

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

### **CERTIFICATION TEST REPORT**

### FOR

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

MODEL NUMBER: A1458, A1459, A1460\*

FCC ID: BCGA1458

IC: 579C-A1458

REPORT NUMBER: 12U14507-1, Revision A

**ISSUE DATE: OCTOBER 04, 2012** 

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
	08/15/12	Initial Issue	F. Ibrahim
A	10/04/12	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.A.
EUT DESCRIPTION:	Handheld device with 802.11 abgn WLAN and BT radios
MODEL:	A1458, A1459, & A1460

SERIAL NUMBER: 20558

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:

Tested By:

FRANK IBRAHIM EMC SUPERVISOR 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 EUT is a iPad 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: BCGA1458 IC ID: 579C-A1458 Model #: A1458

Model A1458, 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: BCGA1459 IC ID: 579C-A1459 Model #: A1459

Model A1459, 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: BCGA1460 IC ID: 579C-A1460 Model #: A1460

Model A1460, 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.

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# 5.3. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	19.03	79.98
2412 - 2462	802.11g	25.20	331.13
2412 - 2462	802.11n HT20	25.05	319.89
5745 - 5825	802.11a	27.58	572.80
5745 - 5825	802.11n HT20	27.27	533.33
5755 - 5795	802.11n HT40	27.61	576.77

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

# 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	-0.26	
5.15-5.25	4.63	
5.25-5.35	4.25	
5.5-5.7	4.51	
5.725-5.85	4.90	

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### 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\_172

The test utility software used during testing was WL\_tool.

## 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

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## 5.7. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST						
Description Manufacturer Model Serial Number FC						
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)

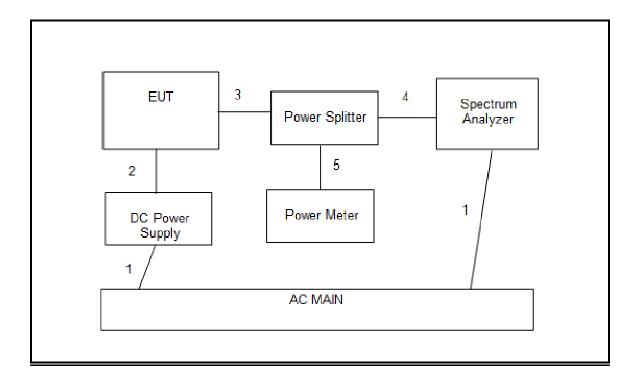
	I/O CABLE LIST							
Cable No.	Port	#of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks		
1	AC	2	AC	Un-shielded	2.0m	N/A		
2	DC	1	DC	Un-shielded	1.0m	N/A		
3	Antenna Port	1	Splitter	Un-shielded	0.1m	N/A		
4	RF out	1	Spectrum Analyzer	Un-Shielded	None	N/A		
5	RF out	1	Power Meter	Shielded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

#### I/O CABLES (RADIATED SETUP)

	I/O Cable List						
Cable No		# 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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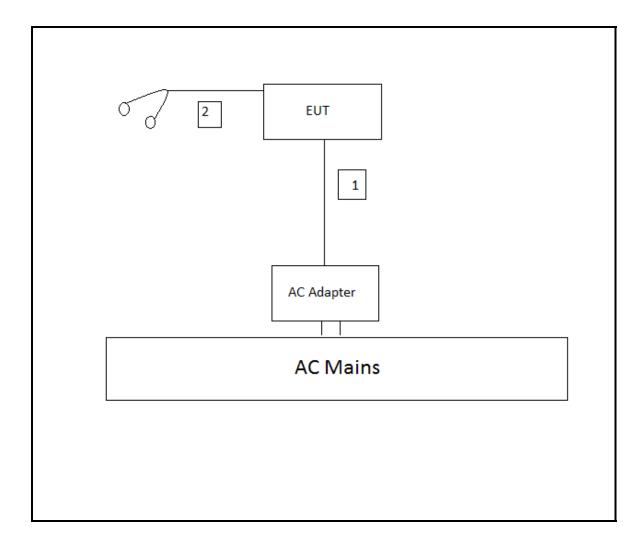
### SETUP DIAGRAM FOR CONDUCTED TEST



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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

### 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

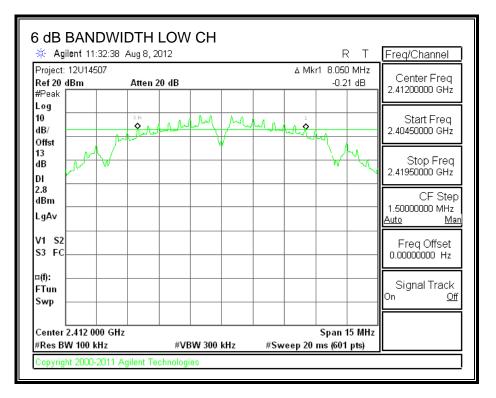
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

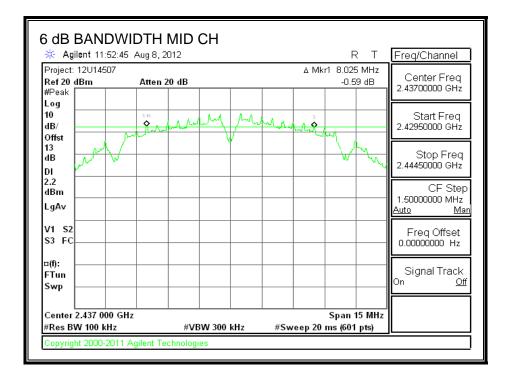
#### **RESULTS**

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.050	0.5
Middle	2437	8.025	0.5
High	2462	7.525	0.5

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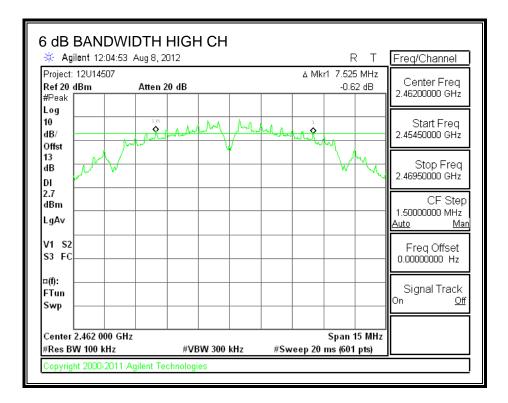
#### 6 dB BANDWIDTH





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### 7.1.2. 99% BANDWIDTH

#### <u>LIMITS</u>

None; for reporting purposes only.

#### TEST PROCEDURE

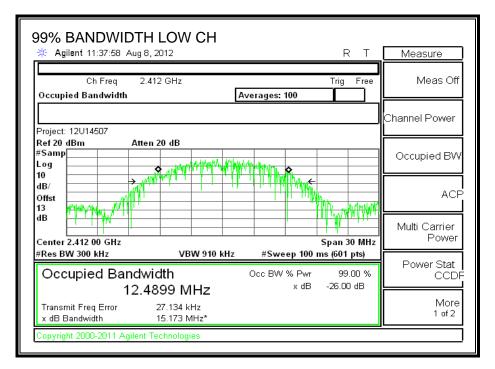
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

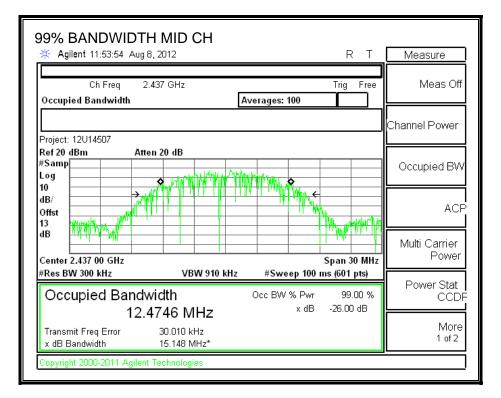
#### **RESULTS**

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.4899
Middle	2437	12.4746
High	2462	12.4764

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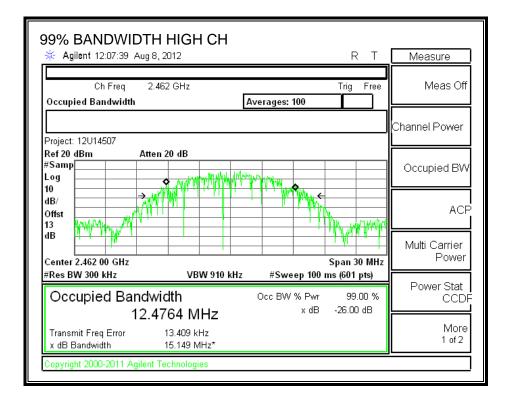
#### 99% BANDWIDTH





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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.

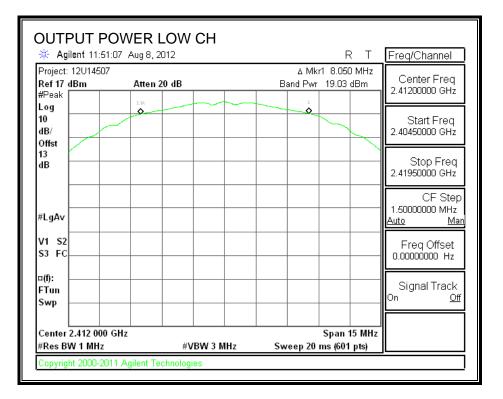
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

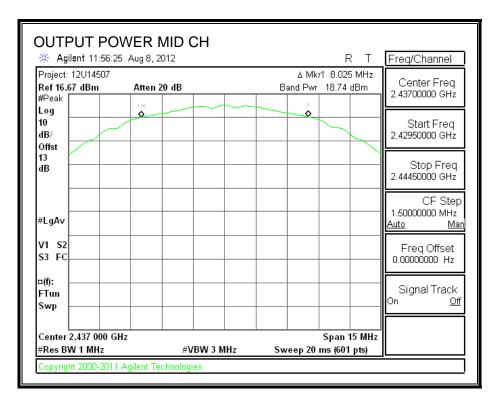
#### <u>RESULTS</u>

Channel	Frequency	Peak Power Reading	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	19.03	30	-10.970
Middle	2437	18.74	30	-11.260
High	2462	18.67	30	-11.330

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#### **OUTPUT POWER**





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_	10:09 Aug 8, 2012		R T	Freq/Channel
Project: 12U1450 Ref 16.75 dBm	Atten 20 dE	∆ Mkr1_7. Band Pwr_18.0		Center Freq 2.46200000 GHz
#Peak Log				
10 dB/				Start Freq 2.45450000 GHz
Offst 13 dB				Stop Freq
				2.46950000 GHz
#LgAv				CF Step 1.50000000 MHz Auto Mar
V1 S2 S3 FC				Freq Offset 0.00000000 Hz
¤(f):				Signal Track
Swp				On <u>Off</u>
	0 GHz		n 15 MHz	

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### 7.1.4. AVERAGE POWER

#### <u>LIMITS</u>

None; for reporting purposes only.

#### 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>

The cable assembly insertion loss of 13dB (including 12 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2412	16.48
Middle	2437	16.46
High	2462	16.49

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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.

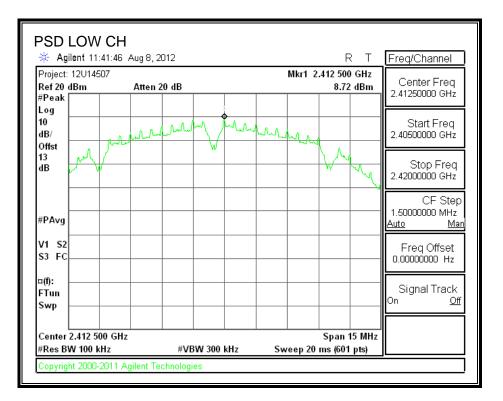
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

#### **RESULTS**

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	2412	8.72	-15.2	-6.48	8	-14.48
Middle	2437	8.11	-15.2	-7.09	8	-15.09
High	2462	8.45	-15.2	-6.75	8	-14.75

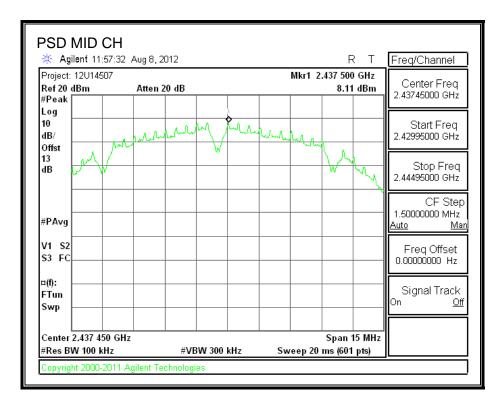
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#### **POWER SPECTRAL DENSITY**

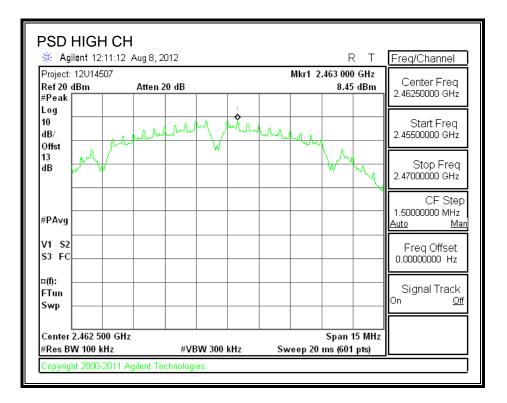


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### 7.1.6. CONDUCTED SPURIOUS EMISSIONS

#### 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.

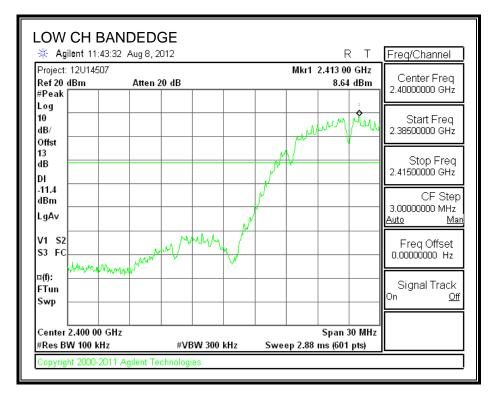
#### TEST PROCEDURE

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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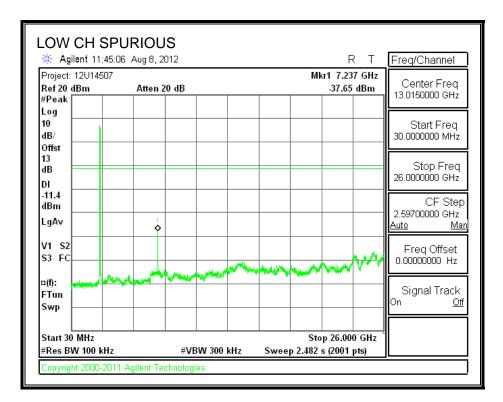
#### **RESULTS**

#### SPURIOUS EMISSIONS, LOW CHANNEL



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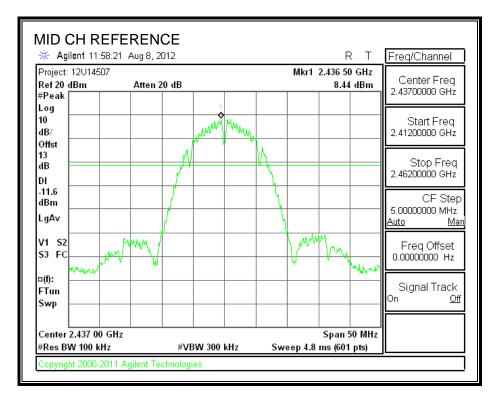
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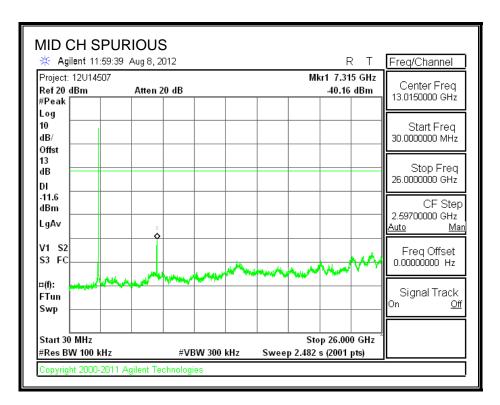
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#### SPURIOUS EMISSIONS, MID CHANNEL



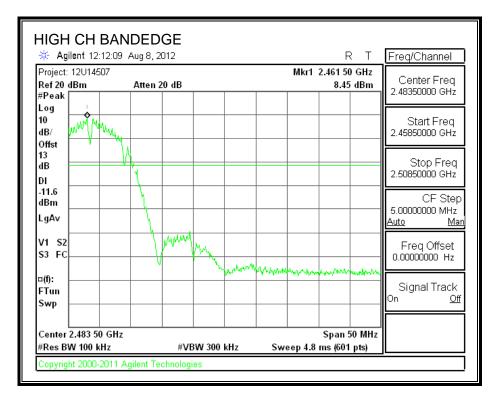
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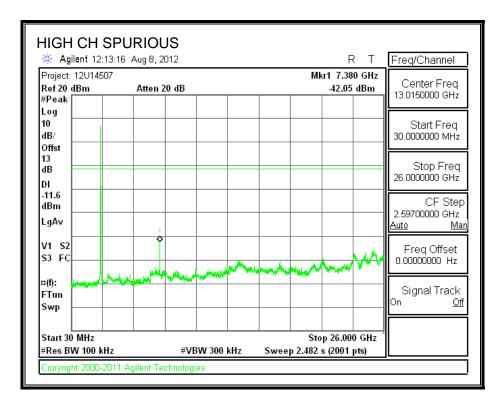
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#### SPURIOUS EMISSIONS, HIGH CHANNEL



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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

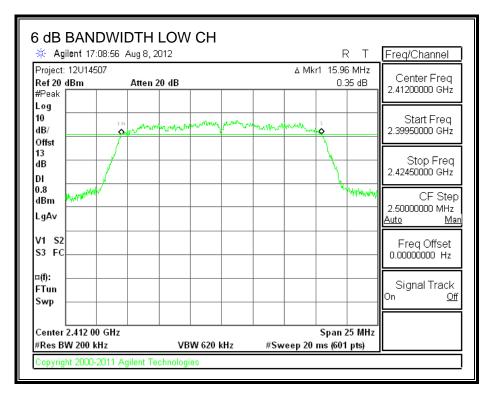
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

#### **RESULTS**

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.96	0.5
Middle	2437	16.00	0.5
High	2462	15.92	0.5

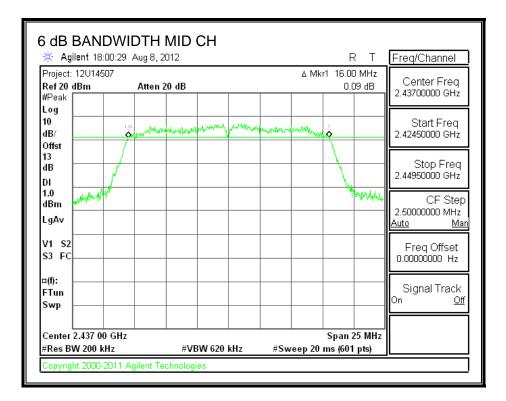
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#### 6 dB BANDWIDTH

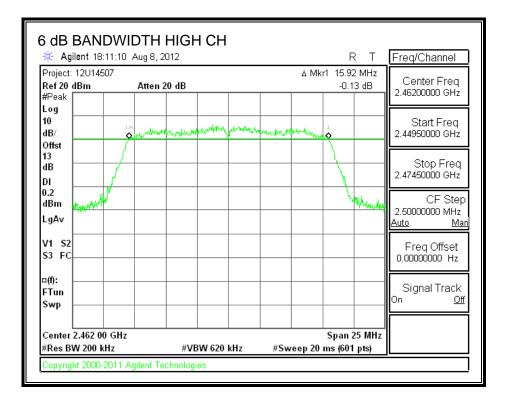


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# 7.2.2. 99% BANDWIDTH

### 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.

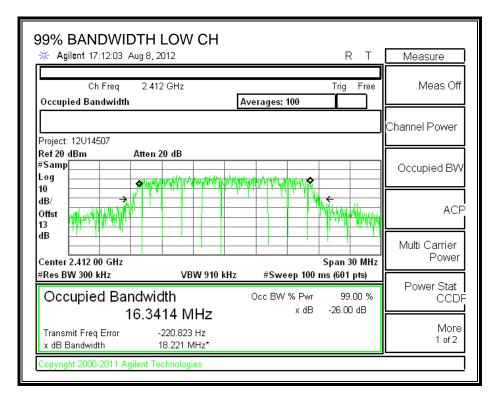
#### **RESULTS**

Channel	Frequency 99% Bandwidt	
	(MHz)	(MHz)
Low	2412	16.3414
Middle	2437	16.3515
High	2462	16.3501

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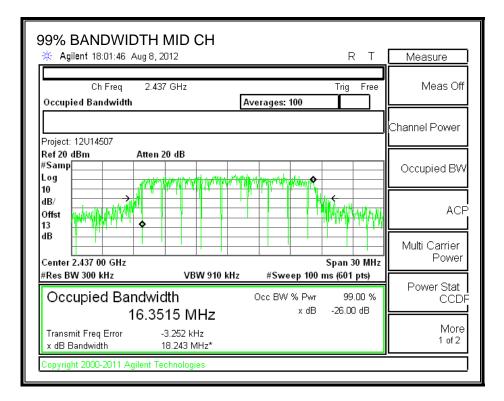
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#### 99% BANDWIDTH



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99% BANDWIDTH HIG	GH CH		RТ	Measure
Ch Freq 2.462 GHz Occupied Bandwidth		Averages: 100	Trig Free	Meas Off
Project: 12U14507				Channel Power
Ref 20 dBm Atten 20 dB #Samp Log		And the Contraction of the Contr		Occupied BW
dB/ Offst				ACP
dB			Span 30 MHz	Multi Carrier Power
#Res BW 300 kHz	VBW 910 kHz	#Sweep 100	ms (601 pts)	Power Stat
Occupied Bandwidth 16.3501	MHz	Occ BW % Pwr x dB		
Transmit Freq Error -6.762 x dB Bandwidth 18.215	kHz 5 MHz*			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.

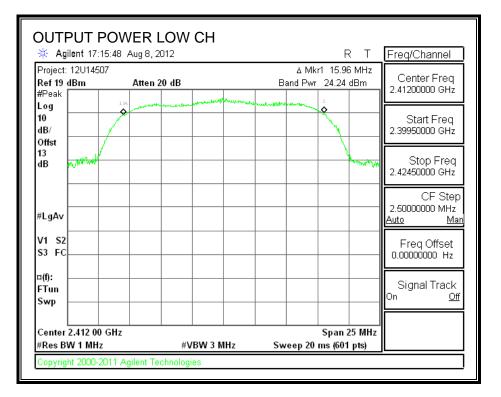
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

## **RESULTS**

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	24.24	30	-5.76
Middle	2437	25.20	30	-4.80
High	2462	24.11	30	-5.89

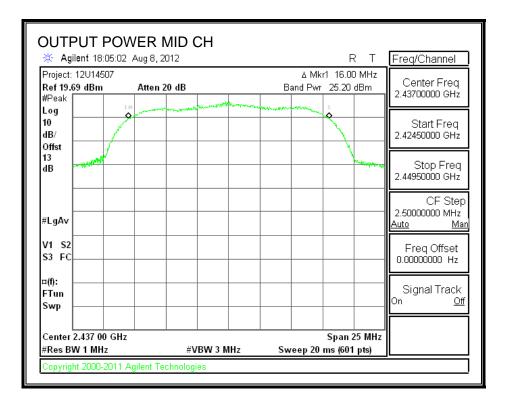
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### **OUTPUT POWER**

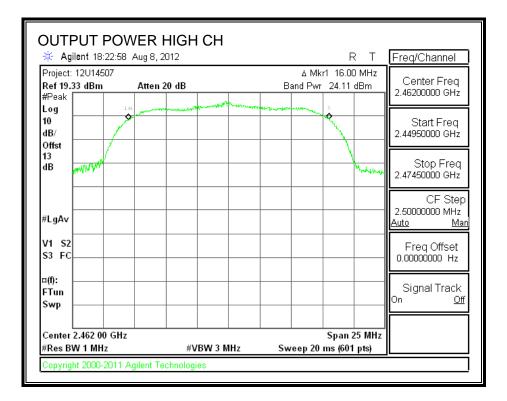


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# 7.2.4. AVERAGE POWER

## <u>LIMITS</u>

None; for reporting purposes only.

# 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>

The cable assembly insertion loss of 13 dB (including 12 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	15.97
Middle	2437	16.45
High	2462	15.46

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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.

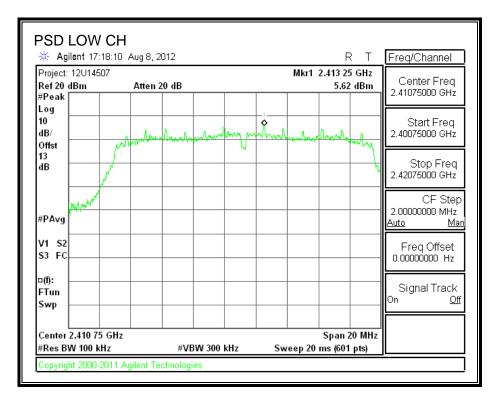
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

## **RESULTS**

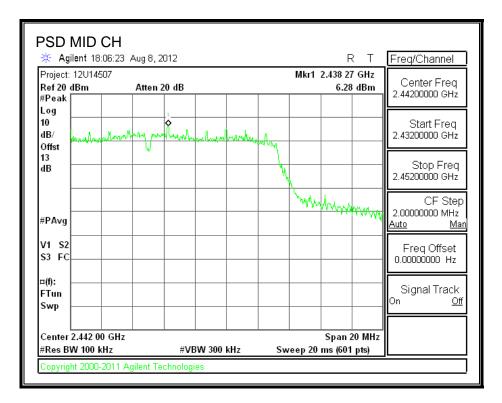
Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	2412	5.62	-15.2	-9.58	8	-17.58
Middle	2437	6.28	-15.2	-8.92	8	-16.92
High	2462	5.04	-15.2	-10.16	8	-18.16

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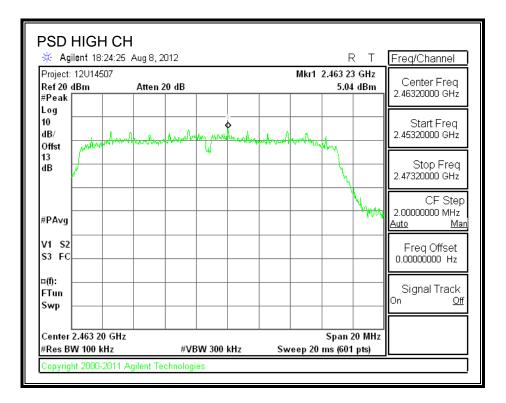
### **POWER SPECTRAL DENSITY**



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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.

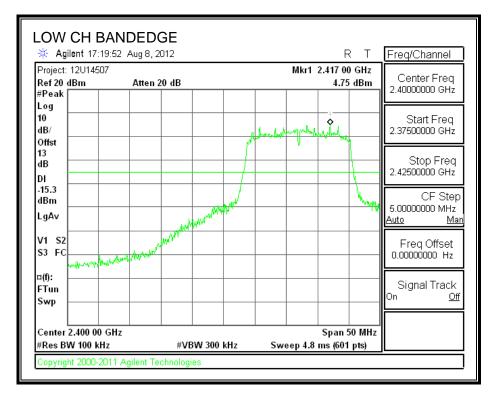
## TEST PROCEDURE

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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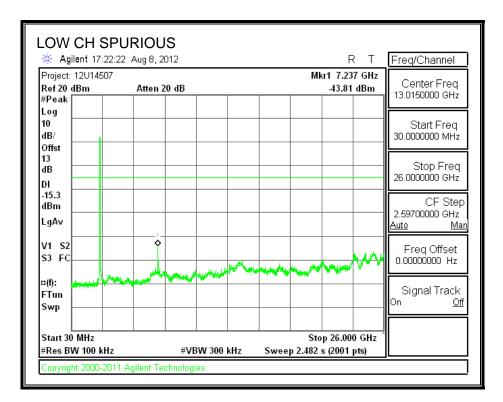
## **RESULTS**

#### SPURIOUS EMISSIONS, LOW CHANNEL



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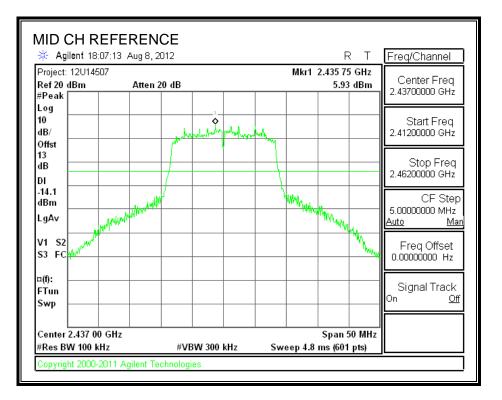
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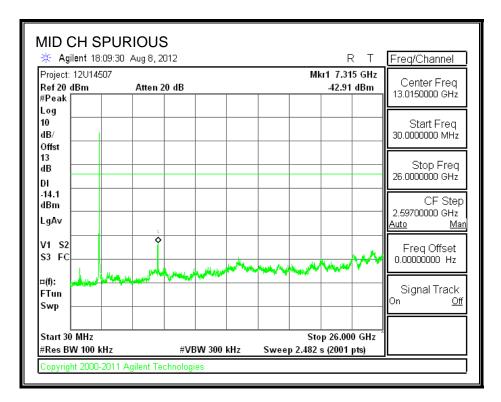
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# SPURIOUS EMISSIONS, MID CHANNEL



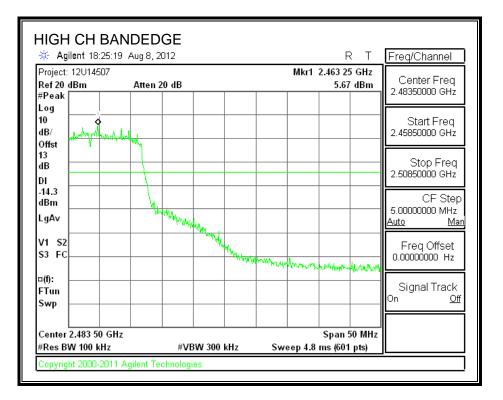
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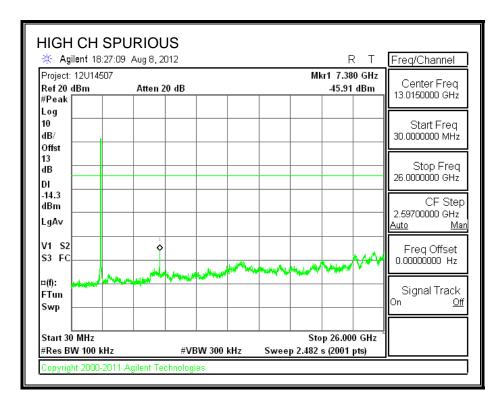
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#### SPURIOUS EMISSIONS, HIGH CHANNEL



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# 7.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

# 7.3.1. 6 dB BANDWIDTH

# <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

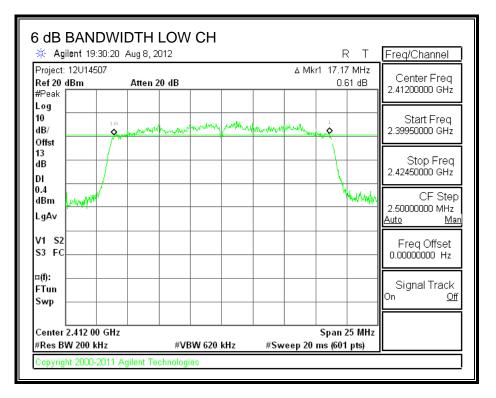
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

## **RESULTS**

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

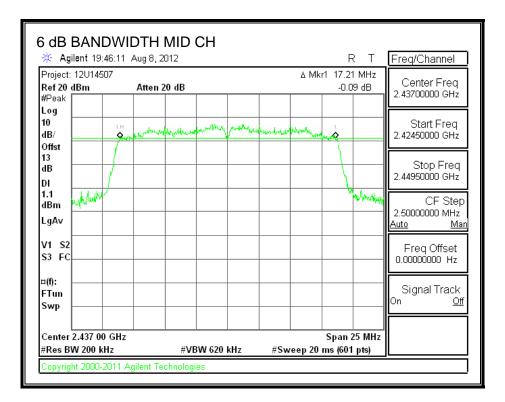
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#### 6 dB BANDWIDTH



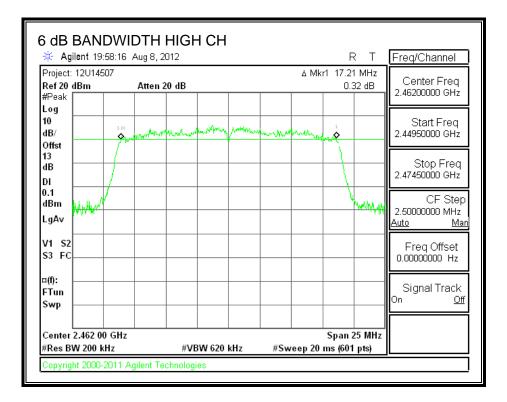
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# 7.3.2. 99% BANDWIDTH

### 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.

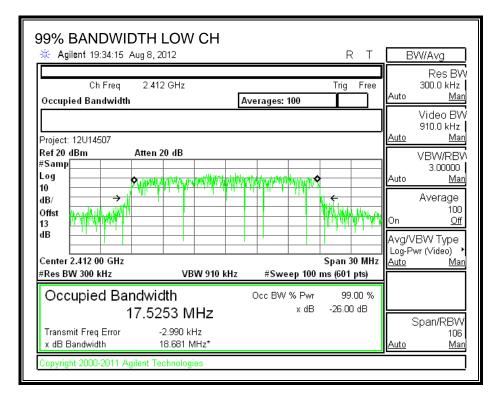
#### **RESULTS**

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	17.5253
Middle	2437	17.5337
High	2462	17.5250

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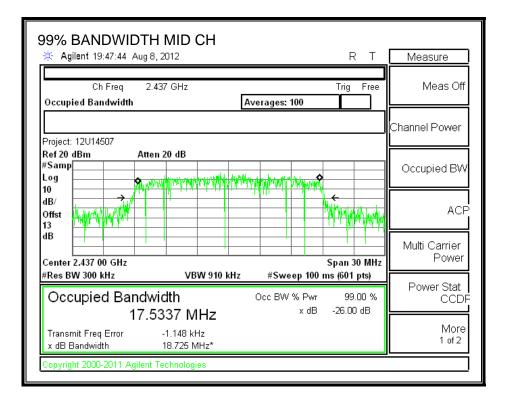
#### 99% BANDWIDTH



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IC: 579C-A1458



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99% BANDWIDTH			RТ	Measure
Ch Freq 2.48 Occupied Bandwidth	i2 GHz	Averages: 100	Trig Free	Meas Off
Project: 12U14507				Channel Power
Ref 20 dBm Atten #Samp Log	20 dB	14 11 11 11 11 11 11 11 11 11 11 11 11 1		Occupied BW
10 dB/ → Offst 13			. ←	ACF
dB			Span 30 MHz	Multi Carrier Power
#Res BW 300 kHz	#VBW 620 kHz	#Sweep 100 г		
Occupied Bandwi 17.52	dth 250 MHz	Occ BW % Pwr x dB		Power Stat CCD
	-6.365 kHz 18.634 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.

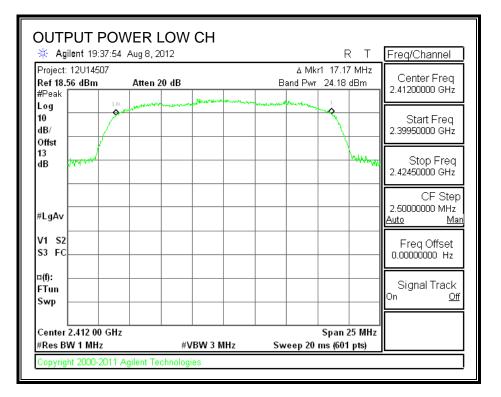
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

## **RESULTS**

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	24.18	30	-5.82
Middle	2437	25.05	30	-4.95
High	2462	23.82	30	-6.18

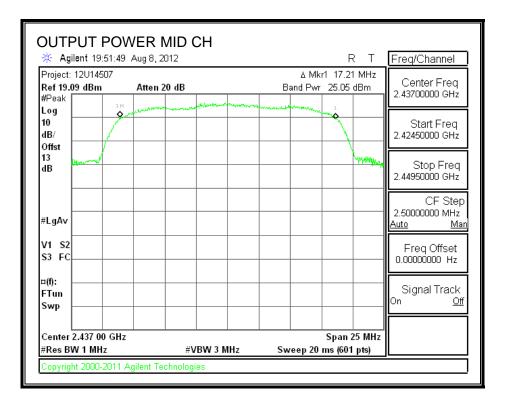
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### **OUTPUT POWER**



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Agilent 20:03 Project: 12U14507	_		R ∆ Mkr1_17.21 M	. I requertament
	Atten 20 di	3	Band Pwr 23.82 dE	Contor Frog
Log 10 dB/			1	Start Freq 2.44950000 GHz
Offst 13 dB				Stop Freq 2.47450000 GHz
#LgAv				CF Step 2.5000000 MHz <u>Auto Mar</u>
V1 S2 S3 FC				Freq Offset 0.00000000 Hz
¤(f): FTun Swp				Signal Track
Center 2.462 00 6 #Res BW 1 MHz	iHz	#VBW 3 MHz	Span 25 Sweep 20 ms (601 p	

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# 7.3.4. AVERAGE POWER

## <u>LIMITS</u>

None; for reporting purposes only.

# 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**

The cable assembly insertion loss of 13 dB (including 12 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	15.48
Middle	2437	16.45
High	2462	14.95

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# 7.3.5. POWER SPECTRAL DENSITY

# LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

# TEST PROCEDURE

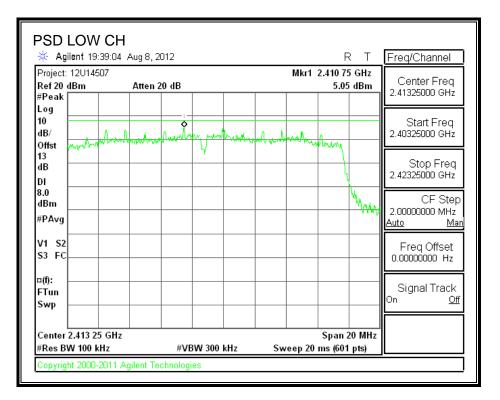
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

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

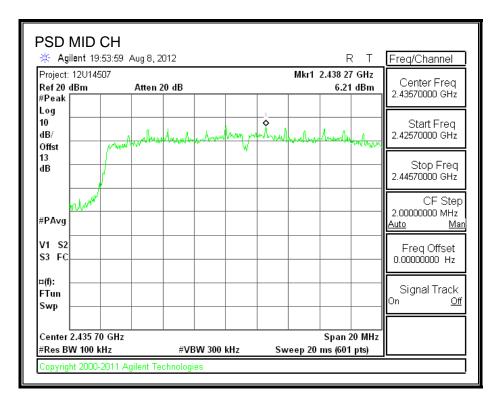
## **RESULTS**

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	2412	5.05	-15.2	-10.15	8	-18.15
Middle	2437	6.21	-15.2	-8.99	8	-16.99
High	2462	4.91	-15.2	-10.29	8	-18.29

#### **POWER SPECTRAL DENSITY**

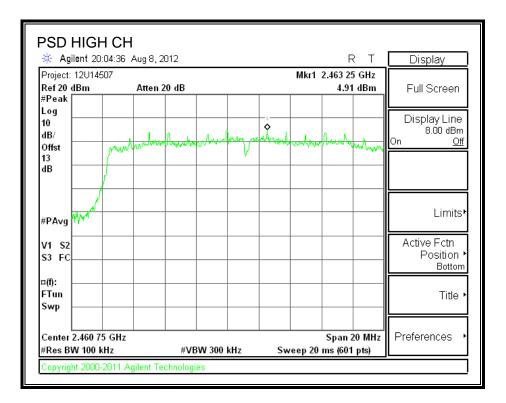


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# 7.3.6. CONDUCTED SPURIOUS EMISSIONS

### **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.

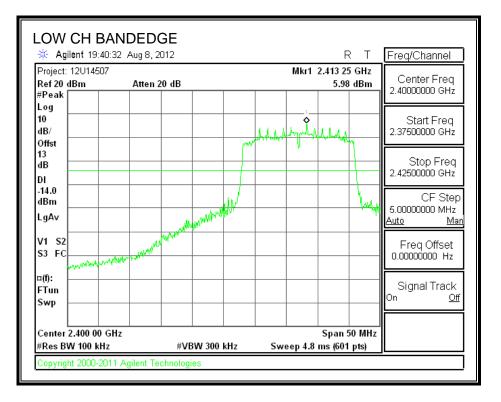
### TEST PROCEDURE

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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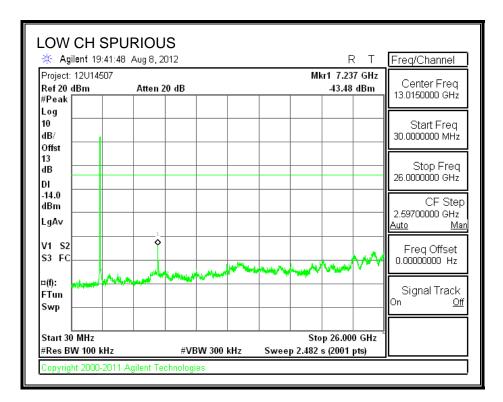
### **RESULTS**

#### SPURIOUS EMISSIONS, LOW CHANNEL



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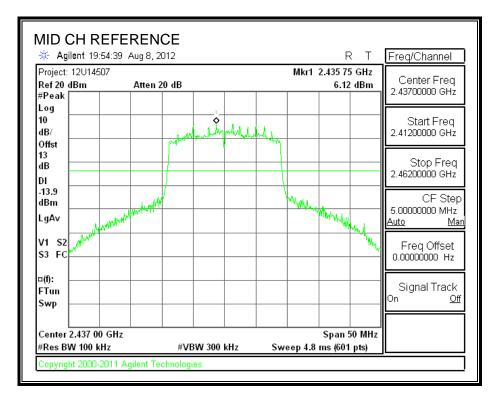
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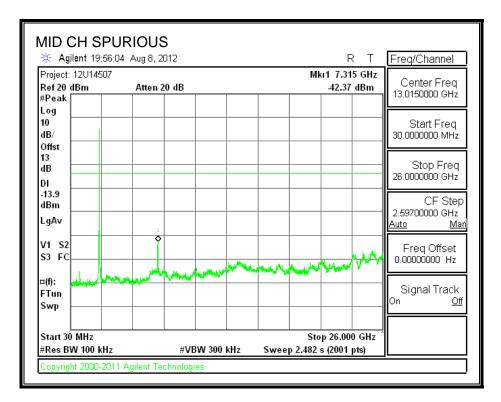
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## SPURIOUS EMISSIONS, MID CHANNEL



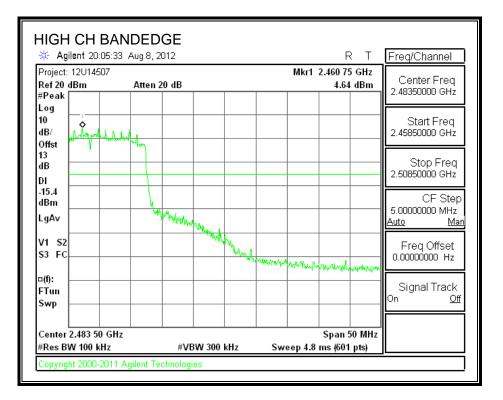
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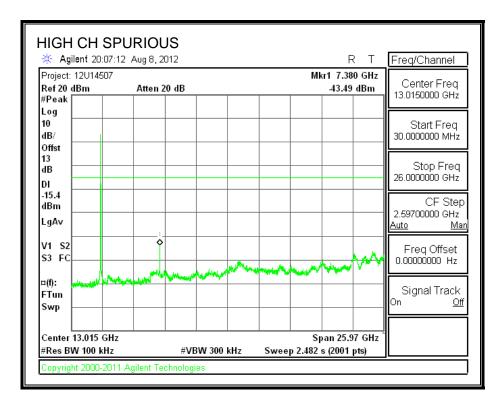
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## SPURIOUS EMISSIONS, HIGH CHANNEL



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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

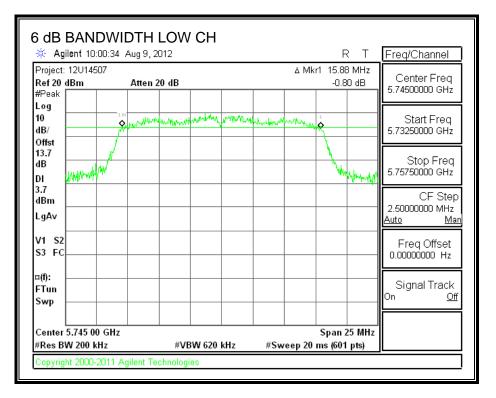
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

### **RESULTS**

Channel	Frequency	6 dB Bandwidth	Minimum Limit	
	(MHz)	(MHz)	(MHz)	
Low	5745	15.88	0.5	
Middle	5785	15.92	0.5	
High	5825	15.96	0.5	

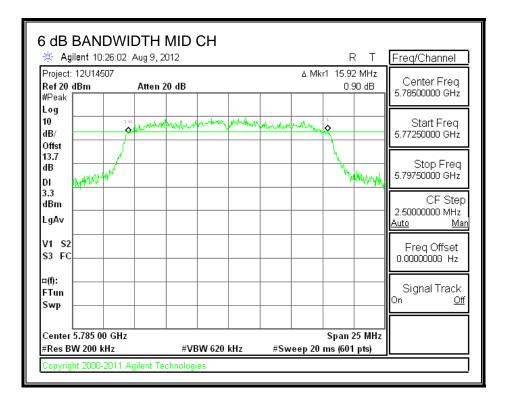
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#### 6 dB BANDWIDTH



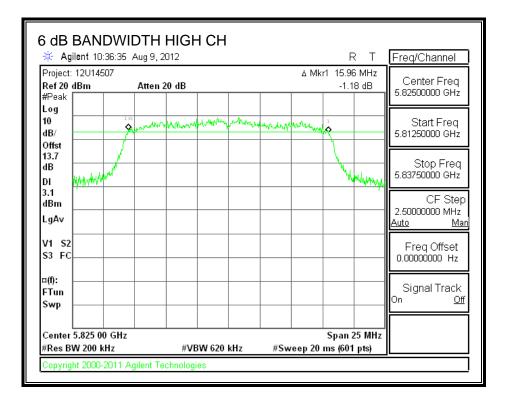
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# 7.4.2. 99% BANDWIDTH

### **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.

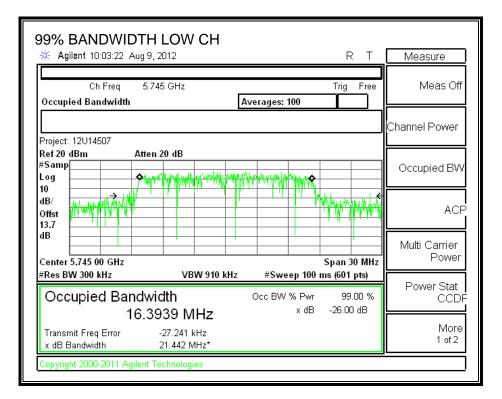
#### **RESULTS**

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5745	16.3939
Middle	5785	16.3939
High	5825	16.4009

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#### 99% BANDWIDTH



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99% BANDWIDTH MID CH * Agilent 10:27:58 Aug 9, 2012	R T Measure
Ch Freq 5.785 GHz Occupied Bandwidth Average	Trig Free Meas Off
Project: 12U14507	Channel Power
Ref 20 dBm Atten 20 dB #Samp Log 10	Occupied BW
dB/ offst 13.7 dB	
Center 5.785 00 GHz	Span 30 MHz Sweep 100 ms (601 pts)
	BW % Pwr 99.00 % x dB -26.00 dB
Transmit Freq Error -29.449 kHz x dB Bandwidth 21.844 MHz*	More 1 of 2
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99% BANDWIDTH HIGH CH	RT	Measure
Ch Freq 5.825 GHz Occupied Bandwidth	Trig Free Averages: 100	Meas Off
Project: 12U14507		Channel Power
Ref 20 dBm Atten 20 dB #Samp Log		Occupied BW
dB/ Offst 13.7		ACP
dB	Span 30 MHz	Multi Carrier Power
#Res BW 300 kHz VBW 910 I	kHz #Sweep 100 ms (601 pts)	Power Stat
Occupied Bandwidth 16.4009 MHz	Occ BW % Pwr 99.00 % x dB -26.00 dB	
Transmit Freq Error -36.813 kHz x dB Bandwidth 21.704 MHz*		More 1 of 2
Copyright 2000-2011 Agilent Technologies		

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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.

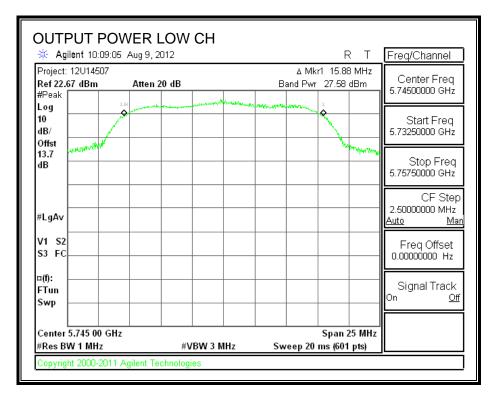
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

### <u>RESULTS</u>

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5745	27.58	30	-2.42
Middle	5785	27.36	30	-2.64
High	5825	27.49	30	-2.51

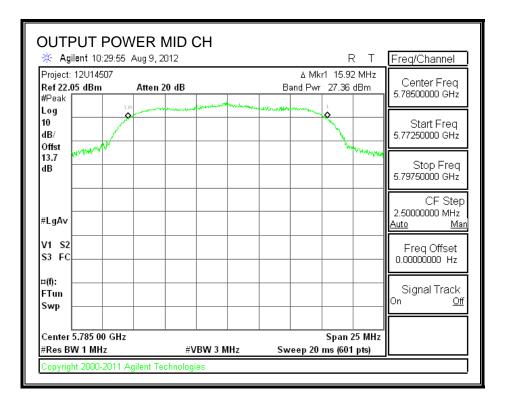
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#### **OUTPUT POWER**



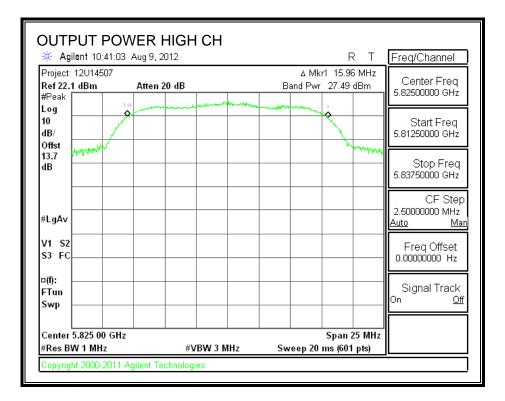
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# 7.4.4. AVERAGE POWER

### <u>LIMITS</u>

None; for reporting purposes only.

## 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>

The cable assembly insertion loss of 13.7 dB (including 12. dB pad and 1.7 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	18.43
Middle	5785	18.43
High	5825	18.47

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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.

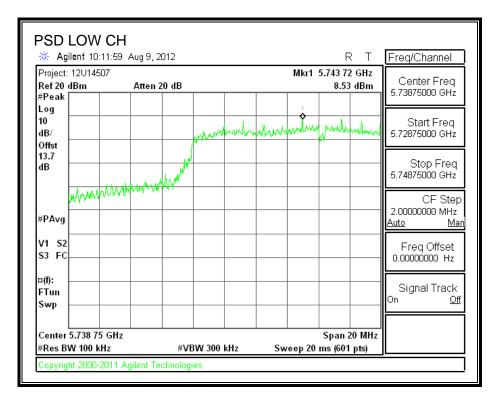
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

### **RESULTS**

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	5745	8.53	-15.2	-6.67	8	-14.67
Middle	5785	8.47	-15.2	-6.73	8	-14.73
High	5825	8.67	-15.2	-6.53	8	-14.53

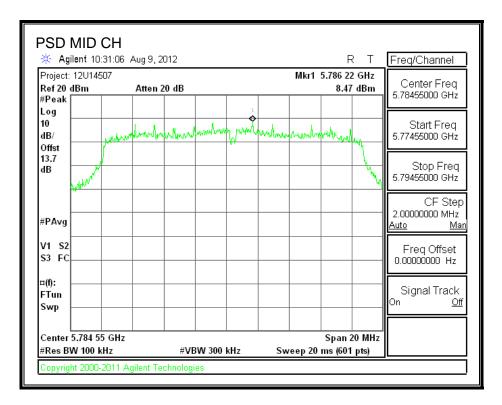
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#### **POWER SPECTRAL DENSITY**



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Project: 12U145	07			Mkr1 5.826		Freq/Channel
Ref 20 dBm #Peak	Atten 2	0 dB		8	.67 dBm	Center Freq 5.81995000 GHz
#Peak Log				1		
10 dB/		mponto	whentered	when produce	Annahana	Start Freq 5.80995000 GHz
Offst 13.7		$\int \int dx$				
dB	العادين المراجع	vf				Stop Freq 5.82995000 GHz
MMM	WANN WANT				_	
						CF Step 2.0000000 MHz
#PA∨g						<u>Auto Ma</u>
V1 S2 S3 FC						Freq Offset 0.00000000 Hz
¤(f):						
FTun						Signal Track On Off
Swp						On <u>Off</u>
Center 5.819 9	5 GHz			Sna	n 20 MHz	

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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.

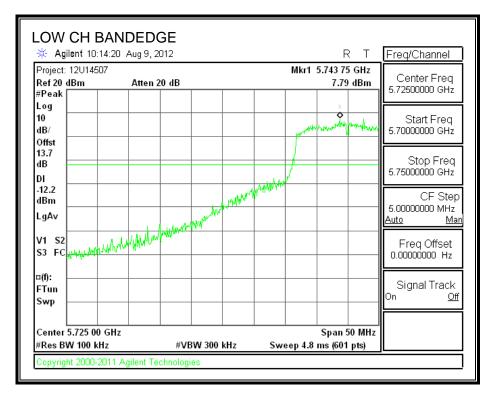
## TEST PROCEDURE

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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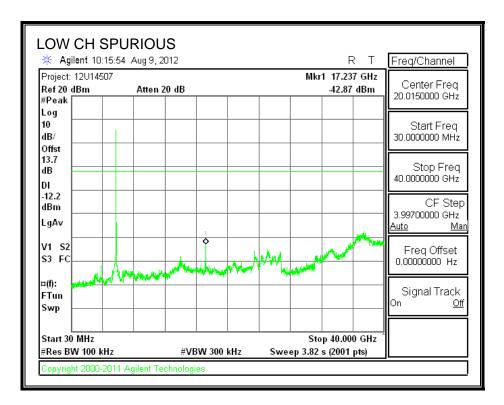
### **RESULTS**

#### SPURIOUS EMISSIONS, LOW CHANNEL



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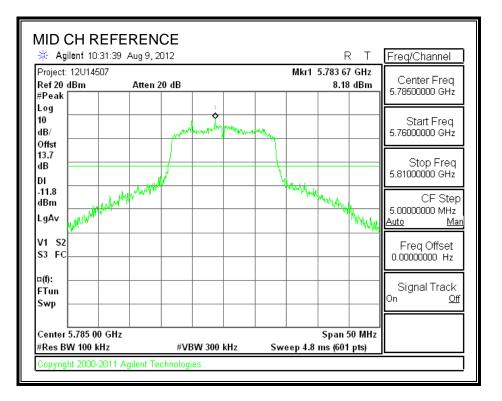
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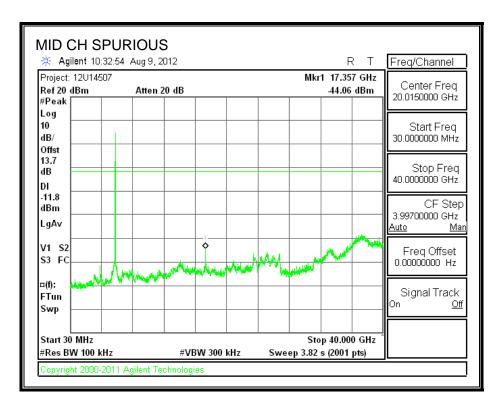
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## SPURIOUS EMISSIONS, MID CHANNEL



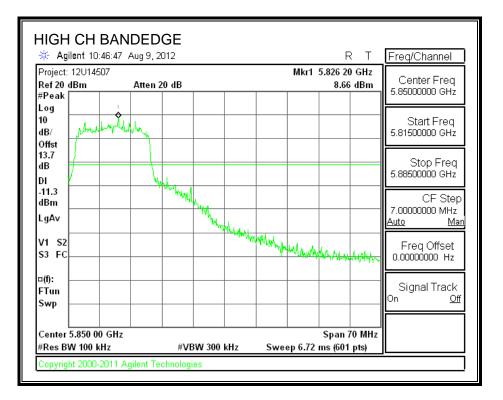
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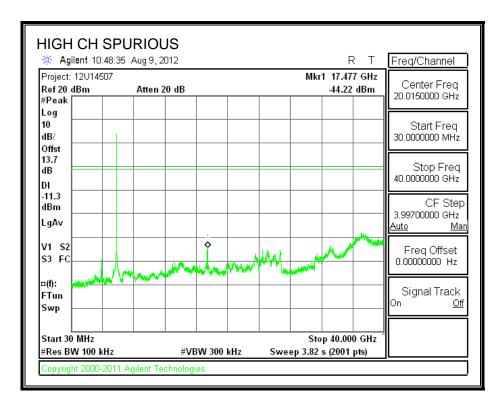
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#### SPURIOUS EMISSIONS, HIGH CHANNEL



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# 7.5. 802.11n HT20 MODE IN THE 5.8 GHz BAND

# 7.5.1.6 dB BANDWIDTH

## <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

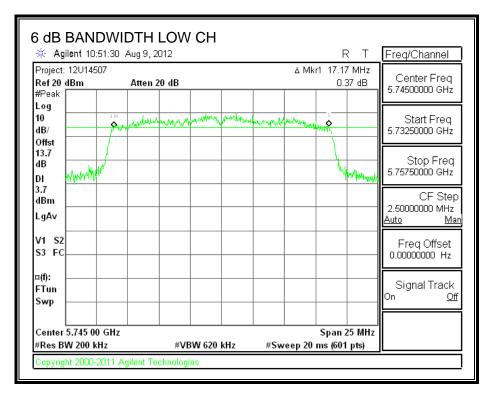
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

### **RESULTS**

Channel	Frequency	6 dB Bandwidth	Minimum Limit	
	(MHz)	(MHz)	(MHz)	
Low	5745	17.17	0.5	
Middle	5785	17.21	0.5	
High	5825	17.12	0.5	

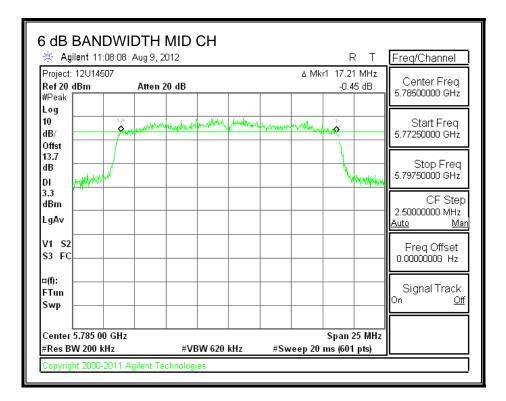
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#### 6 dB BANDWIDTH



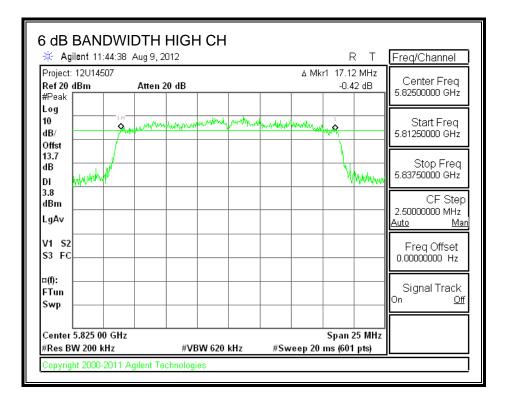
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## 7.5.2. 99% BANDWIDTH

## 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.

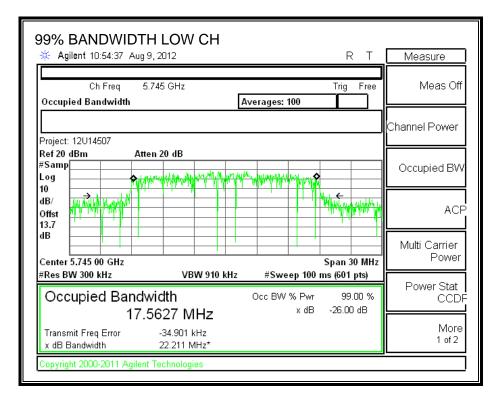
### **RESULTS**

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5745	17.5627
Middle	5785	17.5628
High	5825	17.5644

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#### 99% BANDWIDTH



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REPORT NO: 12U14507-1A

FCC ID: BCGA1458

99% BANDWIDTH MID CH	Measure
Ch Freq 5.785 GHz Trig Free Occupied Bandwidth Averages: 100	Meas Off
Project: 12U14507	Channel Power
Ref 20 dBm Atten 20 dB #Samp Log <b>Shutha (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)</b>	Occupied BW
10 → (1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/	ACF
dB Center 5.785 00 GHz Span 30 MHz	Multi Carrier Power
#Res BW 300 kHz         VBW 910 kHz         #Sweep 100 ms (601 pts)           Occupied Bandwidth         Occ BW % Pwr         99.00 %           17.5028 MUT         X dB         -26.00 dB	Power Stat CCDF
17.5628 MHz × dB -26.00 dB Transmit Freq Error -37.756 kHz × dB Bandwidth 22.100 MHz*	More 1 of 2
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99% BANDWIDTH HIGH CH		Т	Measure
Ch Freq 5.825 GHz Occupied Bandwidth	Trig Averages: 100	Free	Meas Off
Project: 12U14507			Channel Power
Ref 20 dBm Atten 20 dB #Samp Log Area (Marco and Atten 20 dB	7		Occupied BW
dB/ Offst 13.7		<b>₩₩</b> ₩	← ACP
dB	Span 30	MHz	Multi Carrier Power
#ResBW 300 kHz VBW 910	)kHz #Sweep 100 ms (601 p	ts)	Power Stat
Occupied Bandwidth 17.5644 MHz	Осс ВW % Рwr 99.0 x dB -26.00		CCDF
Transmit Freq Error-44.087 kHzx dB Bandwidth22.599 MHz*			More 1 of 2
Copyright 2000-2011 Agilent Technologies			

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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.

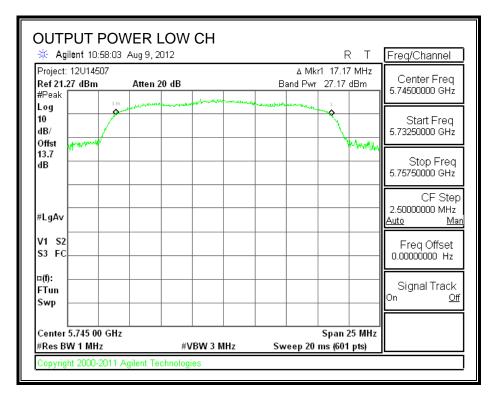
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

## **RESULTS**

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5745	27.17	30	-2.83
Middle	5785	27.27	30	-2.73
High	5825	27.02	30	-2.98

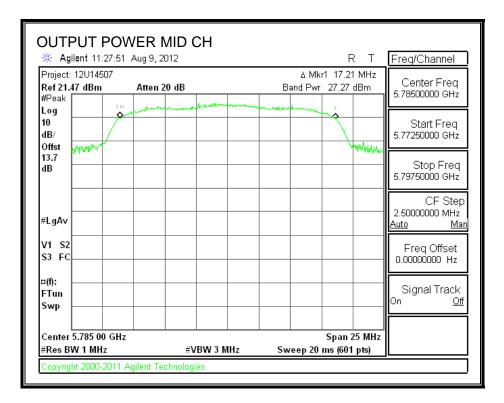
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## **OUTPUT POWER**

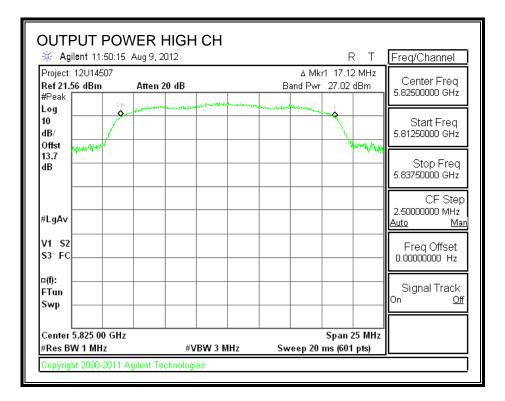


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# 7.5.4. AVERAGE POWER

## LIMITS

None; for reporting purposes only.

## 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**

The cable assembly insertion loss of 13.7 dB (including 12 dB pad and 1.7 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	18.46
Middle	5785	18.45
High	5825	18.48

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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.

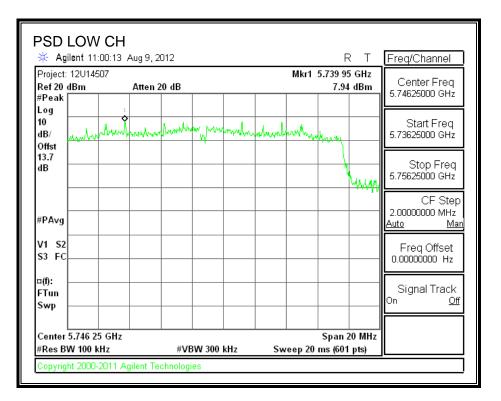
## **RESULTS**

Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	5745	7.94	-15.2	-7.26	8	-15.26
Middle	5785	8.52	-15.2	-6.68	8	-14.68
High	5825	8.50	-15.2	-6.70	8	-14.70

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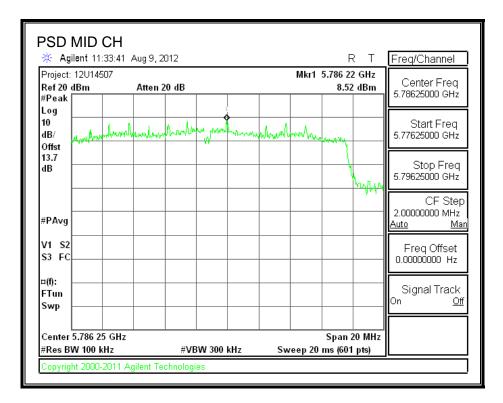
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### **POWER SPECTRAL DENSITY**



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Project: 12		3 Aug 9, 2					Mkr1	5.823 68	GHz	Freq/Channel
Ref20dB #Peak		Atten 2	20 dB						dBm	Center Freq 5.82375000 GHz
Log 10 dB/ Offst		mounday	lunaha	nyn/lenwru	many me	athrough	wylnu	Anarthy	-Areason	Start Freq 5.81375000 GHz
13.7 dB	www									Stop Freq 5.83375000 GHz
#PAvg										CF Step 2.00000000 MHz <u>Auto Ma</u> r
V1 S2 S3 FC										Freq Offset 0.00000000 Hz
¤(f): FTun Swp										Signal Track On <u>Off</u>
Center 5.4 #Res BW		Iz	#\/P	W 300	LU-	<b>.</b>	20	Span 2 ms (601		

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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.

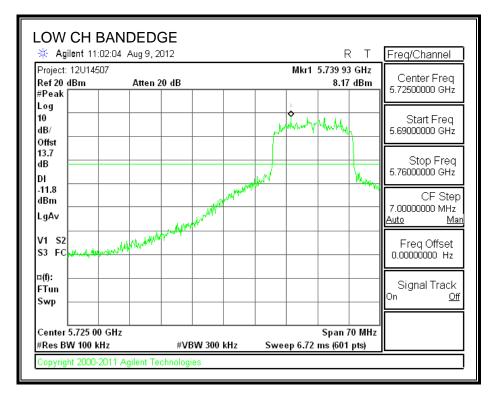
## TEST PROCEDURE

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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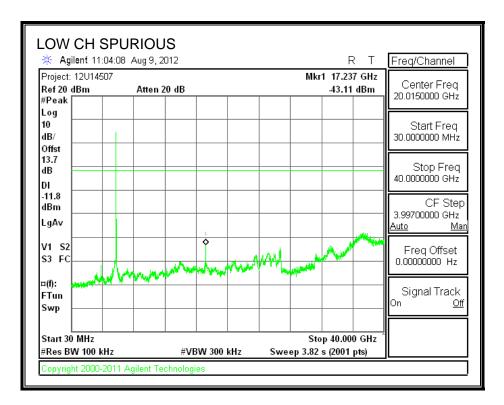
## **RESULTS**

#### SPURIOUS EMISSIONS, LOW CHANNEL



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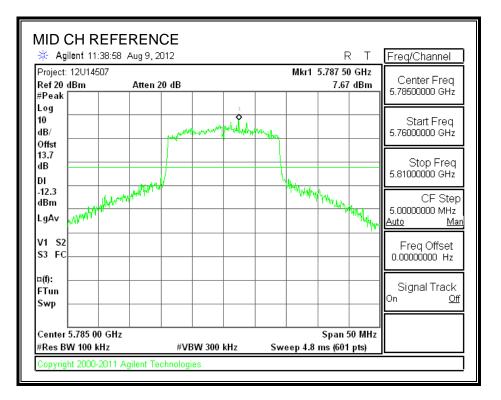
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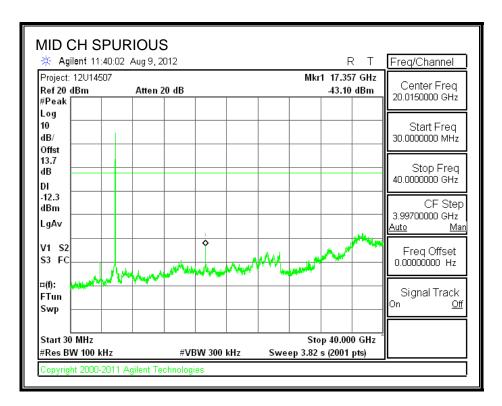
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### SPURIOUS EMISSIONS, MID CHANNEL



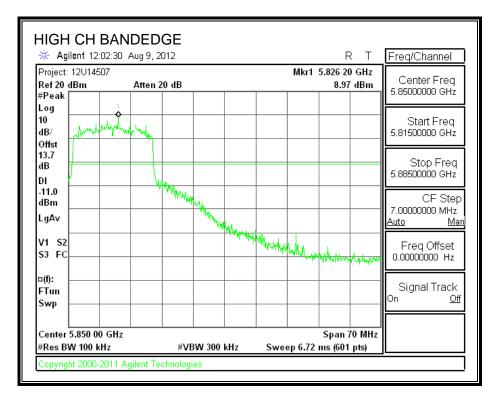
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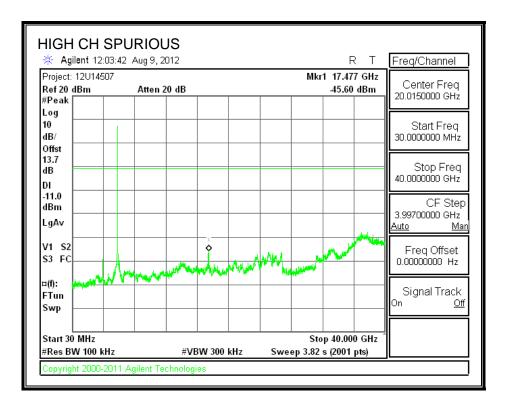
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## SPURIOUS EMISSIONS, HIGH CHANNEL



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# 7.6. 802.11n HT40 MODE IN THE 5.8 GHz BAND

# 7.6.1. 6 dB BANDWIDTH

## <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

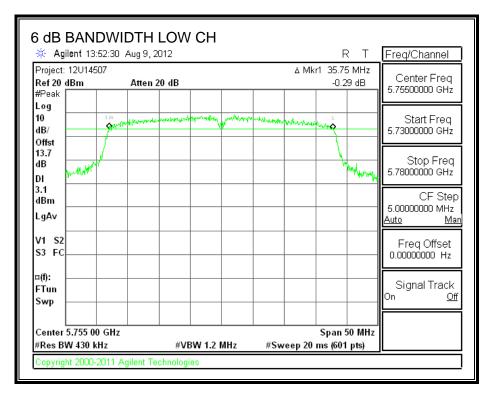
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

## **RESULTS**

Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	5755	35.75	0.5
High	5795	35.67	0.5

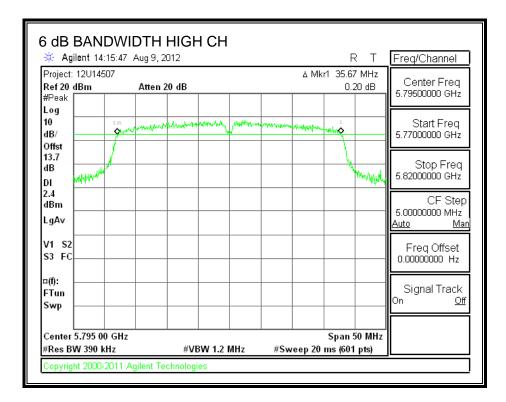
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#### 6 dB BANDWIDTH



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## 7.6.2. 99% BANDWIDTH

## LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

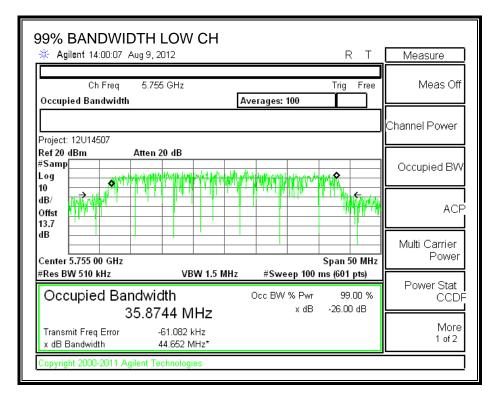
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### **RESULTS**

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5755	35.8744
High	5795	35.9182

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#### 99% BANDWIDTH



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99% BANDWIDTH HIGH (	СН	RТ	BW/Avg
Ch Freq 5.795 GHz Occupied Bandwidth	Averages: 100	Trig Free	Res BW 510.0 kHz Auto <u>Man</u> Video BW
Log 06 07 07 07 07 07 07 07 07 07 07			1.5 MHz <u>Auto Man</u> VBW/RBV 3.00000 Auto <u>Man</u> Average 100 On <u>Off</u> Avg/VBW Type Log-Pwr (Video)
Center 5.795 00 GHz #Res BW 510 kHz VBW	1.5 MHz #Sweep 100 m	Span 50 MHz is (601 pts)	<u>Auto Man</u>
Occupied Bandwidth 35.9182 MH Transmit Freg Error -29.138 kH:		99.00 % -26.00 dB	Span/RBW
x dB Bandwidth 45.084 MH: Copyright 2000-2011 Agilent Technologies			106 <u>Auto Man</u>

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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.

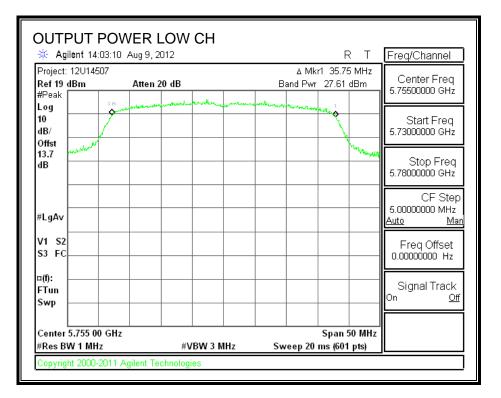
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

## <u>RESULTS</u>

Channel	Frequency	Peak Power	Limit	Margin
		Reading		
	(MHz)	(dBm)	(dBm)	(dB)
Low	5755	27.61	30	-2.39
High	5795	27.43	30	-2.57

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## **OUTPUT POWER**



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OUTPUT PO	WER HIGH CH		
🔆 Agilent 14:24:49	Aug 9, 2012	R T	Freq/Channel
Project: 12U14507 <b>Ref 17.98 dBm</b> #Peak	Atten 20 dB	∆ Mkr1 35.67 MHz Band Pwr 27.43 dBm	Center Freq 5.79500000 GHz
Log o 10 dB/		1	Start Freq 5.77000000 GHz
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 GH: #Res BW 1 MHz	#VBW 3 MHz	Span 50 MHz z Sweep 20 ms (601 pts)	
Copyright 2000-2011	Agilent Technologies		

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# 7.6.4. AVERAGE POWER

## <u>LIMITS</u>

None; for reporting purposes only.

## 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**

The cable assembly insertion loss of 13.7 dB (including 12 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)	
Low	5755	18.43	
High	5795	18.45	

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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.

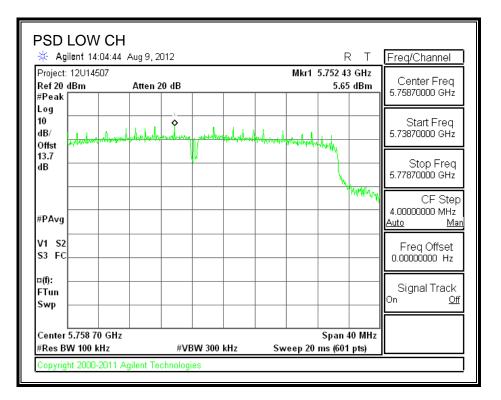
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

### **RESULTS**

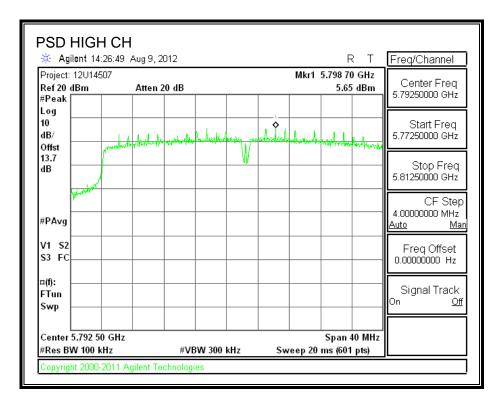
Channel	Frequency	Analyzer Reading	10log(3kHz/100kHz)	PSD	Limit	Margin
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	5755	5.65	-15.2	-9.55	8	-17.55
High	5795	5.65	-15.2	-9.55	8	-17.55

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### **POWER SPECTRAL DENSITY**



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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.

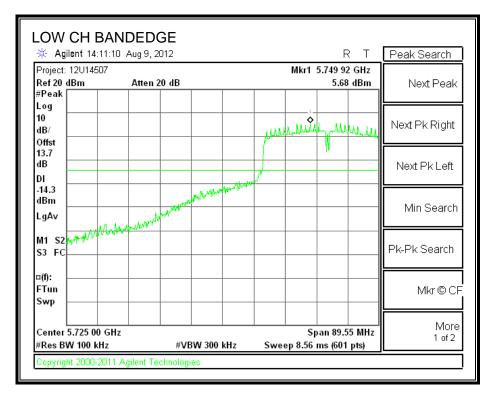
## TEST PROCEDURE

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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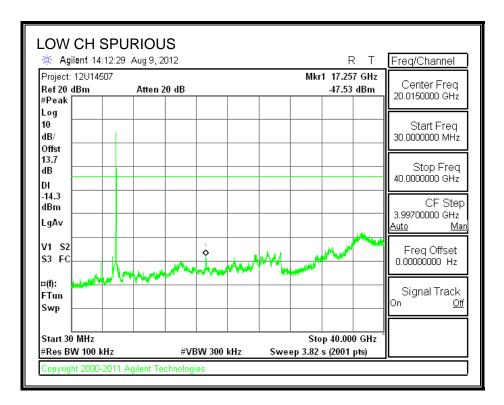
#### **RESULTS**

#### SPURIOUS EMISSIONS, LOW CHANNEL



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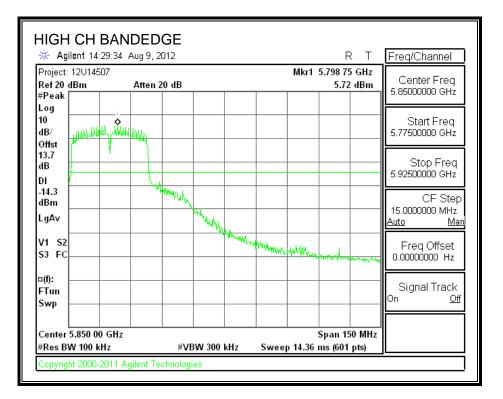
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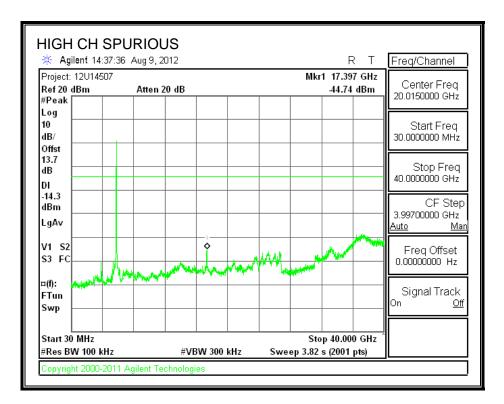
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#### SPURIOUS EMISSIONS, HIGH CHANNEL



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# 8. RADIATED TEST RESULTS

# 8.1. LIMITS AND PROCEDURE

### LIMITS

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.

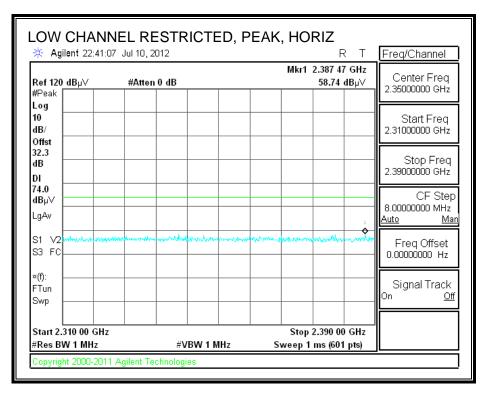
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

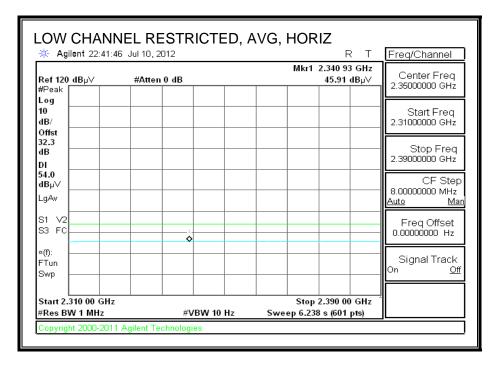
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# 8.2. TRANSMITTER ABOVE 1 GHz

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

### **RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

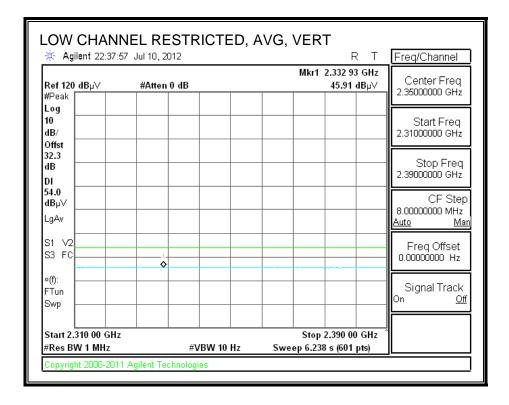




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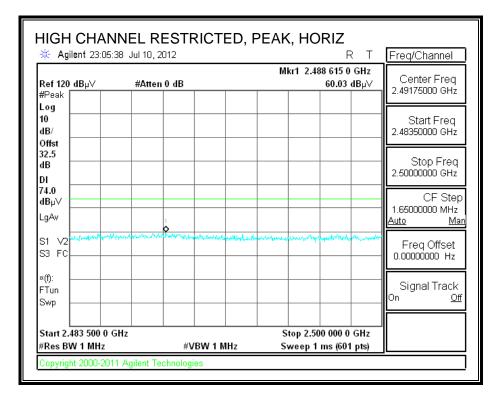
#### **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

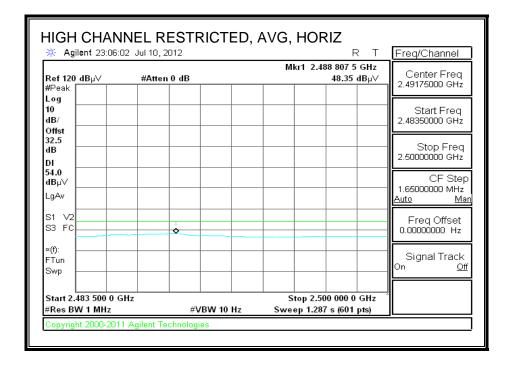
_OW CHANNEL RE		EAK, VERT	Freq/Channel
Ref 120 dBµ∨ #Atten #Peak	0 dB	Mkr1 2.374 67 GHz 58.40 dBµ∨	Center Freq 2.35000000 GHz
Log			Start Freq 2.31000000 GHz
32.3 dB DI			Stop Freq 2.39000000 GHz
74.0 dBµ∨ LgAv			CF Step 8.00000000 MHz <u>Auto Man</u>
S1 V2 Automation Automation Automation S3 FC	Muddharan Monderadal eronadi harra	nserver and a state of the second	Freq Offset 0.00000000 Hz
*(f): FTun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz #Res BW 1 MHz	#VBW 1 MHz	Stop 2.390 00 GHz Sweep 1 ms (601 pts)	



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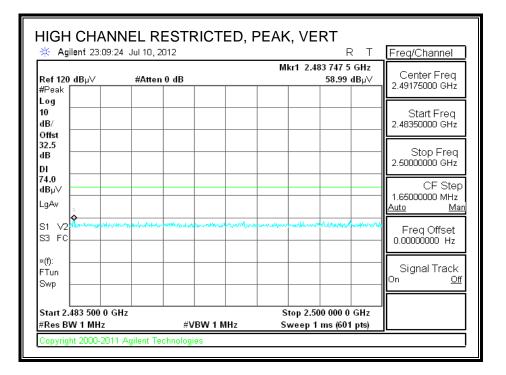
#### **RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

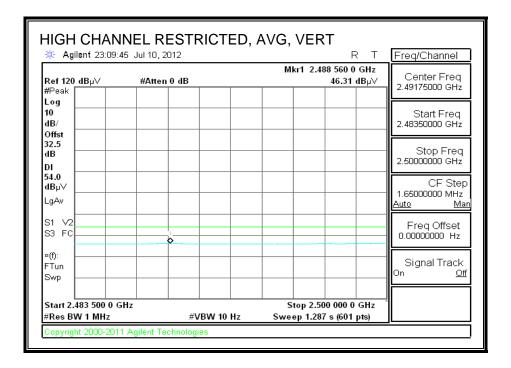




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#### **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





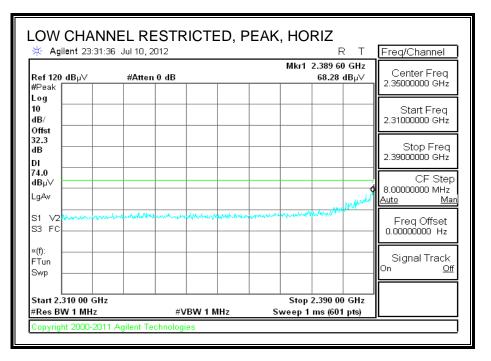
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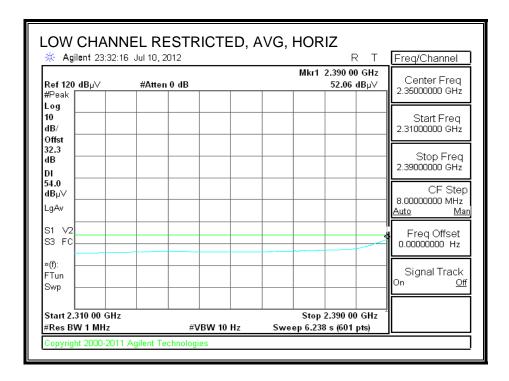
#### HARMONICS AND SPURIOUS EMISSIONS

Test Engi		Chin Pa	-										
Date:		08/04/12											
Project #		12U1450	7										
Company		Apple											
Test Targ		FCC 15.3											
Mode Op	er:	b mode,	TX										
	f	Measuren	nent Fred	pency	Amp	Preamp (	Gain			Average	Field Stren	gth Limit	
	Dist	Distance			-	Distance	Correc	t to 3 me	ters	_	ld Strength	-	
	Read	Analyzer	Reading		Avg	Average	Field St	trength @	3 m	Margin v	s. Average	Limit	
	AF	Antenna	Factor		Peak	Calculate				Margin v	rs. Peak Lis	nit	
	CL	Cable Los	55		HPF	High Pas			-	-			
f	Dist	Read	AF	CL	Amp	D Corr		Corr.			Ant. Pol.		Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Low Ch,													
4.824	3.0	38.5	33.4	6.3		0.0	0.0	42.7	74.0	-31.3	H	P	
4.824	3.0	26.2	33.4	6.3	-35.5	0.0	0.0	30.4	54.0	-23.6	H	A	
4.824	3.0	37.8	33.4	6.3	-35.5	0.0	0.0	42.0	74.0	-32.0	V	P	
4.824	3.0	27.0	33.4	6.3	-35.5	0.0	0.0	31.2	54.0	-22.8	V	A	
Mid Ch.	2437MH												
4.874	3.0	37.1	33.5	6.3	-35.5	0.0	0.0	41.4	74.0	-32.6	H	P	
4.874	3.0	24.9	33.5	6.3	-35.5	0.0	0.0	29.2	54.0	-24.8	H	Ā	
7.311	3.0	37.0	35.7	8.5	-35.4	0.0	0.0	45.8	74.0	-28.2	H	P	
7.311	3.0	25.0	35.7	8.5	-35.4	0.0	0.0	33.8	54.0	-20.2	H	A	
4.874	3.0	37.3	33.5	6.3	-35.5	0.0	0.0	41.6	74.0	- <b>32.4</b>	V	P	
4.874	3.0	25.2	33.5	6.3	-35.5	0.0	0.0	29.5	54.0	-24.5	V	Α	
7.311	3.0	38.0	35.7	8.5	-35.4	0.0	0.0	46.8	74.0	-27.2	V	P	
7.311	3.0	26.0	35.7	8.5	-35.4	0.0	0.0	34.8	54.0	-19.2	V	A	
High Ch	2462MD	Hz											
4.924	3.0	37.7	33.5	6.3	-35.5	0.0	0.0	42.1	74.0	-31.9	H	P	
4.924	3.0	25.2	33.5	6.3	-35.5	0.0	0.0	29.6	54.0	-24.4	H	A	
7.386	3.0	37.0	35.8	8.5	-35.5	0.0	0.0	45.9	74.0	- <b>28.1</b>	H	P	
7.386	3.0	25.3	35.8	8.5	-35.5	0.0	0.0	34.2	54.0	-19.8	H	A	
4.924	3.0	37.6	33.5	6.3	-35.5	0.0	0.0	42.0	74.0	-32.0	V	P	
4.924	3.0	25.0	33.5	6.3	-35.5	0.0	0.0	29.4	54.0	-24.6	V	A	
7.386	3.0	37.4	35.8	8.5	-35.5	0.0	0.0	46.3	74.0	-27.7	V	P	
7.386	3.0	26.5	35.8	8.5	-35.5	0.0	0.0	35.4	54.0	-18.6	V	A	
	1	1	1			Į							

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

#### **RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



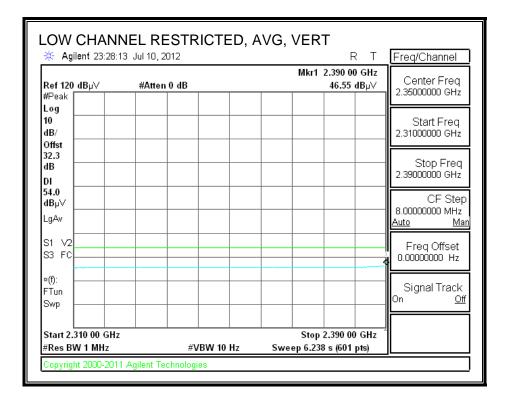


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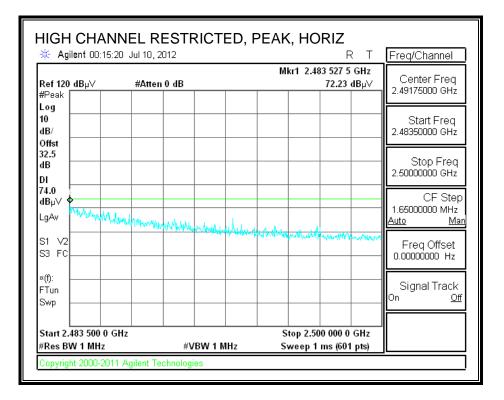
#### **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

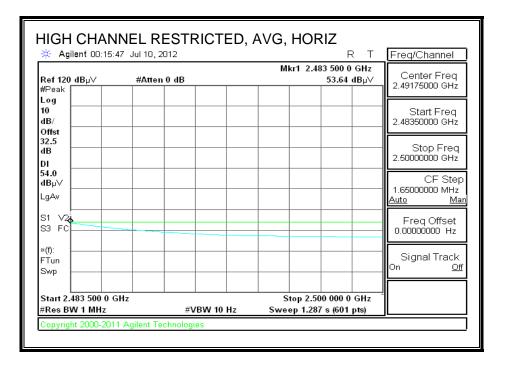
LOW CHANNE		ED, PEAK, VE	RT R T	Freq/Channel
Ref 120 dBµ∨ #Peak	#Atten 0 dB	Mkr1	2.365 87 GHz 59.36 dBµ∨	Center Freq 2.3500000 GHz
Log 10 dB/ Offst				Start Freq 2.3100000 GHz
32.3 dB DI				Stop Freq 2.3900000 GHz
74.0 dBµ∨ LgAv				CF Step 8.0000000 MHz <u>Auto Man</u>
S1 V2 honordationships	anandron and an article and a stadion of	ute ter market to produce the set	erndetservendet der Merk	Freq Offset 0.00000000 Hz
»(f): FTun Swp				Signal Track On <u>Off</u>
Start 2.310 00 GHz #Res BW 1 MHz	#VBW 1	•	2.390 00 GHz ms (601 pts)	
Copyright 2000-2011 A	gilent Technologies			



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#### **RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

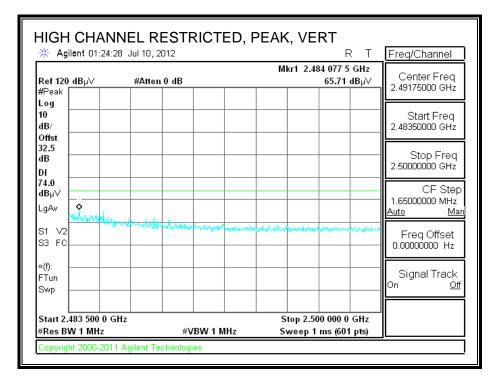


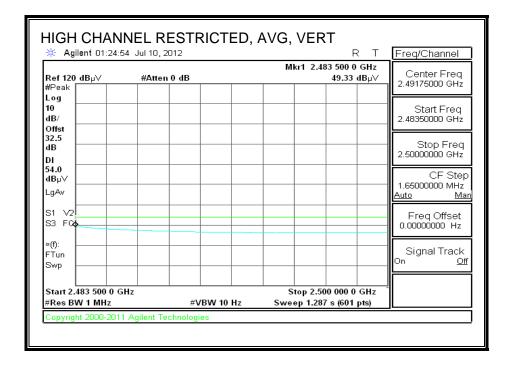


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#### **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





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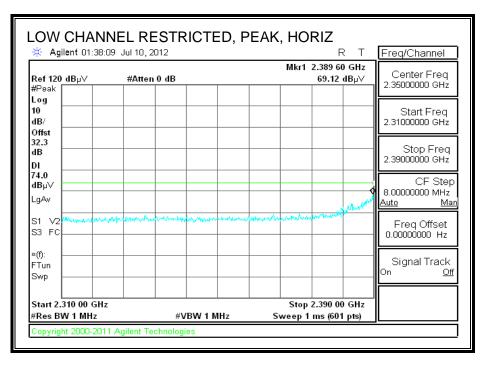
### HARMONICS AND SPURIOUS EMISSIONS

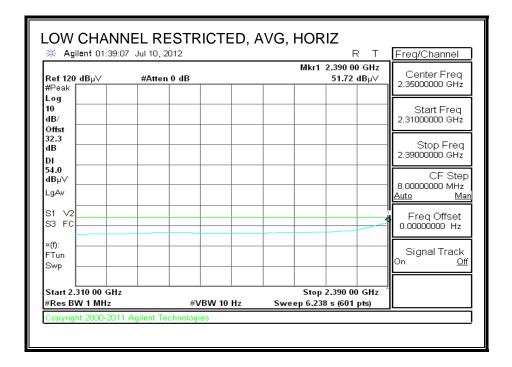
fest Engi		Chin Pa	ng										
Date:		08/04/12	-										
Project #		12U1450											
Company		Apple											
Test Targ		FCC 15.	247										
Mode Op		g mode,											
		-											
	f	Measuren	nent Freq	pency	Amp	Preamp (	Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anten	na	D Corr	Distance	Correc	t to 3 me	ters	Peak Fie	ld Strength	Limit	
	Read	Analyzer	Reading		Avg	Average	Field S	trength @	3 m	Margin v	s. Average	Limit	
	AF	Antenna	Factor		Peak	Calculate	d Peak	Field Stre	ength	_	rs. Peak Lis		
	CL	Cable Los	88		HPF	High Pas	s Filter	T.	_	-			
f	Dist	Read	AF	CL	Amp	D Corr		Corr.			Ant. Pol.		Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Low CH,													
4.824	3.0	42.0	33.4	6.3	-35.5	0.0	0.0	46.2	74.0	-27.8	V	P	
4.824	3.0	26.5	33.4	6.3	-35.5	0.0	0.0	30.7	54.0	-23.3	V	A	
4.824	3.0	42.0	33.4	6.3	-35.5	0.0	0.0	46.2	74.0	-27.8	H	P	
4.824	3.0	27.0	33.4	6.3	-35.5	0.0	0.0	31.2	54.0	-22.8	H	A	
Mid Ch,	127111					••••••							
4.874	3.0	43.0	33.5	6.3	-35.5	0.0	0.0	47.3	74.0	-26.7	V	P	
4.874	3.0	27.1	33.5	6.3	-35.5	0.0	0.0	31.4	54.0	-22.6	V V	A	
7.311	3.0	45.0	35.7	8.5	-35.4	0.0	0.0	53.8	74.0	-20.2	v	P	
7.311	3.0	26.0	35.7	8.5	-35.4	0.0	0.0	34.8	54.0	-19.2	v	Ā	
4.874	3.0	45.0	33.5	6.3	-35.5	0.0	0.0	49.3	74.0	-24.7	H	P	
4.874	3.0	28.3	33.5	6.3	-35.5	0.0	0.0	32.6	54.0	-21.4	H	A	
7.311	3.0	44.1	35.7	8.5	-35.4	0.0	0.0	52.9	74.0	-21.1	H	P	
7.311	3.0	25.7	35.7	8.5	-35.4	0.0	0.0	34.5	54.0	-19.5	H	Α	
		]											
High Ch		Iz											
4.924	3.0	41.5	33.5	6.3	-35.5	0.0	0.0	45.9	74.0	-28.1	V	P	
4.924	3.0	26.7	33.5	6.3	-35.5	0.0	0.0	31.1	54.0	-22.9	V	A	
7.386	3.0	45.0	35.8	8.5	-35.5	0.0	0.0	53.9	74.0	-20.1	V	P	
7.386	3.0	25.8	35.8	8.5	-35.5	0.0	0.0	34.7	54.0	-19.3	V	A	
4.924	3.0	42.0	33.5	6.3	-35.5	0.0	0.0	46.4	74.0	-27.6	H	P	
4.924	3.0	28.0	33.5	6.3	-35.5	0.0	0.0	32.4	54.0	-21.6	H	A P	
7.386	3.0	45.6			-35.5	0.0	0.0	54.5 34.9	74.0	-19.5	H H	••••••	
7.386	3.0	26.0	33.8	0.5	-35.5	0.0	0.0	34.9	54.0	-19.1	H	A	
		÷								łi			
						. 1							

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

#### **RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



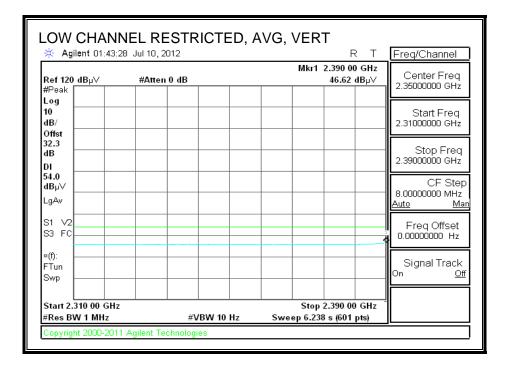


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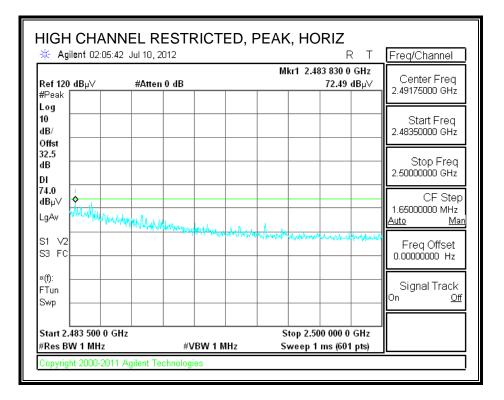
#### **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

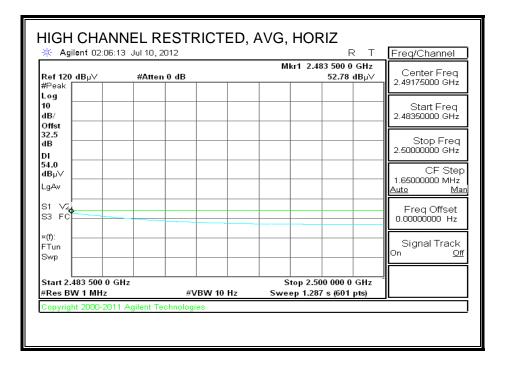
🔆 Agilent 01:42:44 Jul 10, 2	STRICTED, F	R T	Freq/Channel
Ref120 dBµ∨ #Atten #Peak	0 dB	Mkr1 2.336 67 GHz 58.79 dBµ∀	Center Freq 2.35000000 GHz
Log 10 dB/ Offst			Start Freq 2.31000000 GHz
32.3 dB DI			Stop Freq 2.39000000 GHz
74.0 dBµ∨ LgAv	1		CF Step 8.00000000 MHz <u>Auto Man</u>
S1 V2 <mark>Mnamuhandin Magnachan</mark> S3 FC	And the second and th	tern af an particular and a second	Freq Offset 0.00000000 Hz
×(f): FTun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz #Res BW 1 MHz	#VBW 1 MHz	Stop 2.390 00 GHz Sweep 1 ms (601 pts)	



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#### **RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

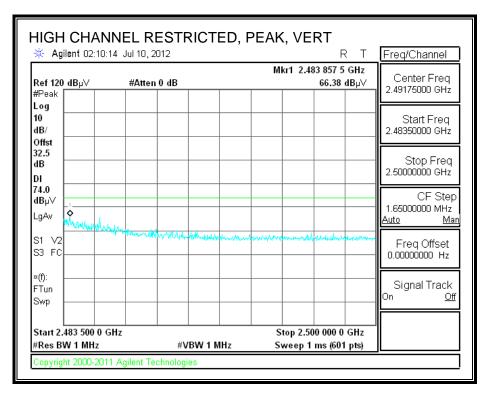


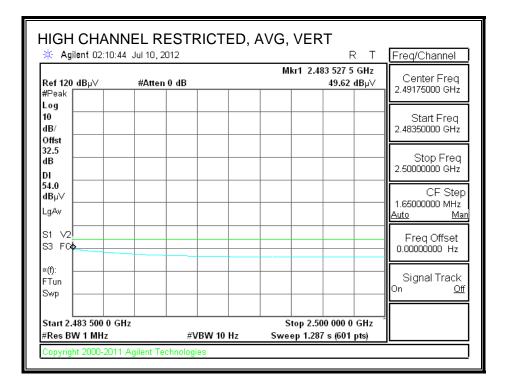


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#### **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





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### HARMONICS AND SPURIOUS EMISSIONS

		Measuren tification		s, Fre	mont 5n	1 Chamb	er						
Test Engr	:	Chin Pa	ng										
Date:		08/04/12											
Project #:		12U1450	7										
Company		Apple											
Test Targ	et:	FCC 15.3	247										
Mode Op	er:	HT20, TX	ζ.										
	f	Measuren	nent Fred	vency	Amp	Preamp (	Gain			Average	Field Stren	gth Limit	
	Dist	Distance				Distance		ct to 3 me	ters		ld Strength		
	Read	Analyzer			Avg			trength @			s. Average		
	AF	Antenna	-		Peak	_		Field Stre		_	rs. Peak Lis		
	CL	Cable Los			HPF	High Pas							
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,	2412MH	z			ļ								
4.824	3.0	42.0	33.4	6.3	-35.5	0.0	0.0	46.2	74.0	-27.8	V	P	
4.824	3.0	27.3	33.4	6.3	-35.5	0.0	0.0	31.5	54.0	-22.5	V	A	
4.824	3.0	43.2	33.4	6.3	-35.5	0.0	0.0	47.4	74.0	-26.6	H	Р	
4.824	3.0	28.0	33.4	6.3	-35.5	0.0	0.0	32.2	54.0	-21.8	H	A	
Marca -	1000.07	l				•							
Mid Ch, 2		~	22 -	63	200	0.0	0.0	46.9	74.0	27.2	v	D	
4.874	3.0 3.0	42.5 27.5	33.5 33.5	6.3 6.3	-35.5 -35.5	0.0 0.0	0.0	46.8	74.0 54.0	-27.2	V V	P A	
4.874 7.311	3.0	41.0	35.5		-35.5	0.0	0.0	31.8 49.8	54.0 74.0	-22.2 -24.2			
7.311	3.0	25.0	35.7	0.5 8.5	-35.4	0.0	0.0	33.8	74.0 54.0	-24.2	V V	P A	
4.874	3.0	43.0	33.5		-35.5	0.0	0.0	47.3	74.0	-26.7	H	P	
4.874	3.0	28.0	33.5		-35.5	0.0	0.0	32.3	54.0	-21.7	H	A	
7.311	3.0	42.0	35.7	8.5	-35.4	0.0	0.0	50.8	74.0	-23.2	H	P	
7.311	3.0	24.6	35.7	8.5	-35.4	0.0	0.0	33.4	54.0	-20.6	H	Ā	
High Ch,		Ý									••		
4.924	3.0	42.0	33.5	6.3	-35.5	0.0	0.0	46.4	74.0	-27.6	V V	P	
4.924	3.0 3.0	28.0	33.5	6.3	-35.5 -35.5	0.0	0.0	32.4 50.9	54.0 74.0	-21.6		A	
7.386 7.386	3.0	42.0 24.5	35.8 35.8	8.5 8.5	-35.5	0.0 0.0	0.0	33.4	74.0 54.0	-23.1 -20.6	V V	P A	
4.924	3.0	43.5	33.5		-35.5	0.0	0.0	47.9	54.0 74.0	-20.0 -26.1	H	P P	
4.924	3.0	28.4	33.5	6.3	-35.5	0.0	0.0	32.8	54.0	-21.2	H	A	
4.924	3.0	43.0	33.5	6.3	-35.5	0.0	0.0	47.4	74.0	-26.6	H	P	
4.924	3.0	28.5	33.5			0.0	0.0	32.9	54.0	-21.1	H	Ā	
7.386	3.0	43.2	35.8	8.5	-35.5	0.0	0.0	52.1	74.0	-21.9	H	P	
7.386	3.0	24.2	35.8		-35.5	0.0	0.0	33.1	54.0	-20.9	H	Ā	
		1			1	1				1			
		:			:								

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# 8.2.4. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.8 GHz BAND

#### HARMONICS AND SPURIOUS EMISSIONS

Test Engr Date: Project #		Chin Pa 08/04/12 12U1450	-										
Company		Apple											
Fest Targ		FCC 15.											
Mode Op	er:	a mode,	5.8GHz	, TX									
	f	Measurer			Amp	Preamp (	Jain			Average	Field Stren	gth Limit	
	Dist	Distance			D Corr	Distance					ld Strength		
	Read	Analyzer	_		Avg	_		trength @			vs. Average		
	AF	Antenna			Peak	Calculate			ength	Margin v	vs. Peak Lis	mit	
	CL	Cable Lo	85		HPF	High Pas	s Filter	r					
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	:	Limit dBuV/m	-	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch,								l					
11.490	3.0	35.2	38.8	10.5	-35.5	0.0	0.7	49.7	74.0	-24.3	V	Р	
11.490	3.0	22.3			-35.5	0.0	0.7	36.8	54.0	-17.2	v	Ā	
11.490	3.0	34.2		¢	-35.5	0.0	0.7	48.7	74.0	-25.3	H	P	
11.490	3.0	22.3	38.8	10.5	-35.5	0.0	0.7	36.8	54.0	-17.2	H	A	
						ļ							
Mid Ch,		· · · · · · · · · · · · · · · · · · ·		ļ	ļ	ļ				ļ			
11.570	3.0	34.9	•••••••••••••••••	¢	-35.5	0.0	0.7	49.6	74.0	-24.4	V	P	
11.570	3.0	24.5		¢	-35.5	0.0	0.7	39.2	54.0	-14.8	V	A	
11.570 11.570	3.0	35.0		¢	-35.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.570	3.0	24.5	38.9	10.0	-35.5	0.0	0.7	39.2	54.0	-14.8	H	A	
High Ch	5825M												
11.650	3.0	35.1	39.0	10.7	-35.5	0.0	0.7	50.0	74.0	-24.0	V	P	
11.650	3.0	22.3		<b></b>	-35.5	0.0	0.7	37.2	54.0	-16.8	v	Ā	
11.650	3.0	35.1	•••••••••••••••••	¢	-35.5	0.0	0.7	50.0	74.0	-24.0	H	P	
11.650	3.0	24.8	39.0	10.7	-35.5	0.0	0.7	39.7	54.0	-14.3	H	A	
						ļ							
				•••••	•					•			

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

#### HARMONICS AND SPURIOUS EMISSIONS

f       Measurement Frequency Amp Dist       Preamp Gain       Average Field Strength Limit         Dist       Distance to Antenna Read       D Corr       Distance Correct to 3 meters       Peak Field Strength Limit         AF       Antenna Factor       Peak       Calculated Peak Field Strength @ 3 m       Margin vs. Average Limit         AF       Antenna Factor       Peak       Field Strength       Margin vs. Average Limit         CL       Cabe Loss       HPF       High Pass Filter       Margin vs. Peak Limit         f       Dist       Read       AF       CL       Amp       D Corr       Flt       Corr.       Limit       Margin vs. Peak Limit         f       Dist       Read       AF       CL       Amp       D Corr       Flt       Corr.       Limit       Margin vs. Peak Limit         11.490       3.0       37.0       38.8       10.5       -35.5       0.0       0.7       51.5       74.0       -22.5       H       P         11.490       3.0       24.0       38.8       10.5       -35.5       0.0       0.7       55.5       H       A         11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       52.1       7	Test Engr Date: Project # Company Test Targ Mode Op	: /: et:	Chin Pa 08/04/12 12U1450 Apple FCC 15. HT20, 5.	07 247	x									
GHz         (m)         dBuV         dB/m         dB         dB         dB         dB         dB         dB         dB         dV/m         dB         V/H         P/A/QP           Low Ch, 5745MHz         11.490         3.0         37.0         38.8         10.5         -35.5         0.0         0.7         51.5         74.0         -22.5         H         P           11.490         3.0         24.0         38.8         10.5         -35.5         0.0         0.7         51.5         74.0         -22.5         H         P           11.490         3.0         24.0         38.8         10.5         -35.5         0.0         0.7         58.5         54.0         -15.5         H         A           11.490         3.0         23.0         38.8         10.5         -35.5         0.0         0.7         50.5         74.0         -23.5         V         P           11.490         3.0         23.0         38.8         10.6         -35.5         0.0         0.7         51.5         74.0         -16.5         V         A           11.570         3.0         37.4         38.9         10.6         -35.5         0.0         0.7		Dist Read AF	Distance Analyzer Antenna	to Anter Reading Factor	ina -	D Corr Avg Peak	Distance Average I Calculate	Corre Field S d Peal	trength @ c Field Stre	3 m	Peak Fie Margin v	ld Strength vs. Average	Limit Limit	
Low Ch, 5745MHz							: :							Notes
11.490       3.0       37.0       38.8       10.5       -35.5       0.0       0.7       51.5       74.0       -22.5       H       P         11.490       3.0       24.0       38.8       10.5       -35.5       0.0       0.7       38.5       54.0       -15.5       H       A         11.490       3.0       36.0       38.8       10.5       -35.5       0.0       0.7       50.5       74.0       -23.5       V       P         11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       50.5       74.0       -23.5       V       P         11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       37.5       54.0       -16.5       V       A         Mid Ch, 5785MHz				dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
11.490       3.0       24.0       38.8       10.5       -35.5       0.0       0.7       38.5       54.0       -15.5       H       A         11.490       3.0       36.0       38.8       10.5       -35.5       0.0       0.7       50.5       74.0       -23.5       V       P         11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       50.5       74.0       -23.5       V       P         11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       37.5       54.0       -16.5       V       A         Mid Ch, 5785MHz				20.0	10.5			0.7	-1 -	74.0		TT	<b>n</b>	
11.490       3.0       36.0       38.8       10.5       -35.5       0.0       0.7       50.5       74.0       -23.5       V       P         11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       37.5       54.0       -16.5       V       A         Mid Ch, 5785MHz			• • • • • • • • • • • • • • • • • • • •		o	<b>*</b>	<b>*******************</b>				<b>*</b>			
11.490       3.0       23.0       38.8       10.5       -35.5       0.0       0.7       37.5       54.0       -16.5       V       A         Mid Ch, 5785MHz			·		¢	\$	\$							
Mid Ch, 5785MHz         3.0         37.4         38.9         10.6         -35.5         0.0         0.7         52.1         74.0         -21.9         H         P           11.570         3.0         37.4         38.9         10.6         -35.5         0.0         0.7         52.1         74.0         -21.9         H         P           11.570         3.0         25.0         38.9         10.6         -35.5         0.0         0.7         39.7         54.0         -14.3         H         A           11.570         3.0         36.0         38.9         10.6         -35.5         0.0         0.7         50.7         74.0         -23.3         V         P           11.570         3.0         24.0         38.9         10.6         -35.5         0.0         0.7         38.7         54.0         -15.3         V         A           High Ch, 5825MHz				•••••••••••••••••••	o	÷	<b>*******</b>				\$			
11.570       3.0       37.4       38.9       10.6       -35.5       0.0       0.7       52.1       74.0       -21.9       H       P         11.570       3.0       25.0       38.9       10.6       -35.5       0.0       0.7       39.7       54.0       -14.3       H       A         11.570       3.0       36.0       38.9       10.6       -35.5       0.0       0.7       50.7       74.0       -23.3       V       P         11.570       3.0       24.0       38.9       10.6       -35.5       0.0       0.7       50.7       74.0       -23.3       V       P         11.570       3.0       24.0       38.9       10.6       -35.5       0.0       0.7       38.7       54.0       -15.3       V       A         High Ch, 5825MHz	11.170	0.0	20.0		10.0	-0010	0.0		07.0	24.0	-10.0	•		
11.570       3.0       25.0       38.9       10.6       -35.5       0.0       0.7       39.7       54.0       -14.3       H       A         11.570       3.0       36.0       38.9       10.6       -35.5       0.0       0.7       50.7       74.0       -23.3       V       P         11.570       3.0       24.0       38.9       10.6       -35.5       0.0       0.7       38.7       54.0       -15.3       V       P         11.570       3.0       24.0       38.9       10.6       -35.5       0.0       0.7       38.7       54.0       -15.3       V       A         High Ch, 5825MHz	Mid Ch, s	5785MH	z		•	1								
11.570       3.0       36.0       38.9       10.6       -35.5       0.0       0.7       50.7       74.0       -23.3       V       P         11.570       3.0       24.0       38.9       10.6       -35.5       0.0       0.7       38.7       54.0       -15.3       V       A         High Ch, 5825MHz         11.650       3.0       34.9       39.0       10.7       -32.7       0.0       0.7       52.6       74.0       -21.4       H       P         11.650       3.0       21.9       39.0       10.7       -32.7       0.0       0.7       39.6       54.0       -14.4       H       A         11.650       3.0       35.0       39.0       10.7       -32.7       0.0       0.7       52.6       74.0       -21.4       H       P         11.650       3.0       35.0       39.0       10.7       -32.7       0.0       0.7       52.6       74.0       -14.4       H       A         11.650       3.0       35.0       39.0       10.7       -32.7       0.0       0.7       52.7       74.0       -21.3       V       P       -14.4       H       A <td>11.570</td> <td>3.0</td> <td>37.4</td> <td>38.9</td> <td>10.6</td> <td>-35.5</td> <td>0.0</td> <td>0.7</td> <td>52.1</td> <td>74.0</td> <td>-21.9</td> <td>H</td> <td>P</td> <td></td>	11.570	3.0	37.4	38.9	10.6	-35.5	0.0	0.7	52.1	74.0	-21.9	H	P	
11.570       3.0       24.0       38.9       10.6       -35.5       0.0       0.7       38.7       54.0       -15.3       V       A         High Ch, 5825MHz	11.570	3.0	25.0	38.9	10.6	-35.5	0.0	0.7	39.7	54.0	-14.3	H	Α	
High Ch, 5825MHz         39.0         10.7         -32.7         0.0         0.7         52.6         74.0         -21.4         H         P           11.650         3.0         21.9         39.0         10.7         -32.7         0.0         0.7         52.6         74.0         -21.4         H         P           11.650         3.0         21.9         39.0         10.7         -32.7         0.0         0.7         39.6         54.0         -14.4         H         A           11.650         3.0         35.0         39.0         10.7         -32.7         0.0         0.7         52.7         74.0         -21.3         V         P	11.570	3.0	36.0	38.9	10.6	-35.5	0.0	0.7	50.7	74.0	-23.3	V	P	
11.650         3.0         34.9         39.0         10.7         -32.7         0.0         0.7         52.6         74.0         -21.4         H         P           11.650         3.0         21.9         39.0         10.7         -32.7         0.0         0.7         39.6         54.0         -14.4         H         A           11.650         3.0         35.0         39.0         10.7         -32.7         0.0         0.7         52.7         74.0         -21.3         V         P	11.570	3.0	24.0	38.9	10.6	-35.5	0.0	0.7	38.7	54.0	-15.3	V	A	
11.650         3.0         34.9         39.0         10.7         -32.7         0.0         0.7         52.6         74.0         -21.4         H         P           11.650         3.0         21.9         39.0         10.7         -32.7         0.0         0.7         39.6         54.0         -14.4         H         A           11.650         3.0         35.0         39.0         10.7         -32.7         0.0         0.7         52.7         74.0         -21.3         V         P														
11.650         3.0         21.9         39.0         10.7         -32.7         0.0         0.7         39.6         54.0         -14.4         H         A           11.650         3.0         35.0         39.0         10.7         -32.7         0.0         0.7         52.7         74.0         -21.3         V         P				20.0	10.5					=				
11.650 3.0 35.0 39.0 10.7 -32.7 0.0 0.7 52.7 74.0 -21.3 V P					å	<b>&amp;</b>	Q							
			• • • • • • • • • • • • • • • • • • •		o	<b>*</b>	o				<b>*</b>			
11.050 3.0 21.7 37.0 10.7 -32.7 0.0 0.7 37.0 24.0 -14.4 V A			· • · · · · · · · · · · · · · · · · · ·		o	o	¢							
	11.030	5.0	#1.7	37.0	10./	-04.1	0.0	V./	37.0	24.0	-14.4	۲		
				1			••••••							
Rev. 4.1.2.7	Rev. 4.1.2	.7				•							i	

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

#### HARMONICS AND SPURIOUS EMISSIONS

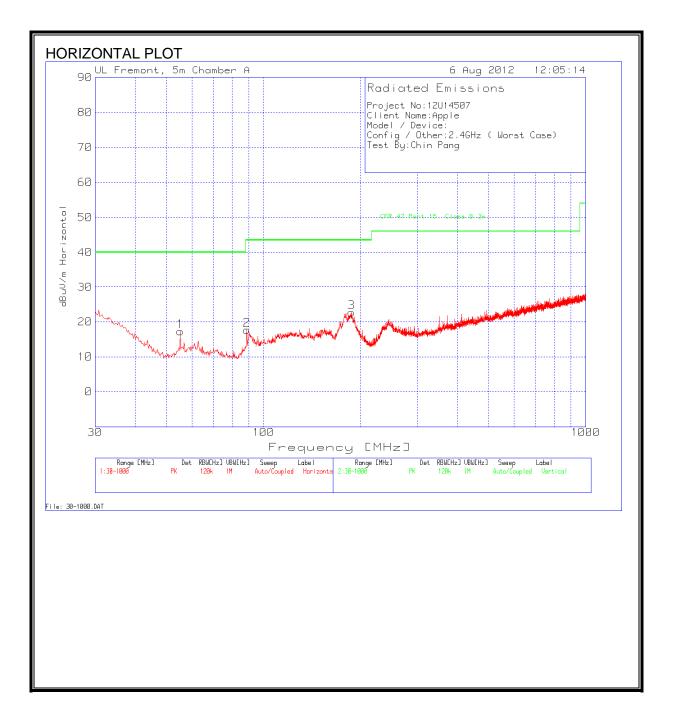
Complia	nce Cer	tification	Service	s, Frei	mont 5n	n Chamb	er						
lest Engi		Chin Pa	ng										
Date:		08/06/12	-										
Project #		12U1450	7										
Company		Apple											
Test Targ		FCC 15.											
Mode Op	er:	TX, 5,8G	Hz HT4	0									
	f	Measuren	nent Fred	luency	Amp	Preamp (	Gain			Average	Field Stren	gth Limit	
	Dist	Distance	to Anter	ina	D Corr	Distance	Correc	ct 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			Peak			r Field Stre	ength	Margin v	vs. Peak Lis	nit	
	CL	Cable Los	38		HPF	High Pas	s Filter	r					
f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Low Ch,	5755MH	z											
11.510	3.0	34.4		å	-32.8	0.0	0.7	51.7	74.0	-22.3	V	P	
11.510	3.0	21.9		<b>\$</b>	-32.8	0.0	0.7	39.1	54.0	-14.9	V	A	
11.510	3.0	34.2		o	-32.8	0.0	0.7	51.4	74.0	-22.6	H	P	
11.510	3.0	21.9	38.8	10.6	-32.8	0.0	0.7	39.1	54.0	-14.9	H	A	
High Ch	5795M	H											
11.590	3.0	35.0	38.9	10.6	-32.7	0.0	0.7	52.5	74.0	-21.5	V	P	
11.590	3.0	21.7			-32.7	0.0	0.7	39.2	54.0	-14.8	V	A	
11.590	3.0	35.0	38.9	10.6	-32.7	0.0	0.7	52.5	74.0	-21.5	H	P	
11.590	3.0	21.8	38.9	10.6	-32.7	0.0	0.7	39.3	54.0	-14.7	H	A	
						ļ							
Rev. 4.1.2 Note: No		missions	were de	tected	l above t	he syster	m noi:	se floor.					

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# 8.3. WORST-CASE BELOW 1 GHz

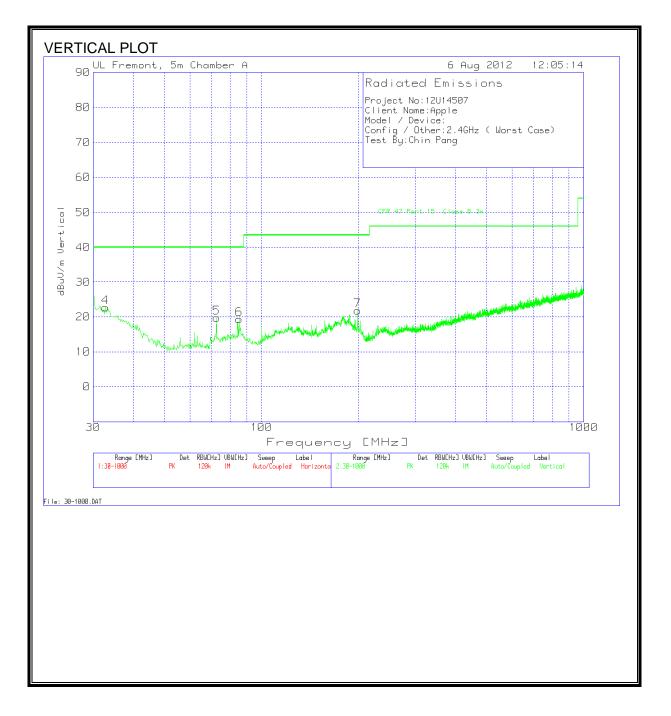
#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



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



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# <u>DATA</u>

55.1998         37.52         PK         -27.3         7.1         17.32         40         -22.68         Hor           88.735         37.16         PK         -27         7.5         17.66         43.5         -25.84         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           Vertical 30         Image: state s									
Model / Device:         Model / De							!		
Config / Other:2.4GHz (Worst Case)       Index       Index<									
Test By:Chin Pang         Image									
Image: series         Image: s			z ( Worst Ca	ase)					
Frequency         Reading         Detector         25MHz-1GHz         T243 Sunol         dBuV/m         CFR 47 Part 15B         Margin         Polari           55.1998         37.52         PK         -27.33         7.1         17.32         40         -22.68         Hor           88.735         37.16         PK         -27.3         7.5         17.66         43.5         -25.84         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           Vertical 30         Image: Margin Mar	Test By:Ch	in Pang							
55.1998         37.52         PK         -27.3         7.1         17.32         40         -22.68         Hor           88.735         37.16         PK         -27         7.5         17.66         43.5         -25.84         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           Vertical 30         Image: state	Horizontal	30 - 1000M	IHz						
88.735         37.16         PK         -27         7.5         17.66         43.5         -25.84         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           187.7898         37.65         PK         -26.3         11.3         22.65         43.5         -20.85         Hor           Vertical 30         1000MHz         Image: Constraint of the state	Frequency	Reading	Detector	25MHz-1GHz	T243 Sunol	dBuV/m	CFR 47 Part 15B	Margin	Polarity
187.7898       37.65       PK       -26.3       11.3       22.65       43.5       -20.85       Hore         Vertical 30       1000MHz       Image: Constraint of the state	55.1998	37.52	PK	-27.3	7.1	17.32	40	-22.68	Horz
Vertical 30 - 1000MHzImage: Sector of the secto	88.735	37.16	PK	-27	7.5	17.66	43.5	-25.84	Horz
Frequency         Reading         Detector         25MHz-1GHz         T243 Sunol         dBuV/m         CFR 47 Part 15B         Margin         Polari           32.7138         31.12         PK         -27.6         19.2         22.72         40         -17.28         Ver	187.7898	37.65	PK	-26.3	11.3	22.65	43.5	-20.85	Horz
Frequency         Reading         Detector         25MHz-1GHz         T243 Sunol         dBuV/m         CFR 47 Part 15B         Margin         Polari           32.7138         31.12         PK         -27.6         19.2         22.72         40         -17.28         Ver	Vertical 30	- 1000MHz	,						
32.7138 31.12 PK -27.6 19.2 22.72 40 -17.28 Ver				25MHz-1GHz	T243 Sunol	dBuV/m	CFR 47 Part 15B	Margin	Polarity
		-				-		-	Vert
72.452 38.7 PK -27.1 8.1 19.7 40 -20.3 Ver	72.452	38.7	PK	-27.1	8.1	19.7	40	-20.3	Vert
85.2458 39 PK -27 7.3 19.3 40 -20.7 Ver	85.2458	39	PK	-27	7.3	19.3	40	-20.7	Vert
198.8389 35.76 PK -26.2 12.2 21.76 43.5 -21.74 Ver	198.8389	35.76	PK	-26.2	12.2	21.76	43.5	-21.74	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 I	Limit (dBuV)
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46 "
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

ANSI C63.4

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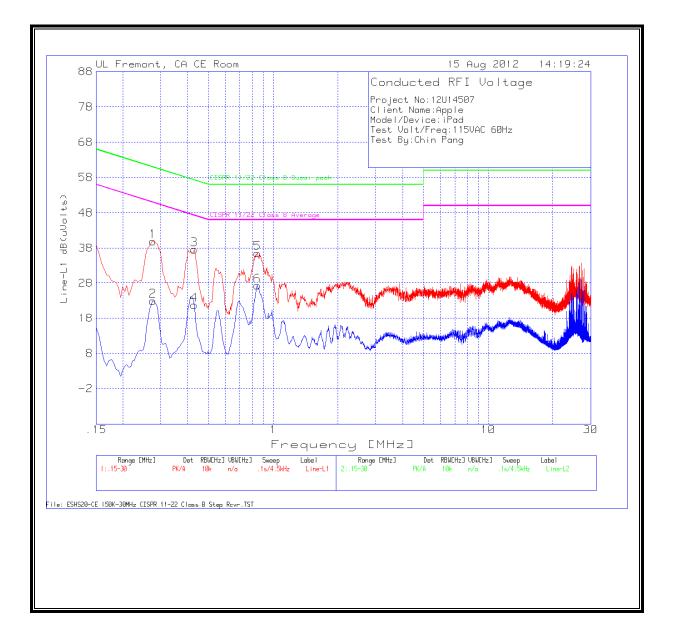
#### **RESULTS**

#### **<u>6 WORST EMISSIONS</u>**

Project No:	12U14507								
Client Name:Apple									
Model/Device:iPad									
Test Volt/Fr	eq:115VA	C 60Hz							
Test By:Chin Pang									
lino 11-15	2014117								
Line-L1 .15 - 30MHz Frequency Reading [		Detector	T04 U 14	LC Cables	dD() (alka		Manain	CICDD Class D Ave	Manain
						CISPR Class B Q-peak	-	CISPR Class B Avg	wargin
0.276	39.77	PK	0.1	0	39.87	60.9	-21.03	-	-
0.276	22.74	Av	0.1	0	22.84	-	-	50.9	-28.06
0.429	37.44	PK	0.1	0	37.54	57.3	-19.76	-	-
0.429	21.62	Av	0.1	0	21.72	-	-	47.3	-25.58
0.843	36.46	PK	0.1	0	36.56	56	-19.44	-	-
0.843	27.17	Av	0.1	0	27.27	-	-	46	-18.73
Line-L2 .15 -	30MHz								
Frequency	Reading	Detector	T24 IL L1.	LC Cables	dB(uVolts	CISPR Class B Q-peak	Margin	CISPR Class B Avg	Margin
0.2715	39.87	PK	0.1	0	39.97	61.1	-21.13	-	-
0.2715	19.94	Av	0.1	0	20.04	-	-	51.1	-31.06
0.4065	38.22	PK	0.1	0	38.32	57.7	-19.38	-	-
0.4065	21.22	Av	0.1	0	21.32	-	-	47.7	-26.38
0.87	33.72	PK	0.1	0	33.82	56	-22.18	-	-
0.87	22.15	Av	0.1	0	22.25	-	-	46	-23.75

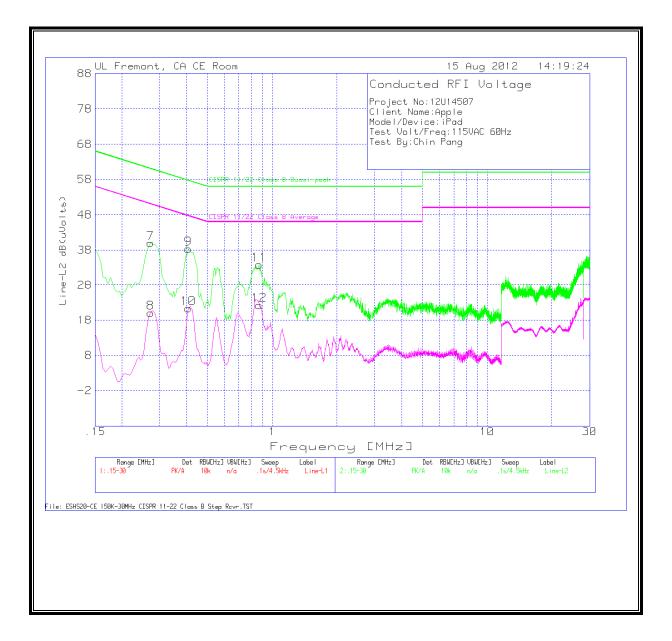
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#### LINE 1 RESULTS



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#### LINE 2 RESULTS



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