



EMC TEST REPORT

Report No. : TS09110041-EME
Model No. : P-3202HN-Ba, P-3202HN-Bb
Issued Date : Dec. 11, 2009

Applicant: ZyXEL Communications Corporation
6, Innovation Rd II, Science-Based Industrial Park,
Hsin-Chu, Taiwan

**Test Method/
Standard:** FCC Part 15 Subpart E Section §15.207、§15.209、§15.407
and ANSI C63.4/2003.

Test By: Intertek Testing Services Taiwan Ltd.
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The test report was prepared by: Sign on File
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The test report was reviewed by:

Name Jacky Chen
Title Engineer



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Summary of Tests

GPON IAD FCC ID: I88P3202HNBA

Test	Reference	Results
Peak output power test	15.407 (a)(1)/(2)/(3) DA 02-2138	Pass
Power Spectrum Density test	15.407 (a)(1)/(2)/(3) DA 02-2138	Pass
Peak excursion to average ratio test	15.407(a)(6) DA 02-2138	Pass
Radiated spurious emission test	15.407(b)(1)/(2)/(3)/(6), 15.209	Pass
Dynamic Frequency Selection (DFS) test	15.407(h), FCC 06-96	No required due to this device was only used UNII band of 5150-5250MHz
Additional provisions	15.215(c)	Pass
AC line conducted emission test	15.407(b)(6) 15.207	Pass



1. General information

1.1 Identification of the EUT

Product:	GPON IAD
Model No.:	P-3202HN-Ba
Operating Frequency:	5180MHz ~ 5240MHz for 802.11a, 802.11n (HT20) 5200MHz ~ 5220MHz for 802.11n (HT40)
Channel Number:	4 channels for 802.11a, 802.11n (HT20) 2 channels for 802.11n (HT40)
Frequency of Each Channel:	5180MHz+20k MHz; k=0~3 for 802.11a, 802.11n (HT20) 5200MHz+20k MHz; k=0~1, for 802.11n (HT40)
Type of Modulation:	OFDM
Rated Power:	DC 18 V from adapter model: ADS18B-W 180100, I/P Voltage: 100-240Vac 50/60Hz
Power Cord:	N/A
Sample Received:	Nov. 09, 2009
Test Date(s):	Nov. 20, 2009 ~ Dec. 02, 2009
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.



1.2 Additional information about the EUT

The EUT is a GPON IAD which is a 802.11 a/b/g/n MIMO product with dual transmitters and dual receivers. The 802.11a/g/n function which can transmit independently and simultaneous transmit

The customer confirmed the model listed below was a series model to model P-3202HN-Ba (EUT), the differences are listed below.

Model Number	Differences
P-3202HN-Ba	with CATV interface, with Fiber interface
P-3202HN-Bb	with Fiber interface, no CATV interface

For more detail features, please refer to User's manual as file name "Installation guide.pdf".



1.3 Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

DAC0

Antenna Gain : 3 dBi
Antenna Type : Dipole antenna
Connector Type : IPEX

DAC1

Antenna Gain : 3 dBi
Antenna Type : Dipole antenna
Connector Type : IPEX

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	Description of Data Cable	FCC ID
Notebook PC	DELL	Latitude D610	5YWZK1S	RJ-45 UTP Cat.5 10 meter	E2K24BNHM

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart E Section § 15.207 、§15.209 、§15.407 、 DA 02-2138 and ANSI C63.4/2003.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

The AC power conducted emissions was invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz (15.207 paragraph).

Radiated emissions were invested cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading (15.209 paragraph), the Peak reading recorded also on the report.

The EUT setup configurations please refer to the photo of test configuration in item.

2.2 Operation mode

The EUT was supplied with DC 18 V from adapter (Test voltage: 120 Vac, 60 Hz) and was tested in normal operating mode.

The EUT was transmitted continuously during the test.

With individual verifying, the maximum output power was found at 6 Mbps data rate for 802.11a mode, 6.5 Mbps data rate for 802.11n (HT20) mode and 13.5 Mbps data rate for 802.11n (HT40) mode. The final tests were executed under these conditions and recorded in this report individually.

802.11a ch40	PK(dBm)
6 Mbps	13.33
9 Mbps	13.24
12 Mbps	13.08
18 Mbps	12.97
24 Mbps	12.88
36 Mbps	12.76
48 Mbps	12.64
54 Mbps	12.49

802.11n (HT 20) ch40	PK(dBm)
6.5 Mbps	13.38
13 Mbps	13.27
19.5 Mbps	13.22
26 Mbps	13.08
39 Mbps	12.79
52 Mbps	12.56
58.5 Mbps	12.44
65 Mbps	12.38

802.11n (HT 40) ch40	PK(dBm)
13.5 Mbps	13.12
27 Mbps	13.01
40.5 Mbps	12.97
54 Mbps	12.85
81 Mbps	12.74
108 Mbps	12.66
121.5 Mbps	12.62
135 Mbps	12.56

2.3 Test equipment

Equipment	Brand	Model No.
EMI Test Receiver	Rohde & Schwarz	ESCS 30
Spectrum Analyzer	Rohde & Schwarz	FSP 30
Spectrum Analyzer	Rohde & Schwarz	FSEK 30
Horn Antenna	SCHWARZBECK	BBHA 9120 D
Horn Antenna	SCHWARZBECK	BBHA 9170
Bilog Antenna	SCHWARZBECK	VULB 9168
Pre-Amplifier	MITEQ	919981
Pre-Amplifier	MITEQ	828825
Controller	HDGmbH	CM 100
Antenna Tower	HDGmbH	MA 2400
LISN	Rohde & Schwarz	ESH3-Z5
Wideband Peak Power Meter/ Sensor	Anritsu	ML2495A/ MA2411B
Temperature Humidity Test Chamber	Juror	TR-4010

- Note: 1. The above equipments are within the valid calibration period.
2. The test antennas (receiving antenna) are calibration per 3 years.
3. The video bandwidth of the power meter and sensor can be up to 65 MHz.



3. Peak Output Power test (FCC 15.407)

3.1 Operating environment

Temperature: 23 °C
 Relative Humidity: 55 %
 Atmospheric Pressure: 1023 hPa

3.2 Test setup & procedure

The power output per FCC §15.407(a) was measured on the EUT using a 50 ohm SMA cable connected to wideband peak power meter via power sensor which the video bandwidth can be up to 65MHz. Power was read directly and cable loss correction (2.0dB) was added to the reading to obtain power at the EUT antenna terminals.

3.3 Limit

Operating Frequency (MHz)	Output power limit
5150~5250	< 50 mW (17 dBm) or 4 dBm+10 log B
5250~5350, 5470~5725	< 250 mW (24 dBm) or 11 dBm+10 log B
5725~5825	< 1 W (30 dBm) or 17 dBm+10 log B

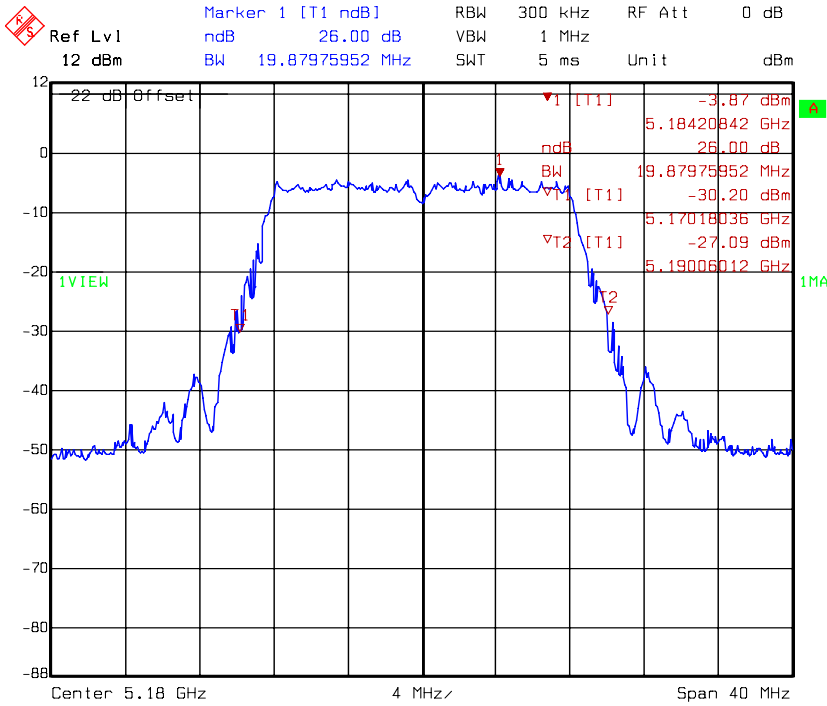
Remark: where B is the -26 dB emission bandwidth in MHz.

3.4 Measured data of Maximum Output Power test results

2Tx

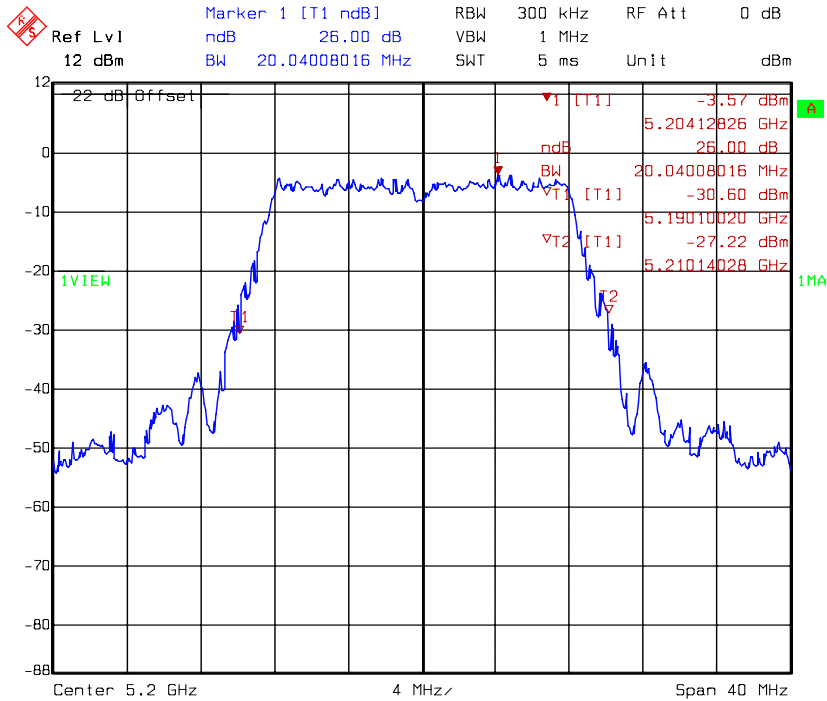
Mode	Channel	Data Rate (Mbps)	Output Power (dBm)		Total Power (PK)		Limit (dBm)
			DAC0	DAC1	mW	dBm	
			PK	PK			
802.11a	36	6	13.02	13.42	42.02	16.23	17
	40		13.33	13.47	43.76	16.41	17
	48		13.47	13.46	44.42	16.48	17
802.11n (HT 20)	36	6.5	13.64	13.22	44.11	16.45	17
	40		13.38	13.41	43.71	16.41	17
	48		13.47	13.42	44.21	16.46	17
802.11n (HT 40)	40	13.5	13.12	13.10	40.93	16.12	17
	44		13.08	12.96	40.09	16.03	17

Chain 0: 26dB Bandwidth @ 802.11a mode channel 36



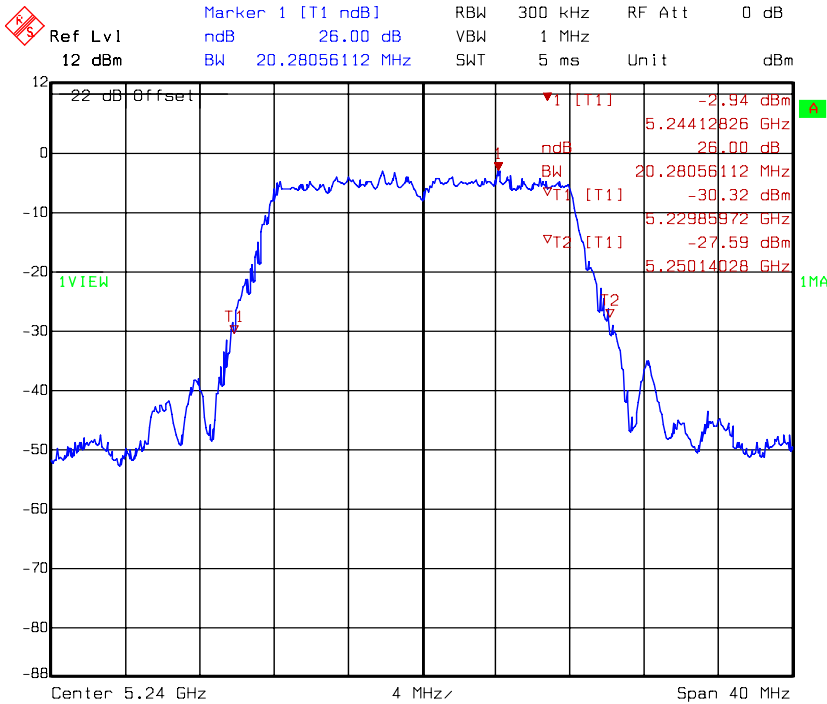
Title: 26dB Bandwidth
 Comment A: CH 36 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:05:01

Chain 0: 26dB Bandwidth @ 802.11a mode channel 40



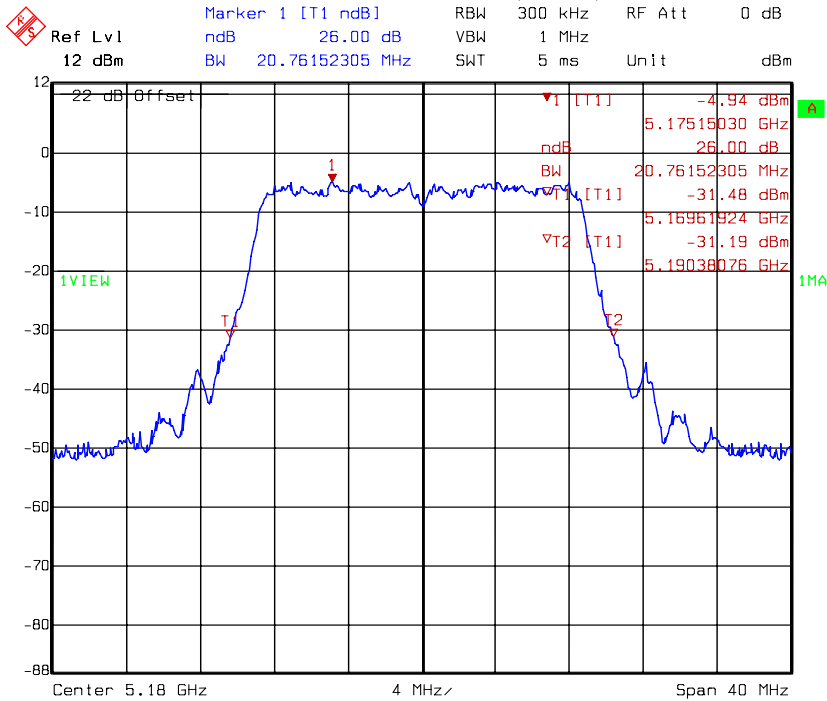
Title: 26dB Bandwidth
 Comment A: CH 40 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:13:11

Chain 0: 26dB Bandwidth @ 802.11a mode channel 48



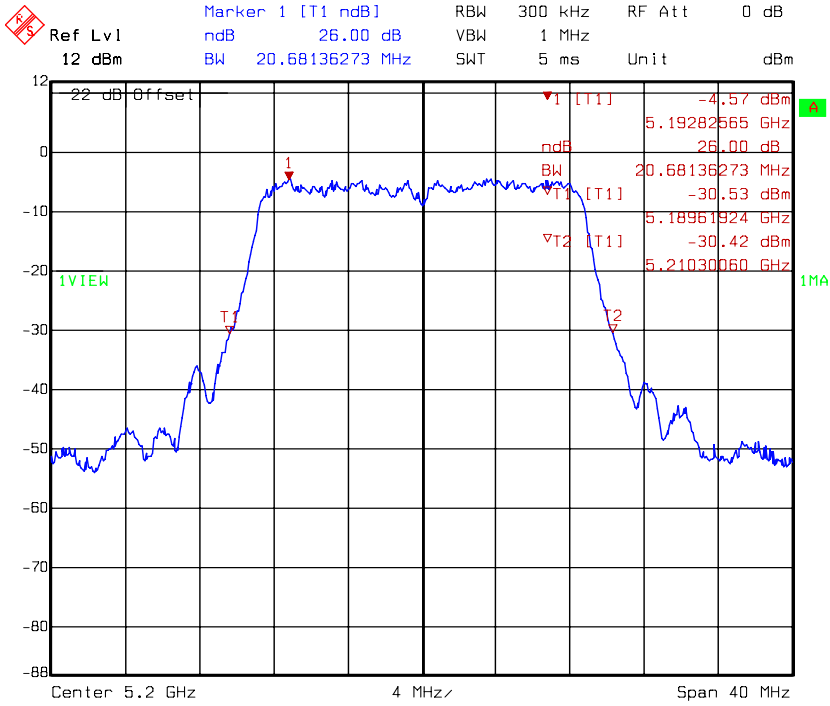
Title: 26dB Bandwidth
 Comment A: CH 48 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:12:32

Chain 0: 26dB Bandwidth @ 802.11n (HT20) mode channel 36



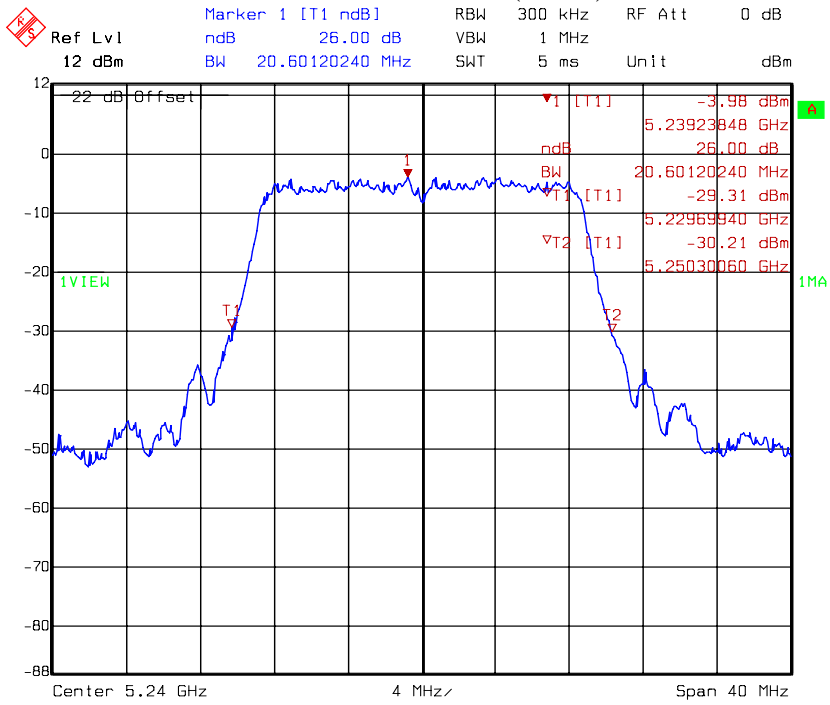
Title: 26dB Bandwidth
 Comment A: 5.180G at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:16:34

Chain 0: 26dB Bandwidth @ 802.11n (HT20) mode channel 40



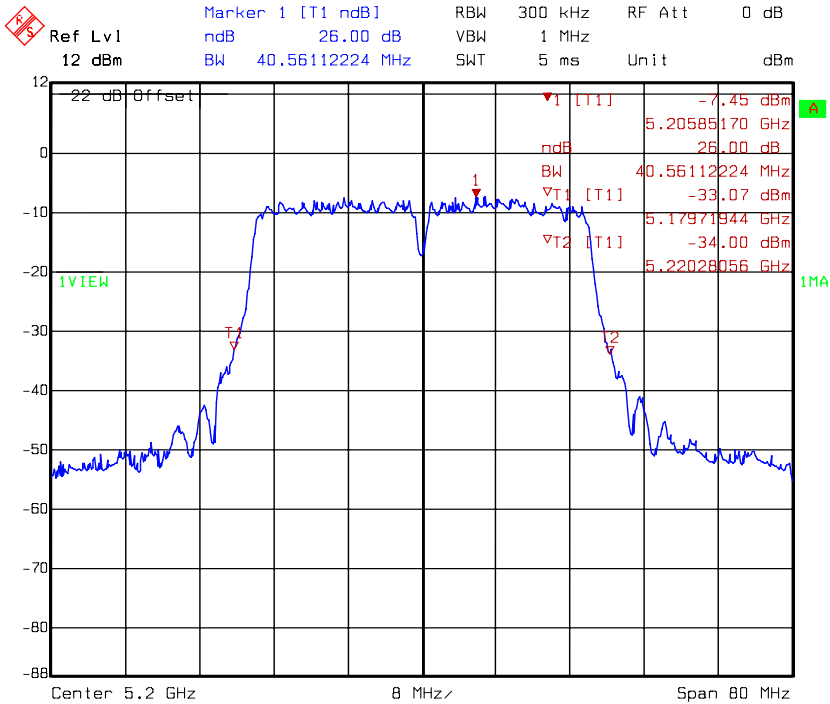
Title: 26dB Bandwidth
 Comment A: 5.200G at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:19:56

Chain 0: 26dB Bandwidth @ 802.11n (HT20) mode channel 48



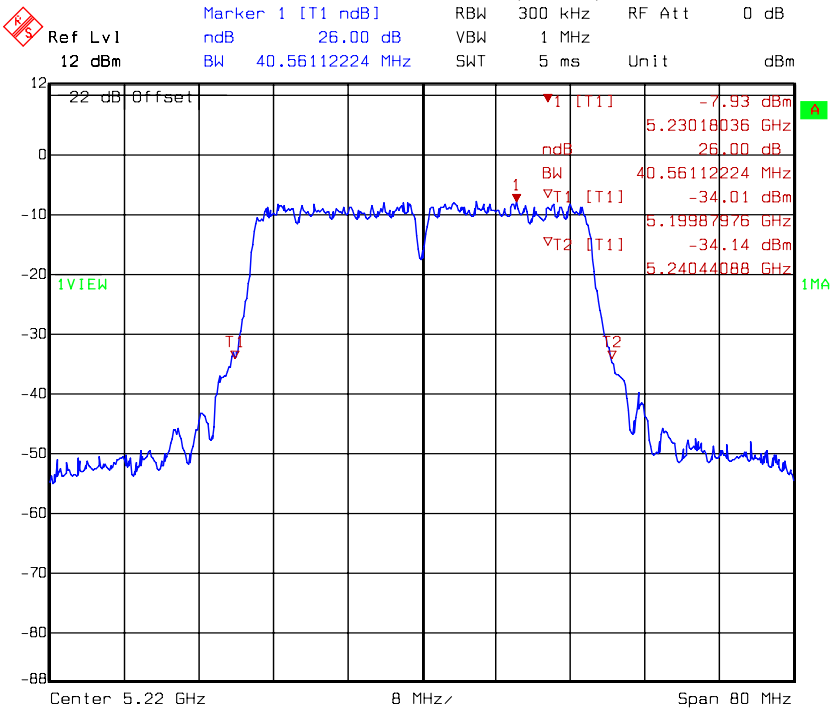
Title: 26dB Bandwidth
 Comment A: 5.240G at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:25:14

Chain 0: 26dB Bandwidth @ 802.11n (HT40) mode channel 40



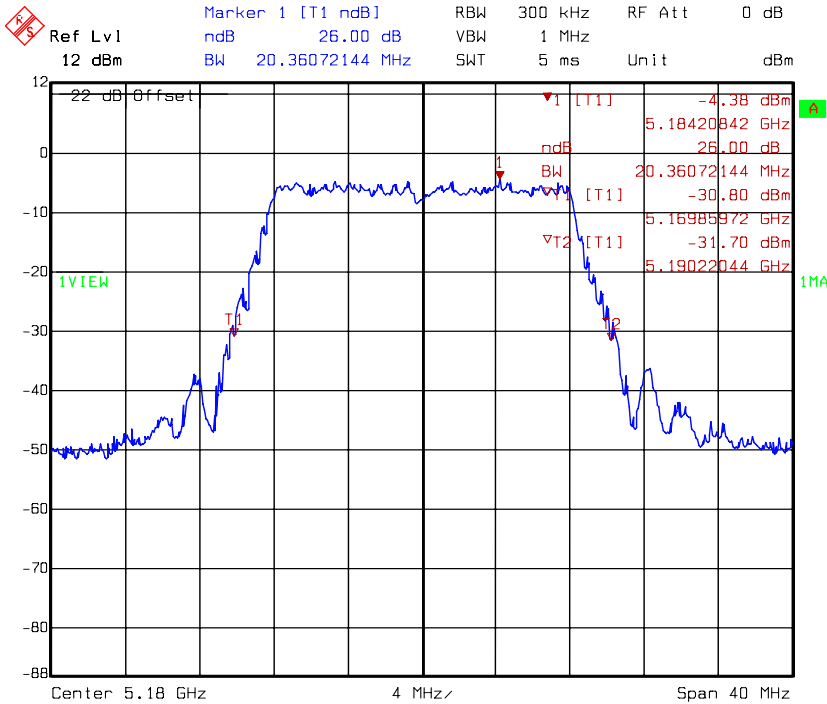
Title: 26dB Bandwidth
 Comment A: 5.2006 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 15:33:08

Chain 0: 26dB Bandwidth @ 802.11n (HT40) mode channel 44



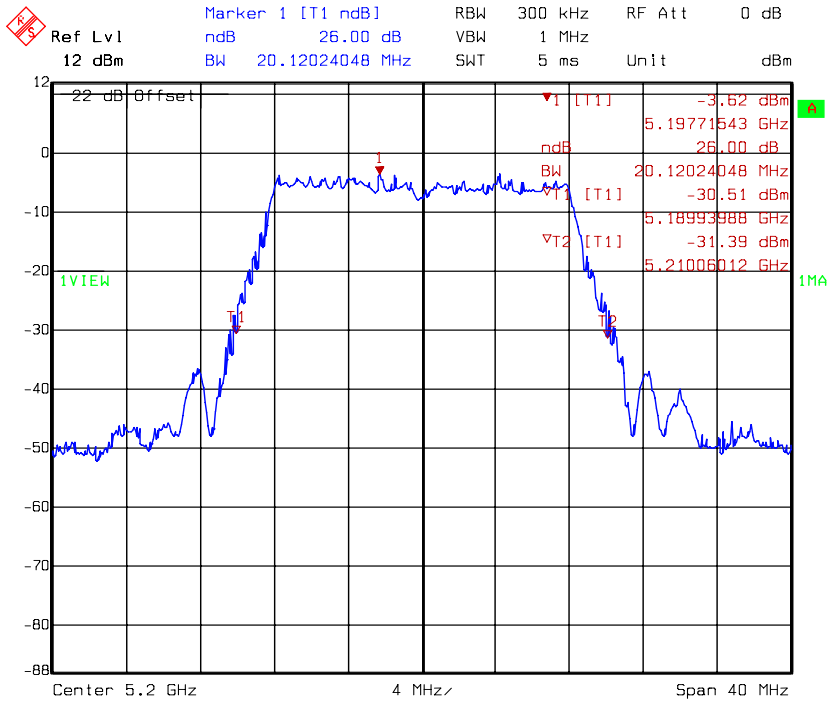
Title: 26dB Bandwidth
 Comment A: 5.2206 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 15:36:02

Chain 1: 26dB Bandwidth @ 802.11a mode channel 36



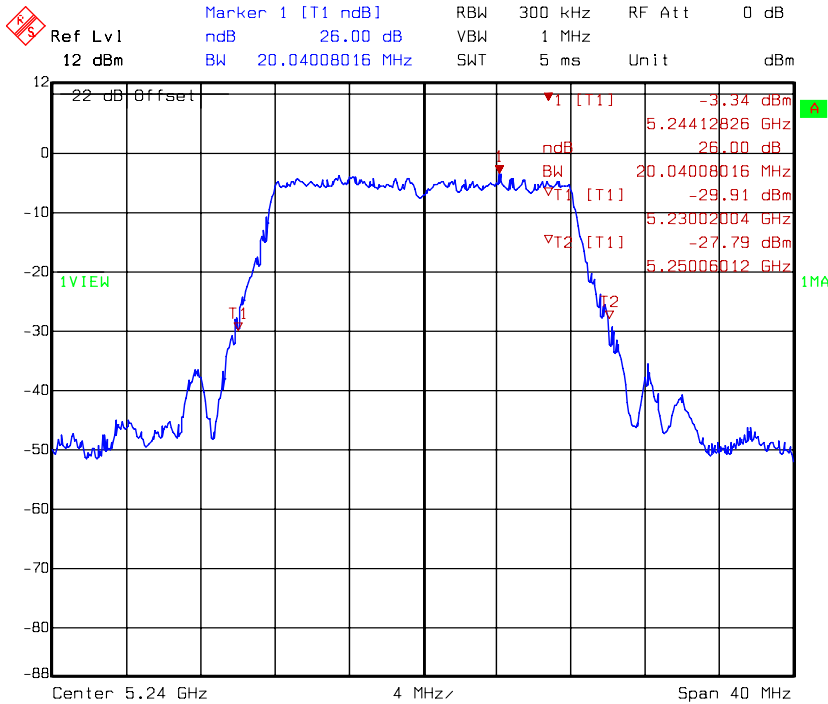
Title: 26dB Bandwidth
 Comment A: CH 36 at 802.11a mode DAC1
 Date: 24.NOV.2009 16:13:08

Chain 1: 26dB Bandwidth @ 802.11a mode channel 40



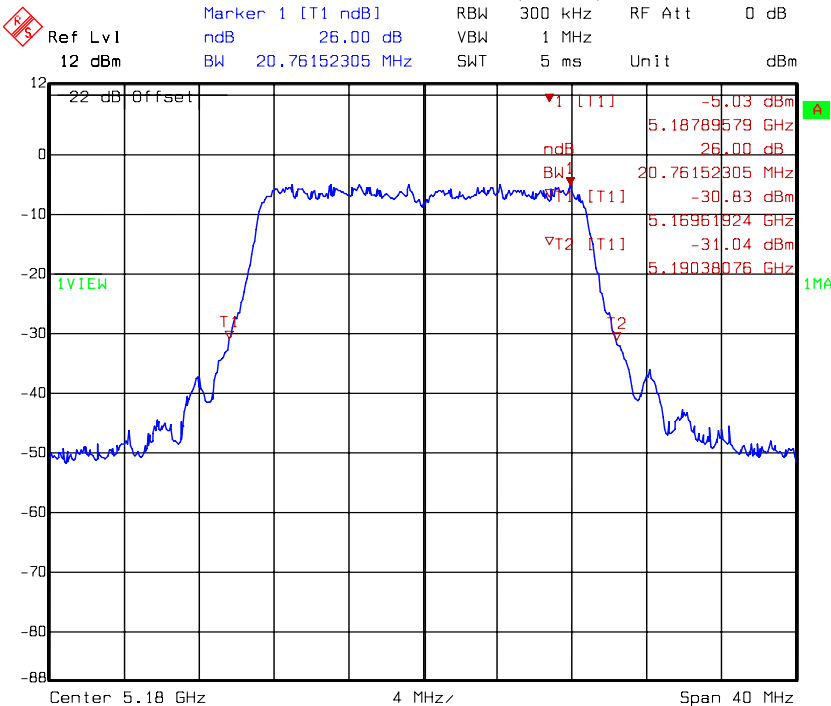
Title: 26dB Bandwidth
 Comment A: CH 40 at 802.11a mode DAC1
 Date: 24.NOV.2009 16:17:35

Chain 1: 26dB Bandwidth @ 802.11a mode channel 48



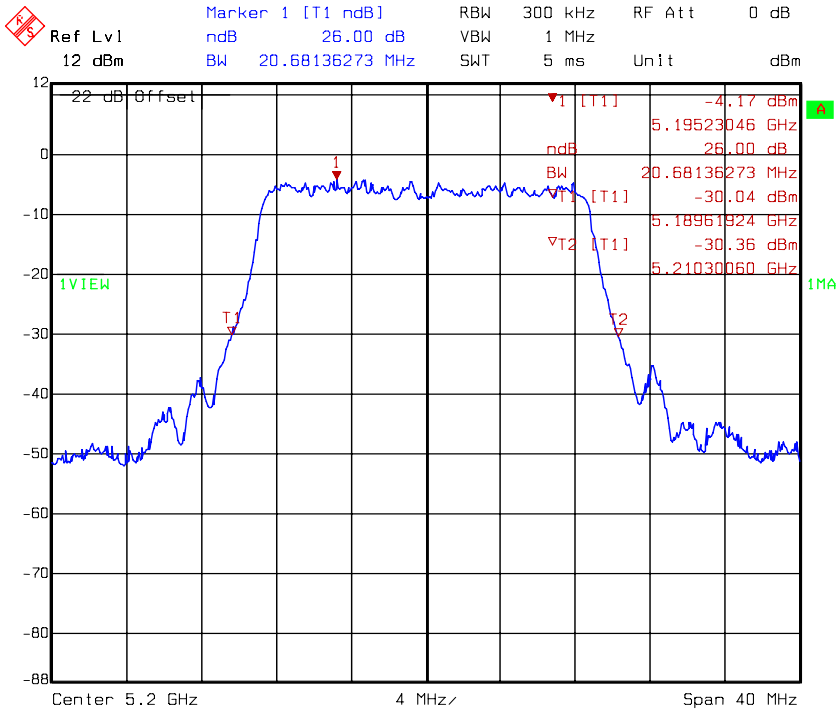
Title: 26dB Bandwidth
 Comment A: CH 48 at 802.11a mode DAC1
 Date: 24.NOV.2009 16:22:31

Chain 1: 26dB Bandwidth @ 802.11n (HT20) mode channel 36



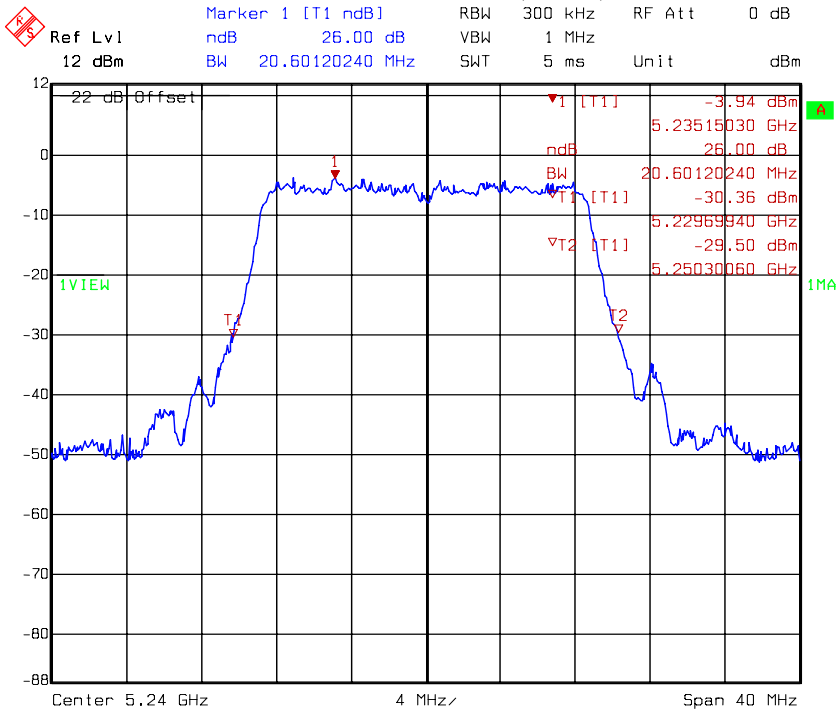
Title: 26dB Bandwidth
 Comment A: 5.1806 at 802.11n mode HT20 DAC1
 Date: 24.NOV.2009 15:52:15

Chain 1: 26dB Bandwidth @ 802.11n (HT20) mode channel 40



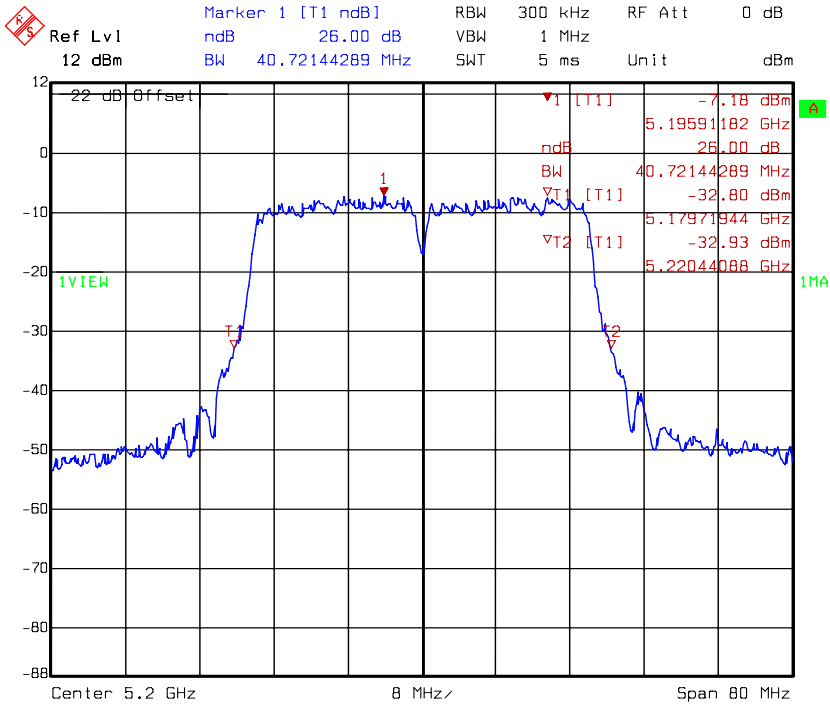
Title: 26dB Bandwidth
 Comment A: 5.2006 at 802.11n mode HT20 DAC1
 Date: 24.NOV.2009 16:00:04

Chain 1: 26dB Bandwidth @ 802.11n (HT20) mode channel 48



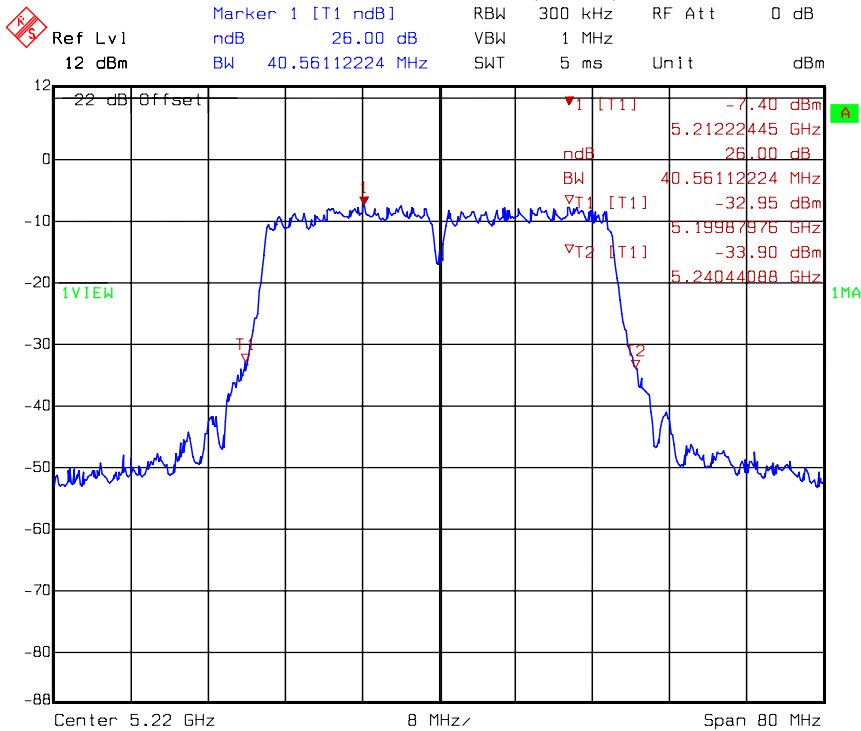
Title: 26dB Bandwidth
 Comment A: 5.2406 at 802.11n mode HT20 DAC1
 Date: 24.NOV.2009 16:04:51

Chain 1: 26dB Bandwidth @ 802.11n (HT40) mode channel 40



Title: 26dB Bandwidth
 Comment A: 5.2006 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:47:08

Chain 1: 26dB Bandwidth @ 802.11n (HT40) mode channel 44



Title: 26dB Bandwidth
 Comment A: 5.2206 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:41:42

4. Power Spectrum Density test (FCC 15.407)

4.1 Operating environment

Temperature: 23 °C
 Relative Humidity: 55 %
 Atmospheric Pressure: 1023 hPa

4.2 Test setup & procedure

The power spectrum 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. Power spectrum density was read directly and cable loss (2.0 dB) correction was added to the reading to obtain power at the EUT antenna terminals.

4.3 Limitation

Operating Frequency (MHz)	Power density limit
5150~5250	< 4 dBm/MHz
5250~5350, 5470~5725	< 11 dBm/MHz
5725~5825	< 17 dBm/MHz

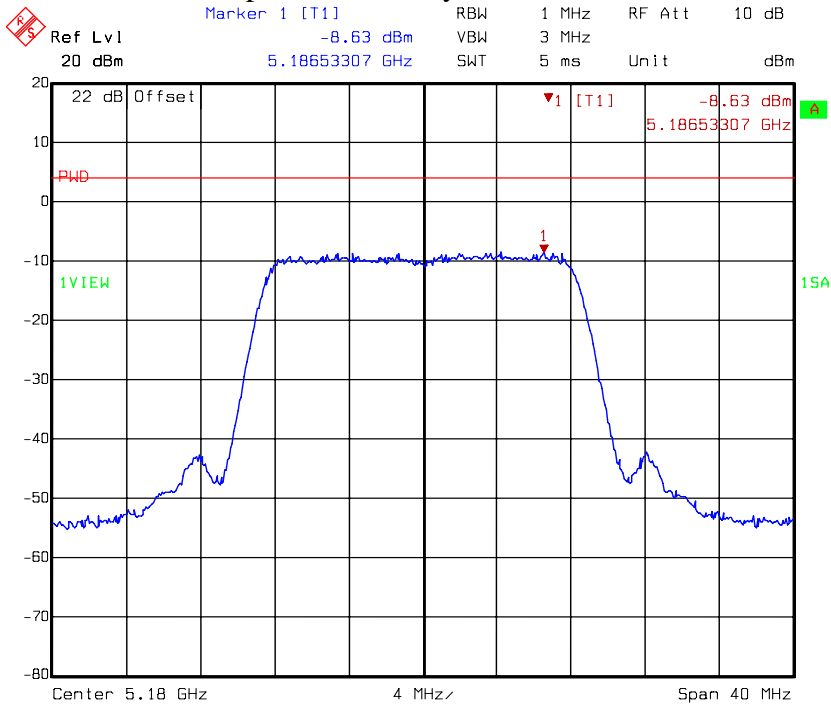
4.4 Measured data of Power Spectrum Density test results

2TX

Mode	Channel	Data rate Mbps	PSD (dBm)		Total PSD		Limit (dBm)
			DAC0	DAC1	mW	dBm	
802.11a	36	6	-8.63	-8.84	0.27	-5.72	4
	40		-8.23	-8.02	0.31	-5.11	4
	48		-7.75	-8.07	0.32	-4.90	4
802.11n (HT 20)	36	6.5	-8.63	-9.14	0.26	-5.87	4
	40		-8.51	-8.21	0.29	-5.35	4
	48		-8.22	-8.45	0.29	-5.32	4
802.11n (HT 40)	40	13.5	-11.43	-11.65	0.14	-8.53	4
	44		-11.81	-11.5	0.14	-8.64	4

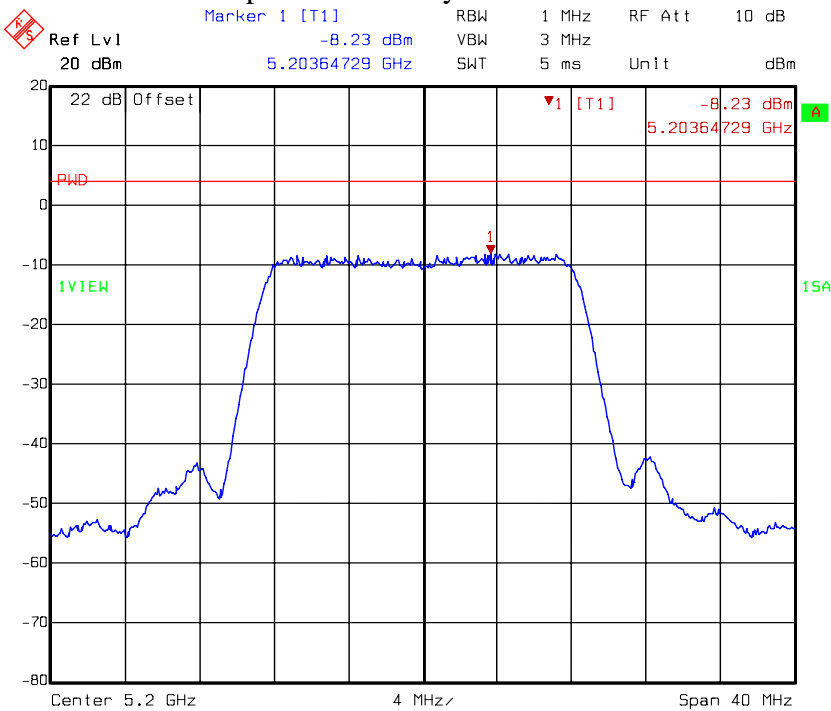
Please see the plot below.

Chain 0: Power Spectrum Density @ 802.11a mode channel 36



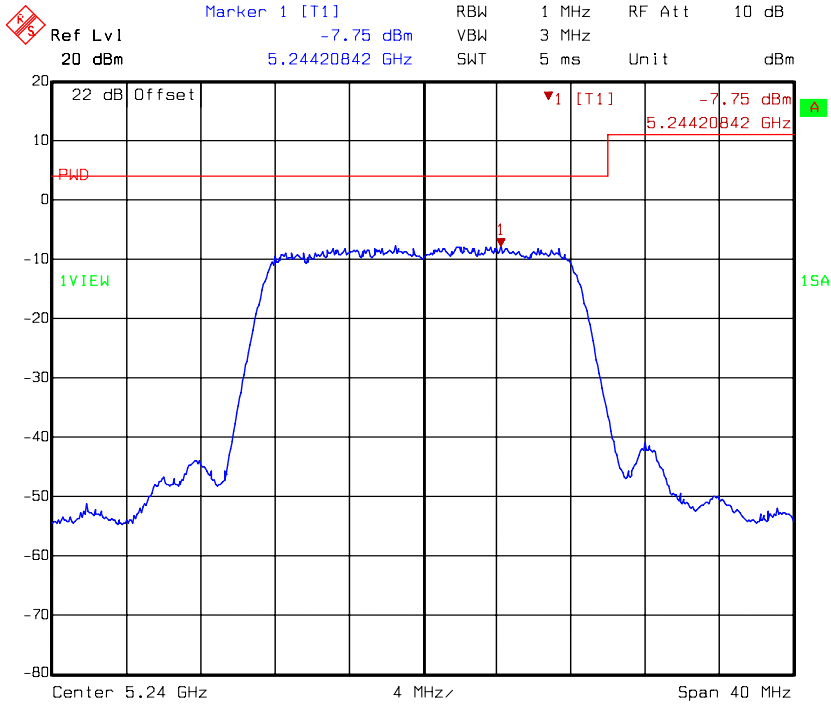
Title: Power Density
 Comment A: CH 36 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:06:28

Chain 0: Power Spectrum Density @ 802.11a mode channel 40



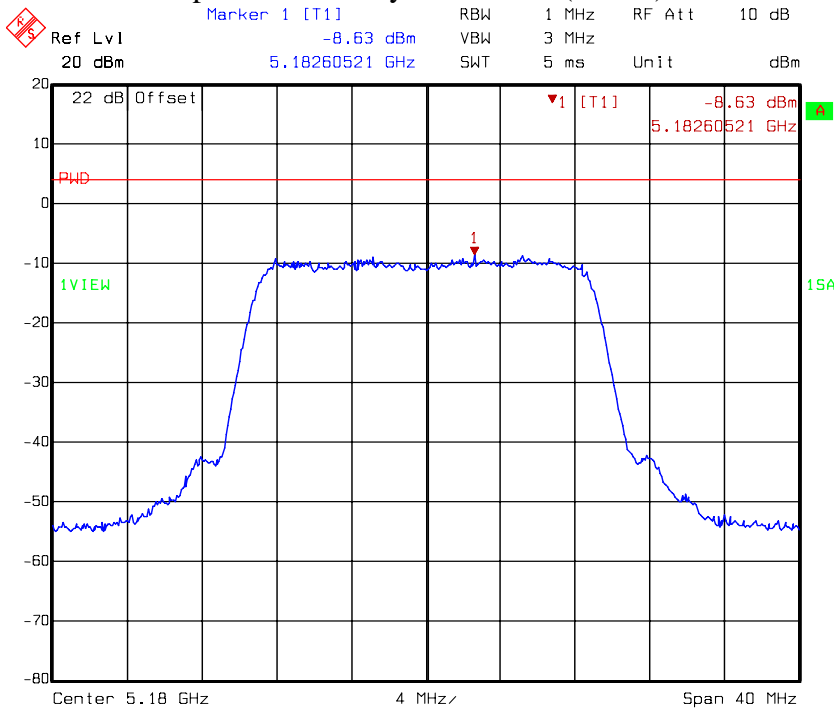
Title: Power Density
 Comment A: CH 40 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:09:05

Chain 0: Power Spectrum Density @ 802.11a mode channel 48



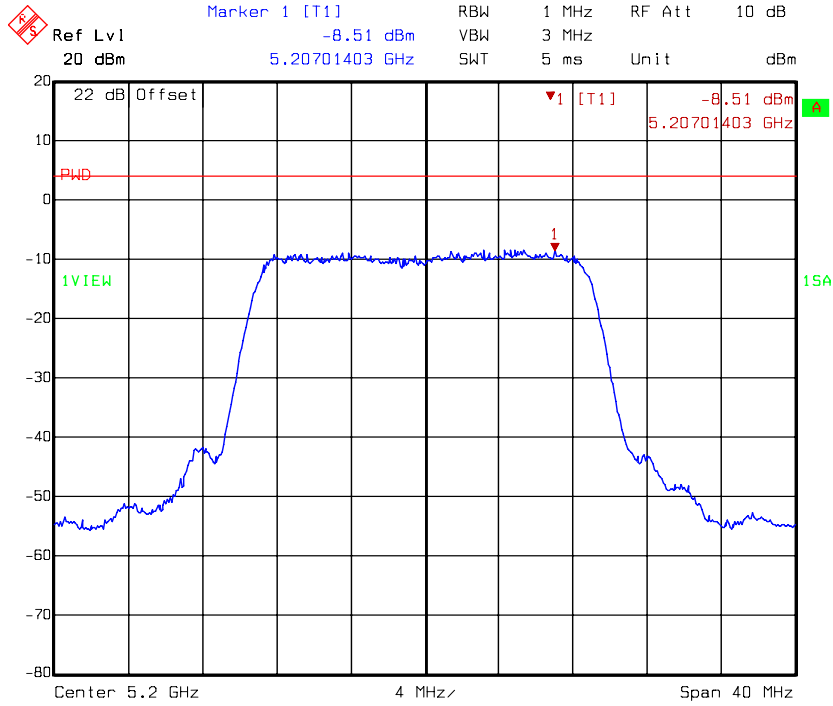
Title: Power Density
 Comment A: CH 48 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:11:03

Chain 0: Power Spectrum Density @ 802.11n (HT 20) mode channel 36



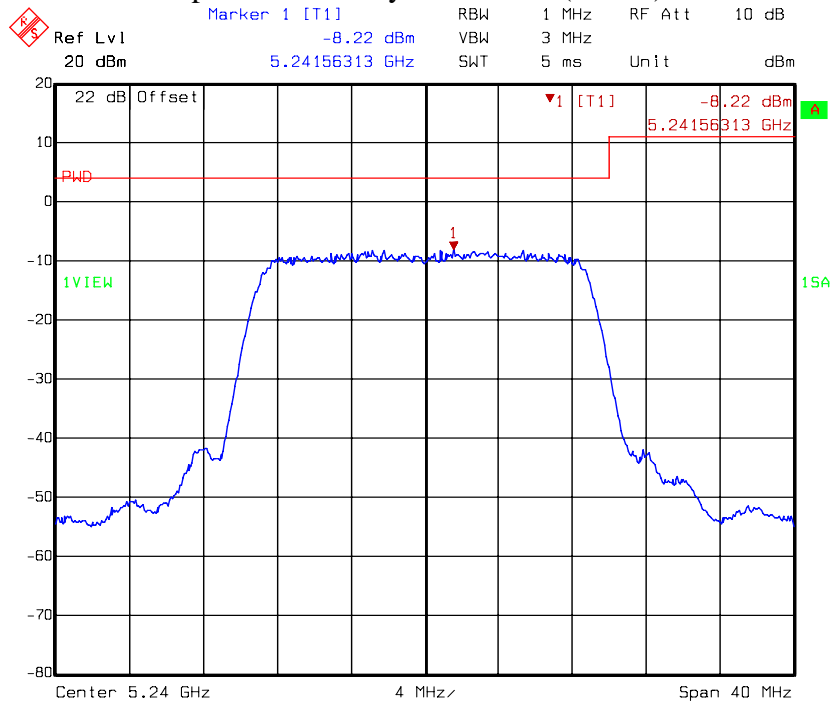
Title: Power Density
 Comment A: 5.1806 at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:18:05

Chain 0: Power Spectrum Density @ 802.11n (HT 20) mode channel 40



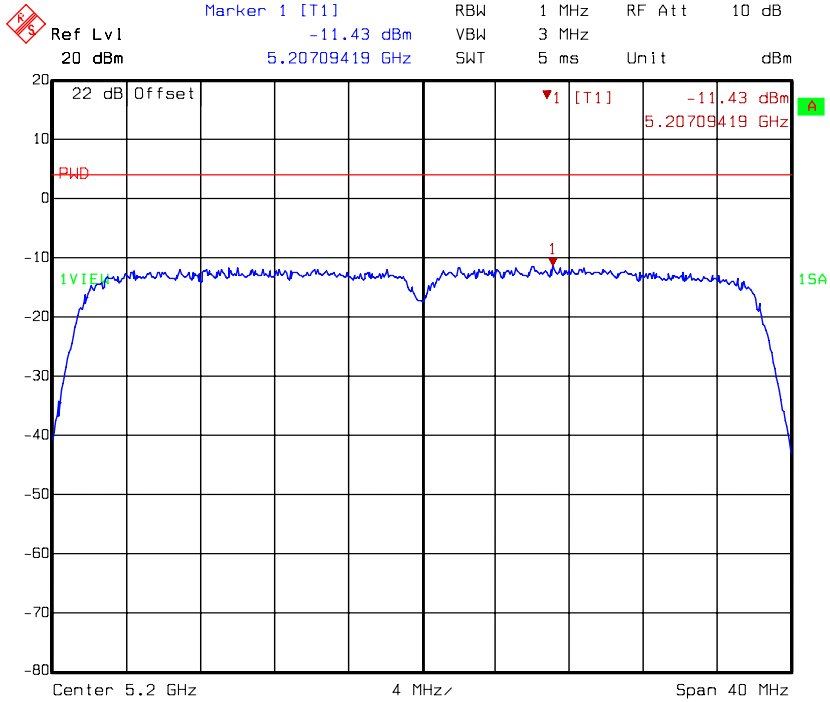
Title: Power Density
 Comment A: 5.2006 at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:21:27

Chain 0: Power Spectrum Density @ 802.11n (HT 20) mode channel 48



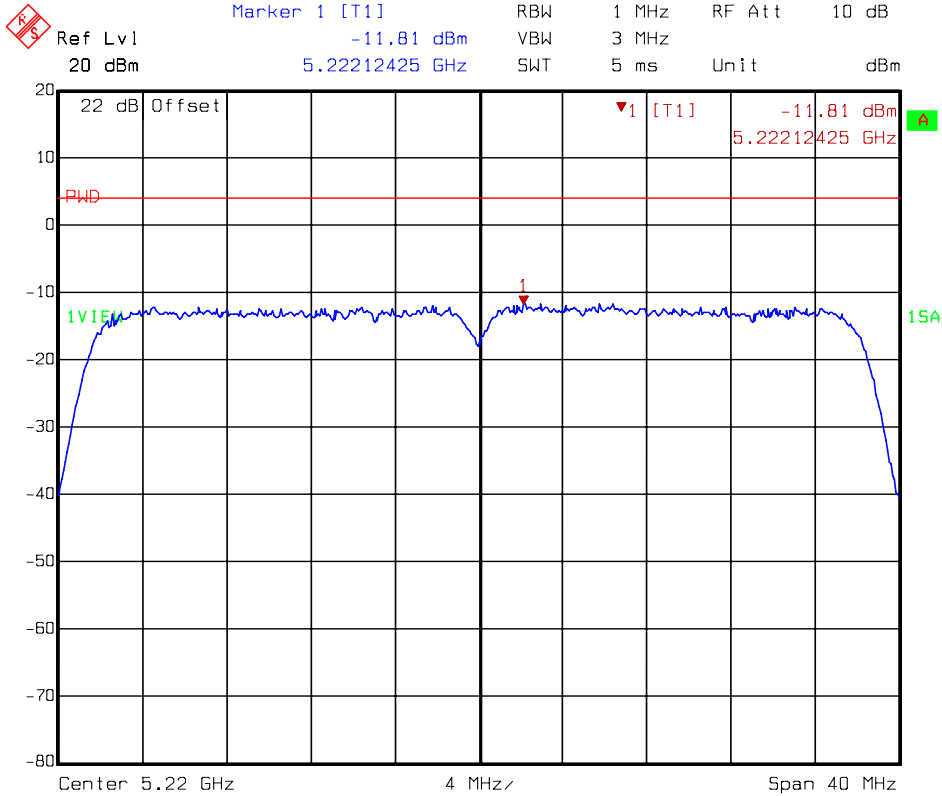
Title: Power Density
 Comment A: 5.2406 at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:26:44

Chain 0: Power Spectrum Density @ 802.11n (HT 40) mode channel 40



Title: Power Density
 Comment A: 5.2006 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 15:34:40

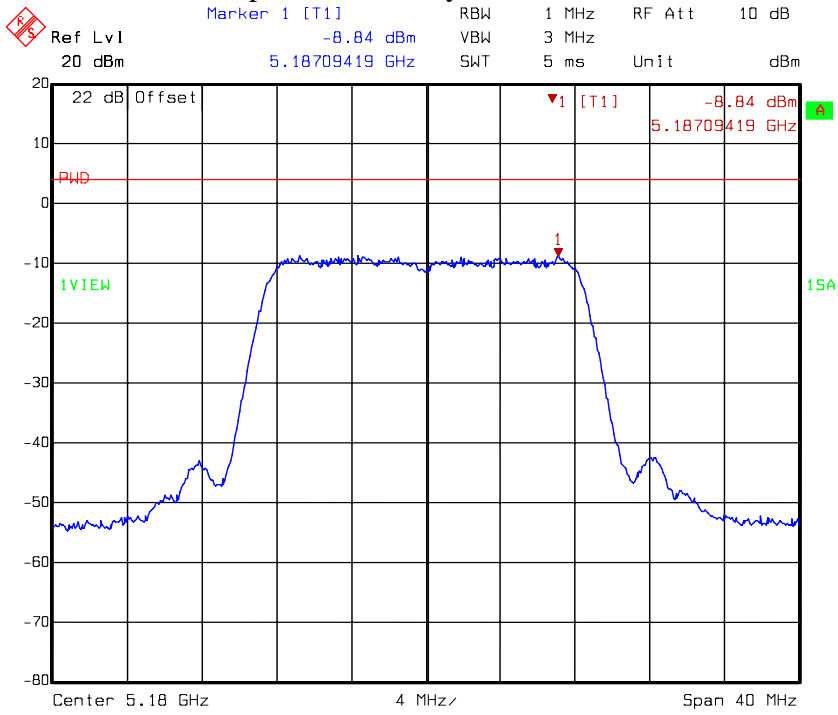
Chain 0: Power Spectrum Density @ 802.11n (HT 40) mode channel 44



Title: Power Density
 Comment A: 5.2206 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 15:37:33

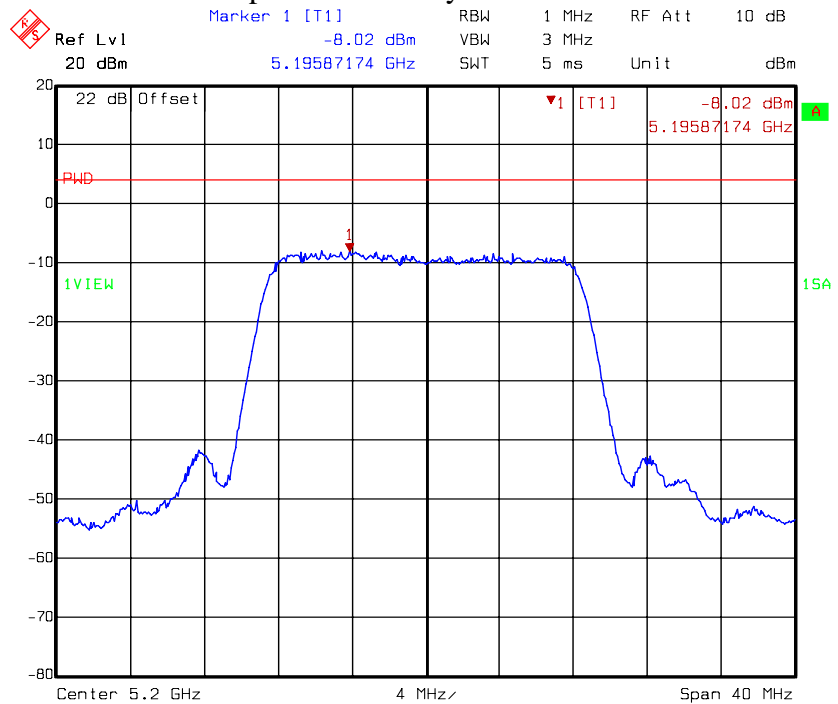


Chain 1: Power Spectrum Density @ 802.11a mode channel 36



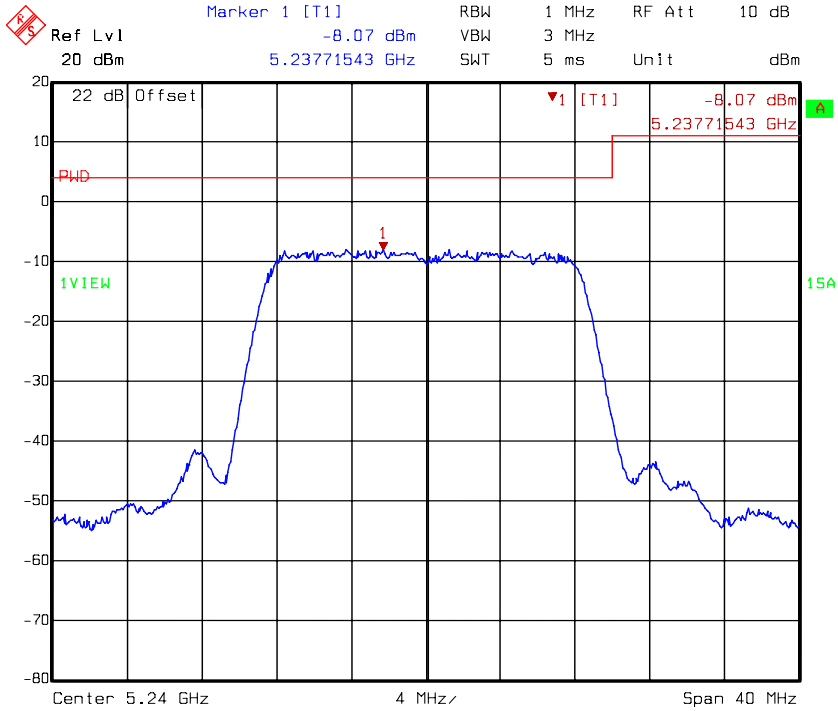
Title: Power Density
Comment A: CH 36 at 802.11a mode DAC1
Date: 24.NOV.2009 16:14:39

Chain 1: Power Spectrum Density @ 802.11a mode channel 40



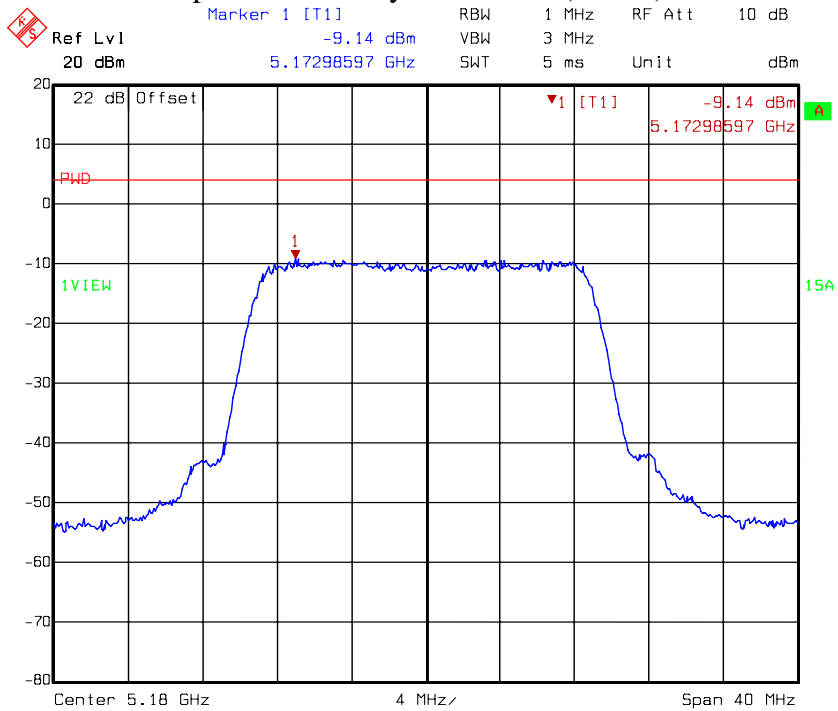
Title: Power Density
Comment A: CH 40 at 802.11a mode DAC1
Date: 24.NOV.2009 16:19:05

Chain 1: Power Spectrum Density @ 802.11a mode channel 48



Title: Power Density
 Comment A: CH 48 at 802.11a mode DAC1
 Date: 24.NOV.2009 16:24:02

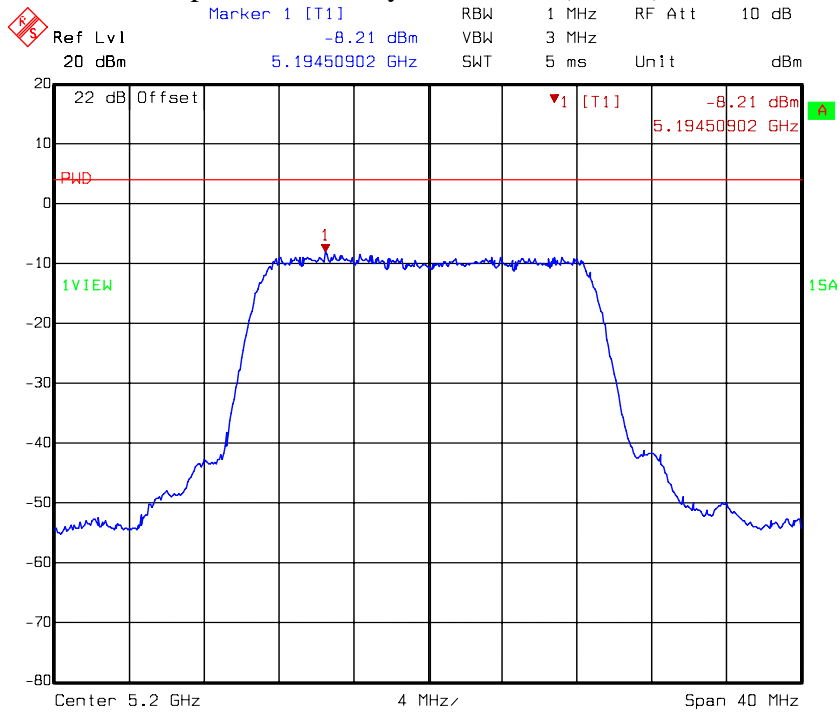
Chain 1: Power Spectrum Density @ 802.11n (HT 20) mode channel 36



Title: Power Density
 Comment A: 5.1806 at 802.11n mode HT20 DAC1
 Date: 24.NOV.2009 15:53:46

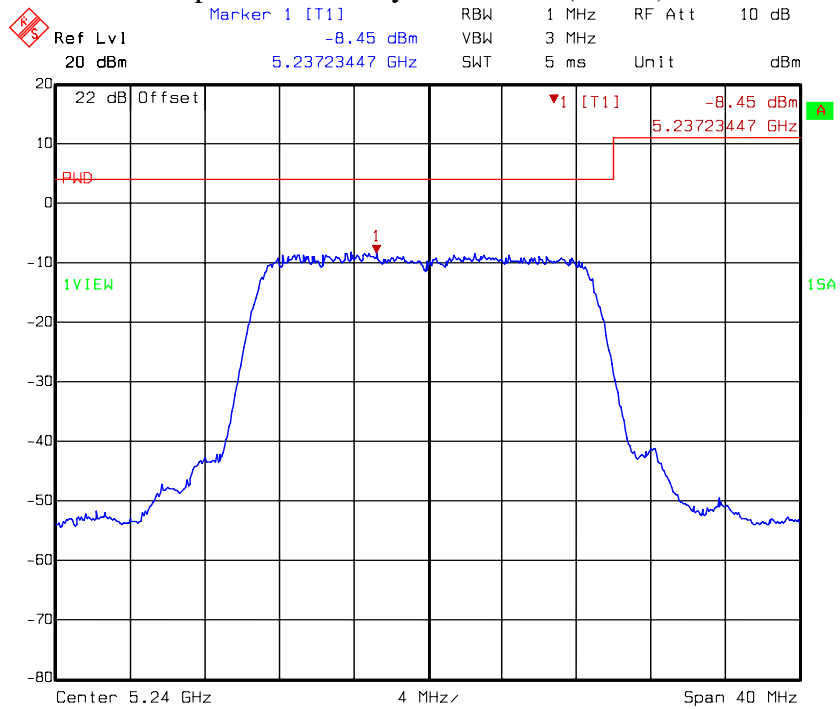


Chain 1: Power Spectrum Density @ 802.11n (HT 20) mode channel 40



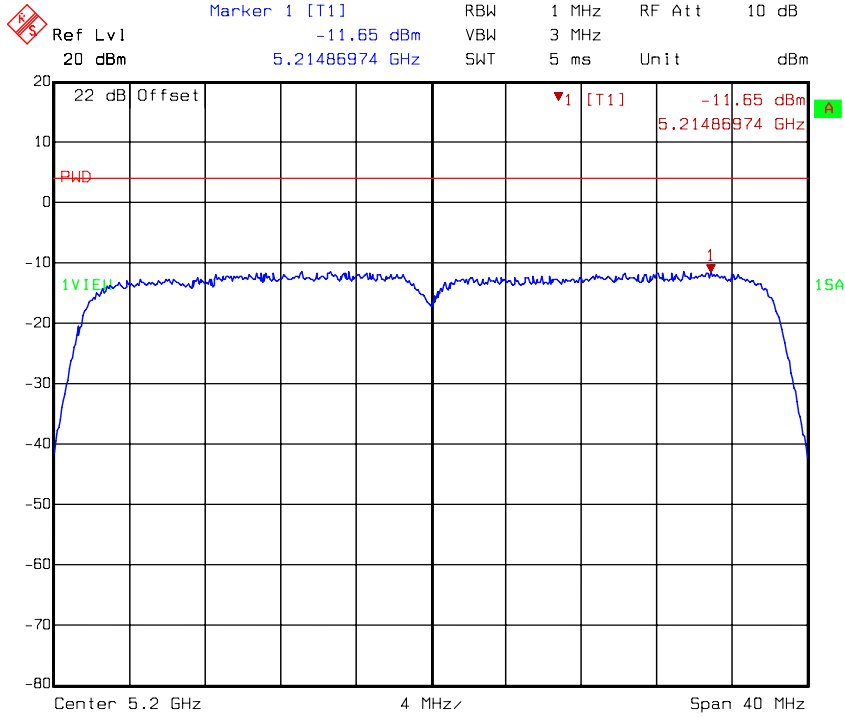
Title: Power Density
Comment A: 5.2006 at 802.11n mode HT20 DAC1
Date: 24.NOV.2009 16:01:38

Chain 1: Power Spectrum Density @ 802.11n (HT 20) mode channel 48



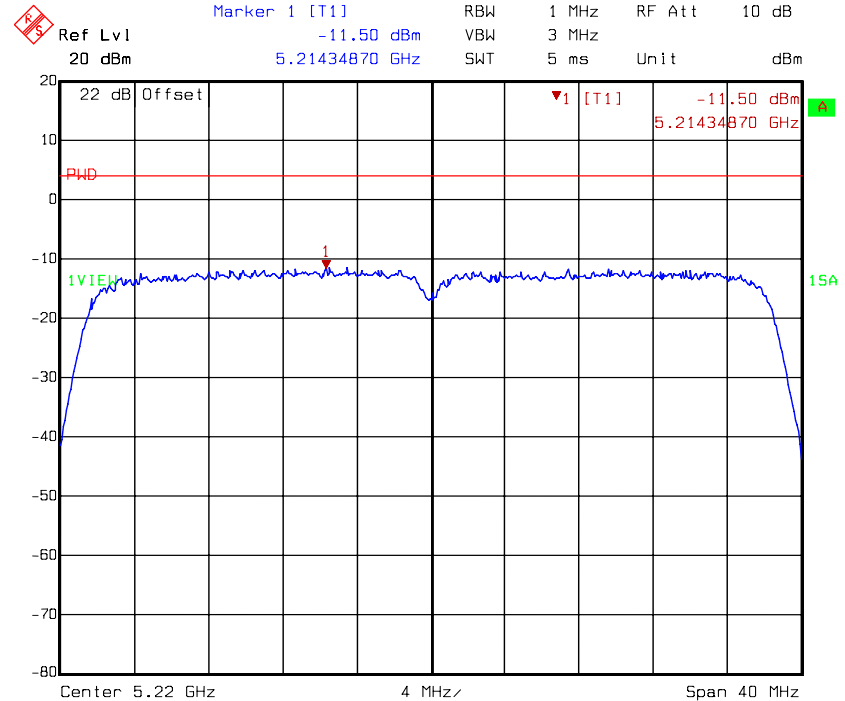
Title: Power Density
Comment A: 5.2406 at 802.11n mode HT20 DAC1
Date: 24.NOV.2009 16:06:22

Chain 1: Power Spectrum Density @ 802.11n (HT 40) mode channel 40



Title: Power Density
 Comment A: 5.2006 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:48:39

Chain 1: Power Spectrum Density @ 802.11n (HT 40) mode channel 44



Title: Power Density
 Comment A: 5.2206 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:43:50

5. Additional provisions test (FCC 15.215)

5.1 Operating environment

Temperature:	25	°C
Relative Humidity:	50	%
Atmospheric Pressure:	1023	hPa

5.2 Procedure of test setup & limitation

The additional provisions mean the device must be designed to ensure that the 20dB bandwidth of the emission or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

This requirement per FCC §15.215 (c) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 300kHz (approximately 1% of the emission bandwidth), the video bandwidth set at 1MHz (VBW > RBW).

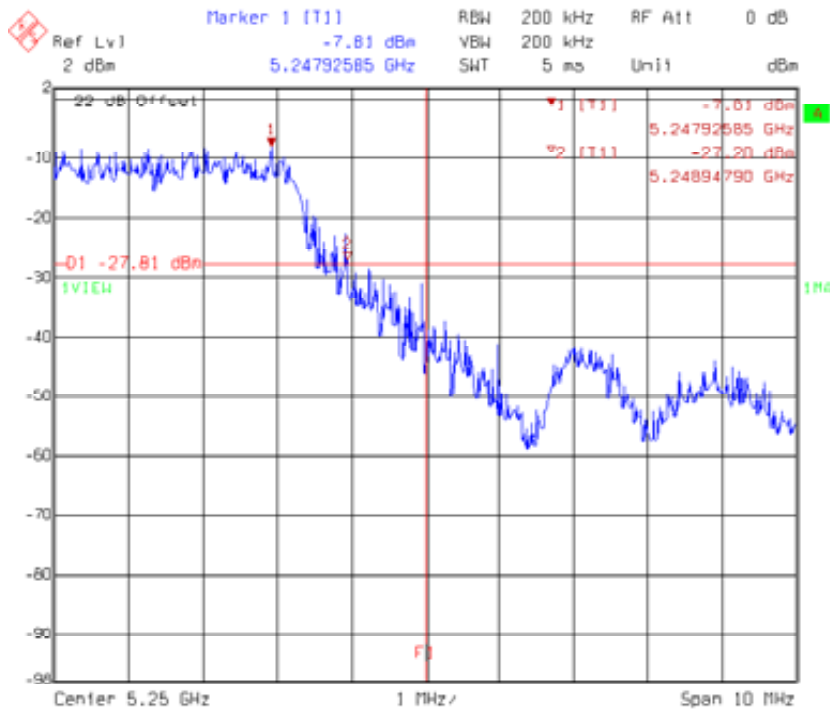
5.3 Measured data of test results

Chain 0: 802.11a mode channel 48



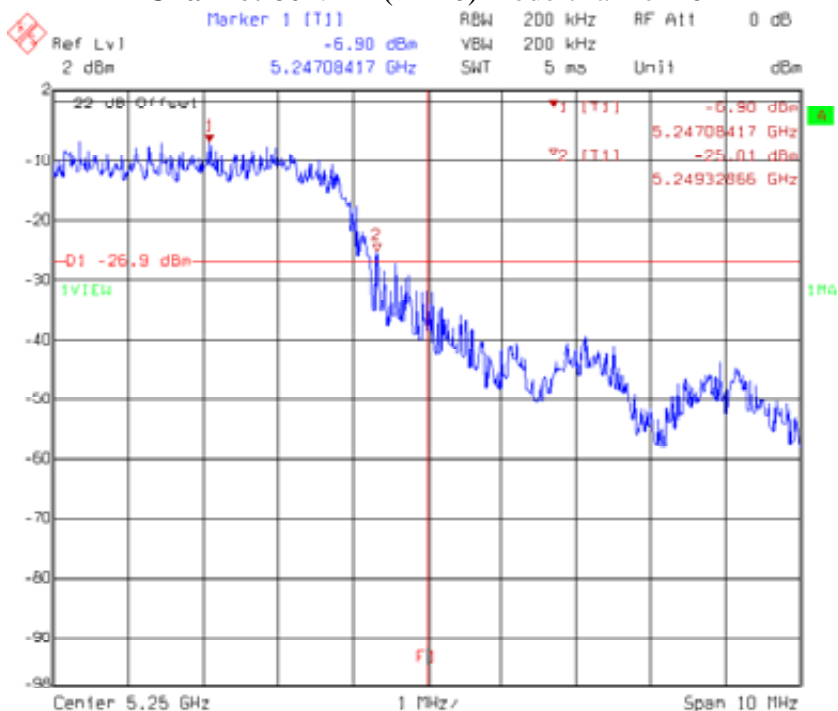
Title: FCC 15.215(C)
 Comment A: 11a ch48 DAC0
 Date: 02.DEC.2009 09:32:15

Chain 1: 802.11a mode channel 48



Title: FCC 15.215(C)
 Comment A: 11a ch48 DAC1
 Date: 02.DEC.2009 09:41:49

Chain 0: 802.11n (HT20) mode channel 48



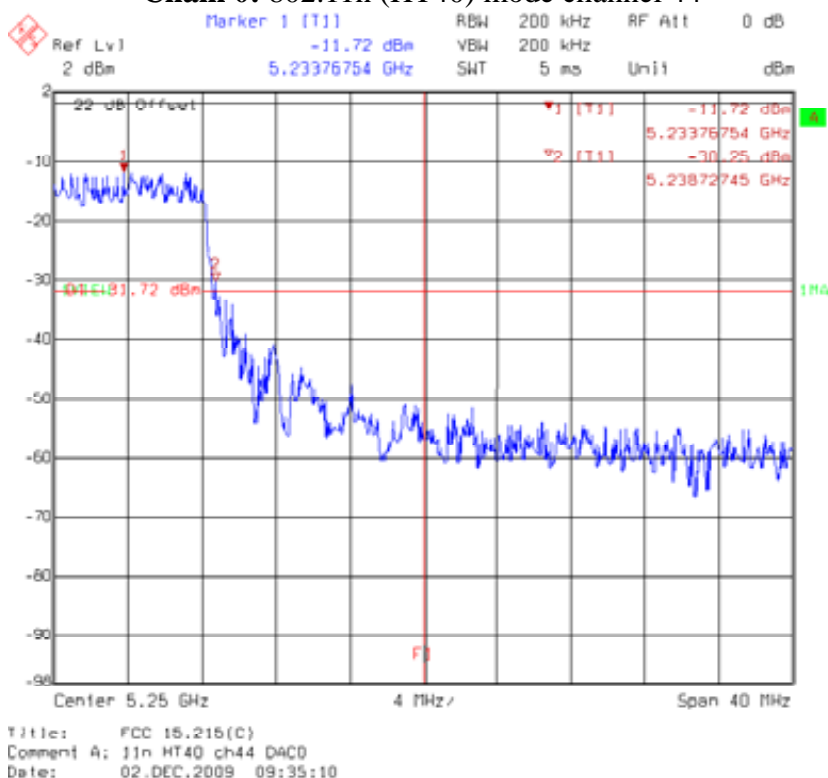
Title: FCC 15.215(C)
 Comment A: 11n HT20 ch48 DAC0
 Date: 02.DEC.2009 09:30:40

Chain 1: 802.11n (HT20) mode channel 48

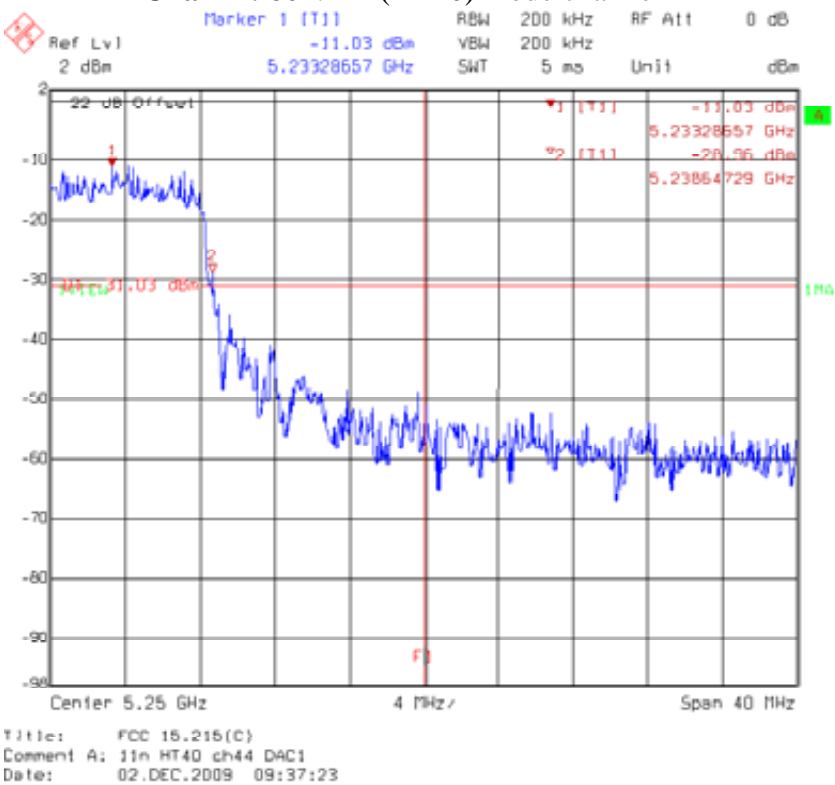


Title: FCC 15.215(C)
 Comment A: 11n HT20 ch48 DAC1
 Date: 02.DEC.2009 09:40:13

Chain 0: 802.11n (HT40) mode channel 44



Chain 1: 802.11n (HT40) mode channel 44



6. Peak excursion to average ratio test (FCC 15.407)

6.1 Operating environment

Temperature: 23 °C
 Relative Humidity: 55 %
 Atmospheric Pressure: 1023 hPa

6.2 Test setup & procedure

The power spectrum density per FCC §15.407(a)(6) was measured from the antenna port of the EUT. Using a 50ohm spectrum analyzer with the RBW=1MHz, VBW=3MHz for peak measurement and RBW=1MHz, VBW=10kHz for average measurement. Peak excursion to average ratio was read directly.

6.3 Limitation

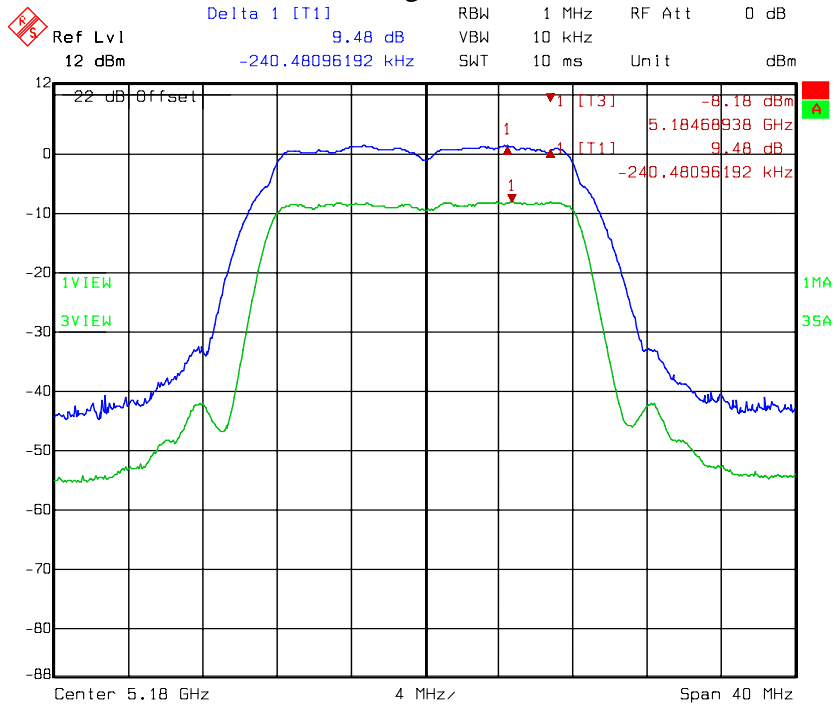
Operating Frequency (MHz)	Peak excursion to average ratio limit
5150~5250	<13dB
5250~5350, 5470~5725	<13dB
5725~5825	<13dB

6.4 Measured data of Peak excursion to average ratio test results

Mode	Channel	Data rate Mbps	PK Excursion (dBm)		Limit (dBm)
			DAC0	DAC1	
802.11a	36	6	9.48	9.49	13
	40		9.42	9.3	13
	48		9.41	9.45	13
802.11n (HT 20)	36	6.5	9.5	9.57	13
	40		9.55	9.47	13
	48		9.73	9.51	13
802.11n (HT 40)	40	13.5	9.47	9.55	13
	44		9.59	9.62	13

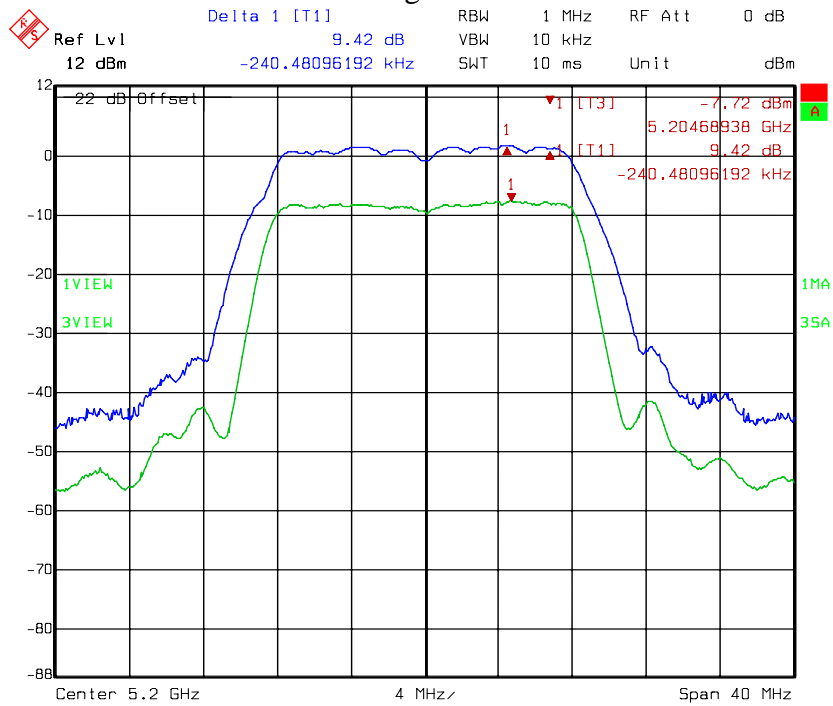
Please see the plot below.

Chain 0: Peak excursion to average ratio @ 802.11a mode channel 36



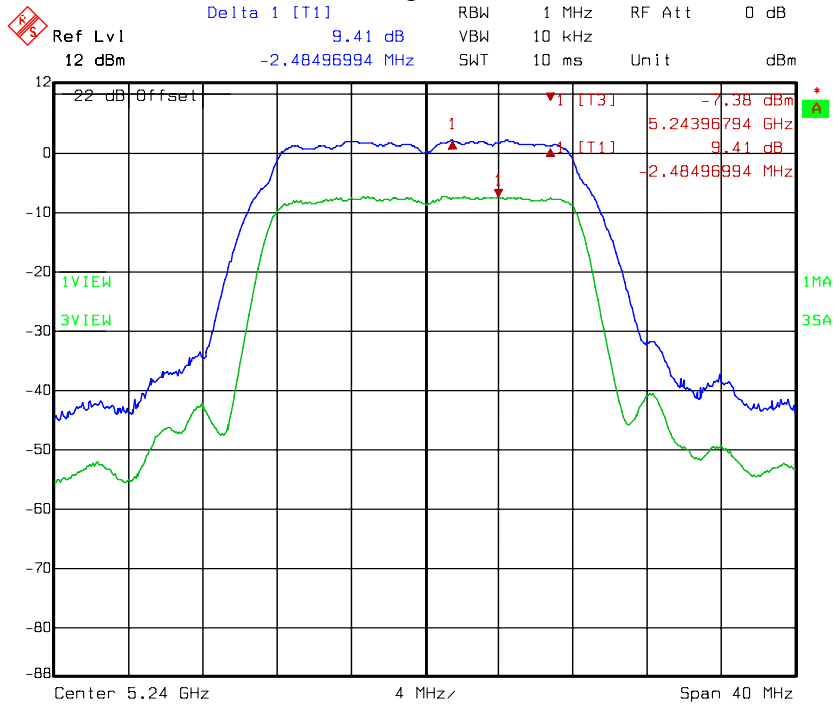
Title: PK Excursion AV
 Comment A: CH 36 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:06:05

Chain 0: Peak excursion to average ratio @ 802.11a mode channel 40



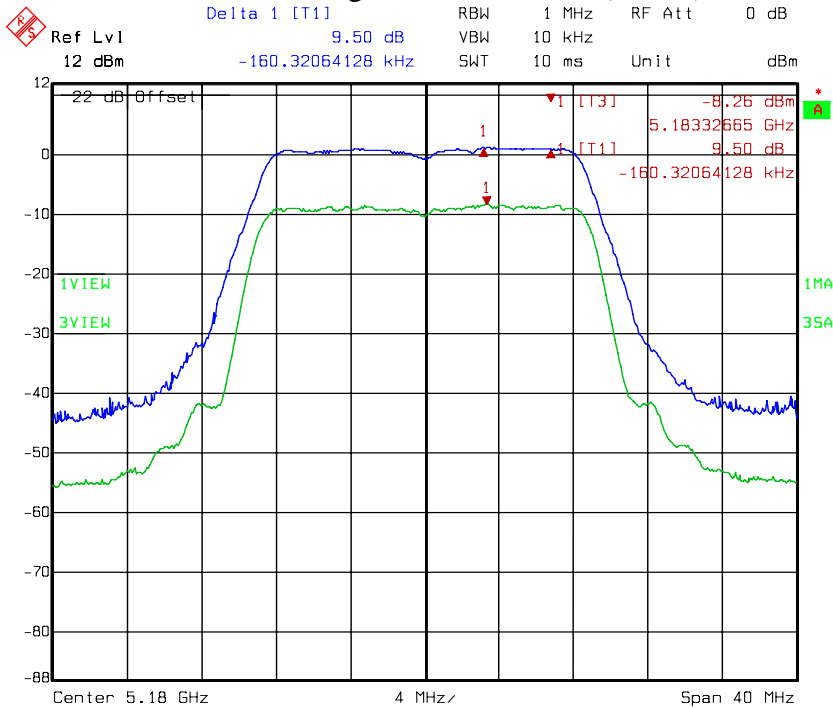
Title: PK Excursion AV
 Comment A: CH 40 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:08:42

Chain 0: Peak excursion to average ratio @ 802.11a mode channel 48



Title: PK Excursion AV
 Comment A: CH 48 at 802.11a mode DAC0
 Date: 24.NOV.2009 15:10:39

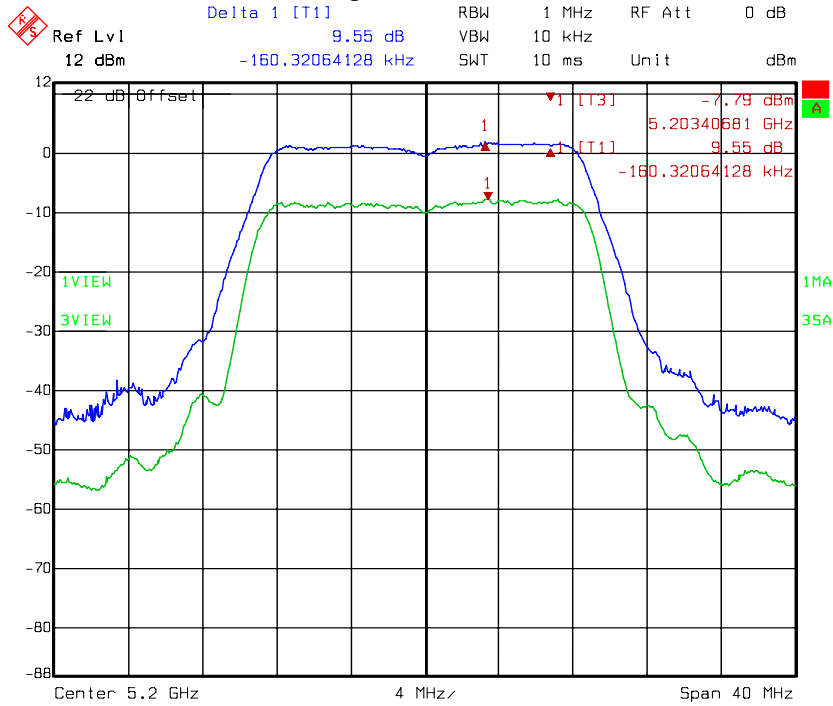
Chain 0: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 36



Title: PK Excursion AV
 Comment A: 5.1806 at 802.11n mode HT20 DAC0
 Date: 24.NOV.2009 15:17:41

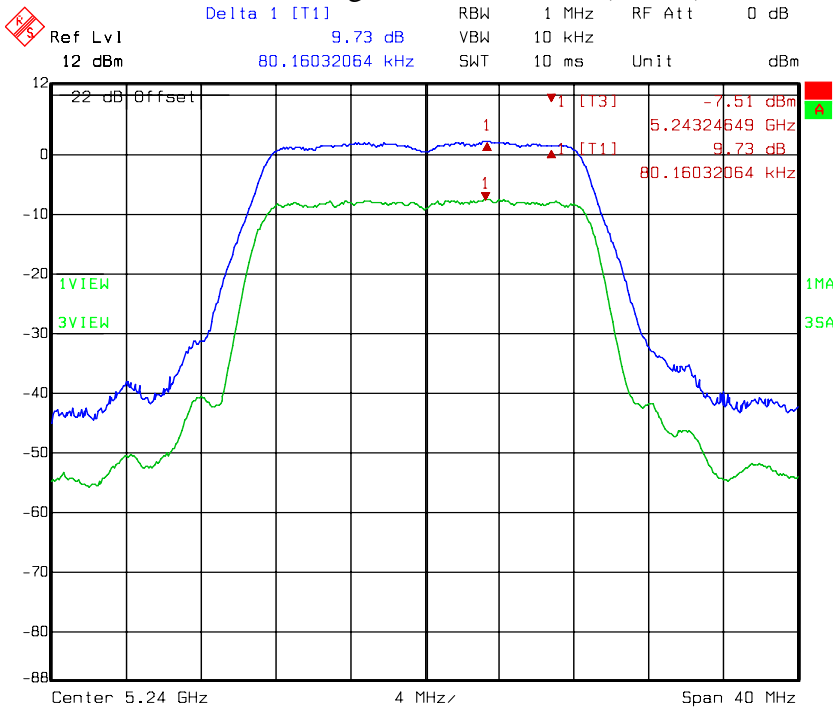


Chain 0: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 40



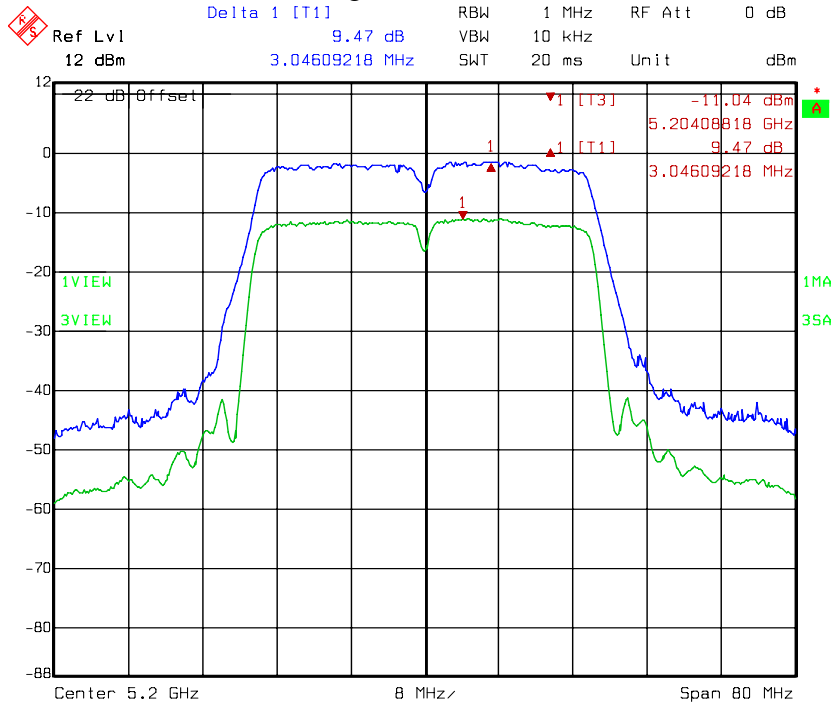
Title: PK Excursion AV
Comment A: 5.2006 at 802.11n mode HT20 DAC0
Date: 24.NOV.2009 15:21:03

Chain 0: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 48



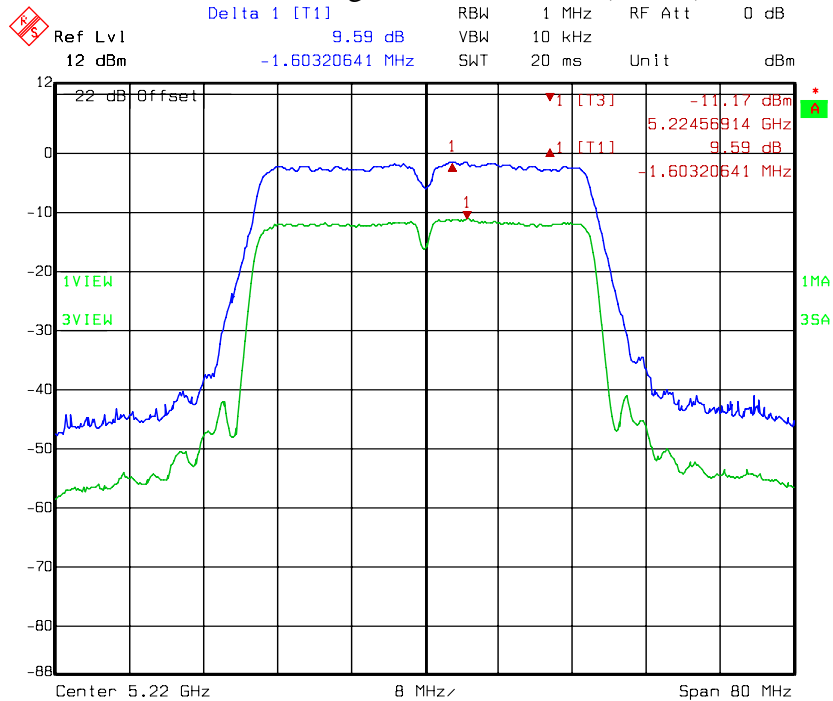
Title: PK Excursion AV
Comment A: 5.2406 at 802.11n mode HT20 DAC0
Date: 24.NOV.2009 15:26:21

Chain 0: Peak excursion to average ratio @ 802.11n (HT 40) mode channel 40



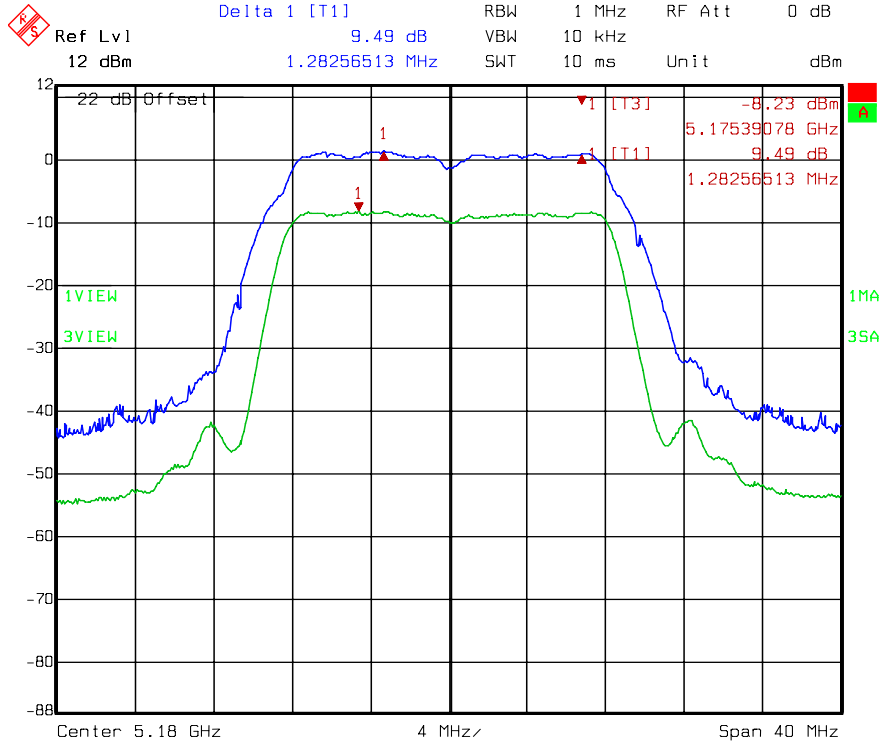
Title: PK Excursion AV
 Comment A: 5.2006 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 15:34:16

Chain 0: Peak excursion to average ratio @ 802.11n (HT 40) mode channel 44



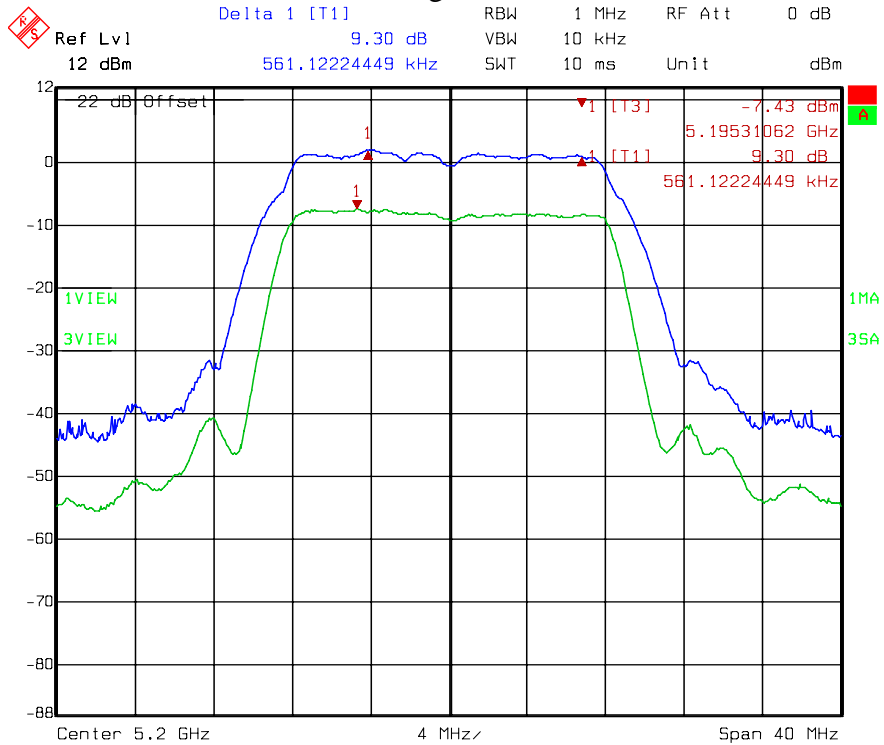
Title: PK Excursion AV
 Comment A: 5.2206 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 15:37:10

Chain 1: Peak excursion to average ratio @ 802.11a mode channel 36



Title: PK Excursion AV
 Comment A: CH 36 at 802.11a mode DAC1
 Date: 24.NOV.2009 16:14:15

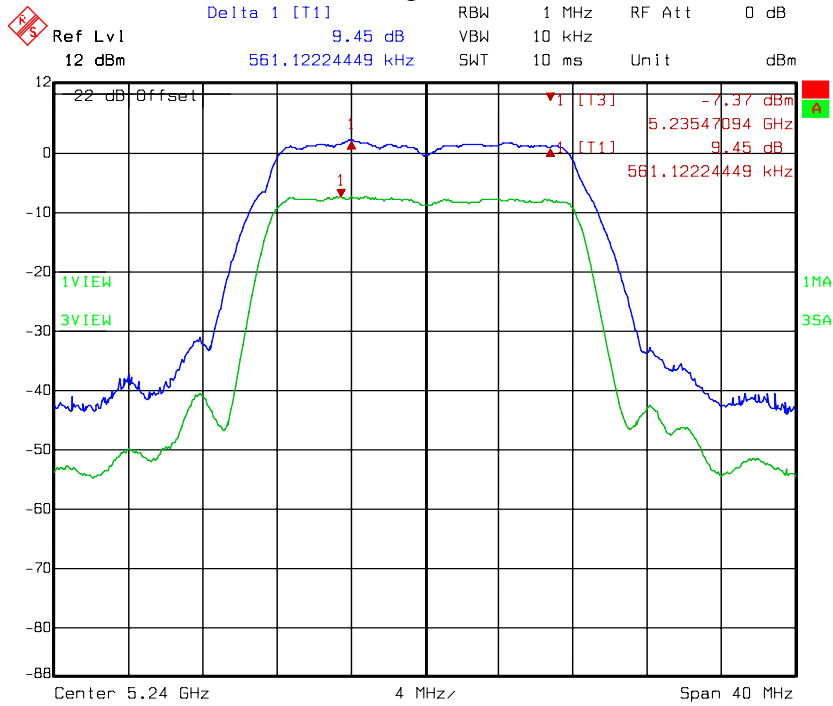
Chain 1: Peak excursion to average ratio @ 802.11a mode channel 40



Title: PK Excursion AV
 Comment A: CH 40 at 802.11a mode DAC1
 Date: 24.NOV.2009 16:18:42

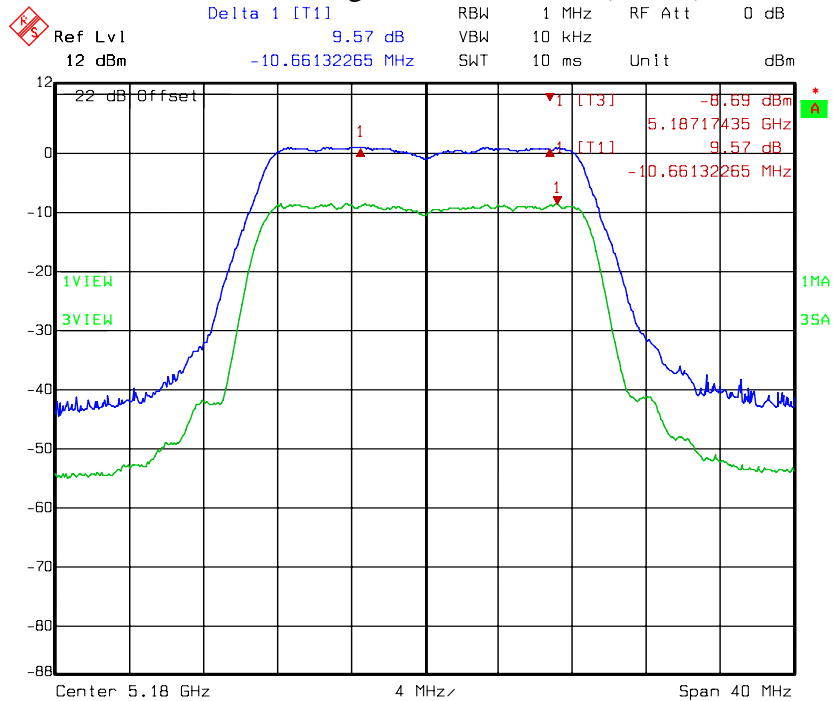


Chain 1: Peak excursion to average ratio @ 802.11a mode channel 48



Title: PK Excursion AV
Comment A: CH 48 at 802.11a mode DAC1
Date: 24.NOV.2009 16:23:38

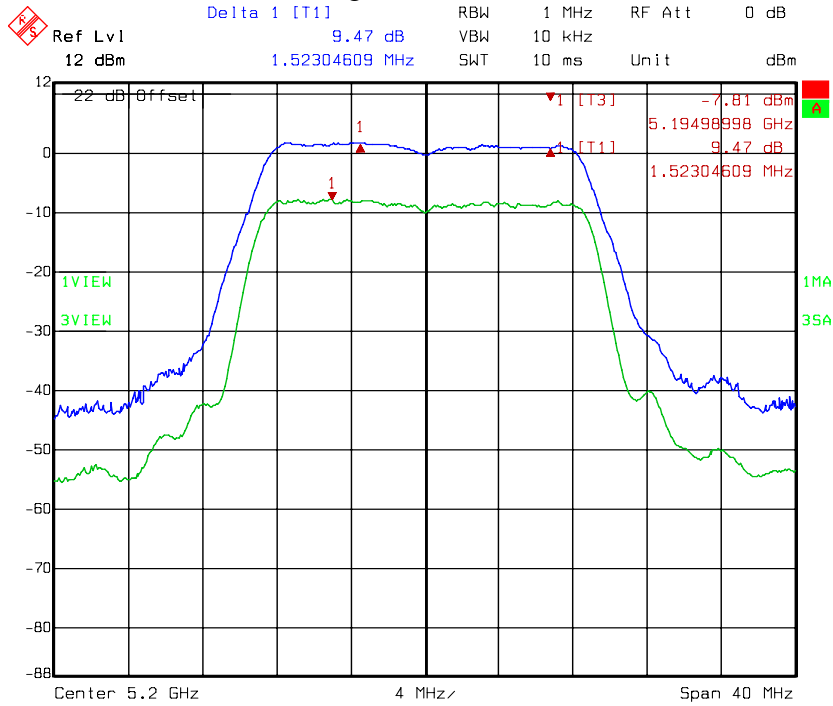
Chain 1: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 36



Title: PK Excursion AV
Comment A: 5.180G at 802.11n mode HT20 DAC1
Date: 24.NOV.2009 15:53:22

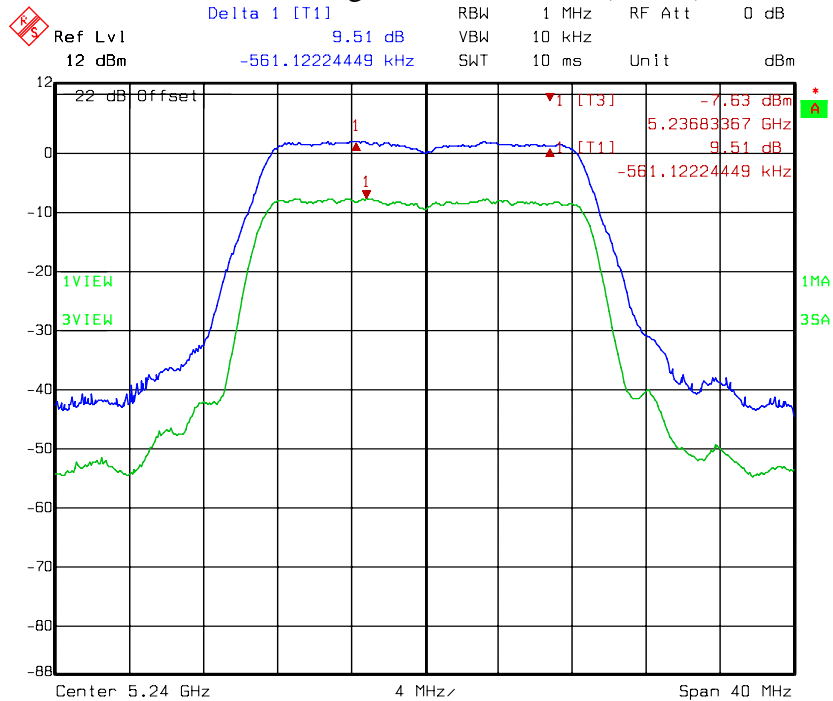


Chain 1: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 40



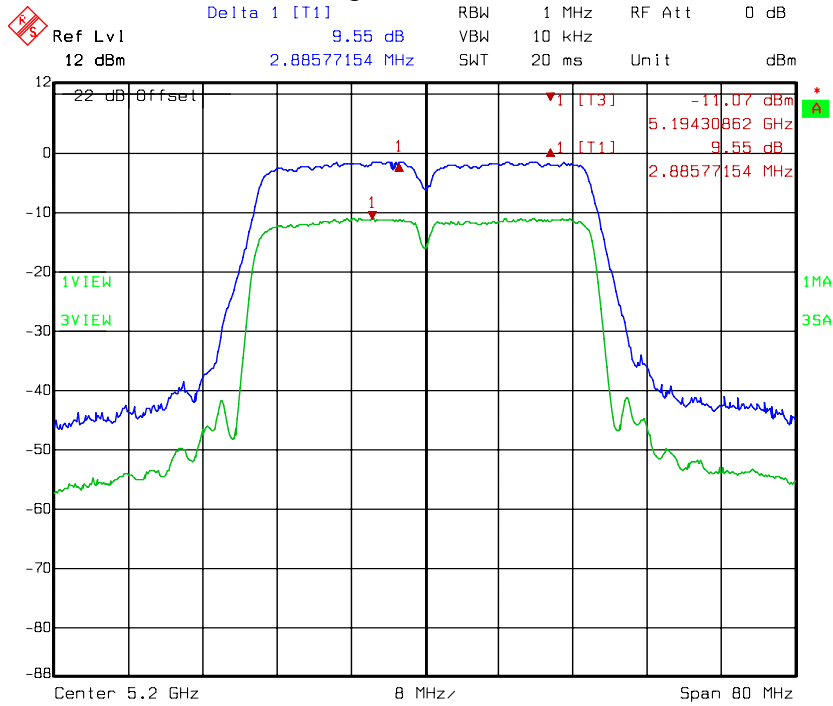
Title: PK Excursion AV
Comment A: 5.200G at 802.11n mode HT20 DAC1
Date: 24.NOV.2009 16:01:13

Chain 1: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 48



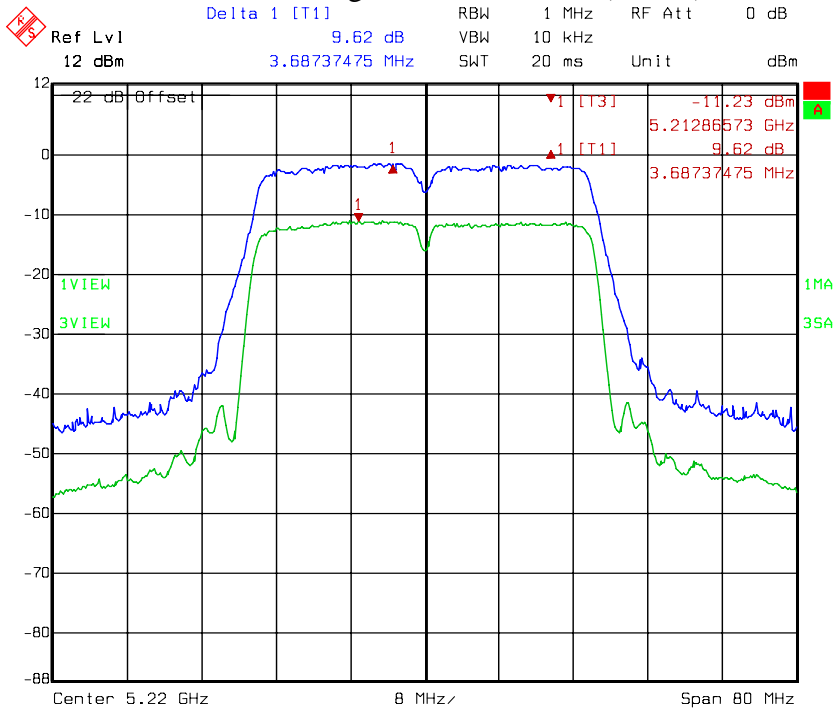
Title: PK Excursion AV
Comment A: 5.240G at 802.11n mode HT20 DAC1
Date: 24.NOV.2009 16:05:59

Chain 1: Peak excursion to average ratio @ 802.11n (HT 40) mode channel 40



Title: PK Excursion AV
 Comment A: 5.2006 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:48:15

Chain 1: Peak excursion to average ratio @ 802.11n (HT 20) mode channel 44



Title: PK Excursion AV
 Comment A: 5.2206 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:43:26

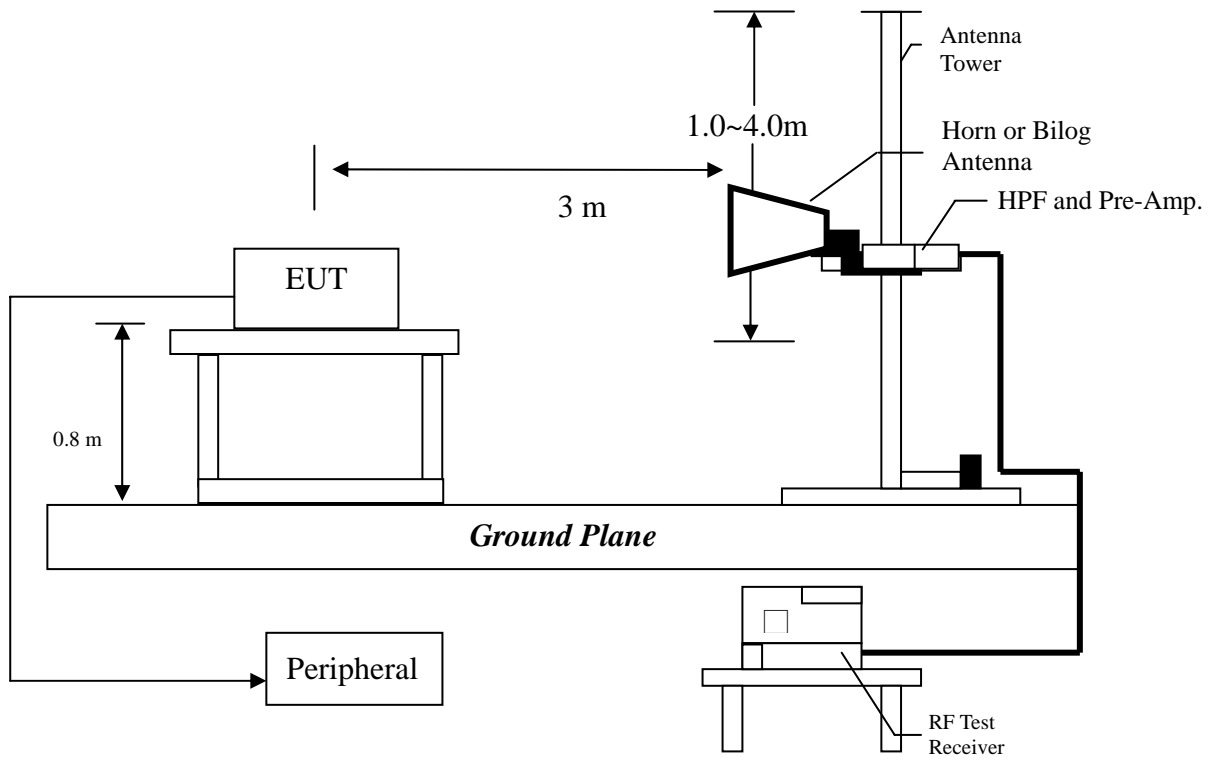
7. Radiated Emission test (FCC 15.407(b), 15.205 & 15.209)

7.1 Operating environment

Temperature: 22 °C
Relative Humidity: 56 %
Atmospheric Pressure 1023 hPa

7.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emission measurements were performed from 30MHz to tenth harmonic or 40GHz. The EUT for testing is arranged on a wooden 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.

7.3 Emission limits

The spurious Emission shall test through the 10th harmonic. Radiated emission shall not exceed an EIRP of -27dBm/MHz (68.2288dBuV/m @3m), as defined in §15.407(b). In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty
Radiated Emission	± 5.056 dB
Conducted Emission	± 2.786 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.



7.4 Radiated spurious emission test data

7.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under 802.11a, 802.11n (HT 20) and 802.11n (HT 40) continuously transmitting mode. The worst case occurred at 802.11a Tx channel 36.

EUT : P-3202HN-Ba
Worst Case : 802.11a Tx at channel 36

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	38.73	QP	12.62	26.27	38.89	40.00	-1.11
V	67.83	QP	12.23	27.08	39.31	40.00	-0.69
V	107.60	QP	7.64	30.13	37.77	43.50	-5.73
V	499.48	QP	18.43	23.59	42.01	46.00	-3.99
V	533.43	QP	19.46	20.99	40.45	46.00	-5.55
V	624.61	QP	20.75	21.87	42.62	46.00	-3.38
H	67.83	QP	12.99	19.56	32.55	40.00	-7.45
H	499.48	QP	18.64	25.77	44.41	46.00	-1.59
H	533.43	QP	19.65	21.38	41.03	46.00	-4.97
H	624.61	QP	20.88	20.42	41.29	46.00	-4.71
H	749.74	QP	22.95	15.89	38.84	46.00	-7.16
H	799.21	QP	23.52	15.21	38.73	46.00	-7.27

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor



7.4.2 Measurement results: frequency above 1GHz

EUT : P-3202HN-Ba
Test Condition : 802.11a Tx at channel 36

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
7466	PK	V	33.00	44.60	38.02	49.62	54.00	-4.38
10360	PK	V	31.30	50.09	31.07	49.86	54.00	-4.14
16576	PK	V	32.70	52.20	41.09	60.59	88.2288	-27.64
16576	AV	V	32.70	52.20	37.51	57.01	68.2288	-11.22
10360	PK	H	31.30	50.09	31.14	49.93	54.00	-4.07

EUT : P-3202HN-Ba
Test Condition : 802.11a Tx at channel 40

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
10400	PK	V	31.30	50.09	31.03	49.82	54.00	-4.18
16640	PK	V	32.70	52.20	42.39	61.89	88.2288	-26.34
16640	AV	V	32.70	52.20	39.11	58.61	68.2288	-9.62
10400	PK	H	31.30	50.09	31.40	50.19	54.00	-3.81

EUT : P-3202HN-Ba
Test Condition : 802.11a Tx at channel 48

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
10480	PK	V	31.30	50.09	31.85	50.64	54.00	-3.36
16768	PK	V	32.70	52.20	43.72	63.22	88.2288	-25.01
16768	AV	V	32.70	52.20	40.73	60.23	68.2288	-8.00
10480	PK	H	31.30	50.09	31.15	49.94	54.00	-4.06



EUT : P-3202HN-Ba
Test Condition : 802.11n (HT 20) mode channel 36

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
10360	PK	V	31.30	50.09	30.76	49.55	54.00	-4.45
16576	PK	V	32.70	52.20	40.81	60.31	88.2288	-27.92
16576	AV	V	32.70	52.20	37.42	56.92	68.2288	-11.31
10360	PK	H	31.30	50.09	31.12	49.91	54.00	-4.09

EUT : P-3202HN-Ba
Test Condition : 802.11n (HT 20) mode channel 40

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
10400	PK	V	31.30	50.09	31.54	50.33	54.00	-3.67
16640	PK	V	32.70	52.20	41.82	61.32	88.2288	-26.91
16640	AV	V	32.70	52.20	38.59	58.09	68.2288	-10.14
10400	PK	H	31.30	50.09	31.76	50.55	54.00	-3.45

EUT : P-3202HN-Ba
Test Condition : 802.11n (HT 20) mode channel 48

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
10480	PK	V	31.30	50.09	31.62	50.41	54.00	-3.59
16768	PK	V	32.70	52.20	43.43	62.93	88.2288	-25.30
16768	AV	V	32.70	52.20	39.96	59.46	68.2288	-8.77
10480	PK	H	31.30	50.09	31.03	49.82	54.00	-4.18



EUT : P-3202HN-Ba
Test Condition : 802.11n (HT 40) mode channel 40

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
7466	PK	V	33.00	44.60	37.91	49.51	54.00	-4.49
10400	PK	V	31.30	50.09	30.85	49.64	54.00	-4.36
16640	PK	V	32.70	52.20	40.73	60.23	88.2288	-28.00
16640	AV	V	32.70	52.20	37.59	57.09	68.2288	-11.14
10400	PK	H	31.30	50.09	31.16	49.95	54.00	-4.05

EUT : P-3202HN-Ba
Test Condition : 802.11n (HT 40) mode channel 44

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
10440	PK	V	31.30	50.09	31.76	50.55	54.00	-3.45
16704	PK	V	32.70	52.20	42.84	62.34	88.2288	-25.89
16704	AV	V	32.70	52.20	39.42	58.92	68.2288	-9.31
10440	PK	H	31.30	50.09	31.72	50.51	54.00	-3.49

8. Emission on the band edge §FCC 15.205

Method of Measurement:

Reference FCC document: KDB 913591

The measurement was made to the average and peak field strength of the fundamental frequency. And the spurious emission in the restrict band must also comply with the FCC subpart C 15.209.

8.1 Operating environment

Temperature:	23	°C
Relative Humidity:	56	%
Atmospheric Pressure	1023	hPa

8.2 Test setup & procedure

Radiated setup:

Reference to section 7.2

Procedure:

STEP 1 - Perform an in-band field strength measurement of the fundamental emission using a 1 MHz RBW, a 1 MHz VBW, and a peak detector (as required by Section 15.35). Repeat the measurement with an average detector (i.e., 1 MHz RBW with 10 Hz VBW).

STEP 2 - Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band edge emission under investigation. Record the peak levels of the fundamental emission and the relevant band edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

STEP 3 - Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths are then used to determine band edge compliance as required by Section 15.205.



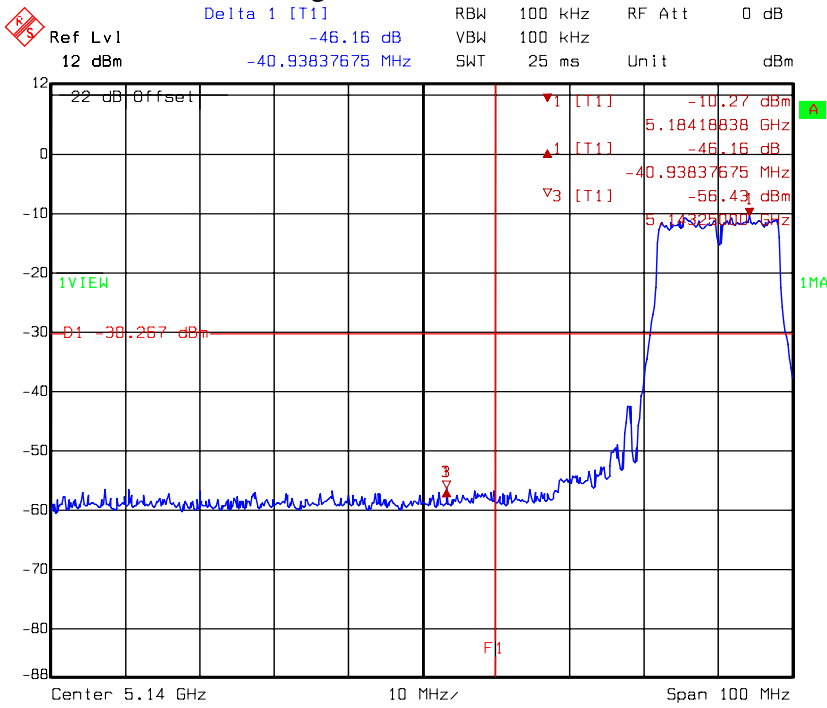
8.3 Test Result

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental (dBuV)	Between Carrier Max. Power and Loca Max. Emission in Restrict Band (dBc)			
Chain 0: 802.11a ch36	PK	104.65	46.16	58.49	74	-15.51
	AV	95.31	50.08	45.23	54	-8.77
Chain 0: 802.11n (HT 20) ch36	PK	104.79	45.72	59.07	74	-14.93
	AV	94.71	49.93	44.78	54	-9.22
Chain 0: 802.11n (HT40) ch40	PK	102.3	43.62	58.68	74	-15.32
	AV	92.71	48.16	44.55	54	-9.45
Chain 1: 802.11a ch36	PK	104.65	44.95	59.7	74	-14.3
	AV	95.31	49.19	46.12	54	-7.88
Chain 1: 802.11n (HT 20) ch36	PK	104.79	45.62	59.17	74	-14.83
	AV	94.71	48.8	45.91	54	-8.09
Chain 1: 802.11n (HT40) ch40	PK	102.3	43.25	59.05	74	-14.95
	AV	92.71	46.94	45.77	54	-8.23

Please see the plots as below pages for conducted method test result.

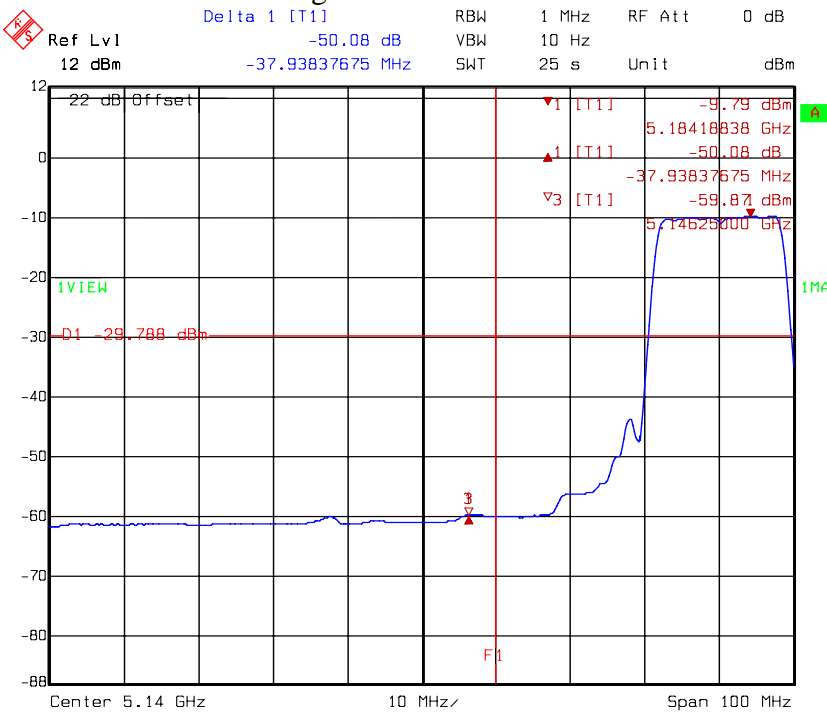


Chain 0: Band edge @ 802.11a mode channel 36 PK



Title: Band Edge
Comment A: CH 36 at 802.11a mode DAC0
Date: 24.NOV.2009 16:32:27

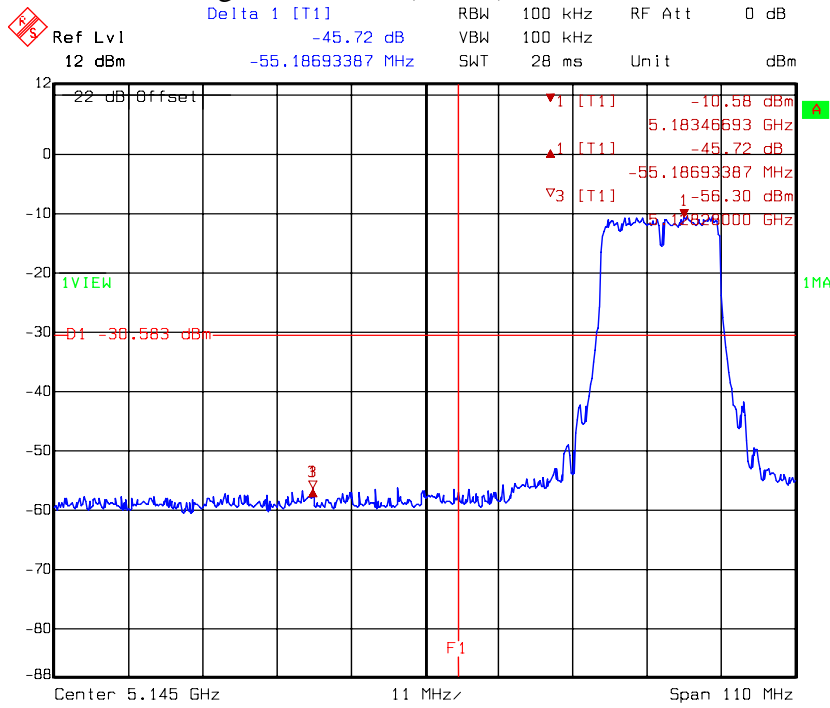
Chain 0: Band edge @ 802.11a mode channel 36 AV



Title: Band Edge
Comment A: CH 36 at 802.11a mode DAC0
Date: 24.NOV.2009 16:33:41

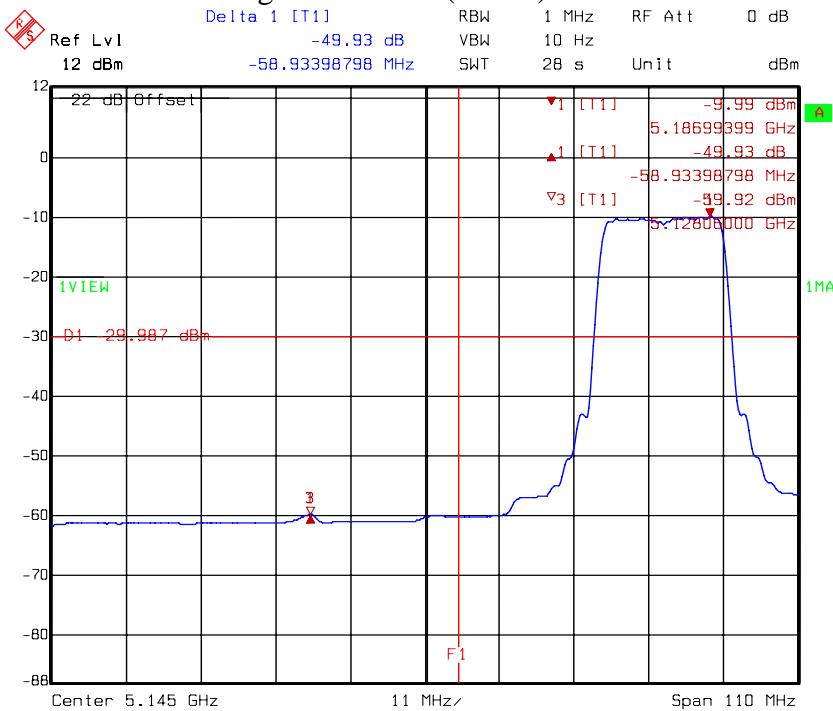


Chain 0: Band edge @ 802.11n (HT 20) mode mode channel 36 PK



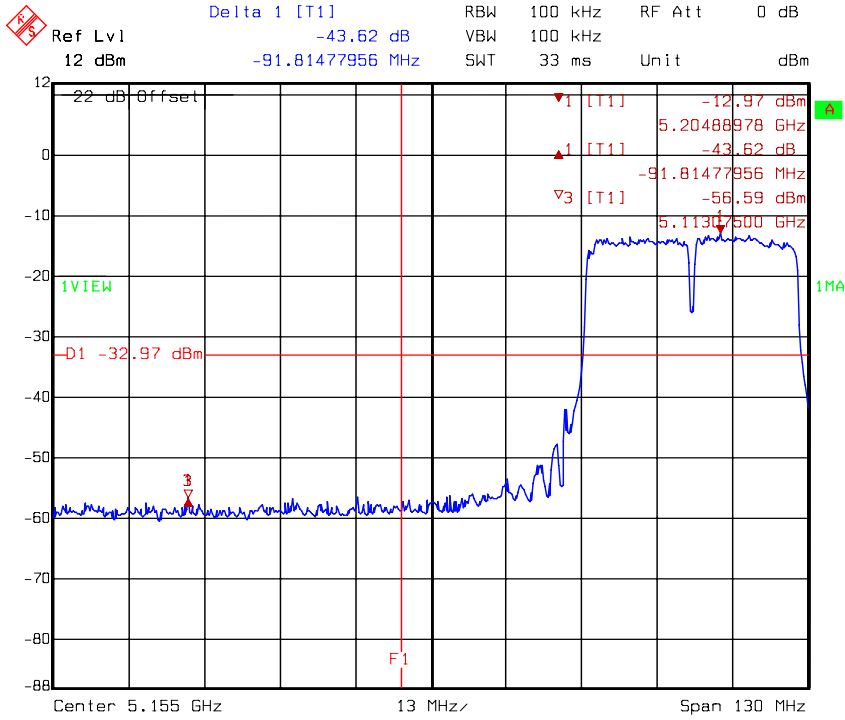
Title: Band Edge
Comment A: 5.1806 at 802.11n mode HT20 DAC0
Date: 24.NOV.2009 16:34:51

Chain 0: Band edge @ 802.11n (HT 20) mode channel 36 AV



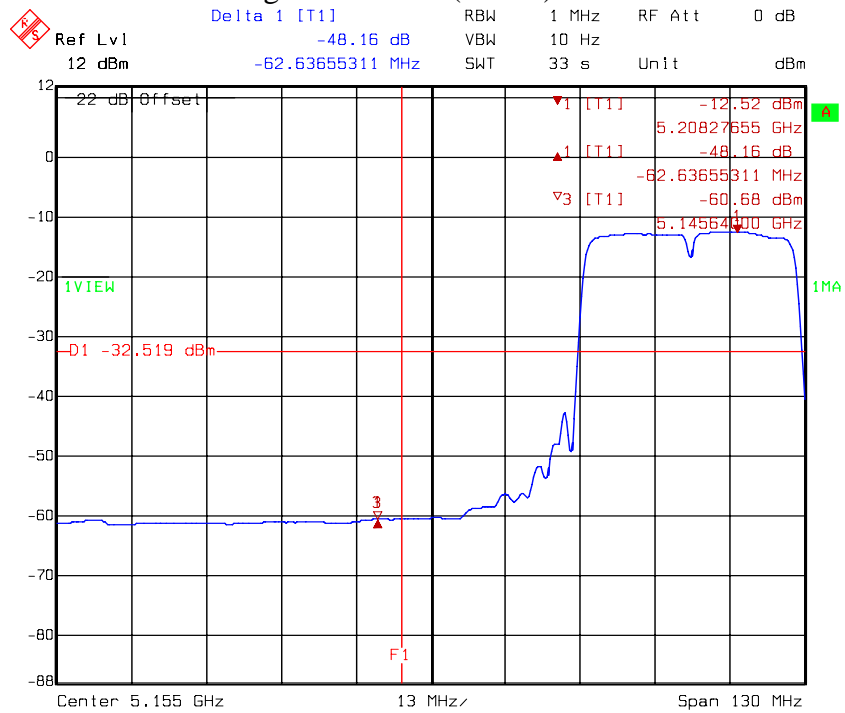
Title: Band Edge
Comment A: 5.1806 at 802.11n mode HT20 DAC0
Date: 24.NOV.2009 16:36:14

Chain 0: Band edge @ 802.11n (HT 40) mode channel 40 PK



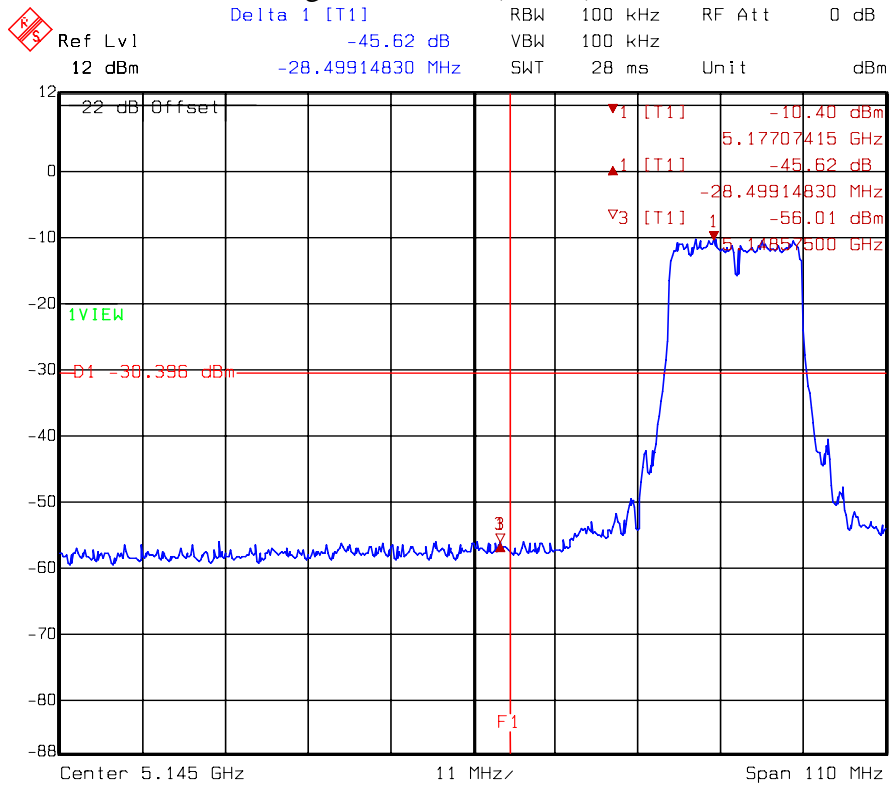
Title: Band Edge
 Comment A: 5.2006 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 16:39:12

Chain 0: Band edge @ 802.11n (HT 40) mode channel 40 AV



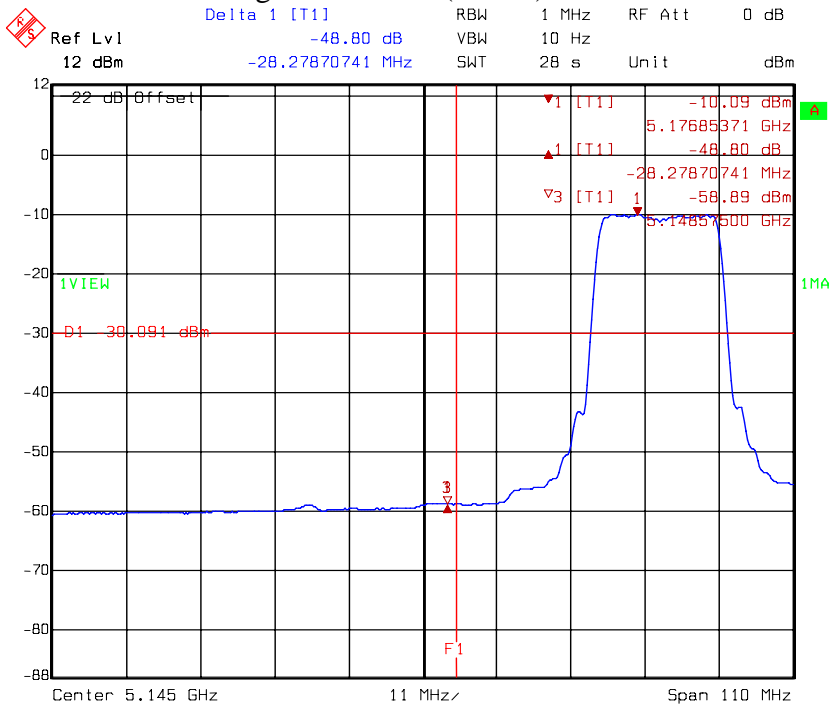
Title: Band Edge
 Comment A: 5.2006 at 802.11n mode HT40 DAC0
 Date: 24.NOV.2009 16:40:42

Chain 1: Band edge @ 802.11n (HT 20) mode channel 36 PK



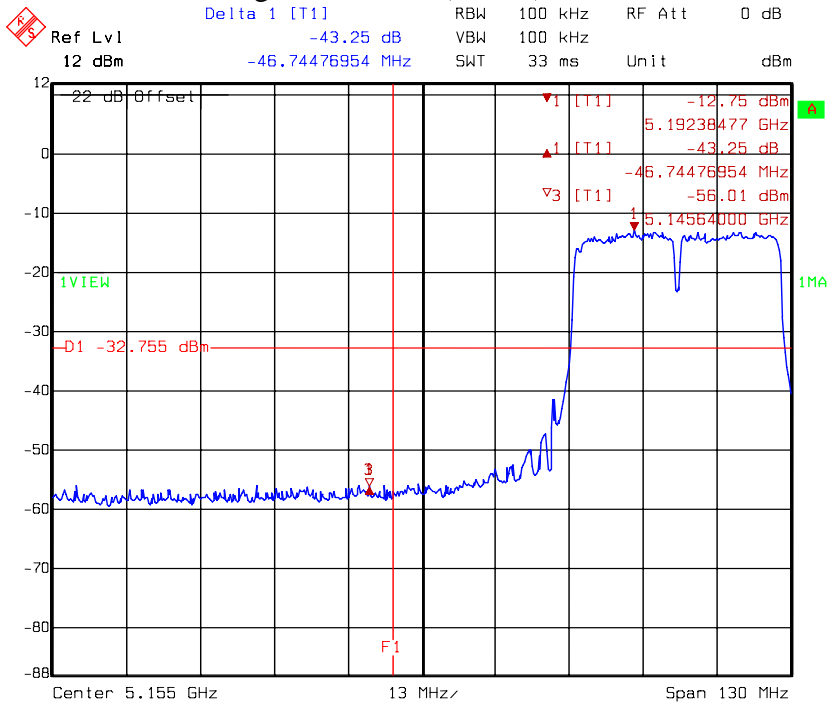
Title: Band Edge
 Comment A: 5.1806 at 802.11n mode HT20 DAC1
 Date: 24.NOV.2009 15:54:14

Chain 1: Band edge @ 802.11n (HT 20) mode channel 36 AV



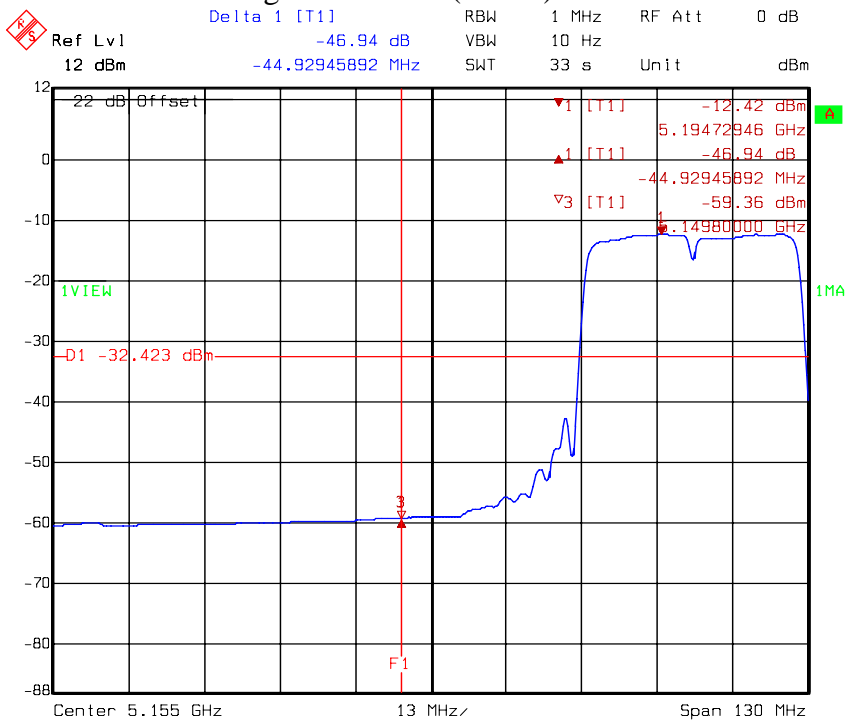
Title: Band Edge
 Comment A: 5.1806 at 802.11n mode HT20 DAC1
 Date: 24.NOV.2009 15:55:33

Chain 1: Band edge @ 802.11n (HT 40) mode channel 40 PK



Title: Band Edge
 Comment A: 5.2006 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:49:09

Chain 0: Band edge @ 802.11n (HT 40) mode channel 40 AV



Title: Band Edge
 Comment A: 5.2006 at 802.11n mode HT40 DAC1
 Date: 24.NOV.2009 15:50:36

9. AC power line conducted emission

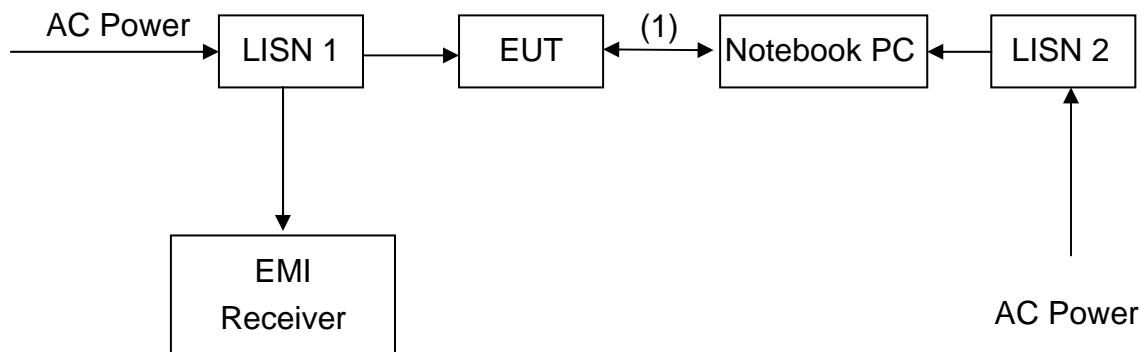
Name of Test	AC power line conducted emission
Base Standard	FCC 15.207

Test Result: Complies
Measurement Data: See Tables & plots below
Method of Measurement:
Reference FCC document: KDB558074, ANSI C63.4

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/ 50 uH coupling impedance with 50 ohm 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 C63.4/2003 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

Test Diagram:



(1) RJ-45 UTP Cat.5 10 meter

Emission Limit:

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

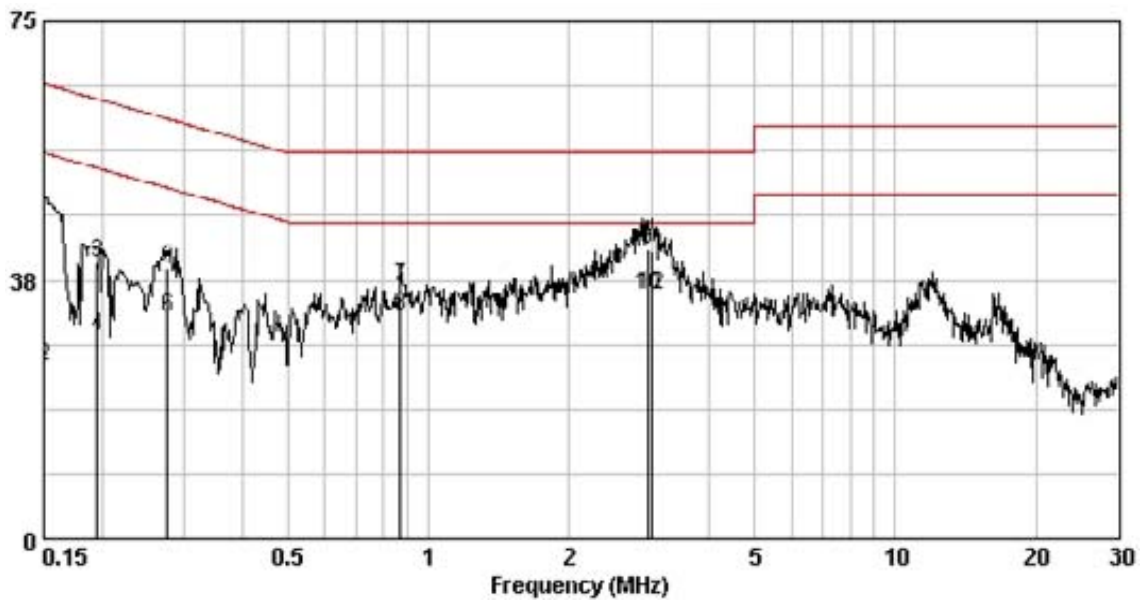
Note: The EUT was tested while in normal communication mode.

Phase : Line
 EUT : P-3202HN-Ba
 Test Condition : Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.15	0.81	47.32	66.00	25.10	56.00	-18.68	-30.90
0.20	0.81	40.04	63.80	29.42	53.80	-23.76	-24.38
0.28	0.49	39.42	60.94	32.13	50.94	-21.52	-18.81
0.87	0.11	36.47	56.00	32.49	46.00	-19.53	-13.51
2.95	0.22	42.06	56.00	35.37	46.00	-13.94	-10.63
3.01	0.23	41.77	56.00	35.48	46.00	-14.23	-10.52

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase : Neutral
 EUT : P-3202HN-Ba
 Test Condition : Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.15	0.11	46.08	65.74	29.15	55.74	-19.66	-26.59
0.24	0.11	40.77	62.17	34.80	52.17	-21.40	-17.37
0.29	0.11	40.07	60.54	34.31	50.54	-20.10	-16.24
0.58	0.11	37.96	56.00	32.57	46.00	-18.04	-13.43
2.90	0.22	42.37	56.00	36.56	46.00	-13.63	-9.44
3.01	0.23	42.77	56.00	36.63	46.00	13.23	9.37
3.12	0.24	41.55	56.00	35.08	46.00	-14.45	-10.92

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

