EMC TEST REPORT for UNII device

No. 140101279SHA-002

Applicant	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089
Manufacturer	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089
Product Name	:	Wireless Access Point
Type/Model	:	APIN0103

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2012): Radio Frequency Devices (Subpart C)

ANSI C63.4 (2009): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

RSS-210 Issue 8 (December 2010): Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

RSS-Gen Issue 3 (December 2010): General Requirements and Information for the Certification of Radiocommunication Equipment

Date of issue: Jan. 24, 2014

Prepared by:	Reviewed by:
Daniel Zhao (*Project Engineer*)	Jonny Jing (*Reviewer*)

Description of Test Facility

Name: Intertek Testing Services Limited Shanghai
Address: Building No.86, 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

FCC Registration Number: 236597
IC Assigned Code: 2042B-1

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Content

1. General Information

1.1 Applicant Information

Applicant	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089
Name of contact	:	Greg Rocha
Tel	:	408-419-4093
Fax	:	/
Manufacturer	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089

1.2 Identification of the EUT

Product Name	:	**Wireless Access Point**
Type/model	:	**APIN0103**
FCC ID	:	Q9DAPIN0103
IC	:	4675A-APIN0103

1.3 Technical specification

Operation Frequency Band	:	5180- 5240 MHz
Type of Modulation	:	OFDM(BPSK,QPSK,16QAM,64QAM)
EUT Modes of Modulation	:	802.11a; 802.11n HT20,HT40;
Channel Number	:	802.11a & 802.11n HT 20: Channel 36 – 48 802.11n HT 40: channel 38 – 46.
Description of EUT	:	The EUT is a wireless access point, and it is a MIMO product.
Port identification	:	power port 1; RJ45 ports 1
Antenna	:	Integral, 3.9 dBi for 2.4GHz band, 4.1 dBi for 5.15 – 5.35GHz band, 4.3 dBi for 5.475 – 5.850 GHz band
Rating	:	DC 12V, 1A (Adaptor) or DC 57V, 350 mA(PoE)

Declared Temperature range	:	0°C ~ 45°C
Category of EUT	:	Class B
EUT type	:	☒ Table top ☐ Floor standing
Sample received date	:	Dec. 26, 2013
Sample Identification No	:	/
Date of test	:	Dec. 26, 2013 – Jan. 10, 2014

MIMO Function Description:

Freq. Band	Modulation	Tx/Rx Function	Beam forming	Array Gain	Note
5180-5240MHz	802.11a	2TX/2RX	NO	0 dBi	
	802.11n HT20	2TX/2RX	NO	0 dBi	
	802.11n HT40	2TX/2RX	NO	0 dBi	
Note: The mimo mode (IEEE 802.11) is Cyclic Delay Diversity, and the array gain is 0 dBi according to clause f) of KDB 662911.					

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2013-10-21	2014-10-20
Test Receiver	ESCI 7	R&S	EC4501	2013-12-29	2014-12-28
Spectrum Analyzer	N9010	Agilent	EC4890	2013-10-21	2014-10-20
Power meter	ML 2495A	Anritsu	EC 4895	2013-10-21	2014-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2014-1-9	2015-1-8
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2013-5-16	2014-5-15
Horn antenna	HF 906	R&S	EC 3049	2013-5-13	2014-5-12
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2013-4-12	2014-4-11
Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2013-4-12	2014-4-11
Log-period antenna	AT 1080	AR	EC 3044-7	2013-5-22	2014-5-21
Biconical antenna	3109PX	ETS	EC3564	2013-8-25	2014-8-24
Semi-anechoic chamber	-	Albatross project	EC 3048	2013-5-21	2014-5-20
Shielded room	-	Zhongyu	EC 2838	2014-1-12	2016-1-11
Shielded room	-	Zhongyu	EC 2839	2014-1-12	2016-1-11
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2013-2-1	2014-1-31
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2013-2-1	2014-1-31
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2013-2-1	2014-1-31
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2013-2-1	2014-1-31

2.2 Test Standard

47CFR Part 15:2012
ANSI C63.4: 2009
KDB 558074 (V03R01)
KDB 662911 (V02R01)
RSS-210 Issue 8: 2010
RSS-Gen Issue 3: 2010

2.3 Mode of operation during the test / Test peripherals used

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The lowest, middle and highest channel were tested as representatives.

Freq. Band	Modulation	Lowest(MHz)	Middle(MHz)	Highest(MHz)
5180-5240MHz	802.11a	5180	5220	5240
	802.11n HT20	5180	5220	5240
	802.11n HT40	5190	/	5230

Test software setting:
The power level setting for 802.11a/b/g/n/ac is used with ART software offered by the manufactory.

Mode 1	Frequency (MHz)	ART Setting	Note
802.11a	5180	11.50	
	5220	11.50	
	5240	11.50	
802.11n HT20	5180	11.50	
	5220	11.50	
	5240	11.50	
802.11n HT40	5190	12.50	
	5230	12.00	

Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	HP ProBook 6470b	NA

Data rate VS Power

The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

After this pre-scan, we choose the following table of the data rata as the worst case.

Freq. Band	Modulation	Worst case data rate
5180-5240MHz	802.11a	6Mbps
	802.11n HT20	MCS8
	802.11n HT40	MCS8

Duty cycle:

Duty cycle	On (ms)	On+Off (ms)	Duty cycle(x)	Duty cycle factor
802.11a	1.36	1.405	0.97	0.14
802.11n20	0.6608	0.704	0.94	0.28
802.11n40	0.3405	0.372	0.92	0.38

2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Maximum conducted output power	15.407(a)(1)	RSS-210 Issue 8 Annex 9.2(1)	Pass
Power spectral density	15.407(a)(1)	RSS-210 Issue 8 Annex 9.2(1)	Pass
Peak excursion radio	15.407(a)(6)	-	Pass
Radiated emission	15.407 (b)(1) 15.205, 15.209	RSS-210 Issue 8 Annex 9.2(1)	Pass
Power line conducted emission	15.207	RSS-Gen Issue 3 Clause 7.2.4	Pass
26 dB Bandwidth	15.407(a)(1)	-	Tested
Emission Bandwidth (99%)	-	RSS-Gen Issue 3 Clause 4.6.1	Tested
Spurious emission for receiver	-	RSS-Gen Issue 3 Clause 6.1	Pass

3. Maximum Conducted Output Power & eirp

Test result: Pass

3.1 Test limit

FCC:

For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50mW or 4dBm + 10log B, where B is the 26-dB emission bandwidth in MHz.

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

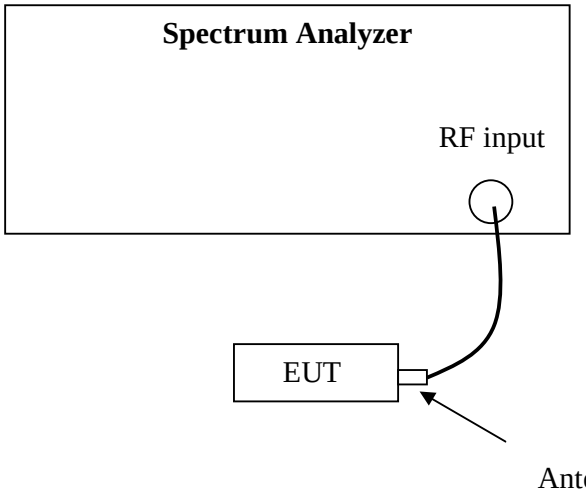
Frequency range (MHz)	Min. 26 dB Bandwidth (MHz)	4+ 10log B (dBm)	Limit (dBm)
5150 - 5250	21.00	>17.22	17.00

RSS-210:

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Mode	Frequency range (MHz)	Min. 99% bandwidth (MHz)	10+ 10log B (dBm)	e.i.r.p. Limit (dBm)
802.11a	5150 - 5250	16.6366	22.21	22.21
802.11n HT 20		17.7253	22.48	22.48
802.11n HT 40		36.4378	25.62	23.00
Note: The antenna gain is 4.1 dBi, so it's deemed to comply with e.i.r.p. limits if the product complies with conduct limits (17 dBm).				

3.2 Test Configuration



3.3 Test procedure and test setup

The power output per FCC §15.407(a) was measured on the EUT using a 50 ohm RF cable connected to spectrum analyzer and the measurement method refer to KDB 789033D01 v01r03: Method SA-1. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

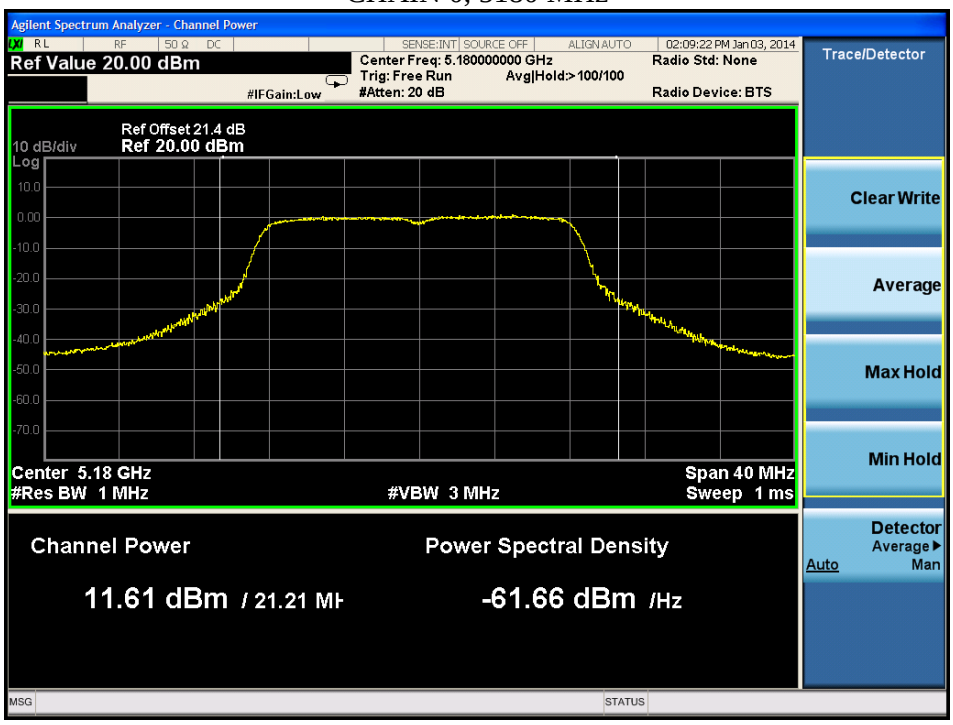
3.4 Test protocol

Temperature : 18 °C
Relative Humidity : 40 %
Test Mode : 802.11a

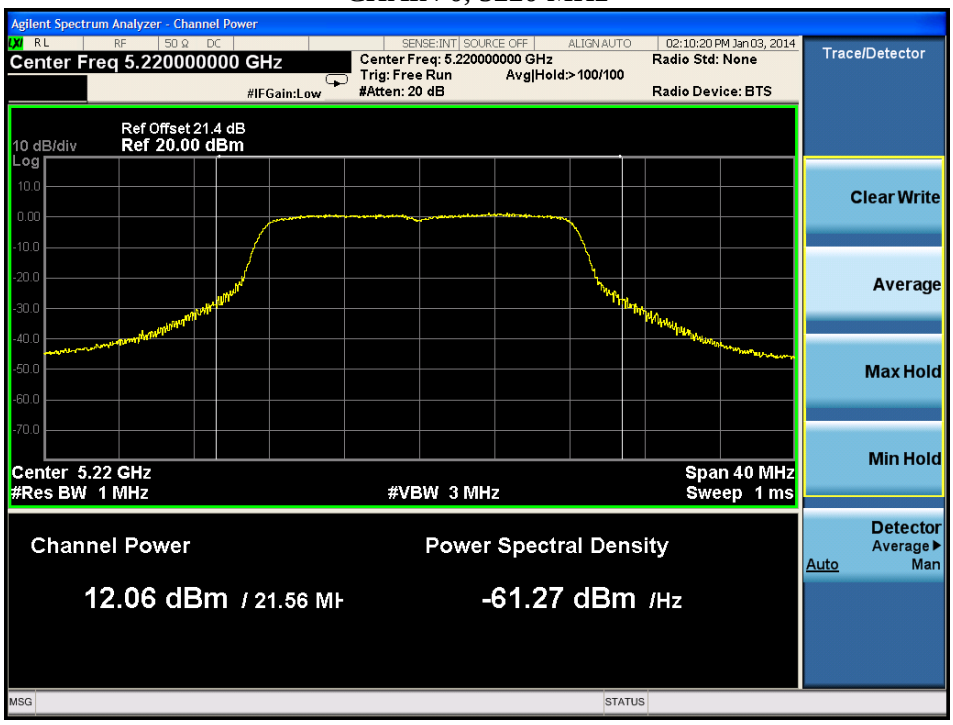
Freq. (MHz)	Reading (dBm)		Duty cycle factor (dB)	Total Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
	Port 0	Port 1				
5180	11.61	12.16	0.14	15.05	17	1.95
5220	12.06	12.47	0.14	15.42	17	1.58
5240	11.14	11.95	0.14	14.72	17	2.28

The maximum EIRP of the EUT = 15.42dBm +4.1dBi = 19.83dBm which is lower than the EIRP limit of RSS-210(22.21 dBm).

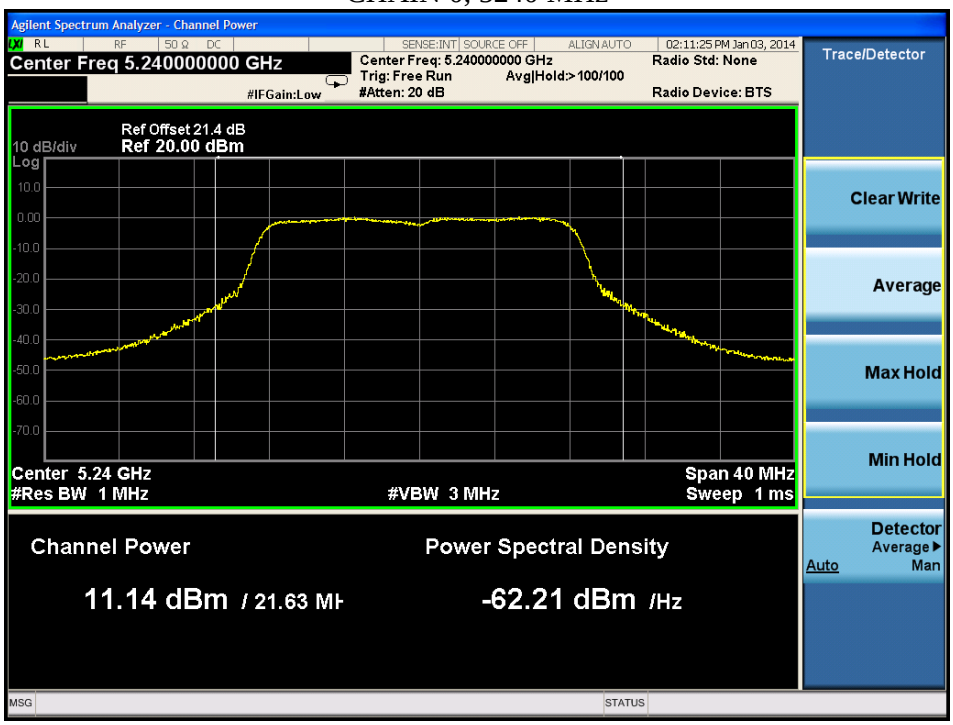
CHAIN 0, 5180 MHz



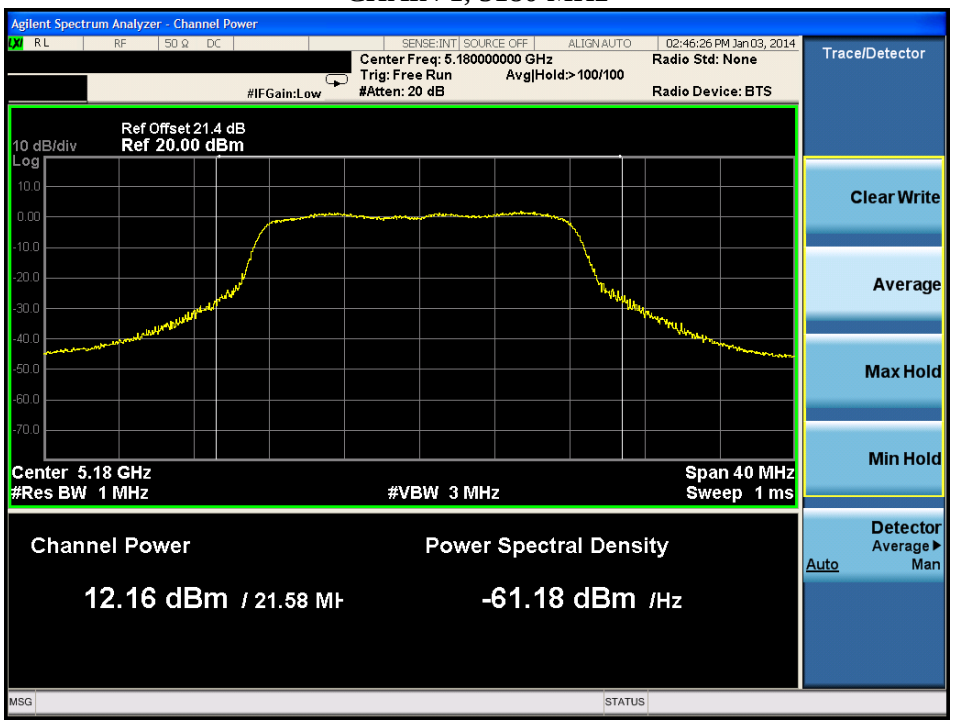
CHAIN 0, 5220 MHz



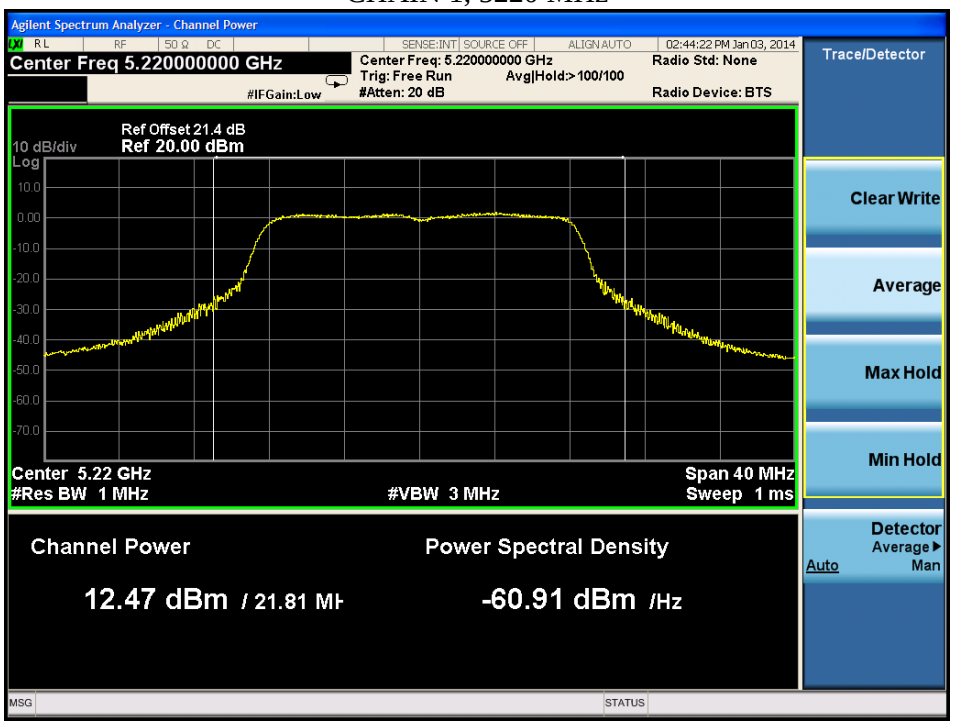
CHAIN 0, 5240 MHz



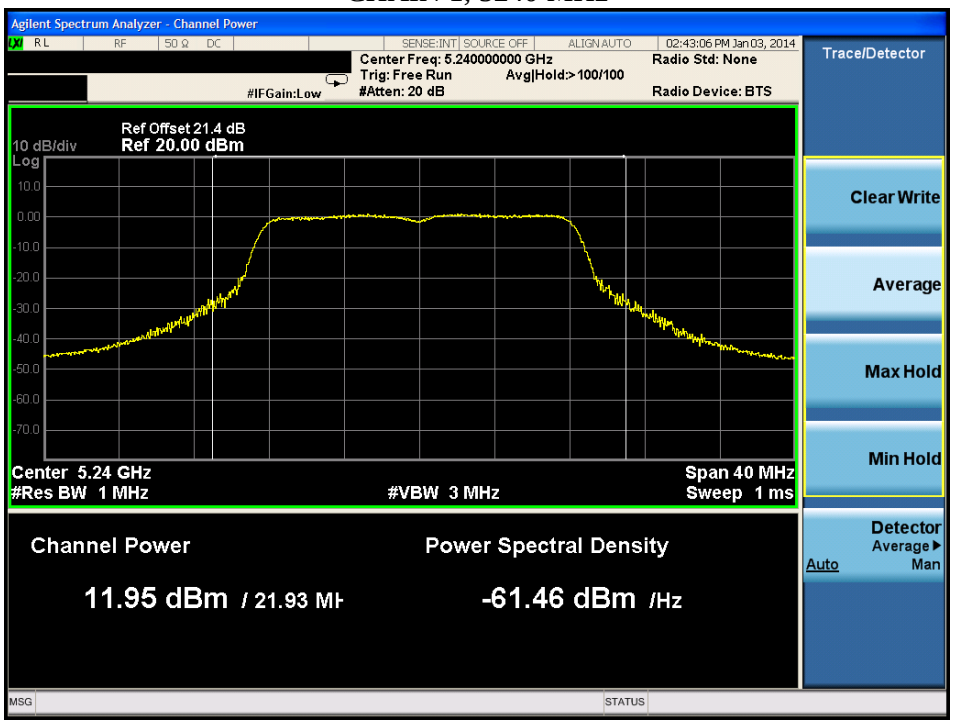
CHAIN 1, 5180 MHz



CHAIN 1, 5220 MHz



CHAIN 1, 5240 MHz

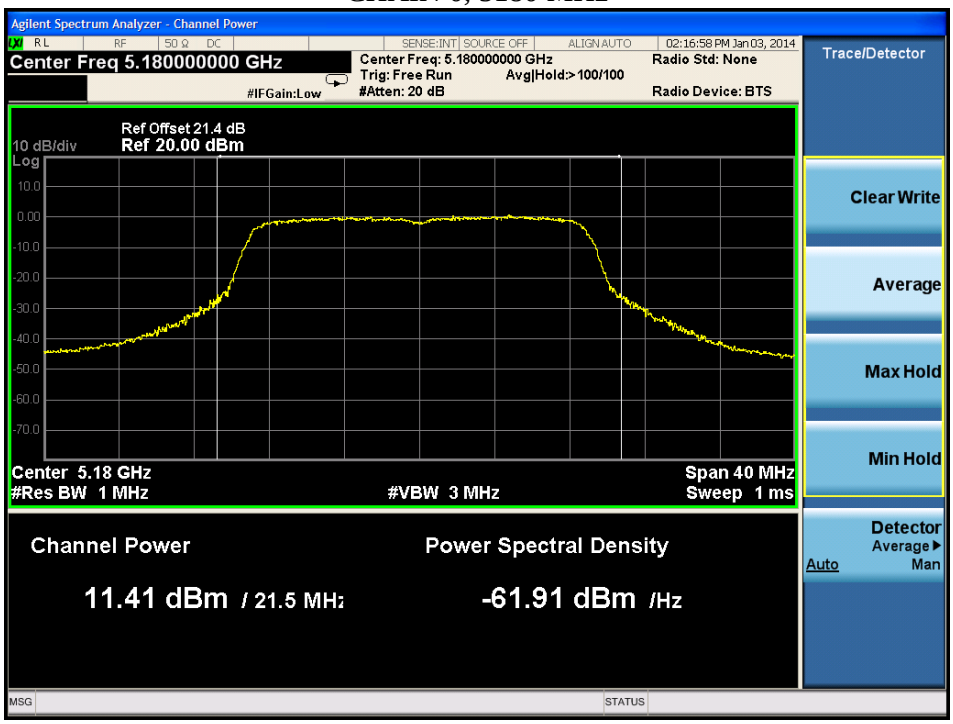


Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11n HT 20

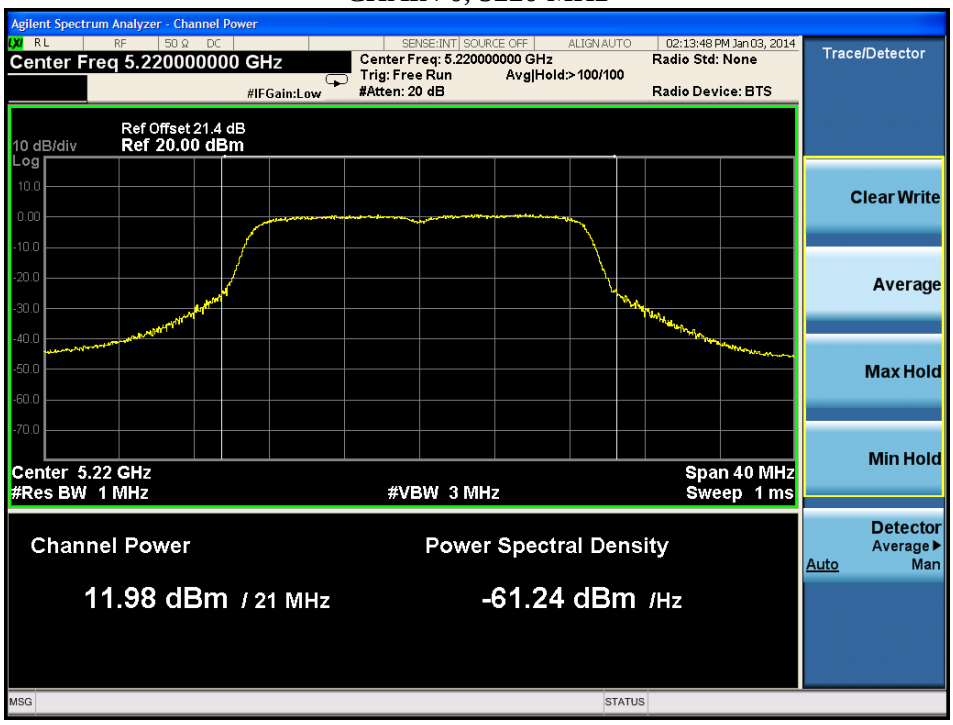
Freq. (MHz)	Reading (dBm)		Duty cycle factor (dB)	Total Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
	Port 0	Port 1				
5180	11.41	12.09	0.28	15.05	17	1.95
5220	11.98	12.27	0.28	15.41	17	1.59
5240	10.88	11.86	0.28	14.68	17	2.32

The maximum EIRP of the EUT = 15.41dBm +4.1dBi = 19.82dBm which is lower than the EIRP limit of RSS-210(22.48 dBm).

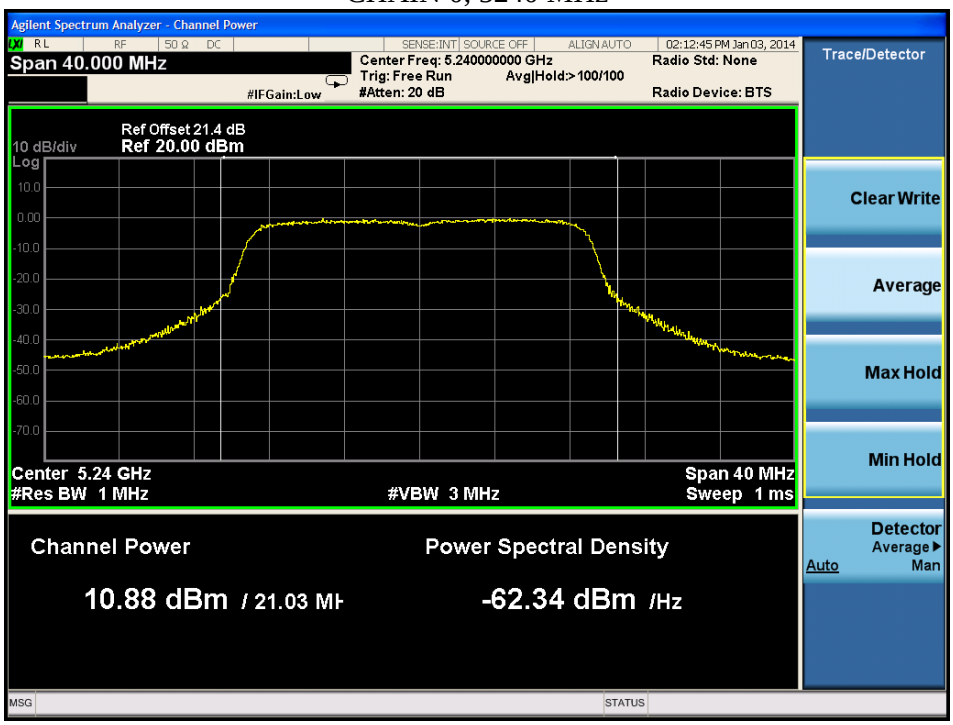
CHAIN 0, 5180 MHz



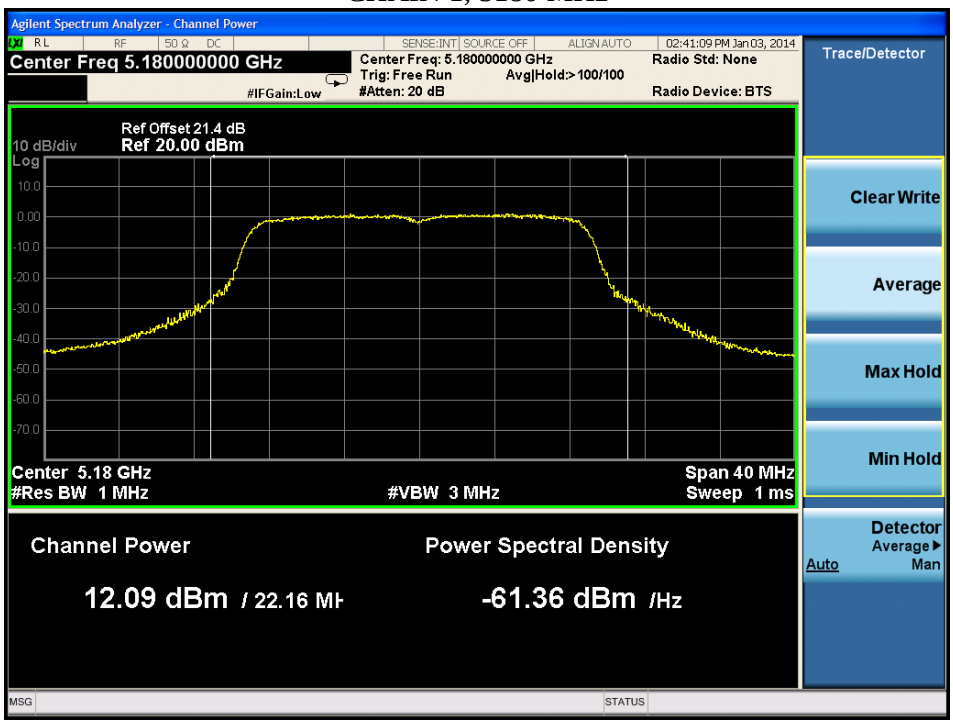
CHAIN 0, 5220 MHz



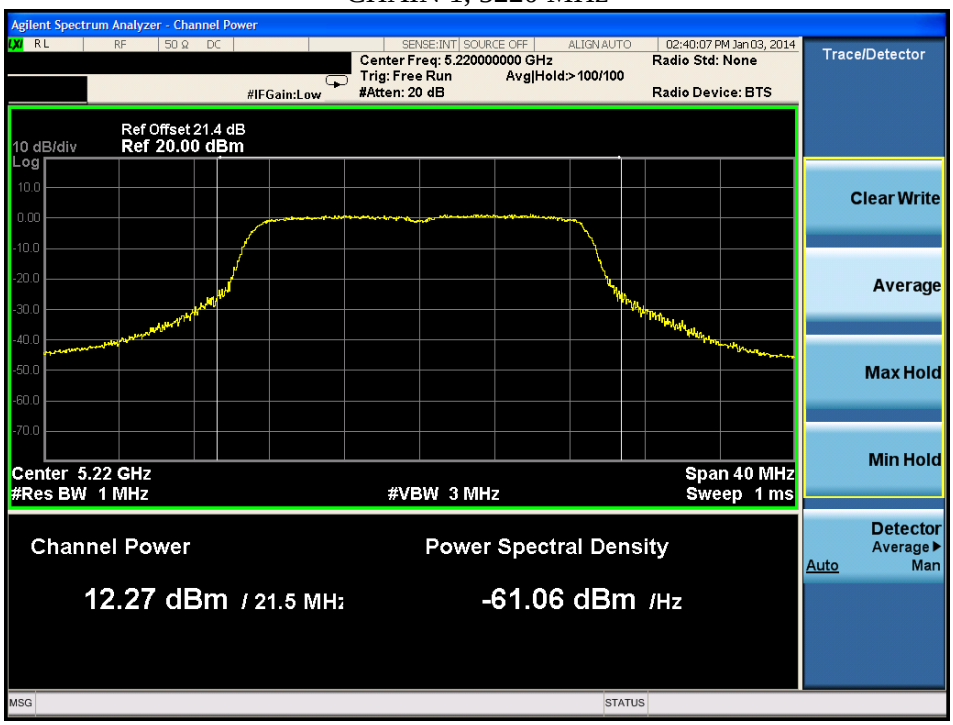
CHAIN 0, 5240 MHz



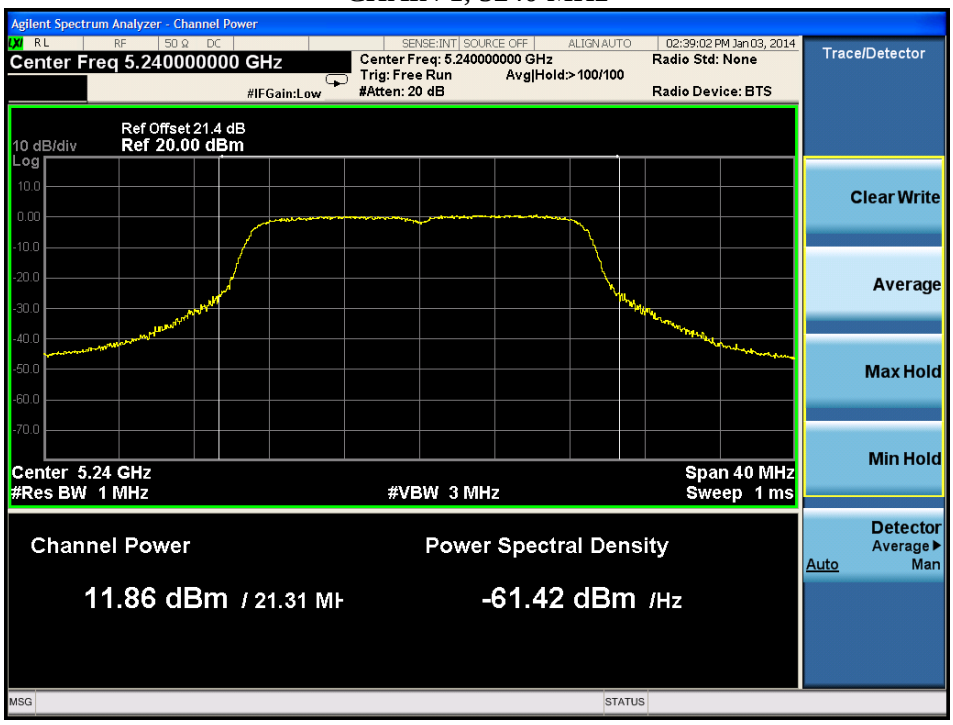
CHAIN 1, 5180 MHz



CHAIN 1, 5220 MHz



CHAIN 1, 5240 MHz



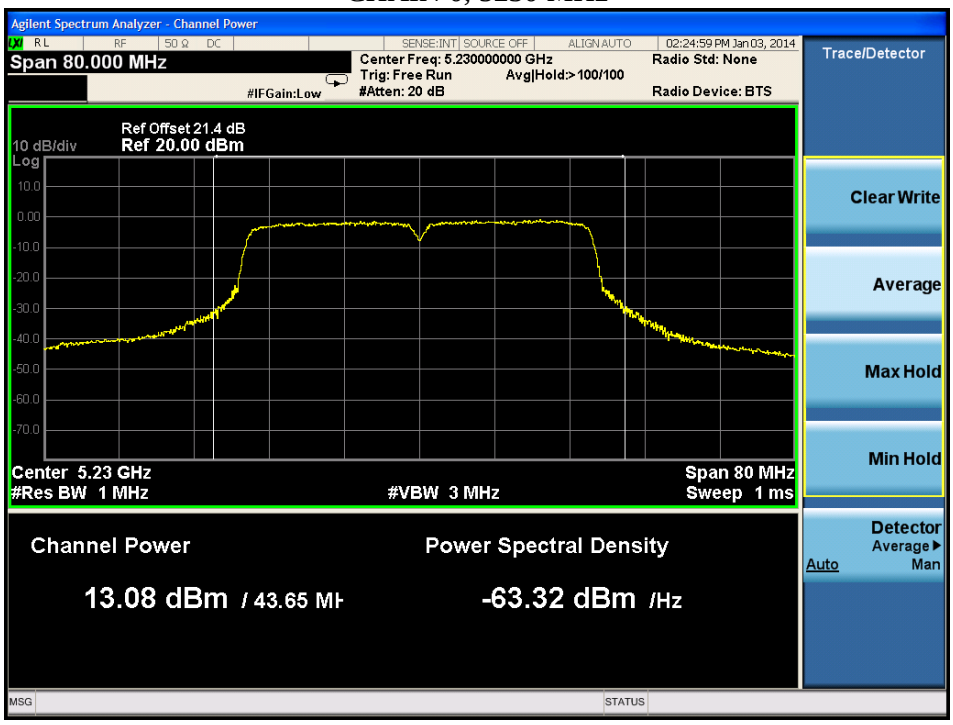
Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11n HT40

Freq. (MHz)	Reading (dBm)		Duty cycle factor (dB)	Total Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
	Port 0	Port 1				
5190	13.46	13.47	0.38	16.86	17	0.14
5230	13.08	13.41	0.38	16.64	17	0.36

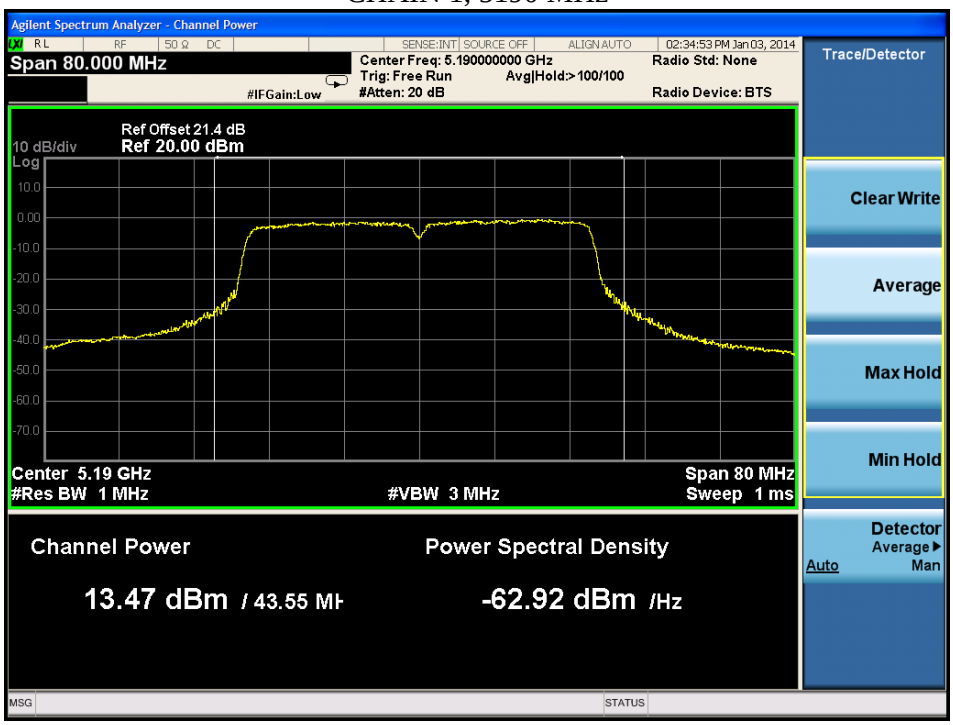
The maximum EIRP of the EUT = 16.86dBm +4.1dBi = 20.96dBm which is lower than the EIRP limit of RSS-210(23.00 dBm).

CHAIN 0, 5190 MHz

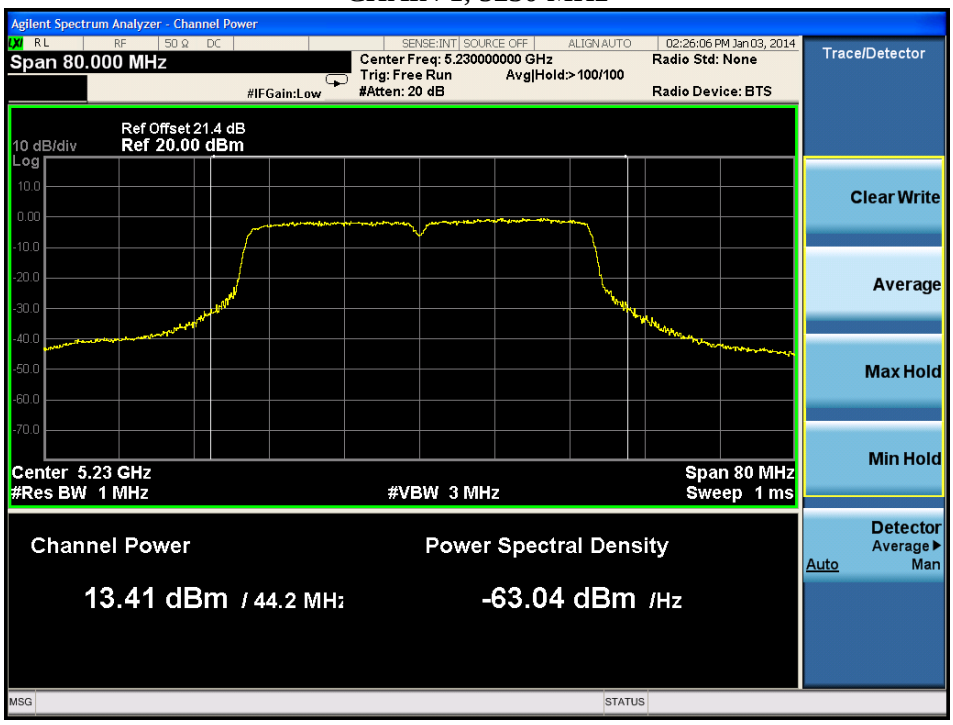
CHAIN 0, 5230 MHz



CHAIN 1, 5190 MHz



CHAIN 1, 5230 MHz



4. Power spectral density

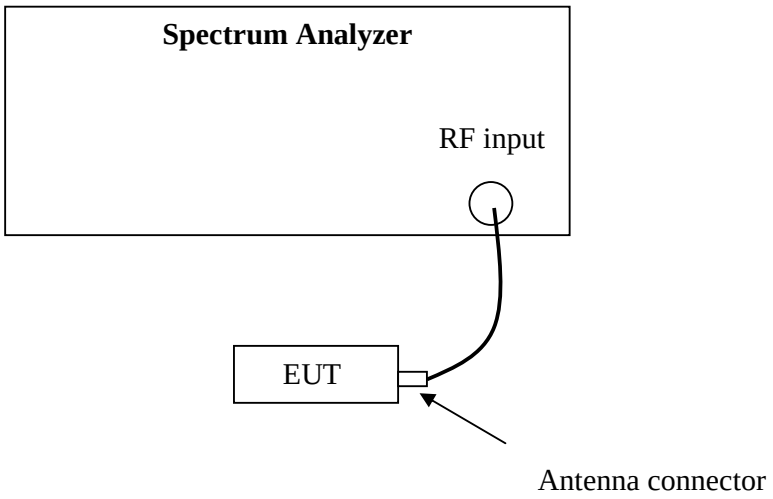
Test result: Pass

4.1 Test limit

FCC:
For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

RSS-210:
The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.
Note: The antenna gain is 4.1 dBi, so it is deemed to comply with e.i.r.p. limits if the product complies with conduct limits (4 dBm/MHz).

4.2 Test Configuration



4.3 Test procedure and test setup

The power spectral density per FCC §15.407(a) was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 1MHz, the video bandwidth set at 3 MHz (measurement method refer to KDB 789033D01 v01r03: section F).
Power spectral density was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

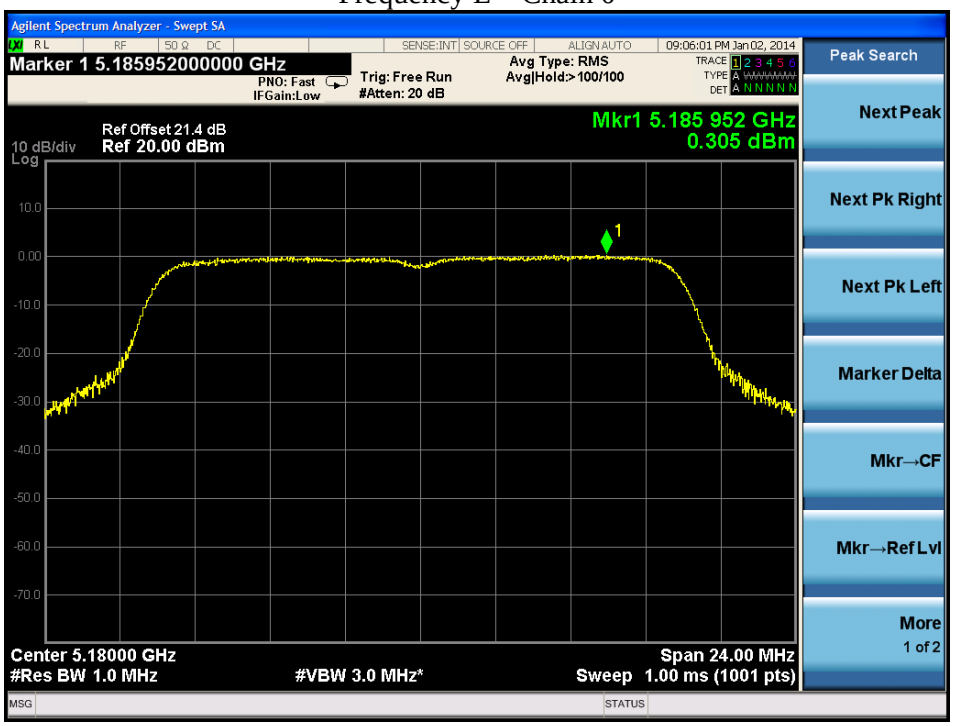
4.4 Test Protocol

Temperature : 18 °C

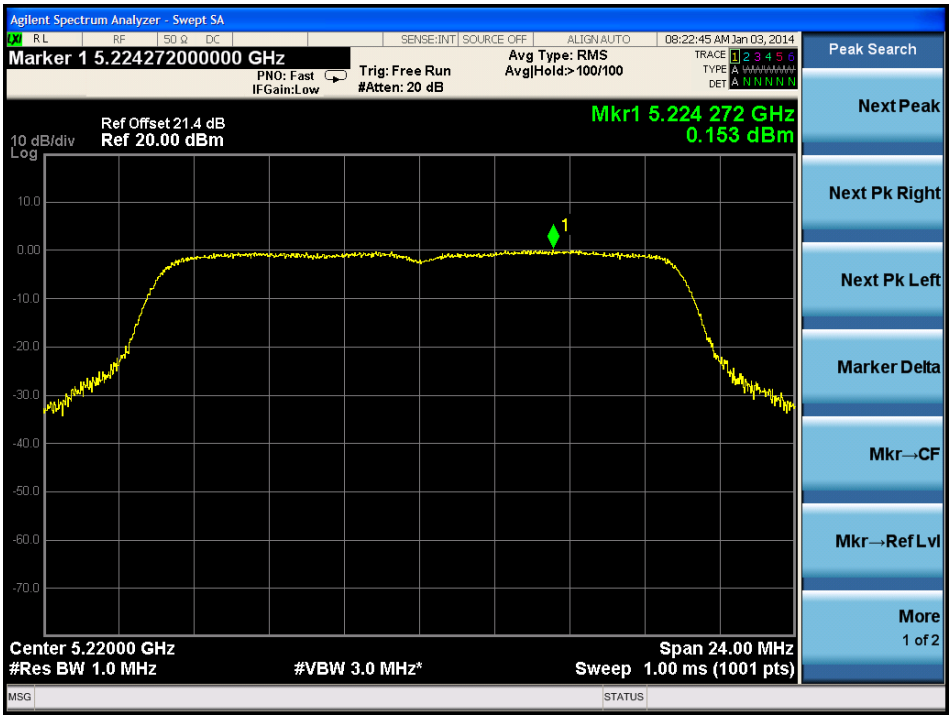
Relative Humidity : 40 %

Mode	Freq. (MHz)	PSD (dBm)		Duty cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
		Port0	Port 1				
802.11a	5180	0.305	1.026	0.14	3.83	4	0.17
	5220	0.153	0.476	0.14	3.47	4	0.53
	5240	0.233	0.632	0.14	3.59	4	0.41

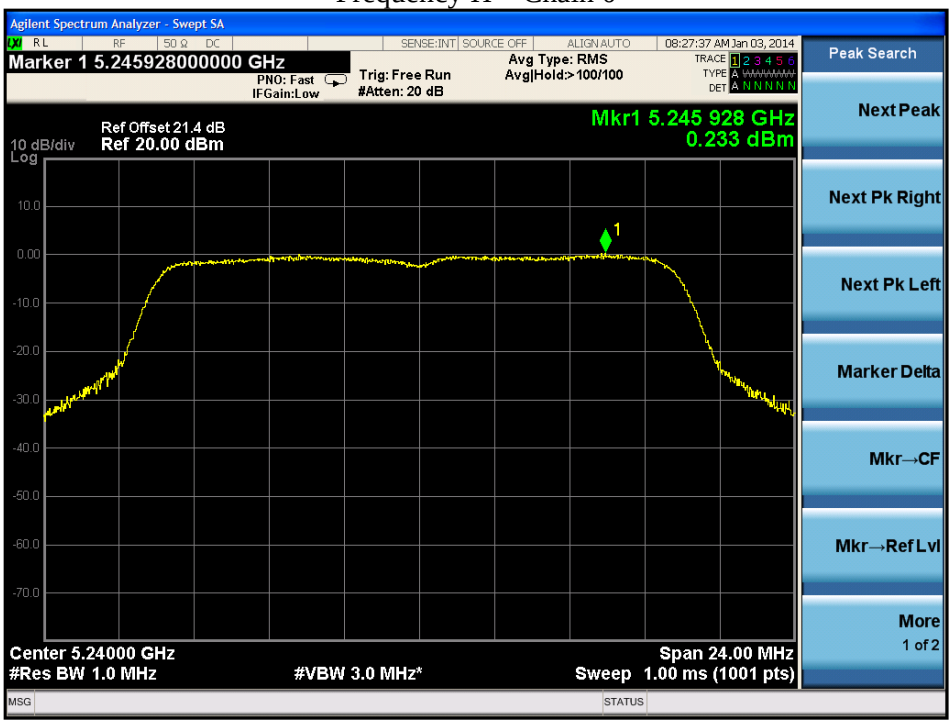
Frequency L – Chain 0



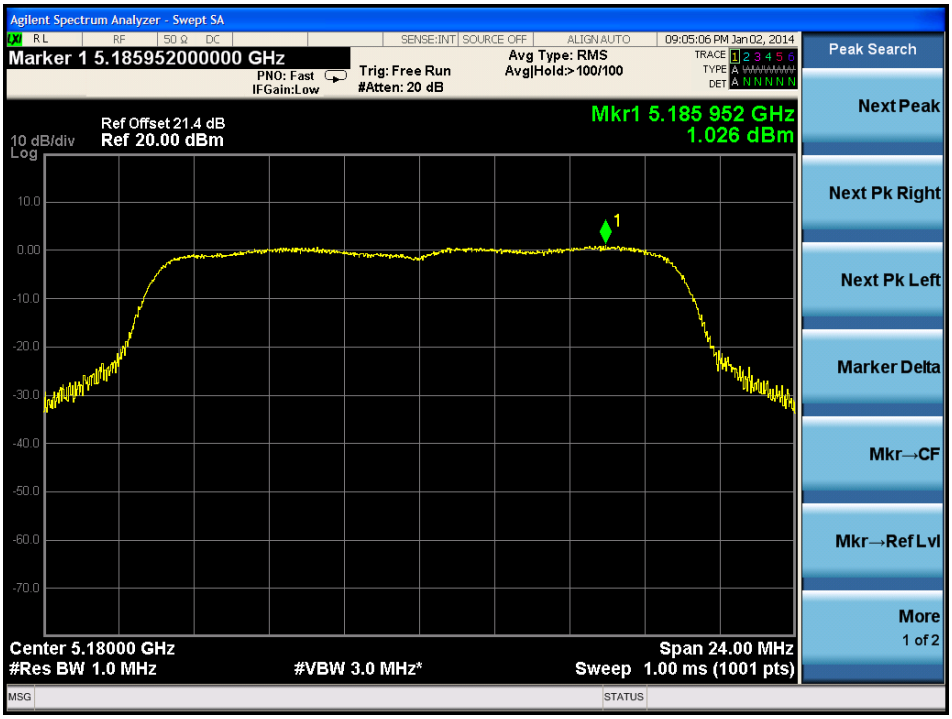
Frequency M – Chain 0



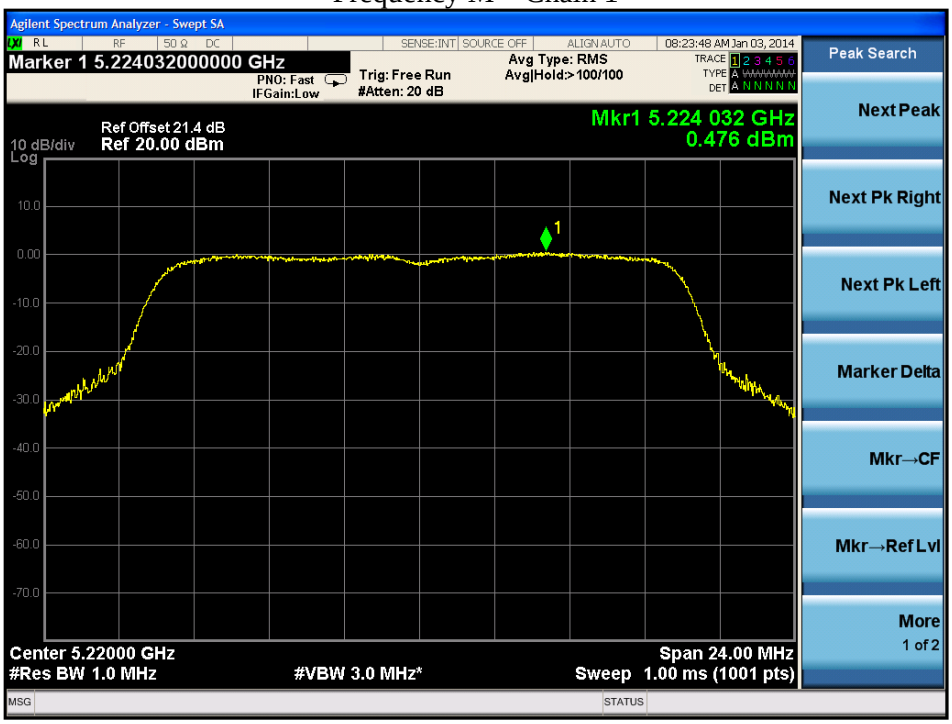
Frequency H – Chain 0



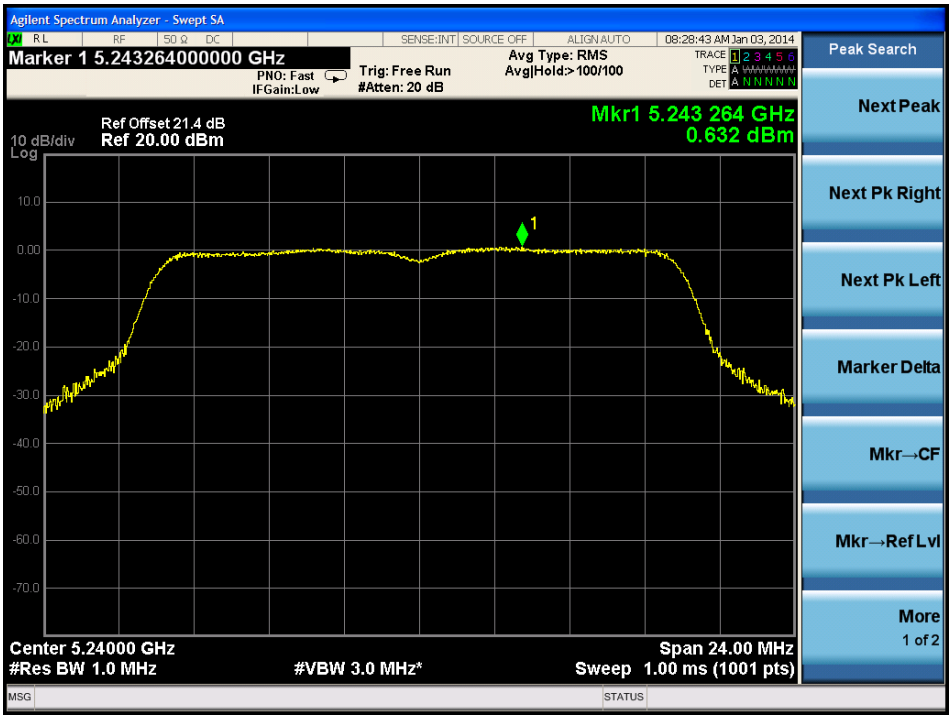
Frequency L – Chain 1



Frequency M – Chain 1

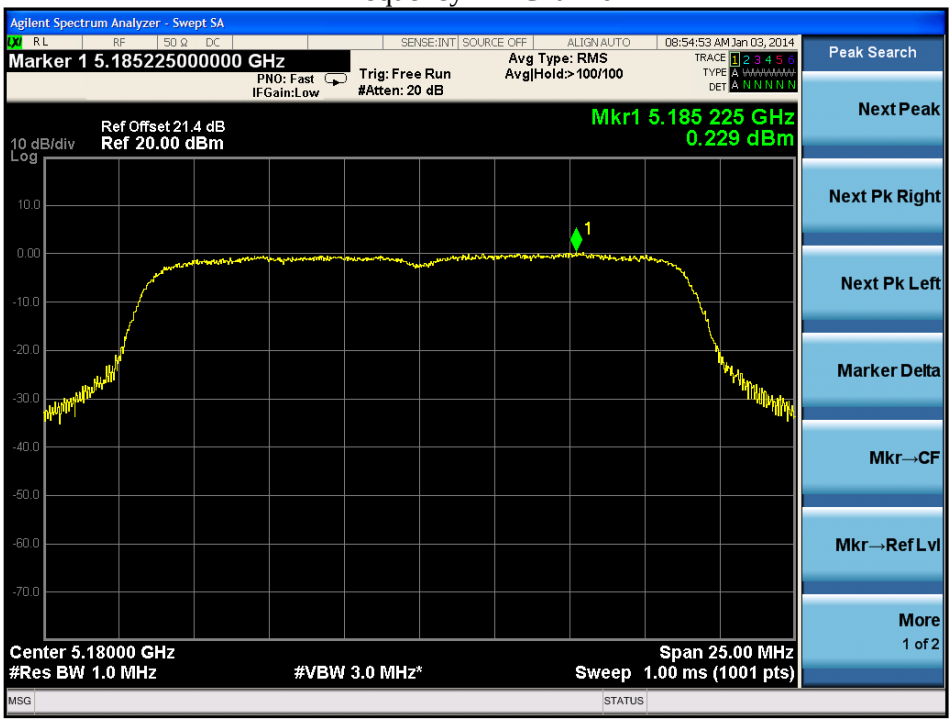


Frequency H – Chain 1

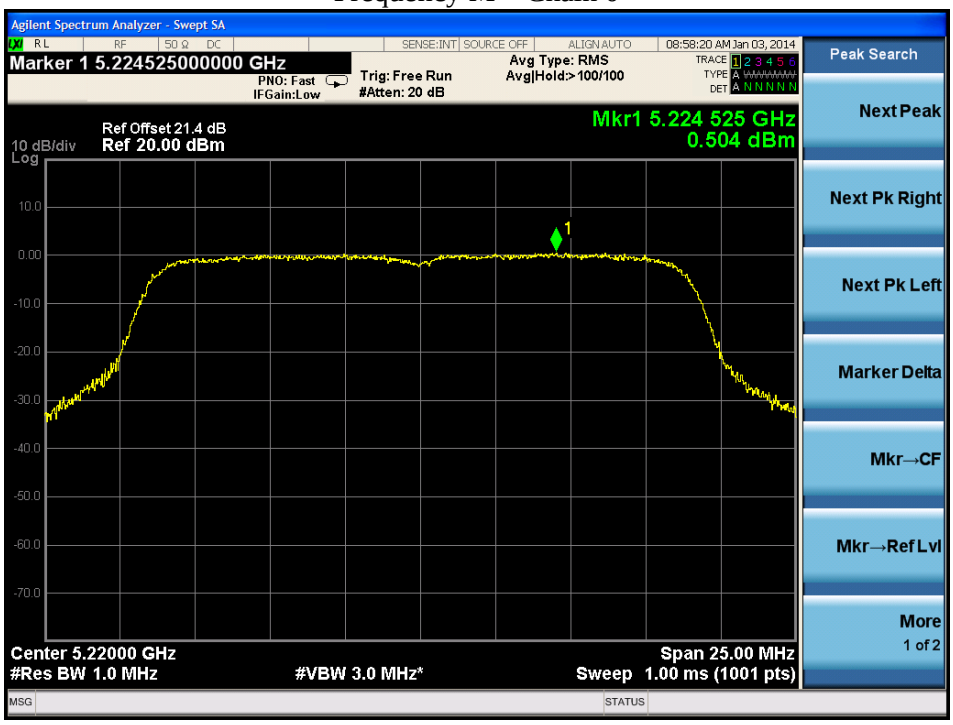

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω DC
SENSE:INT
SOURCE OFF
ALIGN AUTO
08:28:43 AM Jan 03, 2014
Marker 1 5.243264000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: RMS
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE A WWWWW
DET A N N N N N
Ref Offset 21.4 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 5.243 264 GHz
0.632 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 5.24000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 24.00 MHz
Sweep 1.00 ms (1001 pts)
MSG
STATUS
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Mode	Freq. (MHz)	PSD (dBm)		Duty cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
		Port0	Port 1				
802.11n HT20	5180	0.229	0.599	0.28	3.70	4	0.30
	5220	0.504	0.733	0.28	3.91	4	0.09
	5240	0.305	0.486	0.28	3.68	4	0.32

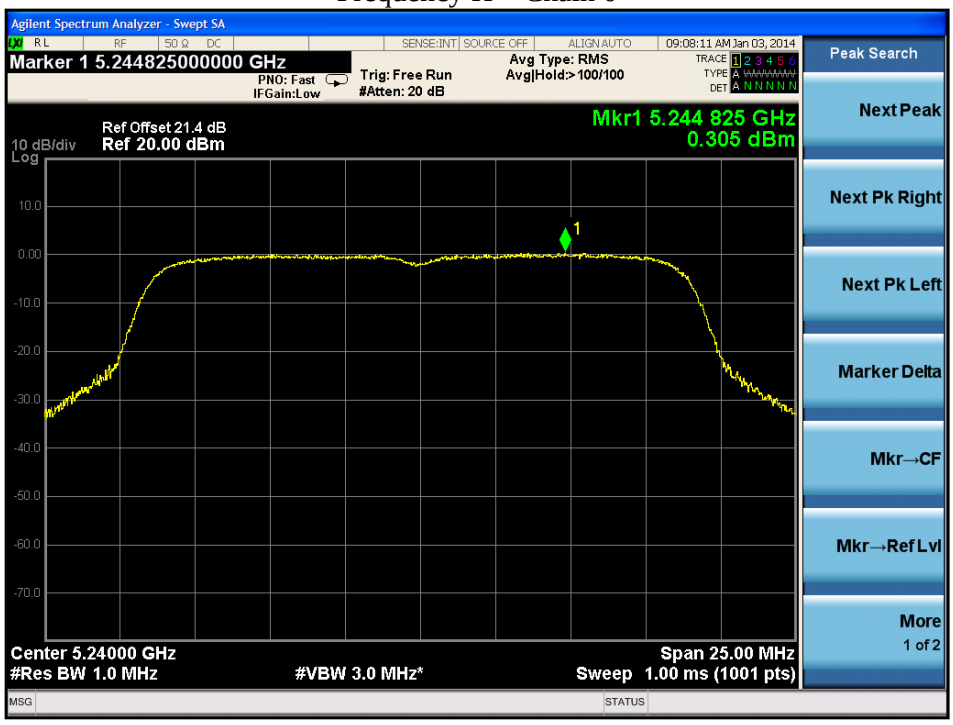
Frequency L – Chain 0



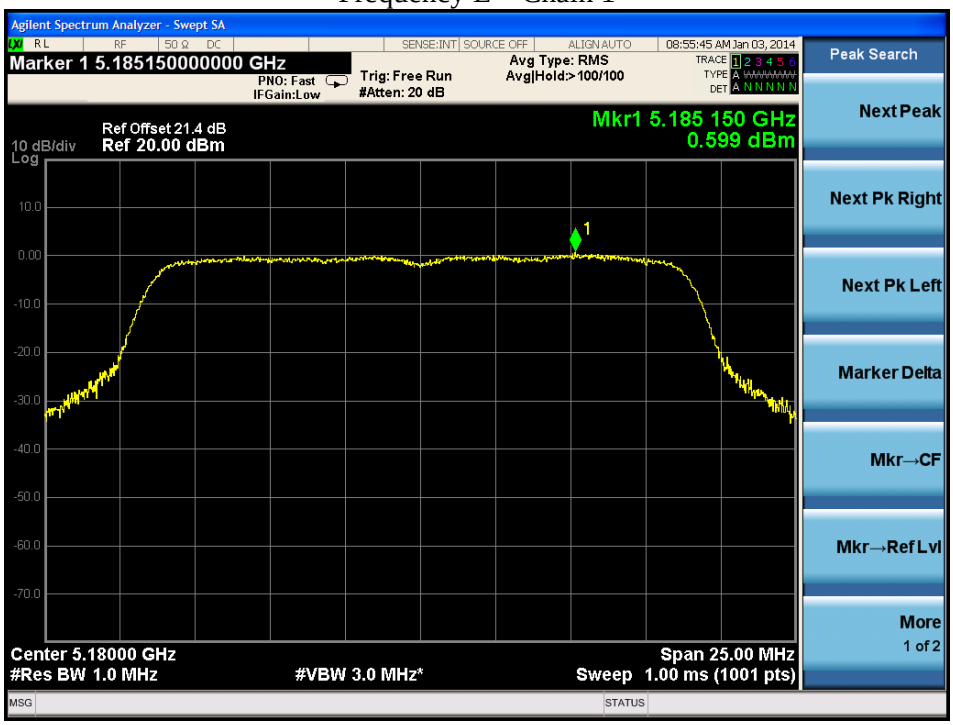
Frequency M – Chain 0



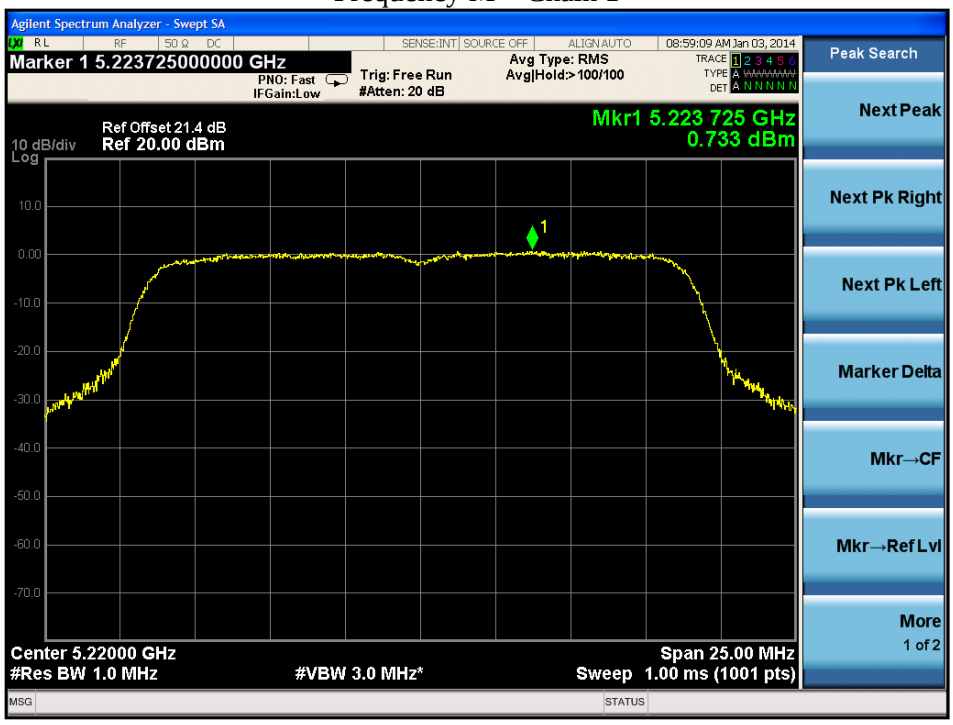
Frequency H – Chain 0



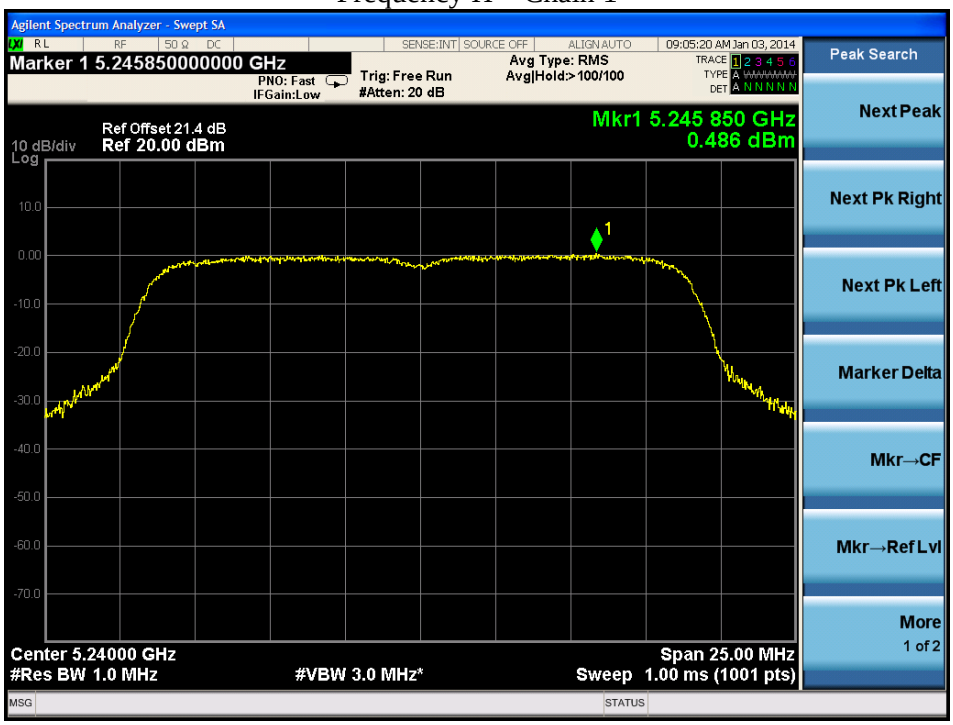
Frequency L – Chain 1



Frequency M – Chain 1

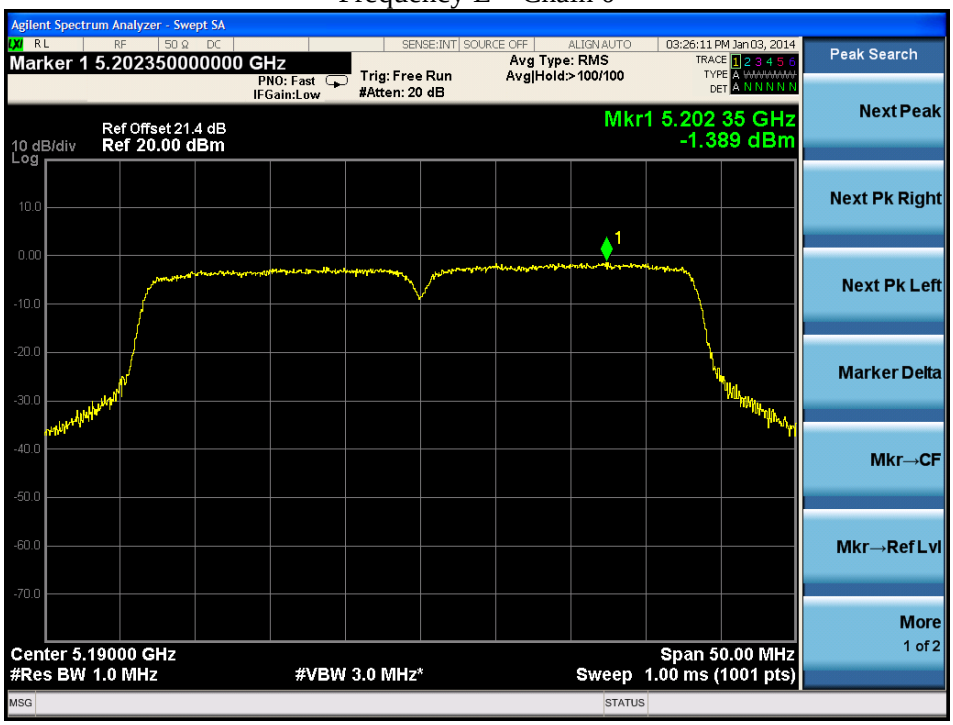


Frequency H – Chain 1

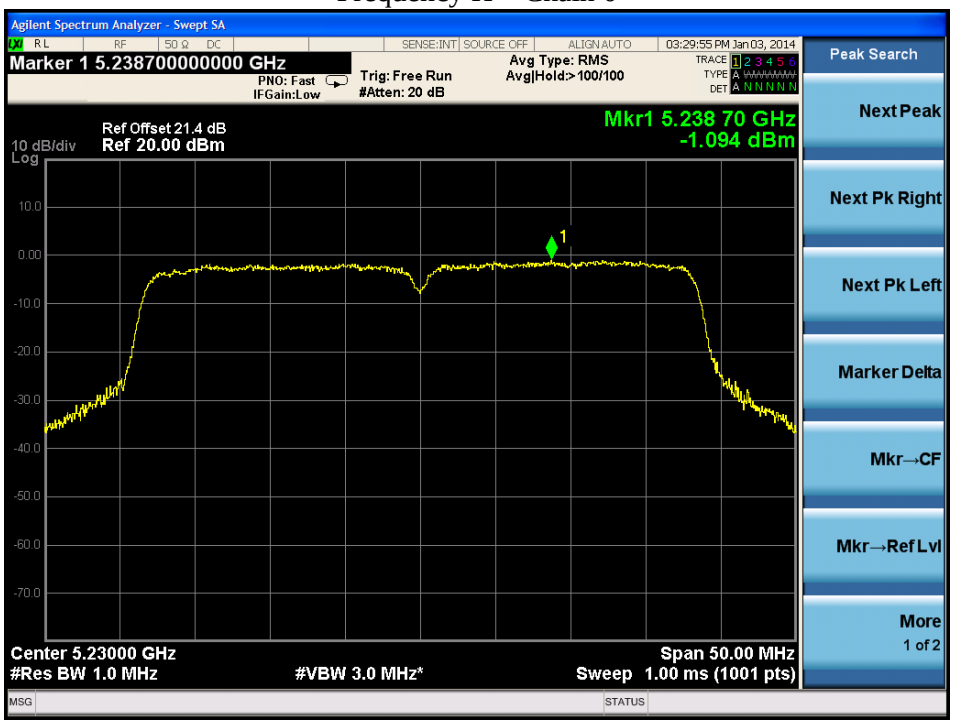


Mode	Freq. (MHz)	PSD (dBm)		Duty cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
		Port0	Port 1				
802.11n HT40	5190	-1.389	-0.440	0.38	2.51	4	1.49
	5230	-1.094	-1.671	0.38	2.02	4	1.98

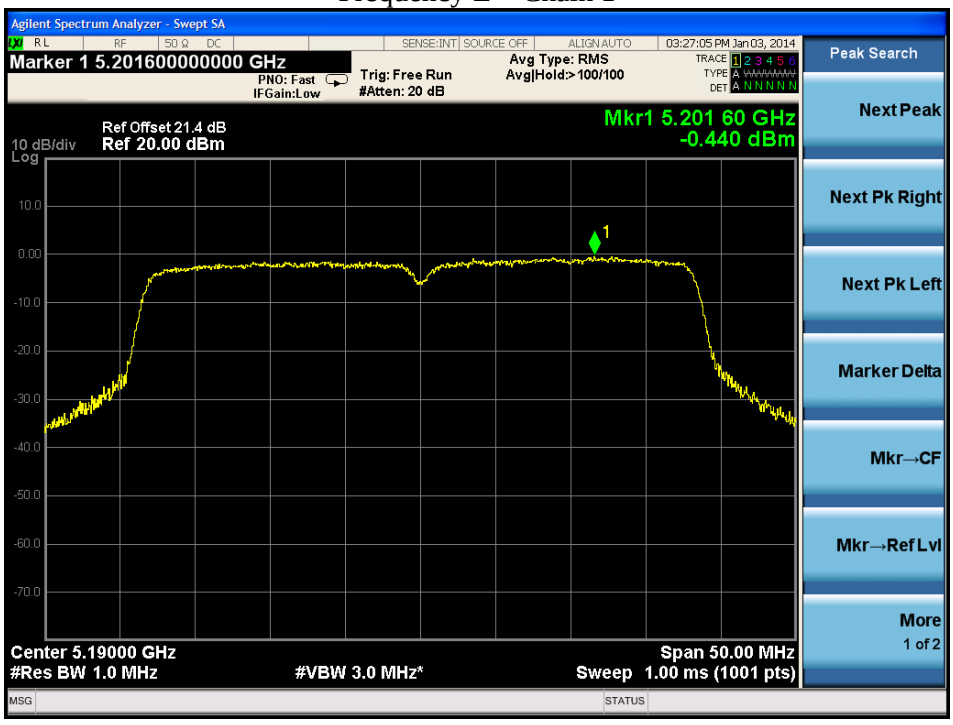
Frequency L – Chain 0



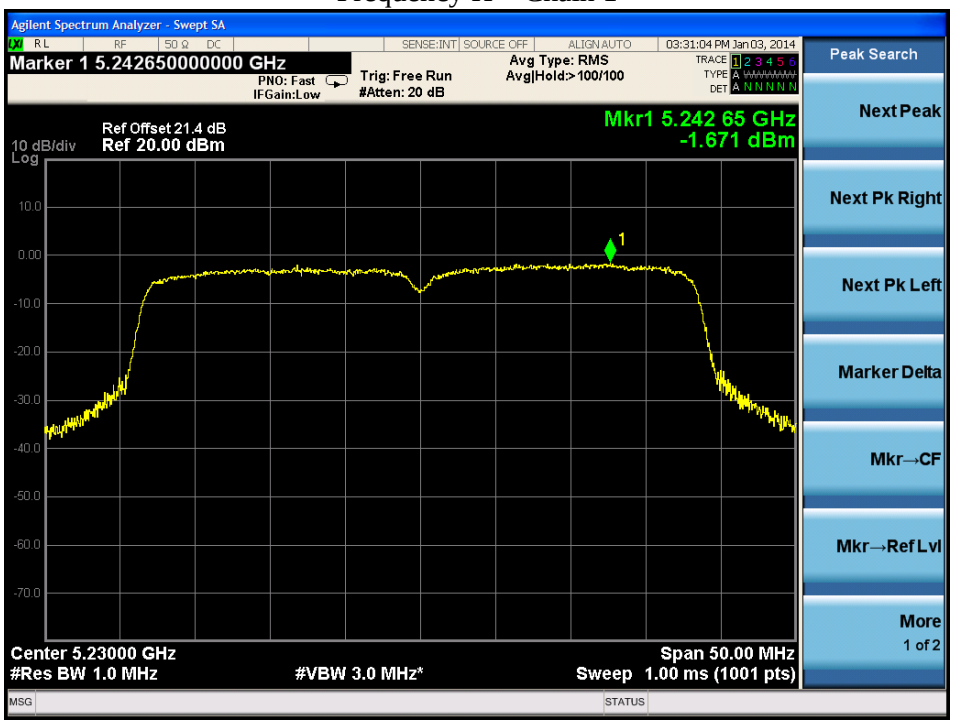
Frequency H – Chain 0



Frequency L – Chain 1



Frequency H – Chain 1



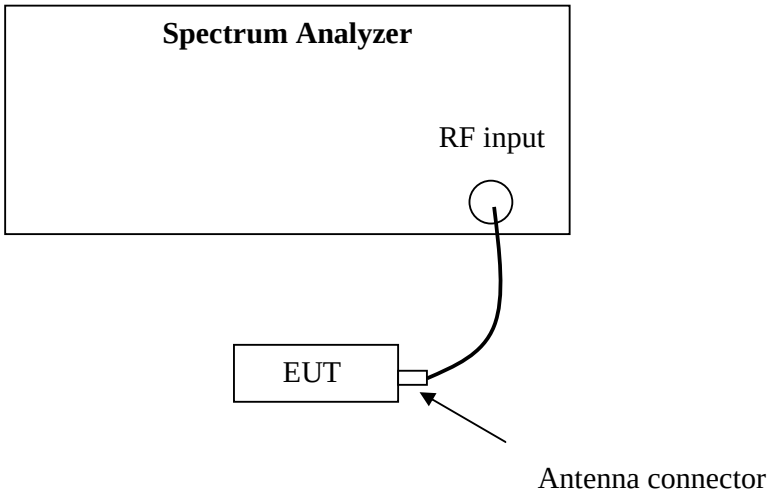
5. Peak Excursion

Test result: PASS

5.1 Limit

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

5.2 Test Configuration



5.3 Test Procedure and test setup

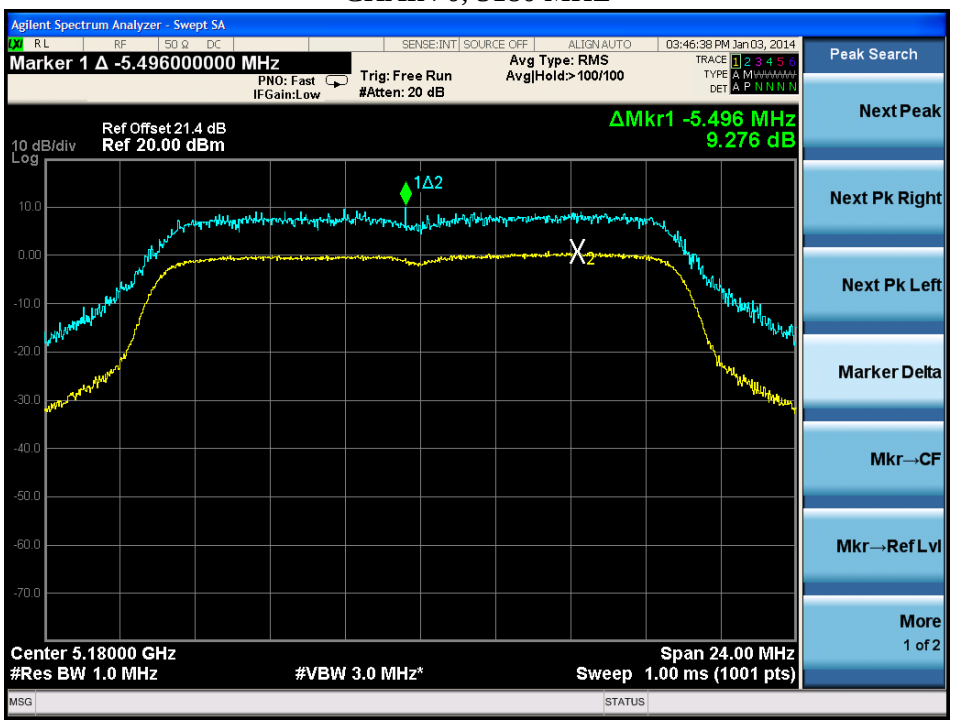
The power spectrum density per FCC §15.407(a)(6) was measured from the antenna port of the EUT. Using a 50ohm spectrum analyzer (measurement method refer to KDB 789033D01 v01r03: Section G) with the RBW=1MHz, VBW=3MHz, Detector=Peak for peak measurement and RBW=1MHz, VBW=3MHz, Detector=RMS for average measurement. And delta-mark peak & average ratio was read directly.

5.4 Test Protocol

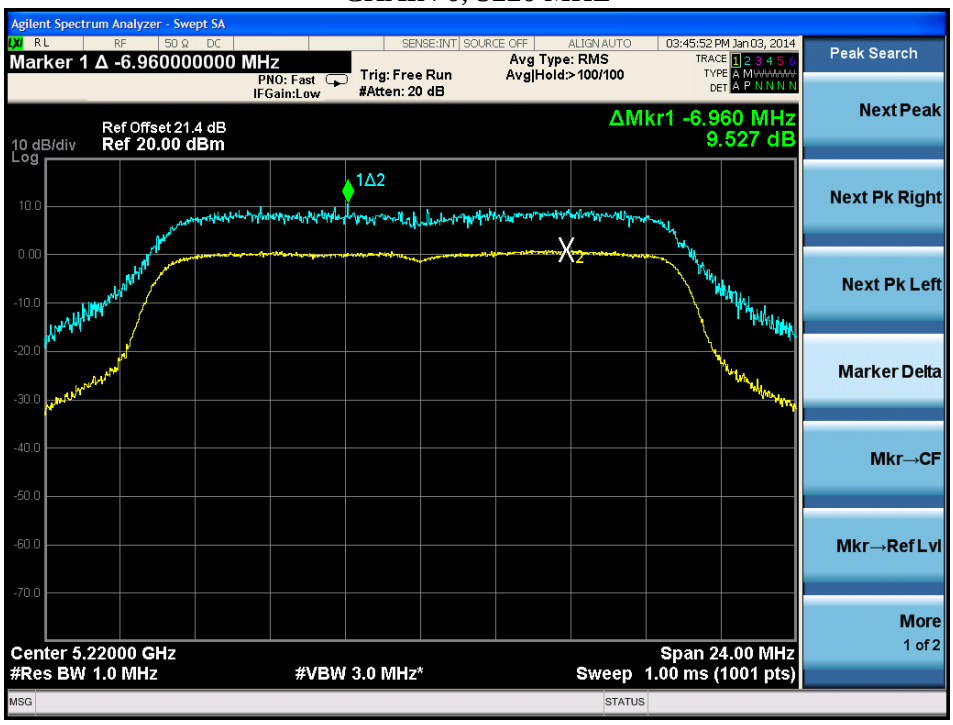
Temperature : 18 °C
Relative Humidity : 40 %
Test Mode : 802.11a

Test frequency	Peak Excursion (dB)		Limits
(MHz)	Port 0	Port 1	(dB)
5180	9.276	8.212	13
5220	9.527	8.358	13
5240	8.937	8.535	13

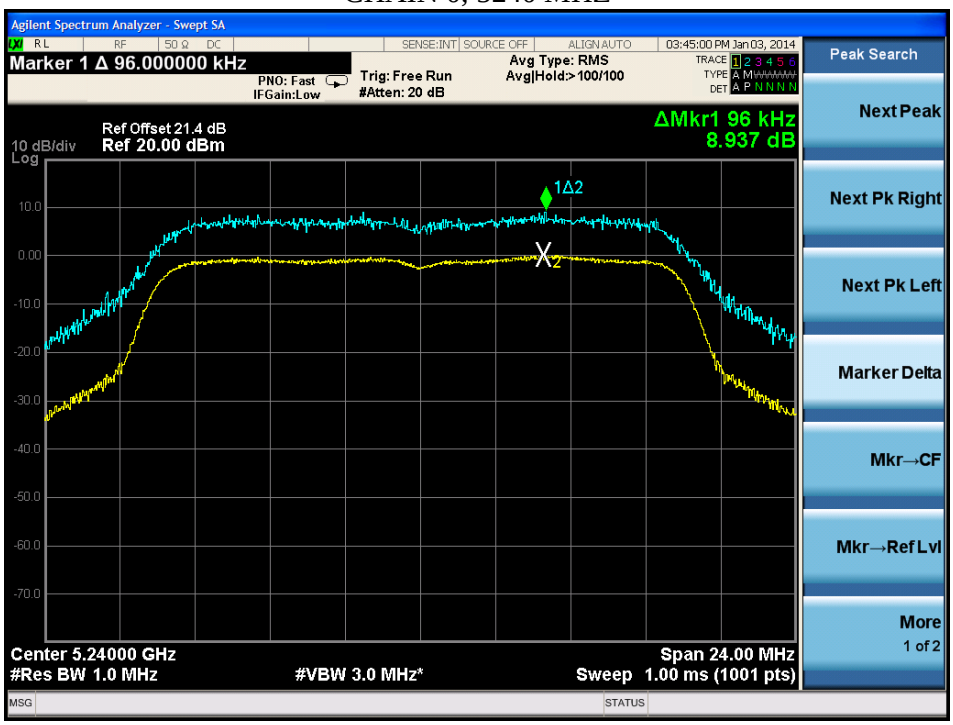
CHAIN 0, 5180 MHZ



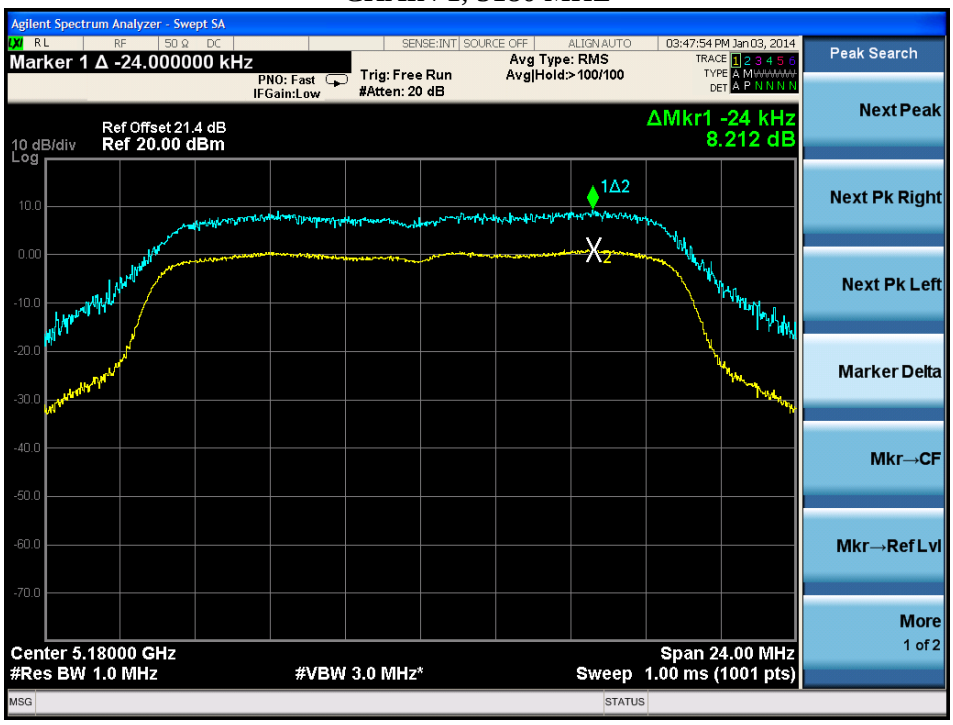
CHAIN 0, 5220 MHZ



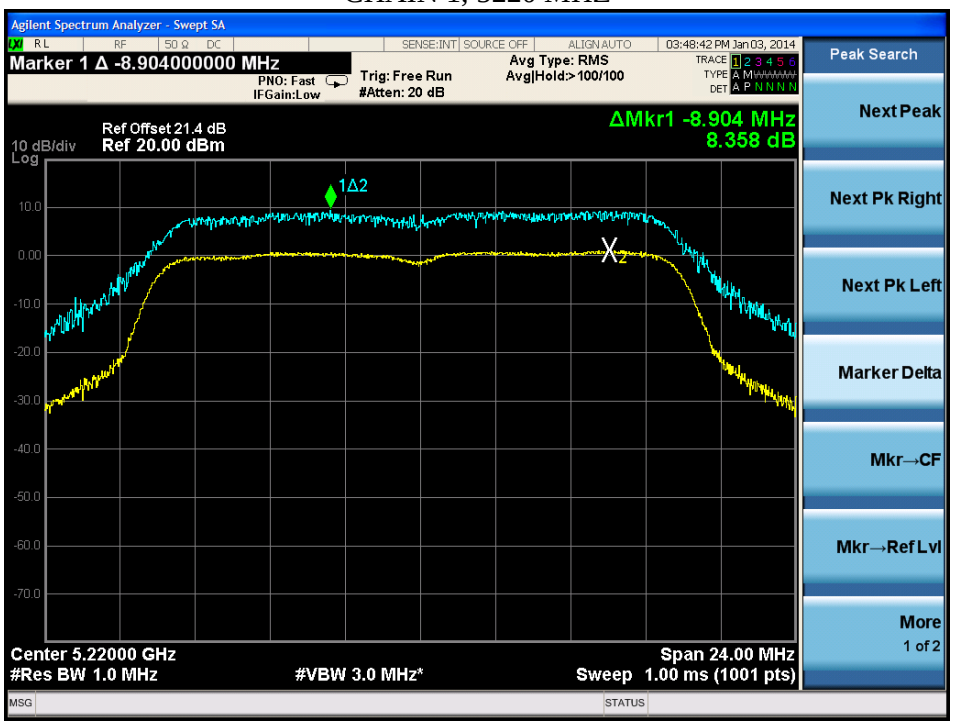
CHAIN 0, 5240 MHZ



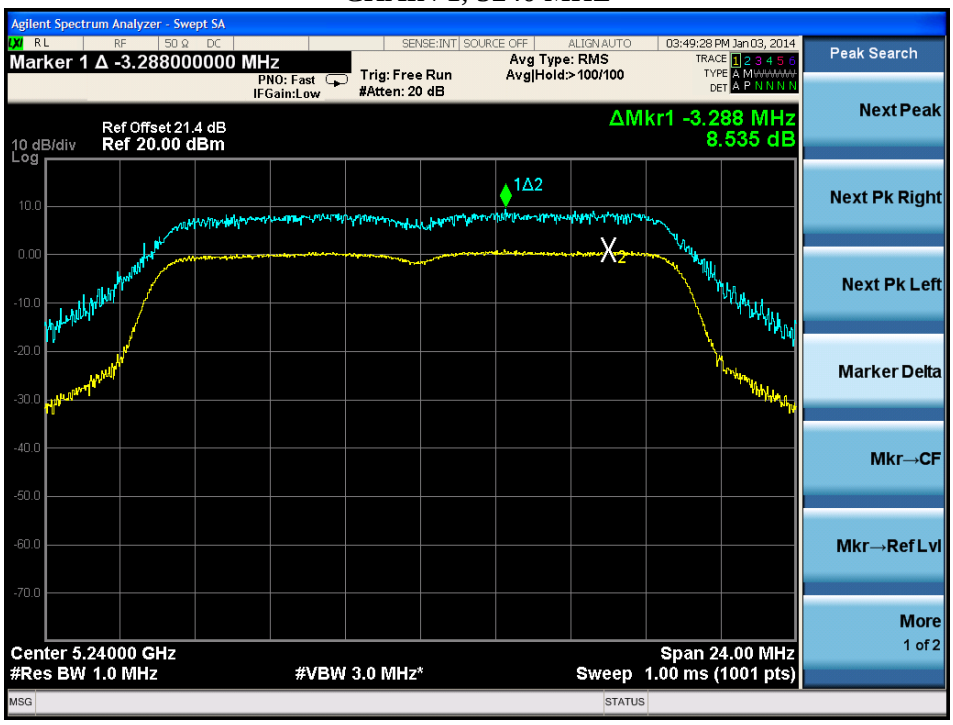
CHAIN 1, 5180 MHZ



CHAIN 1, 5220 MHZ



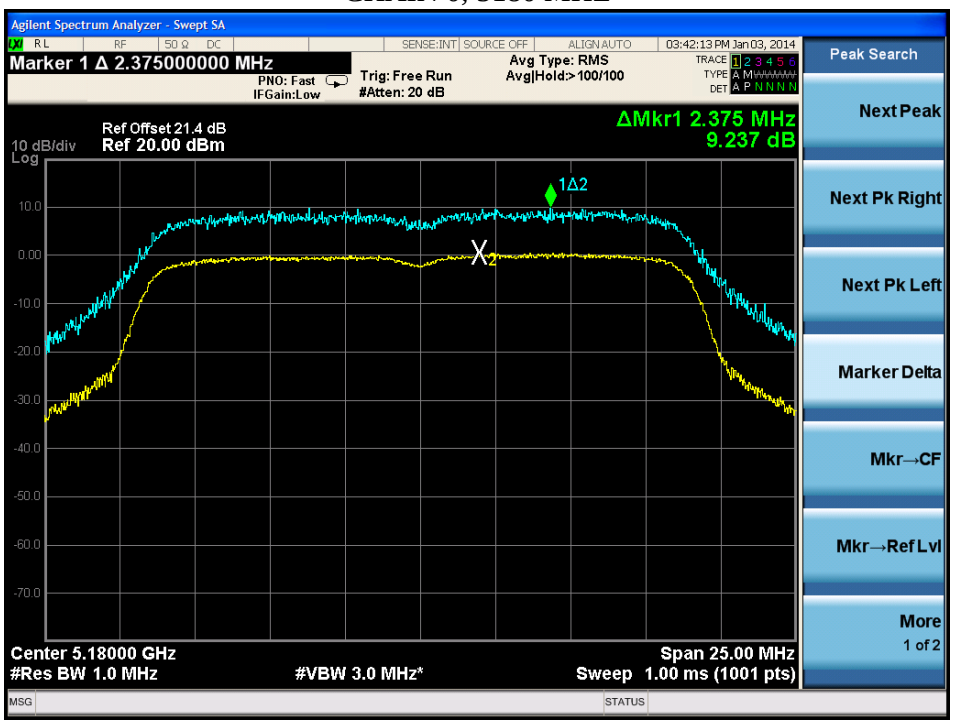
CHAIN 1, 5240 MHZ



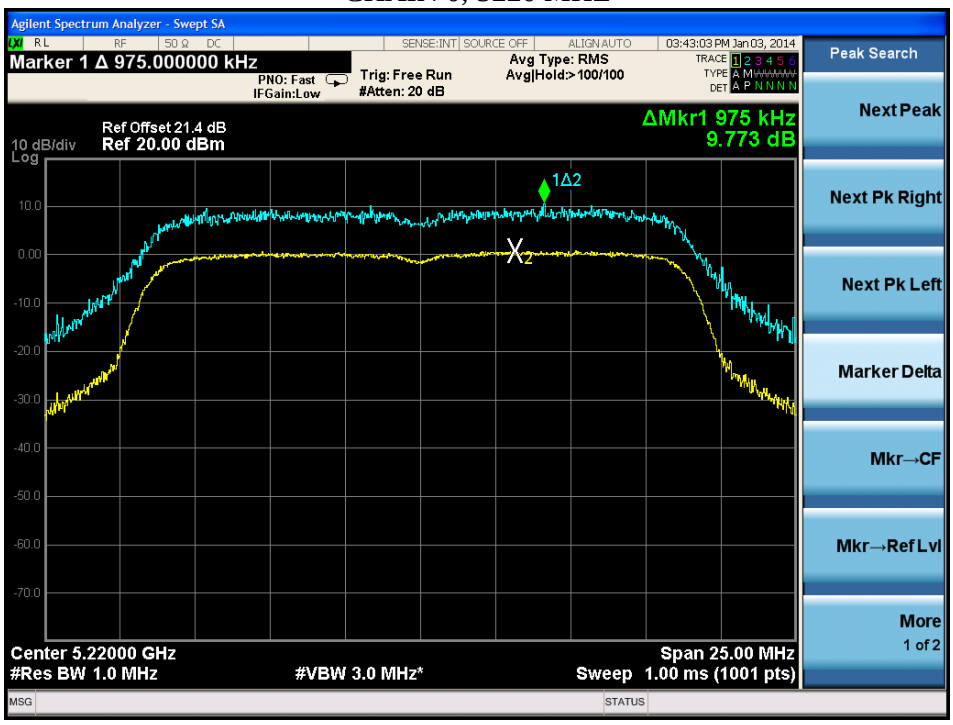
Temperature : 18 °C
Relative Humidity : 40 %
Test Mode : 802.11n20

Test frequency	Peak Excursion (dB)		Limits
(MHz)	Port 0	Port 1	(dB)
5180	9.237	9.463	13
5220	9.773	9.439	13
5240	9.026	8.975	13

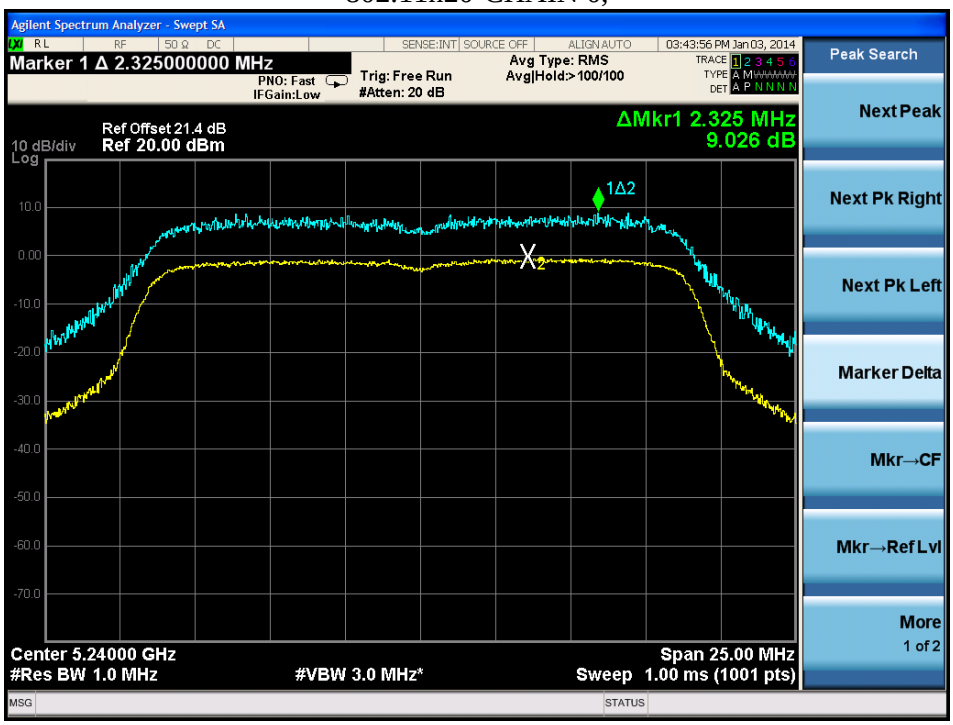
CHAIN 0, 5180 MHZ



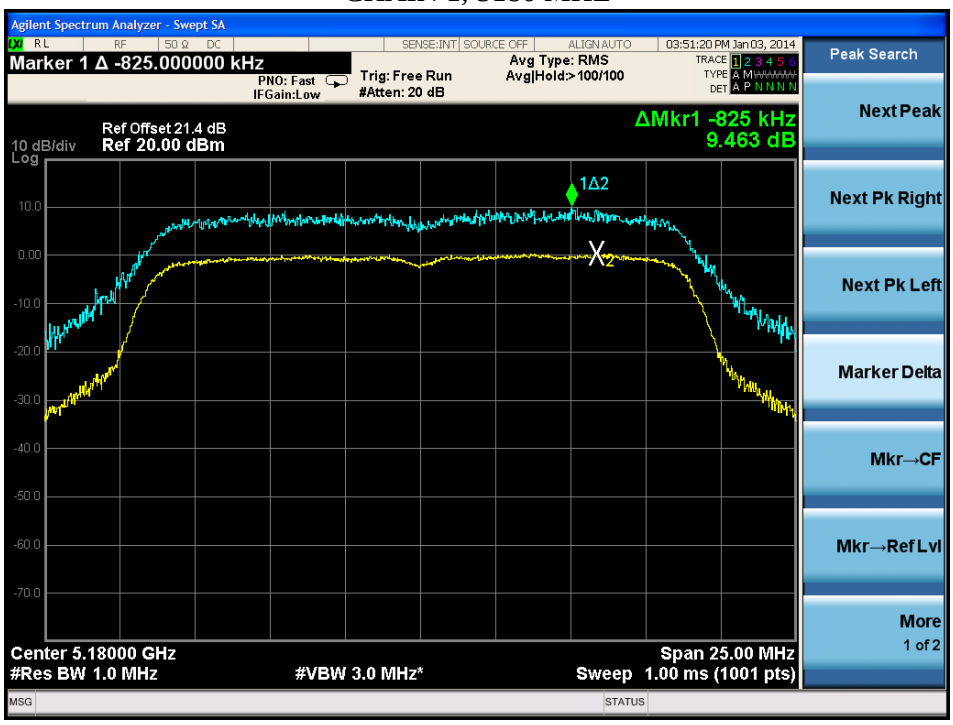
CHAIN 0, 5220 MHZ



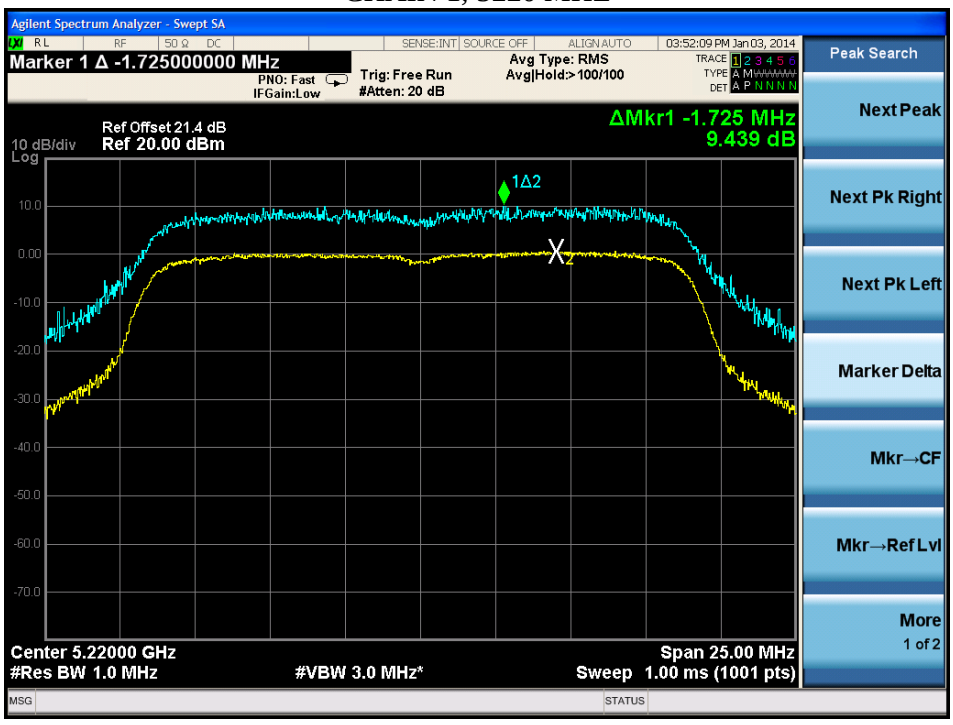
802.11n20-CHAIN 0,



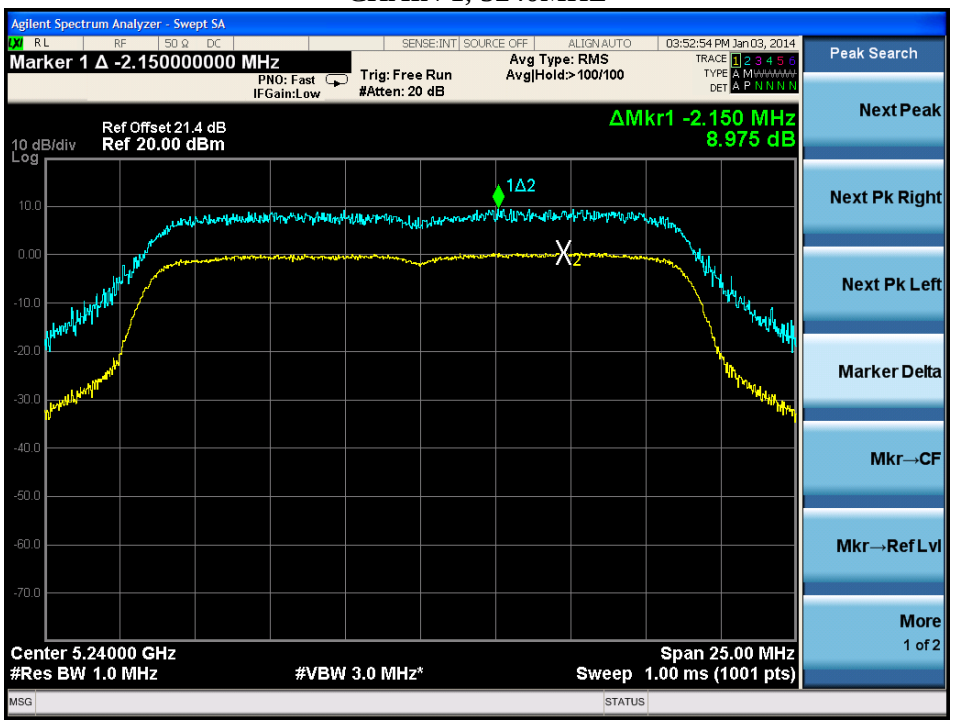
CHAIN 1, 5180 MHZ



CHAIN 1, 5220 MHZ



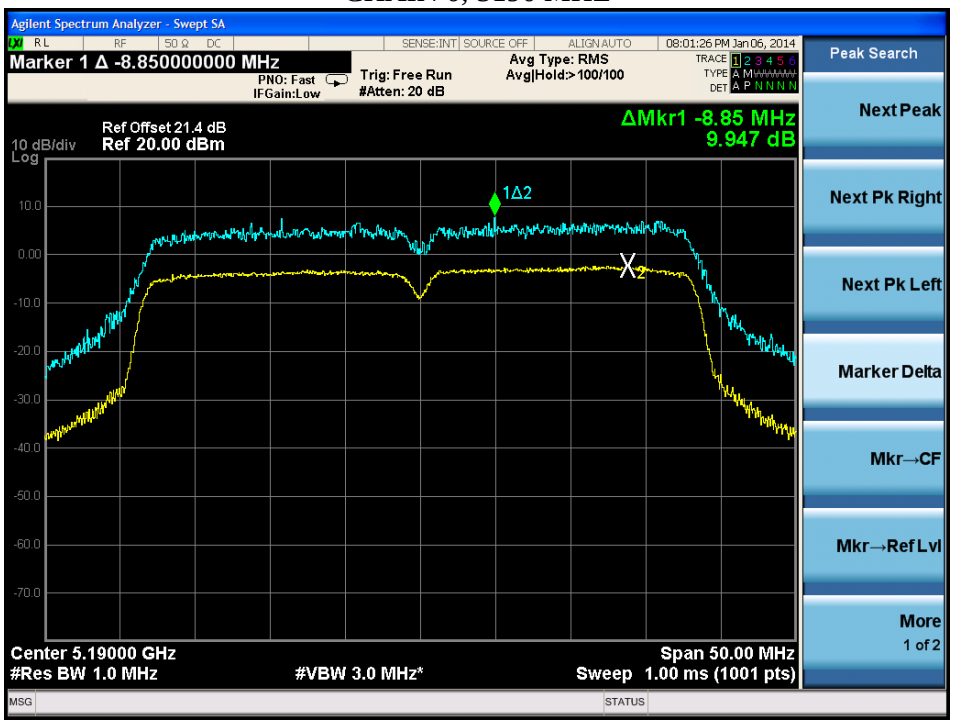
CHAIN 1, 5240MHZ



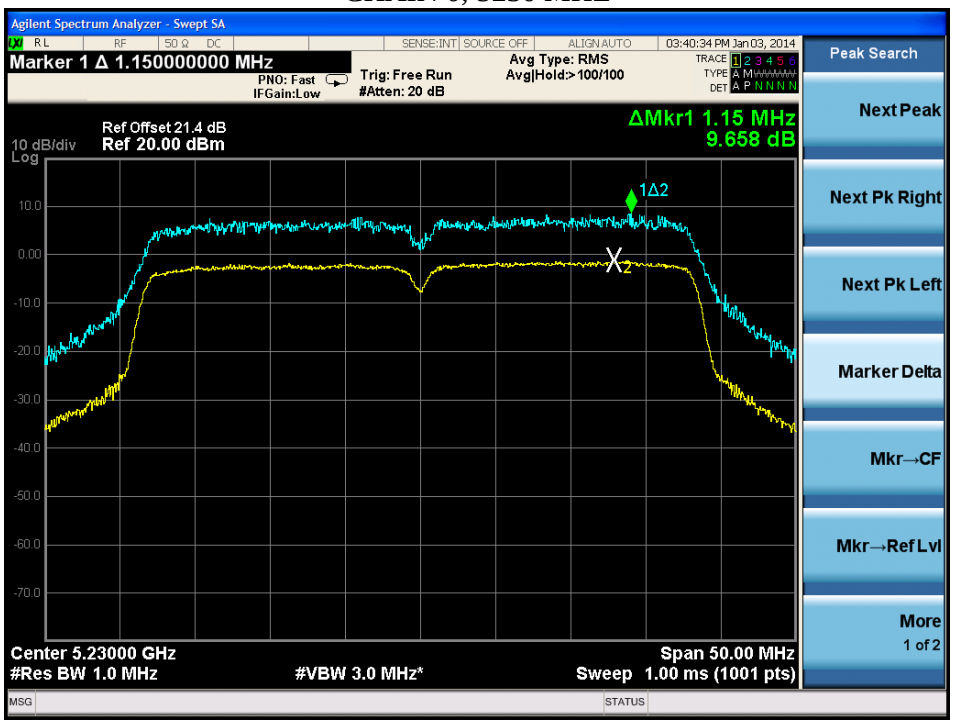
Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11n40

Test frequency	Peak Excursion (dB)		Limits
(MHz)	Port 0	Port 1	(dB)
5190	9.947	9.360	13
5230	9.658	9.378	13

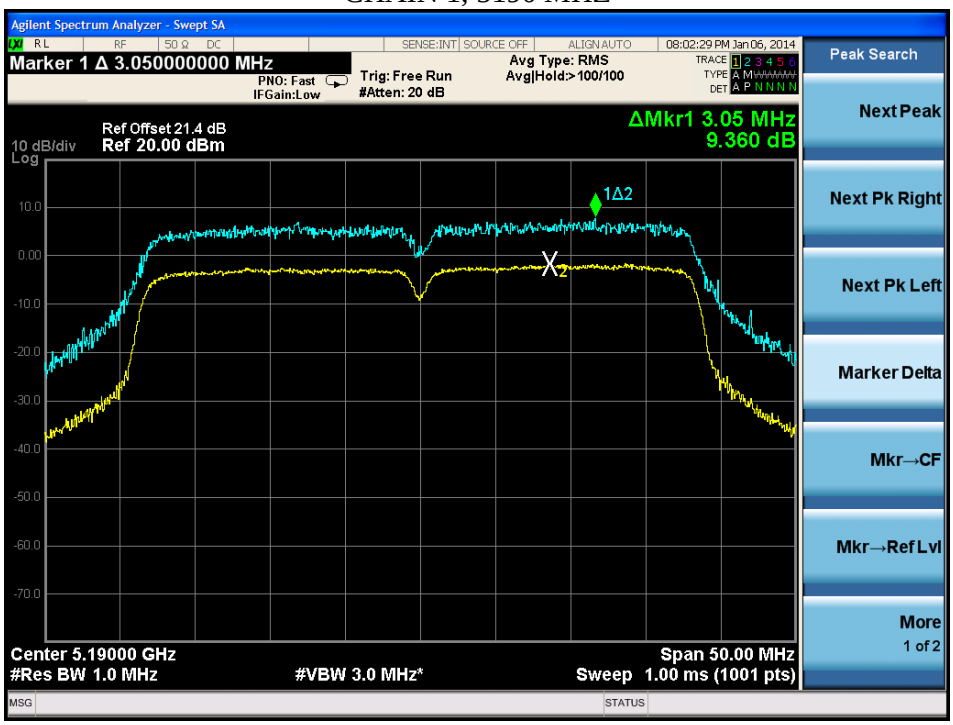
CHAIN 0, 5190 MHZ



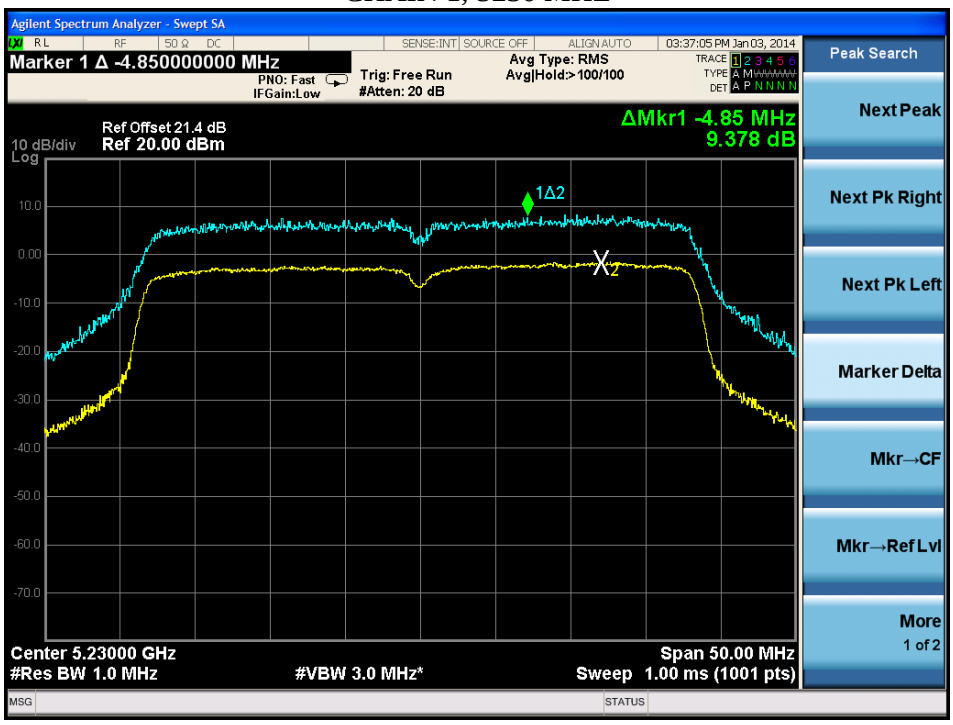
CHAIN 0, 5230 MHZ



CHAIN 1, 5190 MHZ



CHAIN 1, 5230 MHZ



6. Radiated emission

Test result: **PASS**

6.1 Test limit

6.1.1 The radiated emissions which are lower than 1GHz or fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

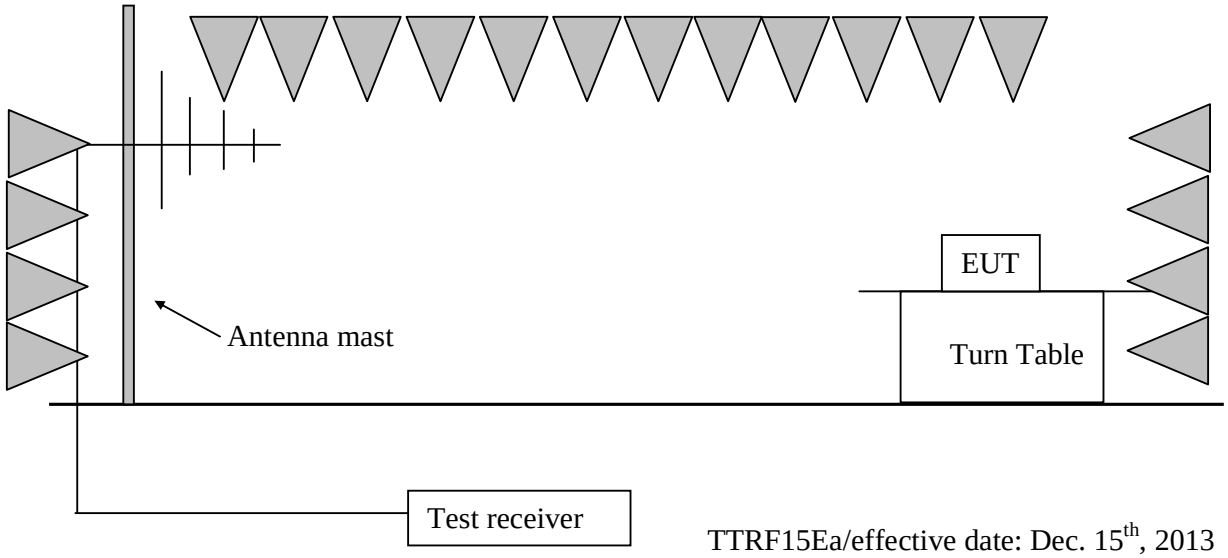
6.1.2 The emission which is outside the restrict bands, should comply with the EIRP limit as below:

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength (3m) (dBμV/m)
1000-5150	-27	68.23
5350-40000	-27	68.23

Note: The Equivalent Field Strength is converted from EIRP with the formula:

E = $(1000000\sqrt{30P}/3)$ μV/m, where P is the EIRP (Watts).

6.2 Test Configuration



6.3 Test procedure and test setup

Radiated emission measurements were performed from 30MHz to tenth harmonic or 40GHz. The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

Testing settings (refer to KDB 789033 v01r03 section H)
Below 1GHz
1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
2, Span=encompass the entire emission
3, RBW=120KHz
4, Detector=Quasi-Peak
5, Trace was allowed to stabilize

Peak Measurements above 1GHz
1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
2, Span=encompass the entire emission
3, RBW=1MHz
4, VBW=3MHz
4, Detector= Peak (Max-hold)
5, Trace was allowed to stabilize

Average Measurements above 1GHz
1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
2, Span=encompass the entire emission
3, RBW=1MHz
4, VBW=3MHz
4, Detector= RMS (Max-hold)
5, Trace was allowed to stabilize

6.4 Test protocol

Temperature : 18 °C
Relative Humidity : 54 %

Mode 802.11a

Chan. Fre. (MHz)	Polarization	Frequency (MHz)	Reading Level (dBuV)	Factor	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
5180	V	5185.6	74.8	36.8	111.6	Fundamental	/	PK
	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	H	5150.0	25.0	36.8	61.8	74.0	-12.2	PK
	H	5150.0	12.5	36.8	49.3	54.0	-4.7	AV
	V	5150.0	25.3	36.8	62.1	74.0	-11.9	PK
	V	5150.0	12.5	36.8	49.3	54.0	-4.7	AV
	V	7349.0	34.7	14.0	48.7	54.0	-5.3	PK
	V	8157.0	34.1	14.9	49.0	54.0	-5.0	PK
	V	8624.0	35.5	14.8	50.3	54.0	-3.7	PK
	V	9262.0	37.0	15.5	52.5	54.0	-1.5	PK
5220	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	V	7318.0	35.1	14.0	49.1	54.0	-4.9	PK
	V	8137.0	34.6	15.0	49.6	54.0	-4.4	PK
	V	8955.0	35.6	14.3	49.9	54.0	-4.1	PK
	V	9260.0	36.2	15.5	51.7	54.0	-2.3	PK
5240	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	V	7517.0	34.7	14.6	49.3	54.0	-4.7	PK
	V	8326.0	34.8	14.5	49.3	54.0	-4.7	PK
	V	8767.0	35.3	14.6	49.9	54.0	-4.1	PK
	V	9240.0	36.7	15.5	52.2	54.0	-1.8	PK

Mode 802.11n20

Chan. Fre. (MHz)	Polarization	Frequency (MHz)	Reading Level (dBuV)	Factor	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
5180	V	5185.0	73.0	36.7	109.7	Fundamental	/	PK
	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	H	5150.0	24.9	36.8	61.7	74.0	-12.3	PK
	H	5150.0	12.5	36.8	49.3	54.0	-4.7	AV
	V	5150.0	25.2	36.8	62.0	74.0	-12.0	PK
	V	5150.0	12.5	36.8	49.3	54.0	-4.7	AV
	V	7230.0	35.6	13.8	49.4	54.0	-4.6	PK
	V	7869.0	34.6	15.0	49.6	54.0	-4.4	PK
	V	8351.0	35.5	14.4	49.9	54.0	-4.1	PK
	V	9137.0	36.5	15.1	51.6	54.0	-2.4	PK
5220	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	V	7431.0	34.9	14.2	49.1	54.0	-4.9	PK
	V	8195.0	34.5	14.7	49.2	54.0	-4.8	PK
	V	8629.0	34.8	14.8	49.6	54.0	-4.4	PK
	V	9278.0	35.9	15.4	51.3	54.0	-2.7	PK
5240	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	V	7462.0	34.6	14.2	48.8	54.0	-5.2	PK
	V	8346.0	35.4	14.4	49.8	54.0	-4.2	PK
	V	8917.0	36.7	14.3	51.0	54.0	-3.0	PK
	V	9268.0	36.1	15.4	51.5	54.0	-2.5	PK

Mode 802.11n40

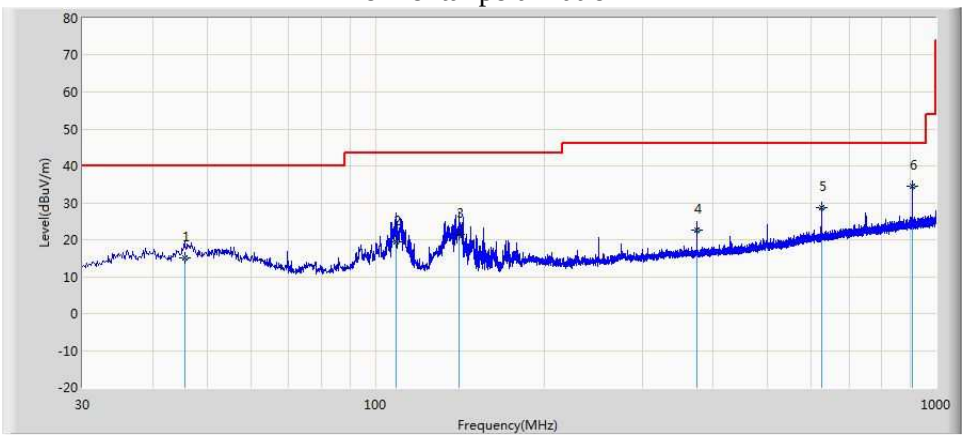
Chan. Fre. (MHz)	Polarization	Frequency (MHz)	Reading Level (dBuV)	Factor	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
5190	V	5202.2	71.6	36.6	108.2	Fundamental	/	PK
	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	H	5150.0	29.4	36.8	66.2	74.0	-7.8	PK
	H	5150.0	15.5	36.8	52.3	54.0	-1.7	AV
	V	5149.4	32.0	36.8	68.8	74.0	-5.2	PK
	V	5150.0	30.7	36.8	67.5	74.0	-6.5	PK
	V	5150.0	16.2	36.8	53.0	54.0	-1.0	AV
	V	7329.0	35.2	14.0	49.2	54.0	-4.8	PK
	V	8367.0	35.9	14.4	50.3	54.0	-3.7	PK
	V	8867.0	36.0	14.3	50.3	54.0	-3.7	PK
	V	9279.0	36.1	15.4	51.5	54.0	-2.5	PK
5230	V	37.8	10.4	13.3	23.7	40.0	-16.3	PK
	H	133.0	5.2	9.5	14.7	43.5	-28.8	PK
	H	263.3	3.5	13.5	17.0	46.0	-29.0	PK
	V	7318.0	35.4	14.0	49.4	54.0	-4.6	PK
	V	8256.0	35.0	14.4	49.4	54.0	-4.6	PK
	V	8913.0	35.7	14.3	50.0	54.0	-4.0	PK
	V	9248.0	35.9	15.5	51.4	54.0	-2.6	PK

Remark: 1. For fundamental & restrict emission at 5000-5150MHz and 5350-5460MHz test, no amplifier is employed.
2. Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
3. Measure level = Original Receiver Reading Level+ Correct Factor
4. Over Limit = Measure level - limit
5. If the PK reading is lower than AV limit, the AV test can be elided.

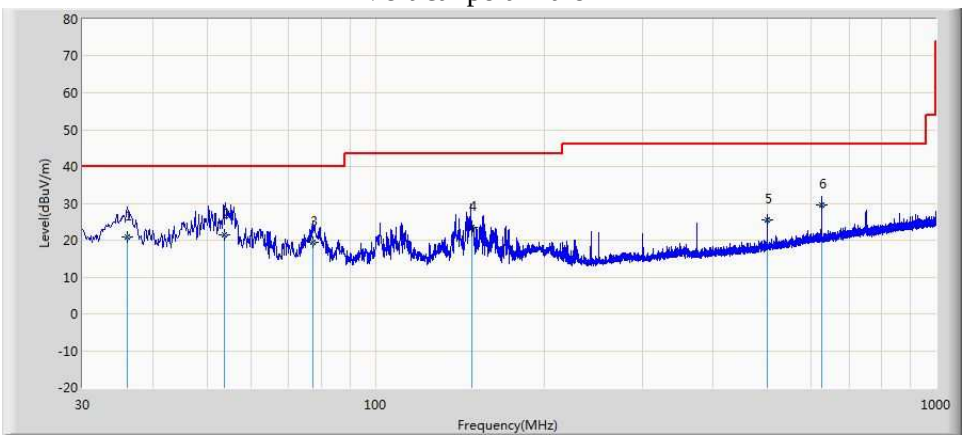
Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading level = 10dBuV.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Measure level = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m, Measure level = 10.20dBuV/m, then Over Limit = 10.20 - 54= -43.80dBuV/m

Test graph (Worst case):

Horizontal polarization



Vertical polarizaion



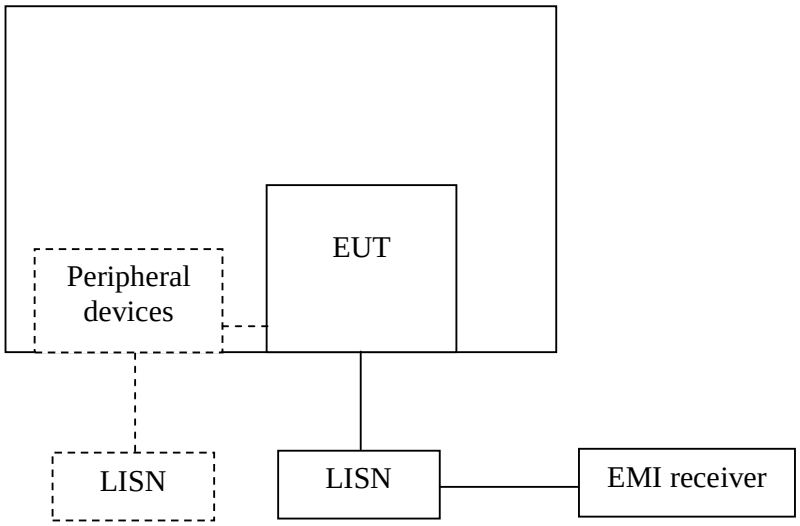
7. Power line conducted emission

Test result: **Pass**

7.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

7.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

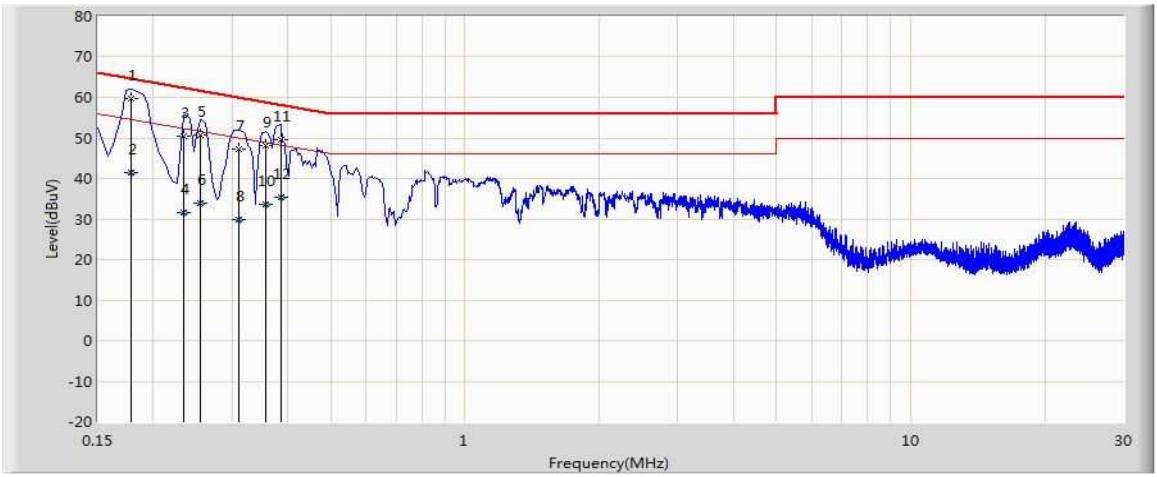
☐ For floor standing equipment, wooden support is 0.1m height rack.

7.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.

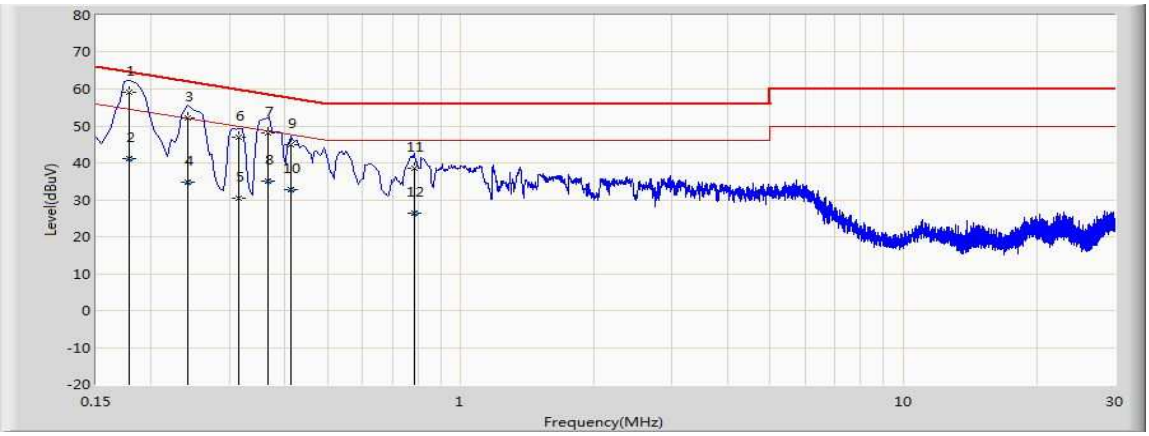
7.4 Test protocol

L Line:



Frequency (MHz)	Reading Level (dBuV)	Factor	Measure Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Type
0.178	49.541	10.058	59.600	64.578	-4.979	QP
0.178	31.324	10.058	41.382	54.578	-13.196	AV
0.234	40.457	9.951	50.408	62.307	-11.899	QP
0.234	21.576	9.951	31.527	52.307	-20.780	AV
0.254	40.722	9.967	50.689	61.625	-10.936	QP
0.254	24.025	9.967	33.992	51.625	-17.633	AV
0.310	37.124	10.012	47.136	59.970	-12.834	QP
0.310	19.944	10.012	29.956	49.970	-20.015	AV
0.358	38.171	10.051	48.222	58.775	-10.553	QP
0.358	23.704	10.051	33.755	48.775	-15.020	AV
0.386	39.369	10.074	49.443	58.149	-8.707	QP
0.386	25.390	10.074	35.464	48.149	-12.686	AV

N line:



Frequency (MHz)	Reading Level (dBuV)	Factor	Measure Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Factor	Type
0.178	49.100	10.049	59.149	64.578	-5.429	10.049	QP
0.178	31.200	10.049	41.249	54.578	-13.329	10.049	AV
0.242	42.100	9.995	52.095	62.027	-9.932	9.995	QP
0.242	24.800	9.995	34.795	52.027	-17.232	9.995	AV
0.314	20.300	10.048	30.348	59.864	-29.516	10.048	QP
0.314	36.800	10.048	46.848	59.864	-13.016	10.048	QP
0.366	37.900	10.087	47.987	58.591	-10.604	10.087	QP
0.366	25.000	10.087	35.087	48.591	-13.504	10.087	AV
0.414	34.800	10.123	44.923	57.568	-12.645	10.123	QP
0.414	22.600	10.123	32.723	47.568	-14.845	10.123	AV
0.786	28.600	10.027	38.627	56.000	-17.373	10.027	QP
0.786	16.400	10.027	26.427	46.000	-19.573	10.027	AV

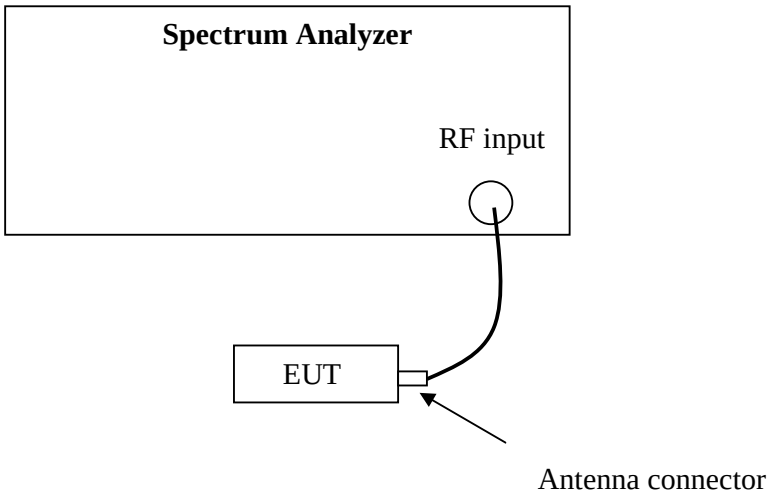
8. 26 dB Bandwidth & Emission Bandwidth (99%)

Test Status: Tested

8.1 Test limit

None

8.2 Test Configuration



8.3 Test procedure and test setup

For 26dB bandwidth test:
The measurement methods refer to KDB 789033D01 v01r03: section C.

Emission bandwidth:
The emission bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz.

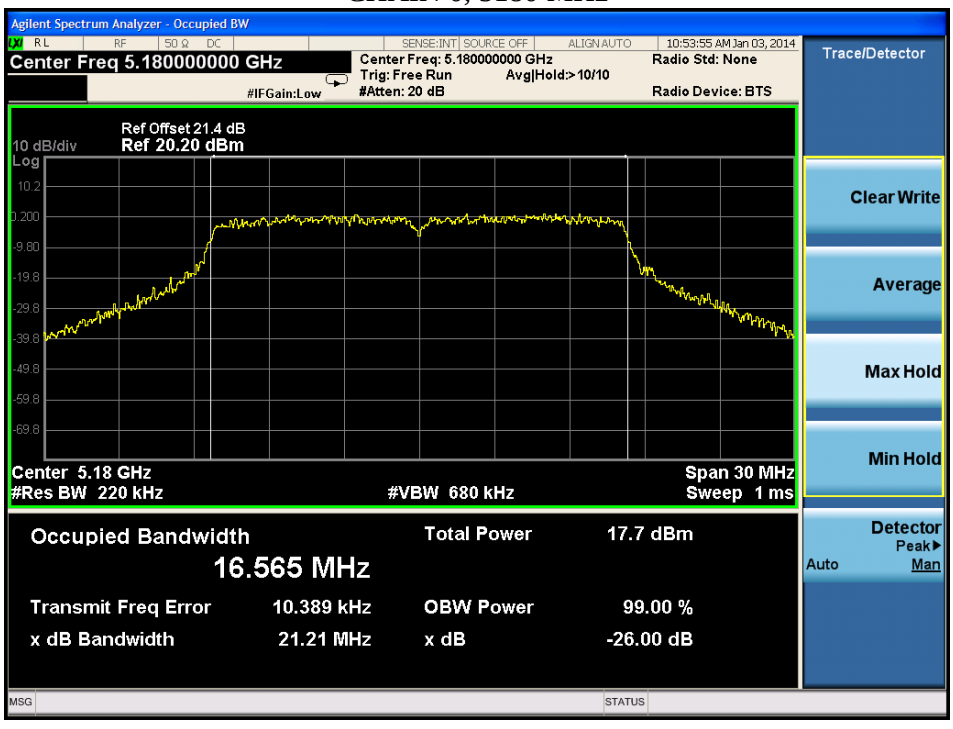
8.4 Test protocol

Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11a

Test frequency	26 dB Bandwidth (MHz)	
(MHz)	Port 0	Port 1
5180	21.21	21.58
5220	21.56	21.81
5240	21.63	21.93

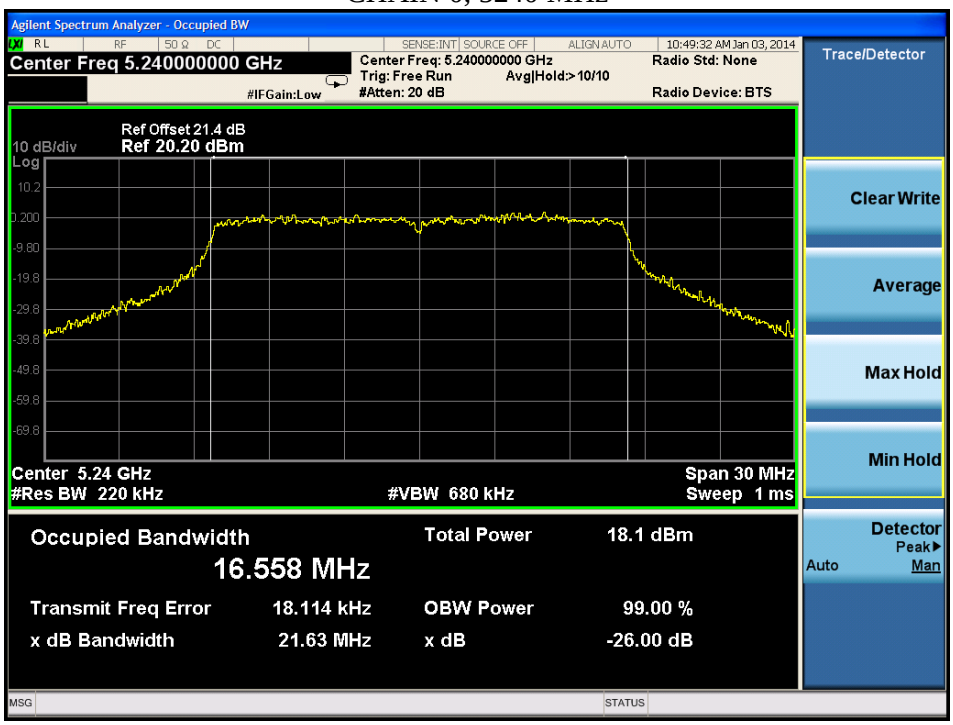
26 dB Bandwidth:

CHAIN 0, 5180 MHz



CHAIN 0, 5220 MHz

CHAIN 0, 5240 MHz



CHAIN 1, 5180 MHz

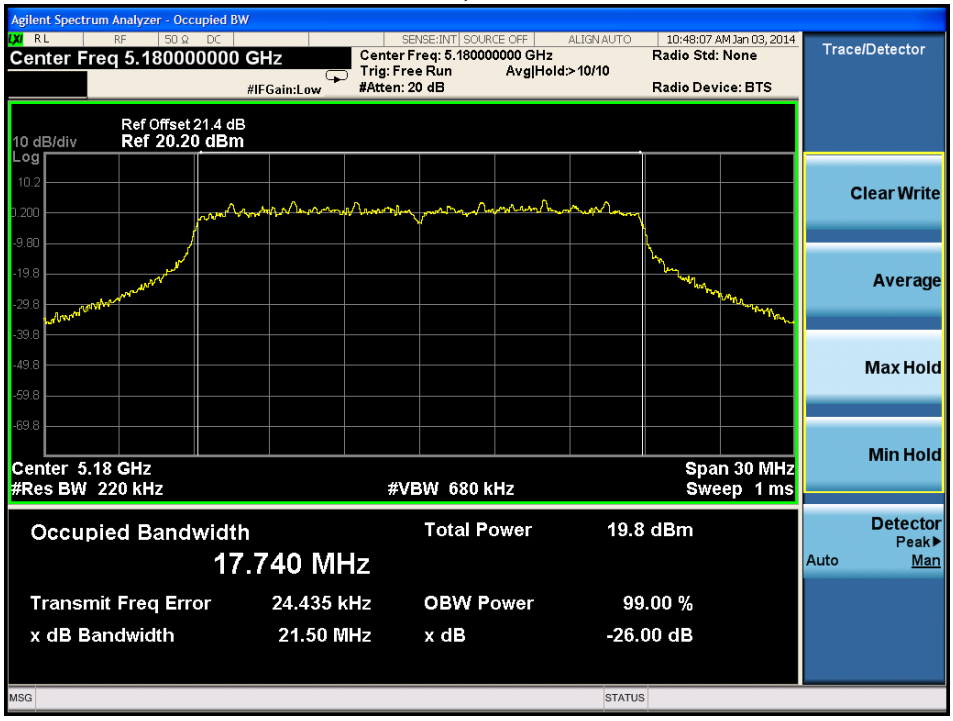
CHAIN 1, 5220 MHz

CHAIN 1, 5240 MHz

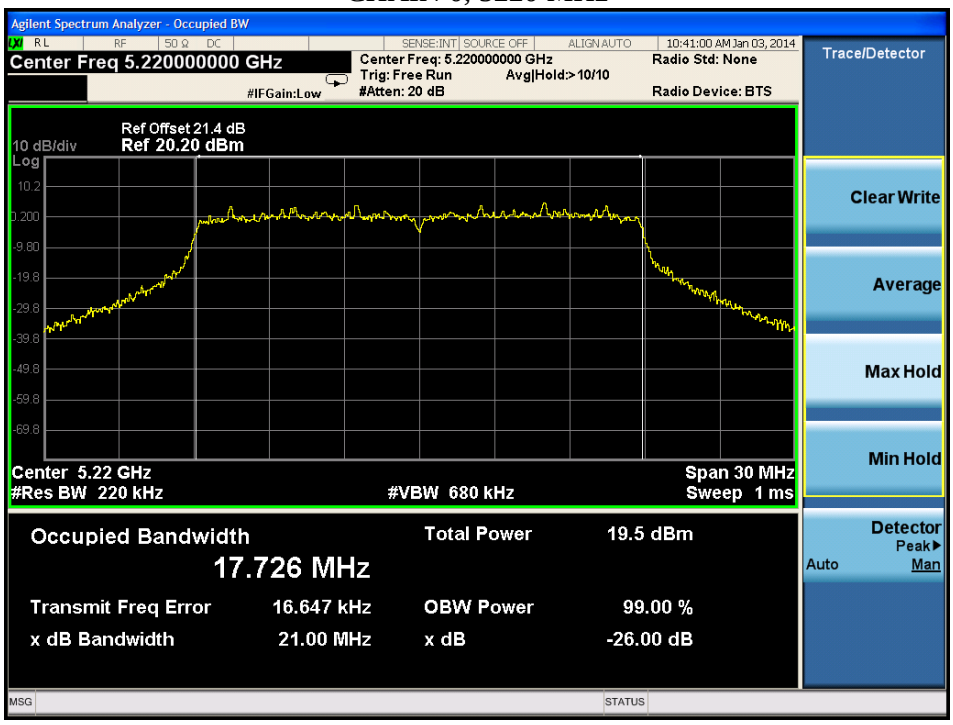
Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11n20

Test frequency	26 dB Bandwidth (MHz)	
(MHz)	Port 0	Port 1
5180	21.50	22.16
5220	21.00	21.50
5240	21.03	21.31

CHAIN 0, 5180 MHz

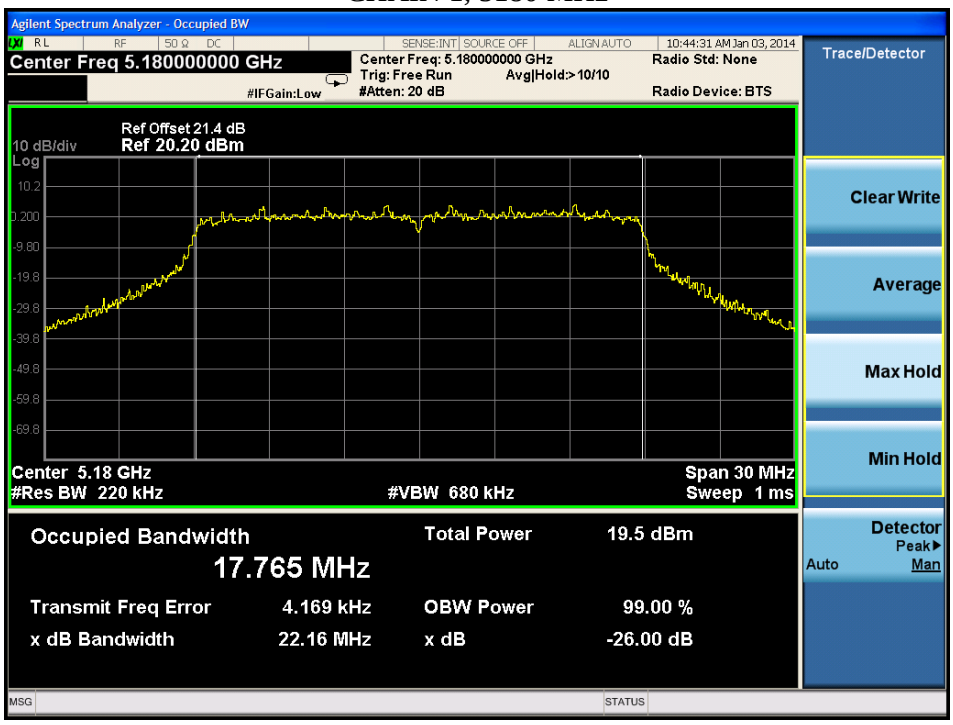


CHAIN 0, 5220 MHz

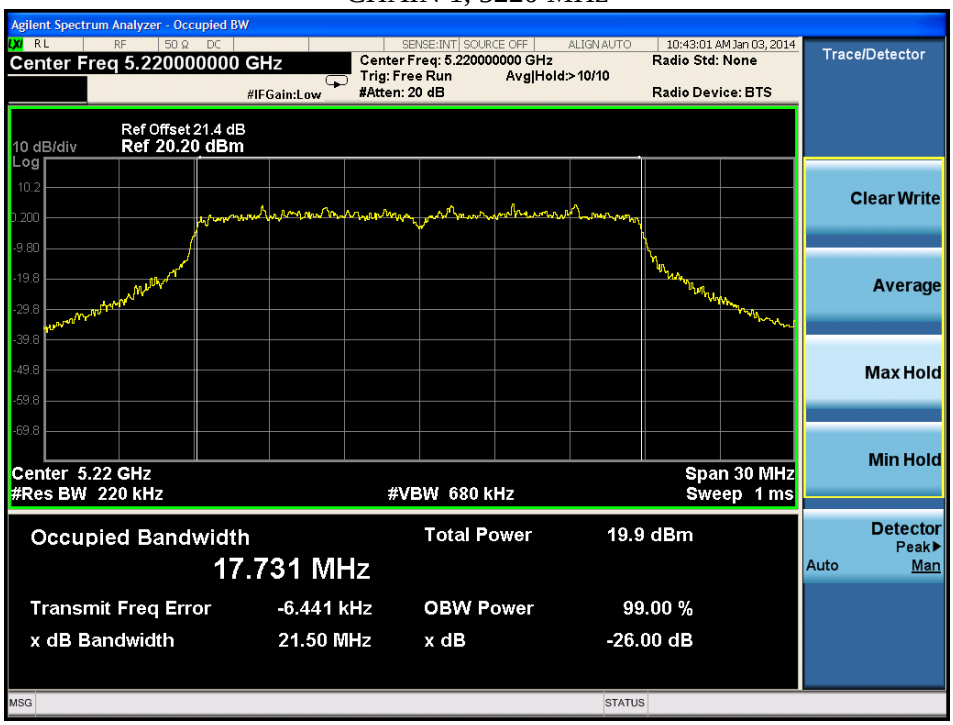


CHAIN 0, 5240 MHz

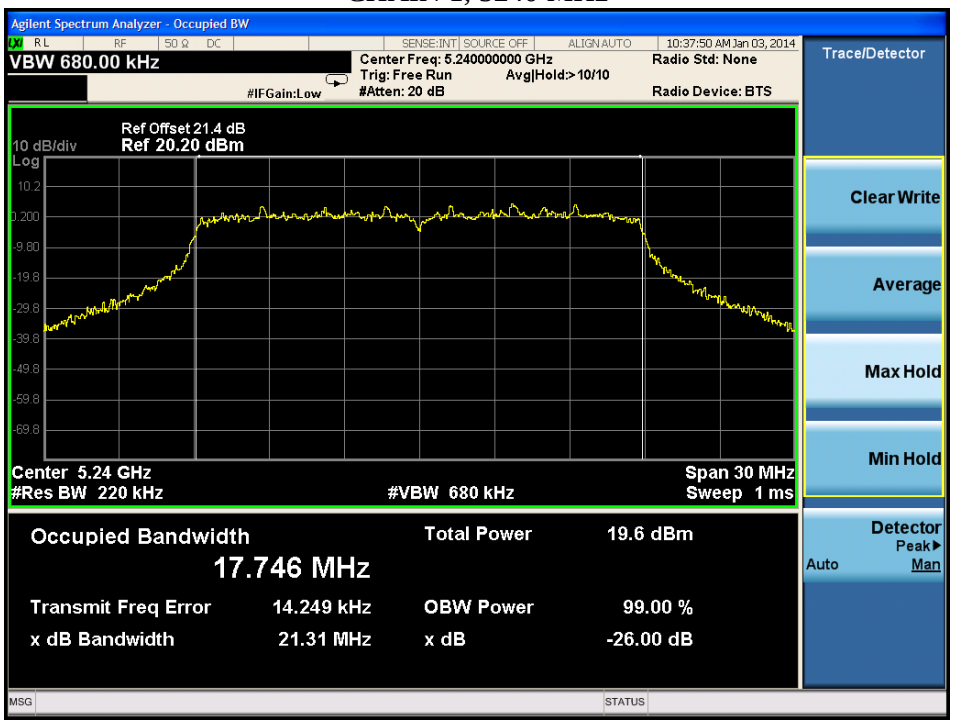
CHAIN 1, 5180 MHz



CHAIN 1, 5220 MHz



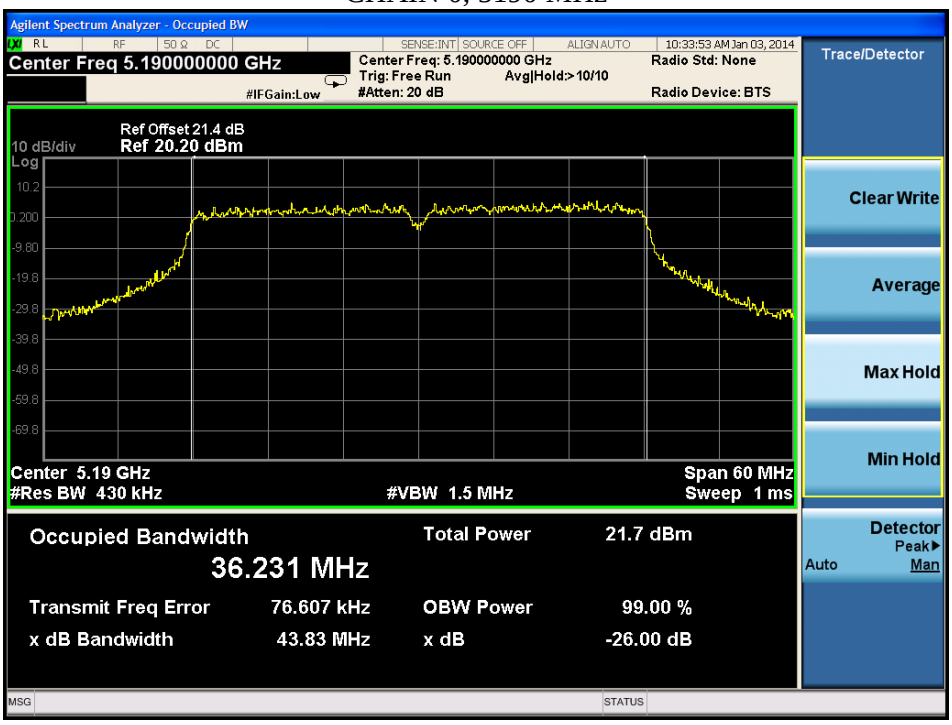
CHAIN 1, 5240 MHz



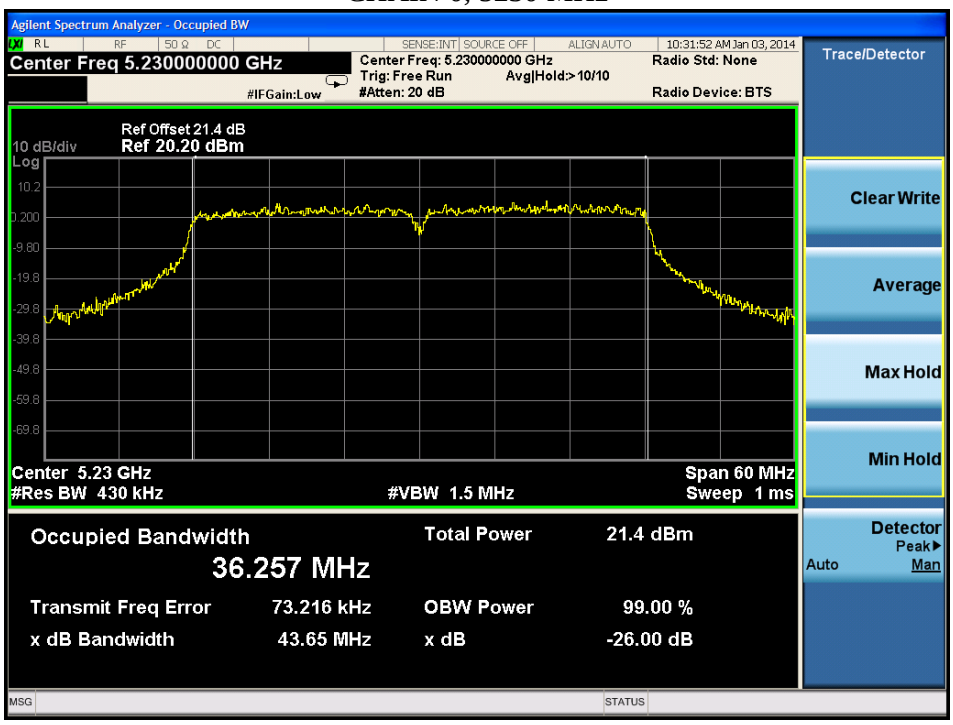
Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11n40

Test frequency	26 dB Bandwidth (MHz)	
(MHz)	Port 0	Port 1
5190	43.83	43.55
5230	43.65	44.20

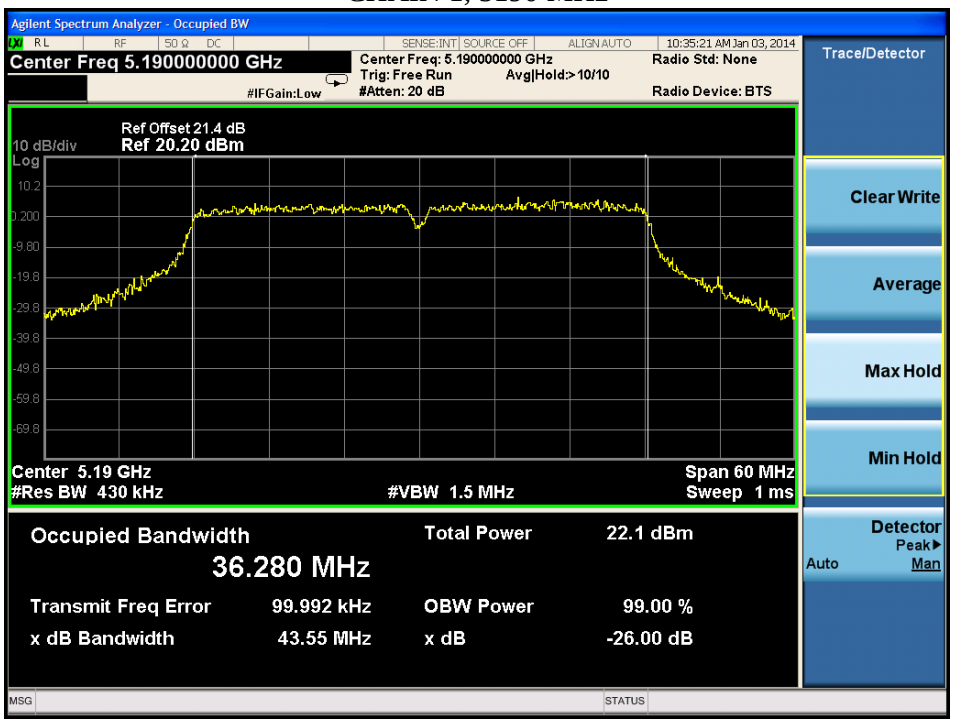
CHAIN 0, 5190 MHz



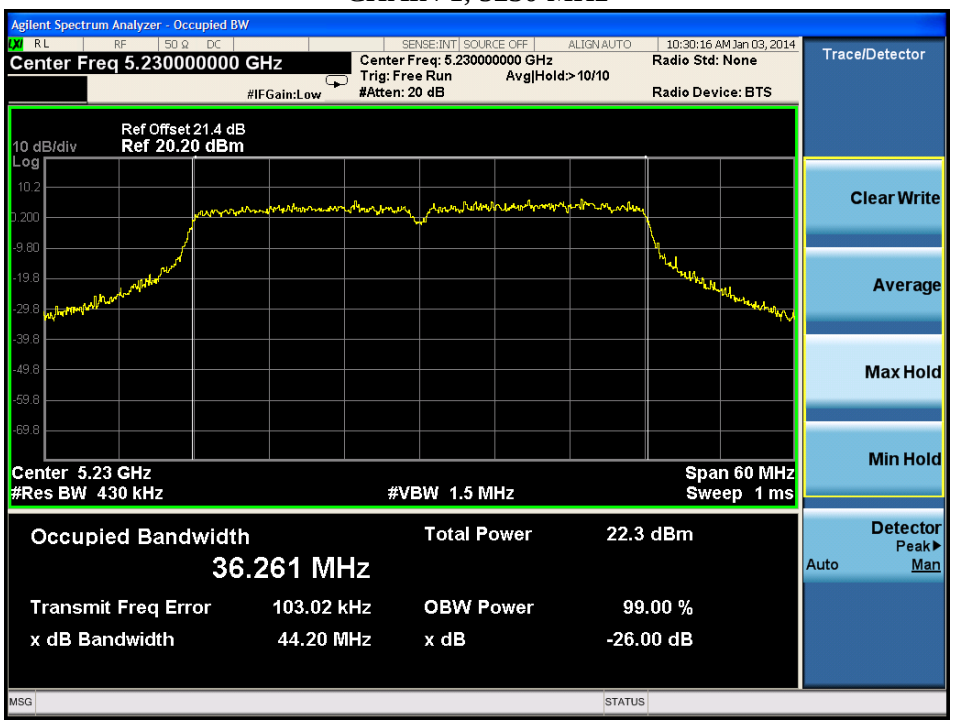
CHAIN 0, 5230 MHz



CHAIN 1, 5190 MHz



CHAIN 1, 5230 MHz

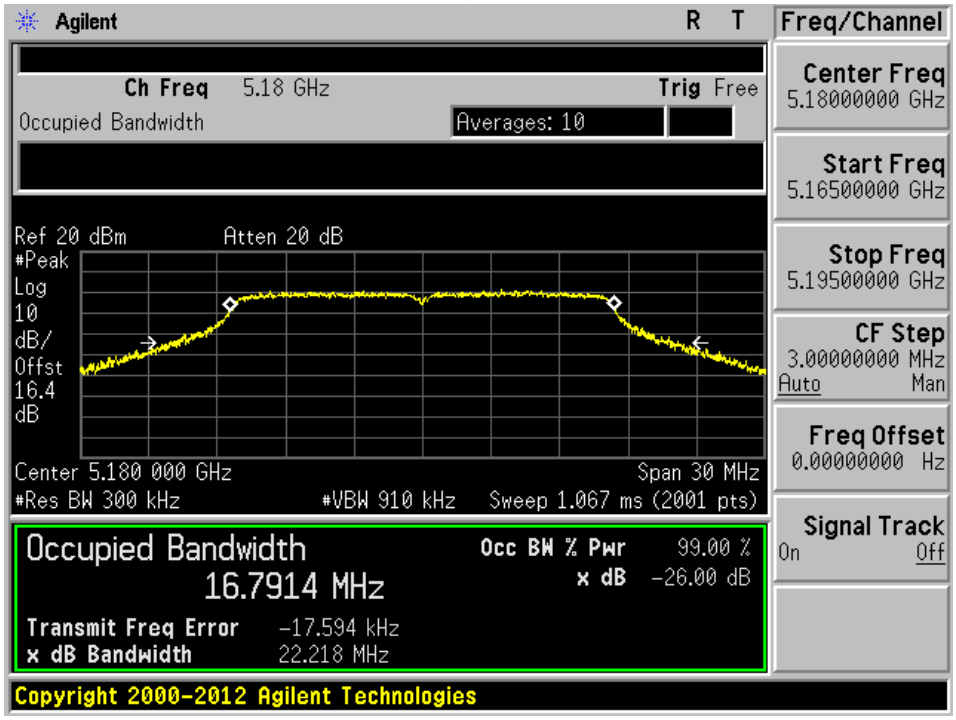


Temperature	:	18 °C
Relative Humidity	:	40 %
Test Mode	:	802.11a

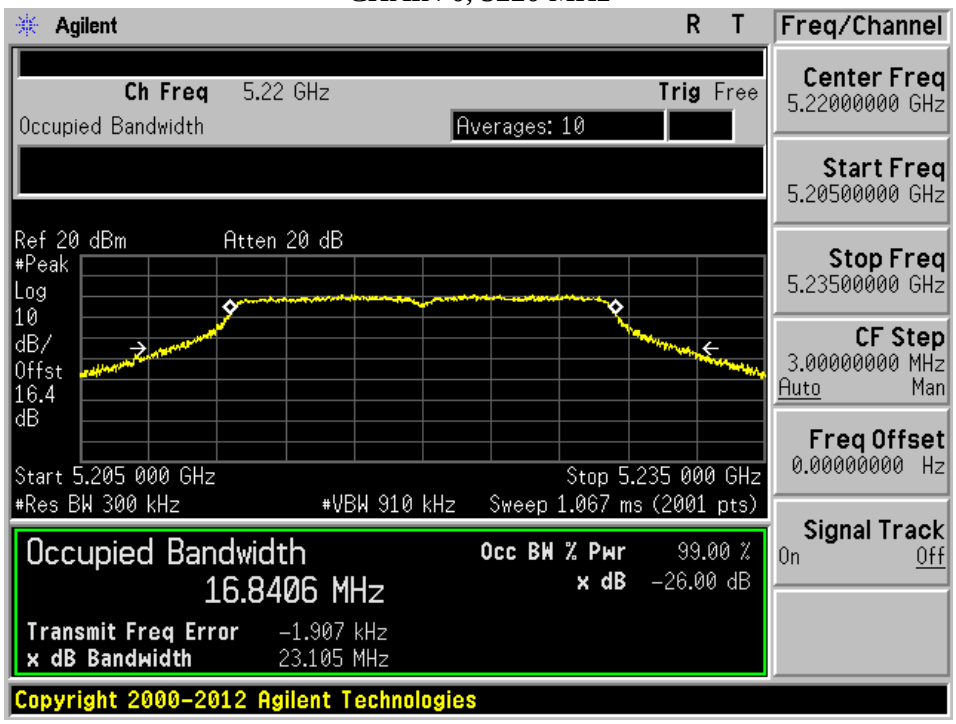
Test frequency	Occupied Bandwidth (99%) (MHz)	
(MHz)	Port 0	Port 1
5180	16.7914	16.6425
5220	16.8406	16.7891
5240	16.6957	16.6366

99% OBW:

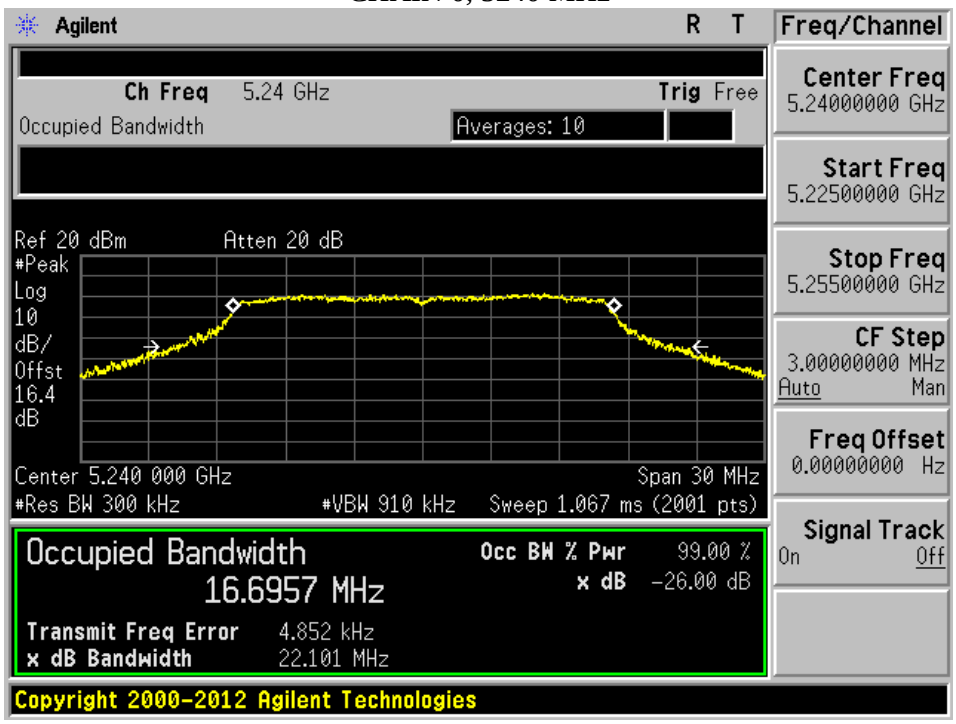
CHAIN 0, 5180 MHz



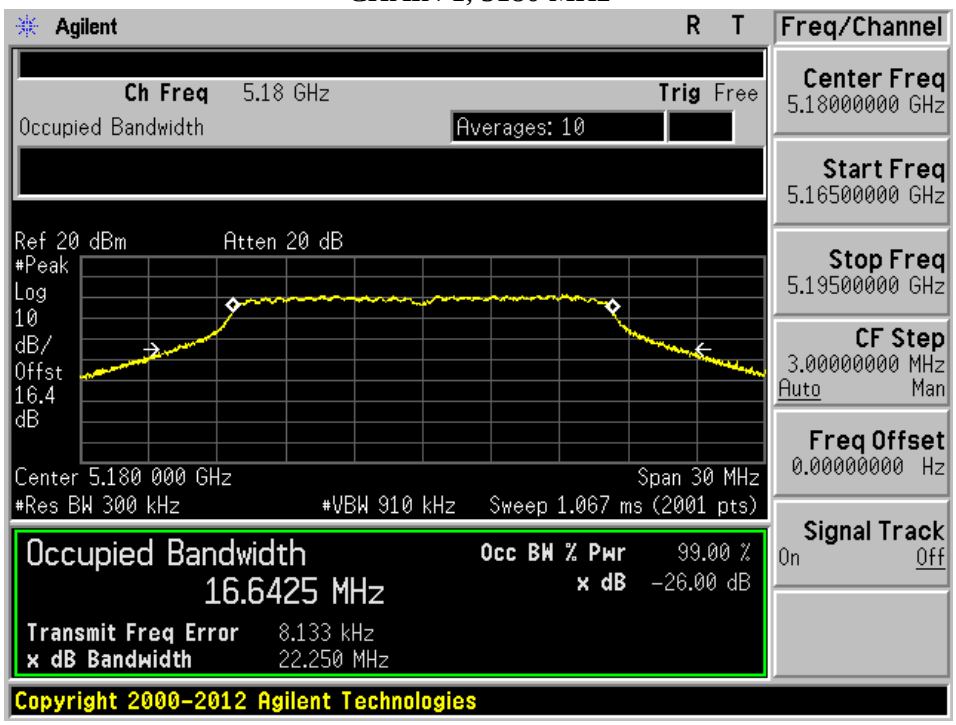
CHAIN 0, 5220 MHz



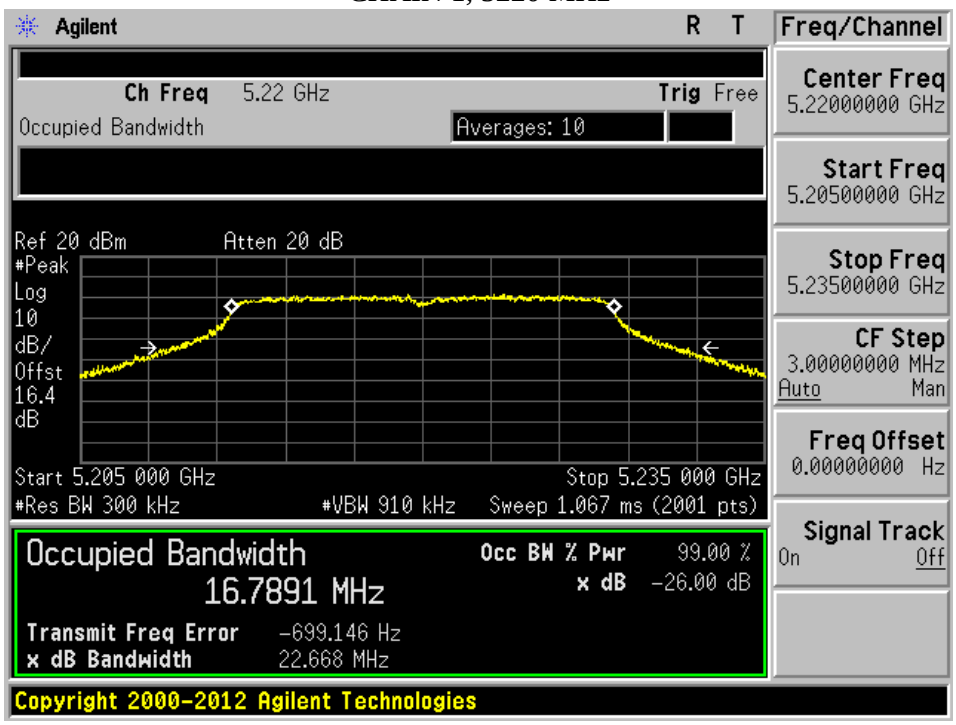
CHAIN 0, 5240 MHz



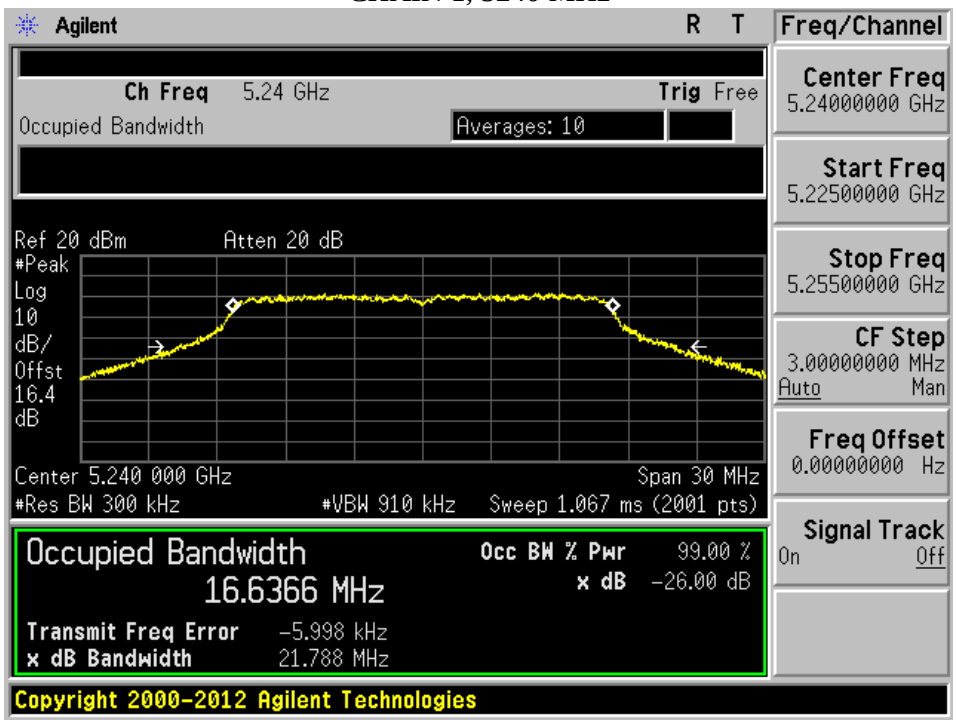
CHAIN 1, 5180 MHz



CHAIN 1, 5220 MHz



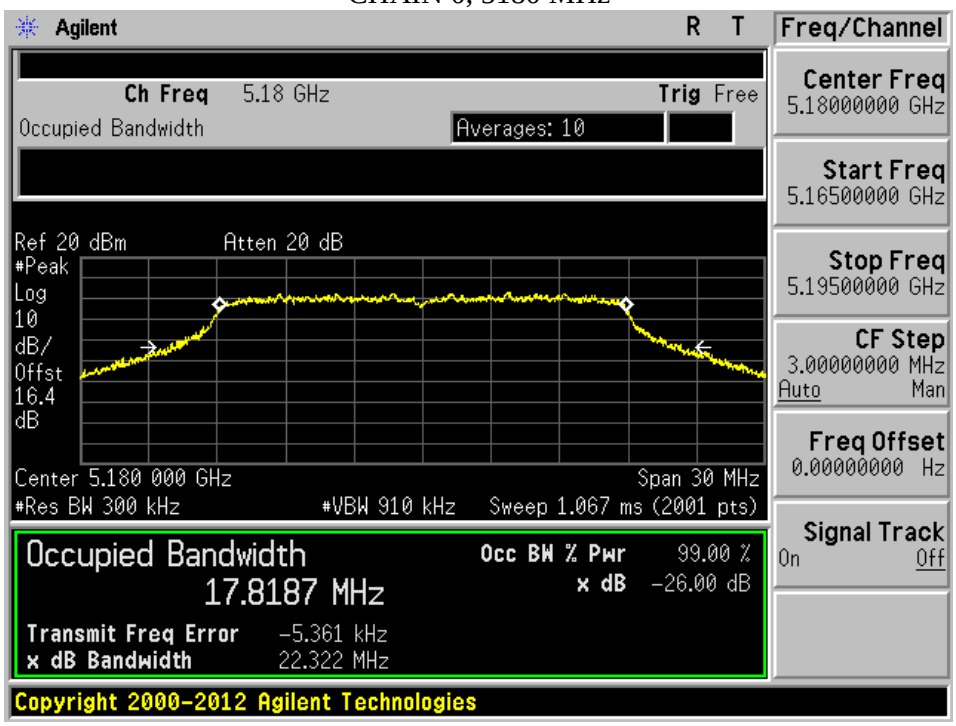
CHAIN 1, 5240 MHz



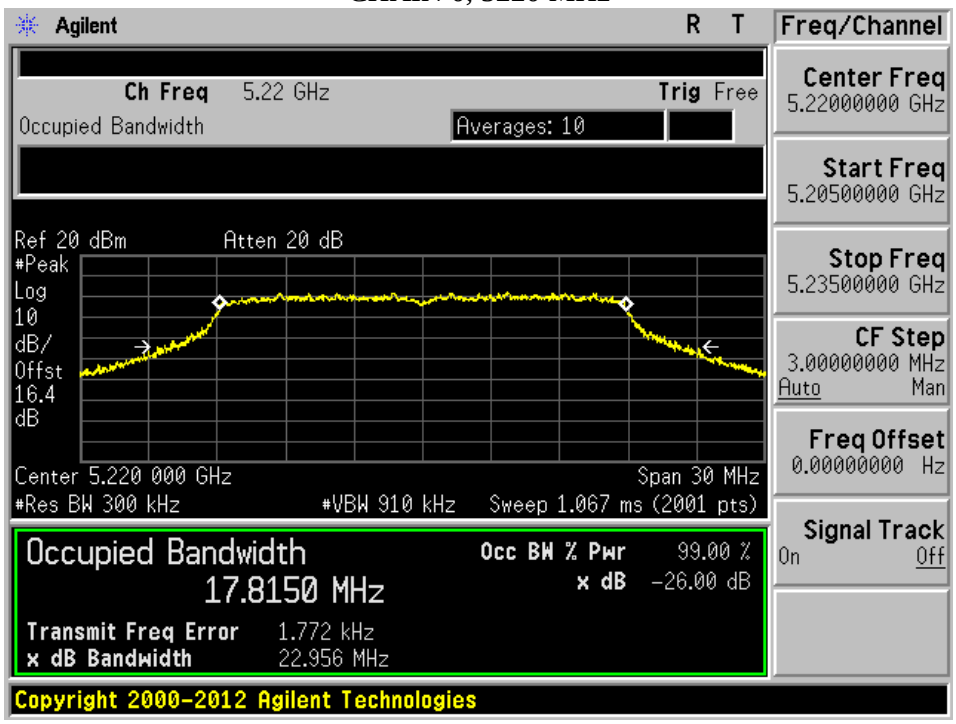
Temperature : 18 °C
Relative Humidity : 40 %
Test Mode : 802.11n20

Test frequency	Occupied Bandwidth (99%) (MHz)	
(MHz)	Port 0	Port 1
5180	17.8187	17.8208
5220	17.8150	17.7253
5240	17.8576	17.7783

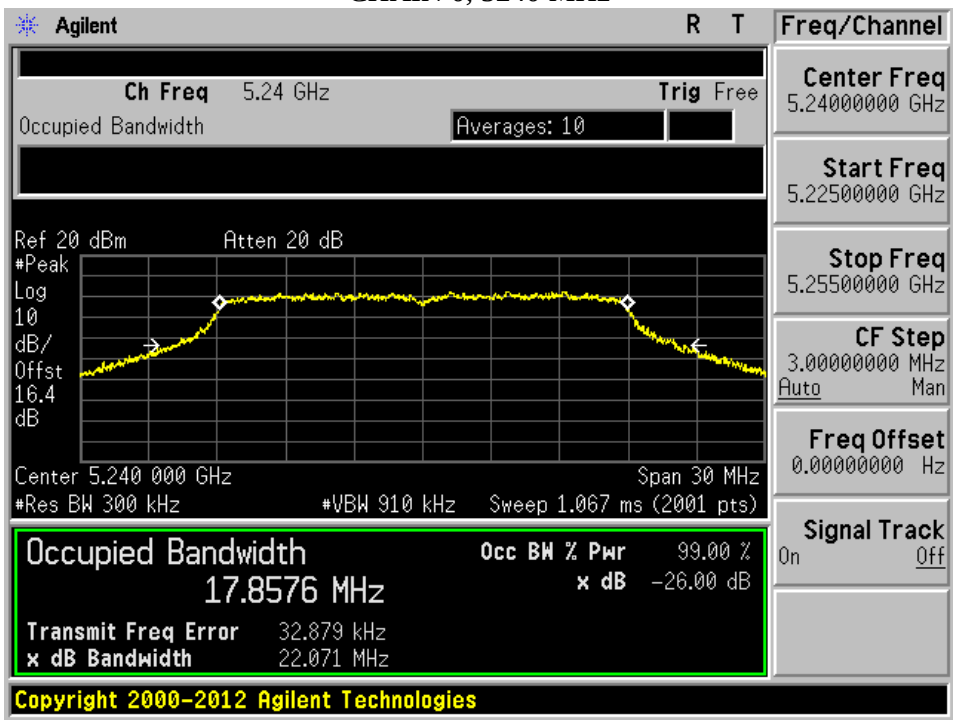
CHAIN 0, 5180 MHz



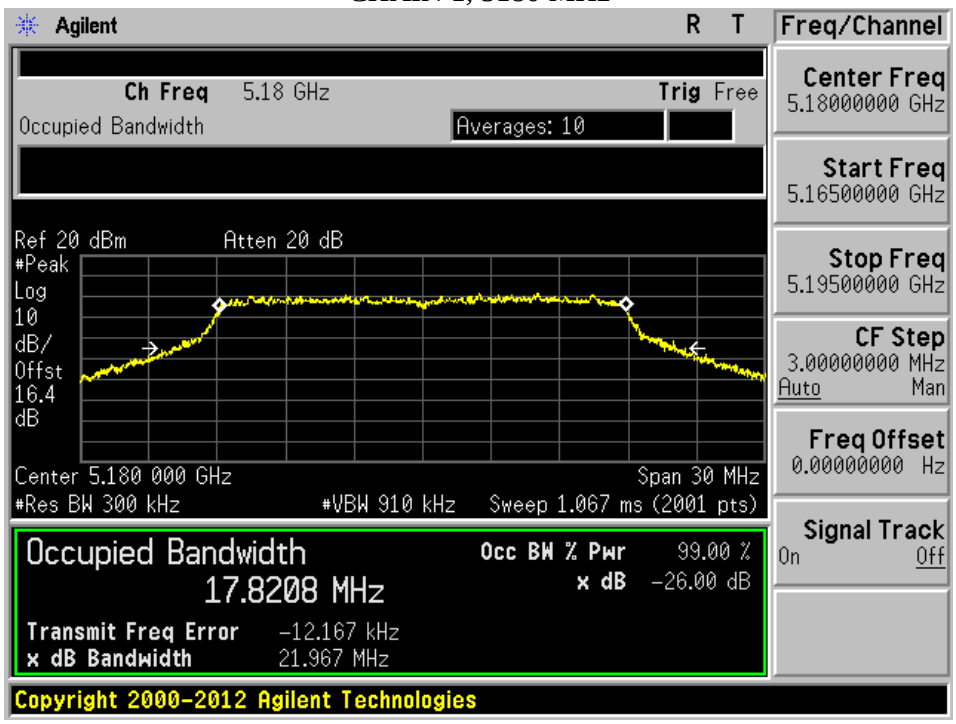
CHAIN 0, 5220 MHz



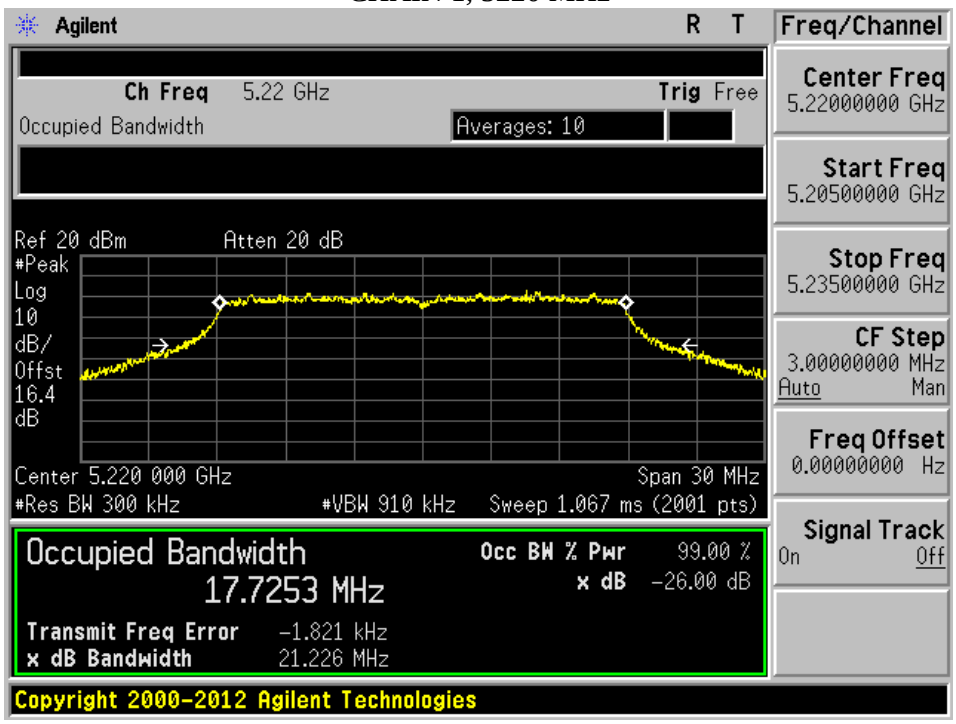
CHAIN 0, 5240 MHz



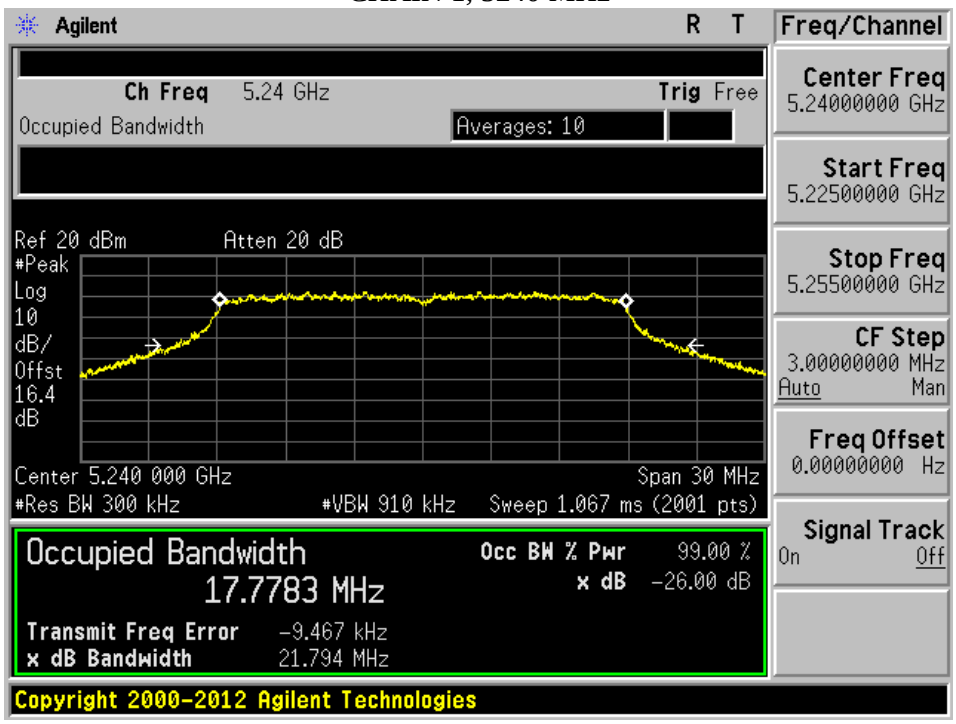
CHAIN 1, 5180 MHz



CHAIN 1, 5220 MHz



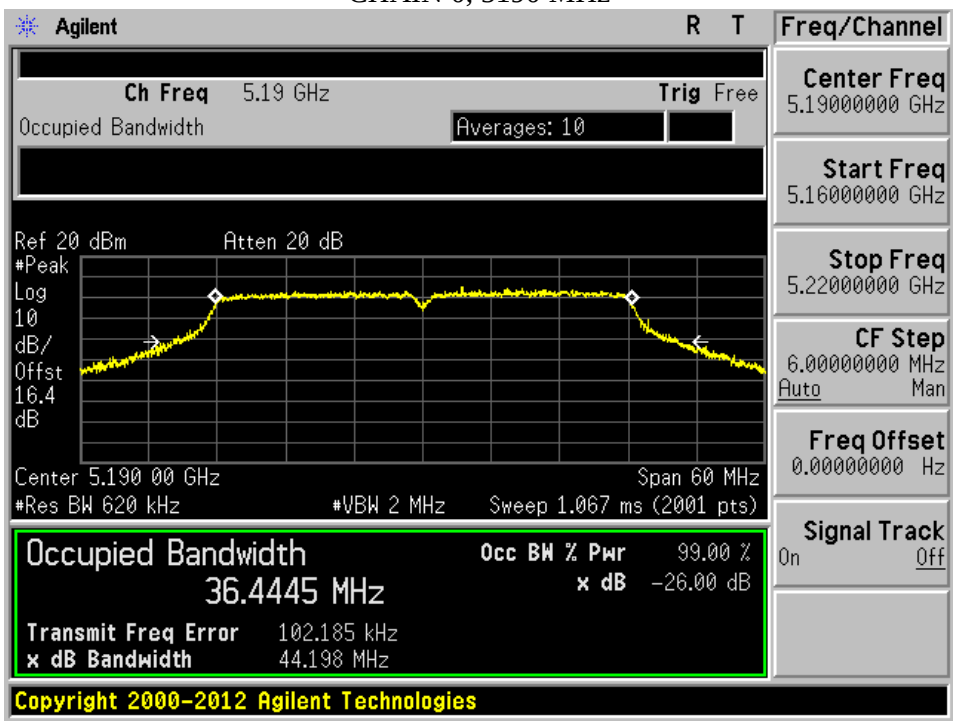
CHAIN 1, 5240 MHz



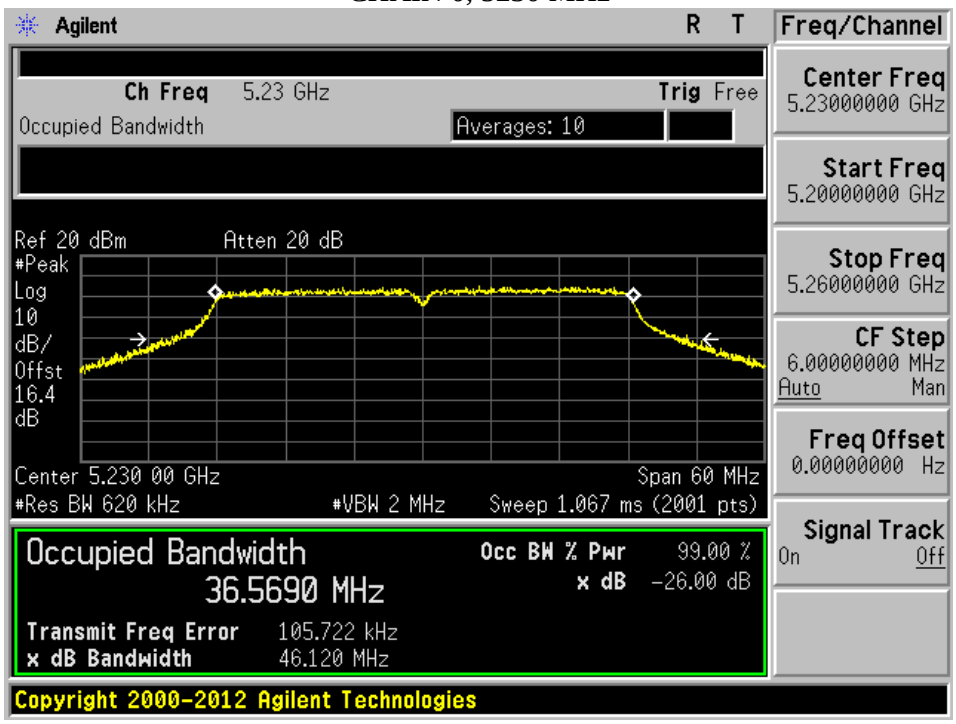
Temperature : 18 °C
Relative Humidity : 40 %
Test Mode : 802.11n40

Test frequency	Occupied Bandwidth (99%) (MHz)	
(MHz)	Port 0	Port 1
5190	36.4445	36.4378
5230	36.5690	36.4541

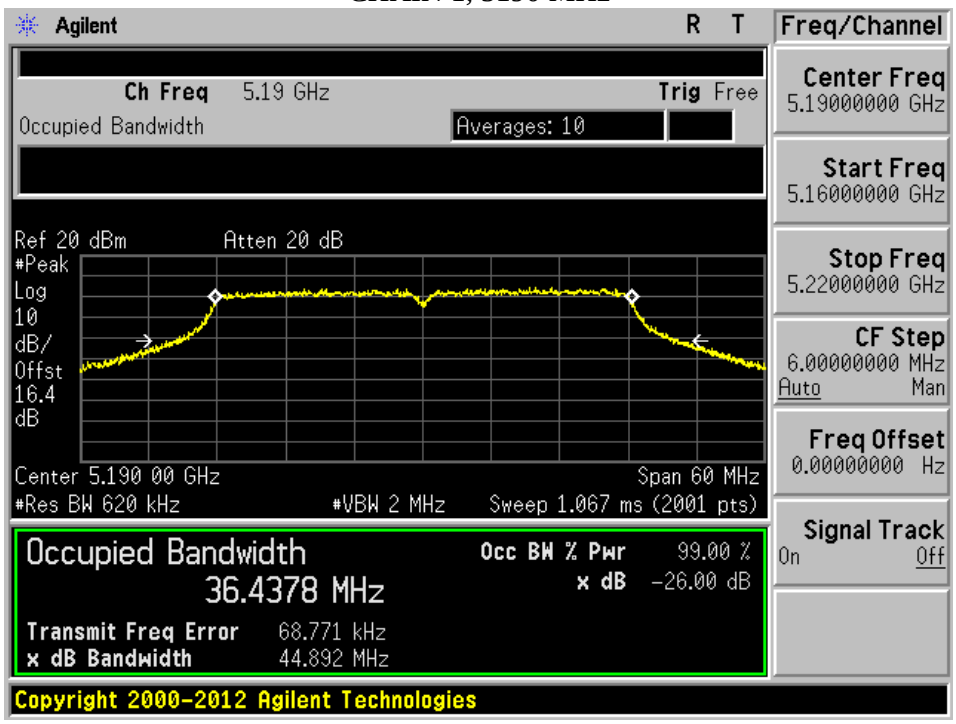
CHAIN 0, 5190 MHz



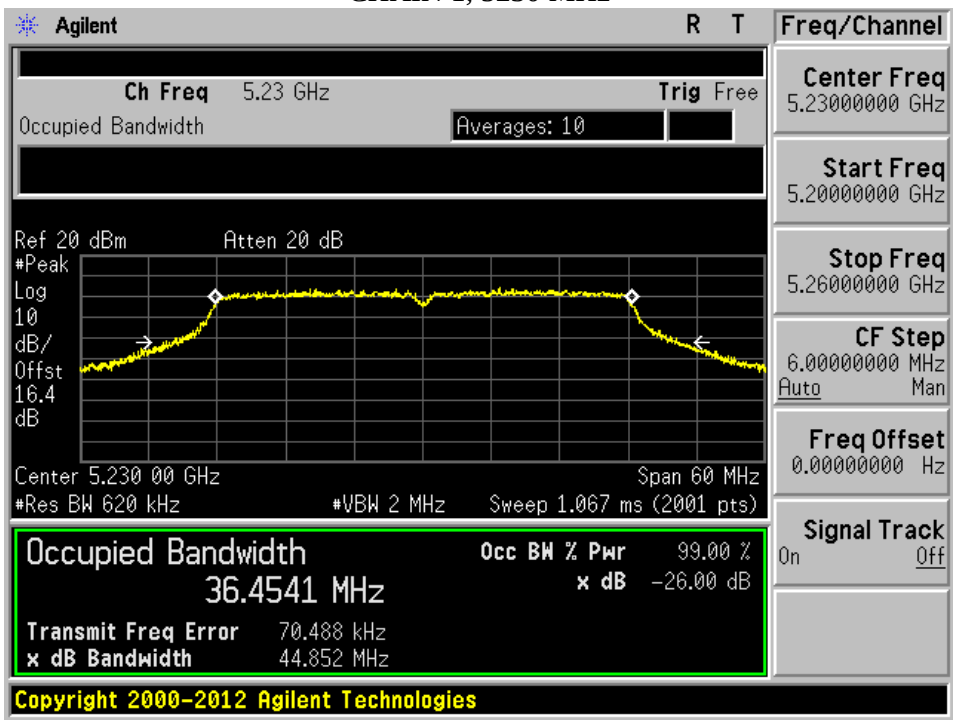
CHAIN 0, 5230 MHz



CHAIN 1, 5190 MHz

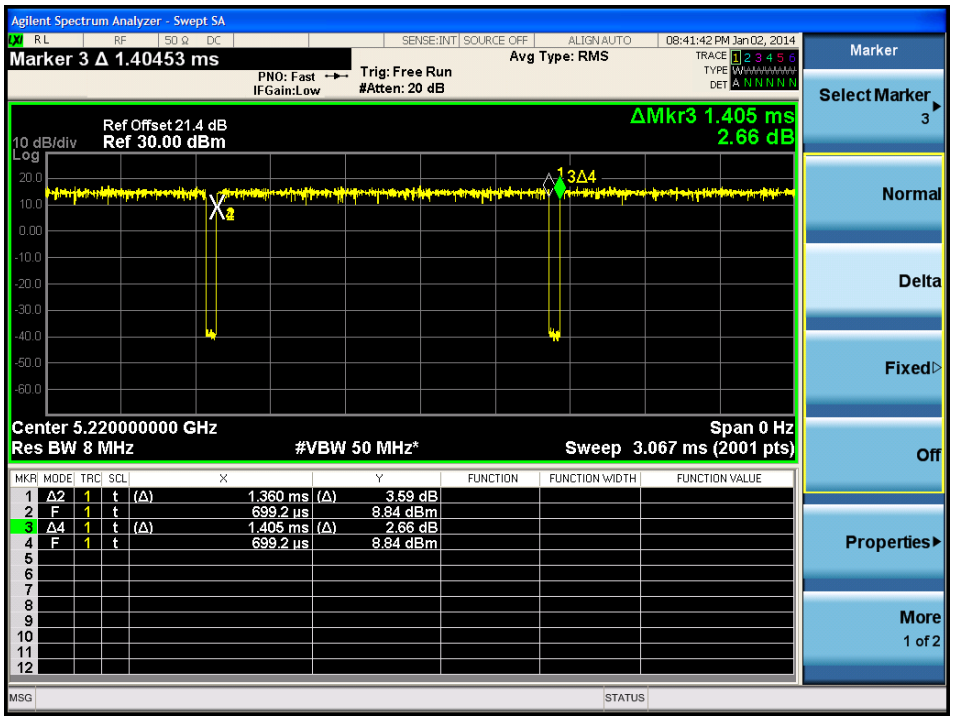


CHAIN 1, 5230 MHz

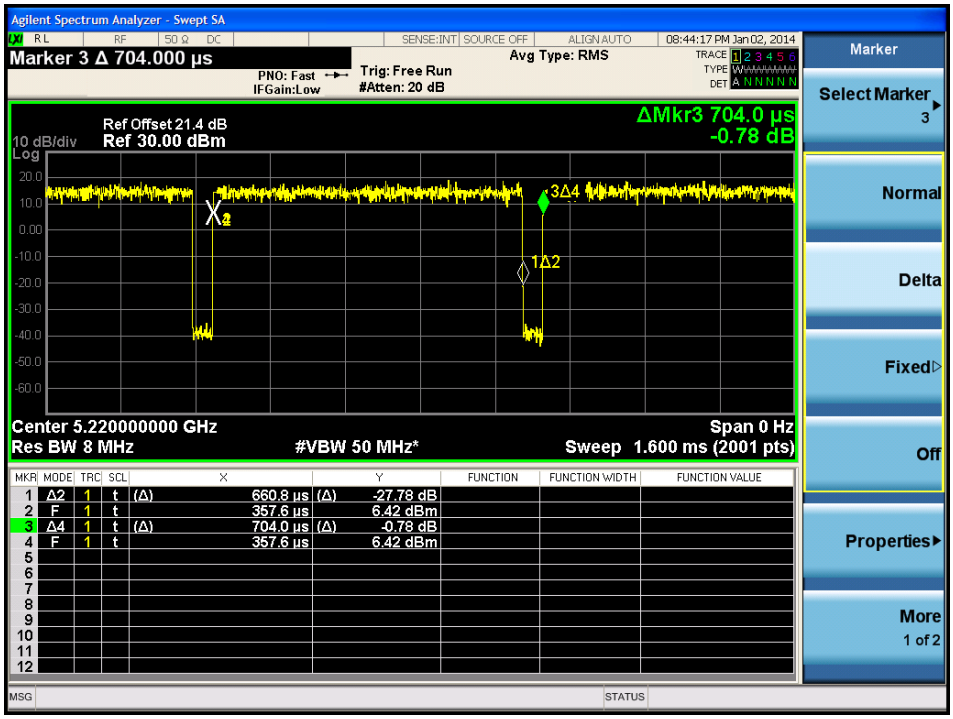


Appendix: Test Graph of Duty Cycle

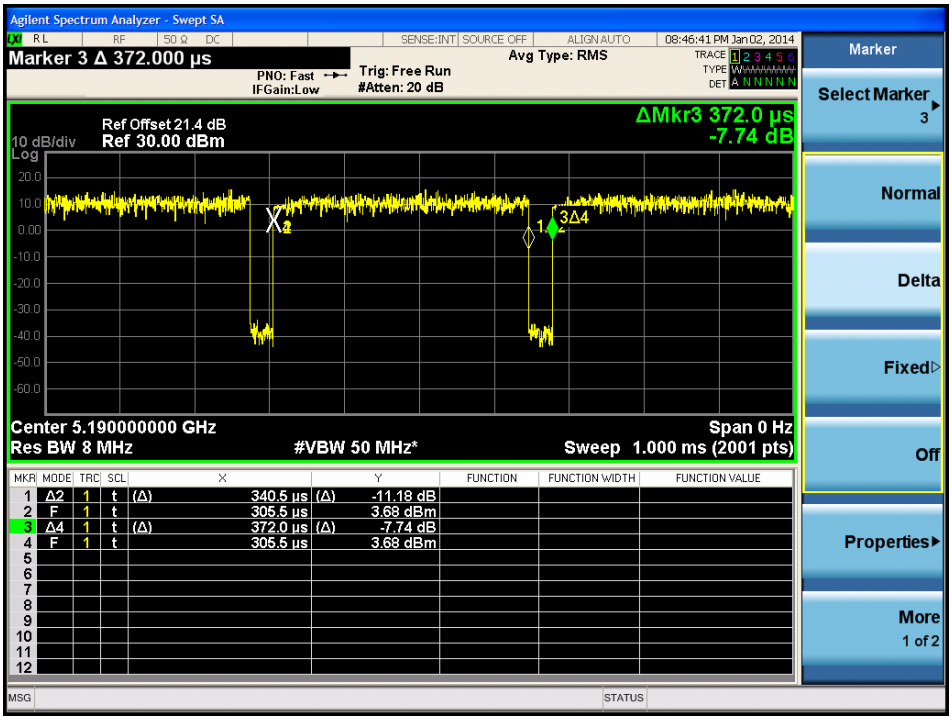
802.11a



802.11n HT20



802.11n HT40


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 372.000 µs
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: RMS
08:46:41 PM Jan 02, 2014
Ref Offset 21.4 dB
10 dB/div
Log
Ref 30.00 dBm
ΔMkr3 372.0 µs
-7.74 dB
Center 5.190000000 GHz
Res BW 8 MHz
#VBW 50 MHz*
Span 0 Hz
Sweep 1.000 ms (2001 pts)
1 Δ2 1 t (Δ) 340.5 µs (Δ) -11.18 dB
2 F 1 t 305.5 µs 3.68 dBm
3 Δ4 1 t (Δ) 372.0 µs (Δ) -7.74 dB
4 F 1 t 305.5 µs 3.68 dBm
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2