000 Research Dr.
Richardson, TX
75082 USA

Customer Representative: Tuan Tran

EUT Description:

EUT Description	Manufacturer	Model	Revision	Serial Number
The EUT is a DTS module	AMX	NXR-MO	A	TP0806013

Test Summary

Appendix	Test/Requirement Description	Deviations from:			Pass / Fail	Applicable Rule Parts
		Base Standard	Test Basis	NTS Procedure		
A	TX 6 dB Bandwidth	No	No	No	PASS	15.247 RSS 210, Issue 6
B	TX Peak Power Output	No	No	No	PASS	15.247 RSS 210, Issue 6
C	TX Peak Power Density	No	No	No	PASS	15.247 RSS 210, Issue 6
D	TX Conducted Spurious Emissions	No	No	No	PASS	15.247, 15.205 RSS 210, Issue 6
E	TX Conducted Spurious Emissions Band edge	No	No	No	PASS	15.247, 15.205 RSS 210, Issue 6
F	TX Radiated Spurious Emissions 30 MHz- 25 GHz	No	No	No	PASS	15.247, 15.205 RSS 210, Issue 6
G	AC Power line Conducted Emissions	No	No	No	N/A	15.207 RSS 210, Issue 6

Note: All testing was done with the module configured in a stand-alone configuration.

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

This is to certify that the preceding report is true and correct to the best of my knowledge.

Robert Stevens,
Quality Assurance Manager

Tom Tidwell,
Wireless Test Engineer

Table of Contents

Register of revisions

Revision	Reason for Revision	Revision Date
0	Original	19 Dec., 2006

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Plano to demonstrate compliance of the NXR-MO module to FCC Part 15 Subpart C section 15.247 for DTS transmitter.

2.0 EUT DESCRIPTION

2.1 CONFIGURATION

Description of EUT

	Name	Model	Revision	Serial Number
EUT	NXR-MO module	NXR-MO	A	TP0806013
RF Exposure Classification	Mobile (>20 cm. separation from user)			
Channels/Frequency Range	2405 – 2480 MHz			
Power	+4 dBm at antenna			
Functional Description	The NXR-MO module is a digital transmission system transceiver with a data rate of 250 kb/s. Modulation is O-QPSK with a symbol rate of 62.5 ksymb/s. The chip rate for spreading is 32 x the symbol rate (2 Mchip/s).			

2.1.1 EUT POWER

Voltage	12 Vdc supplied from NXR-MO debug board
Number of Feeds	+V and Return

2.2 EUT CABLES

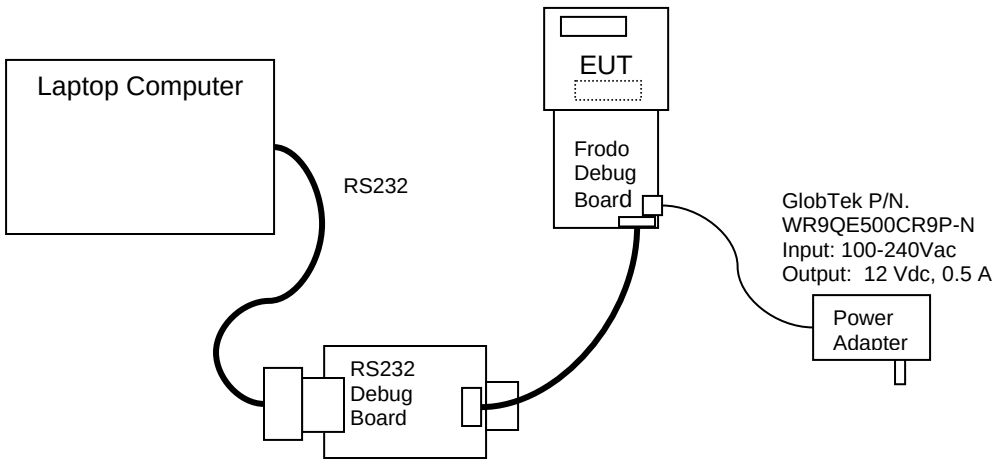
Quantity	Model/Type	Routing		Shielded / Unshielded	Description	Cable Length (m)
		From	To			
1	GlobTek	Power supply	EUT	Unshielded	Permanently attached to power supply	1.7

2.3 MODE OF OPERATION DURING TESTS

The NXR-MO module was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel for all tests. The EUT continuously transmitted a modulated packet with payload. While transmitting the EUT was setup to operate at the intended maximum power output available to the end user. For all test cases pre-scans were completed in all modes to determine worst case levels.

3.0 SUPPORT EQUIPMENT

3.1 CONFIGURATION



3.2 TEST BED/PERIPHERAL CABLES

Shielded RS232, 9 pin cable from laptop to RS232 debug board
4 AWG 18 wire (twisted) from RS232 debug board to NXR-MO debug card

APPENDICES

APPENDIX A: 6 DB BANDWIDTH

A.1. Base Standard & Test Basis

Base Standard	FCC PART 15.247 (A)
Test Basis	RF conducted as per FCC Publication 558074
Test Method	RF conducted as per FCC Publication 558074

A.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.

A.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
1.2 dB / .01 ppm

A.4. Deviations

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

A.5. Test Procedure

RF conducted as per FCC Publication 558074

A.6. Test Results

The EUT is in compliance with the limits as specified above

Channel	6 dB Bandwidth (MHz)
2405 MHz	1.62
2440 MHz	1.61
2480 MHz	1.57

A.7. Operating Mode During Test

The NXR-MO module was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel. The EUT continuously transmitted a modulated packet with a payload. While transmitting the EUT was set to operate at maximum power.

A.8. Sample Calculation

NA

A.9. Test Data

See plots on following pages

A.10. Tested By

Name: Tom Tidwell
Function: Manager of Wireless Services
Date: 15 Dec., 2006

Figure 1 6 dB Bandwidth Low Channel – 2405 MHz

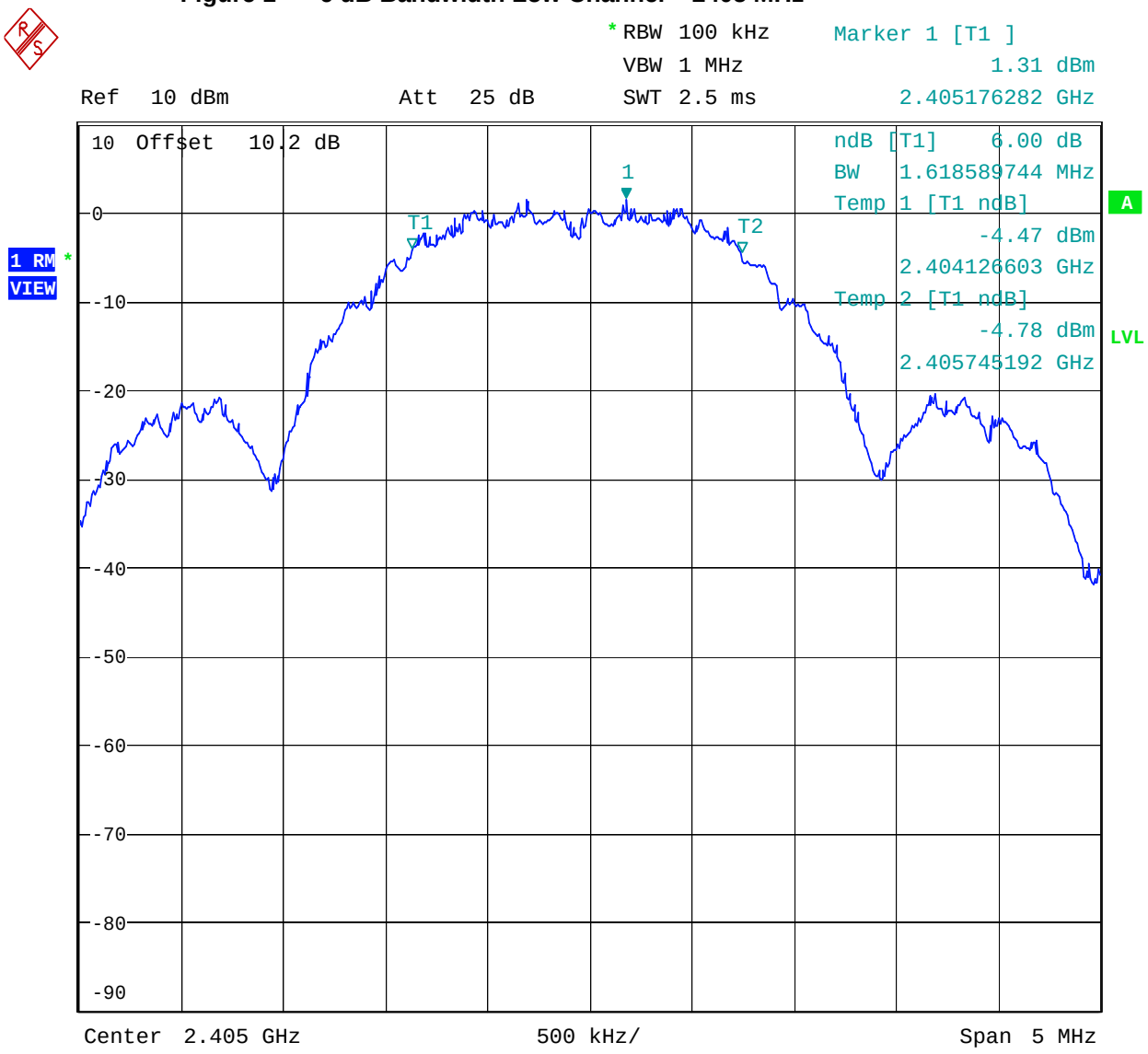


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Figure 2 6 dB Bandwidth Mid Channel – 2440 MHz

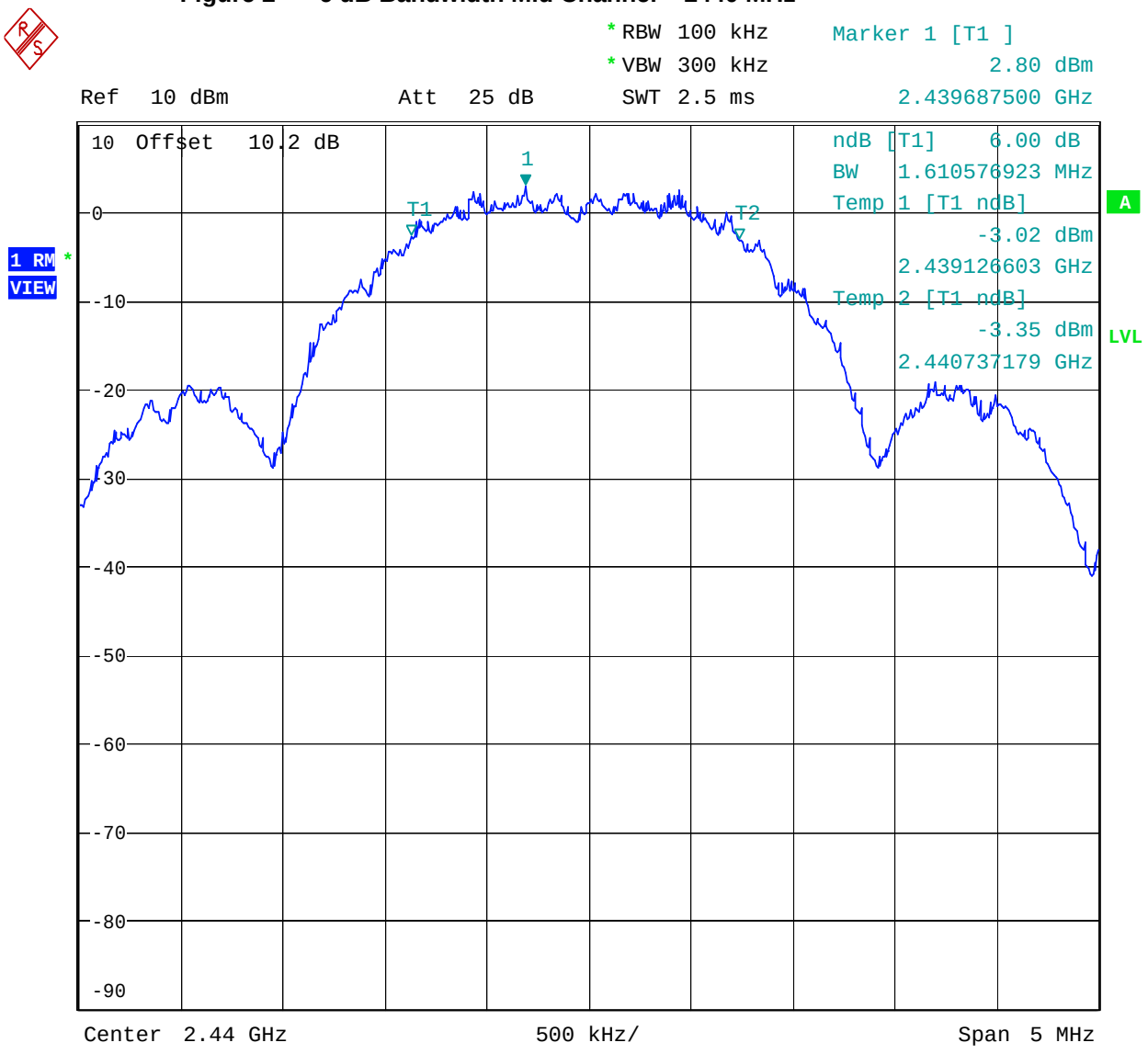

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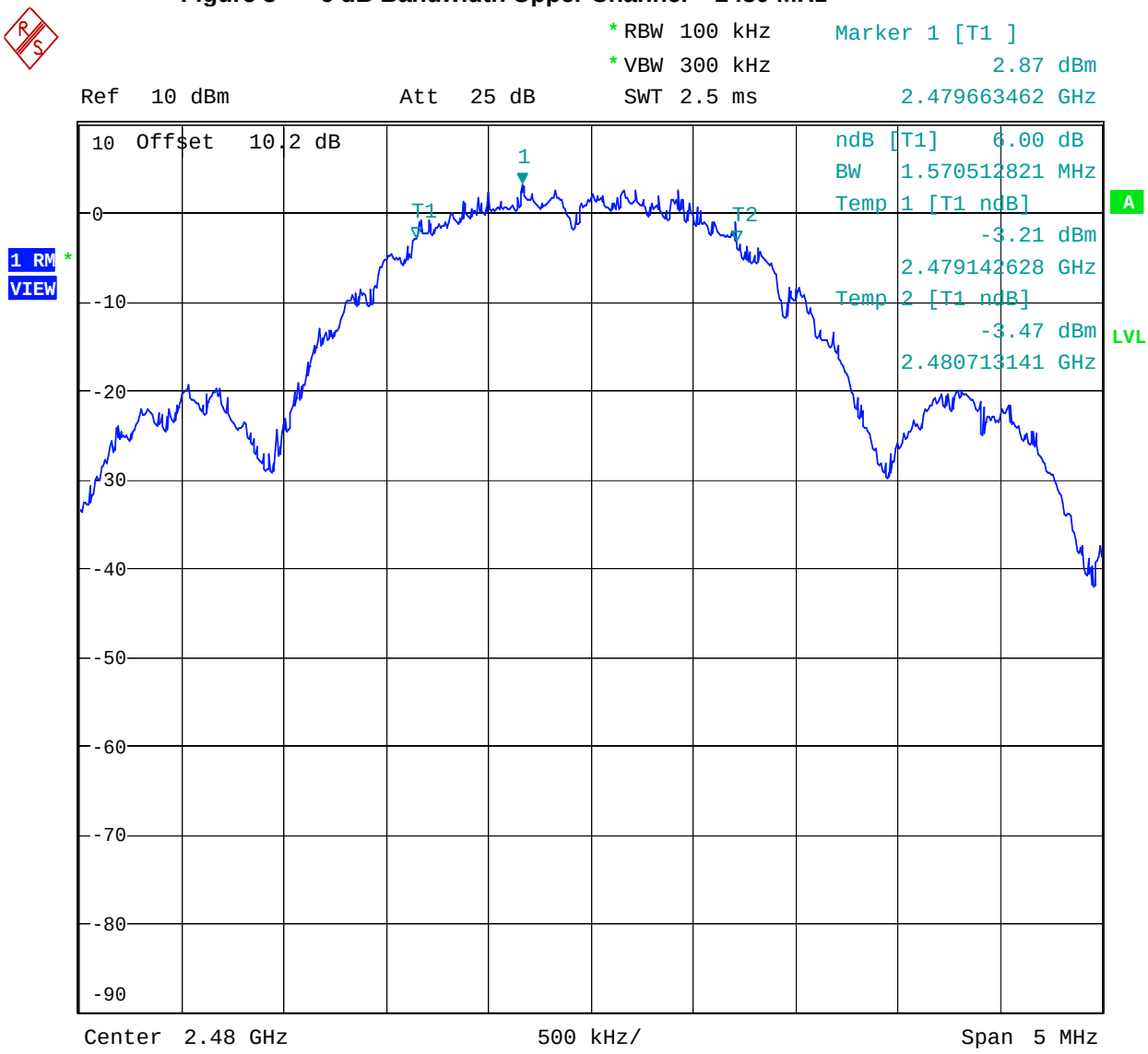
Figure 3 6 dB Bandwidth Upper Channel – 2480 MHz



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APPENDIX B: PEAK POWER OUTPUT

B.1. Base Standard & Test Basis

Base Standard	FCC 15.247
Test Basis	FCC 15.247 RF conducted as per FCC Publication 558074
Test Method	RF conducted as per FCC Publication 558074

B.2. Specifications

The maximum peak output power shall not exceed +30 dBm (1 watt) in the 2400 MHz- 2483.5 MHz band.

B.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
0.06 dB

B.4. Deviations

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

B.5. Test Method

RF conducted as per FCC Publication 558074 using a peak power meter. The peak power meter uses a high number of samples to measure peak power over time.

B.6. Test Results

Compliant – The maximum conducted peak power was +4.08 dBm (.0026 w) eirp.

B.7. Sample Calculation

Peak EIRP(dBm) = Measured max. conducted pk. power(dBm) + TX antenna directional gain(dBi)

Peak EIRP (W) = $[10^{(\text{Peak EIRP(dBm)}/10)}]/1000$

B.8. Test Data Summary

EUT Transmit Frequency (MHz)	Measured Max. Conducted Peak Power (dBm)	Antenna Directional Gain (dBi)	EIRP (dBm)
2405 MHz	4.06	0	4.06
2440 MHz	4.08	0	4.08
2480 MHz	4.03	0	4.03

Note: These measurements were made using a peak power meter. The plots that follow are for visual reference only.

B.9. Tested By

Name: Tom Tidwell
Function: Manager of Wireless Services
Date: 15 December, 2006

Figure 4 Peak Power Output - 2404 MHz

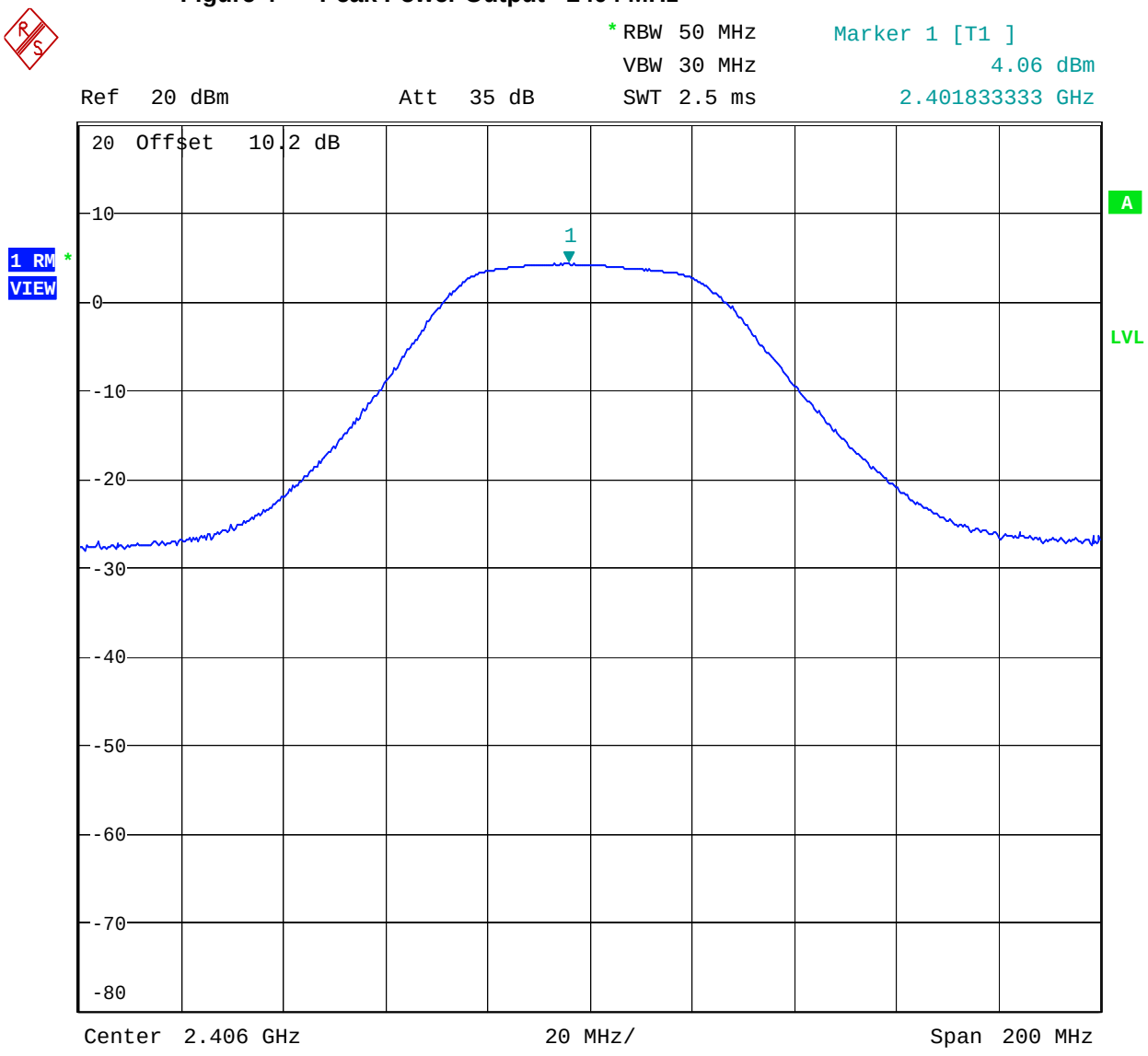

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Figure 5 Peak Power Output 2440 MHz

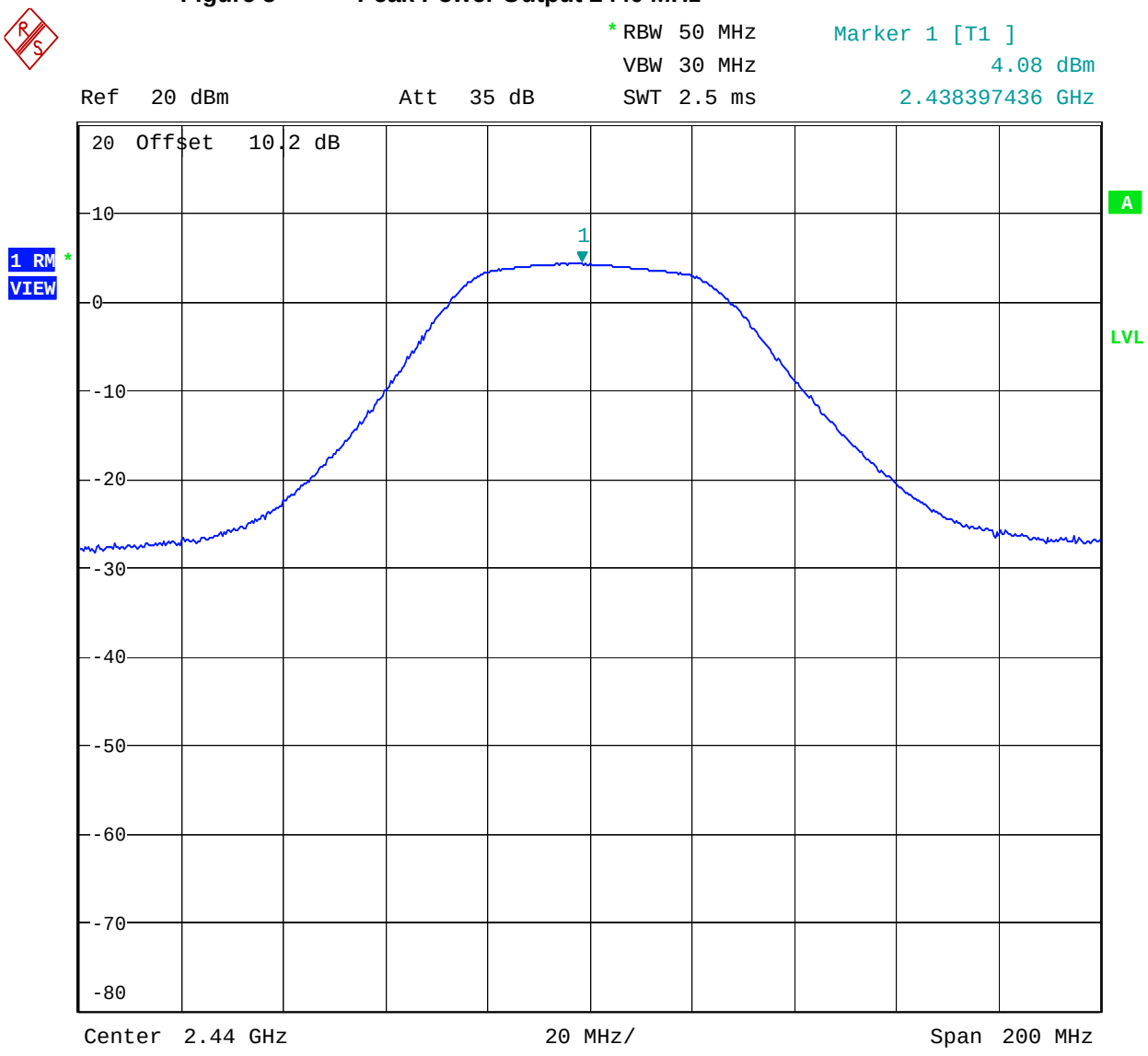

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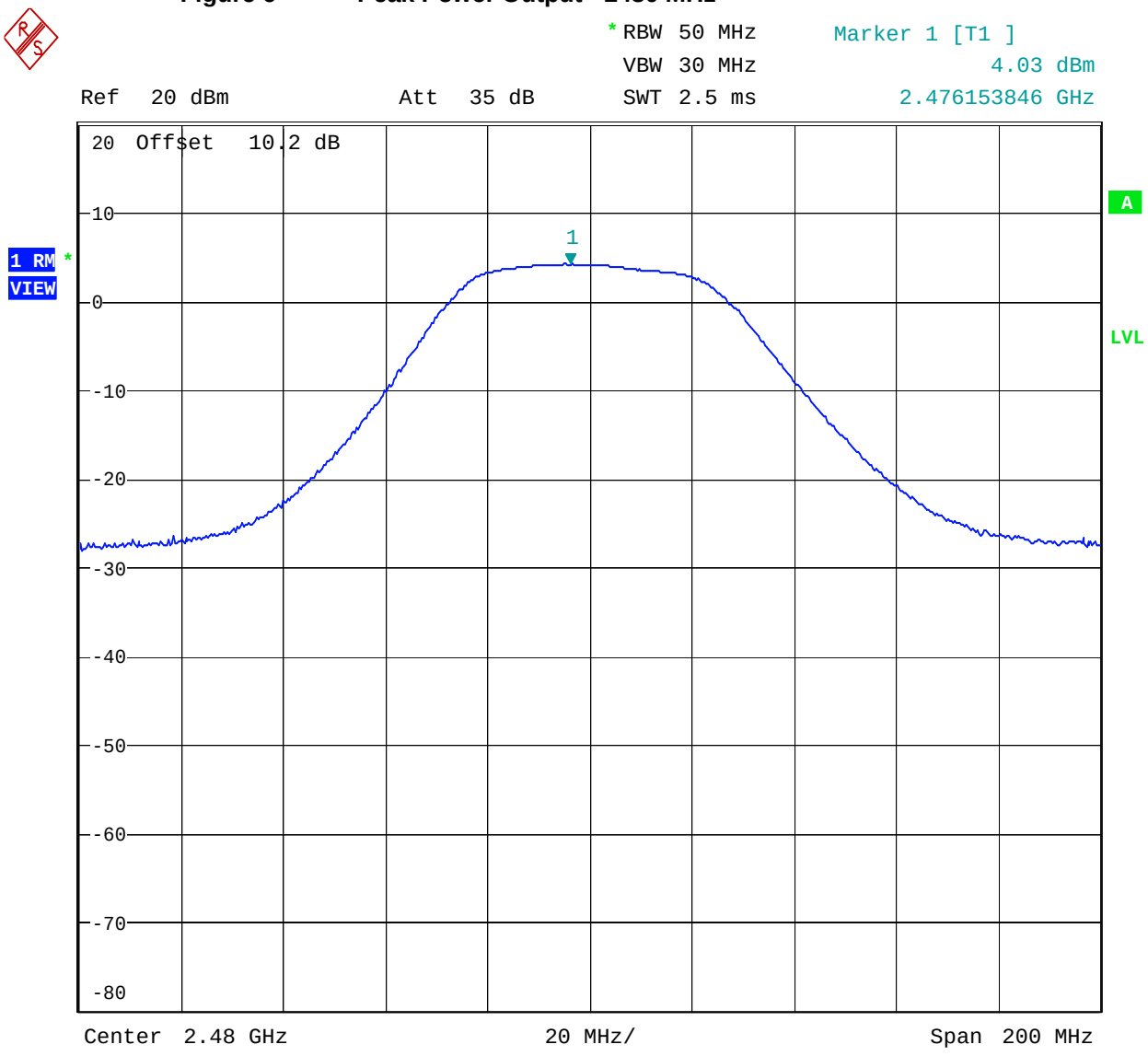
Figure 6 Peak Power Output - 2480 MHz



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APPENDIX C: PEAK POWER DENSITY

C.1. Base Standard & Test Basis

Base Standard	CFR Title 47 – Telecommunications, Chapter I - FCC Part 15.247 – Radio Frequency Devices - Subpart C– Intentional Radiators
Test Basis	RF conducted as per FCC Publication 558074
Test Method	RF conducted as per FCC Publication 558074

C.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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

C.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+/-1.2 dB

C.4. Deviations

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

C.5. Test Method

RF conducted as per FCC Publication 558074

C.6. Test Results

Compliant. The maximum measured Peak Power Density was -19.0 dBm/3 kHz.

C.7. Deviations from Normal Operating Mode During Test

None.

C.8. Sample Calculation

None.

C.9. Test Data

EUT Transmit Channel	Peak Power Density (dBm)
2405 MHz	-20.8
2440 MHz	-20.7
2480 MHz	-19.0

See plots following.

C.10. Tested By

Name: Tom Tidwell
Function: Manager of Wireless Services
Date: 15 December, 2006

Figure 7 Power Density – 2405 MHz

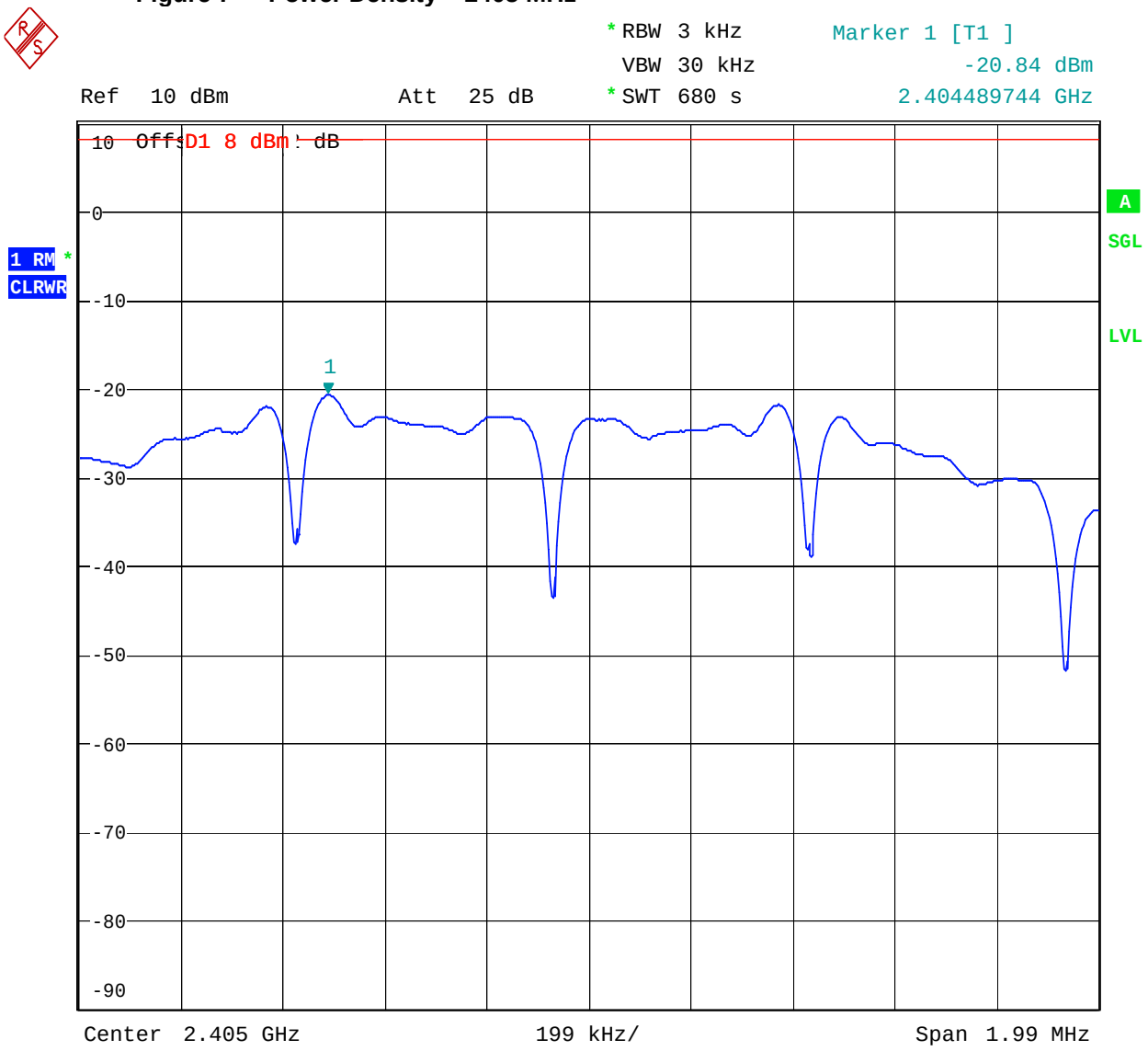

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Figure 8 Power Density – 2440 MHz

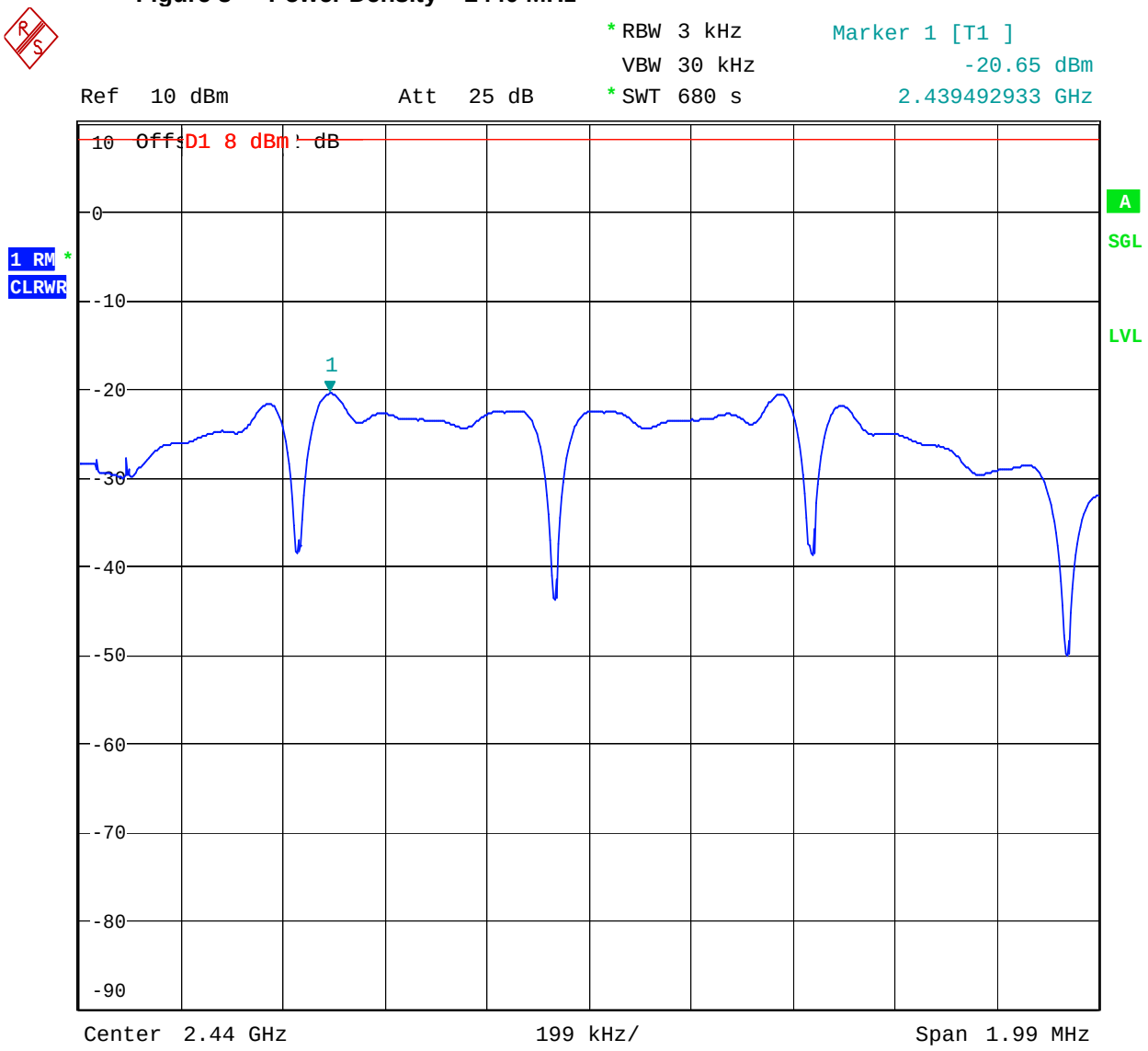

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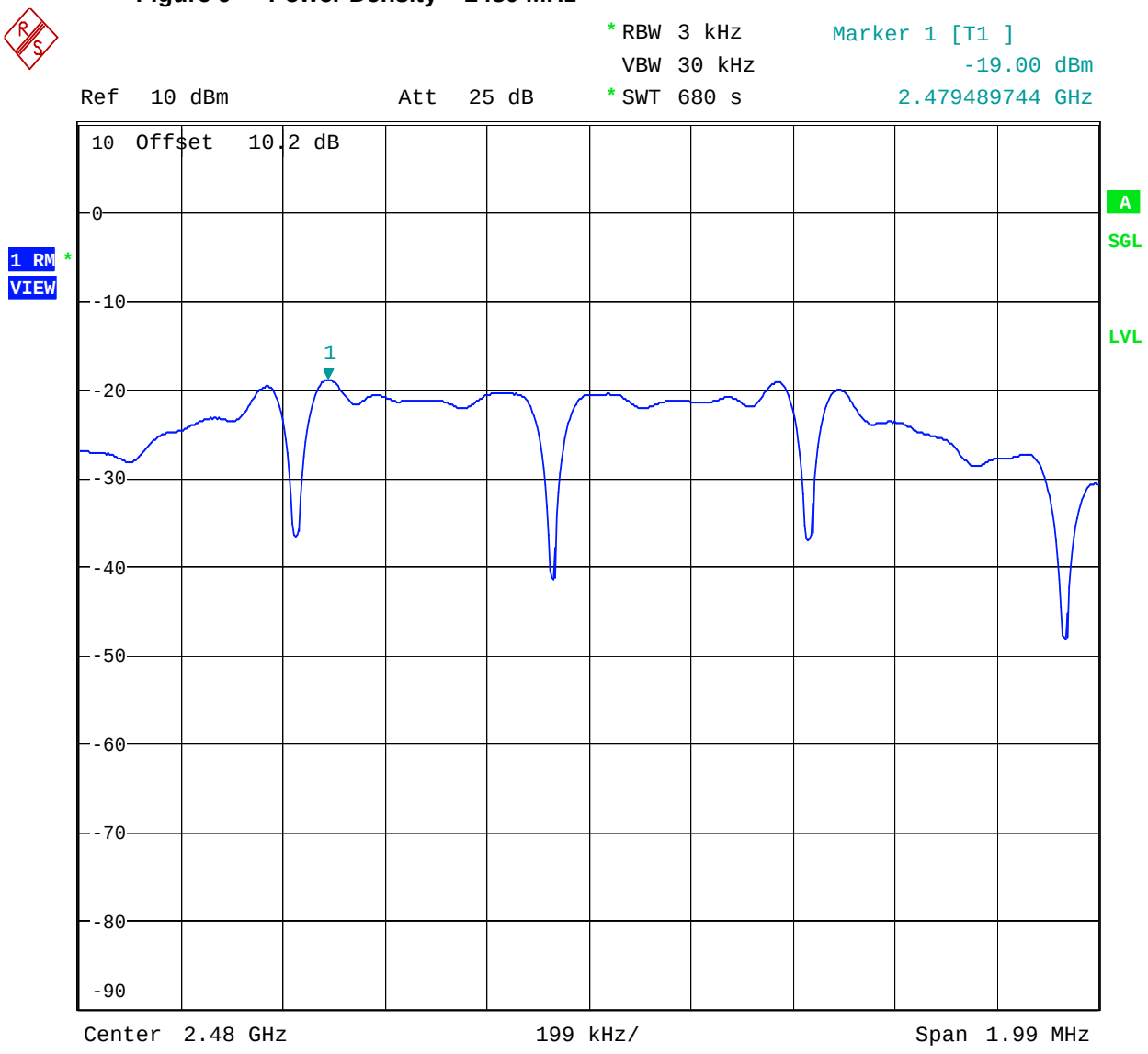
Figure 9 Power Density – 2480 MHz



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APPENDIX D: 15.247 CONDUCTED SPURIOUS EMISSIONS

D.1. Base Standard & Test Basis

Base Standard	CFR Title 47 – Telecommunications, Chapter I – FCC Part 15.247 – Radio Frequency Devices - Subpart C– Intentional Radiators
Test Basis	RF conducted as per FCC Publication 558074
Test Method	RF conducted as per FCC Publication 558074

D.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)).

D.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+/- 1.2 dB

D.4. Deviations

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

D.5. Test Results

Compliant. All peak emissions were more than 20 dB below the in-band power.

D.6. Test Data

See following pages.

D.7. Tested By

Name: Tom Tidwell
Function: Manager of Wireless Services
Date: 15 December, 2006

Figure 10 Conducted Spurious Emissions – Low Channel (2405 MHz)

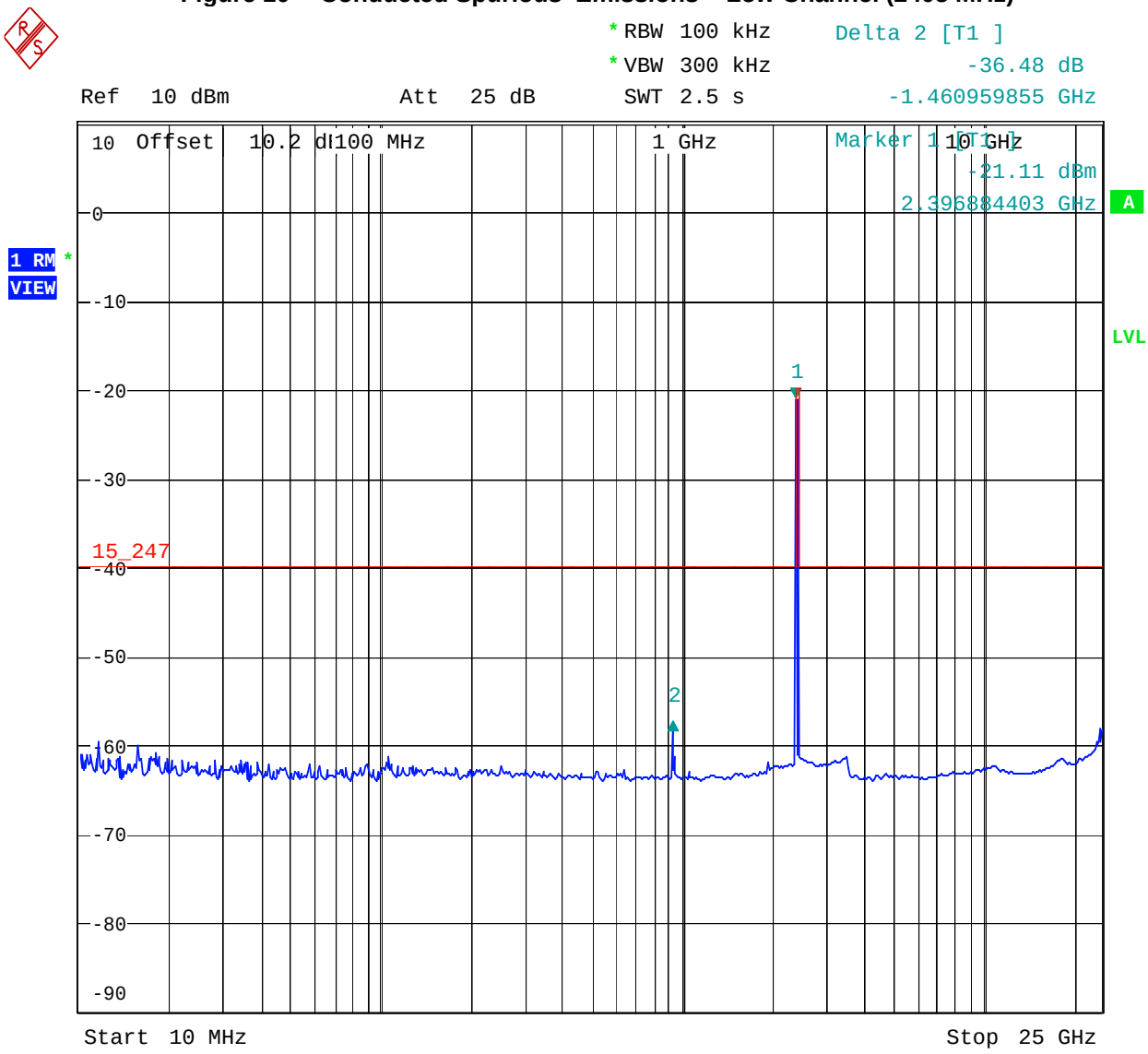

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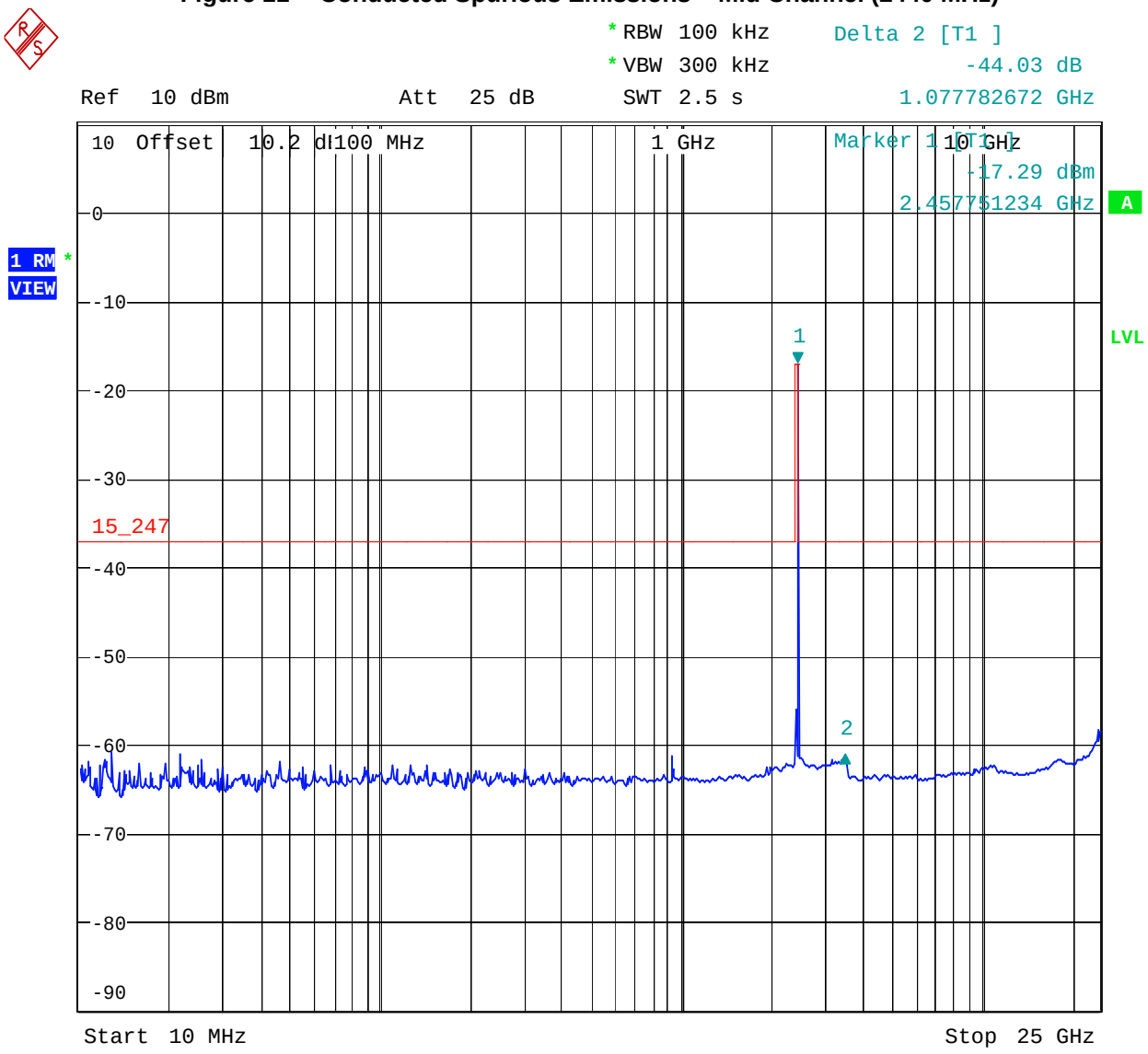
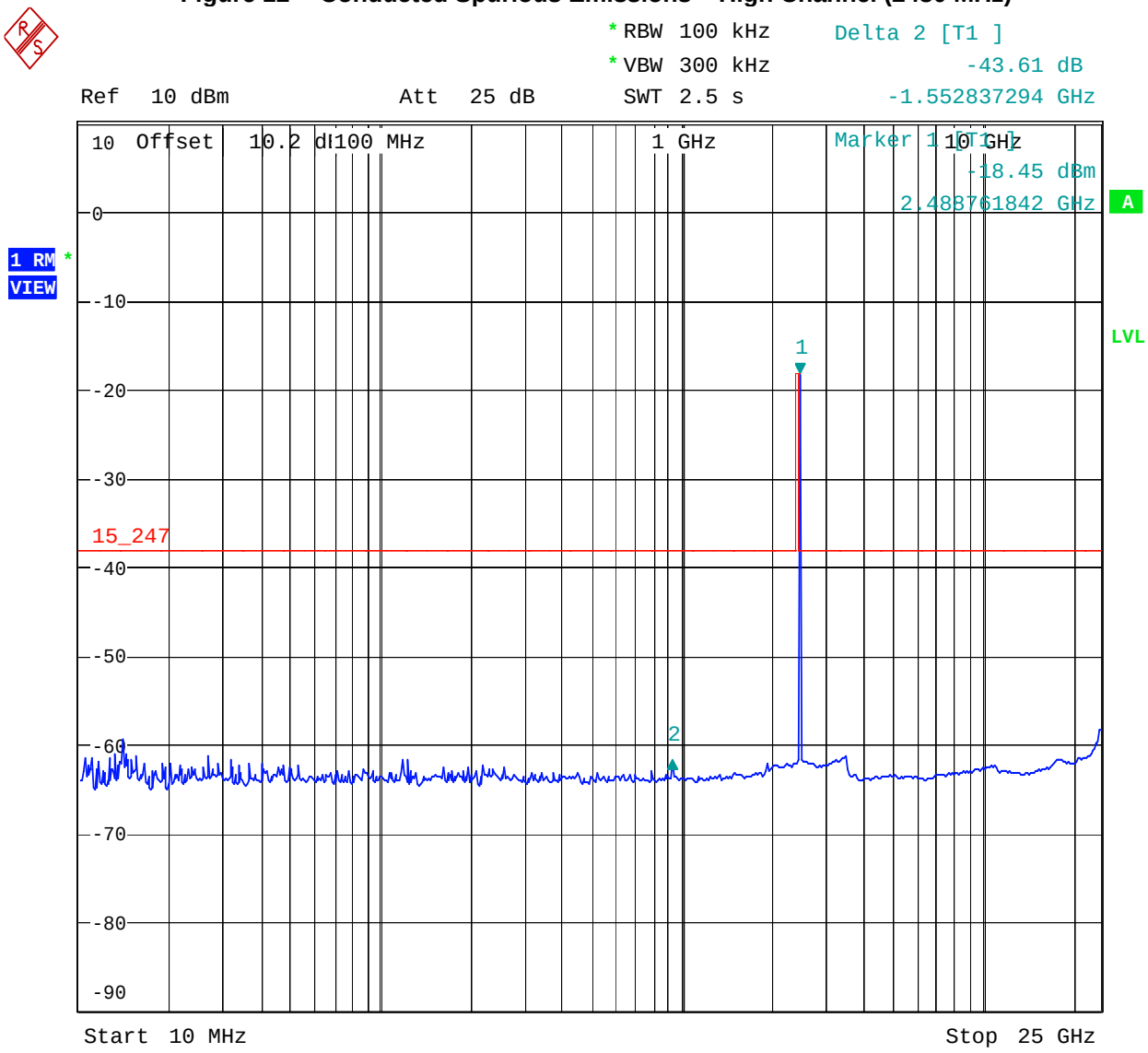
Figure 11 Conducted Spurious Emissions – Mid Channel (2440 MHz)



Date: 15.DEC.2006 20:32:34

Figure 12 Conducted Spurious Emissions – High Channel (2480 MHz)



Date: 15.DEC.2006 20:34:07

APPENDIX E: CONDUCTED SPURIOUS EMISSIONS BAND EDGE MEASUREMENTS

E.1. Base Standard & Test Basis

Base Standard	CFR Title 47 – Telecommunications, Chapter I – FCC Part 15.247 – Radio Frequency Devices - Subpart C– intentional Radiators.
Test Basis	RF conducted as per FCC Publication 558074
Test Method	RF conducted as per FCC Publication 558074

E.2. Limits

(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)).

E.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+/- 1.2 dB, .01 ppm

E.4. Test Results

Compliant. All out of band spurious emissions are more than 20 dB below the in band power of the fundamental.

E.5. Deviations from Normal Operating Mode During Test

None.

E.6. Sample Calculation

NA.

E.7. Test Data

See plots on following pages.

E.8. Tested By

Name: Tom Tidwell
Function: Manager of Wireless Services
Date: 15 December, 2006

Figure 13 2400 MHz Band edge Measurement – TX set to 2404 MHz

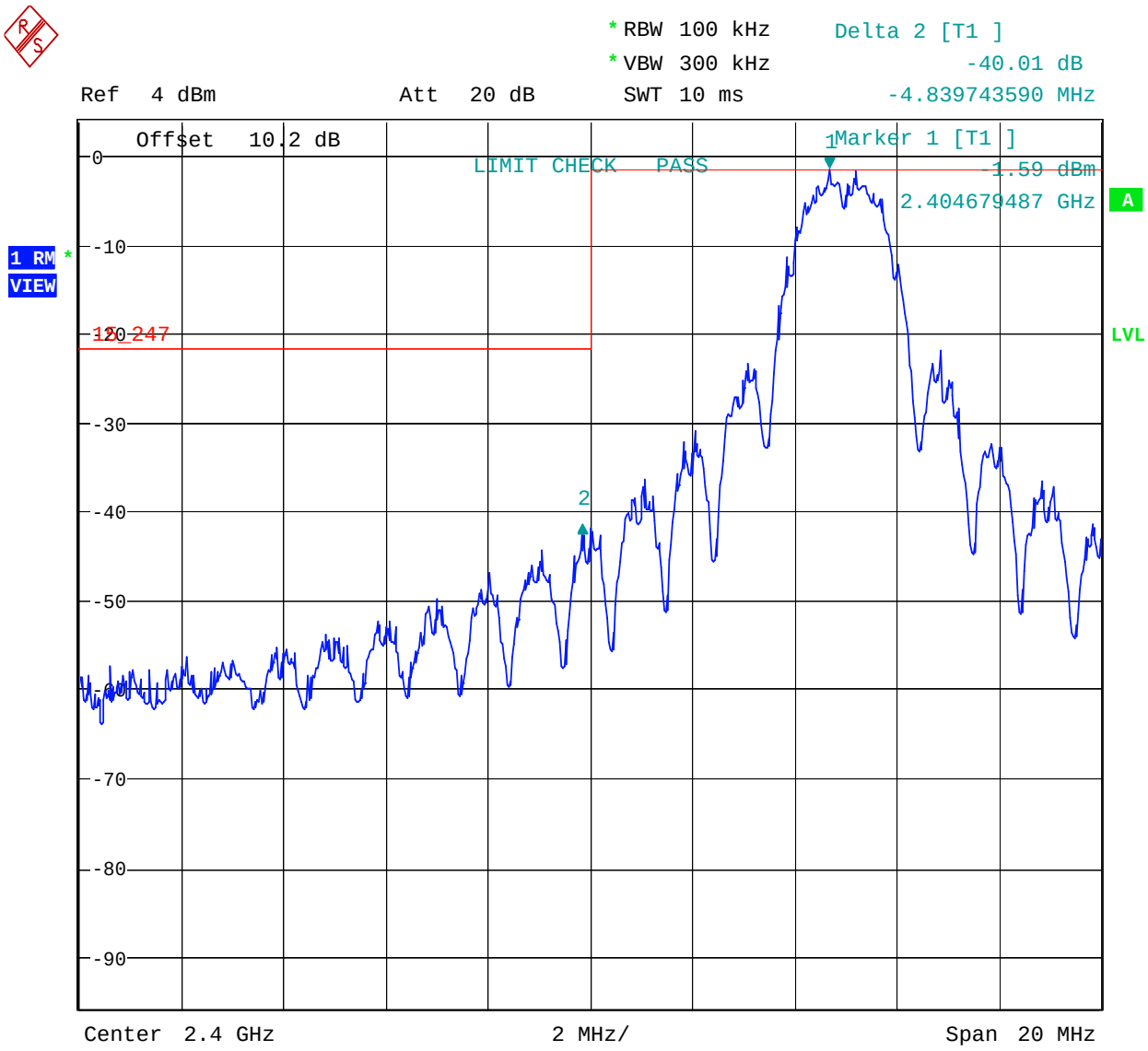


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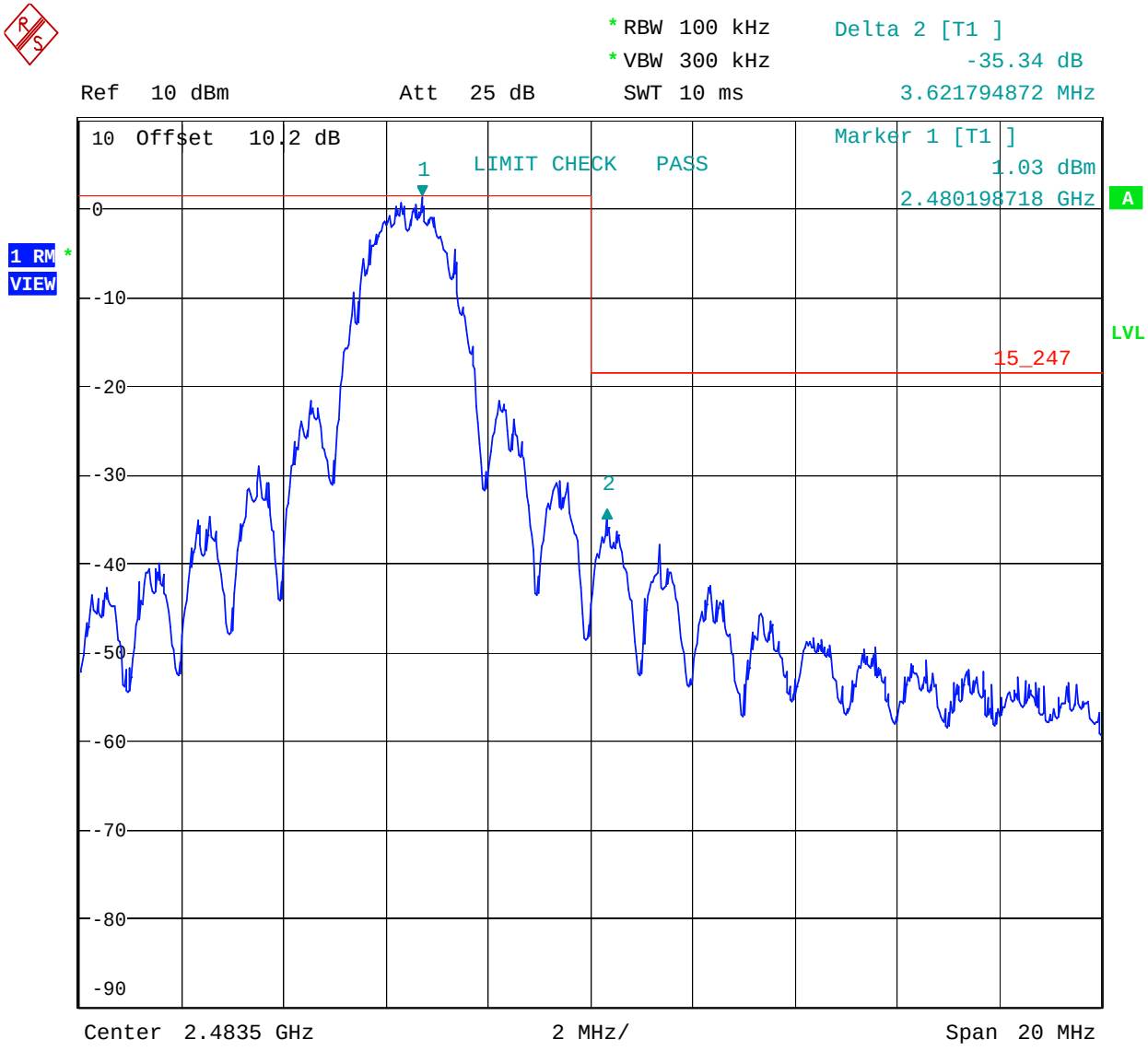
Figure 14 2483.5 MHz Band edge Measurement – TX set to 2479 MHz



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APPENDIX F: RADIATED EMISSIONS IN RESTRICTED BANDS 30 MHz – 25 GHz (TX AND RX)

F.1. Base Standard & Test Basis

Base Standard	CFR Title 47 – Telecommunications, Chapter I - FCC Part 15.209 – Radio Frequency Devices
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	ANSI C63.4-2003 and FCC Publication 558074

Specifications

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	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
\2\ Above 38.6

(b) Except as provided in paragraphs (d) and (e) of this section, 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.

F.2. Measurement Uncertainty

Radiated Emissions 30 MHz – 25 GHz	Expanded Uncertainty (K=2)
(dB)	+/-3.26

F.3. Deviations

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

F.4. Duty Cycle Calculation

A time-based duty cycle was not considered for this testing.

The radio was placed in a continuous transmit mode for this testing. The testing was repeated at low mid and high frequencies (2405 MHz, 2440 MHz, and 2480 MHz).

F.5. Test Results

The EUT is in compliance with FCC CFR47 Part 15.205/15209 Radiated emission limits. The worst case emission was 48 dBμV/m @ 3 meters @ 2483.5 MHz, a pass margin of 6 dB.

F.6. Observations

None

F.7. Deviations from Normal Operating Mode During Test

None.

F.8. Sample Calculation

Emission Level = Measured Level + Correction Factors.
Margin = Limit – Emission Level. A positive margin indicates a passing result.

F.9. Test Data & Photographs

Plots were not provided in order to reduce file size.

F.10. Tested By

Name: Tom Tidwell
Function: Manager of Wireless Services
Date: 8 Dec., 2006

Note: The frequency spectrum was searched up to 25 GHz on each channel

Project No:	W6373
Model:	Frodo Module
Comments:	Transmit full power at 2480 MHz, Continuously streaming data
Date:	8 December, 2006

Distance: 3 m **Standard:** CFR 47, 15.247 **RBW:** (unless noted) < 1 GHz = 120 kHz, > 1 GHz = 1 MHz **VBW:** (unless noted) Peak = 1 MHz, Avg. = 10 Hz

Antenna	Polarization	Frequency	Antenna Factor	Cable Loss + LNA	Duty Cycle Correction	Total Correction	Detector	Measured	Corrected	Limit	Margin
	(V/H)	(MHz)	(dB/m)	(dB)	(dB)	(dB/m)	(Pk/Avg)	(dBuV)	dBuV/m)	(dBuV/m)	(dB)
E1149P	V	2483.5	27.4	0.6	0.0	28.0	Pk	22.6	50.6	74.0	23.4
E1149P	V	2483.5	27.4	0.6	0.0	28.0	Avg	11.9	39.9	54.0	14.1
E1149P	H	2483.5	27.4	0.6	0.0	28.0	Pk	30.7	58.7	74.0	15.3
E1149P	H	2483.5	27.4	0.6	0.0	28.0	Avg	20.0	48.0	54.0	6.0
E1149P	V	4960.0	32.3	-26.5	0.0	5.8	Pk	50.8	56.6	74.0	17.4
E1149P	V	4960.0	32.3	-26.5	0.0	5.8	Avg	40.1	45.9	54.0	8.1
E1149P	H	4960.0	32.3	-26.5	0.0	5.8	Pk	52.2	58.0	74.0	16.0
E1149P	H	4960.0	32.3	-26.5	0.0	5.8	Avg	41.5	47.3	54.0	6.7
E1149P	V	7440.0	35.2	-25.1	0.0	10.1	Pk	40.8	50.9	74.0	23.1
E1149P	V	7440.0	35.2	-25.1	0.0	10.1	Avg	30.1	40.2	54.0	13.8
E1149P	H	7440.0	35.2	-25.1	0.0	10.1	Pk	42.1	52.2	74.0	21.8
E1149P	H	7440.0	35.2	-25.1	0.0	10.1	Avg	31.3	41.4	54.0	12.6
E1068P	V	24400.0	46.0	-11.6	0.0	34.4	Pk	22.6	57.0	74.0	17.0
E1068P	V	24400.0	46.0	-11.6	0.0	34.4	Avg	4.8	39.2	54.0	14.8
E1068P	H	24400.0	46.0	-11.6	0.0	34.4	Pk	23.3	57.7	74.0	16.3
E1068P	H	24400.0	46.0	-11.6	0.0	34.4	Avg	3.8	38.2	54.0	15.8

Notes:
(1) A positive margin indicates a passing result
(2) For 15.247 emissions Peak detector indicates 1 MHz RBW/ 1 MHz VBW and Average indicates 1 MHz RBW / 10 Hz VBW
(3) The device was maximized around three orthogonal axis.

Project No:	W6373
Model:	Frodo Module
Comments:	Transmit full power at 2440 MHz, Continuously streaming data
Date:	8 December, 2006

Distance: 3 m **Standard:** CFR 47, 15.247 **RBW:** (unless noted) < 1 GHz = 120 kHz, > 1 GHz = 1 MHz **VBW:** (unless noted) Peak = 1 MHz, Avg. = 10 Hz

Antenna	Polarization	Frequency	Antenna Factor	Cable Loss + LNA	Duty Cycle Correction	Total Correction	Detector	Measured	Corrected	Limit	Margin
	(V/H)	(MHz)	(dB/m)	(dB)	(dB)	(dB/m)	(Pk/Avg)	(dBuV)	dBuV/m)	(dBuV/m)	(dB)
E1149P	V	4880.0	32.3	-26.6	0.0	5.7	Pk	50.0	55.7	74.0	18.3
E1149P	V	4880.0	32.3	-26.6	0.0	5.7	Avg	39.6	45.3	54.0	8.7
E1149P	H	4880.0	32.3	-26.6	0.0	5.7	Pk	51.8	57.5	74.0	16.5
E1149P	H	4880.0	32.3	-26.6	0.0	5.7	Avg	40.6	46.3	54.0	7.7
E1149P	V	7320.0	35.2	-25.2	0.0	10.0	Pk	46.4	56.4	74.0	17.6
E1149P	V	7320.0	35.2	-25.2	0.0	10.0	Avg	29.5	39.5	54.0	14.5
E1149P	H	7320.0	35.2	-25.2	0.0	10.0	Pk	47.4	57.5	74.0	16.5
E1149P	H	7320.0	35.2	-25.2	0.0	10.0	Avg	28.5	38.5	54.0	15.5
E1149P	V	12200.0	39.2	-19.7	0.0	19.5	Pk	39.3	58.8	74.0	15.2
E1149P	V	12200.0	39.2	-19.7	0.0	19.5	Avg	21.7	41.2	54.0	12.8
E1149P	H	12200.0	39.2	-19.7	0.0	19.5	Pk	40.1	59.6	74.0	14.4
E1149P	H	12200.0	39.2	-19.7	0.0	19.5	Avg	22.3	41.8	54.0	12.2
E1068P	V	24400.0	46.0	-11.6	0.0	34.4	Pk	22.7	57.1	74.0	16.9
E1068P	V	24400.0	46.0	-11.6	0.0	34.4	Avg	5.0	39.4	54.0	14.6
E1068P	H	24400.0	46.0	-11.6	0.0	34.4	Pk	22.5	56.9	74.0	17.1
E1068P	H	24400.0	46.0	-11.6	0.0	34.4	Avg	3.7	38.1	54.0	15.9

Notes:
(1) A positive margin indicates a passing result
(2) For 15.247 emissions Peak detector indicates 1 MHz RBW/ 1 MHz VBW and Average indicates 1 MHz RBW / 10 Hz VBW
(3) The device was maximized around three orthogonal axis.

Project No:	W6373
Model:	Frodo Module
Comments:	Transmit full power at 2405 MHz, Continuously streaming data
Date:	8 December, 2006

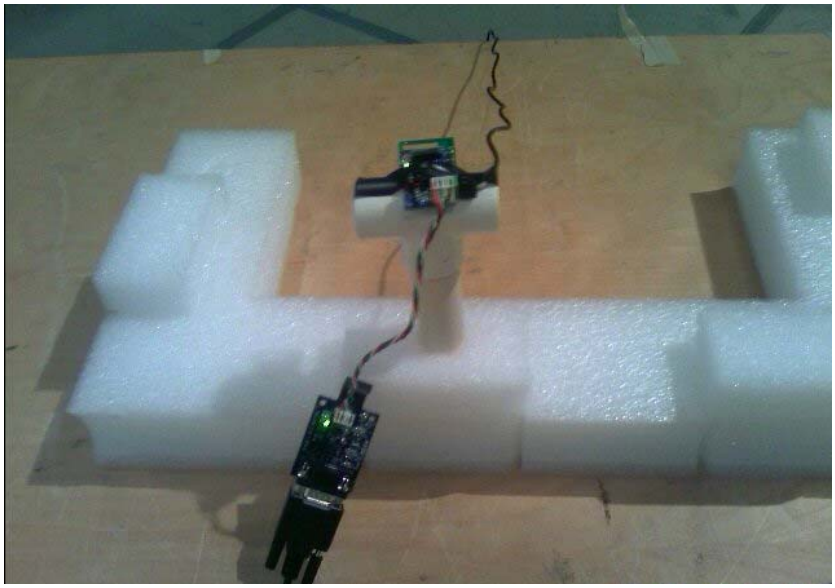
Distance: 3 m

Standard: CFR 47, 15.247 **RBW:** (unless noted) < 1 GHz = 120 kHz, > 1 GHz = 1 MHz **VBW:** (unless noted) Peak = 1 MHz, Avg. = 10 Hz

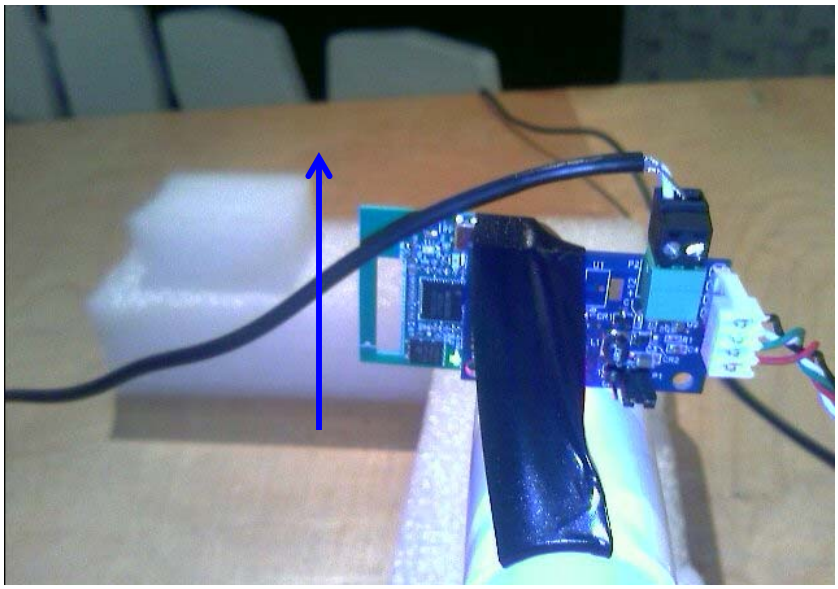
Antenna	Polarization	Frequency	Antenna Factor	Cable Loss + LNA	Duty Cycle Correction	Total Correction	Detector	Measured	Corrected	Limit	Margin
	(V/H)	(MHz)	(dB/m)	(dB)	(dB)	(dB/m)	(Pk/Avg)	(dBuV)	dBuV/m)	(dBuV/m)	(dB)
E1149P	V	4810.0	32.3	-26.8	0.0	5.5	Pk	50.8	56.3	74.0	17.7
E1149P	V	4810.0	32.3	-26.8	0.0	5.5	Avg	40.5	46.0	54.0	8.0
E1149P	H	4810.0	32.3	-26.8	0.0	5.5	Pk	52.2	57.7	74.0	16.3
E1149P	H	4810.0	32.3	-26.8	0.0	5.5	Avg	41.8	47.3	54.0	6.7
E1149P	V	7215.0	35.2	-25.2	0.0	10.0	Pk	42.0	52.0	74.0	22.0
E1149P	V	7215.0	35.2	-25.2	0.0	10.0	Avg	31.8	41.8	54.0	12.2
E1149P	H	9620.0	37.8	-23.1	0.0	14.7	Pk	47.4	62.2	74.0	11.8
E1149P	H	9620.0	37.8	-23.1	0.0	14.7	Avg	28.5	43.2	54.0	10.8
E1149P	V	12025.0	39.2	-20.0	0.0	19.2	Pk	48.8	68.0	74.0	6.0
E1149P	V	12025.0	39.2	-20.0	0.0	19.2	Avg	28.5	47.7	54.0	6.3
E1149P	H	14430.0	41.4	-17.5	0.0	23.9	Pk	42.4	66.3	74.0	7.7
E1149P	H	14430.0	41.4	-17.5	0.0	23.9	Avg	22.1	46.0	54.0	8.0
E1068P	V	24050.0	46.0	-11.6	0.0	34.4	Pk	22.3	56.7	74.0	17.3
E1068P	V	24050.0	46.0	-11.6	0.0	34.4	Avg	3.6	38.0	54.0	16.0
E1068P	H	24050.0	46.0	-11.6	0.0	34.4	Pk	22.3	56.7	74.0	17.3
E1068P	H	24050.0	46.0	-11.6	0.0	34.4	Avg	3.6	38.0	54.0	16.0

Notes:
(1) A positive margin indicates a passing result
(2) For 15.247 emissions Peak detector indicates 1 MHz RBW/ 1 MHz VBW and Average indicates 1 MHz RBW / 10 Hz VBW
(3) The device was maximized around three orthogonal axis.

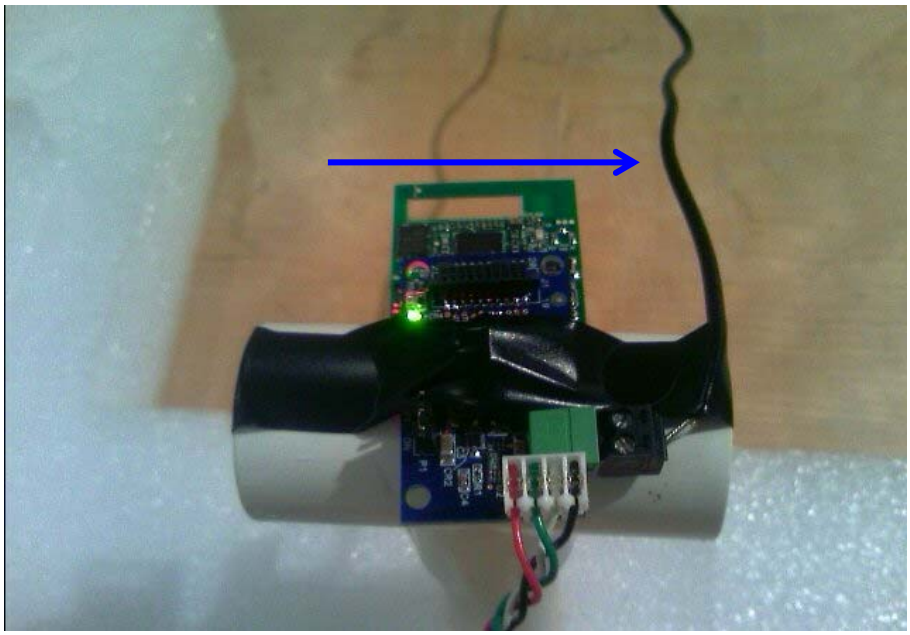
F.11. Test Setup Photos



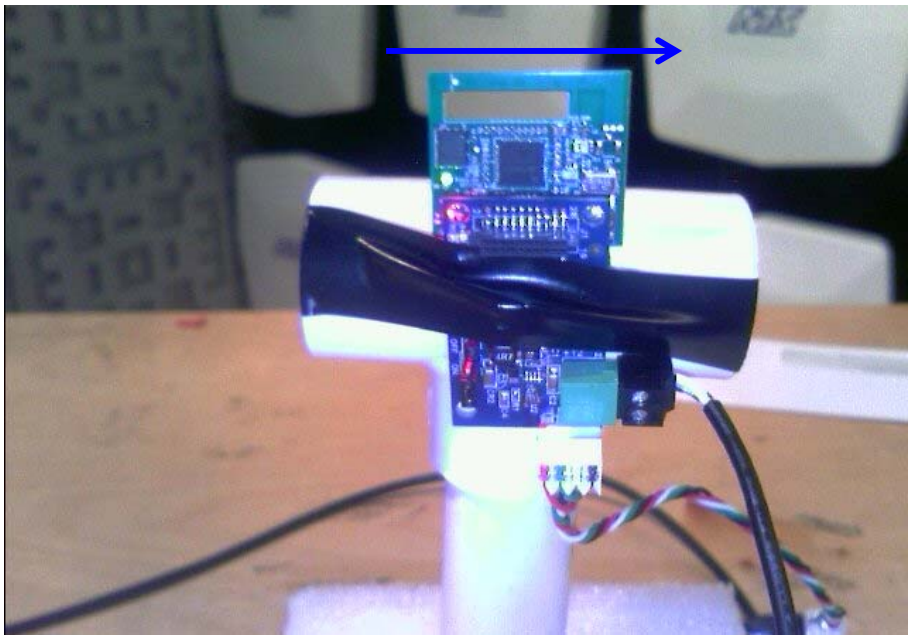
Overall setup showing debug card and power connection



X axis – Module card on edge



X axis – Module card flat



Z axis – Module card vertical

APPENDIX G: POWERLINE CONDUCTED EMISSIONS

G.1. Base Standard & Test Basis

Base Standard	CFR Title 47 – Telecommunications, Chapter I - FCC Part 15.207 – Radio Frequency Devices - Subpart C – Unintentional Radiators
Test Method	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

G.2. Specifications

Frequency	☐ **Class A**		☒ **Class B**	
Limit	**Quasi-Peak**	**Average**	**Quasi-Peak**	**Average**
MHz	**dBµV**	**dBµV**	**dBµV**	**dBµV**
0.150 – 0.500	79.00	66.00	66 to 56[1]	56 to 46[1]
0.500 – 5.00	73.00	60.00	56	46
5.00 – 30.00	73.00	60.00	60	50

Note 1: decrease with the logarithm of the frequency.

G.3. Measurement Uncertainty

Conducted Current Emissions 150 kHz – 30 MHz	**Measurement Uncertainty**	**Expanded Uncertainty (K=2)**
(dB)	+/- 3 dB	+/- 3 dB

G.4. Deviations

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

G.5. Special Considerations

Testing was performed with an “commercial off-the-shelf” power supply to demonstrate compliance.

G.6. Test Results

Compliant. The worst case emission level was 38.5 dBμV at 364 kHz with a 9.5 dB margin of compliance.

G.7. Deviations from Normal Operating Mode During Test

None.

G.8. Sample Calculation

Correction Factor = LISN Correction Factor + Cable Loss
Corrected Value = Measurement + Correction Factor
Margin = Limit – Corrected Emission Level

G.9. Test Data & Photographs

The test data and photographs collected during this test appear following this page.

G.10. Tested By

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

Name: Bobby Mummon
Function: EMI Technician
Date: 12/5/06

Date of measurement: 12/05/06. Test Personnel: Bobby Mummon

EN55022	Class B			High			
Frequency	QP Limits	AVG Limits	Factor	Quasi Raw	AVG Raw	QP Margin	AVG Margin
0.191	64	54	1	43.2	42	-19.8	-11
0.28	61	51	1	40.8	32	-19.2	-18
0.363	58	48	1	41	37.3	-16	-9.7
11.96	60	50	1	36.4	31.2	-22.6	-17.8
13.36	60	50	1	37	31.4	-22	-17.6
25.7	60	50	1	37.5	31	-21.5	-18

EN55022	Class B			Return			
Frequency	QP Limits	AVG Limits	Factor	Quasi Raw	AVG Raw	QP Margin	AVG Margin
0.185	64	54	1	44.6	36	-18.4	-17
0.28	61	51	1	40.6	31.8	-19.4	-18.2
0.364	58	48	1	41	37.5	-16	-9.5
8.72	60	50	1	36.4	31.5	-22.6	-17.5
14.34	60	50	1	35.1	28	-23.9	-21
24.05	60	50	1	35.3	28.9	-23.7	-20.1

The test results derived from this testing demonstrates that the Netlinx Zigbee System (NXR-ZGW Gateway, NXR-ZRD Repeater and NXR-ZMO Module) conforms to EN 55022 Class B for Conducted Emissions.

APPENDIX H: TEST EQUIPMENT LIST

H.1. Radiated Emissions 30 MHz – 1 GHz Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due
Bilog Antenna	ETS	3142C	E1289P	8/21/07
RF Cable	Gore	FJN	EMI8	9/1/07
Spectrum Analyzer	HP	8566B	E1007P	8/29/07
Quasi-Peak Adapter	HP		E1007P	8/29/07
Low Noise Amplifier	Miteq	AM-1431	E1279P	12/4/07
Multi Device Controller (Turntable and Mast)	ETS	2090	00058930	-

H.2. Radiated Emissions 1 GHz – 25 GHz Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due
Horn Antenna 1 GHz – 18 GHz	EMCO	3115	E1149P	8/24/07
Horn Antenna 18 GHz – 26.5 GHz	EMCO	3116	E1068P	8/24/07
High pass filter	K&L	11SH10-2000	W1024P	-
Low Noise Amplifier	HP	8449B	E1010P	5/4/07
Spectrum Analyzer	HP	8566B	E1007P	8/29/07

H.3. Antenna Conducted Emissions Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due
Coaxial attenuator	Inmet	36AH-20	W1019P	9/29/07
Coaxial Cable	MegaPhase	TM26	W1010P	9/29/07
Spectrum Analyzer 20 Hz -26.5 GHz	Rohde & Schwarz	FSQ26	W1020P	10/16/07
Peak Power Meter	Boonton	4532	W1001P	9/1/07
Peak Power Sensor	Boonton	57340	W1002P	9/1/07

H.4. Powerline Conducted Emissions Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due
LISN	Solar	8028-50-TS-24-BNC	E1226 P	01/16/07
LISN	Solar	8028-50-TS-24-BNC	E1227 P	01/16/07
HP Spectrum Analyzer	HP	8566B	E1168 P	01/11/07
Quasi Peak Detector	HP	85650A	E1182 P	01/11/07

END OF DOCUMENT