Certification Test Report

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

NovAtel Inc
DL-V3 Bluetooth

FCC ID # UTU01017829A
IC # 129A-01017829A

Project Code CG-1099

(Report CG-1099-RA-1-1)
Revision: 1

June 2, 2009

Prepared for:	NovAtel Inc
Author:	Deniz Demirci Senior Wireless/EMC Technologist
Approved by:	Nick Kobrosly Director of Canadian Operations

Report Summary

Test Facility:	**National Technical Systems, Canada** Product Integrity Laboratory 5151-47th Street, N.E. Calgary Alberta T3J 3R2
Accreditation Numbers:	0214.22 Electrical 0214.23 Mechanical Accredited by A2LA The American Association for Laboratory Accreditation CLIENTS SERVED: All interested parties FIELDS OF TESTING: Electrical/Electronic, Mechanical/Physical ACCREDITATION DATE:: May 14, 2009 VALID TO: December 31, 2009
Applicant:	NovAtel Inc 1120 - 68th Avenue N.E Calgary, AB T2E 8S5 Canada Phone: (403) 730-4640
Customer Representative:	Name: Jerry Davis Title: Compliance Specialist Phone #. (403) 295-4521 Email Address: jerry.davis@novatel.com

EUT Description

EUT Description	Manufacturer	Model	Revision	Serial Number
DL-V3 GPS Receiver with Bluetooth Wireless Transceiver	NovAtel Inc	01017829	8:00B	NBV09140027

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	No	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 7 2.7 (Rx), A8.5 (Tx)

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

Prepared By: 2009.06.09 10:45:03 -06'00'
Deniz Demirci
Senior Wireless/EMC Technologist

Reviewed By: Glen Moore 2009.06.09 11:20:31 -06'00'
Glen Moore
Wireless/EMC Manager

Approved By: Alex Mathews
Alex Mathews
Quality Management Representative

Table of Contents

Register of revisions

Revision	Date	Description of Revisions
0	May 21, 2009	Draft release
1	June 2, 2009	Final release

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 DL-V3 with Bluetooth from NovAtel 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	DL-V3	01017829	8:00B	NBV09140027
Power Supply	GlobTek Inc. 120/240 VAC – 12V 1.25A	P/N 40023114	N/A	N/A
Device Classification	Mobile			
Antenna	3 dBi Surface Mount Integral Antenna			
Modulation	GFSK			
EUT Size with Enclosure (H x W x D) (in mm)	185 x 162 x 76			
EUT Weight (in grams)	1300			
Channels/Frequency Range	79 channels, 2402 MHz -2480 MHz			
Functional Description	The DL-V3 GPS Receiver is a 72 channel, dual frequency, GPS receiver that collects and records GPS information. Data can be recorded on the internal compact flash or transmitted wirelessly, or wired, to a PC.			

2.1.1 EUT POWERS

Voltage	12V DC powered by Glob Tek Inc. 120/240 VAC - 12V @ 1.25A
Number of Feeds	2

2.2 EUT CABLES

Item	Part Number	Description	Length
1	01017658	Null Modem Shielded Cable (DB9 Female-Male)	2m
2	01017659	Serial Extension Shielded Cable (DB9 Male-Female)	2m
3	01017660	I/O Strobe Shielded Cable	2m
4	01017663	12V Power Adapter Shielded Cable	2m
5	GPS-C016	RF (Coaxial) Antenna Shielded Cable	15m
6	N/A	Power cable	1.9m

2.3 MODE OF OPERATION DURING TESTS

The DL-V3 Bluetooth 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 Bluetooth was set to mid channel with highest Tx power and data rate DH5, Power adapter GlobTek P/N 40023114 was used, GPS was tracking, logging data through Com2 and USB.

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

3.0 SUPPORT EQUIPMENT

3.1 CO-LOCATED SUPPORT EQUIPMENT

Manufacturer	Model	Description	Serial Number or Identifier
NovAtel	GPS-704X	GPS-704X Passive Antenna	N/A
NovAtel	GPS-702GGL	GPS-702GGL Active Antenna	N/A

3.2 OFF SITE SUPPORT EQUIPMENT

Manufacturer	Model	Description	Serial Number or Identifier
Toshiba	Satellite M70 -SR3	Laptop Computer	Y5238237K
Xantrex	LX 20-3	Power Supply	24443
Xantrex	LX 20-3	Power Supply	N/A
MiniCircuits	ZHL-1217HLN	1200 – 1700 MHz Amplifier	D061599-21
NovAtel	GPS-704X	GPS-704X Passive Antenna	N/A
MiniCircuits	ZA3D-2	Splitter	N/A
Rhode & Schwarz	CBT - 1153.9000K35	Bluetooth Tester	100221

3.3 MONITORING SOFTWARE

Description	Version
Slog	2.00V101
HyperTerminal	N/A

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

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

Power Line Conducted emission measurement per ANSI C63.4-2003.

A.4. Test Results

Product Integrity Laboratory V2.5

Project Number: CG-1099 **Tester:** James MacKay
Model: NovAtel DL-V3 Bluetooth **Test ID:** CE02c-10m-1099
Comments: Tx mode Ch38, DH5, Max data rate, Power adapter GlobTek model#GT41052-1512, 120VAC 60Hz, GPS tracking, logging data through Com2 and USB

Standard: FCC15_B

Voltage/Line	Frequency (MHz)	Measurement Detector	Measured Value (dBµV)	Correction Factors (dB)	Emission Level (dBµV)	Limit Type	Limit (dBµV)	Margin (dB)
AC 120V Line1A	0.187	QP	29.53	10.37	39.90	QP	64.18	**24.28**
AC 120V Line1A	2.569	QP	19.02	10.95	29.97	QP	56.00	**26.03**
AC 120V Line1A	24.005	QP	23.36	12.41	35.77	QP	60.00	**24.23**
AC 120V NeutralA	2.577	QP	19.07	10.88	29.95	QP	56.00	**26.05**
AC 120V NeutralA	24.005	QP	23.84	12.26	36.10	QP	60.00	**23.90**
AC 120V Line1A	0.184	AV	18.03	10.37	28.40	AV	54.29	**25.89**
AC 120V Line1A	2.583	AV	13.61	10.95	24.56	AV	46.00	**21.44**
AC 120V Line1A	24.005	AV	22.09	12.41	34.50	AV	50.00	**15.50**
AC 120V NeutralA	0.150	AV	32.68	10.27	42.95	AV	56.00	**13.05**
AC 120V NeutralA	2.559	AV	13.10	10.88	23.98	AV	46.00	**22.02**
AC 120V NeutralA	24.005	AV	22.49	12.26	34.75	AV	50.00	**15.25**

The highest emission measured was 42.95 dBµV with average detector at 150 kHz. It has 13.05 dB margin to the FCC Part 15.207 and RSS-Gen Issue 2 7.2.2 limits.

A.5. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: James MacKay
Function: EMC Technologist

A.6. Test date

May 20, 2009

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

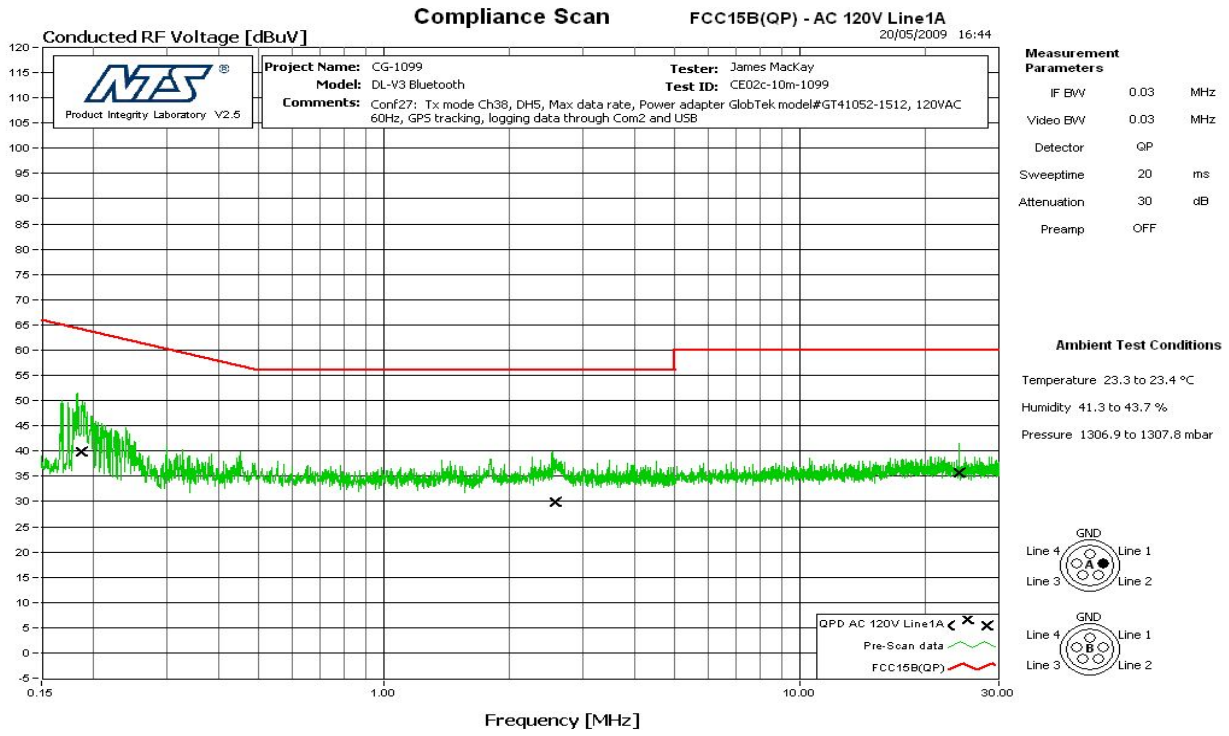


Figure 2 Conducted Emission 120 VAC Return 150 kHz – 30 MHz Quasi-peak Detector

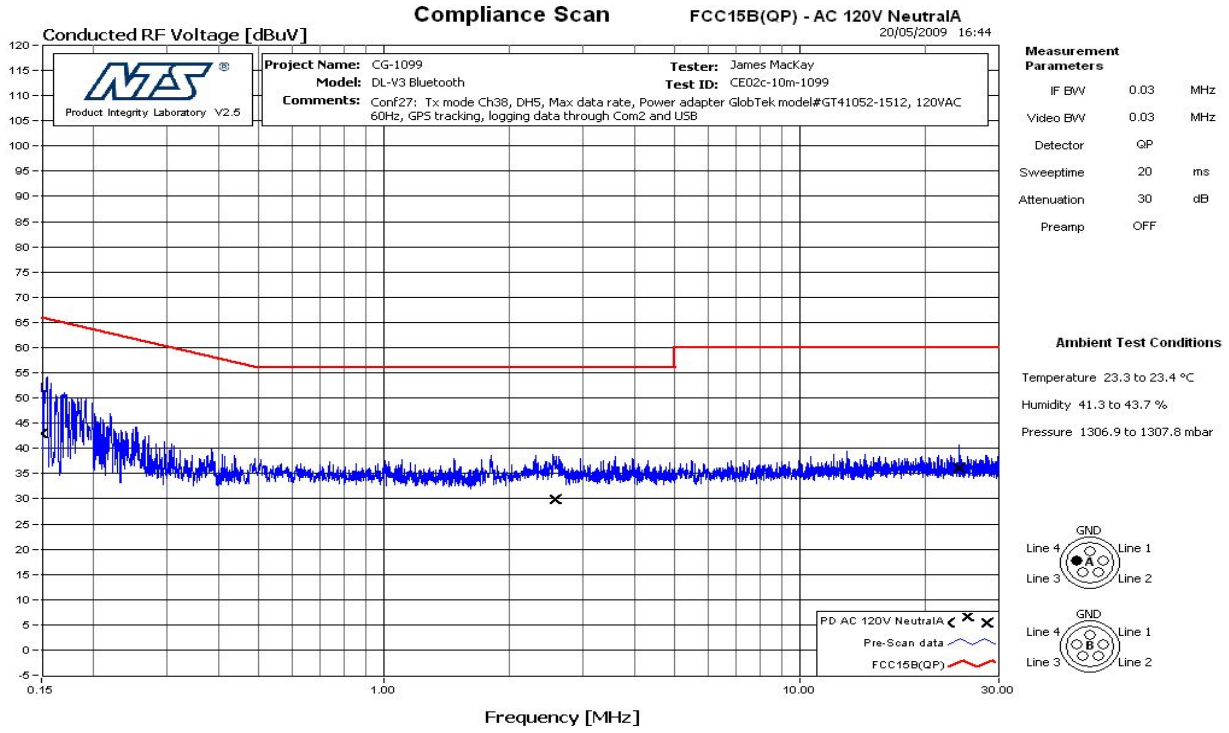


Figure 3 Conducted Emission 120 VAC Line 150 kHz – 30 MHz Average Detector

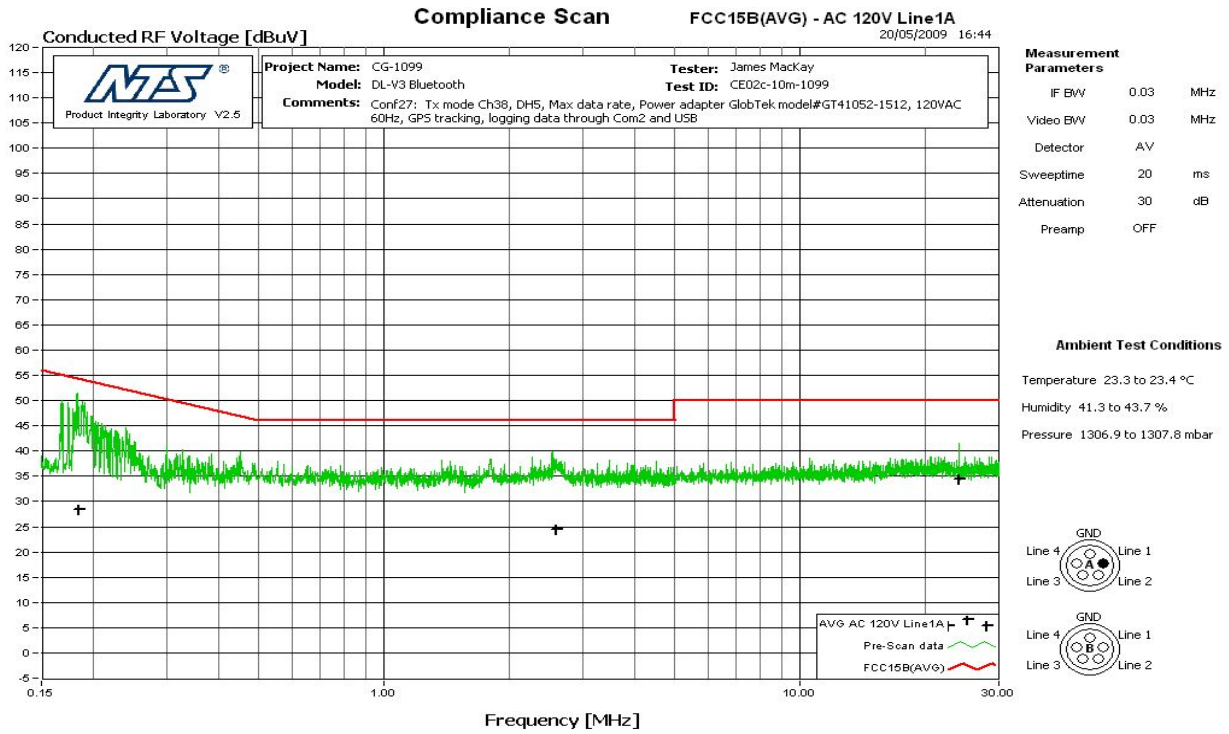
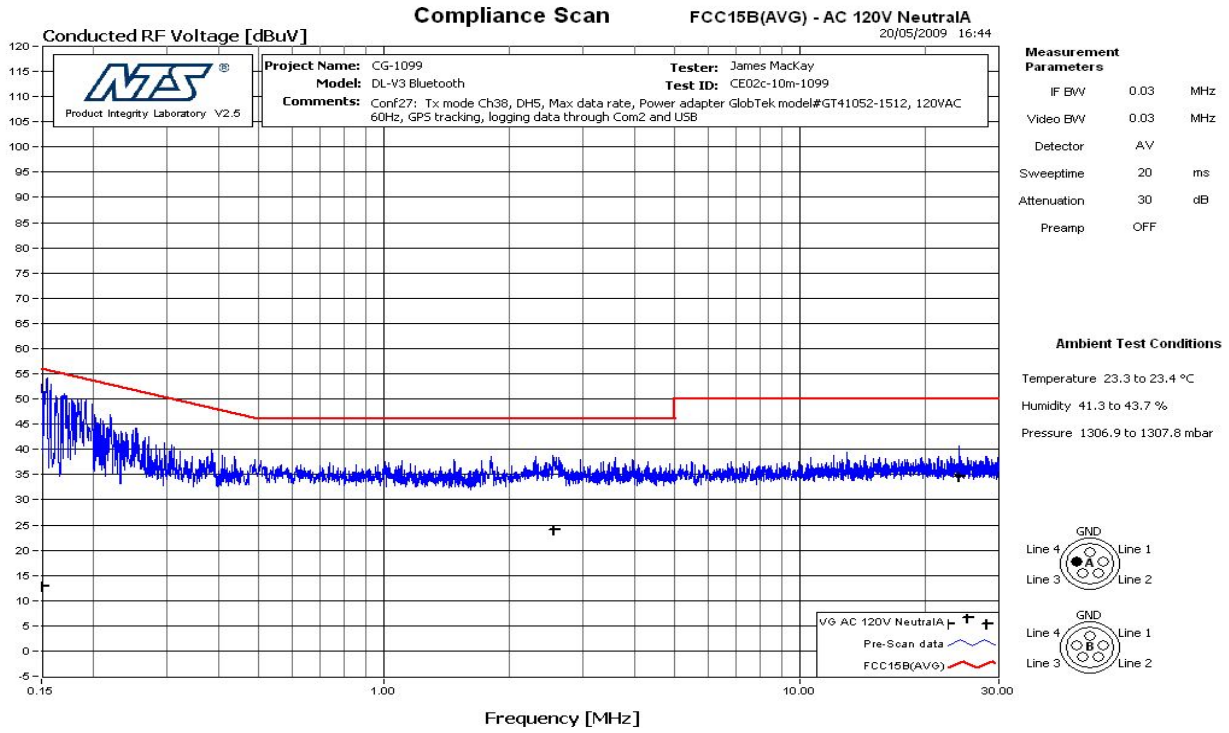


Figure 4 Conducted Emission 120 VAC Return 150 kHz – 30 MHz Average Detector



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)
00	2402	0.517
38	2440	0.581
78	2480	0.581

All final reported values are corrected values.

B.6. Operating Mode During Test

The NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at highest power and maximum data rate.

B.7. Tested By

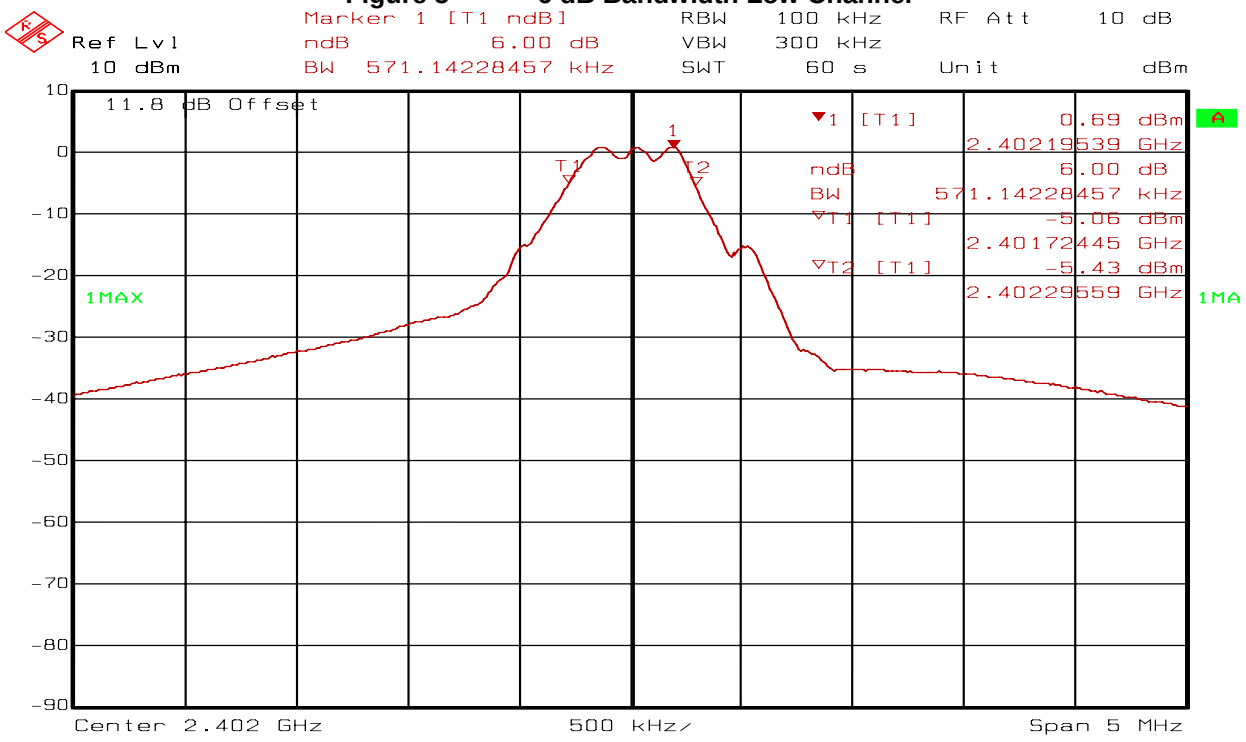
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

B.8. Test date

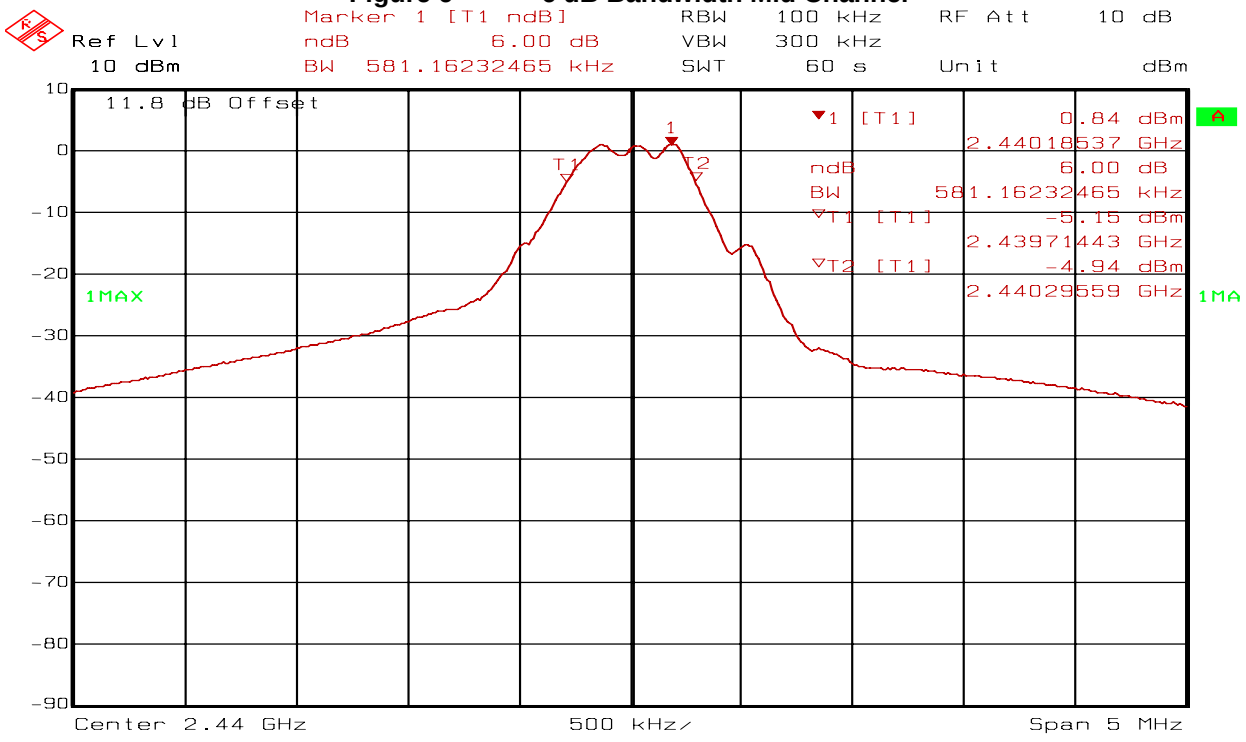
April 30, 2009

Figure 5 6 dB Bandwidth Low Channel



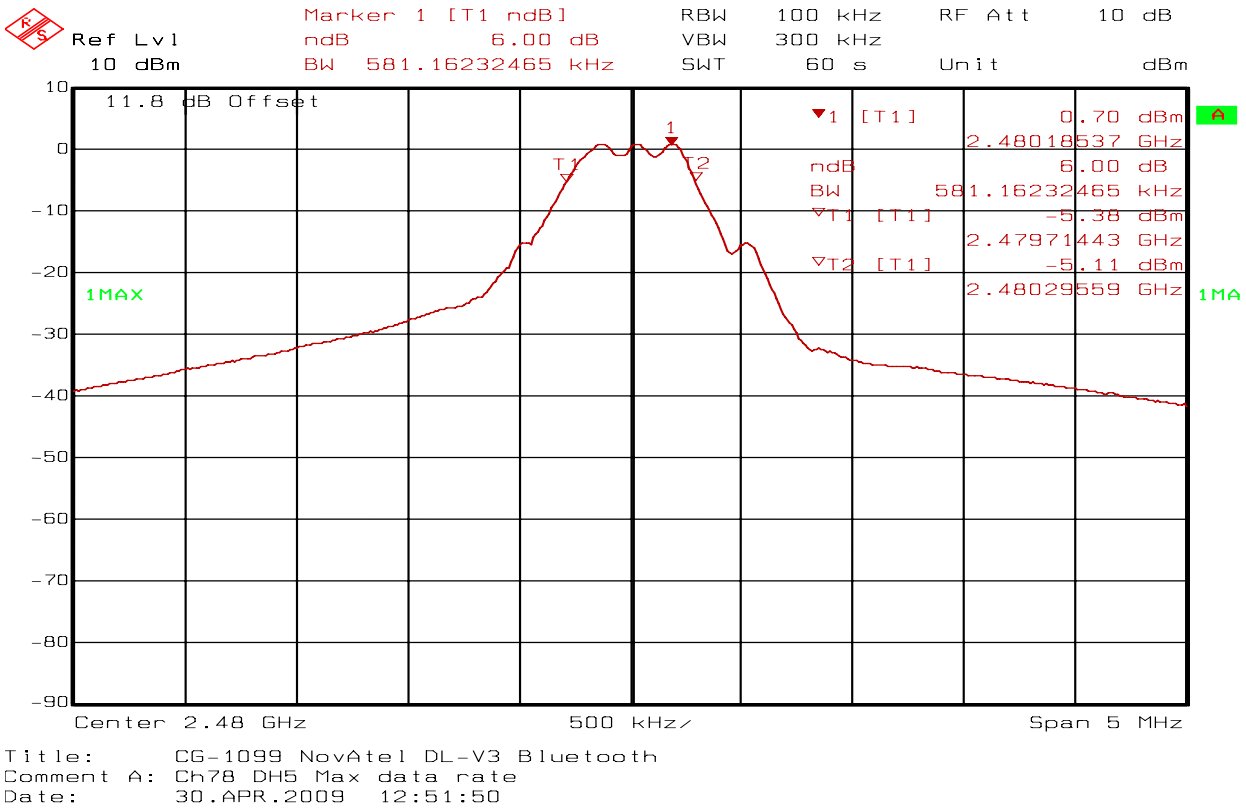
Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:05:15

Figure 6 6 dB Bandwidth Mid Channel



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch38 DH5 Max data rate
Date: 30.APR.2009 12:07:44

Figure 7 6 dB Bandwidth High Channel



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)
00	2402	1.052
38	2440	1.042
78	2480	1.052

All final reported values are corrected values

C.5. Operating Mode During Test

The NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at highest power and maximum data rate.

C.6. Tested By

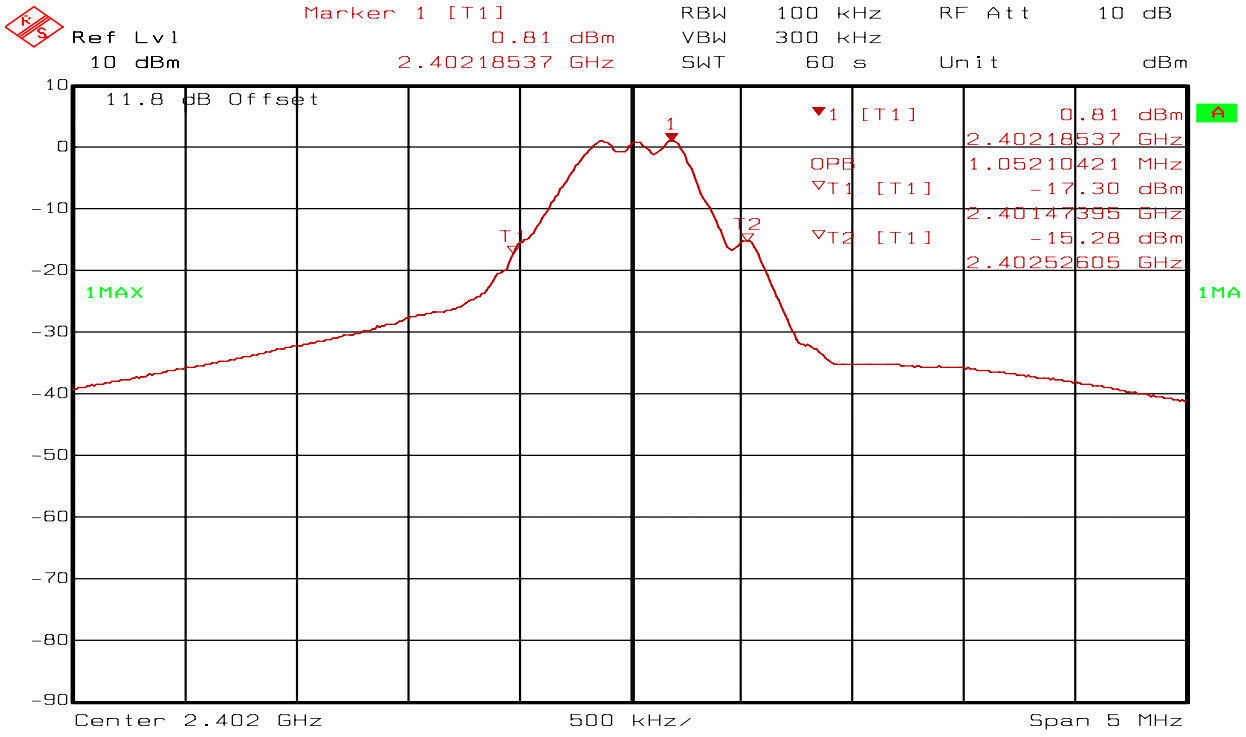
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

C.7. Test date

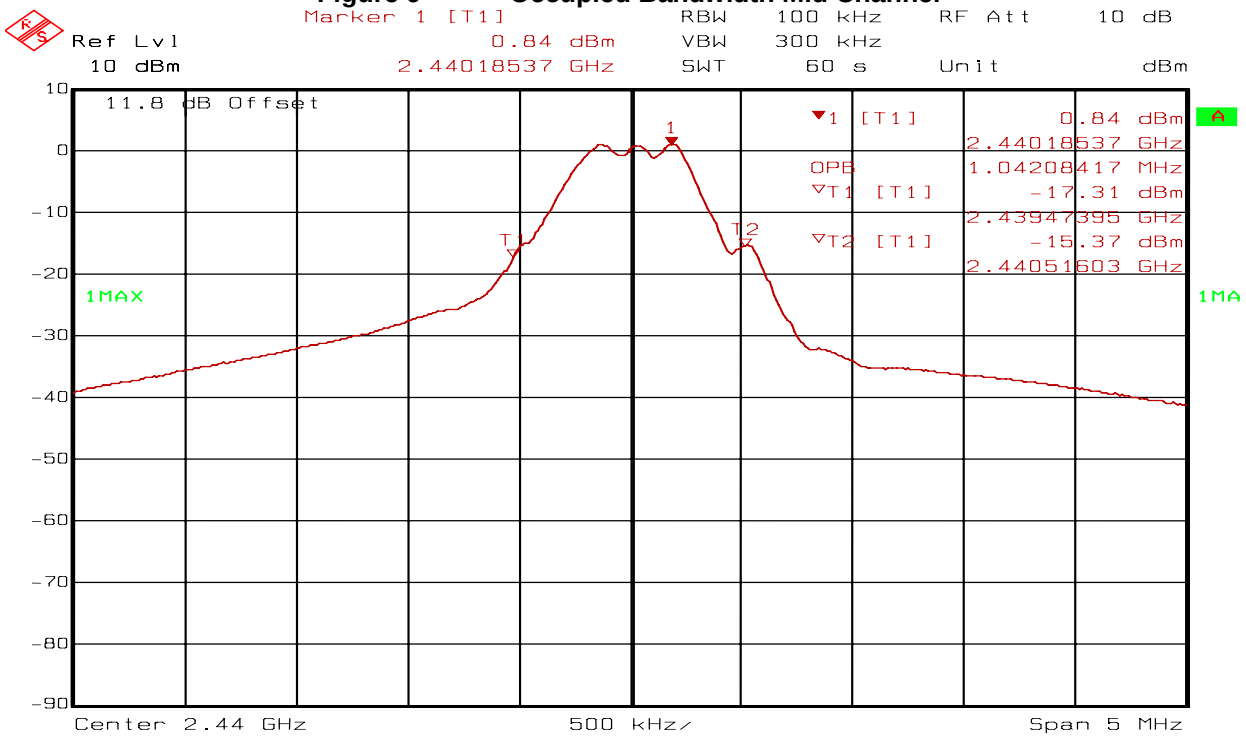
April 30, 2009

Figure 8 Occupied Bandwidth Low Channel



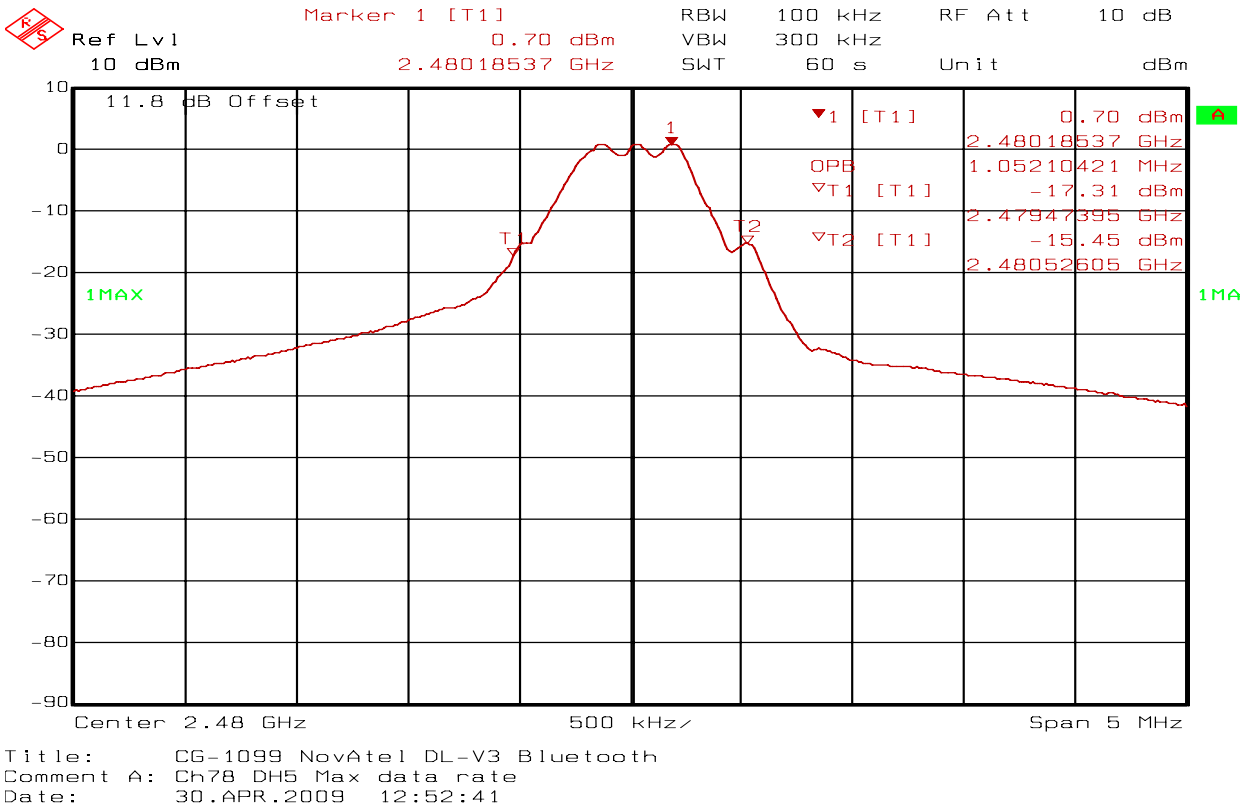
Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:08:08

Figure 9 Occupied Bandwidth Mid Channel



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch38 DH5 Max data rate
Date: 30.APR.2009 12:08:49

Figure 10 Occupied Bandwidth High Channel



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch78 DH5 Max data rate
Date: 30.APR.2009 12:52:41

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 NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at highest power and maximum data rate.

D.5. Test Results

Compliant – The maximum peak power was 1.17 dBm as measured conducted at the RF output port

D.6. Test Data Summary

Channel	Frequency (MHz)	Peak RF power (dBm)
00	2401.94	1.17
38	2439.94	1.04
79	2480.26	0.91

All final reported values are corrected values

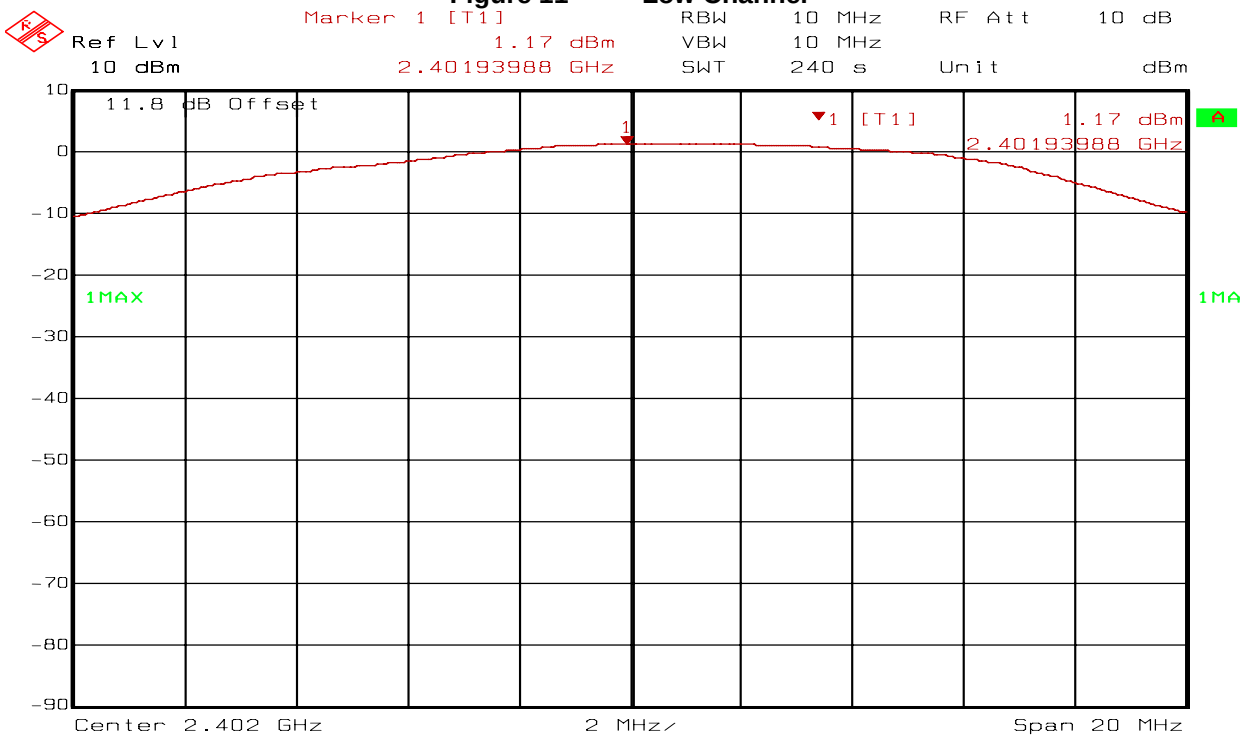
D.7. Tested By

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

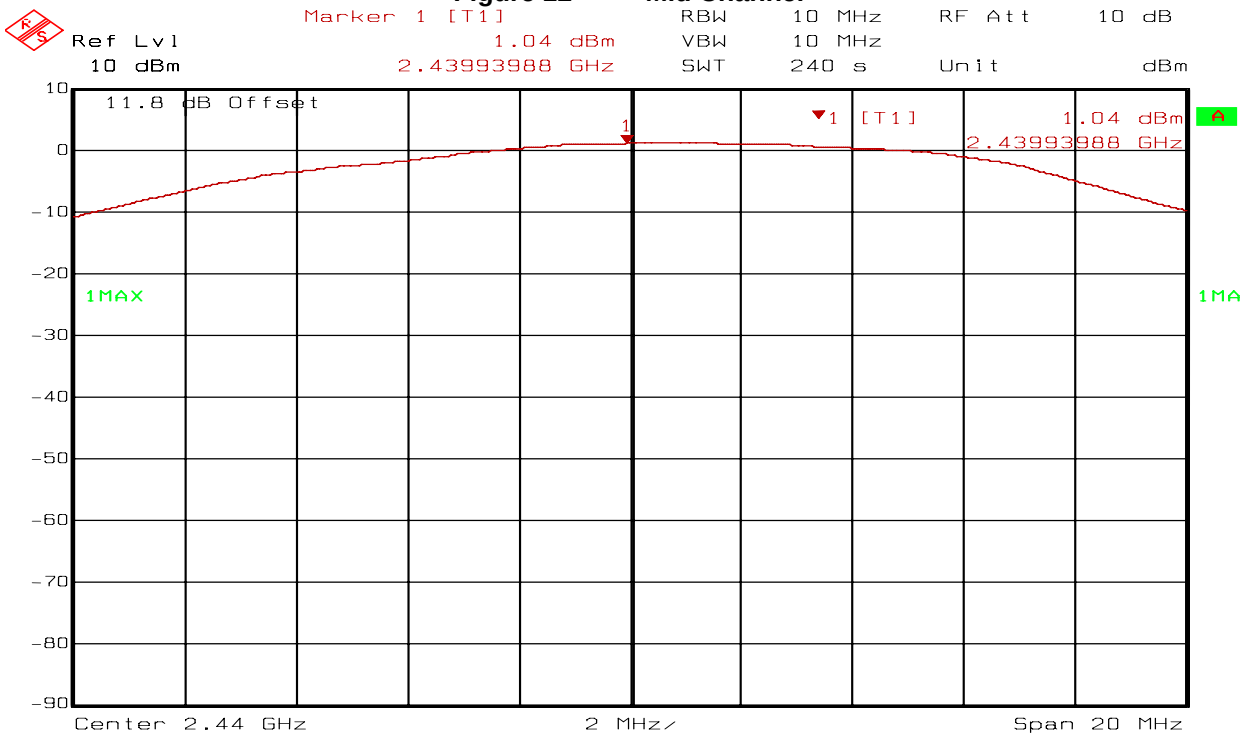
April 30, 2009

Figure 11 Low Channel



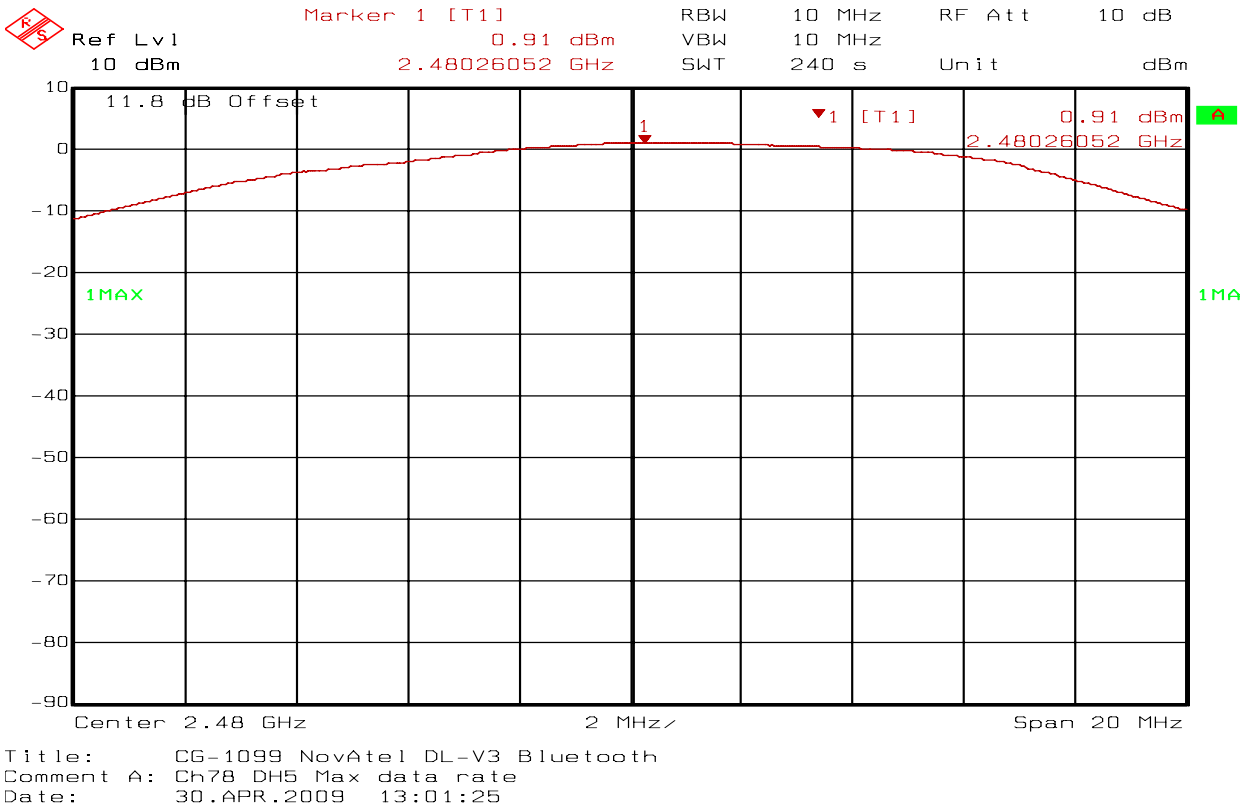
Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:13:42

Figure 12 Mid Channel



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch38 DH5 Max data rate
Date: 30.APR.2009 12:14:47

Figure 13 High Channel



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 NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at highest power and maximum data rate.

E.5. Test Results

Compliant. The maximum measured power spectral density was -5.96 dBm

E.6. Test Data Summary

Channel	Frequency (MHz)	PSD (dBm)
00	2402.19	-6.00
38	2440.19	-5.96
78	2480.19	-6.46

All final reported values are corrected values

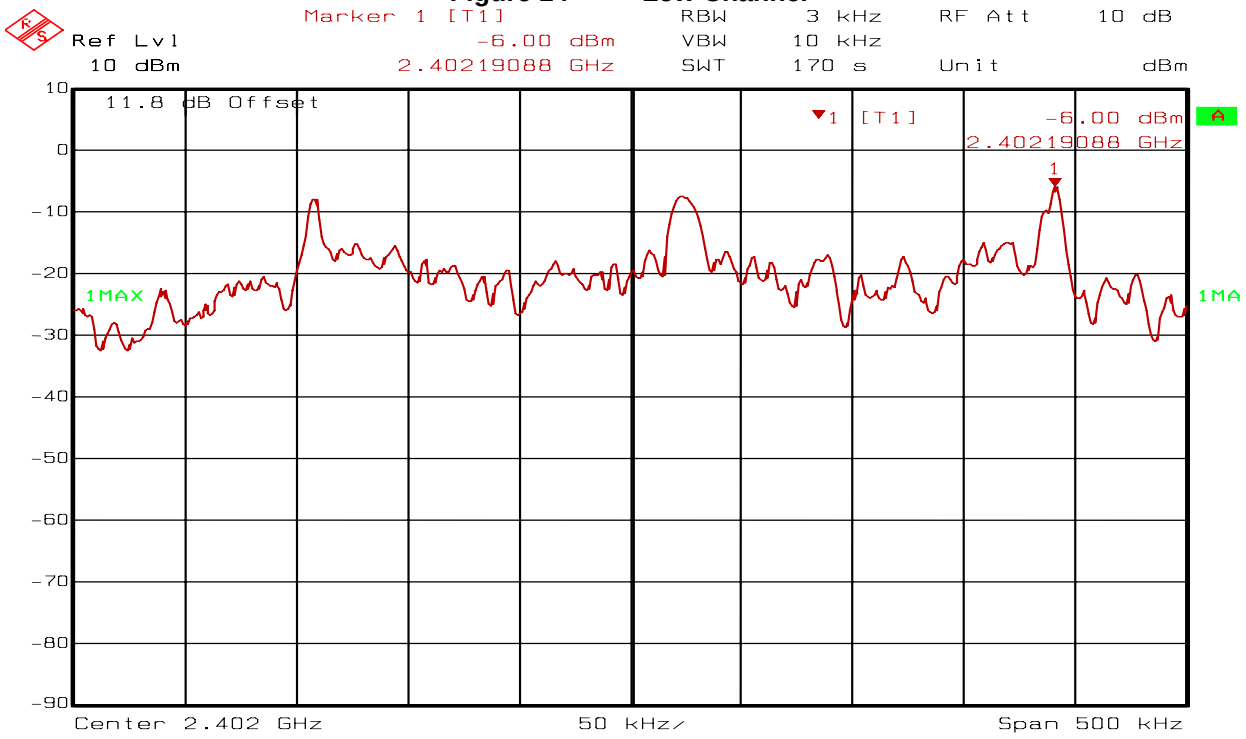
E.7. Tested By

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

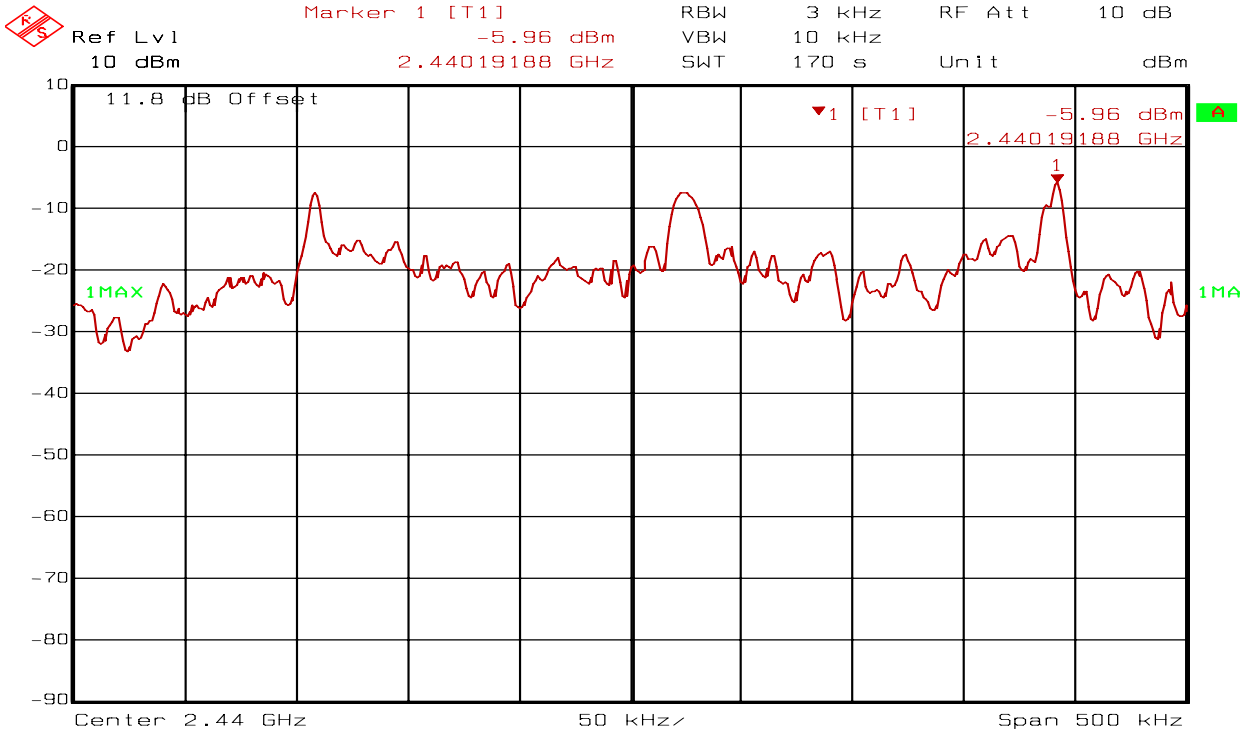
April 30, 2009

Figure 14 Low Channel



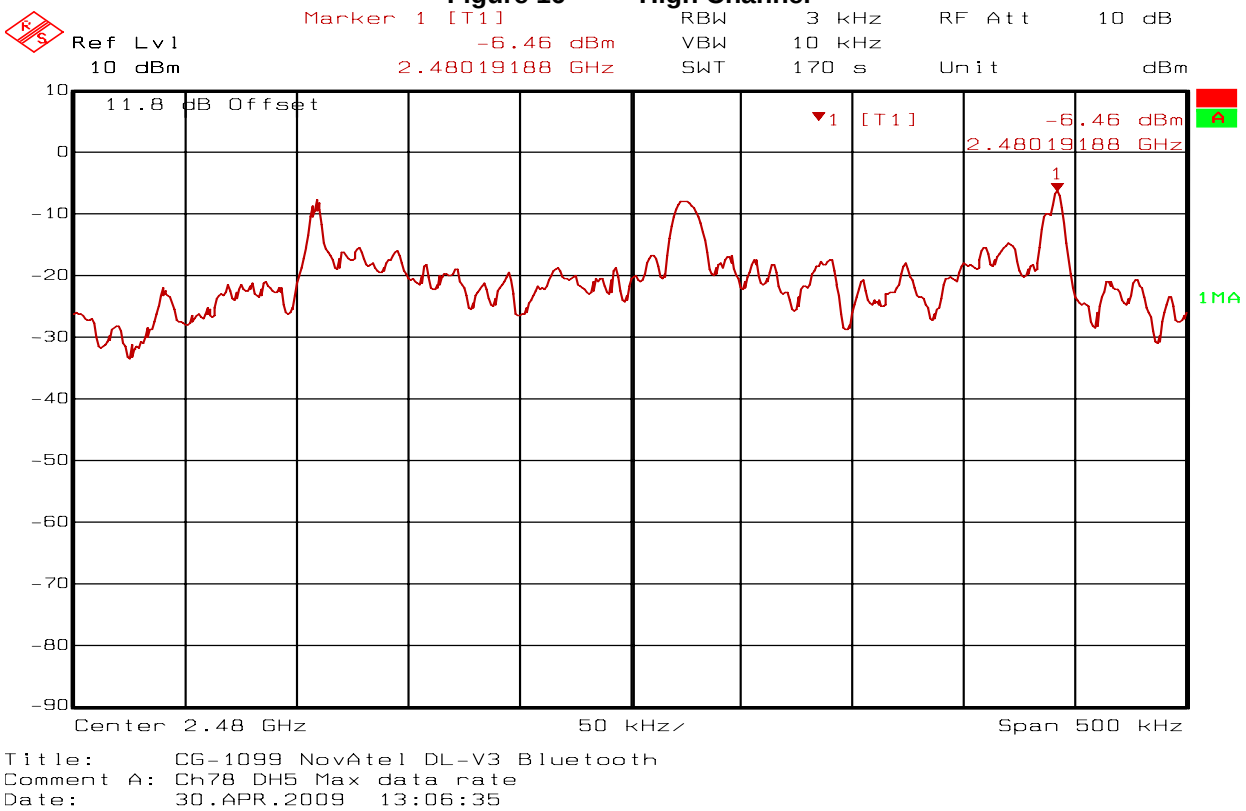
Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:22:06

Figure 15 Mid Channel



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch38 DH5 Max data rate
Date: 30.APR.2009 12:19:42

Figure 16 High Channel



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. Deviations

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

F.4. Test Procedure

As per FCC 15.35 with analyzer in Zero span mode.

F.5. Operating Mode During Test

The NovAtel DL-V3 Bluetooth was tuned to Ch00 at highest power and maximum data rate (DH5).

F.6. Test Results

Number of hoping = 1600 / s
DH5 30 second period dwell time = 5 * 625 µs * 1600 * 1/5 * 1/s / 79 * 30s = 0.3797s
(Bluetooth Core specification V 1.0B)
Duty cycle = 20*log (0.399 * 160 / 79 /100) = -41.85 dB (Worst case)
Duty cycle correction factor = -20 dB used as maximum allowed correction factor

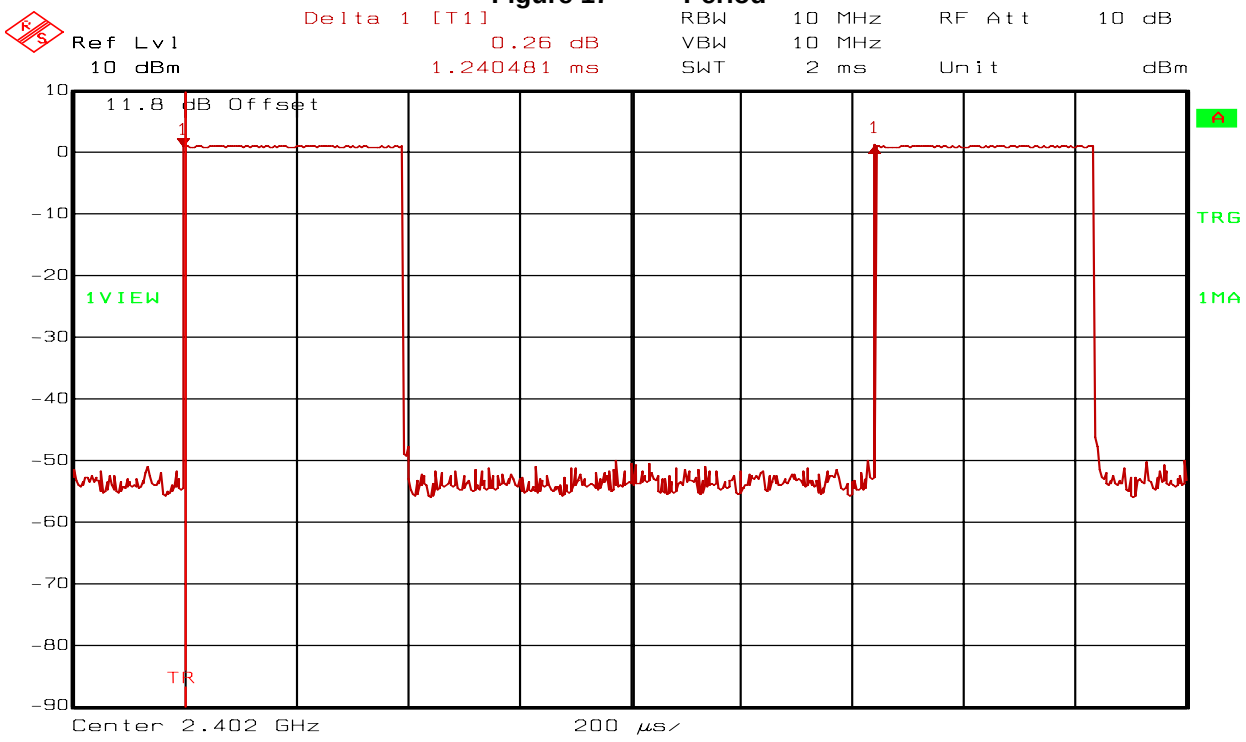
F.7. Tested By

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

F.8. Test date

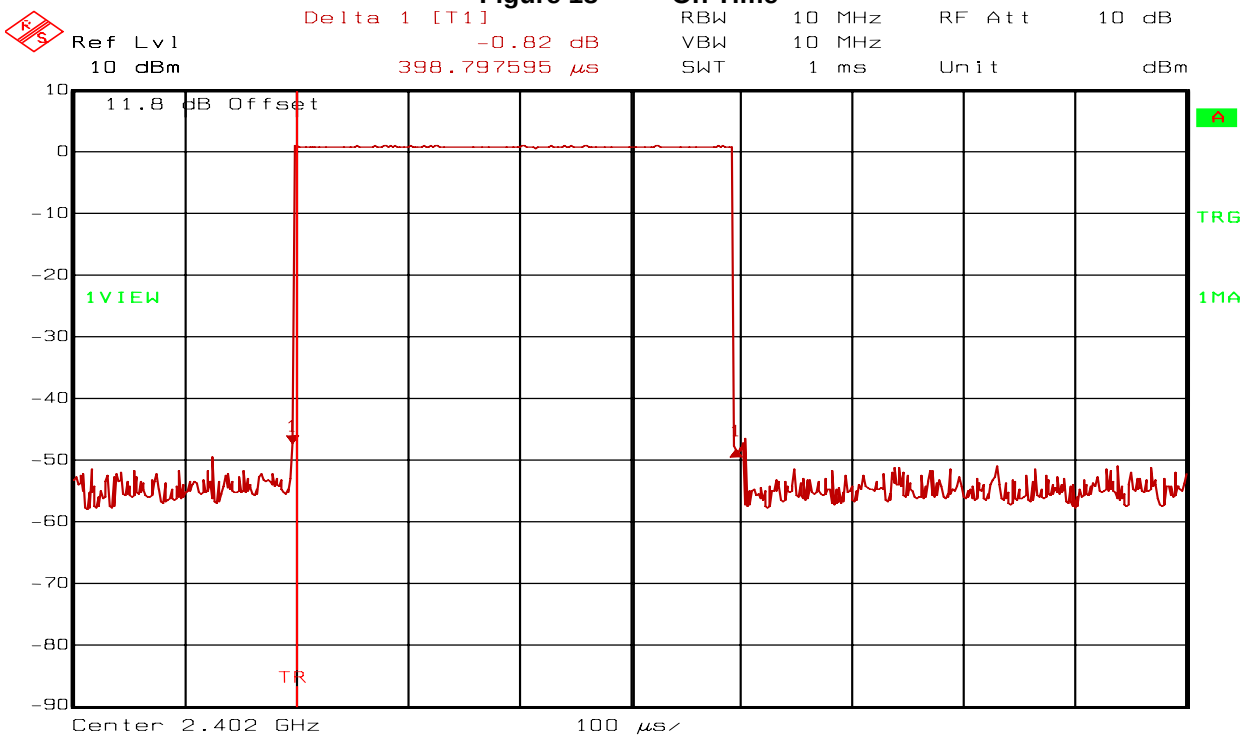
April 30, 2008

Figure 17 Period



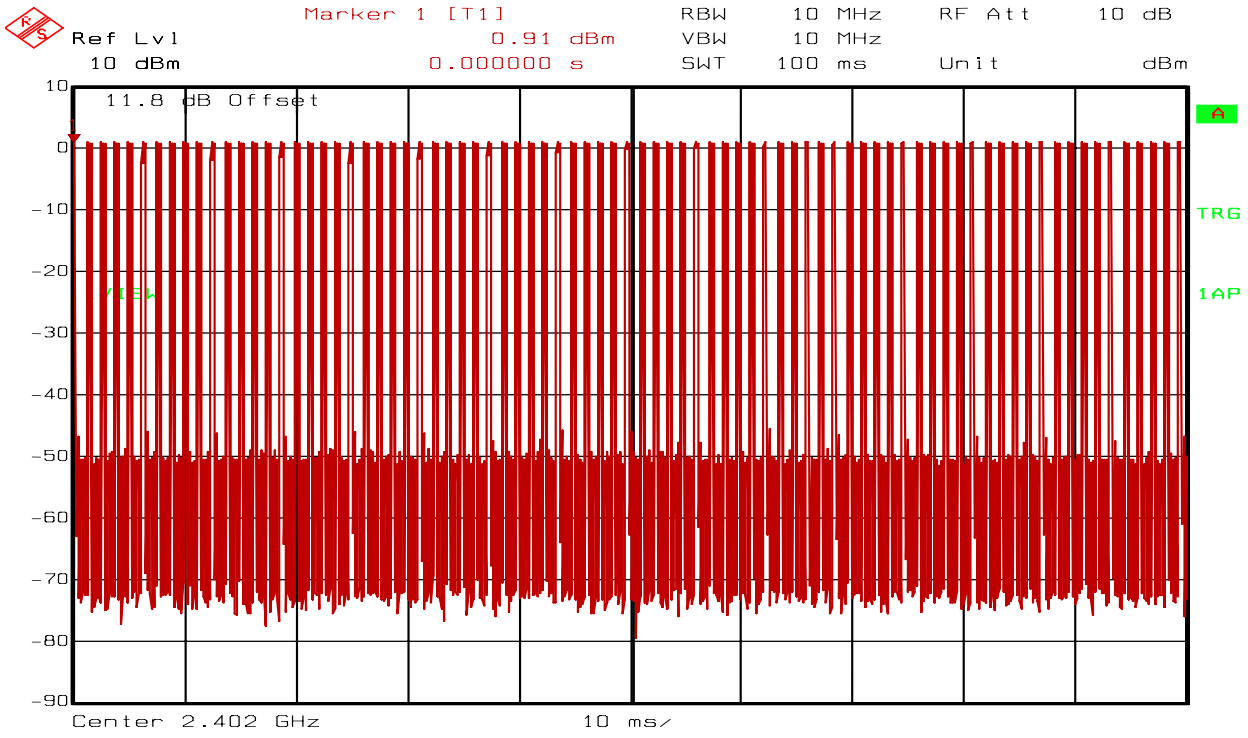
Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:32:37

Figure 18 On Time



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:30:33

Figure 19 100 ms Interval



APPENDIX G: CONDUCTED SPURIOUS EMISSIONS

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 NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at highest power and maximum data rate.

G.5. Test Results Summary

Compliant.

Tx Channel	Worst Case Spurious Frequency (MHz)	Emission Level (dBc)
00	290.22	-34.84
00	550.44	-41.91
38	260.55	-38.30
38	2136.30	-50.79
78	312.65	-39.44
78	625.28	-45.83

The worst case peak spurious emission was 34.84 dB below the carrier at Channel 00.

All final reported values are corrected values

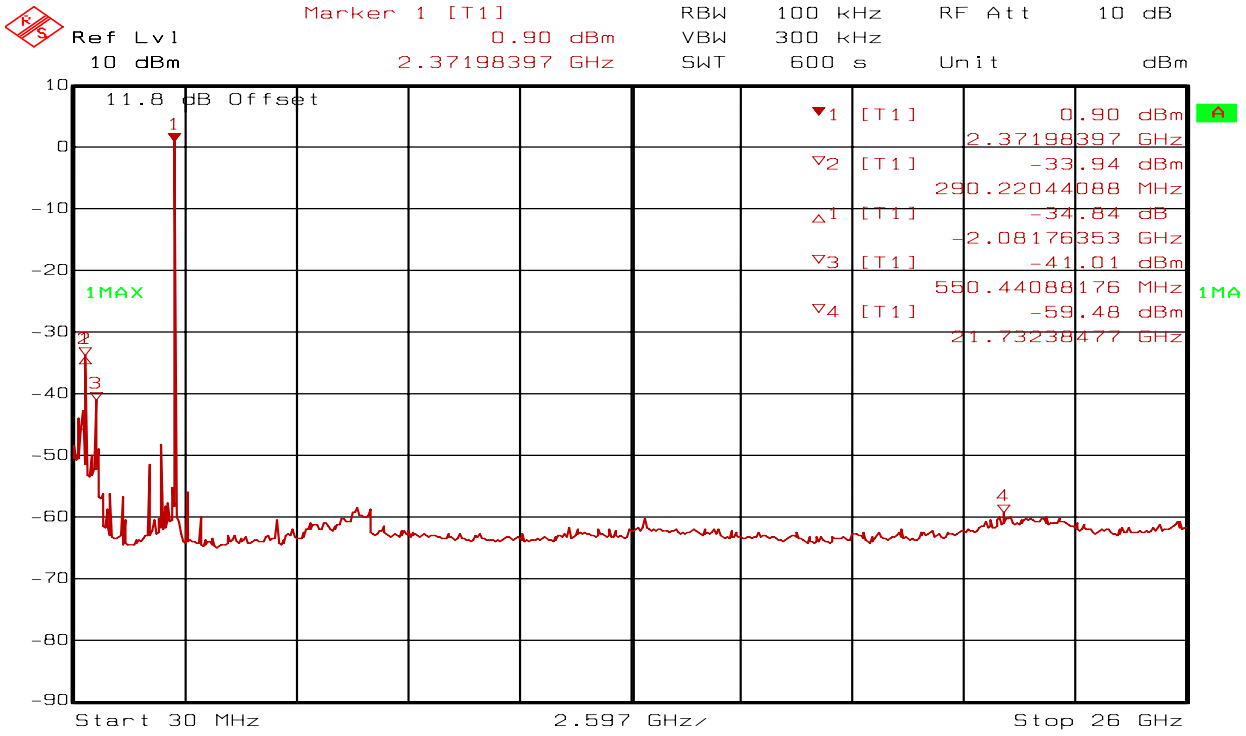
G.6. Tested By

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

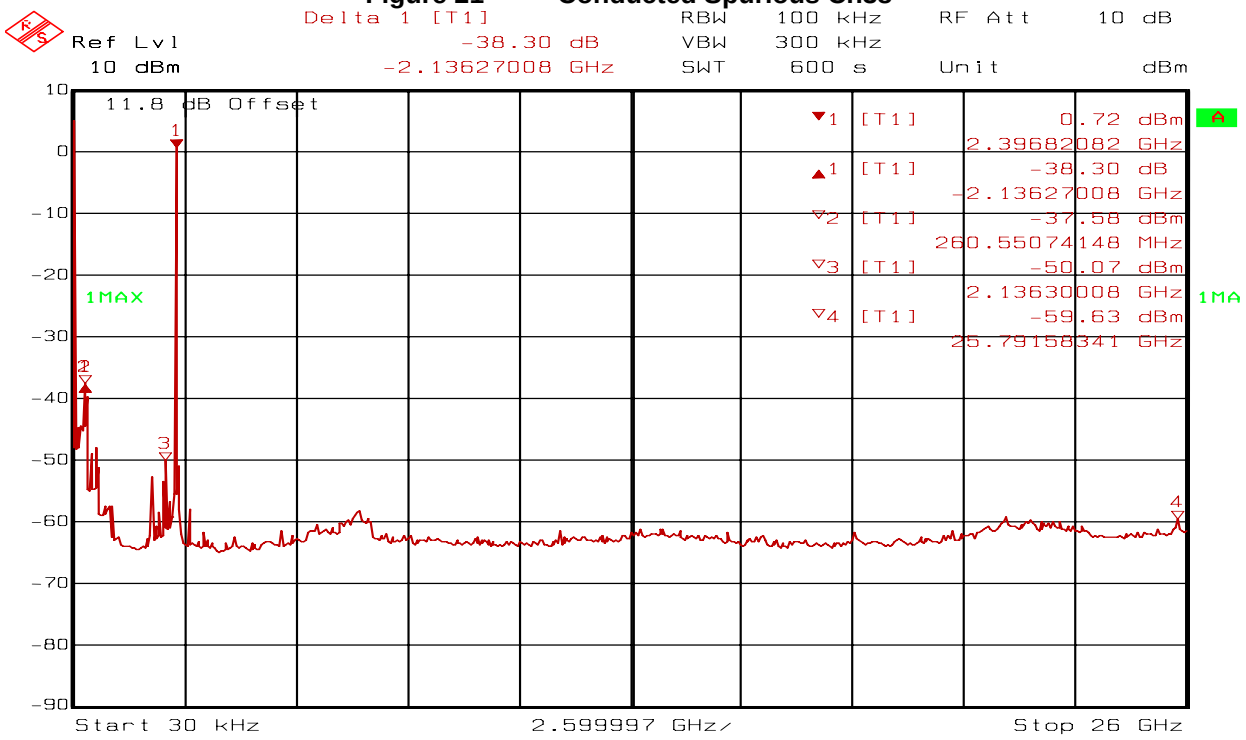
April 30, 2009

Figure 20 Conducted Spurious Ch00



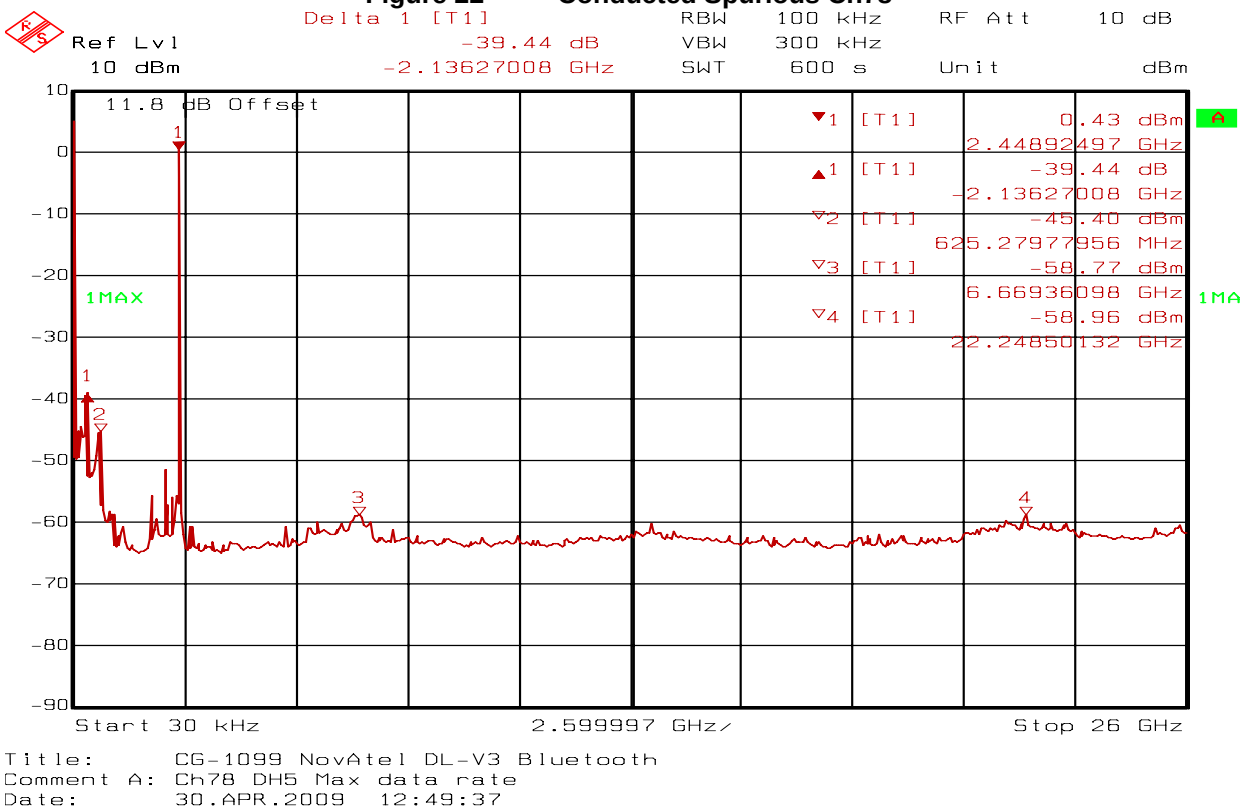
Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:51:56

Figure 21 Conducted Spurious Ch38



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch38 DH5 Max data rate
Date: 30.APR.2009 12:36:04

Figure 22 Conducted Spurious Ch78



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch78 DH5 Max data rate
Date: 30.APR.2009 12:49:37

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 NovAtel DL-V3 Bluetooth was tuned to a low and high channel at highest power and maximum data rate.

H.5. Test Results

Compliant.

Channel/Measurement	Worst Case Spurious Frequency (MHz)	Emission Level (dBc)
00 (Lower band edge)	2400.00	-36.81
78 (Upper band edge)	2483.50	-48.71

Worst case spurious emission was 36.81 dB below the carrier at Channel 00

All final reported values are corrected values

H.6. Tested By

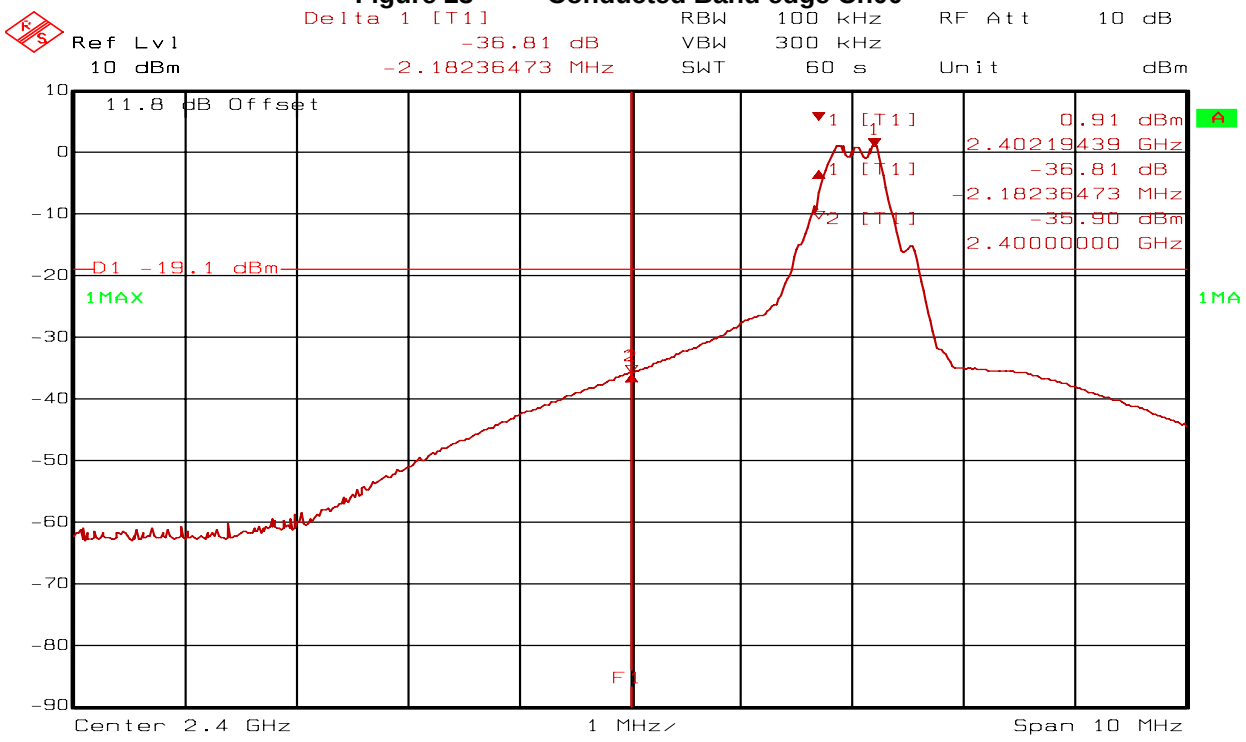
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

H.7. Test date

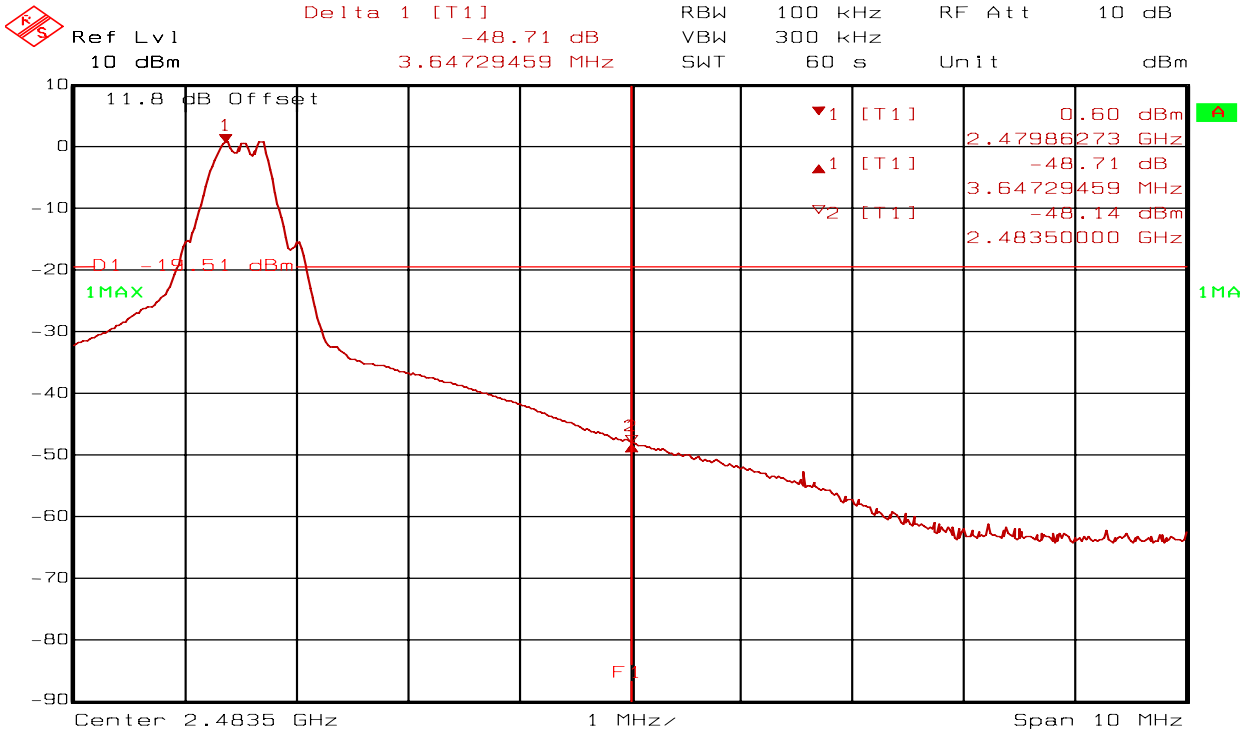
April 30, 2009

Figure 23 Conducted Band edge Ch00



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00 DH5 Max data rate
Date: 30.APR.2009 11:55:59

Figure 24 Conducted Band edge Ch78



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch78 DH5 Max data rate
Date: 30.APR.2009 13:11:53

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 Calgary SOP CAG EMC 02 Emission Test Methods

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.

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.

I.4. Operating Mode During Test

The NovAtel DL-V3 Bluetooth was tuned to a low and high channel at highest power and maximum data rate.

I.5. Test Results

Compliant

Frequency (MHz)	Band Edge Peak Emission Level (dBµV/m)	Duty cycle Correction Factor (dB)	Band Edge Average Emission Value (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)
2390.0	61.78	-20.00	41.78	73.98	53.98	12.20
2483.5	62.62	-20.00	42.62	73.98	53.98	11.36

Maximum peak emission level was 62.62 dBµV/m at 2483.50 MHz. Calculated average value was 42.62 dBµV/m with duty cycle correction factor. It has 11.36 dB margin to the limits.

I.6. Sample Calculations

Average Limit: 500 µV/m @ 3m = 20*Log (500) = 53.98 dBµV/m, Peak limit = 73.98 dBµV/m

Band Edge Emission Level (dBµV/m) = Measured level (dBµV) + Receive antenna factor (dB) + Receive cable loss (dB) – LNA gain (dB)

Band Edge Average Emission Value (dBµV/m) = Band Edge Peak Emission Level (dBµV/m) - Duty cycle correction factor (dB)

I.7. Tested By

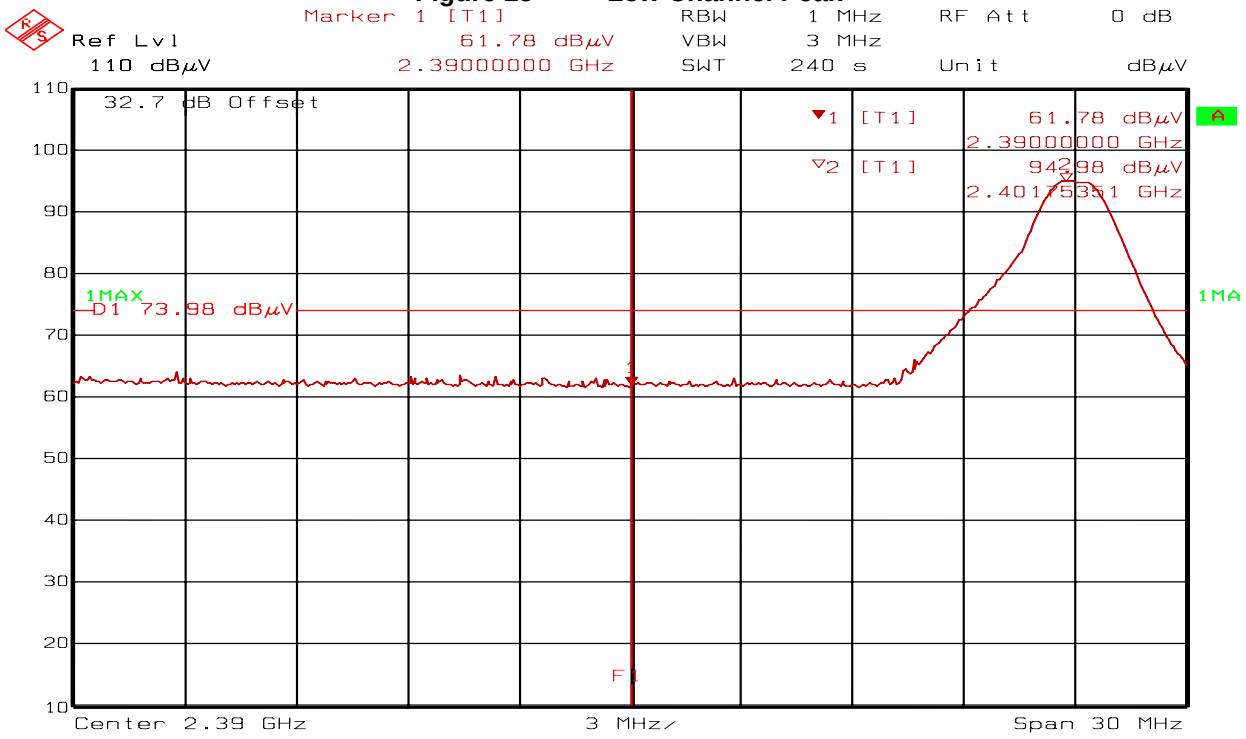
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

I.8. Test date

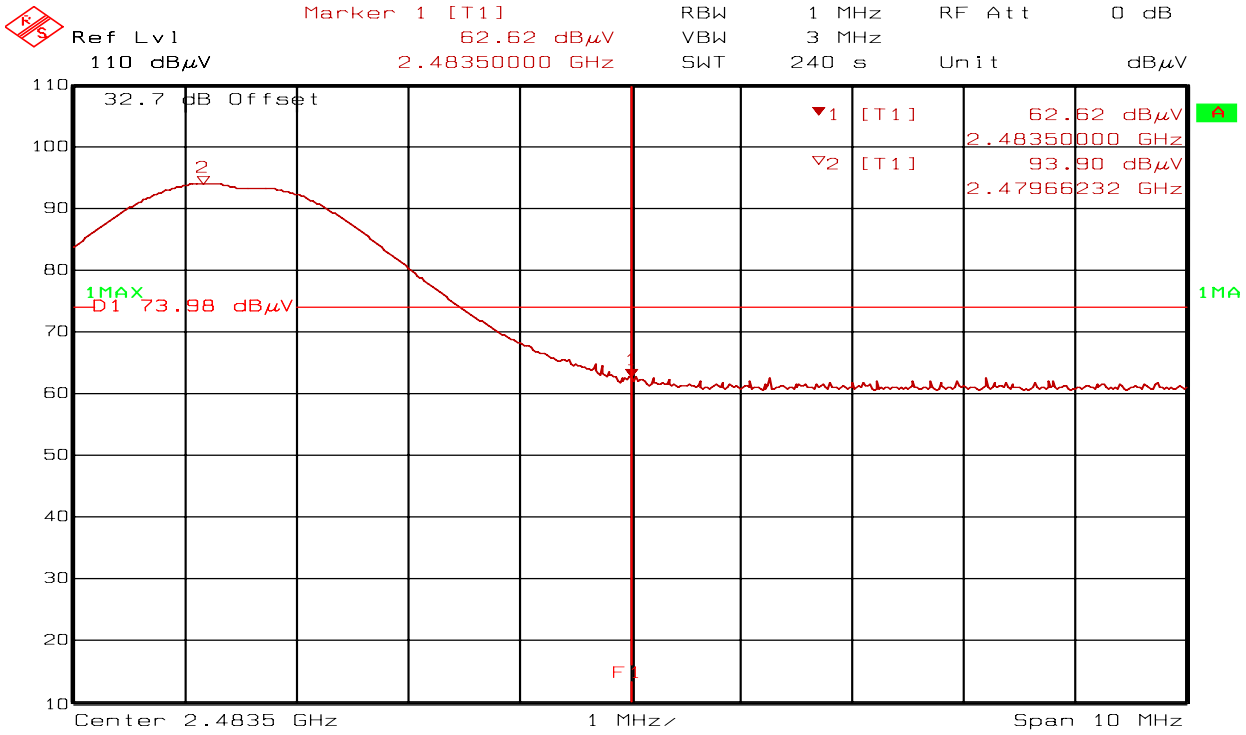
May 1, 2009

Figure 25 Low Channel Peak



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch00, DH5 Maximum Data rate V-pol H:158 TT:246
Date: 1.MAY.2009 9:49:29

Figure 26 High Channel Peak



Title: CG-1099 NovAtel DL-V3 Bluetooth
Comment A: Ch78, DH5 Maximum data rate, V-pol H:155 TT:261
Date: 1.MAY.2009 10:40:54

APPENDIX J: RADIATED SPURIOUS EMISSIONS

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 2.7 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 Calgary SOP CAG EMC 02 Emission Test Methods

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.

RSS 210 Issue 7, 2.7
Table 2: General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8nW)	150 (6.8nW)
219-960	200 (12nW)	200 (12nW)
Above 960	500 (75 nW)	500 (75 nW)

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. 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.

J.3. Operating Mode During Test

- Tx Mode: The NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at highest power and maximum data rate.
- Rx Mode: The NovAtel DL-V3 Bluetooth was tuned to a low, middle and high channel at Rx mode

J.4. Test Results

J.4.1 Tx Mode 30 MHz – 26 GHz

There was no measurable spurious emission detected related to the Bluetooth device.
The highest measured peak fundamental carrier level was 94.70 dBµV/m at channel 78 with vertical receive antenna polarization

J.4.2 RX Mode 30 MHz – 26GHz

There was no measurable spurious emission detected related to the Bluetooth device.

Note:
Plots were not provided in order to reduce file size

J.5. Sample Calculations

None

J.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

J.7. Test date

May 1, 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	10OCT09	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	N/A	N/A
RF cable	Sucoflex	104	115776	N/A	N/A
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