Registration No. 440

Certification Test Report

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

Freescale Semiconductor
1320x-QE128-EVB

FCC ID # RUN1320X-QE128EVB
IC # 6744A-1320XQE
Project Code CG-796

(Report CG-796-RA-1-4)
Revision: 4
(This report supersedes CG-796-RA-1-3)

April 8, 2008

Prepared for:	Freescale Semiconductor
Author:	Deniz Demirci Senior EMC / Wireless Technologist
Approved by:	Nick Kobrosly Lab Manager

Report Summary

Test Facility:	**National Technical Systems, Canada** Product Integrity Laboratory 5151-47th Street, N.E. Calgary Alberta T3J 3R2
Accreditation Numbers:	FCC 101386 IC 3978A-1 - File 46405-3978 **Accredited by Standards Council of Canada** Accredited Laboratory No. 440 Conforms with requirements of CAN−P−4D (ISO/IEC 17025) CLIENTS SERVED: All interested parties FIELDS OF TESTING: Electrical/Electronic, Mechanical/Physical ACCREDITATION DATE:: 2002−03−20 VALID TO: 2009−03−20
Applicant:	Freescale Semiconductor 2100 E Elliot Rd MS EL542 Tempe, AZ 85284 USA
Customer Representative:	Name: Mark R Williams Phone #: 480-413-4730 Email Address: Mark.R.Williams@freescale.com

EUT Description

EUT Description	Manufacturer	Model	Revision	Serial Number
IEEE 802.15.4 2.4 GHz ZigBee Evaluation Board	Freescale Semiconductor	1320x-QE128-EVB	170-23731 REV B	N/A

Test Summary

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

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

Prepared By: _____
Deniz Demirci
Senior EMC / Wireless Technologist

gmoore Digitally signed by gmoore
DN: cn=gmoore, c=US, o=nts, email=glen.moore@ntscorp.com
Date: 2008.04.09 10:53:54 -06'00'

Reviewed By: _____
Glen Moore
EMC / Wireless Manager

Approved By: Robyn Zuehlke 2008.04.09 09:21:22 -06'00'
_____
Robyn Zuehlke
Quality Management Representative

Table of Contents

Register of revisions

Revision	Date	Description of Revisions
0	March 5, 2008	Draft release for Internal review
1	March 20, 2008	Changes after internal review
2	March 26, 2008	IC ID number edited
3	March 26, 2008	Radiated emission plots removed in order to reduce file size
4	April 8, 2008	Model Name corrected per customer request

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 ZigBee 1320x-QE128EVB Evaluation Board from Freescale Semiconductor 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

Description of EUT

	Name	Model	Revision	Serial Number
EUT	1320x-QE128-EVB	1320x-QE128-EVB	170-23731 REV B	N/A
Power Supply	PHIHONG	PSA05R-090	N/A	I44401076A4
Classification	Mobile			
Antenna	Integral* (5dBi)			
Modulation	0-QPSK			
EUT Size (H x W x D) (in inches)	1 ¾ x 7 x 4 ½			
EUT Weight (in pounds)	0.25			
Channels/Frequency Range	15 channels, 2405 MHz -2480 MHz			
Functional Description	The 1320x-QE128-EVB is an evaluation board for developing IEEE® 802.15.4/ZigBee™ software and applications ranging from simple proprietary point-to-point connectivity to complete ZigBee mesh networking on the QE microcontroller platform.			

* SMA RF output is test purposes only. It will not be used in the production.

2.1.1 EUT POWERS

Voltage	9 VDC 120 VAC 60 Hz with PHIHONG Switching Power Supply Model :PSA05R-090
Number of Feeds	1 (1 Hot, 1 Return)

2.2 EUT CABLES

Quantity	Model/Type	Routing		Shielded / Unshielded	Description	Cable Length (m)
		From	To			
1	Power	Power Supply	EUT	Unshielded	Permanent connection to power supply	1.8
1	Serial	EUT	Computer	Unshielded	Serial	1.8

2.3 MODE OF OPERATION DURING TESTS

The 1320x-QE128-EVB was tested while Modulated Tx, PRBS* Tx and Receive modes. The EUT was tuned to a low, middle, and high channel with Modulated Tx, PRBS Tx modes to perform power and occupied bandwidth tests. The EUT was tuned to a low, middle, and high channel with Modulated Tx, PRBS Tx and Receive modes to perform spurious/harmonic tests. For AC conducted emissions the device was tuned to its center frequency. 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.

* Pulse Pseudo Random Binary Sequence (PRBS)

3.0 SUPPORT EQUIPMENT

3.1 CONFIGURATION

Dell Inspiron Laptop computer s/n: TW-0791UH-12800-12G-5260 was used for setting up the EUT.
Telnet port settings: Bits per second: 38400, Data bits: 8, Parity: None, Stop bits: 1, Flow control: None

Computer was used for configuring the EUT only and it was not connected during the tests.

3.2 TEST BED/PERIPHERAL CABLES

NA

4.0 TEST ENVIRONMENT

4.1 NORMAL TEST CONDITIONS

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

The values are the limits registered during the test period.

APPENDICES

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	NTS Conducted Emissions 150 kHz – 30 MHz Automated Test Method 6.0A R2

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. Deviations

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

A.4. Test Results (Peak detector)

Product Integrity Laboratory V2.5

Project Number: CG-796 **Tester:** Spencer Watson
Model: Freescale 1320X-QE128-EVB ZigBee **Test ID:** CE02tc-10m-796
Comments: Conf02: 120 VAC 60 Hz. 1320X-QE128-EVB ZigBee, Ch18, Cont Mod Tx, Integral Ant, w Phihong PSA05R-090 power adapter s/n:I44401076A4, Max Power

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	0.161	Peak	34.12	12.23	46.35	QP	65.43	**19.08**
AC 120V Line1A	0.484	Peak	28.17	10.82	38.99	QP	56.26	**17.27**
AC 120V Line1A	0.677	Peak	28.84	10.77	39.61	QP	56.00	**16.39**
AC 120V Line1A	1.465	Peak	25.75	10.78	36.53	QP	56.00	**19.47**
AC 120V Line1A	3.134	Peak	26.64	10.91	37.55	QP	56.00	**18.45**
AC 120V NeutralA	0.164	Peak	37.09	12.10	49.19	QP	65.28	**16.09**
AC 120V NeutralA	0.197	Peak	34.71	11.66	46.37	QP	63.75	**17.38**
AC 120V NeutralA	0.227	Peak	33.14	11.39	44.53	QP	62.57	**18.04**
AC 120V NeutralA	0.259	Peak	31.90	11.22	43.12	QP	61.48	**18.36**
AC 120V NeutralA	0.476	Peak	29.86	10.77	40.63	QP	56.41	**15.78**
AC 120V NeutralA	0.656	Peak	29.78	10.68	40.46	QP	56.00	**15.54**

The highest emission measured was 40.46 dBµV with peak detector at 656 kHz. It has 15.54 dB margin to the FCC Part 15.207 and RSS-Gen Issue 2 7.2.2limits

A.5. Test Results (Average detector)

Product Integrity Laboratory V2.5

Project Number:	CG-796	**Tester:**	Spencer Watson
Model:	Freescale 1320X-QE128-EVB ZigBee	**Test ID:**	CE02tc-10m-796
Comments:	Conf02: 120 VAC 60 Hz. 1320X-QE128-EVB ZigBee, Ch18, Cont Mod Tx, Integral Ant, w Phihong PSA05R-090 power adapter s/n:I44401076A4, Max Power		

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	0.484	AV	16.46	10.82	27.28	AV	46.26	**18.98**
AC 120V NeutralA	0.164	AV	24.99	12.10	37.09	AV	55.28	**18.19**
AC 120V NeutralA	0.197	AV	22.56	11.66	34.22	AV	53.75	**19.53**
AC 120V NeutralA	0.227	AV	22.12	11.39	33.51	AV	52.57	**19.06**
AC 120V NeutralA	0.259	AV	21.62	11.22	32.84	AV	51.48	**18.64**
AC 120V NeutralA	0.476	AV	19.15	10.77	29.92	AV	46.41	**16.49**
AC 120V NeutralA	0.656	AV	17.96	10.68	28.64	AV	46.00	**17.36**

The highest emission measured was 29.92 dBµV with average detector at 476 kHz. It has 16.49 dB margin to the FCC Part 15.207 and RSS-Gen Issue 2 7.2.2limits.

A.6. Observations

None

A.7. Deviations from Normal Operating Mode During Test

None

A.8. Sample Calculation

Corrected Value = Measured Value + Correction Factors
Margin = Limit – Corrected Value

A.9. Test Data & Photographs

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

A.10. Tested By

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

Name: Spencer Watson
Function: EMC Technologist

Figure 1 Conducted Emission 120 VAC Line 150 kHz – 30 MHz Pre-compliance

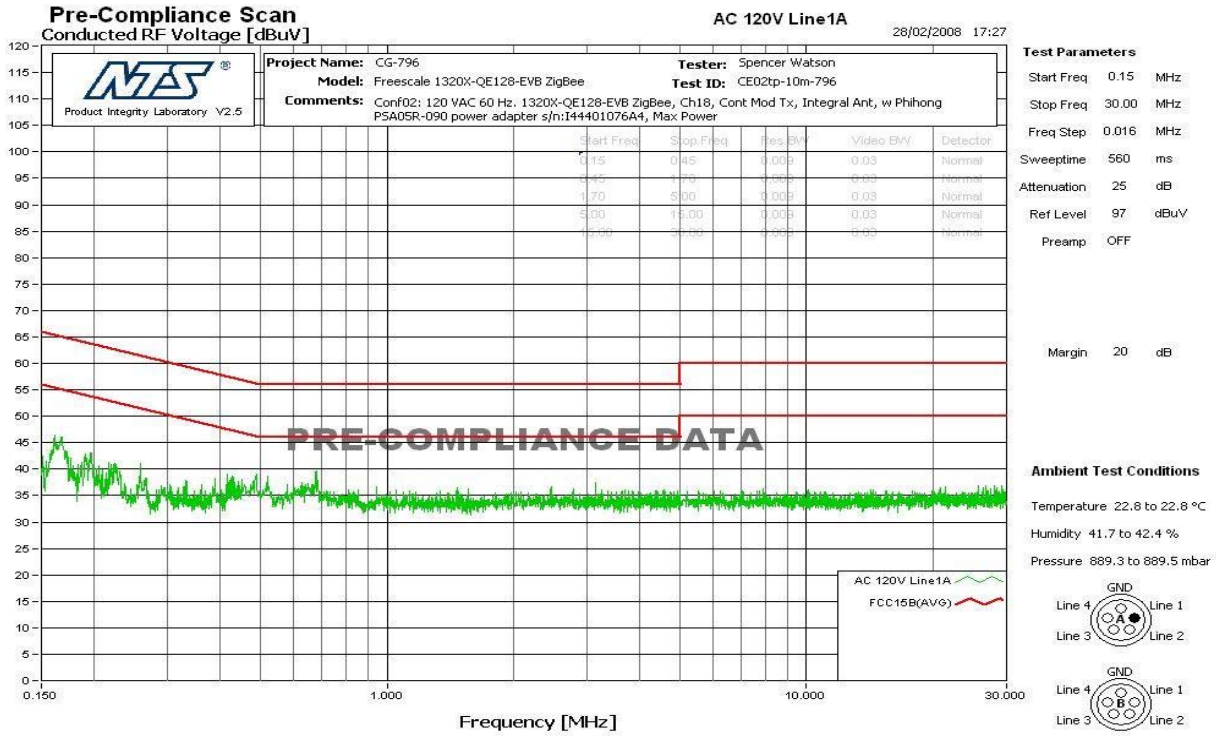


Figure 2 Conducted Emission 120 VAC Return 150 kHz – 30 MHz Pre-compliance

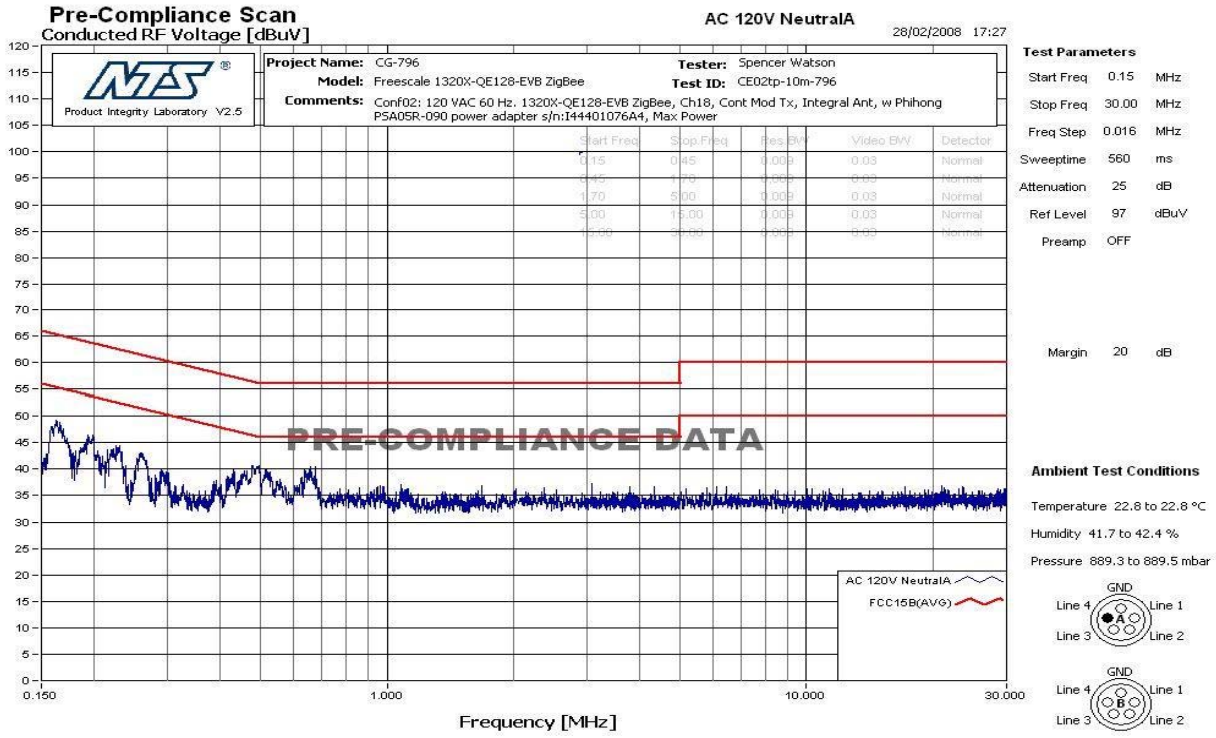


Figure 3 Conducted Emission 120 VAC Line 150 kHz – 30 MHz Average Detector

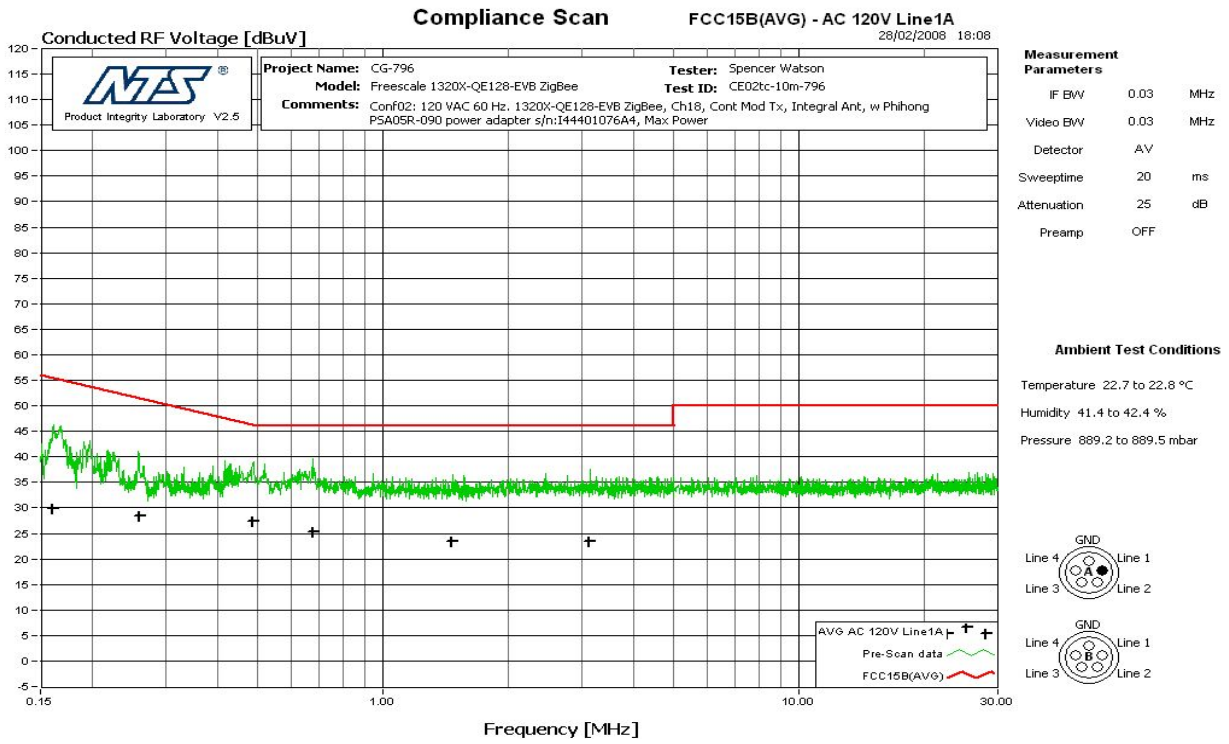
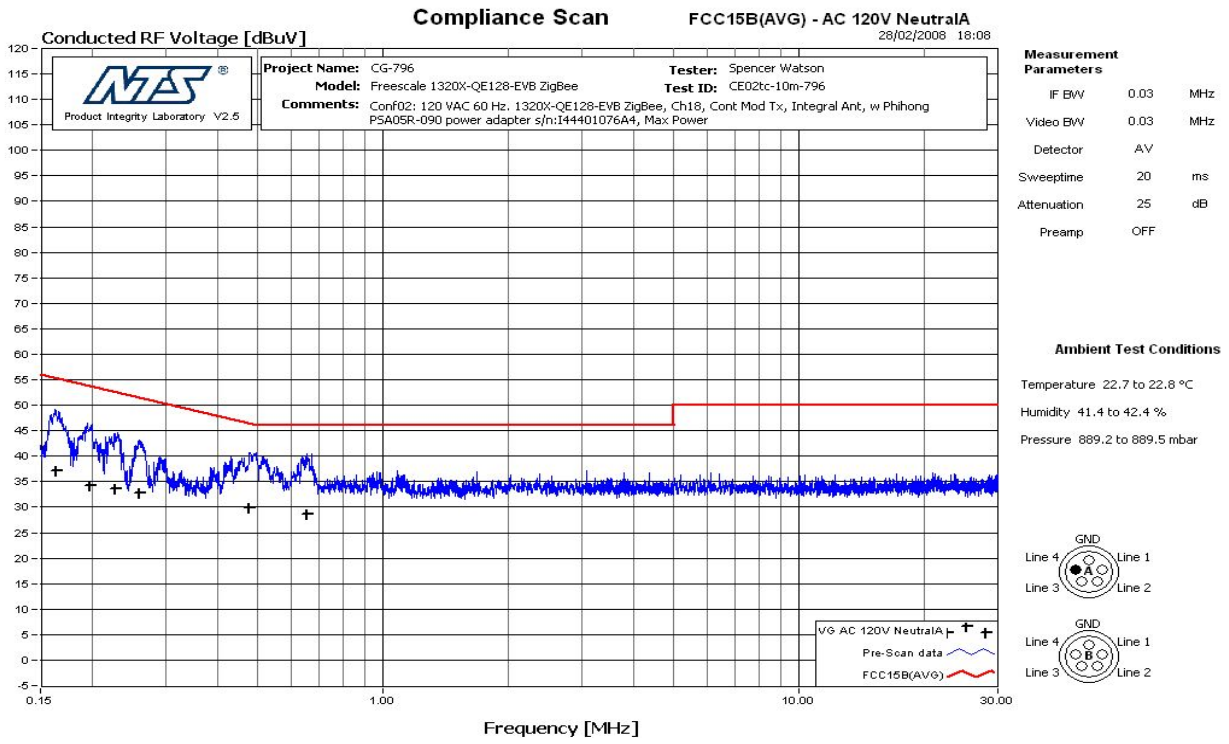


Figure 4 Conducted Emission 120 VAC Return 150 kHz – 30 MHz Average Detector



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

Tx Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
Modulated	11	2405	1.623
	18	2440	1.603
	26	2480	1.623
PRBS	11	2405	1.643
	18	2440	1.643
	26	2480	1.603

Power supply variation within 85 % (102 VAC) to 115 % (138 VAC) of nominal value has no measurable influence on the carrier frequency and carrier levels.

B.6. Operating Mode During Test

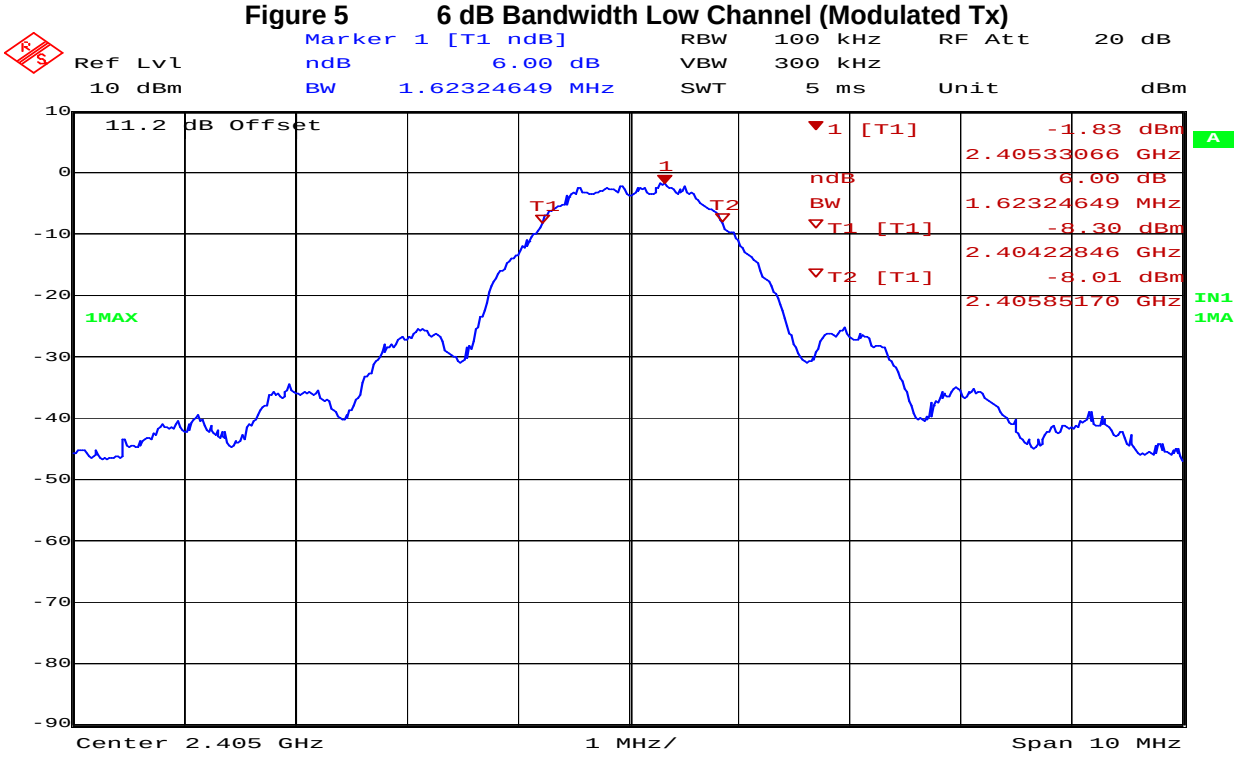
The 1320x-QE128-EVB was tuned to a low, middle, and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

B.7. Tested By

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

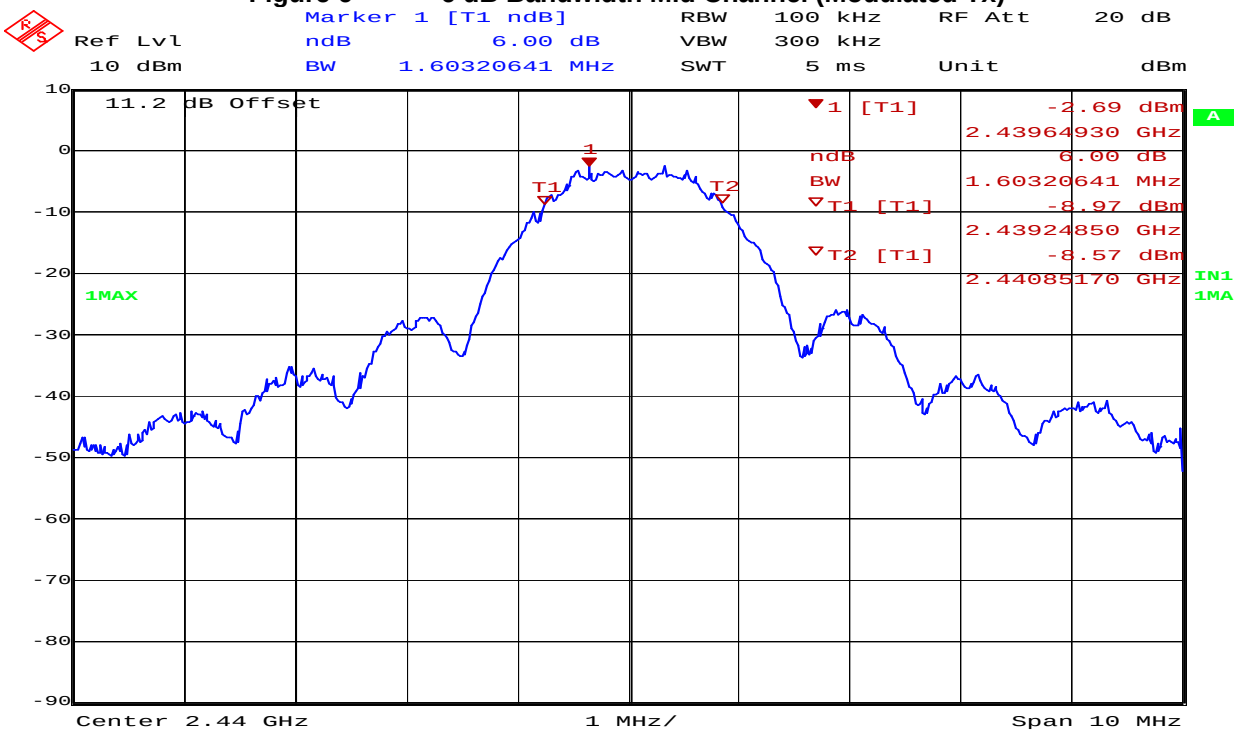
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 5 6 dB Bandwidth Low Channel (Modulated Tx)



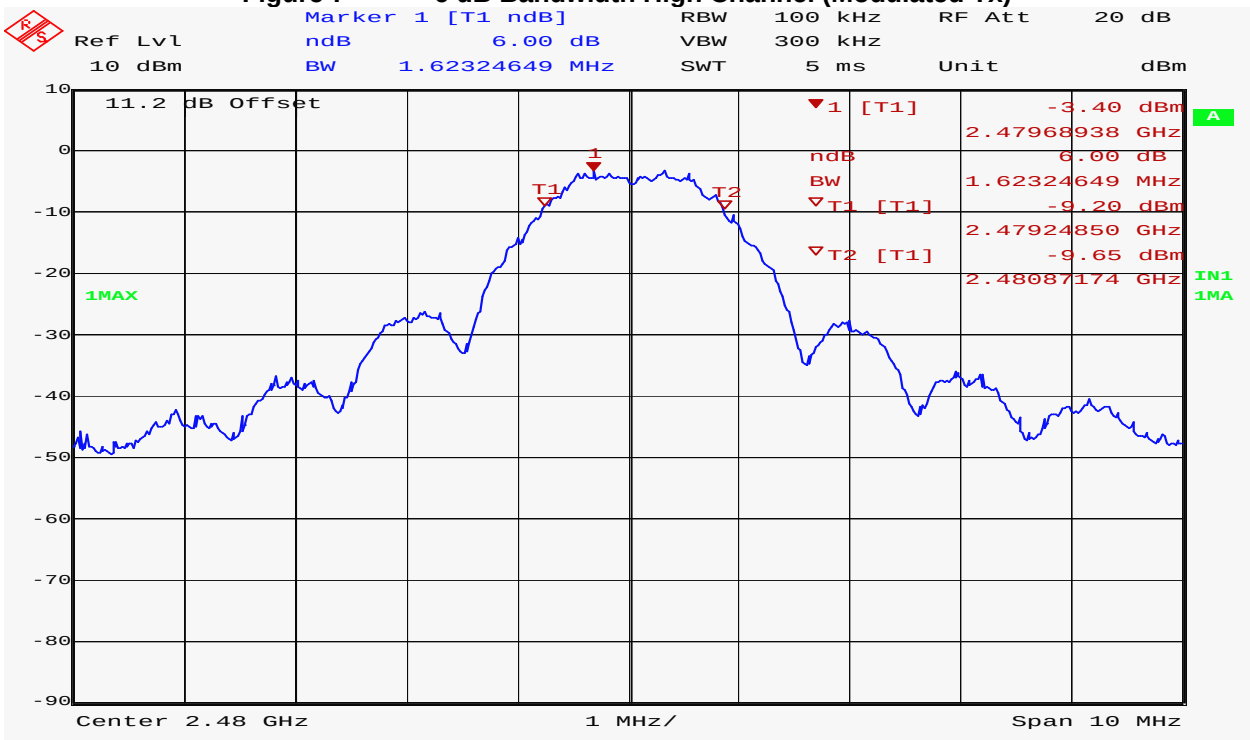
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max.Power
Date: 20.MAR.2008 13:11:17

Figure 6 6 dB Bandwidth Mid Channel (Modulated Tx)



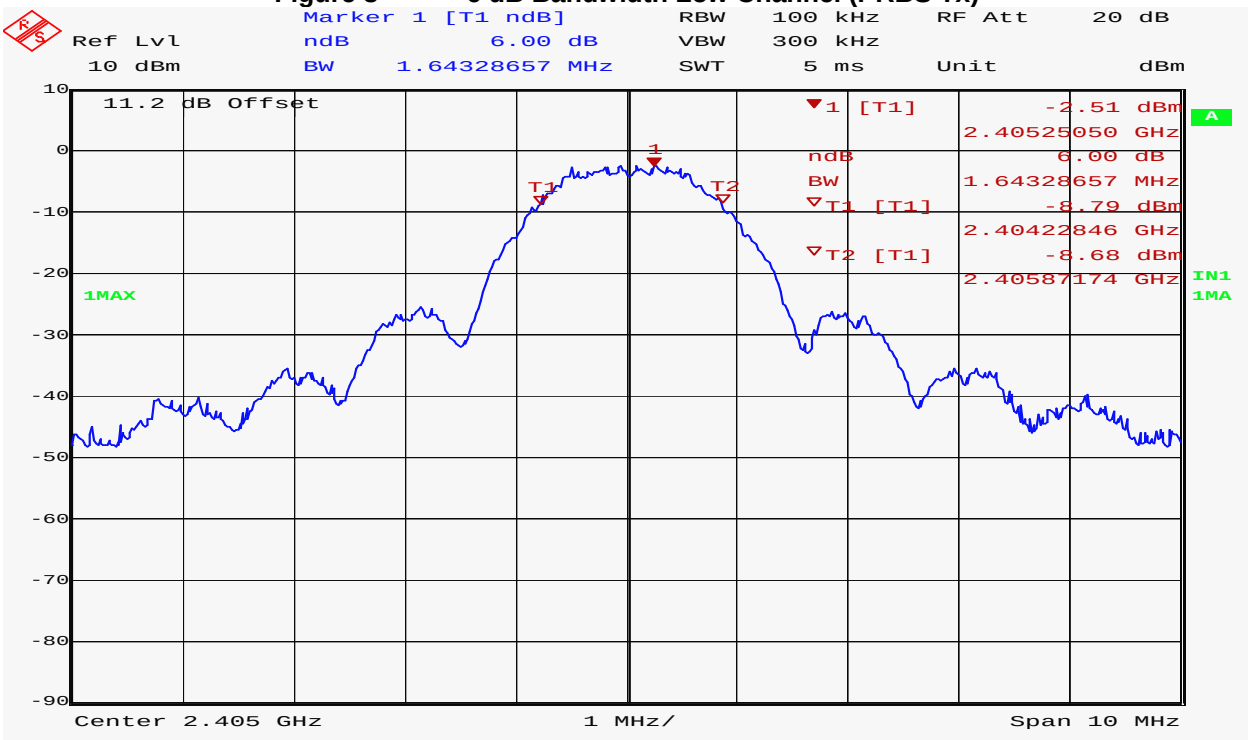
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, Modulated Tx, Max.Power
Date: 20.MAR.2008 12:53:01

Figure 7 6 dB Bandwidth High Channel (Modulated Tx)



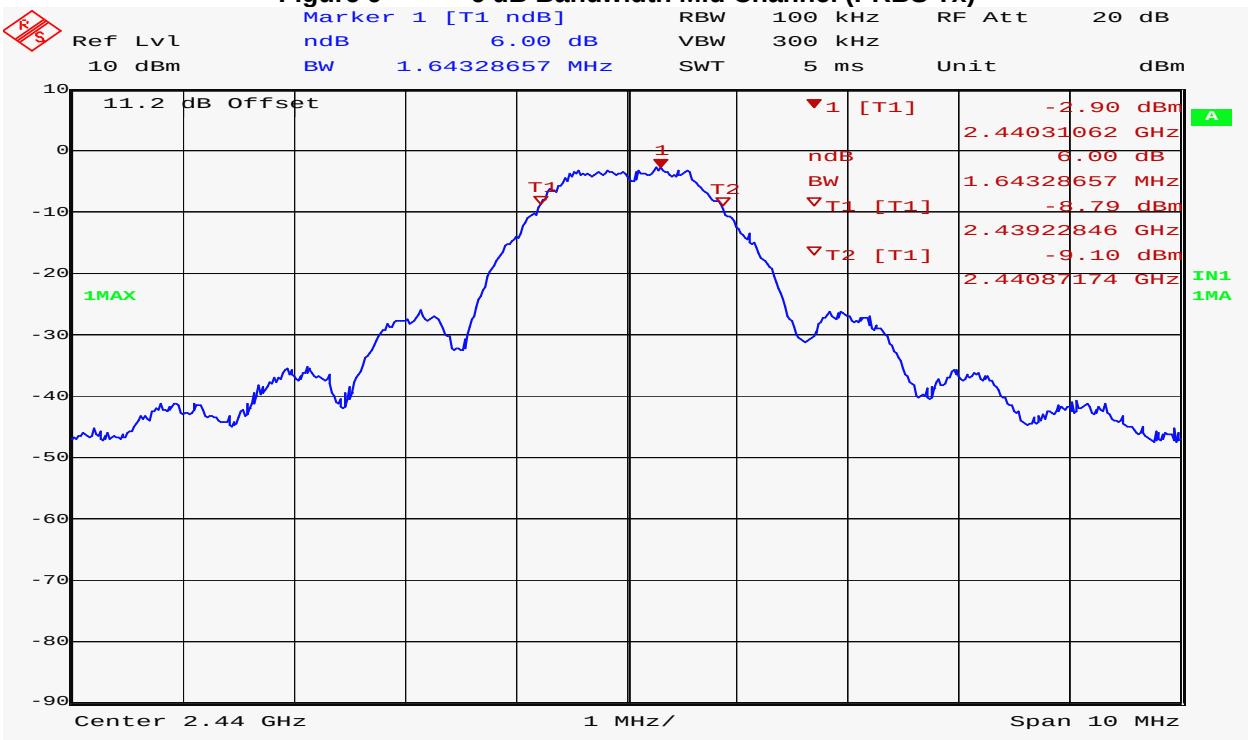
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max.Power
Date: 20.MAR.2008 12:54:05

Figure 8 6 dB Bandwidth Low Channel (PRBS Tx)



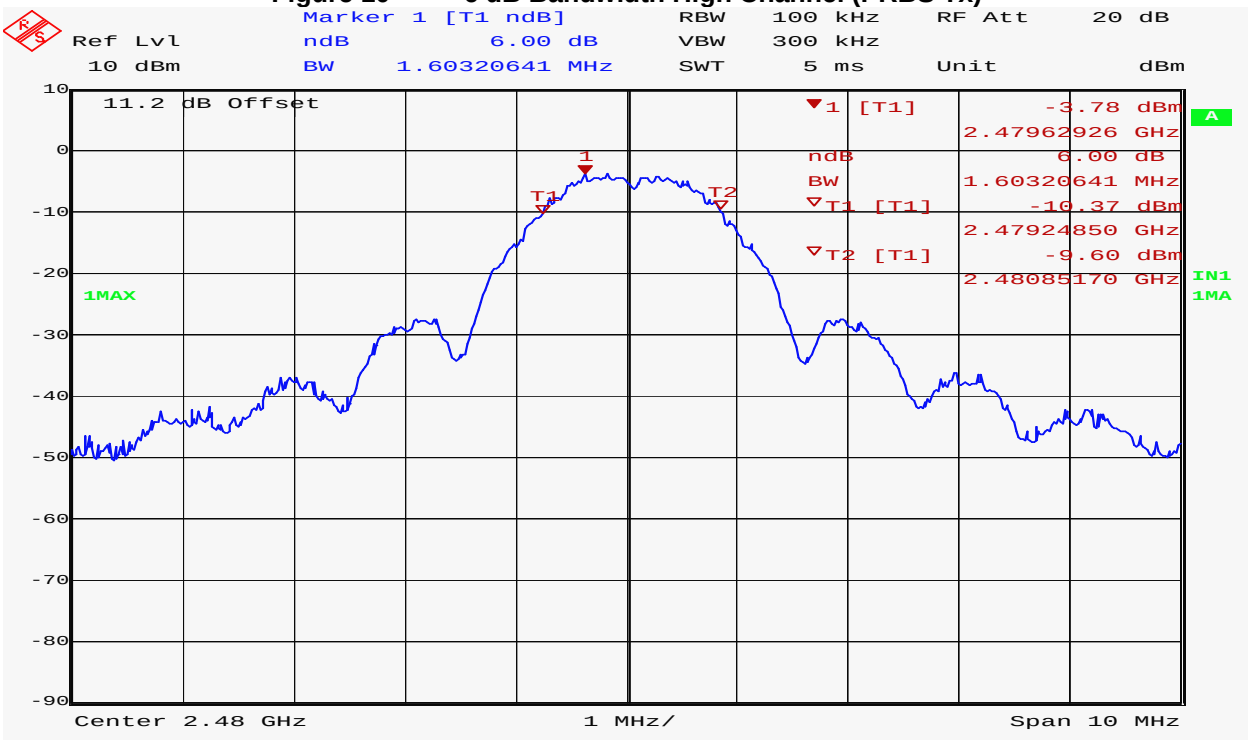
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max.Power
Date: 20.MAR.2008 12:51:20

Figure 9 6 dB Bandwidth Mid Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, PRBS Tx, Max.Power
Date: 20.MAR.2008 12:52:20

Figure 10 6 dB Bandwidth High Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max.Power
Date: 20.MAR.2008 12:54:47

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. Deviations

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

C.4. Test Procedure

RSS-Gen Issue 2

C.5. Test Results

Tx Mode	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
Modulated	11	2405	2.444
	18	2440	2.444
	26	2480	2.424
PRBS	11	2405	2.424
	18	2440	2.444
	26	2480	2.444

Power supply variation within 85 % (102 VAC) to 115 % (138 VAC) of nominal value has no measurable influence on the carrier frequency and carrier levels.

C.6. Operating Mode During Test

The 1320x-QE128-EVB was tuned to a low, middle, and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

C.7. Sample Calculation

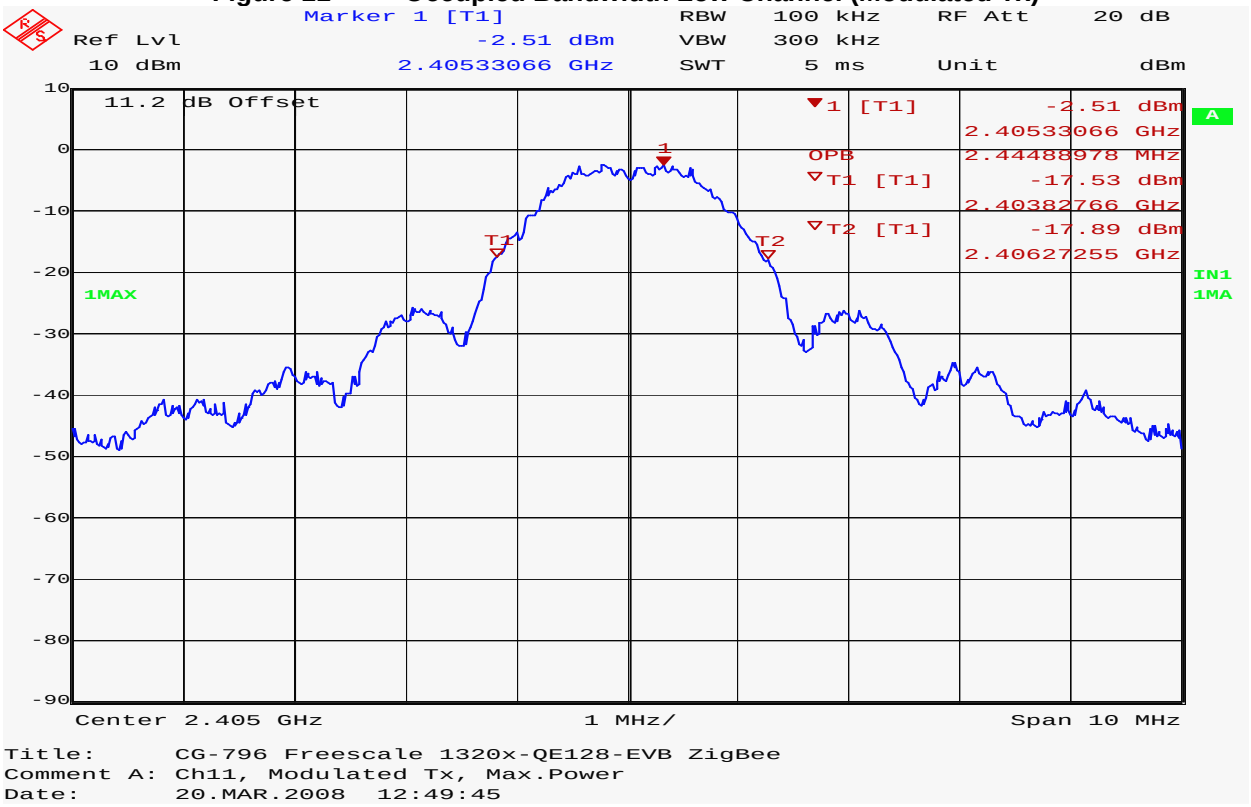
NA

C.8. Tested By

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

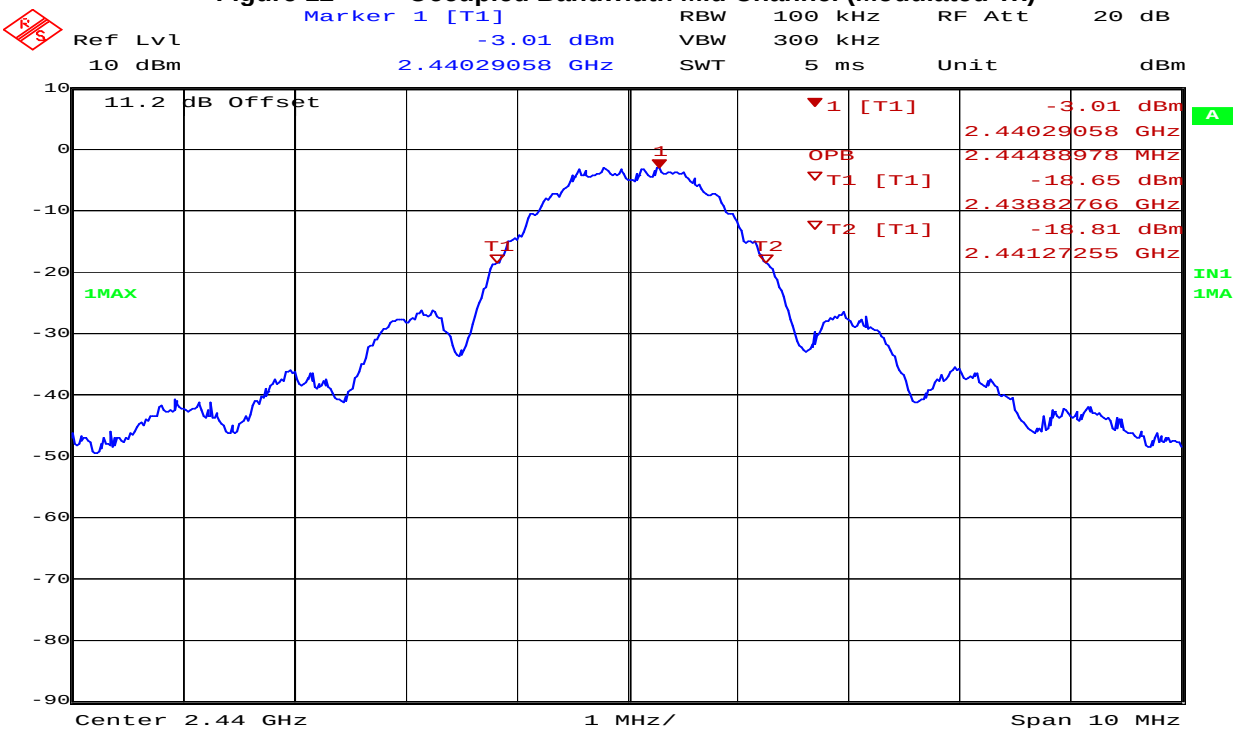
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 11 Occupied Bandwidth Low Channel (Modulated Tx)



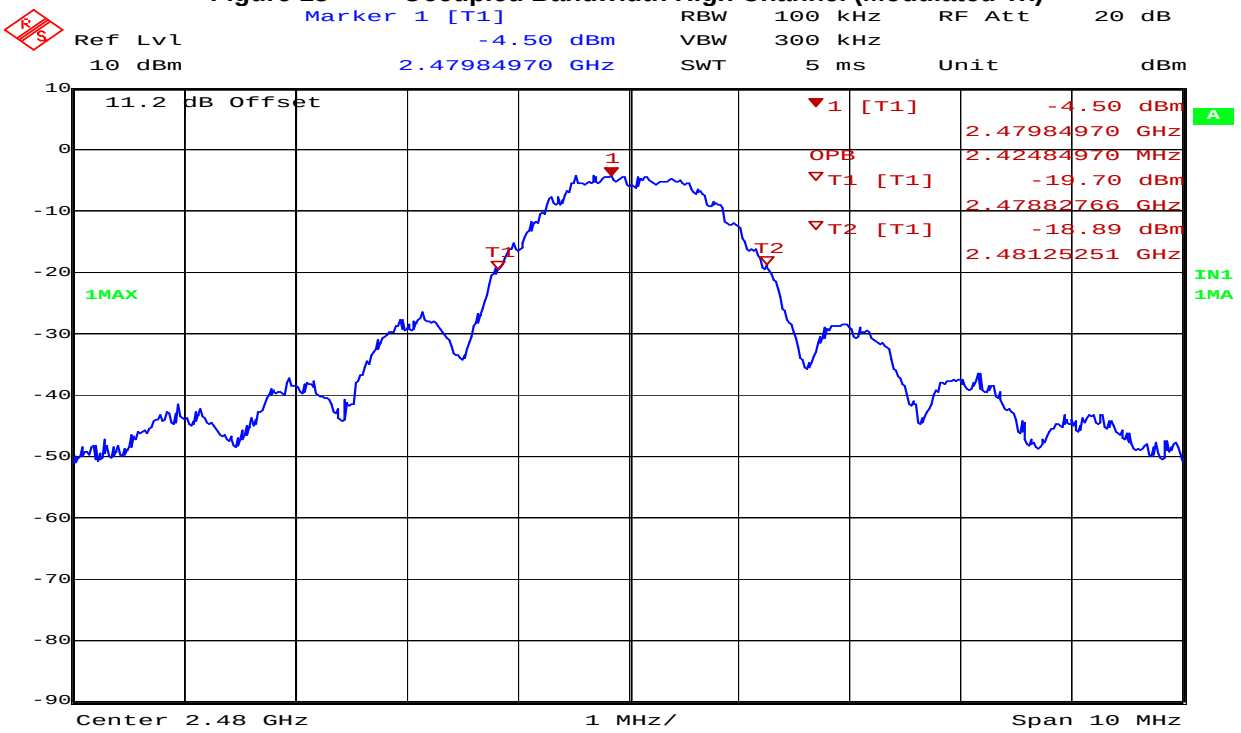
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max.Power
Date: 20.MAR.2008 12:49:45

Figure 12 Occupied Bandwidth Mid Channel (Modulated Tx)



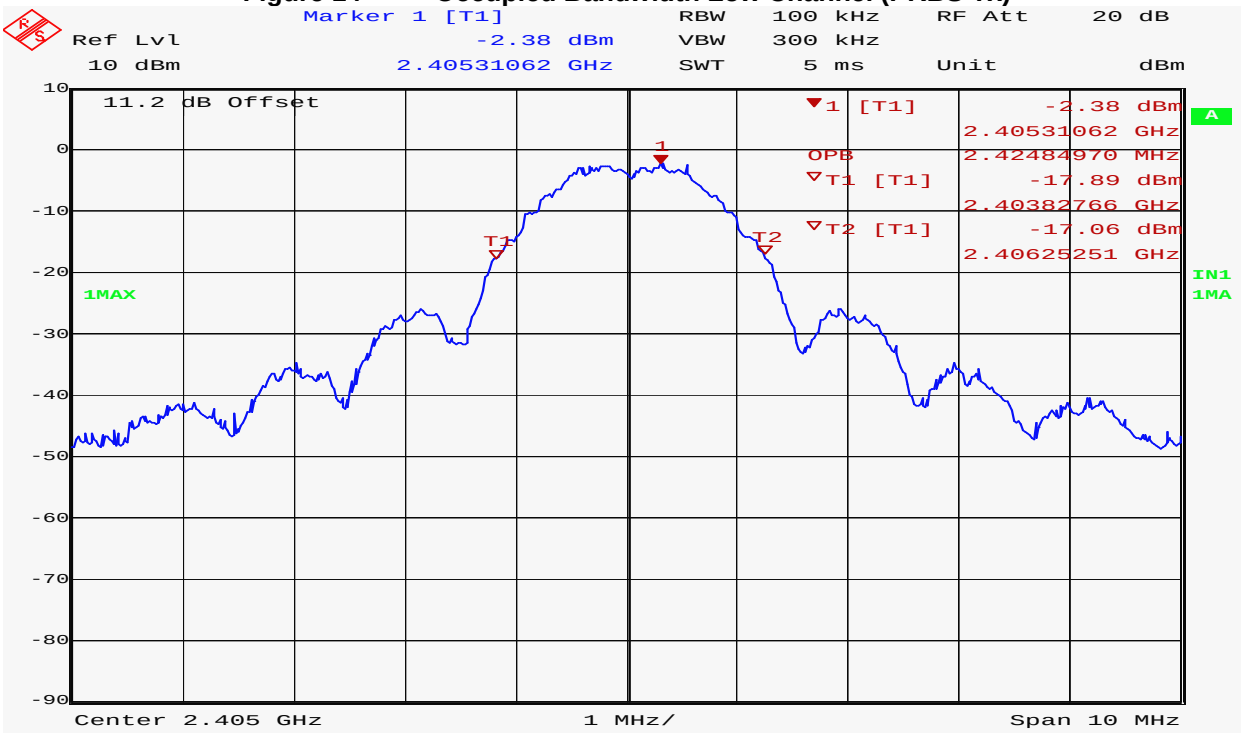
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, Modulated Tx, Max.Power
Date: 20.MAR.2008 12:47:39

Figure 13 Occupied Bandwidth High Channel (Modulated Tx)



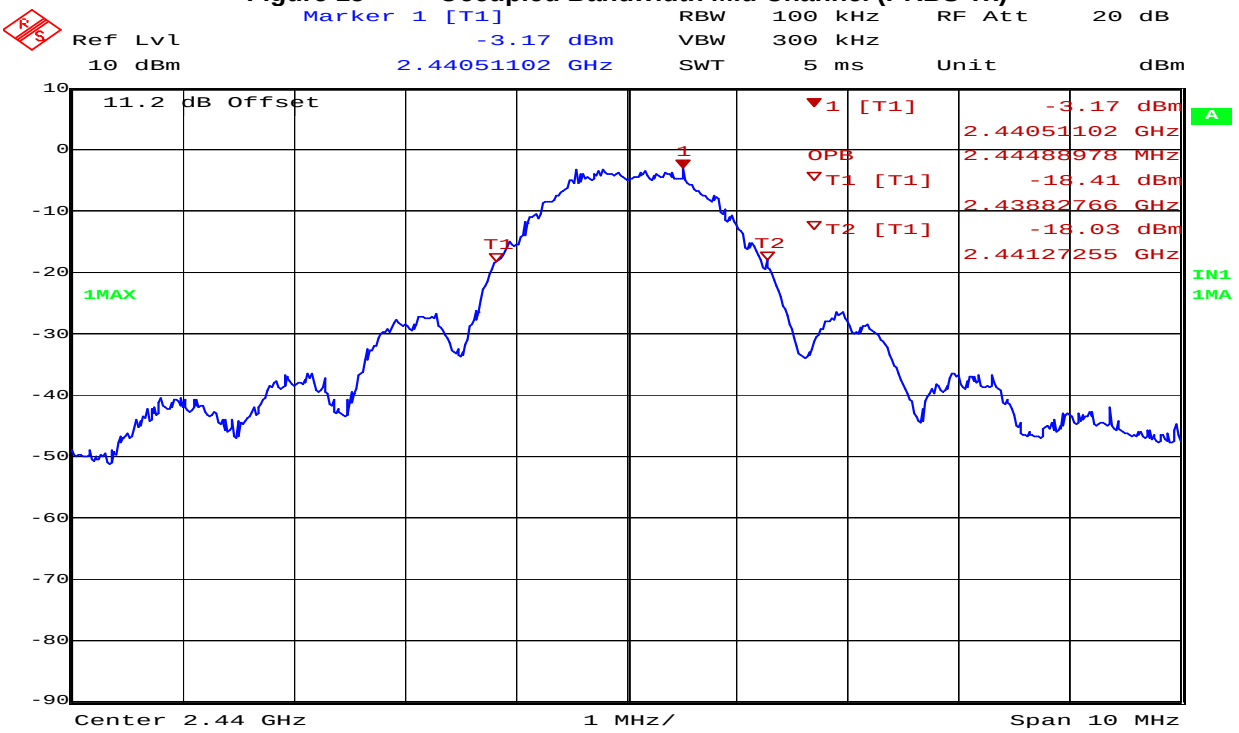
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max.Power
Date: 20.MAR.2008 12:46:46

Figure 14 Occupied Bandwidth Low Channel (PRBS Tx)



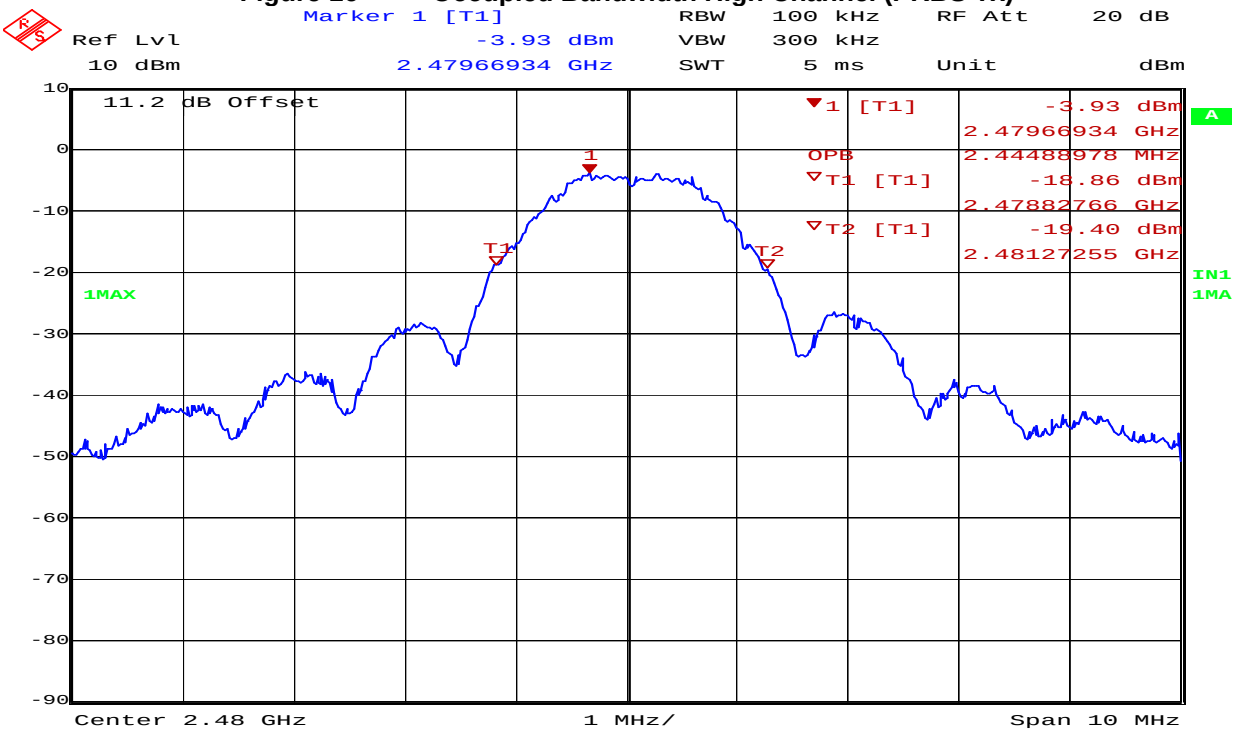
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max.Power
Date: 20.MAR.2008 12:49:02

Figure 15 Occupied Bandwidth Mid Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, PRBS Tx, Max.Power
Date: 20.MAR.2008 12:48:24

Figure 16 Occupied Bandwidth High Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max.Power
Date: 20.MAR.2008 12:45:56

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. Deviations

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

D.4. Test Procedure

FCC Publication 558074 and RSS-Gen Issue 2 4.8

D.5. Operating Mode During Test

The 1320x-QE128-EVB was tuned to a low, middle, and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

D.6. Test Results

Compliant – The maximum peak power was 1.11 dBm

D.7. Sample Calculation

None

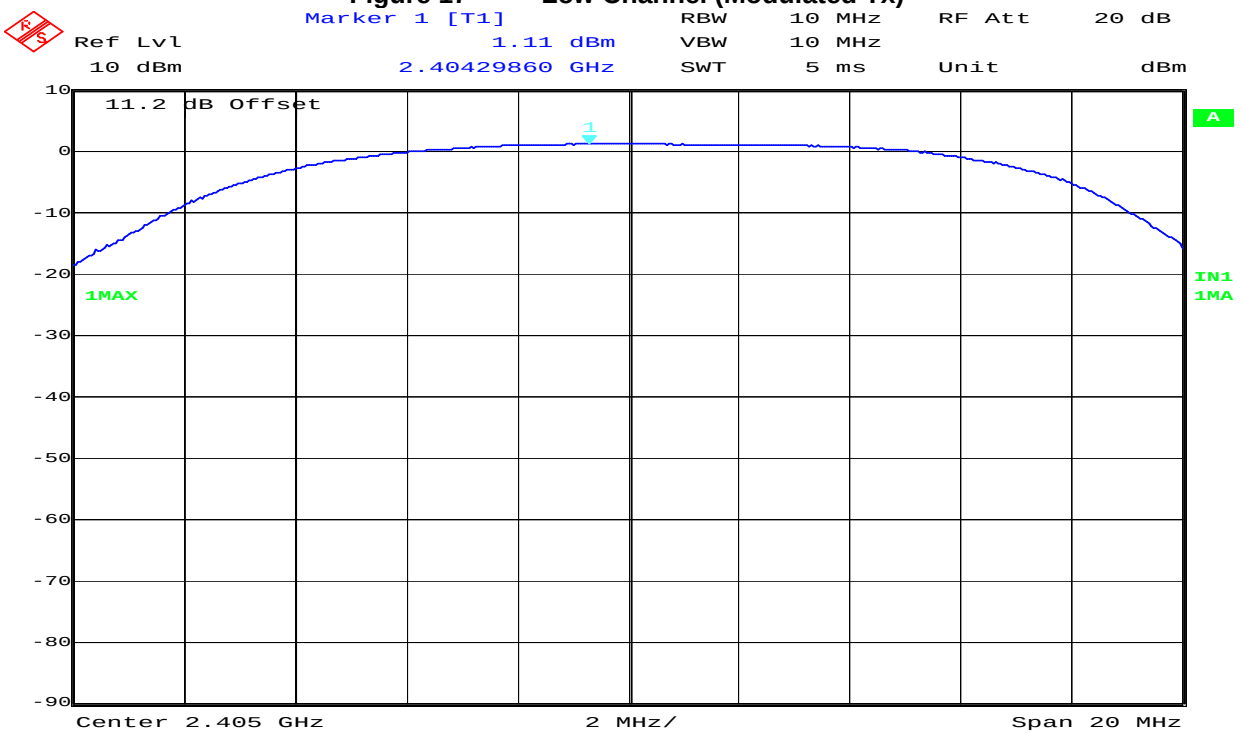
D.8. Test Data Summary

Tx Mode	Channel	Frequency (MHz)	Peak RF power (dBm)
Modulated	11	2404.298	1.11
	18	2439.539	0.36
	26	2478.977	-0.29
PRBS	11	2404.298	1.11
	18	2439.418	0.36
	26	2478.977	-0.41

D.9. Tested By

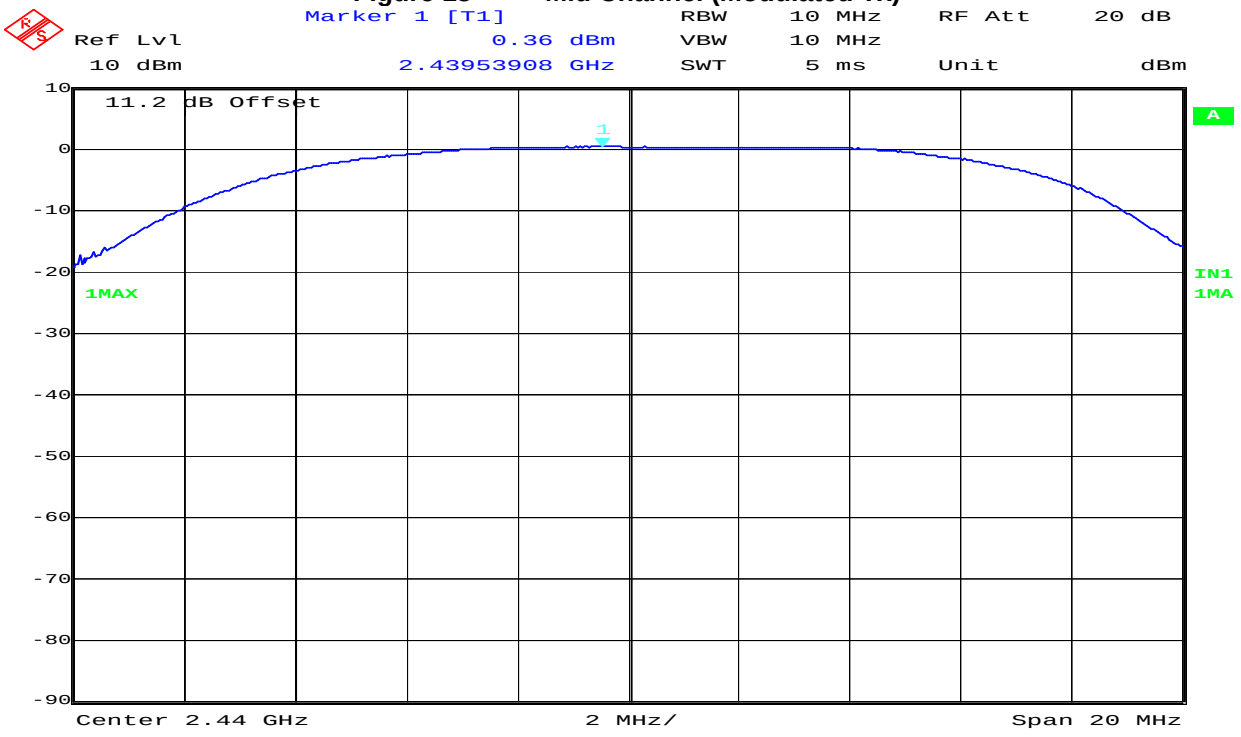
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 17 Low Channel (Modulated Tx)



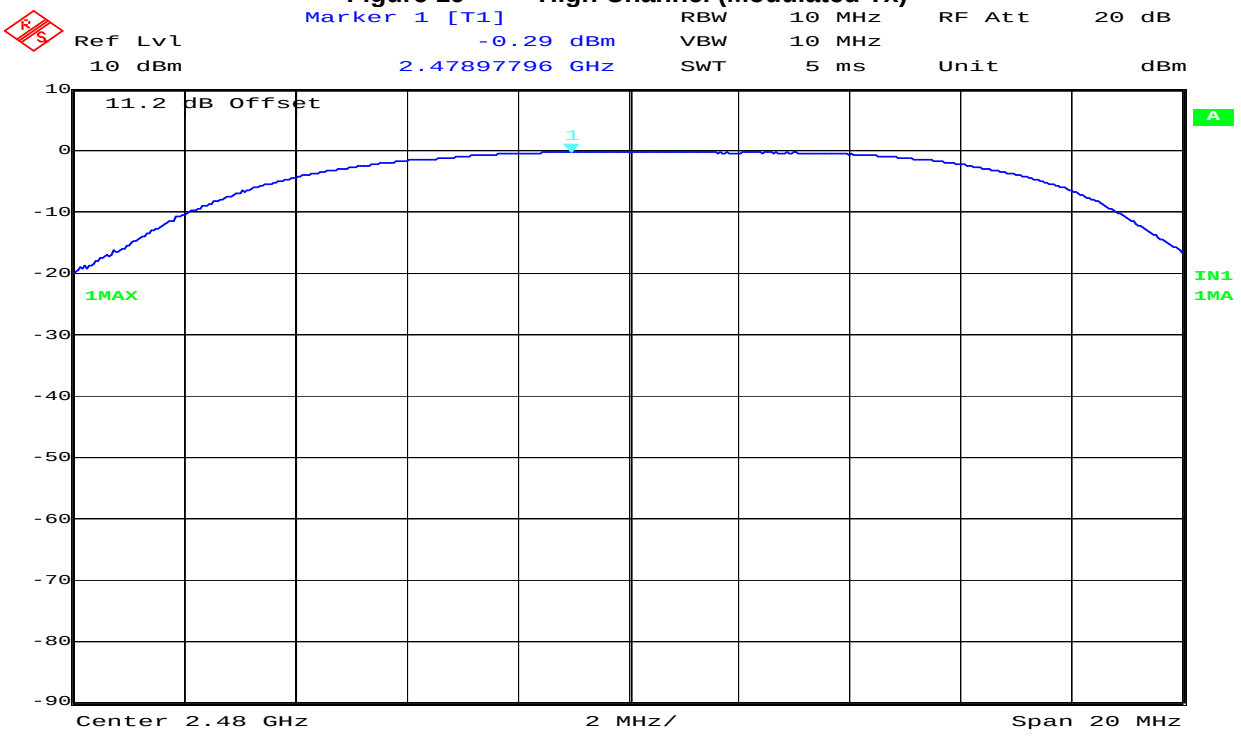
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max.Power
Date: 19.MAR.2008 20:25:22

Figure 18 Mid Channel (Modulated Tx)



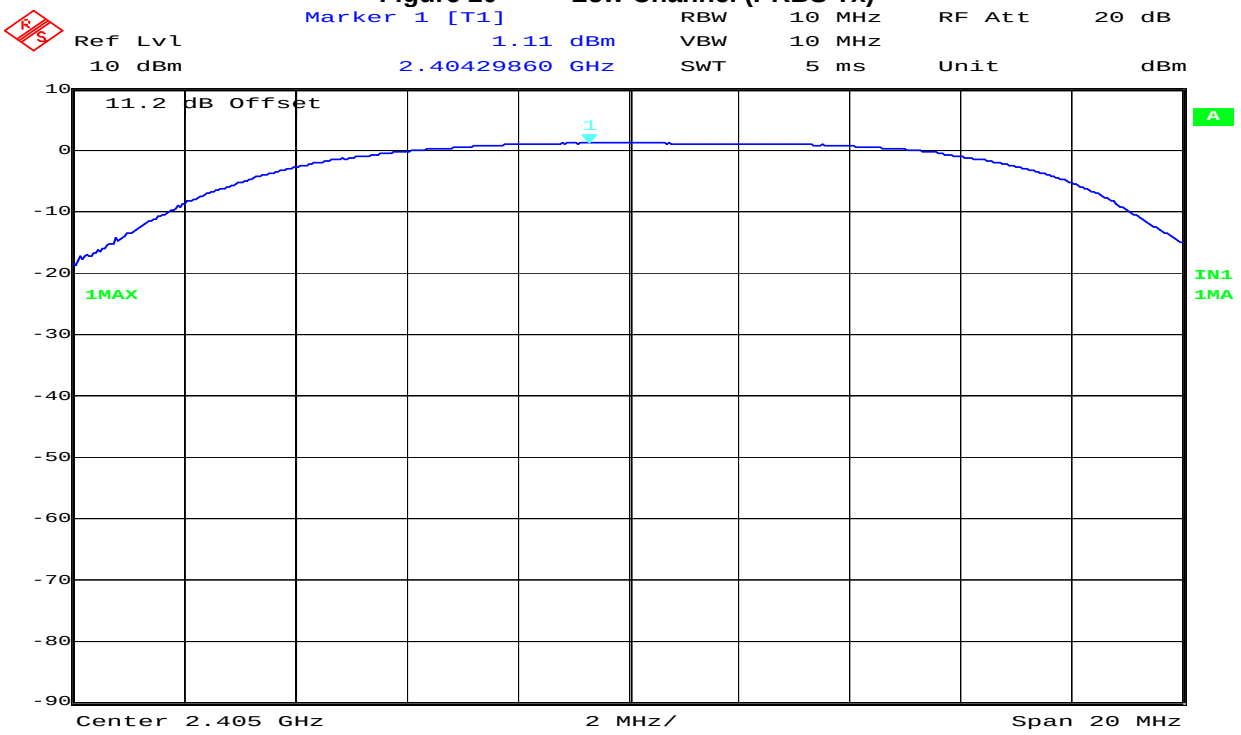
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, Modulated Tx, Max.Power
Date: 19.MAR.2008 20:20:21

Figure 19 High Channel (Modulated Tx)



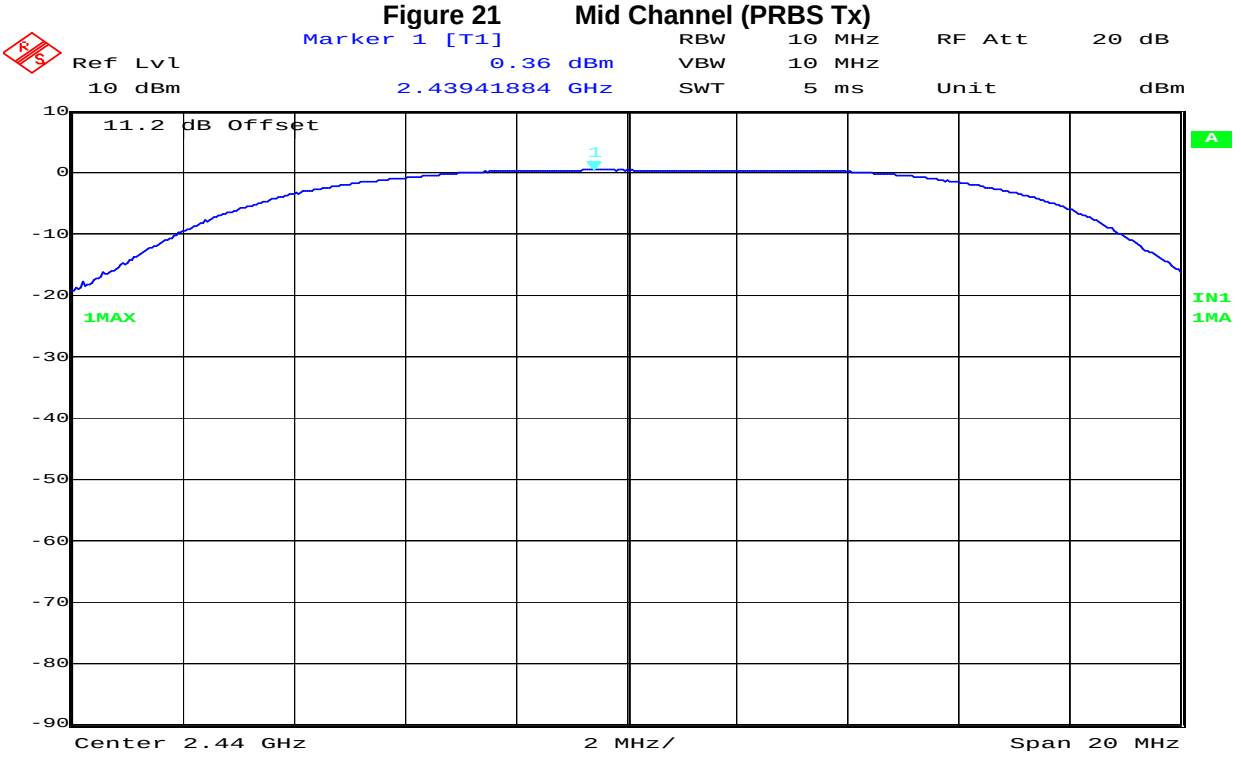

```
Title:      CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A:  Ch26, Modulated Tx, Max.Power
Date:       19.MAR.2008  20:21:11
```

Figure 20 Low Channel (PRBS Tx)



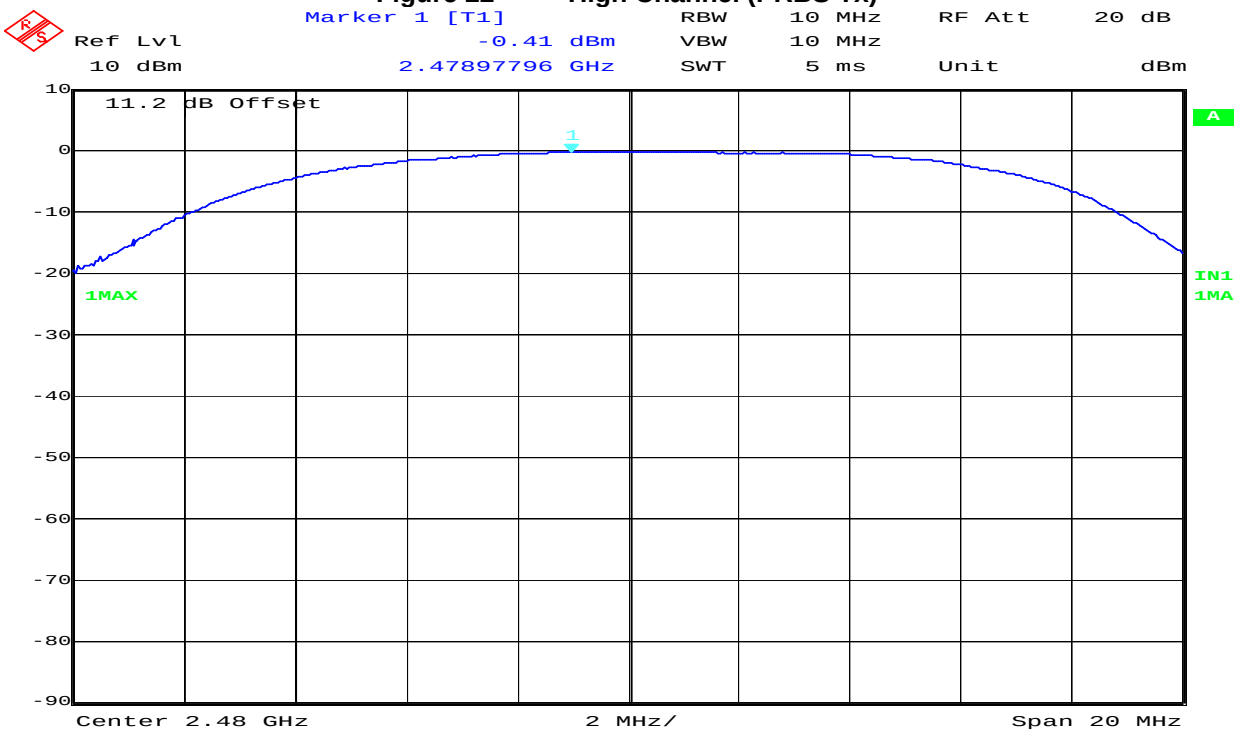

```
Title:      CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A:  Ch11, PRBS Tx, Max.Power
Date:       19.MAR.2008  20:24:17
```

Figure 21 Mid Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, PRBS Tx, Max.Power
Date: 19.MAR.2008 20:23:12

Figure 22 High Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max.Power
Date: 19.MAR.2008 20:22:24

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. Deviations

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

E.4. Test Procedure

FCC Publication 558074

E.5. Operating Mode During Test

The 1320x-QE128-EVB was tuned to a low, middle, and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

E.6. Test Results

Compliant. The maximum measured power spectral density was -11.10 dBm

E.7. Sample Calculation

None

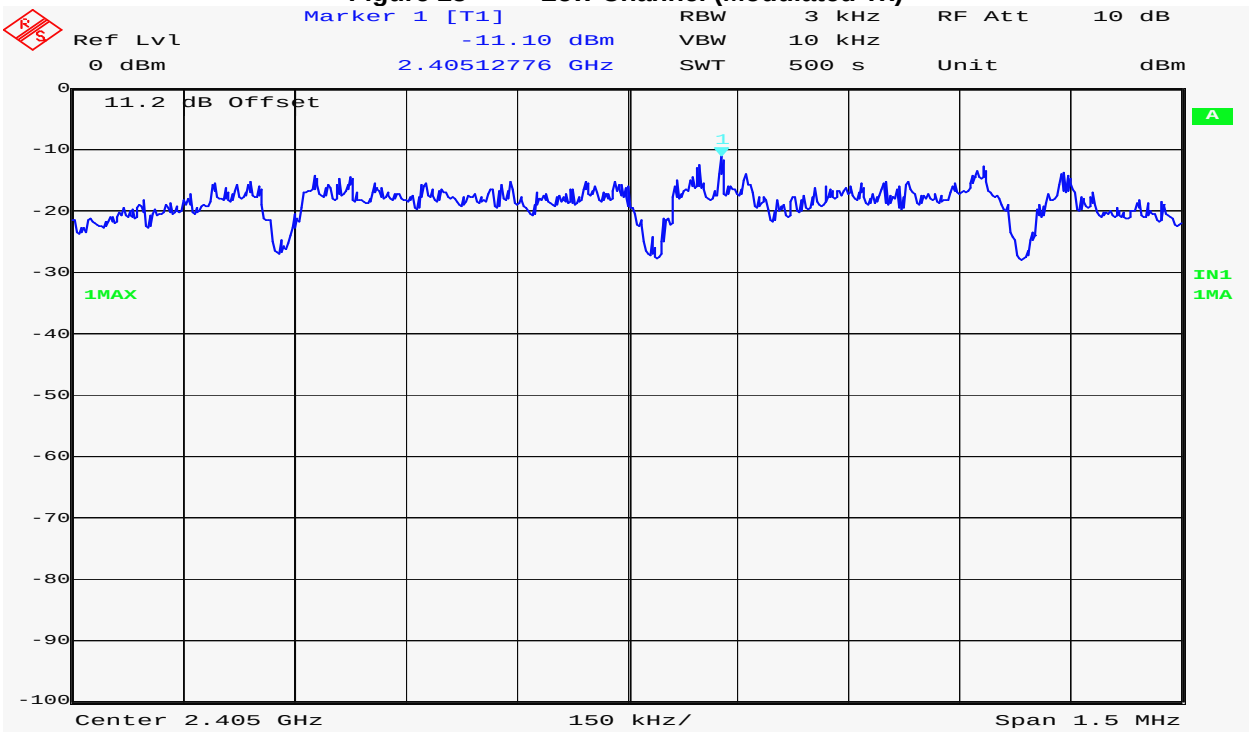
E.8. Test Data Summary

Tx Mode	Channel	Frequency (MHz)	PSD (dBm)
Modulated	11	2405.127	-11.10
	18	2440.130	-12.01
	26	2480.130	-12.86
PRBS	11	2405.482	-13.16
	18	2440.482	-13.90
	26	2480.130	-12.86

E.9. Tested By

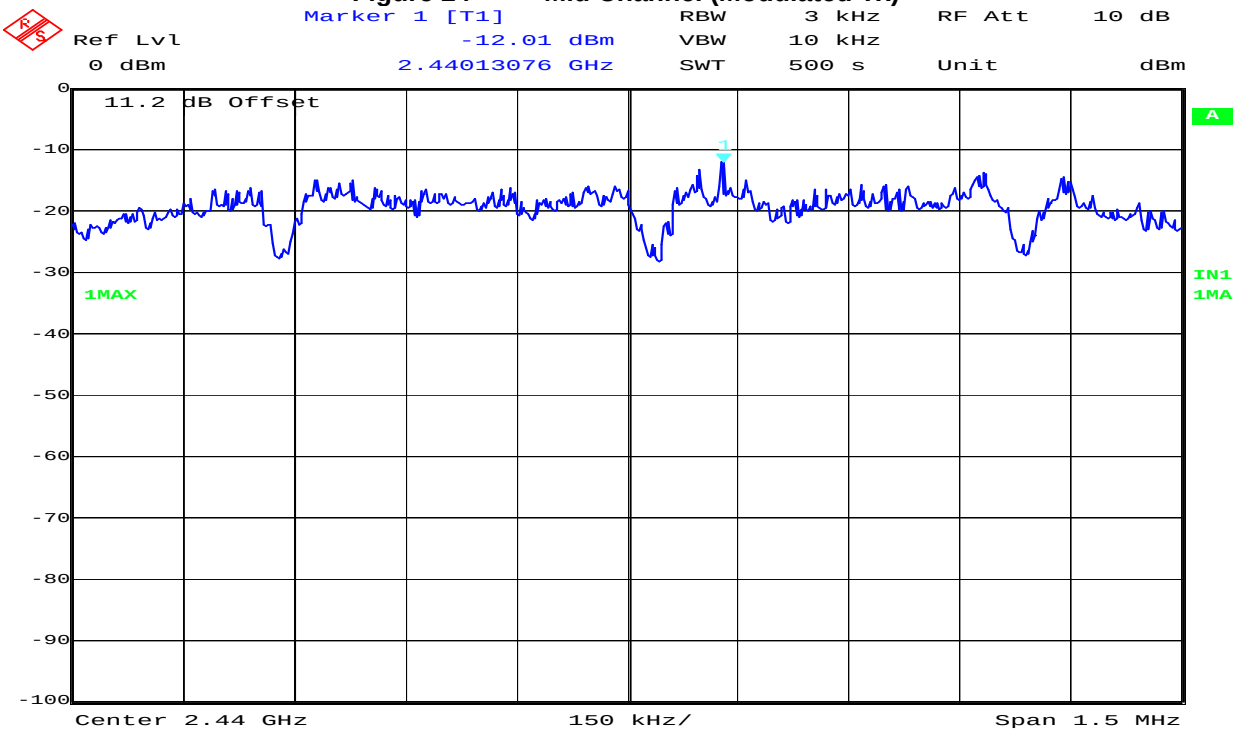
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 23 Low Channel (Modulated Tx)



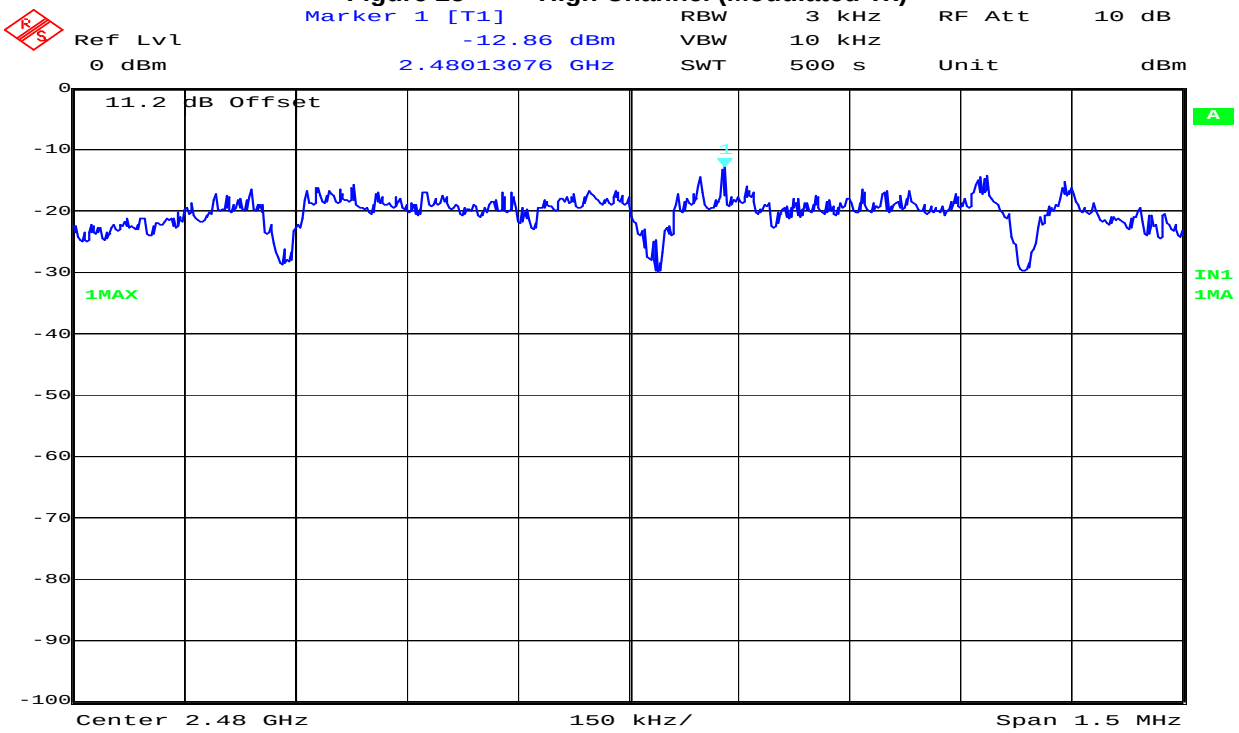
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max.Power
Date: 19.MAR.2008 20:43:12

Figure 24 Mid Channel (Modulated Tx)



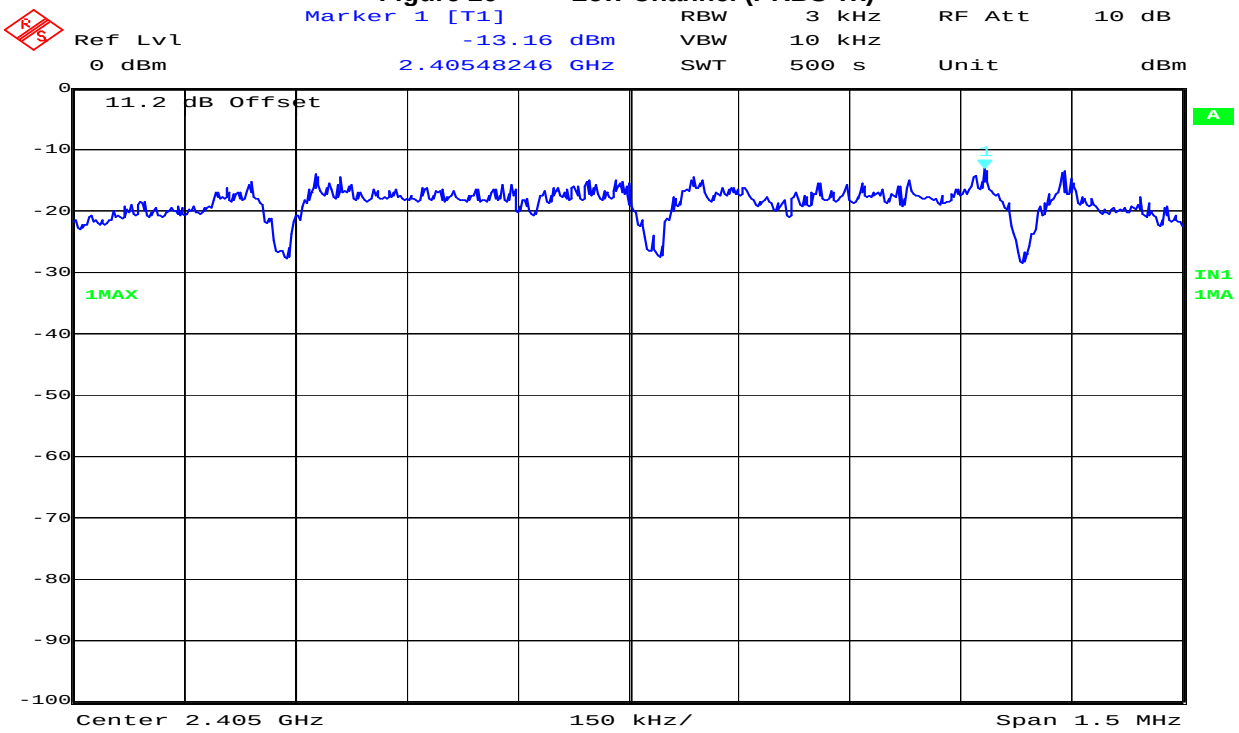
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, Modulated Tx, Max.Power
Date: 19.MAR.2008 21:12:32

Figure 25 High Channel (Modulated Tx)



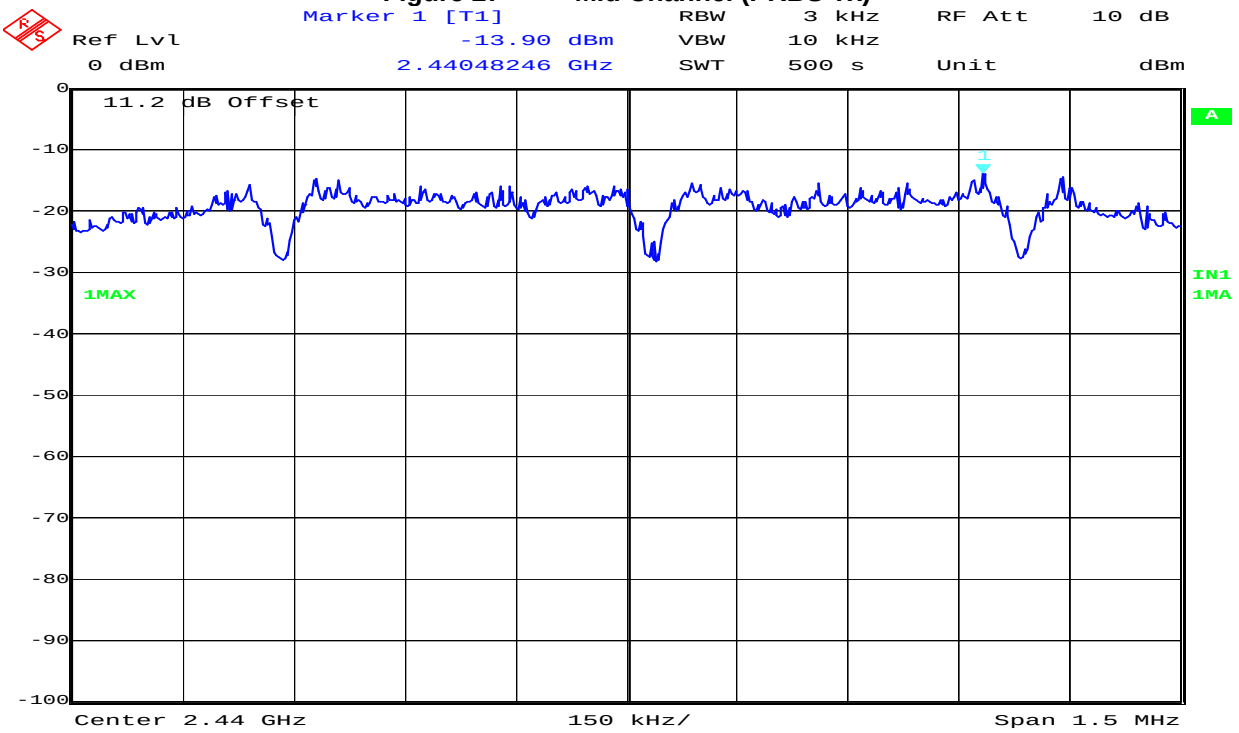
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max.Power
Date: 19.MAR.2008 21:22:49

Figure 26 Low Channel (PRBS Tx)



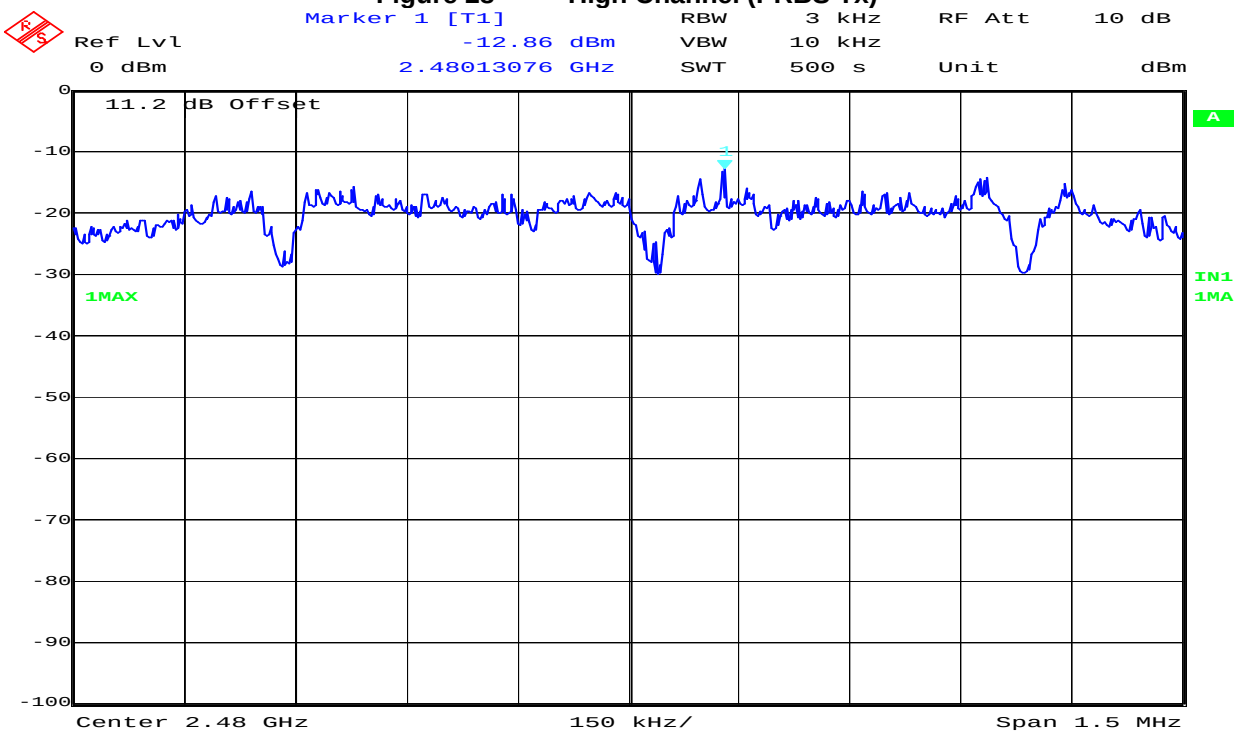
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max.Power
Date: 19.MAR.2008 20:53:23

Figure 27 Mid Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, PRBS Tx, Max.Power
Date: 19.MAR.2008 21:03:07

Figure 28 High Channel (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max.Power
Date: 19.MAR.2008 21:22:49

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

Zero span.

F.5. Operating Mode During Test

The 1320x-QE128-EVB was tuned to Channel 26 operating at maximum rated RF output power with PRBS Tx mode.

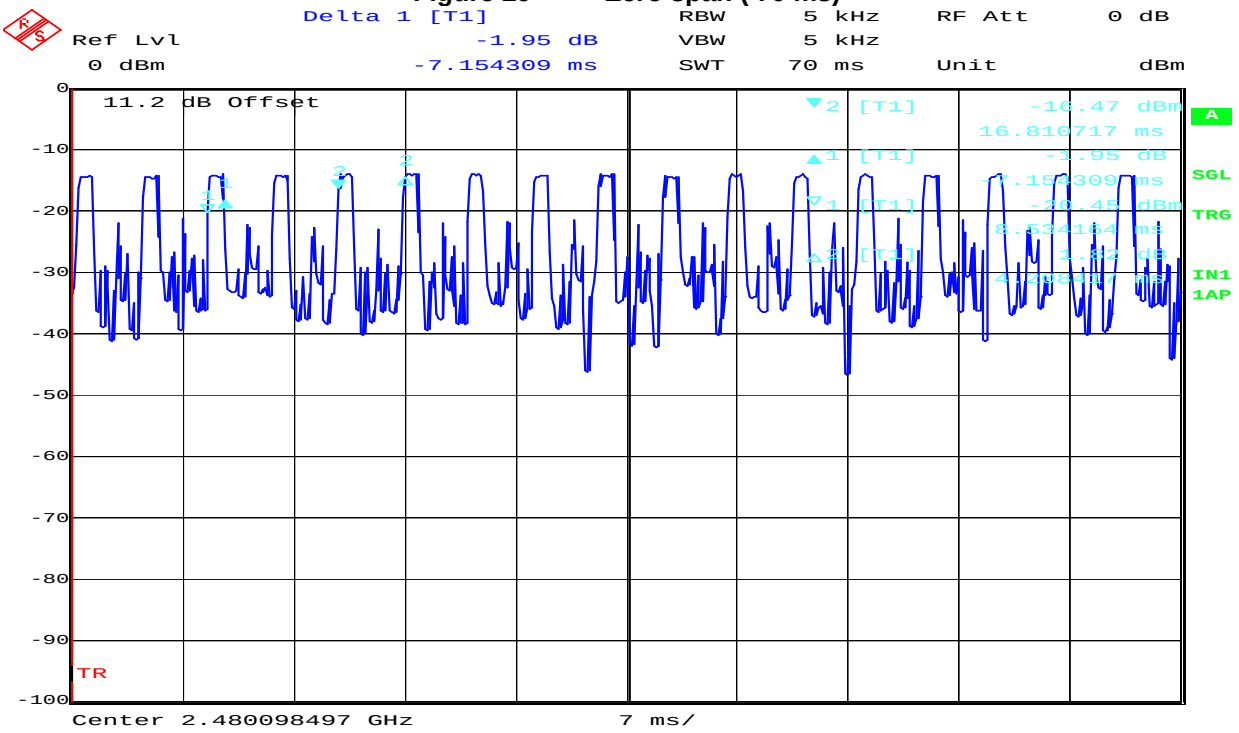
F.6. Test Results

Duty cycle correction factor = 20*Log(1.26/4.12) = -10.42dB

F.7. Tested By

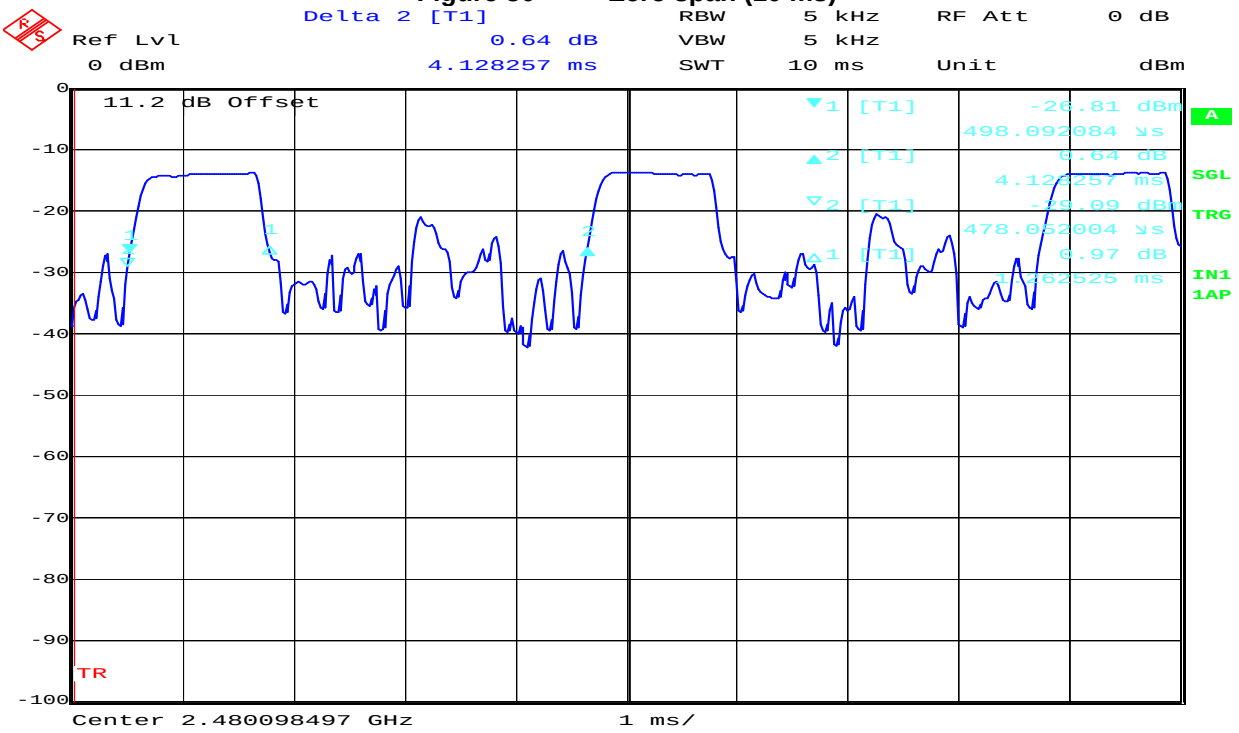
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 29 Zero span (70 ms)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max Power
Date: 22.FEB.2008 12:12:11

Figure 30 Zero span (10 ms)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max Power
Date: 22.FEB.2008 12:01:32

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)).

G.3. Deviations

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

G.4. Test Procedure

FCC Publication 558074

G.5. Operating Mode During Test

G.6. The 1320x-QE128-EVB was tuned to a low and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

G.7. Test Results

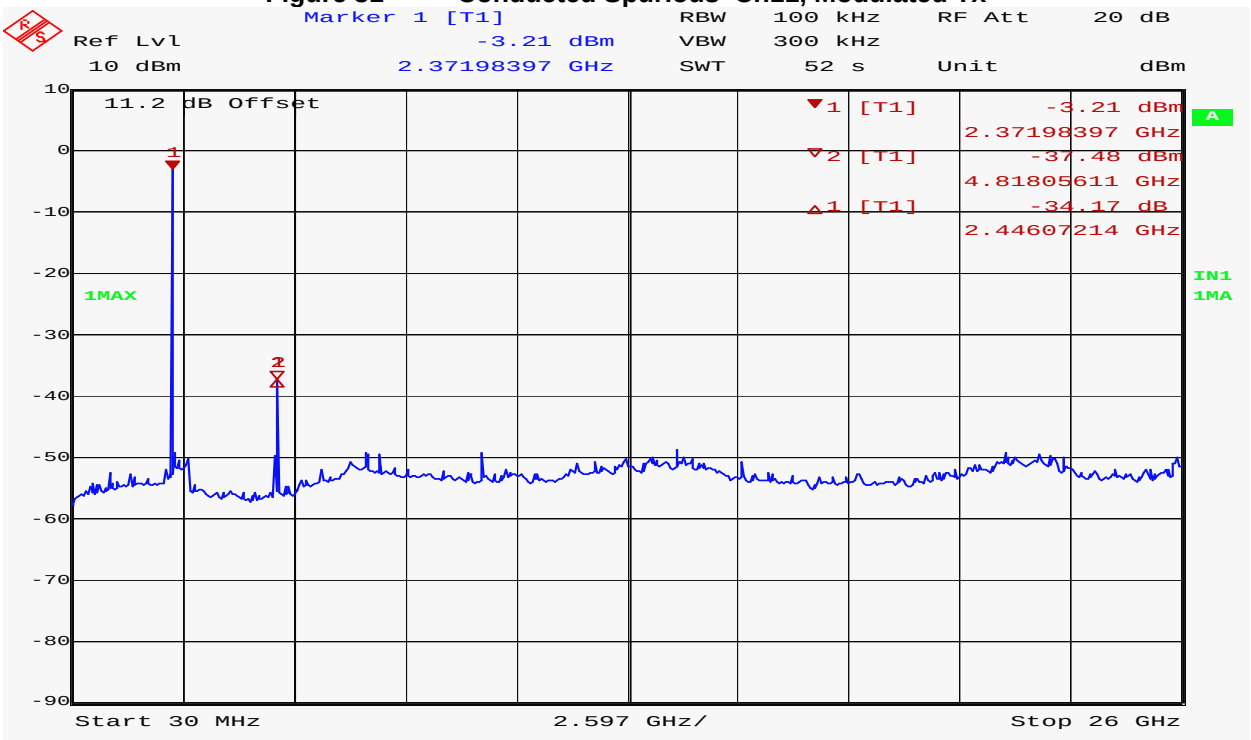
Compliant,
Worst case spurious emission was 31.88 dB below the carrier at Channel 26 with Modulated Tx mode.

G.8. Tested By

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

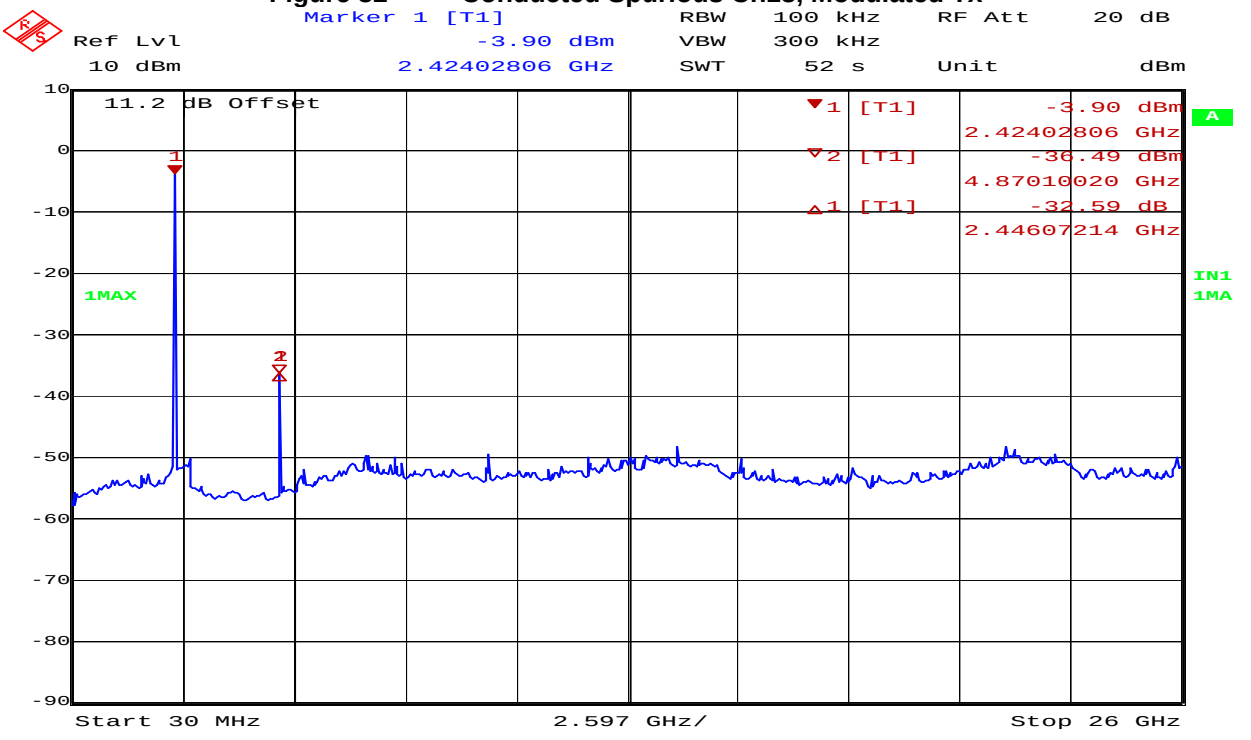
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 31 Conducted Spurious Ch11, Modulated Tx



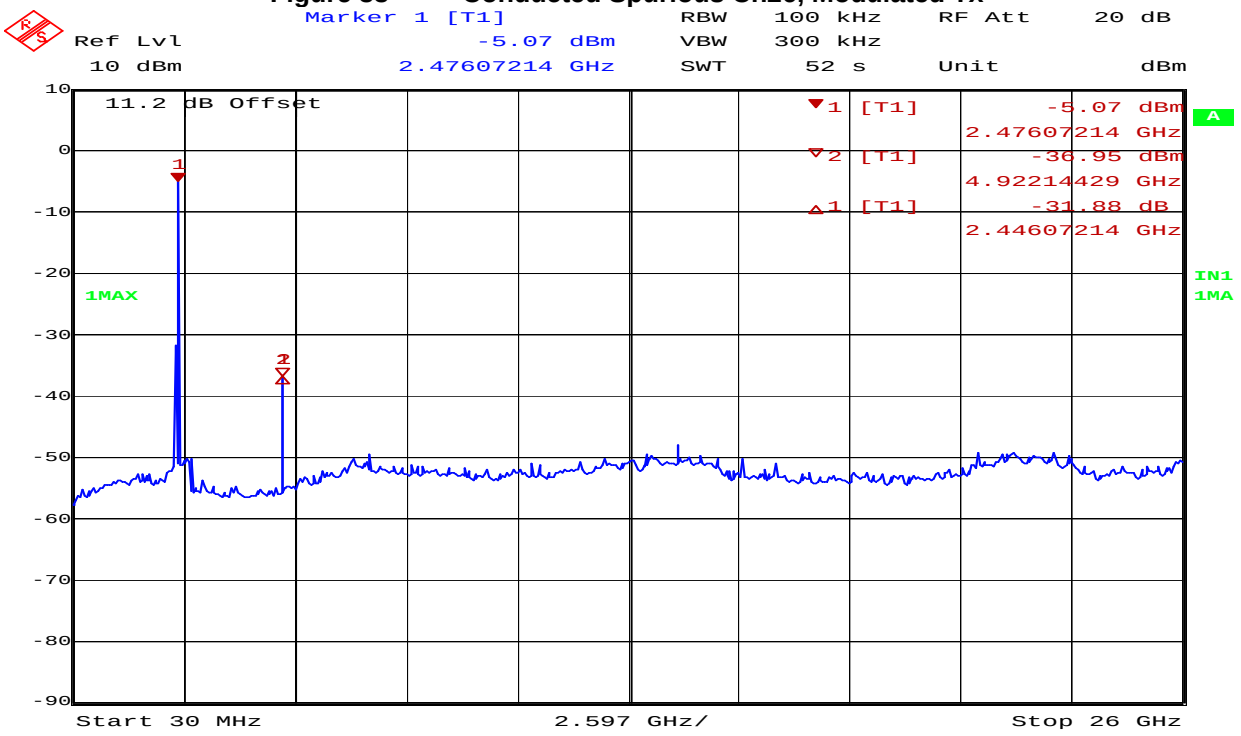
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max.Power
Date: 20.MAR.2008 15:25:52

Figure 32 Conducted Spurious Ch18, Modulated Tx



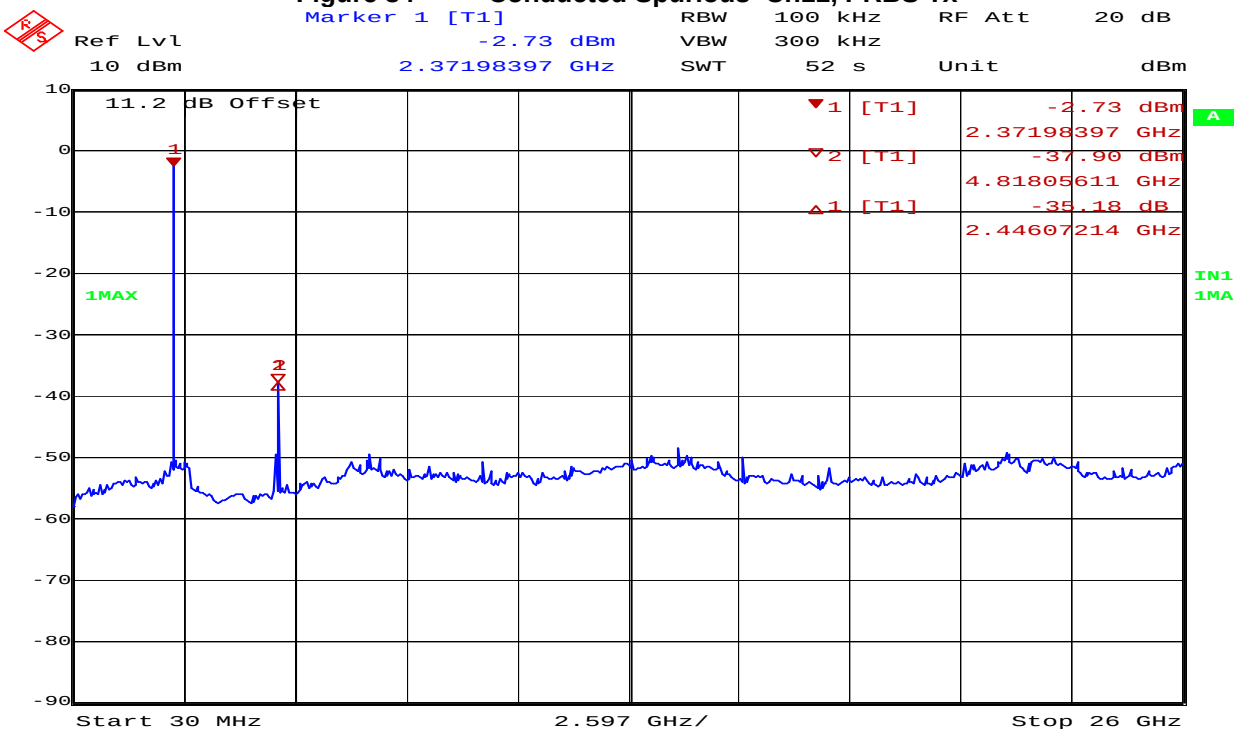
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, Modulated Tx, Max.Power
Date: 20.MAR.2008 15:31:19

Figure 33 Conducted Spurious Ch26, Modulated Tx



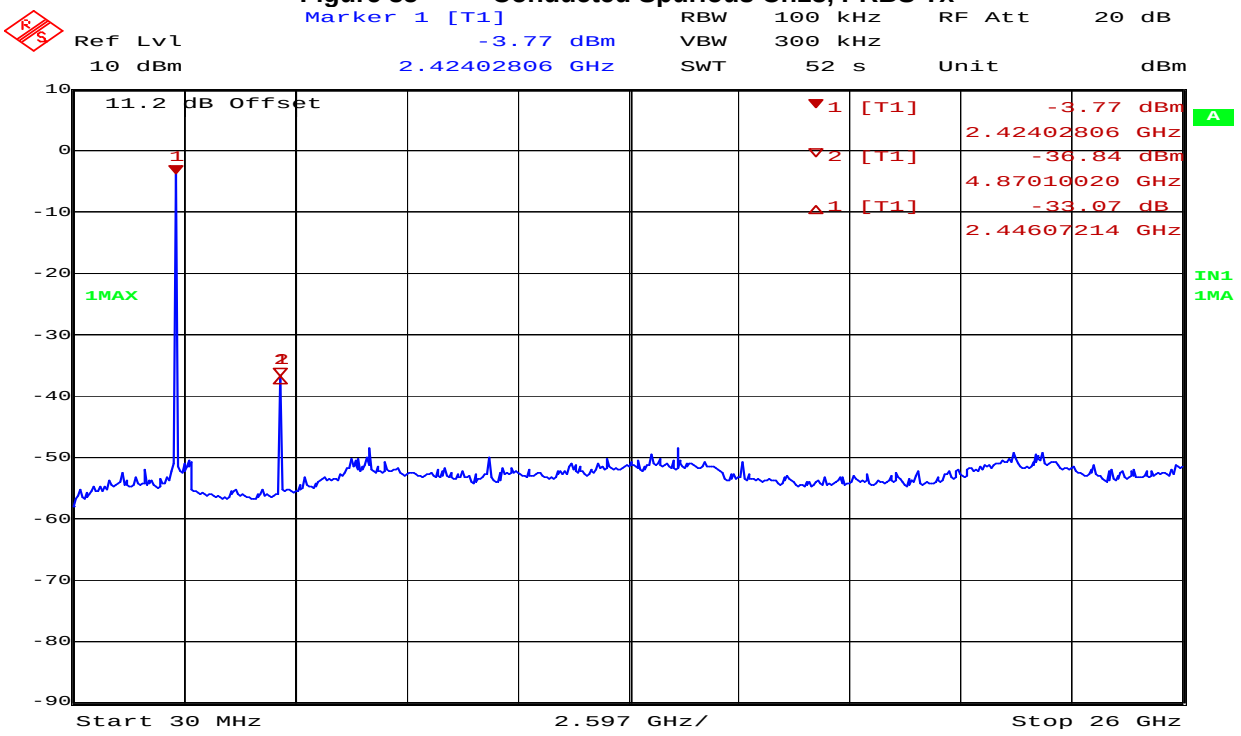
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max.Power
Date: 20.MAR.2008 15:34:58

Figure 34 Conducted Spurious Ch11, PRBS Tx



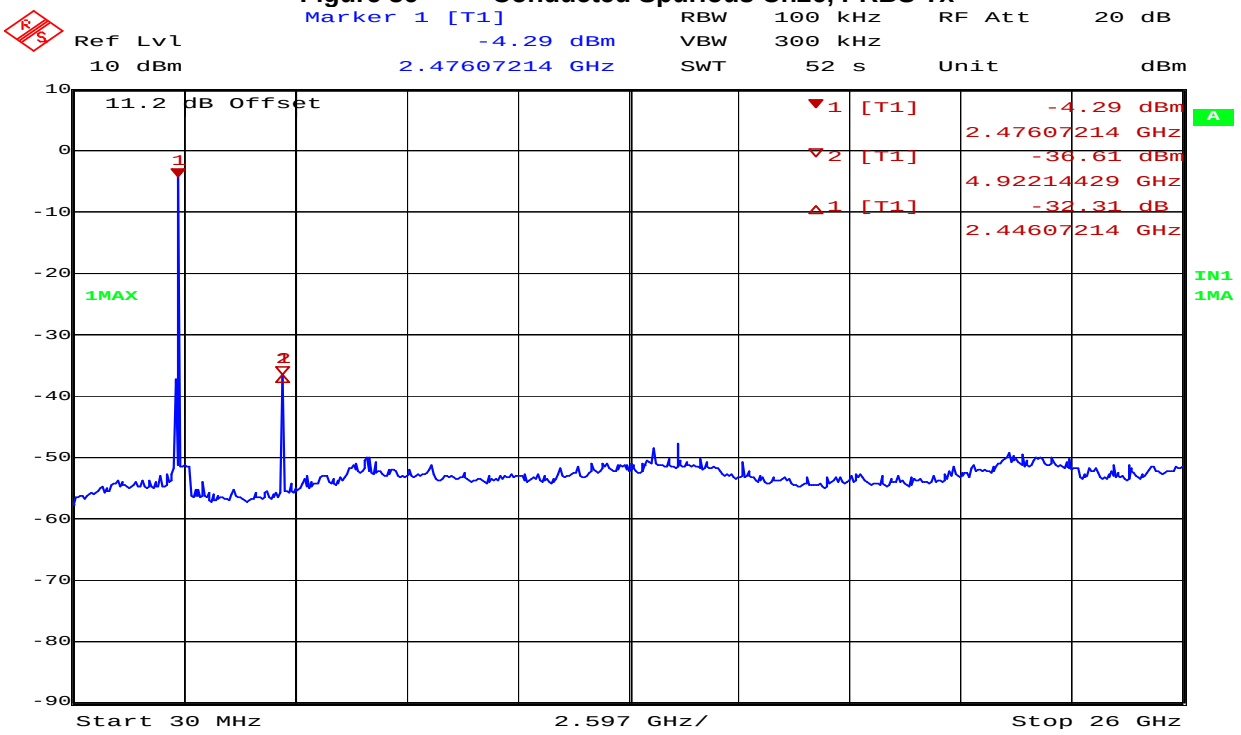
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max.Power
Date: 20.MAR.2008 15:24:11

Figure 35 Conducted Spurious Ch18, PRBS Tx



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch18, PRBS Tx, Max.Power
Date: 20.MAR.2008 15:29:07

Figure 36 Conducted Spurious Ch26, PRBS Tx



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max.Power
Date: 20.MAR.2008 15:36:25

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. Spesifications

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. Deviations

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

H.4. Test Procedure

FCC Publication 558074

H.5. Operating Mode During Test

The 1320x-QE128-EVB was tuned to a low and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

H.6. Test Results

Compliant
Worst case spurious emission was 37.95 dB below the carrier at Channel 26 with PRBS Tx mode.

H.7. Sample Calculation

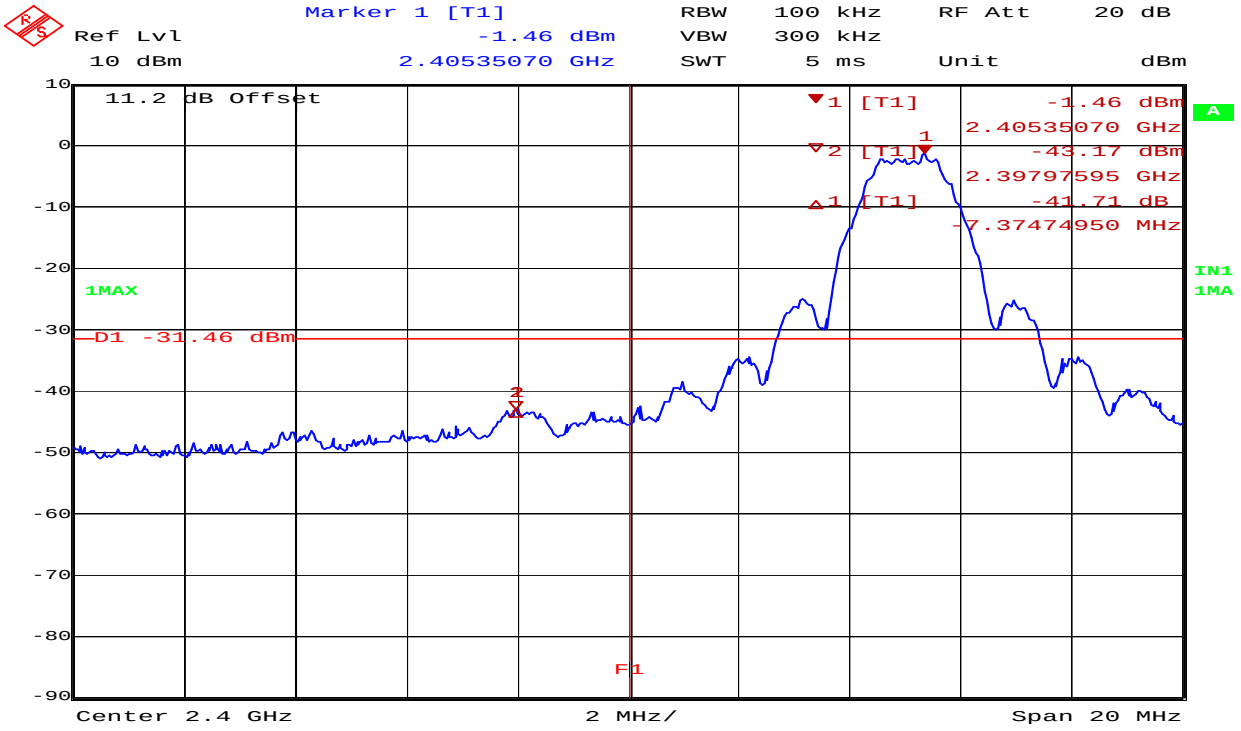
None.

H.8. Tested By

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

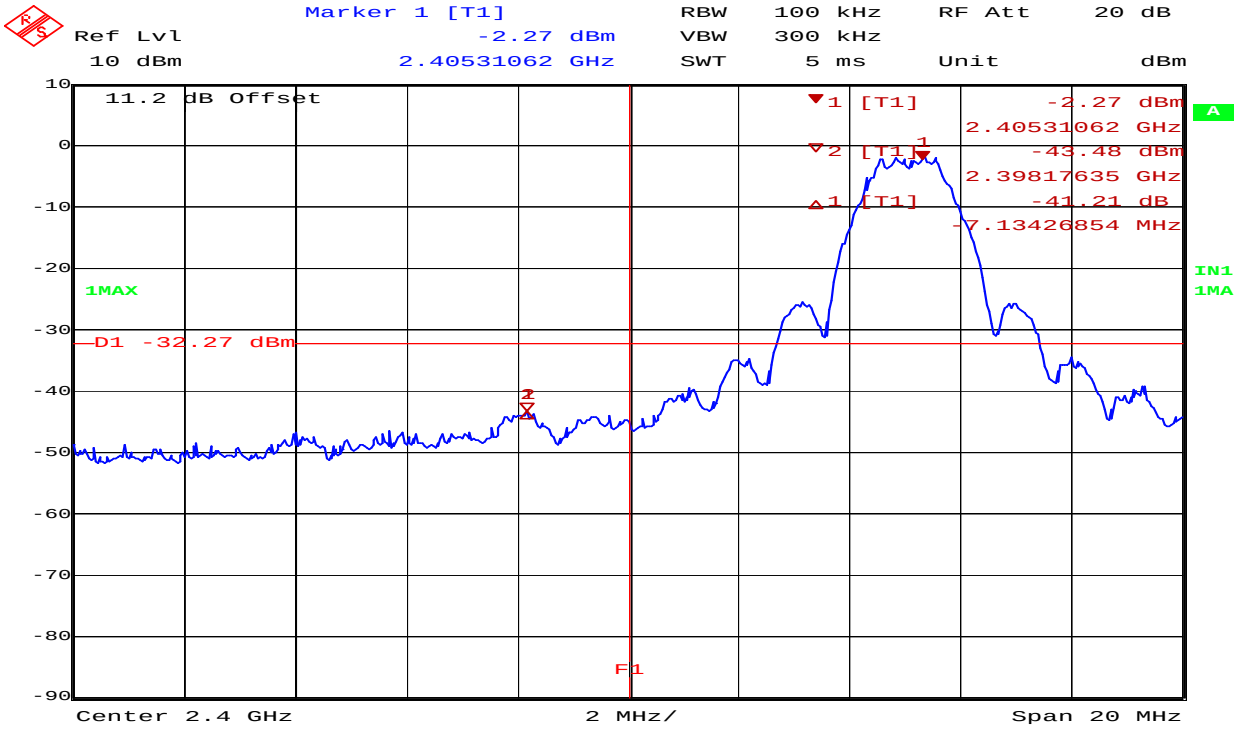
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 37 Conducted Band edge Measurement Ch11 Modulated Tx



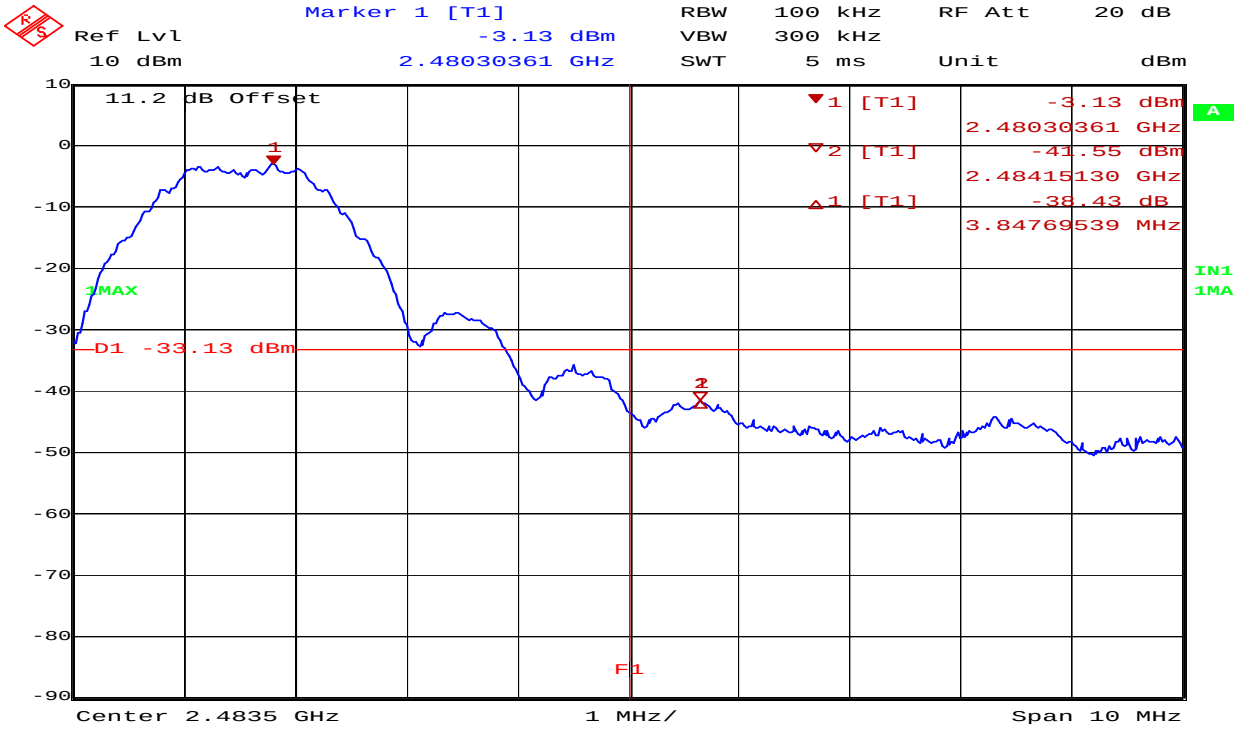
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max.Power
Date: 20.MAR.2008 14:12:37

Figure 38 Conducted Band edge Measurement Ch11, PRBS Tx



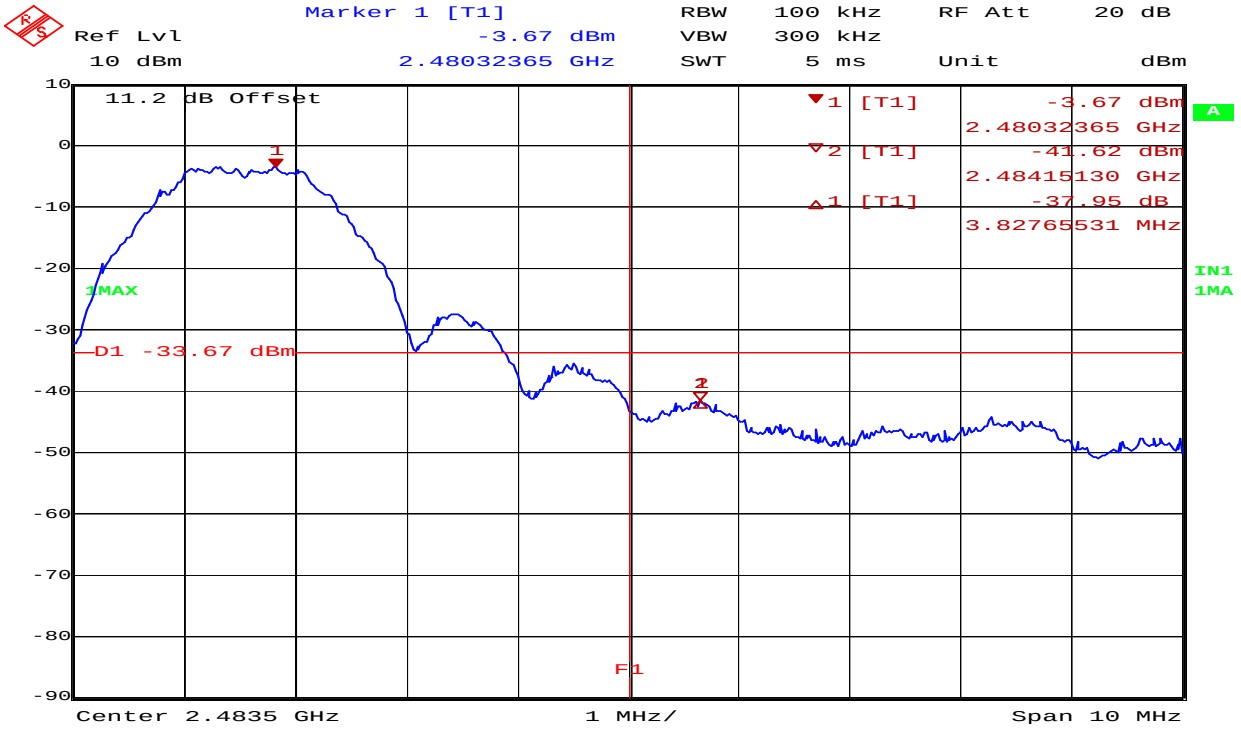
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max.Power
Date: 20.MAR.2008 14:14:33

Figure 39 Conducted Band edge Measurement Ch26, Modulated Tx



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max.Power
Date: 20.MAR.2008 14:21:50

Figure 40 Conducted Band edge Measurement Ch26, PRBS Tx



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max.Power
Date: 20.MAR.2008 14:23:50

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, FCC Publication 558074
Test Method	NTS Radiated Emissions Test Method E001R7 and FCC Publication 558074

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. Deviations

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

I.4. Test Procedure

RF radiated measurement at 3 meters distance per 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.5. Operating Mode During Test

The 1320x-QE128-EVB was tuned to a low and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes.

I.6. Test Results

Compliant

EUT Tx Mode	Frequency (MHz)	Detector	Radiated measured level (dBµV)	Receive Antenna factor (dB)	Receive cable loss (dB)	Radiated emission level (dBµV/m)	Duty cycle correction factor (dB)	Corrected value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Modulated.	2389.398	PK	29.53	28.17	2.65	60.35	N/A	60.35	73.98	13.63
	2483.670	PK	39.85	28.45	2.69	70.99	N/A	70.99	73.98	2.99
	2389.639	AV	17.78	28.17	2.65	48.60	-10.42	38.18	53.98	15.80
	2483.515	AV	32.11	28.45	2.69	63.25	-10.42	52.83	53.98	1.15
PRBS	2389.478	PK	29.41	28.17	2.65	60.23	N/A	60.23	73.98	13.75
	2483.550	PK	39.92	28.45	2.69	71.06	N/A	71.06	73.98	2.92
	2389.799	AV	17.91	28.17	2.65	48.73	-10.42	38.31	53.98	15.67
	2483.510	AV	31.77	28.45	2.69	62.91	-10.42	52.49	53.98	1.49

Maximum peak-average corrected measurement was 52.83 dBµV/m at 2483.515 MHz.
It has 1.15 dB margin to the 15.209 limits.
Antenna height was 100 cm at horizontal polarization and turntable angle was 287 degree.

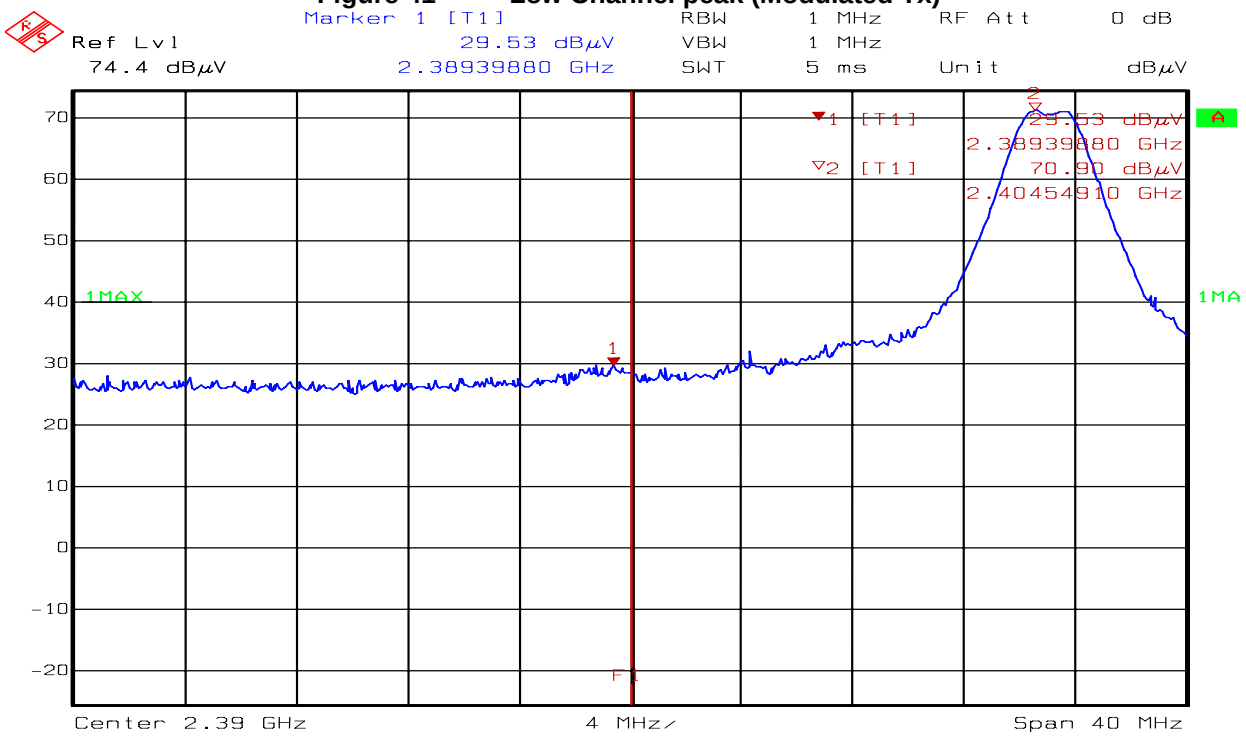
I.7. Sample Calculations

Part 15.209 Average Limit: 500 µV/m @ 3m = 20*Log (500) = 53.98 dBµV/m, Peak limit = 73.98 dBµV/m
Radiated emission level (dBµV/m) = Measured level (dBµV) + Receive antenna factor (dB) + Receive cable loss (dB)
Corrected value (dBµV/m) = Radiated emission level (dBµV/m) - Duty cycle correction factor (dB)

I.8. Tested By

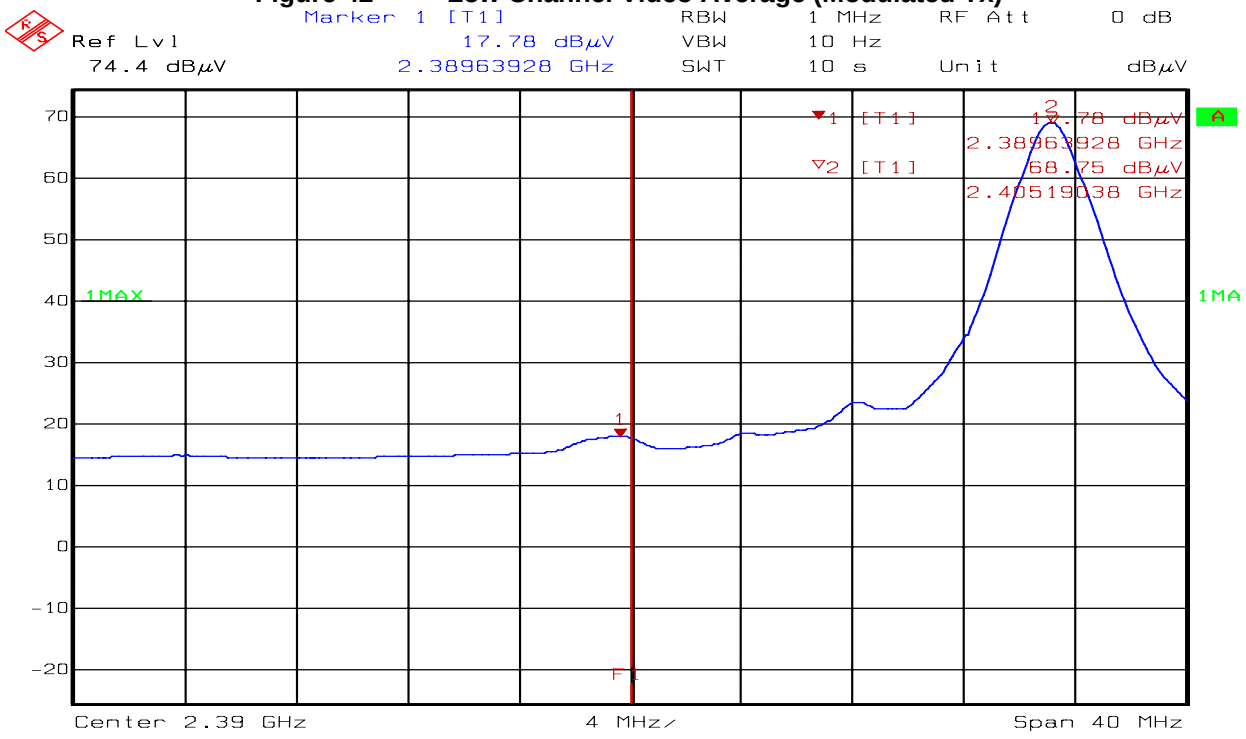
This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.
Name: Deniz Demirci
Function: Senior EMC / Wireless Technologist

Figure 41 Low Channel peak (Modulated Tx)



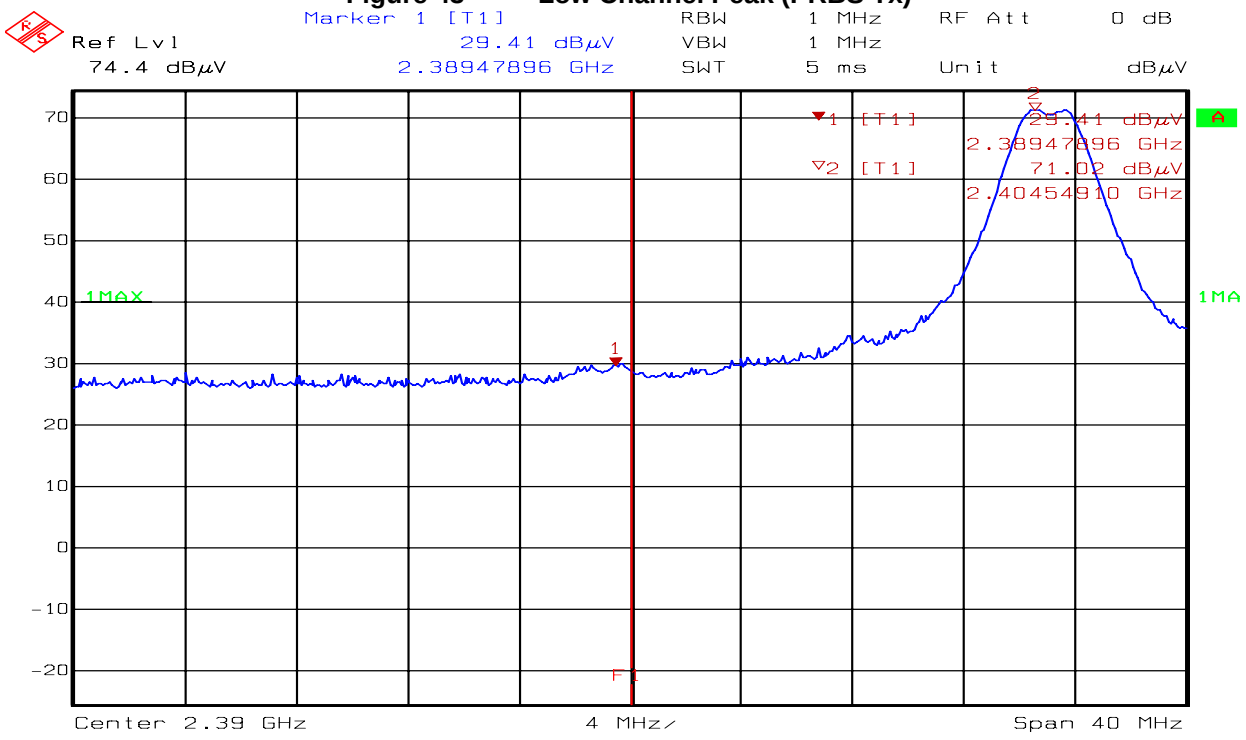
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max. Power
Date: 5.MAR.2008 19:49:31

Figure 42 Low Channel Video Average (Modulated Tx)



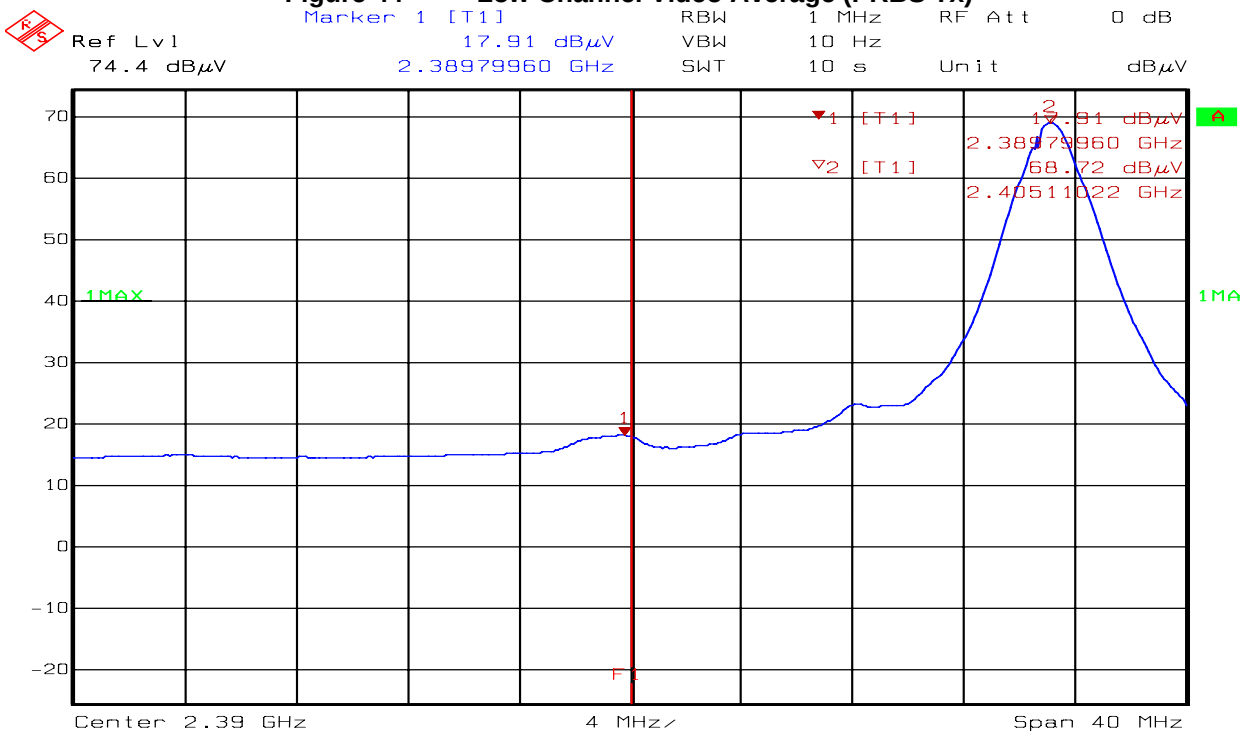
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, Modulated Tx, Max. Power
Date: 5.MAR.2008 19:48:20

Figure 43 Low Channel Peak (PRBS Tx)



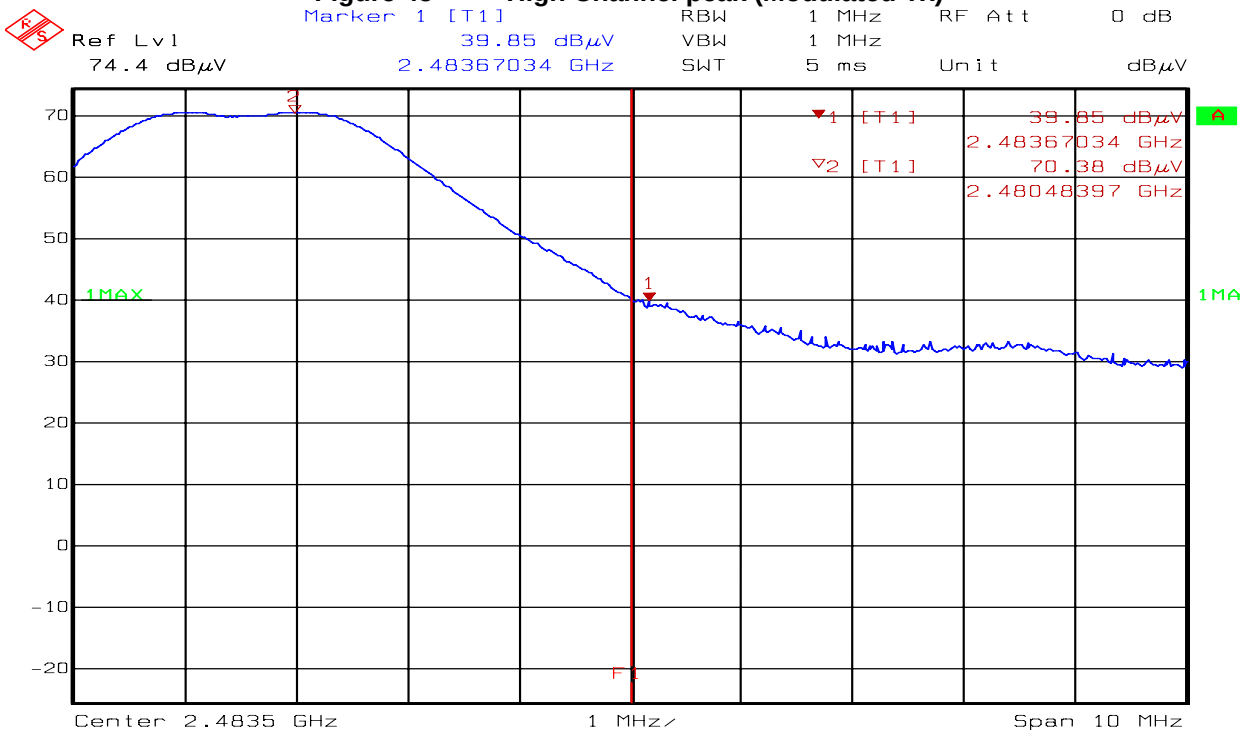
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max. Power
Date: 5.MAR.2008 19:51:42

Figure 44 Low Channel Video Average (PRBS Tx)



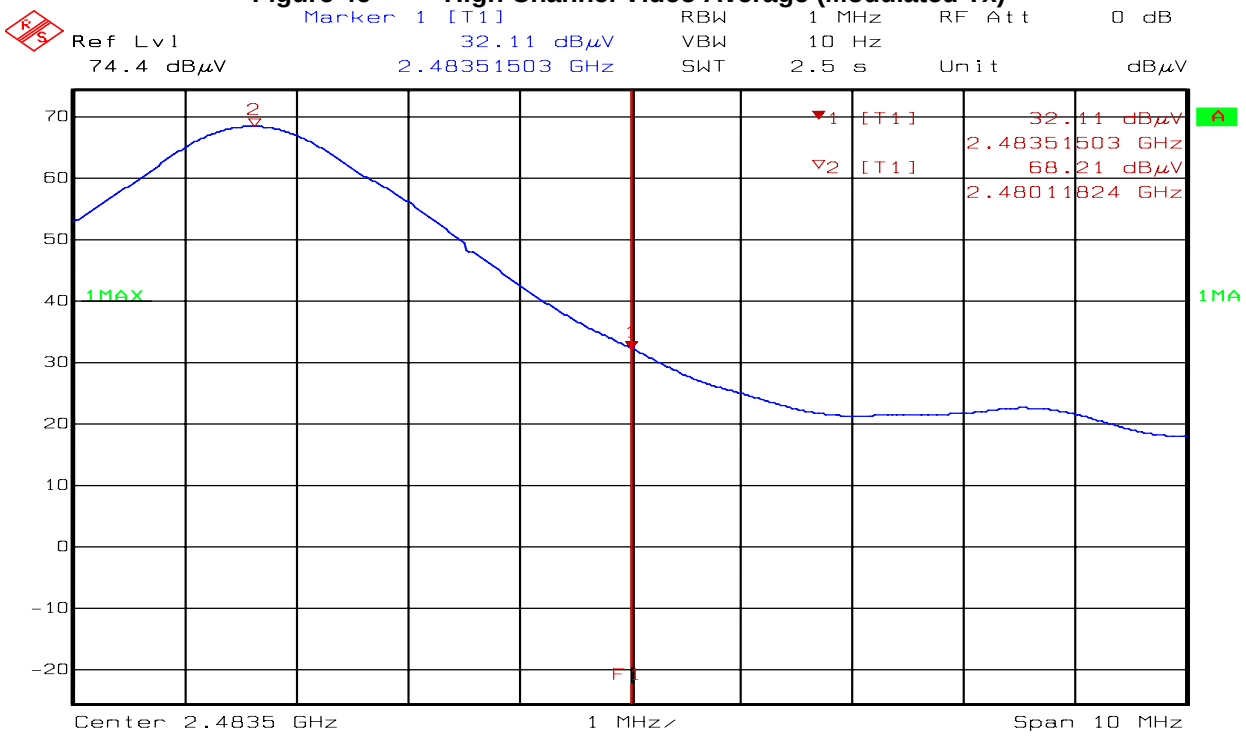
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch11, PRBS Tx, Max. Power
Date: 5.MAR.2008 19:52:56

Figure 45 High Channel peak (Modulated Tx)



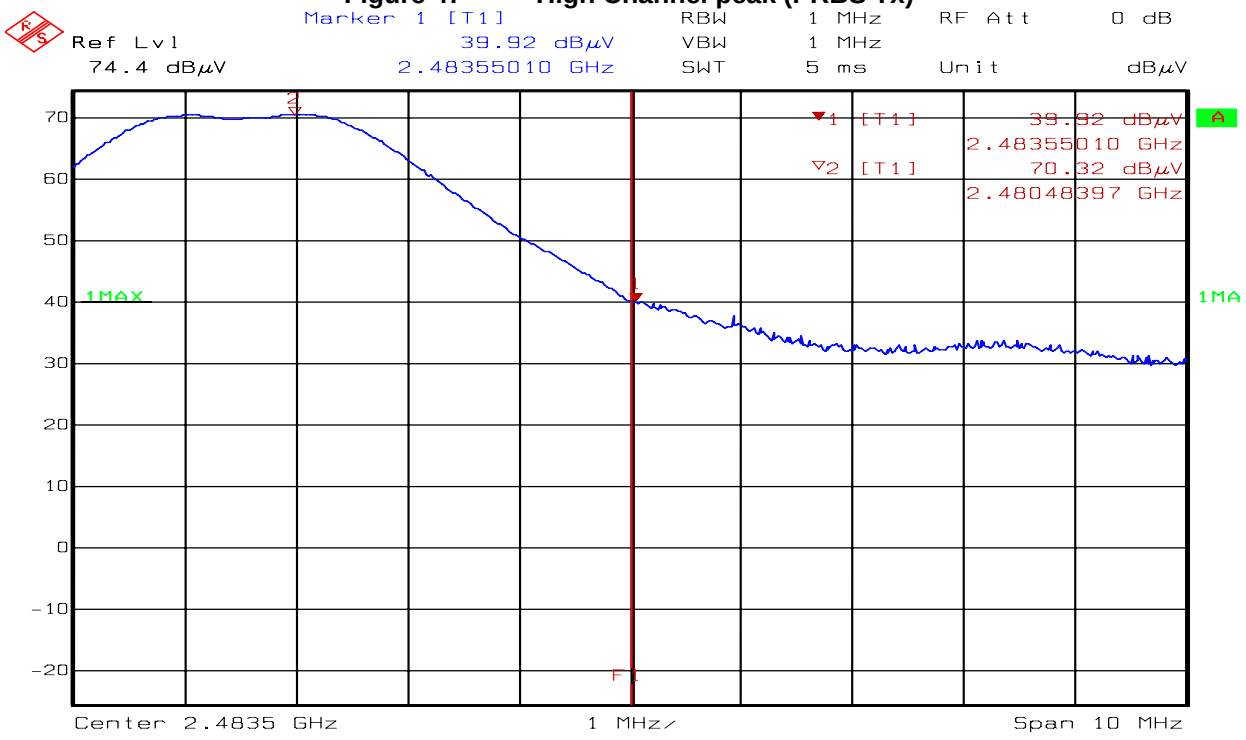
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max. Power
Date: 5.MAR.2008 19:22:58

Figure 46 High Channel Video Average (Modulated Tx)



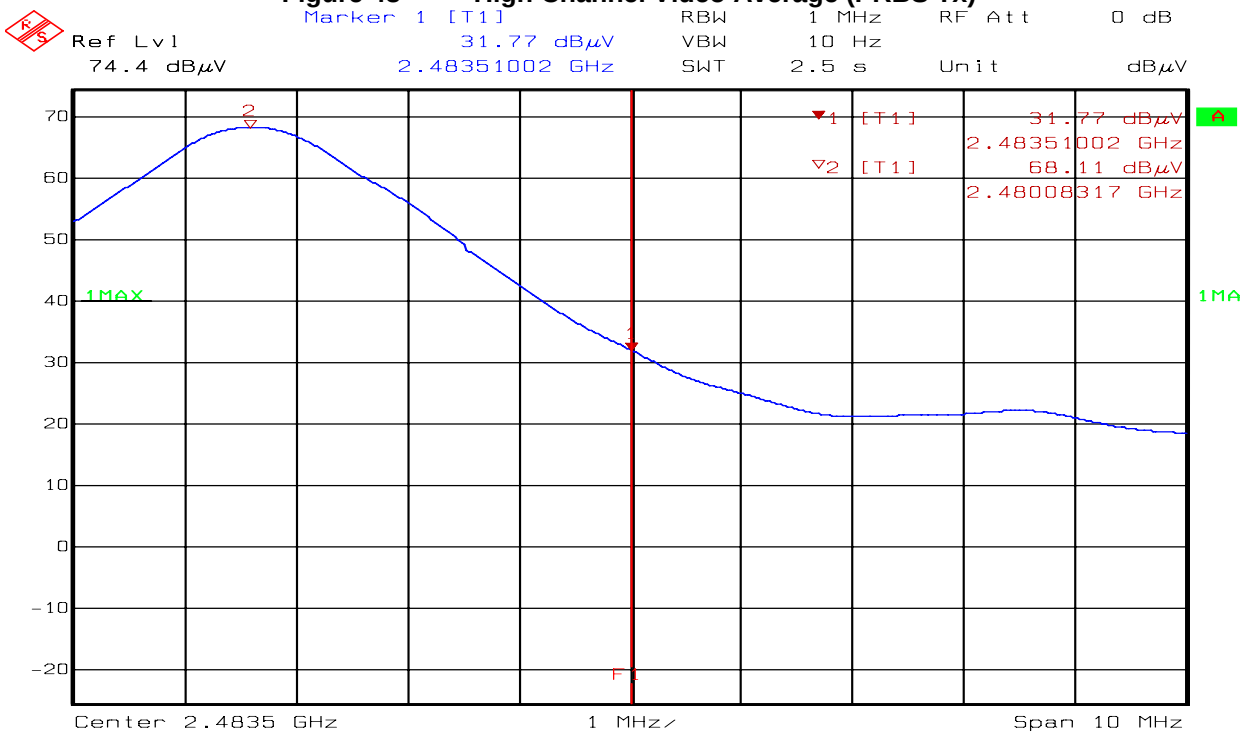
Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, Modulated Tx, Max. Power
Date: 5.MAR.2008 19:21:49

Figure 47 High Channel peak (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max. Power
Date: 5.MAR.2008 19:25:31

Figure 48 High Channel Video Average (PRBS Tx)



Title: CG-796 Freescale 1320x-QE128-EVB ZigBee
Comment A: Ch26, PRBS Tx, Max. Power
Date: 5.MAR.2008 19:26:47

APPENDIX J: RADIATED SPURIOUS EMISSIONS (TX AND RX)

J.1. Base Standard & Test Basis

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

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

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

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

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

J.2. Deviations

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

J.3. 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.

Note: In some bands, a lower RBW detector was used to identify and detect emissions with better measurement system sensitivity.

J.4. Operating Mode During Test

The 1320x-QE128-EVB was tuned to a low, mid and high channel operating at maximum rated RF output power with Modulated Tx and PRBS Tx modes

The 1320x-QE128-EVB was tuned to a low, mid and high channel operating with Receive mode.

J.5. Sample Calculations

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

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

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

Corrected value (dBµV/m) = Radiated emission level (dBµV/m) - Duty cycle correction factor (dB)

J.6. Tested By

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

J.7. Test Results

Compliant

J.7.1 Quasi-peak and Peak measurements

EUT Tx Mode	EUT Channel	Freq. (MHz)	Detector	Measured level (dBµV)	Total correction factor (dB/m)	Radiated emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pol.	Antenna height (cm)	Turntable angle (°)
Modulated	26	546.18	QP	21.68	-4.97	16.71	35.57	18.86*	H	212	129
		44.91	QP	32.93	-16.58	16.35	30.00	13.65*	V	359	1
		48.00	QP	35.04	-18.1	16.94	30.00	13.06*	V	400	113
		114.91	QP	29.05	-13.07	15.98	33.00	17.02	V	101	175
		124.45	QP	28.84	-12.54	16.3	33.00	16.70	V	101	206
		546.90	QP	21.76	-4.94	16.82	35.57	18.75*	V	103	46
Modulated	11	4809.11	PK	56.08	4.97	61.05	73.97	12.92	H	100	175
		7213.63	PK	52.90	9.49	62.39	73.97	11.58	H	100	190
		4808.99	PK	50.42	4.98	55.40	73.97	18.57	V	100	194
		7213.49	PK	45.61	9.55	55.16	73.97	18.81	V	100	190
	18	4879.10	PK	54.77	4.84	59.61	73.97	14.36	H	108	186
		7318.46	PK	54.02	9.53	63.55	73.97	10.42	H	102	192
		4879.10	PK	54.69	4.92	59.61	73.97	14.36	V	115	174
		7321.55	PK	48.77	9.59	58.36	73.97	15.61	V	100	155
	26	4959.10	PK	52.53	5.09	57.62	73.97	16.35	H	100	165
		7438.75	PK	50.05	10.17	60.22	73.97	13.75	H	100	187
		4960.98	PK	47.45	5.18	52.63	73.97	21.34	V	100	171
		7438.53	PK	44.57	11.33	55.90	73.97	18.07	V	110	153
PRBS	11	4810.95	PK	56.88	4.92	61.80	73.97	12.17	H	100	178
		7216.69	PK	53.08	9.55	62.63	73.97	11.34	H	110	196
		4810.99	PK	49.99	4.99	54.98	73.97	18.99	V	100	205
		7216.69	PK	45.76	9.55	55.31	73.97	18.66	V	105	189
	18	4879.05	PK	55.03	4.84	59.87	73.97	14.10	H	100	174
		7321.53	PK	53.59	9.53	63.12	73.97	10.85	H	103	195
		4881.07	PK	49.35	4.92	54.27	73.97	19.70	V	103	172
		7318.61	PK	48.66	9.59	58.25	73.97	15.72	V	100	175
	26	4961.05	PK	53.47	5.18	58.65	73.97	15.32	H	105	186
		7438.58	PK	49.43	10.17	59.6	73.97	14.37	H	100	182
		4961.17	PK	47.78	5.18	52.96	73.97	21.01	V	100	172
		7438.64	PK	43.77	10.23	54.00	73.97	19.97	V	106	155

* Emissions are not in the restricted bands (part 15.205)

Maximum measured level was 16.94 dBµV/m with quasi-peak detector at 48.00 MHz, when antenna was vertically polarized. It has 13.06 dB margin to the Part 15.209 limits. This emission was related with digital circuitry or power supply of the EUT. This emission level was the same with the PRBS mode and receive modes.

There was no measurable emission between 1 GHz and 26 GHz with EUT receive mode.

J.7.2 Average Measurements

EUT Tx Mode	EUT Channel	Freq. (MHz)	Detector	Meas. level (dBµV)	Total Cor. factor (dB/m)	Radiated emission level (dBµV/m)	Duty cycle cor. factor (dB)	Cor. reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pol.	Ant. height (cm)	TT Angle (°)
Mod.	11	4810.21	AV	47.24	4.97	52.21	-10.42	41.79	53.97	12.18	H	100	175
		7213.63	AV	52.90	9.49	52.09	-10.42	41.67	53.97	12.30	H	100	190
		4810.21	AV	41.26	4.98	46.24	-10.42	35.82	53.97	18.15	V	100	194
		7216.40	AV	35.44	9.55	44.99	-10.42	34.57	53.97	19.40	V	100	190
	18	4880.18	AV	46.06	4.84	50.90	-10.42	40.48	53.97	13.49	H	108	186
		7321.22	AV	43.43	9.53	52.96	-10.42	42.54	53.97	11.43	H	102	192
		4880.16	AV	40.38	4.92	45.30	-10.42	34.88	53.97	19.09	V	115	174
		7321.36	AV	38.30	9.59	47.89	-10.42	37.47	53.97	16.50	V	100	155
	26	4960.16	AV	43.49	5.09	48.58	-10.42	38.16	53.97	15.81	H	100	165
		7441.31	AV	39.29	10.17	49.46	-10.42	39.04	53.97	14.93	H	100	187
		4960.16	AV	37.17	5.18	42.35	-10.42	31.93	53.97	22.04	V	100	171
		7441.45	AV	32.36	11.33	43.69	-10.42	33.27	53.97	20.70	V	110	153
PRBS	11	4810.15	AV	48.39	4.92	53.31	-10.42	42.89	53.97	11.08	H	100	178
		7216.31	AV	42.27	9.55	51.82	-10.42	41.40	53.97	12.57	H	110	196
		4810.15	AV	40.80	4.99	45.79	-10.42	35.37	53.97	18.60	V	100	205
		7216.45	AV	35.19	9.55	44.74	-10.42	34.32	53.97	19.65	V	105	189
	18	4880.13	AV	45.96	4.84	50.8	-10.42	40.38	53.97	13.59	H	100	174
		7321.27	AV	42.86	9.53	52.39	-10.42	41.97	53.97	12.00	H	103	195
		4880.15	AV	40.04	4.92	44.96	-10.42	34.54	53.97	19.43	V	103	172
		7321.37	AV	37.93	9.59	47.52	-10.42	37.10	53.97	16.87	V	100	175
	26	4960.17	AV	44.98	5.18	50.16	-10.42	39.74	53.97	14.23	H	105	186
		7441.35	AV	38.81	10.17	48.98	-10.42	38.56	53.97	15.41	H	100	182
		4960.17	AV	38.44	5.18	43.62	-10.42	33.20	53.97	20.77	V	100	172
		7438.86	AV	33.21	10.23	43.44	-10.42	33.02	53.97	20.95	V	106	155

Maximum peak-average corrected measurement was 42.89 dBµV/m at 4810.15 MHz when antenna was horizontally polarized. It has 11.08 dB margin to the 15.209 limits.

Plots were not provided in order to reduce file size

APPENDIX K: MEASUREMENT EQUIPMENT

10 m SEMI-ANECHOIC CHAMBER 150 kHz – 30 MHz Conducted Emission and 30 MHz – 1 GHz Radiated Emission					
Descriptions	**Manufacturer**	**Type/Model**	**Serial #**	**Cal Due**	**Cal Date**
Table Top LISN	EMCO	3825	CG0367	18JAN10	18JAN08
Test Receiver	Rohde & Schwarz	ESMI	CG0433/ CG0434	27MAR08(1)	27FEB07
Bilog Antenna	Teseq	CBL 6112D	CG1177	10OCT08	10OCT07
HPIB Extender	HP	37204	CG0181	N/A	N/A
Mast Controller	EMCO	2090	CG0179	N/A	N/A
Turntable Controller	EMCO	2090	CG0178	N/A	N/A
Digital Barometer / Thermometer	Cole-Parmer	1870	CG0728	19JUN08	19JUN07
3 m SEMI-ANECHOIC CHAMBER 1 GHz – 26 GHz Radiated Emission and Radio					
Horn Antenna (Rx) 1 GHz – 18 GHz	EMCO	3115	CG0103	30AUG08	30AUG06
Standard Gain Horn (Rx) 18 GHz – 26.5 GHz	EMCO	3160-09	CG0075	N/A (2)	27NOV01
High pass filter F > 1000 MHz	MicroTronics	HPM14576	CG0963	10AUG08	10AUG06
High pass filter F > 2800 MHz	MicroTronics	HPM50111	CG0964	10AUG08	10AUG06
LNA 1 GHz - 18 GHz	Miteq	JSD00121	CG0317	10AUG08	10AUG06
LNA 18 GHz - 26.5 GHz	Miteq	JSD00119	CG0482	19JAN09	19JAN07
Spectrum Analyzer 9 kHz – 40 GHz	Rohde & Schwarz	FSEK-20	CG0118	19JUN08	19JUN07
EMI Receiver 9 kHz – 40 GHz	Rohde & Schwarz	ESI	CG0109	12NOV08	12NOV07
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): Calibration extension per CAG 5.1

(2): 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