Certification Test Report

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

Cleankeys Inc.
CKD

FCC ID # XWS-CKD
IC ID # 8721A-CKD
Project Code CG-1369

(Report CG-1369-RA-2-1)
Revision: 1

December 23, 2009

Prepared for:	Cleankeys 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:	Cleankeys Inc. 4664 - 99 Street Edmonton, AB T6E 5H5 Canada Phone: (780)702-1473
Customer Representative:	Randy Marsden CEO & CTO 4664 - 99 Street Edmonton, AB T6E 5H5 Canada Phone: (780)702-1473 x223

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	Conducted Spurious Emissions	No	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 7 A8.5
G	Conducted Spurious Emissions Band Edge	No	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 7 A8.5
H	Duty Cycle Correction Factor	No	No	No	N/A	FCC Subpart C 15.35 (c)	RSS-Gen Issue 2 4.5
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 RSS Gen Issue 2 4.10

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

Prepared By:

Digitally signed by Deniz Demirci
Date: 2009.12.23 15:07:59 -07'00'

Deniz Demirci
Senior Wireless / EMC Technologist

Reviewed By:

Glen Moore

Digitally signed by Glen Moore
DN: cn=Glen Moore, c=US, o=NTS, email=glen.moore@ntscorp.com
Date: 2009.12.27 21:18:15 -07'00'

Glen Moore
Wireless / EMC Manager

Approved By:

Glen Moore

Digitally signed by Glen Moore
DN: cn=Glen Moore, c=US, o=NTS, email=glen.moore@ntscorp.com
Reason: On behalf of
Date: 2009.12.27 21:19:16 -07'00'

Alex Mathews
Quality Management Representative

Table of Contents

Register of revisions

Revision	Date	Description of Revisions
1	December 23, 2009	Final release for customer review

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 CKD Dongle from Cleankeys 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 / Description	Serial Number
EUT	CKD	CKD	N/A	N/A
Classification	Mobile			
Operating Frequency Range	2402 MHz to 2481 MHz			
Modulation	GFSK			
Antenna Type/Gain	PCB trace antenna Peak gain: 0.68 dBi at 2440MHz			
Functional description	Cleankeys USB Dongle and Keyboard are PC peripheral devices comprised of a touch sensitive keyboard and mouse pad and has been designed to be fully enclosed environment with no user access to the inside of the device. User input is obtained through a combination of accelerometers and capacitive touch sensor arrays. All information regarding possible user input is read by the system's microcontroller and if a valid event is determined the keystroke, button press, or mouse movement is sent to the PC.			
Voltage/Power source	5 VDC, 22 mA (USB)			

2.2 MODE OF OPERATION DURING TESTS

The EUT was tested in all configurations to determine worst case results with maximum available duty cycle in low, mid and high channels in continuous Tx and Rx modes . See test appendices for specific EUT operating modes and conditions

3.0 SUPPORT EQUIPMENT

3.1 CONFIGURATION

The following equipment was used as the host system for the EUT

Peripheral / Device Description	Manufacturer	Model	Serial Number
Laptop	ACER	ASPIRE ONE	LUS410B0729121B8C42547
AC/DC Adapter	DELTA ELECTRONICS INC.	ADP-30JH B	202W93C0MCR

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	SOP-CAG- EMC-02

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-1369 **Tester:** Lixin Wang
Model: Cleankeys Inc Cleankeys 2 **Test ID:** CE02tc-10m-1369
Comments: Conf21: 120 VAC, 60 Hz, Dongle TX mid channel (2440 MHz) Max duty cycle, modulated, ACER AspireOne ZG5 with AC adapter.

Standard: FCC15.107B

Voltage/Line	Frequency (MHz)	Measurement Detector	Measured Value (dBμV)	Correction Factors (dB)	Emission Level (dBμV)	Limit Type	Limit (dBμV)	Margin (dB)
AC 120V Line1A	0.153	QP	37.80	12.34	50.14	QP	65.72	**15.58**
AC 120V Line1A	0.199	QP	31.73	11.74	43.47	QP	63.66	**20.19**
AC 120V Line1A	0.410	QP	27.32	10.93	38.25	QP	57.65	**19.40**
AC 120V NeutralA	0.153	QP	38.06	12.27	50.33	QP	65.82	**15.49**
AC 120V NeutralA	0.191	QP	33.11	11.77	44.88	QP	63.99	**19.11**
AC 120V NeutralA	0.407	QP	29.73	10.86	40.59	QP	57.71	**17.12**
AC 120V Line1A	0.154	AV	21.25	12.36	33.61	AV	55.80	**22.19**
AC 120V Line1A	0.187	AV	16.65	11.67	28.32	AV	54.17	**25.85**
AC 120V Line1A	0.406	AV	21.65	10.92	32.57	AV	47.73	**15.16**
AC 120V NeutralA	0.156	AV	18.71	12.25	30.96	AV	55.67	**24.71**
AC 120V NeutralA	0.193	AV	16.80	11.71	28.51	AV	53.91	**25.40**
AC 120V NeutralA	0.410	AV	23.79	10.86	34.65	AV	47.65	**13.00**

The highest emission measured was 34.65 dBμV with average detector at 410 kHz. It has 13.00 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: Lixin Wang
Function: EMC Technologist

A.6. Test date

November 19, 2009

Figure 1 120 VAC Line - Quasi-peak Detector

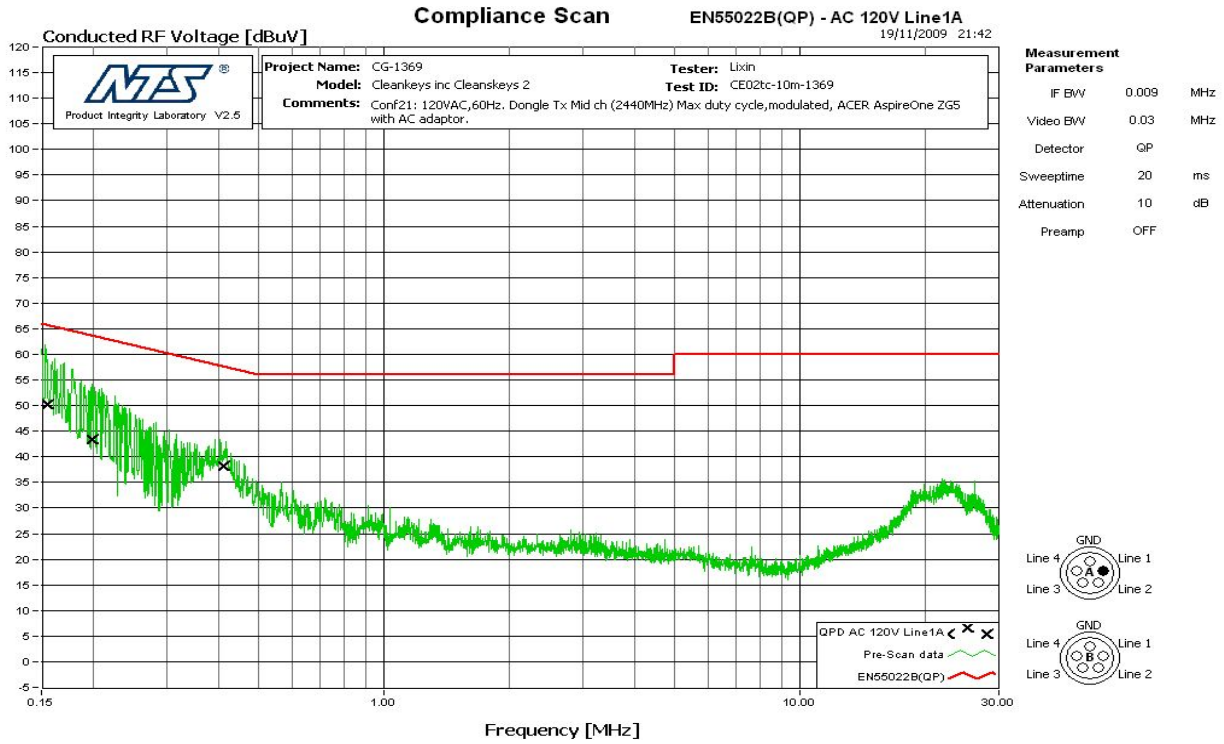


Figure 2 120 VAC Return - Quasi-peak Detector

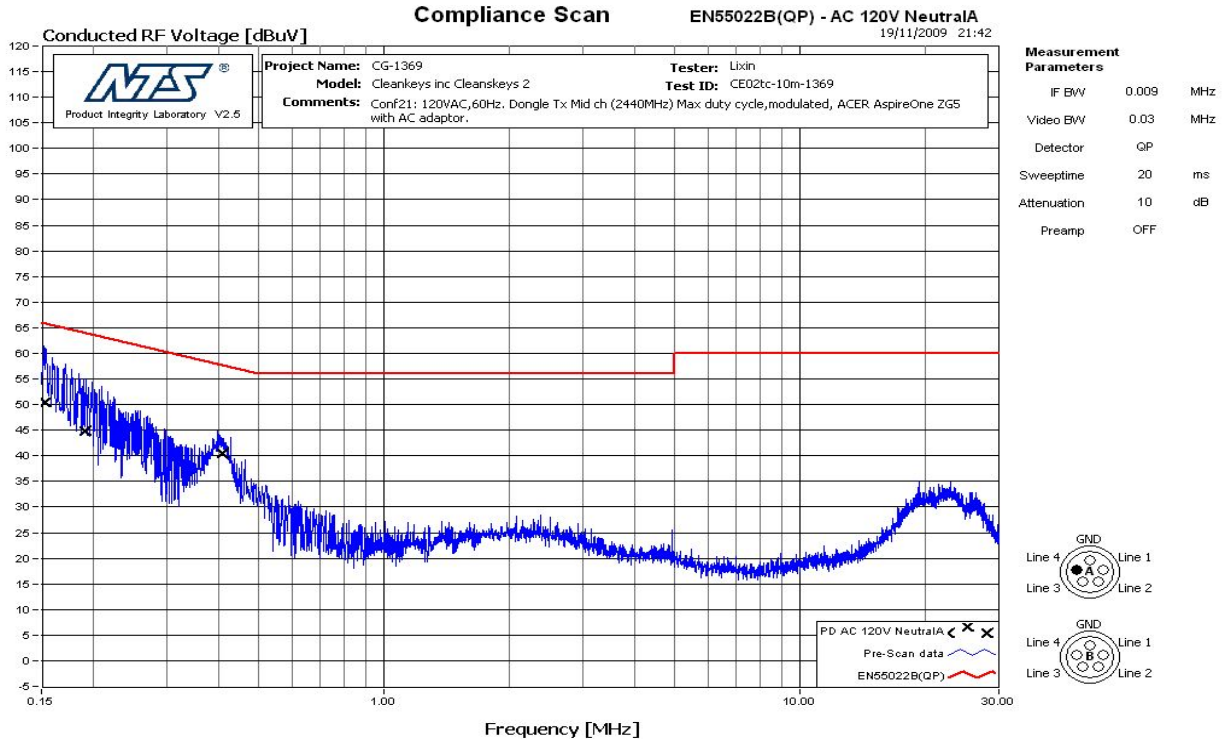


Figure 3 120 VAC Line - Average Detector

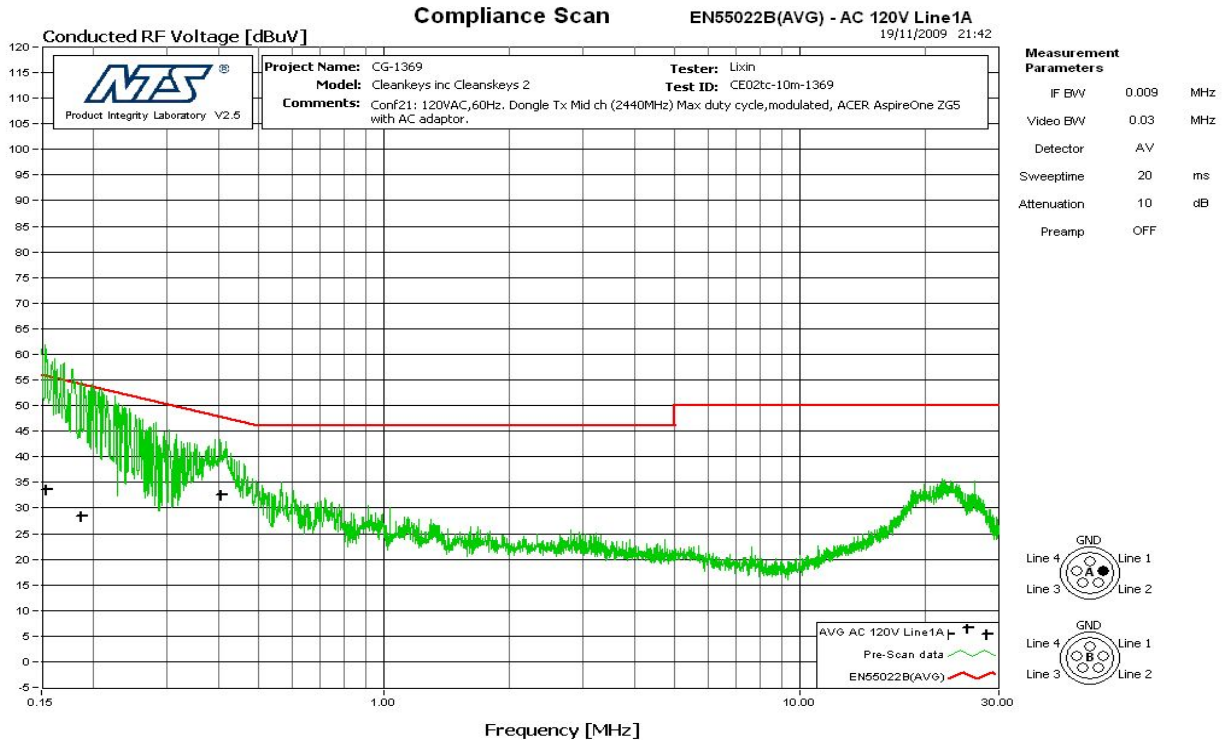
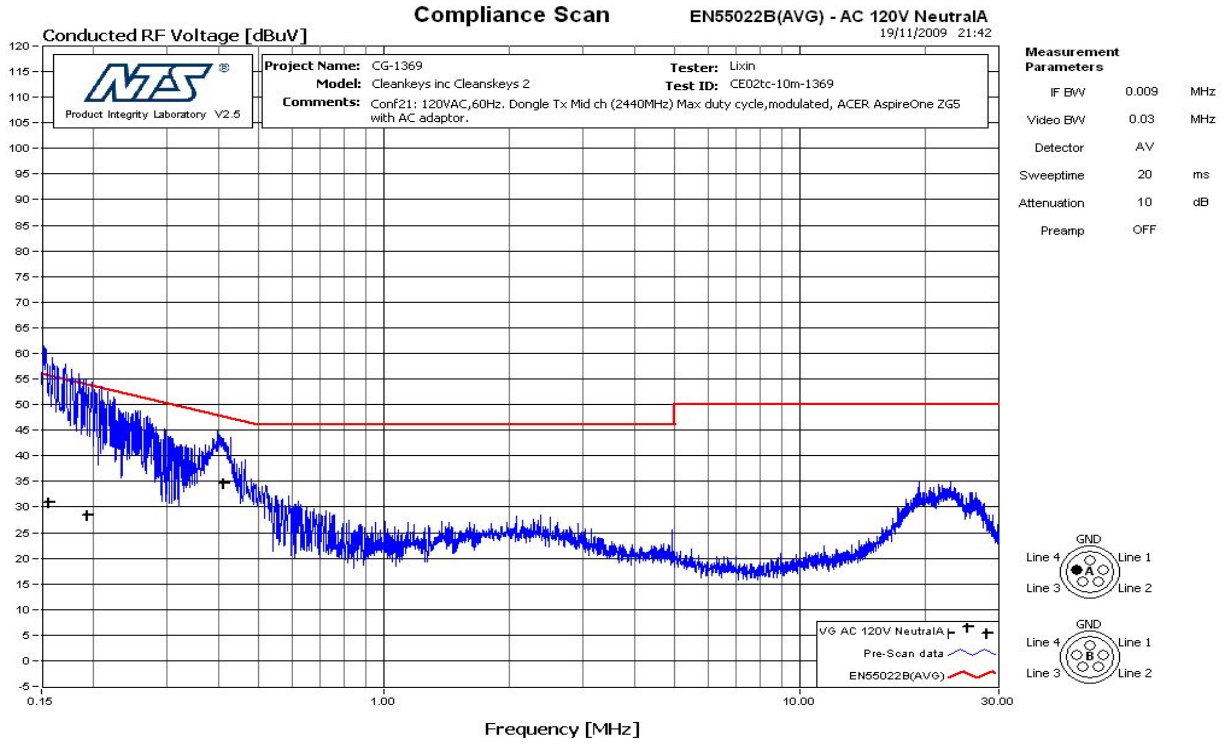


Figure 4 120 VAC Return - Average Detector



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)
Low	2402	1.072
Mid	2440	1.102
High	2481	1.092

All final reported values are corrected values.

B.6. Operating Mode During Test

The EUT was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

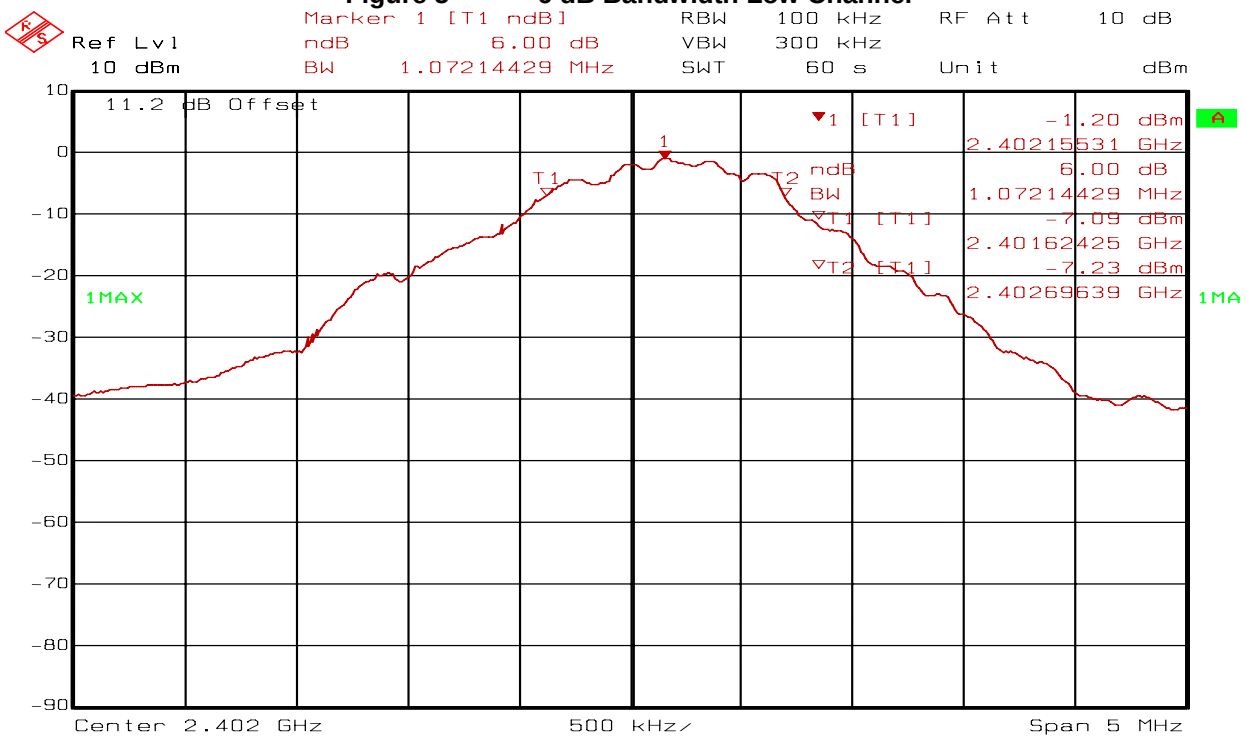
B.7. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

B.8. Test date

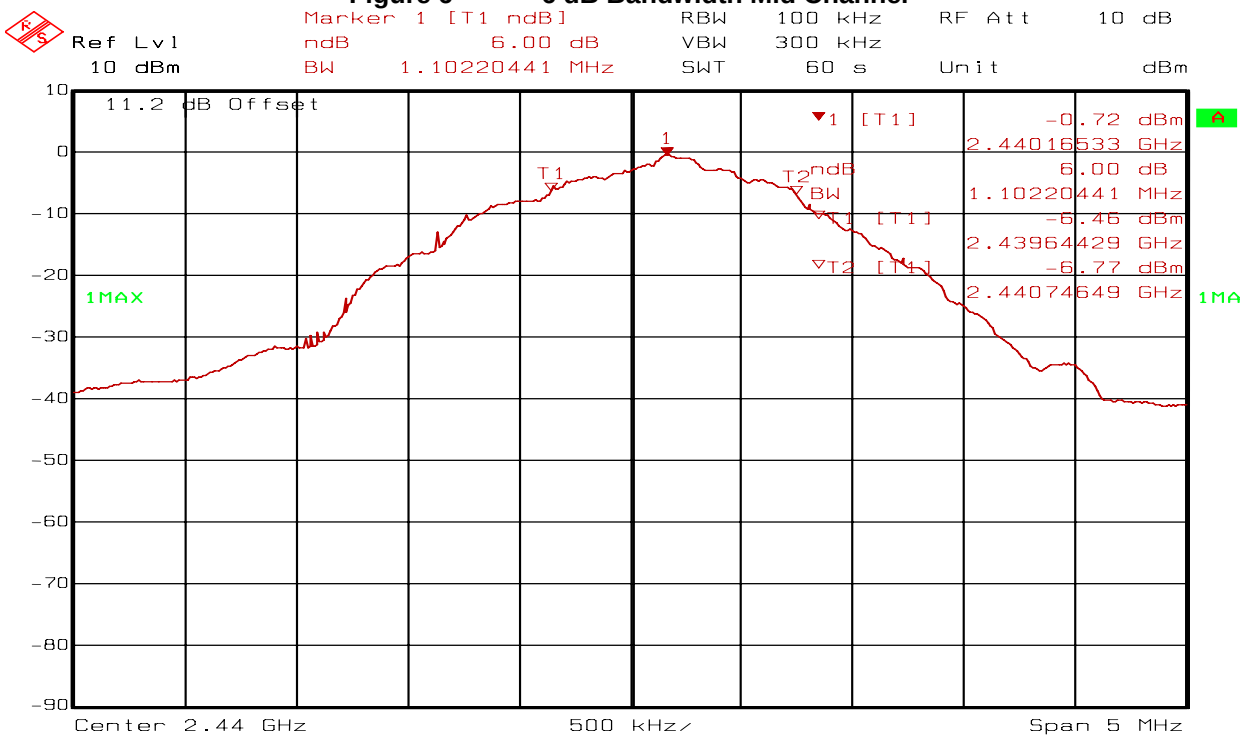
November 26, 2009

Figure 5 6 dB Bandwidth Low Channel



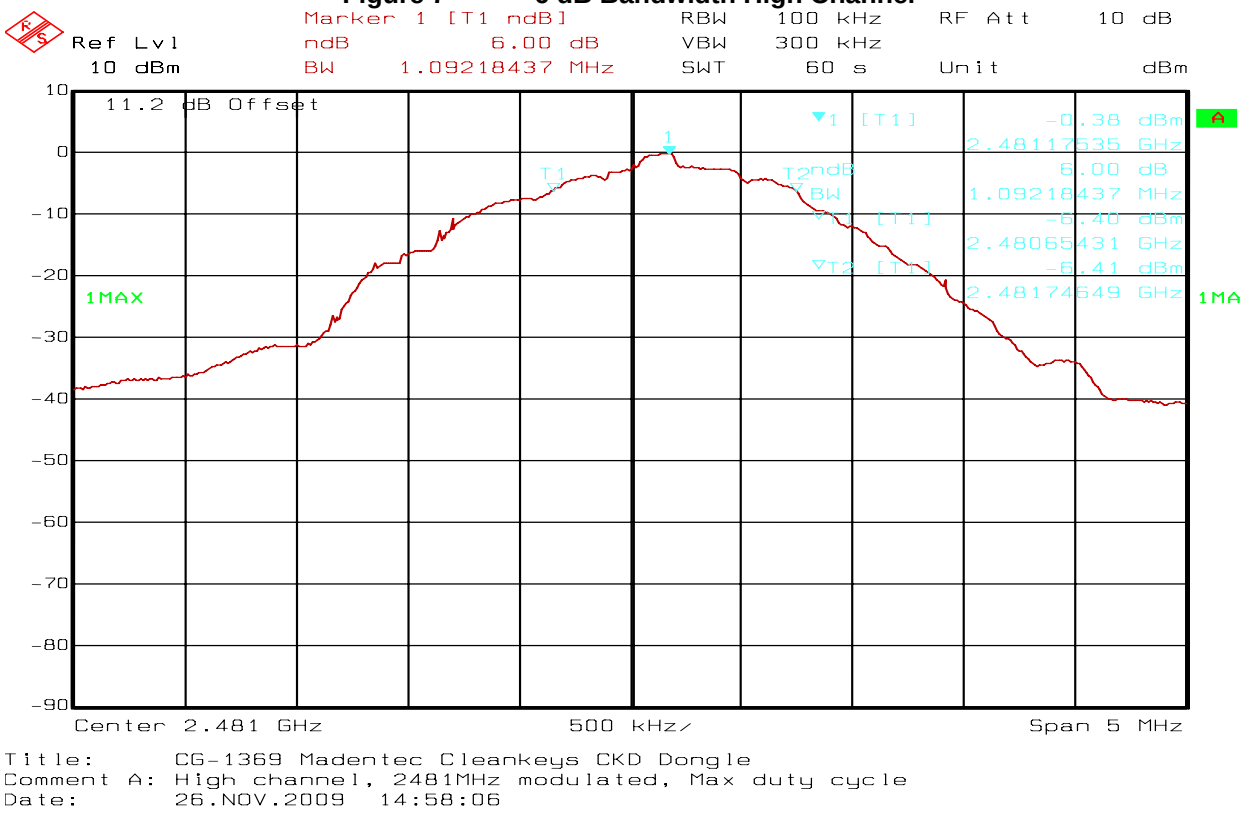
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Low channel, 2402MHz modulated, Max duty cycle
Date: 26.NOV.2009 15:51:17

Figure 6 6 dB Bandwidth Mid Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Mid channel, 2440MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:36:25

Figure 7 6 dB Bandwidth High Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: High channel, 2481MHz modulated, Max duty cycle
Date: 26.NOV.2009 14:58:06

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)
Low	2402	2.144
Mid	2440	2.244
High	2481	2.275

All final reported values are corrected values

C.5. Operating Mode During Test

The EUT was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

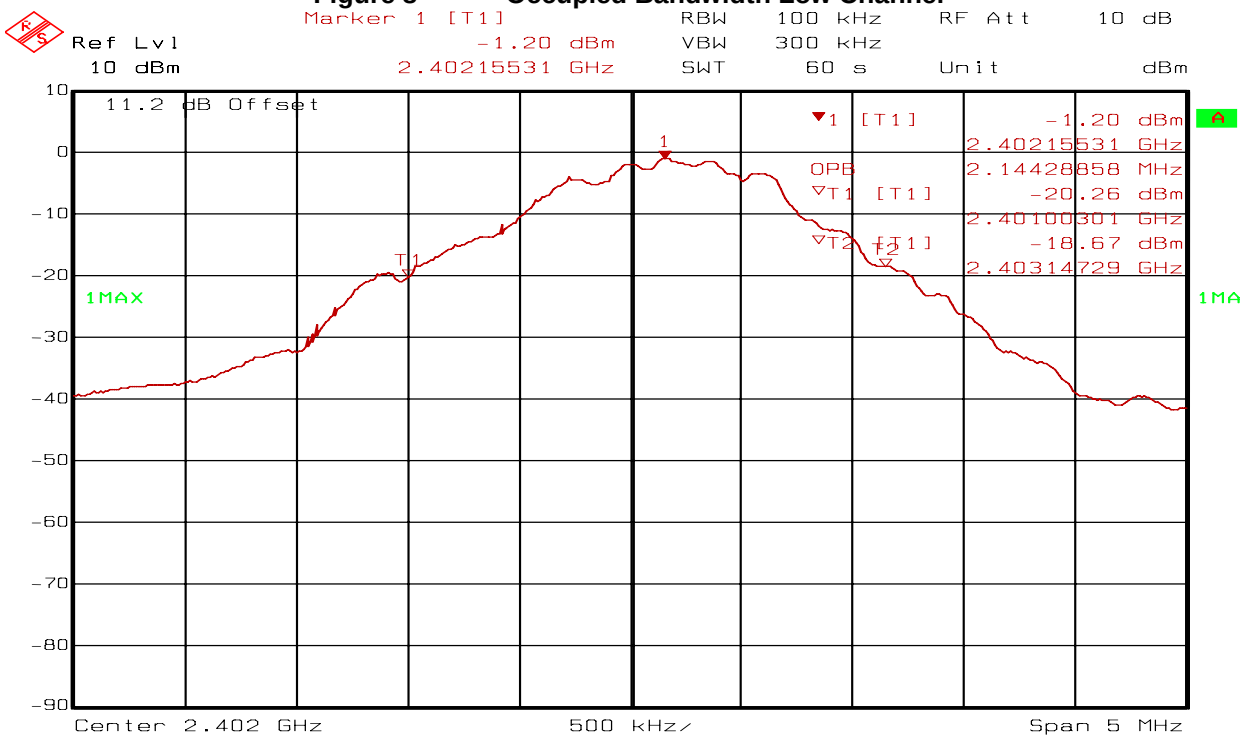
C.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

C.7. Test date

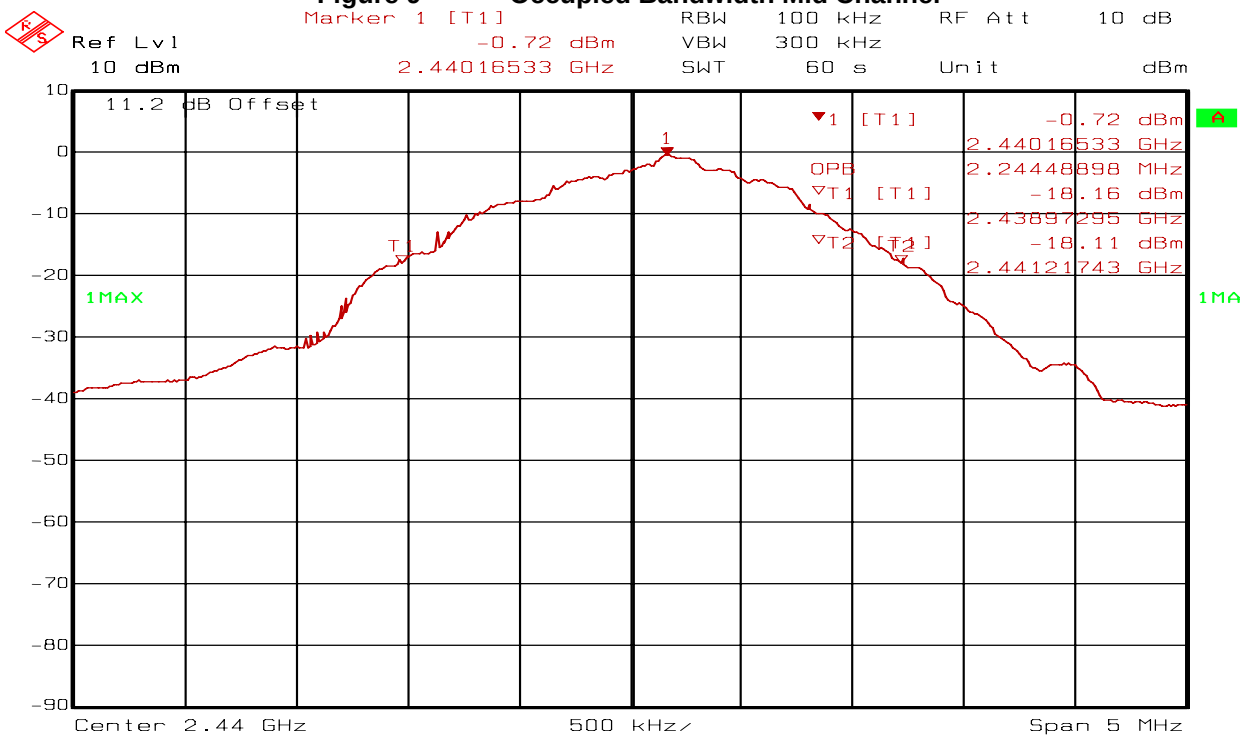
November 26, 2009

Figure 8 Occupied Bandwidth Low Channel



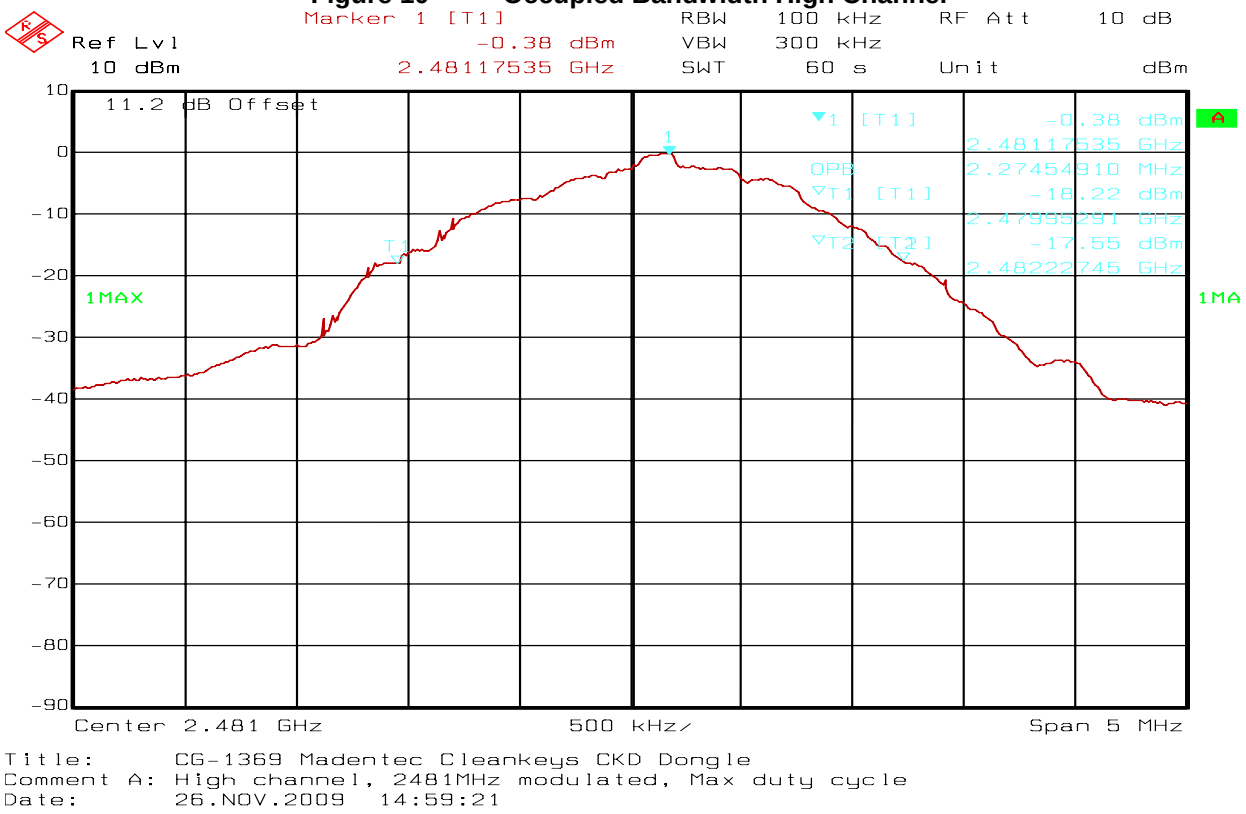
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Low channel, 2402MHz modulated, Max duty cycle
Date: 26.NOV.2009 15:52:08

Figure 9 Occupied Bandwidth Mid Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Mid channel, 2440MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:37:17

Figure 10 Occupied Bandwidth High Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: High channel, 2481MHz modulated, Max duty cycle
Date: 26.NOV.2009 14:59:21

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 EUT was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

D.5. Test Results

Channel	Frequency (MHz)	Peak Power (dBm)
Low	2402	-0.50
Mid	2440	-0.81
High	2481	-1.21

Compliant – The maximum peak power was -0.50 dBm measured conducted at the integral antenna input

All final reported values are corrected values

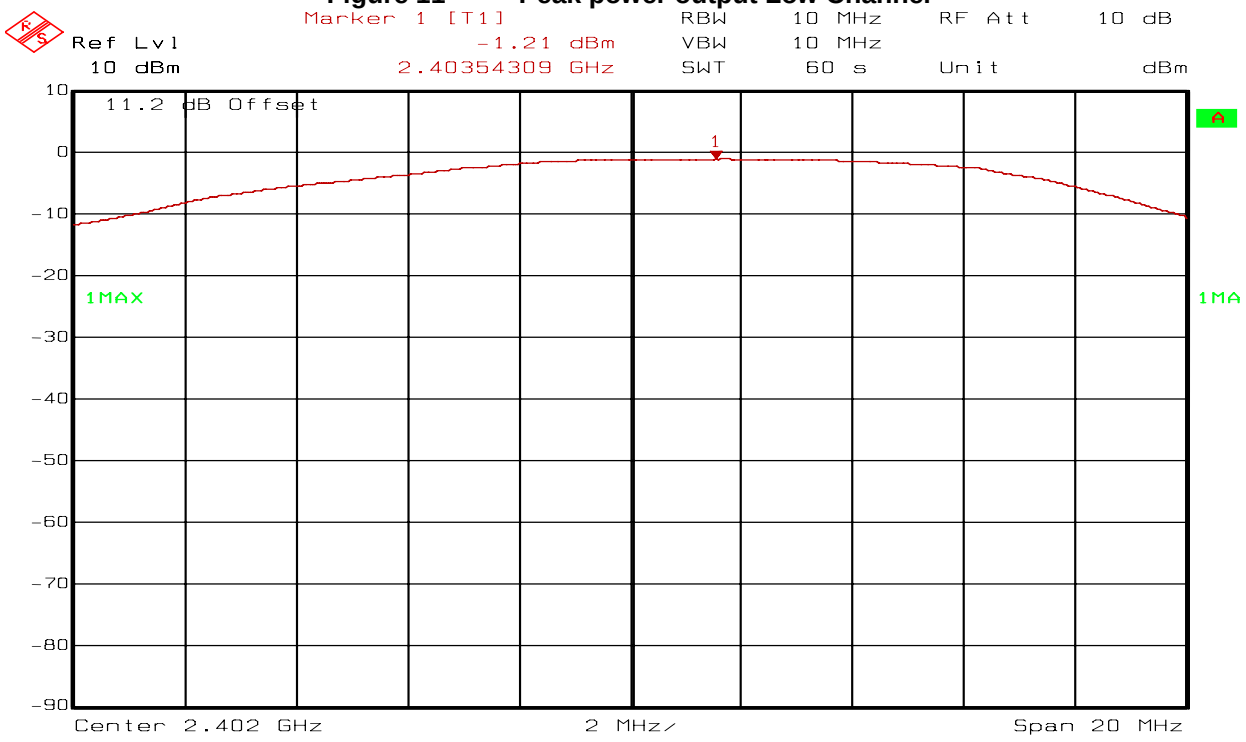
D.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

D.7. Test date

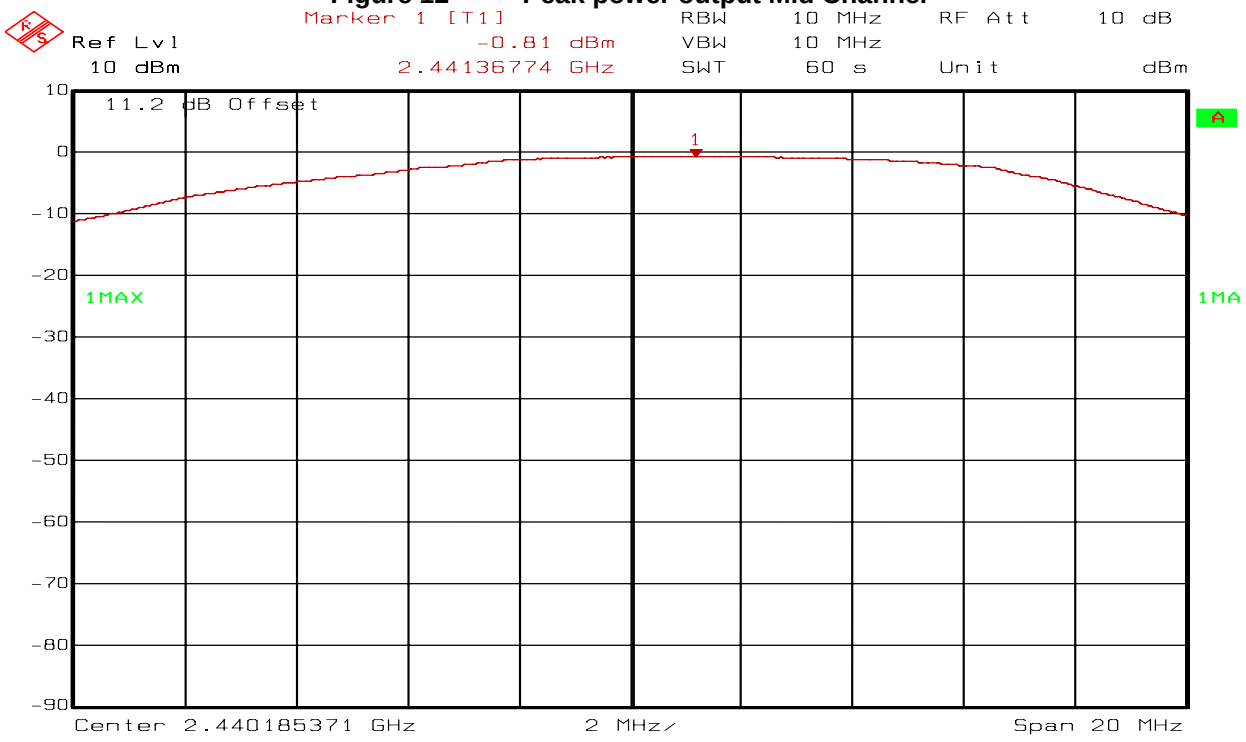
November 26, 2009

Figure 11 Peak power output Low Channel



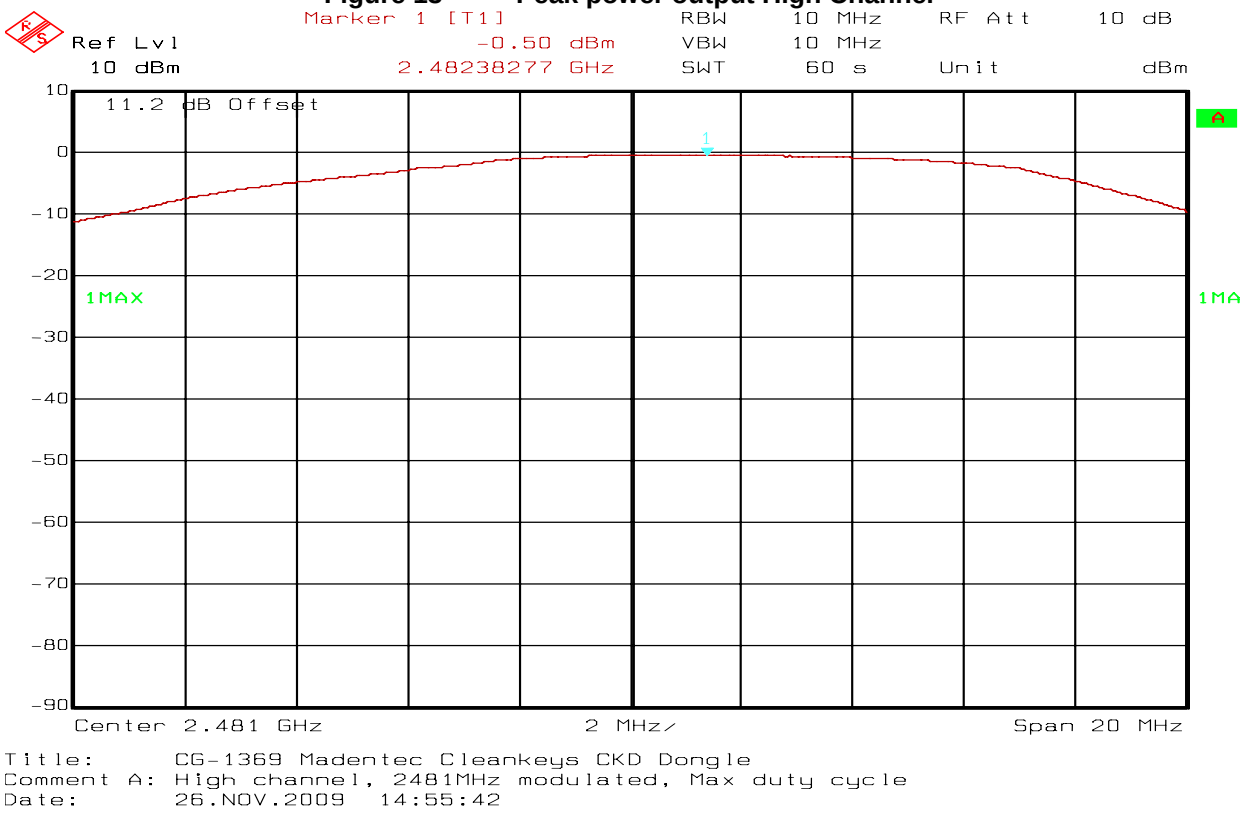
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Low channel, 2402MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:06:26

Figure 12 Peak power output Mid Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Mid channel, 2440MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:29:23

Figure 13 Peak power output 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 EUT was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

E.5. Test Results

Compliant. The maximum measured power spectral density was -12.66 dBm as measured conducted at the integral antenna input

E.6. Test Data Summary

Channel	Frequency (MHz)	Power Spectral Density (dBm)
Low	2402	-14.05
Mid	2440	-12.66
High	2481	-13.81

All final reported values are corrected values

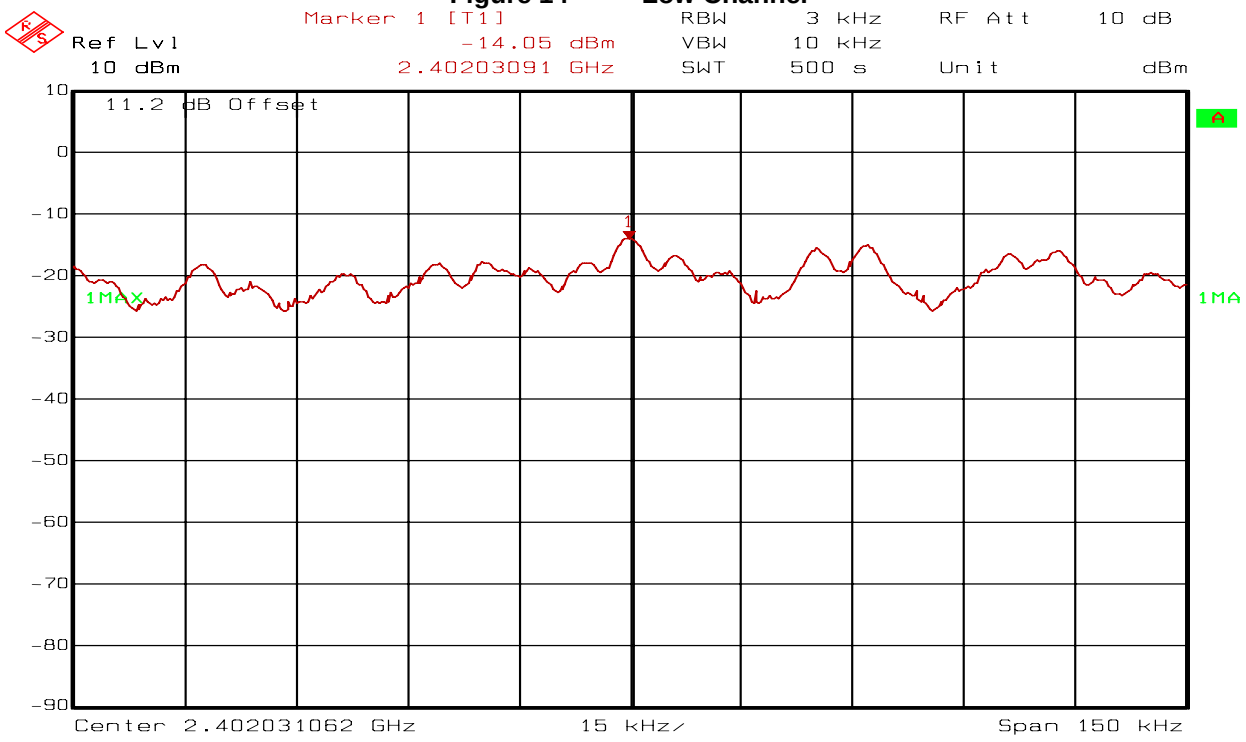
E.7. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

E.8. Test date

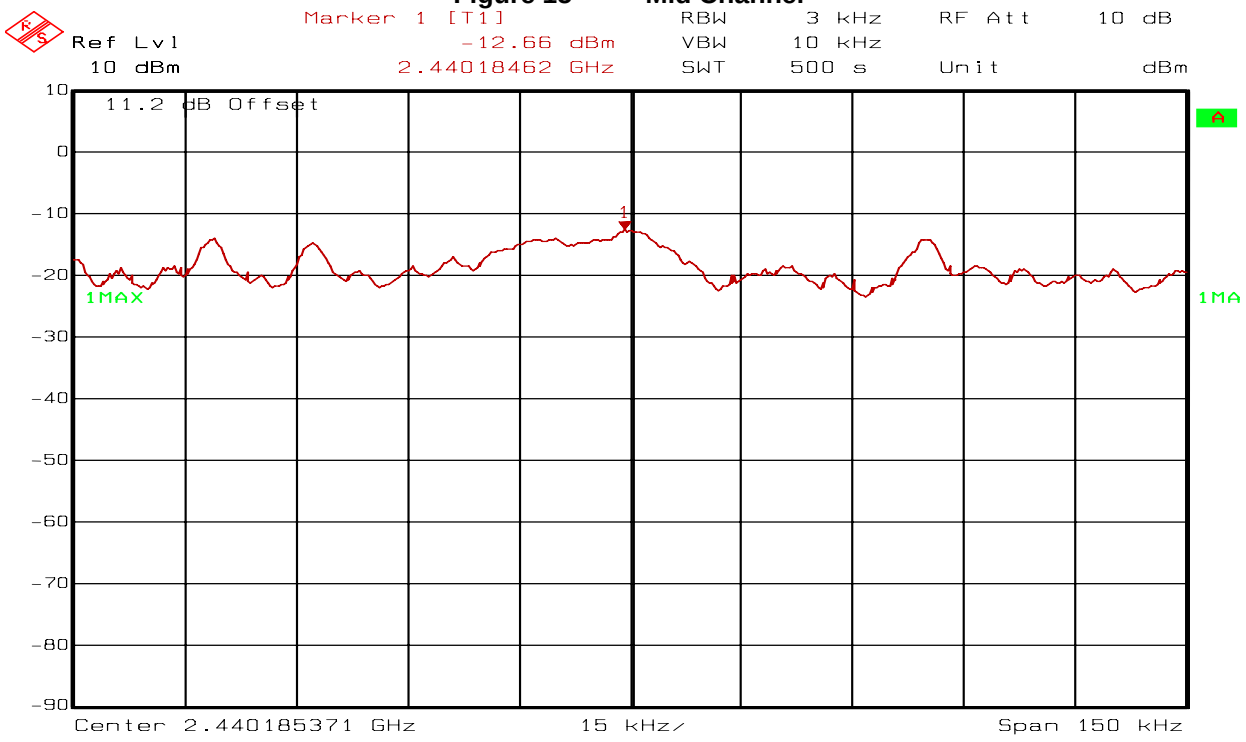
November 26, 2009

Figure 14 Low Channel



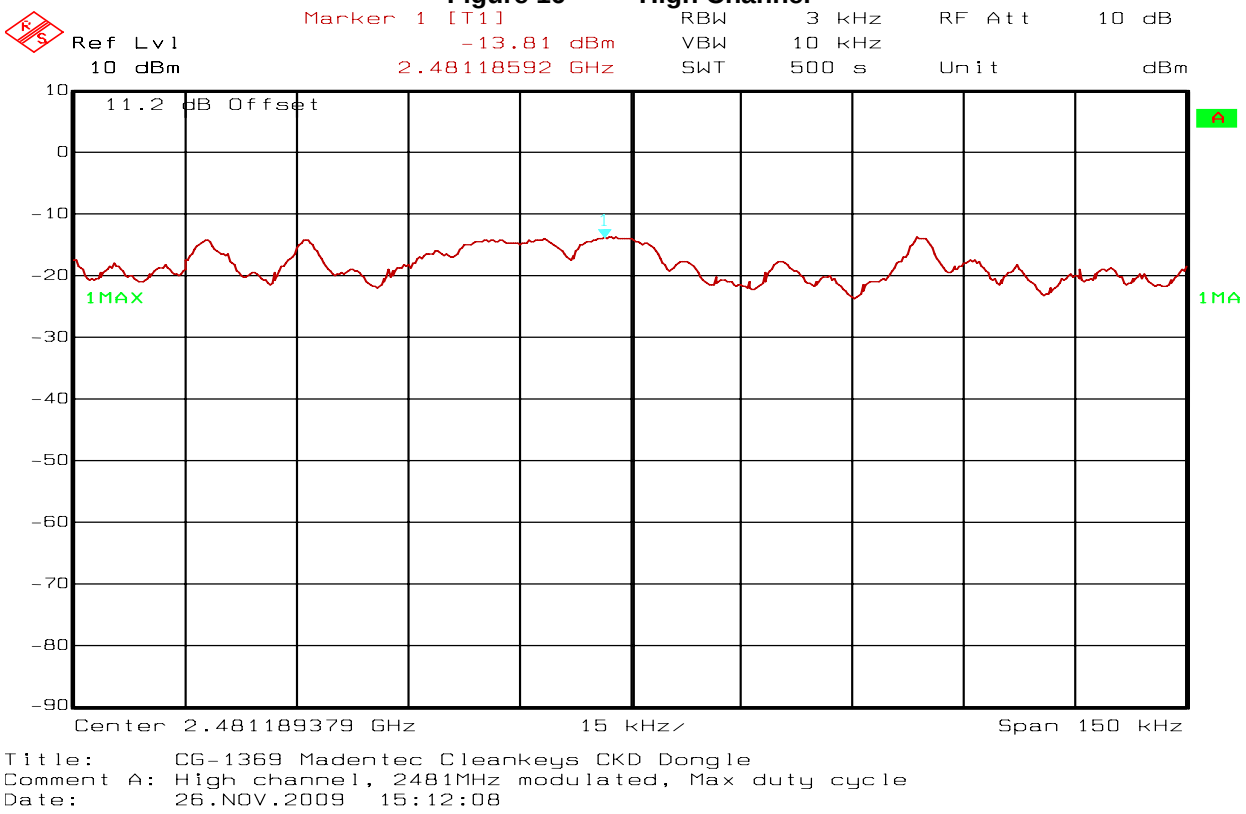
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Low channel, 2402MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:17:02

Figure 15 Mid Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Mid channel, 2440MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:27:11

Figure 16 High Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: High channel, 2481MHz modulated, Max duty cycle
Date: 26.NOV.2009 15:12:08

APPENDIX F: CONDUCTED SPURIOUS EMISSIONS (TX)

F.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

F.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)).

F.3. Test Procedure

FCC Publication 558074

F.4. Operating Mode During Test

The EUT was tuned to a low, middle and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

F.5. Test Results Summary

Compliant.

The worst case emission was 45.59 dB below the carrier power in low channel at 1.174 GHz

All final reported values are corrected values

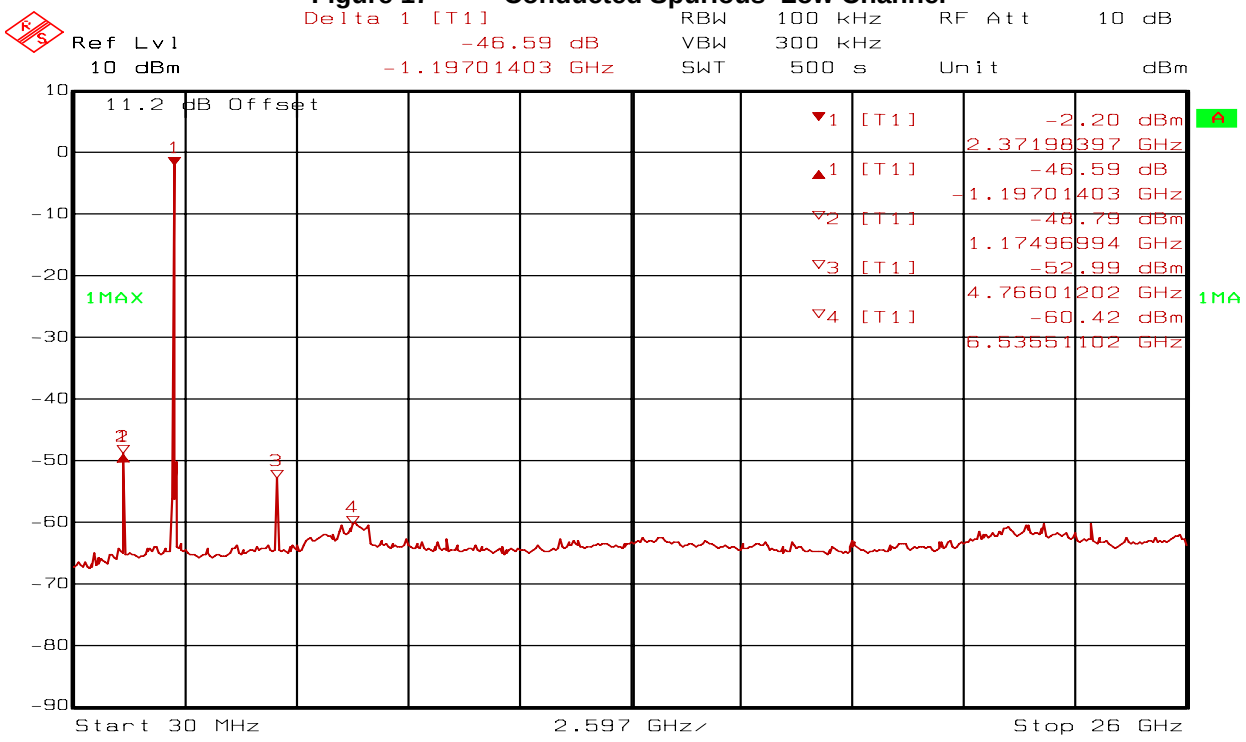
F.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

F.7. Test date

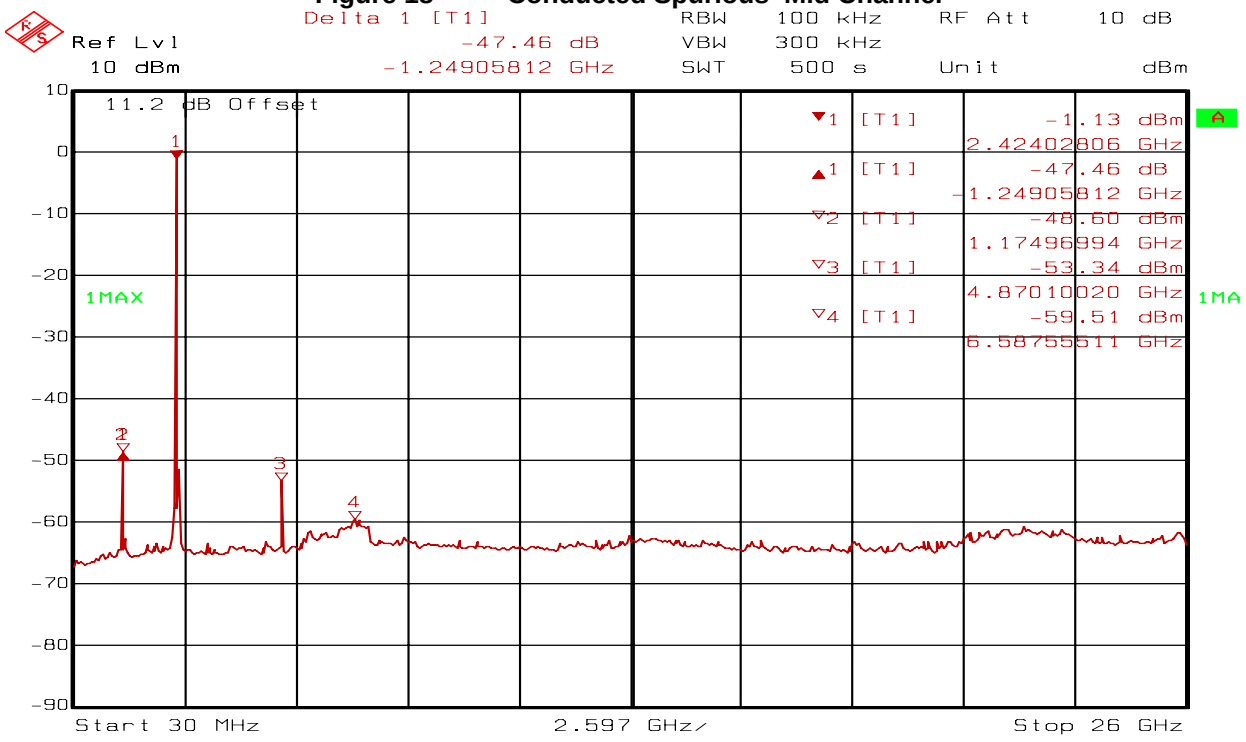
December 18, 2009

Figure 17 Conducted Spurious Low Channel



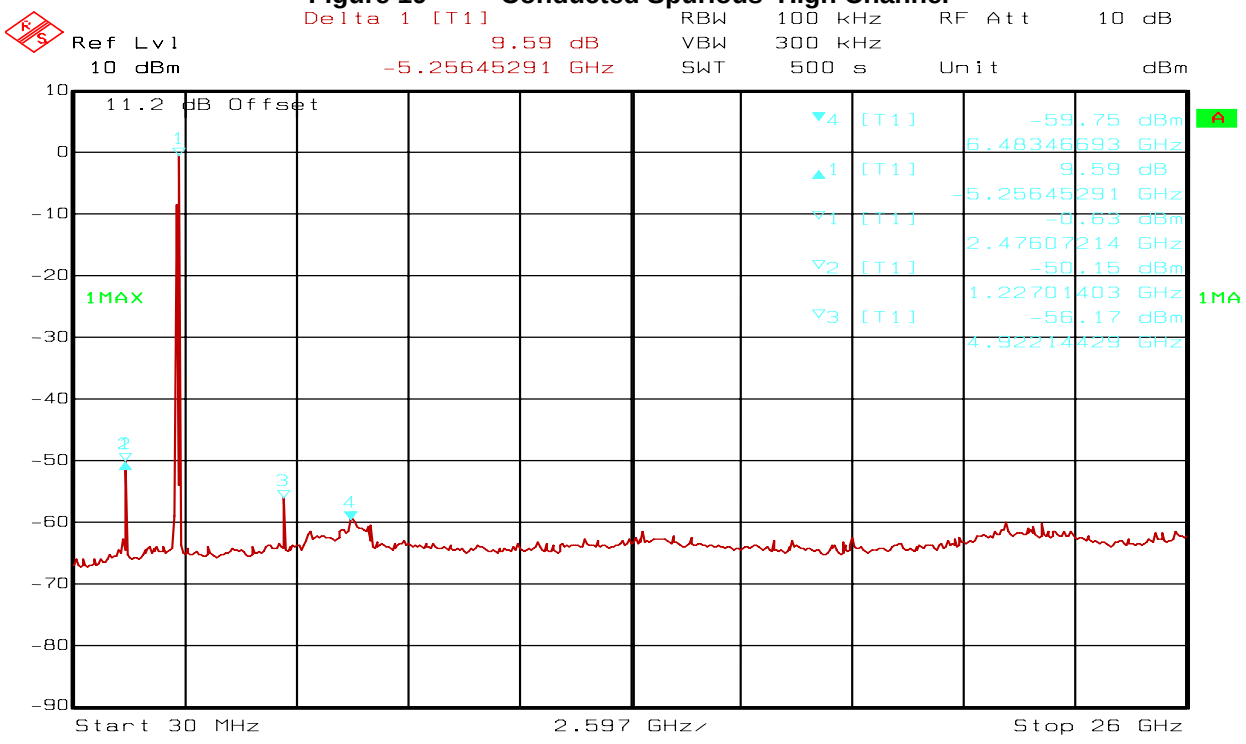
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Low channel, 2402MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:01:48

Figure 18 Conducted Spurious Mid Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Mid channel, 2440MHz modulated, Max duty cycle
Date: 26.NOV.2009 16:52:41

Figure 19 Conducted Spurious High Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: High channel, 2481MHz modulated, Max duty cycle
Date: 26.NOV.2009 15:30:50

APPENDIX G: CONDUCTED SPURIOUS EMISSIONS BAND EDGE

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

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)).

G.3. Test Procedure

FCC Publication 558074

G.4. Operating Mode During Test

The EUT was tuned to a low and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

G.5. Test Results

Compliant.

Channel	Frequency (MHz)	Conducted band edge (dB)
Low	2400.0	36.17
High	2483.5	40.36

Worst case spurious emission was 36.17 dB below the carrier

All final reported values are corrected values

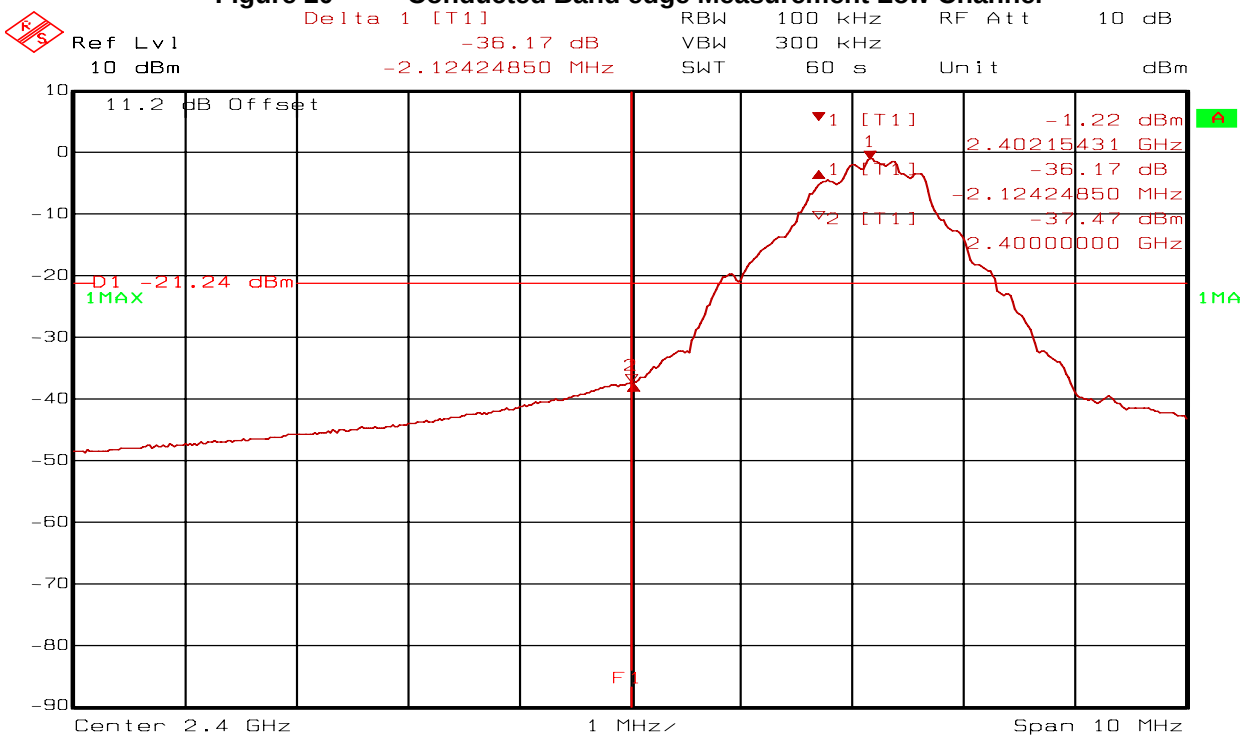
G.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

G.7. Test date

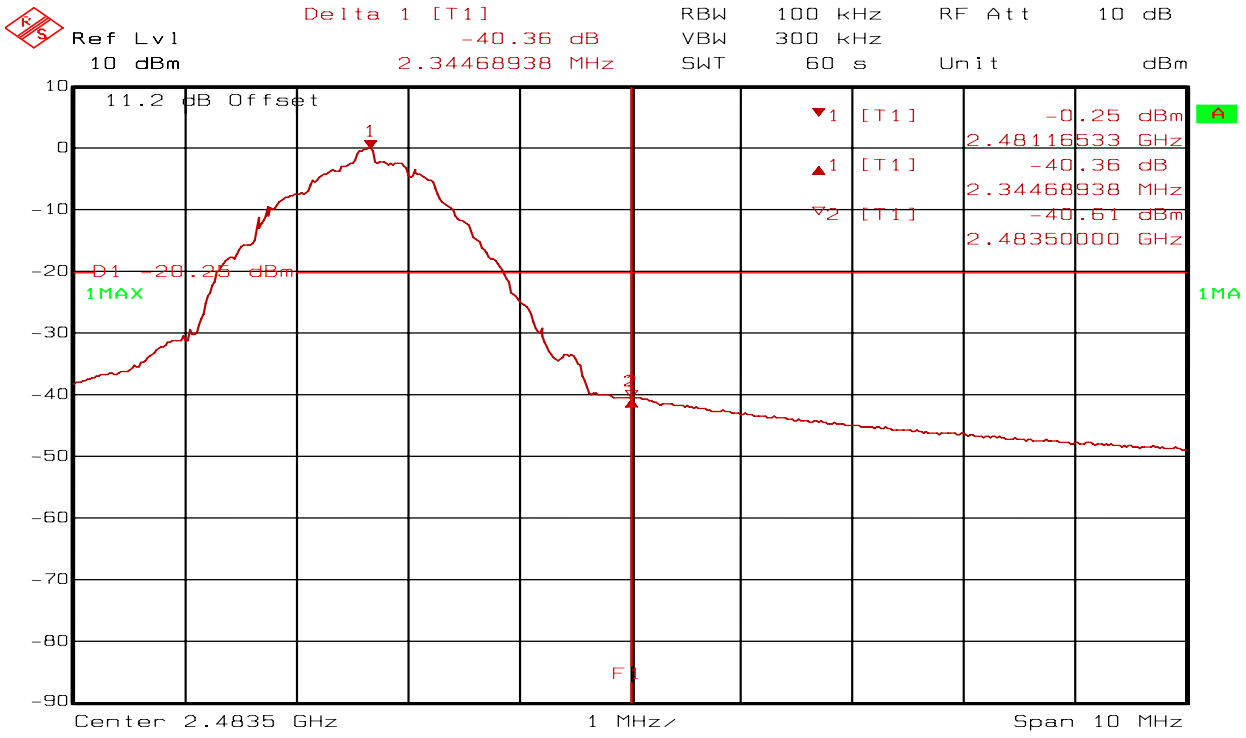
November 26, 2009

Figure 20 Conducted Band edge Measurement Low Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Low channel, 2402MHz modulated, Max duty cycle
Date: 26.NOV.2009 15:48:40

Figure 21 Conducted Band edge Measurement High Channel



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: High channel, 2481MHz modulated, Max duty cycle
Date: 26.NOV.2009 15:42:23

APPENDIX H: DUTY CYCLE CORRECTION FACTOR

H.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	NTS Calgary SOP CAG EMC 02 Emission Test Methods and Zero span

H.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.

H.3. Deviations

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

H.4. Test Procedure

As per FCC 15.35 with analyzer in Zero span mode.

H.5. Operating Mode During Test

CKD USB dongle in normal operating mode, communicating with keyboard, continuous mouse movement (Worst case)

H.6. Test Results

Duty cycle correction factor = 20*log (0.085*14/100) = -38.48 dB
Therefore the maximum allowable Duty cycle correction factor of -20 dB can be applied

Note: Max. 14 pulses in 100 ms

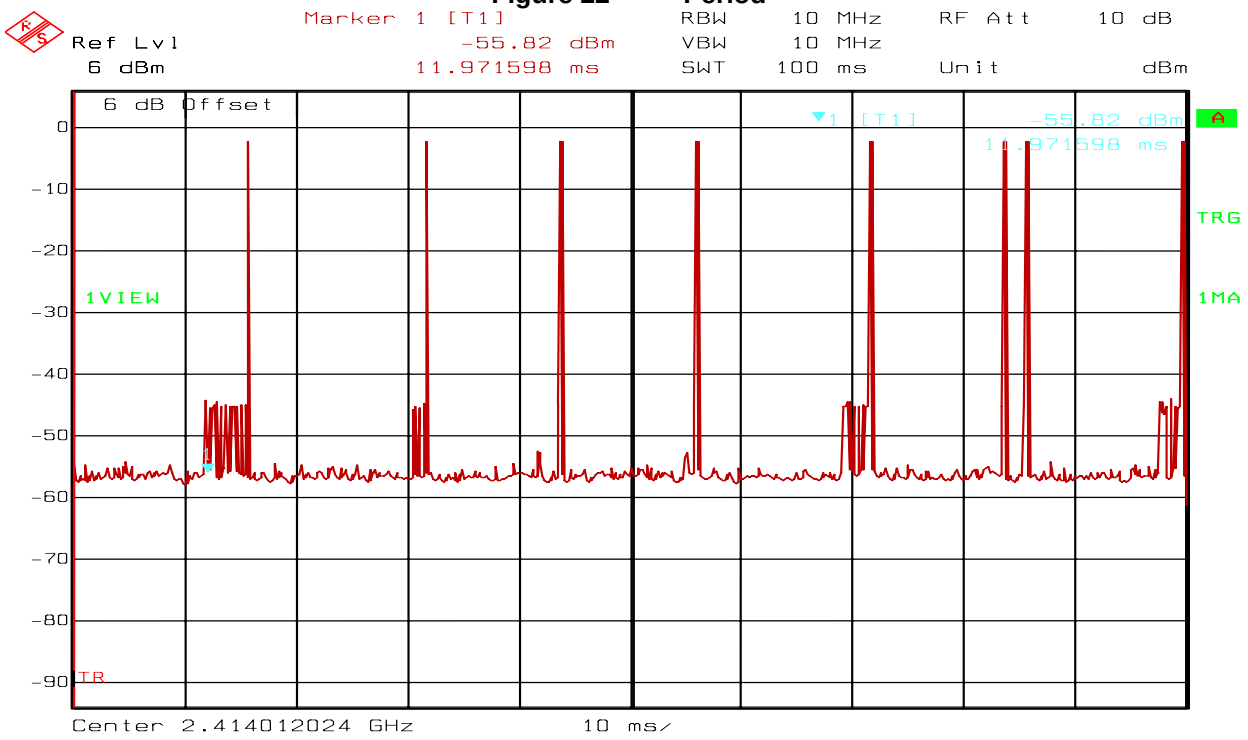
H.7. Tested By

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

H.8. Test date

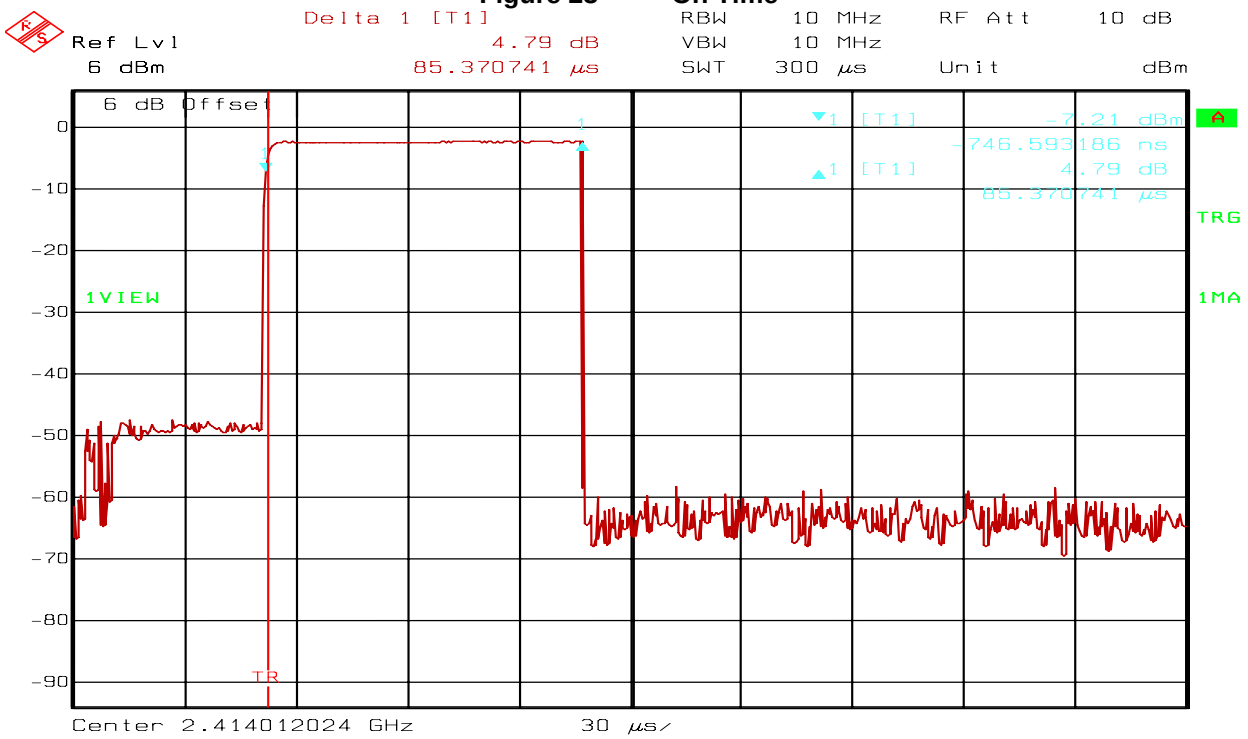
November 26, 2009

Figure 22 Period



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Normal comm mode
Date: 26.NOV.2009 12:54:52

Figure 23 On Time



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Normal comm mode
Date: 26.NOV.2009 12:56:25

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-02 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.

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, and 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 EUT was tuned to a low and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle

I.5. Test Results

Compliant

Frequency (MHz)	Polarization	Measured Carrier Level (dBµV/m)	Marker Delta (dB)	Peak level (dBµV/m)	Duty Cycle correction factor (dB)	Average level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)
2390.0	H	95.36	46.15	49.21	20	29.21	73.98	53.98	24.77
2483.5	H	95.30	45.76	49.54	20	29.54	73.98	53.98	24.44

All final reported values are corrected values

I.6. Sample Calculations

Part 15.209 Average Limit: 500 µV/m @ 3m = 20*Log (500) = 53.98 dBµV/m, Peak limit = 73.98 dBµV/m

Peak level (dBµV/m) = Measured Carrier Level (dBµV/m) - Marker Delta (dB)

Average level (dBµV/m) = Peak level (dBµV/m) - Duty Cycle correction factor (dB)

Margin (dB) = Peak level (dBµV/m) - Peak Limit (dBµV/m) or Average level (dBµV/m) - Average Limit (dBµV/m)

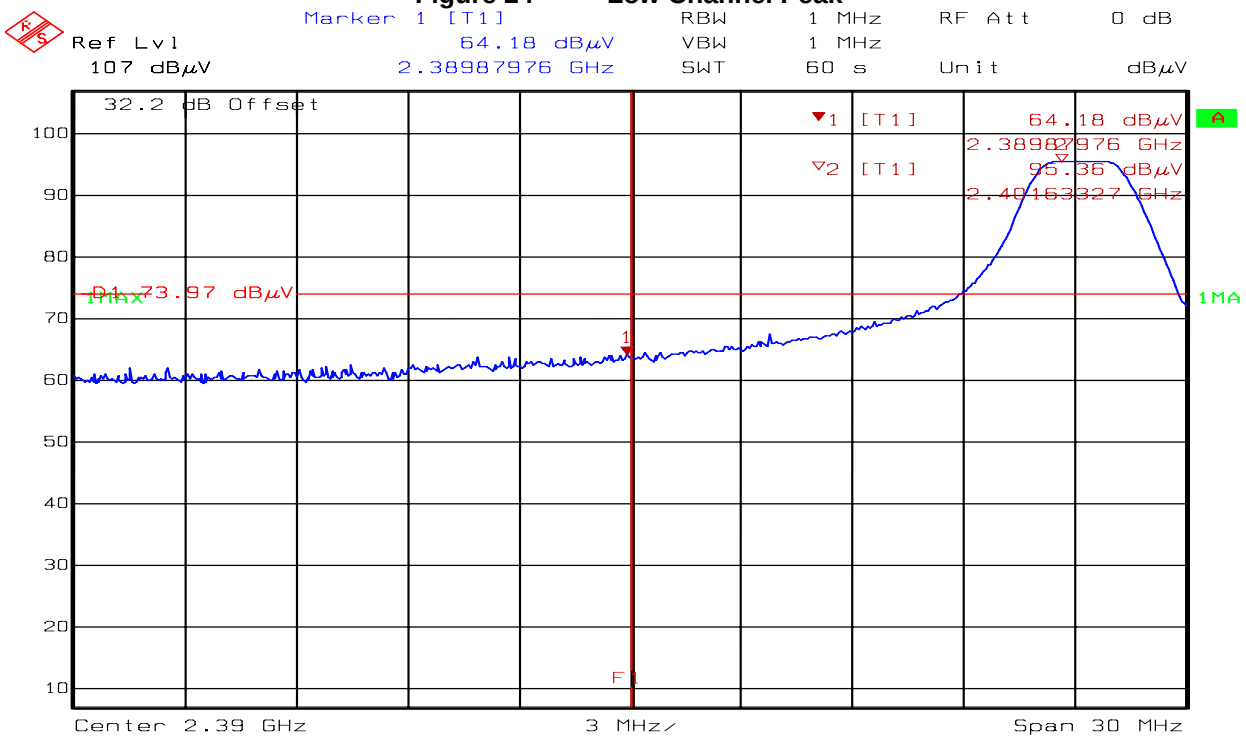
I.7. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior Wireless / EMC Technologist

I.8. Test date

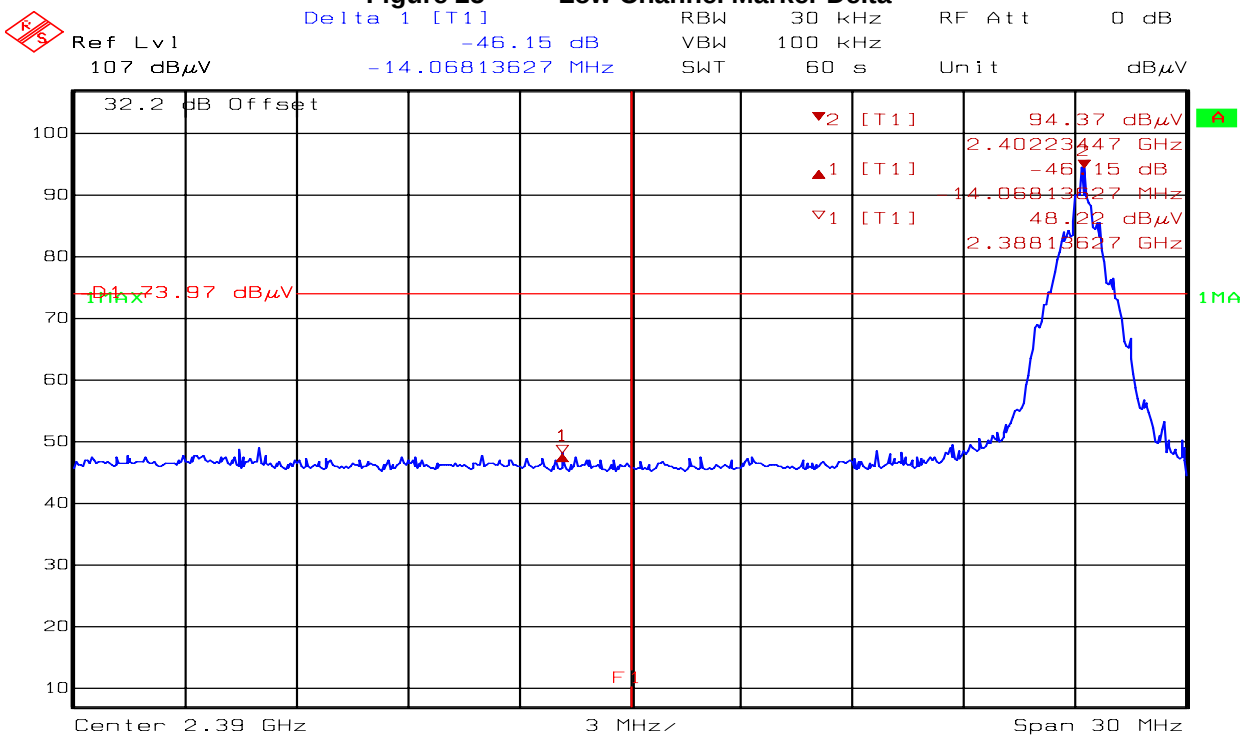
November 18, 2009

Figure 24 Low Channel Peak



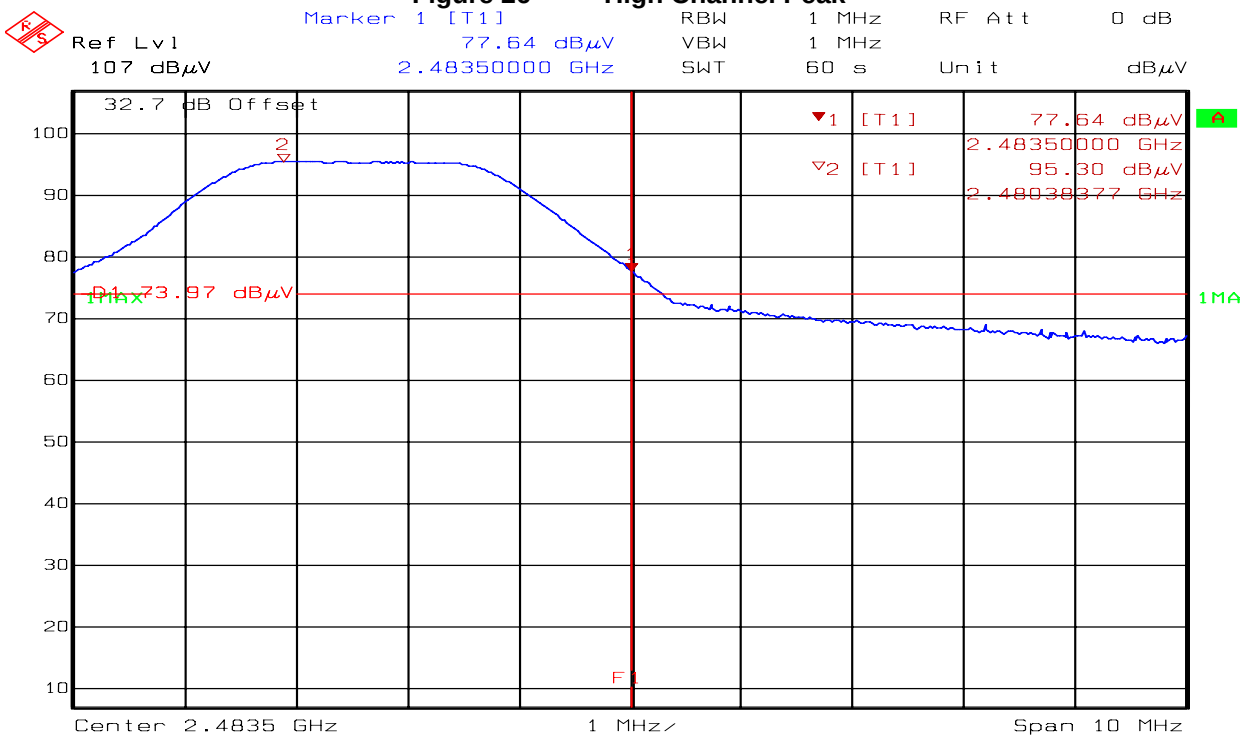
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Modulated Tx, Low Ch 2402MHz, Max duty cycle, w Acer Laptop
Date: 18.NOV.2009 17:13:58

Figure 25 Low Channel Marker Delta



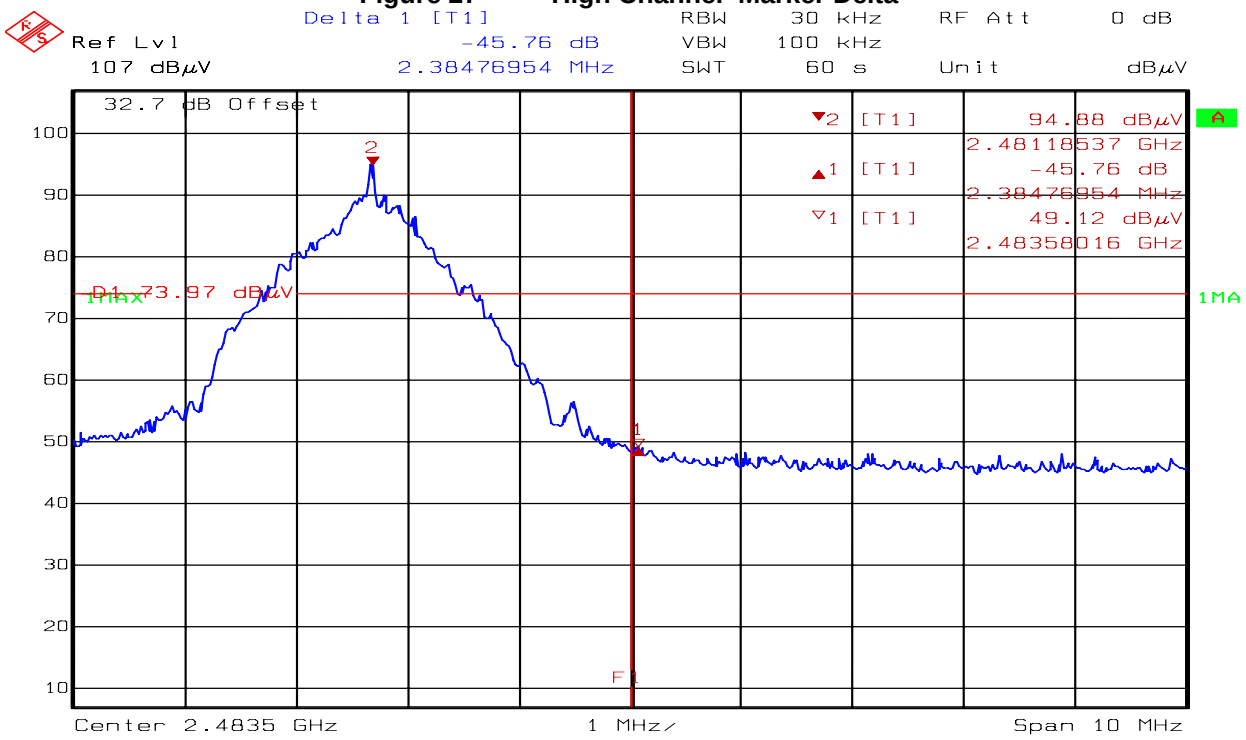
Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Modulated Tx, Low Ch 2402MHz, Max duty cycle, w Acer Laptop
Date: 18.NOV.2009 17:16:08

Figure 26 High Channel Peak



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Modulated Tx, High Channel 2481MHz, Max duty cycle, w Acer
Date: 18.NOV.2009 17:42:49

Figure 27 High Channel Marker Delta



Title: CG-1369 Madentec Cleankeys CKD Dongle
Comment A: Modulated Tx, High Channel 2481MHz, Max duty cycle, w Acer
Date: 18.NOV.2009 17:44:48

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 RSS Gen Issue 2 4.10 and 7.2.3 Receiver Spurious Emission
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 SOP-CAG-EMC-02 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.

J.2. Test Procedure

I.2.1 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, and then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

I.2.2 RSS Gen Issue 2, 4.10 Receiver Spurious Emission

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

Spurious Emission Limits for Receivers

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

J.3. Operating Mode During Test

For Tx spurious emissions: The EUT was tuned to a low, mid and high channel in continuous transmit mode at maximum rated RF output power and maximum duty cycle
For Rx spurious emissions: The EUT was tuned to receive only mode in mid channel

J.4. Test Results

Pass, Worst case results reported

J.4.1 Rx mode

There was no Rx mode related emission observed

Note: Emissions from host laptop were detected. The highest emission was 52 dBµV/m at 3 m distance with peak detector at 1306.61 MHz which was not related to the CKD USB Dongle emissions

J.4.2 TX Mode

Channel	Frequency (MHz)	Polarization	Measured Peak level (dBµV/m)	Duty Cycle correction factor (dB)	Average level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)
Low	4803.97	H	47.56	20	27.56	73.98	53.98	26.42
	4804.17	V	48.19	20	28.19	73.98	53.98	25.79
Mid	4879.73	H	47.59	20	27.59	73.98	53.98	26.39
	4880.55	V	49.74	20	29.74	73.98	53.98	24.24
High	4962.87	H	47.74	20	27.74	73.98	53.98	26.24
	4962.11	V	50.15	20	30.15	73.98	53.98	23.83

Worst case peak spurious emission was 50.15 dBµV/m at 4962.11 MHz vertical polarization in high channel. It has 23.83 dB margin to the peak and average limits.

Note:

Plots were not provided in order to reduce file size

J.5. Sample Calculations

Average Limit for above 960 MHz = 500 µV/m @ 3m = 20*Log (500) = 53.98 dBµV/m
Peak Limit for above 960 MHz = Average Limit + 20 (dB) = 73.98 dBµV/m
Average level (dBµV/m) = Peak level (dBµV/m) - Duty Cycle correction factor (dB)
Margin (dB) = Peak level (dBµV/m) - Peak Limit (dBµV/m) or Average level (dBµV/m) - Average Limit (dBµV/m)

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 Wireless / EMC Technologist

J.7. Test date

December 23, 2009

APPENDIX K: TEST EQUIPMENT LIST

Manufacturer	Type/Model		Asset #	Cal Due	Cal Date
Bilog Antenna	Teseq	CBL 6112B	CG0314	21SEP10	29OCT08
Horn Antenna (Rx) 1 GHz – 18 GHz	EMCO	3115	CG0103	06MAR11	30SEP08
Standard Gain Horn (Rx) 18 GHz – 26.5 GHz	EMCO	3160-09	CG0075	N/A (1)	27NOV01
LNA 1 GHz < f < 18 GHz	Miteq	JSD00121	CG0317	01DEC10	01DEC08
LNA 18GHz < f < 26.5GHz	Miteq	JSD00119	CG0482	02OCT11	02OCT09
High pass filter f > 1000 MHz	MicroTronics	HPM14576	CG0963	01DEC10	01DEC08
High pass filter f > 2800 MHz	MicroTronics	HPM50111	CG0964	N/A	N/A
Spectrum Analyzer 9 kHz – 40 GHz	Rohde & Schwarz	FSEK-20	CG0118	06AUG10	06AUG09
Wireless Communication Test Set	Agilent	8960 E5515C	CG-R-1286	02OCT11	24SEP09
Table Top LISN	EMCO	3825	CG0367	18JAN10	18JAN08
Test Receiver	Rohde & Schwarz	ESAI	CG0123 CG0124	26FEB10	26FEB09
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

(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