



FCC CFR47 PART 15 SUBPART E INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

802.11a/g/n FLOOR STANDING PRODUCT

MODEL NUMBER: SUB

FCC ID: SBVRM005 IC: 5373A-RM005

REPORT NUMBER: 11U14084-6, Revision A

ISSUE DATE: APRIL 19, 2012

Prepared for SONOS, INC. 223 E. DE LA GUERRA SANTA BARBARA, CA 93101, U.S.A.

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

NVLAP LAB CODE 200065-0

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SONOS, INC. 223 E. De La Guerra ST. SANTA BARBARA, CA 93101, I	SONOS, INC. 223 E. De La Guerra ST. SANTA BARBARA, CA 93101, U.S.A.			
EUT DESCRIPTION: 802.11a/g/n FLOOR STANDING PRODUCT					
MODEL: SUB					
SERIAL NUMBER: 1111-00-0E-58-94-00-94-A, 00 0E 58 94 00 32 E					
DATE TESTED: DECEMBER 12, 2011 - JANUARY 13, 2012					
	APPLICABLE STANDARDS				
	STANDARD	TEST RESULTS			
CFR 4	Pass				
INDUSTRY CANA	ADA RSS-210 Issue 8 Annex 9	Pass			
INDUSTRY C	Pass				

Compliance Certification Services (UL CCS) 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

Tested By:

FRANK IBRAHIM EMC SUPERVISOR UL CCS

TOM CHEN EMC ENGINEER UL CCS

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, 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.

UL CCS 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

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%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a floor standing product with 802.11a/g/n 2x2 MIMO.

The radio module is manufactured by Sonos.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
5180 - 5240	802.11n HT20	15.92	39.08
5260 - 5320	802.11n HT20	22.40	173.78
5500 - 5700	802.11n HT20	22.76	188.80

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two dipole antennas on PCB, the antennas gains are as follows:

	Antenna-01(dB)		Antenna-02 (dB)	
Frequency	Peak Gain (dBi)	Efficiency (%)	Peak Gain (dBi)	Efficiency (%)
2400MHz	3.86	49.82	2.79	49.82
2450MHz	3.97	48.91	2.71	50.04
2500MHz	3.81	44.56	3.17	47.93
4900MHz	4.27	53.64	3.17	55.06
5150MHz	4.98	56.08	3.00	57.87
5250MHz	4.10	51.39	3.92	59.00
5350MHz	4.03	56.90	3.55	53.41
5725MHz	4.09	50.56	4.27	54.51
5825MHz	3.55	54.82	4.38	59.36
5850MHz	3.42	54.97	4.38	57.25

5.4. SOFTWARE AND FIRMWARE

The Sonos software version is V3.6 17.1-48020.

5.5. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions below 1 GHz and Power line Conducted Emissions, the channel with the highest conducted output power was selected as worst-case scenario.

Worst-case data rates as provided by the manufacturer are: For 11n HT20 (5180-5240 GHz band): MCS9 For 11n HT20 (5260-5320 GHz band): MCS9 For 11n HT20 (5500-5700 GHz band): MCS9

To determine the worst orientation of the EUT for highest emissions, the EUT's antenna was investigated for X and Y orientations; the worst orientation was Y orientation; therefore, all final radiated emissions were performed with the EUT's antenna laid in the Y orientation.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST					
Description Manufacturer Model Serial Number FCC ID					
Laptop	Dell	P05G	3535214077	DoC	
Laptop AC Adapter	Dell	LA65NS2-01	72438-084	DoC	

I/O CABLES

	I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks	
1	AC	1	US 115V	Un-shielded	1.8m	N/A	
2	AC	1	US 115V	Un-shielded	1m	N/A	
3	DC	1	DC	Un-shielded	1.8m	N/A	
4	Ethnet	1	RJ45	Un-shielded	2m	Connect to Laptop	

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SETUP DIAGRAM FOR 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 Date	Cal Due	
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	08/04/11	08/04/12	
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01176	08/04/11	08/04/12	
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/29/11	06/29/12	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/18/11	07/18/12	
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/16/11	07/16/12	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/11	01/27/12	
Peak Power Meter	Agilent / HP	N1911A	1282124A	08/04/11	08/04/12	
Peak and Avg Power Sensor	Agilent / HP	E9323A	1240537J	08/04/11	08/04/12	
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI7	1000741	7/6/2011	7/6/2012	
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11	11/10/12	
Horn Antenna, 26 GHz	ARA	MWH-1826/B	C00589	07/28/11	07/28/12	
Horn Antenna, 40 GHz	ARA	MWH-2640/B	C00981	06/14/11	06/14/12	
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/12/11	08/12/12	

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7. ANTENNA PORT TEST RESULTS

7.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

CHAIN 1

Channel	annel Frequency 26 dB Bandwidth		99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5180	27.781	16.7589
Middle	5200	28.221	16.5922
High	5240	28.996	16.5246

CHAIN 2

Channel	nel Frequency 26 dB Bandwidth		99% Bandwidth	
	(MHz)	(MHz)	(MHz)	
Low	5180	27.806	16.7598	
Middle	5200	30.942	16.9436	
High	5240	33.676	17.1823	

CHAIN 1

26 dB BANDWIDTH



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BANDWIDTH MID CH	Measure
Ch Freq 5.2 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
IU IU	ACP
dB	Multi Carrier Power
#Res BW 200 kHz VBW 620 kHz #Sweep 100 ms (601 pts)	
Occupied Bandwidth Occ BW % Pwr 99.00 % 17 8435 MHz × dB -26.00 dB	Power Stat CCDF
Transmit Freq Error -227.952 kHz x dB Bandwidth 28.221 MHz	More 1 of 2
Copyright 2000-2010 Agilent Technologies	

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BANDWIDTH HIGH Agilent 08:34:18 Jan 4, 2	I CH		RТ	Measure
Ch Freq 5.24 Occupied Bandwidth	GHz		Trig Free	Meas Off
Project: 11U14084	20.10			Channel Power
Ref 20 dBm Aften #Peak				Occupied BW
dB/ Offst 11.3				ACP
Center 5.240 00 GHz		S	pan 50 MHz	Multi Carrier Power
Res BW 360 kHz	#VBW 1.1 MHz	#Sweep 100 ms	99.00 %	Power Stat CCDF
18.14 Transmit Freq Error x dB Bandwidth	16 MHZ 462.524 kHz 28.996 MHz	× 60	-20,00 00	More 1 of 2
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99% BANDWIDTH



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CHAIN 2

26 dB BANDWIDTH



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BANDWIDTH MID CH	Measure
Ch Freq 5.2 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
10 dB/ offst	ACP
dB	Multi Carrier Power
#Res BW 200 kHz VBW 620 kHz #Sweep 100 ms (601 pts)	Power Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.7426 MHz × dB -26.00 dB	CCDF
Transmit Freq Error -178.697 kHz x dB Bandwidth 30.942 MHz	More 1 of 2
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BANDWIDTH HIGH CH	Measure
Ch Freq 5.24 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
10 dB/ Offst 11.3	ACP
dB	Multi Carrier Power
#Res BW 360 kHz #VBW 1.1 MHz #Sweep 100 ms (601 pts)	Devuer Otet
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.0284 MHz × dB -26.00 dB	CCDF
Transmit Freq Error 332.632 kHz x dB Bandwidth 33.676 MHz	More 1 of 2
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99% BANDWIDTH



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BANDWIDTH HIGH CH Agilent 08:39:53 Jan 4, 2012		RТ	Measure
Ch Freq 5.24 GHz Occupied Bandwidth	Averages: 100	Trig Free	Meas Off
Project: 11U14084			Channel Power
Ref 20 dBm Atten 20 dB #Samp Log	# # # #		Occupied BW
10 dB/ Offst 11.3 dB	·		ACP
Center 5.240 00 GHz		Span 50 MHz	Multi Carrier Power
Occupied Bandwidth	Occ BW % Pwr	99.00 %	Power Stat CCDF
17.1823 MHz Transmit Freq Error -158.565 kH: x dB Bandwidth 25.859 MHz'	2 × 00	-20.00 00	More 1 of 2
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7.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

Based on the characteristics of the EUT and various criteria method SA-3 ALT was selected.

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RESULTS

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5180	17	27.781	18.44	4.98	17.00
Mid	5200	17	28.221	18.51	4.98	17.00
High	5240	17	28.996	18.62	4.98	17.00

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	12.98	12.30	15.66	17.00	-1.34
Mid	5200	13.13	12.68	15.92	17.00	-1.08
High	5240	12.34	12.71	15.54	17.00	-1.46

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CHAIN 1 OUTPUT POWER



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OUTF 🔆 Agi	PUT P(lent 22:14	OWER :50 Jan 5, 2	HIGH	I CH,	CHA	AIN 1		F	₹Т	Freq/Cha	nnel
Project: Ref 20 a #Peak	11U14084 IBm	Atten	20 dB				Mkr2	5.247 10 0.64)GHz IdBm	Center 5.2400000	Freq) GHz
Log 10 dB/ Offst			/			2 •				Start 5.2150000	Freq) GHz
11.3 dB								1		Stop 5.2650000	Freq GHz
#PAvg										CF 5.00000000 <u>Auto</u>	= Step D MHz <u>Man</u>
Center #Res Bu Marker	5.240 00 G N 1 MHz Trace	iHz Type	#\	/ VBW 3 k ×	Hz Axis	#Swe	ep 13 n	Span : ns (1001 Amplitu	50 MHz pts)	Freq C 0.0000000)ffset 10 Hz
1R 1 <u>∆</u> 2	(1) (1) (1)	Freq Freq Freq		5.223 (34.) 5.247 ()O GHz DO MHz IO GHz			-37.45 dB 12.34 dE 0.64 dE	m 9m Im	Signal ⁻ On	Track <u>Off</u>
Copyrigh	nt 2000-201	10 Agilent Te	chnolog	jies							

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CHAIN 2 OUTPUT POWER



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🔆 Agiler	nt 22:35:44 k	Jan 5, 2012					F	RΤ	Freq/Cha	annel
Project: 11 Ref 20 dB #Peak	U14084 m	Atten 20 d	B			Mkr2	5.246 0: 0.75	5GHz idBm	Center 5.2400000	Freq 0 GHz
Log 10 dB/ Offst					\$				Start 5.2150000	Freq 0 GHz
11.3 dB	IR Ø								Stop 5.2650000	Freq 0 GHz
#PAvg -									C 5.0000000 <u>Auto</u>	F Step 0 MHz <u>Mar</u>
Center 5.2 #Res BW	240 00 GHz 1 MHz	Turne	#VBW 3 k	(Hz	#Swe	eep 13 n	Span (ns (1001	50 MHz pts)	Freq 0 0.0000000)ffset)0 Hz
1R 1 <u>A</u> 2	(1) (1) (1)	Freq Freq Freq Freq	5.223 (34. 5.246 (00 GHz 00 MHz 05 GHz			-38.96 dB 12.71 dE 0.75 dE	m)m Im	Signal On	Track <u>Off</u>

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7.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5180	10.50	9.90	13.22
Middle	5200	10.50	10.22	13.37
High	5240	10.30	10.35	13.34

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7.1.4. PEAK POWER SPECTRAL DENSITY

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 4 dBm.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	1.28	0.49	3.91	4	-0.09
Middle	5200	1.09	0.82	3.97	4	-0.03
High	5240	0.64	0.75	3.71	4	-0.29

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CHAIN 1 POWER SPECTRAL DENSITY



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A Ogila	ant 22.11.00	Jan 9, 201.	2				Г	<u> </u>	
Project: 1 Ref 20 dE	1U14084 3m	Atten 20	dB			Mkr2	5.206 79	5 GHz 9 dBm	Center Freq
#Peak					2				3.20000000 0112
10 -			<u> </u>		0				Start Freq
dB/ -		+ /			\vdash				5.17500000 GHz
Offst		+			· · · · ·				
11.3 dB	1					-	1		Stop Freq
	www.www.								5.22500000 GHz
F									
\vdash									СН Step
#PAvg 🗕									Auto Ma
∟ Center 5	200.00.6Hz						Snan ⁴	50 MHz	
#Res BW	1 MHz		#VBW 3 I	dHz	#Swe	ep 13 n	ns (1001	ptsì	Freq Offset
Marker	Trace	Туре	>	Axis			Amplitu	Jde	0.0000000 Hz
1R	(1)	Freq	5.184	00 GHz			-34.33 dB	m	
1Δ	(1)	Freq	32 5 206	.00 MHz 75 GHz			13.13 dE	im Im	Signal Track
-		1164	0.200	10 0112			1.08 42		On <u>Of</u>

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PSD H 🔆 Agile	IIGH CH ent 22:14:50	I , CHAII Jan 5, 2012	N 1				F	RТ	Freq/Channel
Project: 1 Ref 20 dE #Peak	1U14084 3m	Atten 20 d	B			Mkr2	5.247 11 0.64)GHz dBm	Center Freq 5.24000000 GHz
Log 10 dB/ Offet			_		 				Start Freq 5.2150000 GHz
dB	IR.						1		Stop Freq 5.2650000 GHz
#PAvg -									CF Step 5.00000000 MHz <u>Auto Man</u>
Center 5. #Res BW	240 00 GHz 1 MHz		#VBW 3 k	Hz	#Swe	ep 13 n	Span : ns (1001	50 MHz pts)	Freq Offset
Marker 1R 1 <u>∆</u> 2	Trace (1) (1) (1)	Type Freq Freq Freq	X 5.223 (34) 5.247 ⁻	Axis OO GHz OO MHz 10 GHz			Amplitu -37.45 dB 12.34 dE 0.64 dE	ıde m 9m 9m	Signal Track On <u>Off</u>
Copyright	2000-2010 A	gilent Techn	ologies						

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CHAIN 2 POWER SPECTRAL DENSITY



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	11 22.00.00	0an 0, 201	2						
Project: 11 Ref 20 dB	m	Atten 20	dB			MKIZ	5.204 5: 0.82	dBm	Center Freq
Peak				2					
				¢					Start From
dB/			<u> </u>						5.17500000 GHz
Offst 🔔					<u> </u>				
11.3	1						1_1		Stop From
dB	\$						Q.		
									5.22500000 0112
									CE Ster
									5.0000000 MHz
^{#PAvg} ├─									<u>Auto Ma</u>
Center 5.3	200 00 GHz					I	Span :	50 MHz	
#Res BW	1 MHz		#VBW 3	kHz	#Swe	ep 13 n	ns (1001	ptsì	Freq Offset
Marker	Trace	Туре		X Axis		-	Amplitu	Jde	U.0000000 Hz
1R	(1)	Freq	5.18	400 GHz			-37.57 dB	m	
1Δ	(1)	Freq	3	2.00 MHz			12.68 dE) m	Signal Track
2	(1)	Freq	5.20	4 55 GHZ			0.82 de	'm	On Of

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🔆 Agiler	it 22:35:44	Jan 5, 2012					F	RΤ	Freq/Channel
Project: 11 Ref 20 dB #Peak	U14084 m	Atten 20 d	IB			Mkr2	5.246 0: 0.75	5 GHz 5 dBm	Center Freq 5.24000000 GHz
Log 10 dB/					¢				Start Freq 5.21500000 GHz
dB							1		Stop Freq 5.26500000 GHz
#PAvg -									CF Step 5.00000000 MHz <u>Auto Mar</u>
Center 5.2 #Res BW 1	40 00 GHz 1 MHz		#VBW 3 k	dHz	#Swe	ep 13 n	Span : ns (1001	50 MHz pts)	Freq Offset
Marker 1R 1 <u>∆</u> 2	Trace (1) (1) (1)	Type Freq Freq Freq	> 5.223 (34. 5.246 ((Axis 00 GHz 00 MHz 05 GHz			Amplitu -38.96 dB 12.71 dE 0.75 dE	Jde Im 9m 9m	Signal Track On <u>Off</u>

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7.1.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

CHAIN 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	7.88	13	-5.12
Middle	5200	8.74	13	-4.26
High	5240	8.31	13	-4.69

CHAIN 2

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	6.54	13	-6.46
Middle	5200	9.25	13	-3.75
High	5240	9.18	13	-3.82

CHAIN 1

PEAK EXCURSION



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CHAIN 2

PEAK EXCURSION



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7.2. 802.11n HT20 MODE IN THE 5.3 GHz BAND

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

CHAIN 1

Channel	Frequency	26 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5260	24.468	16.1018
Middle	5300	24.778	16.4366
High	5320	27.086	17.0909

CHAIN 2

Channel	Frequency	26 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5260	33.04	16.1088
Middle	5300	31.297	17.3664
High	5320	31.343	16.3699

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CHAIN 1

26 dB BANDWIDTH



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BANDWIDTH MID CH	Measure
Ch Freq 5.3 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
li dB/ offst 11.3	ACP
dB	Multi Carrier Power
#Res BW 270 kHz	Power Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.1010 MHz x dB -26.00 dB	CCDF
Transmit Freq Error -92.110 kHz x dB Bandwidth 24.778 MHz	More 1 of 2
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BANDWIDTH HIGH CH * Agilent 15:39:52 Jan 5, 2012 R T	Measure
Ch Freq 5.32 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
10 dB/ 0 ffst 11.3	ACP
	Multi Carrier Power
#Res BW 330 kHz #VBW 1 MHz #Sweep 100 ms (601 pts)	
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.3152 MHz x dB -26.00 dB	Power Stat CCDF
Transmit Freq Error -33.428 kHz x dB Bandwidth 27.086 MHz	More 1 of 2
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CHAIN 1

99% BANDWIDTH



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CHAIN 2

26 dB BANDWIDTH



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BANDWIDTH MID CH	Measure
Ch Freq 5.3 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
10 dB/ Offst 11.3	ACP
dB ad b ip car g is a range g	Multi Carrier Power
#Res BW 390 kHz #VBW 1.2 MHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 10 2200 MU = x dB -26.00 dB	Power Stat CCDF
I9.3209 IVIHZ x 30 25.00 35 Transmit Freq Error 57.708 kHz x 4B Bandwidth 31.297 MHz	More 1 of 2
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BANDWIDTH HIGH CH	Measure
Ch Freq 5.32 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
10 dB/ Offst 11.3	ACP
dB 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Multi Carrier Power
#Res BW 360 kHz #VBW 1.1 MHz #Sweep 100 ms (601 pts)	
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.1386 MHz × dB -26.00 dB	Power Stat CCDF
Transmit Freq Error -381.364 kHz x dB Bandwidth 31.343 MHz	More 1 of 2
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CHAIN 2

99% BANDWIDTH



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7.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

Based on the characteristics of the EUT and various criteria method SA-3 ALT was selected.

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RESULTS

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5260	24	24.468	24.89	4.10	24.00
Mid	5300	24	24.778	24.94	4.10	24.00
High	5320	24	27.086	25.33	4.10	24.00

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	19.30	19.48	22.40	24.00	-1.60
Mid	5300	19.38	19.39	22.40	24.00	-1.60
High	5320	19.41	19.30	22.37	24.00	-1.63

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CHAIN 1 OUTPUT POWER



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CHAIN 2 OUTPUT POWER



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7.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5260	17.30	17.50	20.41
Middle	5300	17.20	17.20	20.21
High	5320	14.90	15.10	18.01

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7.2.4. PEAK POWER SPECTRAL DENSITY

<u>LIMITS</u>

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 11 dBm.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin	
		PPSD	PPSD	PPSD			
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)	
Low	5260	7.47	7.62	10.56	11	-0.44	
Middle	5300	7.67	7.5	10.60	11	-0.40	
High	5320	7.61	7.56	10.60	11	-0.40	

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CHAIN 1 POWER SPECTRAL DENSITY



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W Ayliei	11 20.27.00	Jan 5, ZUIZ					Г		
Project: 11 Ref 20 dB	U14084 m	Atten 20 d	IB			Mkr2	5.305 80 7.67)GHz ′dBm	Center Freq
#Peak 🗌					2				5.3000000 GHz
Log 🕇									
10					+				Start Freq
dB/ –	lR								5.27500000 GHz
Offst ⊢							\$		
11.3 JD								- and and	Stop Frea
									5.32500000 GHz
									CF Ster
									5.0000000 MHz
#PAvg									Auto Ma
Contor 5 3	00 00 CH2						Snan f	50 MHz	
			#\/D\// 2		#C	on 12 n	3pan . ••• (1001	nto)	Freq Offset
#Res BWV 1 MHZ		T			# SWE	veep is ins (loor pis)			0.00000000 Hz
1R	(1)	Frea	5.284	A AXIS DD GH Z			-21.84 dB	nae m	
1Δ	(Ť)	Freq	32	.00 MHz			19.38 dE	m	Signal Track
2	(1)	Freq	5.305	80 GHz			7.67 dB	m	

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Project: 11014U84 Ref 20 dBm Atten 20 dB #Peak Log 10 dB/ Offst 11.3 dB #PAvg Ecenter 5.320 00 GHz	Mkrz 5.313 40 GHz Center Freq 5.3200000 GHz 7.61 dBm Start Freq 5.3200000 GHz Start Freq 1 Start Freq 5.29500000 GHz Start Freq 2 Start Freq 5.34500000 GHz Start Freq 5.34500000 GHz CF Step 5.00000000 MHz
Log 10 dB/ Offst 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B	Start Freq 5.29500000 GHz Stop Freq 5.34500000 GHz CF Step 5.00000000 MHz
11.3 dB #PAvg Center 5.320 00 GHz	Stop Freq 5.34500000 GHz CF Step 5.00000000 MHz
#PAvg	CF Step 5.0000000 MHz
Center 5.320 00 GHz	Auto Mar
#Res BW 1 MHz #VBW 3 kHz	Span 50 MHz #Sweep 13 ms (1001 pts)
Marker Trace Type X Axis 1R (1) Freq 5.304 00 GHz 1Δ (1) Freq 32.00 MHz 2 (1) Freq 5.313 40 GHz	Amplitude -20.86 dBm 19.41 dBm 7.61 dBm On <u>Off</u>

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CHAIN 2 POWER SPECTRAL DENSITY



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Dunia at 11	114.400.4		-			MI2	5 20C 0	<u> </u>	
Ref 20 dB	014064 m	Atten 20	dB			MKIZ	5.306 0: 7.50	dBm	Center Freq
#Peak					2				5.50000000 0112
Log		1			No.				
10									Start Freq
dB/	16			_			1		5.27500000 GHz
Uffist							0		
11.3 JD				_				- marca	Stop Fred
^{uD} _									5.32500000 GHz
									CF Ste
									5.0000000 MH;
#PAvg									Auto M
Contor 5 3	100 00 GHz						Snan (50 MHz	
#Dec BM	1 MH-2		#\/R\M 3	647	#\$.wa	on 13 n	5pan . 	nte)	Freq Offset
MRES DVV	T	T	#VDVV J	KIIZ	m3446	eh in ii	15 (1001	posj	0.00000000 Hz
1R	(1)	Frea	5.28	4 00 GHz			Ampila -20.61 dB	m	
1Δ	ă	Freq	3	2.00 MHz			19.39 dE		Signal Track
2	(1)	Freq	5.30	6 05 GHz			7.50 dE	m	

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Agilen	GH CH t 21:03:51	I , CHAI Jan 5, 2012	N 2		RT	Marker
Project: 110 Ref 20 dBr	J14084 n	Atten 20 d	В	Mkr2	5.325 20 GHz 7.56 dBm	Select Marker 1 2 3 4
HPeak Log 10 dB/ Offst 11.3	1R				1	Marker Trace Auto 1 2 3 Readout
«D #PAvg						Frequency Marker Table
Center 5.3 #Res BW 1	20 00 GHz MHz		#VBW 3 kHz	#Sweep 13 i	Span 50 MHz ms (1001 pts)	Marker All Off
Marker 1R 1 <u>∆</u> 2	Trace (1) (1) (1)	Type Freq Freq Freq	X Axis 5.304 00 GHz 32.00 MHz 5.325 20 GHz		Amplitude -20.28 dBm 19.30 dBm 7.56 dBm	
						More 2 of 2

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7.2.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

CHAIN 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5260	7.88	13	-5.12
Middle	5300	7.74	13	-5.26
High	5320	7.86	13	-5.14

CHAIN 2

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5260	8.13	13	-4.87
Middle	5300	8.30	13	-4.70
High	5320	8.47	13	-4.53

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CHAIN 1

PEAK EXCURSION



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CHAIN 2

PEAK EXCURSION



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7.3. 802.11n HT20 MODE IN THE 5.6 GHz BAND

7.3.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

CHAIN 1

Channel	Frequency	26 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5500	29.539	16.9873
Middle	5580	30.923	16.4559
High	5700	29.392	16.692

CHAIN 2

Channel	Frequency	26 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5500	28.722	16.1088
Middle	5580	30.685	17.3664
High	5700	29.337	16.3699

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CHAIN 1

26 dB BANDWIDTH



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BANDWIDTH MID CH ※ Agilent 16:30:52 Jan 5, 2012 R T	Measure
Ch Freq 5.58 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
dB/ dB/ Offst 11.3	ACP
dB da local de la local de	Multi Carrier Power
#Res BW 390 kHz #VBW 1.1 MHz #Sweep 100 ms (601 pts)	Power Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.7856 MHz x dB -26.00 dB	CCDF
Transmit Freq Error -801.170 kHz x dB Bandwidth 30.923 MHz	More 1 of 2
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BANDWIDTH HIGH CH	Measure
Ch Freq 5.7 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
IU IV IV	ACP
dB V Low Logd Lot Low Level Low Low Level Low Level Low	Multi Carrier Power
#Res BW 360 kHz #VBW 1 MHz #Sweep 100 ms (601 pts)	Dowor Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.9467 MHz × dB -26.00 dB	
Transmit Freq Error -304.450 kHz x dB Bandwidth 29.392 MHz	More 1 of 2
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CHAIN 1

99% BANDWIDTH



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BANDWIDTH HIG	6H CH , 2012		RТ	Measure
Ch Freq 5 Occupied Bandwidth	.7 GHz	Averages: 100	Trig Free	Meas Off
Project: 11U14084				Channel Power
Ref 20 dBm Atte #Samp Log	en 20 dB			Occupied BW
10 dB/ Offst 11.3 dB				ACP
Center 5.700 00 GHz #Res BW 200 kHz	#VBW 560 kHz	#Sweep 100 r	Span 50 MHz ns (601 pts)	Power
Occupied Bandv 16.6	vidth 6920 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	CCDF
Transmit Freq Error x dB Bandwidth	-74.430 kHz 25.370 MHz*			More 1 of 2
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CHAIN 2

26 dB BANDWIDTH



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BANDWIDTH MID CH	Measure
Ch Freq 5.58 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	ACP
dB Image: Market Application (Market Applicati	Multi Carrier Power
#Res BW 360 kHz #VBW 1.1 MHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 %	Power Stat CCDF
19.3059 MHz x dB -26.00 dB Transmit Freq Error -201.559 kHz -201.559 kHz x dB Bandwidth 30.685 MHz -201.559 kHz	More 1 of 2
Copyright 2000-2010 Agilent Technologies	

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BANDWIDTH HIGH CH * Agilent 16:43:37 Jan 5, 2012 R T	Measure
Ch Freq 5.7 GHz Trig Free Occupied Bandwidth	Meas Off
Project: 11U14084	Channel Power
Ref 20 dBm Atten 20 dB #Peak Log	Occupied BW
10 dB/ Offst 11.3	ACP
dB Center 5.700 00 GHz Span 50 MHz	Multi Carrier Power
#Res BW 330 kHz #VBW 1 MHz #Sweep 100 ms (601 pts)	Power Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 18.0602 MHz x dB -26.00 dB	CCDF
Transmit Freq Error 17.589 kHz x dB Bandwidth 29.337 MHz	More 1 of 2
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CHAIN 2

99% BANDWIDTH



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7.3.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

Based on the characteristics of the EUT and various criteria method SA-3 ALT was selected.

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RESULTS

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5500	24	28.722	25.58	4.27	24.00
Mid	5800	24	30.685	25.87	4.27	24.00
High	5700	24	29.337	25.67	4.27	24.00

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5500	19.87	19.58	22.74	24.00	-1.26
Mid	5800	20.10	19.37	22.76	24.00	-1.24
High	5700	19.76	19.70	22.74	24.00	-1.26

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CHAIN 1 OUTPUT POWER



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11111/00/							ML-2	6 672 21	5 CU2		
11014004 Dof 20 dB		Atton 20	I 4B				INIKIZ	9.22) dBm	Center	Freq
#Peak		Atten Zt	2					0.22		5.5800000	0 GHz
Loa			4								
10 –						\rightarrow				Start	Frea
dB/	1R									5.5550000	D GHz
Offst	0						~~~~	ō			
11.3 🥓	~								man -	~	_
dB 🗌										Stop) ⊢req
										5.6050000	U GHZ
											п мш-
¥PAvg —										Auto	Ma Ma
										<u>. 1010</u>	<u></u>
Center 5.5	80 00 GHz					_		Span :	50 MHz	Frea (Offset
¥Res BW [·]	1 MHz		#V	BM 3 K	Hz	Swe	ep 13 r	ns (1001	pts)	0.0000000	DO Hz
Marker	Trace	Туре		×	. Axis			Amplitu 49 75 40	Jde –		
18	(1)	Freq		5.564 t 32 l	DO GHZ OO MHz			-10.75 dB 20.10 dB	m am		Tuesta
2	ŭ	Freq		5.573 2	25 GHz			8.22 dE	im l	Signal	Track
										Un	<u>U1</u>
									I		

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CHAIN 2 OUTPUT POWER



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7.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5500	17.60	17.30	20.46
Middle	5580	18.30	17.50	20.93
High	5700	17.90	17.60	20.76

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7.3.4. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 11 dBm.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5500	7.76	7.63	10.71	11	-0.29
Middle	5580	8.22	7.52	10.89	11	-0.11
High	5700	7.88	7.77	10.84	11	-0.16

CHAIN 1 POWER SPECTRAL DENSITY



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MC Ayrier	n uz.21.25	Jan 6, 2012						ς Ι ··	
1∪14084 Ref 20 dB⊨ #Peak	m	Atten 20 d	8			Mkr2	5.573 2: 8.22	5 GHz 2 dBm	Center Freq 5.58000000 GHz
Log 10 dB/			×				1		Start Freq 5.55500000 GHz
11.3 2** #B									Stop Freq 5.60500000 GHz
#PAvg -									CF Step 5.00000000 MHz <u>Auto Ma</u>
Center 5.5	80 00 GHz	· · · · ·				42	Span :	50 MHz	Freq Offset
#Res BW 1 MHz Marker Trace 1R (1) 1∆ (1) 2 (1)		Type Freq Freq Freq	#VBW 3 kHz S X Axis 5.564 00 GHz 32.00 MHz 5.573 25 GHz		5₩6	Amplitude -16.75 dBm 20.10 dBm 8.22 dBm			0.00000000 Hz Signal Track On <u>Of</u>

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11U14084 Mkr2 5.692 80 GHz Center Fr Ref 20 dBm Atten 20 dB 7.88 dBm 5.7000000 0 5.7000000 0 #Peak 2 4 4 5.7000000 0 5.7000000 0 11.3 3 4 5.6750000 0 5.6750000 0 5.6750000 0 dB/ 3.R 4 4 5.6750000 0 5.7250000 0 5.7250000 0 dB 4 4 4 4 4 5.7250000 0 5.72500000 0 #PAvg 4 4 4 4 4 4 5.72500000 0 Watker Trace Type XAxis Amplitude Freq Offs 1A (1) Freq 5.685 00 GHz -17.50 dBm 5.0000000 1A (1) Freq 5.692 80 GHz 7.88 dBm Signal Tra 2 (1) Freq 5.692 80 GHz 7.88 dBm Signal Tra	-SD HI 🔆 Agilen	t 02:33:37	1, CHAI Jan 6, 2012	NÏ				F	≀т	Freq/Chann	el
Log 10 10 10 12 18 11.3 11.3 11.3 11.3 11.3 10 10 12 12 13 10 10 10 10 10 10 10 10 10 10	11U14084 Ref 20 dBr #Peak	n	Atten 20 d	8			Mkr2	5.692 80 7.88)GHz dBm	Center Fr 5.70000000 G	eq Hz
11.3 dB Image: Center 5.700 00 GHz Stop F #PAvg Image: Center 5.700 00 GHz Image: Center 5.700 GHz Image: Center 5.700 GHz Image: Center 5.700 GHz Image: Center 5.700 GHz Image:	Log 10 dB/ Offst		1R	Q						Start Fre 5.67500000 G	əq Hz
#PAvg CF S #PAvg Image: Span 50 MHz #Center 5.700 00 GHz Span 50 MHz #Res BW 1 MHz #VBW 3 kHz Sweep 13 ms (1001 pts) Marker Trace Type X-Axis Amplitude 1A (1) Freq 5.685 00 GHz -17.50 dBm 0.00000000 1Δ (1) Freq 5.692 80 GHz 7.88 dBm Signal Trace	11.3 dB									Stop Fr 5.72500000 G	eq Hz
Center 5.700 00 GHz Span 50 MHz #Res BW 1 MHz #VBW 3 kHz Sweep 13 ms (1001 pts) Marker Trace Type XAxis Amplitude 1R (1) Freq 5.686 00 GHz -17.50 dBm 1Δ (1) Freq 30.00 MHz 19.76 dBm 2 (1) Freq 5.682 80 GHz 7.88 dBm	#PAvg									CF S 5.00000000 M <u>Auto</u>	Step 1Hz <u>Mar</u>
Marker Trace Type X Axis Amplitude 0.00000000 1R (1) Freq 5.685 00 GHz -17.50 dBm 14.00000000 0.000000000 0.0000000000 0.000000000000000 0.00000000000000000000000000000000000	Center 5.7 #Res BW 1	00 00 GHz I MHz		#VBW 3 k	:Hz	Swe	ep 13 n	Span 5 115 (1001	iO MHz pts)	Freq Offs	et
	Marker 1R 1 <u>∆</u> 2	Trace (1) (1) (1)	Type Freq Freq Freq	× 5.685 (30. 5.692 (Axis OO GHz OO MHz 30 GHz			Amplitu -17.50 dB 19.76 dB 7.88 dB	., de m m	Signal Tra	nz ack <u>Off</u>

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CHAIN 2 POWER SPECTRAL DENSITY



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11U14084									1
Ref 20 dBn #Peak	n	Atten 20 di	3			Mkr2 :	5.573 25 7.52	5 GHz dBm	Center Freq 5.58000000 GHz
Log			Ò				1 \$		Start Freq 5.55500000 GHz
11.3 dB									Stop Freq 5.60500000 GHz
#PAvg									CF Step 5.00000000 MHz <u>Auto Ma</u>
Center 5.5	BO OO GHz	· · · · · ·				an 12 m	Span 5	50 MHz	Freq Offset
m rtes Dyy I Marker 1R 1∆ 2	Trace (1) (1) (1) (1)	Type Freq Freq Freq	r v D v V 3 Kr X. 5.564 0 32.0 5.573 2	Axis O GHz IO MHz 5 GHz	3₩8	<u>ен 13 Ц</u>	Amplitu 20.25 dB 19.37 dB 7.52 dB	prosj Inde Im Im	0.00000000 Hz Signal Track On <u>Of</u>

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11U14084 Ref 20 dBm #Peak Log 10 dB/ Offeet		Atten 20 dB				Mkr2	5 694 70	CH ₂	
Log 10 dB/							7.77	dBm	Center Freq 5.70000000 GHz
	1R	\square							Start Freq 5.6750000 GHz
11.3 dB								/	Stop Freq 5.7250000 GHz
#PAvg									CF Step 5.0000000 MHz <u>Auto Man</u>
Center 5.700 #Res BW 1 M	00 GHz Hz	#V	'BW 3 kH	lz	Swe	ep 13 m	Span 5 1s (1001	0 MHz pts)	Freq Offset
Marker 1R 1∆ 2	Trace (1) (1) (1)	Type Freq Freq Freq	X / 5.685 00 30.00 5.694 70	^A xis) GHz 0 MHz) GHz			Amplitu 17.91 dBi 19.70 dB 7.77 dB	de n m m	Signal Track On <u>Off</u>

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7.3.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, dated 10/25/2011.

RESULTS

CHAIN 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5500	7.69	13	-5.31
Middle	5580	7.95	13	-5.05
High	5700	8.42	13	-4.58

CHAIN 2

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5500	9.03	13	-3.97
Middle	5580	8.37	13	-4.63
High	5700	8.27	13	-4.73

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CHAIN 1

PEAK EXCURSION



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	JRSION HIGH C	H		
🔆 Agilent 02:39:	15 Jan 6, 2012		RT	Freq/Channel
11U14084 Ref 20 dBm #Peak	Atten 20 dB	۵ M	1kr1 7.45 MHz 8.42 dB	Center Freq 5.70000000 GHz
Log 10 dB/	1.8		*	Start Freq 5.67500000 GHz
dB		1 Connegative States	and we have been and an	Stop Freq 5.72500000 GHz
#PAvg				CF Step 5.0000000 MHz <u>Auto Ma</u>
V1 V2 S3 FC AA				Freq Offset 0.00000000 Hz
¤(f): FTun Swp				Signal Track ^{On <u>Off</u>}
Center 5.700 00 G #Res BW 1 MHz	Hz #VBW 3 I	MHz Sweep 1 i	Span 50 MHz ms (1001 pts)	

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CHAIN 2

PEAK EXCURSION



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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

<u>LIMITS</u>

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 3 kHz for average measurements.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

8.2. DUTY CYCLE AND ON TIME

LIMITS

Not Applicable.

TEST PROCEDURE

Using a spectrum analyzer with 0 span, the ON time and the period were captured. Duty cycle is the ON time divided by the period.



Duty Cycle = (0.35 + 0.35)/3.85 = 18.18%ON time used for BE and Spurious = 0.35 mS as worst case for VBW >= 1/T

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8.3. **TRANSMITTER ABOVE 1 GHz**

8.3.1. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE LOWER 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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🔆 Agilent 13:41:1	6 Jan 11, 2012			RT	Freq/Channel
Project: 11∪14084 Ref 110 dB µ∨ ¥EmiPk	#Atten 0 dB		Mkr1 :	5.075 00 GHz 41.01 dBµ∨	Center Freq 5.07500000 GHz
-og 10 18/					Start Freq 5.00000000 GHz
Jffst 3.7 B					Stop Freq 5.1500000 GHz
i4.0 IBμ∨ #PAvg					CF Step 15.0000000 MHz Auto Ma
И1 S2 33 FC		۰۰۰۰۰ م		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Freq Offset 0.00000000 Hz
(f): Tun Swp					Signal Track On <u>Off</u>
Start 5.000 00 GHz Res RW (CISPR) 1 1	MHz #\/B\	N 3 kHz	Stop :	5.150 00 GHz	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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🔆 Agilent 12:06	:11 Jan 11, 2012			RT	Freq/Channel
Project: 11∪14084 Ref 110 dB µ∨ #EmiPk	#Atten 0 d	B	Mkr1	5.000 00 GHz 45.84 dBµ∨	Center Freq 5.07500000 GHz
Log					Start Freq 5.00000000 GHz
					• Stop Freq 5.1500000 GHz
54.0 dBµ∨ #PAvg					CF Step 15.0000000 MHz Auto Ma
S1 M2 S3 FC	·····			······································	Freq Offset 0.00000000 Hz
*(f): =Tun Swp					Signal Track On <u>Off</u>
Start 5.000 00 GH Res BW (CISPR) 1	z I MHz	#VBW 3 kHz	Sweep 57.36	5.150 00 GHz	

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HARMONICS AND SPURIOUS EMISSIONS

f Measurement Frequency Amp Preamp Gain Average Field Strength f Measurement Frequency Amp Preamp Gain Average Field Strength Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Lir Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Lir AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit CL Cable Loss HPF High Pass Filter Margin Ant. Pol. Margin Ant. Pol. f Dist Read AF CL Amp D Corr Filtr Corr. Limit Margin Ant. Pol. Margin V/H P/H GHz (m) dBuV dB dB dB dB UN Margin V/H P/H	Limit mit mit	
Mode Oper: W52, 802.11n MCS9 f Measurement Frequency Amp Preamp Gain Average Field Strength Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Lir Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Lir AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit CL Cable Loss HPF High Pass Filter Margin Ant. Pol. Margin Ant. Pol. f Dist Read AF CL Amp D Corr Filtr Corr. Limit Margin Ant. Pol. Margin VH P/H GHz (m) dBuV dB dB dB dB UN Margin VH P/H P/H	Limit mit mit	
f Measurement Frequency Amp Preamp Gain Average Field Strength Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Lir Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Lir AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit CL Cable Loss HPF High Pass Filter Margin Ant. Pol. Integration of the presson of the presso	Limit mit mit	
f Measurement Frequency Amp Preamp Gain Average Field Strength Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Lir Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Lir AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Average Lir CL Cable Loss HPF High Pass Filter Margin vs. Peak Limit f Dist Read AF CL Amp D Corr Fltr Corr. Limit Margin Ant. Pol P GHz (m) dBuV dB/m dB dB dB dB ub V/H P	Limit mit mit	
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Lir Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Lir AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit CL Cable Loss HPF High Pass Filter Margin Ant. Pol D f Dist Read AF CL Amp D Corr Filtr Corr. Limit Margin Ant. Pol D GHz (m) dBuV dB/m dB dB dB dB U/H P/	nut nut	
Read Analyzer Keading Avg Average Field Strength (@ 3 m Margin vs. Average Lir AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit CL Cable Loss HPF High Pass Filter Margin vs. Peak Limit f Dist Read AF CL Amp D Corr Fltr Corr. Limit Margin Ant. Pol D GHz (m) dBuV dB/m dB dB dB dB ubuV/m dBuV/m dB V/H P/	nut	
Ar Antenna Factor Feak Calculated Feak Field Strength Margin VS. Peak Limit CL Cable Loss HPF High Pass Filter f Dist Read AF CL Amp D Corr Fltr Corr. Limit Margin Ant. Pol. D GHz (m) dBuV dB/m dB dB dB dB dB U/m dBuV/m dB V/H P/	Dat Nata	
f Dist Read AF CL Amp D Corr Fltr Corr. Limit Margin Ant. Pol. GHz (m) dBuV dB/m dB dB dB dBuV/m dBuV/m dB V/H P/ 5180 MHz. 11	Dat Note	
f Dist Read AF CL Amp D Corr Fltr Corr. Limit Margin Ant. Pol. GHz (m) dBuV dB/m dB dB dB dB dB dB uV/m dBuV/m dBuV/m dB V/H P/ 5180 MHz. 1m	Dat Note	
GHz (m) dBuV dB/m dB dB dB dB dB dB dB uV/m dBuV/m dB V/H P/	Der Hote	Notes
5180 MHz, 11p	/A/QP	
15.540 3.0 34.7 39.0 11.3 -34.8 0.0 0.7 51.0 74.0 -23.0 H	P	
15.540 3.0 24.5 39.0 11.3 -34.8 0.0 0.7 40.8 54.0 -13.2 H	A	
15.540 3.0 35.4 39.0 11.3 -34.8 0.0 0.7 51.6 74.0 -22.4 V	P	
15.540 3.0 24.7 39.0 11.3 -34.8 0.0 0.7 40.9 54.0 -13.1 V 2700 MTH- 11.5	A	
2500 Mills, 11N	р	
15.600 3.0 24.5 38.8 11.4 -34.8 0.0 0.7 40.6 54.0 -13.4 V	Å	
15.600 3.0 35.2 38.8 11.4 -34.8 0.0 0.7 51.3 74.0 -22.7 H	P	•••••
15.600 3.0 24.4 38.8 11.4 -34.8 0.0 0.7 40.6 54.0 -13.4 H	A	
5240 MHz, 11n		
15.720 3.0 34.5 38.4 11.4 -34.7 0.0 0.7 50.3 74.0 -23.7 H	Р	
15.720 3.0 24.2 38.4 11.4 -34.7 0.0 0.7 40.1 54.0 -13.9 H	A	
15.720 3.0 34.8 38.4 11.4 -34.7 0.0 0.7 50.7 74.0 -23.3 V	P	
15.720 ; 3.0 ; 24.3 ; 38.4 ; 11.4 ; -34.7 ; 0.0 ; 0.7 ; 40.2 ; 54.0 ; -13.8 V ;	Α	

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8.3.2. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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- Aynent 13.56.34	F Jan II, 2012			R I	Freq/Channel
oject: 11U14084 2 f 110 dB µV EmiPk	#Atten 0 dB		Mkr1	5.351 83 GHz 53.33 dBµ∨	Center Freq 5.40500000 GHz
)g					Start Freq 5.3500000 GHz
}					Stop Freq 5.4600000 GHz
.0 3μ√ PAvg					CF Step 11.0000000 MHz <u>Auto Ma</u>
M2 3 FC		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			Freq Offset 0.00000000 Hz
): iun vp					Signal Track On <u>Off</u>
art 5.350 00 GHz Res BW (CISPR) 1	MHz #\/F	3 kHz	Sween 42.08	5.460 00 GHz ms (601 nts)	

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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	27 04111,2012	•		L 6 250 00		
roject: 11014084 ef 110 dB µ∨ EmiPk	#Atten 0 d	B		53.51	dBµ∨	Center Freq 5.40500000 GHz
Dg) B/						Start Freq 5.35000000 GHz
B						Stop Freq 5.46000000 GHz
l.0 Βμ∨ ⊃Avg φ						CF Step 11.0000000 MHz <u>Auto Mar</u>
1 V2		and and the second		~~~		Freq Offset 0.00000000 Hz
f): Tun Wp						Signal Track On <u>Off</u>
tart 5.350 00 GHz	1 MH-2	#VBM(3 kHz	S	top 5.460 00	GHz	

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HARMONICS AND SPURIOUS EMISSIONS

lest Engr:		Tom Chen											
Date:		01/11/12											
Project #:		11U1408	4										
Company		Sonos	_										
lest Targe	t:	FCC Cla	ass B	~~~~									
Mode Ope	r:	W53, 80	2.11n M	10.89									
	f	Measuren	nent Fred	piency	Amp	Preamp (Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anter	ina	D Corr	Distance	Correc	rt to 3 me	ters	Peak Fie	ld Strength	Limit	
	Read	Analyzer	Reading		Avg	Average	Field S	trength @)3 m	Margin v	rs. Average	Limit	
	AF	Antenna	Factor		Peak	Calculate	d Peak	Field Str	ength	Margin v	rs. Peak Lii	mit	
	CL	Cable Los	55		HPF	High Pas	s Filter	r					
f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
5260 MHz	, 11n												
15.780	3.0	35.3	38.2	11.5	-34.6	0.0	0.7	51.0	74.0	- 23.0	V	Р	
15.780	3.0	24.8	38.2	11.5	-34.6	0.0	0.7	40.5	54.0	-13.5	V	A	
	3.0	34.4	38.2	11.5	-34.6	0.0	0.7	50.1	74.0	-23.9	H	P	
15.780 200 MTT-	3.0	24.8	38.2	11.5	-34.0	0.0	U. 7	40.6	54.0	-13.4	н	A	
500 MILLY 10 200	, 11N 30	37.6	29.2	0.0	36.6	0.0	0.0	40.1	740	24.0	ч	ъ	
LO.000 10 600	3.0	953	39.3	9.0	-36.6	0.0	0.0	36.8	7460 54 N	-17.2	H	- F A	
15.900	3.0	35.0	37.8	11.5	-34.6	0.0	0.7	50.5	74.0	-23.5	H	P	
15.900	3.0	24.8	37.8	11.5	-34.6	0.0	0.7	40.3	54.0	-13.7	H	Ā	
5300 MHz	, 11n								•				
LO.600	3.0	35.4	38.3	9.0	-36.6	0.0	0.8	46.9	74.0	-27.1	V	P	
10.600	3.0	25.1	38.3	9.0	-36.6	0.0	0.8	36.6	54.0	-17.4	V	A	
15.900	3.0	34.3	37.8	11.5	-34.6	0.0	0.7	49.8	74.0	-24.2	V	Р	
15.900	3.0	24.8	37.8	11.5	-34.6	0.0	0.7	40.3	54.0	-13.7	V	A	
5320 MHz	, 11n												
10.640	3.0	36.9	38.3	9.1	-36.6	0.0	0.8	48.4	74.0	-25.6	V	P	
LU.040	3.U 2.0	24.8	38.3	9.1 11.7	-30.0	0.0	U.8	50.3	54.U 74.0	-17.7	V V	A D	
12.70U	3.0	32.U 72.0	37.6	11.5	-34.5	0.0	0.7	20.3 40.4	746.U 54.0	-43.7	v	r A	
320 MH-	. 11n			11.2	-9462	0.0	v. (-10.4	2-hU	-13.0	¥		
10.640	3.0	39.6	38.3	9.1	-36.6	0.0	0.8	51.1	74.0	-22.9	H	Р	
10.640	3.0	25.1	38.3	9.1	-36.6	0.0	0.8	36.6	54.0	-17.4	H	Ā	
15.960	3.0	35.4	37.6	11.5	-34.5	0.0	0.7	50.7	74.0	-23.3	H	Р	
15.960	3.0	25.2	37.6	11.5	-34.5	0.0	0.7	40.5	54.0	-13.5	H	A	
	-												

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8.3.3. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



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HARMONICS AND SPURIOUS EMISSIONS

test mgr:		Tom Che											
Data	i	10m Che 01/11/12	:11										
Project #:		11111408	4										
Company:		Sonos	•										
fest Target:	Ţ	FCC Class B											
Mode Oper:	,	W56, 807	2.11n M	C \$9									
	,						. .				F: 11.0		
f Dia	1	Weasurem Distance	tent Freq	luency	Amp D.C.	Preamp (7am Carros		.	Average	rield Stren;	gin Limit Timit	
Dist	1	Distance t	Roadin-	uta	lur-	Distance	Correct Figure 1	n to j me	iers 3 m	reak fie Manin	a strength	Limit	
rceac A F	1 4	Analyzer. Antonne I	roeaning Factor		AVg Deal-	Average . Calculate	d Doole Liela 21	Field Stee	:⊃m meth	Margin V	rs. Average ∞ DosleTie	Linut nit	
Ar CI		Cable Los	raciór		HPF	High Pao	u reak s Filter	, rieni stre	ngin	wargin v	э. геак Ци		
		00000 2000					/ 1 11/21						
f Dia	st	Read	AF	CL	Amp	D Corr	Fltr	Согт.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz i (m	<u>0 </u>	dBuV	dB/m	<u>dB</u>	<u>dB</u>	dB.	<u>dB</u>	dBuV/m	dBuV/m	<u> d</u> B	V/H	P/A/QP	
500 MHz, 11n	•	20.2	20.4	0.2	26.2	0.0	07	50.4	740	0 2 6	ц		
	J N	JO.J 75 7	38.4	7.4	-36.3	0.0	0.7	373	74.U 54.0	-43.0	л Н	A P	
11.000 3.0	'n	40.7	38.4	9.2	-36.3	0.0	0.7	52.8	240 74.0	-21.2	V N	P	
11.000 3.4	Ó	32.6	38.4	9.2	-36.3	0.0	0.7	44.6	54.0	-9.4	v	Ā	
5580 MHz, 11r	L I				•	1				<u></u>		·····	
11.160 3.0	D	37.6	38.5	9.3	-36.1	0.0	0.7	50.0	74.0	-24.0	V	P	
11.160 3.0	0	32.6	38.5	9.3	-36.1	0.0	0.7	45.0	54.0	-9.0	V	<u>A</u>	
)	44.0	38.5	9.3	-36.1	0.0	0.7	56.4	74.0	-17.6	H	P	
11.16U 3.		20.0	38.5	9.3	-36.1	0.0	0.7	39.1	54.0	-14.9	н	A	
11.400 3.0	n	39.8	38.7	9.4	-35.9	0.0	0.7	52.7	74.0	-21.3	н	P	
11.400 3.0	Ó	26.3	38.7	9.4	-35.9	0.0	0.7	39.3	54.0	-14.7	H	Ā	
11.400 3.0	0	46.5	38.7	9.4	-35.9	0.0	0.7	59.4	74.0	-14.6	V	P	
11.400 3.0	0	33.9	38.7	9.4	-35.9	0.0	0.7	46.9	54.0	-7.1	V	A	
(ev. 4.1.2.)			of erou	tected	l above i	the system	n nois	e floor.					
ev. 4.1.2.7 ote: No other	rem	uissions v	were ac	accaca									

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8.4. RECEIVER ABOVE 1 GHz

Company 'roject # Date: Cest Eng Configur Mode:	y: #: gineer: ration:		Sonons 11U14084 12/14/2011 Tom Chen EUT standa RX mode, V	done V52												
est Equ	nipmen	<u>t:</u>														
Horn 1-18GHz Pre-amplifer 1-26GHz					GHz	Pre-am	plifer	26-40GH	z	Но	rn >18G	Hz		Limit		
T73; S	T73; S/N: 6717 @3m T144 Miteq 3008A00931 Hi Frequency Cables 3' cable 22807700 12' cable 22807600					931 💂			-	RX RSS 210						
- Hi Frequ 3' C						500	20' cal	ble 22	807500		HPF	Reject Filter			<u>eak Measurements</u> RBW=VBW=1MHz	
3' ca	3' cable 22807700				▼	20' cab	le 2280	07500 -					Avera RBW=	e rage Measurements W=1MHz ; VBW=10Hz		
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
.260	3.0	50.0	32.4	24.8	3.0	-38.5	0.0	0.0	39.4	21.8	74	54	-34.6	-32.2	Н	
628 503	3.0	48.3	30.7	26.1	3.5	-38.0	0.0	0.0	39.9	22.3	74	54	-34.1	-31.7	<u>H</u>	
130	3.0	46.4	22.5	24.3	2.9	-35.4	0.0	0.0	45.0	17.4	74	54 54	-28.2	-25.6	V N	
.260	3.0	46.6	29.0	24.8	3.0	-38.5	0.0	0.0	36.0	18.4	74	54	-38.0	-35.6	V	
390	3.0	47.0	29.4	25.3	3.2	-38.3	0.0	0.0	37.2	19.6	74	54	-36.8	-34.4	V	
ev. 07.08.	f Dist Read AF CL	Measurema Distance to Analyzer R Antenna Fa Cable Loss	ent Frequenc Antenna eading actor	y		Amp D Corr Avg Peak HPF	Preamp (Distance Average Calculate High Pas	Gain Correa Field S d Peal s Filter	ct to 3 mete Strength @ c Field Stre	ers 3 m ength		Avg Lim Pk Lim Avg Mar Pk Mar	Average I Peak Field Margin vs Margin vs	Field Strengtl d Strength Li a. Average Li a. Peak Limit	h Limit imit imit	

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8.5. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



 COMPLIANCE CERTIFICATION SERVICES (UL CCS)
 FORM NO: CCSUP4701D

 47173 BENICIA STREET, FREMONT, CA 94538, USA
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SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)



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111111001								
FIIT standa	lone							
TX mode w	ione iorst case							
TA mode a								
Range 1 30 -	1000MHz							
¥			25MHz-1GHz	5m A T122		CER 47		
			ChmhrA	Bilog helow		Part 15		
Test	Meter		Amplified T	1GHz TXT		Class B		
Frequency	Reading	Detector	X [dB]	[dB]	dBuV/m	3m	Margin	Polarity
43,763	39.37	PK	-27.4	11.6	23.57	40	-16.43	Horz
77.1043	43.45	PK	-27.1	7.5	23.85	40	-16.15	Horz
92.4181	46.03	PK	-27	8.1	27.13	43.5	-16.37	Horz
98.4273	48.89	PK	-26.9	9.6	31.59	43.5	-11.91	Horz
185.8513	51.65	PK	-26.4	11.2	36.45	43.5	-7.05	Horz
250.014	53.2	PK	-25.9	11.8	39.1	46	-6.9	Horz
250.014	53.2	PK	-25.9	11.8	39.1	46	-6.9	Horz
250.014 Range 2 30 -	53.2 1000MHz	PK	-25.9	11.8	39.1	46	-6.9	Horz
250.014 Range 2 30 -	53.2 1000MHz	PK	-25.9	11.8 5m A T122	39.1	46 CFR 47	-6.9	Horz
250.014 Range 2 30 -	53.2 1000MHz	PK	-25.9 25MHz-1GHz ChmbrA	11.8 5m A T122 Bilog below	39.1	46 CFR 47 Part 15	-6.9	Horz
250.014 Range 2 30 - Test	53.2 1000MHz Meter	PK	-25.9 25MHz-1GHz ChmbrA Amplified.T	11.8 5m A T122 Bilog below 1GHz.TXT	39.1	46 CFR 47 Part 15 Class B	-6.9	Horz
250.014 Range 2 30 - Test Frequency	1000MHz Meter Reading	PK Detector	-25.9 25MHz-1GHz ChmbrA Amplified.T X [dB]	11.8 5m A T122 Bilog below 1GHz.TXT [dB]	39.1 dBuV/m	46 CFR 47 Part 15 Class B 3m	-6.9 Margin	Horz Polarity
250.014 Range 2 30 - Test Frequency 43.763	53.2 1000MHz Meter Reading 52.88	PK Detector PK	-25.9 25MHz-1GHz ChmbrA Amplified.T X [dB] -27.4	11.8 5m A T122 Bilog below 1GHz.TXT [dB] 11.6	39.1 dBuV/m 37.08	46 CFR 47 Part 15 Class B 3m 40	-6.9 Margin -2.92	Horz Polarity Vert
250.014 Range 2 30 - Test Frequency 43.763 47.8337	53.2 1000MHz Meter Reading 52.88 54.32	PK Detector PK PK	-25.9 25MHz-1GHz ChmbrA Amplified.T X [dB] -27.4 -27.3	11.8 5m A T122 Bilog below 1GHz.TXT [dB] 11.6 9.4	39.1 dBuV/m 37.08 36.42	46 CFR 47 Part 15 Class B 3m 40 40	-6.9 Margin -2.92 -3.58	Horz Polarity Vert Vert
250.014 Range 2 30 - Test Frequency 43.763 47.8337 60.2398	53.2 1000MHz Meter Reading 52.88 54.32 53.34	PK Detector PK PK PK	-25.9 25MHz-1GHz ChmbrA Amplified.T X [dB] -27.4 -27.3 -27.2	11.8 5m A T122 Bilog below 1GHz.TXT [dB] 11.6 9.4 7.9	39.1 dBuV/m 37.08 36.42 34.04	46 CFR 47 Part 15 Class B 3m 40 40 40	-6.9 Margin -2.92 -3.58 -5.96	Horz Polarity Vert Vert Vert
250.014 Range 2 30 - Test Frequency 43.763 47.8337 60.2398 189.7282	53.2 1000MHz Meter Reading 52.88 54.32 53.34 46.83	PK Detector PK PK PK PK	-25.9 25MHz-1GHz ChmbrA Amplified.T X [dB] -27.4 -27.3 -27.2 -26.3	11.8 5m A T122 Bilog below 1GHz.TXT [dB] 11.6 9.4 7.9 11.3	39.1 dBuV/m 37.08 36.42 34.04 31.83	46 CFR 47 Part 15 Class B 3m 40 40 40 43.5	-6.9 Margin -2.92 -3.58 -5.96 -11.67	Horz Polarity Vert Vert Vert Vert Vert
250.014 Range 2 30 - Test Frequency 43.763 47.8337 60.2398 189.7282 250.014	53.2 1000MHz Meter Reading 52.88 54.32 53.34 46.83 51.29	PK Detector PK PK PK PK PK	-25.9 25MHz-1GHz ChmbrA Amplified.T X [dB] -27.4 -27.3 -27.2 -26.3 -25.9	11.8 5m A T122 Bilog below 1GHz.TXT [dB] 11.6 9.4 7.9 11.3 11.8	39.1 dBuV/m 37.08 36.42 34.04 31.83 37.19	46 CFR 47 Part 15 Class B 3m 40 40 40 43.5 46	-6.9 Margin -2.92 -3.58 -5.96 -11.67 -8.81	Horz Polarity Vert Vert Vert Vert Vert Vert

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)				
	Quasi-peak	Average			
0.15-0.5	66 to 56 "	56 to 46 *			
0.5-5	56	46			
5-30	60	50			

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

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RESULTS

<u>6 WORST EMISSIONS</u>

SONOS									
11U14084									
EUT with su	pport lapto	ор РС							
TX mode we	orst case								
Line-L1 .15 -	30MHz								
			T24 IL	LC Cables				CISPR 22	
Test	Meter		и.тхт	1&3.TXT		CISPR 22		Class B	
Frequency	Reading	Detector	[dB]	[dB]	dBuV	Class B QP	Margin	Avg	Margin
0.1995	46.97	РК	0.1	0	47.07	63.6	-16.53	-	-
0.1995	23.16	Av	0.1	0	23.26	-	-	53.6	-30.34
0.2535	38.34	РК	0.1	0	38.44	61.6	-23.16	-	-
0.2535	25.41	Av	0.1	0	25.51	-	-	51.6	-26.09
23.1315	42.9	РК	0.4	0.2	43.5	60	-16.5	-	-
23.1315	37.8	Av	0.4	0.2	38.4	-	-	50	-11.6
Line-L2 .15 -	30MHz								
			T24 IL	LC Cables				CISPR 22	
Test	Meter		L2.TXT	2&3.TXT		CISPR 22		Class B	
Frequency	Reading	Detector	[dB]	[dB]	dBuV	Class B QP	Margin	Avg	Margin
0.1995	46.78	PK	0.1	0	46.88	63.6	-16.72	-	-
0.1995	20.82	Av	0.1	0	20.92	-	-	53.6	-32.68
0.2535	39.74	PK	0.1	0	39.84	61.6	-21.76	-	-
0.2535	23.72	Av	0.1	0	23.82	-	-	51.6	-27.78
23.1315	42.28	PK	0.4	0.2	42.88	60	-17.12	-	-
23.1315	37.47	Av	0.4	0.2	38.07	-	-	50	-11.93

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LINE 1 RESULTS



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LINE 2 RESULTS



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10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)				
(A) Lin	(A) Limits for Occupational/Controlled Exposures							
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 8				
(B) Limits for General Population/Uncontrolled Exposure								
0.3–1.34	614 824 <i>1</i> f	1.63 2.19/f	*(100) *(180/f ²)	30 30				

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
30–300 300–1500 1500–100 000	27.5	0.073	0.2 f/1500 1.0	30 30 30

f = frequency in MHz

* = Plane-wave equivalent power density NOTE 1 To TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occu-tions where a the attention of the potential for exposure and the potential for exposure.

pational/controlled limits apply provided he or she is made aware of the potential for exposure. NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5

Exposure Limits for Persons Not Classed As RF and Microwave Ex-
posed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/f	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042f ^{0.5}	f/150	6
1 500–15 000	61.4	0.163	10	6
15 000-150 000	61.4	0.163	10	616 000 /f ^{1.2}
150 000-300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616 000 /f ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.

- 2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2 .
- A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

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EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2 EIRP = Equivalent Isotropic Radiated Power in W D = Separation distance in m

Power density in units of W/m² is converted to units of mWc/m² by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m EIRP = Equivalent Isotropic Radiated Power in W S = Power density in W/m^2

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter xGx = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

<u>LIMITS</u>

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

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RESULTS

Multiple chain or colocated transmitters								
Band	Mode	Chain	Separation	Output	Antenna	Duty	IC Power	FCC Power
		for	Distance	Power	Gain	Cycle	Density	Density
		MIMO	(m)	(dBm)	(dBi)	(%)	(W/m^2)	(mW/cm^2)
5 GHz	WLAN	1		18.30	4.98	18		
5 GHz	WLAN	2		17.60	4.38	18		
	Combined		0.20				0.13	0.013

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11. DYNAMIC FREQUENCY SELECTION

11.1. OVERVIEW

11.1.1. LIMITS

INDUSTRY CANADA

IC RSS-210 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-210 Issue 7 A9.4 (b) (ii) Channel Availability Check Time: ...

Additional requirements for the band 5600-5650 MHz: Until further notice, devices subject to this Section shall not be capable of transmitting in the band 5600-5650 MHz, so that Environment Canada weather radars operating in this band are protected.

RSS-210 Issue 7 A9.4 (b) (iv) **Channel closing time:** the maximum channel closing time is 260 ms.

<u>FCC</u>

§15.407 (h) and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

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Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode			
	Master	Client (without radar detection)	Client (with radar detection)	
Non-Occupancy Period	Yes	Not required	Yes	
DFS Detection Threshold	Yes	Not required	Yes	
Channel Availability Check Time	Yes	Not required	Not required	
Uniform Spreading	Yes	Not required	Not required	

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode			
	Master	Client	Client	
		(without DFS)	(with DFS)	
DFS Detection Threshold	Yes	Not required	Yes	
Channel Closing Transmission Time	Yes	Yes	Yes	
Channel Move Time	Yes	Yes	Yes	

Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value				
	(see note)				
≥ 200 milliwatt	-64 dBm				
< 200 milliwatt	-62 dBm				
Note 1: This is the level at the input of the receiver assuming a	0 dBi receive antenna				
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude					
of the test transmission waveforms to account for variations in I	measurement equipment. This				
will ensure that the test signal is at or above the detection thres	hold level to trigger a DFS				
response.					

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Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period

The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:

For the Short pulse radar Test Signals this instant is the end of the Burst.

For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.

For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.

The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Table 5 – Short Pulse Radar Test Waveforms

Radar	Pulse Width	PRI	Pulses	Minimum	Minimum
Туре	(Microseconds)	(Microseconds)		Percentage of	Trials
				Successful	
				Detection	
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (F	Radar Types 1-4)			80%	120

Table 6 – Long Pulse Radar Test Signal

Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000- 2000	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar	Pulse	PRI	Burst	Pulses	Hopping	Minimum	Minimum
Waveform	Width	(µsec)	Length	per	Rate	Percentage of	Trials
	(µsec)		(ms)	Нор	(kHz)	Successful	
						Detection	
6	1	333	300	9	.333	70%	30

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11.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



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SYSTEM OVERVIEW

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at runtime.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from F_L to F_H for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

SYSTEM CALIBRATION

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

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ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Asset Number	Cal Due		
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	11/04/12
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	11/17/12

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11.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



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SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Notebook PC	Dell	P05G001	29717068285	DoC
(Server/Controller)				
AC Adapter (Server PC)	Lite On	LA65NS2-01	CN-0928G4-72438-07F	DoC
	Technologies		16ED-A00	
8-Port Gigabit Switch	Netgear	GS108	1DR1823R0685A	DoC
AC Adapter (Gigabit	Netgear	DSA-12R-12 AUS	01035	DoC
Switch)		120120		
4-Port Serial to USB	N/A	N/A	01037	DoC
Converter				
Notebook PC	Dell	P05G001	3535214077	DoC
(Server/Controller)				
AC Adapter (Server PC)	Lite On	LA65NS2-01	CN-0928G4-72438-084-	DoC
	Technologies		C430-A00	
Wireless Access Point	Cisco	AIR-AP1242AG-A-K9	FTX1446BOUY	LDK102056
AC Adapter (AP)	Delta Electronics	EADP-18MB B	DAB1433MEWJ	DoC
Cable/DSL Router with 8-	Linksys	BEFSR81	C2220E202196	DoC
AC Adapter (Cable/DSL	Linksys	AM-1201000D41	12247	DoC

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11.1.4. DESCRIPTION OF EUT

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without Radar Detection.

The highest power level within these bands is 26.5 dBm EIRP in the 5250-5350 MHz band and 26.98 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly utilized with the EUT has a peak gain of 4.1 dBi in the 5250-5350 MHz band and 4.27 dBi in the 5470-5725 MHz band.

Two identical antennas are utilized to meet the diversity and MIMO operational requirements.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is -64 + 1 = -63 dBm.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses two transmitter/receiver chains, each connected to an antenna to perform radiated tests.

WLAN traffic was generated by streaming the NTIA audio test file from the Master to the Slave using the media player embedded in the Sonos version 3.6 (build 16546280) software resident in the Slave Device.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The software installed in the access point is release C1240-K9W7-M version 12.4 (21a) JA1.

UNIFORM CHANNEL SPREADING

This does not apply to slave radio devices

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OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is a Cisco Access Point, FCC ID: LDK102056. The minimum antenna gain for the Master Device is 3.5 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is -64 + 1 = -63 dBm.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides margin to the limit.

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11.2. **RESULTS FOR 20 MHz BANDWIDTH**

11.2.1. **TEST CHANNEL**

All tests were performed at a channel center frequency of 5500 MHz.

11.2.2. **RADAR WAVEFORM AND TRAFFIC**

RADAR WAVEFORM



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TRAFFIC



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11.2.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.2.4. MOVE AND CLOSING TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

```
Aggregate Transmission Time = (Number of analyzer bins showing transmission) * (dwell time per bin)
```

The observation period over which the FCC aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Agency	Channel Move Time	Limit
	(sec)	(sec)
FCC / IC	0.024	10

Agency	Aggregate Channel Closing Transmission Time	Limit
	(msec)	(msec)
FCC	4.0	60
IC	10.0	260

MOVE TIME



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CHANNEL CLOSING TIME



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AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the IC aggregate monitoring period.



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Only intermittent transmissions are observed during the IC aggregate monitoring period.



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11.2.5. NON-OCCUPANCY PERIOD

RESULTS

No EUT transmissions were observed on the test channel during the 30-minute observation time.

Fun					Signal Track On <u>O</u>
V1 S2 3 FS AA (f):					Freq Offset 0.00000000 Hz
4.0 Bm gAv	a bey and a second s				CF Step 3.0000000 MHz <u>Auto Ma</u>
2.2 B					Stop Freq 5.5000000 GHz
og) B/ ffst ◇					Start Freq 5.5000000 GHz
ef 40 dBm Peak	#Atten 0 dB		∆ Mkr1 3	1.8 ks 13.95 dB	Center Freq 5.5000000 GHz

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12. **SETUP PHOTOS**

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



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RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION



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POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



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DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP



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