

### FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-247 ISSUE 1

### **CERTIFICATION TEST REPORT**

FOR

### **CELLULAR PHONE WITH BLUETOOTH AND WLAN RADIOS**

MODEL NUMBER: A1662

FCC ID: BCG-E2945A IC: 579C-E2945A

REPORT NUMBER: 15U21634-E4V2

**ISSUE DATE: JANUARY 28, 2016** 

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

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NVLAP LAB CODE 200065-0

### **Revision History**

Rev.	Issue Date	Revisions	Revised By
V1	01/22/2016	Initial Issue	M. Mekuria
V2	01/28/2016	Revised report to address TCB's questions	T. Chu

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8.	7.1. 7.2. 7.2. 7.2. 7.2. 7.2. 7.2. 7.2.	ON TIME AND DUTY CYCLE.       ************************************	19         21         225         333         43         43         55         68         69
8.	7.1. 7.2. 7.2. 7.2. 7.2. 7.2. 7.2. 7.2.	ON TIME AND DUTY CYCLE	19         21         225         230         332         343         437         554         68         69

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## **1. ATTESTATION OF TEST RESULTS**

COMPANY NAME: APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.						
<b>EUT DESCRIPTION:</b> CELLULAR PHONE WITH BLUETOOTH AND WLAN						
MODEL:	A1662					
SERIAL NUMBER:	C39QG005GX9C					
DATE TESTED:	AUGUST 20, 2015 – DECEMBER 10, 2015					
APPLICABLE STANDARDS						
ST	ANDARD TEST RESULTS					
CFR 47 F	Part 15 Subpart C Pass					

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

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

Approved & Released For UL Verification Services Inc. By:

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MENGISTU MEKURIA PROJECT LEADER UL VERIFICATION SERVICES INC. Tested By:

ERIC YU EMC ENGINEER UL VERIFICATION SERVICES INC.

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v03r04, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

# 3. FACILITIES AND ACCREDITATION

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

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

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://ts.nist.gov/standards/scopes/2000650.htm</u>.

# 4. CALIBRATION AND UNCERTAINTY

# 4.1. MEASURING INSTRUMENT CALIBRATION

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

# 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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# 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

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# 5. EQUIPMENT UNDER TEST

# 5.1. DESCRIPTION OF EUT

The EUT, Model A1662 is a mobile phone with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/CDMA/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n/ac radio, Bluetooth radio and NFC. The rechargeable battery is not user accessible.

# 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2472	802.11b 1TX	21.52	141.91
2412 - 2472	802.11g	Covered b	y HT20 1TX
2412 - 2472	802.11n HT20 1TX	26.51	447.71

# 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain (dBi)
2.4	-0.90

# 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 7.47.130.1

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### 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X/Y/Z, it was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation.

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

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

The target power for 802.11g and 802.11n HT20 1TX are the same and use the same modulation (OFDM).

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

For simultaneous transmission of multiple channels from the same antenna in the 2.4GHz and 5GHz bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found.

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## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List							
Description Manufacturer Model Serial Number FCC ID							
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	N/A			
Laptop	Lenovo	7659	L3-AL664 08/03	N/A			
Earphone	Apple	N/A	N/A	N/A			
EUT AC/CD adapter	Apple	A1385	D293062F3WVDHLHCF	N/A			

### I/O CABLES (CONDUCTED TEST)

	I/O Cable List								
Cable	Cable         Port         # of identical         Connector         Cable Type         Cable         Remarks								
No		ports	Туре		Length (m)				
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer			
2	USB	1	USB	Shielded	1	N/A			
3	AC	1	AC	Un-shielded	3	N/A			

### I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
None Used						

### I/O CABLES (RADAITED BELOW 1 GHZ)

	I/O Cable List							
Cable	e Port # of Connector Cable Type Cable Remarks							
No		identical	Туре		Length (m)			
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A		
2	AC	1	AC	Un-shielded	3	N/A		

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	I/O Cable List							
Cable	Port         # of         Connector         Cable Type         Cable         Remarks							
No		identical	Туре		Length (m)			
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A		
2	AC	1	AC	Un-shielded	3	N/A		

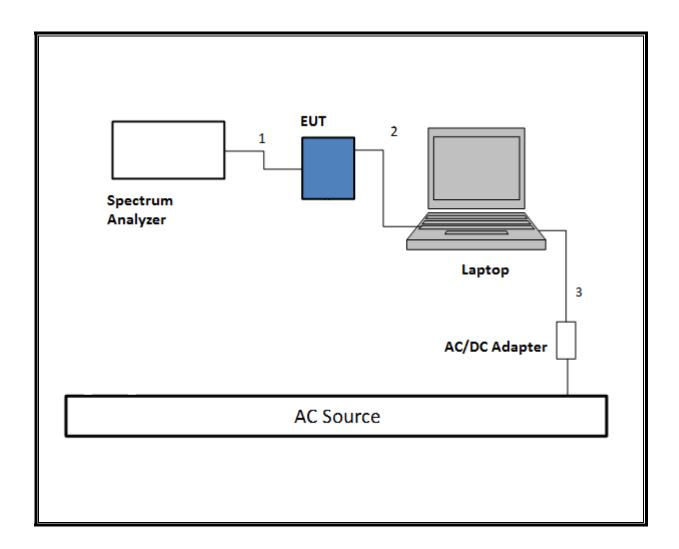
### I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)

	I/O Cable List								
Cable	Port	Port # of Connector Cable Type Cable							
No		identical	Туре		Length (m)				
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A			
2	USB	1	USB	Shielded	1	N/A			
3	AC	1	AC	Un-shielded	3	N/A			

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The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

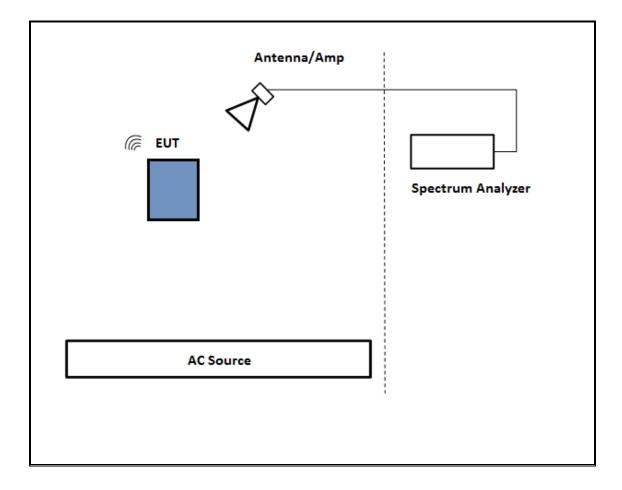
#### SETUP DIAGRAM



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The EUT was tested battery powered. Test software exercised the EUT.

#### SETUP DIAGRAM

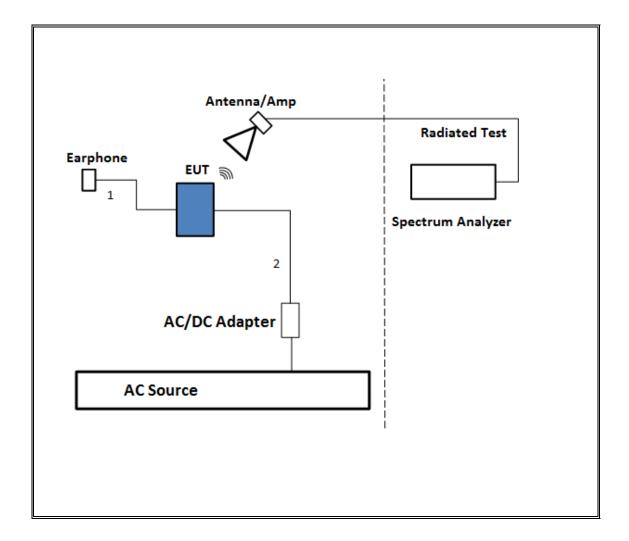


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The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

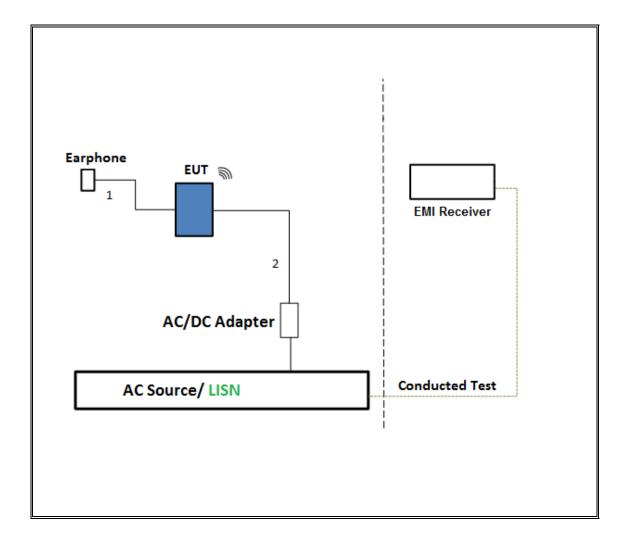
#### SETUP DIAGRAM



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The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. Test software exercised the EUT.

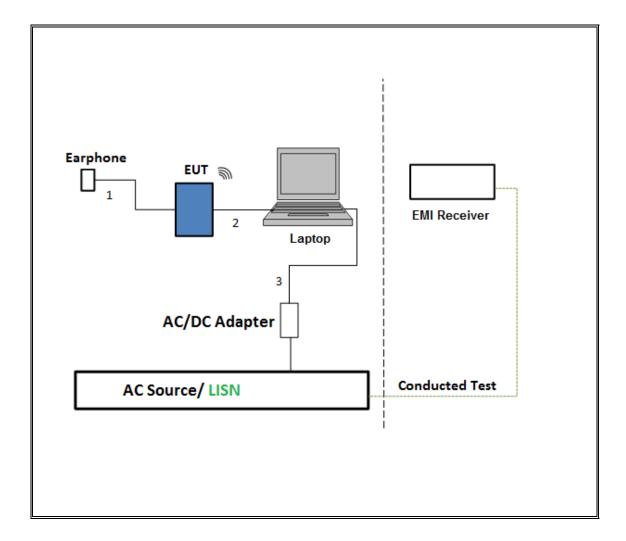
#### SETUP DIAGRAM



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The EUT was tested with earphone connected and powered by host PC via USB cable. Test software exercised the EUT.

#### SETUP DIAGRAM



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# 5.7. TEST AND MEASUREMENT EQUIPMENT

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

	Test Equipn	nent List		
Description	Manufacturer	Model	Cal Date	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	2/10/2015	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	1/14/2015	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42- 00101800-25-S- 42	6/2/2015	6/2/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	6/9/2015	6/9//2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	6/11/2015	6/11/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	2/13/2015	2/13/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	2/20/2015	2/20/2016
Power Meter, P-series single channel	Agilent	N1911A	4/7/2015	4/7/2016
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	2/27/2015	2/27/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	12/17/2014	12/17/2015
Spectrum Analyzer, 40 GHz	Agilent	8564E	8/14/2015	8/14/2016
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	6/29/2015	6/29/2016
	AC Line Cor	nducted		
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ECSI7	09/16/14	08/07/16
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	01/16/15	01/16/16
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	7/28/2015	7/28/2016
	UL SOFT\	NARE		
* Radiated Software	UL	UL EMC	Ver 9.5, Ju	ıly 22, 2014
* Conducted Software	UL	UL EMC		arch 31, 2015
* AC Line Conducted Software	UL	UL EMC	Ver 9.5, A	pril 3, 2015

Note: \* indicates automation software version used in the compliance certification testing

# 6. MEASUREMENT METHODS

<u>6 dB BW</u>: KDB 558074 D01 v03r04, Section 8.1.

Output Power: KDB 558074 D01 v03r04, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r04, Section 12.1.

Band-edge: KDB 558074 D01 v03r04, Section 12.1.

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# 7. ANTENNA PORT TEST RESULTS

# 7.1. ON TIME AND DUTY CYCLE

### <u>LIMITS</u>

None; for reporting purposes only.

### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

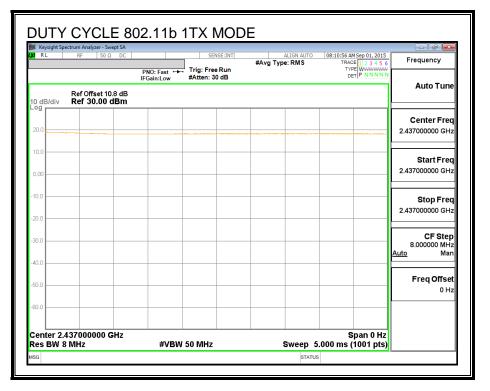
### ON TIME AND DUTY CYCLE RESULTS

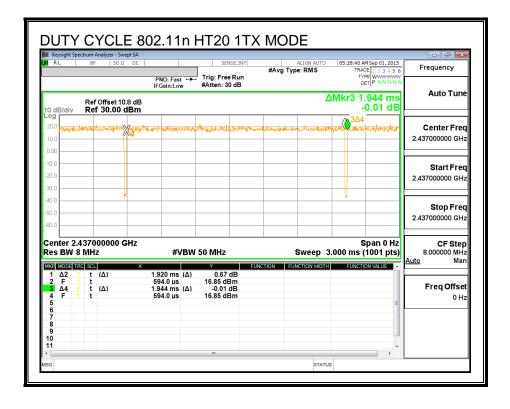
Mode	<b>ON Time</b>	Period	<b>Duty Cycle</b>	Duty	Duty Cycle	1/B
	В		x	Cycle	<b>Correction Factor</b>	Minimum VBW
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)
2.4GHz Band						
802.11b 1TX	5.000	5.000	1.000	100.00%	0.00	0.010
802.11n HT20 1TX	1.920	1.944	0.988	98.77%	0.00	0.010

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### DUTY CYCLE PLOTS

#### 2.4 GHz BAND





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### 7.2. 802.11b SISO MODE IN THE 2.4 GHz BAND

### 7.2.1. 6 dB BANDWIDTH

### **LIMITS**

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

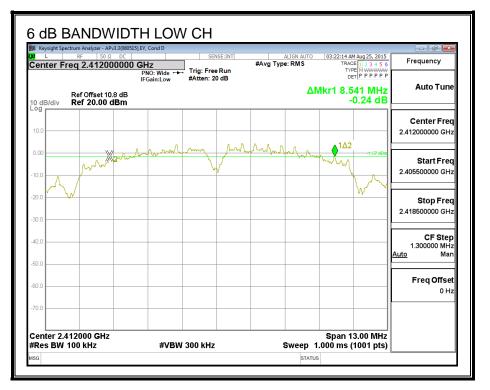
The minimum 6 dB bandwidth shall be at least 500 kHz.

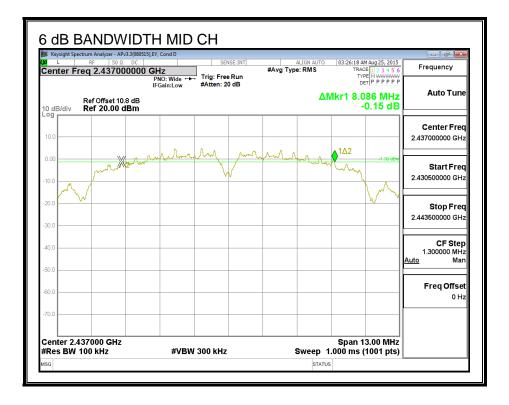
#### **RESULTS for Chain 0**

Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	2412	8.54	0.5
Mid	2437	8.09	0.5
High_11	2462	8.57	0.5
High_12	2467	8.55	0.5
High_13	2472	8.53	0.5

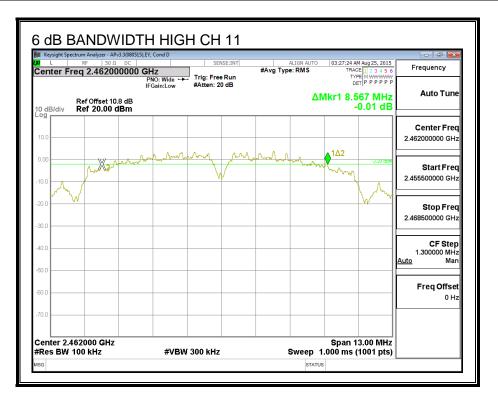
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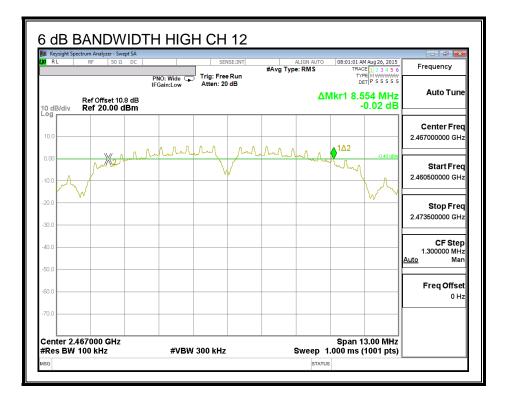
#### 6 dB BANDWIDTH





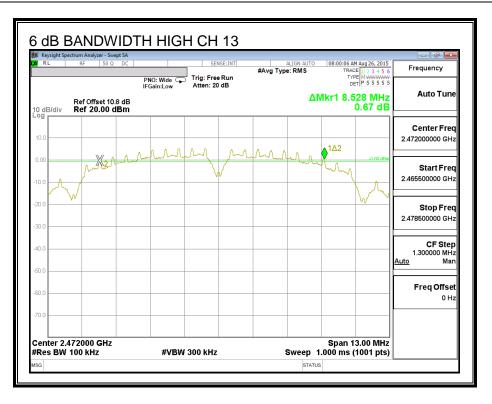
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### 7.2.2. 99% BANDWIDTH

#### **LIMITS**

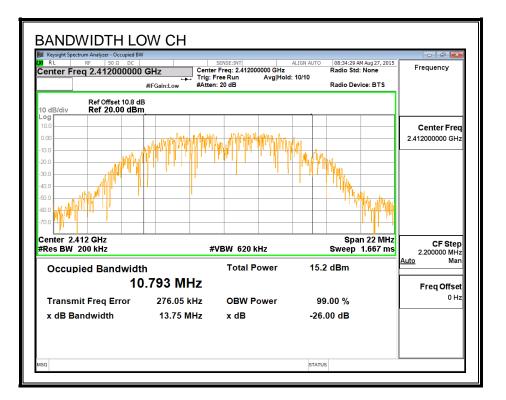
None; for reporting purposes only.

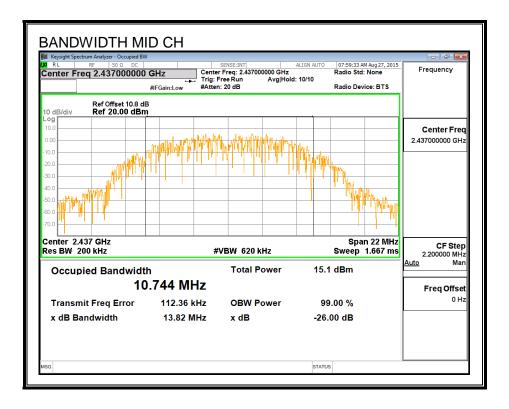
### **RESULTS for Chain 0**

Channel	Frequency	99% Bandwidth	
	(MHz)	(MHz)	
Low	2412	10.793	
Mid	2437	10.744	
High_11	2462	10.527	
High_12	2467	10.587	
High_13	2472	10.952	

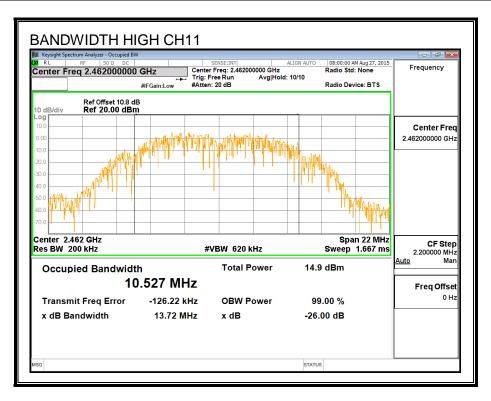
Page 25 of 125

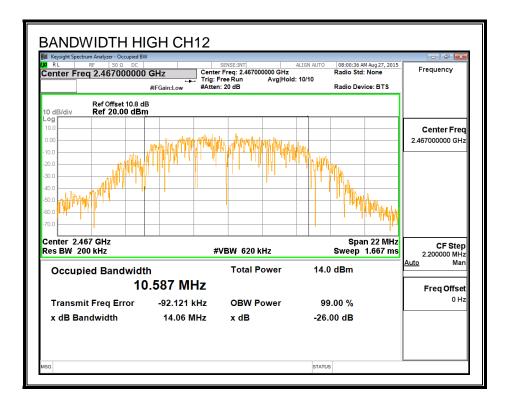
#### 99% BANDWIDTH,



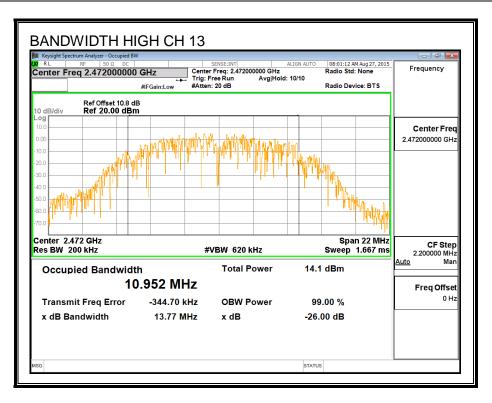


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### 7.2.3. AVERAGE POWER

### **LIMITS**

None; for reporting purposes only.

### **RESULTS**

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	18.45
Mid	2437	18.50
High_11	2462	18.43
High_12	2467	17.98
High_13	2472	14.94

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### 7.2.4. OUTPUT POWER

### <u>LIMITS</u>

FCC §15.247

IC RSS-247 (5.4) (4)

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

### **DIRECTIONAL ANTENNA GAIN**

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

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			.э

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Channel	Frequency	Directional FCC		IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
Low	2412	-0.90	30.00	30	36	30.00
Mid	2437	-0.90	30.00	30	36	30.00
High_11	2462	-0.90	30.00	30	36	30.00
High_12	2467	-0.90	30.00	30	36	30.00
High_13	2472	-0.90	30.00	30	36	30.00

Duty Cycle CF (dB) 0.00

Included in Calculations of Corr'd Power

Channel	Frequency	Chain 0	Total	Power	Margin
		Meas	Corr'd	Limit	
		Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	2412	21.44	21.44	30.00	-8.56
Mid	2437	21.52	21.52	30.00	-8.48
High_11	2462	21.42	21.42	30.00	-8.58
High_12	2467	20.95	20.95	30.00	-9.05
High_13	2472	17.93	17.93	30.00	-12.07

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### 7.2.5. POWER SPECTRAL DENSITY

#### **LIMITS**

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

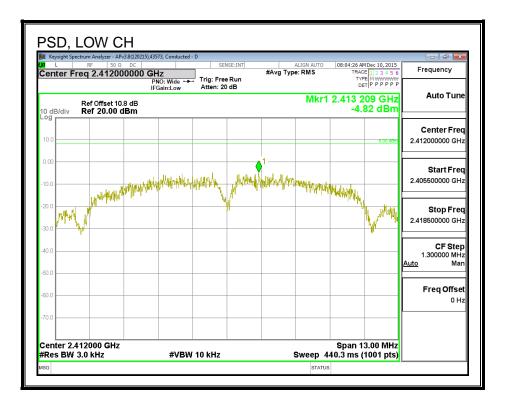
### **RESULTS**

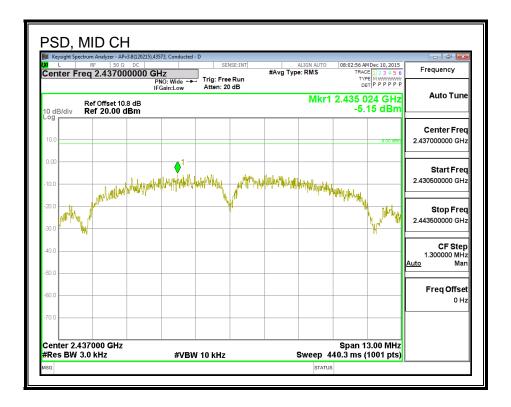
Duty C	Cycle CF (dB)	0.00	Included	Included in Calculations of Corr'd PSD			
PSD Resul	ts						
Channel	Frequency	Chain 0	Total	Limit	Margin		
		Meas	Corr'd				
	(MHz)	(dBm)	PSD				
			(dBm)	(dBm)	(dB)		
Low	2412	-4.82	-4.82	8.0	-12.8		
Mid	2437	-5.15	-5.15	8.0	-13.2		
High_11	2462	-5.51	-5.51	8.0	-13.5		
High_12	2467	-5.96	-5.96	8.0	-14.0		
High_13	2472	-8.69	-8.69	8.0	-16.7		

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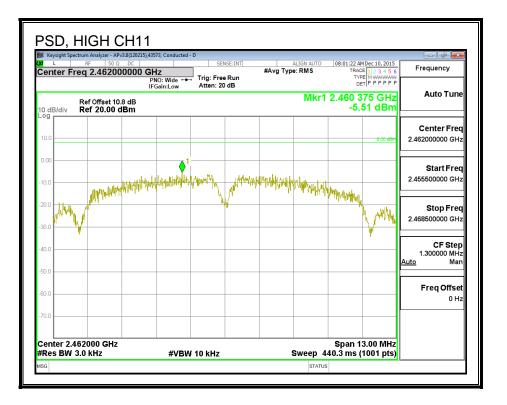
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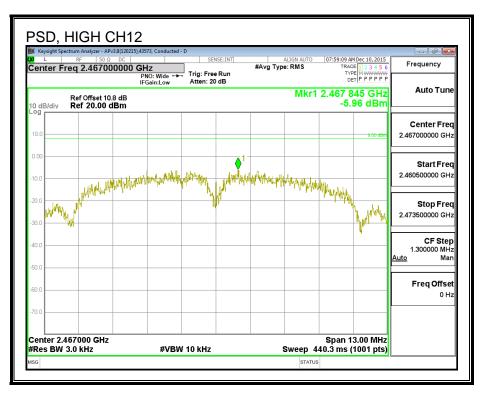
<u>PSD</u>



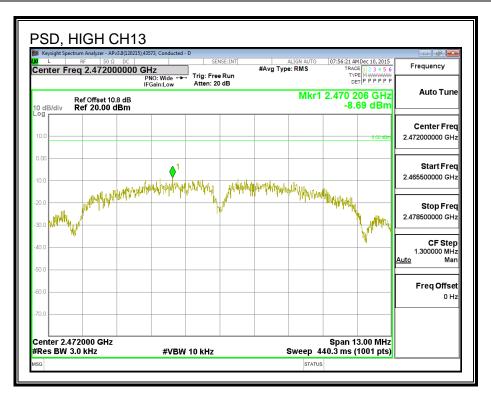


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### 7.2.6. OUT-OF-BAND EMISSIONS

#### LIMITS

FCC §15.247 (d)

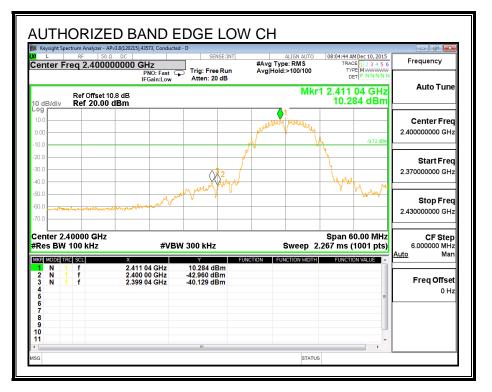
IC RSS-247 (5.5)

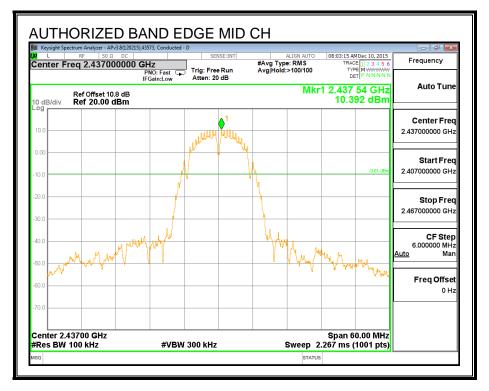
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

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#### RESULTS

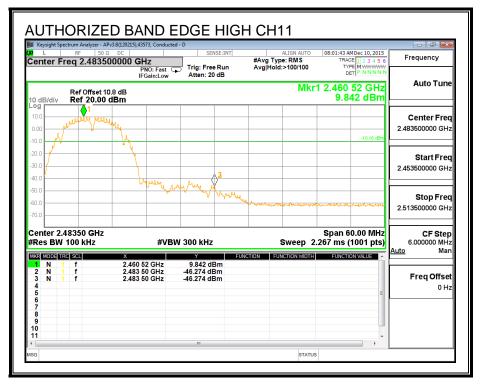
#### LOW CHANNEL BANDEDGE

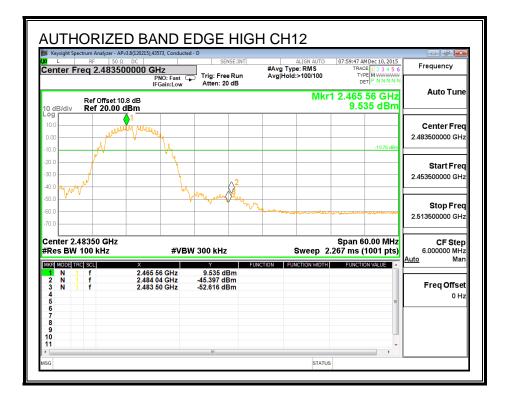




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**DATE: JANUARY 28, 2016** 





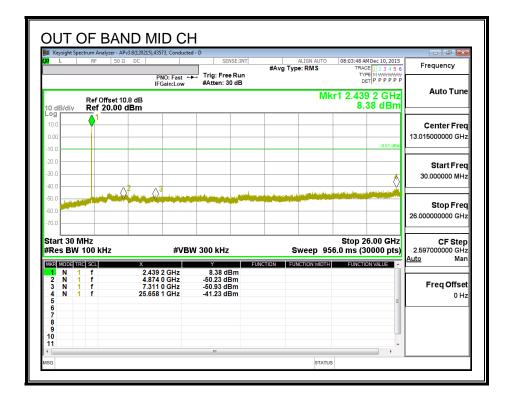
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Keysight Spectrum Analyzer - APv3.8(120 L RF 50 Ω DC		D SENSE:INT	ALIGN AUTO	07:57:42 AM Dec 10, 2015	Frequency
enter Freq 2.48350000	O GHZ PNO: Fast ↓ IFGain:Low	Trig: Free Run Atten: 20 dB	#Avg Type: RMS Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	
Ref Offset 10.8 dB			Mkr	1 2.471 02 GHz 6.612 dBm	Auto Tune
og 10.0	<b>↓</b> <sup>1</sup>				Center Fred
0.00	wind hours				2.483500000 GH
10.0		A		-13.39 dBm	
		<b>\</b>			Start Free
0.0		A2			2.453500000 GH
0.0 V www		M 3 View			Stop Free
0.0		~ ~	Marine was how to be a second	man and a second and	2.513500000 GH
0.0					
enter 2.48350 GHz Res BW 100 kHz	#VBW	300 kHz	Sweep 2	Span 60.00 MHz .267 ms (1001 pts)	CF Ste 6.000000 MH
KR MODE TRC SCL X			INCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Ma
2 N 1 f 2	.471 02 GHz .485 54 GHz .483 50 GHz	6.612 dBm -47.196 dBm -55.749 dBm			Freg Offse
5 N 1 T 2	.463 50 GHZ	-55.749 dBm		E	0 H
6					
8 9					
10  1					
		m		•	

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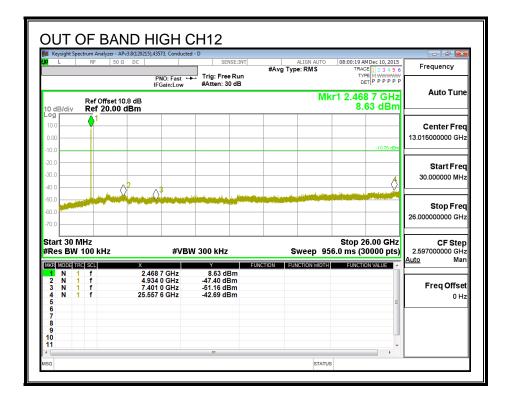
#### OUT-OF-BAND EMISSIONS

		- APv3.8(120215),43573, Conducte				- 6 <del>x</del>
L	RF	50 Ω DC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	08:05:22 AM Dec 10, 2015 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast ← IFGain:Low	► Trig: Free Run #Atten: 30 dB		DET P P P P P	
0 dB/div	Ref Offse Ref 20.0			Mk	r1 2.409 8 GHz 8.38 dBm	Auto Tune
.og	<u></u> 1					
10.0	- <u>Y</u>					Center Fred
0.00					-9.72 dBm	13.015000000 GHz
10.0					-9.72 dbm	
20.0						Start Fred
30.0					A	30.000000 MH;
40.0		<mark>23</mark>				
50.0	A AN INCOME					Oton Eng
60.0						Stop Fred 26.00000000 GH;
70.0						26.00000000 GH
tart 30	N411-				Oton 26 00 OU	
	101HZ	#VB	W 300 kHz	Sweep 95	Stop 26.00 GHz 6.0 ms (30000 pts)	CF Step 2.597000000 GH
ikri modei	TRCI SCL	X	Y E	JNCTION FUNCTION WIDTH		<u>Auto</u> Mar
1 N	1 f	2.409 8 GHz	8.38 dBm	Forenes mental		
2 N 3 N	1 f 1 f	4.824 0 GHz 7.236 0 GHz	-48.85 dBm -47.95 dBm			Freq Offse
4 N 5	1 f	25.597 5 GHz	-42.19 dBm		=	0 H:
6					=	
7 8						
9						



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		zer - APv3.8(120215),4357	3, Conducte						- đ <b>-</b>
<mark>d</mark> L	RF	50 Ω DC		SENSE:IN		ALIGN AUTO Type: RMS		E 1 2 3 4 5 6	Frequency
			O:Fast ← ain:Low	Trig: Free Run #Atten: 30 dB		.,	TYP	T P P P P P P	
10 dB/div		set 10.8 dB 0.00 dBm				Mł	(r1 2.46( 9.(	) 9 GHz 58 dBm	Auto Tun
10.0	<b>1</b>								
0.00									Center Fre 13.015000000 GH
-10.0								-10.16 dBm	13.015000000 GH
20.0									Start Fre
30.0								đ	30.000000 MH
40.0		$\Delta^2$	n thursday		in an	يبايع ومقدمينا ومرو			
50.0					No. of Concession, Name				Stop Fre
60.0									26.00000000 GH
-70.0									
Start 30 #Res BW	MHz / 100 kHz	2	#VBI	N 300 kHz		Sweep 95		6.00 GHz 0000 pts)	CF Ste 2.597000000 G⊢ Auto Ma
MKR MODE		× 2.460 9		Y 9.58 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	Auto Ma
2 N	1 f 1 f	4.924 0	GHz	-49.24 dBm					
	1 f 1 f	7.386 0 25.473 7		-49.31 dBm -42.67 dBm					Freq Offse 0 H
5	· ·	20.4701	0.112	42.07 0.011				E	08
7									
8 9									
10 11									
11									



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L		APv3.8(120215),43573, Conduc Ω DC	SENSE:IN		ALIGN AUTO	07:58:18 AM Dec 10, 2015	
		PNO: Fast IFGain:Low	+++ Trig: Free Rur #Atten: 30 dB		g Type: RMS	TRACE 1 2 3 4 5 6 TYPE M WWW DET P P P P P P	Frequency
0 dB/div	Ref Offset Ref 20.00				Mk	r1 2.472 1 GHz 5.01 dBm	Auto Tune
10.0	<u>1</u>						0
							Center Free 13.015000000 GH;
10.0						-13:39 dBm	
20.0							Start Free
80.0						4	30.000000 MH
40.0		2 03				Q	
50.0	and the second second	Marca QI and a					01 E
50.0							Stop Free 26.00000000 GH
70.0							20.000000000 011
tart 30	MH2					Stop 26.00 GHz	CF Ster
	/ 100 kHz	#VE	3W 300 kHz		Sweep 95	6.0 ms (30000 pts)	2.597000000 GH
IKR MODE		Х	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Mar
1 N 2 N	1 f 1 f	2.472 1 GHz 4.944 0 GHz	5.01 dBm -49.42 dBm				
	1 f 1 f	7.416 0 GHz 25.652 0 GHz	-51.46 dBm -42.29 dBm				Freq Offse
5	· · ·					E	01.
7							
8 9							
10							

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

## 7.3.1. 6 dB BANDWIDTH

#### **LIMITS**

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

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

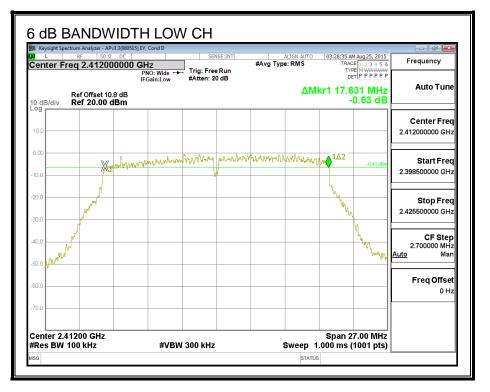
#### <u>RESULTS</u>

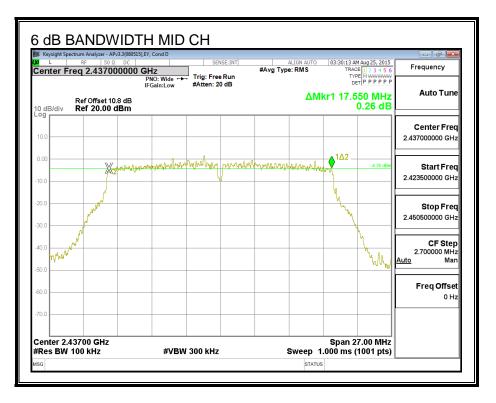
Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	2412	17.63	0.5
Mid	2437	17.55	0.5
High_11	2462	16.55	0.5
High_12	2467	16.95	0.5
High_13	2472	17.24	0.5

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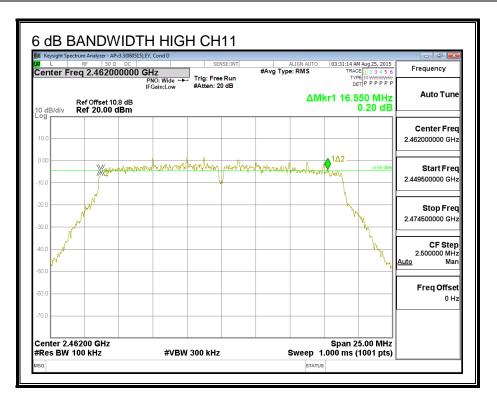
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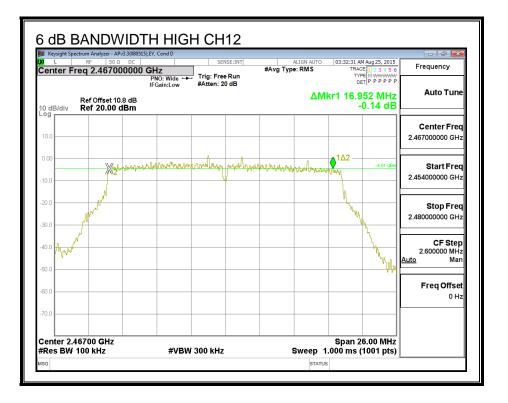
#### 6 dB BANDWIDTH,



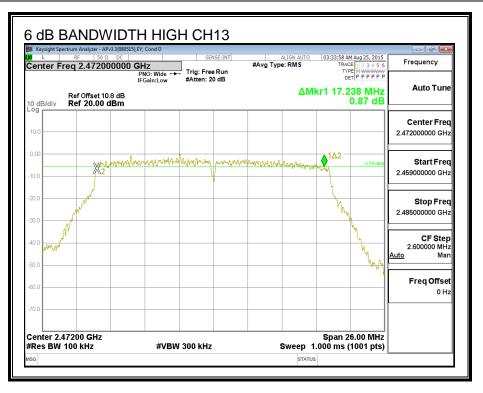


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## 7.3.2. 99% BANDWIDTH

#### **LIMITS**

None; for reporting purposes only.

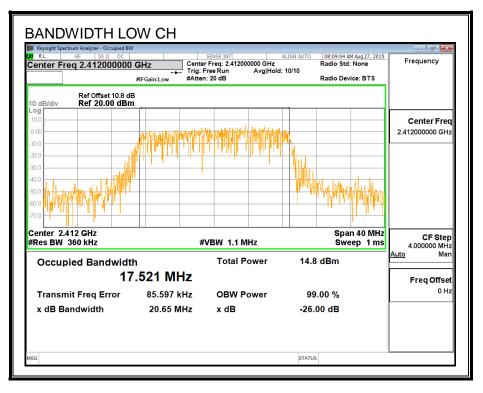
#### **RESULTS**

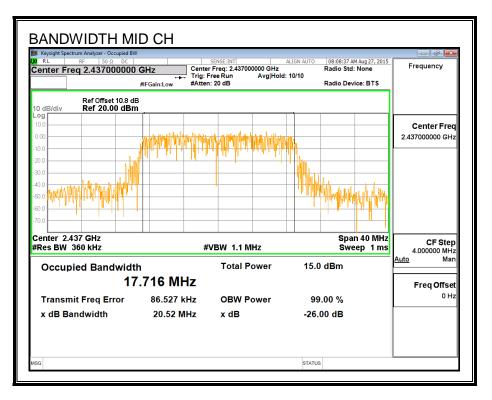
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	17.521
Mid	2437	17.716
High_11	2462	17.686
High_12	2467	17.685
High_13	2472	17.588

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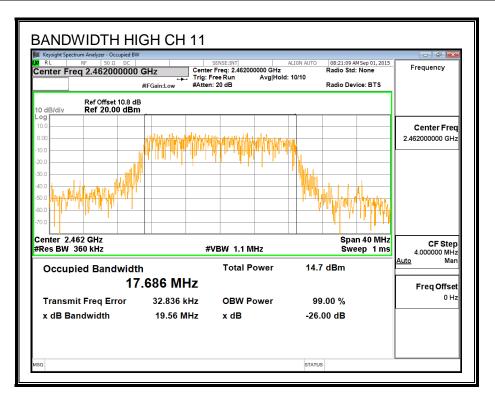
#### 99% BANDWIDTH,

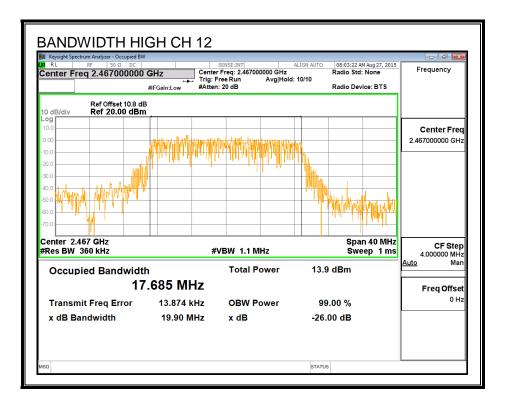




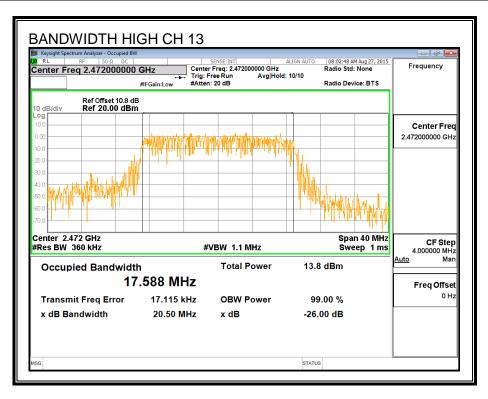
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## 7.3.3. AVERAGE POWER

#### **LIMITS**

None; for reporting purposes only.

#### **RESULTS**

Channel	Frequency	Power
	(MHz)	(dBm)
Low_1	2412	15.98
Low_2	2417	18.42
Mid	2437	18.42
High_10	2457	17.44
High_11	2462	13.93
High_12	2467	11.96
High_13	2472	4.90

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## 7.3.4. OUTPUT POWER

#### LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

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

#### **DIRECTIONAL ANTENNA GAIN**

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

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#### **RESULTS**

#### Limits

Channel	Frequency	Directional	FCC	IC	IC	Max
		Gain	Power	Power	EIRP	Power
			Limit	Limit	Limit	
	(MHz)	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
Low_1	2412	-0.90	30.00	30	36	30.00
Low_2	2417	-0.90	30.00	30	36	30.00
Mid	2437	-0.90	30.00	30	36	30.00
High_10	2457	-0.90	30.00	30	36	30.00
High_11	2462	-0.90	30.00	30	36	30.00
High_12	2467	-0.90	30.00	30	36	30.00
High_13	2472	-0.90	30.00	30	36	30.00

Duty Cycle CF (dB) 0.00 Included in Calculations of Corr'd Power

#### Results

Channel	Frequency	Meas	Total	Power	Margin
		Power	Corr'd	Limit	
			Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low_1	2412	24.07	24.07	30.00	-5.93
Low_2	2417	26.51	26.51	30.00	-3.49
Mid	2437	26.47	26.47	30.00	-3.53
High_10	2457	25.61	25.61	30.00	-4.39
High_11	2462	21.95	21.95	30.00	-8.05
High_12	2467	20.07	20.07	30.00	-9.93
High_13	2472	12.95	12.95	30.00	-17.05

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## 7.3.5. POWER SPECTRAL DENSITY

#### **LIMITS**

FCC §15.247

IC RSS-247 (5.2) (2)

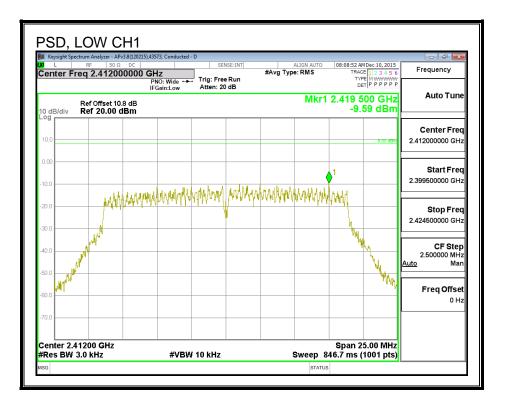
For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

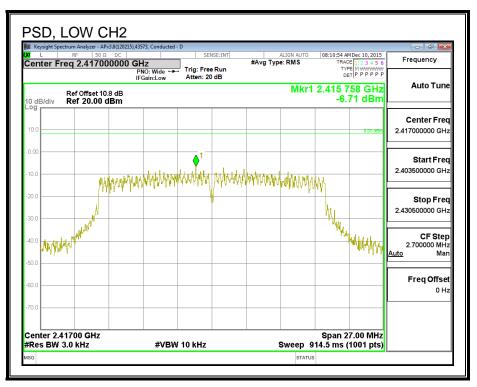
#### **RESULTS**

Duty C	ycle CF (dB)	0.00	Included	in Calc	ulations	of Corr'd PSD
PSD Resu	ults					
Channel	Frequency	Meas	Total	Limit	Margin	
			Corr'd			
	(MHz)	(dBm)	PSD			
			(dBm)	(dBm)	(dB)	
Low_1	2412	-9.59	-9.59	8.0	-17.6	
Low_2	2417	-6.71	-6.71	8.0	-14.7	
Mid	2437	-6.56	-6.56	8.0	-14.6	
High_10	2457	-8.68	-8.68	8.0	-16.7	
High_11	2462	-9.90	-9.90	8.0	-17.9	
High_12	2467	-13.56	-13.56	8.0	-21.6	
High_13	2472	-20.77	-20.77	8.0	-28.8	

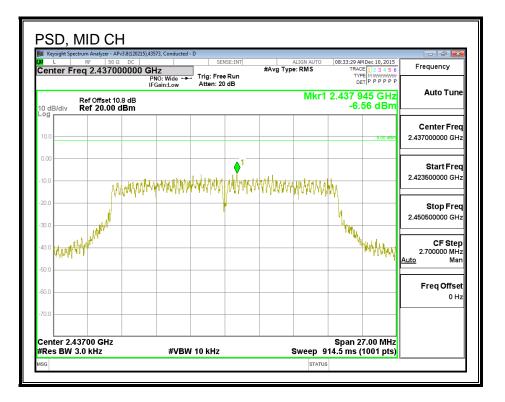
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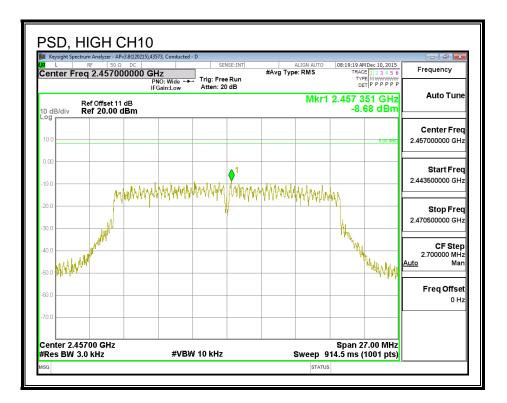
<u>PSD</u>



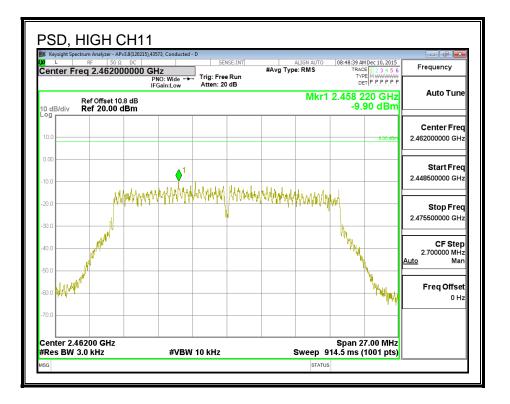


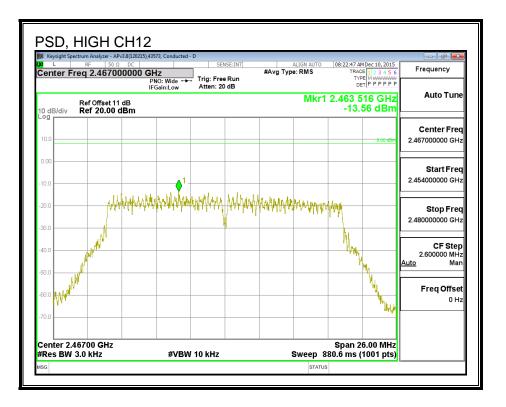
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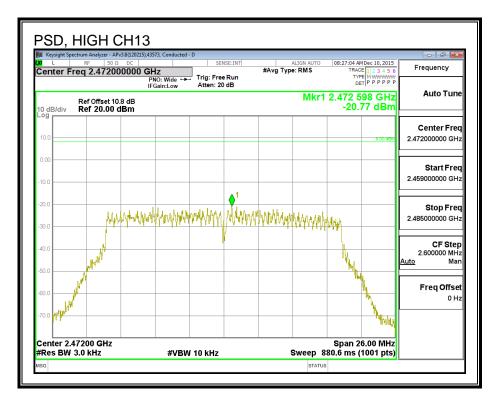


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## 7.3.6. OUT-OF-BAND EMISSIONS

#### **LIMITS**

FCC §15.247 (d)

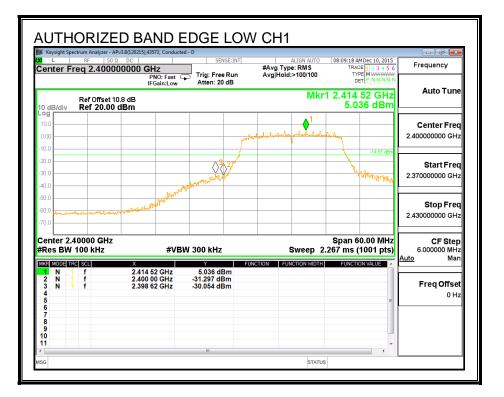
IC RSS-247 (5.5)

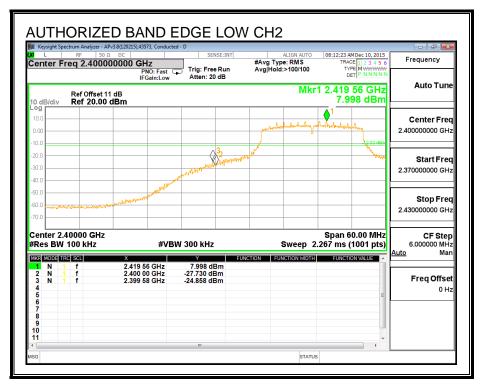
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

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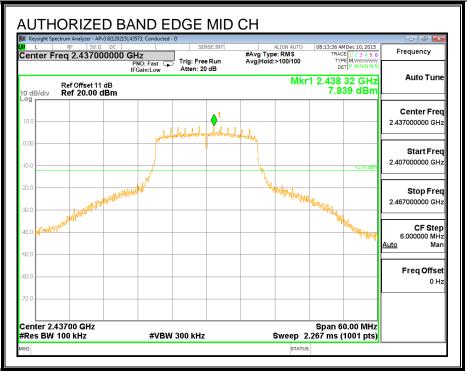
#### RESULTS 0

#### LOW CHANNEL BANDEDGE

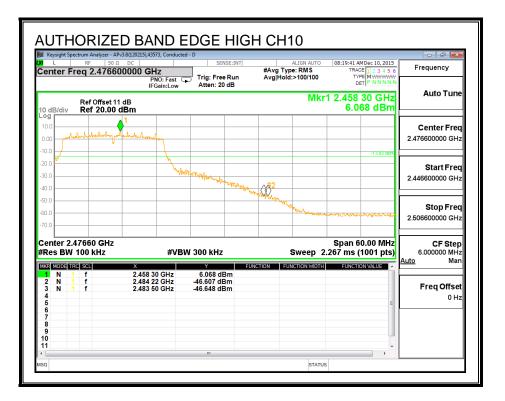




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#### HIGH CHANNEL BANDEDGE



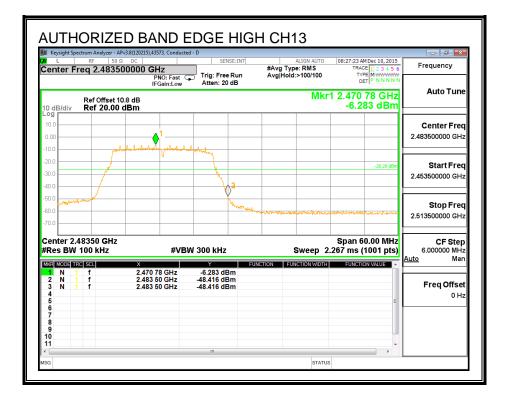
UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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Keysight Sp	RF 50 Ω	3.8(120215),43573, Conduc DC		E:INT	ALIGN AUTO	08:21:06 AM Dec 1		7 ×
enter F	req 2.48050	0000 GHz		#Av	Type: RMS	TRACE 1 2	3 4 5 6 Frequen	су
		PNO: Fast IFGain:Low	Trig: Free I Atten: 20 d		Hold:>100/100		INNNN	
	Ref Offset 11 Ref 20.00 (				Mkr	1 2.460 76 3.641 c	GHZ	Tune
odB/div	Ref 20.00 C	IBM				0.0410		
0.0	<b>∲</b> ¹						Cente	r Frec
).00	whentertheatheatheatheatheatheatheatheatheathea	what when has hard when					2.48050000	00 GH2
0.0						-1	6.36 dBm	
10.0							Star	tFrec
0.0 /			<b>L</b>	a 🤊			2.45050000	00 GHz
0.0			When thypart	M				
0.0				WHAT WARMING			Stor	Fred
0.0				"Un	how when the state	portrans war brilly to the		
0.0								
enter 2	.48050 GHz					Span 60.00	MHz CF	Step
Res BW	/ 100 kHz	#VI	300 kHz		Sweep 2	.267 ms (100	1 pts) 6.0000	O MH
KR MODE T		X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VAL		Mar
1 N 2 N	1 f 1 f	2.460 76 GHz 2.483 56 GHz	3.641 dBi -43.646 dBi					
3 N 4	1 f	2.483 50 GHz	-44.570 dBr	n			Freq	Official 0 Hz
5 6							=	0 11
7								
8 9								
0							-	
							•	

Page 62 of 125

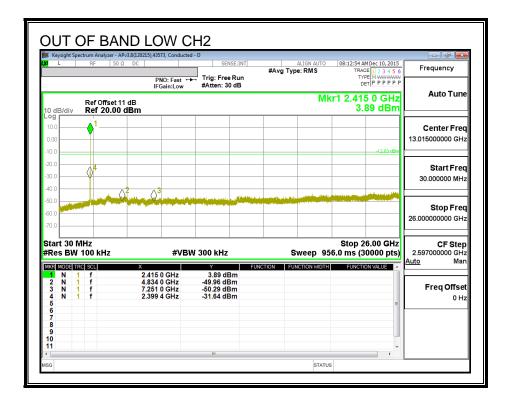
	r - APv3.8(120215),43573, Conduct 50 Ω DC	ed - D SENSE:INT	ALIGN AUTO	08:24:53 AM Dec 10, 2015	- 6 론
enter Freq 2.48	3500000 GHz PNO: Fast		#Avg Type: RMS Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE M WWWW DET P N N N N N	Frequency
0 dB/div Ref 20.	IFGain:Low et 10.8 dB 00 dBm	Atten: 20 dB	Mkr	1 2.462 02 GHz 0.818 dBm	Auto Tuno
0.00 10.0	1- Andreakey wheele have been been been been been been been be				Center Free 2.483500000 GH
0.0				-19.18 dBm	<b>Start Fre</b> 2.453500000 GH
50.0 50.0 70.0			Mar mar hour filling fil in the second ships	Ward 152,0[-1774] 16	<b>Stop Fre</b> 2.513500000 GH
enter 2.48350 GH Res BW 100 kHz		W 300 kHz	Sweep 2	Span 60.00 MHz .267 ms (1001 pts)	CF Stej 6.000000 MH Auto Ma
MODE         TRC         SCL           1         N         1         f           2         N         1         f           3         N         1         f           4         5         -         -           6         -         -         -           7         -         -         -           8         9         -         -	X 2.462 02 GHz 2.484 22 GHz 2.483 50 GHz	0.818 dBm -51.293 dBm -52.190 dBm	FUNCTION WIDTH	FUNCTION VALUE	Auto Mar FreqOffse 0 H
9  0  1		111			



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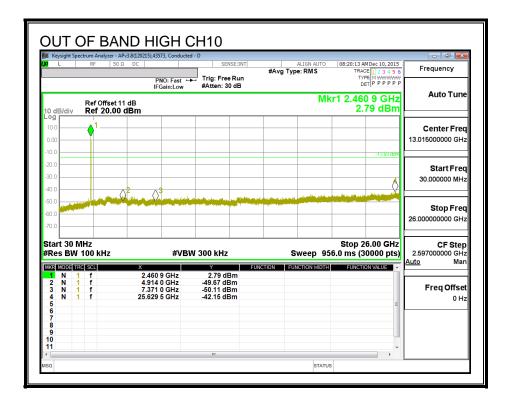
#### OUT-OF-BAND EMISSIONS

		vzer - APv3.8(120215),43573, Condu				- đ 💌						
L	RF	50 Ω DC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	08:09:53 AM Dec 10, 2015 TRACE 1 2 3 4 5 6	Frequency						
		PNO: Fast IFGain:Low	→→ Trig: Free Run #Atten: 30 dB		TYPE M WWWWW DET P P P P P P	Auto Tune						
0 dB/div												
og 🗌												
10.0						Center Fred						
0.00	Ť					13.015000000 GHz						
10.0					-14.97 dBm							
20.0						Start Fred						
30.0	()⁴					30.00000 MHz						
40.0		A2 A3			ter alle gelffelle generaties in the							
50.0						Oton From						
60.0						Stop Fred 26.00000000 GH;						
70.0						28.00000000 GH						
tart 30	NAL 1				Stop 26.00 GHz							
	ivinz / 100 kH	z #V	BW 300 kHz	Sweep 95	6.0 ms (30000 pts)	CF Step 2.597000000 GH						
KR MODE	IBC SCI	X	Y	UNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Mar						
1 N	1 f	2.414 1 GHz	1.09 dBm									
2 N 3 N	1 f 1 f	4.824 0 GHz 7.236 0 GHz	-50.36 dBm -51.28 dBm			Freq Offse						
4 N 5	1 f	2.398 5 GHz	-36.23 dBm		E	0 H:						
6												
7												
8												
8 9												



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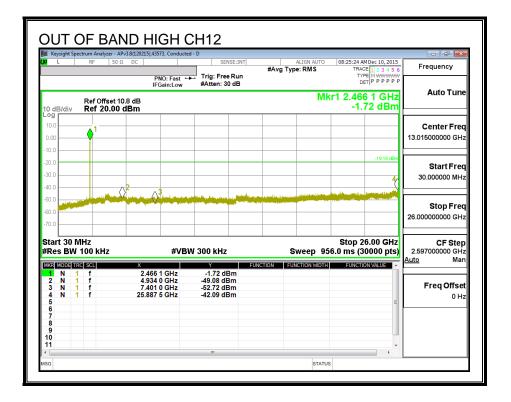
E Keysight S	pectrum Ana RF	lyzer - APv3.8(120215), 50 Ω DC	43573, Conducto	ed - D SENSE:I	1.07	ALIGN AUTO	08:15:00 AM Dec 10, 201	
L	KP-	50 Ω DC			#Av	g Type: RMS	TRACE 1 2 3 4 5	6 Frequency
			PNO: Fast ( IFGain:Low	Trig: Free Ru #Atten: 30 dB			DET P P P P P	P
0 dB/div		ffset 11 dB 20.00 dBm				Mk	r1 2.442 7 GH: 4.12 dBn	
°g								1
10.0	<b>9</b> '-							Center Fred
0.00								- 13.015000000 GH;
10.0							-12.16 dBr	<b>P</b>
20.0								Start Free
80.0							A	30.000000 MH:
40.0	<mark> </mark>	<u>2</u>	∧3				a transmission determination	2
50.0		And Street and	Color in the second					Stop Fred
50.0								26.00000000 GHz
70.0								20.000000000000
	B.411-						<b>0</b> 4 00 00 <b>0</b> 11	
tart 30 Res BV	191 <b>1</b> 12 V 100 kl	47	#VB	W 300 kHz		Sweep 95	Stop 26.00 GH 6.0 ms (30000 pts	
IKR MODE		·		~	FUNCTION	FUNCTION WIDTH	EUNCTION VALUE	Auto Mar
1 N	1 f		27 GHz	4.12 dBm	TONCTION	Fonction motif	TONCTION VALUE	
2 N 3 N	1 f 1 f		4 0 GHz 1 0 GHz	-50.65 dBm -50.79 dBm				Freq Offset
4 N	1 f		4 5 GHz	-41.47 dBm				0 Hz
5 6								
7								
8 9								
10 11								
								-



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		Spec		Analyzer -			5),4357	3, Condu	cted -	D														d X
	L		RF	5	) <u>Ω</u>	DC	_			1	SEI	NSE:IN	Γ	ALIGN AUTO #Avg Type: RMS			08:41:05 AM Dec 10, 2015 TRACE 1 2 3 4 5 (				Frequer	псу		
								O: Fast ain:Low			g: Free ten: 3								TYP	PE M₩ T P P	PPPF			
0 4	Ref Offset 10.8 dB Mkr1 2.457 4 GH: dB/div Ref 20.00 dBm 0.28 dBn														Auto	Tune								
og		v	Re	20.0		5111													-					
10.0	⊢		<u> </u>																				Cente	r Freq
0.00	$\vdash$		-		-																	13.0	150000	00 GHz
10.0	$\vdash$				_															.16	.36 dBm			
20.0					-		_													-10			Sta	t Freq
30.0																					_		30.0000	
40.0					~2		3														_\$		22.0000	
50.0				and that	$\langle \rangle$	line a	$\langle \rangle$		17.1.1	And the second	(1) of the		n Huur	the second second	مماليه	a de la companya de La companya de la comp	an a				(and	-		
60 O																								p Freq
70.0																						26.0	000000	00 GHz
10.0																								
	rt 3			kHz				-#\/	<b>D147</b>	300	×Ц-					voon	0.5	Sto 6.0 ms		6.00		2	0000	F Step
_								#V	044	300	КПZ					<u> </u>					• •	Auto		Man
MKR	MODE	1	f SCL			× 2	457 4	GHz		Y 0	.28 di	Bm	FUNC	CTION	FUN	CTION W	DTH	FU	NCTIO	on valu	JE 🖌			
2	N	1	f			4.	924 0	GHz		-49.	.07 dE	Зm											Fred	Offset
3 4	N N	1	f					GHz GHz			.68 dE .53 dE												1104	0 Hz
5 6																					E			311
7																								
8 9																								
10 11																								
																					+			



Page 66 of 125

L L	RF 50	APv3.8(120215),43573, Conduct Ω DC	ed - D SENSE:IN		ALIGN AUTO	08:27:56 AM Dec 10, 2015	Frequency
		PNO: Fast IFGain:Low	Trig: Free Rur #Atten: 30 dB		g Type: RMS	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P	
0 dB/div	Ref Offset 7			Auto Tune			
10.0							0
	- 1						Center Fred 13.015000000 GH;
10.0	<b>\</b>						10.01000000 011
20.0							
30.0						-26.28 dBm	Start Free
40.0		~?					30.000000 MH;
50.0	and the second second			and the second second	and the second second second		
							Stop Fred
70.0							26.00000000 GH;
itart 30 l Res BM	VIHZ 100 kHz	#\/F	W 300 kHz		Sween 95	Stop 26.00 GHz 5.0 ms (30000 pts)	CF Step 2.597000000 GH
KR MODE T		×	VIT COO INTE	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Mar
1 N 1	f	2.468 7 GHz	-9.06 dBm	TONCTION	I ONCTION MOTI	FORCHONVALUE	
2 N 1		4.944 0 GHz 7.416 0 GHz	-48.56 dBm -53.54 dBm				Freq Offse
4 N 1	f	25.632 9 GHz	-41.80 dBm				0 H:
5 6						E	
7							
9							
10 11							

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# 8. RADIATED TEST RESULTS

## 8.1. LIMITS AND PROCEDURE

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

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

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 for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. 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, the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

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

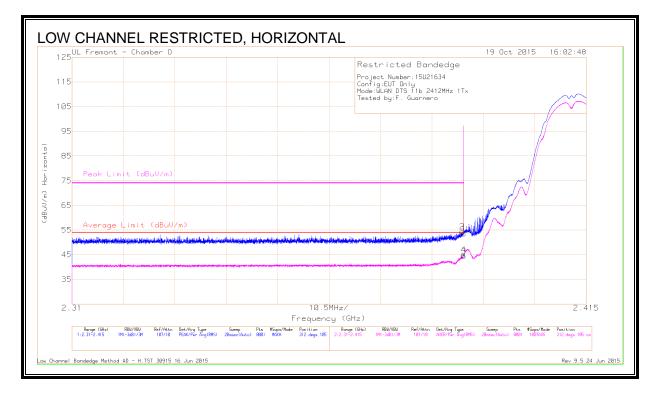
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

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# 8.2. TRANSMITTER ABOVE 1 GHz

## 8.2.1. 802.11b 1Tx MODE IN THE 2.4 GHz BAND

#### **RESTRICTED BANDEDGE (LOW CHANNEL, CH 1)**



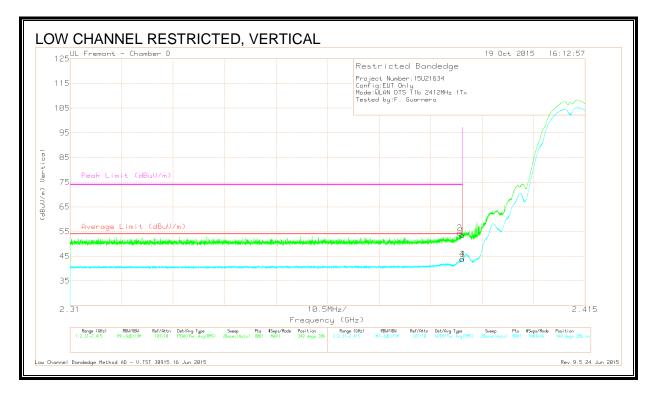
### **Trace Markers**

Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.39	42.13	Pk	32.1	-20.7	53.53	-	-	74	-20.47	312	105	Н
2	* 2.39	42.94	Pk	32.1	-20.7	54.34	-	-	74	-19.66	312	105	н
3	* 2.39	33.07	RMS	32.1	-20.7	44.47	54	-9.53	-	-	312	105	Н
4	* 2.39	33.61	RMS	32.1	-20.7	45.01	54	-8.99	-	-	312	105	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 



### Trace Markers

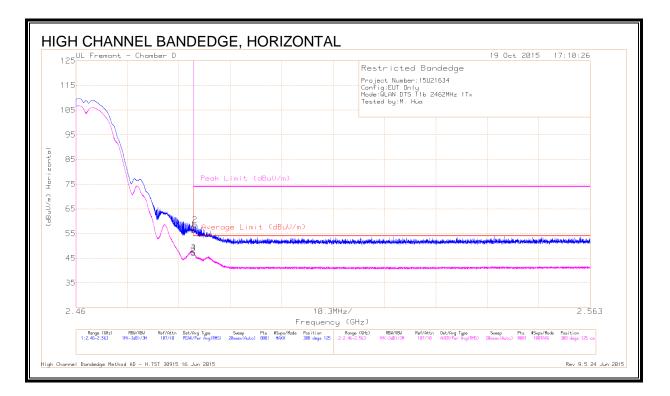
Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading (dBuV)		(dB/m)	Fltr/Pad (dB)	Reading (dBuV/m)	Limit (dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
2	* 2.389	43.11	Pk	32.1	-20.7	54.51	-	-	74	-19.49	349	386	V
1	* 2.39	41.97	Pk	32.1	-20.7	53.37	-		74	-20.63	349	386	v
1		-		-	-		-	_		-20.03			V
3	* 2.39	32.44	RMS	32.1	-20.7	43.84	54	-10.16	-	-	349	386	V
4	* 2.39	32.4	RMS	32.1	-20.7	43.8	54	-10.2	-	-	349	386	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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### **Trace Markers**

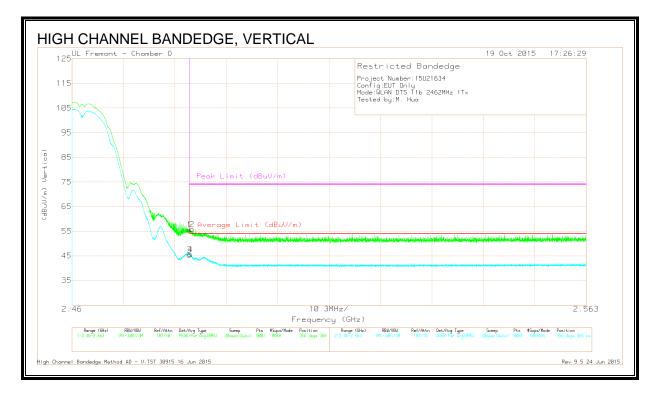
Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading (dBuV)		(dB/m)	Fltr/Pad (dB)	Reading (dBuV/m)	Limit (dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
1	* 2.484	44.94	Pk	32.2	-20.8	56.34	-	-	74	-17.66	308	125	Н
2	* 2.484	47.16	Pk	32.2	-20.8	58.56	-	-	74	-15.44	308	125	Н
3	* 2.484	35.84	RMS	32.2	-20.8	47.24	54	-6.76	-	-	308	125	Н
4	* 2.484	35.86	RMS	32.2	-20.8	47.26	54	-6.74	-	-	308	125	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	44.18	Pk	32.2	-20.8	0	55.58	-	-	74	-18.42	356	365	V
2	* 2.484	44.32	Pk	32.2	-20.8	0	55.72	-	-	74	-18.28	356	365	V
3	* 2.484	34.1	RMS	32.2	-20.8	0	45.5	54	-8.50	-	-	356	365	V
4	* 2.484	34.18	RMS	32.2	-20.8	0	45.58	54	-8.42	-	-	356	365	V

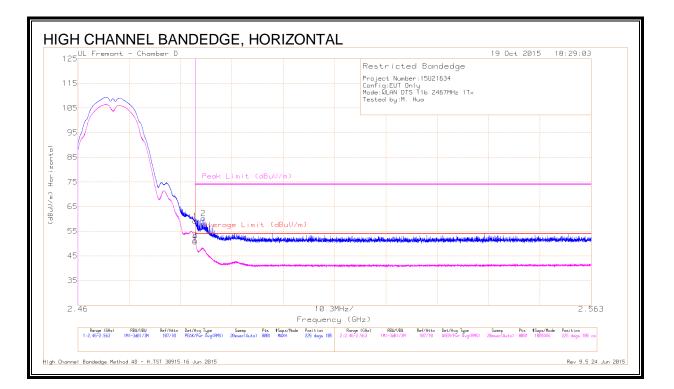
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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#### AUTHORIZED BANDEDGE (HIGH CHANNEL, CH 12)



#### Trace Markers

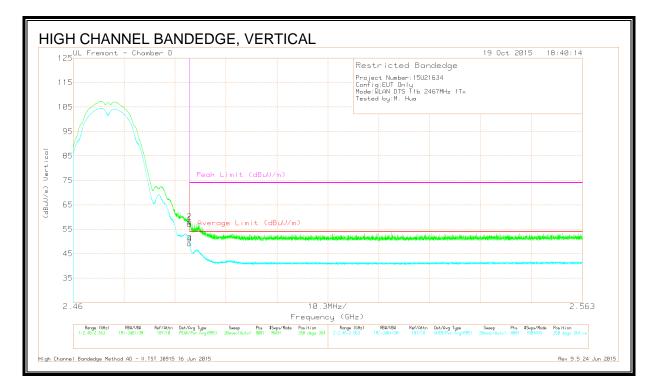
Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	47.68	Pk	32.2	-20.8	59.08	-	-	74	-14.92	225	105	н
3	* 2.484	39.89	RMS	32.2	-20.8	51.29	54	-2.71	-	-	225	105	н
4	* 2.484	39.41	RMS	32.2	-20.8	50.81	54	-3.19	-	-	225	105	н
2	* 2.485	48.86	Pk	32.2	-20.8	60.26	-	-	74	-13.74	225	105	н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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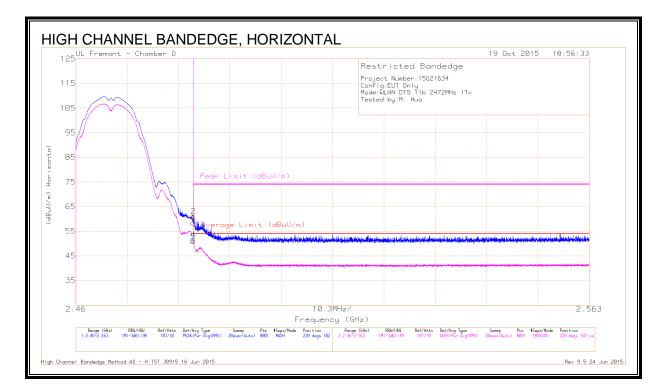
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.74	Pk	32.2	-20.8	0	57.14	-	-	74	-16.86	260	364	V
2	* 2.484	46.67	Pk	32.2	-20.8	0	58.07	-	-	74	-15.93	260	364	V
3	* 2.484	37.73	RMS	32.2	-20.8	0	49.13	54	-4.87	-	-	260	364	V
4	* 2.484	37.78	RMS	32.2	-20.8	0	49.18	54	-4.82	-	-	260	364	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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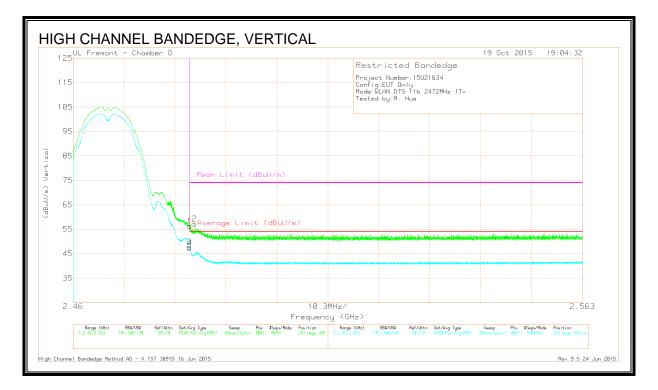
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.05	Pk	32.2	-20.8	0	58.45	-	-	74	-15.55	220	102	Н
2	* 2.484	49.75	Pk	32.2	-20.8	0	61.15	-	-	74	-12.85	220	102	н
3	* 2.484	39.47	RMS	32.2	-20.8	0	50.87	54	-3.13	-	-	220	102	н
4	* 2.484	39.96	RMS	32.2	-20.8	0	51.36	54	-2.64	-	-	220	102	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.03	Pk	32.2	-20.8	0	56.43	-	-	74	-17.57	243	365	V
3	* 2.484	36.44	RMS	32.2	-20.8	0	47.84	54	-6.16	-	-	243	365	V
4	* 2.484	36.01	RMS	32.2	-20.8	0	47.41	54	-6.59	-	-	243	365	V
2	* 2.485	45.9	Pk	32.2	-20.8	0	57.3	-	-	74	-16.7	243	365	V

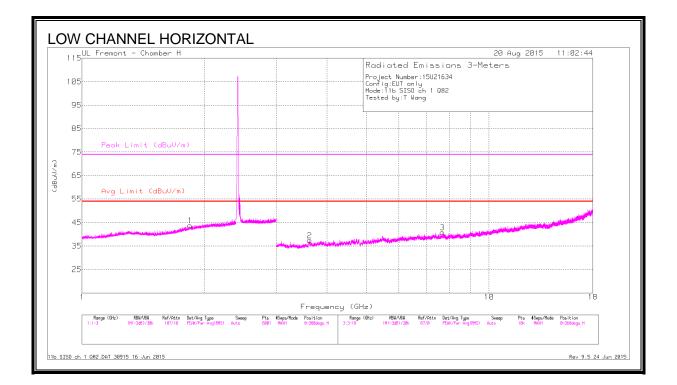
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

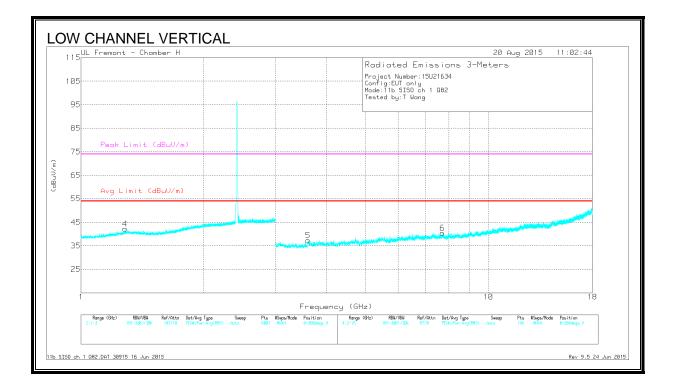
Pk - Peak detector

**RMS - RMS detection** 

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#### HARMONICS AND SPURIOUS EMISSIONS LOW CHANNEL, CH 1





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Marker	Frequency	Meter	Det	AF T863	Amp/Cbl/	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)							
4	* 1.281	44.28	PK2	28.8	-24.9	48.18	-	-	74	-25.82	1	100	V
	* 1.282	32.71	MAv1	28.8	-24.9	36.61	54	-17.39	-	-	1	100	V
2	* 3.621	42.15	PK2	33.1	-31.8	43.45	-	-	74	-30.55	1	100	н
	* 3.621	30.83	MAv1	33.1	-31.8	32.13	54	-21.87	-	-	1	100	Н
3	* 7.684	39.34	PK2	35.9	-28.2	47.04	-	-	74	-26.96	1	100	Н
	* 7.686	27.77	MAv1	35.9	-28.1	35.57	54	-18.43	-	-	1	100	Н
5	* 3.608	41.86	PK2	33	-31.7	43.16	-	-	74	-30.84	1	100	V
	* 3.608	31.03	MAv1	33	-31.7	32.33	54	-21.67	-	-	1	100	V
6	* 7.708	38.88	PK2	35.9	-27.8	46.98	-	-	74	-27.02	1	100	V
	* 7.706	28.06	MAv1	35.9	-27.8	36.16	54	-17.84	-	-	1	100	V
1	1.842	37.44	Pk	30.5	-24.2	43.74	-	-	74	-30.26	0-360	201	Н

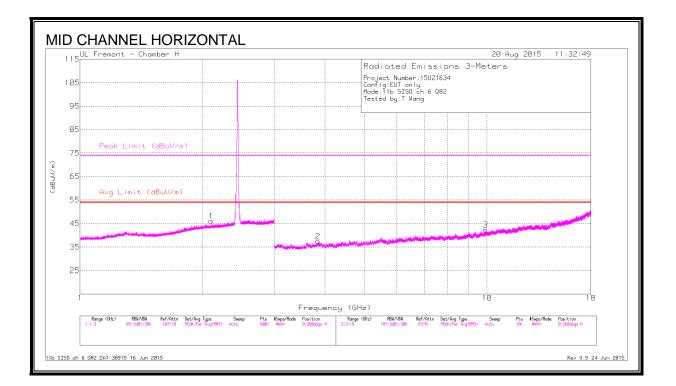
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

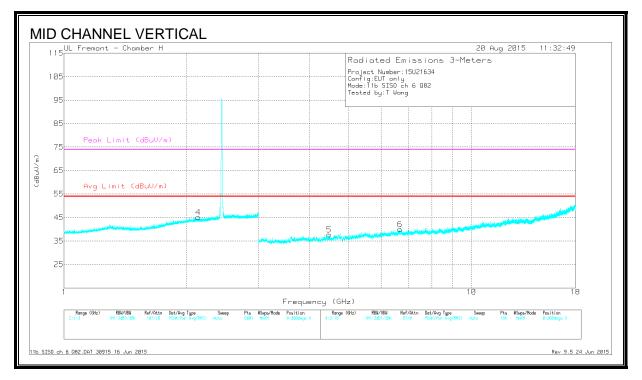
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS MID CHANNEL, CH 6





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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 3.841	42.31	PK2	33.5	-31.1	44.71	-	-	74	-29.29	2	100	Н
	* 3.844	31.25	MAv1	33.5	-31.1	33.65	54	-20.35	-	-	2	100	Н
1	2.099	38.31	Pk	31.5	-23.8	46.01	-	-	74	-27.99	0-360	201	Н
4	2.135	37.5	Pk	31.4	-23.8	45.1	-	-	74	-28.9	0-360	200	V
5	4.473	35.21	Pk	33.8	-31.3	37.71	-	-	74	-36.29	0-360	100	V
6	6.683	32.8	Pk	35.8	-28.6	40	-	-	74	-34	0-360	200	V
3	9.925	30.97	Pk	36.9	-25.5	42.37	-	-	74	-31.63	0-360	100	Н

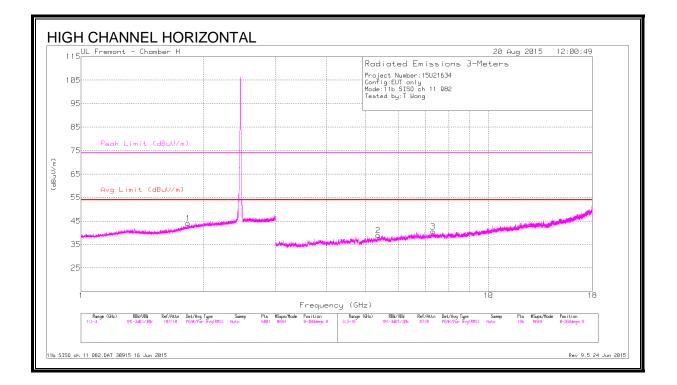
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

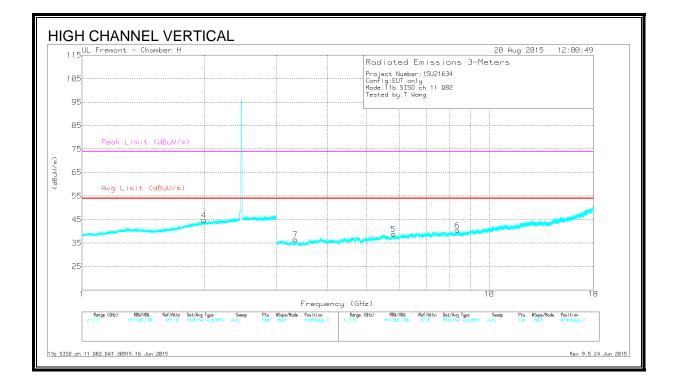
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL, CH 11





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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 5.364	41.05	PK2	35.1	-31.2	44.95	-	-	74	-29.05	0	100	Н
	* 5.364	29.91	MAv1	35.1	-31.2	33.81	54	-20.19	-	-	0	100	Н
3	* 7.31	39.41	PK2	35.9	-28.4	46.91	-	-	74	-27.09	0	100	Н
	* 7.307	28.24	MAv1	35.9	-28.4	35.74	54	-18.26	-	-	0	100	Н
6	* 8.342	38.92	PK2	35.9	-27.1	47.72	-	-	74	-26.28	0	100	V
	* 8.343	27.24	MAv1	35.9	-27.1	36.04	54	-17.96	-	-	0	100	V
1	1.83	37.87	Pk	30.4	-24.2	44.07	-	-	74	-29.93	0-360	100	Н
4	1.992	37.52	Pk	31.2	-24	44.72	-	-	74	-29.28	0-360	200	V
7	3.342	35.11	Pk	32.8	-31.4	36.51	-	-	74	-37.49	0-360	100	V
5	5.809	33.83	Pk	34.9	-29.9	38.83	-	-	74	-35.17	0-360	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

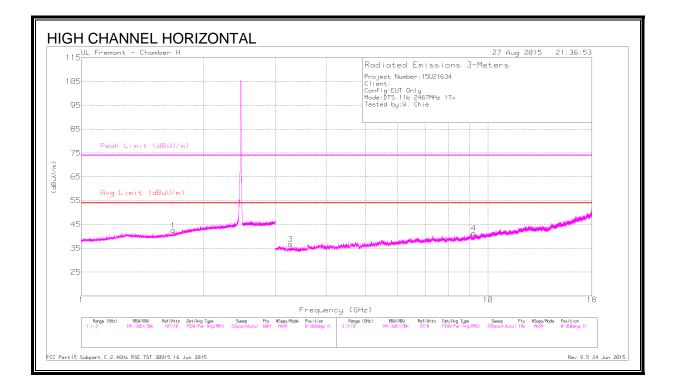
PK2 - KDB558074 Method: Maximum Peak

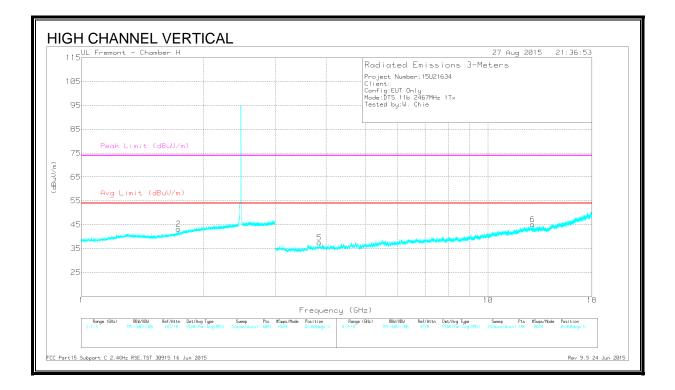
MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL, CH 12





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#### **DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.687	43.86	PK2	28.9	-24.1	48.66	-	-	74	-25.34	184	163	н
	* 1.687	31.59	MAv1	28.9	-24.1	36.39	54	-17.61-	-	-	184	163	Н
5	* 3.847	41.73	PK2	33.5	-31.2	44.03	-	-	74	-29.97	169	217	V
	* 3.849	30.84	MAv1	33.5	-31.2	33.14	54	-20.86-	-	-	169	217	V
2	1.735	43.84	PK2	29.4	-24	49.24	-	-	-	-	216	239	V
3	3.271	41.34	PK2	32.8	-31.7	42.44	-	-	-	-	238	189	Н
4	9.222	37.2	PK2	36.4	-27.2	46.4	-	-	-	-	221	121	Н
6	12.862	35.6	PK2	39.4	-24.8	50.2	-	-	-	-	236	386	V

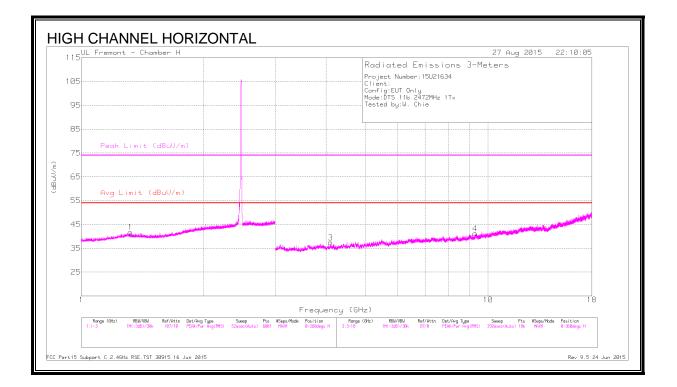
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

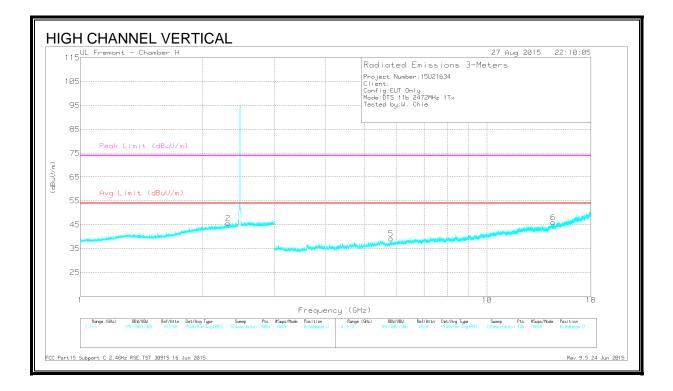
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL, CH 13





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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.322	43.95	PK2	28.9	-24.8	48.05	-	-	74	-25.95	91	131	Н
	* 1.32	31.88	MAv1	28.9	-24.8	35.98	54	-18.02	-	-	91	131	Н
3	* 4.105	41.93	PK2	33.5	-30.7	44.73	-	-	74	-29.27	42	283	Н
	* 4.098	29.59	MAv1	33.5	-30.8	32.29	54	-21.71	-	-	42	283	Н
4	* 9.302	37.96	PK2	36.4	-26.1	48.26	-	-	74	-25.74	296	363	Н
	* 9.304	25.48	MAv1	36.4	-26.1	35.78	54	-18.22	-	-	296	363	Н
2	2.31	43.45	PK2	31.8	-23.5	51.75	-	-	-	-	104	216	V
5	5.805	40.13	PK2	34.9	-29.6	45.43	-	-	-	-	275	118	V
6	14.548	37.35	PK2	40	-25.6	51.75	-	-	-	-	248	124	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

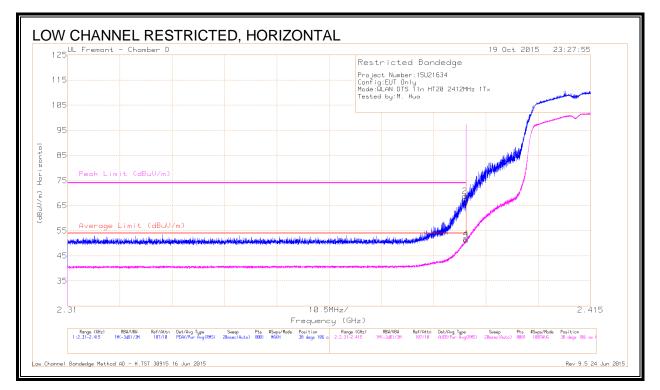
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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# 8.2.2. 802.11n HT20 1Tx MODE IN THE 2.4 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL, CH 1)



#### **Trace Markers**

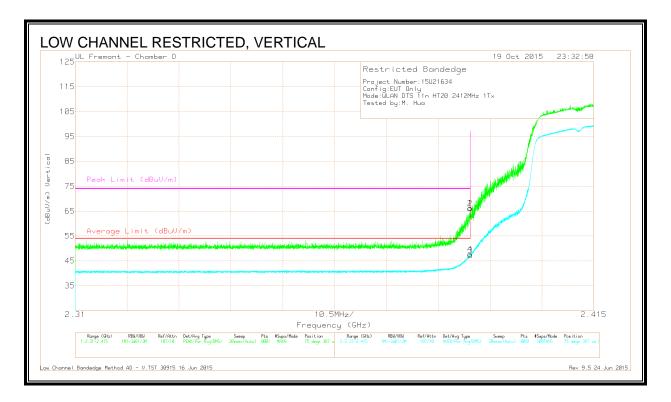
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	55.07	Pk	32.1	-20.7	0	66.47	-	-	74	-7.53	38	106	Н
2	* 2.39	57.43	Pk	32.1	-20.7	0	68.83	-	-	74	-5.17	38	106	Н
3	* 2.39	39.79	RMS	32.1	-20.7	0	51.19	54	-2.81	-	-	38	106	Н
4	* 2.39	40.22	RMS	32.1	-20.7	0	51.62	54	-2.38	-	-	38	106	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	54.79	Pk	32.1	-20.7	0	66.19	-	-	74	-7.81	75	387	V
2	* 2.39	54.61	Pk	32.1	-20.7	0	66.01	-	-	74	-7.99	75	387	V
3	* 2.39	35.84	RMS	32.1	-20.7	0	47.24	54	-6.76	-	-	75	387	V
4	* 2.39	36.29	RMS	32.1	-20.7	0	47.69	54	-6.31	-	-	75	387	V

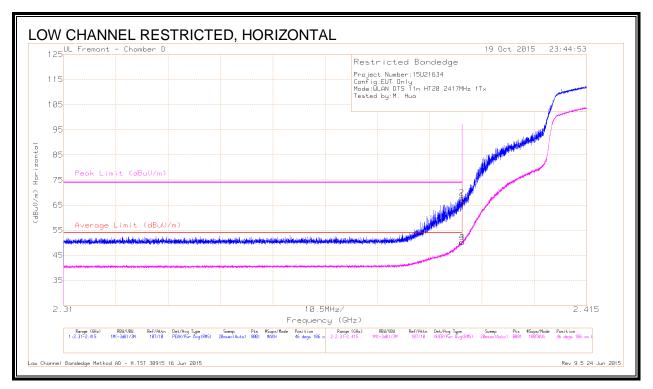
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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#### **RESTRICTED BANDEDGE (LOW CHANNEL, CH 2)**



#### **Trace Markers**

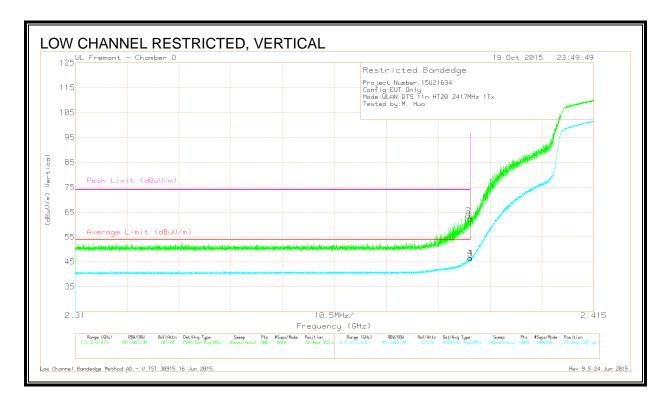
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	55.41	Pk	32.1	-20.7	0	66.81	-	-	74	-7.19	46	106	Н
2	* 2.39	56.52	Pk	32.1	-20.7	0	67.92	-	-	74	-6.08	46	106	н
3	* 2.39	38.81	RMS	32.1	-20.7	0	50.21	54	-3.79	-	-	46	106	Н
4	* 2.39	38.83	RMS	32.1	-20.7	0	50.23	54	-3.77	-	-	46	106	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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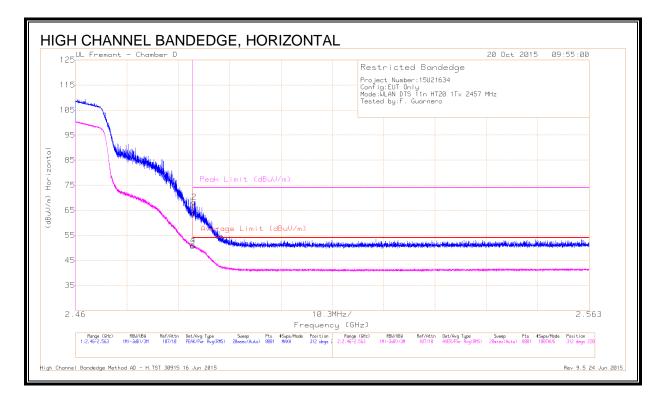
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	50.81	Pk	32.1	-20.7	0	62.21	-	-	74	-11.79	78	385	V
2	* 2.39	52.13	Pk	32.1	-20.7	0	63.53	-	-	74	-10.47	78	385	V
3	* 2.39	34.88	RMS	32.1	-20.7	0	46.28	54	-7.72	-	-	78	385	V
4	* 2.39	35.18	RMS	32.1	-20.7	0	46.58	54	-7.42	-	-	78	385	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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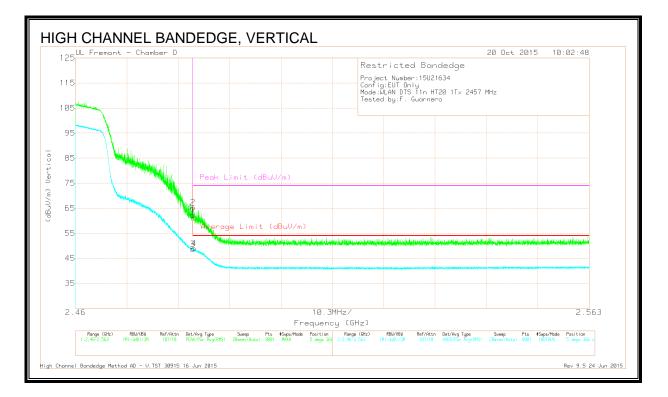
Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	52.33	Pk	32.2	-20.8	63.73	-	-	74	-10.27	312	220	н
2	* 2.484	56.85	Pk	32.2	-20.8	68.25	-	-	74	-5.75	312	220	Н
3	* 2.484	39.28	RMS	32.2	-20.8	50.68	54	-3.32	-	-	312	220	Н
4	* 2.484	39.57	RMS	32.2	-20.8	50.97	54	-3.03	-	-	312	220	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	50.91	Pk	32.2	-20.8	62.31	-	-	74	-11.69	5	366	V
2	* 2.484	53.88	Pk	32.2	-20.8	65.28	-	-	74	-8.72	5	366	V
3	* 2.484	37.35	RMS	32.2	-20.8	48.75	54	-5.25	-	-	5	366	V
4	* 2.484	37.56	RMS	32.2	-20.8	48.96	54	-5.04	-	-	5	366	V

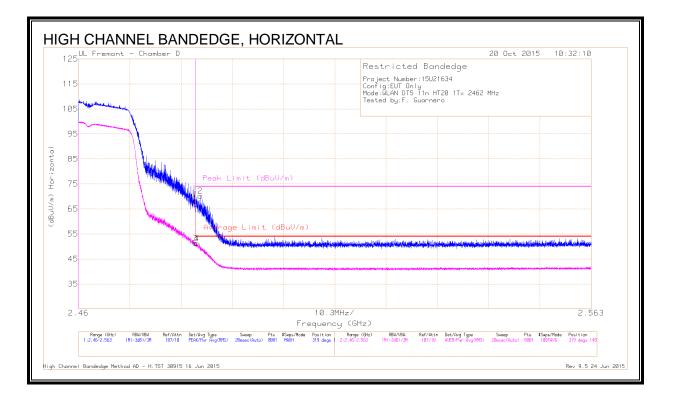
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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#### AUTHORIZED BANDEDGE (HIGH CHANNEL, CH 11)



#### Trace Markers

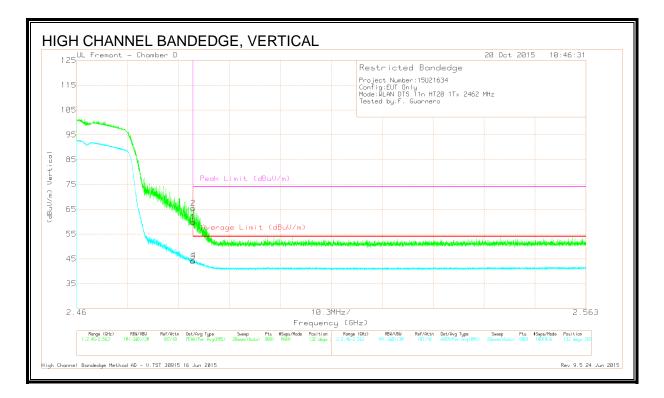
Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	55.55	Pk	32.2	-20.8	66.95	-	-	74	-7.05	319	148	н
2	* 2.484	58.8	Pk	32.2	-20.8	70.2	-	-	74	-3.8	319	148	н
3	* 2.484	39.9	RMS	32.2	-20.8	51.3	54	-2.7	-	-	319	148	Н
4	* 2.484	39.79	RMS	32.2	-20.8	51.19	54	-2.81	-	-	319	148	н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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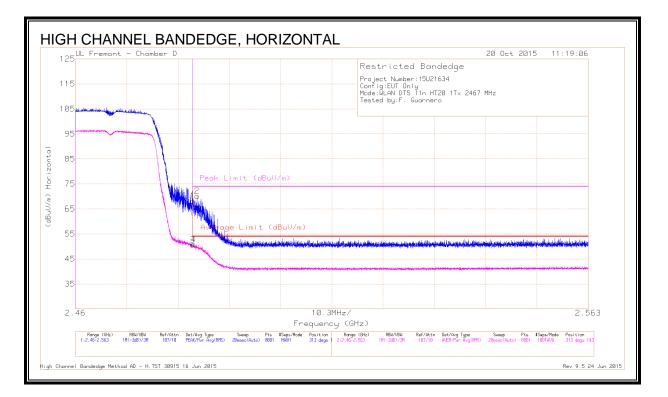
Marker	Frequency (GHz)	Meter Reading	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad	Corrected Reading	Average Limit	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	48.42	Pk	32.2	-20.8	59.82	-	-	74	-14.18	132	365	V
2	* 2.484	54.04	Pk	32.2	-20.8	65.44	-	-	74	-8.56	132	365	V
3	* 2.484	32.57	RMS	32.2	-20.8	43.97	54	-10.03	-	-	132	365	V
4	* 2.484	32.96	RMS	32.2	-20.8	44.36	54	-9.64	-	-	132	365	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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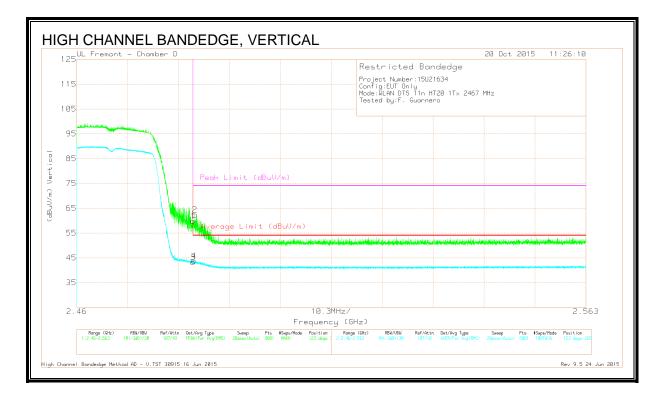
Marker	Frequency (GHz)	Meter Reading	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad	Corrected Reading	Average Limit	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
	(- <i>)</i>	(dBuV)			(dB)	(dBuV/m)	(dBuV/m)	. ,		. ,	( 0.)	. ,	
1	* 2.484	56.87	Pk	32.2	-20.8	68.27	-	-	74	-5.73	313	143	Н
2	* 2.484	58.77	Pk	32.2	-20.8	70.17	-	-	74	-3.83	313	143	Н
3	* 2.484	39.27	RMS	32.2	-20.8	50.67	54	-3.33	-	-	313	143	Н
4	* 2.484	39.41	RMS	32.2	-20.8	50.81	54	-3.19	-	-	313	143	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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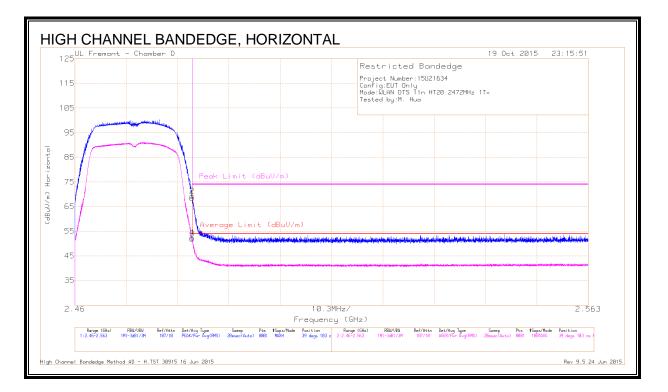
Marker	Frequency (GHz)	Meter Reading	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad	Corrected Reading	Average Limit	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	48.46	Pk	32.2	-20.8	59.86	-	-	74	-14.14	123	365	V
2	* 2.484	50.97	Pk	32.2	-20.8	62.37	-	-	74	-11.63	123	365	V
3	* 2.484	31.87	RMS	32.2	-20.8	43.27	54	-10.73	-	-	123	365	V
4	* 2.484	32.4	RMS	32.2	-20.8	43.8	54	-10.2	-	-	123	365	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

**RMS - RMS detection** 

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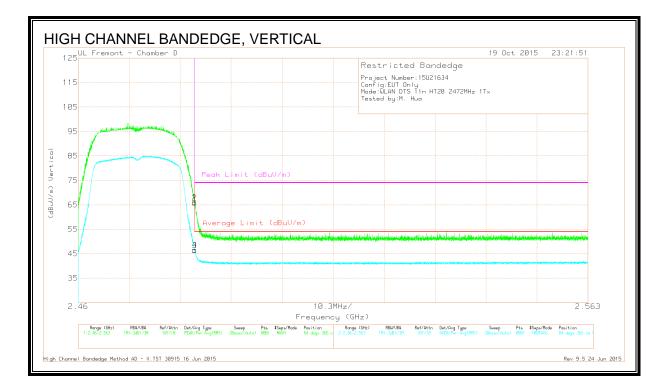
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	57.04	Pk	32.2	-20.8	0	68.44	-	-	74	-5.56	39	103	Н
2	* 2.484	57.92	Pk	32.2	-20.8	0	69.32	-	-	74	-4.68	39	103	н
3	* 2.484	40.57	RMS	32.2	-20.8	0	51.97	54	-2.03	-	-	39	103	н
4	* 2.484	41.03	RMS	32.2	-20.8	0	52.43	54	-1.57	-	-	39	103	Н

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	54.8	Pk	32.2	-20.8	0	66.2	-	-	74	-7.8	84	366	V
2	* 2.484	54.36	Pk	32.2	-20.8	0	65.76	-	-	74	-8.24	84	366	V
3	* 2.484	35.08	RMS	32.2	-20.8	0	46.48	54	-7.52	-	-	84	366	V
4	* 2.484	35.22	RMS	32.2	-20.8	0	46.62	54	-7.38	-	-	84	366	V

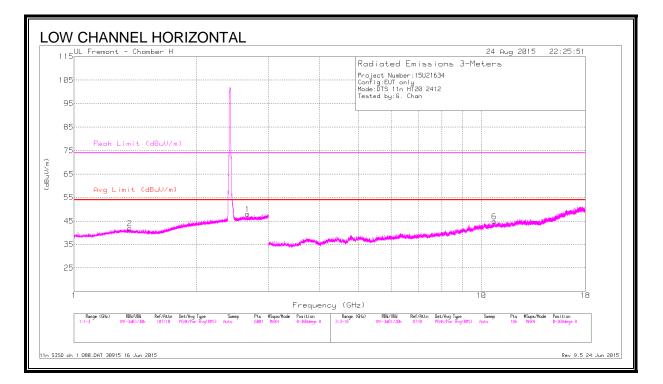
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

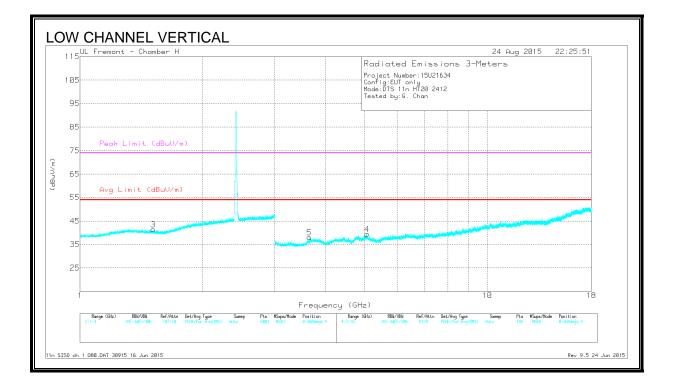
Pk - Peak detector

**RMS - RMS detection** 

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#### HARMONICS AND SPURIOUS EMISSIONS LOW CHANNEL, CH 1





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Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading (dBuV)		(dB/m)	Fltr/Pad (dB)	Reading (dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
1	* 2.669	41.93	PK2	32.4	-20.6	53.73	-	-	74	-20.27	279	107	н
	* 2.668	30.19	MAv1	32.4	-20.6	41.99	54	-12.01	-	-	279	107	н
2	* 1.368	41.86	PK2	28.7	-22.2	48.36	-	-	74	-25.64	317	168	н
	* 1.369	30.39	MAv1	28.7	-22.2	36.89	54	-17.11	-	-	317	168	Н
3	* 1.512	42.21	PK2	28.2	-21.9	48.51	-	-	74	-25.49	348	246	V
	* 1.511	30.15	MAv1	28.2	-21.9	36.45	54	-17.55	-	-	348	246	V
6	* 10.759	33.8	PK2	37.9	-20.4	51.3	-	-	74	-22.7	15	284	Н
	* 10.757	22.45	MAv1	37.9	-20.4	39.95	54	-14.05	-	-	15	284	Н
4	* 5.061	37.57	PK2	34.3	-26.7	45.17	-	-	74	-28.83	72	247	V
	* 5.058	26.39	MAv1	34.3	-26.7	33.99	54	-20.01	-	-	72	247	V
5	* 3.66	38.79	PK2	33.1	-29.2	42.69	-	-	74	-31.31	136	199	V
	* 3.66	27.49	MAv1	33.1	-29.2	31.39	54	-22.61	-	-	136	199	V

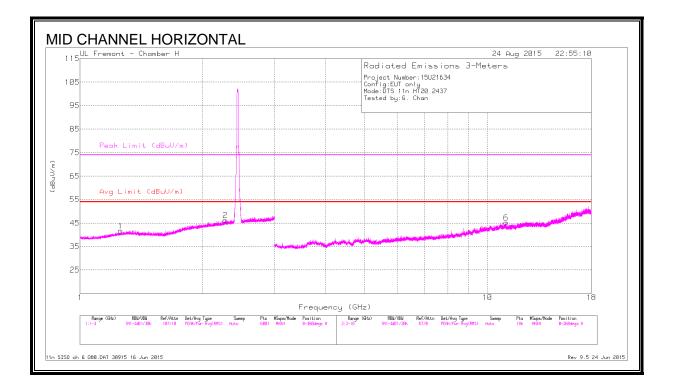
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

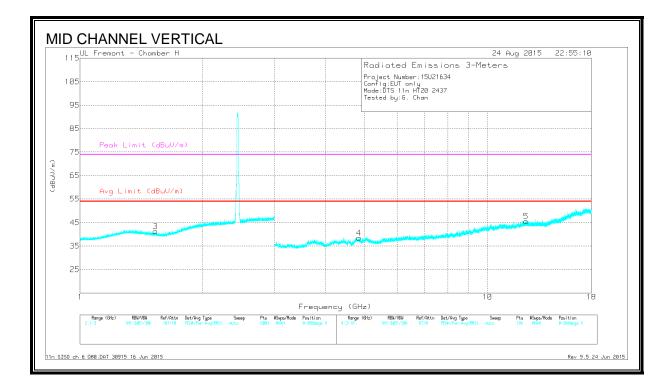
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS MID CHANNEL, CH 6





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Marker	Frequency	Meter	Det	AF T344	Amp/Cbl/	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading (dBuV)		(dB/m)	Fltr/Pad (dB)	Reading (dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
1	* 1.258	42.2	PK2	28.6	-22.3	48.5	-	-	74	-25.5	83	115	Н
	* 1.259	30.49	MAv1	28.6	-22.3	36.79	54	-17.21	-	-	83	115	Н
2	* 2.272	41.78	PK2	31.9	-20.9	52.78	-	-	74	-21.22	146	157	Н
	* 2.274	30.12	MAv1	31.9	-20.9	41.12	54	-12.88	-	-	146	157	Н
3	* 1.532	41.91	PK2	28.2	-21.9	48.21	-	-	74	-25.79	191	177	V
	* 1.53	30.28	MAv1	28.2	-21.9	36.58	54	-17.42	-	-	191	177	V
6	* 11.11	34.35	PK2	38	-21.2	51.15	-	-	74	-22.85	137	153	Н
	* 11.109	22.97	MAv1	38	-21.2	39.77	54	-14.23	-	-	137	153	Н
4	* 4.836	38	PK2	34.1	-27.6	44.5	-	-	74	-29.5	225	140	V
	* 4.834	26.62	MAv1	34.1	-27.6	33.12	54	-20.88	-	-	225	140	V
5	* 12.455	34.98	PK2	39	-21.6	52.38	-	-	74	-21.62	193	201	V
	* 12.454	23.38	MAv1	39	-21.6	40.78	54	-13.22	-	-	193	201	V

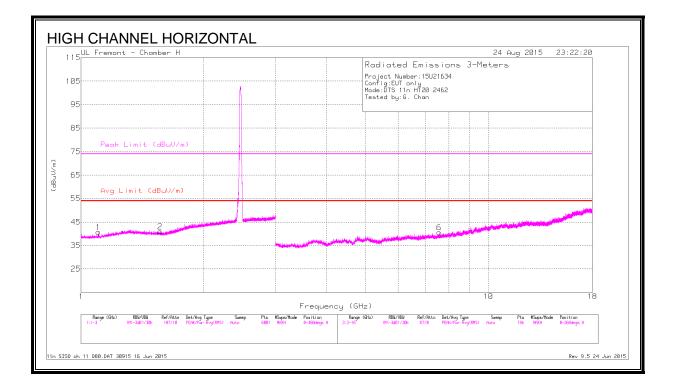
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

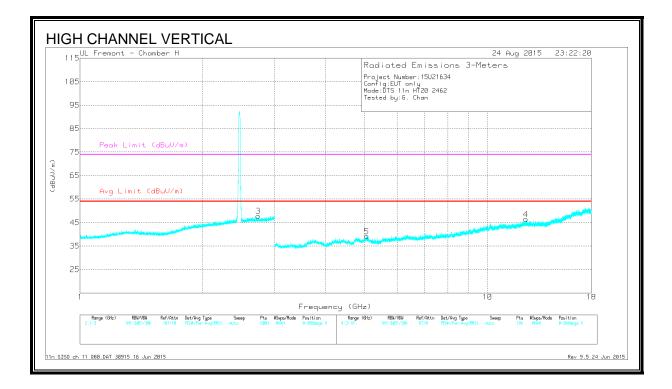
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL, CH 11





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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.102	41.81	PK2	27.2	-22.5	46.51	-	-	74	-27.49	349	261	Н
	* 1.102	30.3	MAv1	27.2	-22.5	35	54	-19	-	-	349	261	Н
2	* 1.564	43.07	PK2	28.1	-21.9	49.27	-	-	74	-24.73	178	227	Н
	* 1.565	30.14	MAv1	28.1	-21.9	36.34	54	-17.66	-	-	178	227	Н
3	* 2.739	42.13	PK2	32.5	-20.5	54.13	-	-	74	-19.87	65	166	V
	* 2.738	30.17	MAv1	32.5	-20.5	42.17	54	-11.83	-	-	65	166	V
6	* 7.574	36.08	PK2	35.6	-24.9	46.78	-	-	74	-27.22	243	100	Н
	* 7.574	24.5	MAv1	35.6	-25	35.1	54	-18.9	-	-	243	100	Н
4	* 12.431	35.32	PK2	39	-21.1	53.22	-	-	74	-20.78	4	233	V
	* 12.429	22.76	MAv1	39	-21.1	40.66	54	-13.34	-	-	4	233	V
5	* 5.056	37.9	PK2	34.3	-26.7	45.5	-	-	74	-28.5	87	170	V
	* 5.056	25.85	MAv1	34.3	-26.7	33.45	54	-20.55	-	-	87	170	V

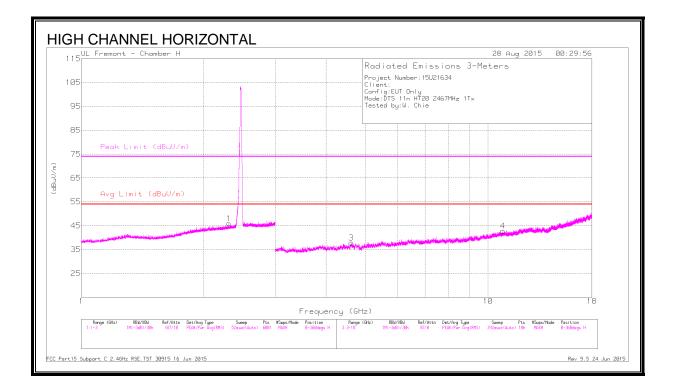
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

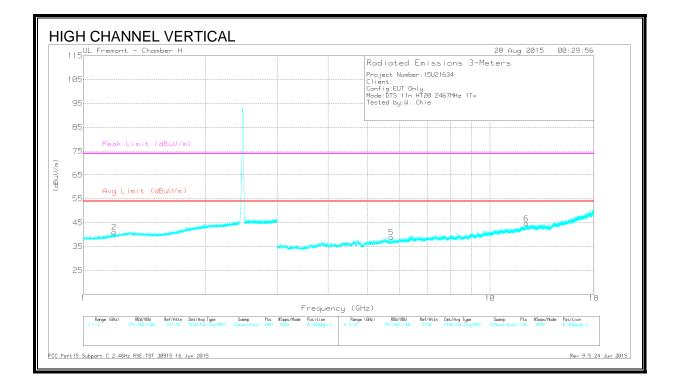
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL, CH 12





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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 1.191	43.74	PK2	28	-24.9	46.84	-	-	74	-27.16	355	146	V
	* 1.191	32.02	MAv1	28	-24.9	35.12	54	-18.88	-	-	355	146	V
3	* 4.615	42.63	PK2	34	-31.2	45.43	-	-	74	-28.57	142	212	Н
	* 4.612	30.31	MAv1	34	-31.2	33.11	54	-20.89	-	-	142	212	Н
4	* 10.874	35.61	PK2	37.8	-24.6	48.81	-	-	74	-25.19	150	268	Н
	* 10.874	24.47	MAv1	37.8	-24.6	37.67	54	-16.33	-	-	150	268	н
6	* 12.295	36.03	PK2	39.1	-24.3	50.83	-	-	74	-23.17	33	218	V
	* 12.296	24.53	MAv1	39.1	-24.3	39.33	54	-14.67	-	-	33	218	V
1	2.305	43.57	PK2	31.8	-23.5	51.87	-	-	-	-	332	120	н
5	5.721	41	PK2	34.8	-30.4	45.4	-	-	-	-	158	252	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

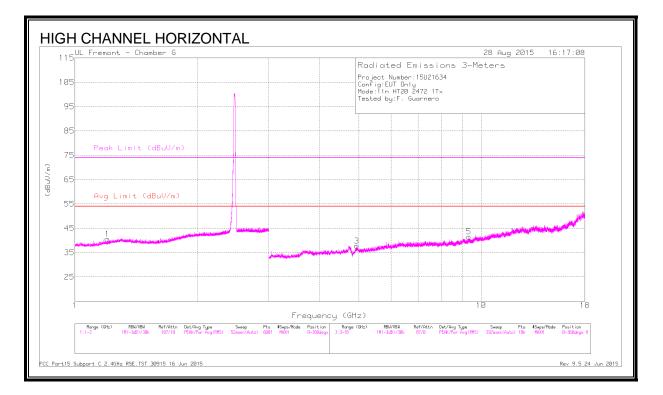
PK2 - KDB558074 Method: Maximum Peak

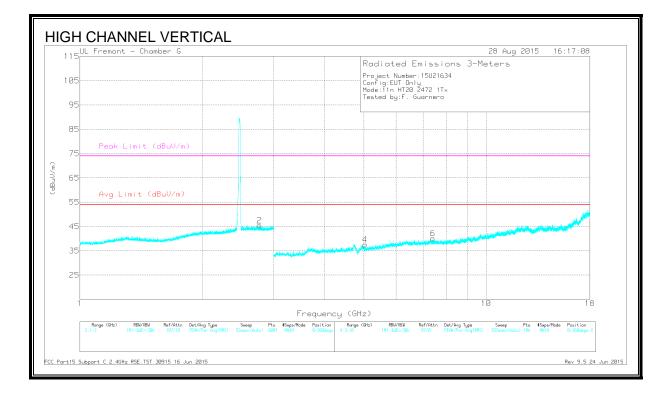
MAv1 - KDB558074 Option 1 Maximum RMS Average

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#### HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL, CH 13





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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.201	44.15	PK2	28.4	-25.7	46.85	-	-	74	-27.15	63	169	Н
	* 1.202	32.56	MAv1	28.4	-25.7	35.26	54	-18.74	-	-	63	169	Н
2	* 2.768	43.92	PK2	32.3	-24.4	51.82	-	-	74	-22.18	189	222	V
	* 2.768	32.25	MAv1	32.3	-24.4	40.15	54	-13.85	-	-	189	222	V
3	* 4.94	41.9	PK2	34.1	-32.6	43.4	-	-	74	-30.6	341	282	Н
	* 4.937	30.75	MAv1	34.1	-32.6	32.25	54	-21.75	-	-	341	282	Н
5	* 9.331	39.36	PK2	36.5	-28.4	47.46	-	-	74	-26.54	243	306	Н
	* 9.33	28.31	MAv1	36.5	-28.4	36.41	54	-17.59	-	-	243	306	Н
4	* 5.037	41.46	PK2	34.2	-32.3	43.36	-	-	74	-30.64	113	193	V
	* 5.037	30.41	MAv1	34.2	-32.3	32.31	54	-21.69	-	-	113	193	V
6	* 7.388	41.3	PK2	35.6	-31	45.9	-	-	74	-28.1	269	356	V
	* 7.39	30.22	MAv1	35.6	-31	34.82	54	-19.18	-	-	269	356	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

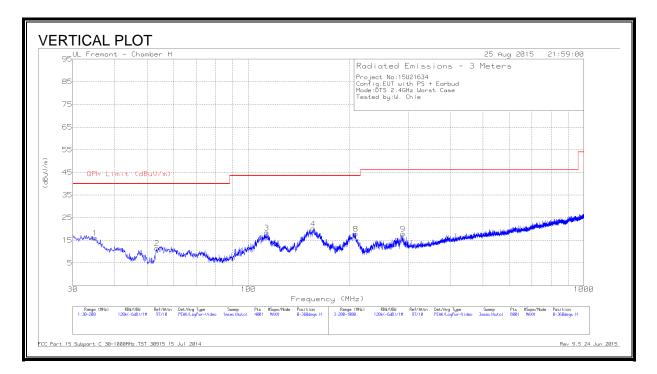
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

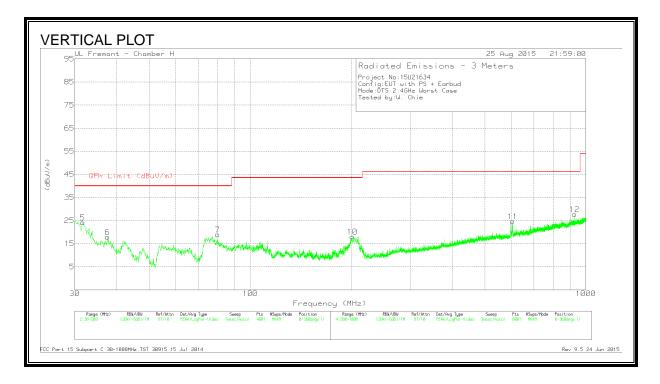
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# 8.3. WORST-CASE BELOW 1 GHz

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



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



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#### DATA

Marker	Frequency	Meter	Det	AF T900	Amp/Cbl (dB)	Corrected	QPk Limit	Margin	Azimuth	Height	Polarity
	(MHz)	Reading		(dB/m)		Reading	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)					
3	* 113.64	35.73	Pk	13.1	-30.4	18.43	43.52	-25.09	0-360	301	Н
6	* 37.565	32.5	Pk	16.6	-31.2	17.9	40	-22.1	0-360	100	V
5	31.7	34.67	Pk	20.8	-31.3	24.17	40	-15.83	0-360	100	V
1	34.9513	28.87	Pk	18.4	-31.2	16.07	40	-23.93	0-360	401	Н
2	53.5025	35.33	Pk	7.2	-31	11.53	40	-28.47	0-360	401	Н
7	79.98	41.79	Pk	7.8	-30.7	18.89	40	-21.11	0-360	100	V
4	156.14	38.14	Pk	12.1	-30	20.24	43.52	-23.28	0-360	201	Н
10	201.5	35.78	Pk	12	-29.7	18.08	43.52	-25.44	0-360	99	V
8	209.3	37.27	Pk	10.4	-29.7	17.97	43.52	-25.55	0-360	201	н
9	288.9	33.83	Pk	13.3	-29.2	17.93	46.02	-28.09	0-360	100	н
11	604.2	33.83	Pk	18.8	-27.9	24.73	46.02	-21.29	0-360	99	V
12	924.8	31.57	Pk	22.3	-26.2	27.67	46.02	-18.35	0-360	201	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

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# 8.4. WORST-CASE 18 to 26 GHz

# SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

	26 Aug 2015 00:45:29
5UL EMC	RF Emissions
5	Project Number:15U21634 Client: Configuration:EUT Only Mode:2.4GHz Worst Case Tested by / SN:W. Chie
5. Peak Limit (dBuV/m)	
5	
_ Avg Limit (dBuV/m) 5	
5 5 <sup>11</sup> MMM-Marinething	and and and an and an and an and an and and
5	
5	
5	26 Frequency (GHz) Sweep Pts Kisps/Node Label Range (Btz) RBU/18U Ref/Rtin Det/Ring Type Sweep Pts Kisps/Node Label

5 UL EM	0	26 Aug 2015 00:45:29
		RF Emissions
5		Project Number:15U21634 Client: Configuration:EUT Only Mode:2.46Hz Worst Case
5		Tested by / SN:W. Chie
Peak	Limit (dBuV/m)	
5		
	_imit (dBuV/m)	
5	4	and the second and the se
5	multer and we do not the second	har fan de fan general fan de fan
5		
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1		
18		20
		Frequency (GHz)
	(GHz) RBW/VBN Ref/Attn Det/Avg Typ	- Sweep Pts #Swps/Nade Label Range (GHz) RBW/UBU Ref/Attn Det/Avg Typ Sweep Pts #Swps/Nade Label 2:18-25 1M(-348)/3M 97/8 PEAK/- 168wsec(Auto) 1282 MAIH Vertical

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#### HORIZONTAL & VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	21.024	41.9	Pk	32.5	-25.4	-9.5	39.5	54	-14.5	74	-34.5
2	21.277	41.77	Pk	33.2	-25.3	-9.5	40.16	54	-13.83	74	-33.83
3	23.908	43.33	Pk	33.4	-23.9	-9.5	43.33	54	-10.66	74	-30.66
4	18.58	41.53	Pk	32.5	-25.2	-9.5	39.33	54	-14.66	74	-34.66
5	23.982	43.67	Pk	33.3	-24.3	-9.5	43.16	54	-10.83	74	-30.83
6	25.427	44.67	Pk	33.8	-24.3	-9.5	44.66	54	-9.33	74	-29.33

Pk - Peak detector

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# 9. AC POWER LINE CONDUCTED EMISSIONS

# LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

\*Decreases with the logarithm of the frequency.

# TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

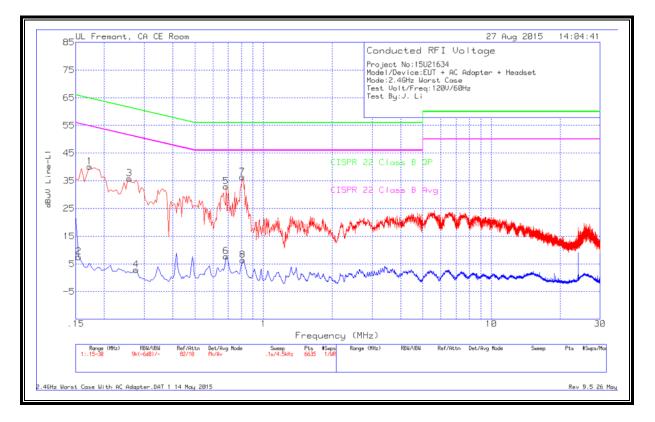
Line conducted data is recorded for both NEUTRAL and HOT lines.

**RESULTS:** 

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# 9.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE





#### LINE 1 RESULTS

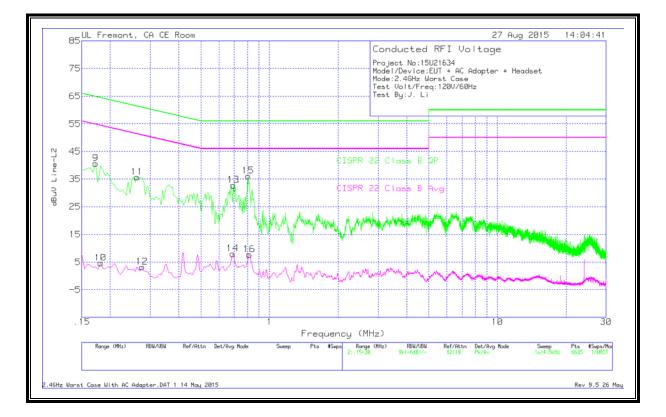
Marker	Frequency	Meter	Det	T24 IL L1	LC Cables	Corrected	CISPR 22	Margin	CISPR 22	Margin
	(MHz)	Reading			1&3	Reading	Class B QP	(dB)	Class B	(dB)
		(dBuV)				dBuV			Avg	
1	.1725	38.97	Pk	1.1	0	40.07	64.84	-24.77	-	-
2	.1545	6.23	Av	1.3	0	7.53	-	-	55.75	-48.22
3	.258	35.14	Pk	.7	0	35.84	61.5	-25.66	-	-
4	.276	2.26	Av	.6	0	2.86	-	-	50.94	-48.08
5	.6855	32.61	Pk	.3	0	32.91	56	-23.09	-	-
6	.6855	7.42	Av	.3	0	7.72	-	-	46	-38.28
7	.807	36.06	Pk	.3	0	36.36	56	-19.64	-	-
8	.8115	6.06	Av	.3	0	6.36	-	-	46	-39.64

Pk - Peak detector

Av - Average detection

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#### <u>LINE 2</u>



#### LINE 2 RESULTS

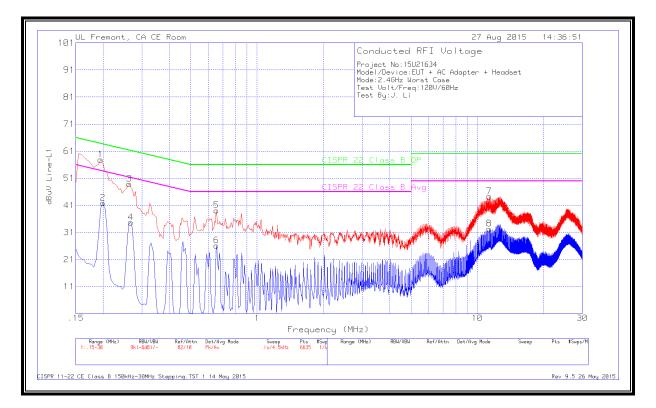
Marker	Frequency	Meter	Det	T24 IL L2	LC Cables	Corrected	CISPR 22	Margin	CISPR 22	Margin
	(MHz)	Reading			2&3	Reading	Class B QP	(dB)	Class B	(dB)
		(dBuV)				dBuV			Avg	
9	.1725	39.42	Pk	1.2	0	40.62	64.84	-24.22	-	-
10	.1815	3.42	Av	1.2	0	4.62	-	-	54.42	-49.8
11	.2625	34.97	Pk	.7	0	35.67	61.35	-25.68	-	-
12	.276	2.51	Av	.7	0	3.21	-	-	50.94	-47.73
13	.6945	32.44	Pk	.3	0	32.74	56	-23.26	-	-
14	.69	7.69	Av	.3	0	7.99	-	-	46	-38.01
15	.807	35.79	Pk	.3	0	36.09	56	-19.91	-	-
16	.816	7.38	Av	.3	0	7.68	-	-	46	-38.32

Pk - Peak detector

Av - Average detection

# 9.2. EUT POWERED BY HOST PC VIA USB CABLE





#### LINE 1 RESULTS

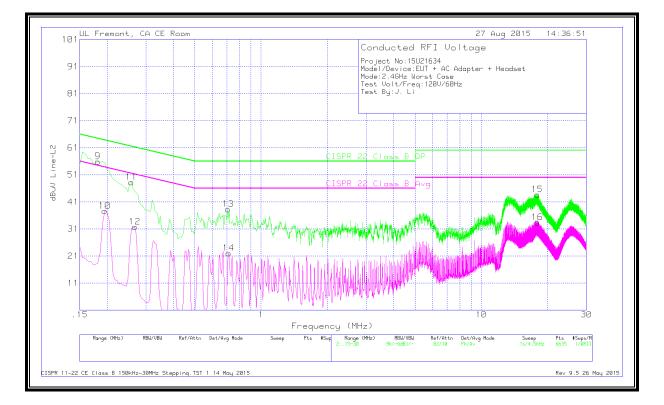
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.195	56.86	Pk	1	0	57.86	63.82	-5.96	-	-
2	.1995	40.98	Av	.9	0	41.88	-	-	53.63	-11.75
3	.2625	48.23	Ρk	.7	0	48.93	61.35	-12.42	-	-
4	.267	34.07	Av	.6	0	34.67	-	-	51.21	-16.54
5	.654	38.79	Ρk	.3	0	39.09	56	-16.91	-	-
6	.654	25.83	Av	.3	0	26.13	-	-	46	-19.87
7	11.319	43.86	Ρk	.2	.2	44.26	60	-15.74	-	-
8	11.319	31.89	Av	.2	.2	32.29	-	-	50	-17.71

Pk - Peak detector

Av - Average detection

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#### LINE 2



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
9	.1815	54.66	Pk	1.2	0	55.86	64.42	-8.56	-	-
10	.195	36.59	Av	1	0	37.59	-	-	53.82	-16.23
11	.258	47.57	Pk	.7	0	48.27	61.5	-13.23	-	-
12	.267	31.05	Av	.7	0	31.75	-	-	51.21	-19.46
13	.708	37.97	Pk	.3	0	38.27	56	-17.73	-	-
14	.7125	21.73	Av	.3	0	22.03	-	-	46	-23.97
15	17.961	43.16	Pk	.3	.2	43.66	60	-16.34	-	-
16	17.961	32.88	Av	.3	.2	33.38	-	-	50	-16.62

Pk - Peak detector

Av - Average detection