

CERTIFICATION TEST REPORT

Report Number. : 12097277-E5V2

- Applicant : SONY MOBILE COMMUNICATIONS INC. 4-12-3 HIGASHI-SHINAGAWA, SHINAGAWA-KU TOKYO, 140-0002, JAPAN
 - FCC ID : PY7-72474U
- EUT Description : GSM/WCDMA/LTE PHONE with BT, DTS/UNII a/b/g/n/ac & NFC
- **Test Standard(s)** : FCC 47 CFR PART 15 SUBPART E (EXCEPT DFS)

Date Of Issue:

January 29, 2018

Prepared by:

UL Verification Services Inc. 47173 Benicia Street Fremont, CA 94538, U.S.A. TEL: (510) 771-1000 FAX: (510) 661-0888



.

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/24/18	Initial Issue	Dan Coronia
V2	01/29/18	Updated Section 5.3, 9.4.1, 9.4.2 & 9.8.3	Kiya Kedida

UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Page 2 of 381

TABLE OF CONTENTS

1.	Α	ATTESTATION OF TEST RESULTS	6
2.	т	TEST METHODOLOGY	7
3.	F.	FACILITIES AND ACCREDITATION	7
4.	С	CALIBRATION AND UNCERTAINTY	7
4	l.1.	1. MEASURING INSTRUMENT CALIBRATION	7
4	¹ .2.	2. SAMPLE CALCULATION	7
4	1.3.	3. MEASUREMENT UNCERTAINTY	8
5.	Е	EQUIPMENT UNDER TEST	9
5	5.1.	1. DESCRIPTION OF EUT	9
5	5.2.	2. MAXIMUM OUTPUT POWER	9
5	5.3.	B. DESCRIPTION OF AVAILABLE ANTENNAS	10
5	5.4.	4. SOFTWARE AND FIRMWARE	10
5	5.5.	5. LIST OF TEST REDUCTION AND MODES	10
5	5.6.	6. WORST-CASE CONFIGURATION AND MODE	11
5	5.7.	7. DESCRIPTION OF TEST SETUP	12
6.	Т	TEST AND MEASUREMENT EQUIPMENT	15
6. 7.		TEST AND MEASUREMENT EQUIPMENT	
•••	Μ	MEASUREMENT METHODS	16
7. 8.	Μ	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS	16 17
7. 8.	М О 3.1.	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS	16 17 17
7. 8. 8	М О 3.1.	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS I. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS	16 17 17 20
7. 8. 8	M O S. 1. A D. 1. 91	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS I. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS I. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND 9.1.1. 26 dB BANDWIDTH	16 17 17 20 20
7. 8. 8	M O B. 1. D. 1. 9 9	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS I. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS I. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND	16 17 17 20 20 20 20 24
7. 8. 9. g	M O B. 1. D. 1. 9 9	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS 1. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS 1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND 9.1.1. 26 dB BANDWIDTH 9.1.2. 99% BANDWIDTH 9.1.3. OUTPUT POWER AND PPSD	16 17 17 20 20 24 28
7. 8. 9. g	M O 3.1. 9. 9. 9. 9. 9. 9.	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS 1. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS 1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND 9.1.1. 26 dB BANDWIDTH 9.1.2. 99% BANDWIDTH 9.1.3. OUTPUT POWER AND PPSD 2. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND 9.2.1. 26 dB BANDWIDTH	16 17 20 20 20 24 28 34 34
7. 8. 9. g	M O 3.1. 9. 9. 9. 9. 9. 9. 9. 9.	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS I. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS I. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND 9.1.1. 26 dB BANDWIDTH 9.1.2. 99% BANDWIDTH 9.1.3. OUTPUT POWER AND PPSD 2. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND	16 17 20 20 20 24 28 28 34 34 34 38
7. 8. 9. 9	M O 3.1. 9. 9. 9. 9. 9. 9. 9. 9.	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS. 1. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS 1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND 91.1. 26 dB BANDWIDTH 99% BANDWIDTH 91.3. OUTPUT POWER AND PPSD 2. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND. 9.2.1. 26 dB BANDWIDTH 9.2.2. 99% BANDWIDTH 9.2.3. OUTPUT POWER AND PPSD 3. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND.	16 17 17 20 20 20 24 28 28 24 34 34 34 34 42 48
7. 8. 9. 9	N O A A D 1 2 3 9 9 9 9 9 9 9 9 9 9	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS. 1. ON TIME AND DUTY CYCLE. ANTENNA PORT TEST RESULTS 1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND	16 17 17 20 20 24 28 24 28 24 34 34 38 42 48 48
7. 8. 9. 9	N O B . 1. D D D D D D D D D D	MEASUREMENT METHODS ON TIME, DUTY CYCLE AND MEASUREMENT METHODS. 1. ON TIME AND DUTY CYCLE ANTENNA PORT TEST RESULTS 1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND 91.1. 26 dB BANDWIDTH 99% BANDWIDTH 91.3. OUTPUT POWER AND PPSD 2. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND. 9.2.1. 26 dB BANDWIDTH 9.2.2. 99% BANDWIDTH 9.2.3. OUTPUT POWER AND PPSD 3. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND.	16 17 17 20 20 20 24 28 28 24 28 34 34 38 42 48 48 48 48 51

9.4.1. 2	HT80 2TX CDD MIMO MODE IN THE 5.2GHz BAND 26 dB BANDWIDTH	.59
9.4.3. C	99% BANDWIDTH DUTPUT POWER AND PPSD	.63
9.5.1. 2 9.5.2. 9	27X CDD MIMO MODE IN THE 5.3GHz BAND 26 dB BANDWIDTH 99% BANDWIDTH	.67 .71
9.6. 11n F	OUTPUT POWER AND PPSD 1T20 2TX CDD MIMO MODE IN THE 5.3GHz BAND	.81
9.6.2. 9	26 dB BANDWIDTH 99% BANDWIDTH DUTPUT POWER AND PPSD	.85
9.7.1. 2	HT40 2TX CDD MIMO MODE IN THE 5.3GHz BAND 26 dB BANDWIDTH 99% BANDWIDTH	.95
9.7.3. C	DUTPUT POWER AND PPSD1	01
9.8.1. 2 9.8.2. 9	HT80 2TX CDD MIMO MODE IN THE 5.3GHz BAND	06 08
9.9. 11a 2 9.9.1. 2 9.9.2. 9	2TX CDD MIMO MODE IN THE 5.6GHz BAND	13 13 19
9.10. 111 9.10.1. 9.10.2. 9.10.3.	n HT20 2TX CDD MIMO MODE IN THE 5.6GHz BAND	32 38
9.11. 111 9.11.1. 9.11.2. 9.11.3.	n HT40 2TX CDD MIMO MODE IN THE 5.6GHz BAND	51 57
9.12. 11a 9.12.1. 9.12.2. 9.12.3.	ac HT80 2TX CDD MIMO MODE IN THE 5.6GHz BAND	70 74
9.13. 11a 9.13.1. 9.13.2. 9.13.3.	a 2TX CDD MIMO MODE IN THE 5.8GHz BAND	83 88
9.14. 111 9.14.1. 9.14.2. 9.14.3.	n HT20 2TX CDD MIMO MODE IN THE 5.8GHz BAND	97 202
9.15. 111 9.15.1. 9.15.2.	n HT40 2TX CDD MIMO MODE IN THE 5.8GHz BAND	211

Page 4 of 381

REPORT NO: 12097277-E5V2 FCC ID: PY7-72474U

10010.111-1	124740	
9.15.3.	OUTPUT POWER AND PSD	218
9.16. 1	1ac HT80 2TX CDD MIMO MODE IN THE 5.8GHz BAND	
9.16.1.	6 dB BANDWIDTH	222
9.16.2.	99% BANDWIDTH	
9.16.3.	OUTPUT POWER AND PSD	
10. RADIA	ATED TEST RESULTS	230
10.1. LI	IMITS AND PROCEDURE	
10.1.1.	11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND	231
10.1.2.	11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND	239
10.1.3.	11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND	
10.1.4.	11ac HT80 2TX CDD MIMO MODE IN THE 5.2GHz BAND	
10.1.5.	11a 2TX CDD MIMO MODE IN THE 5.3GHz BAND	-
10.1.6.	11n HT20 2TX CDD MIMO MODE IN THE 5.3GHz BAND	
10.1.7.	11n HT40 2TX CDD MIMO MODE IN THE 5.3GHz BAND	
10.1.8.	11ac HT80 2TX CDD MIMO MODE IN THE 5.3GHz BAND	
10.1.9.	11a 2TX CDD MIMO MODE IN THE 5.6GHz BAND	
10.1.10.	11n HT20 2TX CDD MIMO MODE IN THE 5.6GHz BAND	
10.1.11.	11n HT40 2TX CDD MIMO MODE IN THE 5.6GHz BAND	
10.1.12.	11ac HT80 2TX CDD MIMO MODE IN THE 5.6GHz BAND	
10.1.13.	11a 2TX CDD MIMO MODE IN THE 5.8GHz BAND	
10.1.14.	11n HT20 2TX CDD MIMO MODE IN THE 5.8GHz BAND	
10.1.15.	11n HT40 2TX CDD MIMO MODE IN THE 5.8GHz BAND	
10.1.16.	11ac HT80 2TX CDD MIMO MODE IN THE 5.8GHz BAND	
10.2. W	ORST CASE BELOW 30 MHz	
10.3. W	/ORST-CASE BELOW 1 GHz	
10.4. W	/ORST-CASE 18 to 26 GHz	
10.5. W	/ORST-CASE 26 to 40 GHz	
11. AC PC	OWER LINE CONDUCTED EMISSIONS	377
12. SETU	P PHOTOS	

Page 5 of 381

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SONY MOBILE COMMUNICATIONS INC. 4-12-3 HIGASHI-SHINAGAWA, SHINAGAWA-KU TOKYO, 140-0002, JAPAN
EUT DESCRIPTION:	GSM/WCDMA/LTE PHONE with BT, DTS/UNII a/b/g/n/ac, & NFC
SERIAL NUMBER:	BH90007VAY & BH900064AY (CONDUCTED) BH9000A9AY & BH90009SAY (RADIATED)
DATE TESTED:	DECEMBER 20, 2017 – JANUARY 12, 2018

APPLICABLE STANDARDS		
STANDARD	TEST RESULTS	
CFR 47 Part 15 Subpart E (EXCEPT DFS)	Complies	

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:

Dan Coronia Operations Leader / Project Engineer UL Verification Services Inc.

Prepared By:

allet In

Clifford Susa Project Engineer UL Verification Services Inc.

Page 6 of 381

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC KDB 662911 D01 v02r01, FCC KDB 789033 D02 v02r01, ANSI C63.10-2013.

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(ISED: 2324B-1)	Chamber D(ISED: 22541-1)
Chamber B(ISED: 2324B-2)	Chamber E(ISED: 22541-2)
Chamber C(ISED: 2324B-3)	Chamber F(ISED: 22541-3)
	Chamber G(ISED: 22541-4)
	Chamber H(ISED: 22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

Chambers A through C are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

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

Page 7 of 381

4.3. MEASUREMENT UNCERTAINTY

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

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

Parameter	Uncertainty
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

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.

Page 8 of 381

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, & NFC.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
E180 E240	802.11a CDD 2TX	13.86	24.32
5180 - 5240	802.11n HT20 CDD 2TX	13.88	24.43
5190 - 5230	802.11n HT40 CDD 2TX	14.07	25.53
5210	802.11ac VHT80 CDD 2TX	13.91	24.60

5.3GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5200 5220	802.11a CDD 2TX	14.45	27.86
5260 - 5320	802.11n HT20 CDD 2TX	14.24	26.55
5270 - 5310	802.11n HT40 CDD 2TX	14.11	25.76
5290	802.11a c VHT80 CDD 2TX	13.85	24.27

5.6GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5500 - 5720	802.11a CDD 2TX	12.59	18.16
5500 - 5720	802.11n HT20 CDD 2TX	12.74	18.79
5510 - 5710	802.11n HT40 CDD 2TX	12.77	18.92
5530-5690	802.11ac VHT80 CDD 2TX	12.29	16.94

5.8GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a CDD 2TX	13.34	21.58
5745 - 5825	802.11n HT20 CDD 2TX	11.19	13.15
5755 - 5795	802.11n HT40 CDD 2TX	11.08	12.82
5775	802.11ac VHT80 CDD 2TX	11.13	12.97

Page 9 of 381

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes Loop Type antennas for Chain 0 and Monopole antennas for Chain 1, with the following maximum gains:

	Peak Antenna Gain (dBi)		
Frequency (GHz)	Main (Chain 0)	Sub (Chain 1)	
5180-5320	-2.10	-4.30	
5500-5700	-0.80	-5.40	
5725-5850	-1.40	-5.10	

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was SONY, s_atp_1_00139_B_10_5. The test utility software used during testing was Tera Term Ver 4.79.

5.5. LIST OF TEST REDUCTION AND MODES

Antenna port &	Radiated Testing
Mode	Covered by
802.11a Legacy	802.11a 2TX CDD
802.11HT20 2TX STBC	802.11n HT20 2TX CDD
802.11H120 21X 31BC	802.11n HT20 2TX CDD
802.11ac VHT20 2TX STBC	802.11n HT20 2TX CDD
802.11ac VH120 21X 31BC	802.11n HT20 2TX CDD
802.11n HT40 2TX STBC	802.11n HT40 2TX CDD
802.1111 H140 21X 31BC	802.11n HT40 2TX CDD
802.11ac VHT40 2TX STBC	802.11n HT40 2TX CDD
002.110C V 1140 21X 31BC	802.11n HT40 2TX CDD
802.11ac VHT80 2TX STBC	802.11ac VHT80 2TX CDD
002.11dt V 1100 21X 31DC	802.11ac VHT80 2TX CDD

Page 10 of 381

5.6. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30MHz, 1GHz, above 18GHz, 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, using the following two configurations, AC/DC Adapter and headphone. It was determined that X-Axis with only AC/DC Adapter was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X-Axis with AC/DC Adapter orientation.

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

802.11a mode: 6 Mbps 802.11n HT20 mode: 13 Mbps (MCS8) 802.11n HT40 mode: 27 Mbps (MCS8) 802.11ac VHT80 mode: 58.5 Mbps (MCS0)

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages and have the same power settings.

The simultaneous mode (SISO 2.4GHz Chain 0 and 5GHz chain 1) was checked and stand-alone (MIMO) 2.4 GHz / 5GHz remain worst case.

NOTE: SISO mode is covered by MIMO mode due to same maximum tune-up limit (power).

Page 11 of 381

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List						
Description	Manufacturer	Model	Serial Number	FCC ID		
Laptop	Lenovo	20B7S0A200	PC015REW	NA		
AC Adapter	SONY	1309-8864.1	VB17W46601037	NA		
DC Power Supply	Ametek	XT 15-4	T463	NA		

I/O CABLES (CONDUCTED TEST)

	I/O Cable List							
Cable	Port	# of identical	Connector	Cable Type	Cable	Remarks		
No		ports	Туре		Length (m)			
1	Antenna	1	RF	Shielded	0.2	To spectrum Analyzer		
2	USB	1	USB	Shielded	1	N/A		
3	DC	1	DC	Shielded	0.3	N/A		

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

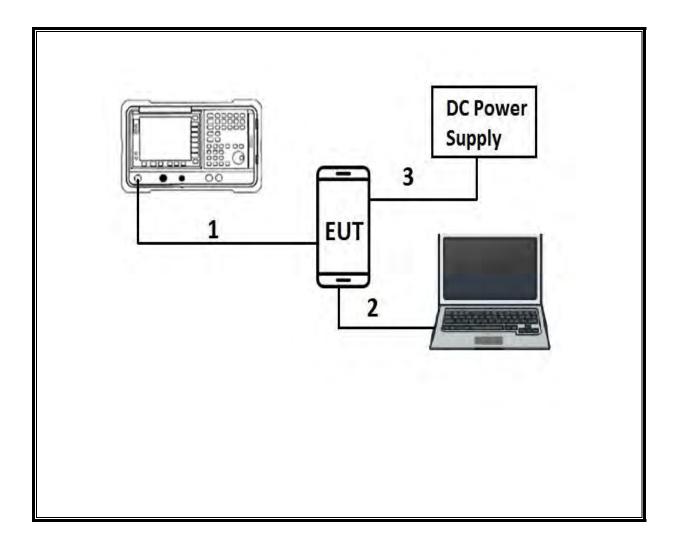
	I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks	
1	USB	1	USB	Shielded	3	N/A	

Page 12 of 381

REPORT NO: 12097277-E5V2 FCC ID: PY7-72474U

TEST SETUP

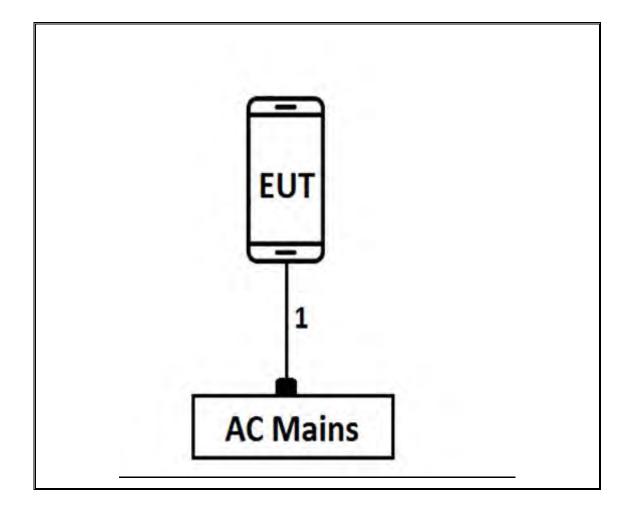
CONDCUTED TEST SETUP DIAGRAM



Page 13 of 381

TEST SETUP

RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM



Page 14 of 381

6. TEST AND MEASUREMENT EQUIPMENT

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

	TEST EQUIPMENT LIS	T		
Description	Manufacturer	Model	ID Num	Cal Due
Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB Pad	Sunol Sciences Corp.	JB3	T899	06/15/2018
Antenna, Active Loop 9kHz-30MHz	Com-Power Corp.	AL-130R	T1866	10/10/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T711	01/30/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T346	03/28/18
Antenna, Horn 18-26.5GHz	ARA	MWH-1826	T89	01/04/2018
Antenna, Horn 26.5 - 40GHz	ARA	MWH-2640	T90	08/25/2018
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1268	06/15/2018
Power Sensor, P – series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1223	03/29/2018
Amplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25- S-42	T742	11/29/2018
Amplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25- S-42	T1131	06/29/2018
Pre Amplifier, 1-26.5GHz	Agilent	8449B	T404	7/23/2018
Pre-Amplifier, 26-40 GHz	MITEQ	TTA2640-35-HG	T1864	9/21/2018
Amplifier, 10kHz-1GHz	Agilent (Keysight) Technologies	8447D	T10	02/15/2018
Amplifier, 1-8GHz	MITEQ	AMF-4D-01000800- 30-29P	T1169	6/29/2018
Filter, LPF 5.0GHz	MICRO-TRONICS	LPS17541	T422	11/29/2018
Filter, LPF 5.0GHz	MICRO-TRONICS	LPS17541	T420	6/29/2018
Filter, High Pass 6.0GHz	MICRO-TRONICS	HPS17542	T423	11/29/2018
Filter, High Pass 6.0GHz	MICRO-TRONICS	HPS17542	T424	6/29/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1210	07/17/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T341	11/12/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T906	02/14/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1466	04/11/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T907	01/23/2018
Test Receiver, EMI, 10Hz-7GHz	Rhode&Schwarz	ESR	T1436	01/06/2018
LISN	FISCHER	FCC-LISN-50/250- 25-2-01	T1310	01/17/2018

Test Software List					
Description	Manufacturer	Model	Version		
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016		
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015		
Antenna Port Software	UL	UL RF	Ver 7.7, Dec 14, 2017		

NOTE: *testing is completed before equipment calibration expiration date.

Page 15 of 381

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 789033 D02 v02r01, Section B.

6 dB Emission BW: KDB 789033 D02 v02r01, Section C.2.

<u>26 dB Emission BW</u>: KDB 789033 D02 v02r01, Section C.1.

<u>99% Occupied BW</u>: KDB 789033 D02 v02r01, Section D.

Conducted Output Power: KDB 789033 D02 v02r01, Section E.3.b (Method PM-G)

Power Spectral Density: KDB 789033 D02 v02r01, Section F

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Page 16 of 381

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

8.1. ON TIME AND DUTY CYCLE

<u>LIMITS</u>

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

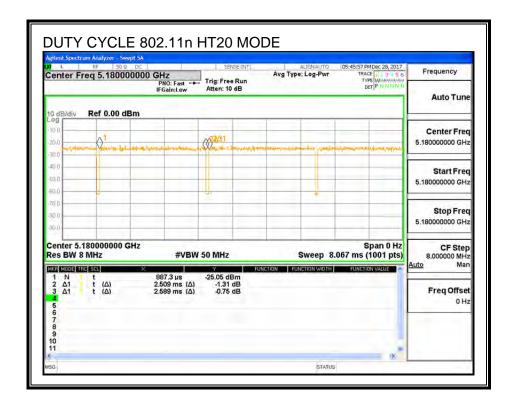
RESULTS

Mode	ON Time	Period	Duty Cycle	Duty	Duty Cycle	1/T
	В		x	Cycle	Correction Factor	Minimum VBW
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)
802.11a	2.020	2.059	0.981	98.1%	0.00	0.010
802.11n HT20	2.509	2.589	0.969	96.9%	0.14	0.399
802.11n HT40	1.194	1.334	0.895	89.5%	0.48	0.838
802.11ac VHT80	0.580	0.686	0.845	84.5%	0.73	1.724

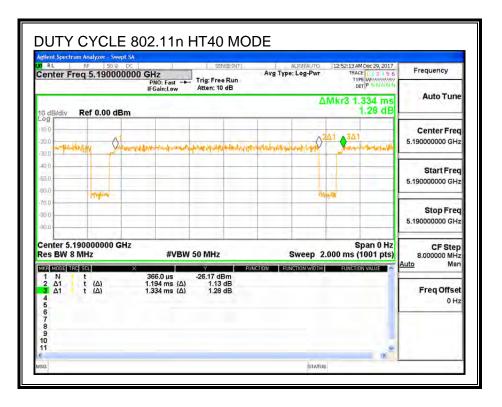
Page 17 of 381

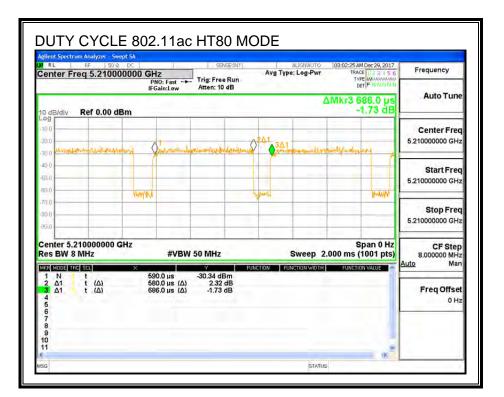
DUTY CYCLE PLOTS

Frequency	03:19:28 PM Dec 26, 2017 TRACE 3 5 6 TYPE WWWWWW	ALIGN AUTO Type: Log-Pwr	Run	SEN Trig: Free Atten: 10	GHz PNO: Fast ↔	50 Ω DC 180000000	RF req 5	s ter F	
Auto Tune	Mkr3 2.059 ms -0.02 dB	Δ		Atten. Iv	IFGain:Low	0.00 dBm	Ref	B/div	di
Center Free			341	N				1	g
5.180000000 GH:	an managerative have	re-allowedges	Harphonething	and south	distantin alles		and part	V.V.	0.0
Start Free 5.180000000 GH:									0.0
Stop Fred 5.18000000 GH:									0.0 0.0
CF Step 8.000000 MH	Span 0 Hz 400 ms (1001 pts)	Sweep 4.		50 MHz	#VBW :	0000 GHz	18000 MHz		
<u>Auto</u> Mar	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	Y	120.0	х	IC SCL		
Freq Offse 0 H	E.		в	-16.71 dE -0.16 -0.02	132.0 μs 2.020 ms (Δ) 2.059 ms (Δ)	Δ) Δ)		Ν Δ1 Δ1	4
Scale Type									6 7 8 9



Page 18 of 381





Page 19 of 381

9. ANTENNA PORT TEST RESULTS

9.1. 11a 2TX CDD MIMO MODE IN THE 5.2GHz BAND

9.1.1. 26 dB BANDWIDTH

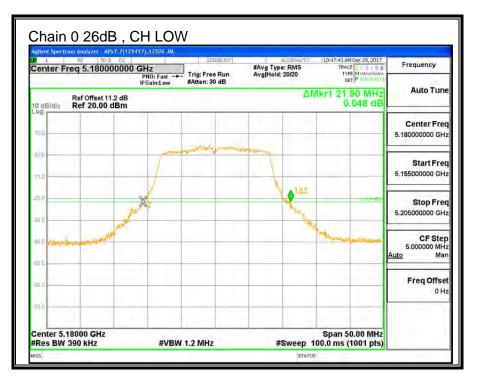
LIMITS

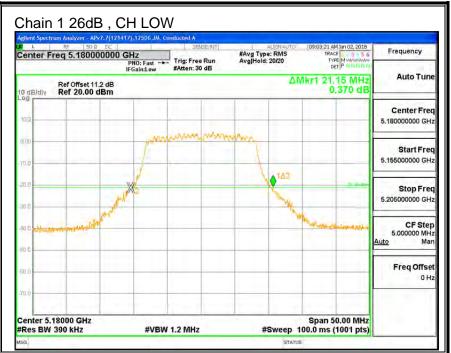
None; for reporting purposes only.

RESULTS

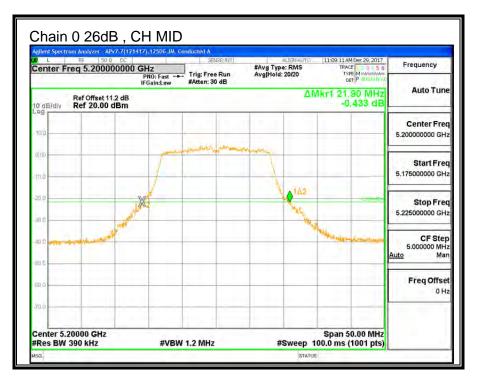
Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	21.90	21.15
Mid	5200	21.90	20.75
High	5240	21.35	20.85

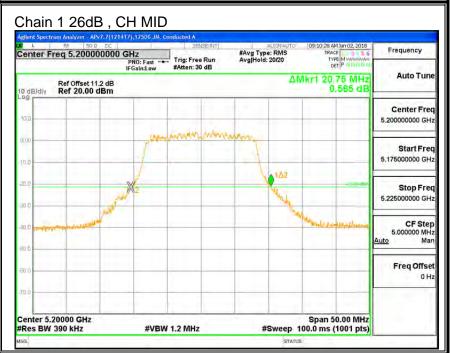
Page 20 of 381



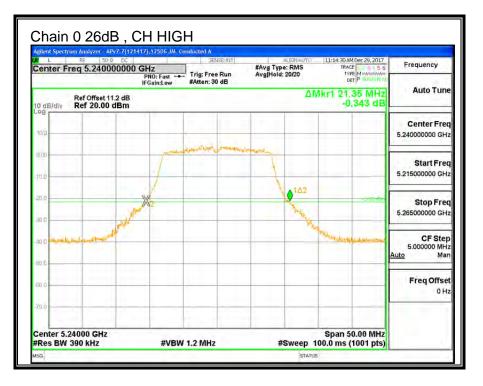


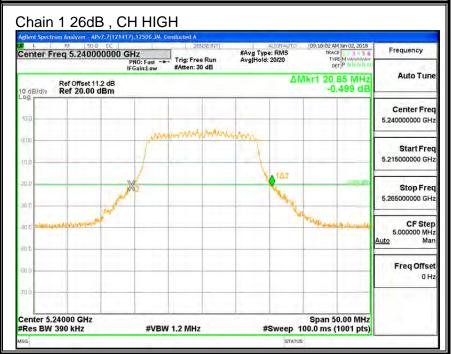
Page 21 of 381





Page 22 of 381





Page 23 of 381

9.1.2. 99% BANDWIDTH

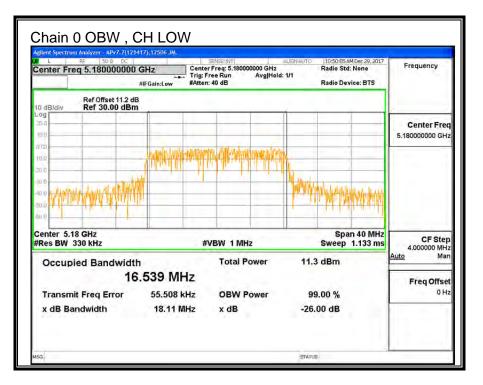
LIMITS

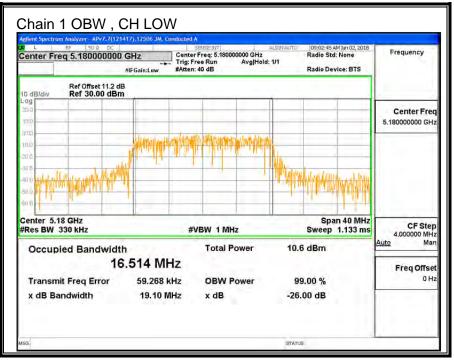
None; for reporting purposes only.

RESULTS

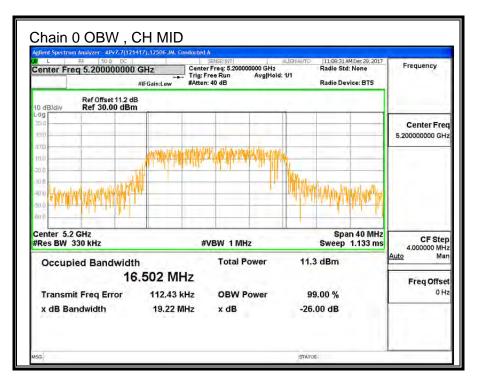
Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	16.539	16.514
Mid	5200	16.502	16.498
High	5240	16.429	16.546

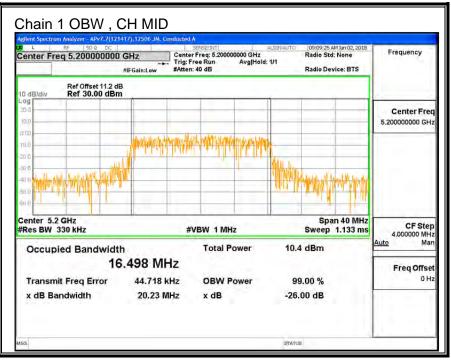
Page 24 of 381



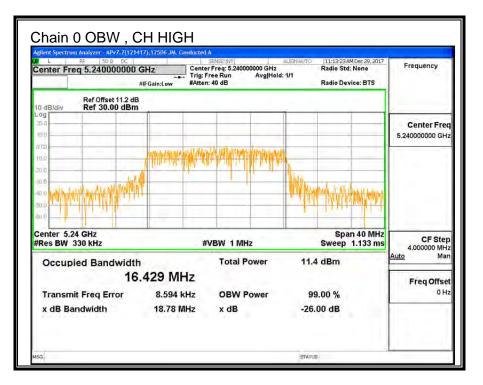


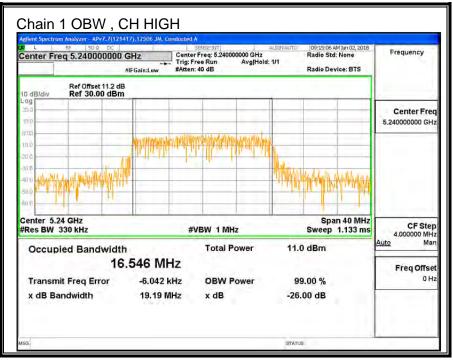
Page 25 of 381





Page 26 of 381





Page 27 of 381

9.1.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 28 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 29 of 381

RESULTS

יםו.	12506 IM	Data	01/00/10	
ID:	12506 JM	Date:	01/08/18	

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5180	21.15	16.514	-3.06	-0.12
Mid	5200	20.75	16.498	-3.06	-0.12
High	5240	20.85	16.429	-3.06	-0.12

Limits

Channel	Frequency	FCC Power Limit	IC EIRP Limit	Max IC Power	Power Limit	FCC PPSD Limit	IC eirp PSD Limit	PPSD Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5180	24.00	22.18	25.24	24.00	11.00	10.00	10.12
Mid	5200	24.00	22.17	25.23	24.00	11.00	10.00	10.12
High	5240	24.00	22.16	25.22	24.00	11.00	10.00	10.12

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

Output Power Results

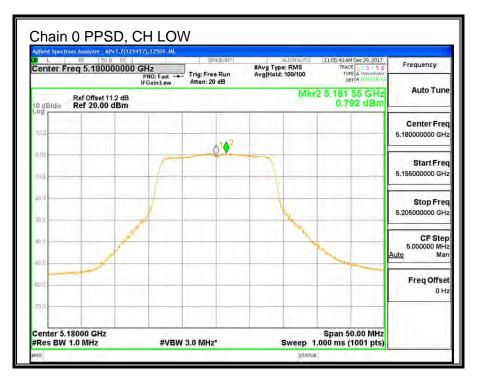
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	11.42	10.20	13.86	24.00	-10.14
Mid	5200	11.36	10.17	13.82	24.00	-10.18
High	5240	11.05	10.61	13.85	24.00	-10.15

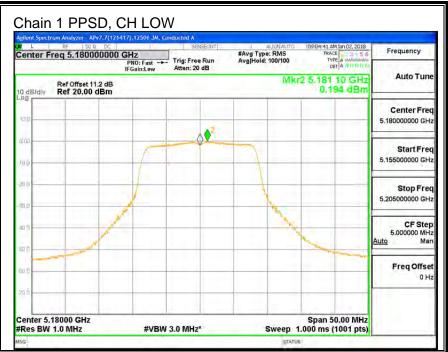
PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	0.792	0.194	3.51	10.12	-6.61
Mid	5200	1.016	-0.153	3.48	10.12	-6.64
High	5240	0.836	0.447	3.66	10.12	-6.46

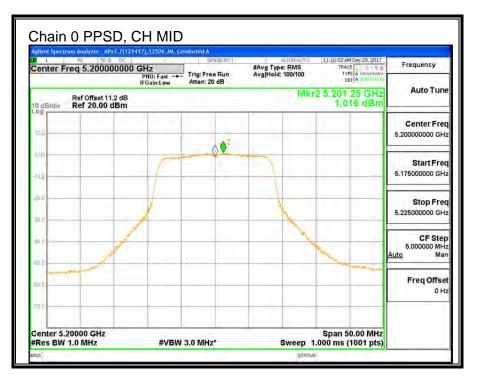
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

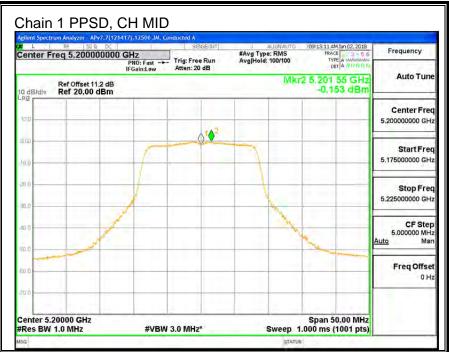
Page 30 of 381



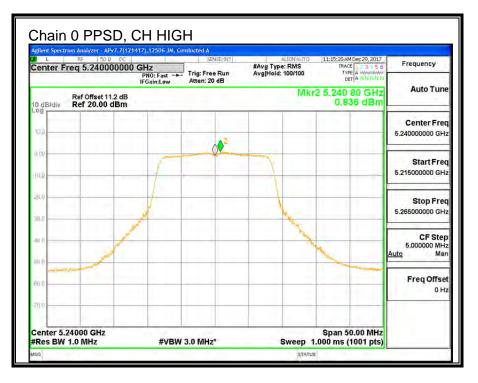


Page 31 of 381





Page 32 of 381





Page 33 of 381

9.2. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND

9.2.1. 26 dB BANDWIDTH

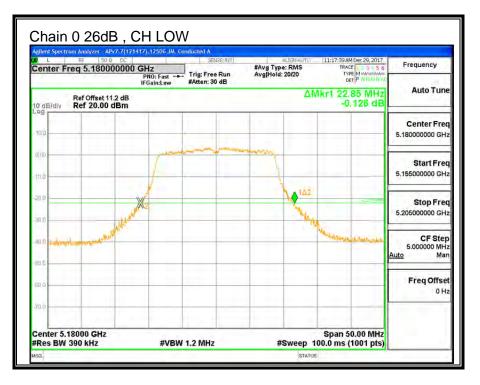
<u>LIMITS</u>

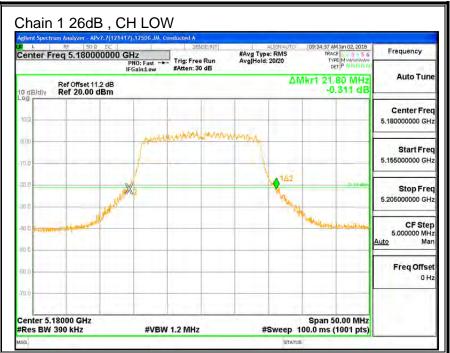
None; for reporting purposes only.

RESULTS

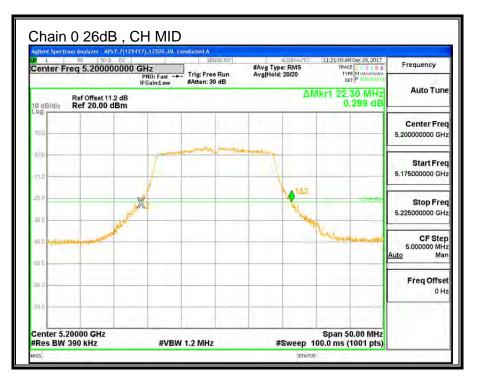
Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	22.85	21.80
Mid	5200	22.30	22.35
High	5240	22.75	22.00

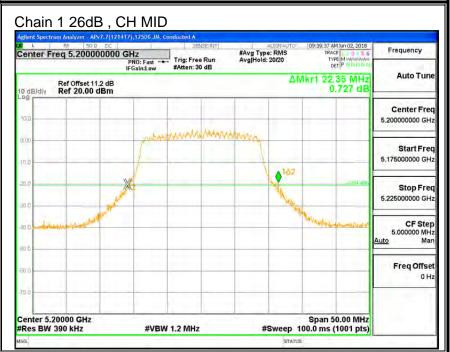
Page 34 of 381



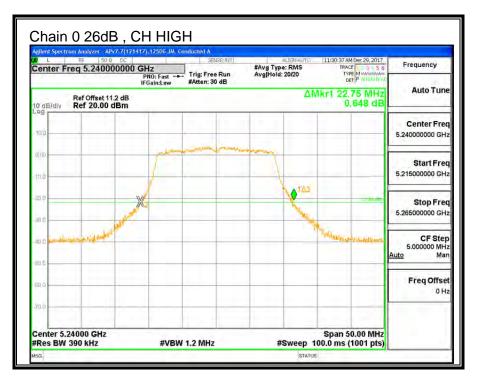


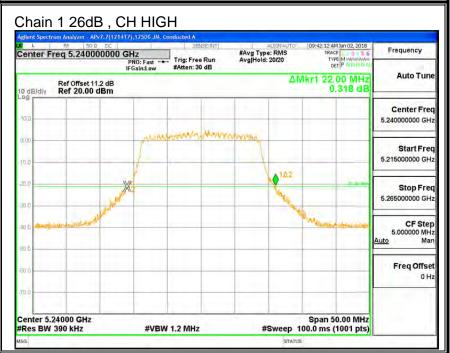
Page 35 of 381





Page 36 of 381





Page 37 of 381

9.2.2. 99% BANDWIDTH

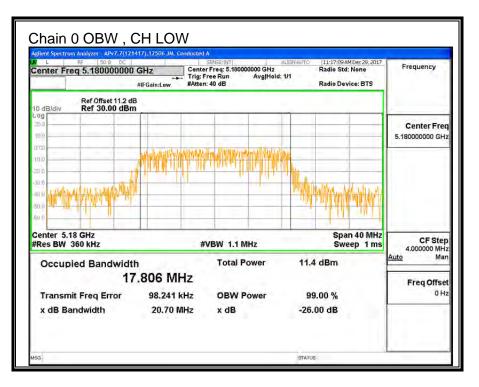
LIMITS

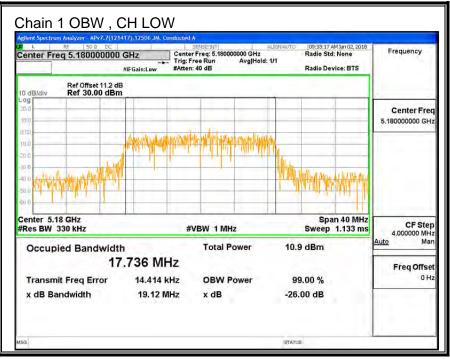
None; for reporting purposes only.

RESULTS

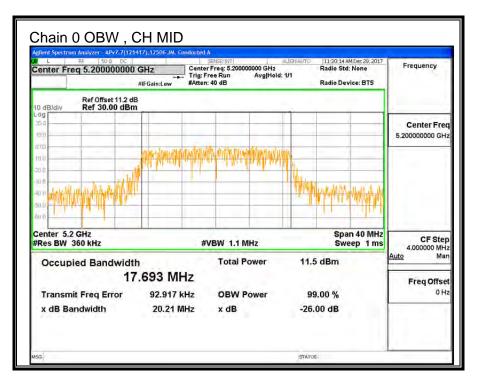
Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.806	17.736
Mid	5200	17.693	17.708
High	5240	17.624	17.735

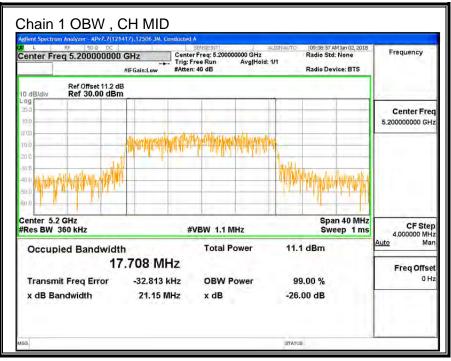
Page 38 of 381



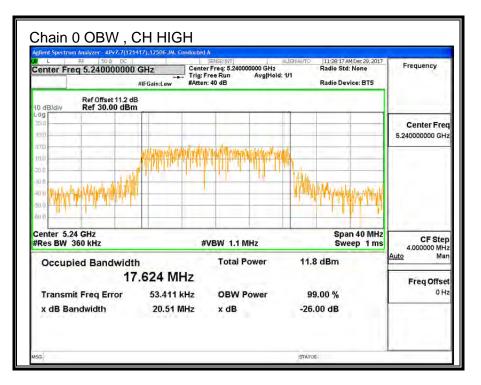


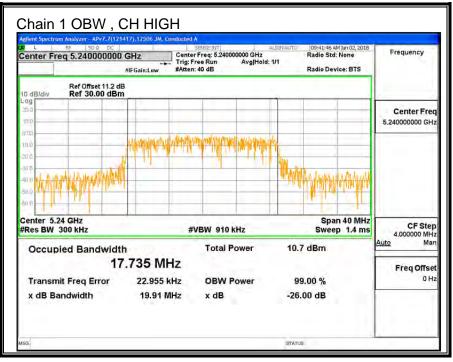
Page 39 of 381





Page 40 of 381





Page 41 of 381 **UL VERIFICATION SERVICES INC.** FORM NO: CCSUP4701J 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.

9.2.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 42 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 43 of 381

RESULTS

ID:	12506 JM	Date:	01/08/18
	12000 0101	Duto.	01/00/10

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5180	21.80	17.736	-3.06	-0.12
Mid	5200	22.30	17.693	-3.06	-0.12
High	5240	22.00	17.624	-3.06	-0.12

Limits

Channel	Frequency	FCC Power Limit	IC EIRP Limit	Max IC Power	Power Limit	FCC PPSD Limit	IC eirp PSD Limit	PPSD Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5180	24.00	22.49	25.55	24.00	11.00	10.00	10.12
Mid	5200	24.00	22.48	25.54	24.00	11.00	10.00	10.12
High	5240	24.00	22.46	25.52	24.00	11.00	10.00	10.12

Duty Cycle CF (dB) 0.14 Included in Calculations of Corr'd PPSD

Output Power Results

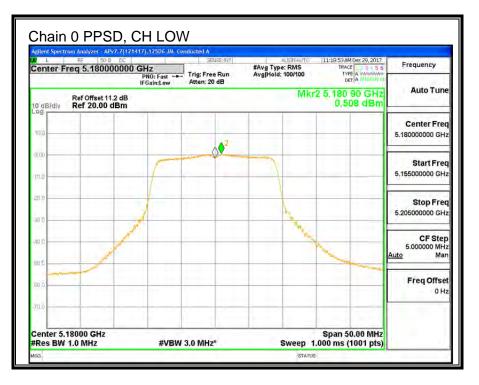
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	10.98	10.76	13.88	24.00	-10.12
Mid	5200	10.95	10.71	13.84	24.00	-10.16
High	5240	11.14	10.53	13.86	24.00	-10.14

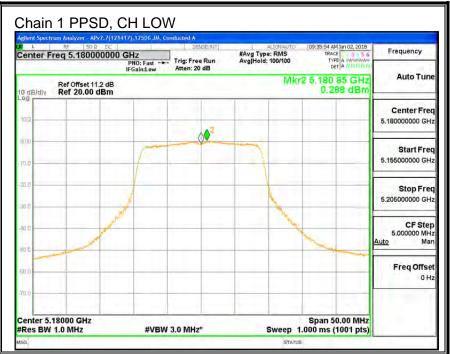
PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	0.508	0.288	3.55	10.12	-6.57
Mid	5200	0.498	0.188	3.50	10.12	-6.62
High	5240	1.023	0.028	3.70	10.12	-6.42

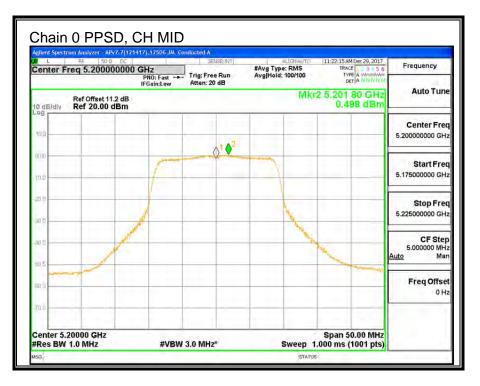
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

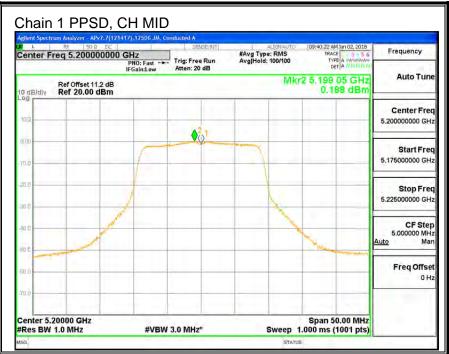
Page 44 of 381



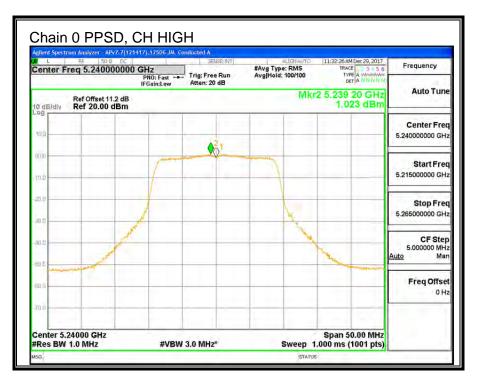


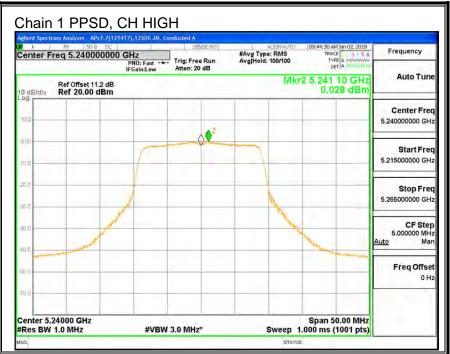
Page 45 of 381





Page 46 of 381





Page 47 of 381

9.3. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND

9.3.1. 26 dB BANDWIDTH

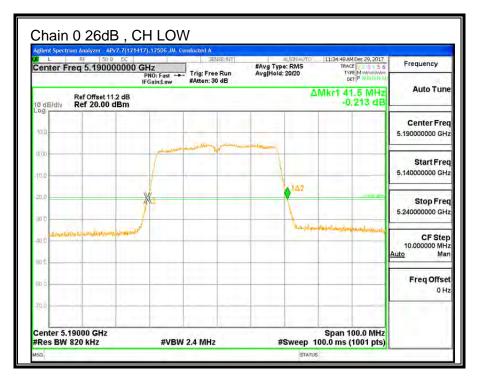
<u>LIMITS</u>

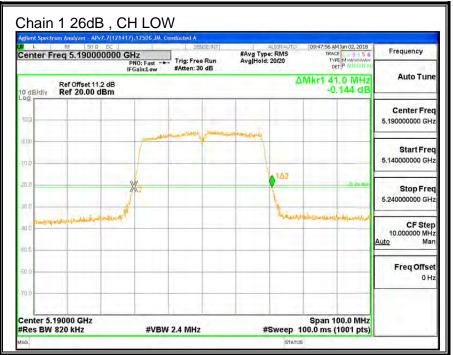
None; for reporting purposes only.

RESULTS

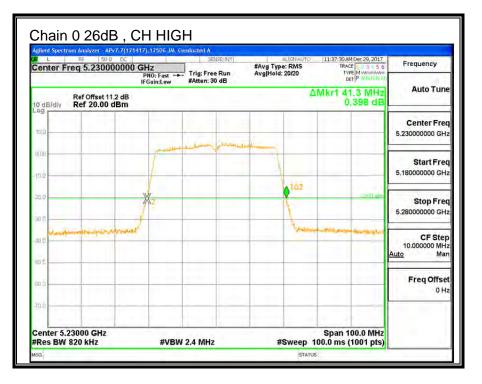
Channel	Frequency		26 dB BW Chain 1 (MHz)
Low	5190	41.5	41.0
High	5230	41.3	41.1

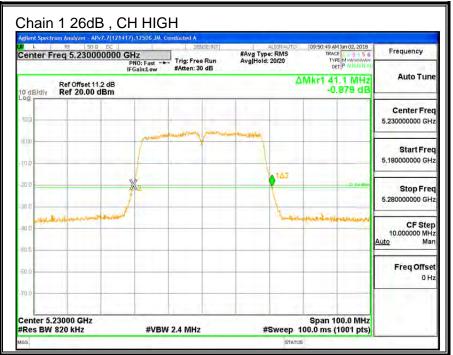
Page 48 of 381





Page 49 of 381





Page 50 of 381

9.3.2. 99% BANDWIDTH

<u>LIMITS</u>

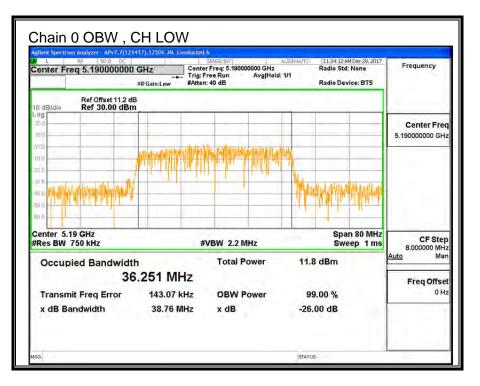
None; for reporting purposes only.

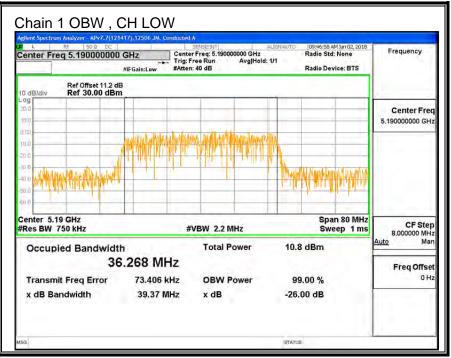
RESULTS

Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5190	36.251	36.268
High	5230	36.335	36.375

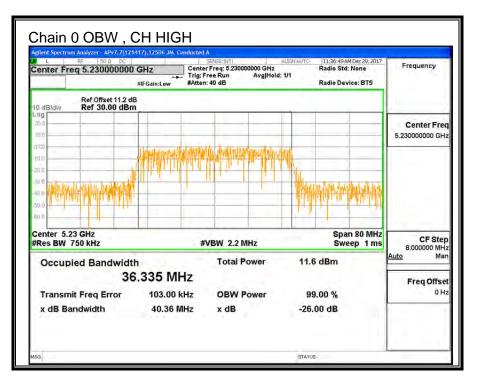
UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

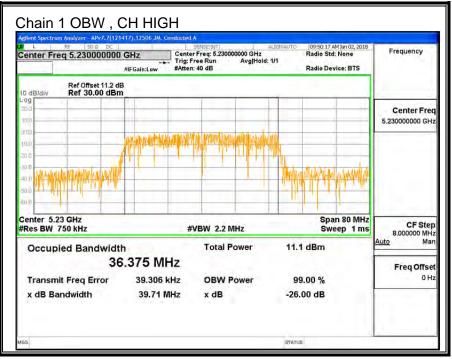
Page 51 of 381





Page 52 of 381





Page 53 of 381

9.3.3. OUTPUT POWER AND PPSD

<u>LIMITS</u>

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 54 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 55 of 381

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5190	41.00	36.251	-3.06	-0.12
High	5230	41.10	36.335	-3.06	-0.12

Limits

Channel	Frequency	FCC	IC	Max	Power	FCC	IC	PPSD
		Power	EIRP	IC	Limit	PPSD	eirp	Limit
		Limit	Limit	Power		Limit	PSD	
							Limit	
	(MHz)	(dBm)						
Low	5190	24.00	23.00	26.06	24.00	11.00	10.00	10.12
High	5230	24.00	23.00	26.06	24.00	11.00	10.00	10.12

Duty Cycle CF (dB) 0.48 Included

Included in Calculations of Corr'd PPSD

Output Power Results

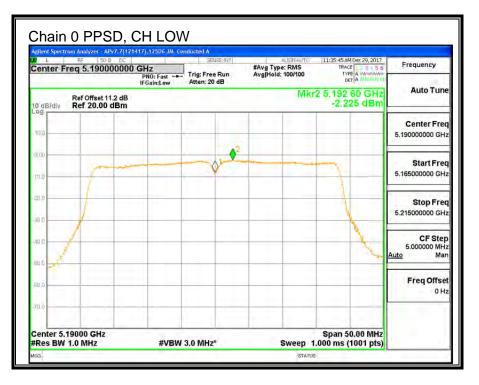
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	(MHz) 5190	(dBm) 11.49	(dBm) 10.59	(dBm) 14.07	(dBm) 24.00	(dB) -9.93

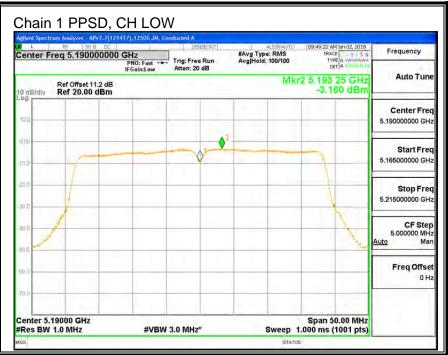
PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	-2.225	-3.160	0.82	10.12	-9.30
High	5230	-2.129	-2.951	0.97	10.12	-9.15

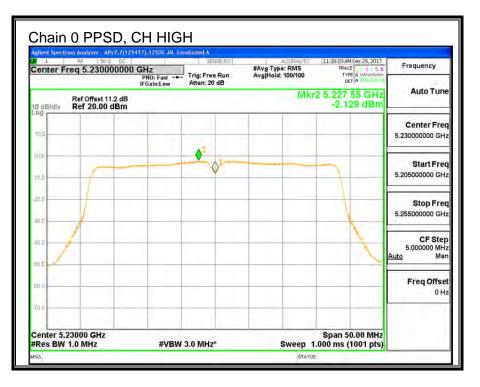
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

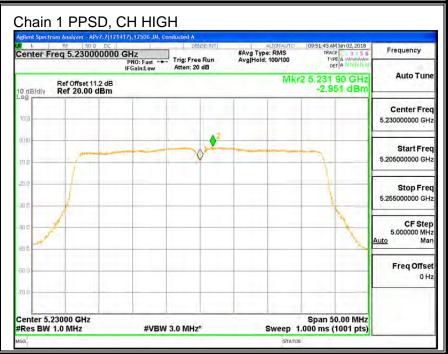
Page 56 of 381





Page 57 of 381





Page 58 of 381

9.4. 11ac HT80 2TX CDD MIMO MODE IN THE 5.2GHz BAND

9.4.1. 26 dB BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

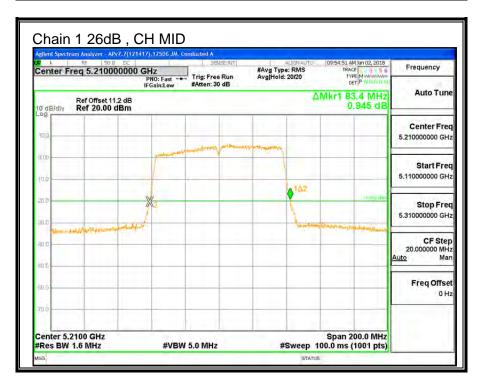
RESULTS

Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5210	83.4	83.4

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.

Page 59 of 381

Keysight Spectrum Analyzer	- APv7.7(121417),129	06 JM, Temp A	1.000	SEINT		ALIGN AUTO	L.C. an all is	M Jan 12, 2018	
Center Freq 5.21	0000000 GH	IZ NO: Fast →			#Avg Typ Avg Hold	e: RMS	TRAC	E 1 2 3 4 5 6	Frequency
Ref Offse	IFC	Gain:Low	#Atten: 30			(accept	Mkr1 8	3.4 MHz	Auto Tune
	JU GBM		-		-		_		
(0.0)									Center Free 5.21000000 GH:
6.00		men	inter the	and the state of the	and a production of	1	1		
100									Start Free 5.110000000 GH
						142		111	100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100
20.0	*	2				X -		(4.1-19.75 dim	Stop Free 5,31000000 GH
-50.0	+				-	1			0.0100000000
No Charles and Contraction	and pringly f					matter	nanthytom	horning half	CF Step 20.000000 MH: Auto Mar
50.0					_				Auto Mai
80.0									Freq Offse 0 H
70.0					_				
1									Scale Type
Center 5.2100 GHz		-		-			Span 2	00.0 MHz	Log Lin



Page 60 of 381

9.4.2. 99% BANDWIDTH

DATE: JANUARY 29, 2018

<u>LIMITS</u>

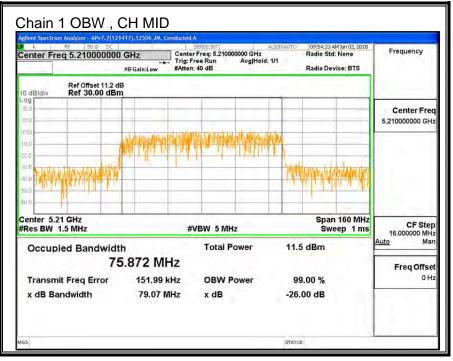
None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
	5210		

Page 61 of 381 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.





Page 62 of 381

9.4.3. OUTPUT POWER AND PPSD

<u>LIMITS</u>

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 63 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5150-5250 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 64 of 381

RESULTS

ID:	12506 JM	Date:	01/08/18
	12000 0101	Duto.	01/00/10

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5210	83.40	75.687	-3.06	-0.12

Limits

Channel	Frequency	FCC	IC	Max	Power	FCC	IC	PPSD
		Power	EIRP	IC	Limit	PPSD	eirp	Limit
		Limit	Limit	Power		Limit	PSD	
							Limit	
	(MHz)	(dBm)						
Low	5210	24.00	23.00	26.06	24.00	11.00	10.00	10.12

Duty Cycle CF (dB) 0.73 Included in Calculations of Corr'd PPSD

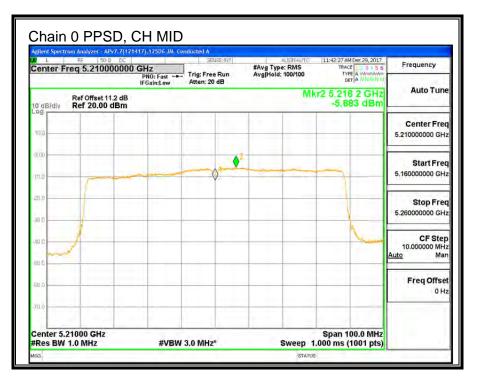
Output Power Results

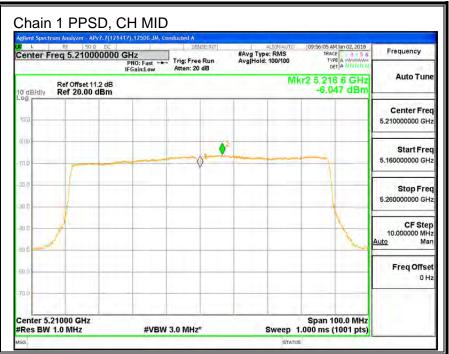
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5210	10.97	10.82	13.91	24.00	-10.09

PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5210	-5.683	-6.047	-2.12	10.12	-12.24

<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.





Page 66 of 381

9.5. 11a 2TX CDD MIMO MODE IN THE 5.3GHz BAND

9.5.1. 26 dB BANDWIDTH

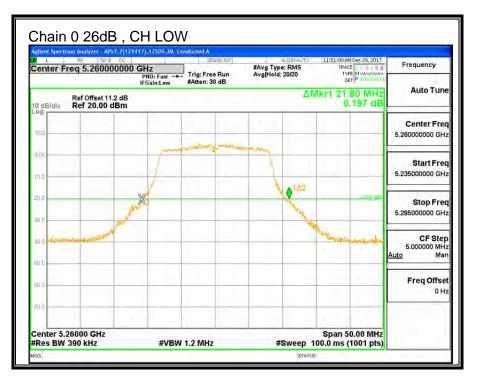
<u>LIMITS</u>

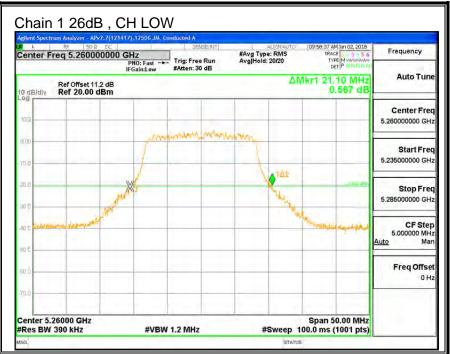
None; for reporting purposes only.

RESULTS

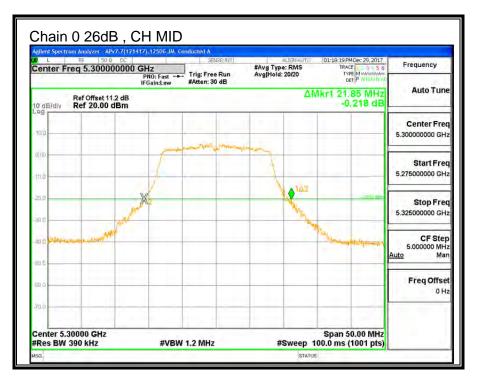
Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5260	21.80	21.10
Mid	5300	21.85	21.00
High	5320	21.65	20.95

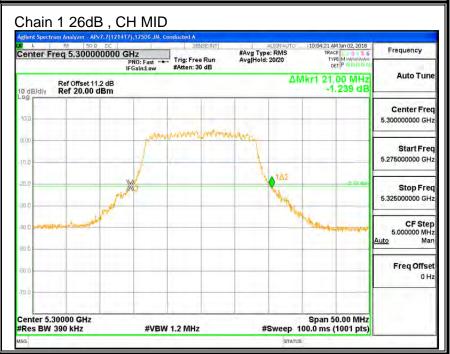
Page 67 of 381





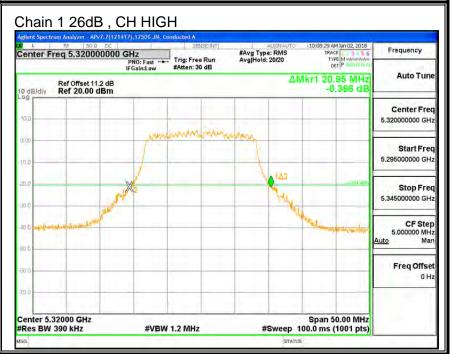
Page 68 of 381





Page 69 of 381





Page 70 of 381

9.5.2. 99% BANDWIDTH

<u>LIMITS</u>

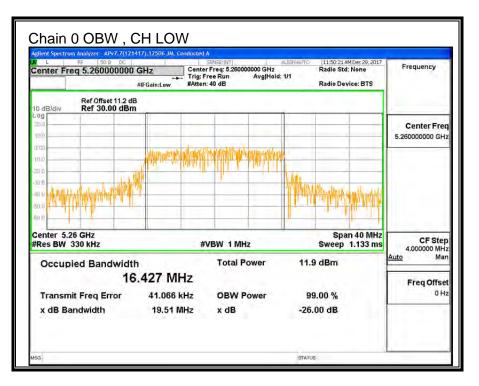
None; for reporting purposes only.

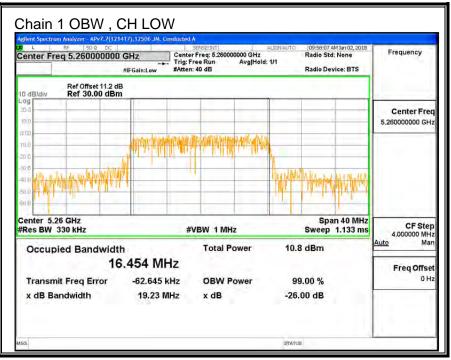
RESULTS

Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5260	16.427	16.454
Mid	5300	16.443	16.581
High	5320	16.528	16.469

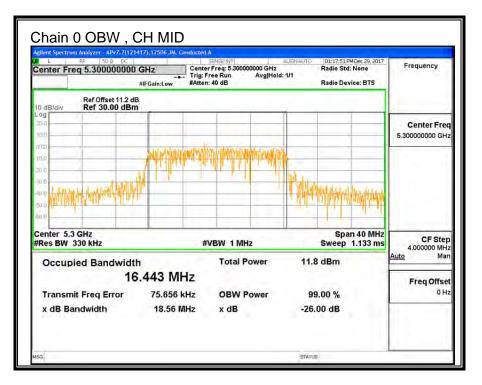
UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

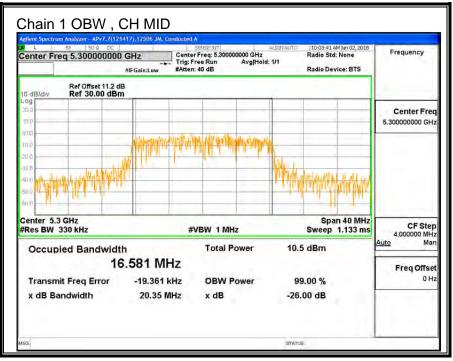
Page 71 of 381



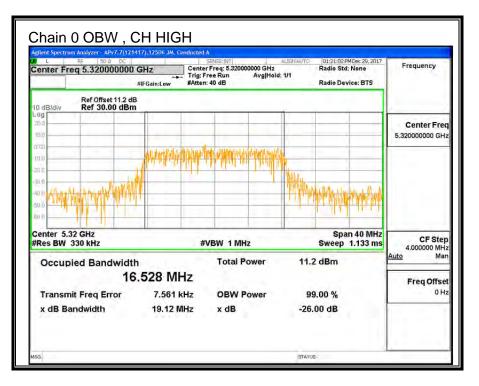


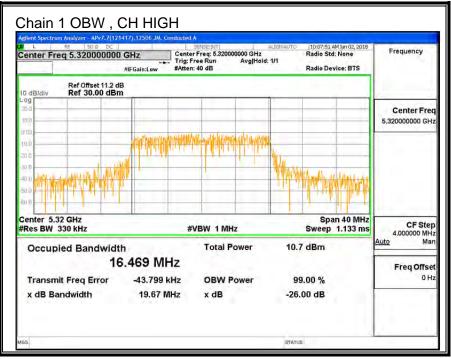
Page 72 of 381





Page 73 of 381





Page 74 of 381

9.5.3. OUTPUT POWER AND PPSD

<u>LIMITS</u>

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 75 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5250-5350 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5250-5230 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 76 of 381

RESULTS

ID:	12506 JM	Date:	01/08/18
	12000 0101	Duto.	01/00/10

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5260	21.10	16.427	-3.06	-0.12
Mid	5300	21.00	16.443	-3.06	-0.12
High	5320	20.95	16.469	-3.06	-0.12

0.00

Limits

Channel	Frequency	FCC	IC	IC	Power	FCC	IC	PPSD
		Power	Power	EIRP	Limit	PPSD	PSD	Limit
		Limit	Limit	Limit		Limit	Limit	
	(MHz)	(dBm)						
Low	5260	24.00	23.16	29.16	23.16	11.00	11.00	11.00
Mid	5300	24.00	23.16	29.16	23.16	11.00	11.00	11.00
High	5320	24.00	23.17	29.17	23.17	11.00	11.00	11.00

Duty Cycle CF (dB)

Included in Calculations of Corr'd PPSD

Output Power Results

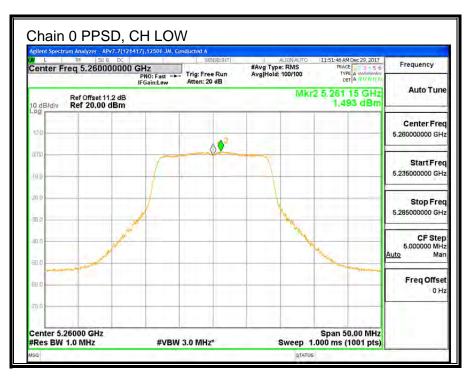
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	11.65	10.54	14.14	23.16	-9.01
Mid	5300	12.13	10.61	14.45	23.16	-8.71
High	5320	11.63	10.76	14.23	23.17	-8.94

PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	1.493	0.448	4.01	11.00	-6.99
Mid	5300	1.226	0.047	3.69	11.00	-7.31
High	5320	0.792	-0.039	3.41	11.00	-7.59

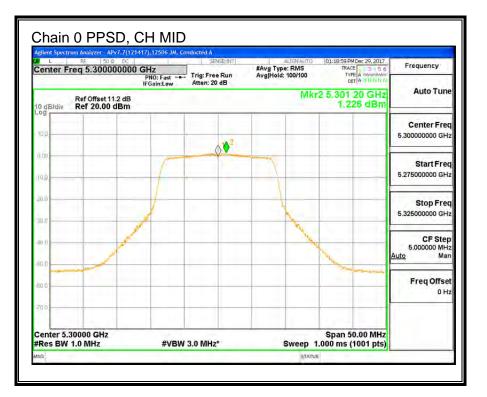
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

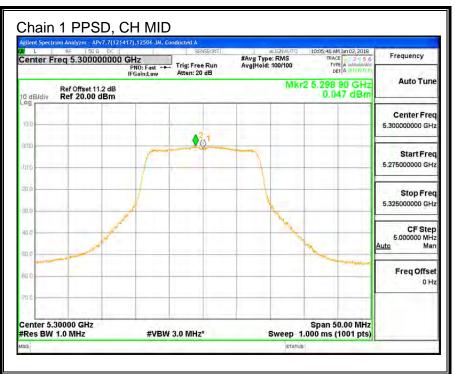
Page 77 of 381



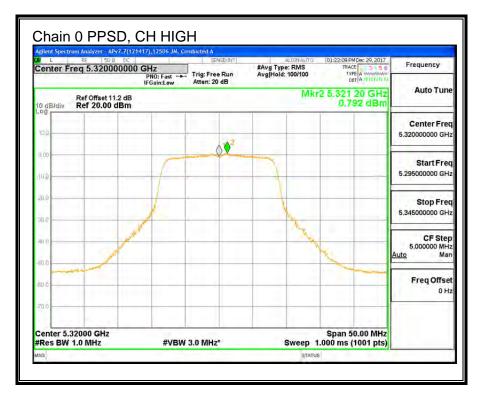


Page 78 of 381





Page 79 of 381





Page 80 of 381

9.6. 11n HT20 2TX CDD MIMO MODE IN THE 5.3GHz BAND

9.6.1. 26 dB BANDWIDTH

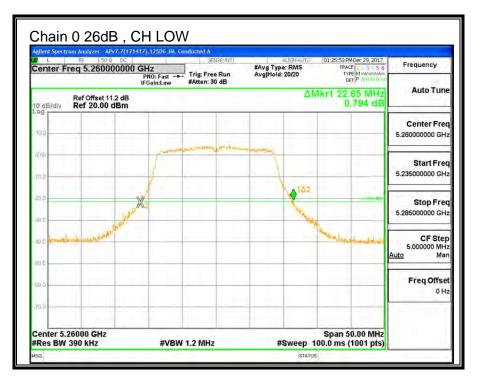
<u>LIMITS</u>

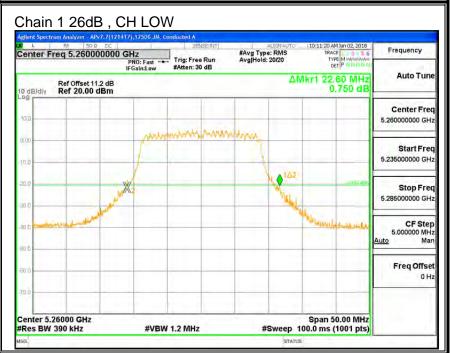
None; for reporting purposes only.

RESULTS

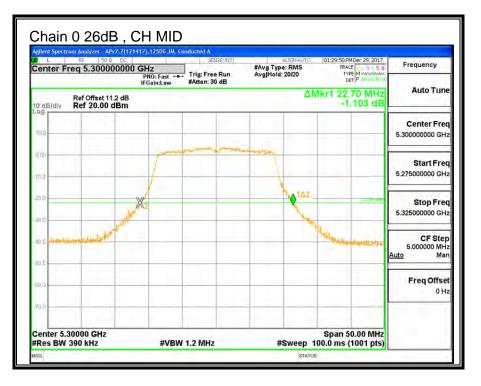
Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5260	22.65	22.60
Mid	5300	22.70	22.20
High	5320	22.50	21.65

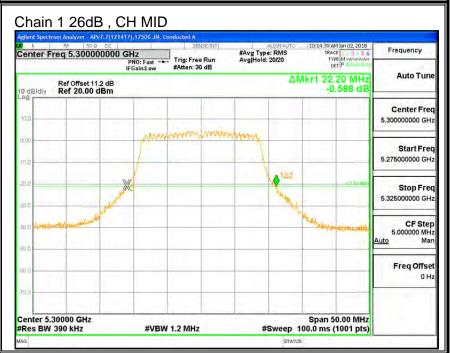
Page 81 of 381



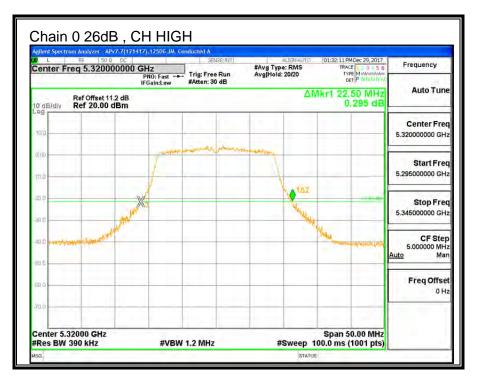


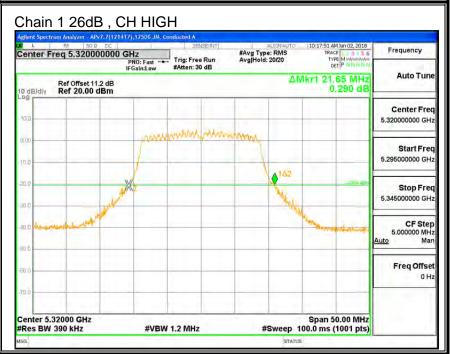
Page 82 of 381





Page 83 of 381





Page 84 of 381

9.6.2. 99% BANDWIDTH

<u>LIMITS</u>

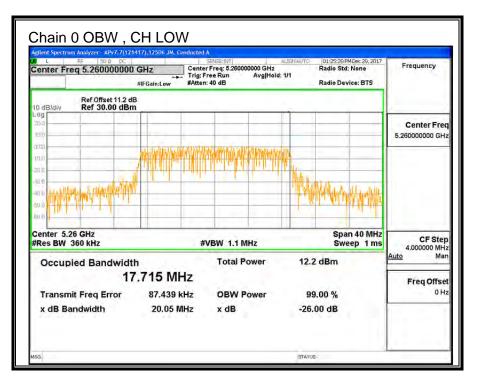
None; for reporting purposes only.

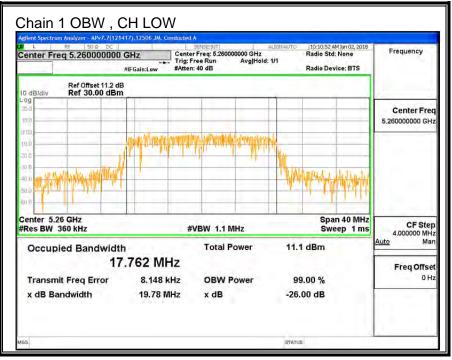
RESULTS

Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5260	17.715	17.762
Mid	5300	17.710	17.657
High	5320	17.738	17.803

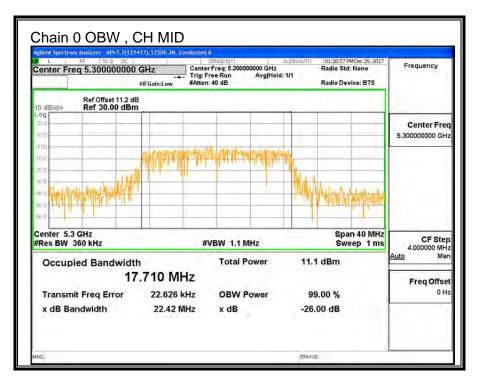
UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

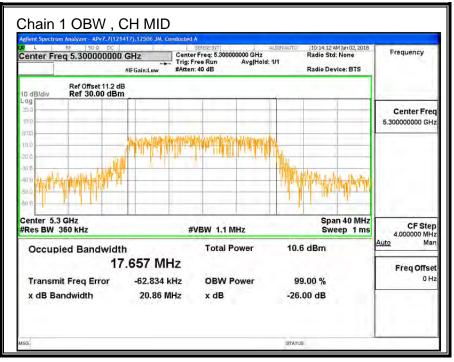
Page 85 of 381



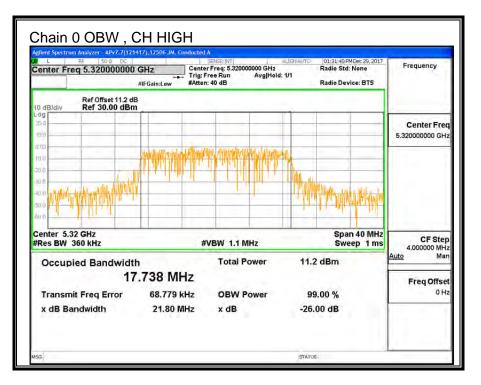


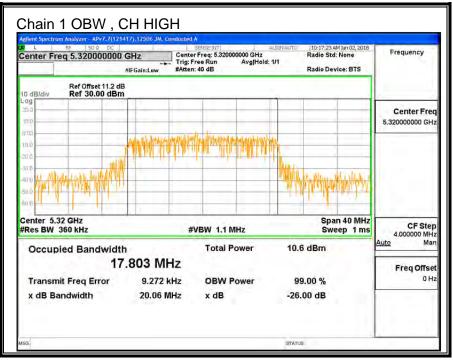
Page 86 of 381





Page 87 of 381





Page 88 of 381

9.6.3. OUTPUT POWER AND PPSD

<u>LIMITS</u>

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 89 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5250-5350 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5250-5230 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 90 of 381

RESULTS

ID:	12506 JM	Date:	01/08/18
10.	12000 0101	Date.	01/00/10

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB 99%		Gain	Gain
		BW BW		for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5260	22.60	17.715	-3.06	-0.12
Mid	5300	22.20	17.657	-3.06	-0.12
High	5320	21.65	17.738	-3.06	-0.12

Limits

Channel	Frequency	FCC	IC	IC	Power	FCC	IC	PPSD
		Power	Power	EIRP	Limit	PPSD	PSD	Limit
		Limit	Limit	Limit		Limit	Limit	
	(MHz)	(dBm)						
Low	5260	24.00	23.48	29.48	23.48	11.00	11.00	11.00
Mid	5300	24.00	23.47	29.47	23.47	11.00	11.00	11.00
High	5320	24.00	23.49	29.49	23.49	11.00	11.00	11.00

Duty Cycle CF (dB) 0.14 Included in Calculations of Corr'd PPSD

Output Power Results

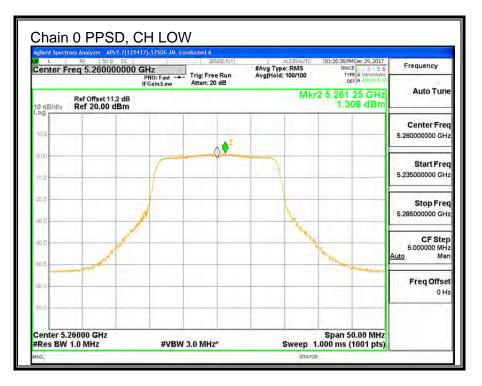
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	11.48	10.97	14.24	23.48	-9.24
Mid	5300	11.07	10.99	14.04	23.47	-9.43
High	5320	11.11	10.87	14.00	23.49	-9.49

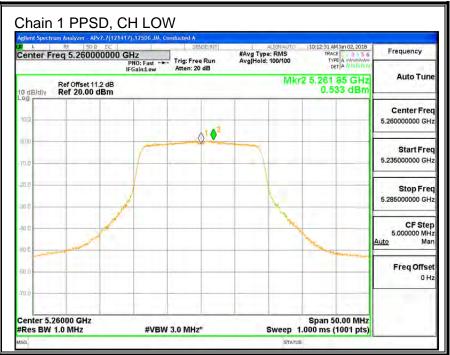
PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	1.308	0.533	4.09	11.00	-6.91
Mid	5300	0.212	0.213	3.36	11.00	-7.64
High	5320	0.246	-0.312	3.13	11.00	-7.87

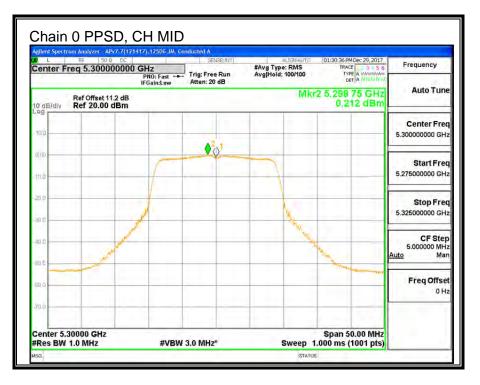
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

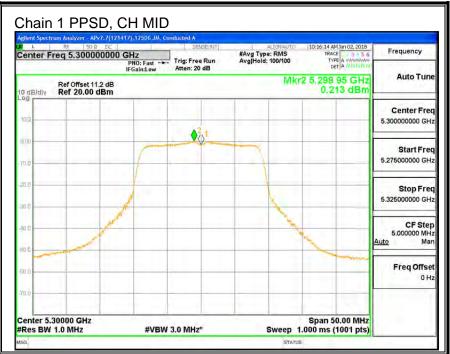
Page 91 of 381



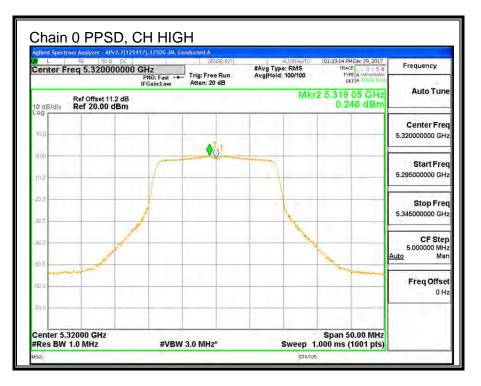


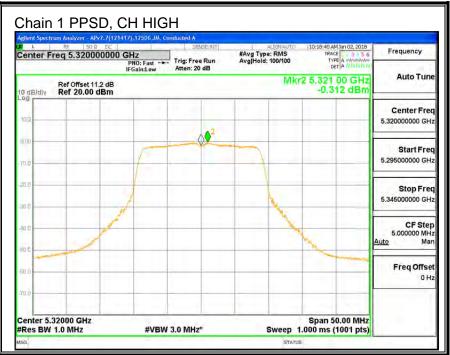
Page 92 of 381





Page 93 of 381





Page 94 of 381

9.7. 11n HT40 2TX CDD MIMO MODE IN THE 5.3GHz BAND

9.7.1. 26 dB BANDWIDTH

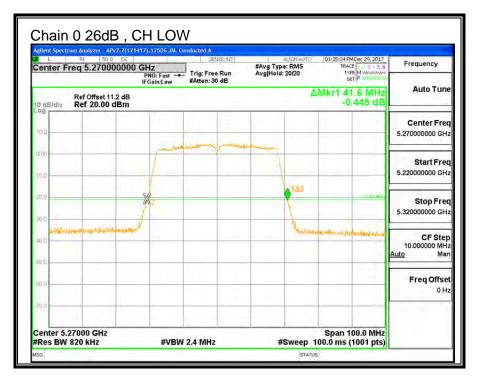
<u>LIMITS</u>

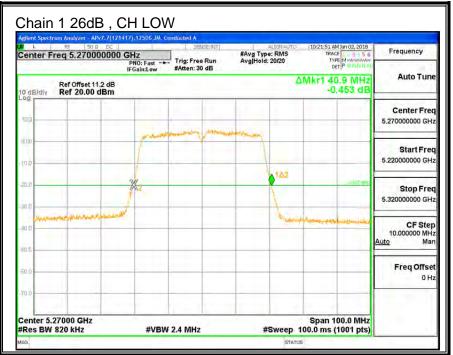
None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	
Low	5270	41.6	40.9	
High	5310	41.7	41.1	

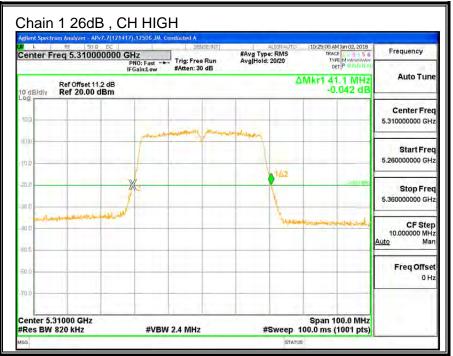
Page 95 of 381





Page 96 of 381





Page 97 of 381

9.7.2. 99% BANDWIDTH

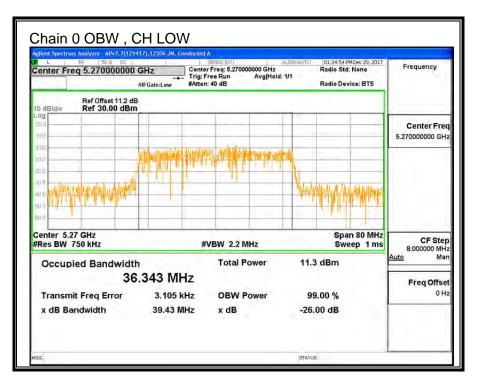
LIMITS

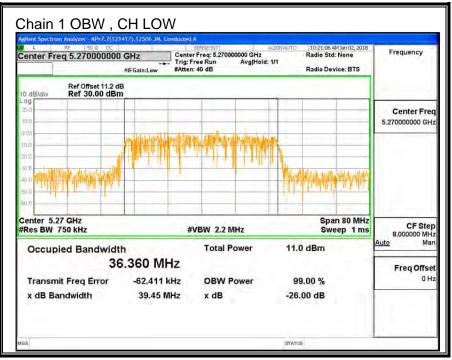
None; for reporting purposes only.

RESULTS

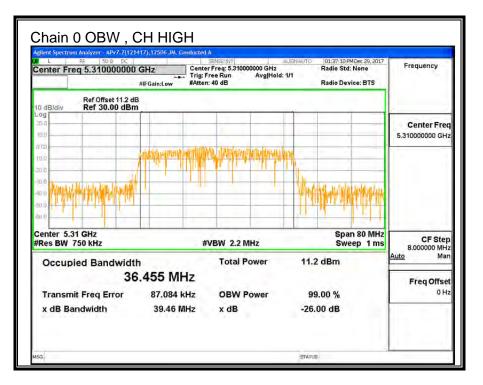
Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	
Low	5270	36.343	36.360	
High	5310	36.455	36.384	

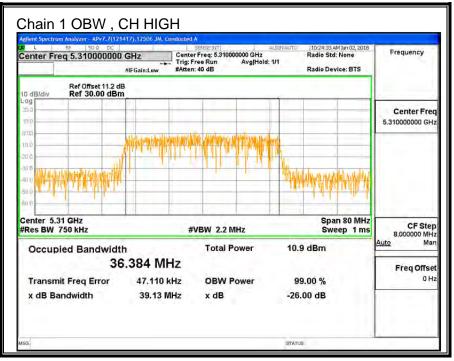
Page 98 of 381





Page 99 of 381





Page 100 of 381

9.7.3. OUTPUT POWER AND PPSD

<u>LIMITS</u>

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Page 101 of 381

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5250-5350 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5250-5230 MHz

Chain 0	Chain 1	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-0.12

Page 102 of 381

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5270	40.90	36.343	-3.06	-0.12
High	5310	41.10	36.384	-3.06	-0.12

Limits

Channel	Frequency	FCC	IC	IC	Power	FCC	IC	PPSD
		Power	Power	EIRP	Limit	PPSD	PSD	Limit
		Limit	Limit	Limit		Limit	Limit	
	(MHz)	(dBm)						
Low	5270	24.00	24.00	30.00	24.00	11.00	11.00	11.00
High	5310	24.00	24.00	30.00	24.00	11.00	11.00	11.00

Duty Cycle CF (dB) 0.48 Included in Calculations of Corr'd PPSD

Output Power Results

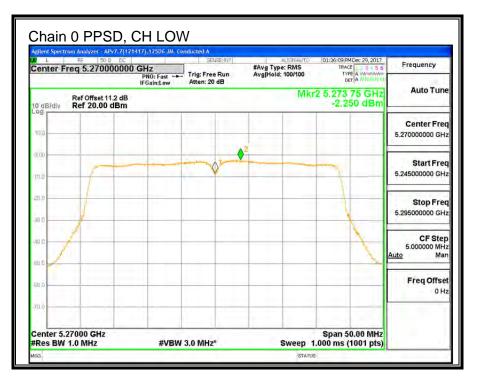
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5270	11.38	10.81	14.11	24.00	-9.89
High	5310	11.02	11.02	14.03	24.00	-9.97

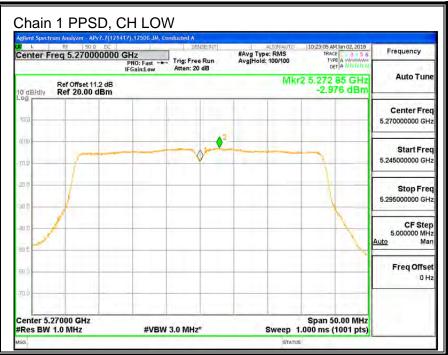
PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5270	-2.250	-2.976	0.89	11.00	-10.11
High	5310	-2.840	-3.007	0.57	11.00	-10.43

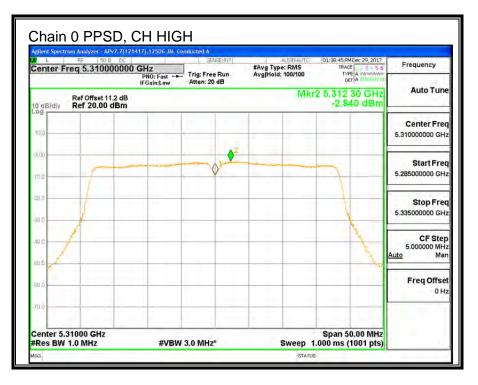
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

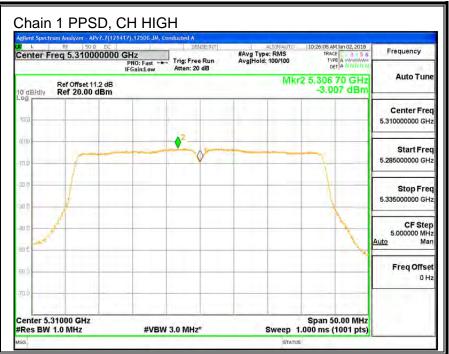
Page 103 of 381





Page 104 of 381





Page 105 of 381

9.8. 11ac HT80 2TX CDD MIMO MODE IN THE 5.3GHz BAND

9.8.1. 26 dB BANDWIDTH

<u>LIMITS</u>

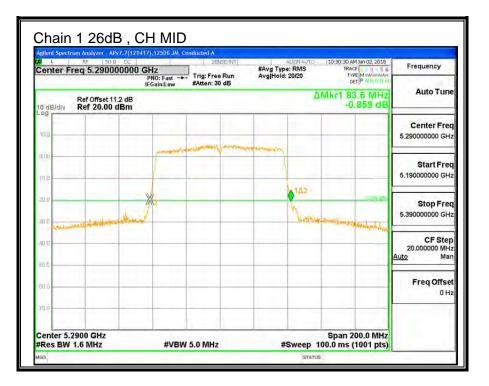
None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Mid	5290	83.8	83.6

Page 106 of 381

Keysight Spectrum Analyzer - A			ISEINT	ALIGN AUTO	11:36:30 AM Jan 12, 20	
Center Freq 5.2900			#Avg T	ype: RMS old: 20/20	TRACE 1 3 4 TYPE MWWW DET P N N	5.6 Frequency
Ref Offset 1 IO dB/div Ref 20.00	IFGain:L		0 dB	4	Mkr1 83.8 Mi -0.076 c	Auto Tune
10.0		and the share of the same	and the state of t	*		Center Free 5.290000000 GH
ado				162		Start Free 5.190000000 GH
30.0	×				DL1 (1840)	Stop Free 5.39000000 GH
na a yahayahayahayahayahayahayahayahayaha	undtraval.			hirton	nde-indiana/contradi	CF Step 20.000000 MH Auto Mar
60.0						Freq Offse 0 H:
Center 5.2900 GHz		VBW 5.0 MHz			Span 200.0 M 00.0 ms (1001 p	



Page 107 of 381

9.8.2. 99% BANDWIDTH

DATE: JANUARY 29, 2018

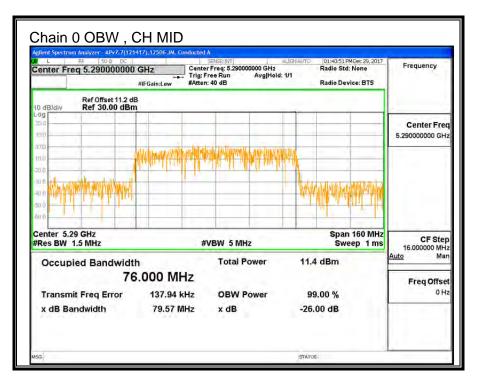
<u>LIMITS</u>

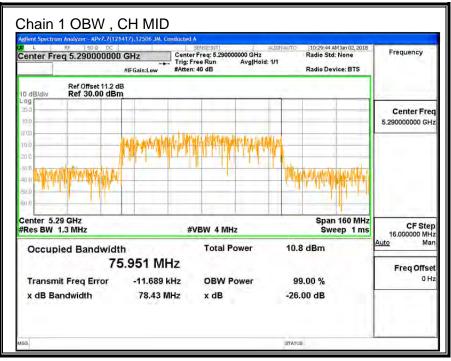
None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)

Page 108 of 381





Page 109 of 381

<u>LIMITS</u>

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1– MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5250-5350 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-2.10	-4.30	-3.06

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5250-5230 MHz

Chain 0	Chain 1	Correlated Chains	
Antenna	Antenna	Directional	
Gain	Gain	Gain	
(dBi)	(dBi)	(dBi)	
-2.10	-4.30	-0.12	

Page 110 of 381

RESULTS

ID: 12506 JM Date: 01/0

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Mid	5290	83.60	75.951	-3.06	-0.12

0.73

Limits

Channel	Frequency	FCC	IC	IC	Power	FCC	IC	PPSD
		Power	Power	EIRP	Limit	PPSD	PSD	Limit
		Limit	Limit	Limit		Limit	Limit	
	(MHz)	(dBm)						
Mid	5290	24.00	24.00	30.00	24.00	11.00	11.00	11.00

Duty Cycle CF (dB)

Included in Calculations of Corr'd PPSD

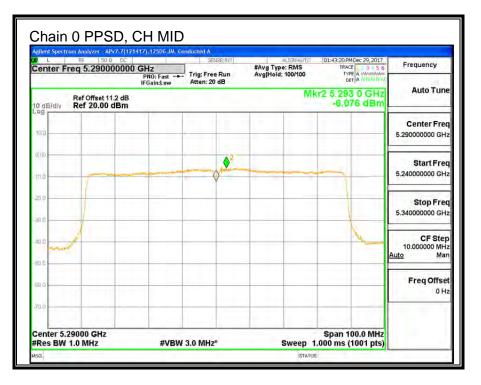
Output Power Results

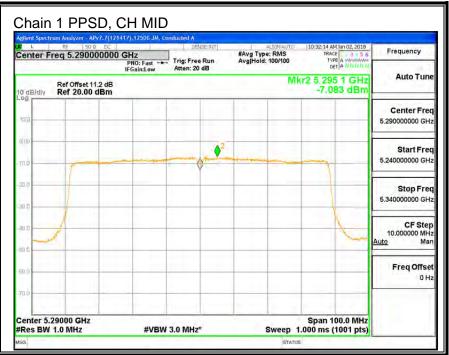
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Mid	5290	11.04	10.62	13.85	24.00	-10.15

PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Mid	5290	-6.076	-7.083	-2.81	11.00	-13.81

<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.





Page 112 of 381

9.9. 11a 2TX CDD MIMO MODE IN THE 5.6GHz BAND

9.9.1. 26 dB BANDWIDTH

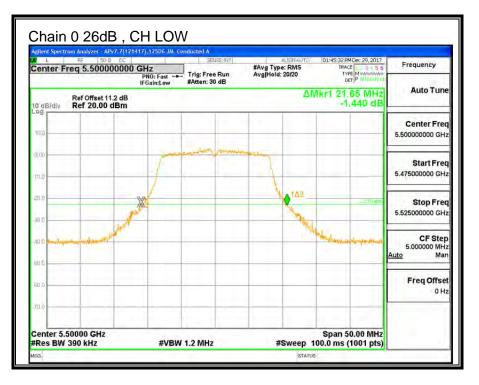
LIMITS

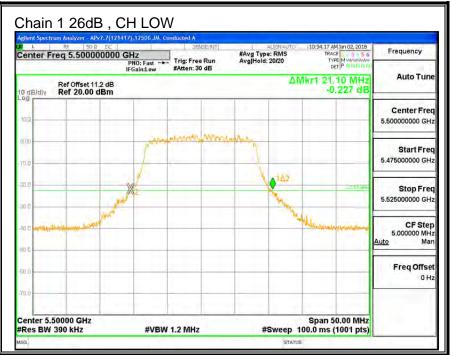
None; for reporting purposes only.

RESULTS

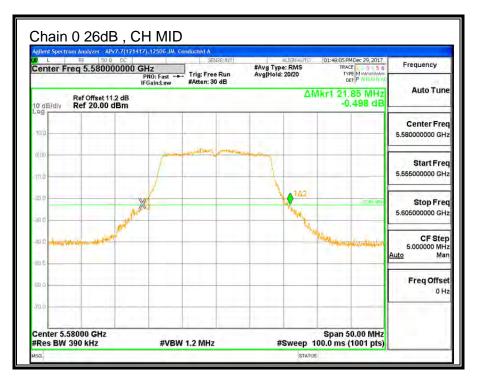
Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5500	21.65	21.10
Mid	5580	21.85	21.00
Mid (FCC)	5640	21.20	21.05
High	5700	21.75	21.40
144	5720	21.60	21.15

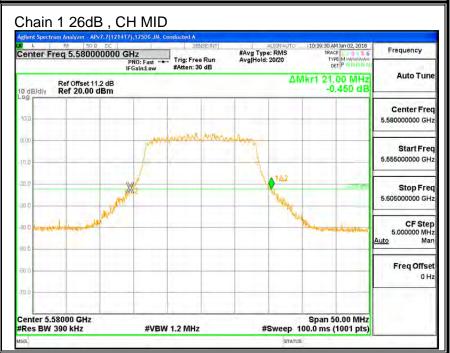
Page 113 of 381



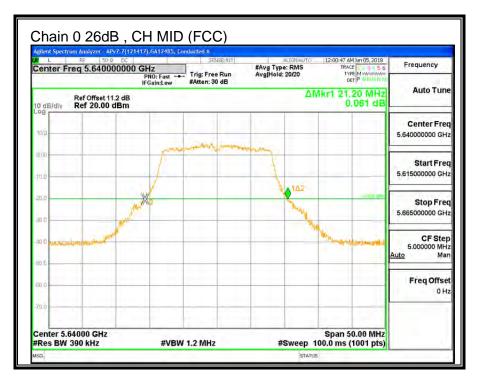


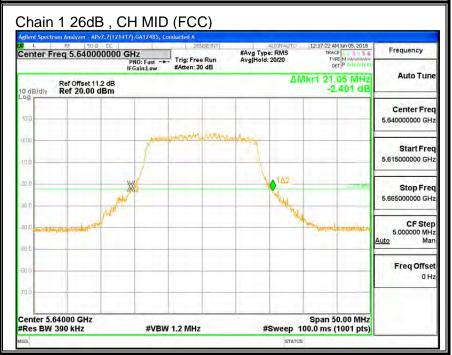
Page 114 of 381



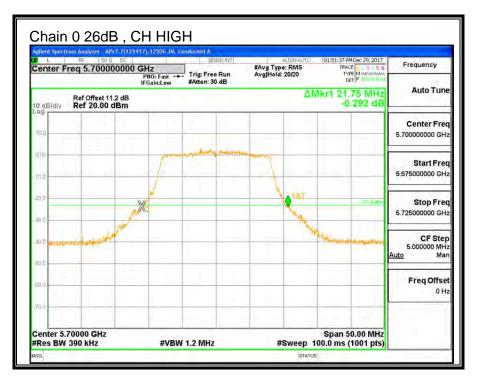


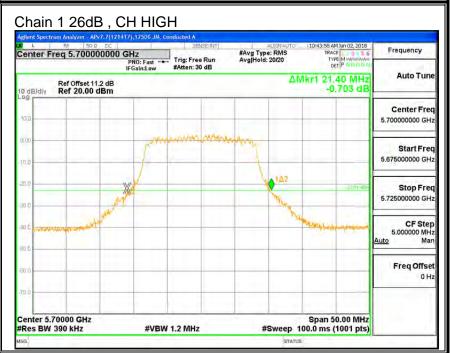
Page 115 of 381



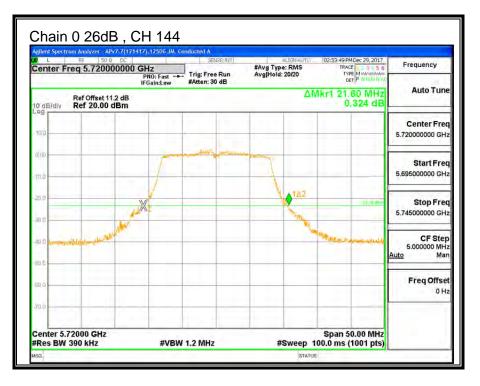


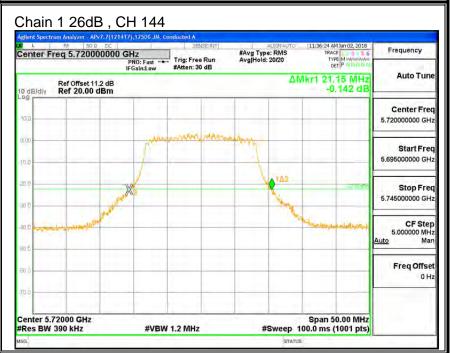
Page 116 of 381





Page 117 of 381





Page 118 of 381

9.9.2. 99% BANDWIDTH

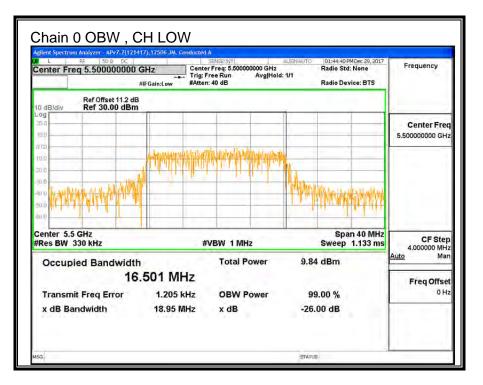
<u>LIMITS</u>

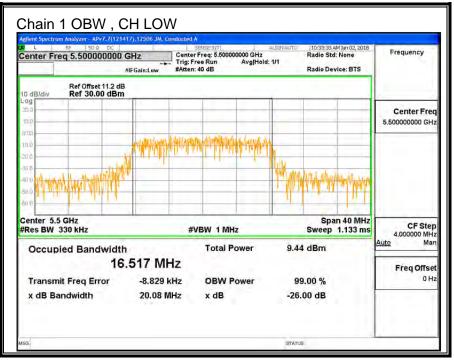
None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5500	16.501	16.517
Mid	5580	16.521	16.479
Mid (FCC)	5640	16.453	16.413
High	5700	16.469	16.458
144	5720	16.528	16.500

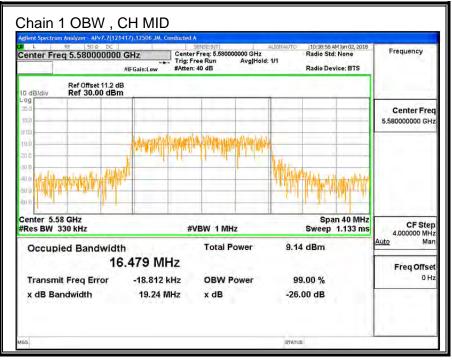
Page 119 of 381





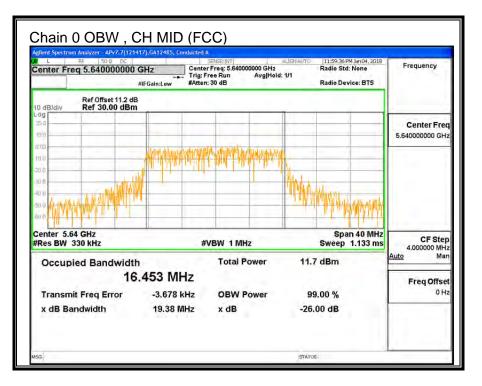
Page 120 of 381

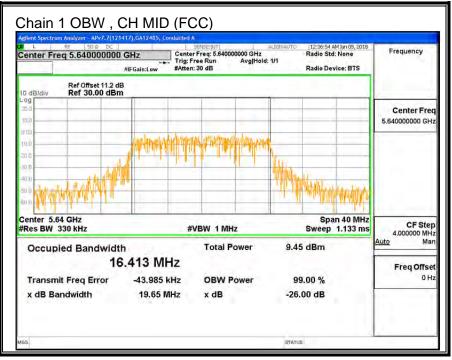




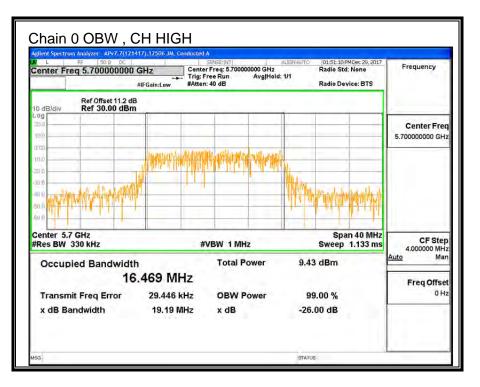
UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

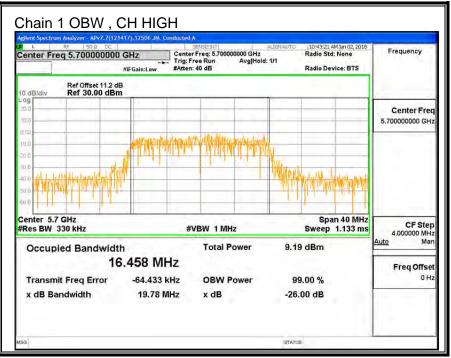
Page 121 of 381



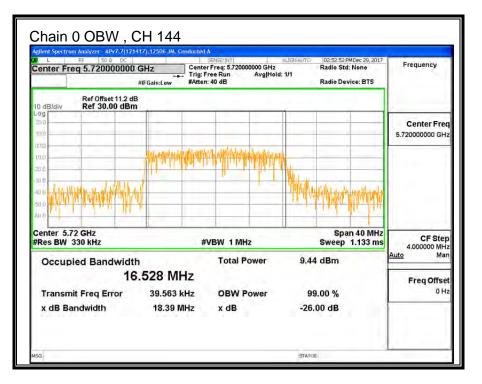


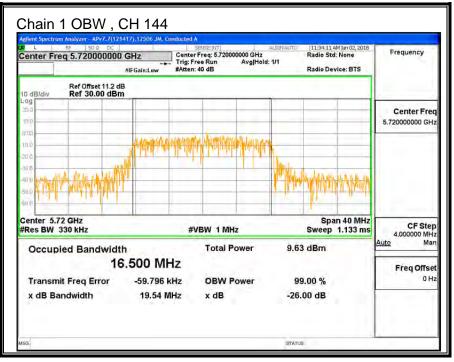
Page 122 of 381





Page 123 of 381





Page 124 of 381

9.9.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (2)

For the band 5.47–5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1– MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5470-5725 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-0.80	-5.40	-2.52

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5470-5725 MHz

Chain 0	Chain 1	Correlated Chains	
Antenna	Antenna	Directional	
Gain	Gain	Gain	
(dBi)	(dBi)	(dBi)	
-0.80	-5.40	0.21	

FCC ID: PY7-72474U

RESULTS

ID:	12506 JM	Date:	01/08/18	
	120000111		01/00/10	

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min	Directional	Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5500	21.10	16.501	-2.52	0.21
Mid	5580	21.00	16.479	-2.52	0.21
Mid (FCC)	5640	21.05	16.413	-2.52	0.21
High	5700	21.40	16.458	-2.52	0.21
144	5720	15.58	13.250	-2.52	0.21

Limits

Channel	Frequency	FCC	IC	IC	Power	FCC	IC	PPSD
		Power	Power	EIRP	Limit	PPSD	PSD	Limit
		Limit	Limit	Limit		Limit	Limit	
	(MHz)	(dBm)						
Low	5500	24.00	23.18	29.18	23.18	11.00	11.00	11.00
Mid	5580	24.00	23.17	29.17	23.17	11.00	11.00	11.00
Mid (FCC)	5640	24.00	23.15	29.15	23.15	11.00	11.00	11.00
High	5700	24.00	23.16	29.16	23.16	11.00	11.00	11.00
144	5720	22.92	22.22	28.22	22.22	11.00	11.00	11.00

Duty Cycle CF (dB) 0.00

Included in Calculations of Corr'd PPSD

Output Power Results

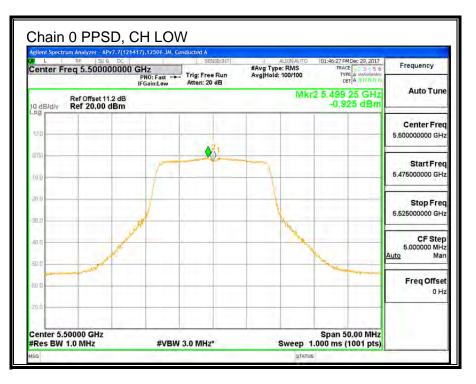
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5500	9.87	9.27	12.59	23.18	-10.58
Mid	5580	9.71	9.27	12.51	23.17	-10.66
Mid (FCC)	5640	9.37	9.22	12.31	23.15	-10.85
High	5700	9.37	8.87	12.14	23.16	-11.03
144	5720	9.29	9.36	12.34	22.22	-9.89

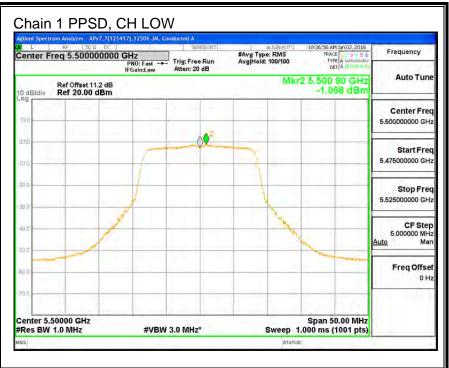
PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5500	-0.925	-1.068	2.01	11.00	-8.99
Mid	5580	-1.209	-1.445	1.68	11.00	-9.32
Mid (FCC)	5640	-1.178	-0.724	2.07	11.00	-8.93
High	5700	-0.846	-1.294	1.95	11.00	-9.05
144	5720	-1.092	-1.066	1.93	11.00	-9.07

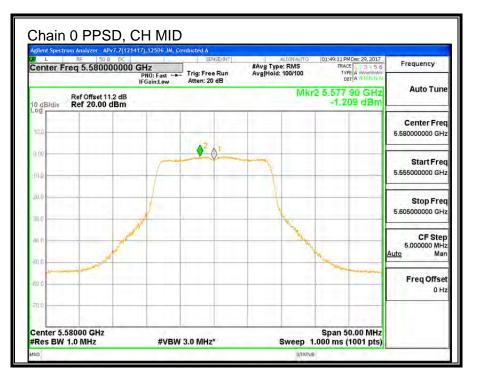
Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

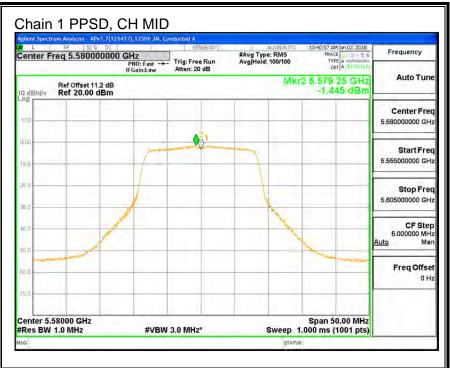
Page 126 of 381



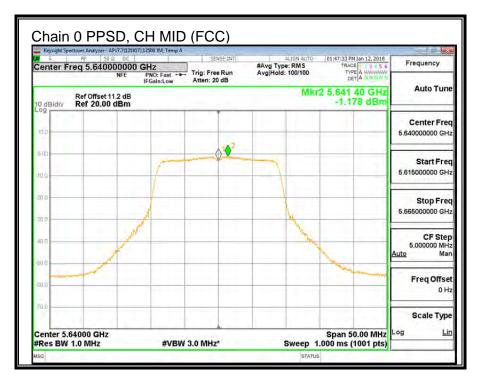


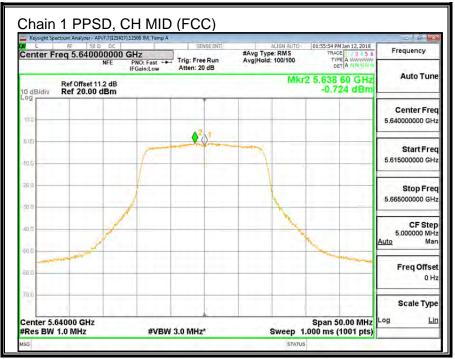
Page 127 of 381



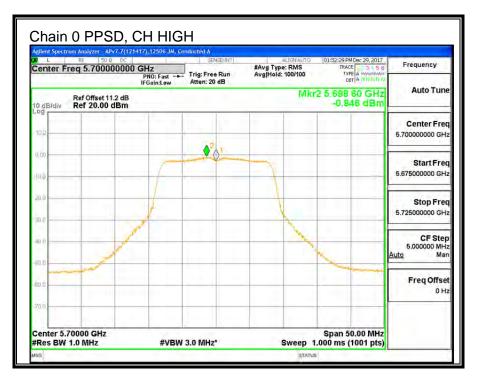


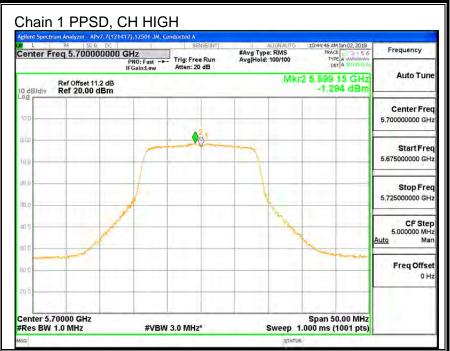
Page 128 of 381



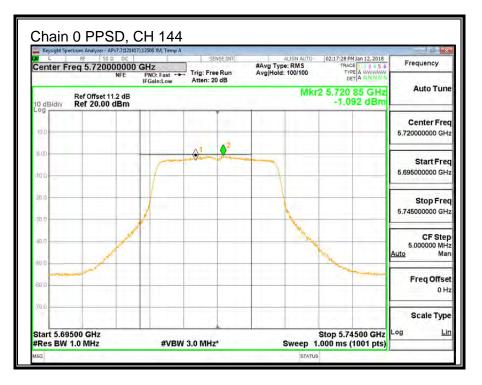


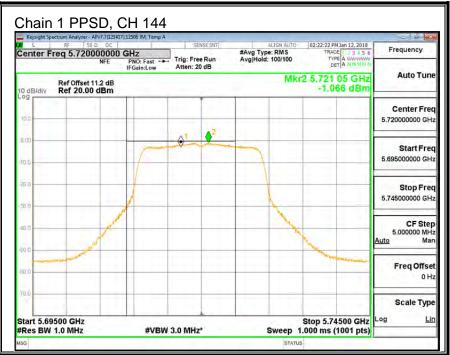
Page 129 of 381





Page 130 of 381





Page 131 of 381

9.10. 11n HT20 2TX CDD MIMO MODE IN THE 5.6GHz BAND

9.10.1. 26 dB BANDWIDTH

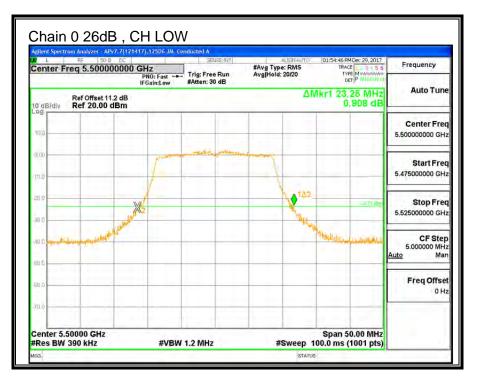
<u>LIMITS</u>

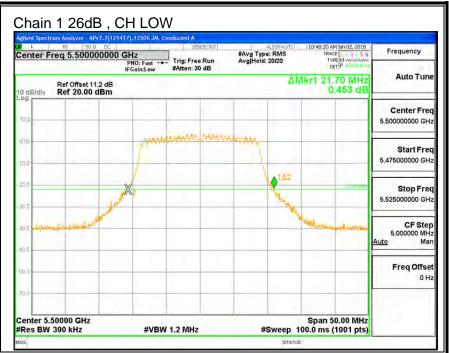
None; for reporting purposes only.

RESULTS

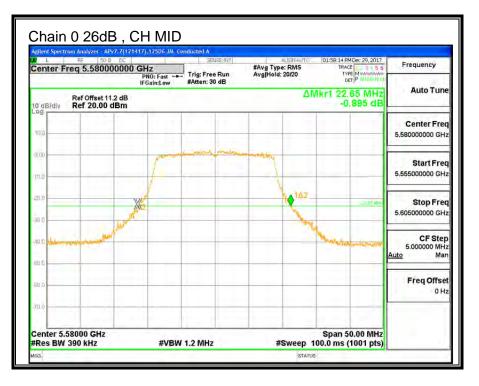
Channel	Frequency	26 dB BW Chain 0	26 dB BW Chain 1
		(MHz)	(MHz)
Low	5500	23.25	21.70
Mid	5580	22.65	22.10
Mid (FCC)	5640	22.55	21.75
High	5700	22.60	22.35
144	5720	22.95	21.75

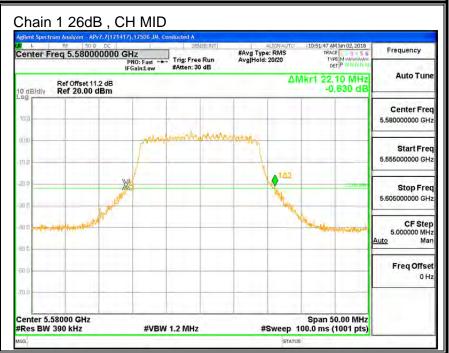
Page 132 of 381



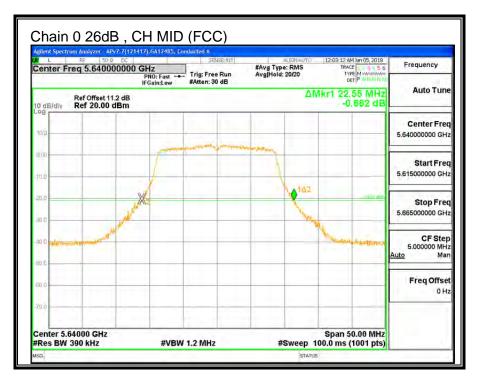


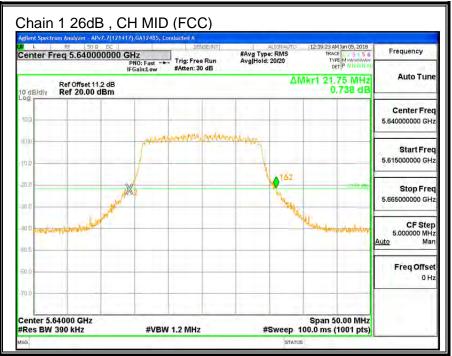
Page 133 of 381



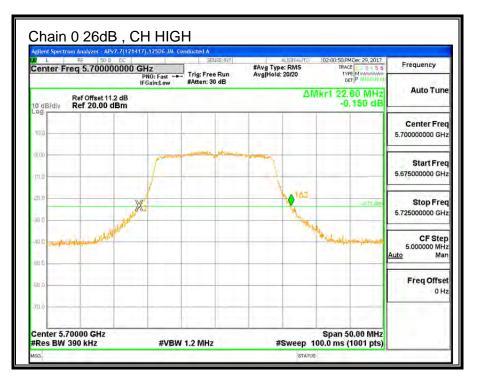


Page 134 of 381



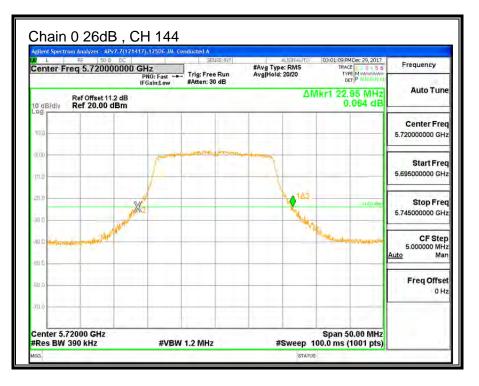


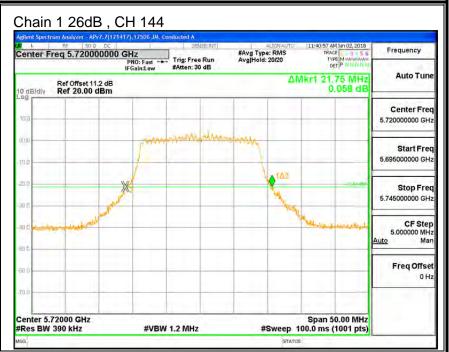
Page 135 of 381





Page 136 of 381





Page 137 of 381

9.10.2. 99% BANDWIDTH

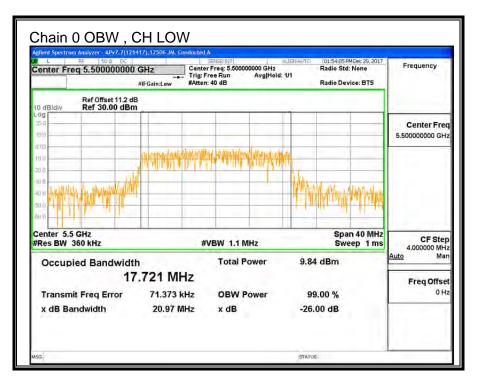
LIMITS

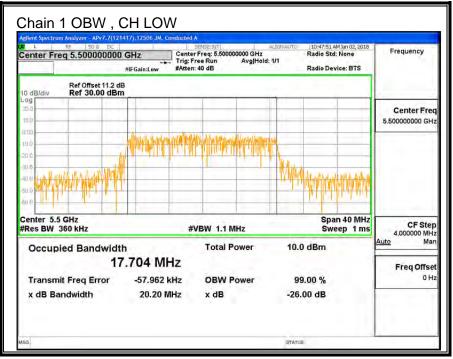
None; for reporting purposes only.

RESULTS

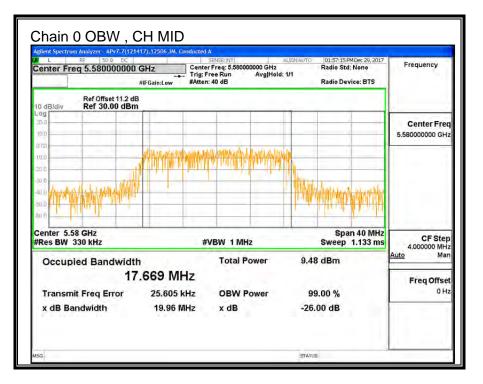
Channel	Frequency	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5500	17.721	17.704
Mid	5580	17.669	17.763
Mid (FCC)	5640	17.710	17.751
High	5700	17.753	17.739
144	5720	17.786	17.691

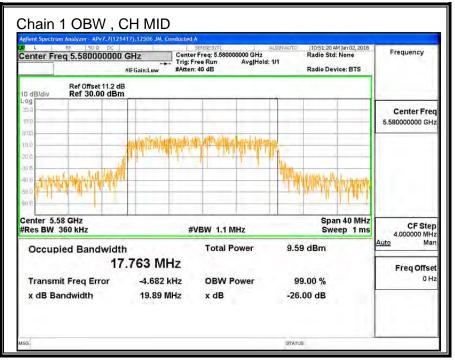
Page 138 of 381



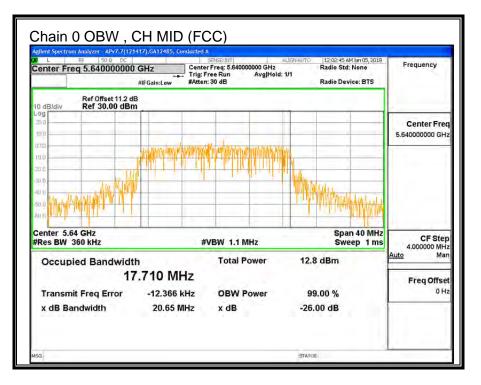


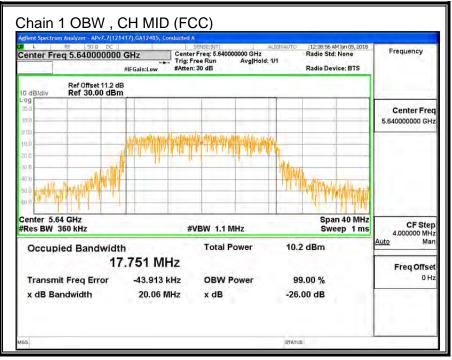
Page 139 of 381



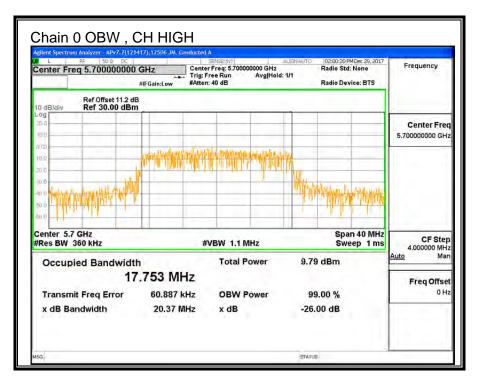


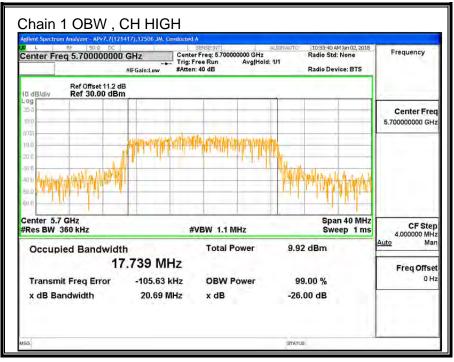
Page 140 of 381



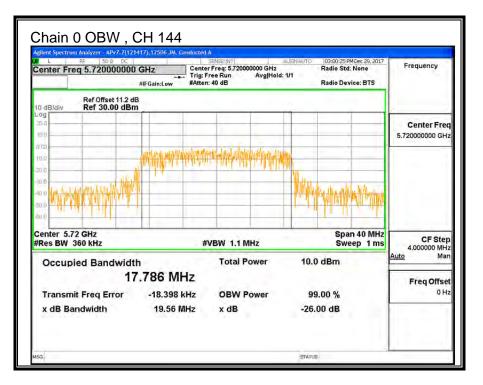


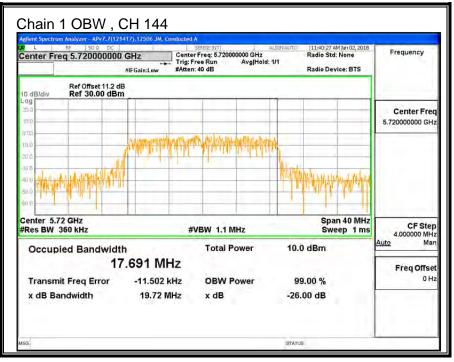
Page 141 of 381





Page 142 of 381





Page 143 of 381

9.10.3. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (2)

For the band 5.47–5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

For power, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

5470-5725 MHz

Chain 0	Chain 1	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
-0.80	-5.40	-2.52

For PSD the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

5470-5725 MHz

Chain 0	Chain 1	Correlated Chains			
Antenna	Antenna	Directional			
Gain	Gain	Gain			
(dBi)	(dBi)	(dBi)			
-0.80	-5.40	0.21			

FCC ID: PY7-72474U

RESULTS

ID:	12506 JM	Date:	01/08/18	

Bandwidth and Antenna Gain

Channel	Frequency	Min	Min Min Directional Dire		Directional
		26 dB	99%	Gain	Gain
		BW	BW	for Power	for PPSD
	(MHz)	(MHz)	(MHz)	(dBi)	(dBi)
Low	5500	21.70	17.704	-2.52	0.21
Mid	5580	22.10	17.669	-2.52	0.21
Mid (FCC)	5640	21.75	17.710	-2.52	0.21
High	5700	22.35	17.739	-2.52	0.21
144	5720	15.88	13.846	-2.52	0.21

Limits

Channel	Frequency	FCC	IC	IC	Power	FCC	IC	PPSD
		Power	Power	EIRP	Limit	PPSD	PSD	Limit
		Limit	Limit	Limit		Limit	Limit	
	(MHz)	(dBm)						
Low	5500	24.00	23.48	29.48	23.48	11.00	11.00	11.00
Mid	5580	24.00	23.47	29.47	23.47	11.00	11.00	11.00
Mid (FCC)	5640	24.00	23.48	29.48	23.48	11.00	11.00	11.00
High	5700	24.00	23.49	29.49	23.49	11.00	11.00	11.00
144	5720	23.01	22.41	28.41	22.41	11.00	11.00	11.00

Duty Cycle CF (dB) 0.14

Included in Calculations of Corr'd PPSD

Output Power Results

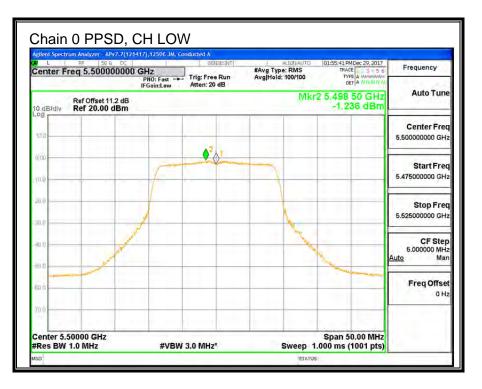
Channel	Frequency	Chain 0	Chain 1	Total	Power	Power
		Meas	Meas	Corr'd	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5500	9.55	9.81	12.69	23.48	-10.79
Mid	5580	9.63	9.83	12.74	23.47	-10.73
Mid (FCC)	5640	9.27	9.79	12.55	23.48	-10.93
High	5700	9.25	9.57	12.42	23.49	-11.07
144	5720	9.63	9.47	12.56	22.41	-9.85

PPSD Results

Channel	Frequency	Chain 0	Chain 1	Total	PPSD	PPSD
		Meas	Meas	Corr'd	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5500	-1.236	-0.551	2.27	11.00	-8.73
Mid	5580	-1.248	-1.393	1.83	11.00	-9.17
Mid (FCC)	5640	1.747	-0.715	3.84	11.00	-7.16
High	5700	-1.201	-0.778	2.17	11.00	-8.83
144	5720	-0.793	-0.917	2.30	11.00	-8.70

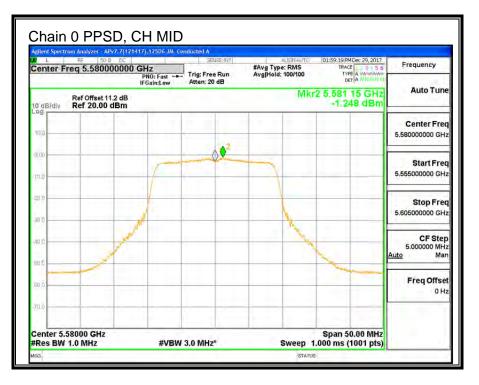
<u>Note:</u> the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

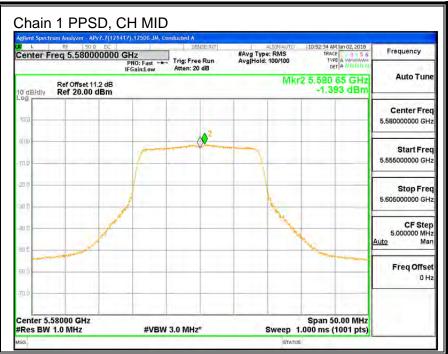
Page 145 of 381



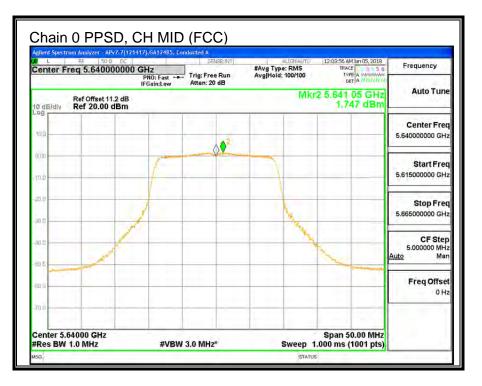


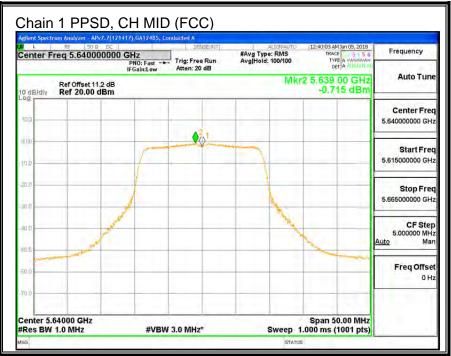
Page 146 of 381



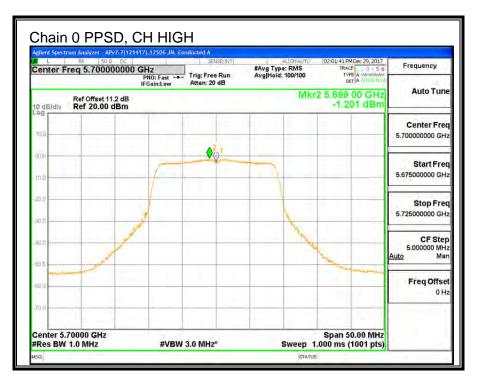


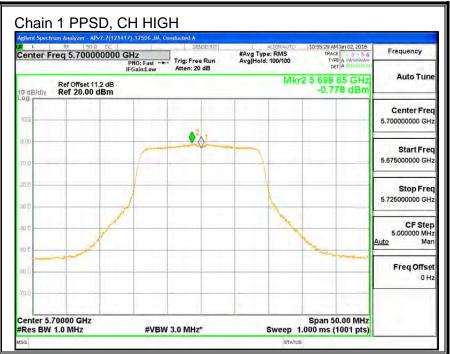
Page 147 of 381



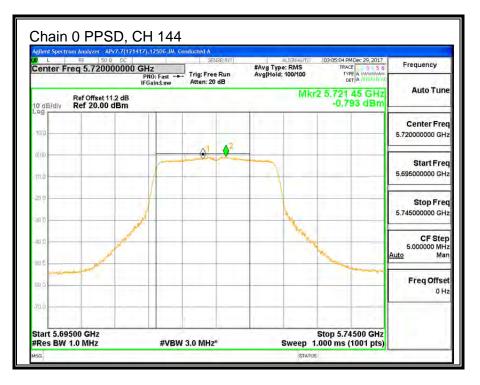


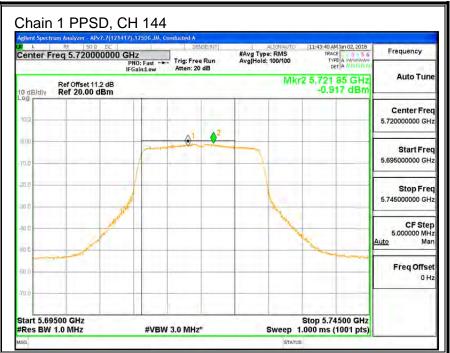
Page 148 of 381





Page 149 of 381





Page 150 of 381

9.11. 11n HT40 2TX CDD MIMO MODE IN THE 5.6GHz BAND

9.11.1. 26 dB BANDWIDTH

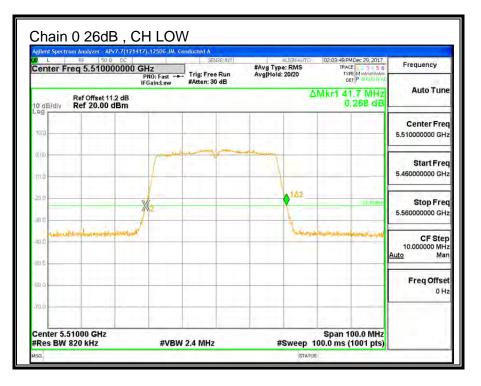
LIMITS

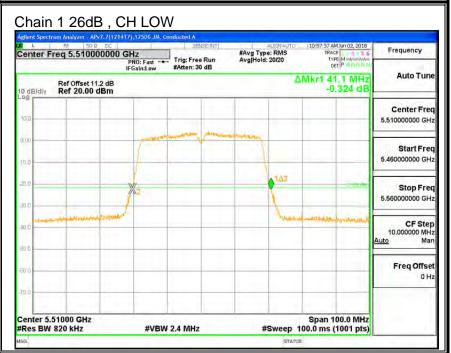
None; for reporting purposes only.

RESULTS

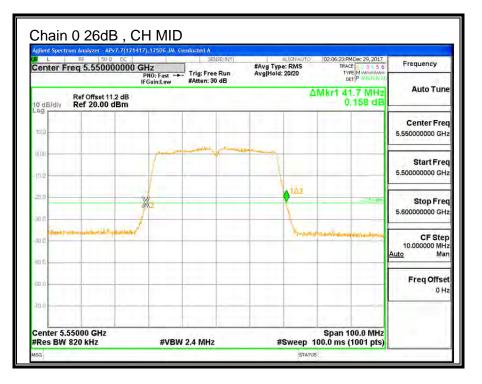
Channel	Frequency	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5510	41.7	41.1
Mid	5550	41.7	41.2
Mid (FCC)	5630	41.9	41.2
High	5670	41.7	41.1
142	5710	42.0	40.9

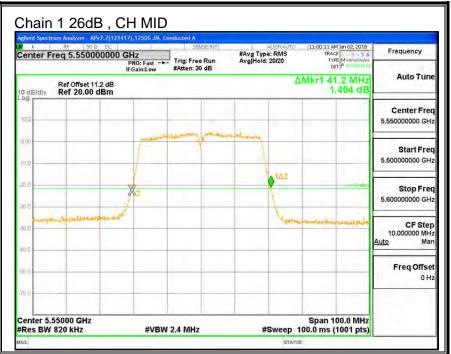
Page 151 of 381



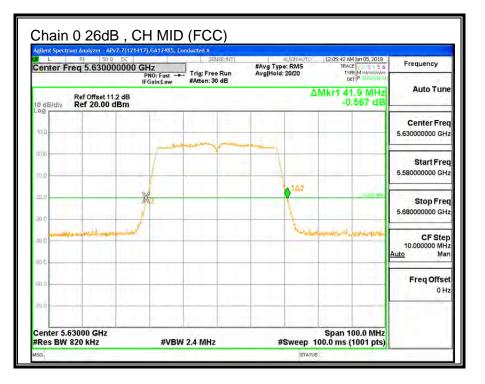


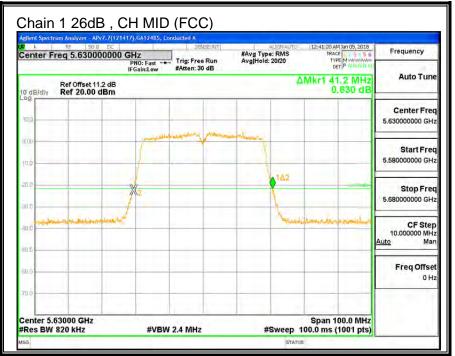
Page 152 of 381





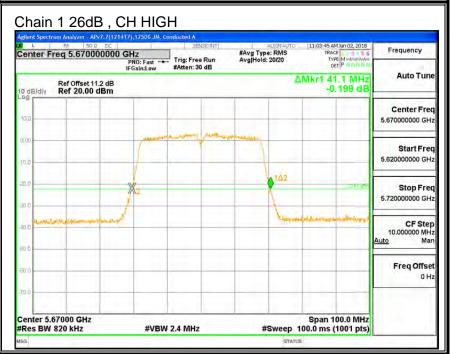
Page 153 of 381





Page 154 of 381





Page 155 of 381