

FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

Tablet with IEEE 802.11a/b/g/n (MIMO 2x2) and Bluetooth Radio

MODEL NUMBER: A1489

FCC ID: BCGA1489 IC: 579C-A1489

REPORT NUMBER: 13U15668-1

ISSUE DATE: SEPTEMBER 17, 2013

Prepared for

APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.

Prepared by UL VERIFICATION SERVICES INC. 47173 BENICIA STREET FREMONT, CA 94538, U.S.A. TEL: (510) 771-1000 FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
	09/17/13	Initial Issue	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.		
EUT DESCRIPTION:	Tablet with IEEE 802.11a/b/g/n (MIMO 2x2) and Bluetooth radio		
MODEL:	A1489		
SERIAL NUMBER:	DLXL201MFN8M (Radiated); DLXL2009FN8Y (Conducted)		
DATE TESTED:	JULY 25 – SEPTEMBER 16, 2013		
APPLICABLE STANDARDS			

APPLICABLE STANDARDS				
STANDARD	TEST RESULTS			
CFR 47 Part 15 Subpart C	Pass			
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass			
INDUSTRY CANADA RSS-GEN Issue 3	Pass			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Verification Services Inc. By:

Tested By:

Thu Chan WiSE Operations Manager UL Verification Services Inc.

Mona Hua WiSE Technician UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street		
Chamber A	🖂 Chamber D		
Chamber B	🛛 Chamber E		
Chamber C	🛛 Chamber F		

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://www.ccsemc.com</u>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPad Model A1489 is a tablet with IEEE 802.11a/b/g/n (MIMO 2x2) and bluetooth radio.The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted peak output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2472	802.11b	19.48	88.72
2412 - 2472	802.11g	24.83	304.09
2412 - 2472	802.11n HT20 CDD 2TX	27.68	586.14
5745 - 5825	802.11a	23.28	212.81
5745 - 5825	802.11n HT20 CDD 2TX	25.82	381.94
5755 - 5795	802.11n HT40 SISO	23.38	217.77
5755 - 5795	802.11n HT40 CDD 2TX	25.65	367.28

List of test reduction and modes covering other modes:

Frequency Range (MHz)	Mode	Covered by	
2.4 GHz band	-		
2412 - 2472	802.11g 2TX CDD	802.11n HT20 CDD 2TX	
2412 - 2472	802.11n SISO	802.11g SISO	
2412 - 2472	802.11n HT20 2TX STBC	802.11n HT20 CDD 2TX	
2412 - 2472	802.11n HT20 2TX SDM	802.11n HT20 CDD 2TX	
5.8 GHz band			
5745 - 5825	802.11a 2TX CDD	802.11n HT20 CDD 2TX	
5745 - 5825	802.11n SISO	802.11a SISO	
5745 - 5825	802.11n HT20 2TX STBC	802.11n HT20 CDD 2TX	
5745 - 5825	802.11n HT20 2TX SDM	802.11n HT20 CDD 2TX	
5755 - 5795	802.11n HT40 2TX STBC	802.11n HT40 CDD 2TX	
5755 - 5795	802.11n HT40 2TX SDM	802.11n HT40 CDD 2TX	

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Frequency Band	Antenna Gain		Uncorrelated Gain
(GHz)	Tx1	Tx2	Sheorrelated Gam
2.4	0.81	-1.86	-0.32
5.2	-0.02	3.06	1.79
5.3	0.75	3.25	2.18
5.5	2.43	4.29	3.46
5.8	2.68	3.76	3.25

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Broadcom WL Tool Version 6.25.86.

5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z, with AC Adapter and Headset, it was determined that X orientation without AC Adapter and Headset was the worst-case orientation for 2.4GHz band, and Z orientation was the worst-case orientation for 5.8 GHz band; therefore, all final radiated testing was performed with the EUT in X orientation for 2.4GHz band, and Z orientation for 5.8 GHz band.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps 802.11g mode: 6 Mbps 802.11a mode: 6 Mbps 802.11n HT20mode: MCS0 802.11n HT40mode: MCS0

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was including headset, AC charger and the mode and channel with the highest output power.

For all modes with single chain, chain 0 was selected per the software provided by the client. Based on the client a preliminary investigation was performed on the two chains and chain 0 was found to be worst-case for the antenna port. The radiated emissions test was based on the port with the higher antenna gain.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List						
Description	Manufacturer	Model	Serial Number	FCC ID		
AC/DC adapter	Apple	A1357	A/12981EA	DoC		
Earphone	Apple	NA	NA	NA		

I/O CABLES (CONDUCTED TEST)

I/O Cable List							
Cable Port # of identical		Connector	Cable Type	Cable	Remarks		
No		ports	Туре		Length (m)		
1	Antenna	1	SMA	Un-Shielded	0.1m	To Spectrum Analyzer	

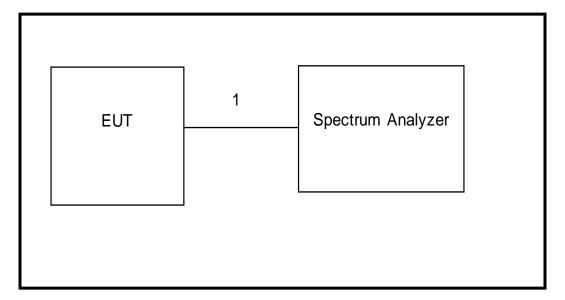
I/O CABLES (RADIATED TEST)

	I/O Cable List									
Cable	Port	# of identical	Connector	Cable Type	Cable	Remarks				
No		ports	Туре		Length (m)					
1	Audio	1	Jack	Un-Shielded	0.5m	NA				

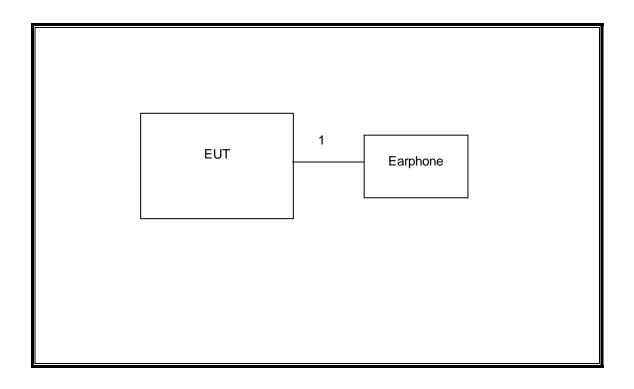
I/O CABLES (AC POWER CONDUCTED TEST)

			I/C	Cable List		
Cable	Port	# of identical	Connector	Cable Type	Cable	Remarks
No		ports	Туре		Length (m)	
1	AC	1	US115	Un-Shielded	2m	NA
2	DC	1	USB	Un-Shielded	2m	NA
3	Audio	1	Jack	Un-Shielded	0.5m	NA

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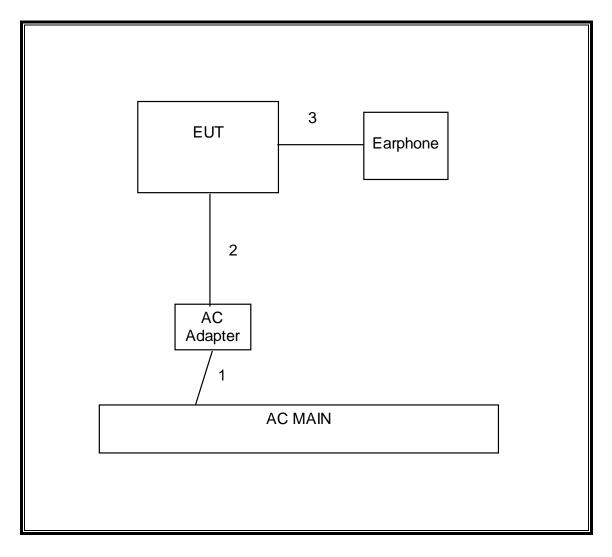


SETUP DIAGRAM FOR RADIATED TESTS



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SETUP DIAGRAM FOR BELOW 1GHZ & AC POWER CONDUCTED TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

	Test Equipment	List		
Description	Manufacturer	Model	Asset	Cal Due
Horn Antenna 1-18GHz	ETS Lindgren	3117	F00131	02/19/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/14
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	05/06/14
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	F00027	03/07/14
Peak / Average Power Sensor	Agilent / HP	E9323A	F00163	04/03/14
P-Series single channel Power Meter	Agilent / HP	N1911A	F00164	04/03/14
Spectrum Analyzer, 3Hz-44GHz	Agilent	N9030A	F00127	02/22/14
Spectrum Analyzer, 3Hz-44GHz	Agilent	E4446A	C01012	10/21/13
PreApmplifier, 1-26.5GHz	Agilent	8449B	C01052	10/22/13
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	F00194	05/14/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/15/14
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/14

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7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

7.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time	Period	Duty Cycle	Duty	Duty Cycle	1/T	
	В		x	Cycle	Correction Factor	Minimum VBW	
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)	
2.4 GHz					-		
802.11b	12.41	12.44	0.998	99.8%	0.00	0.010	
802.11g	2.060	2.095	0.983	98.3%	0.00	0.010	
802.11n HT20	1.91	1.94	0.984	98.4%	0.00	0.010	
5.8 GHz							
802.11a	2.060	2.094	0.984	98.4%	0.00	0.010	
802.11n HT20 CDD	1.900	1.934	0.982	98.2%	0.00	0.010	
802.11n HT40 SISO	0.930	0.948	0.980	98.0%	0.00	0.010	
802.11n HT40 CDD	0.922	0.941	0.980	98.0%	0.00	0.010	

7.2. MEASUREMENT METHODS

<u>6 dB BW</u>: KDB 558074 D01.

Output Power: KDB 558074 D01.

Power Spectral Density: KDB 558074 D01.

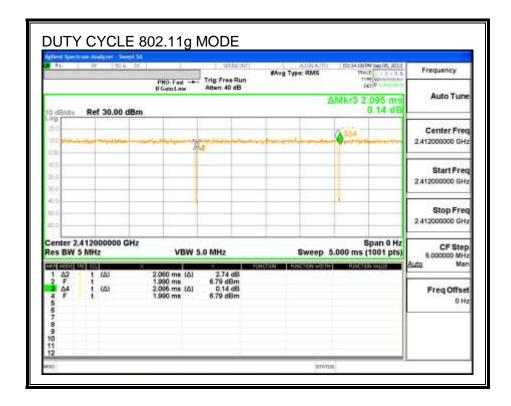
Out-of-band emissions in non-restricted bands: KDB 558074 D01.

Out-of-band emissions in restricted bands: KDB 558074 D01.

DUTY CYCLE PLOTS

2.4 GHz Band

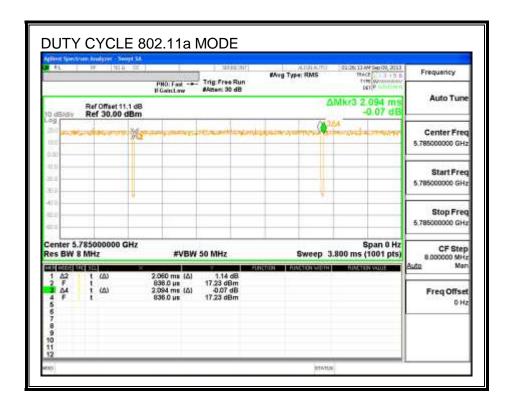
RL.		1719	SE	PNO: Fast -	ļ	Trig Free Run Atten: 40 dB	#Avg Type	RMS	TO:20:20 PM Sep 06, 20 MAKE 2:3 1 TYPE WOWNIN DCT P In Total	Frequency
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00 00 00					+					Stop Free 2.412000000 GH
	er 2.41 BW 5 M	2000000 C	3Hz	VBV	¥ 5.	.0 MHz	ş	weep 1	Span 0 F 15.00 ms (1001 pt	5.000000 MH
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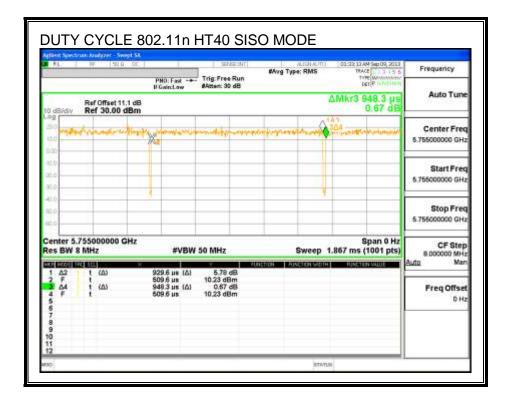
TRACE 23155 THE WOMEN'S AND STREET	#Avg Type: RMS	Trig Free Run Atten: 40 dB	PND: Fast	k ale ac	5	-
Mkr3 1.935 ms Auto Tun -0,19 dB	۵			ef 30.00 dBm		
Center Free 2.41200000 GH	304	ي سينيو د الهدي ور				.00 200
Start Free 2.412000000 GH						0.0 0.0 0.0
Stop Free 2.412000000 GH			.*			40.0
Span 0 Hz CF Step 5.000000 MH Support Acato Mar		0 MHz	VBW 5	000000 GHz tz	BW 5 N	
Freq Offse 0 H		2.55 dB 7.67 dBm -0.19 dB 7.67 dBm	1.906 ms (Δ) 1.776 ms 1.936 ms (Δ) 1.775 ms	<u>م</u> ى م	Δ2 F Δ4 F	2

5.8GHz Band



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AL.	H 1418	and a second	PND: Fast -+	Trig Free Run Adment 30 dB	#Avg Type; RMS	THE WOMEN CONTRACT OF THE WOMEN CONTRACT.	Frequency
Ubleb 0	Ref Offset 11 Ref 30.00	.1 dB	GainLine	Evense: ou an	1	Mkr3 1.934 ms	Auto Tune
09	Her botoo	1000			304		Center Free
10.00		M.	- The Important				5.78500000 GH
10.0 20.0							Start Free 5.78500000 GH
10 0 10 0							Stop Fre 5.78500000 GH
enter 5. tes BW 8	785000000 C MHz	SHz	#VBW	50 MHz	Sweep :	Span 0 Hz L800 ms (1001 pts)	CF Step 8 000000 MH Auto Mar
1 Δ2 2 F 3 64 4 F 5 6 7 8 9 10 11	t (Δ) t t (Δ) t	8	900 ms (Δ) 936 0 μs 934 ms (Δ) 36 0 μs	0,15 dB 16,71 dBm 0,07 dB 16,71 dBm	ANCTON ANCTON VIDTH	HUNCTER VALUE	A <u>uto</u> Mar Freq Offse 0 H:



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RL I IF	TI 0 SC PHO: Fa	t -+- Trig Free	#Avg Typ Run		TAGE 2 3 4 5 6 TAGE 2 3 4 5 6 TARE WANNAMER OCT P TATALAND	Frequency
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0.0						Stop Free 5.75500000 GH
enter 5.75500000 es BW 8 MHz		VBW 50 MHz		Sweep 1.867 r		CF Step 8 000000 MH: Auto Mar
1 Δ2 t (Δ) 2 F t 4 F t 5 6 7 8	922.1 µ 669.3 µ 940.0 µ 569.3 µ	t 10.28 dE (Δ) -0.16 d	3m dB	2,50 - 51 b - 51		Freq Offse 0 H
8 9 10 11 12						

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8. ANTENNA PORT TEST RESULTS

8.1. 802.11b MODE IN THE 2.4 GHz BAND

8.1.1.6 dB BANDWIDTH

<u>LIMITS</u>

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

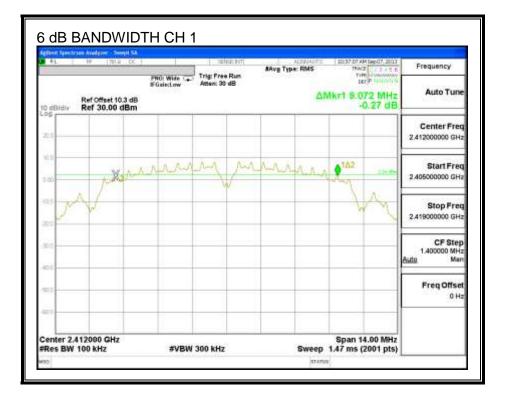
TEST PROCEDURE

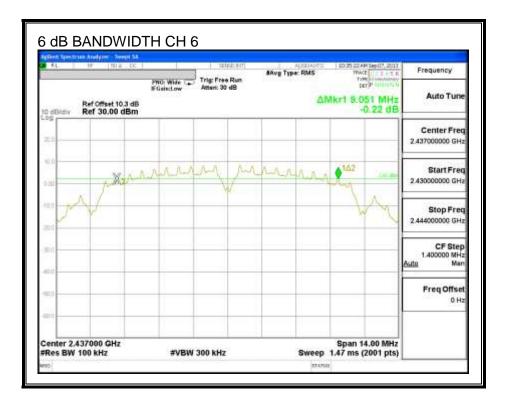
KDB 558074 D01 v01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

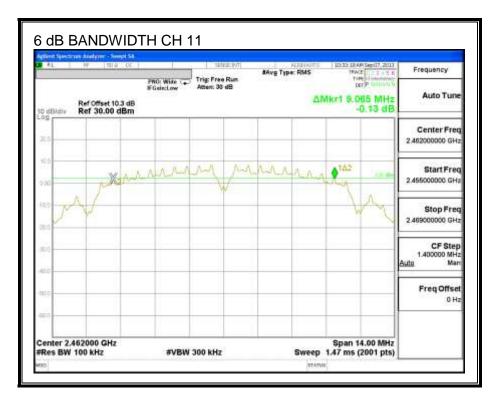
Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
1	2412	9.072	0.5
6	2437	9.051	0.5
11	2462	9.065	0.5
12	2467	9.065	0.5
13	2472	8.589	0.5

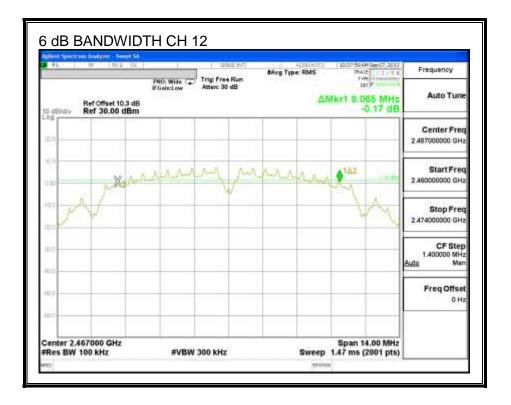
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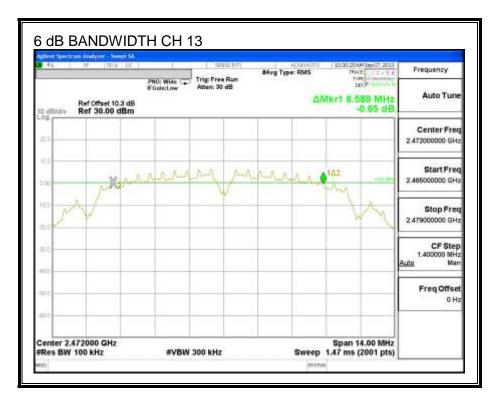


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8.1.2. 99% BANDWIDTH

LIMITS

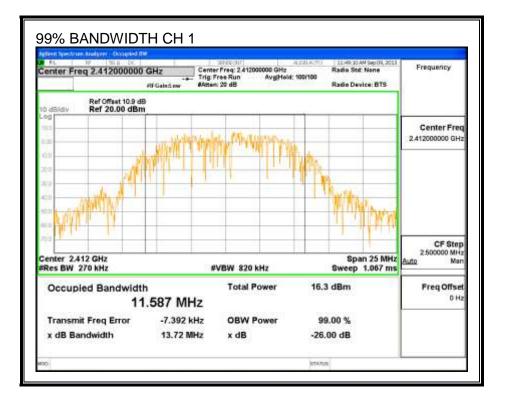
None; for reporting purposes only.

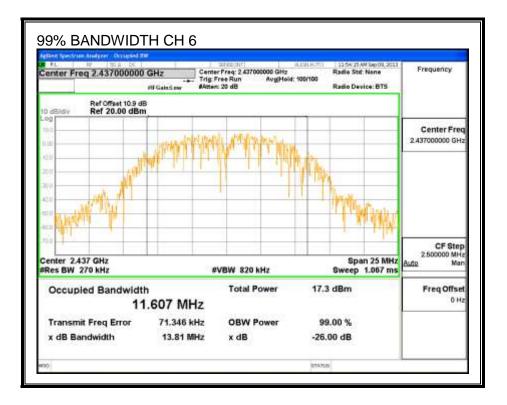
<u>RESULTS</u>

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
1	2412	11.5870
6	2437	11.6070
11	2462	11.7270
12	2467	11.7120
13	2472	11.8820

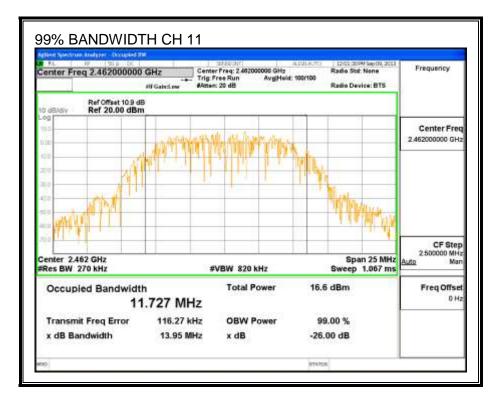
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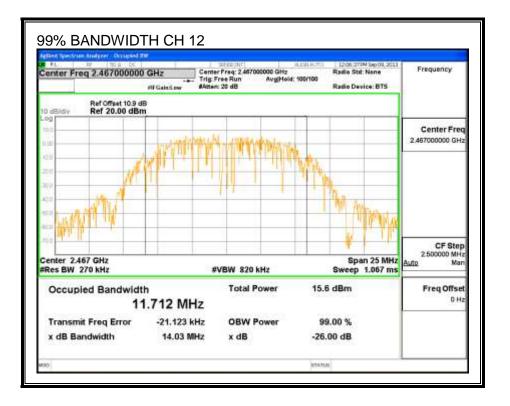
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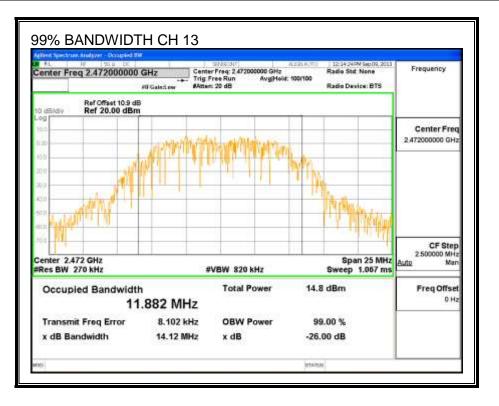
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8.1.3. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.4 dB (including 10 dB pad and 0.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
1	2412	16.45
6	2437	16.50
11	2462	16.50
12	2467	15.40
13	2472	14.46

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8.1.4. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

Limits

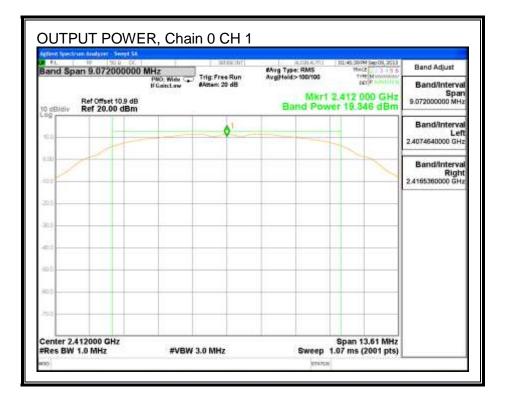
Channel	Frequency	Directional	FCC	IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
1	2412	0.81	30.00	30	36	30.00
6	2437	0.81	30.00	30	36	30.00
11	2462	0.81	30.00	30	36	30.00
12	2467	0.81	30.00	30	36	30.00
13	2472	0.81	30.00	30	36	30.00

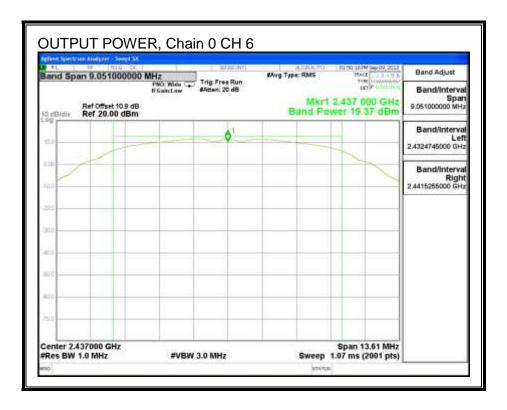
Results

Channel	Frequency	Chain 0	Total	Power	Margin
		Meas	Corr'd	Limit	
		Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
1	2412	19.35	19.35	30.00	-10.65
6	2437	19.37	19.37	30.00	-10.63
11	2462	19.48	19.48	30.00	-10.52
12	2467	18.53	18.53	30.00	-11.47
13	2472	17.53	17.53	30.00	-12.47

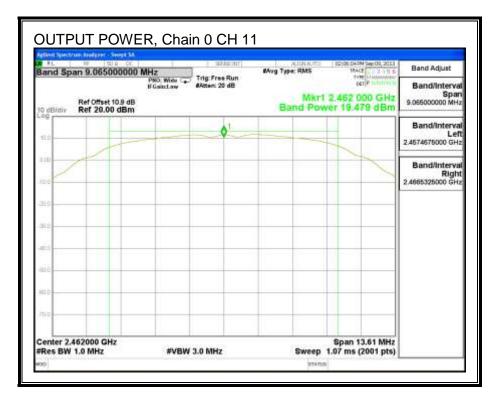
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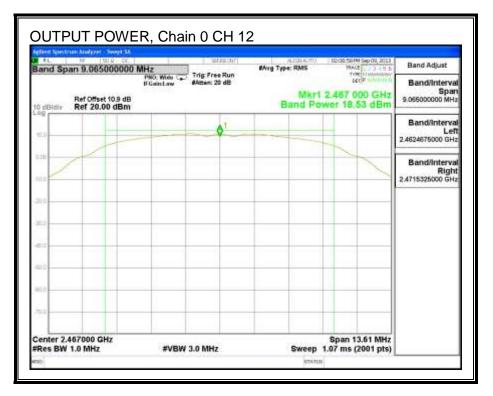
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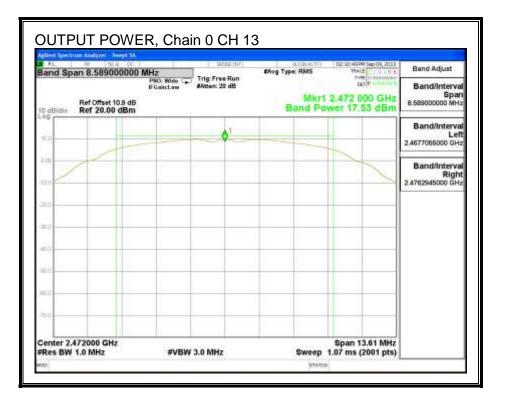


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8.1.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

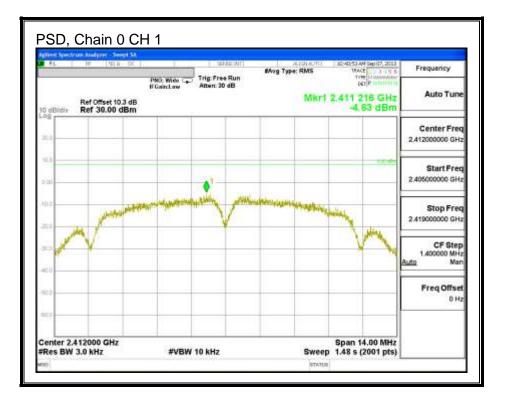
<u>RESULTS</u>

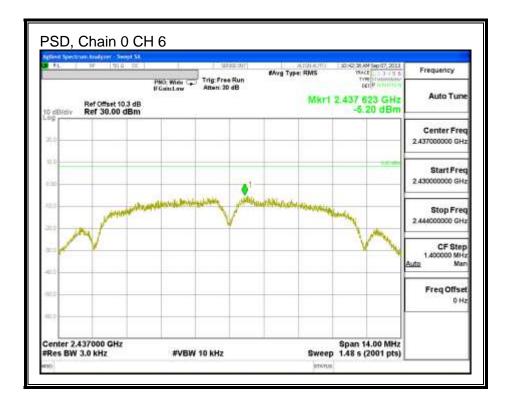
PSD Results

Channel	Frequency	Chain 0	Limit	Margin
		Meas		
	(MHz)	(dBm)	(dBm)	(dB)
1	2412	-4.63	8.0	-12.6
6	2437	-5.20	8.0	-13.2
11	2462	-3.79	8.0	-11.8
12	2467	-6.57	8.0	-14.6
13	2472	-6.65	8.0	-14.7

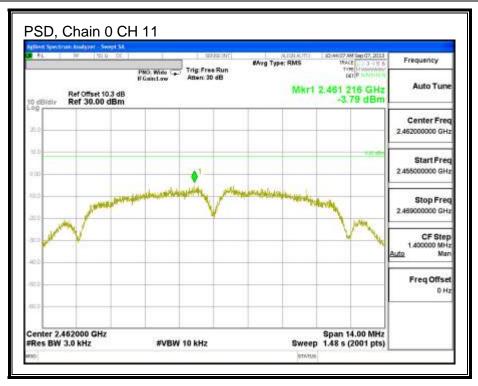
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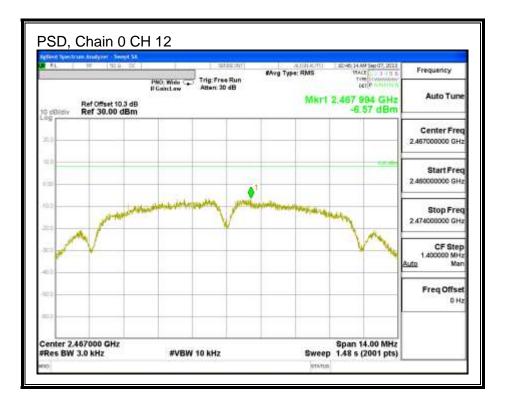
PSD, Chain 0





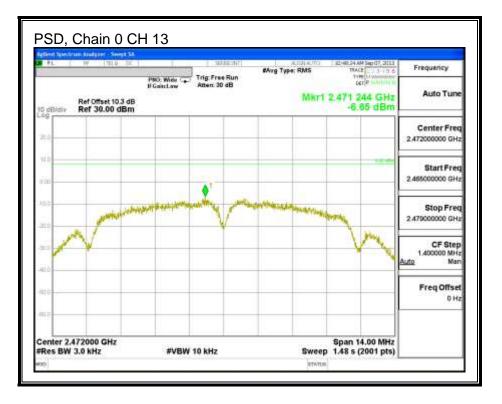
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8.1.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

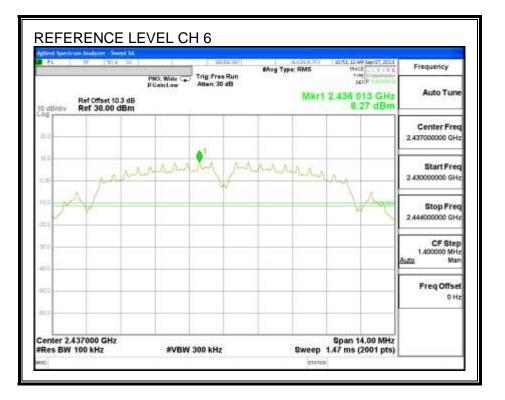
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the inband reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

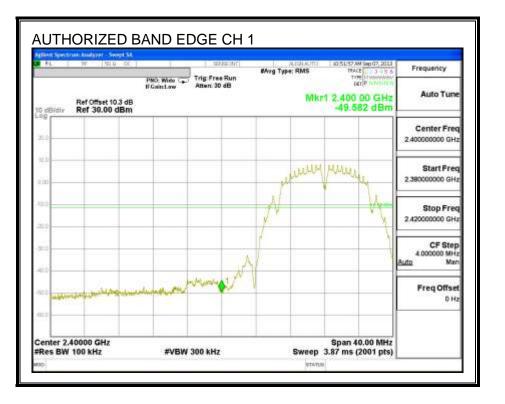
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IN-BAND REFERENCE LEVEL

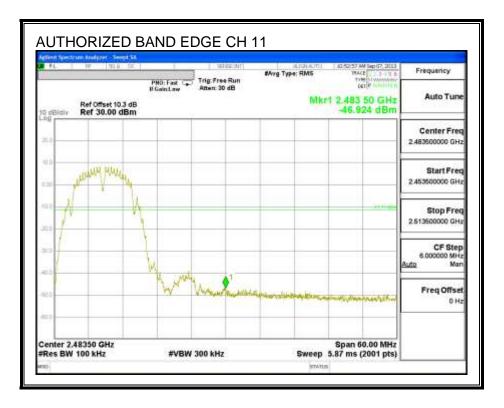


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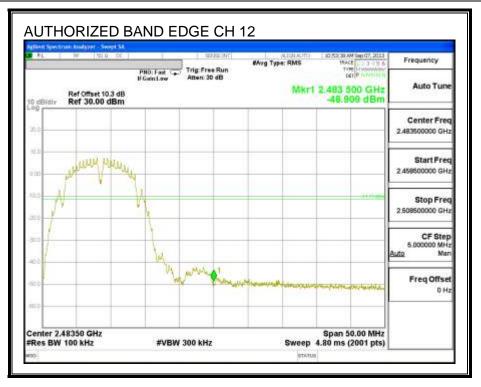
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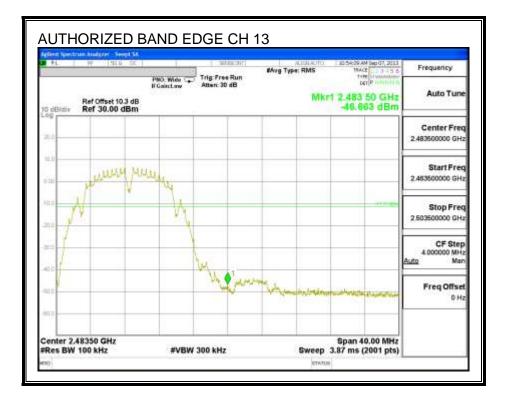


HIGH CHANNEL BANDEDGE



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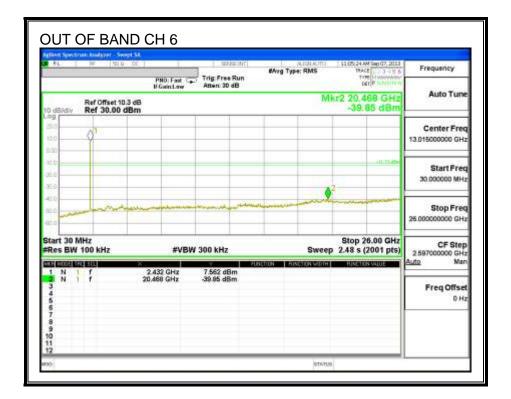




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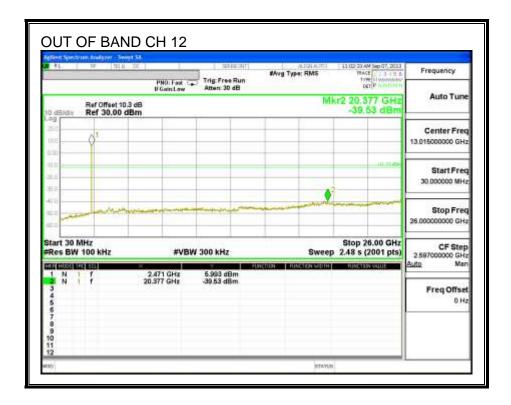
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RL.	F 1919	- 50	SERVER MIL	#Avg Type: RMS	11 00:00 AM Sep 07, 2013 TRACE 2, 2, 3, 4 5, 5	Frequency
	and a first state of the	PND: Fast Ca If GainLaw	Trig Free Run Atten: 30 dB	every type; stars	TARE SI WARNAGE	
0 dB/div	Ref Offset 10 Ref 30.00 (M	40,00 dBm	Auto Tun
00 000	01					Center Free 13.01500000 GH
0.0						Start Fre 30.000000 MH
0.0	-	ويعلمو المردي ويرجرو وحموار	an and a start and a start a st			Stop Fre 26.00000000 GH
tart 30 Res BV	MHz / 100 kHz	#VBW	/ 300 kHz	Sweet	Stop 26.00 GHz 2.48 s (2001 pts)	CF Step 2.597000000 GH
1 N 2 N 3 4 5 5 7 8 9 0 11	1 F	2.419 GHz 20.339 GHz	6.817 dBm -40.00 dBm	нстан нистан чалн	RIMETERS VALUE	Auto Mar Freq Offse 0 H



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Ref Offse 10 dBidsv Ref 30.0 000 000 000 000 000 000 000	00 dBm	Atten: 30 dB	M	kr2 20.144 GHz -40.34 dBm	Auto Tune Center Freq 13.01500000 GH2 Start Freq 30.000000 MH2
-99 200 100 000 000 000 000 400 000					13.01500000 GH: Start Free
000 300 400 600				0.15.69	0.0000000000
			6		
			- Andrew - A		Stop Fre 26.000000000 GH
Start 30 MHz Res BW 100 kHz	#VBV	W 300 kHz	Sweep	Stop 26.00 GHz 2.48 s (2001 pts)	
1 N 1 f 3 A 1 f 4 5	2.471 GHz 20.144 GHz	4.464 dBm -40.34 dBm	истон нистоныргн		Auto Mar Freq Offse 0 H
6 7 8 9 10 11					



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ellent Spectrum Andyzer – Seng Ru III III III III Ru III III		Trig Free Run Atten: 30 dB	Auducito Avg Type; RMS	112.01:30.49 Sep 07, 2013 TRACE [2:3:3:5:5 1178 14 Warmshire Der P Internet	Frequency
Ref Offset 10.3 0 dB/dly Ref 30.00 dl			М	41.17 dBm	Auto Tune
					Center Freq 13.01500000 GHz
10.0: 20.0 20.0					Start Freq 30.000000 MHz
100 100 100					Stop Freq 26.00000000 GHz
itart 30 MHz Res BW 100 kHz	#VB	W 300 kHz	Sweep	Stop 26.00 GHz 2.48 s (2001 pts)	CF Step 2.597000000 GHz
Cal Broose Arca Base 1 N 1 F 3 A 5 6 6 7 7 8 9 9 10 11 12	2.471 GHz 20.131 GHz	5.620 dBm -41.17 dBm	AREADA METAN	HINCIES VILLE	<u>Auto</u> Man Freq Offset 0 Hz

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8.2. 802.11g SISO MODE IN THE 2.4 GHz BAND

8.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

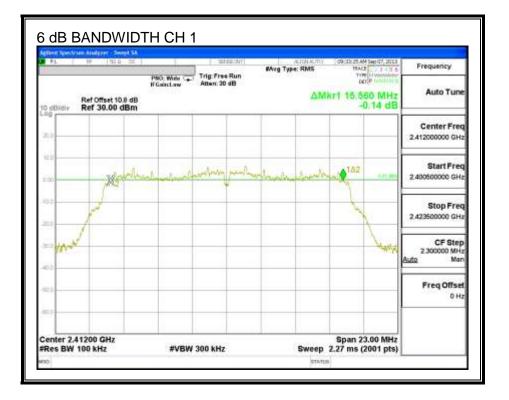
TEST PROCEDURE

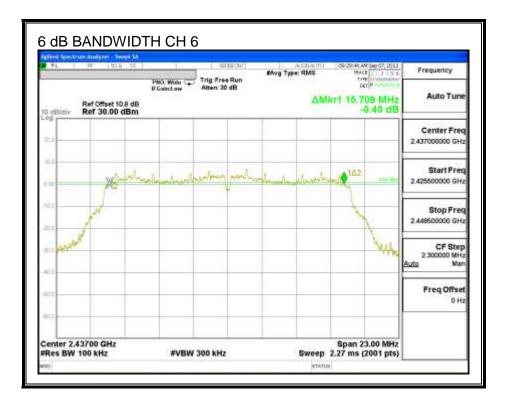
KDB 558074 D01 v01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

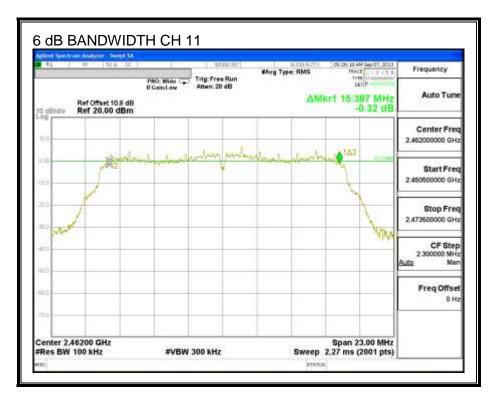
Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
1	2412	15.560	0.5
6	2437	15.709	0.5
11	2462	15.387	0.5
12	2467	15.157	0.5
13	2472	15.456	0.5

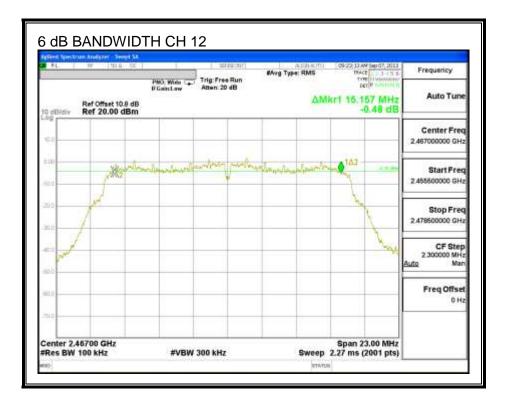
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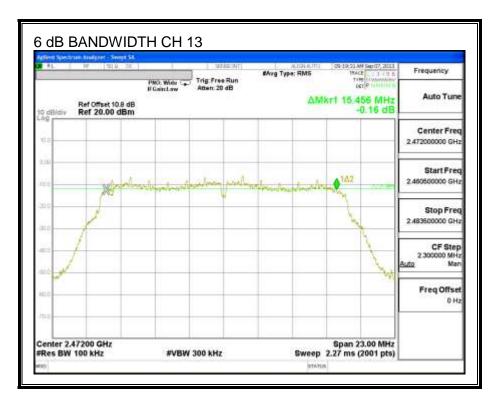


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8.2.2. 99% BANDWIDTH

DATE: SEPTEMBER 17, 2013 IC: 579C-A1489

LIMITS

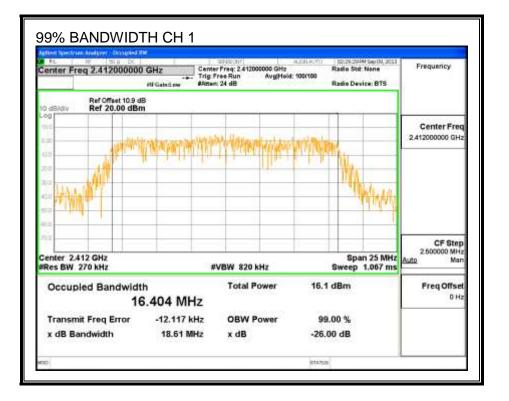
None; for reporting purposes only.

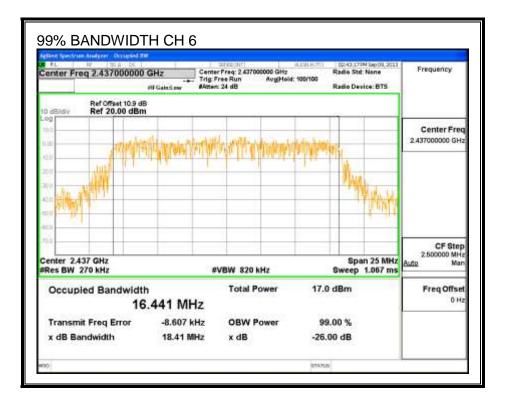
RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
1	2412	16.4040
6	2437	16.4410
11	2462	16.4320
12	2467	16.4600
13	2472	16.4140

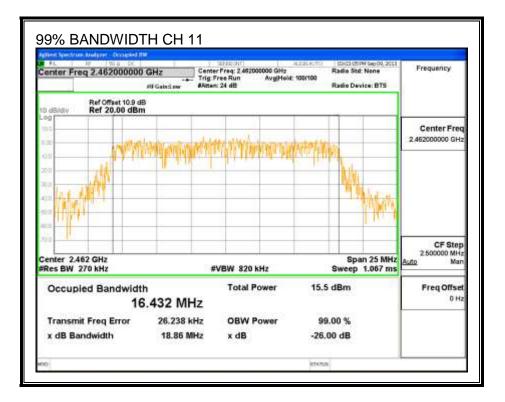
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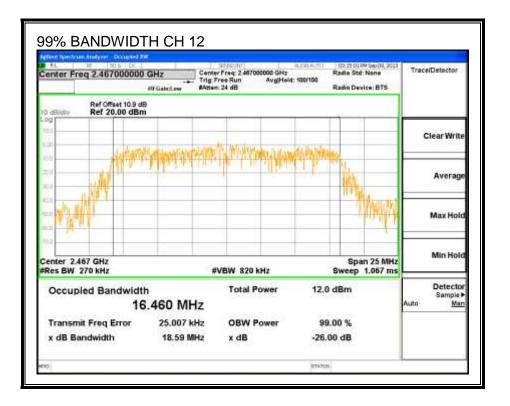
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Center Freq 2.472000000 GHz (Galixiew Freq 2.472000000 GHz (Galixiew Freq 2.47200000 GHz (Galixiew Freq 2.472000000 GHz (Galixiew Freq 2.472000000 GHz (Galixiew Freq 2.472000000 GHz				
Ref Offset 10.9 d			11	
	Ninetti 1 44	n man rayan		Center Freq 2.47200000 GHz
enter 2.472 GHz Res BW 270 kHz		VBW 820 kHz	Span 25 Mi Sweep 1.067 n	
Occupied Bandwidt	^h 6.414 MHz	Total Power	3.84 dBm	Freq Offset 0 Hz
Transmit Freq Error x dB Bandwidth	20.259 kHz 19.08 MHz	OBW Power x dB	99.00 % -26.00 dB	

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8.2.3. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.4 dB (including 10 dB pad and 0.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
1	2412	16.00
6	2437	16.50
11	2462	15.47
12	2467	11.45
13	2472	3.76

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8.2.4. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

Limits

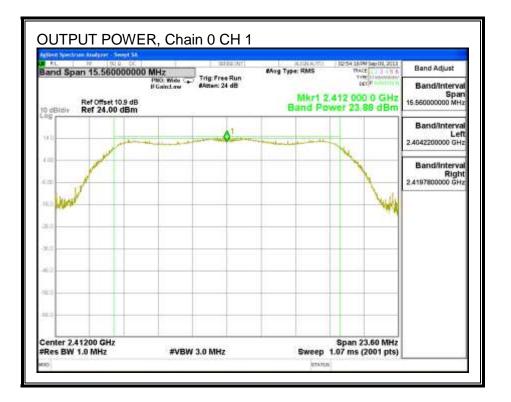
Channel	Frequency	Directional	FCC	IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
1	2412	0.81	30.00	30	36	30.00
6	2437	0.81	30.00	30	36	30.00
11	2462	0.81	30.00	30	36	30.00
12	2467	0.81	30.00	30	36	30.00
13	2472	0.81	30.00	30	36	30.00

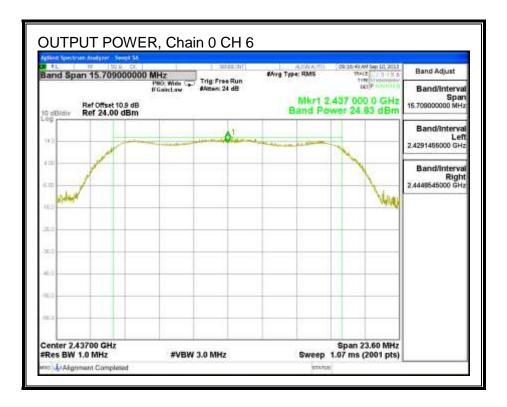
Results

Channel	Frequency	Chain 0	Total	Power	Margin
		Meas	Corr'd	Limit	
		Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
1	2412	23.88	23.88	30.00	-6.12
6	2437	24.83	24.83	30.00	-5.17
11	2462	23.38	23.38	30.00	-6.62
12	2467	19.70	19.70	30.00	-10.30
13	2472	11.97	11.97	30.00	-18.03

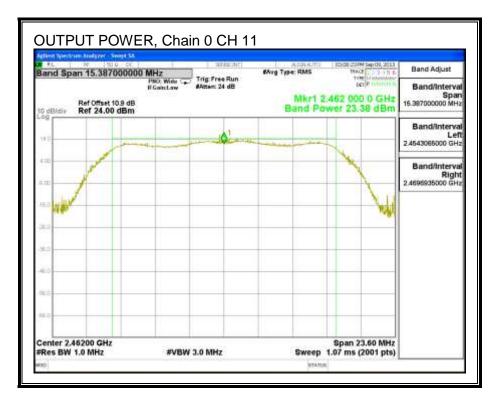
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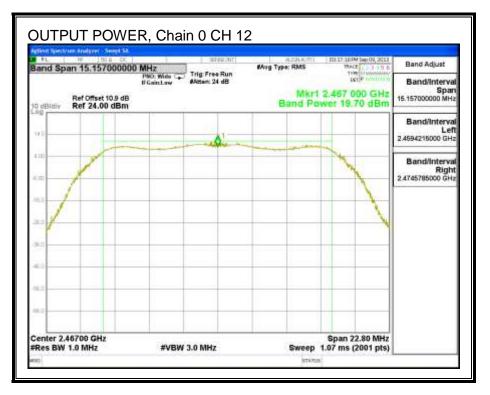
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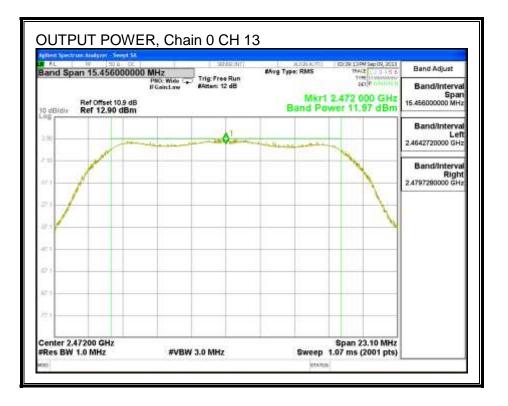
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8.2.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

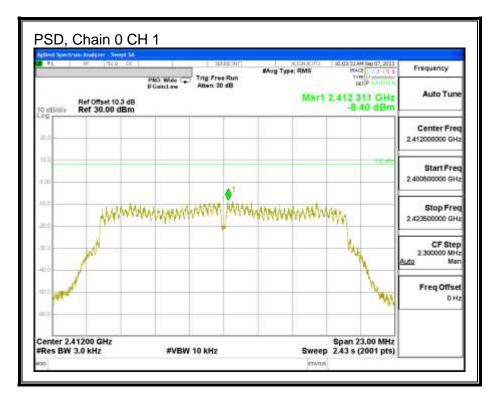
<u>RESULTS</u>

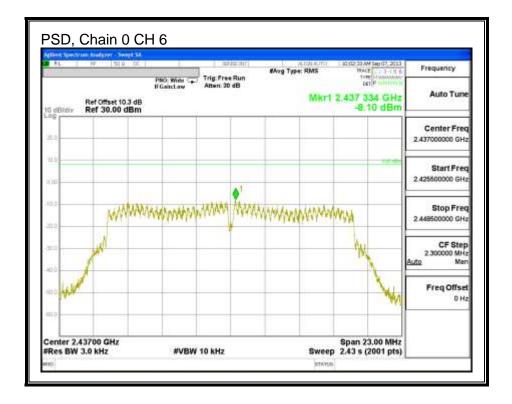
PSD Results

Channel	Frequency	Chain 0	Limit	Margin
		Meas		
	(MHz)	(dBm)	(dBm)	(dB)
1	2412	-8.40	8.0	-16.4
6	2437	-8.10	8.0	-16.1
11	2462	-8.70	8.0	-16.7
12	2467	-11.48	8.0	-19.5
13	2472	-19.77	8.0	-27.8

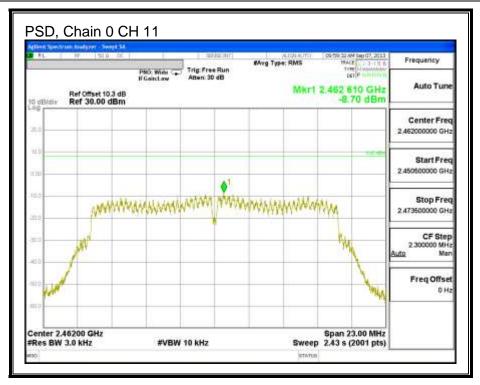
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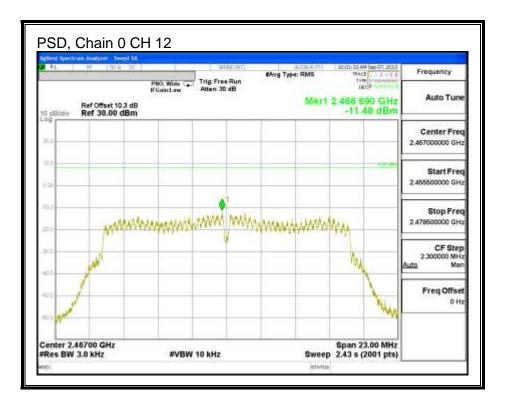
PSD, Chain 0





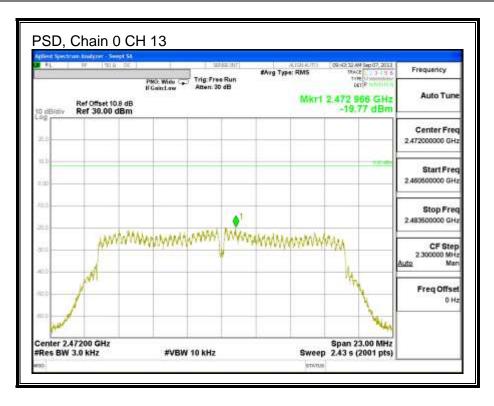
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8.2.6. OUT-OF-BAND EMISSIONS

<u>LIMITS</u>

FCC §15.247 (d)

IC RSS-210 A8.5

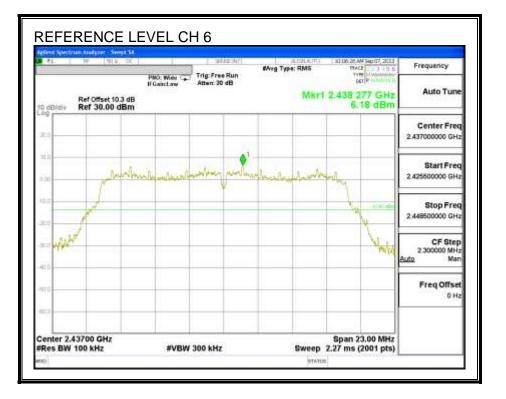
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

TEST PROCEDURE

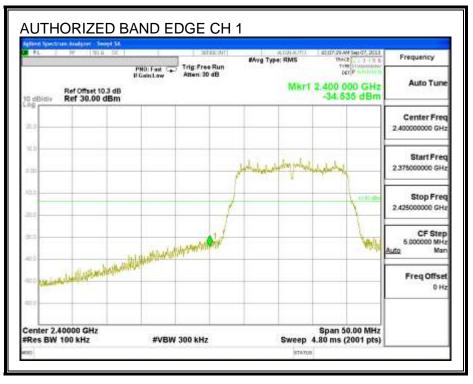
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the inband reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

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IN-BAND REFERENCE LEVEL

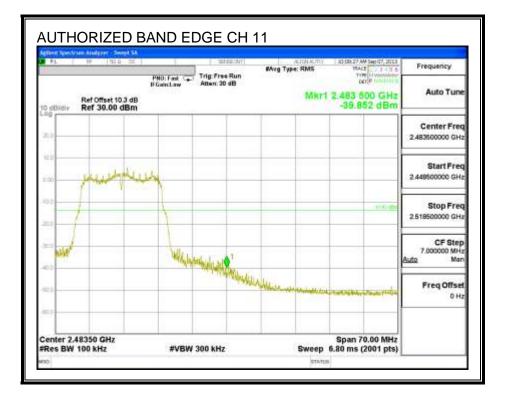


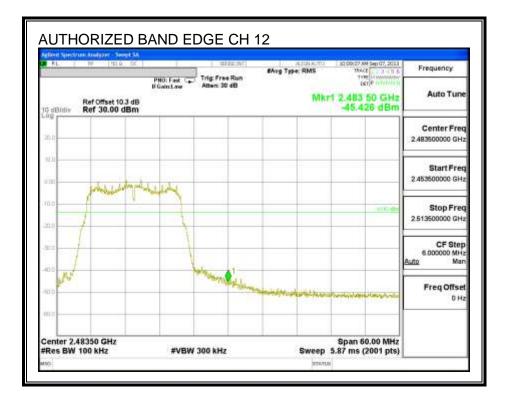
LOW CHANNEL BANDEDGE



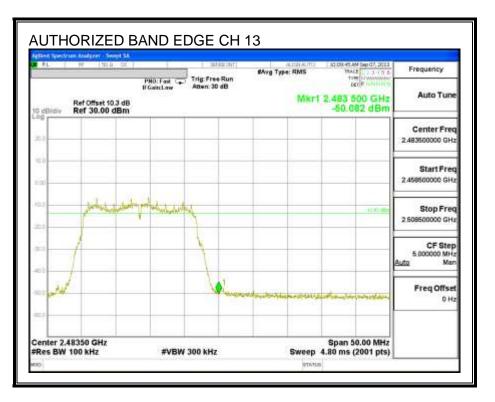
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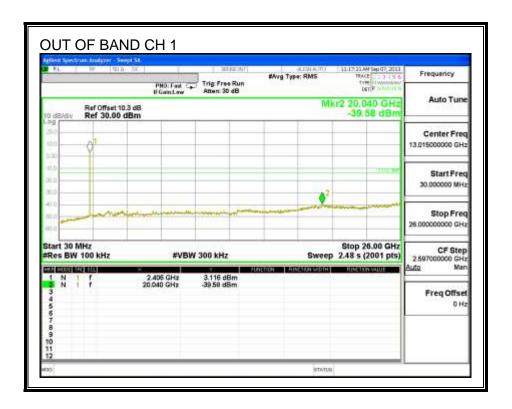




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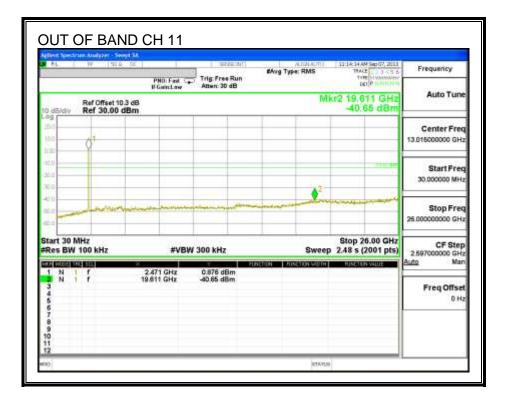


OUT-OF-BAND EMISSIONS



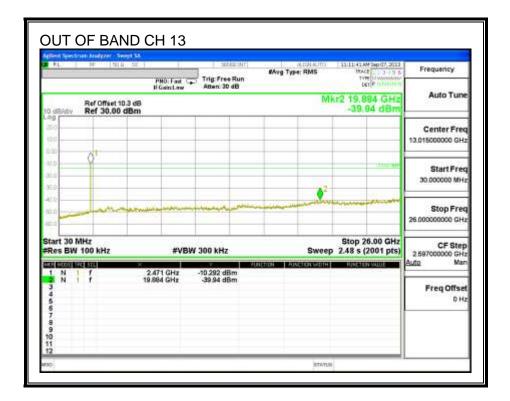
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RL W HA	PND: Fast C	Trig Free Run	#Avg Type: RMS	11:15:51 AM Sep 07, 2013 WACE 1 2 3 -75 5 THE LI WALL	Frequency
Ref Offset 10.		Atten: 30 dB	M	412 20.001 GHz -39,17 dBm	Auto Tune
					Center Freq 13.01500000 GHz
10.0 20.0 20.0			1	010 80	Start Free 30.000000 MH
40.0 10.0 10.0		and a second			Stop Free 26.00000000 GH
Start 30 MHz Res BW 100 kHz	#VBI	V 300 kHz	Sweep	Stop 26.00 GHz 2.48 s (2001 pts)	CF Step 2 597000000 GHt
1 N 1 F 8 N 1 F 3 A 5 7	2.432 GHz 20.001 GHz	6,194 dBm -39,17 dBm	NETON HUNCTON HOTH		Auto Man Freq Offset 0 Hz
8 9 10 11					



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RL.	PF 1419	PNO: Fast	Trig Free Run	#Avg Type: RMS	11:12:47 AM Sep 07, 2013 MACE 1, 2, 3, 4, 5, 5 Trife 14 Wanted	Frequency
	tef Offset 10.3 tef 30.00 dE		Atten: 30 dB	M	kr2 19,404 GHz -40,16 dBm	Auto Tune
	01					Center Freq 13.01500000 GHz
0.0 0.0 0.0				A2	11112 100	Start Free 30.000000 MH
0.0	monthe	الحصيل بالمرجع مراجع	and a second			Stop Free 26.00000000 GH
tart 30 MH Res BW 10		#VB	W 300 kHz	Swee	Stop 26.00 GHz p 2.48 s (2001 pts)	CF Step 2.597000000 GH
1 N 1 2 N 1 3 4 5 5 7 7 8 9 10 11	f f	2.471 GHz 19.404 GHz	1.353 dBm -40.16 dBm	ALCTON HUNCTION LAD TH	HIM: ICH WADE	Auto Mar Freq Offset 0 Ha



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8.3. 802.11n HT20 MIMO CDD 2TX MODE IN THE 2.4 GHz BAND

8.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

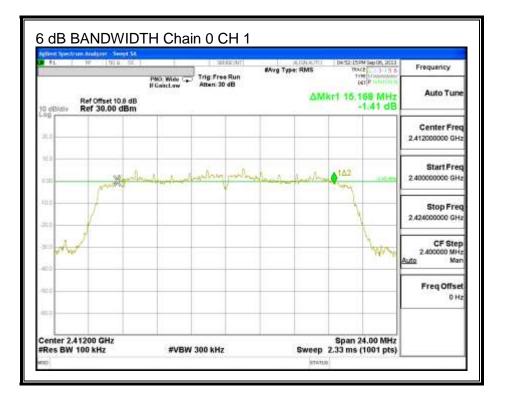
TEST PROCEDURE

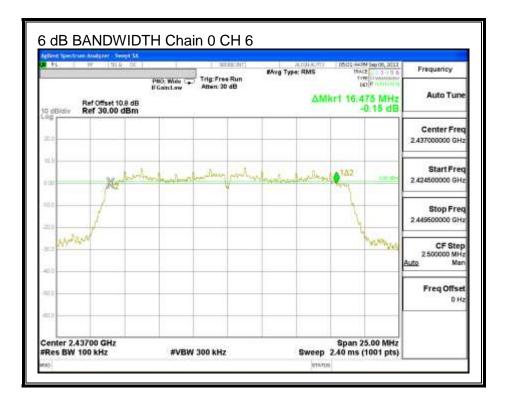
KDB 558074 D01 v01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

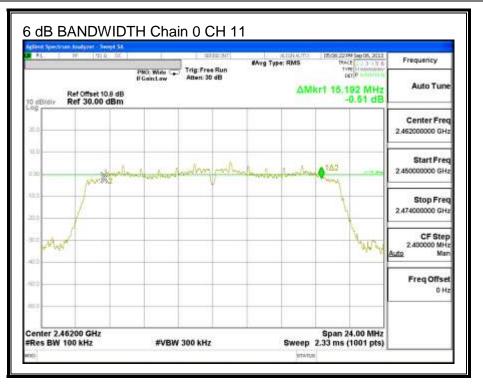
Channel	Frequency	6 dB BW	6 dB BW	Minimum
		Chain 0	Chain 1	Limit
	(MHz)	(MHz)	(MHz)	(MHz)
1	2412	15.168	15.576	0.5
6	2437	16.475	16.375	0.5
11	2462	15.192	15.744	0.5
12	2467	15.192	15.936	0.5
13	2472	15.480	15.816	0.5

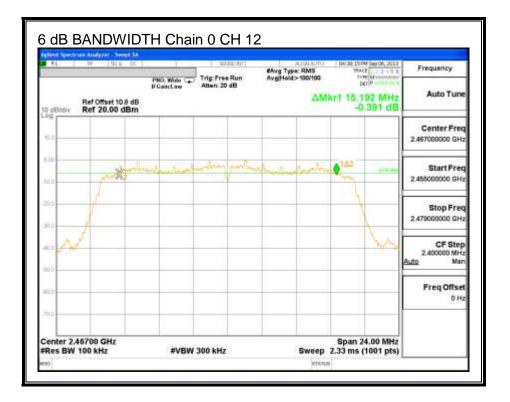
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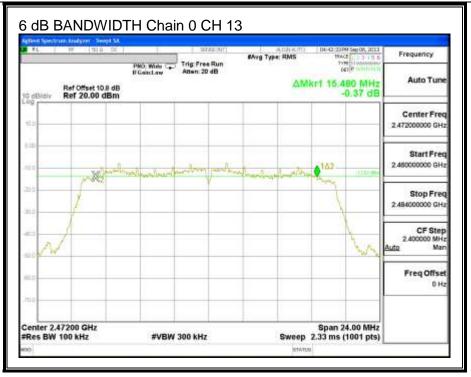
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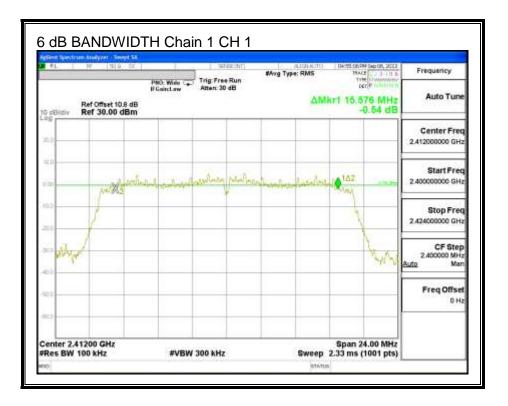


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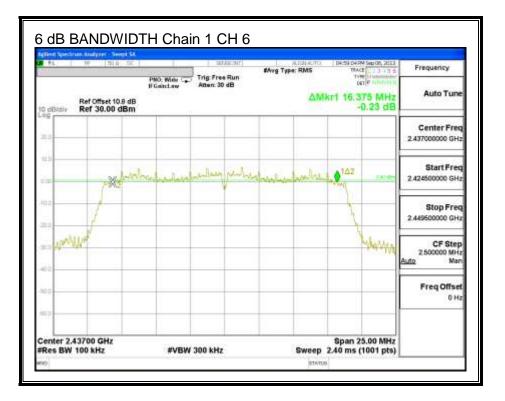
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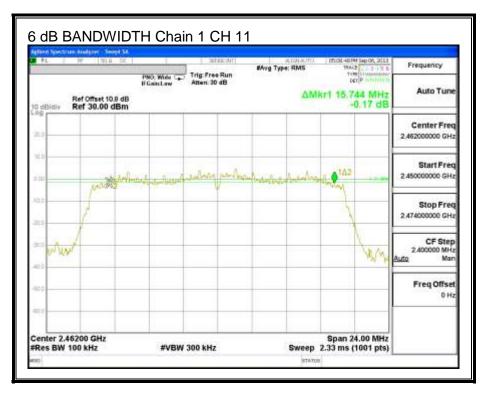


6 dB BANDWIDTH, Chain 1



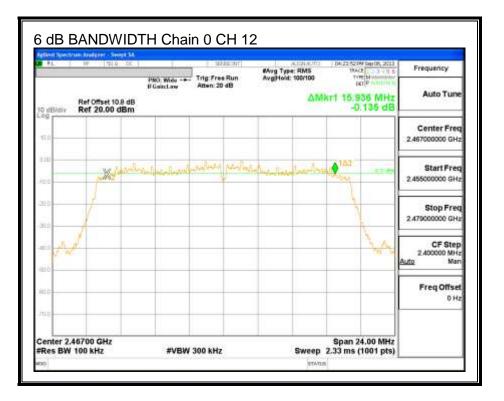
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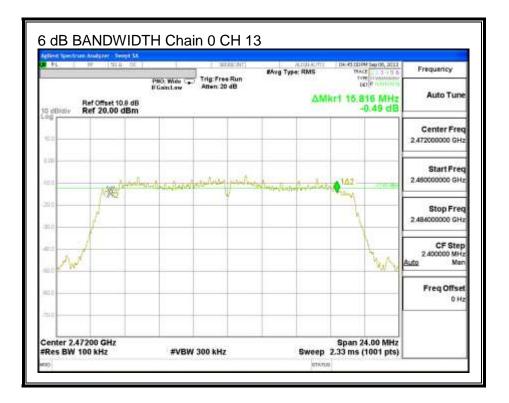




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8.3.2. 99% BANDWIDTH

DATE: SEPTEMBER 17, 2013 IC: 579C-A1489

LIMITS

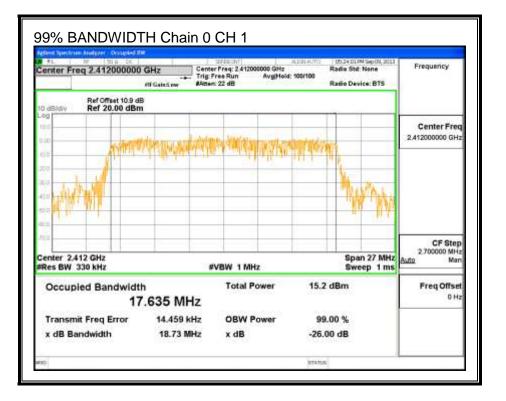
None; for reporting purposes only.

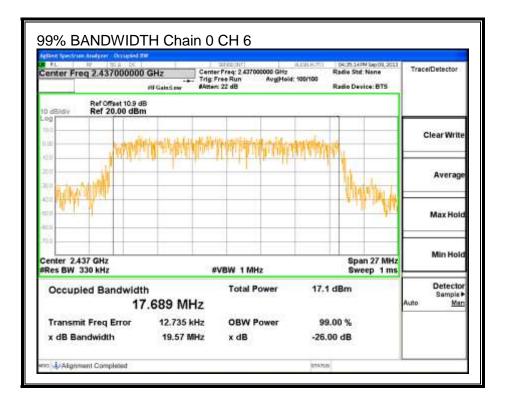
RESULTS

Channel	Frequency	99% BW	99% BW
		Chain 0	Chain 1
	(MHz)	(MHz)	(MHz)
1	2412	17.6350	17.6890
6	2437	17.6890	17.6560
11	2462	17.6630	17.6930
12	2467	17.6610	17.6700
13	2472	17.6530	17.6360

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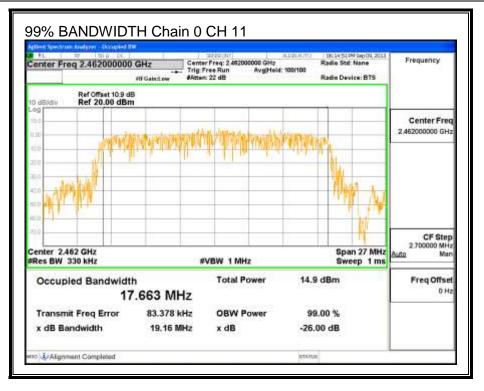
Page 72 of 261

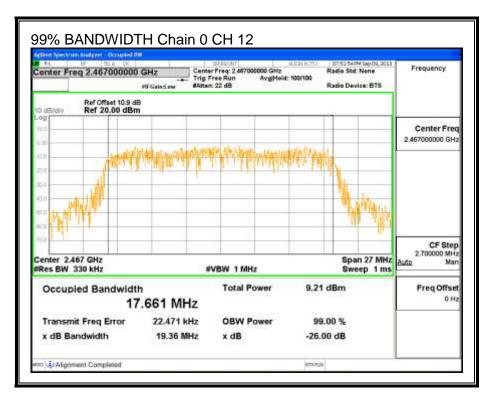




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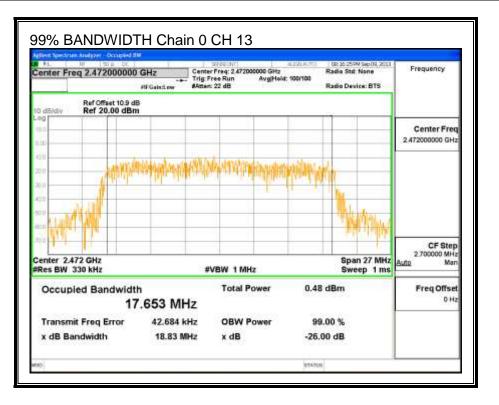
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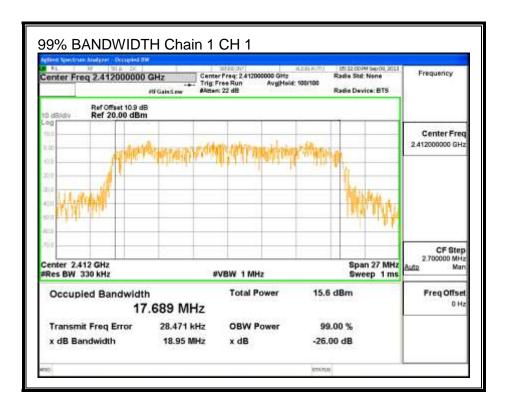


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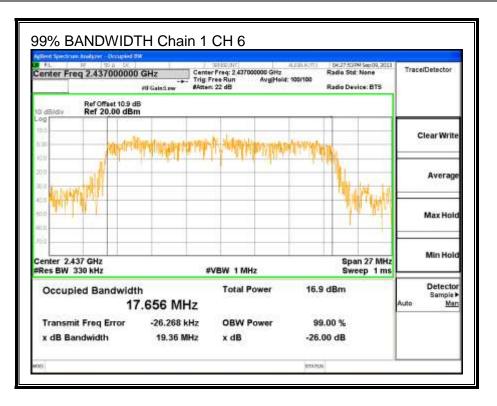
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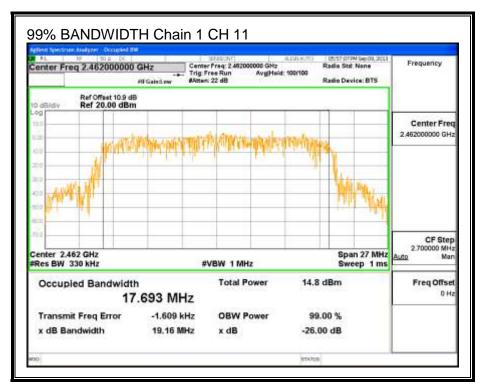


99% BANDWIDTH, Chain 1



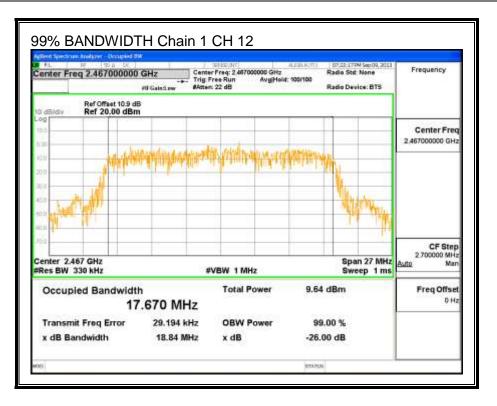
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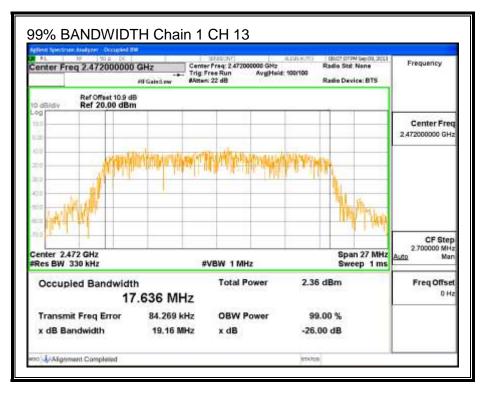




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8.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.9 dB (including 10 dB pad and 0.9 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
1	2412	14.92	14.90	17.92
6	2437	16.44	16.42	19.44
11	2462	14.50	14.50	17.51
12	2467	9.47	9.50	12.50
13	2472	2.00	2.00	5.01

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8.3.4. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247 IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
0.81	-1.86	-0.32

<u>RESULTS</u>

Limits

Channel	Frequency	Directional	FCC	IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
1	2412	-0.32	30.00	30	36	30.00
6	2437	-0.32	30.00	30	36	30.00
11	2462	-0.32	30.00	30	36	30.00
12	2467	-0.32	30.00	30	36	30.00
13	2472	-0.32	30.00	30	36	30.00

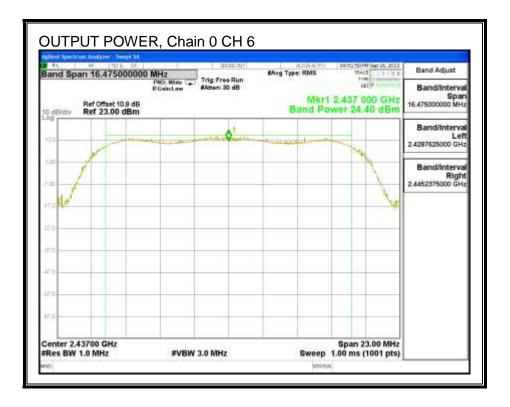
Results

Channel	Frequency	Chain 0	Chain 1	Total	Power	Margi
		Meas	Meas	Corr'd	Limit	
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
1	2412	23.02	23.34	26.19	30.00	-3.81
6	2437	24.40	24.92	27.68	30.00	-2.32
11	2462	22.85	23.01	25.94	30.00	-4.06
12	2467	17.94	18.21	21.09	30.00	-8.91
13	2472	9.88	10.37	13.14	30.00	-16.86

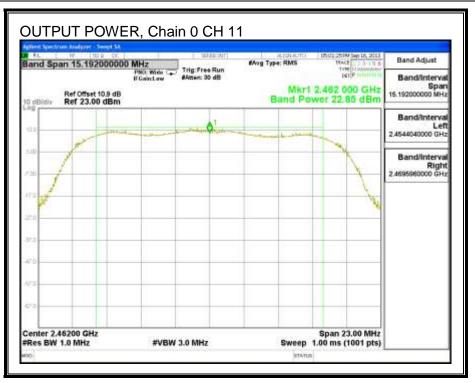
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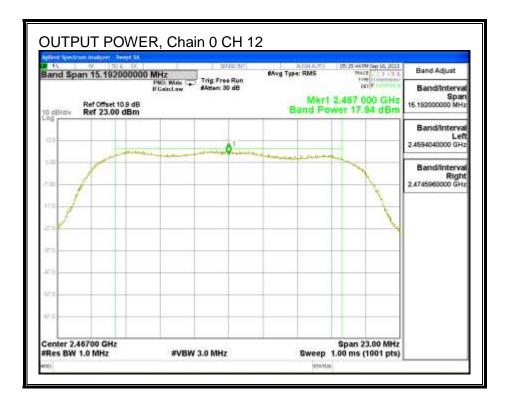
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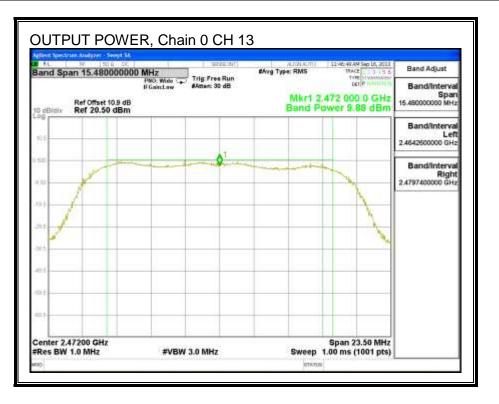
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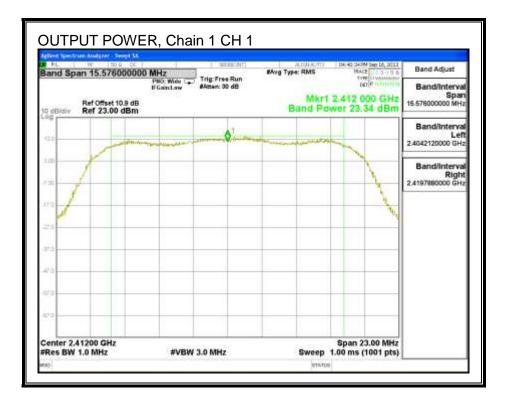


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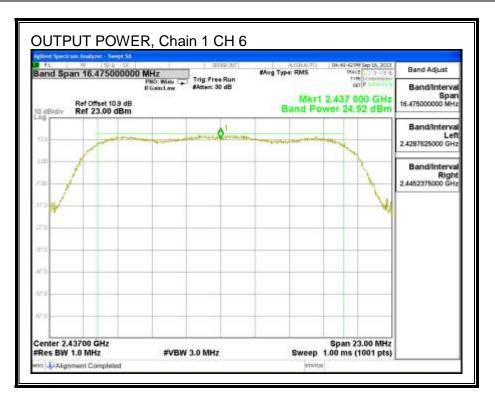
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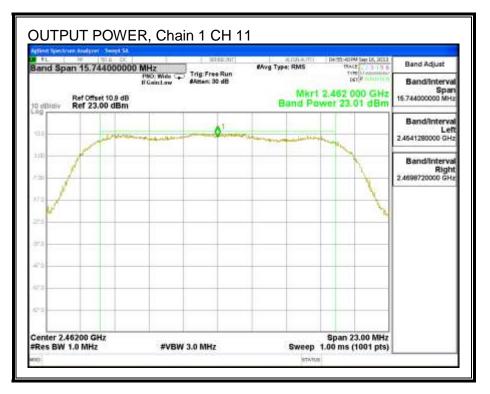


OUTPUT POWER, Chain 1



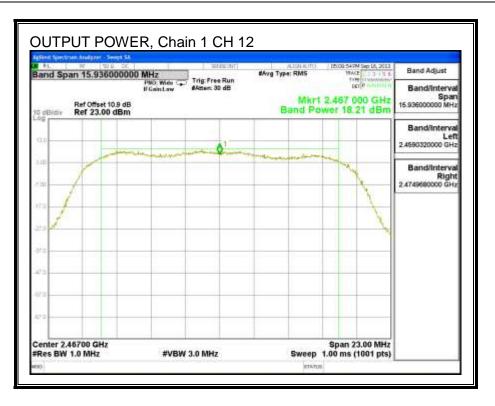
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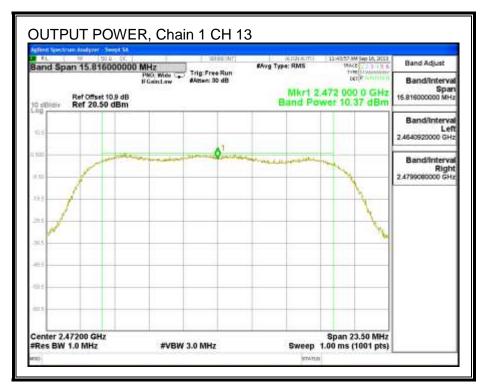




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8.3.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

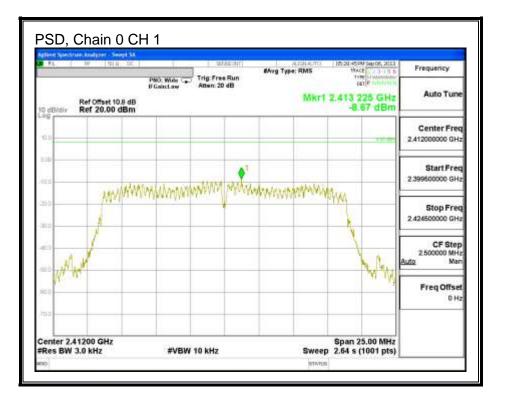
<u>RESULTS</u>

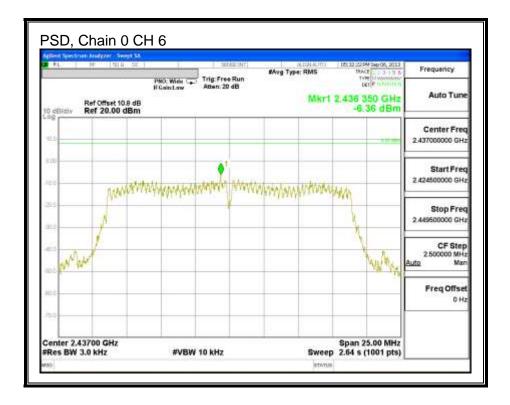
PSD Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Meas	Meas	PSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
1	2412	-8.67	-8.71	-5.68	8.0	-13.7
6	2437	-6.36	-7.61	-3.93	8.0	-11.9
11	2462	-8.56	-8.88	-5.71	8.0	-13.7
12	2467	-13.99	-13.84	-10.91	8.0	-18.9
13	2472	-21.74	-20.92	-18.30	8.0	-26.3

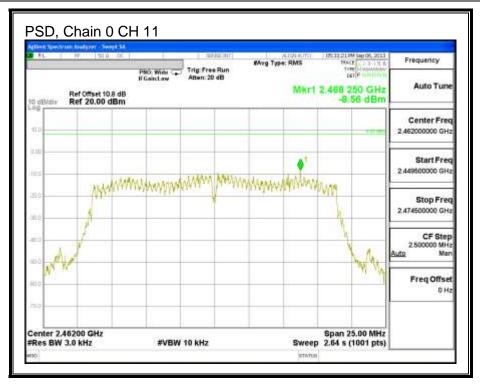
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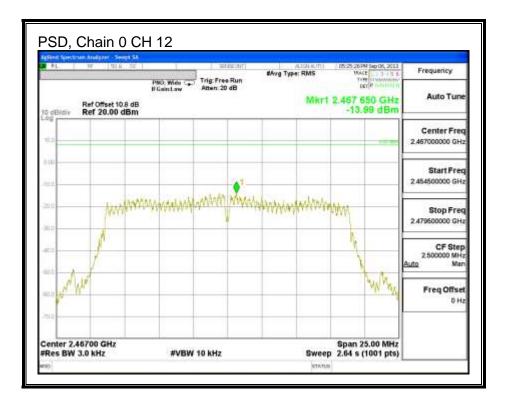
PSD, Chain 0





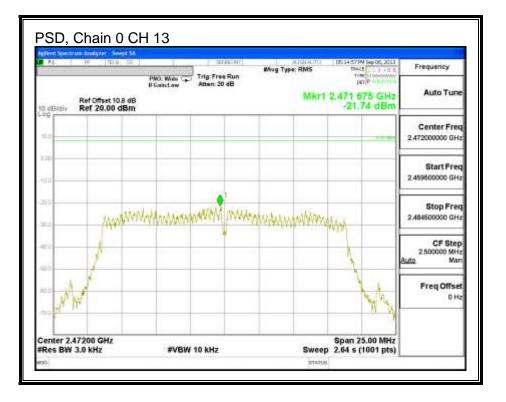
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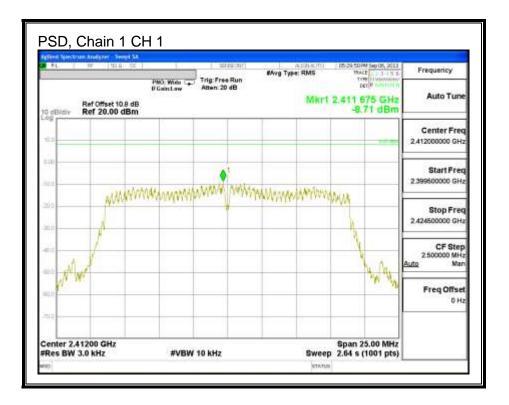


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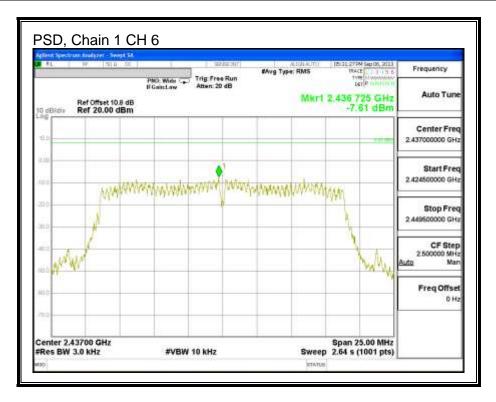
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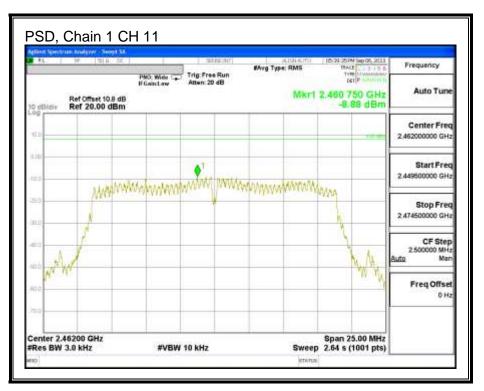


PSD, Chain 1



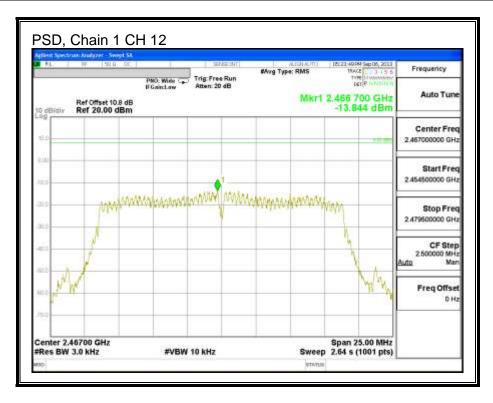
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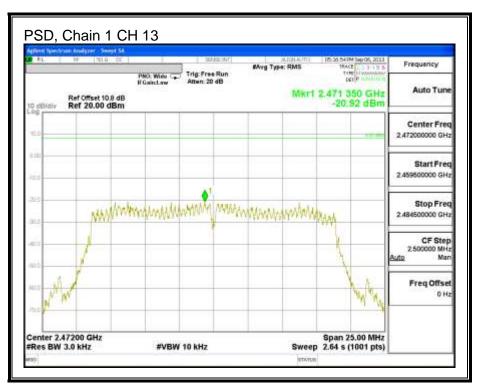




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8.3.6. OUT-OF-BAND EMISSIONS

<u>LIMITS</u>

FCC §15.247 (d)

IC RSS-210 A8.5

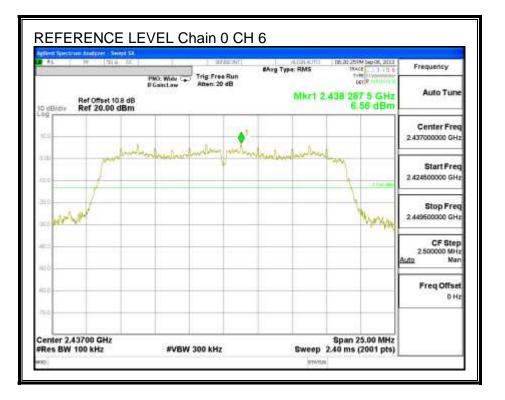
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

TEST PROCEDURE

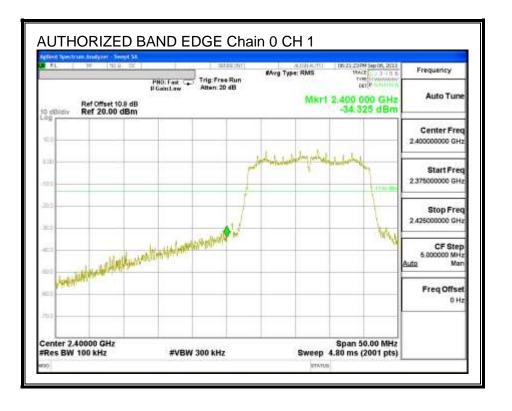
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the inband reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

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IN-BAND REFERENCE LEVEL, Chain 0

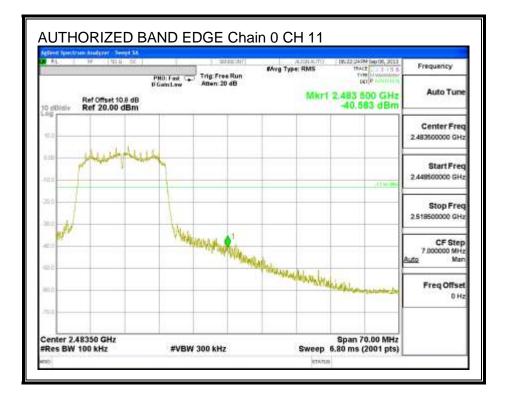


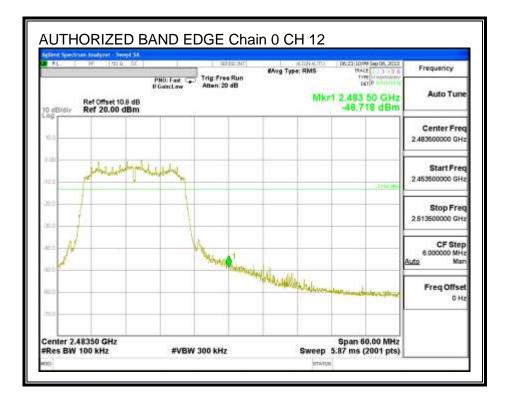
LOW CHANNEL BANDEDGE, Chain 0



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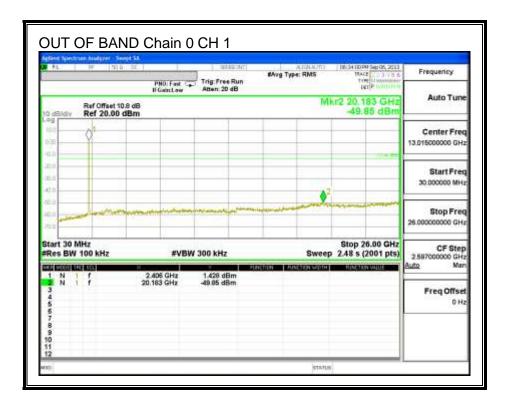




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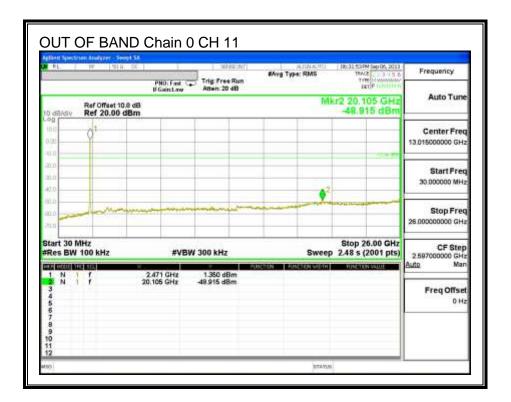
RL.	14 1418 S	PHO: Fast C	Trig Free Run Atten 20 dB	#Avg Type: RMS	IN-20-ADPM Sep 06, 2011 INACE 12-3-75 5 TVRE IN WARNING DOT P INTERNA	
VINB/Bb 0	Ref Offset 10.8 d Ref 20.00 dBr			M	49,58 dBm	Auto Tun
00 00 00	Q ¹	8 I				Center Free 13.015000000 GH
0.0						Start Free 30.000000 MH
0.0	- some of		and a second			Stop Free 26.00000000 GH
art 30 Mi Res BW 1		#VBI	W 300 kHz	Sweep	Stop 26.00 GHz 2.48 s (2001 pts)	CF Step 2 597000000 GH
1 N 1 2 N 1 3 4 5 5 6 7 7 8 9 9 0 1	f f	2.471 GHz 20.106 GHz	-3.186 dBm -49.59 dBm	ANCIDA VETH	FINCTER VALUE	Auto Mar Freq Offse 0 H

OUT-OF-BAND EMISSIONS, Chain 0



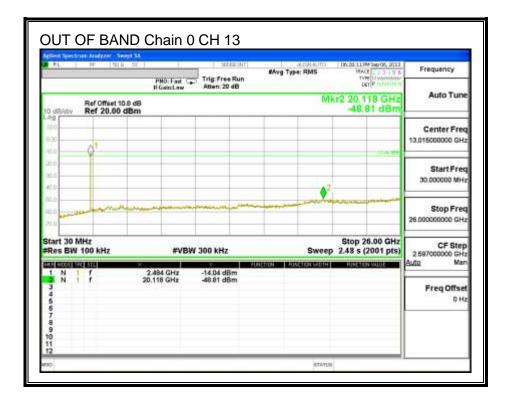
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	1 19	ndazer – See Fille	- 55	MD: Fast C	Trig Free Run	#Avg Type; RM		Title Line Providence	Frequency
to develo		f Offset 10	8 dB	Gain:Low	Atten 20 dB		Mkr2	20.442 GHz -49.09 dBm	Auto Tune
00 0.20	0	1							Center Freq 13.01500000 GHz
20.0							2-		Start Free 30.000000 MH
0.0 20.0	_								Stop Free 26.00000000 GH
Start 30		kHz		#VBI	W 300 kHz	SI		top 26.00 GHz 18 s (2001 pts)	CF Step 2.597000000 GH
1 N 2 N 3 4 5 6 7 8 9 10 11 12				6 GHz 2 GHz	4.336 dBm -49.09 dBm	HAREFOLD AUXEMENT	UDTH	HARTEN VEDE	Auto Mar Freq Offset 0 Ha

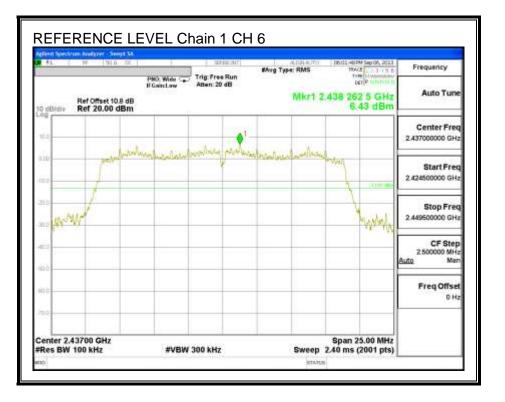


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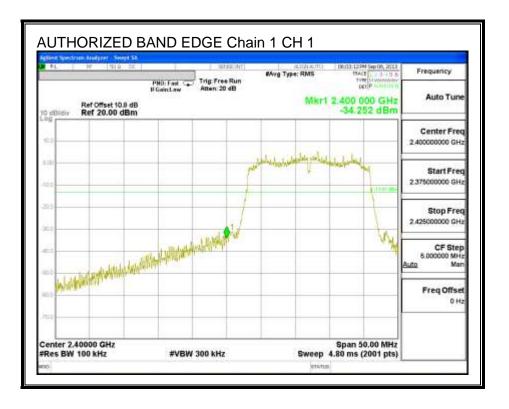
NL IV 1910		Trig. Free Run	ALTRACITO Mvg Type: RMS	18/29:4099 Sep 06, 2011 18/42 2 3 1 5 5 19/90 14 www.selectory	Frequency
Ref Offset 10	li GaintLaw	Atten 20 dB	M	kr2 20.105 GHz -49.58 dBm	Auto Tune
0 dB/div Ref 20.00 (38m			45.55 (151	Center Free 13.015000000 GH:
00 00 00			a2		Start Free 30.000000 MH
00	and and a start of the start of				Stop Free 26.00000000 GH
tart 30 MHz Res BW 100 kHz	#VB	W 300 kHz		Stop 26.00 GHz 2.48 s (2001 pts)	CF Step 2 59700000 GH Auto Mar
22 00 00 10 00 10 00 1 N 1 F 23 N 1 F 3 5 5 6 7 7 8 9 9 9 10 11 12 2	2.471 GHz 20.105 GHz	-3,196 dBm -49,50 dBm	ANCON ANCON	FUNCTION VALUE	Freq Offse 0 H



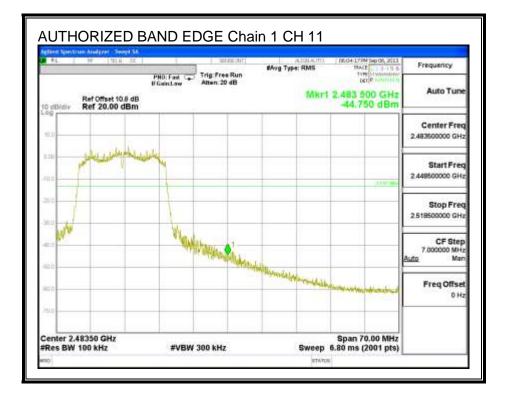
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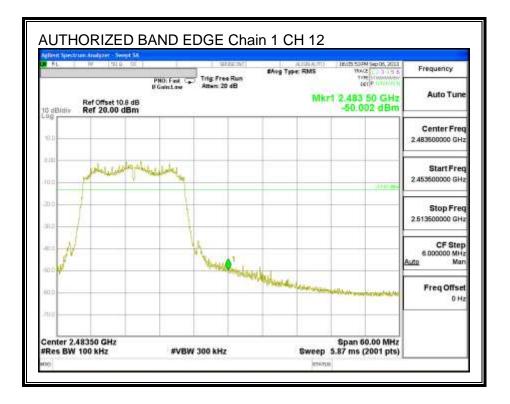


LOW CHANNEL BANDEDGE, Chain 1

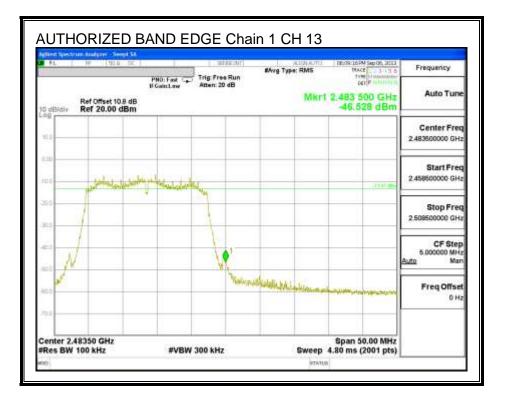


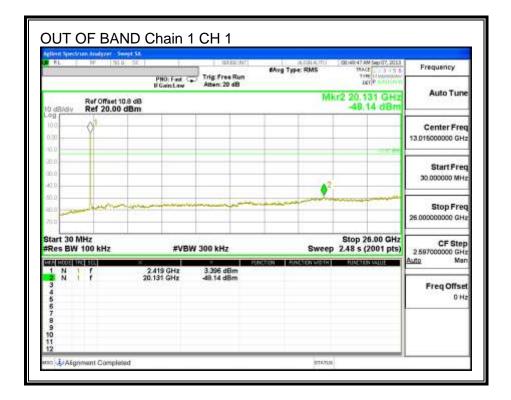
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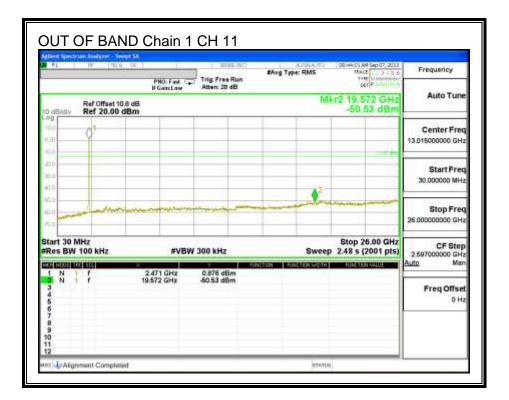
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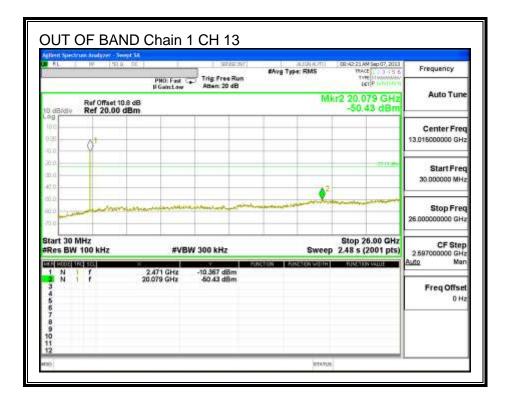
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RL.		indazer – Sens 7 – 1919 –	SE .	Feet Ca	Trig Free Run	#Avg Type	CIGUALITO RMS	000-452 12 AM Sep 07, 2013 TRACE 12: 3 -4 5 -5 Trift: 14 www.holds	Frequency
0 dBMIV		f Offset 10.8 f 20.00 dt	II Gan		Atten 20 dB		M	4r2 19,326 GHz -50,44 dBm	Auto Tune
000	Ý	1	2411						Center Free 13.015000000 GH:
0.0 0.0 40.0							12		Start Free 30.000000 MH
	-	-matrix	-			and some first	Jun		Stop Free 26.000000000 GH
itart 30 Res BW		kHz		#VBV	/ 300 kHz		Sweep	Stop 26.00 GHz 2.48 s (2001 pts)	2.597000000 GH
1 N 2 N 3 4 5 6 7 8 9 10 11 12		2	2,432 (19,326 (iHz iHz	4.190 dBm -50.44 dBm			FUNCTION VALUE	Auto Mar Freq Offse 0 H3



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RL.	14	1919	ρ	NO: Fast C	Trig Free		#Avg Typ	e: RMS	1040	8 Sep 07, 2013 8 1 2 3 4 5 5 9 1 Watersteiner 7 P	Frequency
VIMBE D		ffset 10.6 20.00 dl	8 dB	Gain:Law	Atten: 20 d	iB		M	r2 20.1	2	Auto Tuni
99 00 00	01										Center Free 13.015000000 GH:
0.0								- 42		anie	Start Free 30.000000 MH
0.0	-	and the second sec		*****	******	-	مەخىسىيە	بلير		and a second second	Stop Free 26.00000000 GH
tart 30 Res BW		Hz		#VB	W 300 kHz		1	Sweep		6.00 GHz 2001 pts)	CF Step 2 597000000 GH
1 N 2 N 3 4 5 5 5 7 8 9 1				8 GHz 4 GHz	-2.712 dB -50.47 dB	m	CTON AUX	NUM MULT	HINCTL		Auto Mar Freq Offse 0 H



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8.4. 802.11a SISO MODE IN THE 5.8 GHz BAND

8.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

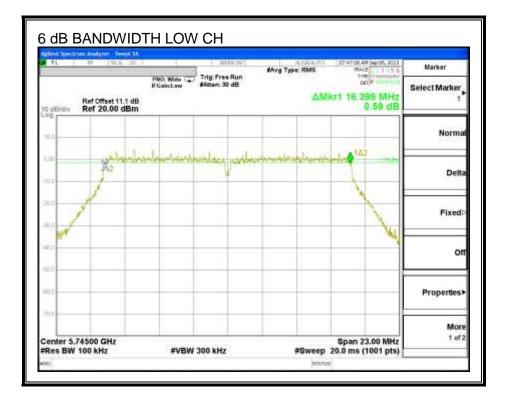
TEST PROCEDURE

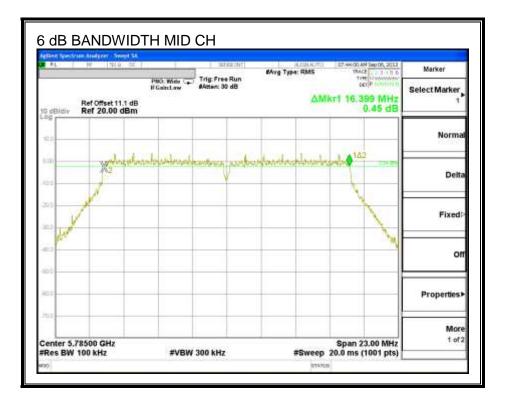
KDB 558074 D01 v01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

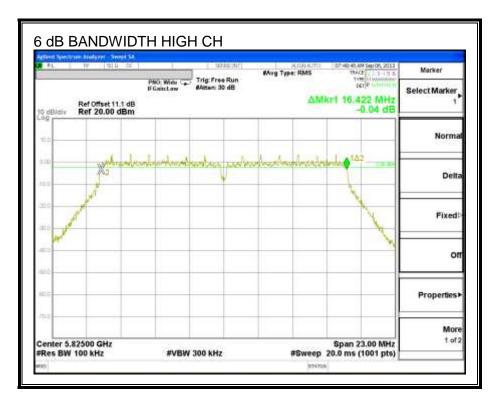
Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	5745	16.399	0.5
Mid	5785	16.399	0.5
High	5825	16.422	0.5

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8.4.2. 99% BANDWIDTH

DATE: SEPTEMBER 17, 2013 IC: 579C-A1489

LIMITS

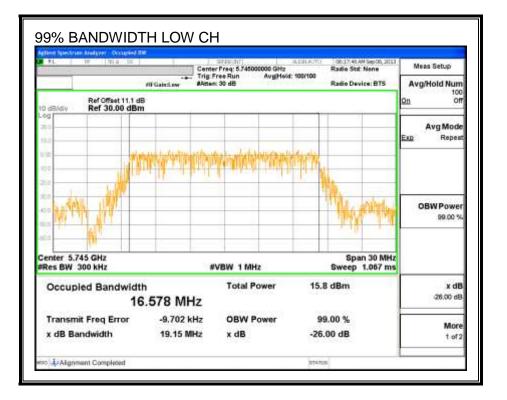
None; for reporting purposes only.

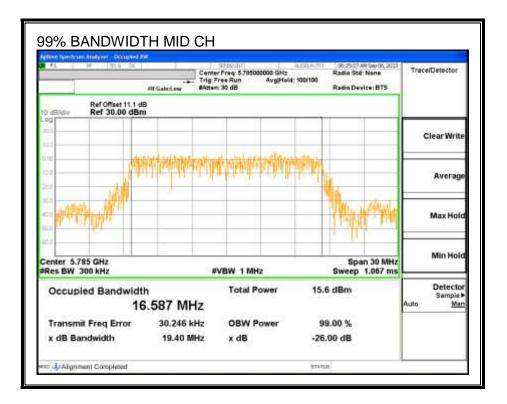
RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5745	16.5780
Mid	5785	16.5870
High	5825	16.4760

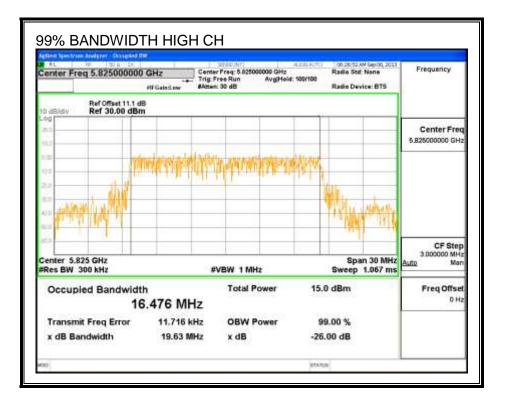
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8.4.3. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.1 dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
Low	5745	15.50
Mid	5785	15.50
High	5825	15.42

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8.4.4. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

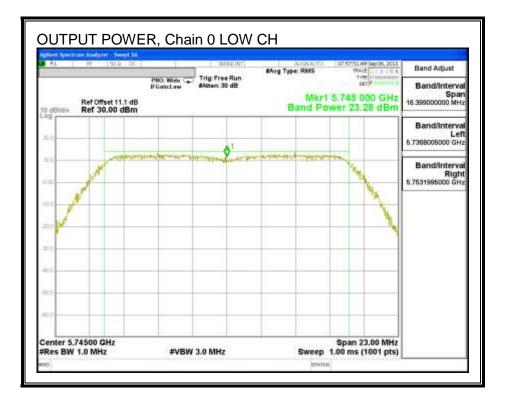
RESULTS

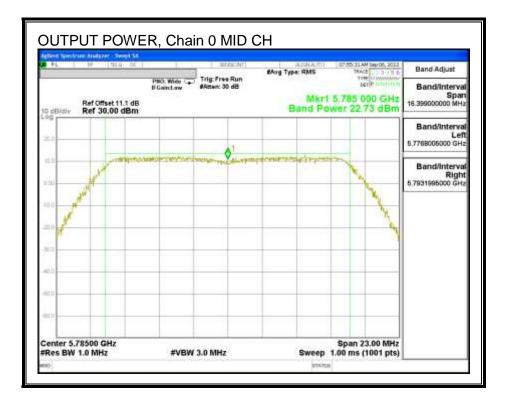
Limits

Channel	Frequency	Directional	FCC	IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5745	3.76	30.00	30	36	30.00
Mid	5785	3.76	30.00	30	36	30.00
High	5825	3.76	30.00	30	36	30.00

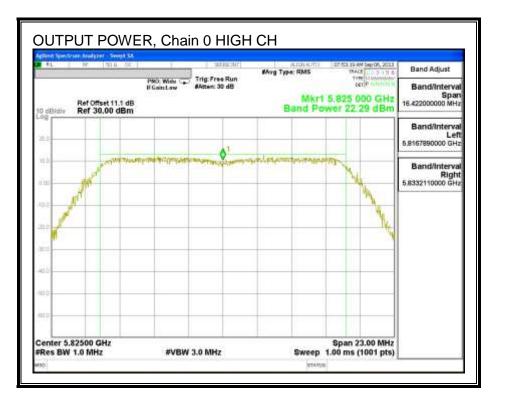
Results

Channel	Frequency	Chain 0	Total	Power	Margin
		Meas	Corr'd	Limit	
		Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5745	23.28	23.28	30.00	-6.72
Mid	5785	22.73	22.73	30.00	-7.27
High	5825	22.29	22.29	30.00	-7.71





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8.4.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

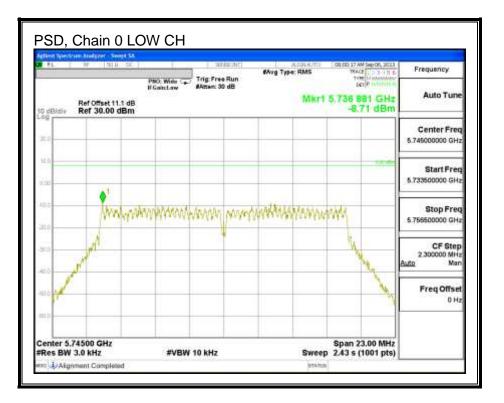
<u>RESULTS</u>

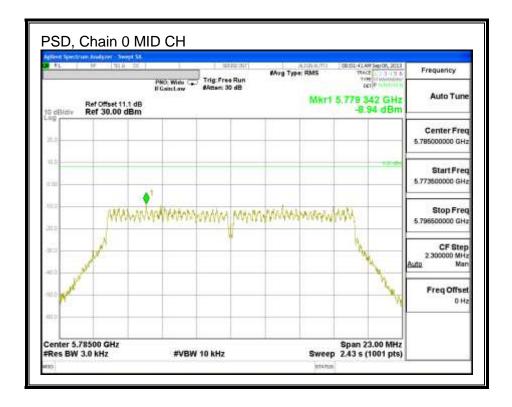
PSD Results

Channel	Frequency	Chain 0	Limit	Margin
		Meas		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5745	-8.71	8.0	-16.7
Mid	5785	-8.94	8.0	-16.9
High	5825	-9.63	8.0	-17.6

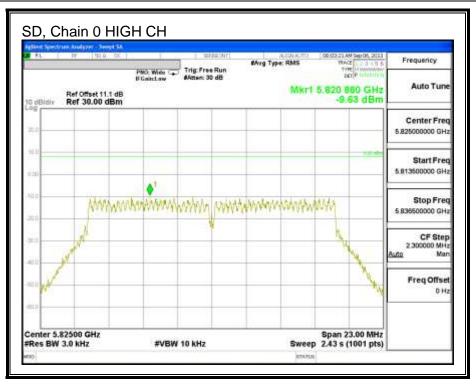
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PSD, Chain 0





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8.4.6. OUT-OF-BAND EMISSIONS

<u>LIMITS</u>

FCC §15.247 (d)

IC RSS-210 A8.5

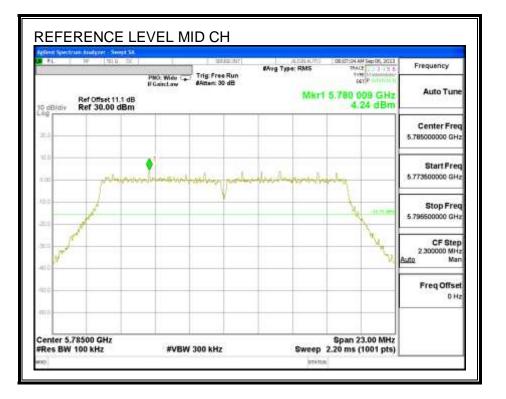
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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.

TEST PROCEDURE

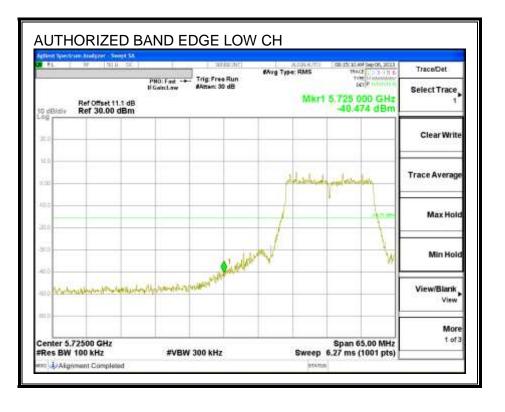
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the inband reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

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IN-BAND REFERENCE LEVEL

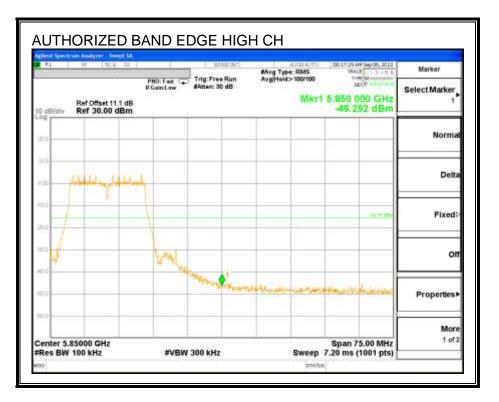


LOW CHANNEL BANDEDGE

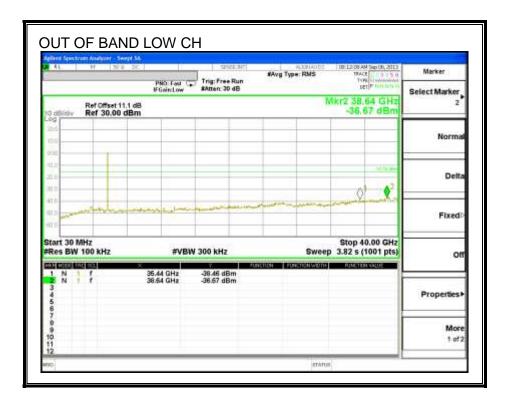


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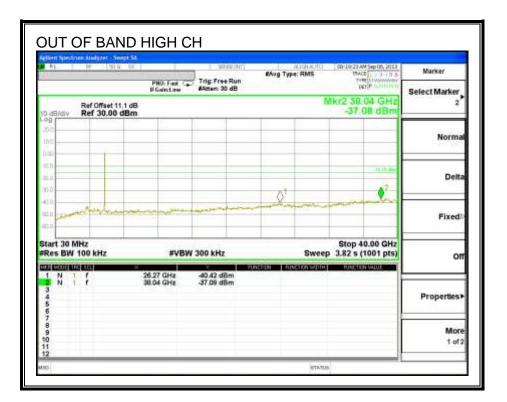


OUT-OF-BAND EMISSIONS



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Marker	101-09:50 AM Sep 06, 2013 70-45 5	Type: RMS	1	321Y221	and the second second	SI 2 DC	11		AL.
Select Marker	DET P THE H H H		19 - F	Trig: Free Ru #Amen: 30 dE	PHD: Fast				_
2	-38.64 GHz -38.69 dBm					t 11.1 dB 00 dBm			0 48
Norma									000 - 000
Delta	01 0 ²								0.0 0.0
Fixed	-X-X-	n Lonino			a production of the second		tint	-	0.0 0.0
or	Stop 40.00 GHz 3.82 s (1001 pts)	Sweep	etter	300 kHz	#VBW		00 kHz	30 MH BW 10	Res
Properties				-37.92 dBm -36.69 dBm	D4 GHz 64 GHz		;		1 2 3 4 6 6
More 1 of									7 8 9 10



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8.5. 802.11n HT20 CDD 2TX MODE IN THE 5.8 GHz BAND

8.5.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

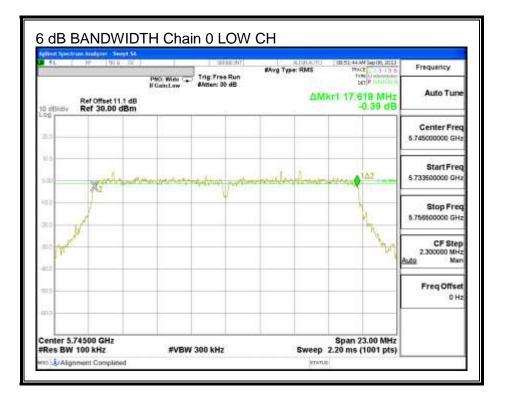
TEST PROCEDURE

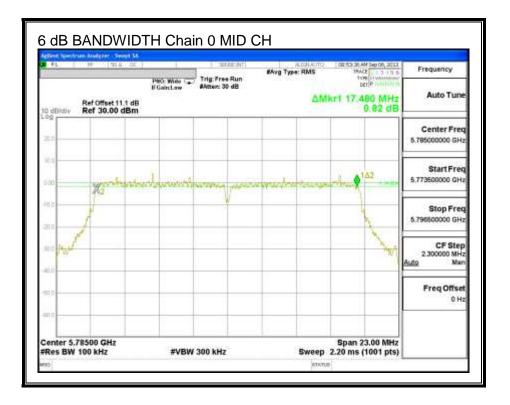
KDB 558074 D01 v01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

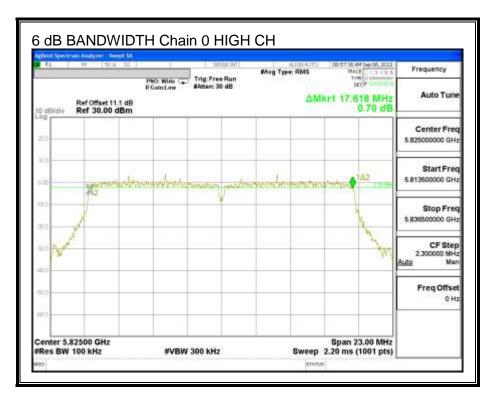
Channel	Frequency	6 dB BW	6 dB BW	Minimum
		Chain 0	Chain 1	Limit
	(MHz)	(MHz)	(MHz)	(MHz)
Low	5745	17.618	17.641	0.5
Mid	5785	17.480	17.641	0.5
High	5825	17.618	17.618	0.5

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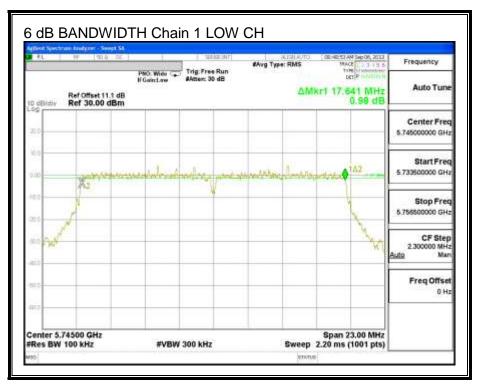




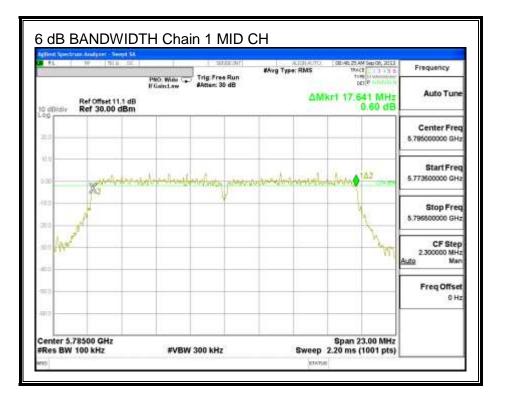
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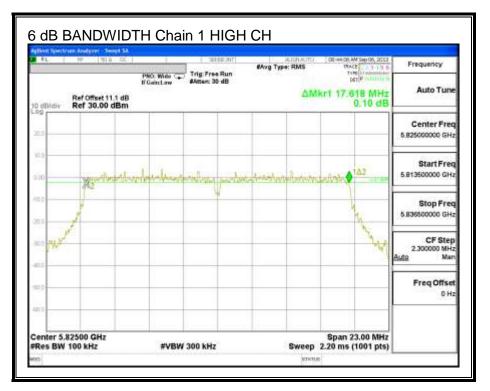


6 dB BANDWIDTH, Chain 1



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8.5.2. 99% BANDWIDTH

DATE: SEPTEMBER 17, 2013 IC: 579C-A1489

LIMITS

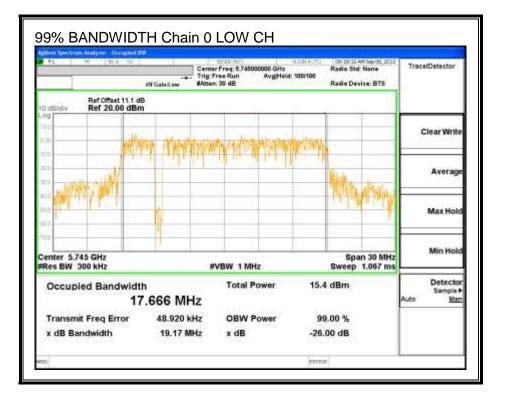
None; for reporting purposes only.

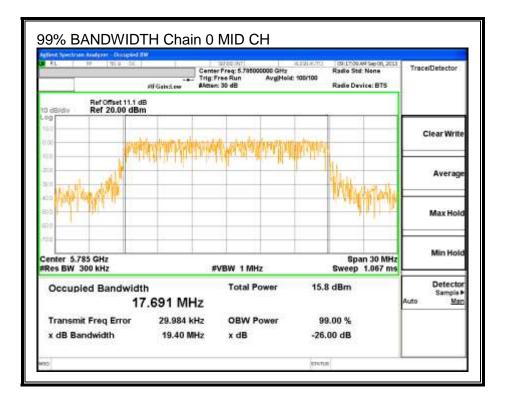
RESULTS

Channel	Frequency	99% BW	99% BW
		Chain 0	Chain 1
	(MHz)	(MHz)	(MHz)
Low	5745	17.6660	17.7630
Mid	5785	17.6910	17.7470
High	5825	17.6610	17.6840

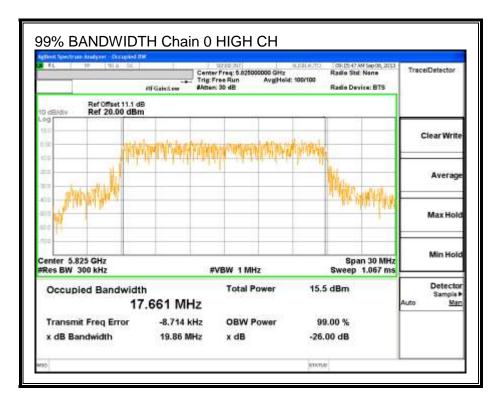
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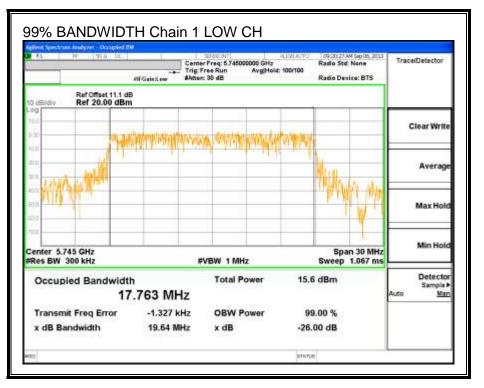




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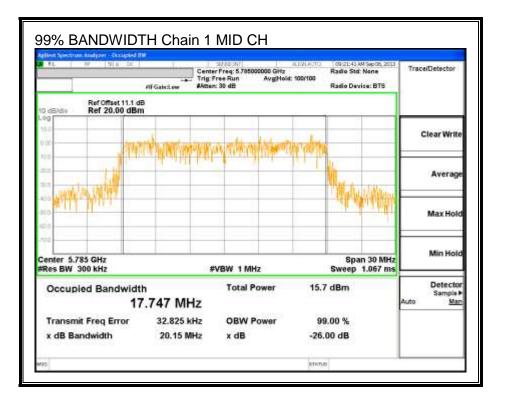


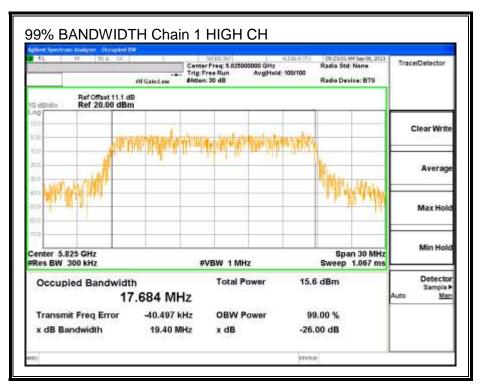
99% BANDWIDTH, Chain 1



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8.5.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.1 dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Chain 0	Chain 1	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5745	15.38	15.50	18.45
Mid	5785	15.39	15.50	18.46
High	5825	15.50	15.48	18.50

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8.5.4. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
2.68	3.76	3.25

RESULTS

Limits

Channel	Frequency	Directional	FCC	IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5745	3.25	30.00	30	36	30.00
Mid	5785	3.25	30.00	30	36	30.00
High	5825	3.25	30.00	30	36	30.00

Results

Channel	Frequency	Chain 0	Chain 1	Total	Power	Margi
		Meas	Meas	Corr'd	Limit	
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5745	22.64	22.49	25.58	30.00	-4.42
Mid	5785	22.59	22.43	25.52	30.00	-4.48
High	5825	22.66	22.96	25.82	30.00	-4.18

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