

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

CERTIFICATION TEST REPORT

FOR

The Apple iPad is a tablet device with multimedia functions (music, application support, and video), 802.11a/b/g/n radio, and Bluetooth radio functions

MODEL NUMBER: A1432, A1454, & A1455*

FCC ID: BCGA1432 IC: 579C-A1432

REPORT NUMBER: 12U14526-1, Revision A

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

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

*Models differences are detailed within the body of this report

NVLAP LAB CODE 200065-0

Revision History

Rev.	lssue Date	Revisions	Revised By
	09/05/12	Initial Issue	F. Ibrahim
A	10/03/12	Detailed method was referenced for output power and PSD under test procedure titles	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	APPLE, INC.	
	1 INFINITE LOOP	
	CUPERTINO, CA 95014, U.S.	۹.
	, , , ,	
EUT DESCRIPTION:	The Apple iPad is a tablet devie application support, and video) Bluetooth radio functions.	ce with iPod functions (music, , 802.11a/b/g/n radio, and
MODEL:	A1432, A1454, A1455	
SERIAL NUMBER:	PT758824	
DATE TESTED:	JULY 15 - AUGUST 22, 2012	
	APPLICABLE STANDARDS	
	STANDARD	TEST RESULTS
		5

CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

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 WISE PROJECT LEADER UL CCS

The

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 C63.10-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, 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 Apple iPad is a tablet device with iPod functions (music, application support, and video), 802.11a/b/g/n radio, and Bluetooth radio functions.

5.2. DESCRIPTION OF MODELS DIFFERENCES

FCC ID: BCGA1432 IC ID: 579C-A1432 Model #: A1432

Model A1432, is a tablet with multimedia functions (music, application support, and video)IEEE 802.11a/b/g/n radio and Bluetooth radio. The rechargeable battery is not user accessible.

FCC ID: BCGA1454 IC ID: 579C-A1454 Model #: A1454

Model A1454 is a tablet with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n and Bluetooth radio. The rechargeable battery is not user accessible.

FCC ID: BCGA1455 IC ID: 579C-A1455 Model #: A1455

Model A1455, is a tablet with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/CDMA1xRTT/ EV-DO Rev 0, A, B / LTE radio, IEEE 802.11a/b/g/n radio and Bluetooth radio. The rechargeable battery is not user accessible.

5.3. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	18.89	77.45
2412 - 2462	802.11g	25.47	352.37
2412 - 2462	802.11n HT20	25.31	339.63
5745 - 5825	802.11a	24.99	315.50
5745 - 5825	802.11n HT20	24.89	308.32
5755 - 5795	802.11n HT40	25.12	325.09

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5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain as shown below:

Frequency Band (GHz)	Antenna Gain (dBi)
2.4-2.4835	1.41
5.15-5.25	4.70
5.25-5.35	5.08
5.5-5.7	5.42
5.725-5.85	5.27

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 10A378

The EUT driver software installed during testing was Broadcom_Rel_6_10_56_166

The EUT is connected to the power meter.

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5.6. WORST-CASE CONFIGURATION AND MODE

For the fundamental investigation, since the EUT is a portable device that has three orientations; X, Y and Z orientations have been investigated, also with AC/DC adapter, and earphone, and the worst case was found to be at Y orientation without AC adapter and earphone for both 2.4GHz and 5GHz band.

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

Worst-case data rates as provided by the manufacturer are:

For 11b mode: 1Mbps For 11g mode: 6Mbps For 11n HT20: MCS0 For 11a mode: 6Mbps For 11n HT20 (5.8 GHz band): MCS0 For 11n HT40 (5.8 GHz band): MCS0

For 2.4 GHz band, an investigation of the fundamental frequency on both Ant0 and Ant1 ports showed that Ant0 is worst-case; therefore, all final radiated testing was performed using Ant0.

For 5 GHz bands, an investigation of the fundamental frequency on both Ant0 and Ant1 ports showed that Ant1 is worst-case; therefore, all final radiated testing was performed using Ant1.

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5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST						
Description	Serial Number	FCC ID				
AC Adapter	Apple	A1401	D060812	DoC		
Power Splitter	Krytar	158010	99250	N/A		
Dc Power Supply	Agilent	E3610A	KR24104150	N/A		
Laptop PC	Apple	MacBook Pro	AOU269116	N/A		

I/O CABLES (CONDUCTED SETUP)

I/O CABLE LIST						
Cable No.	Port	#of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	AC	Un-shielded	2.0m	N/A
2	DC	1	DC	Un-shielded	1.0m	N/A
3	Antenna Port	1	Splitter	Un-shielded	0.1m	N/A
4	RF out	1	Spectrum Analyzer	Un-Shielded	None	N/A
5	RF out	1	Power Meter	Shielded	None	NA

I/O CABLES (RADIATED SETUP)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	MINI USB	UN-SHELDED	1.0m	N/A
2	AUDIO	1	MINI JACK	UN-SHELDED	1.0m	N/A

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SETUP DIAGRAM FOR CONDUCTED TEST



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SETUP DIAGRAM FOR RADIATED TEST



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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		
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	11/11/12		
Antenna, Horn, 18 GHz	EMCO	3115	C00945	10/06/12		
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	11/11/12		
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1		02/07/13		
Horn Antenna, 26.5 GHz	ARA	MWH-1826/B	C00589	04/23/13		
Horn Antenna, 40 GHz	ARA	MWH-2640/B	C00981	06/14/13		
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	03/14/13		
Reject Filter, 2.0-2.9 GHz	Micro-Tronics	BRM50702	N02684	CNR		
High Pass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR		
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/15/12		
E-Series Power Sensor 9 kHg~18 GHz	Agilent	E9304A	1260847C	05/23/13		
P-Series single channel Power Meter	Agilent / HP	N1911A		07/27/13		
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02676	CNR		
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR		
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR		
EMI Test Receiver, 30MHz	R & S	ESHS 20	N02396	08/19/13		
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	12/13/12		

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7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 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", dated 01/18/2012.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.050	0.5
Middle	2437	8.050	0.5
High	2462	8.050	0.5

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6 dB BANDWIDTH



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7.1.2. 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHZ)	(IVIHZ)
Low	2412	12.3546
Middle	2437	12.3440
High	2462	12.3339

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99% BANDWIDTH



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99% BANDWIDTH MID CH	T Measure
Ch Freq 2.437 GHz Trig Fi Occupied Bandwidth Averages: 100	Tree Meas Off
Project: 12U14526	Channel Power
Ref 20 dBm Atten 10 dB #Samp Log	Occupied BW
10 dB/ Offst 21.8 dB/ dB/ dB/ dB/ dB/ dB/ dB/ dB/	ACP
Center 2.437.00 GHz Span 20 M	Multi Carrier Power
#Res BW 200 kHz VBW 620 kHz #Sweep 100 ms (601 pts	s)
Occupied Bandwidth Occ BW % Pwr 99.00 12.3440 MHz × dB -26.00 dE	Power Stat CCDF
Transmit Freq Error 37.301 kHz x dB Bandwidth 14.929 MHz*	More 1 of 2
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Ch Freq 2.452 GHz Trig Free Mea Occupied Bandwidth Averages: 100 Channel Po Project: 12U14526 Channel Po Occupied Ref 20 dBm Atten 10 dB Occupied Occupied 10 Multi Car Occupied Multi Car 10 Multi Car Span 20 MHz Power 30 Center 2.462 00 GHz VBW 620 kHz #Sweep 100 ms (601 pts) Power 30 Occupied Bandwidth Occ BW % Pwr 99.00 % Cocupied	T Measure	RT	14:25:00 Aug 20, 2012	9% BAINDVV Agilent 14:25:00
Channel Po Project: 12U14526 Ref 20 dBm Atten 10 dB #Samp Log 10 dB/ Offst 21.8 dB Center 2.462 00 GHz #Res BW 200 kHz VBW 620 kHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 12 3339 MHz x dB -26.00 dB	Free Meas (Trig Free Averages: 100	Ch Freq 2.462 GHz andwidth	Ch Freq Occupied Bandwid
Atten 10 dB Ref 20 dBm Atten 10 dB Samp Occupied 10 Multi Car dB/ Multi Car Center 2.462 00 GHz Span 20 MHz #Res BW 200 kHz VBW 620 kHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 12 3339 MHz x dB -26.00 dB	Channel Powe		4506	troject: 121114526
dB/ dB/ offst 21.8 dB dB/ dB/ dB/ dB/ dB/ dB/ dB/ dB/ dB/ dB/	Occupied B	An Walter Million All Loren .	Atten 10 dB	Samp
Center 2.462 00 GHz Span 20 MHz Multi Car #Res BW 200 kHz VBW 620 kHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 12 3339 MHz × dB -26.00 dB				B/ Hffst 1.8
Occupied Bandwidth Occ BW % Pwr 99.00 %	MultiCarrie	Span 20 MHz #Sweep 100 ms (601 pts)	00 GHz) kHz VBW 620	Center 2.462 00 GHz Res BW 200 kHz
	DO % Power Sta dB	Occ BW % Pwr 99.00 % x dB -26.00 dB	ed Bandwidth 12 3339 MHz	Occupied B
Transmit Freq Error 43.889 kHz 1 x dB Bandwidth 14.921 MHz* 1	Mo 1 of		eq Error 43.889 kHz idth 14.921 MHz*	Transmit Freq Error x dB Bandwidth

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7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Peak Power Reading	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	18.62	30	-11.38
Middle	2437	18.89	30	-11.11
High	2462	18.83	30	-11.17

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OUTPUT POWER



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7.1.4. 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 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	AV power
	(MHz)	(dBm)
Low	2412	15.93
Middle	2437	16.00
High	2462	15.95

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7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

<u>RESULTS</u>

Channel	Frequency	PSD	10log(3kHz/100kHz)	Limit	Margin
	(IVIHZ)	(abm)	(aBm)	(asm)	(aB)
Low	2412	8.16	-15.2	8	-15.04
Middle	2437	8.79	-15.2	8	-14.41
High	2462	9.01	-15.2	8	-14.19

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POWER SPECTRAL DENSITY



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7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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SPURIOUS EMISSIONS, MID CHANNEL



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SPURIOUS EMISSIONS, HIGH CHANNEL



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7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 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", dated 01/18/2012.

<u>RESULTS</u>

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.54	0.5
Middle	2437	15.71	0.5
High	2462	15.92	0.5

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6 dB BANDWIDTH

Agilent 14:4	D:09 Aug 20	2012	П			R	Т	Freq/Channel
Project: 12U1452 Ref 20 dBm #Peak	6 Atten	10 dB			∆ Mkr1	15.54 N -0.27 (1Hz JB	Center Freq 2.41200000 GHz
Log 10 dB/	1R Ammw	mayullanaminan	ing with	Mur Vinsee				Start Freq 2.39950000 GHz
dB DI	\square					\mathbf{h}		Stop Freq 2.42450000 GHz
1.1 dBm LgAv						W	Whether	CF Step 2.5000000 MHz <u>Auto Man</u>
/1 S2 53 FC								Freq Offset 0.00000000 Hz
τ(f): =Tun Swp								Signal Track On <u>Off</u>
Center 2.412 00 #Res BW 180 kH	GHz	#VBW 5	510 kHz	#Swee	S ep 20 ms	pan 25 s (601 pt	MHz ts)	

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3 dB BANE	DWID	TH HIG	ЭН СН						
🔆 Agilent 15:1	4:58 Au	g 20, 2012					F	₹ T	Freq/Channel
Project: 12U1452 Ref 20 dBm #Peak	26 	tten 10 dB				∆ Mk	r1 15.92 -0.3	2 MHz 9 dB	Center Freq 2.46200000 GHz
Log 10 dB/		manante	monthey	prosence	han ng bahan	hinning	1		Start Freq 2.44950000 GHz
Offst 21.8 dB DI	\mathcal{H}						$\frac{1}{\sqrt{2}}$		Stop Freq 2.47450000 GHz
0.6 dBm dan datatat LgAv							V	vhruhtø	CF Step 2.5000000 MHz Auto Ma
V1 S2 S3 FC									Freq Offset 0.00000000 Hz
¤(f): FTun Swp									Signal Track On <u>Off</u>
Center 2.462 00 #Res BW 180 kH	GHz Iz	#	VBW 510	kHz	#Sw	eep 20	Span 2 ms (601	25 MHz pts)	
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7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	16.3240
Middle	2437	16.3244
High	2462	16.3297

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99% BANDWIDTH



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Ch Freq 2.437 GHz Trig Free Occupied Bandwidth Averages: 100 Auto Mail Project: 12U14526 Auto Mail Ref 20 dBm Atten 10 dB Wideo Bill Video Bill Jog Auto Mail Video Bill Iong Auto Mail Auto Mail Log Occupied Bandwidth Auto Mail VBW/RB 3.00000 Log Auto Mail Auto Mail Auto Mail Bill Auto Mail Auto Mail Auto Mail Center 2.437 00 GHz Span 25 MHz Span 25 MHz Mail #Res BW 240 kHz VBW 750 kHz #Sweep 100 ms (601 pts) Mail Occupied Bandwidth Occ BW % Pwr 99.00 % Span/RBW Transmit Freq Error 14.170 kHz X dB Span/RBW Auto Mail	99% BANDWIDTF	1 MID CH 0, 2012		RТ	В	W/Avg
Project: 12U14526 Ref 20 dBm Atten 10 dB #Samp WBW/RB Log WBW/RB 10 WBW/RB <t< th=""><th>Ch Freq 2. Occupied Bandwidth</th><th>437 GHz</th><th>Averages: 100</th><th>Trig Free</th><th>Auto</th><th>Res BV 240.0 kHz <u>Ma</u></th></t<>	Ch Freq 2. Occupied Bandwidth	437 GHz	Averages: 100	Trig Free	Auto	Res BV 240.0 kHz <u>Ma</u>
Ref 20 dBm Atten 10 dB VBW/RB #Samp	Project: 12U14526				Auto	Video BV 750.0 kHz <u>Ma</u>
B/ Offst Average 21.8 Average 100 dB/ Average 100 Offst Average 100 21.8 Average 100 dB/ Average 100 Center 2.437 00 GHz Span 25 MHz #Res BW 240 kHz VBW 750 kHz #Sweep 100 ms (601 pts) Occ Upied Bandwidth Occ BW % Pwr 99.00 % 16.3244 MHz x dB -26.00 dB Transmit Freq Error 14.170 kHz X dB x dB Bandwidth 18.127 MHz* Auto	Ref 20 dBm Atte #Samp Log	n 10 dB			Auto	VBW/RB ⁾ 3.00000 <u>Ma</u>
dB	dB/ → // Offst 21.8				On	Average 100 <u>Off</u>
#Res BW 240 kHz VBW 750 kHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 16.3244 MHz x dB -26.00 dB Transmit Freq Error 14.170 kHz 0cc x dB Bandwidth 18.127 MHz* Auto	dB			Span 25 MHz	Avg/V Log-P Auto	/BW Type wr (Video) <u>Ma</u>
Occupied Bandwidth Occ BW % Pwr 99.00 % 16.3244 MHz x dB -26.00 dB Transmit Freq Error 14.170 kHz Span/RBV x dB Bandwidth 18.127 MHz* Auto	#Res BW 240 kHz	VBW 750 k	Hz #Sweep 100	ms (601 pts)		
16.3244 MHz x dB -26.00 dB Span/RBV Transmit Freq Error 14.170 kHz 100 x dB Bandwidth 18.127 MHz* Auto Ma	Occupied Bandw	/idth	Occ BW % Pwr	99.00 %		
Transmit Freq Error 14.170 kHz 100 x dB Bandwidth 18.127 MHz* <u>Auto Ma</u>	16.3	3244 MHz	x dB	-26.00 dB	<u> </u>	
	Transmit Freq Error x dB Bandwidth	14.170 kHz 18.127 MHz*			Auto	5рап/к.вм 106 <u>Ма</u>

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99% BANDWIDTH	HIGH CH		RТ	Measure
Ch Freq 2.46)2 GHz		Trig Free	Meas Off
Occupied Bandwidth	4	Averages: 100		Channel Power
Project: 12U14526 Ref 20 dBm Atten #Samp Log	10 dB	riyu ya ashi ku ya ku ya ka ka	•	Occupied BW
10 AMANANA dB/ Offst AMANA 21.8				ACF
dB Center 2.462 00 GHz			Span 25 MHz	Multi Carrier Power
#Res BW 240 kHz Occupied Bandwi	VBW 750 kHz	#Sweep 100	ms (601 pts) 99.00 %	Power Stat CCDF
16.32 Transmit Freq Error x dB Bandwidth	2 97 MHz 6.469 kHz 18 115 MHz*	x dB	-26.00 dB	More 1 of 2
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7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	25.16	30	-4.84
Middle	2437	25.15	30	-4.85
High	2462	25.47	30	-4.53

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OUTPUT POWER



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7.2.4. 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 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	15.99
Middle	2437	15.94
High	2462	15.98

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7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	PSD	10log(3kHz/100kHz)	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	2412	5.71	-15.2	8	-17.49
Middle	2437	5.82	-15.2	8	-17.38
High	2462	6.15	-15.2	8	-17.05

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POWER SPECTRAL DENSITY



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🔆 Agilent 15:07	:34 Aug 20, 2012			RT	Freq/Channel
Project: 12U14528 Ref 20 dBm *Poak	Atten 10 dB		Mkr	1 2.438 25 GHz 5.82 dBm	Center Freq 2.44200000 GHz
log dB/	at margarition marke				Start Freq 2.42950000 GHz
Offst 21.8 dB			h h		Stop Freq 2.45450000 GHz
≠PAvg			- WWW	ANAMANANA	CF Ster 2.50000000 MHz <u>Auto Ma</u>
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
a(f): FTun Swp					Signal Track
Center 2.442 00 (#Res BW 100 kH	GHz 7 #V	/BW 300 kHz	Sween	Span 25 MHz 20 ms (601 pts)	

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7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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SPURIOUS EMISSIONS, MID CHANNEL



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SPURIOUS EMISSIONS, HIGH CHANNEL



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7.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

7.3.1. 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", dated 01/18/2012.

<u>RESULTS</u>

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.25	0.5
Middle	2437	17.21	0.5
High	2462	17.17	0.5

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6 dB BANDWIDTH

🤄 Agi	lent 15	:31:12 /	Aug 20, 3	2012					F	₹ T	Freq/Channel
Project: Ref 20 (#Peak	12U148 IBm	526	Atten 1	0 dB				∆ Mkr	1 17.25 0.8	5 MHz 36 dB	Center Freq 2.41200000 GHz
.og 0 IB/			wayah wa	Mesnelinum	morten	monthered	that	www.wy	1		Start Freq 2.39950000 GHz
1.8 B									+		Stop Freq 2.42450000 GHz
.3 Bm gAv	the state of the s								(www.wh	CF Step 2.5000000 MHz Auto Ma
1 S2 3 FC											Freq Offset 0.00000000 Hz
(f): Tun wp											Signal Track On <u>Off</u>
Center 3	2.412 0 N 180 I	0 GHz dHz		#VF	3W 560	kH7	#Sw	eep 20	Span 2 ms (601	25 MHz	

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Project: 12U14526 Ref 20 dBm Atten 10 dB #Peak Log 10 dB/ Offst 21.8 dB	△ Mkr1 17.21 MHz 0.04 dB 2.43700000 G Start Fre 2.42450000 G
Log 10 18 18 18 18 18 18 18 18 18 18	Start Fre 2.42450000 Gl
dB	Stop Fre
	2.44950000 GP
1.0 dBm LgAv	CF S 2.50000000 MI
V1 S2 S3 FC	Freq Offse
□(f): FTun Swp	Signal Tra- On
Center 2.437 00 GHz #Res BW 180 kHz #VBW 560 kHz #	Span 25 MHz Sweep 20 ms (601 pts)

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K Agilent 16:03:1	5 Aug 20, 2	012			RI	Freq/Channel
Project: 12U14526 Ref 20 dBm #Peak	Atten 1) dB		∆ Mk	r1 17.17 MH 0.94 dE	Center Freq 2.46200000 GHz
-og 0 1 B/ 4	R MAN	unternation	monum	montematica	1 ••••••••••••••••••••••••••••••••••••	Start Freq 2.44950000 GHz
21.8 IB						Stop Freq 2.47450000 GHz
.1 IBm .gAv					Wayne	CF Step 2.5000000 MHz <u>Auto</u> Ma
/1 S2 ;3 FC						Freq Offset 0.00000000 Hz
(f): Tun Swp						Signal Track On <u>Of</u>
Center 2.462 00 GF Res BW 180 kHz	lz	#VBW 560	kHz	#Sweep 20	Span 25 Mi ms (601 pts)	Hz

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7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	15.96
Middle	2437	16.00
High	2462	15.93

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99% BANDWIDTH



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🔆 Agilent 15:46:14 Aug	20, 2012		RΤ	B	W/Avg
Ch Freq 2 Occupied Bandwidth	2.437 GHz	Averages: 100	Trig Free	Auto	Res B\ 240.0 kHz <u>Ma</u>
Project: 12U14526				<u>Auto</u>	Video BV 750.0 kHz <u>Ma</u>
Ref 20 dBm Att #Samp Log	en 10 dB	MARY AND A MARY AND A		Auto	VBW/RB 3.00000 <u>Ma</u>
dB/ Offst				On	Average 100 <u>Of</u>
Center 2.437 00 GHz			Span 25 MHz	Avg/V Log-P ⁱ <u>Auto</u>	/BW Type wr (Video) <u>Ma</u>
#Res BW 240 kHz	VBW 750 kHz	#Sweep 100	ms (601 pts)		
Occupied Band	width	Occ BW % Pwr	99.00 %		
. 17.	5179 MHz	x dB	-26.00 dB		
Transmit Freq Error	13.612 kHz			Auto	Span/RBV 108 Ma

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99% BANDWIDTH HIGH CH	Measure
Ch Freq 2.462 GHz Trig Free Occupied Bandwidth Averages: 100	Meas Off
Project: 12U14526	Channel Power
Ref 20 dBm Atten 10 dB #Samp Log	Occupied BW
10 dB/ → 0ffst 21.8	
dB Center 2.462 00 GHz Span 25 MH	Multi Carrier z Power
#Res BW 240 kHz VBW 750 kHz #Sweep 100 ms (601 pts)	Power Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 17.5013 MHz × dB -26.00 dB	CCDF
Transmit Freq Error 11.042 kHz x dB Bandwidth 18.622 MHz*	More 1 of 2
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7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	25.05	30	-4.95
Middle	2437	25.31	30	-4.69
High	2462	25.19	30	-4.81

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OUTPUT POWER



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7.3.4. 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 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	15.96
Middle	2437	16.00
High	2462	15.93

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7.3.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

<u>RESULTS</u>

Channel	Frequency (MHz)	PSD (dBm)	10log(3kHz/100kHz) (dBm)	Limit (dBm)	Margin (dB)
Low	2412	5.92	-15.2	8	-17.28
Middle	2437	6.16	-15.2	8	-17.04
High	2462	6.14	-15.2	8	-17.06

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POWER SPECTRAL DENSITY



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🔆 Agilent 1	5:52:14	Aug 20,	2012					F	₹ T	Freq/Channel
Project: 12U14 Ref 20 dBm	1526	Atten	10 dB	1			Mkr1	2.438 29 6.16) GHz dBm	Center Freq 2.43575000 GHz
log 10 dB/			maleri	Lukow	any men			h. 1		Start Freq 2.42325000 GHz
Offst 21.8 dB		man			V			and the particular		Stop Freq 2.44825000 GHz
#PAvg ₩\\\\	have								Mary	CF Ste 2.5000000 MHz <u>Auto M</u> i
V1 S2 S3 FC										Freq Offset 0.00000000 Hz
¤(f): FTun Swp										Signal Track On <u>O</u>
Center 2.435 #Res BW 100	75 GHz		#\/F	300 300	kH7	Su	/	Span 2 ms /601	25 MHz	

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7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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SPURIOUS EMISSIONS, MID CHANNEL



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SPURIOUS EMISSIONS, HIGH CHANNEL



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7.4. 802.11a MODE IN THE 5.8 GHz BAND

7.4.1.6 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", dated 01/18/2012.

<u>RESULTS</u>

Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	5745	15.79	0.5
Middle	5785	15.88	0.5
High	5825	15.96	0.5

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6 dB BANDWIDTH

🔆 Agilent 10):45:25	Aug 21, 3	2012	••••				F	≀ T	Freq/Channel
Project: 12U14 R ef 20 dBm #Peak	526	Atten 1	0 dB				∆ Mk	r1 15.79 -0.4	9 MHz 9 dB	Center Freq 5.74500000 GHz
Log 10 dB/		an putween	monalesta	mathering	mahara	www.u	4.M. may	1		Start Freq 5.73250000 GHz
22.5 dB	f							$\overline{}$		Stop Freq 5.75750000 GHz
1.0 dBm _{My} wyyy LgAv	M ^r							X	White	CF Step 2.5000000 MHz Auto Man
/1 S2 53 FC										Freq Offset 0.00000000 Hz
a(f): -Tun Swp										Signal Track On <u>Off</u>
Center 5.745 0 #Res BW 200	0 GHz kHz		#VE	3W 620	kHz	#Sw	eep 20	Span 2 ms (601	25 MHz pts)	

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dB BANDWIDT	H MID CH	RT	Freq/Channel
Project: 12U14526 Ref 20 dBm At #Peak	ten 10 dB	∆ Mkr1 15.88 MHz 0.05 dB	Center Freq 5.78500000 GHz
Log 10 1.8 dB/ <u>Spp</u>	under and and	manutemante	Start Freq 5.77250000 GHz
DI			Stop Freq 5.79750000 GHz
1.1 dBm ////////////////////////////////////		WHUH	CF Step 2.5000000 MHz Auto Ma
V1 S2 S3 FC			Freq Offset 0.00000000 Hz
⊏(f): FTun Swp			Signal Track On <u>Off</u>
Center 5.785 00 GHz #Res BW 200 kHz	#VBW 620 kHz	Span 25 MH #Sweep 20 ms (601 pts)	z

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6 dB	BAN	DWI	DTH	HIGH	I CH						
🔆 Agi	ilent 11	:24:36	Aug 21, 3	2012					F	₹ T	Freq/Channel
Project: Ref 20 #Peak	12U145 d Bm	526	Atten 1	0 dB				∆ Mk	r1 15.98 -0.3	6 MHz 5 dB	Center Freq 5.82500000 GHz
Log 10 dB/			monthe	manakan	mm	pangan	hhanganta	whitehear	1		Start Freq 5.81250000 GHz
0ffst 22.5 dB DI		+									Stop Freq 5.83750000 GHz
0.5 dBm LgA∨	M.M.MM	/							V	WMANAAAA	CF Step 2.5000000 MHz Auto Man
V1 S2 S3 FC											Freq Offset 0.00000000 Hz
¤(f): FTun Swp											Signal Track On <u>Off</u>
Center #Res B\	5.825 0 W 200 k	0 GHz (Hz		#VE	3W 620	kHz	#Sw	reep 20	Span 2 ms (601	25 MHz pts)	
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7.4.2. 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5745	16.3187
Middle	5785	16.3261
High	5825	16.3253

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99% BANDWIDTH



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99% BANDWIDT	H MID CH		RТ	Measure
Ch Freq 5 Occupied Bandwidth	.785 GHz	Averages: 100	Trig Free	Meas Off
				Channel Power
Project: 12U14526	40 JD		,	
#Samp			•	Occupied BW
10 dB/ 22.5	en e			ACF
dB				Multi Carrier
Center 5.785 00 GHz #Res BW 240 kHz	#VBW 750	kHz #Sweep100	Span 25 MHz ms (601 pts)	POWer
Occupied Band	width	Occ BW % Pwr x dB	99.00 % -26.00 dB	Power Stat CCD
Transmit Freq Error x dB Bandwidth	-7.101 kHz 18.179 MHz*			More 1 of 2
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99% BANDWIDTH	HIGH CH		RΤ	Measure
Ch Freq 5. Occupied Bandwidth	325 GHz	Averages: 100	Trig Free	Meas Off
Project: 121114526				Channel Power
Ref 20 dBm Atte	n 10 dB	Malenia Maritan Malakana Malakana Malakana Malakana Maritan Maritan Maritan Maritan Maritan Maritan Maritan Ma		Occupied BW
dB/ offst 22.5 dB/ offst				ACI
Center 5.825 00 GHz #Res BW 240 kHz	VBW 750 kH	z #Sweep 100	Span 25 MHz ms (601 pts)	Multi Carrier Power
Occupied Bandw 16.3	/idth 3253 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	Power Stat CCD
Transmit Freq Error x dB Bandwidth	-12.958 kHz 18.171 MHz*			More 1 of 2
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7.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5745	24.88	30	-5.12
Middle	5785	24.38	30	-5.62
High	5825	24.99	30	-5.01

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OUTPUT POWER



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7.4.4. 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 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Power
	(MHz)	(dBm)
Low	5745	15.91
Middle	5785	15.94
High	5825	15.96

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7.4.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	5745	5.97	-15.2	-9.23	8	-17.23
Middle	5785	5.77	-15.2	-9.43	8	-17.43
High	5825	6.09	-15.2	-9.11	8	-17.11

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POWER SPECTRAL DENSITY



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🤄 Agilent 11:09:0	2 Aug 21, 2012					F	₹ T	Freq/Channel
Project: 12U14526 Ref 20 dBm Peak	Atten 10 dB				Mkr1 :	5.786 24 5.77	IGHz dBm	Center Freq 5.77995000 GHz
.og 0 IB/		Anna	walnut	unthing	min	man	human	Start Freq 5.76745000 GHz
inst i2.5 IB					/			Stop Freq 5.79245000 GHz
PAvg	-Hallaharthan							CF Step 2.5000000 MHz <u>Auto Ma</u>
/1 S2								Freq Offset 0.00000000 Hz
(f): -Tun Swp								Signal Track On <u>O</u> t
Center 5.779 95 GH Res BW 100 kHz	 z #V	BW 300 k	Hz	Sw	eep 20	Span 2 ms (601	25 MHz pts)	

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7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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SPURIOUS EMISSIONS, MID CHANNEL



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SPURIOUS EMISSIONS, HIGH CHANNEL



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7.5. 802.11n HT20 MODE IN THE 5.8 GHz BAND

7.5.1. 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", dated 01/18/2012.

<u>RESULTS</u>

Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	5745	17.25	0.5
Middle	5785	17.25	0.5
High	5825	17.21	0.5

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6 dB BANDWIDTH

Agilent 11:4	41:53 Aug	21,2012	Сп				R	т	Freq/Channel
Project: 12U1452 Ref 20 dBm #Peak	26 Att	en 10 dB				∆ Mkr	r1 17.25 -1.2	i MHz 6 dB	Center Freq 5.74500000 GHz
Log 10 dB/	IR Annul	handermaker	history	rondern	motolywan	mathing	1. Ma		Start Freq 5.73250000 GHz
22.5 dB DI									Stop Freq 5.75750000 GHz
0.2 dBm <mark>//hy</mark> /₩µ/M LgAv	*						'n	White	CF Step 2.5000000 MHz <u>Auto Man</u>
V1 S2 S3 FC									Freq Offset 0.00000000 Hz
⊐(f): FTun Swp									Signal Track On <u>Off</u>
Center 5.745 00 #Res BW 200 kt	GHz Iz	#VB	W 620	kHz	#Sw	eep 20	Span 2 ms (601	5 MHz pts)	

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Agilent 11:56:03 Aug 21, 2012 R T Project: 12U14526 Δ Mkr1 17.25 MHz Ref 20 dBm Atten 10 dB 0.69 dB #Peak Log 10 18 0 10 11 0 10 11 0 10 10 11 0 12 0 12 0 12 0 12 0 13 14 15 10 12 12 13 14 14 15 16 17 18 19 10 12 13 14 14 17 18 19 <	Freq/Channel Center Freq 5.78500000 GHz
Project: 12U14526 A Mkr1 17.25 MHz Ref 20 dBm Atten 10 dB 0.69 dB #Peak 0.69 dB Log 1 10 1R 1 dB/ 0.69 dB 0ffst 2.5 dB 0 01 1.2 dBm 0 V1 S2 0	Center Freq 5.78500000 GHz
Log 10 18 18 18 18 18 18 19 19 19 19 19 19 19 19 19 19	
Onst 22.5	Start Freq 5.77250000 GHz
LgAv V1 S2	Stop Freq 5.79750000 GHz
V1 S2	CF Step 2.5000000 MHz
\$3 FC	Freq Offset 0.00000000 Hz
¤(f): FTun Swp	Signal Track On <u>Off</u>
Center 5.785 00 GHz Span 25 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 20 ms (601 pts)	

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6 dB	BAND	DWI	ЭΤΗ	HIGH	н СН						
🔆 Ag	ilent 12:0	07:51 /	Aug 21, 3	2012					F	R Τ	Freq/Channel
Project: Ref 20 #Peak	12U1452 dBm	26	Atten 1	0 dB				∆ Mki	r1 17.21 -0.2	1 MHz 15 dB	Center Freq 5.82500000 GHz
Log 10 dB/			popular da	murtunto	mattering	promen	Minaka	where wh	1		Start Freq 5.81250000 GHz
22.5 dB DI		+							\rightarrow		Stop Freq 5.83750000 GHz
1.1 dBm LgA∨	www.hum								J	MANA	CF Step 2.5000000 MHz Auto Man
V1 S2 S3 FC											Freq Offset 0.00000000 Hz
¤(f): FTun Swp											Signal Track On <u>Off</u>
Center #Res B	5.825 00 W 200 kł	GHz Iz		#VE	3W 620	kHz	#Sw	eep 20	Span 2 ms (601	25 MHz pts)	
Copyrig	ht 2000-2	011 Aç	gilent Te	chnologi	es			•	*		

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7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5745	17.5209
Middle	5785	17.5179
High	5825	17.5157

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99% BANDWIDTH



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99% BANDWIDT	H MID CH		RТ	Measure
Ch Freq 5 Occupied Bandwidth	.785 GHz	Averages: 100	Trig Free	Meas Off
				Channel Power
Project: 12014526 Ref 20 dBm Att #Samp Log	en 10 dB	Milebolt Andrewski Haven Administra	◆	Occupied BW
10 dB/ Offst 22.5				ACF
dB			Span 25 MHz	Multi Carrier Power
#Res BW 240 kHz	VBW 750	kHz #Sweep100ı	ns (601 pts)	Dower Stat
Occupied Band 17.	width 5179 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	
Transmit Freq Error x dB Bandwidth	-9.032 kHz 18.636 MHz*			More 1 of 2
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99% BANDWIDTH	HIGH CH		RТ	Measure
Ch Freq 5.8 Occupied Bandwidth	25 GHz	Averages: 100	Trig Free	Meas Off
Project: 12U14526				Channel Power
Ref 20 dBm Atter #Samp Log		1. M. B. Warder and M. Barrison		Occupied BW
10 dB/ Offst 44 22.5				ACP
dB Center 5.825 00 GHz			Span 25 MHz	Multi Carrier Power
#Res BW 240 kHz Occupied Bandwi	VBW 750 k	Hz #Sweep 100 Occ BW % Pwr	ms (601 pts) 99.00 %	Power Stat
17.5	157 MHz	x dB	-26.00 dB	
Transmit Freq Error x dB Bandwidth	-11.100 kHz 18.614 MHz*			More 1 of 2
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7.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5745	24.89	30	-5.11
Middle	5785	24.80	30	-5.20
High	5825	24.75	30	-5.25

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OUTPUT POWER



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Agilent 12:17:11	Aug 21, 2012				F	хт	Freq/Channel
Project: 12U14526 Ref 19.48 dBm #Peak	Atten 10 dB		Ba	∆ Mkr1 and Pwr	l 17.2 [.] 24.75	l MHz dBm	Center Freq 5.82500000 GHz
.og 1R 0 IB/	and a second and a second second	na-mard for an or themany		anne Radan			Start Freq 5.81250000 GHz
2.5 IB					\	WHAT A	Stop Freq 5.83750000 GHz
EgAv							CF Step 2.5000000 MHz <u>Auto Ma</u>
/1 S2 53 FC							Freq Offset 0.00000000 Hz
l(f): :Tun Swp							Signal Track On <u>Ot</u>
Center 5.825 00 GHz Res BW 1 MHz		3W 3 MHz	Sw	eep 20 n	Span 2 ns (601	25 MHz pts)	

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7.5.4. 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 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Power		
	(MHz)	(dBm)		
Low	5745	15.97		
Middle	5785	15.99		
High	5825	15.99		

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7.5.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	5745	6.17	-15.2	-9.03	8	-17.03
Middle	5785	6.14	-15.2	-9.06	8	-17.06
High	5825	6.20	-15.2	-9.00	8	-17.00

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POWER SPECTRAL DENSITY



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7.5.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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SPURIOUS EMISSIONS, MID CHANNEL



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SPURIOUS EMISSIONS, HIGH CHANNEL



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7.6. 802.11n HT40 MODE IN THE 5.8 GHz BAND

7.6.1. 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", dated 01/18/2012.

<u>RESULTS</u>

Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	5755	35.58	0.5
High	5795	35.33	0.5

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6 dB BANDWIDTH

Agilent 13:53	WIDIH 3:18 Aug 21,	2012	H		R	Freq/Channel
Project: 12U14528 Ref 20 dBm #Peak	6 Atten	10 dB		∆ Mi	rr1 35.58 MH -0.25 dE	z Center Freq 5.75500000 GHz
Log 10 dB/	IR Opphelensterne	a fryhillyward anythi	an france	where a construction of the	1	Start Freq 5.73000000 GHz
22.5 dB DI	/				h	Stop Freq 5.78000000 GHz
0.8 M [™] dBm LgAv					/W	CF Step 5.0000000 MHz <u>Auto Man</u>
V1 S2 S3 FC						Freq Offset 0.00000000 Hz
¤(f): FTun Swp						Signal Track On
Center 5.755 00 (#Res BW 390 kH;	GHz	# VBW 1	.2 MHz	#Sweep 20	Span 50 M ms (601 pts)	Hz

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🔆 Agilent 14:1	4:57 Aug 21, 201	2		RТ	Freq/Channel
Project: 12U1452 Ref 20 dBm #Peak	6 Atten 10 (IB	∆ Mkr1 35.: -0	33 MHz .01 dB	Center Freq 5.79500000 GHz
Log 10 dB/	IR Sunderstrandback	town the second	hannen marinen and		Start Freq 5.77000000 GHz
Offist 22.5 dB DI				Ww.	Stop Freq 5.82000000 GHz
1.2 dBm LgAv				North Car	CF Step 5.0000000 MHz Auto Mai
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
¤(f): FTun Swp					Signal Track On <u>Off</u>
Center 5.795 00 #Res BW 430 kH	GHz	#VBW 1.2 MHz	Span #Sweep 20 ms /6(50 MHz	

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7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5755	35.8653
High	5795	35.8203

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99% BANDWIDTH

99% BANDWIDTH LOW CH		RT	Measure
Ch Freq 5.755 GHz Occupied Bandwidth	Averages: 100	Trig Free	Meas Off
Project: 101114506			Channel Power
Ref 20 dBm Atten 10 dB #Samp Log	r with with the second second		Occupied BW
10 77 77 77 77 77 77 77 77 77 77 77 77 77			ACP
dB	Hz #Sweep 100	Span 50 MHz ms (601 pts)	Multi Carrier Power
Occupied Bandwidth 35.8653 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	Power Stat CCDF
Transmit Freq Error -25.872 kHz x dB Bandwidth 40.491 MHz*			More 1 of 2
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99% BANDWIDTH H	HIGH CH		RТ	Measure
Ch Freq 5.795 Occupied Bandwidth	GHz 7	Averages: 100	Trig Free	Meas Off
Project: 12114526				Channel Power
Ref 20 dBm Atten 10 #Samp Log Atala the have	D dB	rither for the stand labor as the new block.	tt. \$	Occupied BW
10 (B/ Offst 22.5				ACI
dB			Span 50 MHz	Multi Carrier Power
#Res BW 510 kHz	VBW 1.5 MHz	#Sweep 100 ı	ns (601 pts)	Dowor Stat
Occupied Bandwid 35.820	th)3 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	CCD
Transmit Freq Error -1 x dB Bandwidth 41	2.516 kHz).538 MHz*			More 1 of 2
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7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5755	25.12	30	-4.88
High	5795	25.03	30	-4.97

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OUTPUT POWER



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	VER HIGH CH				[]
- Agilent 14:21:42	Aug 21, 2012		ŀ	< I	Freq/Channel
Project: 12U14526 Ref 16.83 dBm #Peak	Atten 10 dB	B	∆ Mkr1 35.3 and Pwr 25.03	3 MHz dBm	Center Freq 5.79500000 GHz
Log 1R 10 dB/ Offst	ment the manual and provided and provided and		1 Alexandress of the second se		Start Freq 5.77000000 GHz
22.5 dB				-	Stop Freq 5.8200000 GHz
#LgAv					CF Step 5.0000000 MHz <u>Auto Man</u>
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
¤(f): FTun Swp					Signal Track ^{On <u>Off</u>}
Center 5.795 00 GHz #Res BW 1 MHz	#VBW 3	MHz Sw	Span veep 20 ms (601	50 MHz pts)	
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7.6.4. 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 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Power
	(MHz)	(dBm)
Low	5755	15.95
High	5795	15.93

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7.6.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

RESULTS

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	5755	3.05	-15.2	-12.15	8	-20.15
High	5795	2.87	-15.2	-12.33	8	-20.33

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POWER SPECTRAL DENSITY



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	CH			ВТ	Freq/Channel
Project: 12U1452 Ref 20 dBm #Peak	26 Atten 10 dB		Mkr1	5.798 75 GHz 2.87 dBm	Center Freq 5.79000000 GHz
Log 10 dB/ Offst			*	multime -1	Start Freq 5.76500000 GHz
22.5 dB					Stop Freq 5.81500000 GHz
#PAvg	where the second s			۲ <u>،</u>	CF Step 5.0000000 MHz <u>Auto Man</u>
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
¤(f): FTun Swp					Signal Track On <u>Off</u>
Center 5.790 00 #Res BW 100 kH	GHz Iz #V	/BW 300 kHz	Sweep 20	Span 50 MHz ms (601 pts)	
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7.6.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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SPURIOUS EMISSIONS, HIGH CHANNEL



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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, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

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8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz, 802.11b 1TX MODE, 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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			ħ	1kr1 2.38	4 93 GHz	
Ref 110 dBµ∀ #Peak	#Atten 0 dB			43.	.90 dBµ∨	Center Freq 2.35000000 GHz
.og						
10 1B/						Start Freq 2.31000000 GHz
Dffst 12.4 1B						Stop Freq
						2.39000000 0112
14.0 1Βμ∨						CF Step
_gAv						8.00000000 MHz <u>Auto Ma</u>
S1 V2						Freq Offset
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						0.0000000 Hz
(f):						Signal Track
Swp						On <u>Of</u>
Start 2.310 00 GHz				Stop 2.39	0 00 GHz	
Res BW 1 MHz	#VBW	10 Hz	Sweep	6.238 s íð	i01 ptsì	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

4 440 JD 37	404 0 JD		Mkr1 2.385 07	GHz Center Fred
eak	#Atten 0 ub			2.35000000 GH
(g) /				Start Free 2.31000000 GH
.4				Stop Fre 2.39000000 GH
.0 µ∨ Av	and have be a second days of	uhan, an and be understa		CF Ste 8.0000000 MH
V2 FC				Freq Offset
): iun /p				Signal Trac
art 2.310 00 GHz			Stop 2.390 00	GHz

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			Mkr1	2 385 20 GHz	
Ref 110 dBµ∨ ⁄Peak	#Atten 0 dB			44.02 dBµ∨	Center Freq 2.35000000 GHz
.og					Start Freq 2.31000000 GHz
)1150 1150 1150 1150 1150 1150 1150 1150					Stop Freq 2.39000000 GHz
4.0 ΙΒμ∨ gAv					CF Step 8.00000000 MHz <u>Auto Ma</u>
31 V2				\$	Freq Offset 0.00000000 Hz
(f): Tun Wp					Signal Track On <u>Of</u>
Start 2.310 00 GH;	Z	(D)&(10, U -	Stop	2.390 00 GHz	~

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

			Mkr1 2.4	85 370 0 GHz	
110 dB µ∀ eak	#Atten 0 dB			57.01 dBµ∨	Center Freq 2.49175000 GHz
					Start Freq 2.48350000 GHz
					Stop Frec 2.5000000 GHz
	ang	an ware when a second second second	an the gal more	an marager and way	CF Ste 1.65000000 MHz <u>Auto M</u>
V2 FC					Freq Offset 0.00000000 Hz
ın					Signal Track On <u>C</u>
rt 2.483 500 0 (GHz		Stop 2.5	D0 000 0 GHz	

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		Mkr1 2 488 807 5 GHz	
Ref 110 dBµ∀	#Atten 0 dB	44.58 dBµ∨	Center Freq 2.49175000 GHz
.og			
0 18/			Start Freq 2.48350000 GHz
)ffst 2.6			
IB			Stop Freq
) 4_0			_
IB _μ ∨			CF Step 1 6500000 MHz
.gAv			<u>Auto</u> <u>Ma</u>
S1 √2	1 (Frea Offset
33 FC			0.00000000 Hz
(f):			
Tun			On <u>Of</u>
5mp			
		Et 2 500 000 0 CU-	

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

					<u>i roqronannor</u>
f 110 dB µ∀ ∋ak	#Atten 0 dB		Mkr1 2.48	6 085 0 GHz 57.20 dBµ∨	Center Freq 2.49175000 GHz
() /					Start Freq 2.48350000 GHz
					Stop Freq 2.5000000 GHz
0 µ∨ [↓] v voolst _{eet} voors	1 Of an some of the second	etter and had been a	Marchine probabilities	UManatardageradada	CF Ste 1.6500000 MHz <u>Auto M</u> i
V2 FC					Freq Offset 0.00000000 Hz
: Jn p					Signal Track On <u>O</u>
art 2.483 500 0 (GHz HS		Stop 2.50	0 000 0 GHz	

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		Mbr1 2 499 962 5 CH-	
Ref 110_dBµ∨	#Atten 0 dB	MKT 2.400 002 3 GH2 44.28 dBµ∀	Center Freq
Peak			2:4011 3000 0112
.0g 0 IB/			Start Freq 2.48350000 GHz
0ffst 2.6			Stop Freq
10 11			2.5000000 GHz
4.0 Βμ∀			CF Ster
.gAv			1.65000000 MHz <u>Auto Ma</u>
31 V2	1 (Freq Offset 0.00000000 Hz
(f):			
Tun wp			On <u>Of</u>
Start 2.483 500 0 G	Hz	Stop 2.500 000 0 GHz	Î

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HARMONICS AND SPURIOUS EMISSIONS

Test Engr		Chin Pa	ng										
Date:	-	08/13/12											
Proiect #:		12U1452	12U14526										
Company	:	Apple	nnle										
Test Targe	et:	FCC 15.	247										
Mode Op	er:	b mode.	TX (Wo	rst Ca	ase)								
		,											
	f	Measuren	nent Fred	quency	Amp	Preamp (Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anter	ina	D Corr	Distance	Correc	et to 3 me	ters	Peak Fie	ld Strength	Limit	
	Read	Analyzer	Reading		Avg	Average	Field S	trength @	3 m	Margin v	vs. Average	Limit	
	AF	Antenna	Factor		Peak	Calculate	d Peak	Field Stre	ength	Margin v	s. Peak Li	nit	
	CL	Cable Los	88		HPF	High Pas	s Filter						
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	dBu V/m	dBuV/m	dB	V/H	P/A/QP	
Low Ch, 2	2412MH	<u>z</u>	ļ	ļ		Į							
4.824	3.0	37.0	33.4	6.3	-35.5	0.0	0.0	41.2	74.0	-32.8	<u>V</u>	Р	
4.824	3.0	24.7	33.4	6.3	-35.5	0.0	0.0	28.9	54.0	-25.1	<u> </u>	A	
4.824	3.0	38.4	33.4	6.3	-35.5	0.0	0.0	42.6	74.0	-31.4	H	<u>Р</u>	
4.824	3.0	30.1	33.4	0.3	-35.5	0.0	0.0	34.3	54.0	-19.7	н	<u>A</u>	
Mid Ch. 2	437MH	1 7											
4.874	3.0	37.1	33.5	6.3	-35.5	0.0	0.0	41.4	74.0	-32.6	V	Р	
4.874	3.0	24.1	33.5	6.3	-35.5	0.0	0.0	28.4	54.0	-25.6	V	A	
7.311	3.0	35.5	35.7	8.5	-35.4	0.0	0.0	44.3	74.0	-29.7	V	Р	
7.311	3.0	23.4	35.7	8.5	-35.4	0.0	0.0	32.2	54.0	-21.8	V	Α	
4.874	3.0	41.4	33.5	6.3	-35.5	0.0	0.0	45.7	74.0	-28.3	H	Р	
4.874	3.0	38.2	33.5	6.3	-35.5	0.0	0.0	42.5	54.0	-11.5	H	<u>A</u>	
7.311	3.0	35.9	35.7	8.5	-35.4	0.0	0.0	44.6	74.0	-29.4	H	P	
/.311	3.0	23.0	35.7	8.5	-35.4	0.0	0.0	32.4	54.0	-21.0	Н	A	
High Ch	1 2462MI	1 17	1		l					1			
4.924	3.0	36.4	33.5	6.3	-35.5	0.0	0.0	40.8	74.0	-33.2	V	Р	
4.924	3.0	24.2	33.5	6.3	-35.5	0.0	0.0	28.6	54.0	-25.4	V	Ā	
7.386	3.0	36.1	35.8	8.5	-35.5	0.0	0.0	45.0	74.0	-29.0	V	Р	
7.386	3.0	23.6	35.8	8.5	-35.5	0.0	0.0	32.5	54.0	-21.5	V	A	
4.924	3.0	37.4	33.5	6.3	-35.5	0.0	0.0	41.8	74.0	-32.2	H	Р	
4.924	3.0	29.2	33.5	6.3	-35.5	0.0	0.0	33.6	54.0	-20.4	H	A	
7.386	3.0	36.8	35.8	8.5	-35.5	0.0	0.0	45.7	74.0	-28.3	H	P	
/.386	3.0	25.4	35.8	8.5	-35.5	0.0	0.0	34.3	54.0	-19.7	H	A	
	3	1	2	1	5	\$	1	8	1	8	1	I	

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8.2.2. TX ABOVE 1 GHz, 802.11g 1TX MODE, 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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			Mkr1 2.390 00 GHz	Contor Frod
Ref 110 dB µ∨ #Peak	#Atten 0 dB		48.87 dBµ∨	2.35000000 GHz
.og				
0 1B/				Start Freq
Offst				
IB				Stop Freq
				2.39000000 GHz
i4.0 IBµ∀				CF Step
.gAv				8.00000000 MHz Auto Ma
			_	
33 FC				- Freq Offset
Tun				Signal Track
Swp				
			Ctore 2 200 00 CU-	
Start 2.3 10 00 GHZ (Dos B)M 1 MHz	#\/B\M 10	Hz Swoo	510p 2.390 00 GHZ	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

			NI 4 0 000	00.011	r rogronannor
110 dB µ∨ eak	#Atten 0 dB		MKr1 2.390 63.2	UU GHZ 3 dBµ∨	Center Freq 2.35000000 GHz
					Start Freq 2.3100000 GHz
					Stop Frec 2.3900000 GHz
I √ √ vtoregnungestur	-marine	unter management and service	where all we wanted the	and all and the state	CF Ste 8.0000000 MHz <u>Auto M</u>
V2 FC					Freq Offset 0.00000000 Hz
ın					Signal Track On <u>C</u>
rt 2 310 00 GHz			Stop 2.390	00 GHz	

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	•	Mket	2 200 00 CH2	
tef 110_dBµ∀	#Atten 0 dB	 WINT	2.350 00 GH2 49.01 dBµ∨	Center Freq
Peak				2.33000000 0112
0 B/				Start Freq 2.3100000 GHz
0ffst 2.4 B				Stop Freq
				2.39000000 GHz
4.0 Βμ∨				CF Step 8.0000000 MHz
gAv				Auto Ma
3 FC				Freq Offset 0.00000000 Hz
(f):				
Tun wp				On <u>Of</u>
itart 2.310 00 GHz	2	Stop	2.390 00 GHz	

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

			Mbr1 2 483 940	0 CH2);
110 dBµ∨	#Atten 0 dB		69.3	0 0112 9 dBµ∨	Center Fre 2.49175000 GH
					Start Free 2.48350000 GH
					Stop Fre
•					2.50000000 GH
Marshophoreday	. date de la				CF St
	and a second of the second of	white was the fi	www.manyhoutineweekek	hip me Making	1.65000000 MF <u>Auto 1</u>
V2					Freq Offse
					0.00000000 H
					Signal Trac
					Un .
			Stop 2 500 000	0.687	

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		Mkr1 2.4	183 500 0 GHz	
lef 110 dBµ∀	#Atten 0 dB		51.36 dBµ∨	Center Freq 2.49175000 GHz
oq				
B/				Start Freq 2.48350000 GHz
effst 2.6 B				Stop Freq
I				2.5000000 GHZ
4.0 Βμ∀				CF Ster
gAv 4				Auto Ma
1 V2 3 FC				Freq Offset 0.00000000 Hz
(f):				- Signal Track
Tun wp				
tart 2 483 500 0 G	Hz	Stop 2.	500 000 0 GHz	-

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

			ML-1 2 493	720 0 CH ₂	1
ef 110 dBµ∨ ^l eak	#Atten 0 dB			69.34 dBµ∨	Center Freq 2.49175000 GHz
9					Start Freq 2.48350000 GHz
.6 1 1 0					Stop Freq 2.5000000 GHz
.0 βμγ Αν	ater den de la contraction	homenegeneredethelyeder	wardenester Barneley and made	understaat mensionaanst	CF Ste 1.6500000 MHz <u>Auto M</u> i
V2 FC					Freq Offset 0.00000000 Hz
): iun vp					Signal Track On <u>O</u>
art 2.483 500 0 G	iHz		Stop 2.500	000 0 GHz	

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			Mkr1 2	483 500 0 GHz	
ef 110 dBµ∨	#Atten 0 dB		WIRIT 2.	49.96 dBµ∨	Center Freq
Peak					2.101100000 0112
0 D B/					Start Freq 2.48350000 GHz
ffst					
2.6 B					Stop Freq
					2.00000000 0112
4.0 Βμ∨					CF Ste 1.6500000 MHz
gAv <u> </u>		_			<u>Auto Ma</u>
1 V2 3 FC					Freq Offset 0.00000000 Hz
(A)					
Tun					Signal Track
tart 2 483 500 0 G	<u> </u>		Stop 24	500 000 0 GHz	
Res BW 1 MHz	#\/B\M	10 Hz	Sween 1 2	87 s (601 nts)	

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HARMONICS AND SPURIOUS EMISSIONS

Test Engr	:	Chin Pa	ng										
Date:	-	08/13/12	8										
Project #	•	12U1452	6										
Company		Apple											
Test Targ	et:	FCC 15.	247										
Mode Op	er:	HT20, TX	Worst	t Case	.)								
		.,			,								
	f	Measuren	nent Fred	quency	Amp	Preamp (Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anten	ına	D Corr	Distance	Correc	t to 3 me	ters	Peak Fie	ld Strength	Limit	
	Read	Analyzer	Reading		Avg	Average	Field St	trength @	3 m	Margin v	vs. Average	Limit	
	AF	Antenna	Factor		Peak	Calculate	d Peak	Field Stre	ength	Margin v	s. Peak Li	nit	
	CL	Cable Los	s		HPF	High Pass	s Filter						
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	dBu V/m	dBuV/m	dB	V/H	P/A/QP	
Low Ch, 1	2412MH	Z											
4.824	3.0	36.2	33.4	6.3	-35.5	0.0	0.0	40.4	74.0	-33.6	V	Р	
4.824	3.0	24.4	33.4	6.3	-35.5	0.0	0.0	28.6	54.0	-25.4	<u>v</u>	<u>A</u>	
4.824	3.0	37.4	33.4	6.3	-35.5	0.0	0.0	41.6	74.0	-32.4	H	Р	
4.824	3.0	25.6	33.4	6.3	-35.5	0.0	0.0	29.8	54.0	-24.2	H	<u>A</u>	
MidCh))/37MH	7	<u> </u>										
4 874	3.0	37.2	33.5	63	-35 5	0.0	0.0	41 5	74.0	-32.5	v	Р	
4.874	3.0	23.9	33.5	6.3	-35.5	0.0	0.0	28.2	54.0	-25.8	v	A	
7.311	3.0	35.1	35.7	8.5	-35.4	0.0	0.0	43.9	74.0	-30.1	v	P	
7.311	3.0	23.2	35.7	8.5	-35.4	0.0	0.0	32.0	54.0	-22.0	V	Α	
4.874	3.0	35.8	33.5	6.3	-35.5	0.0	0.0	40.1	74.0	-33.9	H	P	
4.874	3.0	23.7	33.5	6.3	-35.5	0.0	0.0	28.0	54.0	-26.0	H	Α	
7.311	3.0	35.7	35.7	8.5	-35.4	0.0	0.0	44.5	74.0	-29.5	H	Р	
7.311	3.0	23.5	35.7	8.5	-35.4	0.0	0.0	32.3	54.0	-21.7	H	<u>A</u>	
High Ch.	2462M	Hz											
4.924	3.0	36.2	33.5	6.3	-35.5	0.0	0.0	40.6	74.0	-33.4	V	Р	
4.924	3.0	23.8	33.5	6.3	-35.5	0.0	0.0	28.2	54.0	-25.8	V	A	
7.386	3.0	36.3	35.8	8.5	-35.5	0.0	0.0	45.2	74.0	-28.8	V	P	
7.386	3.0	23.4	35.8	8.5	-35.5	0.0	0.0	32.3	54.0	-21.7	V	A	
4.924	3.0	38.9	33.5	6.3	-35.5	0.0	0.0	43.3	74.0	-30.7	H	Р	
4.924	3.0	26.5	33.5	6.3	-35.5	0.0	0.0	30.9	54.0	-23.1	H	A	
7.386	3.0	35.8	35.8	8.5	-35.5	0.0	0.0	44.7	74.0	-29.3	H	P	
7.386	3.0	23.7	35.8	8.5	-35.5	0.0	0.0	32.7	54.0	-21.3	H	A	
D 414	3	1	3	<u> </u>	1	<u>{</u>	<u> </u>	8		8			
Rev. 4.1.2	.7												

8.2.3. TX ABOVE 1 GHz, 802.11n HT20 1TX MODE, 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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			Mkr1 2.	390 00 GHz	1
Ref 110 dBµ∨	#Atten 0 dB			50.13 dBµ∨	Center Freq 2.35000000 GHz
-00					
10 18/					Start Freq 2.31000000 GHz
Dffst 12.4 1B					Stop Freq
					2.39000000 GHZ
i4.0 IBµ∀					CF Step
_gAv					Auto Ma
S1 ∨2					Freq Offset
					0.0000000 Hz
(f): Tun					Signal Track On <u>Of</u>
Start 2.310 00 GHz			Stop 2.	390 00 GHz	
Res BW 1 MHz	#VBW *	10 Hz	Sween 6,238 s	: (601 nts)	

Page 172 of 197

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

			ML-1 2 200	72 CH-	
i 110 dB µ∨ eak	#Atten 0 dB		66.0)4 dBµ∨	Center Freq 2.35000000 GHz
3					Start Freq 2.3100000 GHz
4					Stop Freq 2.39000000 GHz
	where wheel we and a second second	an water and the state of the s	windowelow resolution	www.witer	CF Ste 8.0000000 MHz <u>Auto M</u>
√2 FC					Freq Offset 0.00000000 Hz
p					Signal Track On <u>O</u>
irt 2.310 00 GHz			Stop 2.390	00 GHz	

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		Mbr1 2 200 00 CH	-
Ref 110 dBµ∨	#Atten 0 dB	50.31 dBμ\	2.35000000 GHz
og			
D B/			Start Freq 2.31000000 GHz
lffst 2.4 B			Stop Freq
1			2.3900000 GHz
4.0 Βμ∨			CF Ste
gAv			<u>Auto M</u>
1 V2			Freq Offset
m.			
Tun wp			Signal Track On <u>O</u>
tart 2.310 00 GHz		Stop 2.390 00 GH	z

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

•			ML 4 3 4	02 555 0 611-	
440 JD 37	4044 0 ID		MKF1 2.4	72 40 JD V	
ak	#Atten u ab			72.40 abµv	Next Peak
1					
,					Nove DL Direkt
, L					Next PK Right
st					
6					
					Next PK Left
n www.	· · · · · · · · · · · · · · · · · · ·				
	marchen				
w l		white a bar of white which down	mon with a part with the ful	And make a stranger was	Min Search
√2					
FC					Pk-Pk Search
AA					
in					III Mkr©C
p					
					b.dow
rt 2.483 500 0 G	iHz		Stop 2.5	00 000 0 GHz	
es BW 1 MHz	#\v	'BW 1 MHz	Sweep 1	ms (601 pts)	

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-			Mil4	2 402 500 0 4	<u></u>	
			MKU	2.483 500 0 0	offz	
let 110 dBµ∨	#Atten U dB			53.55 d	Вµ∨	Next Peak
reak						
.0g n						
U R/						Next Pk Right
)ffet						_
2.6						
B						Next Pk Left
u						Nover N Lone
4.0						
Bµ∀						Min Coorda
aAv 📩						win Search
° 1						
'1 S2						
3 FC						Pk-Pk Search
AA						
(f):						
Tun						Mkr © C
wp						
tart 2 483 500 0 G	Hz		Ston	2 500 000 0 6	Hz	More
		0.40 11-	Stop Stop	207 - 401		1 of 2

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

-			MI-4 2 40	1 245 0 CU-	
110 dB µ∨ eak	#Atten 0 dB		WIKET 2.40	67.40 dBµ∨	Center Freq 2.49175000 GHz
					Start Freq 2.48350000 GHz
					Stop Frec 2.5000000 GHz
	station and a second	mannharanharah	er been blen waare	un an	CF Ste 1.6500000 MHz <u>Auto M</u>
V2 FC					Freq Offset 0.00000000 Hz
ın					Signal Track On <u>O</u>
rt 2.483 500 0	GHz		Stop 2.50	0 000 0 GHz	

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			Mkr1 2.4	83 500 0 GHz	
lef 110 dBµ∀	#Atten 0 dB			48.81 dBµ∨	Center Freq 2.49175000 GHz
oa					
- 3 0 B/					Start Freq 2.48350000 GHz
iffst					1
2.6 B					Stop Freq
					2.000000000000
4.0 Βμ∀					CF Ste
gAv					Auto Ma
3 FC					0.00000000 Hz
m:					
Tun					Signal Track
wp					
tart 2 483 500 0 G	<u> </u>		Ston 2.5	00.000.0.GHz	-ļ
Res BW 1 MHz	#VB	W 10 Hz	Sween 1.28	7 s (601 nts)	

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HARMONICS AND SPURIOUS EMISSIONS

$ \begin{array}{cccc} & 08/13/2 \\ regict #: & 12U14526 \\ company: Apple \\ Fest Target: & FCC 15.247 \\ Wode Oper: & g mode, TX (Worst case) \\ \end{array} \\ \begin{array}{ccccc} f & Measurement Frequency Amp \\ Dist & Distance to Antenna \\ D Corr & Distance Correct to 3 meters \\ AF & Antenna Factor \\ CL & Cable Loss \\ HPF \\ \end{array} \\ \begin{array}{ccccccc} regardle & Correct to 3 meters \\ AF & Antenna Factor \\ CL & Cable Loss \\ HPF \\ \end{array} \\ \begin{array}{cccccccccc} regardle & Strangth @ 3 \\ High Pass Filter \\ \end{array} \\ \end{array} \\ \begin{array}{ccccccccccccccccccccccccccccccccccc$	Fest Engr	:	Chin Pa	ng										
Project #: 12U14526 Company: Apple Est Target: FCC 15.247 Mode Oper: g mode, TX (Worst case) f Measment Frequency Amp Name Pream Gain D Corr Average Field Strength @ 3 m Average Field Strength @ 3 m Average Field Strength Limit Margin vs. Average Limit AF Anenna Factor Peak Calculated Peak Field Strength @ 3 m Areage Field Strength @ 3 m AF Anenna Factor Peak Calculated Peak Field Strength @ 3 m Margin vs. Average Limit Margin vs. Peak Limit f Bist Mead AF CL Amp D Corr Fitr Corr. Limit Margin vs. Peak Limit G1Z (m) Bad Af B dB BB B dB B dB B dB B dB Margin vs. Peak Limit Las24 3.0 34.4 6.3 -35.5 0.0 0.0 41.3 74.0 -32.7 V P 4.824 3.0 24.0 33.4 6.3 -35.5 0.0 0.0 43.1 74.0 -33.3 V P 4.824 3.0 36.4 33.5	Date:		08/13/12	0										
Company: Kaple Rest Target: FC 015.247 Wode Oper: gende, TX (Worst case) f Measurement Frequency Amp Dist Preamp Gain Distance to Antenna Analyzer Reading Analyzer Reading Arg Preamp Gain Average Field Strength Limit Peak Field Strength Limit Margin vs. Average Limit Margin vs. Average Limit r Dist Distance to Antenna Analyzer Reading Arg CL Strength Calued Peak Field Strength Calued Piak Strength Calued Piak Piak Piak Piak Piak Calue	Project #:		12U1452	.6										
Best Targer: $FCC 15.247$ Mode Oper: g mode, TX (Worst case) f Measurement Frequency Amp Distance to Antenna Read Preamp Gain Distance Correct to 3 meters Peak Field Strength Limit Margin vs. Average Limit Margin vs. Peak Limit P/A/QP f Dist BdB V dB/m dB dB dB dB Corr. Limit Margin vs. Average Limit Margin vs. Peak Limit k244 3.0 37.1 33.4 6.3 -35.5 0.0 0.0 41.3 74.0 -32.7 V P k324 3.0 26.1 33.4 6.3 -35.5 0.0 0.0 43.1 74.0 -32.7	Company	:	Apple											
Mode Oper: g mode, TX (Worst case) f Measurement Frequency Amp Dist Pream Gain Distance to Antenna Analyzer Reading AF Analyzer Reading Analyzer Reading Analyzer Reading AF Aprice Name Analyzer Reading Analyzer Reading AF Aprice Name Analyzer Reading Analyzer Reading AF Aprice Name Analyzer Reading Analyzer Reading Analyzer Reading AF Aprice Name Analyzer Reading Analyzer Reading Analyzer Reading Analyzer Reading Ar Aprice Name Analyzer Reading Analyzer Reading Analyzer Reading Analyzer Reading Analyzer Reading Analyzer Anatom Analyzer Reading AF Aprice Name Analyzer Reading Analyzer Reading Analyzer Reading Analyzer Anatom Analyzer Anatom Analyzer Anatom Analyzer Anatom A	Test Targe	et:	FCC 15.2	247										
f Measurement Frequency Amp Distance to Antenna Read Preamp Gain Arr Average Field Strength Limit Margin vs. Average Limit Margin vs. Peak Limit f Dist CL Read AF CL Amp D D Corr Fit Corr. Limit Margin vs. Average Limit Margin vs. Peak Limit f Dist CL Read AF CL Amp D D Corr Fit Corr. Limit Limit Margin vs. Peak Limit g Dist CH Read AF CL Amp D D Corr Fit Corr. Limit Margin vs. Peak Limit g Dist CH Read AF CL Amp D D Corr Fit Corr. Limit Margin vs. Peak Limit 4824 3.0 33.4 6.3 35.5 0.0 0.0 42.5 5.4 - - 4824 3.0 36.4 6.3 -35.5 0.0 0.0 43.1 74.0 -33.3 V P 4824 3.0 36.4 6.3	Mode Op	er:	g mode,	TX (Wo	rst ca	se)								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $														
		f	Measuren	nent Frec	puency	Amp	Preamp (Gain			Average	Field Stren	gth Limit	
Read Analyzer Reading AF Average Field Strength (CL) Margin vs. Average Limit Margin vs. Average Limit (Calculated Peak Field Strength High Pass Filter Margin vs. Average Limit Margin vs. Peak Limit f Dist (CHz) Read MB AF CL Amp MB D Corr B Fit (Calculated Peak Field Strength High Pass Filter Margin vs. Average Limit Margin vs. Peak Limit f Dist (GHz) Read MB AF CL Amp MB D Corr B Fit (Calculated Peak Field Strength MB Margin vs. Average Limit Margin vs. Average Limit f Dist (GHz) Read MB AF CL Amp MB D Corr MB Fit (Calculated Peak Field Strength MB Margin vs. Average Limit Margin vs. Average Limit ks24 3.0 27.1 33.4 6.3 -35.5 0.0 0.0 43.7 74.0 -32.7 V P 4.824 3.0 2.6.1 33.4 6.3 -35.5 0.0 0.0 43.7 74.0 -33.3 V P 4.824 3.0 2.6.1 33.4 6.3 -35.5 0.0 0.0 28.3 54		Dist	Distance	to Anten	ina	D Corr	Distance	Correc	t to 3 me	ters	Peak Fie	ld Strength	Limit	
AF Antenna Factor CL Peak HPF Calculated Peak Field Strength High Pass Filter Margin vs. Peak Limit f Dist (m) Read (BU) AF (BL) CL Amp (BB D Corr (BB Fitr (BB Corr. Limit (BB Margin vs. Peak Limit Notes f Dist (H) Read (BB/m) AF (BB CL Amp (BB D Corr Fitr (BB Corr. Limit (BB Margin vs. Peak Limit Low Ch, 2412MHz Z <td></td> <td>Read</td> <td>Analyzer</td> <td>Reading</td> <td></td> <td>Avg</td> <td>Average</td> <td>Field St</td> <td>trength @</td> <td>3 m</td> <td>Margin v</td> <td>vs. Average</td> <td>Limit</td> <td></td>		Read	Analyzer	Reading		Avg	Average	Field St	trength @	3 m	Margin v	vs. Average	Limit	
f Dist Read AF CL Amp D Corr Hight with Hight with Hight with Hight with Hight with Hight Wind Bu V/m dB Ant. Pol. Det. Notes GHZ (m) dBu V dB dB dB dB dB dB dB V/m dB V/H P/A/QP Law Ch, 2412MHz <t< td=""><td></td><td>AF CL</td><td>Antenna Cable Los</td><td>Factor</td><td></td><td>Peak HPF</td><td>Calculate High Pas</td><td>d Peak s Filter</td><td>Field Stre</td><td>ength</td><td>Margin v</td><td>s. Peak Lii</td><td>nit</td><td></td></t<>		AF CL	Antenna Cable Los	Factor		Peak HPF	Calculate High Pas	d Peak s Filter	Field Stre	ength	Margin v	s. Peak Lii	nit	
			1	3					8	s <u> </u>	*			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
Low Ch, 2412MHz Image: Constraint of the second state of th	GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Low Ch, 2	2412MH	z											
4.324 3.0 24.3 33.4 0.3 >3-5.5 0.0 0.0 28.5 54.0 -25.5 V A 4.824 3.0 38.9 33.4 6.3 -35.5 0.0 0.0 43.1 74.0 -30.9 H P 4.824 3.0 26.1 33.4 6.3 -35.5 0.0 0.0 43.1 74.0 -30.9 H P 4.824 3.0 26.1 33.4 6.3 -35.5 0.0 0.0 20.3 -23.7 H A Mid Ch, 2437MHz	4.824	3.0	37.1	33.4	6.3	-35.5	0.0	0.0	41.3	74.0	-32.7	V	P	
3.02 $3.0.7$ $3.0.7$ $5.3.5$ 0.00 0.01 43.1 74.00 530.5 11 11 4.824 3.0 26.1 33.4 6.3 -35.5 0.0 0.0 30.3 54.0 -22.77 H A Mid Ch, 2437 MHz I I I I I I I I 4.874 3.0 36.4 33.5 6.3 -35.5 0.0 0.0 40.7 74.0 -33.3 V P 4.874 3.0 36.4 33.5 6.3 -35.5 0.0 0.0 28.3 54.0 -25.7 V A 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 V A 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 32.1 54.0 -21.7 V A 7.311 3.0 23.5	1.824	3.0	24.3	33.4	0.3 6.2	-35.5	0.0	0.0	28.5	54.0	-25.5	<u> </u>	A P	
Number of the second secon	+.024 1 871	3.0	26.1	33.4	0.3 63	-35.5	0.0	0.0	45.1	74.0	-30.9	п Н	<u>г</u> А	
Mid Ch, 2437MHz Image: Constraint of the constraint of	1.024	5.0	20.1	55.4	0.5	-33.5	0.0	0.0	50.5	34.0	-43.1			
4.874 3.0 36.4 33.5 6.3 -35.5 0.0 0.0 40.7 74.0 -33.3 V P 4.874 3.0 24.0 33.5 6.3 -35.5 0.0 0.0 28.3 54.0 -25.7 V A 7.311 3.0 35.8 35.7 8.5 -35.4 0.0 0.0 44.6 74.0 -29.4 V P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 44.2 74.0 -29.4 V P 7.311 3.0 23.5 6.3 -35.5 0.0 0.0 44.2 74.0 -29.8 H P 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 42.2 74.0 -29.2 H P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A 4.924 3.0 35.9 33.5 <t< td=""><td>Mid Ch. 2</td><td>437MH</td><td>l Z</td><td>t</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td>1</td><td></td><td></td><td></td></t<>	Mid Ch. 2	437MH	l Z	t					1		1			
4.874 3.0 24.0 33.5 6.3 -35.5 0.0 0.0 28.3 54.0 -25.7 V A 7.311 3.0 35.8 35.7 8.5 -35.4 0.0 0.0 44.6 74.0 -29.4 V P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 V A 4.874 3.0 39.9 33.5 6.3 -35.5 0.0 0.0 44.2 74.0 -29.8 H P 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 44.2 74.0 -29.2 H P 7.311 3.0 36.0 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 42.3 -21.7 H A High Ch, 2462MHz	4.874	3.0	36.4	33.5	6.3	-35.5	0.0	0.0	40.7	74.0	-33.3	V	Р	~~~~~~~
7.311 3.0 35.8 35.7 8.5 -35.4 0.0 0.0 44.6 74.0 -29.4 V P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 V A 4.874 3.0 39.9 33.5 6.3 -35.5 0.0 0.0 44.2 74.0 -29.8 H P 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 44.2 74.0 -29.8 H P 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 32.1 54.0 -21.9 H P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A 7.311 3.0 23.5 35.7 8.5 -35.5 0.0 0.0 44.3 74.0 -23.7 V	4.874	3.0	24.0	33.5	6.3	-35.5	0.0	0.0	28.3	54.0	-25.7	V	A	
7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 V A 4.874 3.0 39.9 33.5 6.3 -35.5 0.0 0.0 44.2 74.0 -29.8 H P 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 32.1 54.0 -21.9 H A 4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 32.1 54.0 -21.9 H A 7.311 3.0 36.0 35.7 8.5 -35.4 0.0 0.0 44.8 74.0 -29.2 H P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A 4.924 3.0 35.9 33.5 6.3 -35.5 0.0 0.0 28.4 54.0 -25.6 V A	7.311	3.0	35.8	35.7	8.5	-35.4	0.0	0.0	44.6	74.0	-29.4	V	Р	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	7.311	3.0	23.5	35.7	8.5	-35.4	0.0	0.0	32.3	54.0	-21.7	V	<u>A</u>	
4.874 3.0 27.8 33.5 6.3 -35.5 0.0 0.0 32.1 54.0 -21.9 H A 7.311 3.0 36.0 35.7 8.5 -35.4 0.0 0.0 44.8 74.0 -29.2 H P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A 4.924 3.0 35.9 33.5 6.3 -35.5 0.0 0.0 40.3 74.0 -33.7 V P 4.924 3.0 24.0 33.5 6.3 -35.5 0.0 0.0 28.4 54.0 -25.6 V A 7.386 3.0 23.6 35.8 8.5 -35.5 0.0 0.0 42.5 H P	4.874	3.0	39.9	33.5	6.3	-35.5	0.0	0.0	44.2	74.0	-29.8	Н	Р	
7.311 3.0 36.0 35.7 8.5 -35.4 0.0 0.0 44.8 74.0 -29.2 H P 7.311 3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A High Ch, 2462MHz	4.874	3.0	27.8	33.5	6.3	-35.5	0.0	0.0	32.1	54.0	-21.9	H	<u>A</u>	
3.0 23.5 35.7 8.5 -35.4 0.0 0.0 32.3 54.0 -21.7 H A High Ch, 2462MHz	7.311	3.0	36.0	35.7	8.5	-35.4	0.0	0.0	44.8	74.0	-29.2	H	P	
High Ch, 2462MHz Image: Ch and the second seco	/.311	3.0	23.5	35.7	8.5	-35.4	0.0	0.0	32.3	54.0	-21.7	H	A	
High CH, 24024HD 3.0 35.9 33.5 6.3 -35.5 0.0 0.0 40.3 74.0 -33.7 V P 4.924 3.0 24.0 33.5 6.3 -35.5 0.0 0.0 40.3 74.0 -33.7 V P 4.924 3.0 24.0 33.5 6.3 -35.5 0.0 0.0 28.4 54.0 -25.6 V A 7.386 3.0 23.6 35.8 8.5 -35.5 0.0 0.0 44.7 74.0 -29.3 V P 7.386 3.0 23.6 35.8 8.5 -35.5 0.0 0.0 44.7 74.0 -29.3 V P 4.924 3.0 37.2 33.5 6.3 -35.5 0.0 0.0 41.6 74.0 -32.4 H P 4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 7.386 3.0 27.4 35.8 8.5 -	High Ch	1 2462ME	17 17											
3.02 3.03 5.03 5.03 5.03 6.00 0.0 28.4 54.0 -21.5 V A 4.924 3.0 37.2 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 4.924 3.0 27.1 35.8 8.5 -35.5 0.0 0.0 <t< td=""><td>1 924</td><td>3.0</td><td>35.9</td><td>33.5</td><td>63</td><td>-35 5</td><td>0.0</td><td>0.0</td><td>40.3</td><td>74.0</td><td>-33 7</td><td>v</td><td>Р</td><td></td></t<>	1 924	3.0	35.9	33.5	63	-35 5	0.0	0.0	40.3	74.0	-33 7	v	Р	
7.386 3.0 35.7 35.8 8.5 -35.5 0.0 0.0 44.7 74.0 -29.3 V P 7.386 3.0 23.6 35.8 8.5 -35.5 0.0 0.0 44.7 74.0 -29.3 V P 7.386 3.0 23.6 35.8 8.5 -35.5 0.0 0.0 32.5 54.0 -21.5 V A 4.924 3.0 37.2 33.5 6.3 -35.5 0.0 0.0 41.6 74.0 -32.4 H P 4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 7.386 3.0 37.4 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A 7.386 3.0 23.8 35.8 8.5 -35.5	4.924	3.0	24.0	33.5	6.3	-35.5	0.0	0.0	28.4	54.0	-25.6	v	A	
7.386 3.0 23.6 35.8 8.5 -35.5 0.0 0.0 32.5 54.0 -21.5 V A 4.924 3.0 37.2 33.5 6.3 -35.5 0.0 0.0 41.6 74.0 -32.4 H P 4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 7.386 3.0 37.4 35.8 8.5 -35.5 0.0 0.0 46.3 74.0 -27.7 H P 7.386 3.0 23.8 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A	7.386	3.0	35.7	35.8	8.5	-35.5	0.0	0.0	44.7	74.0	-29.3	v	P	
4.924 3.0 37.2 33.5 6.3 -35.5 0.0 0.0 41.6 74.0 -32.4 H P 4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 7.386 3.0 37.4 35.8 8.5 -35.5 0.0 0.0 46.3 74.0 -27.7 H P 7.386 3.0 23.8 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A	7.386	3.0	23.6	35.8	8.5	-35.5	0.0	0.0	32.5	54.0	-21.5	V	A	***************************************
4.924 3.0 25.1 33.5 6.3 -35.5 0.0 0.0 29.5 54.0 -24.5 H A 7.386 3.0 37.4 35.8 8.5 -35.5 0.0 0.0 46.3 74.0 -27.7 H P 7.386 3.0 23.8 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A 7.386 0.0 23.8 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A	4.924	3.0	37.2	33.5	6.3	-35.5	0.0	0.0	41.6	74.0	-32.4	Н	Р	
7.386 3.0 37.4 35.8 8.5 -35.5 0.0 0.0 46.3 74.0 -27.7 H P 7.386 3.0 23.8 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A	4.924	3.0	25.1	33.5	6.3	-35.5	0.0	0.0	29.5	54.0	-24.5	Н	A	
7.386 3.0 23.8 35.8 8.5 -35.5 0.0 0.0 32.7 54.0 -21.3 H A	7.386	3.0	37.4	35.8	8.5	-35.5	0.0	0.0	46.3	74.0	-27.7	Н	Р	
	7.386	3.0	23.8	35.8	8.5	-35.5	0.0	0.0	32.7	54.0	-21.3	H	<u>A</u>	
		ļ	ļ	ļ		ļ	ļ	ļ	Ļ					
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8.2.4. TX ABOVE 1 GHz, 802.11a MODE, 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

Test Engr:Chin PangDate:08/14/12Project #:12U14526Company:Apple													
st Targe	FCC 15.2	247											
ode Oper	r:	a mode,	5.8GHz	, TX ('	Worst C	case)							
	f	Magguran	nant Fra	menev	Amn	Preamp (Gain			Average	Field Stren	oth Limit	
	1 Dist	Distance	to Anter	ina	D Corr	Distance	Correc	t to 3 me	ters	Peak Fie	ld Strength	I imit	
	Read	d Analyzer Reading Avg Antenna Factor Peak				Average	Field St	trenoth @	3 m	Margin y	ia Strength	Limit	
	AF					Calculate	d Peak	Field Stre	enoth	Margin y	s. Peak Li	mit	
	CL	Cable Los	s		HPF	High Pas	s Filter				o. i out En		
								-					
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	
)w Ch, 57	/45MH 3.0	Z 35.0	38.8	10.5	-35 5	0.0	0.7	10.5	74.0	-24.5	V	P	
490	3.0	22.5	38.8	10.5	-35.5	0.0	0.7	37.0	54.0	-17.0	v	Δ	
.490	3.0	35.0	38.8	10.5	-35.5	0.0	0.7	49.5	74.0	-24.5	, H	P	
.490	3.0	22.5	38.8	10.5	-35.5	0.0	0.7	37.0	54.0	-17.0	H	Ā	
id Ch, 57	/85MH	Z											
.570	3.0	35.5	38.9	10.6	-35.5	0.0	0.7	50.2	74.0	-23.8	V	Р	
.570	3.0	22.2	38.9	10.6	-35.5	0.0	0.7	36.9	54.0	-17.1	<u>V</u>	<u>A</u>	
.570	3.0	35.3	38.9	10.6	-35.5	0.0	0.7	49.9	74.0	-24.1	H	<u>Р</u>	
	3.0	22.1	38.9	10.6	-35.5	0.0	0.7	36.8	54.0	-17.2	H	A	
igh Ch 5	5825MI	1	<u> </u>		<u> </u>					-			
.650	3.0	35.8	39.0	10.7	-35.5	0.0	0.7	50.6	74.0	-23.4	v	Р	
.650	3.0	22.5	39.0	10.7	-35.5	0.0	0.7	37.3	54.0	-16.7	V	A	
.650	3.0	35.2	39.0	10.7	-35.5	0.0	0.7	50.1	74.0	-23.9	Н	Р	
.650	3.0	22.4	39.0	10.7	-35.5	0.0	0.7	37.3	54.0	-16.7	H	Α	
			Į	ļ	L		ļ						
.650 .650 .ev. 4.1.2.7 ote: No o	3.0 3.0 3.0 7 7 9ther e	22.5 35.2 22.4 missions	39.0 39.0 39.0 were de	10.7 10.7 10.7 tected	-35.5 -35.5 -35.5	0.0 0.0 0.0	0.7 0.7 0.7 m nois	50.1 37.3 e floor.	54.0 74.0 54.0	-16.7	V H H	A P A	

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8.2.5. TX ABOVE 1 GHz, 802.11n HT20 MODE, 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

Date:	Test Engr: Chin Pang												
Date: 08/14/12													
Project #:	12U1452	6											
Company:		Apple											
Test Targe	t:	FCC 15.247											
Mode Ope	r:	H120 mo	de, 5.80	GHz, T	IX (Wo	rst Case)							
	f	Measurem	nent Fred	quency	Amp	Preamp (Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anter	ına	D Corr	Distance	Correc	t to 3 me	ters	Peak Fie	ld Strength	Limit	
	Read	Analyzer	Reading		Avg	Average	Field S	rength @	3 m	Margin v	s. Average	Limit	
	AF	Antenna	Factor		Peak	Calculate	d Peak	Field Stre	ength	Margin v	s. Peak Lii	nit	
	CL	Cable Los	is.		HPF	High Pas	s Filter						
f CHa	Dist	Read	AF		Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
	{ (III) 745\ATT		ud/m	uß	uß	uß	uß	<u>и Б и V/M</u>	<u>иви v/m</u>	uß	v/H	r/A/Qr	
Low Cn, 5 11 490	745MH 3.0	Z 353	38.8	10.5	-35 5	0.0	0.7	49.8	74.0	-24 2	v	Р	
11.490	3.0	22.5	38.8	10.5	-35.5	0.0	0.7	37.1	54.0	-16.9	v	A	
11.490	3.0	35.9	38.8	10.5	-35.5	0.0	0.7	50.5	74.0	-23.5	Н	Р	
11.490	3.0	22.5	38.8	10.5	-35.5	0.0	0.7	37.0	54.0	-17.0	Н	A	
Mid Ch 5	785MH												
11.570	3.0	35.2	38.9	10.6	-35.5	0.0	0.7	49.9	74.0	-24.1	V	Р	
11.570	3.0	22.1	38.9	10.6	-35.5	0.0	0.7	36.8	54.0	-17.2	V	A	
11.570	3.0	34.5	38.9	10.6	-35.5	0.0	0.7	49.2	74.0	-24.8	Н	Р	
11.570	3.0	22.1	38.9	10.6	-35.5	0.0	0.7	36.8	54.0	-17.2	H	<u>A</u>	
High Ch. 5	1 5825MI	l Iz											
11.650	3.0	35.8	39.0	10.7	-35.5	0.0	0.7	50.7	74.0	-23.3	V	Р	
11.650	3.0	22.4	39.0	10.7	-35.5	0.0	0.7	37.2	54.0	-16.8	V	A	
11.650	3.0	35.5	39.0	10.7	-35.5	0.0	0.7	50.3	74.0	-23.7	H	P	
11.650	3.0	22.4	39.0	10.7	-35.5	0.0	0.7	37.2	54.0	-16.8	H	A	

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8.2.6. TX ABOVE 1 GHz, 802.11n HT40 MODE, 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

Test Engr:Chin PangDate:08/14/12Project #:12U14526Company:AppleTest Target:FCC 15.247Mode Oper:HT40, 5.8GHz, 7			X(W	orst Ca:	se)								
	f Dist Read AF CL	Measuren Distance Analyzer Antenna Cable Los	nent Free to Anter Reading Factor ss	quency 1na	Amp D Corr Avg Peak HPF	Preamp C Distance Average Calculate High Pass	Gain Correc Field S d Peak s Filter	t to 3 me trength @ Field Stre	eters 3 m ength	Average Peak Fie Margin v Margin v	Field Stren Id Strength s. Average s. Peak Lir	gth Limit Limit Limit nit	
f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	j (m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
<u>ow Ch, 5</u> 1 510	3/35MH	Z 35 1	38.8	10.6	-35 5	0.0	0.7	49 7	74.0	-24 3	v	Р	
.510	3.0	22.4	38.8	10.6	-35.5	0.0	0.7	37.0	54.0	-17.0	v	A	
.510	3.0	35.8	38.8	10.6	-35.5	0.0	0.7	50.4	74.0	-23.6	Н	Р	
.510	3.0	22.4	38.8	10.6	-35.5	0.0	0.7	37.0	54.0	-17.0	Н	Α	
ah Ch	570514	L.											
ugn Ch, 1.590	3/95MH	1Z 353	38.9	10.6	-35 5	0.0	07	50.0	74.0	-24 0	v	Р	
.590	3.0	22.2	38.9	10.6	-35.5	0.0	0.7	37.0	54.0	-17.0	v	A	
.590	3.0	34.7	38.9	10.6	-35.5	0.0	0.7	49.5	74.0	-24.5	Н	Р	
1.590	3.0	22.3	38.9	10.6	-35.5	0.0	0.7	37.0	54.0	-17.0	H	<u>A</u>	
000000000000000000000000000000000000000	+												
ote: No	other ei	<u>missions</u>	were de	tected	above t	he syster	n nois	e floor.					

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8.3. WORST-CASE BELOW 1 GHz

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



UL CCS FORM NO: CCSUP4701G 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL CCS.

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



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Project No:	12U14526							
Client Name	e:Apple							
Model / Dev	vice:C15							
Config / Otł	ner:EUT/AC	Adapter/I	leadset					
Test By:Chin Pang								
Horizontal 3	30 - 1000MI	lz						
			25MHz-1GHz					
			ChmbrA	T243 Sunol		CFR 47 Part 15B		
Frequency	Reading	Detector	Amplified.TX (dB)	Bilog.TXT (dB)	dBuV/m	3m	Margin	Polarity
55.7814	38.68	РК	-27.3	7.1	18.48	40	-21.52	Horz
95.9073	35.93	РК	-26.9	9.1	18.13	43.5	-25.37	Horz
143.787	34.53	РК	-26.6	12.5	20.43	43.5	-23.07	Horz
181.5867	35.05	РК	-26.4	11.2	19.85	43.5	-23.65	Horz
Vertical 30 -	1000MHz							
			25MHz-1GHz					
			ChmbrA	T243 Sunol		CFR 47 Part 15B		
Frequency	Reading	Detector	Amplified.TX (dB)	Bilog.TXT (dB)	dBuV/m	3m	Margin	Polarity
40.8553	36.22	РК	-27.4	13.4	22.22	40	-17.78	Vert
55.3937	39.71	РК	-27.3	7.1	19.51	40	-20.49	Vert
70.9013	38.37	РК	-27.1	8.1	19.37	40	-20.63	Vert
	35.56	РК	-26.2	12.2	21.56	43.5	-21.94	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

6 WORST EMISSIONS

Project No:	12U14526								
Client Name:Apple									
Model/Dev	vice:2.4GHz	z (Worst Ca	ise)						
Test Volt/F	req:115VA	C 60Hz							
Test By:Chi									
Line-L1 .15 - 30MHz									
Frequency	Reading	Detector	T24 IL L1.	LC Cables	dBuV	CISPR 22B QI	Margin	CISPR 22B	Margin
0.1635	62.39	PK	0.1	0	62.49	65.3	-2.81	-	-
0.1635	48.07	Av	0.1	0	48.17	-	-	55.3	-7.13
0.24	55.06	PK	0.1	0	55.16	62.1	-6.94	-	-
0.24	32.43	Av	0.1	0	32.53	-	-	52.1	-19.57
0.321	51.78	PK	0.1	0	51.88	59.7	-7.82	-	-
0.321	28.15	Av	0.1	0	28.25	-	-	49.7	-21.45
Line-L2 .15 - 30MHz									
Frequency	Reading	Detector	T24 IL L1.	LC Cables	dBuV	CISPR 22B QI	Margin	CISPR 22B	Margin
0.1545	52.48	PK	0.1	0	52.58	65.8	-13.22	-	-
0.1545	33.96	Av	0.1	0	34.06	-	-	55.8	-21.74
0.2355	44.83	PK	0.1	0	44.93	62.3	-17.37	-	-
0.2355	29.13	Av	0.1	0	29.23	-	-	52.3	-23.07
0.3165	42.07	PK	0.1	0	42.17	59.8	-17.63	-	-
0.3165	27.41	Av	0.1	0	27.51	-	-	49.8	-22.29

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LINE 1 RESULTS



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LINE 2 RESULTS



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