FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

FOR

802.11a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card

MODEL NUMBER: BCM943602CS

FCC ID: QDS-BRCM1080

REPORT NUMBER: 13U16561-66, Revision C

ISSUE DATE: JULY 22, 2014

Prepared for
BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, U.S.A.

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/04/14	Initial Issue	F. Ibrahim
A	06/05/14	Revised section 5.3 Changed “DTS” to “UNII-3” throughout the report Revised 8.27.1 Revised the power and PSD limits to 30 dBm and 30 dBm/500 kHz for the portion of the straddle channel that lie in UNN-3 bands throughout the rpeort	F. Ibrahim
B	06/16/14	Removed Regression Data	F. Ibrahim
C	07/22/14	Added Regression Data in Appendix A and updated section 5.2	J. Wu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, U.S.A.

EUT DESCRIPTION: 802.11a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card

MODEL: BCM943602CS

SERIAL NUMBER: 318 (Radiated Sample), P374 (Regression Sample)
333 and 339 (Conducted Samples)

DATE TESTED: February 24 – July 18, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

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

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

Approved & Released For
UL Verification Services Inc. By:

FRANK IBRAHIM
PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

JOSEPH GOMEZ
LAB ENGINEER
UL Verification Services Inc.

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 06-96, FCC KDB 789033, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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

47173 Benicia Street	47266 Benicia Street
☒ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	±3.52 dB
Radiated Disturbance, 30 to 1000 MHz	±4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card.

The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2 GHz BAND

Frequency Range (MHz)	Mode	Power, Chain 0 (dBm)	Power, Chain 1 (dBm)	Power, Chain 2 (dBm)	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 1TX						
5180 - 5240	802.11a	18.37			18.37	68.71
5190 - 5230	802.11n HT40	18.55			18.55	71.61
5210	802.11n AC80	14.81			14.81	30.27
5.2 GHz band, 3TX						
5180 - 5240	802.11n HT20 CDD	15.31	15.21	15.18	20.00	100.11
5180 - 5240	802.11n HT20 STBC	18.41	18.48	18.84	23.35	216.37
5180 - 5240	802.11n HT20 BF	13.82	13.83	14.17	18.71	74.38
5190 - 5230	802.11n HT40 CDD	18.07	18.18	18.02	22.86	193.27
5190 - 5230	802.11n HT40 BF	14.25	13.65	14.34	18.86	76.95
5210	802.11ac VHT80 CDD	12.70	12.50	12.20	17.24	53.00
5210	802.11ac VHT80 TxBF	10.60	10.30	10.20	15.14	32.67

5.3 GHz BAND

Frequency Range (MHz)	Mode	Power, Chain 0 (dBm)	Power, Chain 1 (dBm)	Power, Chain 2 (dBm)	Output Power (dBm)	Output Power (mW)
5.3GHz band, 1TX						
5180 - 5240	802.11a LEGACY		20.17		20.17	103.99
5190 - 5230	802.11n HT40		15.08		15.08	32.21
5210	802.11ac VHT80		13.83		13.83	24.15
5.3 GHz band, 3TX						
5260 - 5320	802.11n HT20 CDD	16.47	16.63	16.32	21.25	133.24
5260 - 5320	802.11n HT20 STBC	18.65	18.51	18.32	23.27	212.16
5260 - 5320	802.11n HT20 BF	14.04	13.70	13.58	18.55	71.60
5270 - 5310	802.11n HT40 CDD	19.09	18.92	18.86	23.73	235.99
5270 - 5310	802.11n HT40 BF	14.33	14.28	14.22	19.05	80.32
5290	802.11ac VHT80 CDD	11.60	11.50	11.40	16.27	42.38
5290	802.11ac VHT80 BF	9.90	9.80	9.60	14.54	28.44

5.6 GHz BAND

Frequency Range (MHz)	Mode	Power, Chain 0 (dBm)	Power, Chain 1 (dBm)	Power, Chain 2 (dBm)	Output Power (dBm)	Output Power (mW)
5.6GHz band, 1TX						
5500-5700	802.11a LEGACY		17.01		17.01	50.23
5510-5670	802.11n HT40		18.11		18.11	64.71
5530	802.11ac VHT80		12.78		12.78	18.97
5690	802.11ac VHT80		16.30		16.30	42.66
5.6 GHz band, 3TX						
5500-5700	802.11n HT20 CDD	15.90	15.91	16.07	20.73	118.36
5500-5700	802.11n HT20 STBC	18.50	18.94	19.10	23.63	230.42
5500-5700	802.11n HT20 BF	14.82	14.64	14.81	19.53	89.72
5720	802.11n HT20 CDD	15.70	15.80	15.80	20.54	113.19
5720	802.11n HT20 STBC	18.75	18.76	18.79	23.54	225.83
5720	802.11n HT20 BF	15.70	15.80	15.80	20.54	113.19
5510-5670	802.11n HT40 CDD	19.00	19.10	19.00	23.80	240.15
5510-5670	802.11n HT40 BF	14.94	14.82	14.77	19.62	91.52
5710	802.11n HT40 CDD	16.45	16.42	16.44	21.21	132.07
5710	802.11n HT40 BF	15.08	15.25	15.00	19.88	97.33
5530	802.11ac VHT80 CDD	12.50	12.50	12.50	17.27	53.35
5530	802.11ac VHT80 BF	11.00	10.80	11.00	15.71	37.20
5610	802.11ac VHT80 CDD	18.40	18.30	18.00	23.01	199.89
5690	802.11ac VHT80 CDD	18.38	18.46	18.29	23.15	206.46
5690	802.11ac VHT80 BF	15.01	15.15	15.23	19.90	97.77

5.8 GHz BAND

Frequency Range (MHz)	Mode	Power, Chain 0 (dBm)	Power, Chain 1 (dBm)	Power, Chain 2 (dBm)	Total power (dBm)	Total power (mW)
5.8 GHz Band, 1Tx						
5745 - 5825	802.11a LEGACY 1TX		21.90		21.90	154.88
5755 - 5795	802.11n HT40 1TX		14.70		14.70	29.51
5775	802.11ac VHT80 1TX		14.70		14.70	29.51
5.8 GHz Band, 2Tx						
5745 - 5825	802.11n HT20 CDD 2TX	17.70	17.90		20.81	120.54
5755 - 5795	802.11n HT40 CDD 2TX	15.10	15.20		18.16	65.47
5755 - 5795	802.11n HT40 BF 2TX	15.51	15.38		18.46	70.08
5775	802.11ac VHT80 CDD 2TX	14.80	14.70		17.76	59.71
5775	802.11ac VHT80 BF 2TX	14.80	14.70		17.76	59.71
5.8 GHz Band, 3Tx						
5745 - 5825	802.11n HT20 CDD 3TX	21.50	21.20	21.10	26.04	401.90
5745 - 5825	802.11n HT20 BF 3TX	18.10	18.20	18.40	23.01	199.82
5755 - 5795	802.11n HT40 CDD 3TX	18.20	18.10	17.60	22.75	188.18
5755 - 5795	802.11n HT40 BF 3TX	18.50	18.40	18.30	23.17	207.59
5775	802.11ac VHT80 CDD 3TX	13.20	13.30	13.60	18.14	65.18
5775	802.11ac VHT80 BF 3TX	13.30	13.90	13.60	18.38	68.84

Frequency Range (MHz)	Mode	Power, Chain 0 (dBm)	Power, Chain 1 (dBm)	Power, Chain 2 (dBm)	Output Power (dBm)
5.6 GHz band, 3TX (Channels overlapping UNII and DTS bands)					
5720 (UNII portion)	802.11n HT20 CDD	11.68	11.74	11.85	16.75
5720 (DTS portion)	802.11n HT20 CDD	6.04	5.94	6.10	11.02
5720 (Whole signal)	802.11n HT20 CDD	12.73	12.75	12.87	**17.78**
5720 (UNII portion)	802.11n HT20 STBC	15.37	15.31	15.69	20.44
5720 (DTS portion)	802.11n HT20 STBC	10.17	9.95	9.74	14.94
5720 (Whole signal)	802.11n HT20 STBC	16.52	16.42	16.67	**21.52**
5720 (UNII portion)	802.11n HT20 BF	11.68	11.74	11.85	16.75
5720 (DTS portion)	802.11n HT20 BF	6.04	5.94	6.10	11.02
5720 (Whole signal)	802.11n HT20 BF	12.73	12.75	12.87	**17.78**
5710 (UNII portion)	802.11n HT40 CDD	15.43	15.54	15.89	20.87
5710 (DTS portion)	802.11n HT40 CDD	7.05	5.36	6.14	11.48
5710 (Whole signal)	802.11n HT40 CDD	16.02	15.94	16.33	**21.34**
5710 (UNII portion)	802.11n HT40 BF	11.78	11.87	12.06	17.15
5710 (DTS portion)	802.11n HT40 BF	2.77	1.04	1.71	7.14
5710 (Whole signal)	802.11n HT40 BF	12.29	12.21	12.44	**17.56**
5690 (UNII portion)	802.11ac VHT80 CDD	14.55	13.51	14.19	19.73
5690 (DTS portion)	802.11ac VHT80 CDD	1.44	0.83	0.80	6.65
5690 (Whole signal)	802.11ac VHT80 CDD	14.76	13.74	14.38	**19.93**
5690 (UNII portion)	802.11ac VHT80 BF	11.96	12.10	12.07	17.66
5690 (DTS portion)	802.11ac VHT80 BF	-1.85	-1.79	-1.86	3.79
5690 (Whole signal)	802.11ac VHT80 BF	12.14	12.27	12.24	**17.84**

List of test reduction (Non Beam-Forming modes)

Antenna Port Testing		
Band	**Mode**	**Covered by**
5 GHz bands	802.11a Legacy 1TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11a CDD 2TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11a CDD 3TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11n HT20 CDD/SDM/STBC 2TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11n HT40 1TX	802.11n HT40 CDD 3TX
5 GHz bands	802.11n HT40 CDD/SDM/STBC 2TX	802.11n HT40 CDD 3TX
5 GHz bands	802.11n HT40 STBC 3TX	802.11n HT40 CDD 3TX
5 GHz bands	802.11ac VHT80 1TX	802.11ac VHT80 CDD 3TX
5 GHz bands	802.11ac VHT80 CDD/SDM/STBC 2TX	802.11ac VHT80 CDD 3TX
5 GHz bands	802.11ac VHT80 STBC 3TX	802.11ac VHT80 CDD 3TX

Radiated Testing		
Band	**Mode**	**Covered by**
5 GHz bands	802.11a Legacy 1TX (Harmonics)	802.11n HT20 CDD 3TX (Harmonics)
5 GHz bands	802.11a CDD 2TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11a CDD 3TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11n HT20 CDD/SDM/STBC 2TX	802.11n HT20 CDD 3TX
5 GHz bands	802.11n HT40 1TX (Harmonics)	802.11n HT40 CDD 3TX (Harmonics)
5 GHz bands	802.11n HT40 STBC 3TX	802.11n HT40 CDD 3TX
5 GHz bands	802.11ac VHT80 1TX (Harmonics)	802.11ac VHT80 CDD 3TX (Harmonics)
5 GHz bands	802.11ac VHT80 CDD/SDM/STBC 2TX	802.11ac VHT80 CDD 3TX
5 GHz bands	802.11ac VHT80 STBC 3TX	802.11ac VHT80 CDD 3TX

List of test reduction (Beam-Forming modes)

Antenna Port Testing		
Band	**Mode**	**Covered by**
5 GHz bands	802.11n HT40 BF 2Tx	802.11n HT40 BF 3Tx
5 GHz bands	802.11ac VHT80 BF 2Tx	802.11ac VHT80 BF 3Tx

Radiated Testing		
Band	**Mode**	**Covered by**
5 GHz bands	802.11a BF 2TX	802.11n HT20 BF 3Tx
5 GHz bands	802.11a BF 3TX	802.11n HT20 BF 3Tx
5 GHz bands	802.11n HT20 BF 2Tx	802.11n HT20 BF 3Tx
5 GHz bands	802.11n HT40 BF 2Tx	802.11n HT40 BF 3Tx
5 GHz bands	802.11ac VHT80 BF 2Tx	802.11ac VHT80 BF 3Tx

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT utilizes the following antennas:

First set (used for testing) except for BT/BLE where we used 4.82 dBi worst case antenna.

Antenna Type	Model	Peak Gain @ 2412, 2422, 2432MHz	Peak Gain (5150 - 5250 MHz) @ 5200MHz	Peak Gain (5250 - 5350 MHz) @ 5320MHz	Peak Gain (5479 - 5725 MHz) @5500, 5700 MHz	Peak Gain (5725 - 5850MHz) @5785, 5805 MHz
802.11 abgn WLAN Antenna	613 -1143 WiFi 1	0.12	7.04	7.09	5.03	2.66
802.11 abgn WLAN Antenna	613 -1143 WiFi 2	5.3	6.7	7.06	6.66	5.93
802.11 abgn WLAN / BT Antenna	613 -1143 WiFi 3 & BlueTooth	4.69	3.79	3.58	3.94	6.04

Second set:

Antenna Type	Model	Peak gain @ 2412, 2422, 2432MHz,	Peak gain (5150-5250MHz) @5200MHz	Peak gain (5250-5350MHz) @5320MHz	Peak gain (5470-5725MHz) @5500, 5700MHz	Peak gain (5725-5850MHz) @5785, 5805MHz
802.11abgn WLAN Antenna	613-1631 Wi-Fi1	2.47	4.18	3.35	3.32	3.56
802.11abgn WLAN Antenna	613-1631 Wi-Fi2	2.64	4.22	3.44	2.41	3.68
802.11abgn WLAN Antenna	613-1631 Wi-Fi3 & Bluetooth	4.82	4.63	3.01	4.63	4.31

WiFi: For SISO radiated testing, the antenna with highest gain from set 1 was used as worst-case representative for other antennas. For MIMO radiated modes, the antennas from set 1 were used as worst-case representative for other modes.
BT/BLE: for radiated testing, the antenna from set 2 which has higher gain than the BT/BLE antenna in set 1 was used as worst-case representative for the other antenna.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Broadcom, rev. 7.16.27.0.

The test utility software used during testing was BCM Internal, rev. 7.16.RC27.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC.

EUT is for desktop applications; there is only one orientation for the antenna, the EUT was tested with normal antenna orientation.

Radiated emission below 1 GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Worst-Case data rates, as provided by the client, were as follows:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11a mode: 6 Mbps
802.11n HT20mode: MCS0
802.11n HT40mode: MCS0
802.11ac VHT80MHz: MCS0.

For MIMO modes, the 3TX emission testing was considered as a worst case scenario and was performed at power levels, per transmit chain, greater than or equal to the maximum power in any 1TX mode.

For all modes with single chain, chain 0 (connector J0) was selected for the 5.2GHz band, and chain 1 (connector J1) was selected for the 5.3GHz and 5.6GHz bands per the software provided by the client. Based on feedback from the client, those chains were worst-case.

Based on client's input, there is no colocation among different radios.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Dell	Latitude E6400	2477655473	DoC
AC Adapter	Dell	DA90PE3-00	CN-0WTC00V-48661	DoC
Catalyst PCIe. Board	Enterprises Inc.	NA	NA	DoC
X29T Adaptor Board	Broadcom	BCM94331C5AD	NA	DoC
Laptop	Dell	Latitude E6400	6MYFMJ1	DoC
AC Adapter	Dell	PA2 /CF745	CN-0CF745-48661	DoC
Catalyst PCIe. Board	Enterprises Inc.	NA	NA	DoC
Laptop	Lenovo	G560	CB06427681	DoC
AC Adapter	Lenovo	Adp-65KH B	36001646	DoC

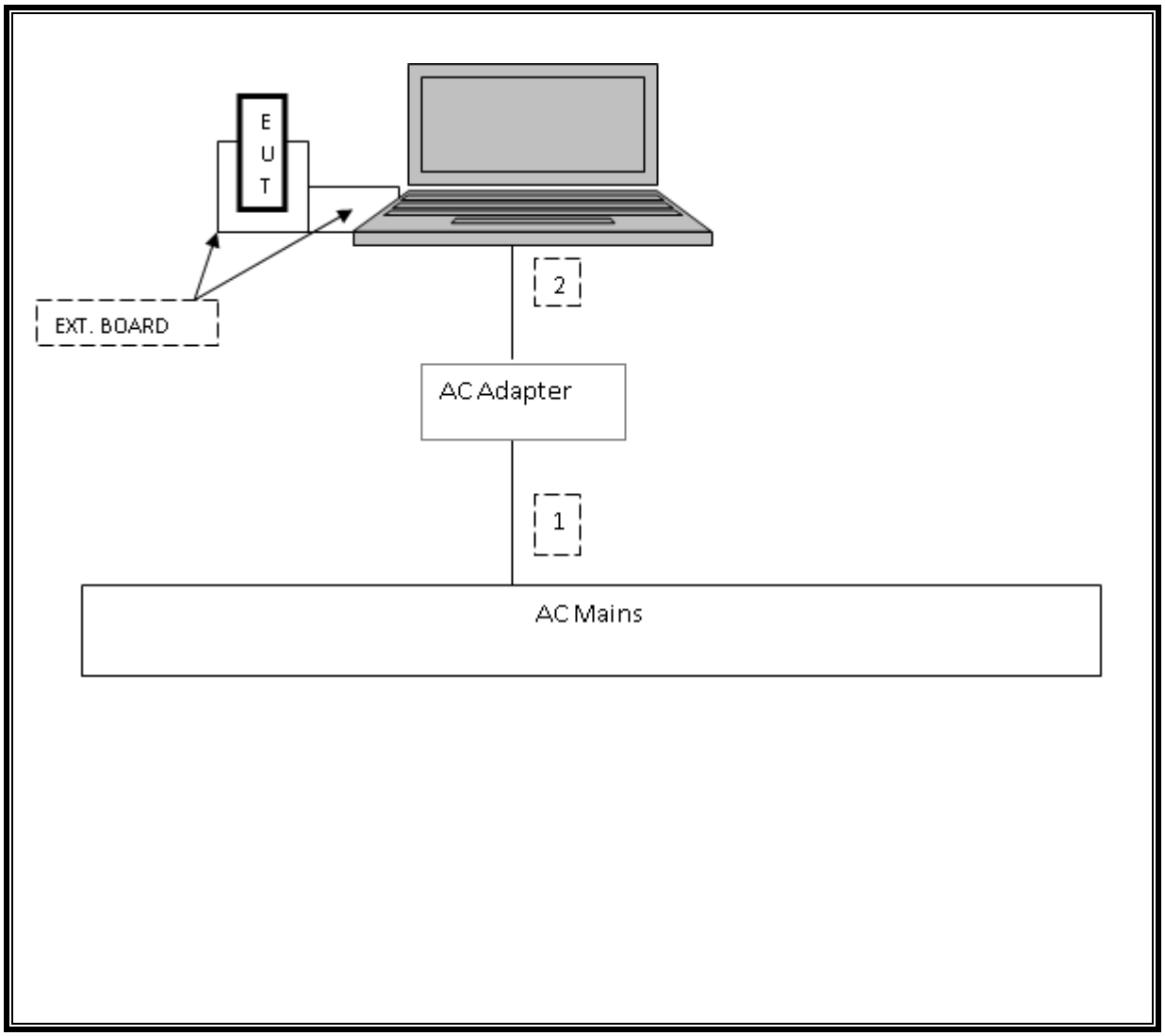
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	US 115V	Un-Shielded	1.0m	NA
2	DC	1	19.5 Vdc	Un-Shielded	0.8m	NA

TEST SETUP

The EUT is attached to a jig board which is installed in the PCMCI slot of a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4446A	C00996	05/22/13	05/22/14
Spectrum Analyzer, 40 GHz	Agilent	E4446A	T99	05/22/13	05/22/14
PXA Signal Analyzer	Agilent	N9030A	T339	12/10/13	12/10/14
Horn Antenna, 1GHz-18GHz	ETS Lindgren	3117	T119	01/06/14	01/06/15
Antenna, Horn, 18 GHz	EMCO	3115	C01218	01/18/14	01/18/15
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/13	11/14/14
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/28/13	06/28/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	08/22/13	08/22/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	10/19/13	10/19/14
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/13	08/20/14
Peak Power Meter	Agilent / HP	E9323A	F00051	10/04/13	10/04/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/14	01/16/15
5GHz Low Pass Filter	Micro-Tronics	LPS17541	F00219	06/26/13	06/26/14
3GHz High Pass Filter	Micro-Tronics	HPS17542	F00222	06/26/13	06/26/14
6GHz High Pass Filter	Micro-Tronics	HPM17543	F00224	06/26/13	06/26/14

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

7.1. ON TIME AND DUTY CYCLE RESULTS

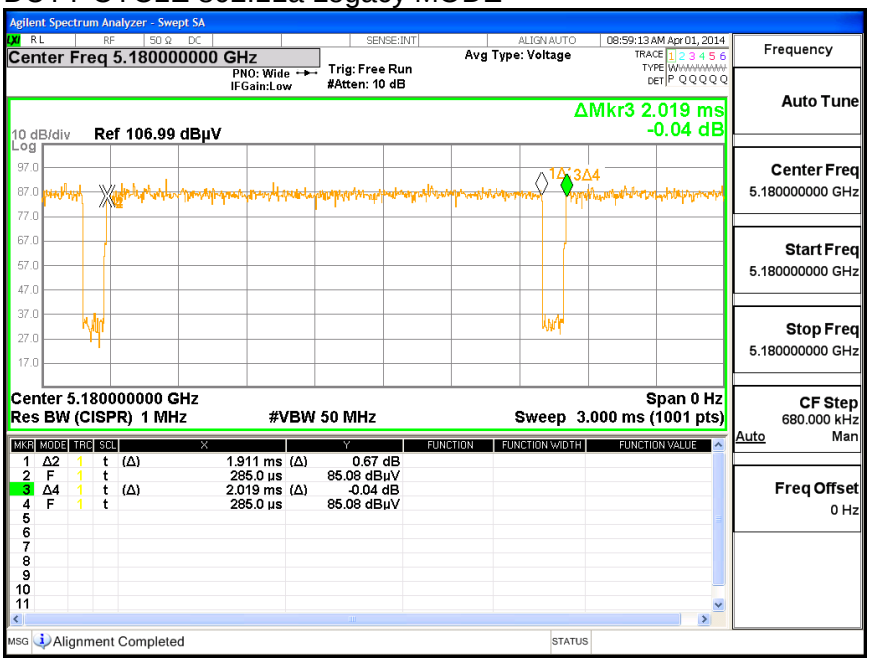
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	D.C.C.F (dB)	1/B Minimum VBW (kHz)
802.11a Legacy	1.911	2.019	0.947	94.65%	0.24	0.523
802.11n HT20 CDD 3Tx	1.918	2.018	0.950	95.04%	0.22	0.521
802.11n HT20 STBC 3Tx	1.927	2.024	0.952	95.21%	0.21	0.519
802.11n HT20 BF 3Tx	0.638	1.434	0.445	44.49%	3.52	1.567
802.11n HT40 1Tx	0.935	1.042	0.897	89.73%	0.47	1.070
802.11n HT40 CDD 3Tx	0.942	1.05	0.897	89.71%	0.47	1.062
802.11n HT40 BF 3Tx	0.509	1.5110	0.337	33.69%	4.73	1.965
802.11ac VHT80 1Tx	0.4581	0.5590	0.819	81.95%	0.86	2.183
802.11ac VHT80 CDD 3Tx	0.458	0.557	0.822	82.23%	0.85	2.183
802.11ac VHT80 BF 3Tx	0.328	1.163	0.282	28.20%	5.50	3.049
802.11n HT20 CDD 3Tx_5.8GHz band	0.9467	1.0430	0.908	90.77%	0.42	1.056
802.11n HT40 CDD 3Tx_5.8GHz band	0.4600	0.5583	0.824	82.39%	0.84	2.174
802.11ac VHT80 CDD 3Tx_5.8GHz band	1.9180	2.0180	0.950	95.04%	0.22	0.521

Note:

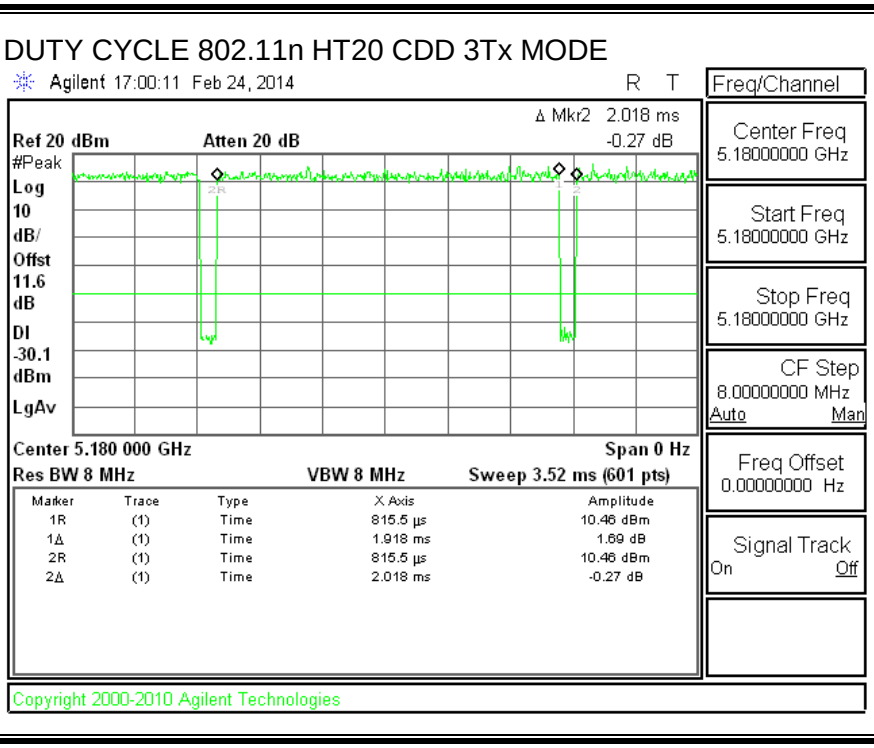
The duty cycle correction factors of CDD modes were used for antenna port beam-forming testing, however, the duty cycle correction factors of beam-forming modes were used for radiated emissions of beam-forming modes.

7.2. **DUTY CYCLE PLOTS**

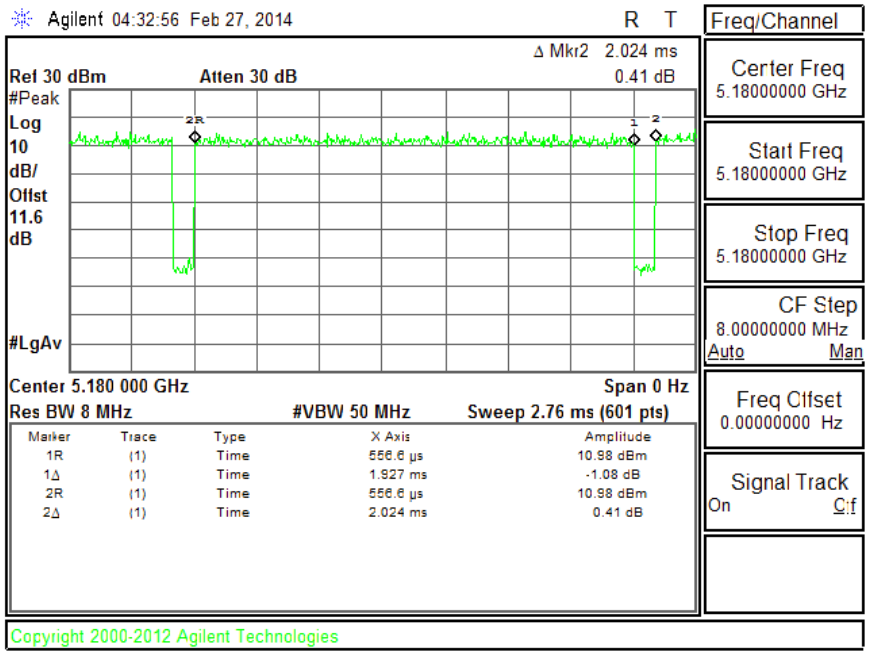
DUTY CYCLE 802.11a Legacy MODE



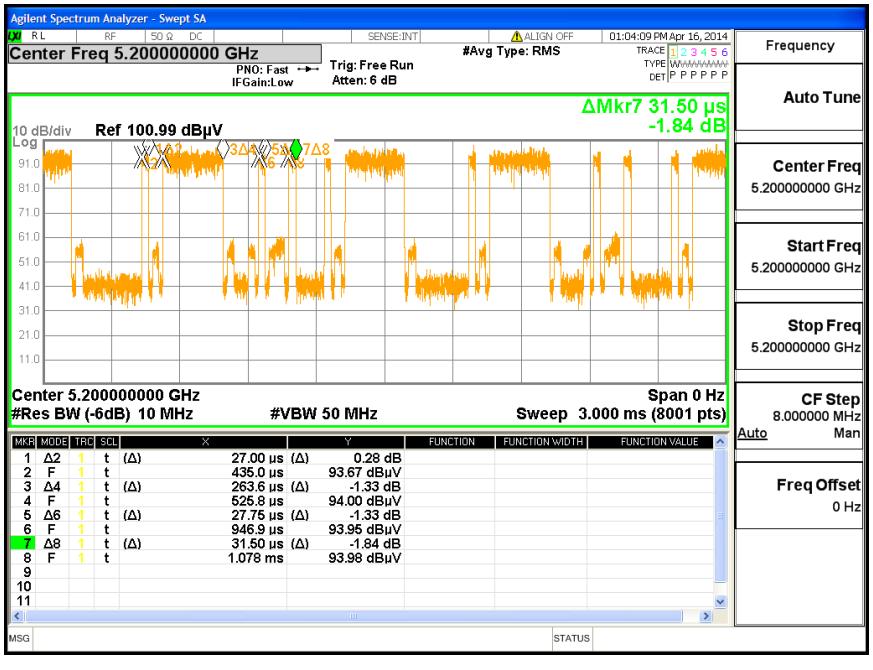
DUTY CYCLE 802.11n HT20 CDD 3Tx MODE



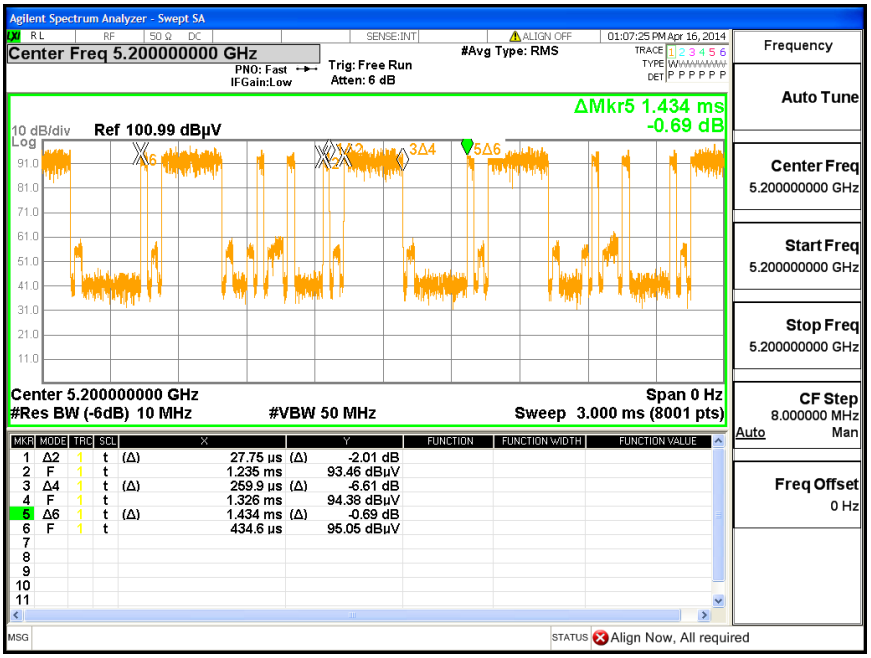
DUTY CYCLE 802.11n HT20 STBC 3Tx MODE



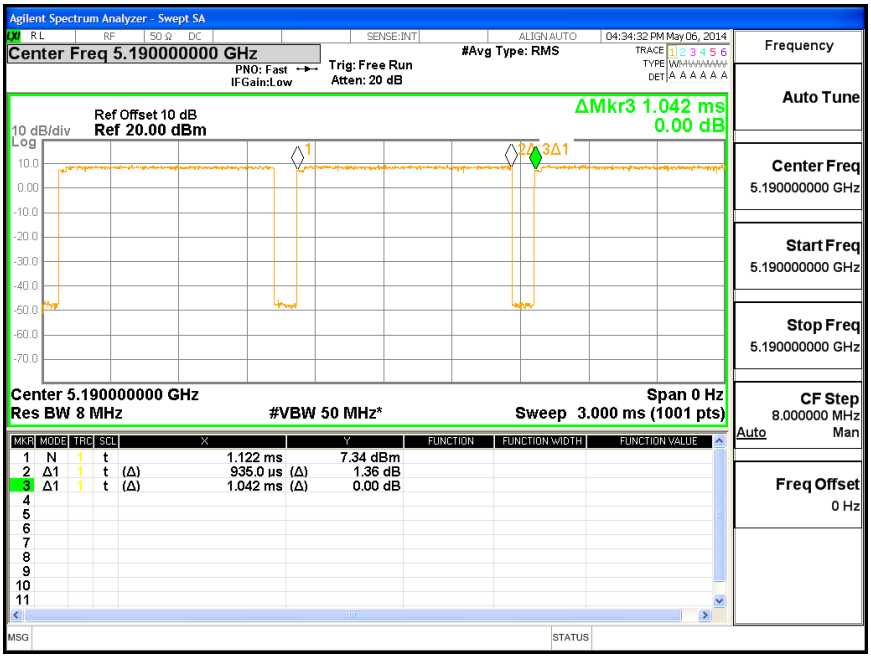
DUTY CYCLE 802.11n HT20 BF 3Tx MODE 1 of 2



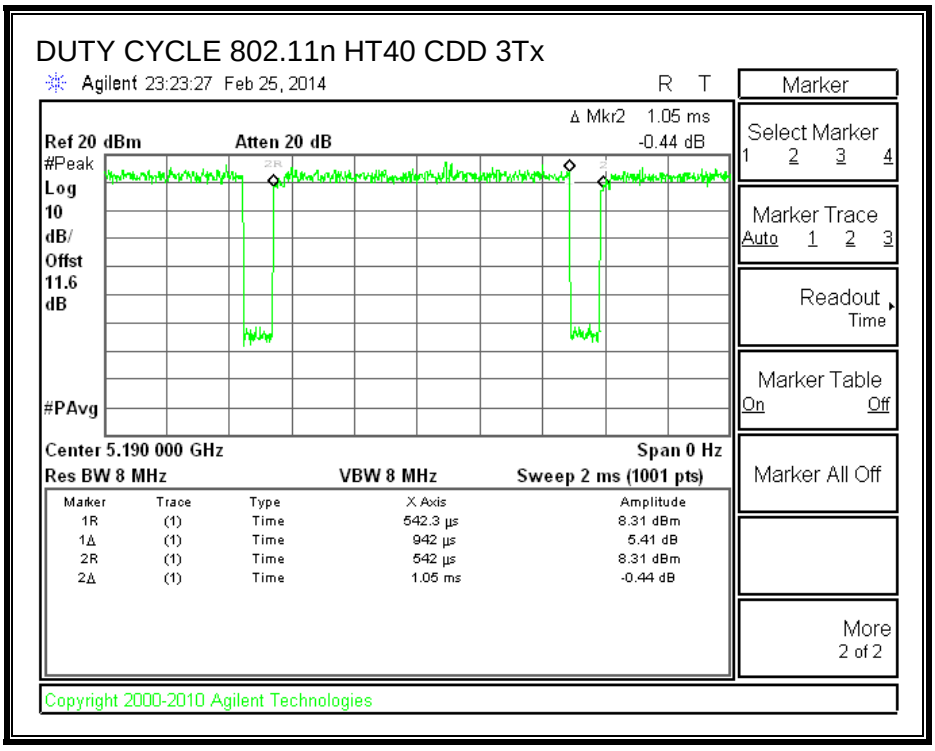
DUTY CYCLE 802.11n HT20 BF 3Tx MODE 2 of 2



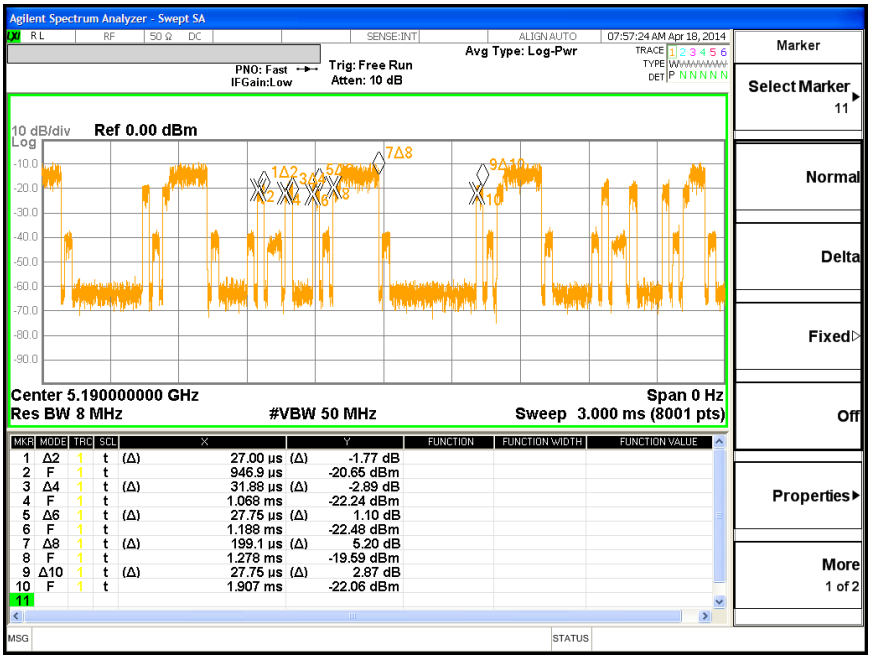
DUTY CYCLE 802.11n HT40 1Tx MODE



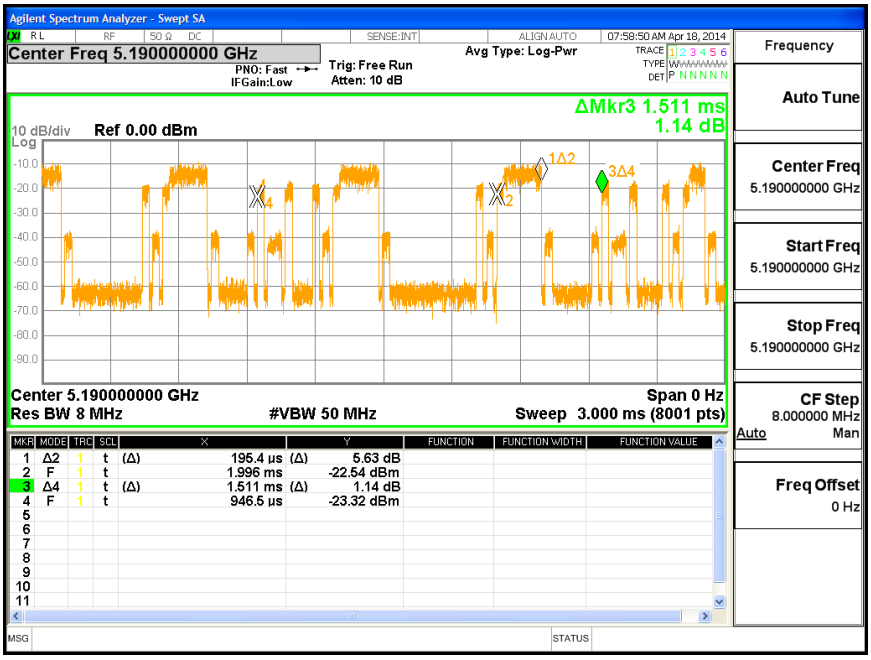
DUTY CYCLE 802.11n HT40 CDD 3Tx



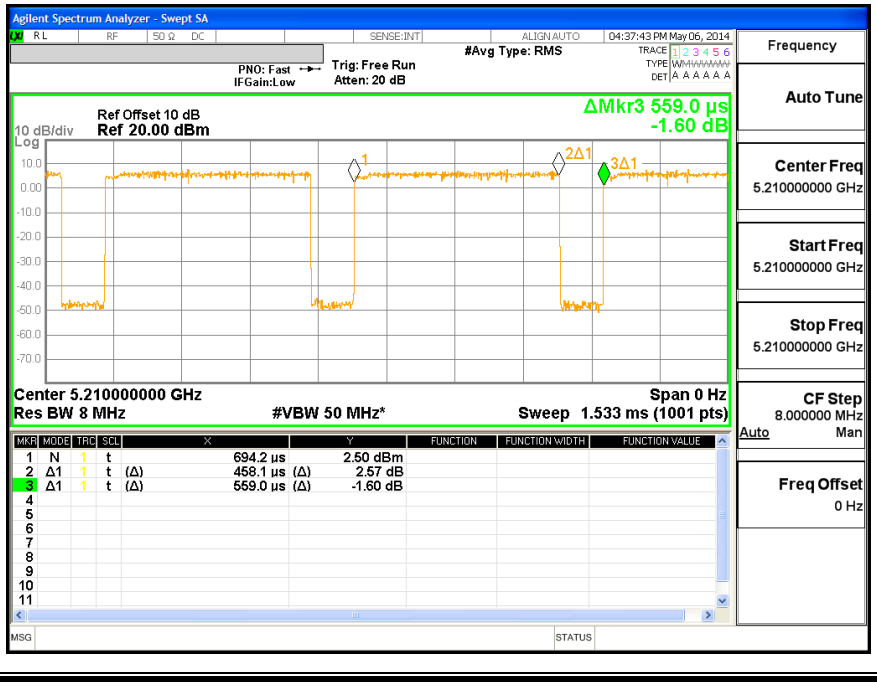
DUTY CYCLE 802.11n HT40 BF 3Tx MODE 1 of 2



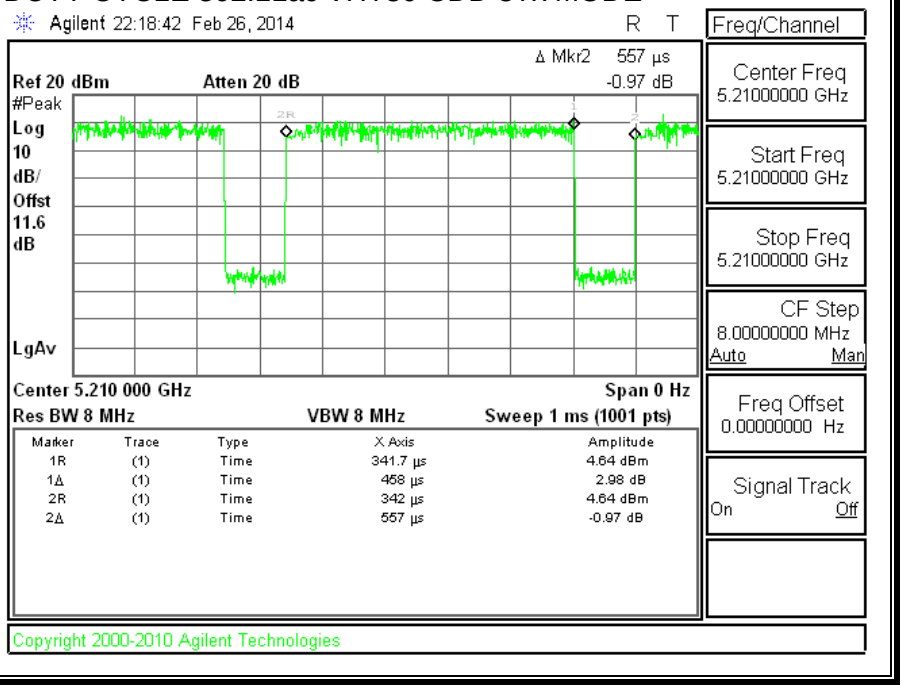
DUTY CYCLE 802.11n HT40 BF 3Tx MODE 2 of 2



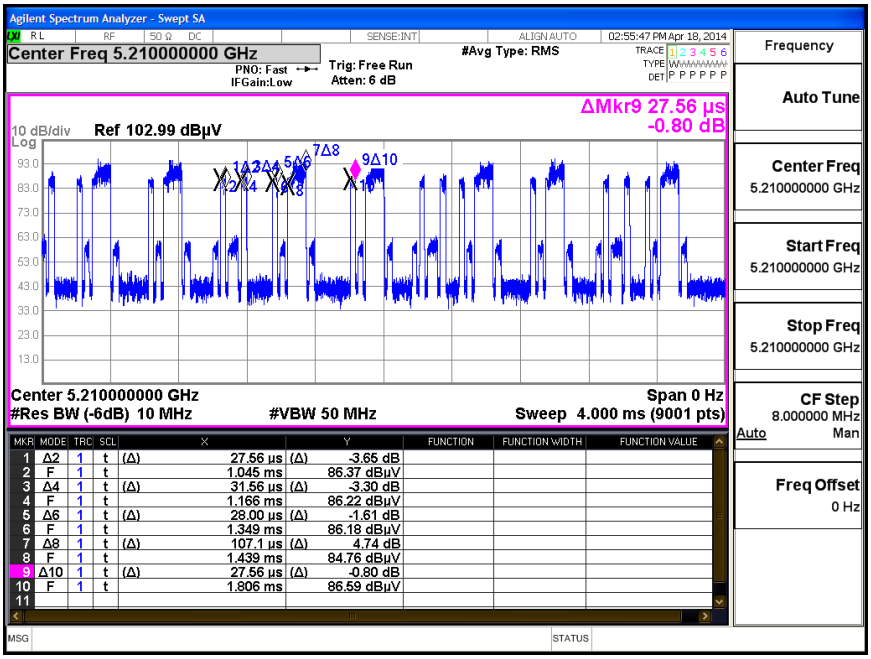
DUTY CYCLE 802.11ac VHT80 1Tx MODE



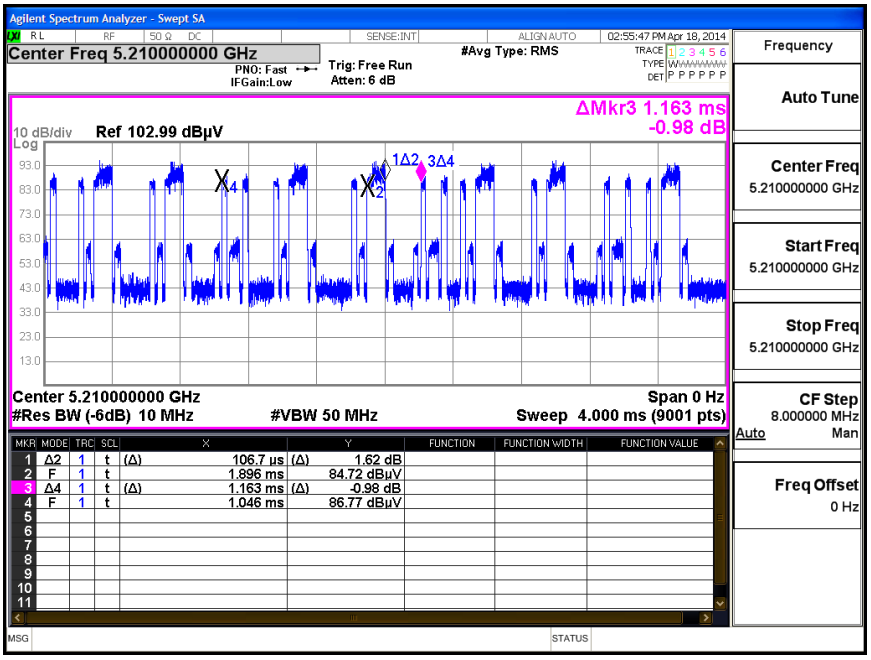
DUTY CYCLE 802.11ac VHT80 CDD 3Tx MODE



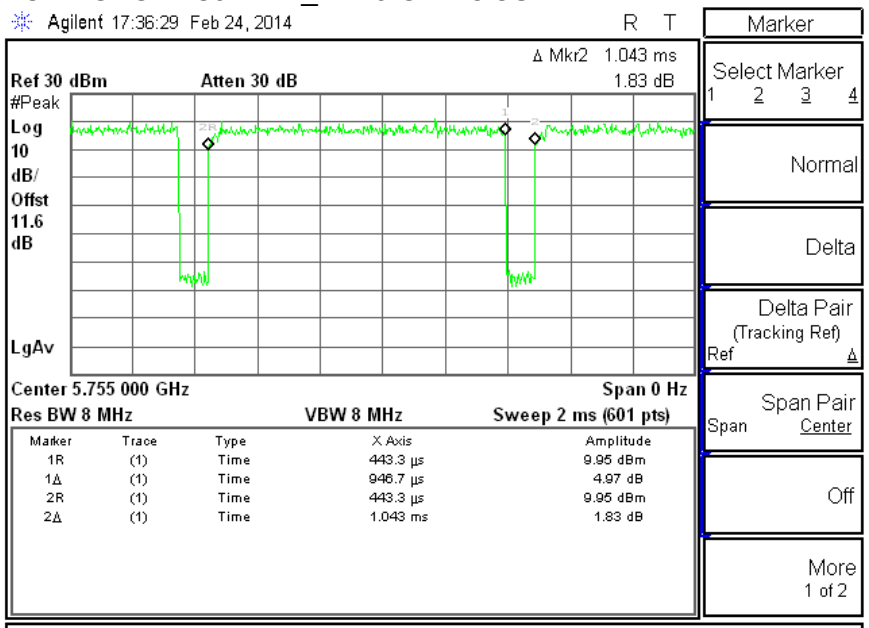
DUTY CYCLE 802.11n HT80 BF 3Tx MODE 1 of 2



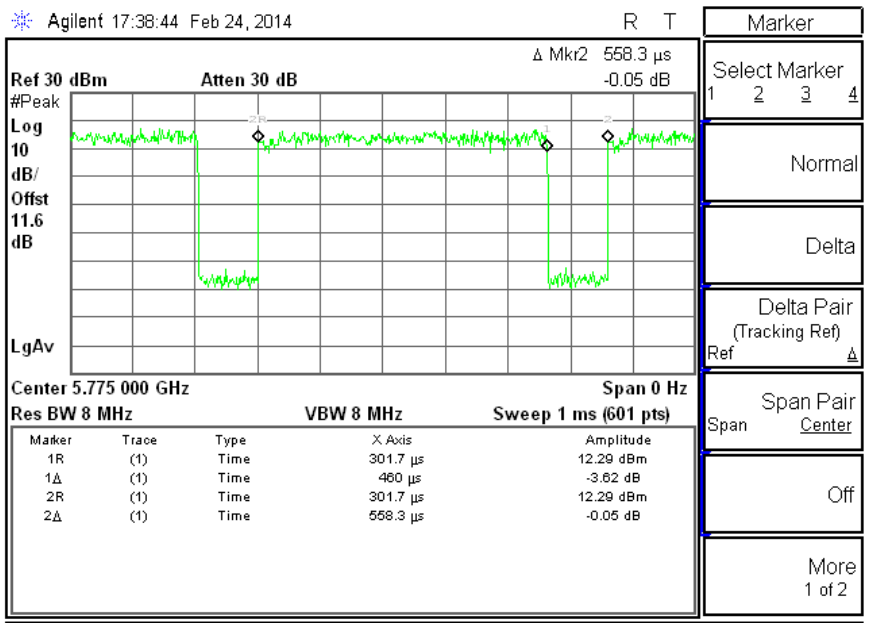
DUTY CYCLE 802.11n HT80 BF 3Tx MODE 2 of 2

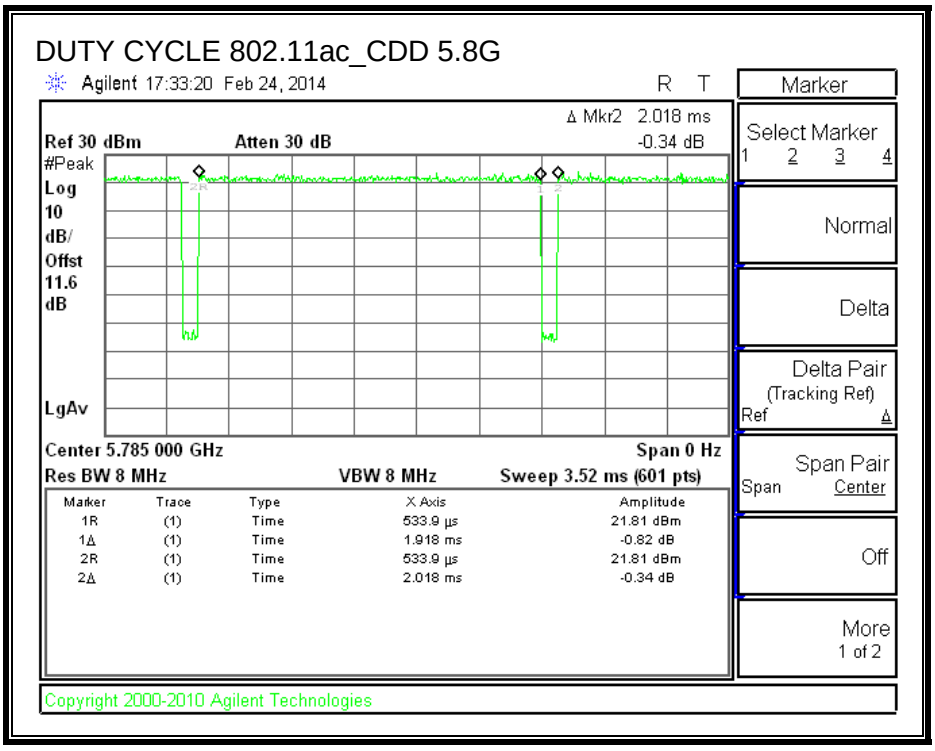


DUTY CYCLE 802.11n_HT20 CDD 5.8G



DUTY CYCLE 802.11n HT40 CDD 5.8G





7.3. MEASUREMENT METHODS

26 dB Emission BW: KDB 789033 D02 DR02-41759, Section C.

99% Occupied BW: KDB 789033 D02 DR02-41759, Section D.

Conducted Output Power: KDB 789033 D02 DR02-41759, Section E.2.b (Method SA-1) and Section E.3.b

Power Spectral Density: KDB 789033 D02 DR02-41759, Section F.

Unwanted emissions in restricted bands: KDB 789033 D02 DR02-41759, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 DR02-41759, Sections G.3, G.4, and G.5.

8. ANTENNA PORT TEST RESULTS

8.1. 802.11a LEGACY MODE IN THE 5.2 GHz BAND

8.1.1. OUTPUT POWER

OUTPUT POWER

LIMITS

FCC §15.407 (a): (1)

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.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)
Low	5180	7.04	22.96
Middle	5200	7.04	22.96
High	5240	7.04	22.96

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5180	18.37			18.37	22.96	-4.59
Middle	5200	18.20			18.20	22.96	-4.76

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

8.2. 802.11n HT20 CDD 3TX MODE IN THE 5.2 GHz BAND

8.2.1. 26 dB BANDWIDTH

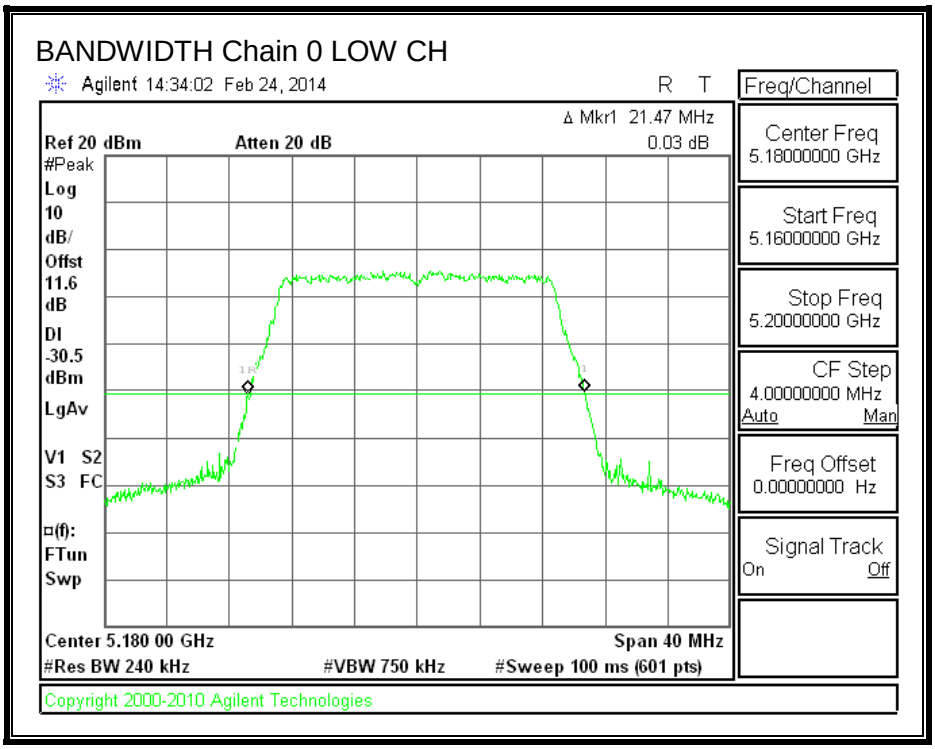
LIMITS

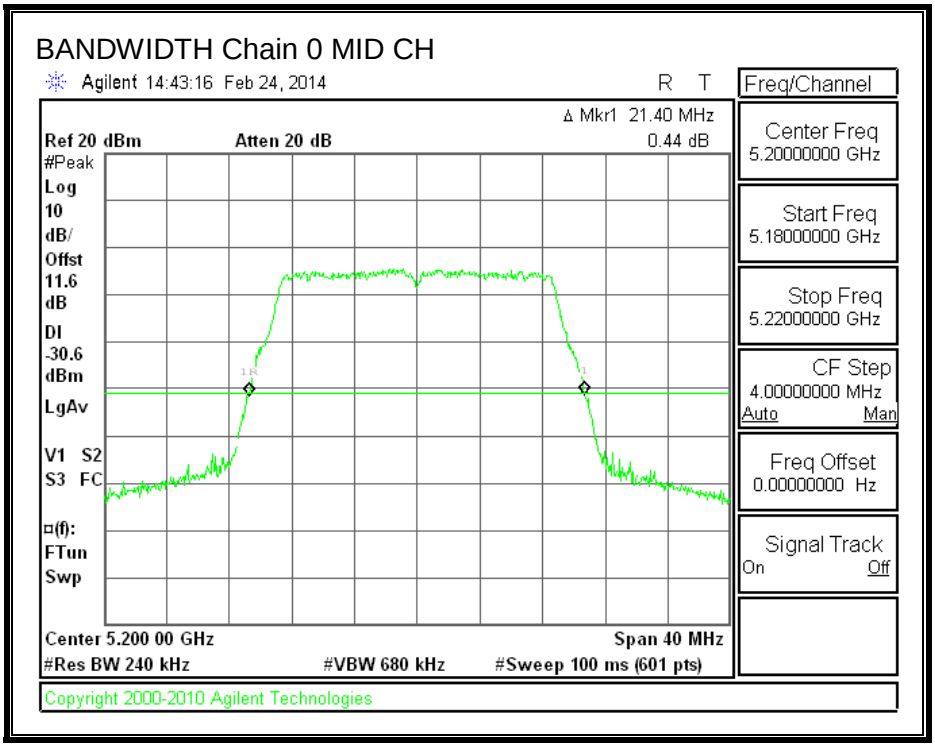
None; for reporting purposes only.

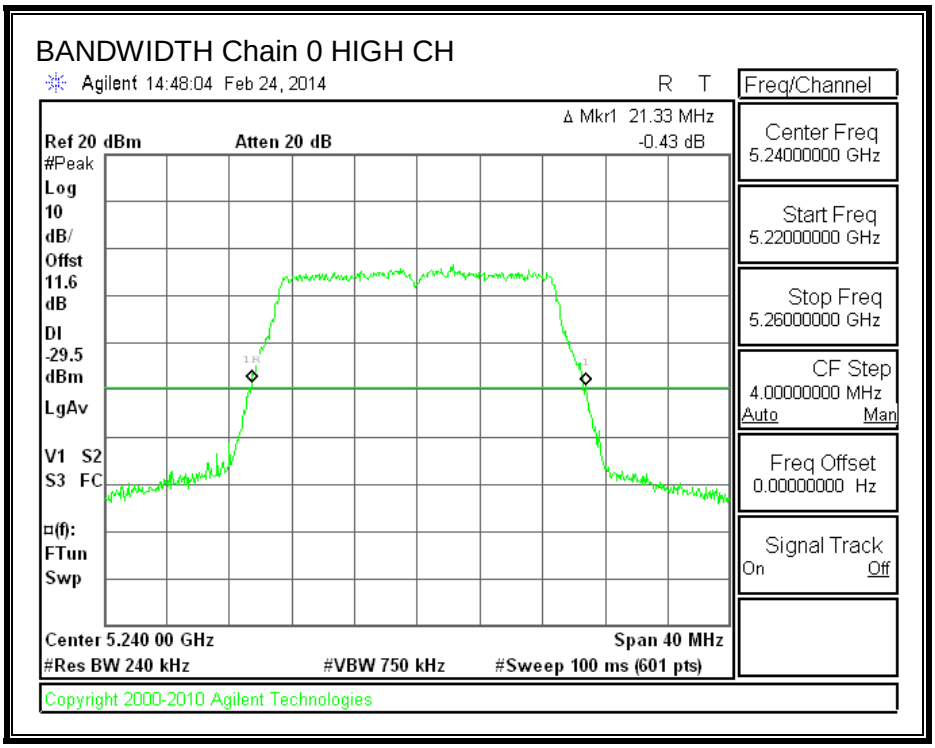
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5180	21.47	21.20	21.40
Mid	5200	21.40	21.27	21.40
High	5240	21.33	21.27	21.40

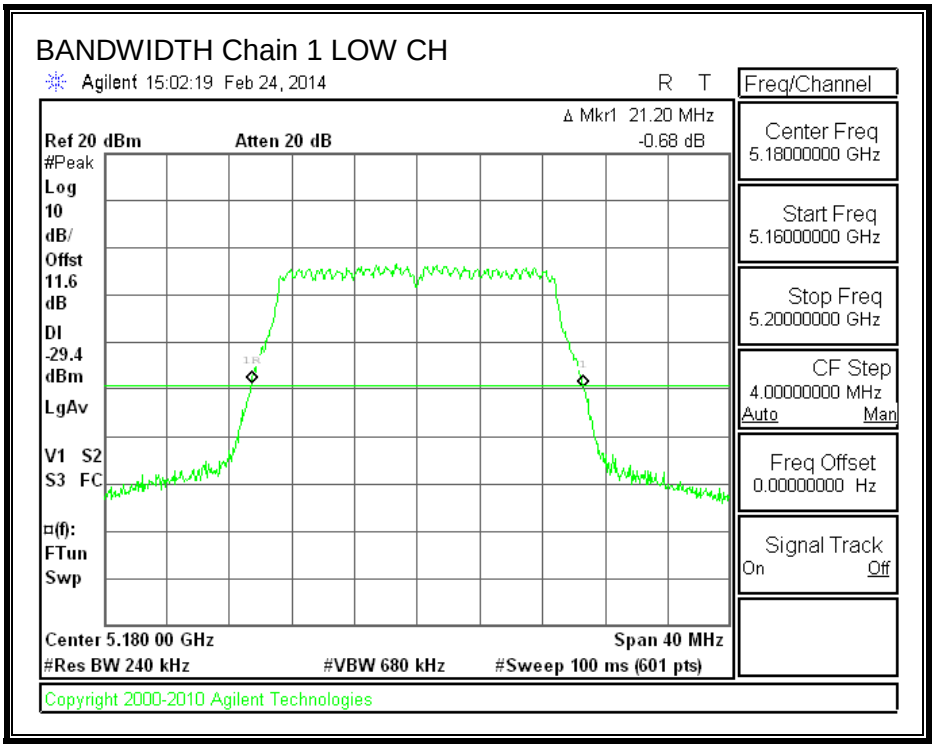
26 dB BANDWIDTH, Chain 0



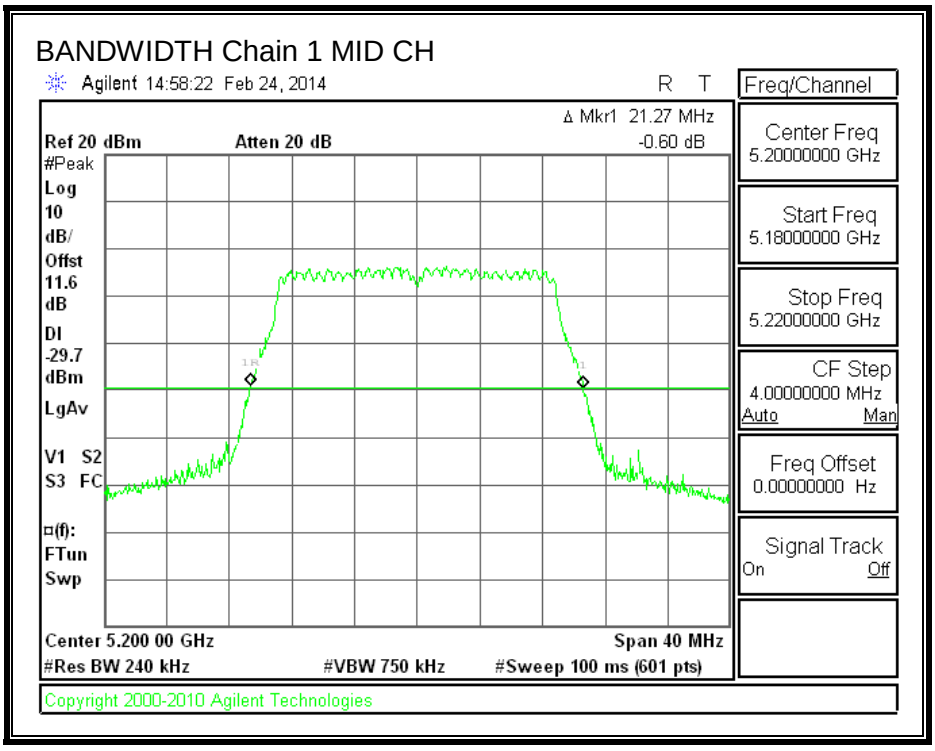




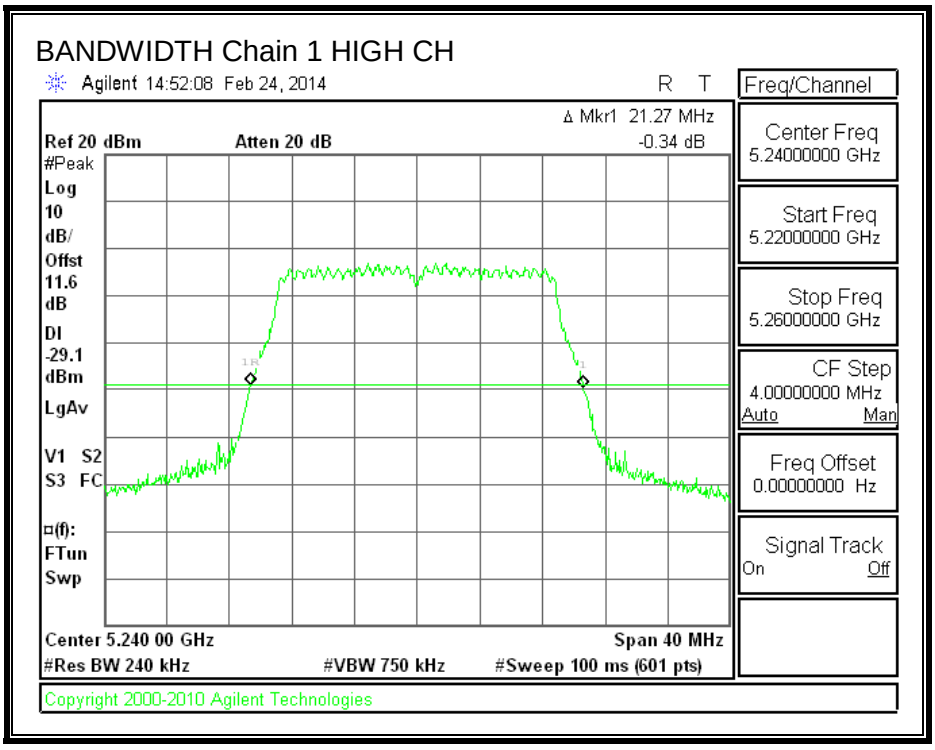
26 dB BANDWIDTH, Chain 1



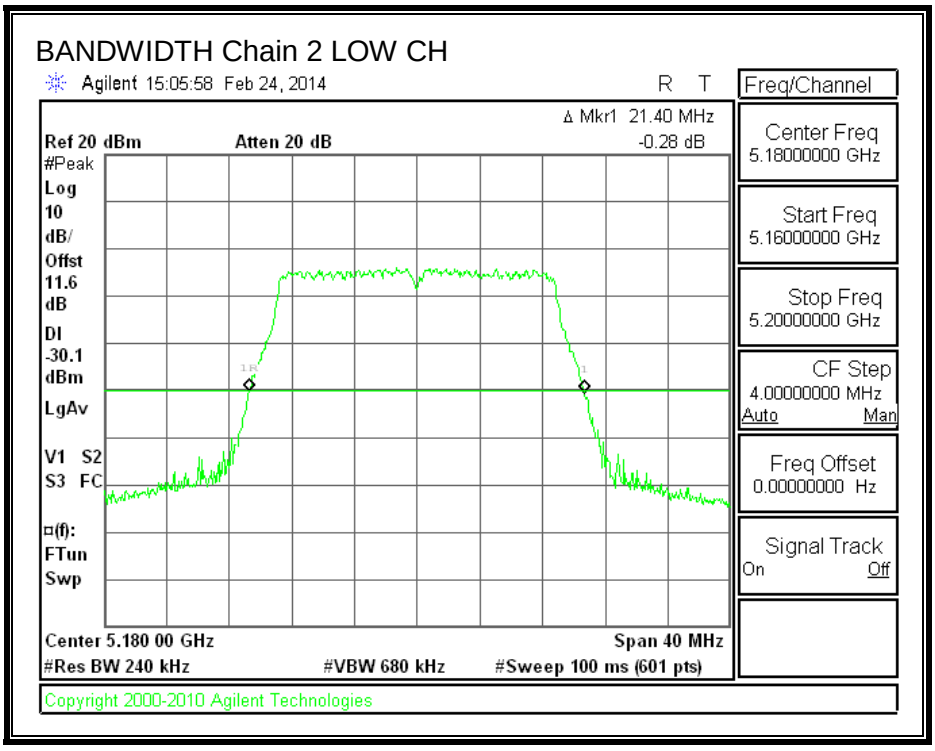
BANDWIDTH Chain 1 MID CH

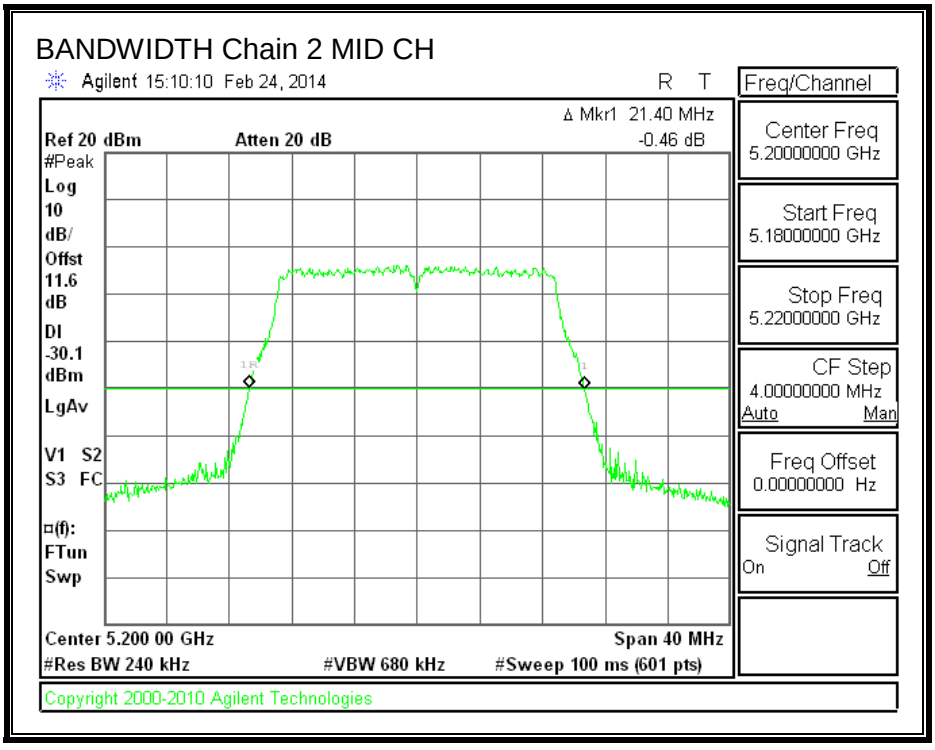


BANDWIDTH Chain 1 HIGH CH

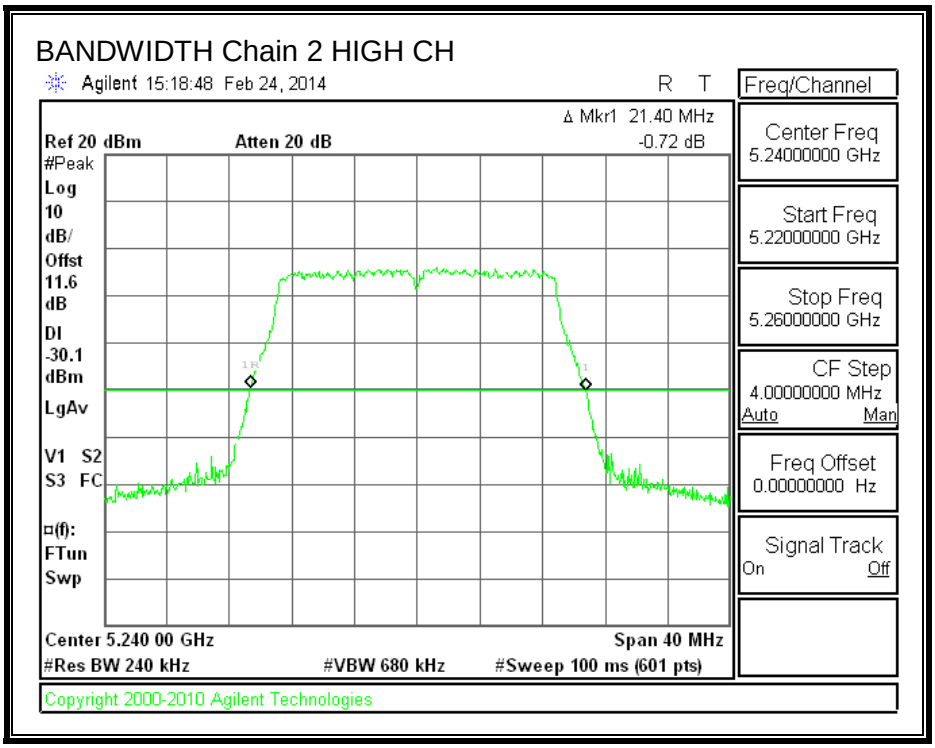


26 dB BANDWIDTH, Chain 2





BANDWIDTH Chain 2 HIGH CH



8.2.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
7.04	6.70	3.79	6.07

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
7.04	6.70	3.79	10.73

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5180	N/A	N/A	6.07	10.73
Mid	5200	N/A	N/A	6.07	10.73
High	5240	N/A	N/A	6.07	10.73

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	23.93	N/A	N/A	23.93	6.27	N/A	N/A
Mid	5200	23.93	N/A	N/A	23.93	6.27	N/A	N/A
High	5240	23.93	N/A	N/A	23.93	6.27	N/A	N/A

Duty Cycle CF (dB)	0.22	Included in Calculations of Corr'd PPSD

Output Power Results

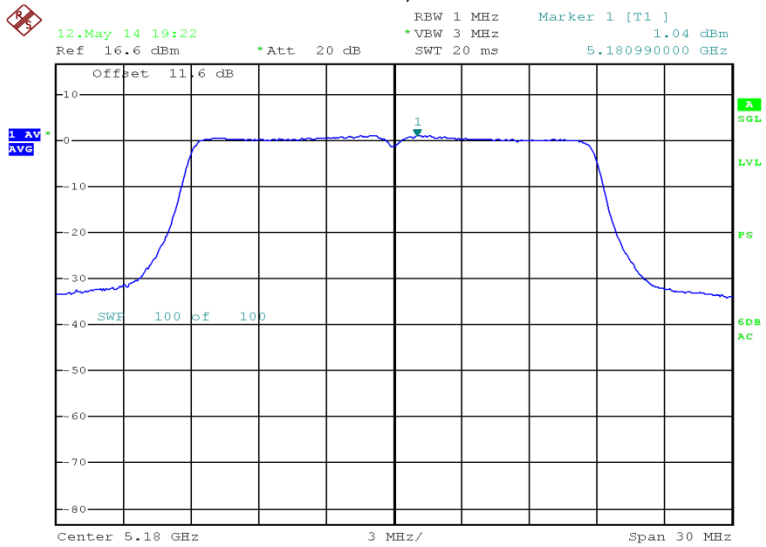
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.98	14.71	14.51	19.51	23.93	-4.42
Mid	5200	15.08	14.80	14.97	19.72	23.93	-4.21
High	5240	15.31	15.21	15.18	20.00	23.93	-3.93

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	1.04	0.97	0.90	5.96	6.27	-0.31
Mid	5200	1.21	1.07	1.05	6.10	6.27	-0.17
High	5240	1.23	1.14	1.12	6.15	6.27	-0.12

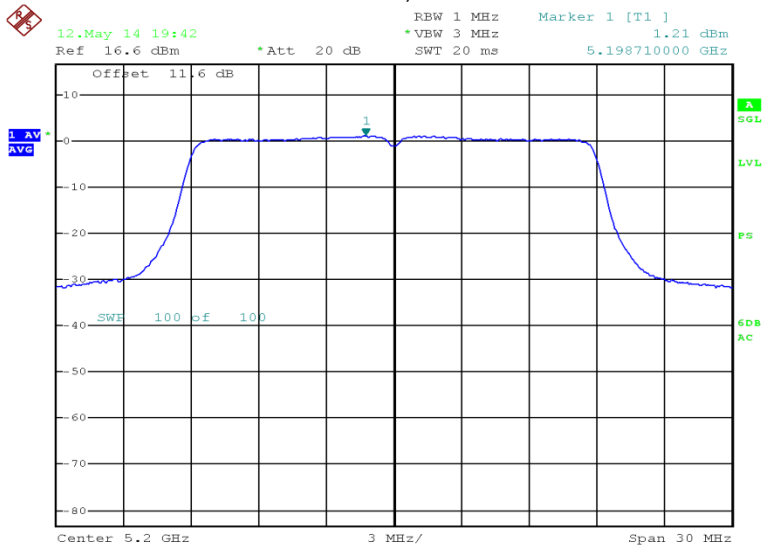
OUTPUT POWER AND PPSD, Chain 0

OUTPUT POWER AND PPSD, Chain 0 LOW CH



Date: 12.MAY.2014 19:22:04

OUTPUT POWER AND PPSD, Chain 0 MID CH



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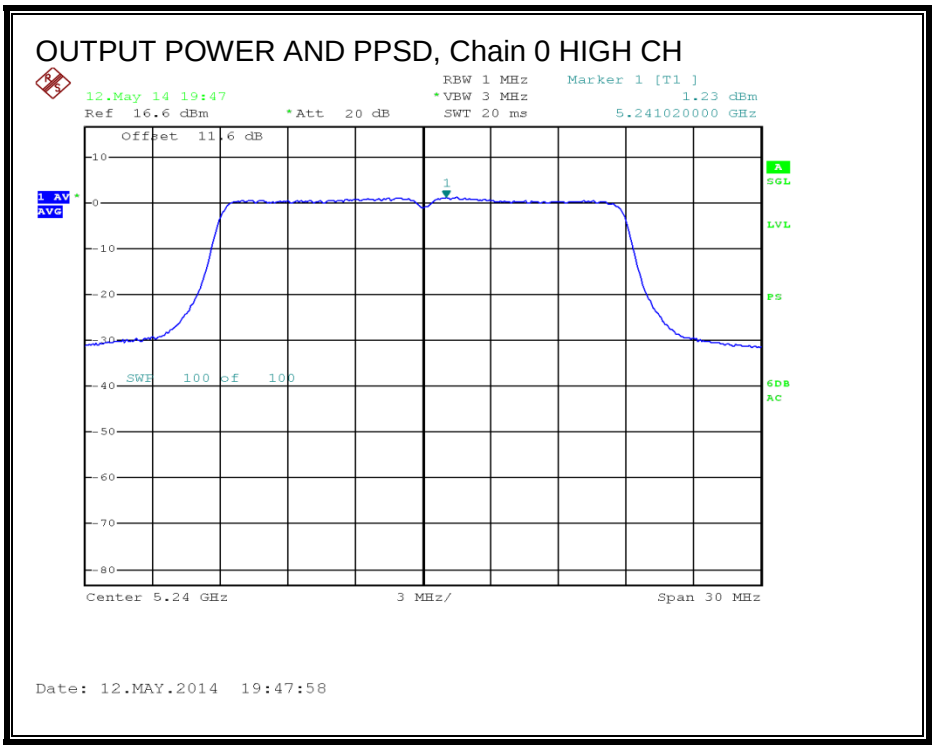
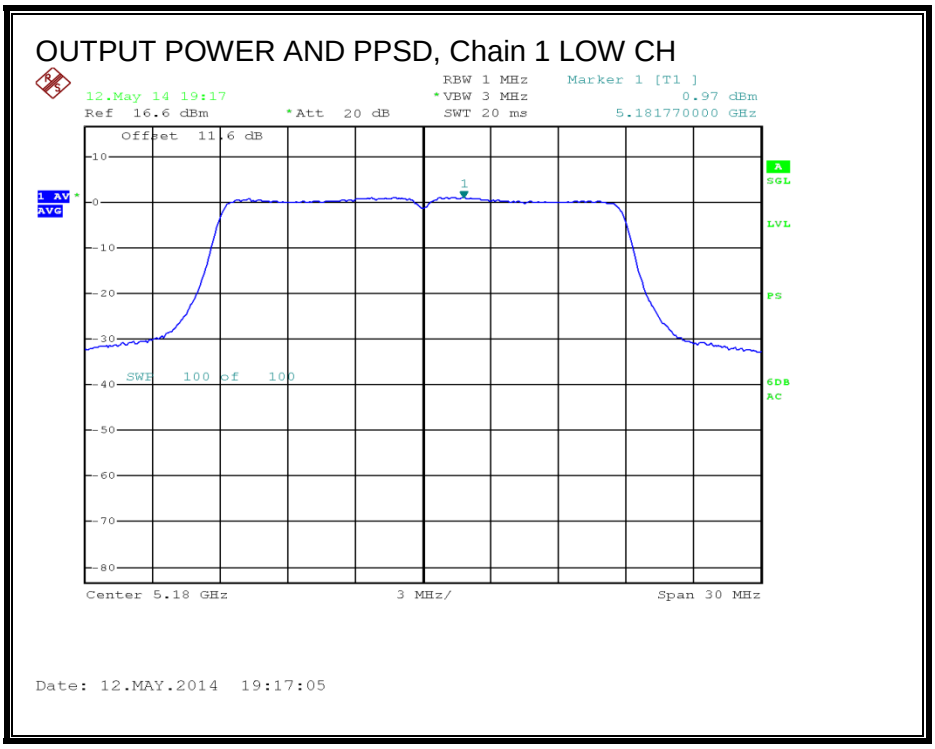
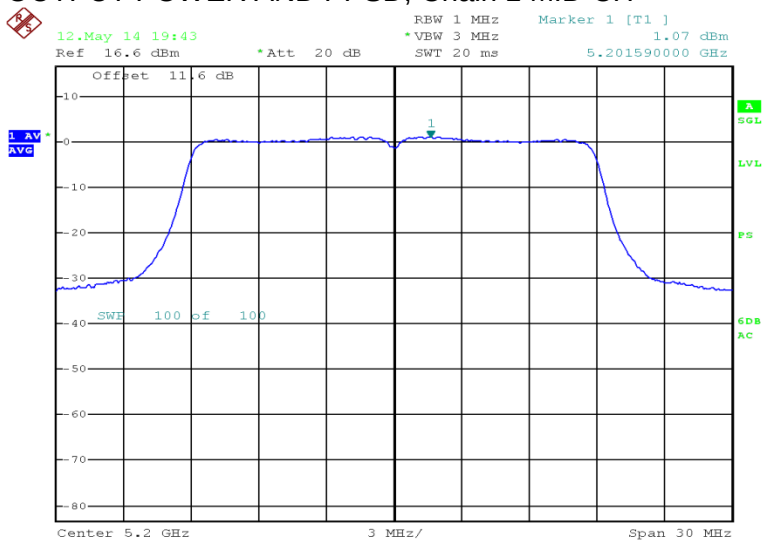


OUTPUT POWER AND PPSD, Chain 1

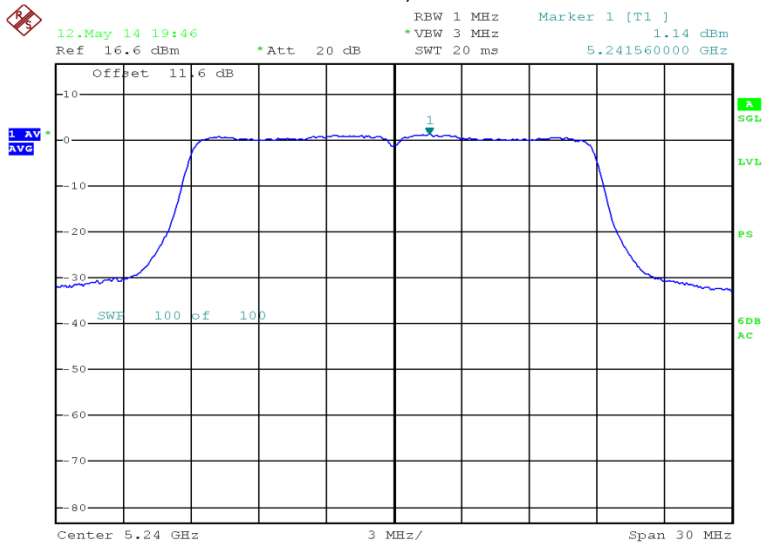


OUTPUT POWER AND PPSD, Chain 1 MID CH



Date: 12.MAY.2014 19:43:51

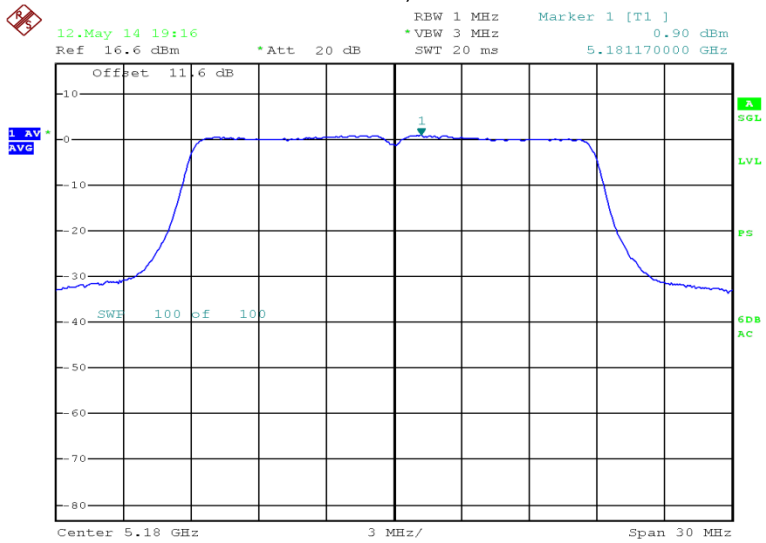
OUTPUT POWER AND PPSD, Chain 1 HIGH CH



Date: 12.MAY.2014 19:46:06

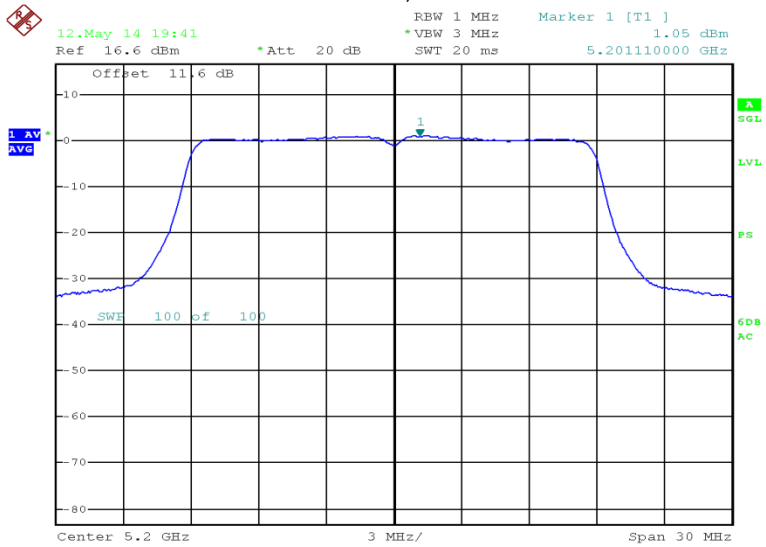
OUTPUT POWER AND PPSD, Chain 2

OUTPUT POWER AND PPSD, Chain 2 LOW CH



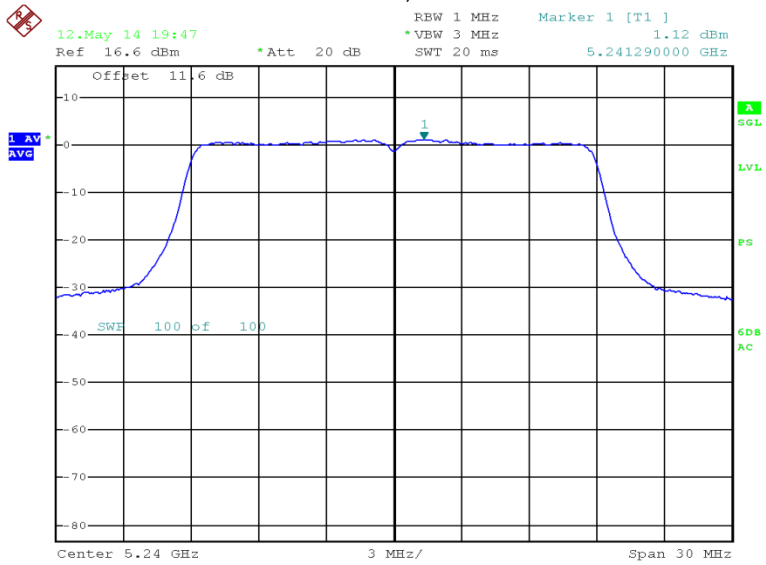
Date: 12.MAY.2014 19:16:13

OUTPUT POWER AND PPSD, Chain 2 MID CH



Date: 12.MAY.2014 19:41:39

OUTPUT POWER AND PPSD, Chain 2 HIGH CH



Date: 12.MAY.2014 19:47:05

8.3. 802.11n HT20 STBC 3TX MODE IN THE 5.2 GHz BAND

8.3.1. 26 dB BANDWIDTH

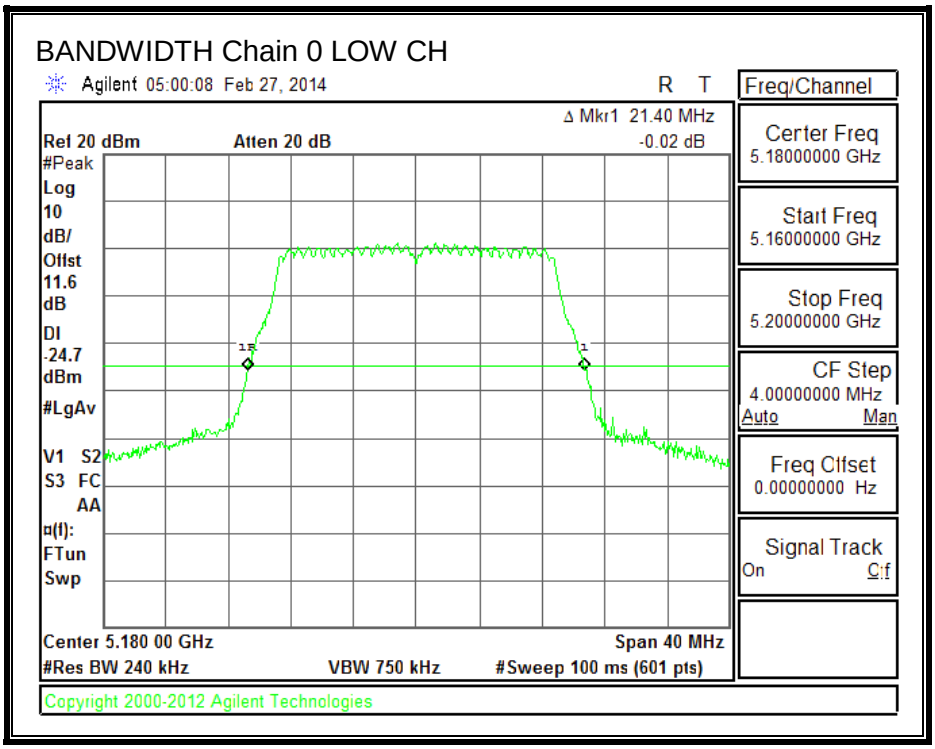
LIMITS

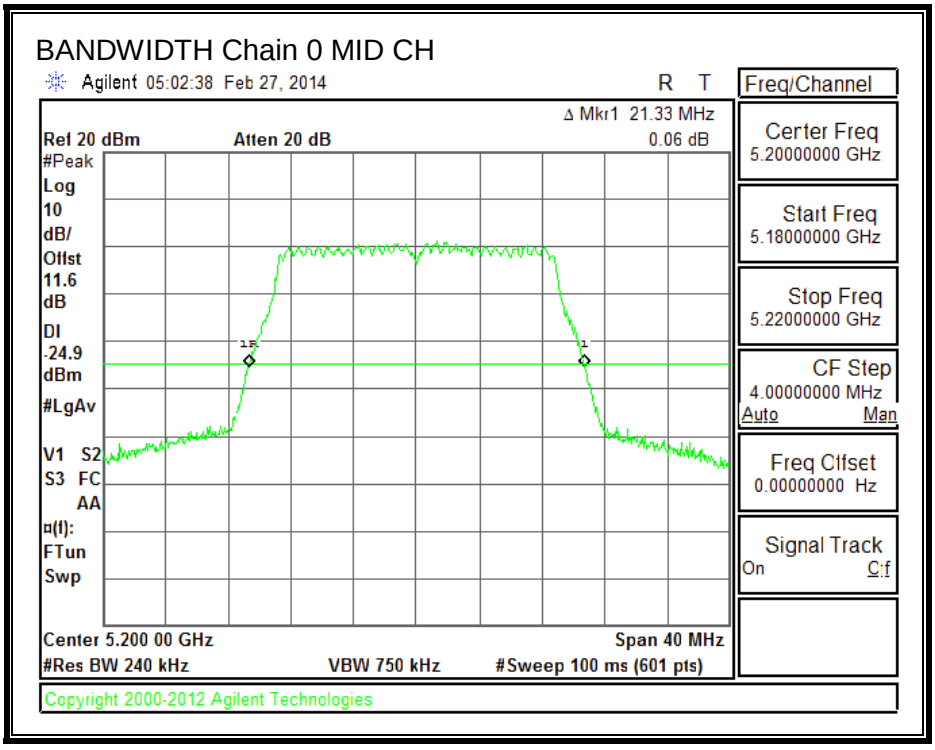
None; for reporting purposes only.

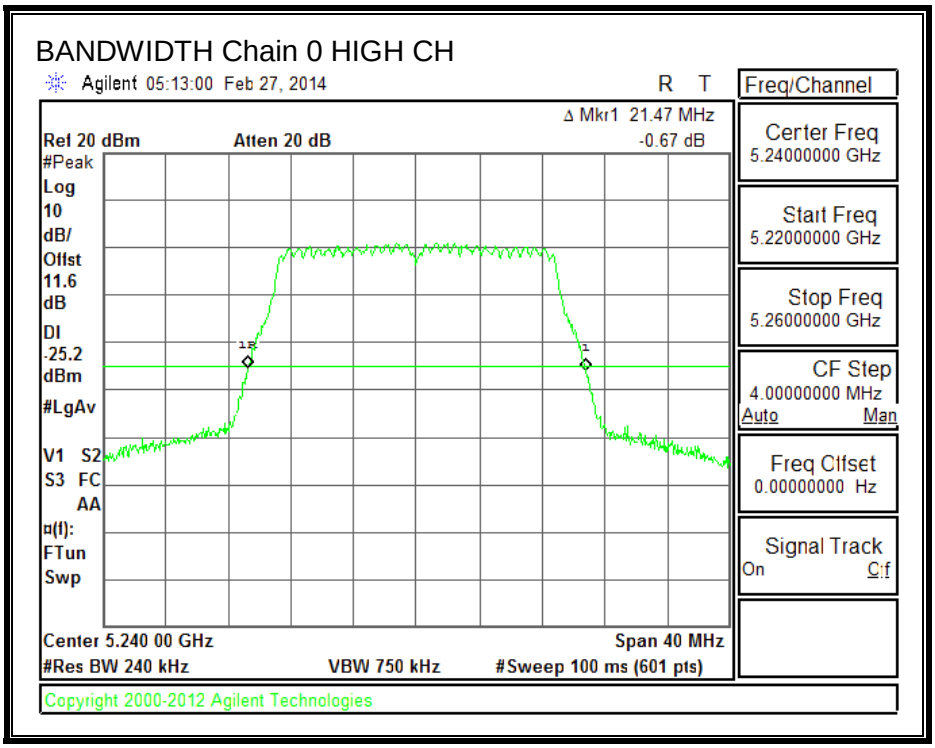
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5180	21.40	21.27	21.07
Mid	5200	21.33	21.27	21.20
High	5240	21.47	21.33	21.27

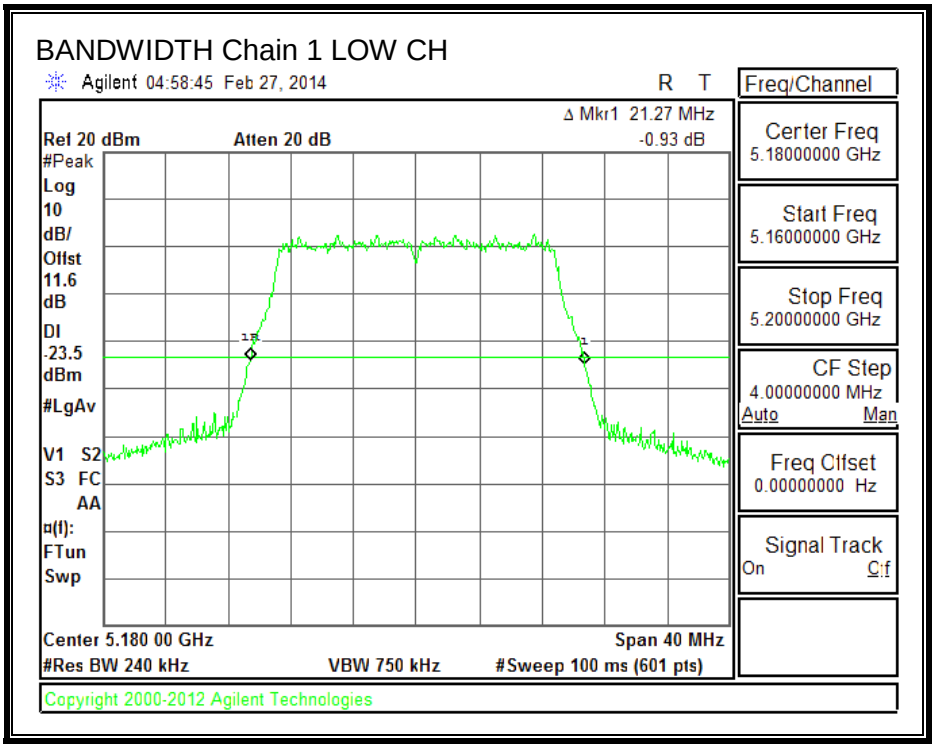
26 dB BANDWIDTH, Chain 0



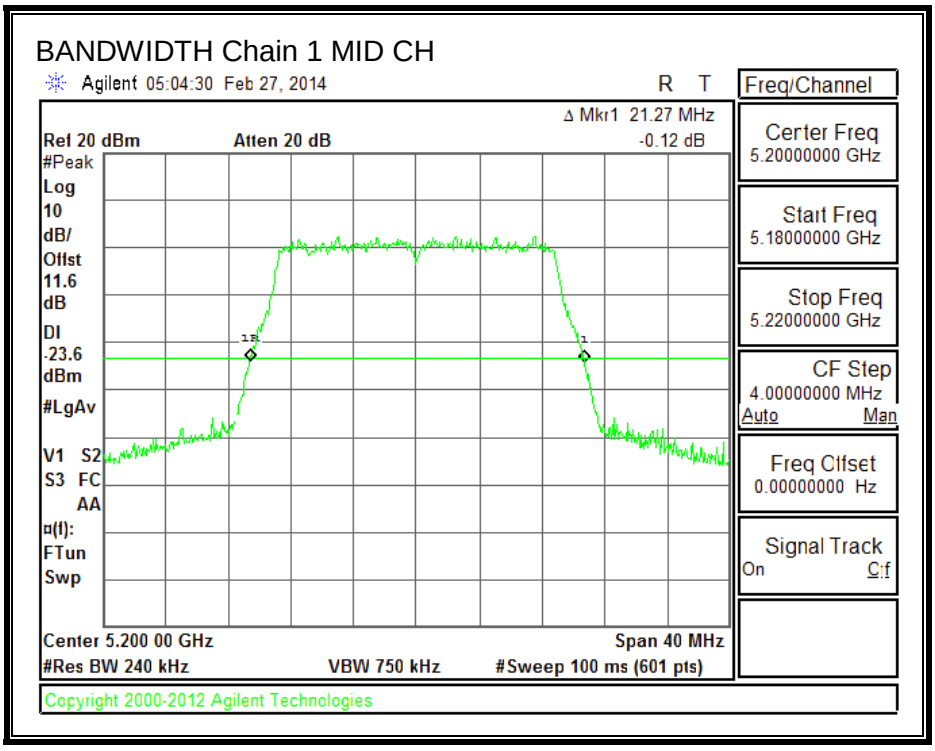




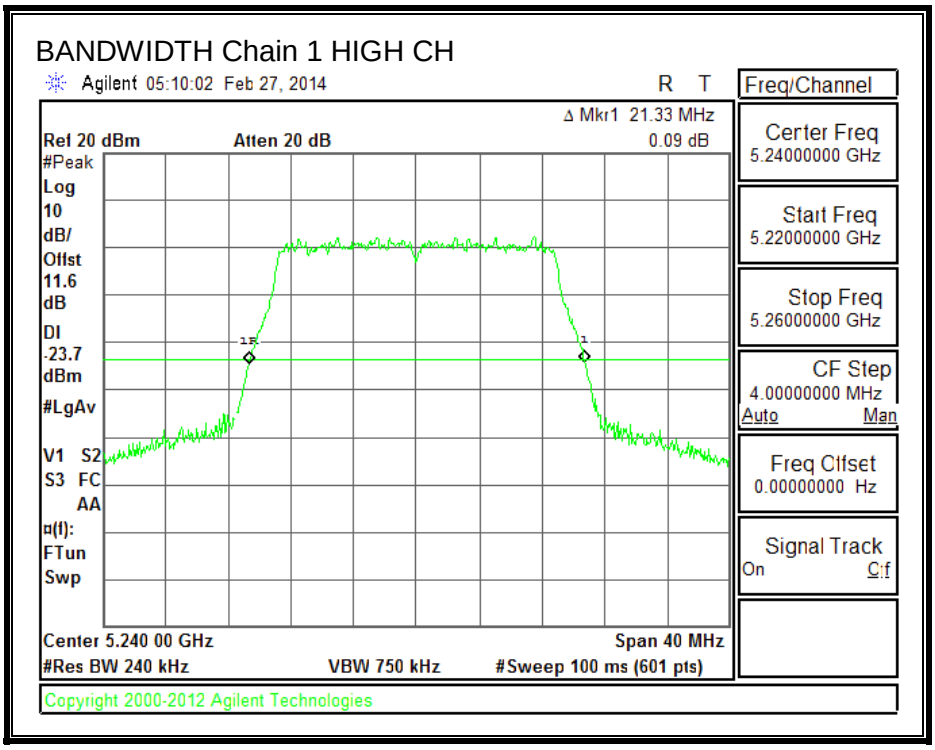
26 dB BANDWIDTH, Chain 1



BANDWIDTH Chain 1 MID CH

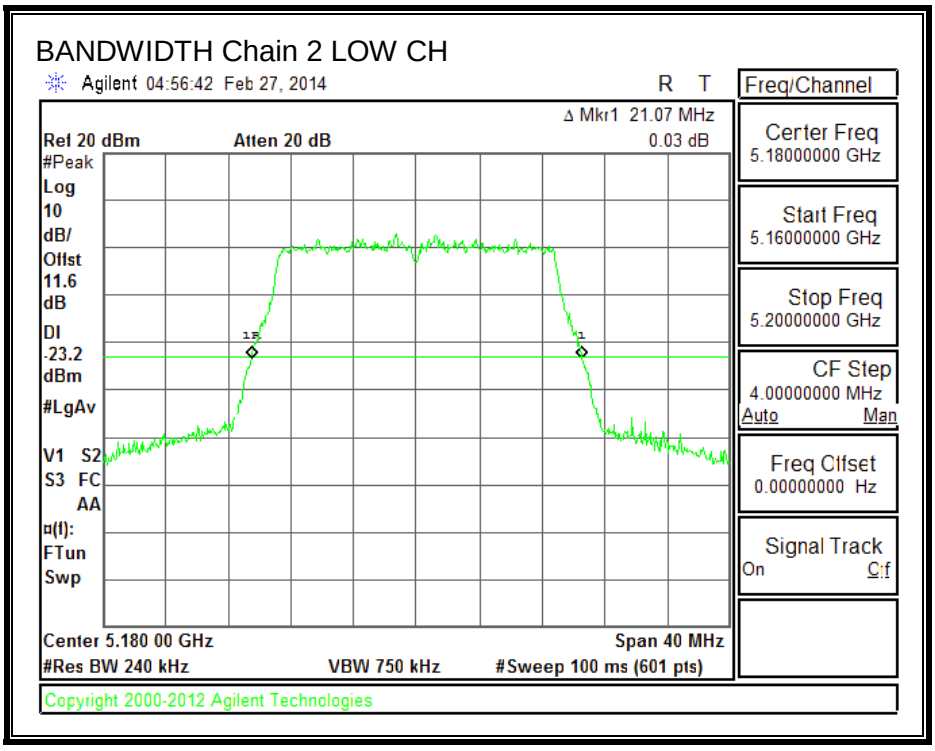


BANDWIDTH Chain 1 HIGH CH

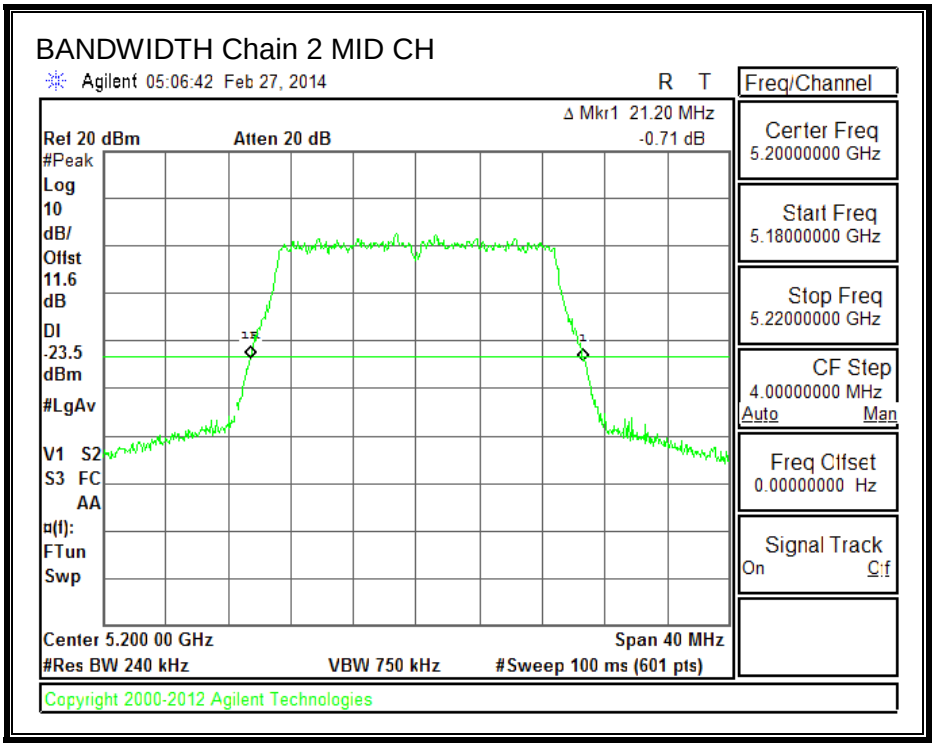


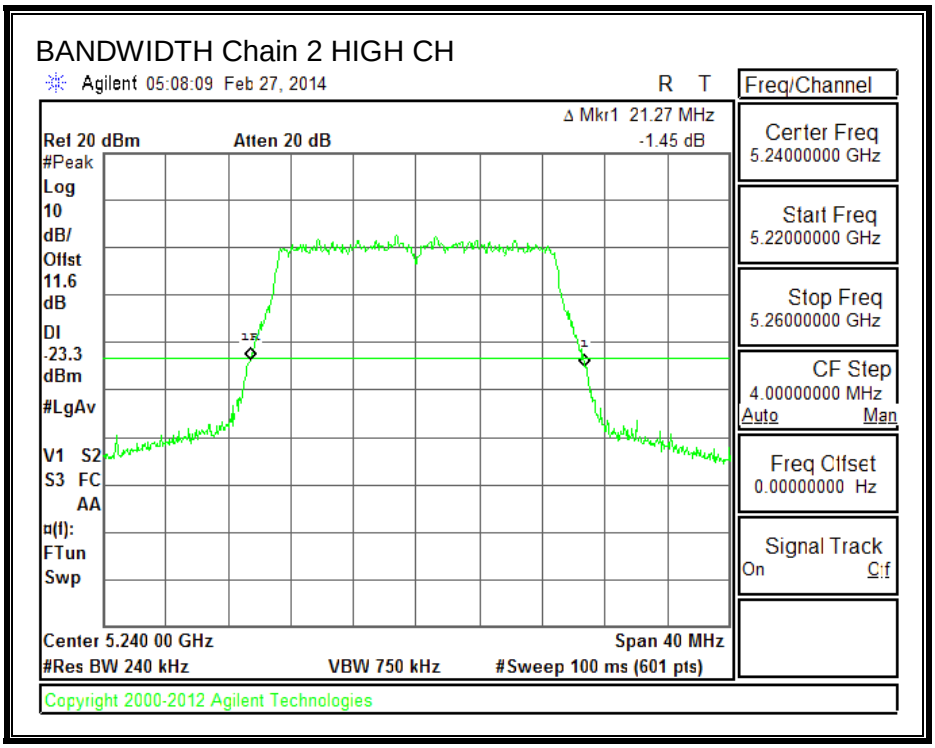
26 dB BANDWIDTH, Chain 2

BANDWIDTH Chain 2 LOW CH



BANDWIDTH Chain 2 MID CH





8.3.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
7.04	6.70	3.79	6.07

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5180	N/A	N/A	6.07	6.07
Mid	5200	N/A	N/A	6.07	6.07
High	5240	N/A	N/A	6.07	6.07

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	23.93	N/A	N/A	23.93	10.93	N/A	N/A
Mid	5200	23.93	N/A	N/A	23.93	10.93	N/A	N/A
High	5240	23.93	N/A	N/A	23.93	10.93	N/A	N/A

Duty Cycle CF (dB)	0.21	Included in Calculations of Corr'd PPSD

Output Power Results

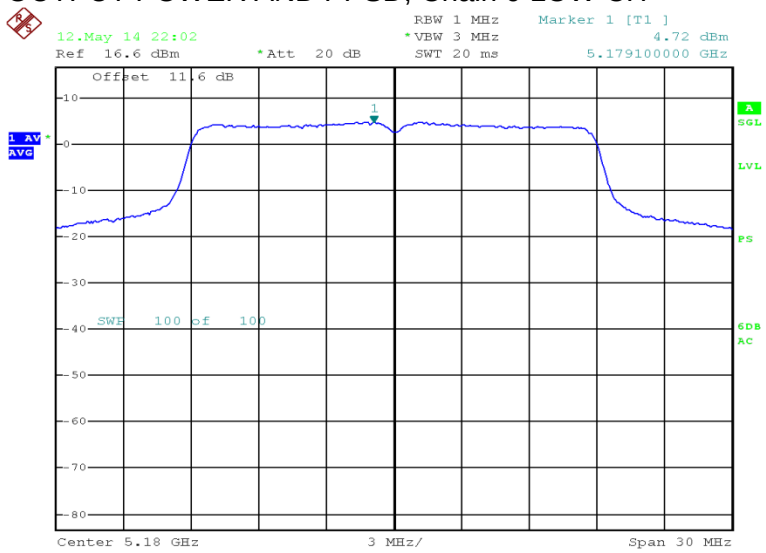
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	18.41	18.48	18.84	23.35	23.93	-0.58
Mid	5200	18.52	18.44	18.62	23.30	23.93	-0.63
High	5240	18.57	18.31	18.44	23.21	23.93	-0.72

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	4.72	4.35	4.24	9.42	10.93	-1.51
Mid	5200	4.29	4.14	4.01	9.13	10.93	-1.80
High	5240	4.32	3.59	3.47	8.79	10.93	-2.14

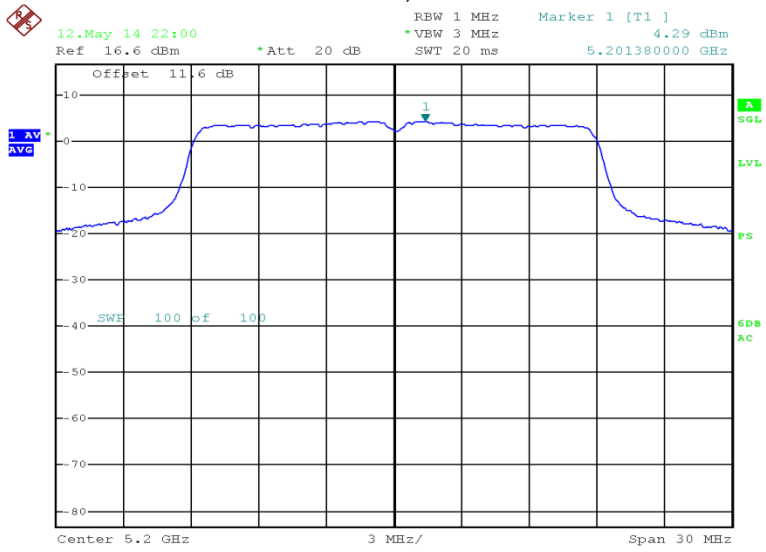
OUTPUT POWER AND PPSD, Chain 0

OUTPUT POWER AND PPSD, Chain 0 LOW CH

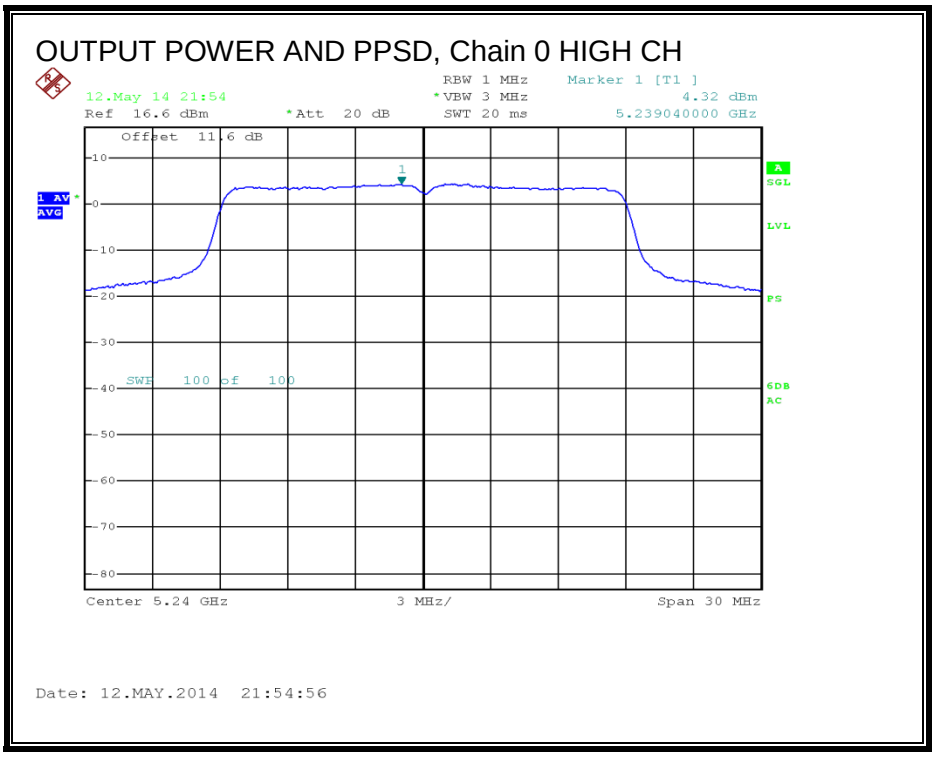


Date: 12.MAY.2014 22:02:07

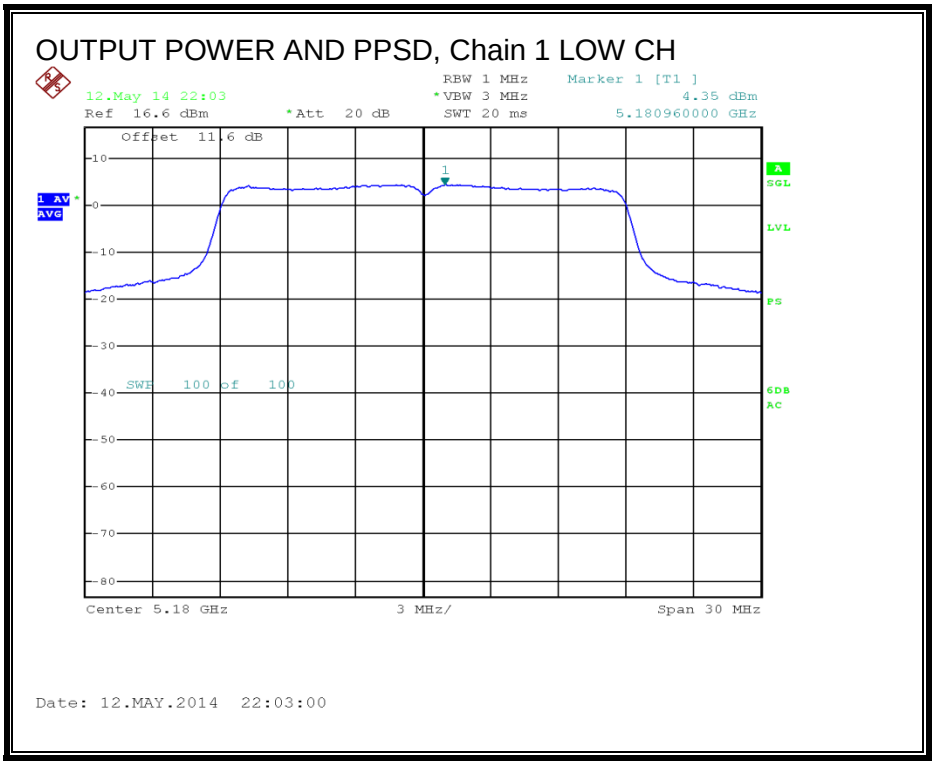
OUTPUT POWER AND PPSD, Chain 0 MID CH



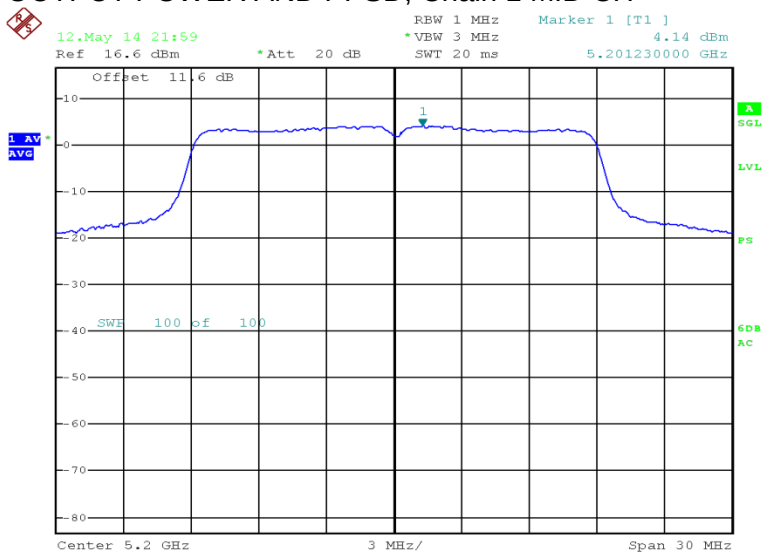
Date: 12.MAY.2014 22:00:41



OUTPUT POWER AND PPSD, Chain 1

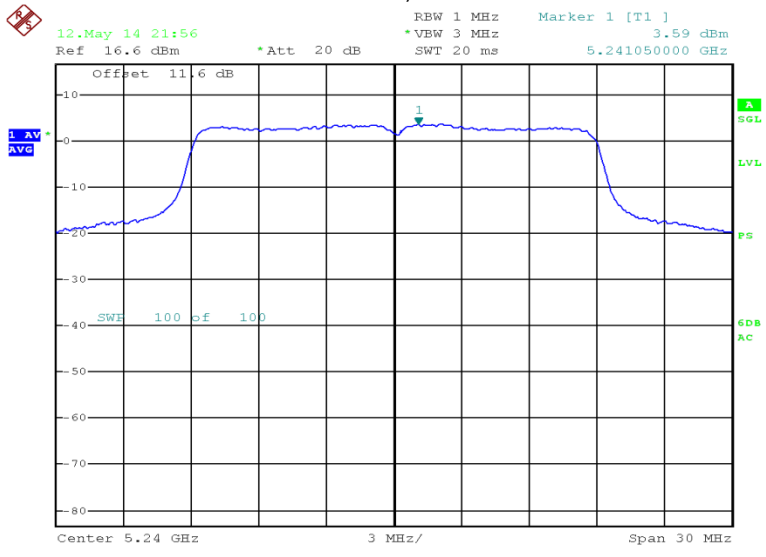


OUTPUT POWER AND PPSD, Chain 1 MID CH



Date: 12.MAY.2014 21:59:46

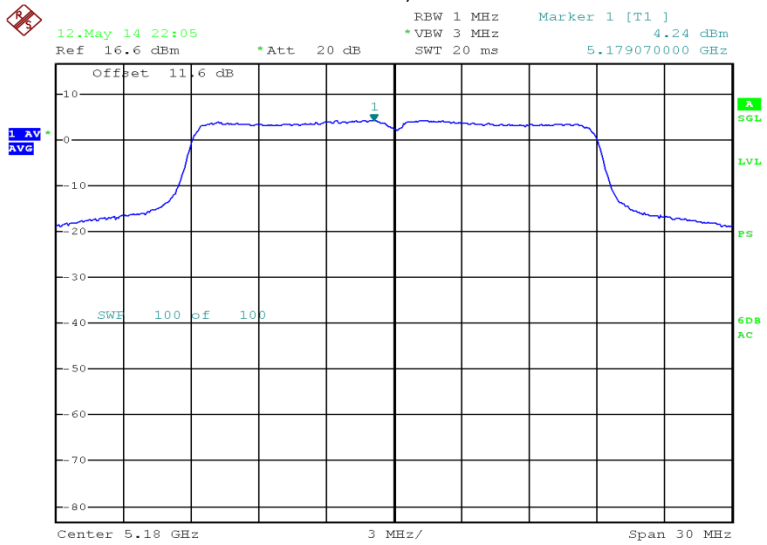
OUTPUT POWER AND PPSD, Chain 1 HIGH CH



Date: 12.MAY.2014 21:56:03

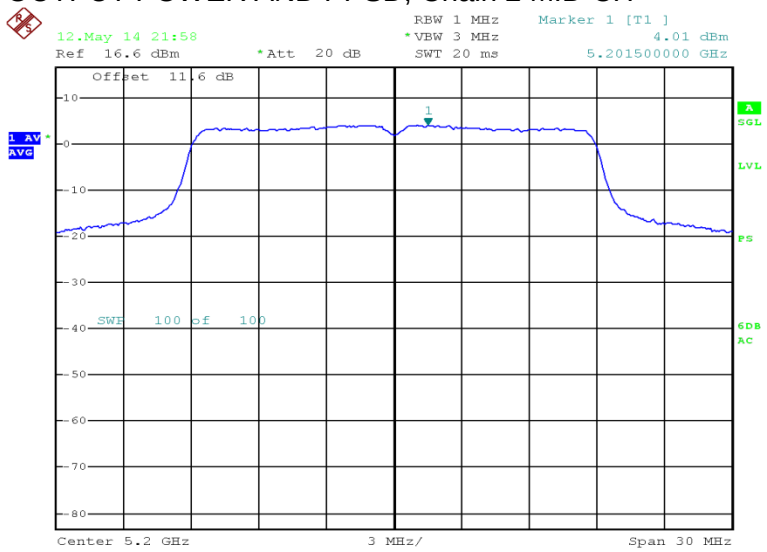
OUTPUT POWER AND PPSD, Chain 2

OUTPUT POWER AND PPSD, Chain 2 LOW CH



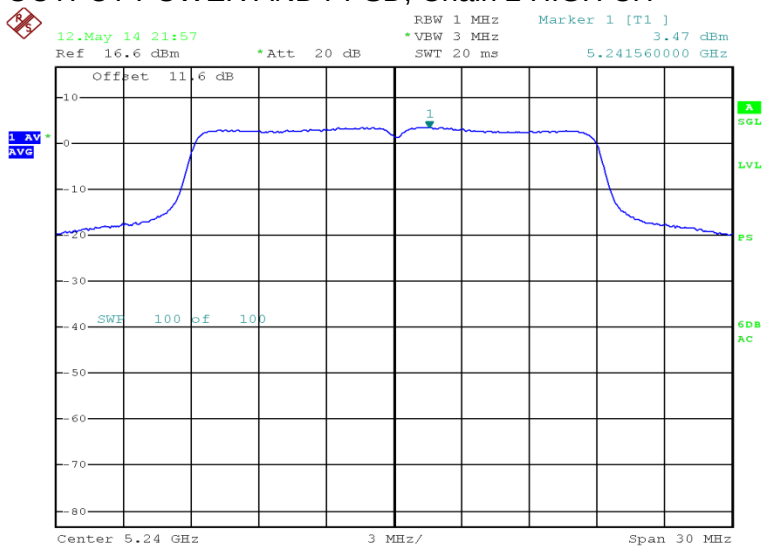
Date: 12.MAY.2014 22:05:01

OUTPUT POWER AND PPSD, Chain 2 MID CH



Date: 12.MAY.2014 21:58:24

OUTPUT POWER AND PPSD, Chain 2 HIGH CH



Date: 12.MAY.2014 21:57:28

8.4. 802.11n HT20 BF 3TX MODE IN THE 5.2GHz BAND

8.4.1. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
7.04	6.70	3.79	10.73

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5180	N/A	N/A	10.73	10.73
Mid	5200	N/A	N/A	10.73	10.73
High	5240	N/A	N/A	10.73	10.73

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	19.27	N/A	N/A	19.27	6.27	N/A	N/A
Mid	5200	19.27	N/A	N/A	19.27	6.27	N/A	N/A
High	5240	19.27	N/A	N/A	19.27	6.27	N/A	N/A

Duty Cycle CF (dB)	0.22	Included in Calculations of Corr'd PPSD

Output Power Results

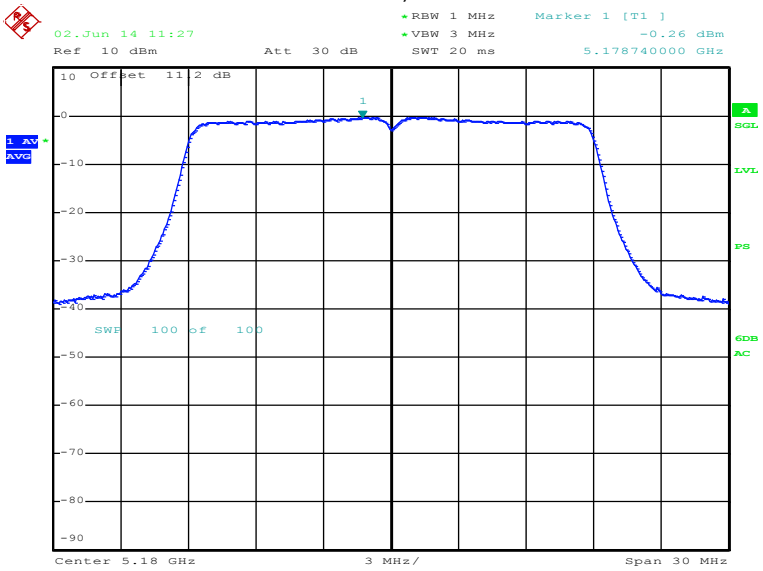
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	13.81	13.84	14.16	18.71	19.27	-0.56
Mid	5200	13.82	13.83	14.17	18.71	19.27	-0.56
High	5240	13.86	13.86	14.03	18.69	19.27	-0.58

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-0.26	-0.18	0.26	4.94	6.27	-1.33
Mid	5200	-0.38	-0.42	0.01	4.73	6.27	-1.54
High	5240	-0.55	-0.68	-0.34	4.47	6.27	-1.80

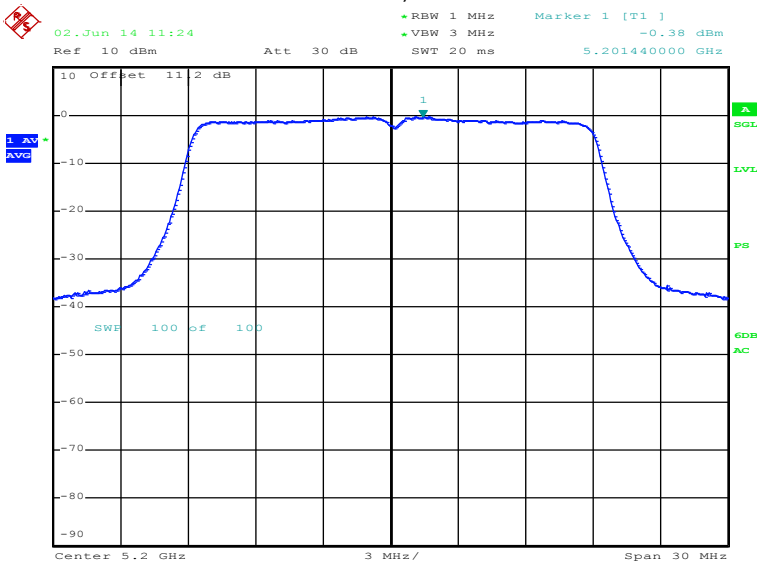
OUTPUT POWER AND PPSD, Chain 0

OUTPUT POWER AND PPSD, Chain 0 LOW CH



Date: 2.JUN.2014 11:27:51

OUTPUT POWER AND PPSD, Chain 0 MID CH



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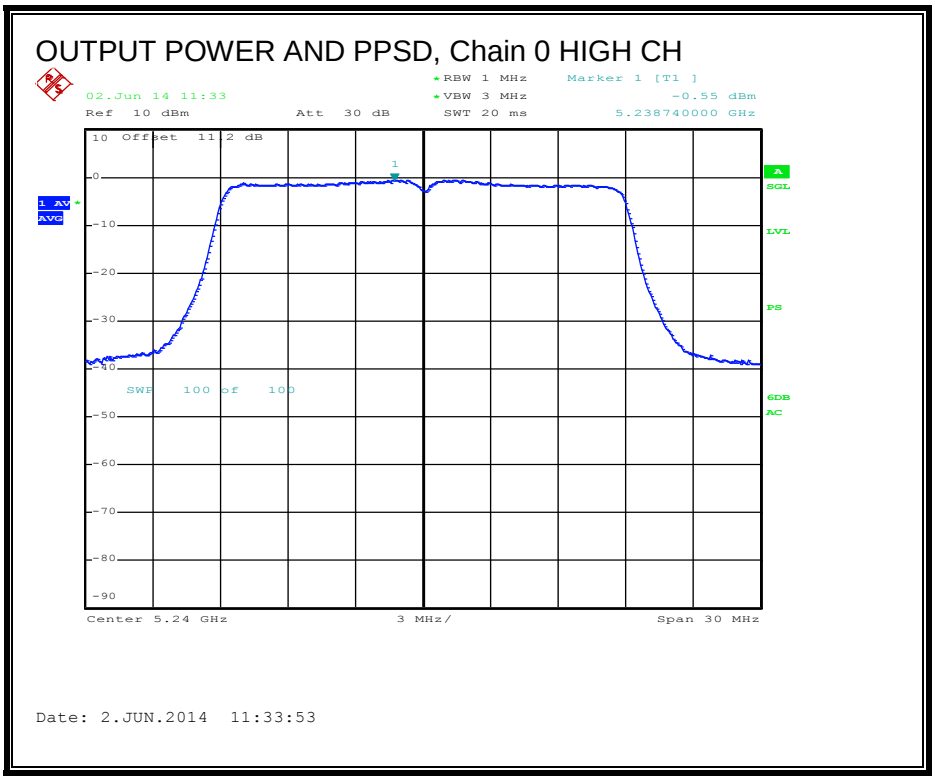
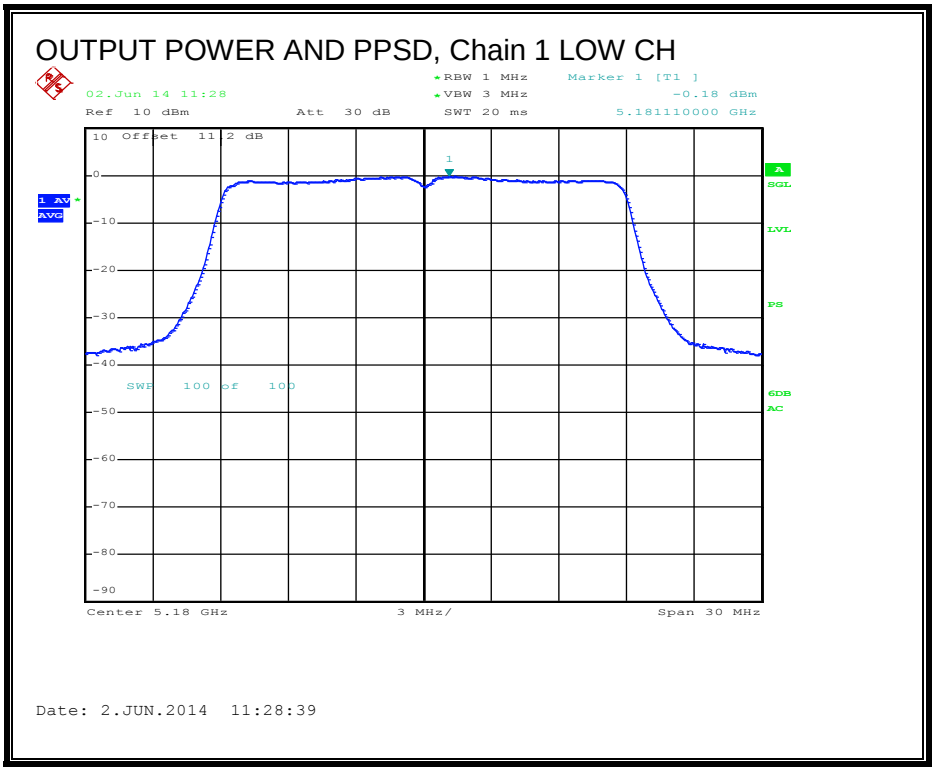
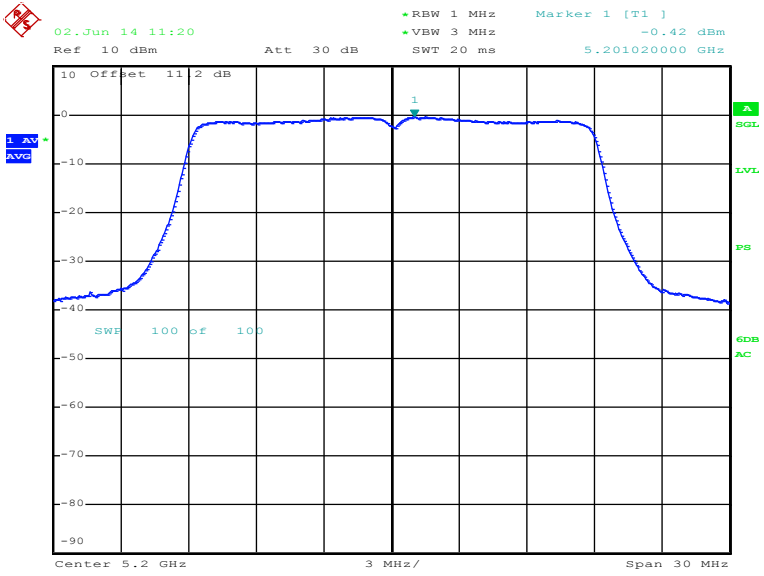


OUTPUT POWER AND PPSD, Chain 1

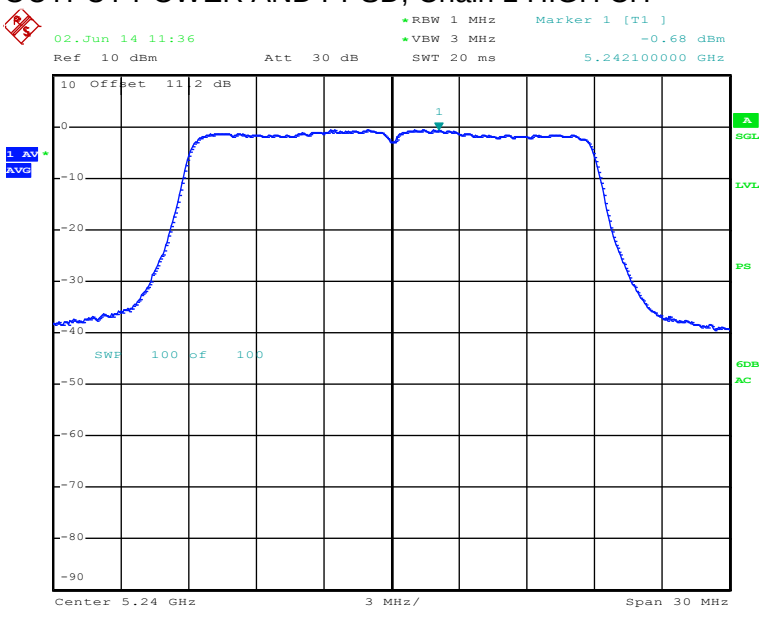


OUTPUT POWER AND PPSD, Chain 1 MID CH



Date: 2.JUN.2014 11:20:06

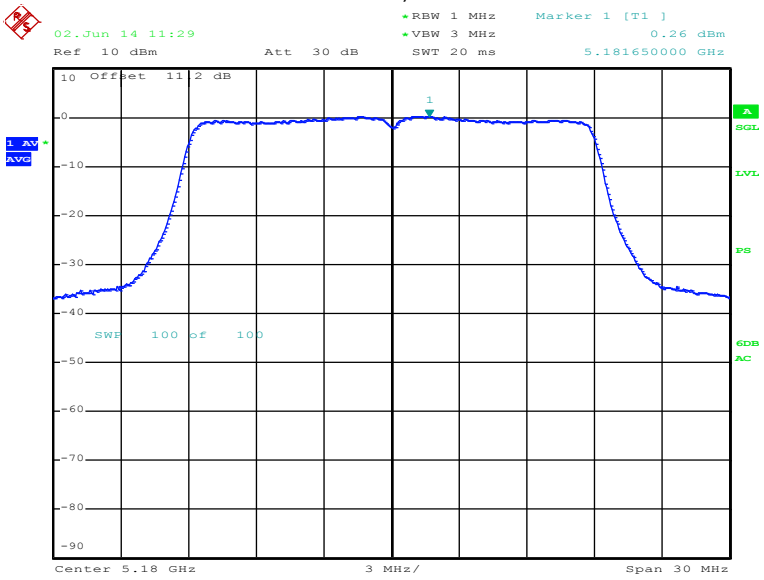
OUTPUT POWER AND PPSD, Chain 1 HIGH CH



Date: 2.JUN.2014 11:36:40

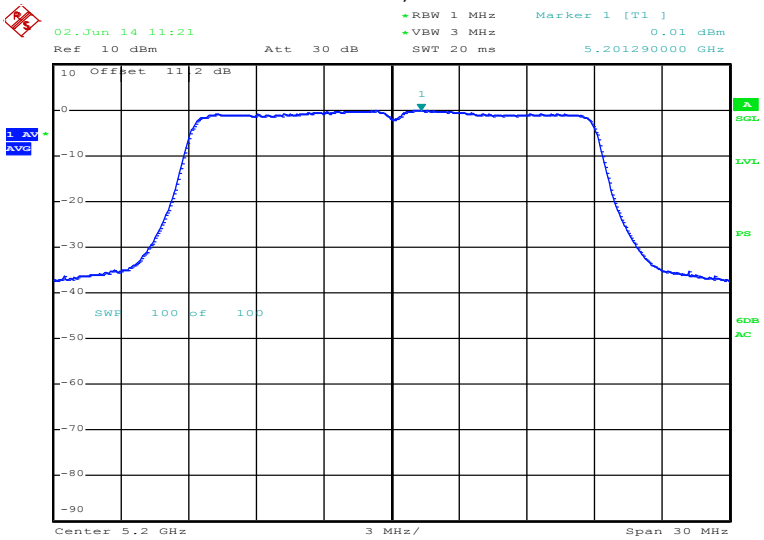
OUTPUT POWER AND PPSD, Chain 2

OUTPUT POWER AND PPSD, Chain 2 LOW CH



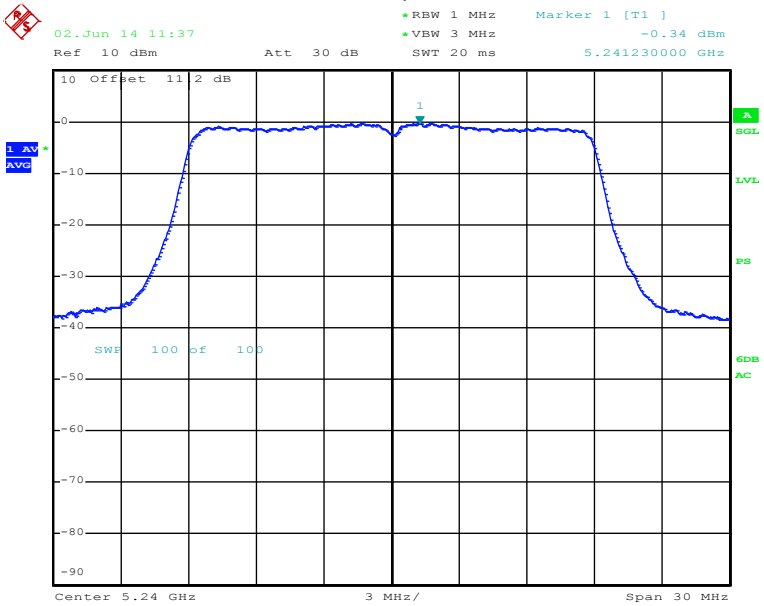
Date: 2.JUN.2014 11:29:17

OUTPUT POWER AND PPSD, Chain 2 MID CH



Date: 2.JUN.2014 11:21:07

OUTPUT POWER AND PPSD, Chain 2 HIGH CH



Date: 2.JUN.2014 11:37:54

8.5. 802.11n HT40 1TX MODE IN THE 5.2 GHz BAND

8.5.1. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)
Low	5190	7.04	22.96
High	5230	7.04	22.96

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5190	15.63			15.63	22.96	-7.33
High	5230	18.55			18.55	22.96	-4.41

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

8.6. 802.11n HT40 CDD 3TX MODE IN THE 5.2 GHz BAND

8.6.1. 26 dB BANDWIDTH

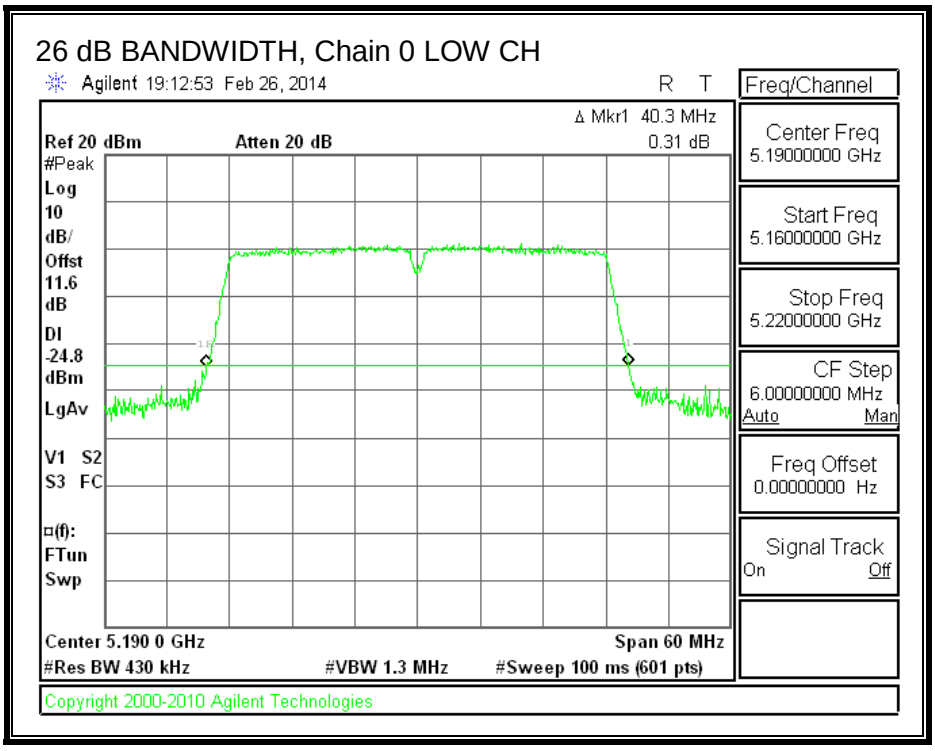
LIMITS

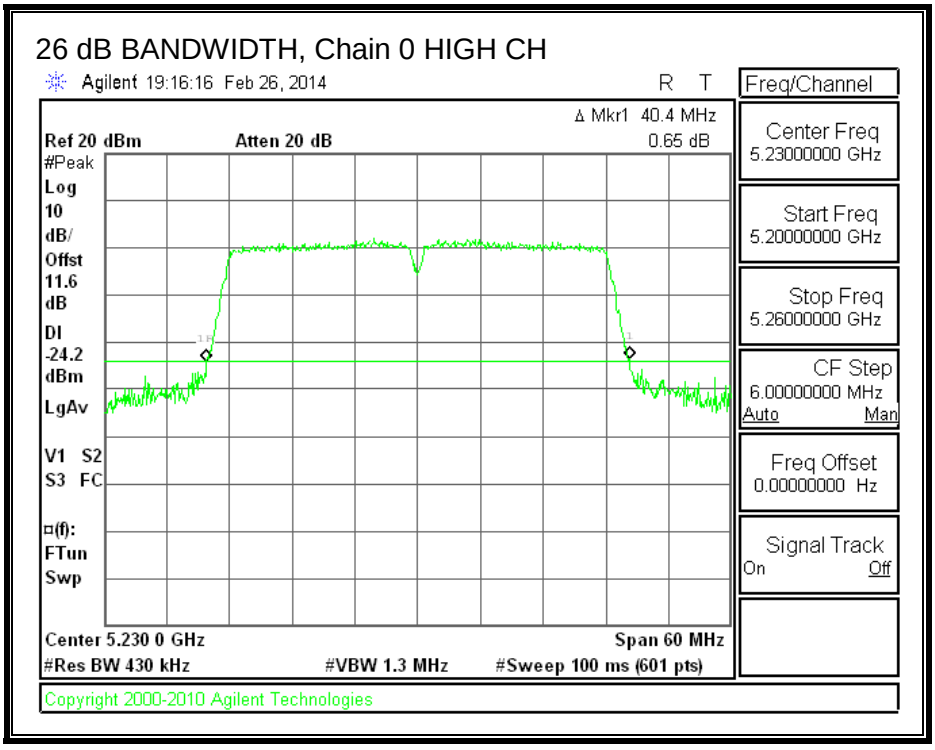
None; for reporting purposes only.

RESULTS

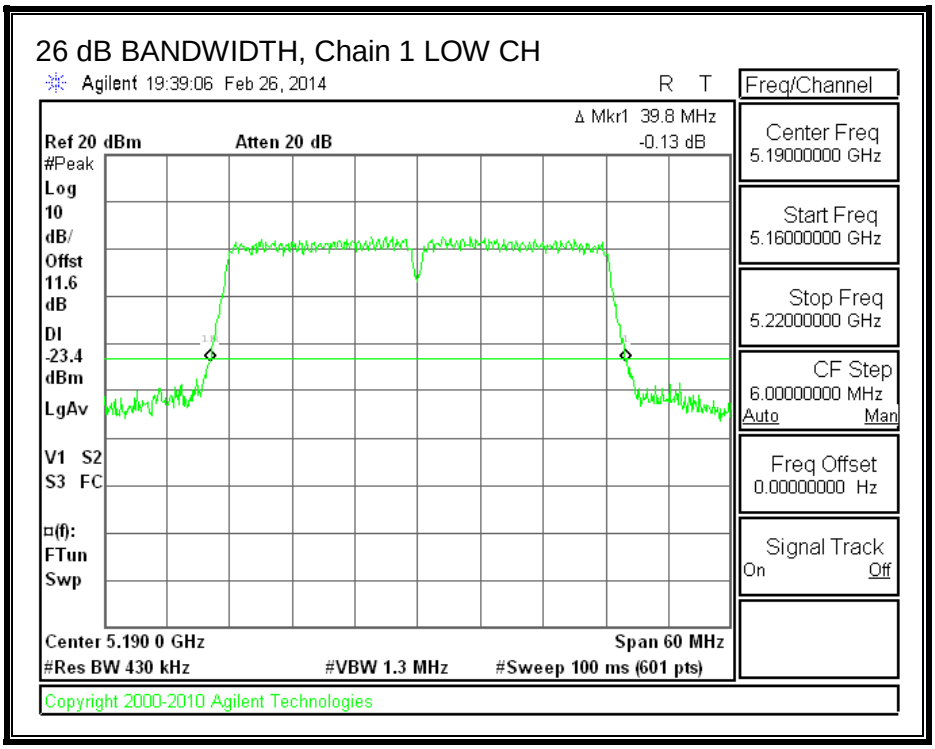
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5190	40.30	39.80	39.80
High	5230	40.40	39.90	39.80

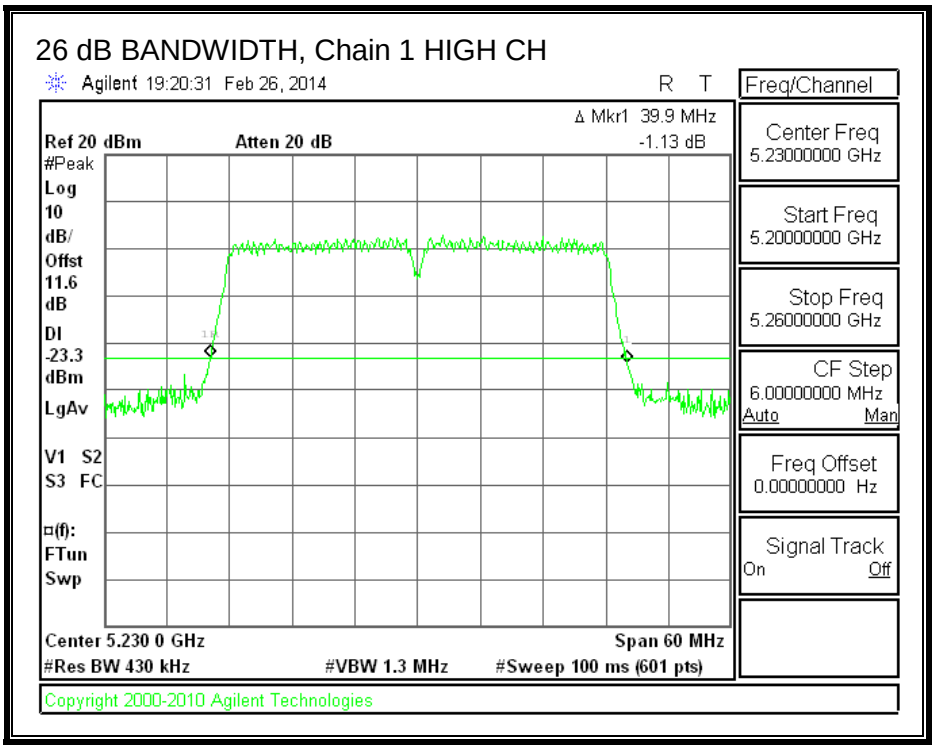
26 dB BANDWIDTH, Chain 0



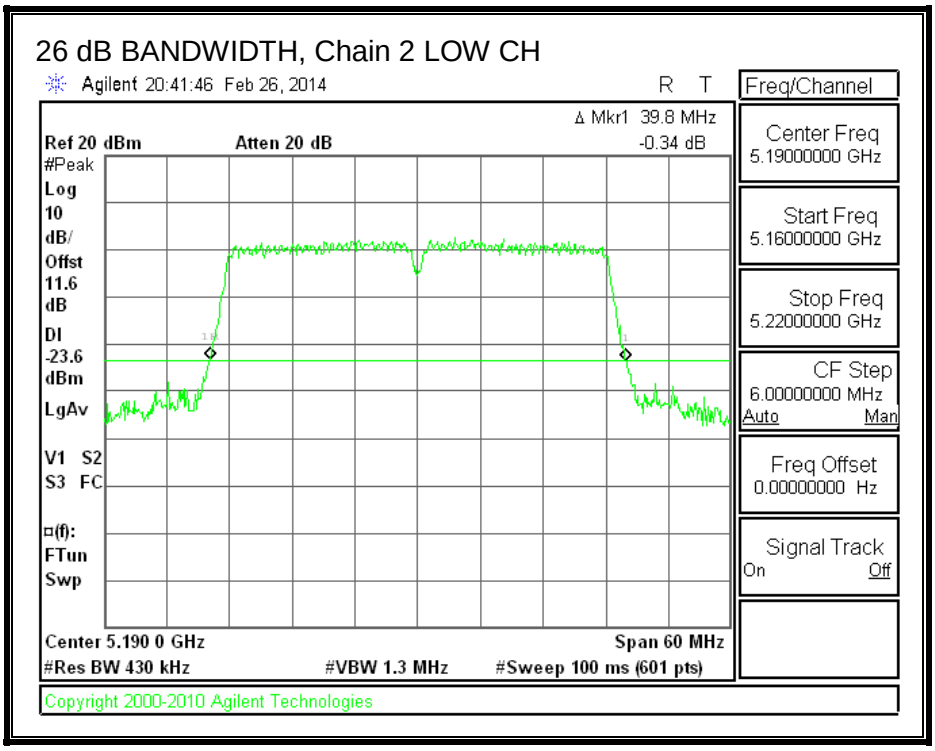


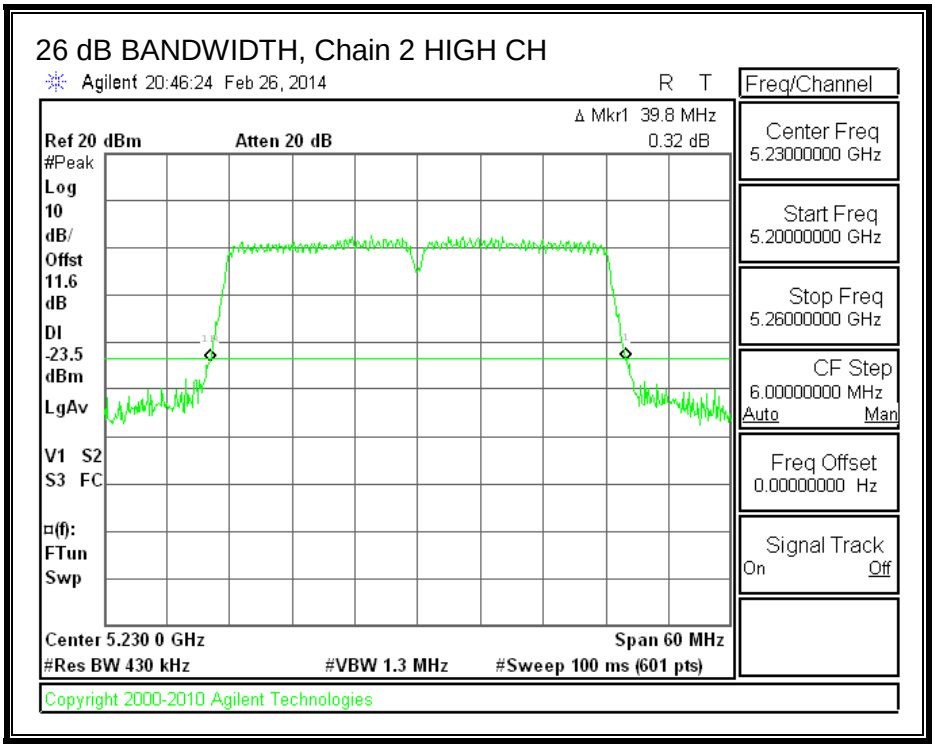
26 dB BANDWIDTH, Chain 1





26 dB BANDWIDTH, Chain 2





8.6.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
7.04	6.70	3.79	6.07

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
7.04	6.70	3.79	10.73

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5190	N/A	N/A	6.07	10.73
High	5230	N/A	N/A	6.07	10.73

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5190	23.93	N/A	N/A	23.93	6.27	N/A	N/A
High	5230	23.93	N/A	N/A	23.93	6.27	N/A	N/A

Duty Cycle CF (dB)	0.47	Included in Calculations of Corr'd PPSD

Output Power Results

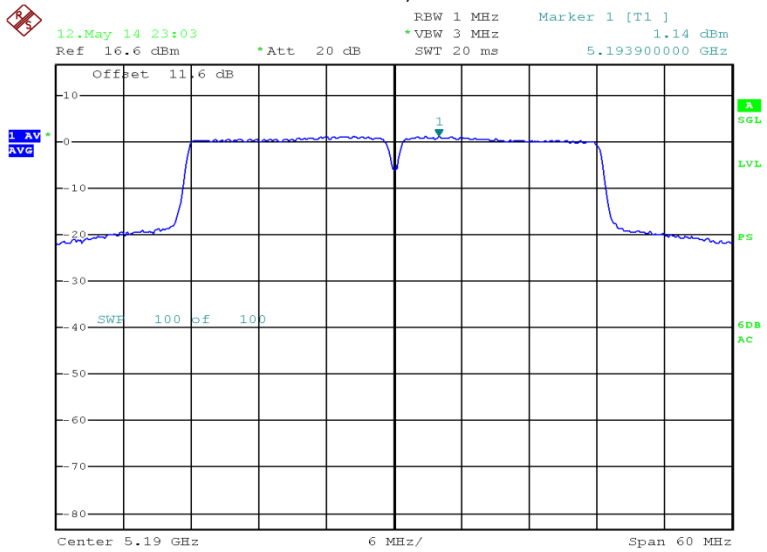
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	12.77	12.58	12.61	17.43	23.93	-6.50
High	5230	18.07	18.18	18.02	22.86	23.93	-1.07

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5190	1.14	0.92	0.98	6.26	6.27	-0.01
High	5230	1.17	0.95	0.86	6.24	6.27	-0.03

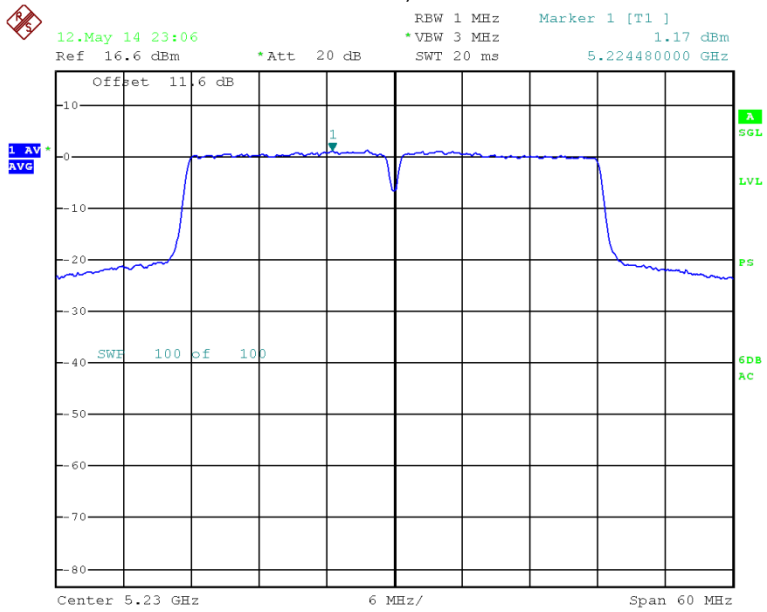
OUTPUT POWER AND PPSD, Chain 0

OUTPUT POWER AND PPSD, Chain 0 LOW CH



Date: 12.MAY.2014 23:03:57

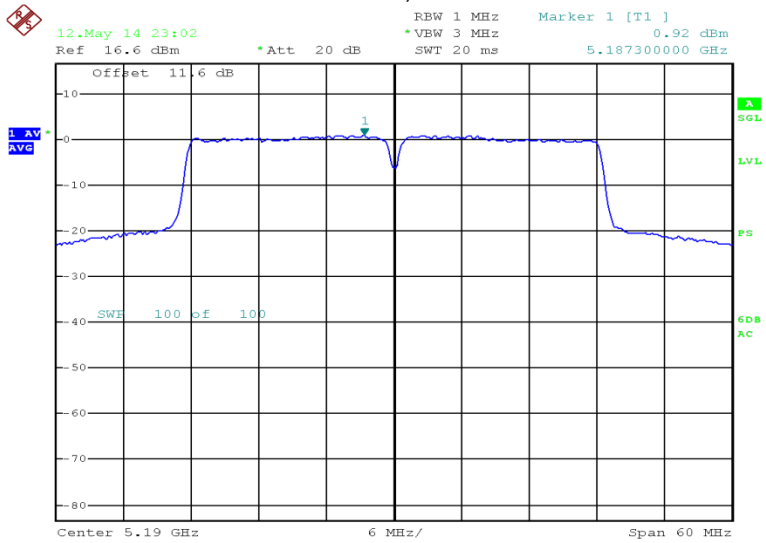
OUTPUT POWER AND PPSD, Chain 0 HIGH CH



Date: 12.MAY.2014 23:06:19

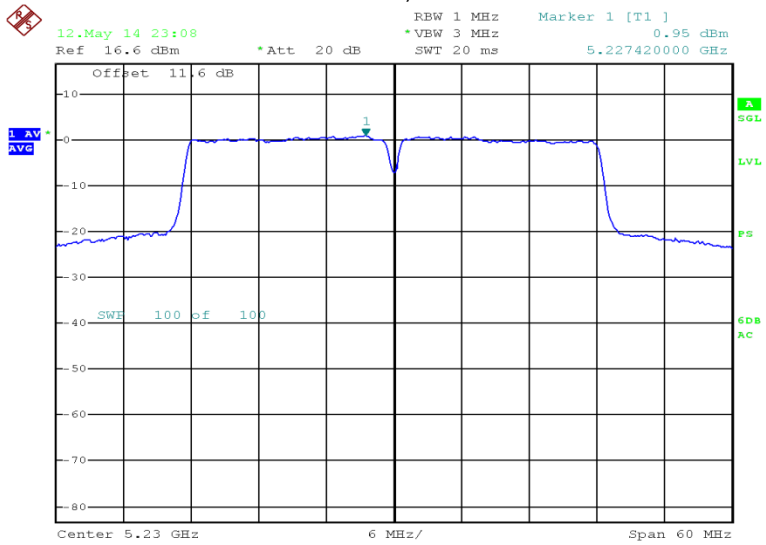
OUTPUT POWER AND PPSD, Chain 1

OUTPUT POWER AND PPSD, Chain 1 LOW CH



Date: 12.MAY.2014 23:02:45

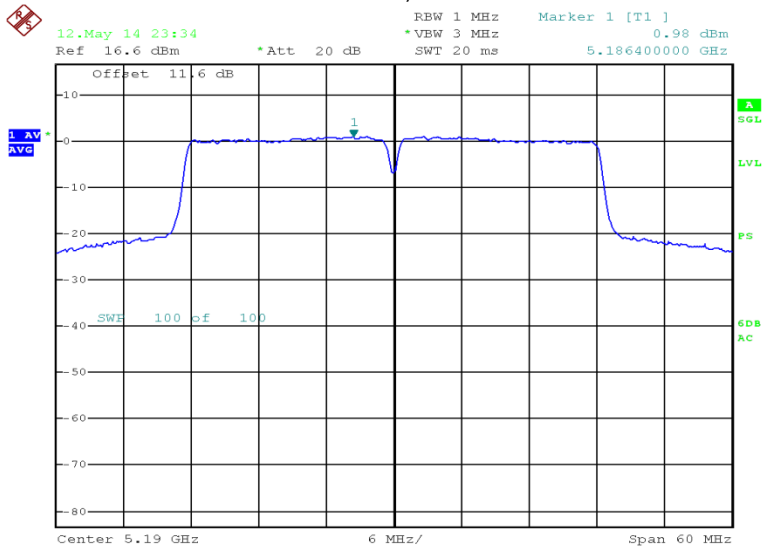
OUTPUT POWER AND PPSD, Chain 1 HIGH CH



Date: 12.MAY.2014 23:08:20

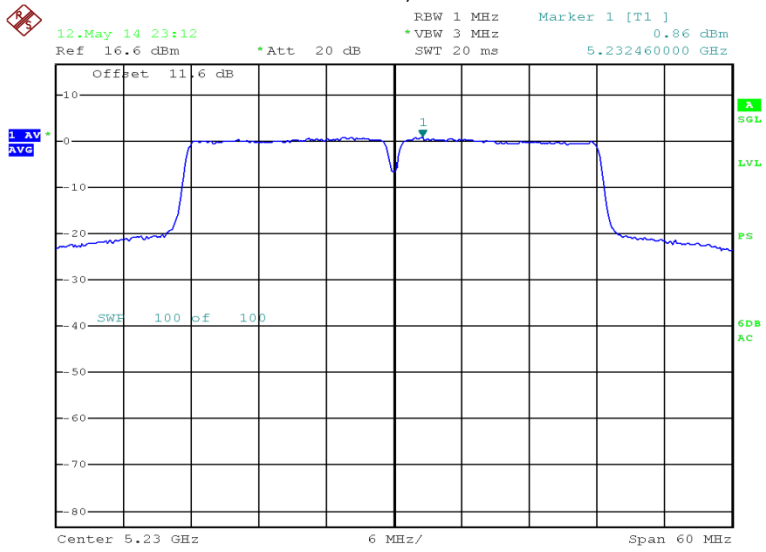
OUTPUT POWER AND PPSD, Chain 2

OUTPUT POWER AND PPSD, Chain 2 LOW CH



Date: 12.MAY.2014 23:34:10

OUTPUT POWER AND PPSD, Chain 2 HIGH CH



Date: 12.MAY.2014 23:12:16

8.7. 802.11n HT40 BF 3TX MODE IN THE 5.2 GHz BAND

8.7.1. 26 dB BANDWIDTH

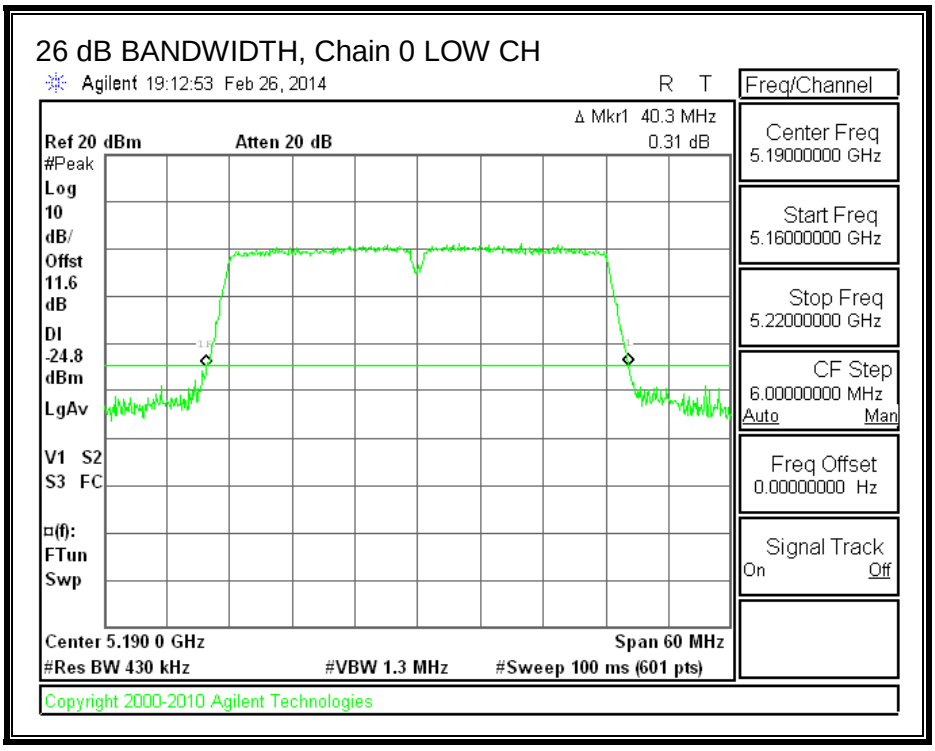
LIMITS

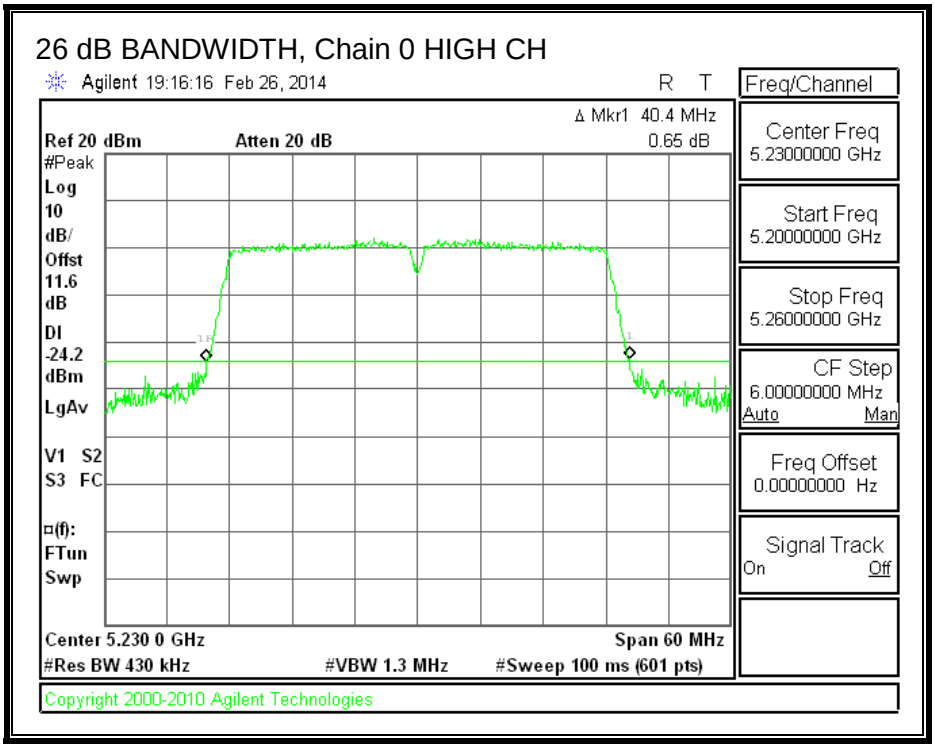
None; for reporting purposes only.

RESULTS

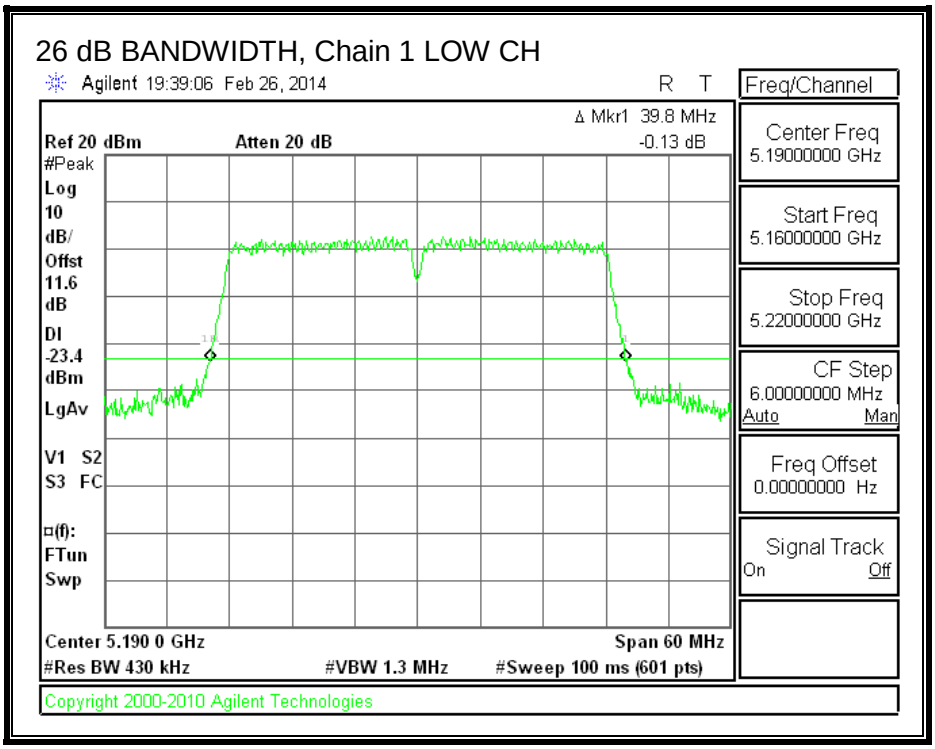
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5190	40.30	39.80	39.80
High	5230	40.40	39.90	39.80

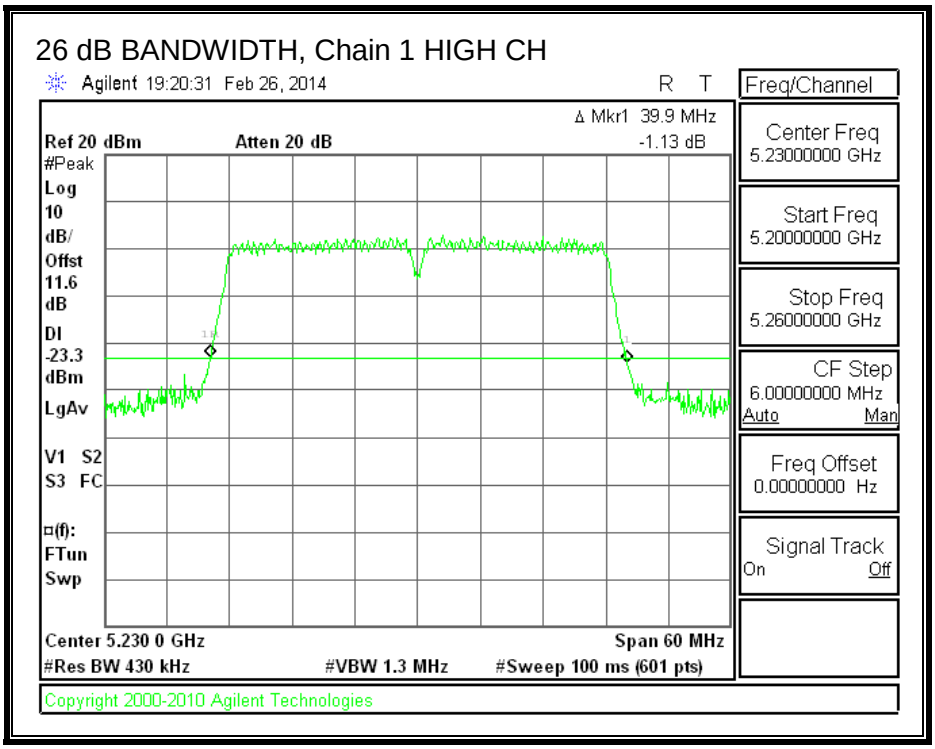
26 dB BANDWIDTH, Chain 0



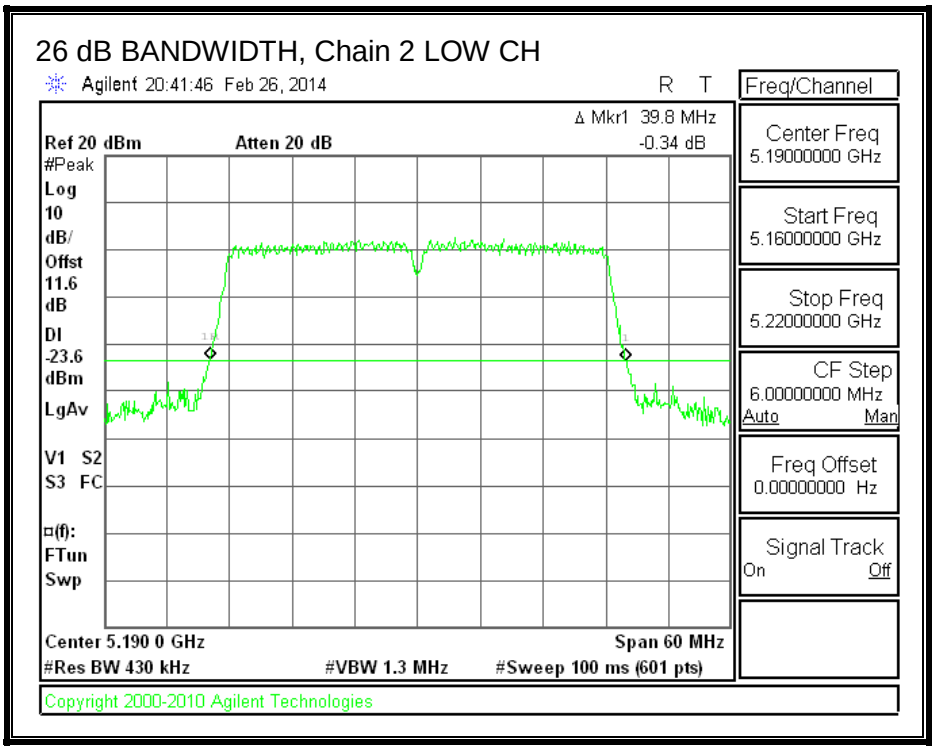


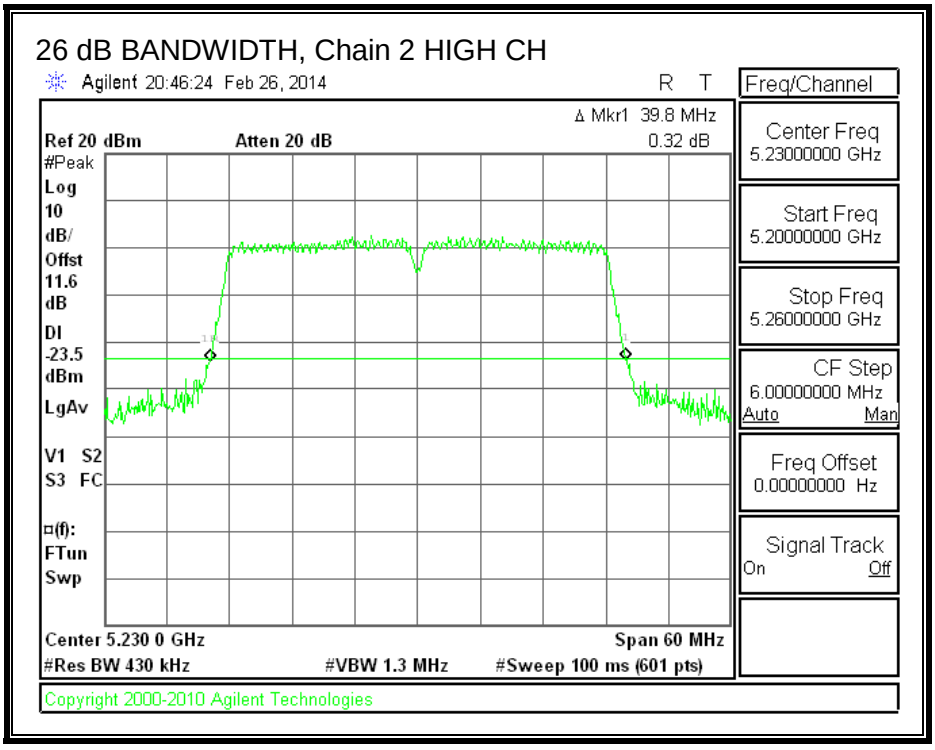
26 dB BANDWIDTH, Chain 1





26 dB BANDWIDTH, Chain 2





8.7.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
7.04	6.70	3.79	10.73

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5190	N/A	N/A	10.73
High	5230	N/A	N/A	10.73

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5190	19.27	N/A	N/A	19.27	6.27	N/A	N/A
High	5230	19.27	N/A	N/A	19.27	6.27	N/A	N/A

Duty Cycle CF (dB)	0.47	Included in Calculations of Corr'd Power & PPSD

Output Power Results

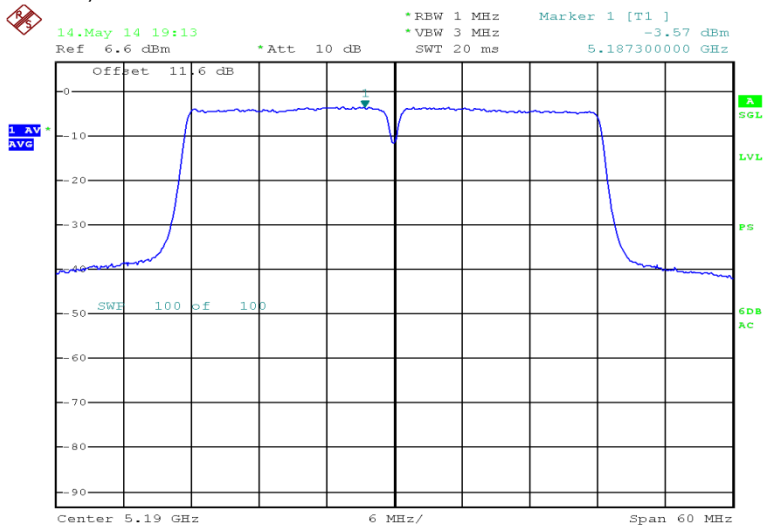
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.70	13.40	13.40	18.27	19.27	-1.00
High	5230	14.25	13.65	14.34	18.86	19.27	-0.41

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5190	-3.57	-3.67	-3.80	1.56	6.27	-4.71
High	5230	-3.52	-3.62	-3.52	1.69	6.27	-4.58

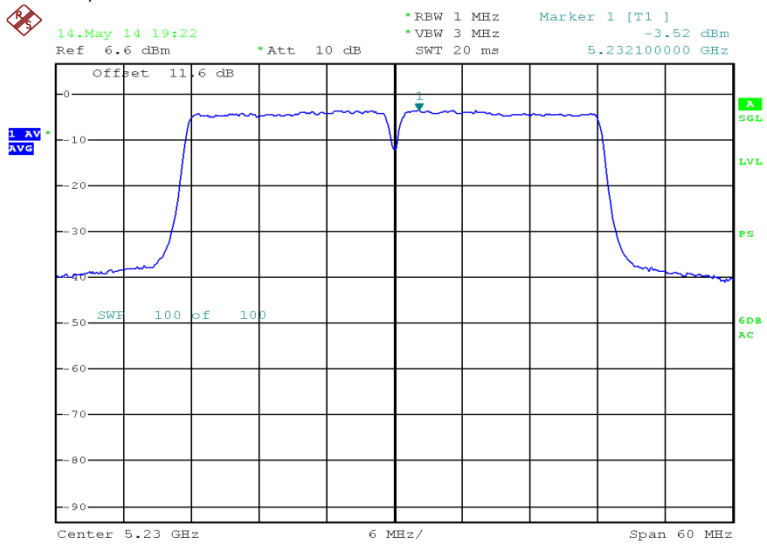
OUTPUT POWER AND PPSD, Chain 0

PPSD, Chain 0 LOW CH



Date: 14.MAY.2014 19:13:10

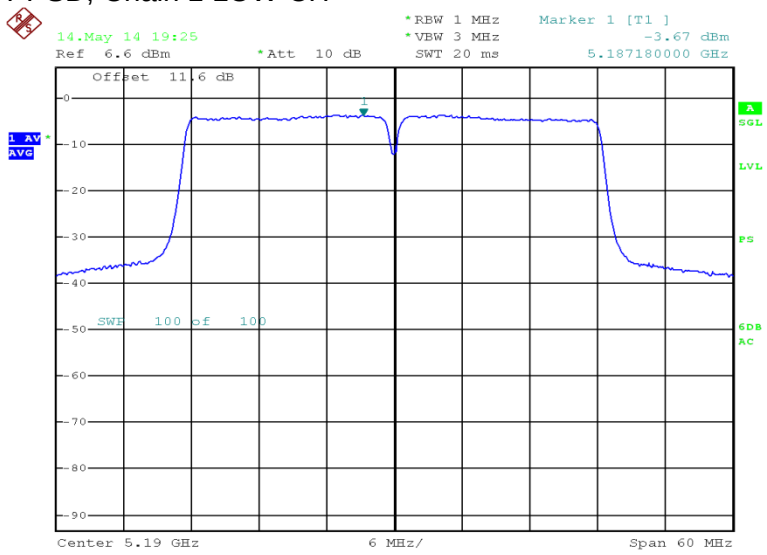
PPSD, Chain 0 HIGH CH



Date: 14.MAY.2014 19:22:27

OUTPUT POWER AND PPSD, Chain 1

PPSD, Chain 1 LOW CH



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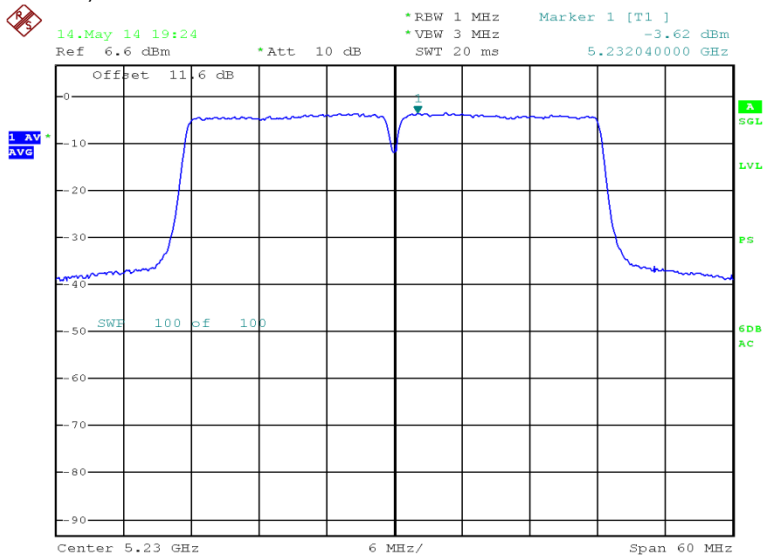
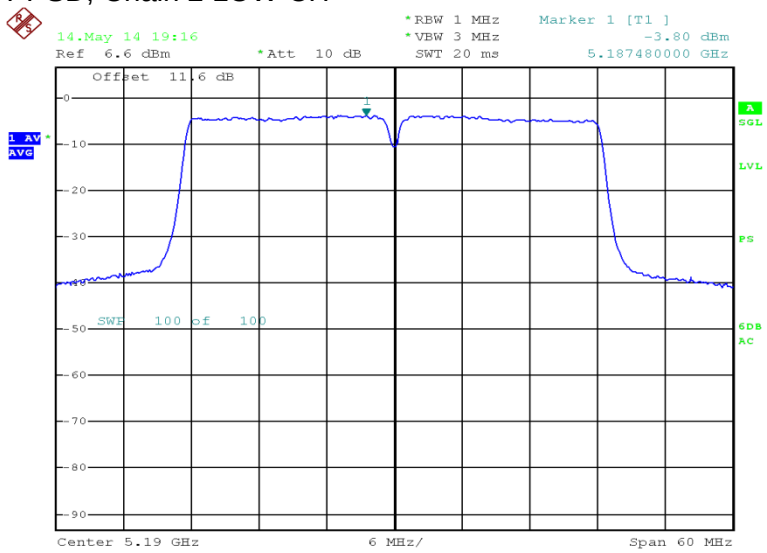
PPSD, Chain 1 HIGH CH



Date: 14.MAY.2014 19:24:08

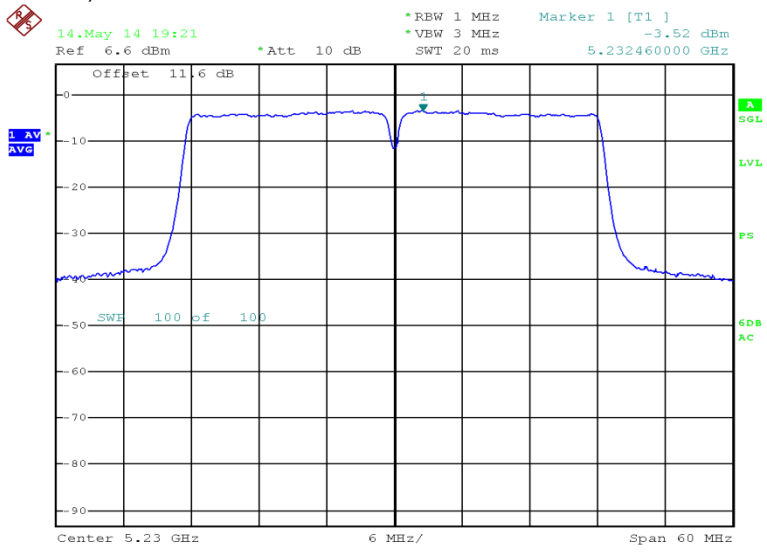
OUTPUT POWER AND PPSD, Chain 2

PPSD, Chain 2 LOW CH



Date: 14.MAY.2014 19:16:29

PPSD, Chain 2 HIGH CH



Date: 14.MAY.2014 19:21:20

8.8. 802.11ac VHT80 1TX MODE IN THE 5.2GHz BAND

8.8.1. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)
Low	5210	7.04	22.96

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5210	14.81			14.81	22.96	-8.15

8.9. 802.11ac VHT80 CDD 3Tx MODE IN THE 5.2 GHz BAND

8.9.1. 26 dB BANDWIDTH

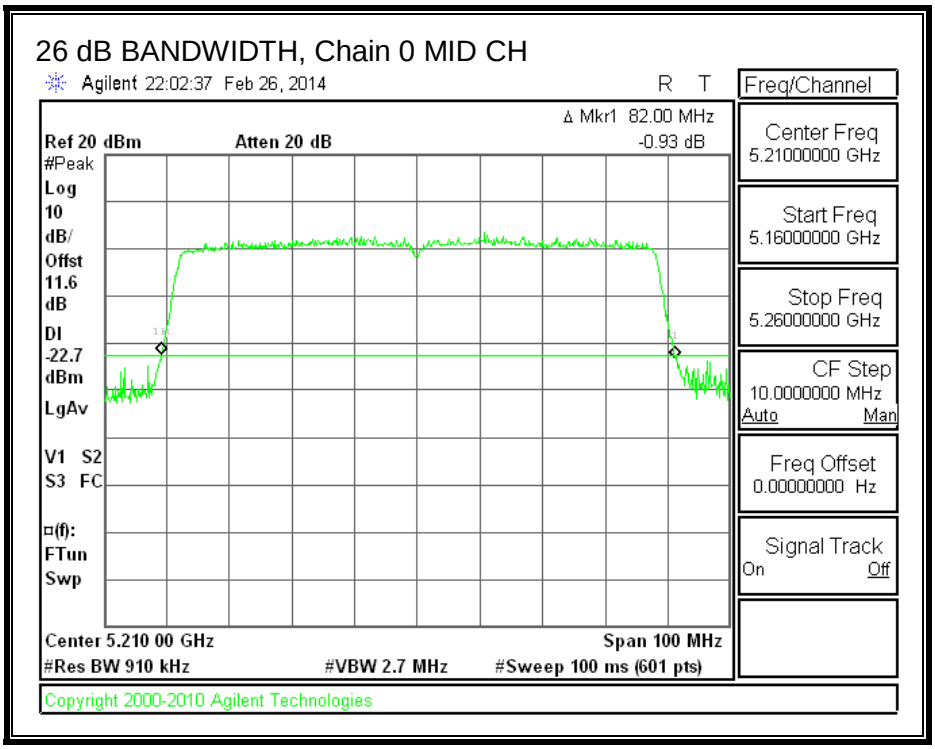
LIMITS

None; for reporting purposes only.

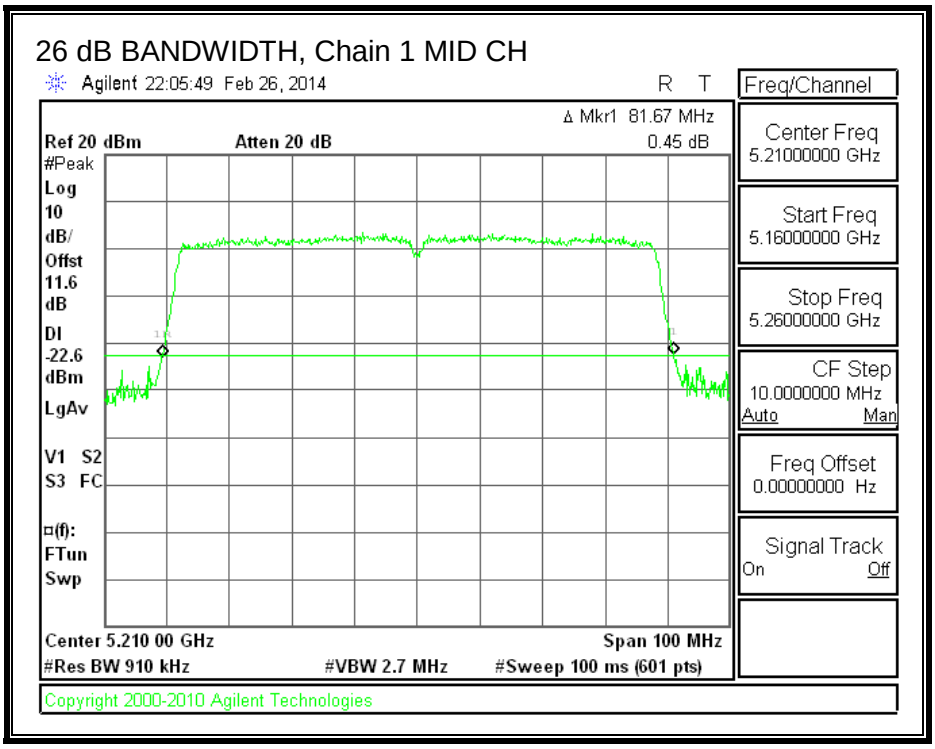
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Mid	5210	82.00	81.67	81.50

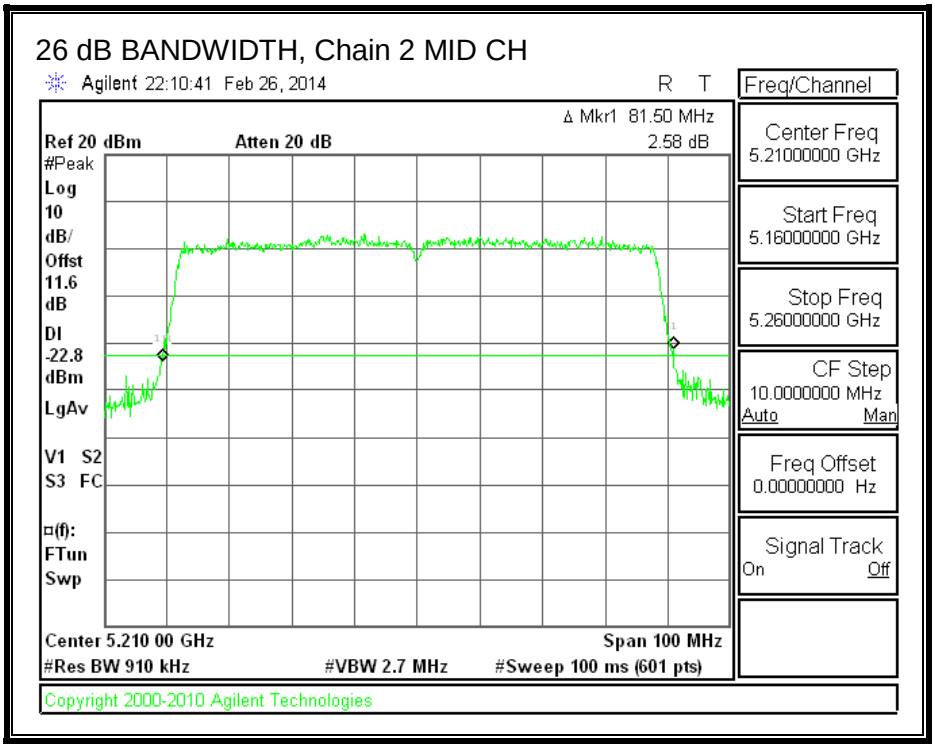
26 dB BANDWIDTH, Chain 0



26 dB BANDWIDTH, Chain 1



26 dB BANDWIDTH, Chain 2



8.9.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
7.04	6.70	3.79	6.07

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
7.04	6.70	3.79	10.73

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Mid	5210	N/A	N/A	6.07	10.73

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Mid	5210	23.93	N/A	N/A	23.93	6.27	N/A	N/A

Duty Cycle CF (dB)	0.85	Included in Calculations of Corr'd PPSD

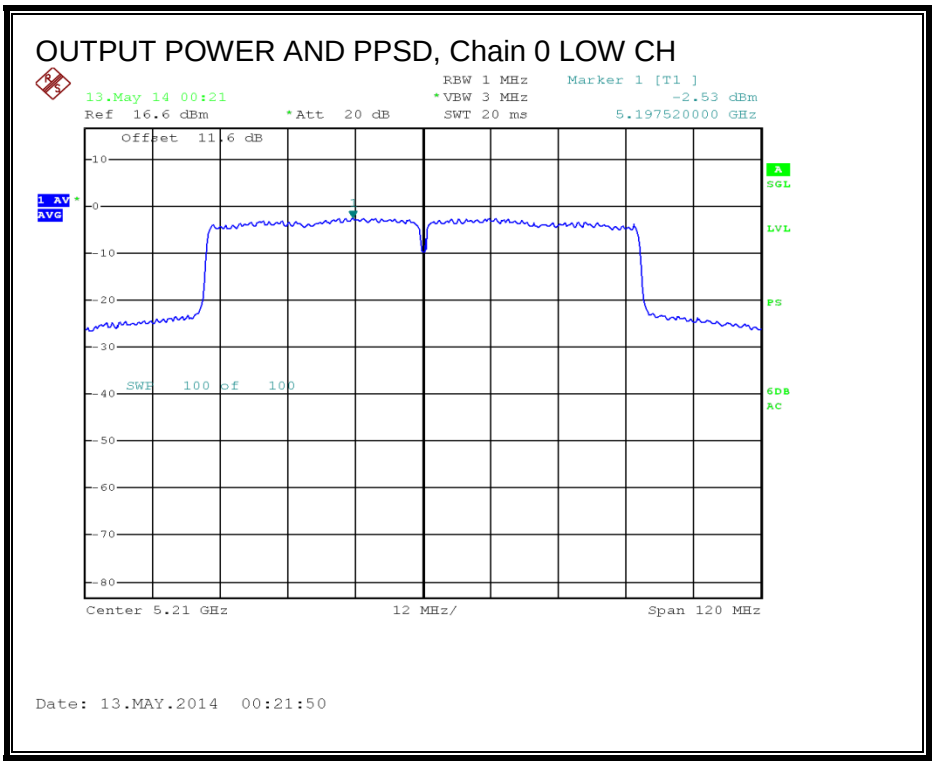
Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	11.30	10.74	11.01	15.79	23.93	-8.14

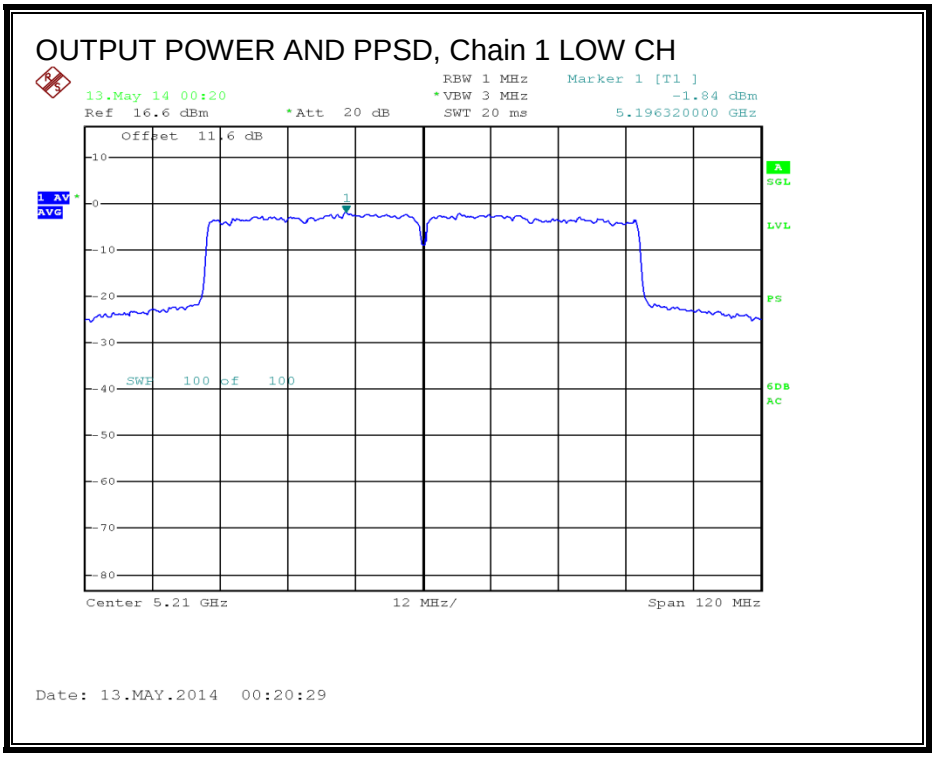
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Chain 2 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Mid	5210	-2.53	-1.84	-2.35	3.39	6.27	-2.88

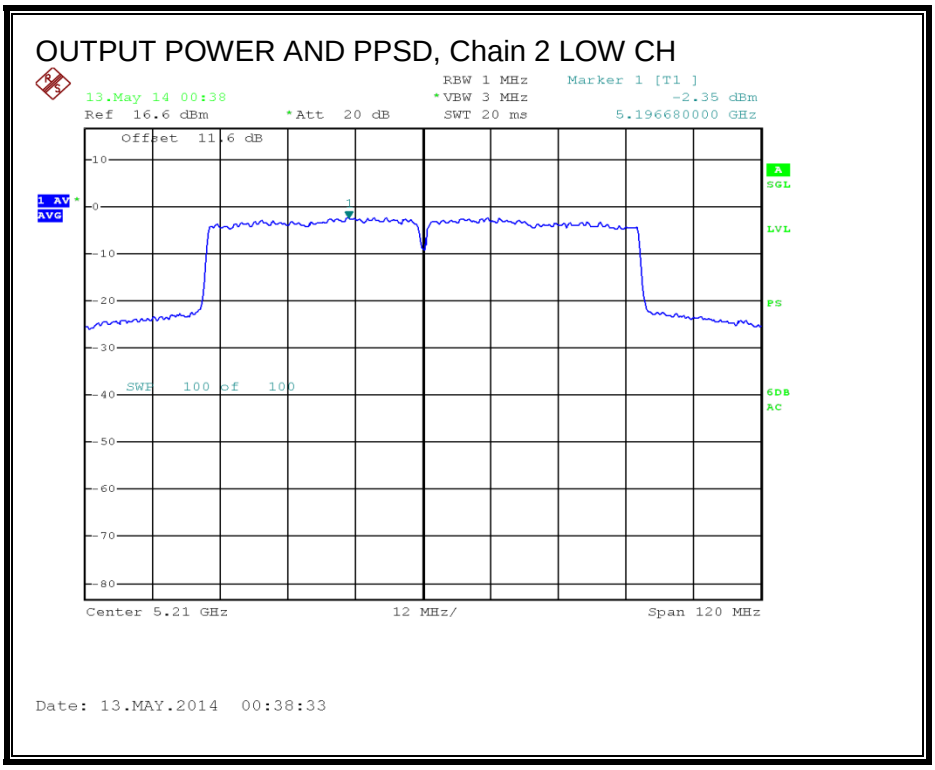
OUTPUT POWER AND PPSD, Chain 0



OUTPUT POWER AND PPSD, Chain 1



OUTPUT POWER AND PPSD, Chain 2



8.10. 802.11ac VHT80 BF 3TX MODE IN THE 5.2 GHz BAND

8.10.1. 26 dB BANDWIDTH

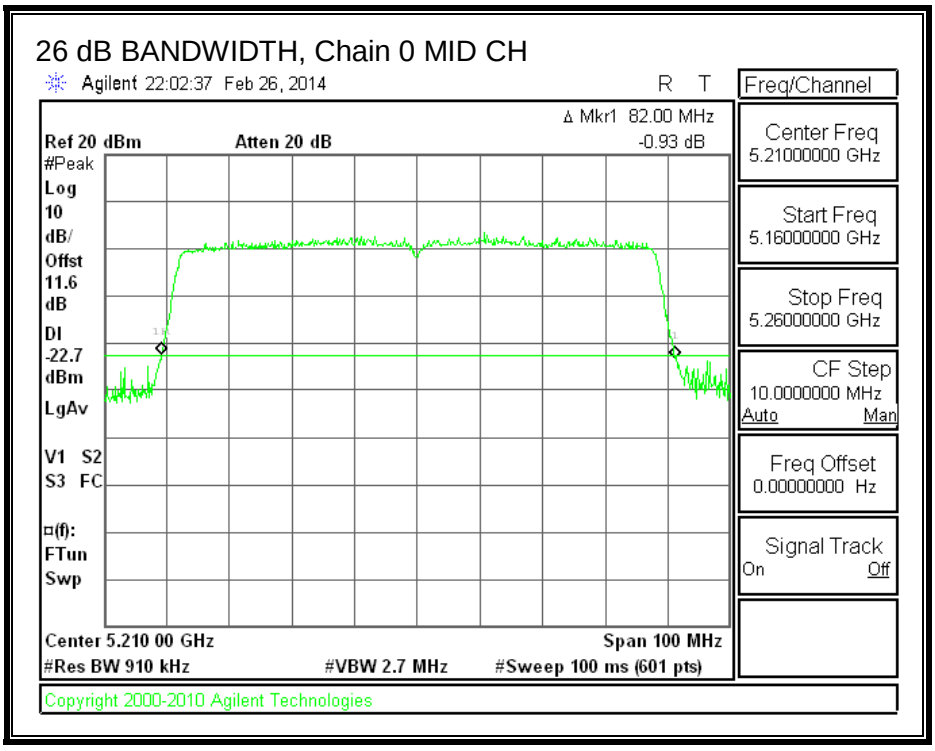
LIMITS

None; for reporting purposes only.

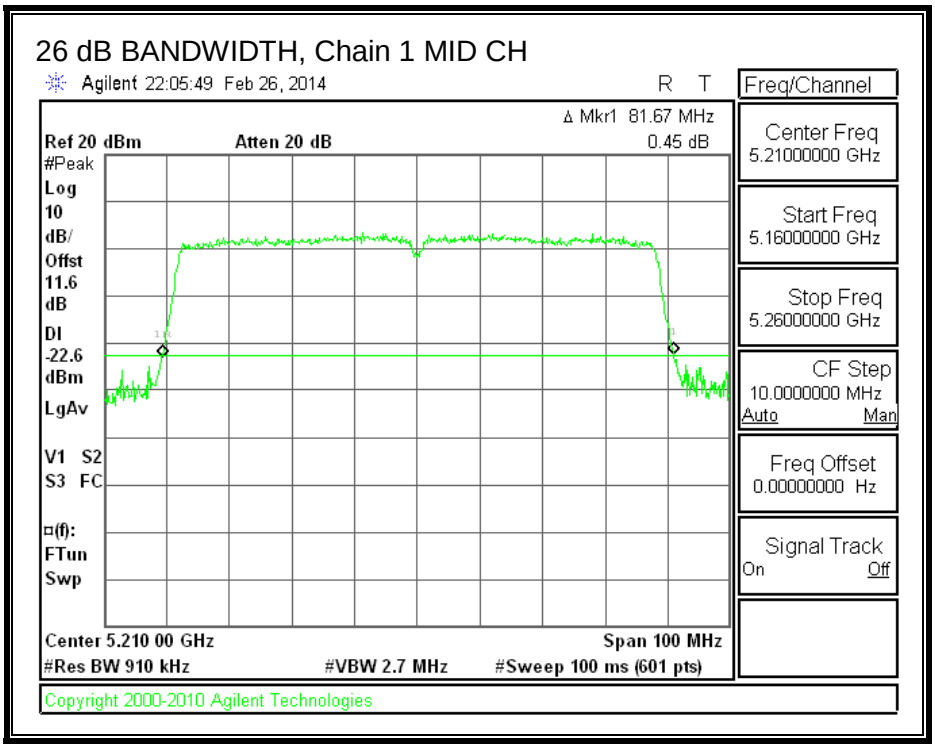
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Mid	5210	82.00	81.67	81.50

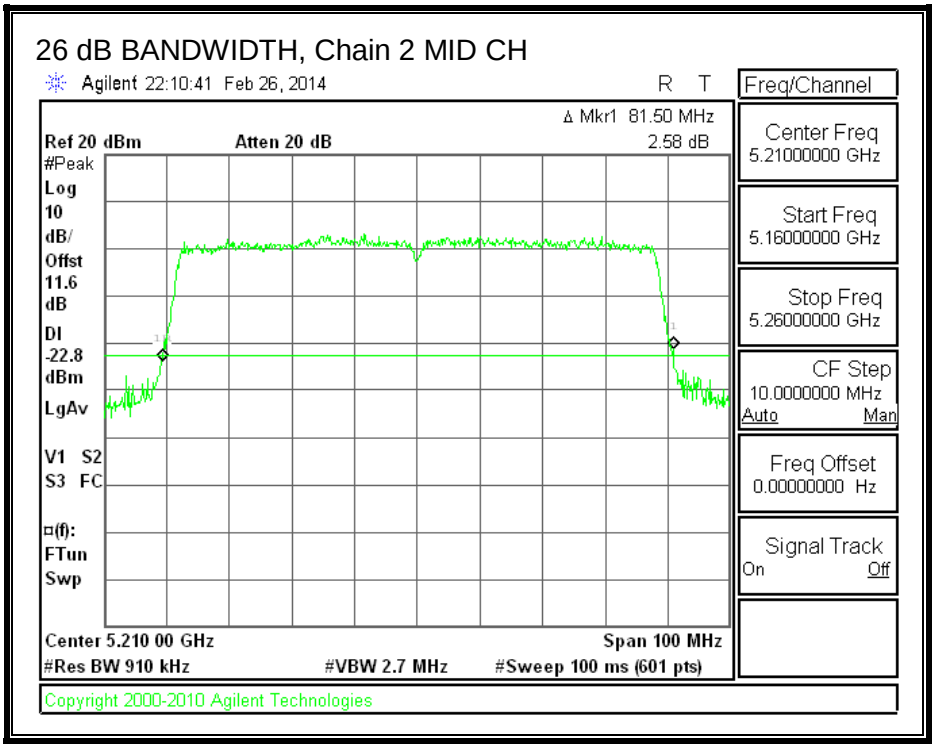
26 dB BANDWIDTH, Chain 0



26 dB BANDWIDTH, Chain 1



26 dB BANDWIDTH, Chain 2



8.10.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

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.

DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
7.04	6.70	3.79	10.73