

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

CERTIFICATION TEST REPORT

FOR

Apple TV device (digital media receiver) with WiFi and Bluetooth radios

MODEL NUMBER: A1469

FCC ID: BCGA1469 IC: 579C-A1469

REPORT NUMBER: 12U14680-9, Revision A

ISSUE DATE: DECEMBER 17, 2012

Prepared for APPLE INC. 1 INIFINITE 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

(R)

NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
	12/10/12	Initial Issue	F. Ibrahim
A	12/17/12	Corrected model number	T. Chen

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	APPLE INC.
	1 INIFINITE LOOP
	CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: Apple TV device (digital media receiver) with WiFi and Bluetooth radios

MODEL: A1469

SERIAL NUMBER: PT800489

DATE TESTED: November 15-29, 2012

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

UL 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:

FRANK IBRAHIM WiSE Project Lead UL CCS

Tested By:

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, 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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple TV device is a digital media receiver designed to play internet content onto a TV through an HDMI port. It incorporates WiFi and Bluetooth radios.

The Bluetooth module is manufactured by Broadcom.

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)
2402 - 2480	Basic GFSK	11.13	12.97
2402 - 2480	DQPSK	12.68	18.54
2402 - 2480	Enhanced 8PSK	12.73	18.75

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Antenna Gain:			
Frequency			
(MHz)	Gain (UBI)		
2412	3.4		
5180	3.93		
5260	3.16		
5540	2.34		
5745	2.62		

5.4. SOFTWARE AND FIRMWARE

The EUT software installed during testing was Broadcom Bluetool.

The firmware installed in the EUT during testing was BCM4334B0_002.001.013.0121.0000.

The EUT is also linked in Bluetooth Enable Test mode with Rohde & Schwarz CBT Test box.

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5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, and it was found that X orientation is worst-case orientation; therefore, final radiated testing was performed with the EUT in the X orientation.

The worst-case data rate for each mode is determined to be as follows, based on input from the manufacturer of the radio.

All final tests in the GFSK mode were made at 1 Mb/s. All final tests in the 8PSK mode were made at 3 Mb/s.

For radiated emissions below 1 GHz and power line conducted emissions the channel with the highest output power was selected as worst-case scenario.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List							
Description	Description Manufacturer Model Serial Number FCC ID						
Laptop PC	Apple	MacBook M42A	PT358811	DoC			
AC-DC Adapter	Apple	A1343	N/A	N/A			
Mouse	НР	MOAFUO	CT: FATSK0J9W0EFU4	DoC			

I/O CABLES

I/O Cable List							
Cable	Port	# of identical	Connector	Cable Type	Cable	Remarks	
No		ports	Туре		Length (m)		
1	AC	1	2P	Non-shielded	1.83		
2	AC	1	3P	Non-shielded	1.85		
3	DC	1	DC	Non-shielded	1.8		
4	USB	1	USB	Non-shielded	1.87		
5	USB	1	USB	Non-shielded	1.9		
6	AC	1	3P	Non-shielded	1.9		
7	SMA	1	SMA	Shielded	2.4		

TEST SETUP

The EUT is powered by AC source only during test. Test software exercised the Bluetooth card to link with the Bluetooth Tester through the air.

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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	
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	03/23/12	03/23/13	
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/12	10/25/13	
Power Meter	Agilent / HP	437B	T226	07/25/12	07/25/13	
Average Power Sensor	Agilent / HP	8481A	T269	07/26/12	07/26/13	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/30/12	12/30/13	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/12	10/22/13	
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	02/16/12	02/16/13	
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	03/22/12	03/22/13	
Bluetooth Tester	R & S	СВТ	T258	05/15/12	05/15/13	
Horn Antenna, 18 GHz	EMCO	3115	C00943	CNR	CNR	
Horn Antenna, 18 GHz	ARA	MWH-1826/B	C00980	11/14/12	11/14/13	

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7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB AND 99% BANDWIDTH

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to \geq 1% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

Channel Frequency		20 dB Bandwidth	99% Bandwidth	
	(MHz)	(kHz)	(kHz)	
Low	2402	1042	1006.0	
Middle	2441	1043	1008.0	
High	2480	1042	1006.8	

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20 dB BANDWIDTH



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99% BANDWIDTH



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BANDWIDTH MID CH	Measure
Ch Freq 2.441 GHz Trig Free Occupied Bandwidth	Meas Off
12U14680	Channel Power
Ref 20.3 dBm #Atten 20 dB #Samp Log	Occupied BW
	ACP
dB	Multi Carrier Power
#Res BW 30 kHz VBW 91 kHz #Sweep 100 ms (601 pts)	Power Stat
Occupied Bandwidth Occ BW % Pwr 99.00 % 1.0080 MHz × dB -20.00 dB	CCDF
Transmit Freq Error -7.584 kHz x dB Bandwidth 1.037 MHz*	More 1 of 2
Copyright 2000-2011 Agilent Technologies	

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7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

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RESULTS

HOPPING FREQUENCY SEPARATION



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7.1.3. NUMBER OF HOPPING CHANNELS

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 nonoverlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 79 Channels observed. AFH Mode supports 20 Channels.

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NUMBER OF HOPPING CHANNELS



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7.1.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Norma	I Mode				
DH1	0.3767	31	0.117	0.4	-0.283
DH3	1.633	15	0.245	0.4	-0.155
DH5	2.88	10	0.288	0.4	-0.112

RESULTS

DH Packet	Pulse	Number of	Average Time	Limit	Margin
	Width	Pulses in	of Occupancy		
	(msec)	0.8	(sec)	(sec)	(sec)
GFSK AFH M	lode				
DH1	0.3767	64	0.241	0.4	-0.159
DH3	1.633	21	0.343	0.4	-0.057
DH5	2.88	13	0.374	0.4	-0.026

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PULSE WIDTH - DH1

🔆 Agilent 15:	37:26 Nov 26, 2012		RT	Freq/Channel
12U14680 Ref 20 dBm #Peak	#Atten 20 dB		Δ Mkr1 376.7 μs 1.17 dB	Center Freq 2.44100000 GHz
Log 10 dB/	1R \$ 707			Start Freq 2.44100000 GHz
16.7 dB				Stop Freq 2.44100000 GHz
#LgAv				CF Step 1.00000000 MHz <u>Auto Mar</u>
W1 S2 S3 VS AA	waki hake ha	halpourtheaproduces. He	www.	Freq Offset 0.00000000 Hz
¤(f): FTun				Signal Track On <u>Off</u>
Center 2.441 00 Res BW 1 MHz	0 GHz V	BW 1 MHz	Span 0 Hz Sweep 2 ms (601 pts)	

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



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PULSE WIDTH - DH3



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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



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PULSE WIDTH - DH5

Aglient 15:	39:59 Nov 2t	5, 2012		R I	Freq/Channel
2014680 2ef 20 dBm Peak 🔽 🗌	#Atte	n 20 dB	∆ Mkr1	2.88 ms 0.27 dB	Center Freq 2.44100000 GHz
og 0 B/	↓R ◆			\$ •	Start Freq 2.44100000 GHz
6.7 B					Stop Freq 2.44100000 GHz
LgAv					CF Step 1.00000000 MHz <u>Auto Ma</u>
V1 S2 3 VS AA (f):				Holy Marriel March 11	Freq Offset 0.00000000 Hz
Tun					Signal Track On <u>Of</u>
enter 2.441 00	0 GHz		6	Span 0 Hz	

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



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7.1.5. OUTPUT POWER

<u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 20.97 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	9.70	20.97	-11.27
Middle	2441	11.13	20.97	-9.84
High	2480	10.54	20.97	-10.43

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OUTPUT POWER



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* Agilent 14:30:32 Nov 26, 20	12	R	Т	Freq/Channel
12U14680 Ref 20 dBm #Atten 20 #Peak	dB	Mkr1 2.479 850 10.54	GHz dBm	Center Freq 2.48000000 GHz
Log 10 dB/	•			Start Freq 2.47500000 GHz
dB				Stop Freq 2.48500000 GHz
#LgAv				CF Step 1.00000000 MHz Auto Ma
M1 S2 S3 FS				Freq Offset 0.00000000 Hz
⊐(f): FTun Swp				Signal Track On <u>Off</u>
Center 2.480 000 GHz #Res BW 3 MHz	VBW 3 MHz	Span 1 Sweep 1 ms (601	0 MHz pts)	

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7.1.6. AVERAGE POWER

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	9.20
Middle	2441	10.40
High	2480	9.90

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7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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- Agrici	10.00.40	1407 20, 20	14						
12U14680		#Attan 20	4D			M	1kr3 4.7	9 GHz	Center Frea
#Peak	1	#Allen 20					-42.70		13.0150000 GHz
Log	Ŷ								
									Start Freq
Offst									33.3653000 10112
16.7									Stop Fred
	2	3							26.0000000 GHz
.10.6				man	-	and the second	مسيم	WW	
dBm 💾	and the second	A REAL PROVIDENT							CF Ster
#LgAv —				_					Auto Ma
	H7					S1	on 26.0	0.687	
#Res BW	100 kHz		VBW 30	0 kHz	Swe	ep 8.775	is/601	pts)	Freq Offset
Marker	Trace	Туре		X Axis		•	Amplitu	ude	0.0000000 Hz
1	(1)	Freq		2.41 GHz			6.54 dE	m	
2	(1)	Freq		3.19 GHz 4.79 GHz			-47.10 dB .42 76 dB	m m	Signal Track
Ŭ	(.)						12.10 30		On <u>O</u> 1

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SPURIOUS EMISSIONS, MID CHANNEL



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	N 10.00.00	1407 20, 20	14						
12014680			10			M	lkr3 4.8	8 GHz	Center Frea
κer zu αΒι ⊭Peak [m o	#Aπen 20					-42.99	abm	13.0150000 GHz
Log	1								Otort Error
									Start Freq
Offst									
16.7									Stop Frea
	2	3							26.0000000 GHz
9.3	- Ľ	Land	man the marken	-	••••	and the second	mand	vwv	
dBm 🎽		+•							CH Step 2 59700000 GHz
[⊭] LgAv ├─									<u>Auto Ma</u>
Start 30 M	Hz					St	op 26.0	0 GHz	
∜Res BW	100 kHz		VBW 300	kHz	Swee	ep 8.775	s (601	pts)	
Marker	Trace	Туре		X Axis			Amplitu	de	
1	(1)	Freq		2.46 GHZ 3.28 GHz			-11.10 dB -46.15 dB		Ciencel Tready
3	(Ť)	Freq		4.88 GHz			42.99 dB	m	
									<u>oi</u>
								I	

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SPURIOUS EMISSIONS, HIGH CHANNEL



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Ayner	n 15.55.20	1409 20, 20	12			г. I	
12014680					Mkr3	4.96 GHz	Center Fred
Ret20 dB ÿPeak ∏	m	#Atten 20	dB		-40	.43 dBm	13.0150000 GHz
Log	Ĩ						Otart Errar
							Start Freq
Offst							
16.7						_	Stop Frea
		3					26.000000 GHz
9.7	- La		man more free	menon	hanne	~~~~~	
dBm 📙							2 5970000 GHz
#LgAv ⊢							<u>Auto Ma</u>
Start 30 M	IHz		I		Stop 2	6.00 GHz	
#Res BW	100 kHz		VBW 300 kHz	Swe	ep 8.775 s (6	501 pts)	
Marker	Trace	Туре	X Axis	;	Am 40.4	plitude	
2	(1)	Freq	3.32 (2HZ 3HZ	-48.1	B d Bm	Ciencel Tready
3	(Ť)	Freq	4.96 (ЭHz	-45.43	3 dBm	
							<u>.</u>
						I	

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SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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HIGH BAND	EDGE WITH 16 Nov 26, 2012	HOPPINC	G ON	RТ	Freq/Channel
12U14680 Ref 20 dBm #Peak	#Atten 20 dB		Mkr1 2.479 8	133 GHz .93 dBm	Center Freq 2.48350000 GHz
Log 1 10 dB/	1				Start Freq 2.47850000 GHz
dB DI					Stop Freq 2.48850000 GHz
-11.1 dBm #LgAv					CF Step 1.00000000 MHz <u>Auto Man</u>
M1 S2 S3 FC AA	- May	manno	a marantet and	mhrm	Freq Offset 0.00000000 Hz
¤(f): f>50k Swp					Signal Track On <u>Off</u>
Center 2.483 500 G #Res BW 100 kHz	Hz VBV	V 300 kHz	Spa Sweep 1 ms (in 10 MHz 601 pts)	
Copyright 2000-2011	l Agilent Technologie	s		• '	

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7.2. ENHANCED DATA RATE QPSK MODULATION

7.2.1. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 20.97 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	11.50	20.97	-9.47
Middle	2441	12.68	20.97	-8.29
High	2480	12.19	20.97	-8.78

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OUTPUT POWER



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7.2.2. AVERAGE POWER

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10 dB (including 10 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	9.30
Middle	2441	10.40
High	2480	9.60

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7.3. ENHANCED DATA RATE 8PSK MODULATION

7.3.1. 20 dB AND 99% BANDWIDTH

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to \geq 1% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(kHz)	(kHz)
Low	2402	1182	1098.5
Middle	2441	1183	1071.6
High	2480	1184	1115.1

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20 dB BANDWIDTH



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99% BANDWIDTH



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7.3.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

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RESULTS

HOPPING FREQUENCY SEPARATION



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7.3.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 nonoverlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 79 Channels observed. AFH Mode: 20 Channels declared.

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NUMBER OF HOPPING CHANNELS



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7.3.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

8PSK (EDR) Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.385	32	0.123	0.4	-0.277
DH3	1.642	18	0.296	0.4	-0.104
DH5	2.892	10	0.289	0.4	-0.111

Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate on page 26 demonstrates compliance with channel occupancy when AFH is employed.

PULSE WIDTH - DH1

🔆 Agilent 10	0:28:52	Nov 27 ,	2012					F	: Τ	Freq/Channel
12U14680 Ref 20 dBm #Peak		#Atten	20 dB				∆ Mk	r1 38 1.1	5 µs 0 dB	Center Freq 2.44100000 GHz
Log 10 dB/		<u> </u>	<u>9</u>							Start Freq 2.44100000 GHz
01151 010 010										Stop Freq 2.44100000 GHz
9.8 dBm #LgAv										CF Step 1.00000000 MHz <u>Auto Ma</u>
W1 S2 S3 VS	MARY MA		···	'nfred Martel	ntonyhylpou	h hand hand hand hand hand hand hand han	Auntotat	hintai the	whinter	Freq Offset 0.00000000 Hz
¤(f): FTun										Signal Track ^{On <u>Off</u>}
Center 2.441 (Res BW 1 MH	D00 GHz z		v	BW 1 M	Hz	S	weep 3	Spa ms (601	n0Hz pts)	

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



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PULSE WIDTH – DH3

🔆 Agilent 10:27	7:34 Nov 27, 2012					F		Freq/Channel
12U14680 Ref 20 dBm #Peak	#Atten 20 dB	1		1	∆ Mk	r1 1.64 0.9	42 ms 91 dB	Center Freq 2.44100000 GHz
Log 10 dB/		•						Start Freq 2.44100000 GHz
16.7 dB DI								Stop Freq 2.44100000 GHz
9.8 dBm ≇LgA∨								CF Step 1.0000000 MHz <u>Auto Ma</u>
N1 S2 53 VS		-	t effective the	aller the section of	William of the provide	tree and the	haber of free	Freq Offset 0.00000000 Hz
a(f): -Tun								Signal Track On <u>Off</u>
Center 2.441 000 Res BW 1 MHz	GHz	/ /BW 1 M	Hz	s	weep 5	Spa ms (601	n 0 Hz pts)	

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



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PULSE WIDTH - DH5

 U14680			Δ Mkr1 (2.892 ms	
ef 20 dBm Peak	#Atten 20 dB			0.87 dB	Center Freq 2.44100000 GHz
99 AR			¢		Start Freq 2.44100000 GHz
.7					Stop Fred 2.44100000 GHz
8 3m _gA∨					CF Ste 1.0000000 MHz <u>Auto M</u>
1 S2 VS			- Holdenian Juan	(ybythe had top-a	Freq Offset 0.00000000 Hz
): Tun					Signal Track On <u>C</u>
enter 2.441 000 (Se BW 1 MHz	GHz	VBW 1 MHz	Sween 5 ms /	Span 0 Hz 601 pts)	

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



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7.3.5. OUTPUT POWER

<u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 20.97 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	11.57	20.97	-9.40
Middle	2441	12.73	20.97	-8.24
High	2480	12.28	20.97	-8.69

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OUTPUT POWER



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12U14680 Ref 20 dBm #Atten 20 dB #Peak 	Mkr1 2.479 850 GHz 12.28 dBm	Center Freq 2.48000000 GHz Start Freq 2.47500000 GHz Stop Freq 2.48500000 GHz CF Step
Log 10 dB/ Offst 16.7 dB #LgAv		Start Freq 2.47500000 GHz Stop Freq 2.48500000 GHz
#LgAv		Stop Freq 2.48500000 GHz CF Step
#LgAv		CF Step
		1.00000000 MHz <u>Auto Mar</u>
M1 S2 S3 FC AA		Freq Offset 0.00000000 Hz
¤(f): FTun Swp		Signal Track On <u>Off</u>
Center 2.480 000 GHz #Res BW 3 MHz S	Span 10 MHz Sweep 20 ms (601 pts)	

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7.3.6. AVERAGE POWER

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	9.30
Middle	2441	10.40
High	2480	9.70

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7.3.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

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RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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Aylie	nt 11.1J.4z	. 1407 27,2	012							
12U14680 Ref 20 dB	βm	#Atten 2	0 dB				N	35.87 Ikr3	9 GHz dBm	Center Freq
≠Peak	1									13.0150000 GHz
	Ŷ									Chart Error
										30 000000 MHz
Offst _										
16.7		3								Stop Fred
		<u> </u>								26.0000000 GHz
10.7		1	have been a	The other start	renteres.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-	ليسهد		
dBm 🎽	warner with the state of the	~~~~								CH Step
≠LgAv —										Auto Ma
Start 30 M	//Hz						St	on 26.0		
≠Res BW	100 kHz		VB	W 300 I	kHz	Swe	ep 8.775	s (601	pts)	Freq Offset
Marker	Trace	Туре		×	Axis			Amplitu	de	0.0000000 H2
1	(1)	Freq		2	.41 GHz			6.06 dB	m	
3	(1)	Freq		4	.79 GHz			-42.30 dB -35.87 dB	m	Signal Track
										Un <u>Ut</u>

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SPURIOUS EMISSIONS, MID CHANNEL



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					ML-2 4.00 CU-	 ر
12014680 Ref 20 dBi #Peak □	m	#Atten 20 d	IB		42.31 dBm	Center Freq 13.0150000 GHz
	- -					
10 –						Start Freq
dB/		+				30.000000 MHz
Uffist		+				
		3				Stop Freq
		>───		+	4	26.0000000 GHz
9.3	- Cherry A	1 m	marker and and and	-	altran Vran V	
dBm 💾						
⊭LgAv —						Auto Ma
C4					Star 20.00 CH-	
HDoc BW	100 VH-7		VBW 300 FH-	Swoon 8	775 e (601 pte)	Freq Offset
Markor	Trace	Type	Y DVV JOO KIIZ	Sweep o.	Amplituda	0.00000000 Hz
1	(1)	Freq	2.45 GHz		8.29 dBm	
2	(1)	Freq	3.28 GHz		-43.92 dBm	Signal Track
3	(1)	Freq	4.88 GHz		-42.31 dBm	On Of

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SPURIOUS EMISSIONS, HIGH CHANNEL



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40114 4000			· • •						
12014680 Ref 20 dB #Peak □	m	#Atten 20	dB			IV	47.25	dBm	Center Freq 13.0150000 GHz
Log 10 — dB/ —	•								Start Freq 30.000000 MHz
DISC	2	 ♦						~~~~	Stop Freq 26.000000 GHz
-9.8 dBm ∽∽ #LgAv —	milter								CF Step 2.59700000 GHz <u>Auto Ma</u>
Center 13 #Res BW	.02 GHz 100 kHz		VBW 300	kHz	Swee	Sp ep 8.775	oan 25.9 5 s (601	7 GHz pts)	Freq Offset
Manker 1 2 3	Trace (1) (1) (1)	Type Freq Freq Freq		X Axis 2.50 GHz 3.32 GHz 4.96 GHz			Amplitu 7.19 dB 46.43 dB 47.25 dB	nde m m m	Signal Track

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SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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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 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. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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Project: 121114680		Mbr1 2 389 /	
toject. 12014888 tef 104.5 dBµ∨ Peak	#Atten 0 dB	37.77	dBµ√ Center Freq 2.35000000 GHz
og 0 IB/			Start Freq 2.31000000 GHz
.53 B			Stop Freq 2.39000000 GHz
4.0 Βμ√ gAv			CF Step 8.0000000 MHz <u>Auto Ma</u>
11 V2 33 FC			Freq Offset 0.00000000 Hz
(f): Tun Wp			Signal Track
itart 2.310 00 GHz	#VBW 10 I	Stop 2.390 0	0 GHz

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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	22 NOV 13, 2012	NU-1 2 200 17 CU-	
roject: 12014680 tef 104.5 dB µ∀ Peak	#Atten 0 dB	MKF1 2.389 47 GHZ 35.93 dBµ∨	Center Freq 2.35000000 GHz
og 0 IB/			Start Freq 2.31000000 GHz
IB			Stop Freq 2.39000000 GHz
4.0 Βμ√ gAv			CF Step 8.00000000 MHz <u>Auto Mar</u>
11 V2 33 FC			Freq Offset 0.00000000 Hz
(f): Tun Wyp			Signal Track On <u>Off</u>
itart 2.310 00 GHz Res BW 1 MHz	#VBW 10 Hz	Stop 2.390 00 GHz Sweep 6.238 s (601 pts)	

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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	J 1404 13, 2012			
roject: 12014680 e f 104.8 dB µ∨ Peak	#Atten 0 dB		MKr1 2.483 500 0 GH2 40.78 dBμ ^v	Center Freq 2.49175000 GHz
og 0 B/				Start Freq 2.48350000 GHz
83 B				Stop Freq 2.5000000 GHz
4.0 Βμ∨ gAv				CF Step 1.6500000 MHz <u>Auto Ma</u>
1 V2 3 FC				Freq Offset 0.00000000 Hz
(f): Tun wp				Signal Track
tart 2.483 500 0 GI Res BW 1 MHz	lz #VBW 1	0 Hz Sv	Stop 2.500 000 0 GHz weep 1.287 s (601 pts)	z

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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Rynem 00.57.5	0 1907 13,2012				
/roject: 12014680 tef 104.8 dB µ∨ Peak	#Atten 0 dB		Mkr1 2.48	83 500 0 GHz 36.84 dBµ∨	Center Freq 2.49175000 GHz
og 0 B/					Start Freq 2.48350000 GHz
.83 B					Stop Freq 2.5000000 GHz
4.0 Βμ∨ gAv					CF Step 1.6500000 MHz <u>Auto Ma</u>
31 √2 3 FC					Freq Offset 0.00000000 Hz
(f): Tun Wp					Signal Track On <u>Off</u>
itart 2.483 500 0 G Res BW 1 MHz	Hz #VB	W 10 Hz	Stop 2.50 Sweep 1.287	00 000 0 GHz 7 s (601 pts)	

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HARMONICS AND SPURIOUS EMISSIONS

est Engr: ate: roject #: ompany: est Target: lode Oper: f Dis Rea AF CL	Ol 11 12 Ap FC Bl st Di sad Ar 7 Ar 2 Ca	liver Su /13/12 (U1468(pple CC 15.2 (uetoot) easurem stance t halyzer]	u 0 247 h GFSK o Anten Reading	T , T x uency	Amp								
ate: roject #: ompany: est Target: lode Oper: f Dis Re: AF CL	11 12 AF FC BI Ma st Di ad Ar 7 Ar 2 Ca	/13/12 /U14680 pple CC 15.2 luetoot stance t nalyzer 1 ttenna E	0 247 h GFSK eent Freq to Anten Reading	T , T x uency	Amp	_							
roject #: ompany: est Target: lode Oper: f Dis Rea AF CL	12 Ap FC Bl Ma st Di sad Ar F Ar Ca	2U1468(pple CC 15.2 uetoot easurem stance t nalyzer	0 247 h GFSK eent Freq to Anten Reading	, Tx uency	Amp								
ompany: est Target: lode Oper: f Dis Rea AF CL	AI FC Bl Ma st Di st Di st Ar F Ar Ca	pple CC 15.2 uetoot easurem stance t nalyzer	247 h GFSK ent Freq to Anten Reading	, Tx Juency	Amp								
est Target: lode Oper: f Dis Rea AF CL	FC Bl Ma st Di sad Ar F Ar Ca	easurem stance t	247 h GFSK ent Freq to Anten Reading	, Tx juency	Amp								
lode Oper: f Dis Rea AF CL	Bl Ma st Di ad Ar F Ar Ca	easurem stance t nalyzer 1	h GFSK ent Freq to Anten Reading	uency	Amp								
f Dis Re: AF CL	Ma st Di ad Ar 7 Ar 2 Ca	easurem stance t nalyzer l	ent Freq to Anten Reading	uency na	Amp								
f Dis Re: AF CL	Me st Di ad Ar F Ar L Ca	easurem stance t nalyzer l	ent Freq o Anten Reading	uency na	Amp	-							
T Dis Rea AF CL	st Di ad Ar F Ar Ca	stance t nalyzer	o Anten Reading	na	Amp	Ducoman	7			A	Eald Steen	ath Lingit	
AF CL	ad Ar Ar Ar Ca	alyzer l	O Anten Reading	na	D C-	Preamp C	Jain			Average	Field Streng	gin Limit	
AF CL	F Ar Ca	ialyzer I	R 1- 47		D Corr	Austance	Correc	t to 5 me	ters	Peak Fie	a Arengen	Limit	
CL	Ca		Factor		Deal	Calculate	d Dool-	Field Star	o math	Margin V	is. Average	Lillin nit	
	- Ca	hle Los	s		I Cak HPF	High Page	u reak s Filter	rield Stre	ngtii	wargin V	s. r cak LlI	un	
		OIC LUS	3		111 1,	ringii F dS	5 I III CI						
f D	Dist I	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz (1	m) d	lBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
ow Ch (2402	2MHz)												
804 3	3.0	54.2	33.1	6.3	-34.8	0.0	0.0	58.7	74.0	-15.3	Н	Р	
804 3	3.0	47.3	33.1	6.3	-34.8	0.0	0.0	49.4	54.0	-4.6	H	A	
804 3	3.0	55.2	33.1	6.3	-34.8	0.0	0.0	59.7	74.0	-14.3	V	P	
804 <u>3</u> 6d Ch (2441	5.0 ·	47.9	33.1	6.3	-34.8	0.0	0.0	50.1	54.0	-3.9	V	A	
110 Cn (2441 882 3	$\frac{MHZ}{3.0}$	52.0	33.1	63	-34.8	0.0	0.0	56.6	74.0	-17.4	V	P	
882 3	3.0	32.0 45.3	33.1	63	-34.8	0.0	0.0	47.5	54.0	-6.5	V	Δ I	
882 3	3.0	51.8	33.1	6.3	-34.8	0.0	0.0	56.4	74.0	-17.6	н	P	
882 3	3.0	45.0	33.1	6.3	-34.8	0.0	0.0	47.3	54.0	-6.7	Н	A	
igh Ch (248	BOMHz)												
.960 3	3.0	49.9	33.2	6.4	-34.8	0.0	0.0	54.7	74.0	-19.3	Н	Р	
.960 3	3.0	43.5	33.2	6.4	-34.8	0.0	0.0	45.9	54.0	-8.1	Н	A	
.960 3	3.0	49.2	33.2	6.4	-34.8	0.0	0.0	54.0	74.0	-20.0	V	Р	
.960 3	3.0	42.7	33.2	6.4	-34.8	0.0	0.0	45.1	54.0	-8.9	V	A	
ev. 4.1.2.7													
ote: No othe	er emis	ssions v	were de	tected	above t	he syster	n nois	e floor.					

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8.2.2. ENHANCED DATA RATE 8PSK MODULATION

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Agrient 00.44.3	39 NOV 15, ZU1Z			K 1	Freq/Criannei
Project: 12∪1468∪ Ref 104.5 dB µ∨ #Peak	#Atten 0 dB		Mkr1	2.375 87 GHz 37.37 dBµ∨	Center Freq 2.35000000 GHz
.og 10 1B/					Start Freq 2.31000000 GHz
7.53 IB DI					Stop Freq 2.39000000 GHz
54.0 1Βμ∨ _gAv					CF Step 8.00000000 MHz <u>Auto Ma</u> i
51 V2 53 FC					Freq Offset 0.00000000 Hz
×(f): =Tun Swp					Signal Track On <u>Off</u>
Start 2.310 00 GHz Res BW 1 MHz		BW 10 Hz	Stop Sweep 6.23		

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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Project: 121/14680		Mkr1 2 317 73 GHz	
Ref 104.5 dBµ∨ Peak	#Atten 0 dB	35.92 dBµ√	Center Freq 2.35000000 GHz
.og 0 IB/			Start Freq 2.31000000 GHz
/ist .53 IB			Stop Freq 2.39000000 GHz
4.0 ΙΒμ∨ gAv			CF Step 8.0000000 MHz <u>Auto Mar</u>
31 V2 33 FC			Freq Offset 0.00000000 Hz
(f): :Tun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz Res BW 1 MHz	#VBW 10 Hz	Stop 2.390 00 GHz	

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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roioot: 10U14690	4 100 13,2012	Mb-1 2 492 592 5 CH-	
roject. 12014600 ef 104.8 dBµ∨ ⊃eak	#Atten 0 dB	39.70 dBµ√	Center Freq 2.49175000 GHz
og) B/			Start Freq 2.48350000 GHz
83 B			Stop Freq 2.5000000 GHz
4.0 Вµ∨ gAv			CF Step 1.6500000 MHz <u>Auto Ma</u>
1 V2 0			Freq Offset 0.00000000 Hz
(f): Tun wp			Signal Track
tart 2.483 500 0 G Res BW 1 MHz	Hz #VBW 10 Hz	Stop 2.500 000 0 GHz	Ì

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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	0 1400 13,2012				
roject: 12014680 a ef 104.8 dB µ∨ Peak	#Atten 0 dB		MKr1 2.48	36.52 dBµ∨	Center Freq 2.49175000 GHz
og 0 B/					Start Freq 2.48350000 GHz
B					Stop Freq 2.5000000 GHz
4.0 Βμ∨ gAv					CF Step 1.65000000 MHz <u>Auto Ma</u>
11 V2 13 FC					Freq Offset 0.00000000 Hz
(f): Tun /wp					Signal Track On <u>Off</u>
itart 2.483 500 0 Gl Res BW 1 MHz	Hz #VB	W 10 Hz	Stop 2.50 Sweep 1.287	00 000 0 GHz 7 s (601 pts)	

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HARMONICS AND SPURIOUS EMISSIONS

High Freq	uency I	Measuren	ient							-				
Complian	ce Cert	ification	Service	s, Frei	nont 5n	ı Chamb	er							
		Oliver Su												
Test Engr:		Oliver S	lliver Su											
Date:		11/13/12	1/13/12											
Project #:		12U1468	2014680											
Company:		Apple	pple											
Test Targe	t:	FCC 15.2	247											
Mode Ope	r:	Bluetoot	h 8PSK	, Tx										
	f	Measurem	nent Free	quency	Amp	Preamp (Gain			Average	Field Stren	gth Limit		
	Dist	Distance	to Anten	nna	D Corr	Distance	Correc	t to 3 me	ters	Peak Fie	ld Strength	Limit		
	Read	Analyzer	Reading		Avg	Average	Field S	trength @	3 m	Margin	s. Average	Limit		
	AF	Antenna	Factor		Peak	Calculate	d Peak	Field Str	ength	Margin	s. Peak Li	nit		
	CL	Cable Los	s		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	dBuV/m	dBuV/m	dB	V/H	P/A/QP		
Low Ch (2	402MH	z)		ĺ				Î		1				
4.804	3.0	51.6	33.1	6.3	-34.8	0.0	0.0	56.2	74.0	-17.8	V	Р		
4.804	3.0	43.4	33.1	6.3	-34.8	0.0	0.0	47.9	54.0	-6.1	V	A		
4.804	3.0	48.8	33.1	6.3	-34.8	0.0	0.0	53.4	74.0	-20.6	Н	Р		
4.804	3.0	41.0	33.1	6.3	-34.8	0.0	0.0	45.6	54.0	-8.4	Н	Α		
Mid Ch (2	441MH	z)												
4.882	3.0	47.6	33.1	6.3	-34.8	0.0	0.0	52.3	74.0	-21.7	Н	Р		
4.882	3.0	40.2	33.1	6.3	-34.8	0.0	0.0	44.9	54.0	-9.1	Н	A		
4.882	3.0	49.5	33.1	6.3	-34.8	0.0	0.0	54.2	74.0	-19.8	V	P		
4.882	3.0	41.6	33.1	6.3	-34.8	0.0	0.0	46.3	54.0	-7.7	V	A		
High Ch (2480MI	1z)		(1)	24.0	0.0	0.0	40.0			X 7			
4.960	3.0	45.1	33.2	6.4	-34.8	0.0	0.0	49.9	74.0	-24.1	V	P		
4.960	3.0	37.4	33.2	0.4 6.4	-34.8	0.0	0.0	42.2	54.0	-11.8	<u>v</u> ц	A D		
4.900	3.0	37.1	33.2	6.4	-34.8	0.0	0.0	49.7	54.0	-24.3	н	Γ Δ		
Pov 412	7	57.1	55.2	0.4	-54.0	0.0	0.0	11.7	54.0	-12.2		А		
Note: No	other ei	missions	were de	tected	l above t	he syste	m nois	e floor.						

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8.3. WORST-CASE BELOW 1 GHz

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



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



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HORIZONTAL AND VERTICAL DATA

Project No:12U14680 Client Name:Apple Model /Device:A1469 Config /Other:EUT (BT mode) Test By:Oliver Su

Horizontal 30 - 1000MHz

			T122 Supol	5mB Amp		CEP 47 Part		
Test	Meter		Bilog.TXT	1000MHz		15 Class B		
Frequency	Reading	Detector	(dB)	(dB)	dBuV/m	3m	Margin	Polarity
30.5815	31.69	РК	21	-29.3	23.39	40	-16.61	Horz
132.1563	37.08	РК	13.9	-28.2	22.78	43.5	-20.72	Horz
170.3437	43.6	РК	11.8	-27.8	27.6	43.5	-15.9	Horz
248.4632	41.81	РК	11.6	-27.2	26.21	46	-19.79	Horz
324.2566	37.23	РК	13.9	-26.8	24.33	46	-21.67	Horz
899.3945	29.62	РК	22.3	-24.7	27.22	46	-18.78	Horz

Vertical 30 - 1000MHz

			T122 Sunol	5mB Amp Path 30-		CFR 47 Part		
Test	Meter		Bilog.TXT	1000MHz		15 Class B		
Frequency	Reading	Detector	(dB)	(dB)	dBuV/m	3m	Margin	Polarity
31.3164	25.67	QP	20.4	-29.3	16.77	40	-23.23	Vert
40.4676	47.6	РК	13.4	-29.1	31.9	40	-8.1	Vert
55.7814	52.62	РК	7.2	-29	30.82	40	-9.18	Vert
176.9345	46.42	РК	11.3	-27.7	30.02	43.5	-13.48	Vert
550.0859	35.4	РК	18.3	-26.8	26.9	46	-19.1	Vert
840.0779	32.25	PK	21.7	-25.2	28.75	46	-17.25	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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

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RESULTS

<u>6 WORST EMISSIONS</u>

Project No:12U14680 Client Name:Apple Model/Device:A1469 Test Volt/Freq:120 VAC / 60 Hz Test By:Tom Chen

Line-L1 .15 - 30MHz

				LC Cables		CFR 47 Part		CFR 47 Part	
Test	Meter		T24 IL	1&3.TXT		15 Class B		15 Class B	
Frequency	Reading	Detector	L1.TXT (dB)	(dB)	dB(uVolts)	QP	Margin	Avg	Margin
0.159	51.41	РК	0.1	0	51.51	65.5	-13.99	-	-
0.159	31.25	Av	0.1	0	31.35	-	-	55.5	-24.15
0.222	49.03	PK	0.1	0	49.13	62.7	-13.57	-	-
0.222	28.16	Av	0.1	0	28.26	-	-	52.7	-24.44
13.659	44.57	PK	0.2	0.2	44.97	60	-15.03	-	-
13.659	30.23	Av	0.2	0.2	30.63	-	-	50	-19.37

Line-L2 .15 - 30MHz

				LC Cables		CFR 47 Part		CFR 47 Part	
Test	Meter		T24 IL	2&3.TXT		15 Class B		15 Class B	
Frequency	Reading	Detector	L2.TXT (dB)	(dB)	dB(uVolts)	QP	Margin	Avg	Margin
0.1995	46.71	РК	0.1	0	46.81	63.6	-16.79	-	-
0.1995	23.53	Av	0.1	0	23.63	-	-	53.6	-29.97
0.2625	45.57	РК	0.1	0	45.67	61.4	-15.73	-	-
0.2625	25.84	Av	0.1	0	25.94	-	-	51.4	-25.46
9.5235	42.43	PK	0.1	0.2	42.73	60	-17.27	-	-
9.5235	27.66	Av	0.1	0.2	27.96	-	-	50	-22.04

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LINE 1 RESULTS



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LINE 2 RESULTS



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