

EMC TEST REPORT

Report No. : TS12110032-EME
Model No. : PLA4231
Issued Date : Dec. 09, 2012

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

Test Method/ Standard: 47 CFR FCC Part 15.247 & ANSI C63.4 2003

Test By: Intertek Testing Services Taiwan Ltd.
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Title Engineer

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1. Summary of Test Data

Test/Requirement Description	Applicable Rule	Result
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum Output Power	15.247(b)	Pass
Power Spectral Density	15.247(e)	Pass
RF Antenna Conducted Spurious	15.247(d)	Pass
Radiated Spurious Emission	15.247(d), 15.205, 15.209	Pass
Emission on the Band Edge	15.247(d)	Pass
AC Power Line Conducted Emission	15.207	Pass

2. General Information

Identification of the EUT

Product:	500 Mbps Powerline Wireless N Extender
Model No.:	PLA4231
FCC ID.:	I88PLA4231
Frequency Range:	2412 MHz to 2462 MHz for 802.11b, 802.11g, 802.11n HT20 2422 MHz to 2452 MHz for 802.11n HT40
Channel Number:	11 channels for 802.11b, 802.11g, 802.11n HT20 7 channels for 802.11n HT40
Rated Power:	100-240 Vac, 50/60 Hz, 0.1 A, 7 W
Power Cord:	N/A
Sample Received:	Nov. 1, 2012
Test Date(s):	Nov. 16, 2012 ~ Nov. 30, 2012
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.

Description of EUT

The EUT is a 500 Mbps Powerline Wireless N Extender, the device is a MIMO product, it's two transmitter and two receiver with one wireless module embedded.

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

Antenna description

(1) Antenna 1 (Chain 0)

The EUT uses a permanently connected antenna.

Antenna Gain : 3.1 dBi max
Antenna Type : SMD Chip-omni antenna
Connector Type : Fixed

(2) Antenna 2 (Chain 1)

The EUT uses a permanently connected antenna.

Antenna Gain : 3.1 dBi max
Antenna Type : SMD Chip-omni antenna
Connector Type : Fixed

Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Notebook PC	DELL	Latitude D610	FXWZK1S	(1) RJ-45 UTP Cat.5 10 meter (2) RJ-45 STP Cat.5 2 meter

Operation mode

The EUT was supplied 120Vac, 60Hz and it was run in TX mode that was controlled by “ART2 2.27.3” program.

With individual verifying, the maximum output power were found out 1 Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g 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 recorded in this report individually.

802.11b ch6 chain0

Data rate (Mbps)	Chain 0 PK(dBm)
1	20.27
2	20.19
5.5	19.94
11	19.78

802.11n HT20 ch6

Data rate (Mbps)	Chain 0 PK(dBm)	Chain 1 PK(dBm)
6.5	22.68	22.84
13	22.62	22.35
19.5	22.26	22.28
26	22.19	22.18
39	22.15	22.02
52	22.54	22.12
58.5	21.98	21.94
65	21.68	21.77

802.11g ch6

Data rate (Mbps)	Chain 0 PK(dBm)
6	22.76
9	22.47
12	22.23
18	22.14
24	22.08
36	21.93
48	21.85
54	21.65

802.11n HT40 ch6

Data rate (Mbps)	Chain 0 PK(dBm)	Chain 1 PK(dBm)
13.5	21.82	22.86
27	21.78	22.62
40.5	21.62	22.58
54	21.55	22.46
81	21.48	22.31
108	21.42	22.24
121.5	21.36	22.18
135	21.29	22.08

3. Maximum 6 dB Bandwidth

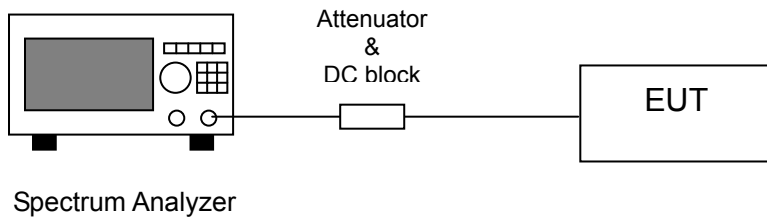
Name of Test	Maximum 6dB Bandwidth
Base Standard	FCC 15.247 (a)(2)

Test Result: Complies
Measurement Data: See Table & plots below

Method of Measurement:
Reference FCC document: KDB558074

Make the measurement with the spectrum analyzer’s resolution bandwidth (RBW) = 1-5 % of the DTS channel bandwidth and not to exceed 100kHz, video bandwidth (VBW) ≥ 3 x RBW. In order to make an accurate measurement, set the span greater than DTS channel bandwidth. The 6 dB bandwidth must be greater than 500 kHz.

Test Diagram:



Note: The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13.5 Mbps data rate for 802.11n HT40 mode. The EUT was tuned to a low, middle and high channel.

Table 1. Maximum 6dB Bandwidth

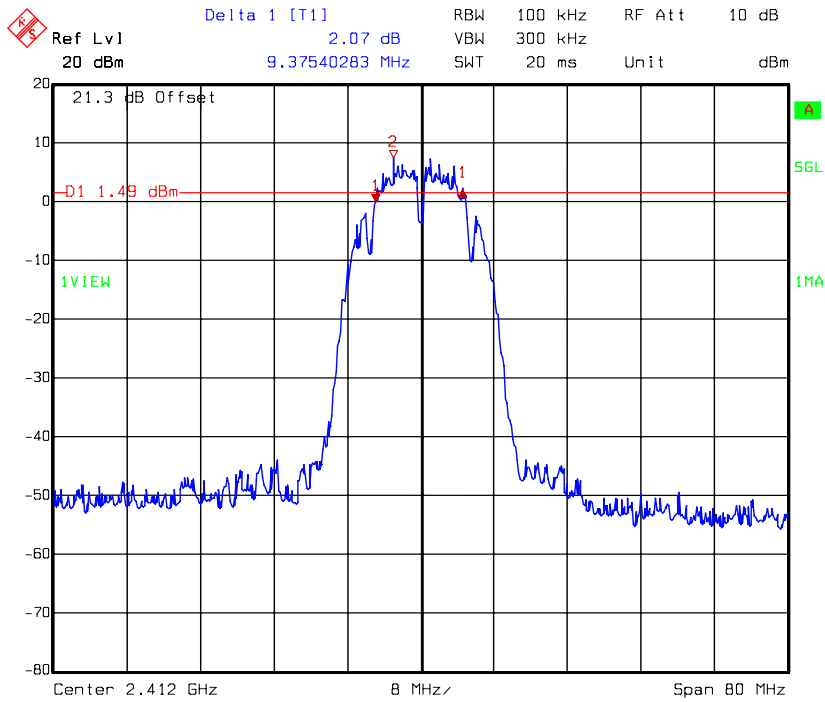
Single TX

Mode	Channel	Frequency (MHz)	6dB Bandwidth(MHz)	Limit (MHz)	Pass/Fail
			Chain 0		
802.11b	1	2412	9.375	0.5	Pass
	6	2437	9.566	0.5	Pass
	11	2462	9.761	0.5	Pass
802.11g	1	2412	16.528	0.5	Pass
	6	2437	16.587	0.5	Pass
	11	2462	16.6	0.5	Pass

2TX

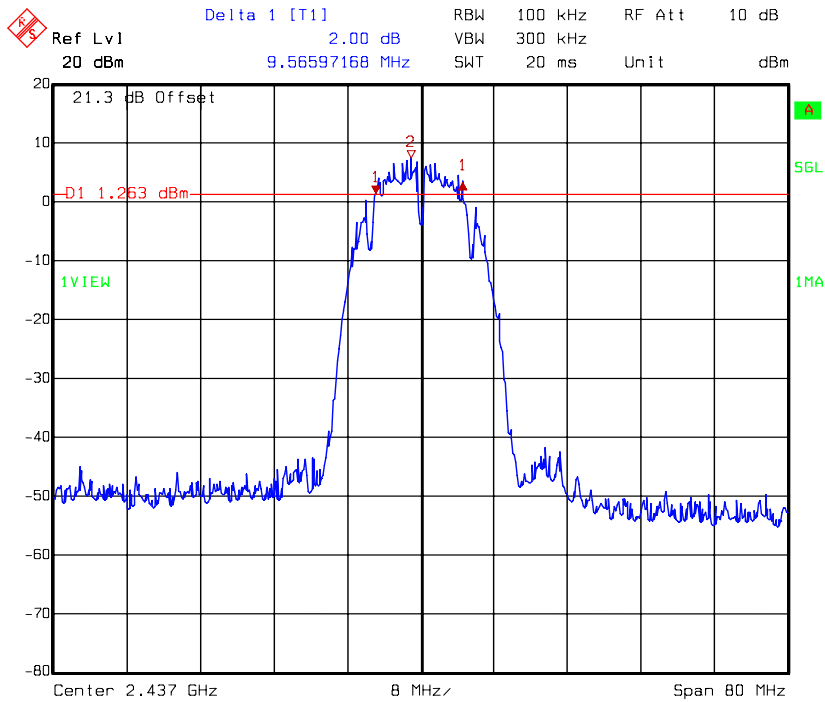
Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Limit (MHz)	Pass/Fail
			Chain 0	Chain 1		
802.11n (HT20)	1	2412	17.824	17.771	0.5	Pass
	6	2437	17.765	17.426	0.5	Pass
	11	2462	17.79	17.722	0.5	Pass
802.11n (HT40)	3	2422	36.537	36.615	0.5	Pass
	6	2437	36.596	36.185	0.5	Pass
	9	2452	36.52	36.528	0.5	Pass

Chain 0: 6dB Bandwidth @ 802.11b mode channel 1



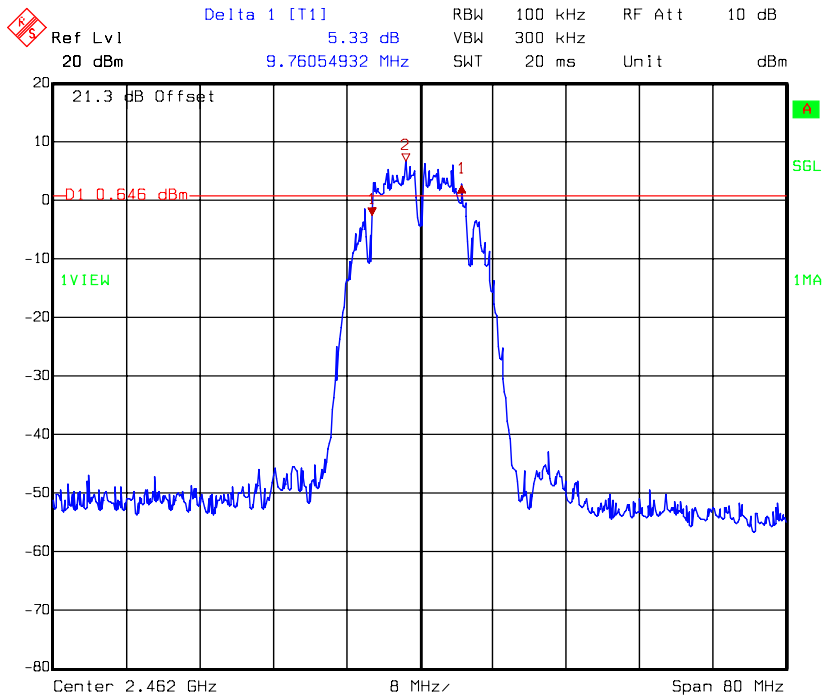
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch01_2412
Date: 03.DEC.2012 18:06:21

Chain 0: 6dB Bandwidth @ 802.11b mode channel 6



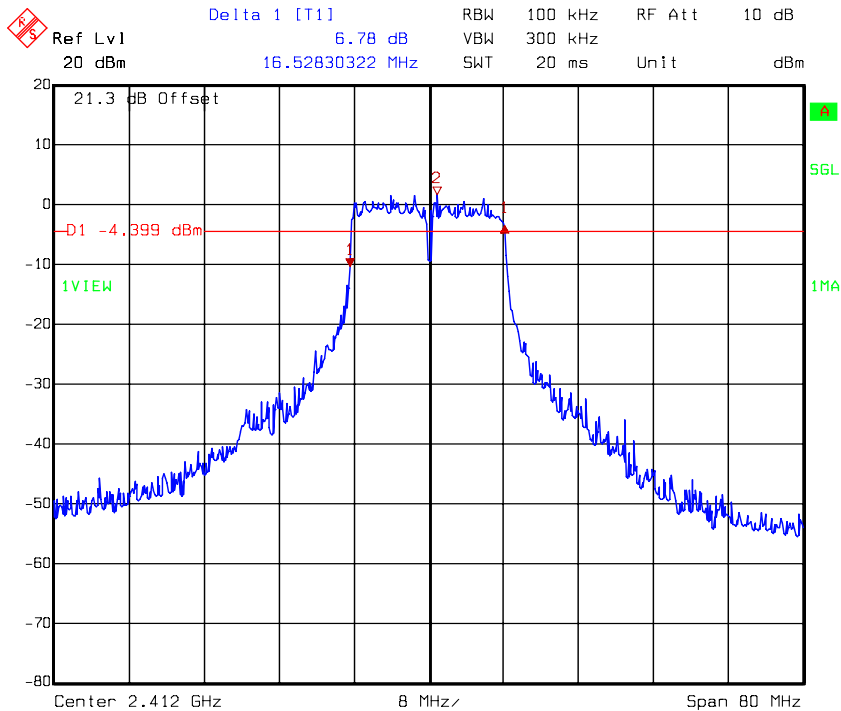
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch06_2437
Date: 03.DEC.2012 18:06:49

Chain 0: 6dB Bandwidth @ 802.11b mode channel 11



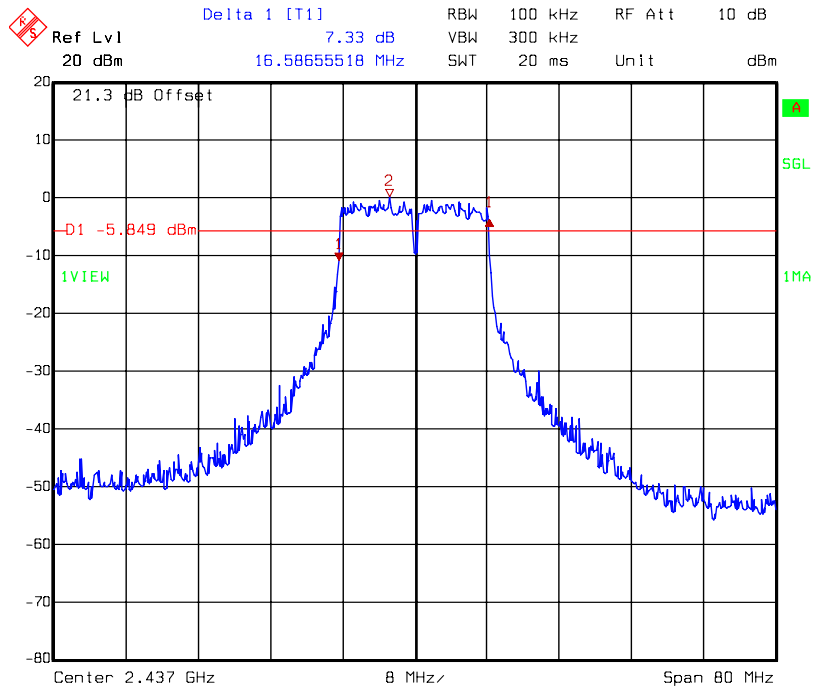
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch11_2462
Date: 03.DEC.2012 18:11:42

Chain 0: 6dB Bandwidth @ 802.11g mode channel 1



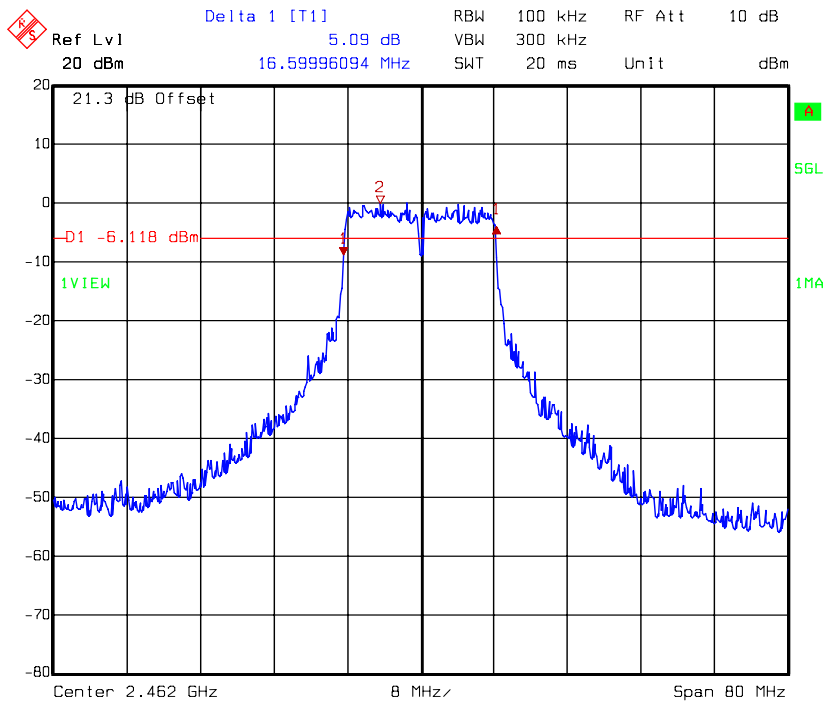
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch01_2412
Date: 03.DEC.2012 18:33:45

Chain 0: 6dB Bandwidth @ 802.11g mode channel 6



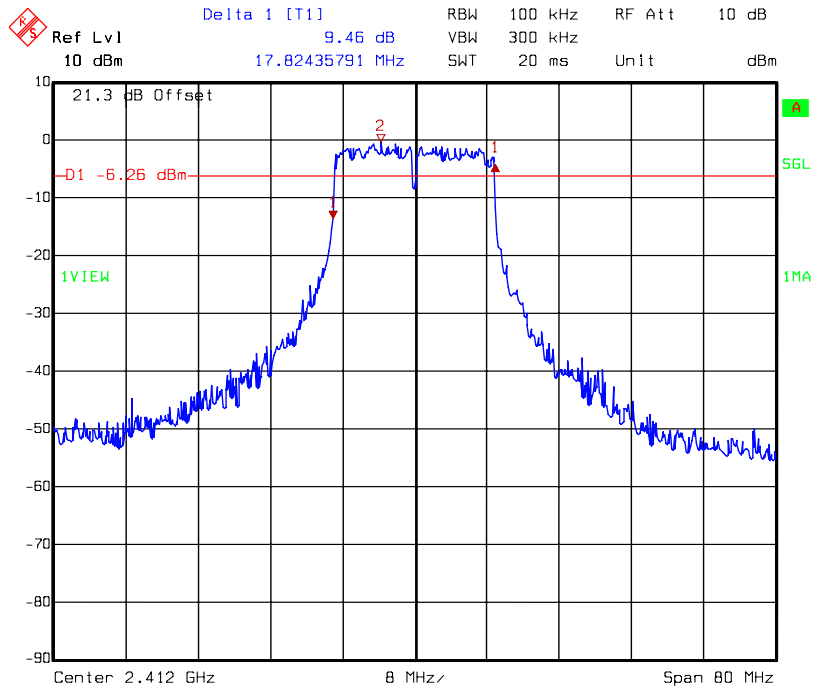
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch06_2437
Date: 03.DEC.2012 18:21:00

Chain 0: 6dB Bandwidth @ 802.11g mode channel 11



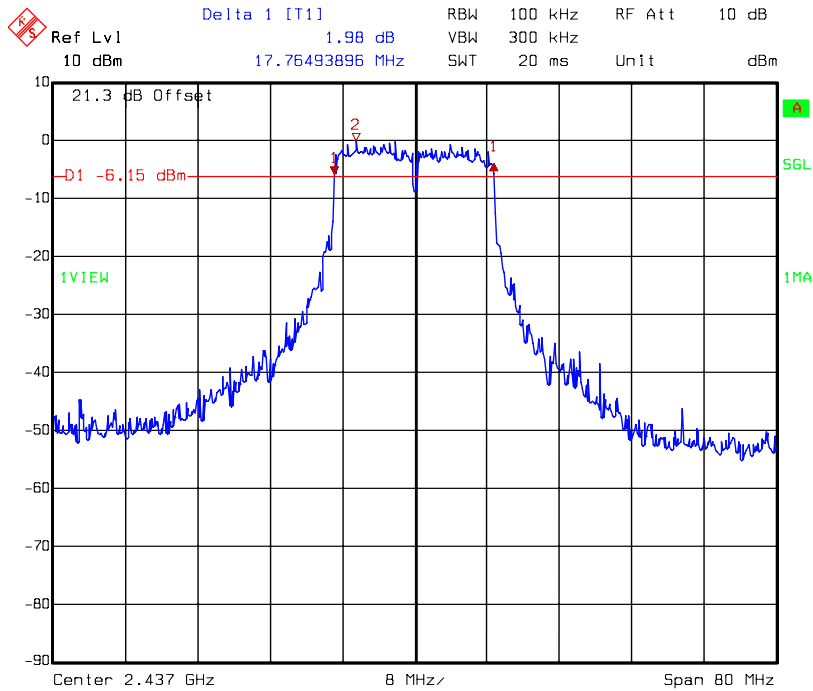
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch11_2462
Date: 03.DEC.2012 18:21:39

Chain 0: 6dB Bandwidth @ 802.11n (HT20) mode channel 1



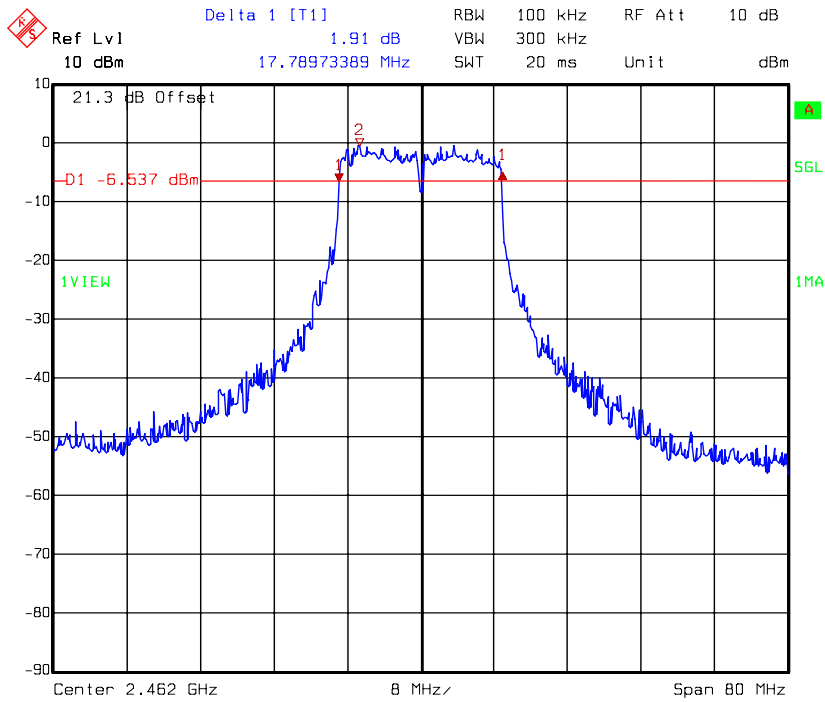
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain0_Ch01_2412
 Date: 03.DEC.2012 18:23:02

Chain 0: 6dB Bandwidth @ 802.11n (HT20) mode channel 6



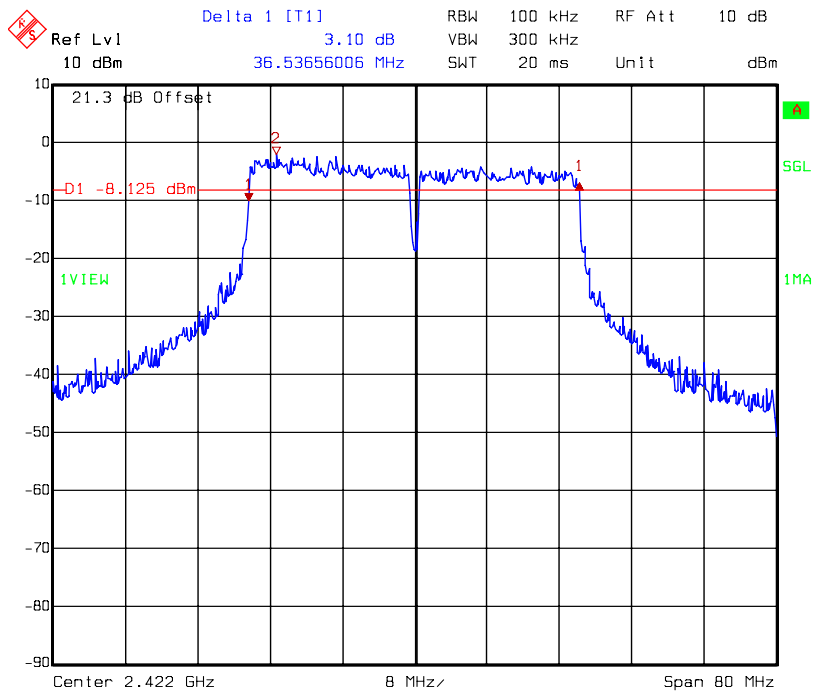
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain0_Ch06_2437
 Date: 03.DEC.2012 18:24:02

Chain 0: 6dB Bandwidth @ 802.11n (HT20) mode channel 11



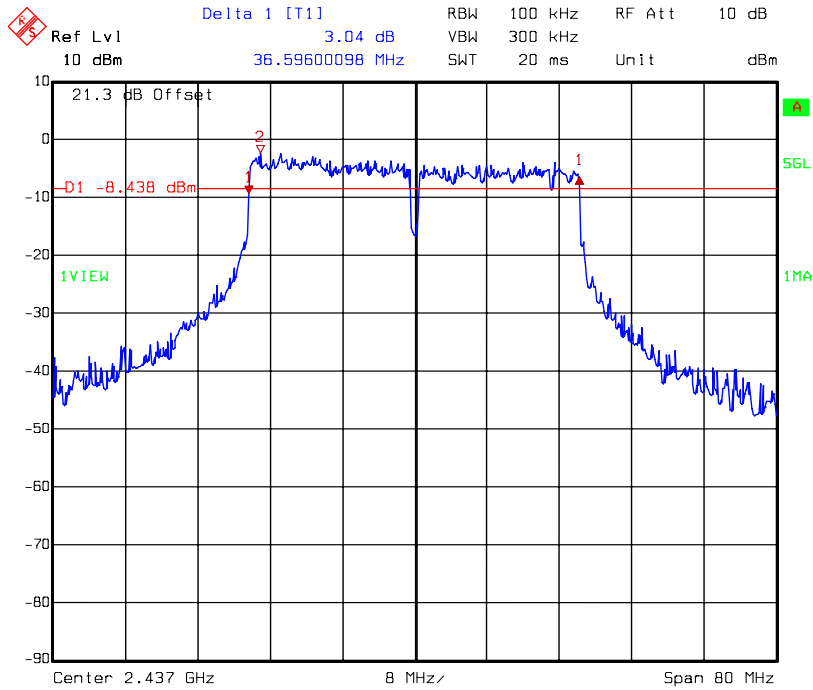
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain0_Ch11_2462
Date: 03.DEC.2012 18:24:37

Chain 0: 6dB Bandwidth @ 802.11n (HT40) mode channel 3



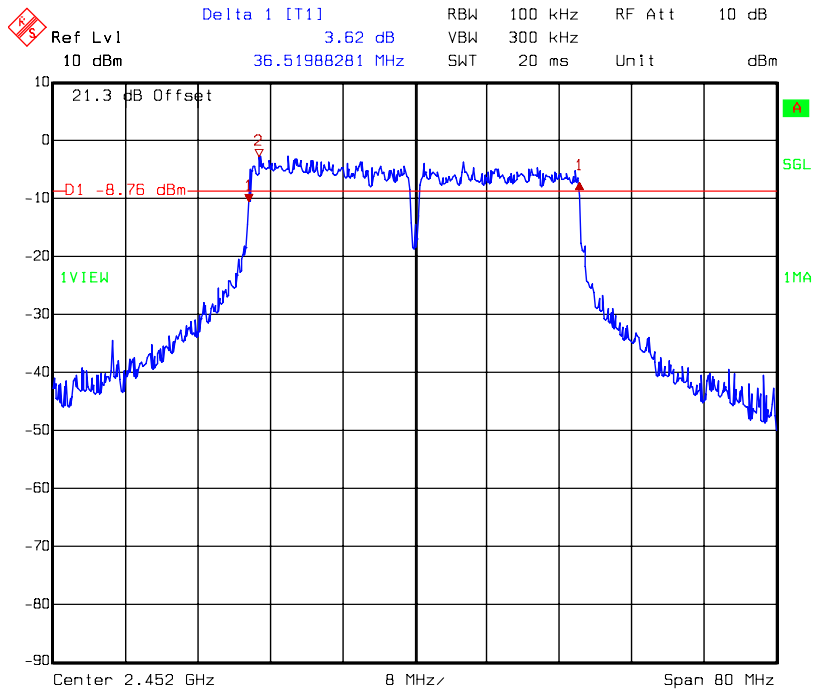
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain0_Ch03_2422
Date: 03.DEC.2012 18:49:03

Chain 0: 6dB Bandwidth @ 802.11n (HT40) mode channel 6



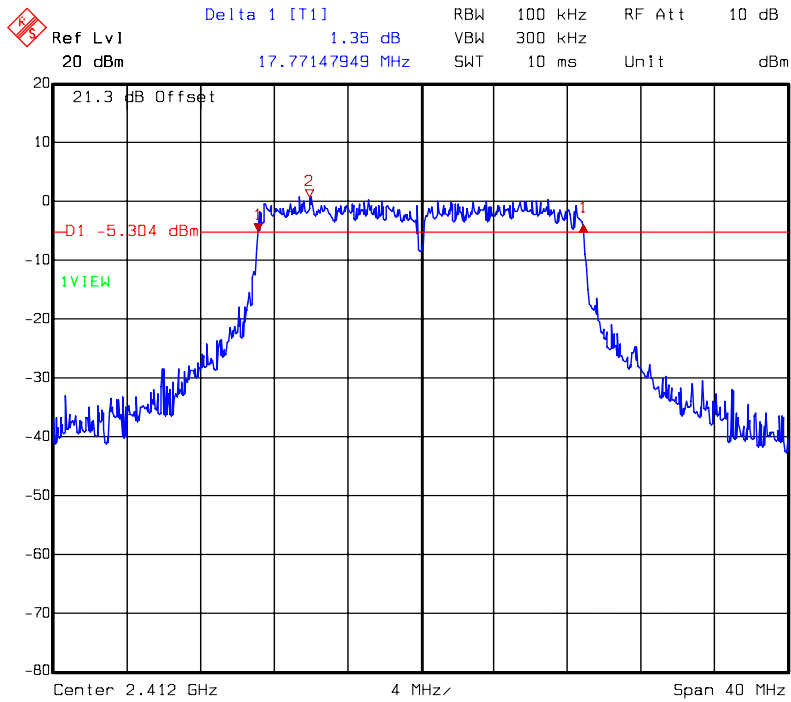
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch06_2437
 Date: 03.DEC.2012 18:49:56

Chain 0: 6dB Bandwidth @ 802.11n (HT40) mode channel 9



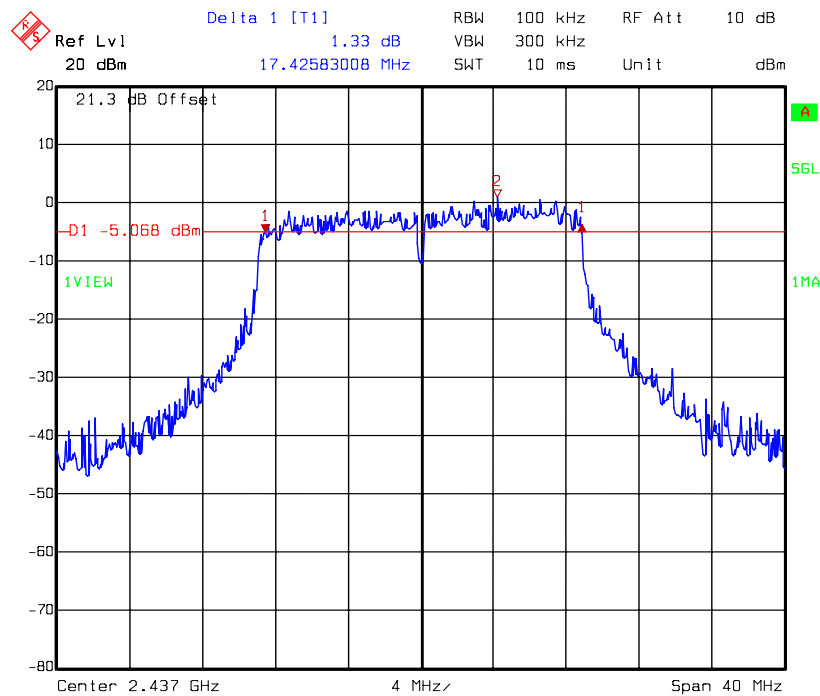
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch09_2452
 Date: 03.DEC.2012 18:51:05

Chain 1: 6dB Bandwidth @ 802.11n (HT20) mode channel 1



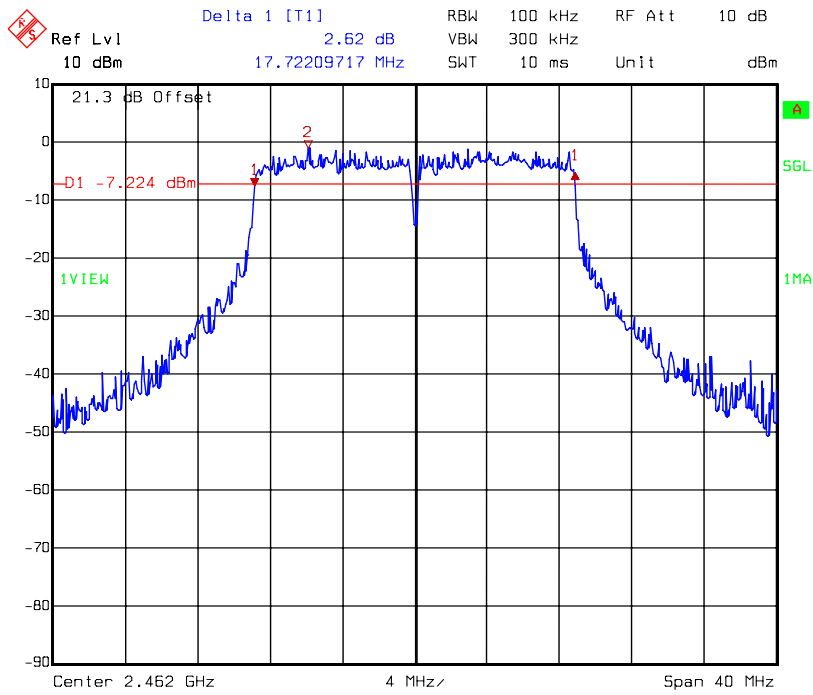
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain1_Ch01_2412
Date: 03.DEC.2012 18:57:39

Chain 1: 6dB Bandwidth @ 802.11n (HT20) mode channel 6



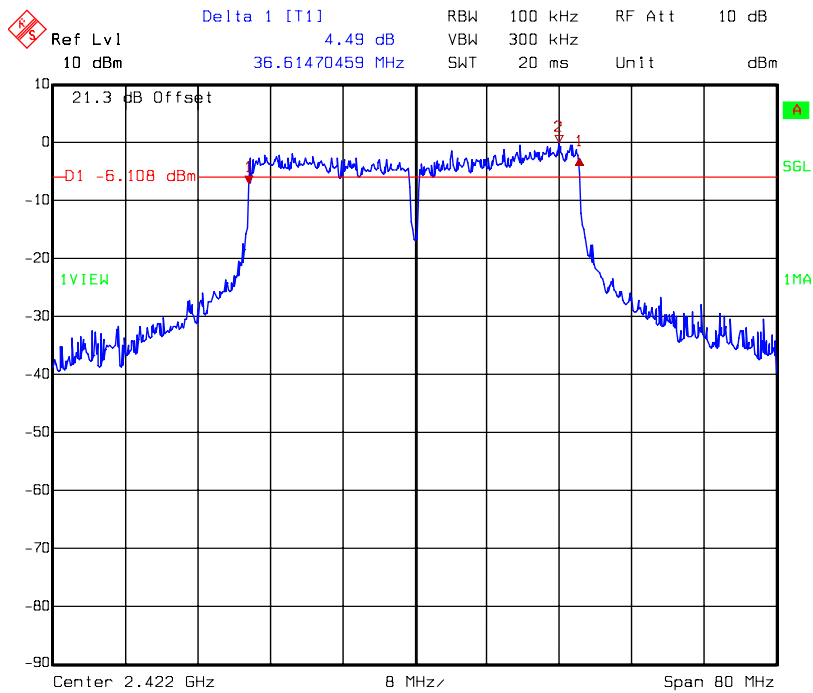
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain1_Ch06_2437
Date: 03.DEC.2012 18:58:14

Chain 1: 6dB Bandwidth @ 802.11n (HT20) mode channel 11



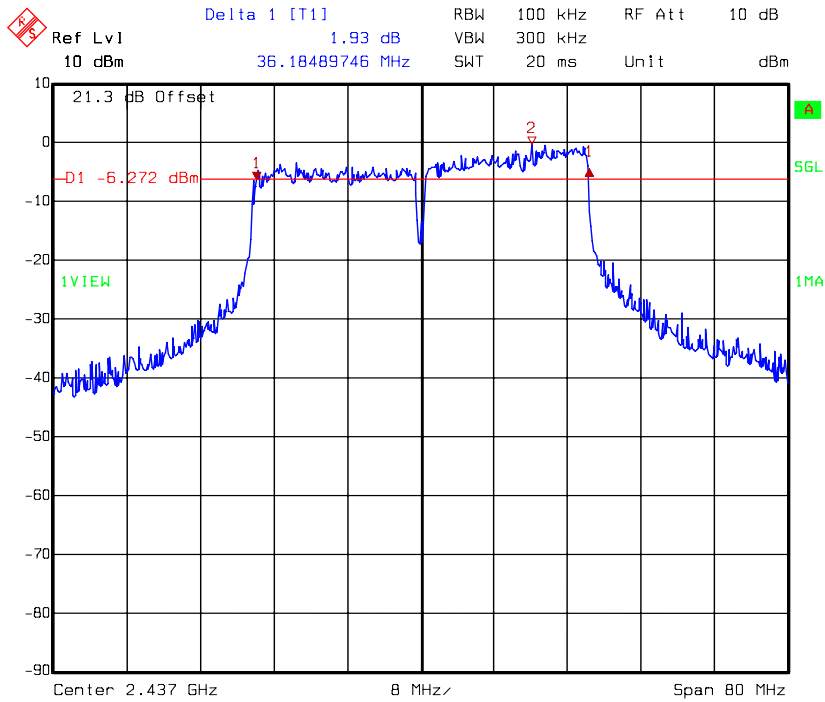
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain1_Ch11_2462
 Date: 03.DEC.2012 18:58:43

Chain 1: 6dB Bandwidth @ 802.11n (HT40) mode channel 3



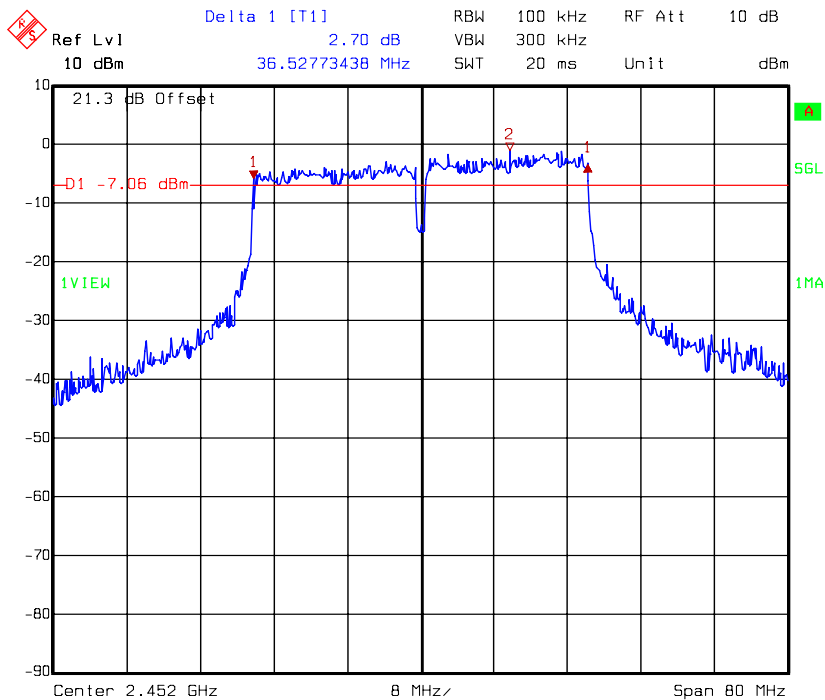
Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch03_2422
 Date: 03.DEC.2012 18:52:04

Chain 1: 6dB Bandwidth @ 802.11n (HT40) mode channel 6



Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain1_Ch06_2437
Date: 03.DEC.2012 18:54:53

Chain 1: 6dB Bandwidth @ 802.11n (HT40) mode channel 9



Title: 6dB Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain1_Ch09_2452
Date: 03.DEC.2012 18:55:21

4. 99% Occupied Bandwidth

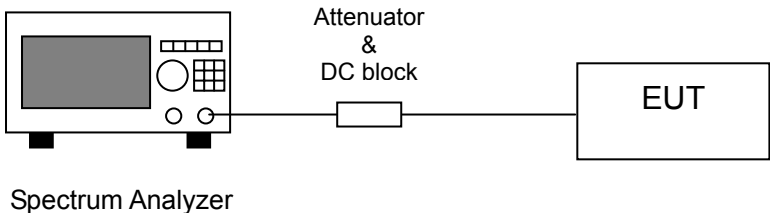
Name of Test	99% Occupied Bandwidth
Base Standard	None; for reporting purposes only

Test Result: Complies
Measurement Data: See Table & plots below

Method of Measurement:
Reference FCC document: KDB558074

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1 % of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform. The appropriate bandwidth mask is applied to the output waveform to verify compliance.

Test Diagram:



Note: The EUT was tested while in a continuous transmit mode and the worst case data rates are Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13 Mbps data rate for 802.11n HT40 mode. The EUT was tuned to a low, middle and high channel.

Table 2. 99% Occupied Bandwidth

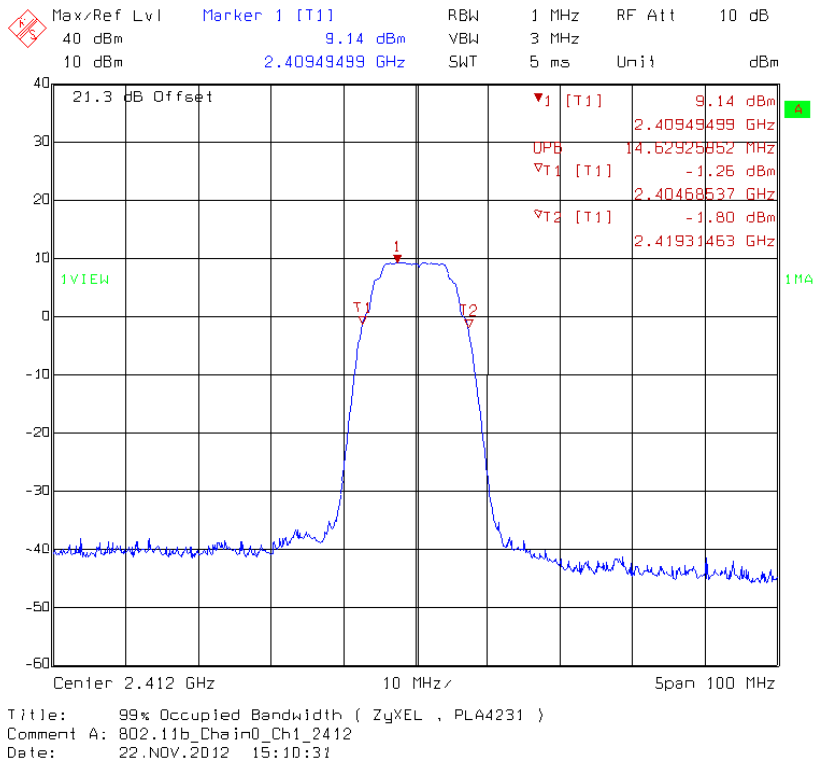
Single TX

Mode	Channel	99% Bandwidth(MHz)
		Chain0
802.11b	1	14.629
	6	14.429
	11	14.429
802.11g	1	19.238
	6	19.038
	11	19.238

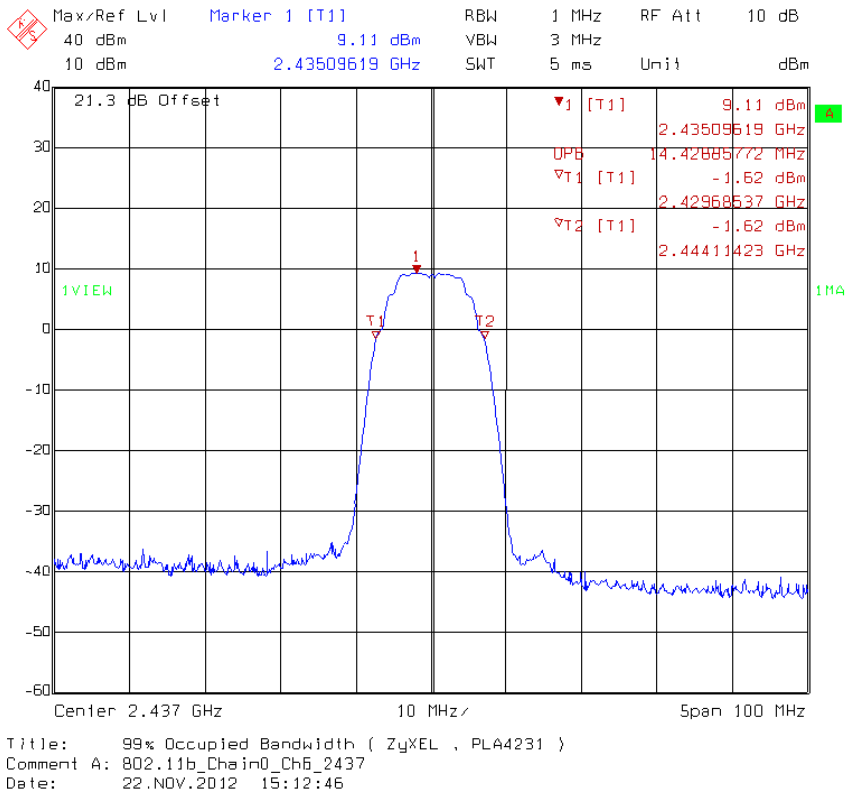
2TX

Mode	Channel	99% Bandwidth (MHz)	
		Chain0	Chain1
802.11n (HT20)	1	20.240	20.441
	6	20.040	19.840
	11	20.040	19.639
802.11n (HT40)	3	39.078	39.679
	6	38.677	38.677
	9	38.677	38.277

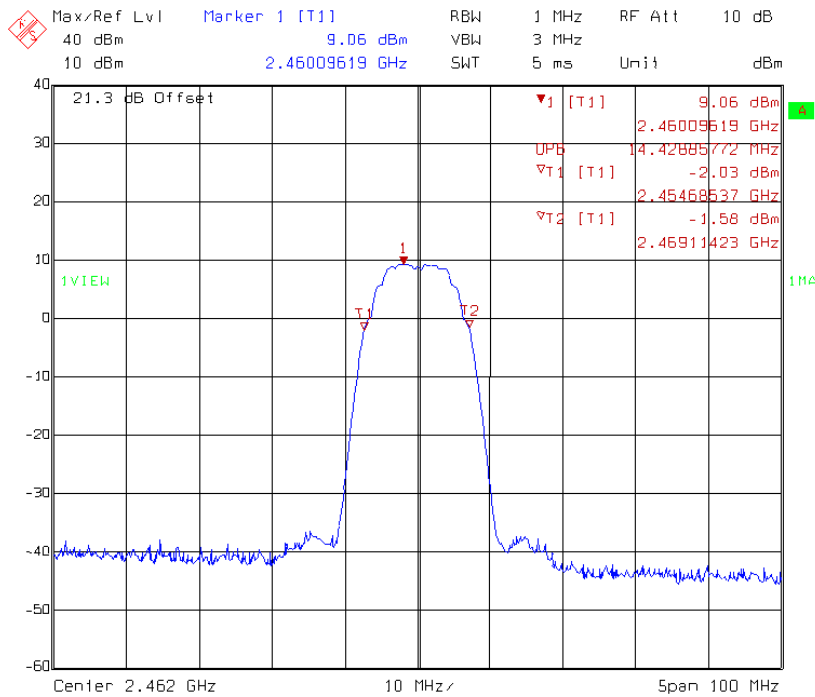
Chain 0: 99% Occupied Bandwidth @ 802.11b mode channel 1



Chain 0: 99% Occupied Bandwidth @ 802.11b mode channel 6

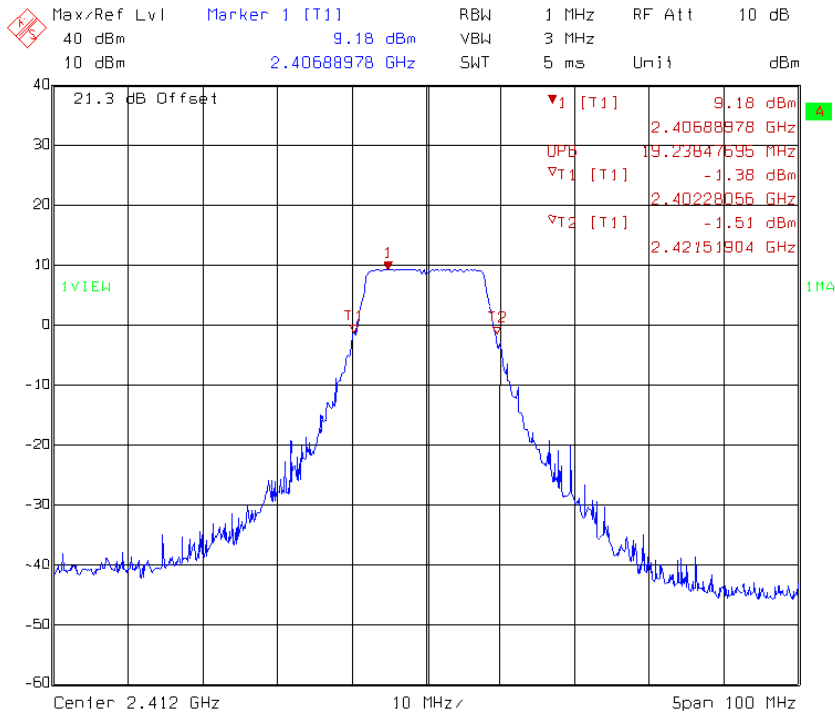


Chain 0: 99% Occupied Bandwidth @ 802.11b mode channel 11



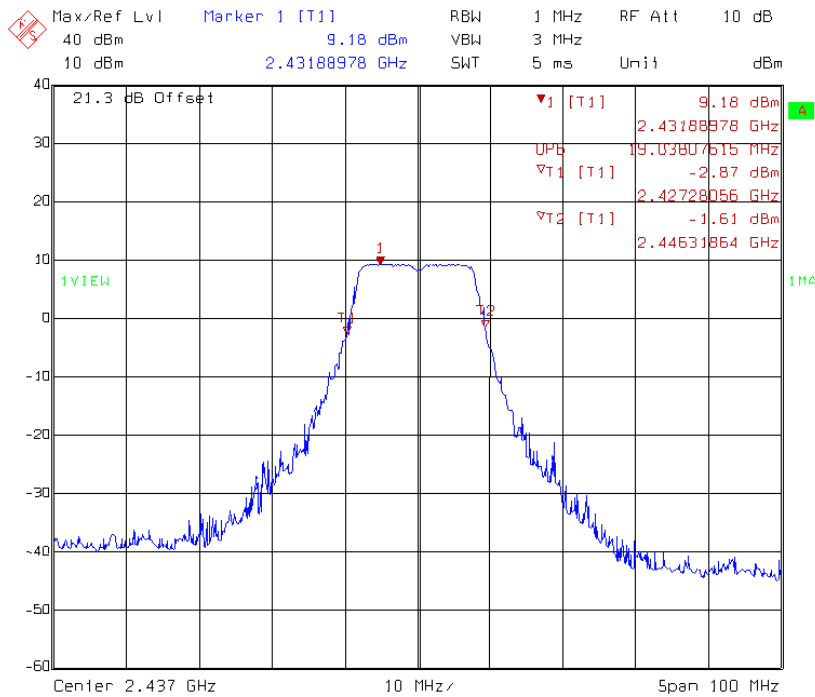
Title: 99% Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch11_2462
Date: 22.NOV.2012 15:14:48

Chain 0: 99% Occupied Bandwidth @ 802.11g mode channel 1



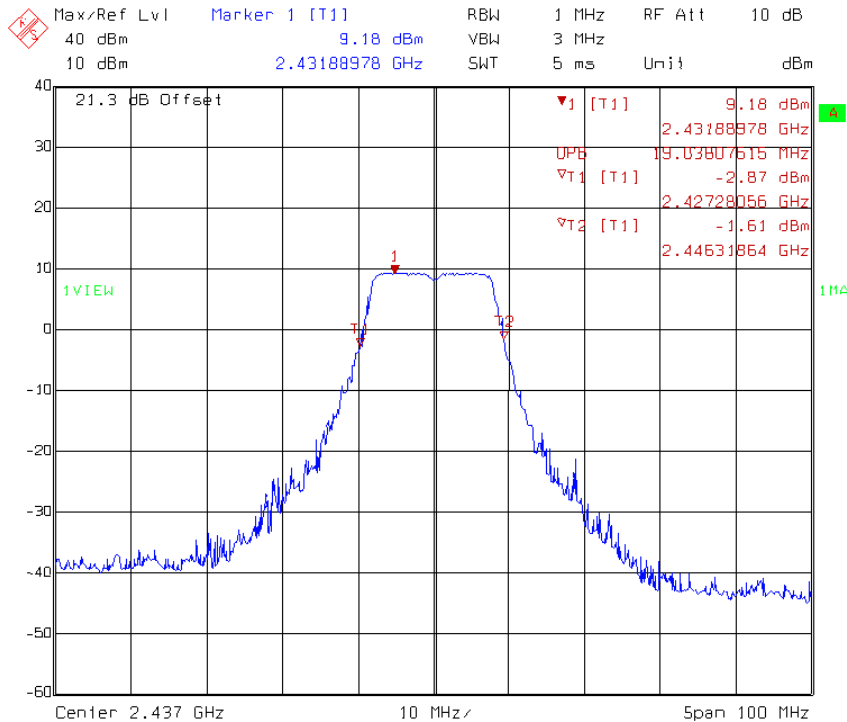
Title: 99% Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch1_2412
Date: 22.NOV.2012 19:20:42

Chain 0: 99% Occupied Bandwidth @ 802.11g mode channel 6



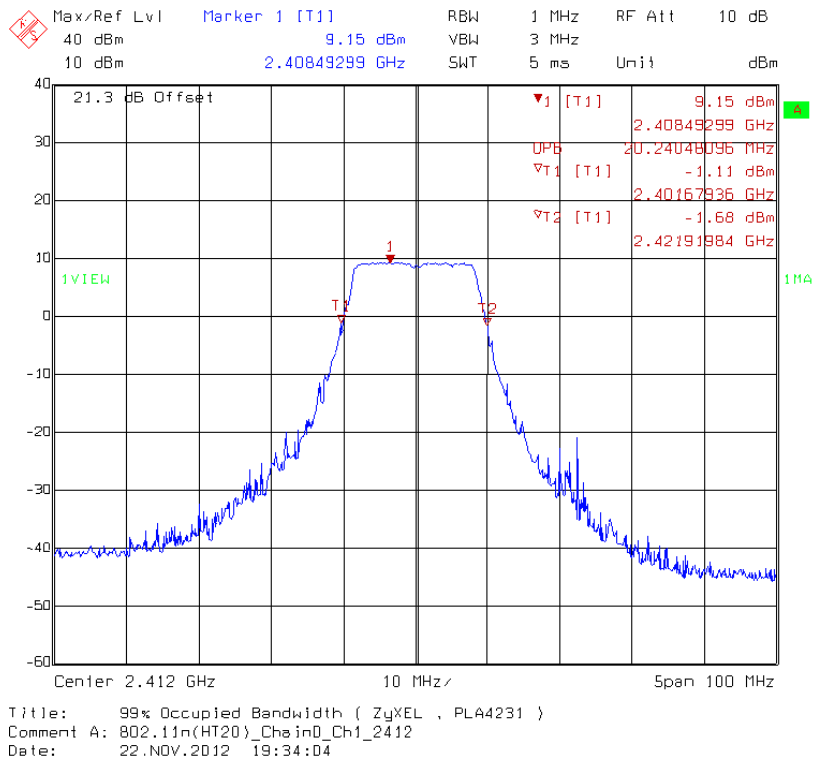
Title: 99% Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch6_2437
Date: 22.NOV.2012 19:23:00

Chain 0: 99% Occupied Bandwidth @ 802.11g mode channel 11

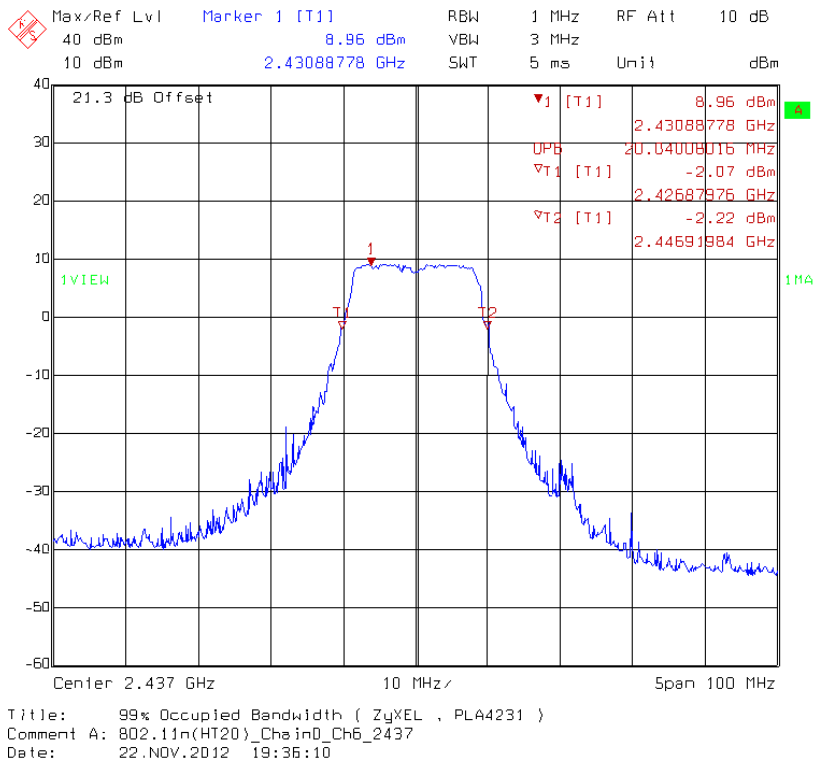


Title: 99% Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch6_2437
Date: 22.NOV.2012 19:23:00

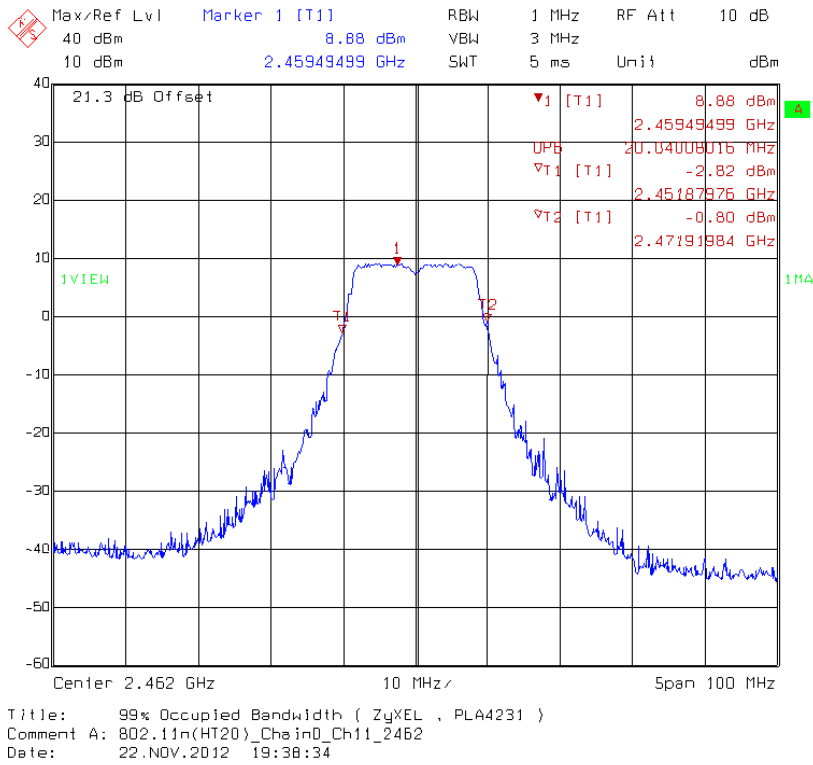
Chain 0: 99% Occupied Bandwidth @ 802.11n (HT20) mode channel 1



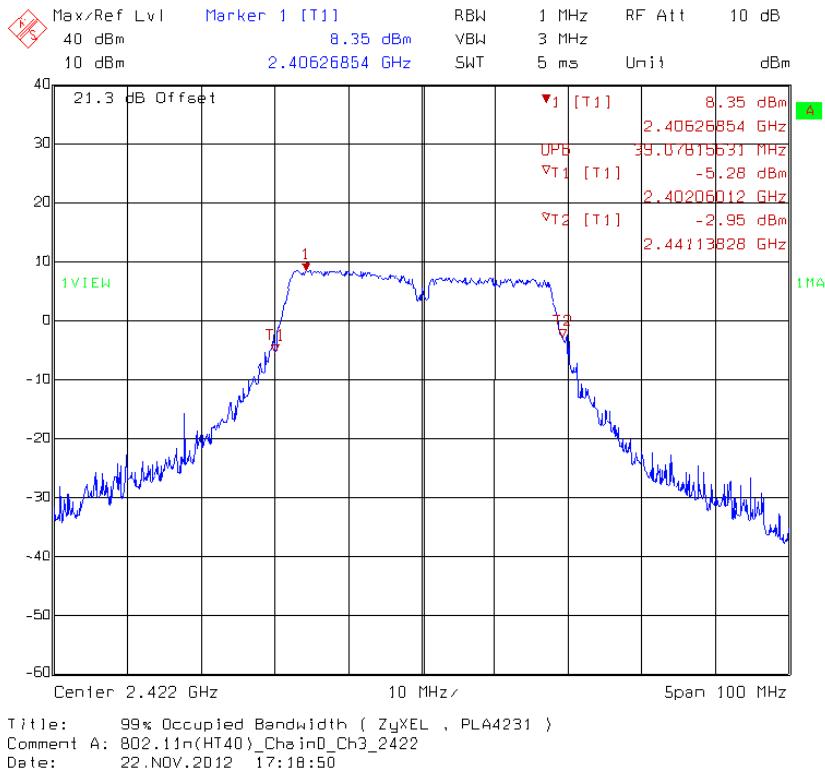
Chain 0: 99% Occupied Bandwidth @ 802.11n (HT20) mode channel 6



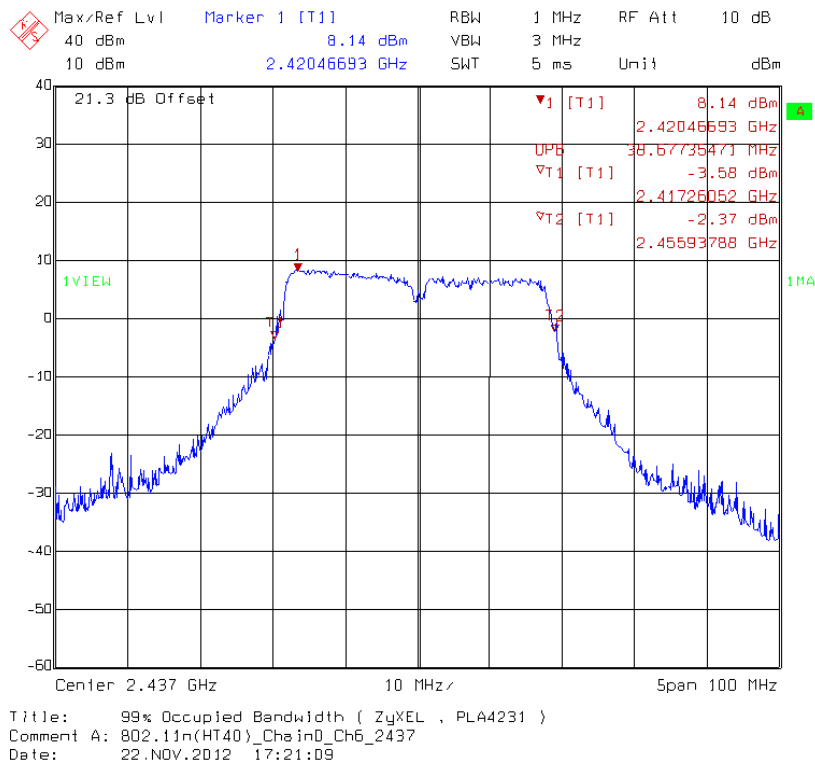
Chain 0: 99% Occupied Bandwidth @ 802.11n (HT20) mode channel 11



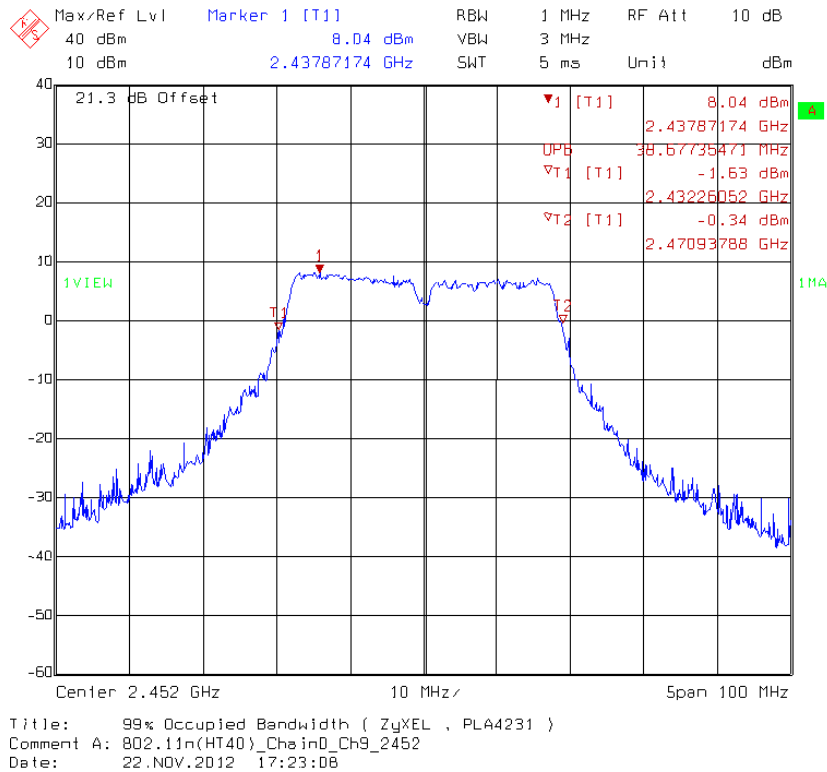
Chain 0: 99% Occupied Bandwidth @ 802.11n (HT40) mode channel 3



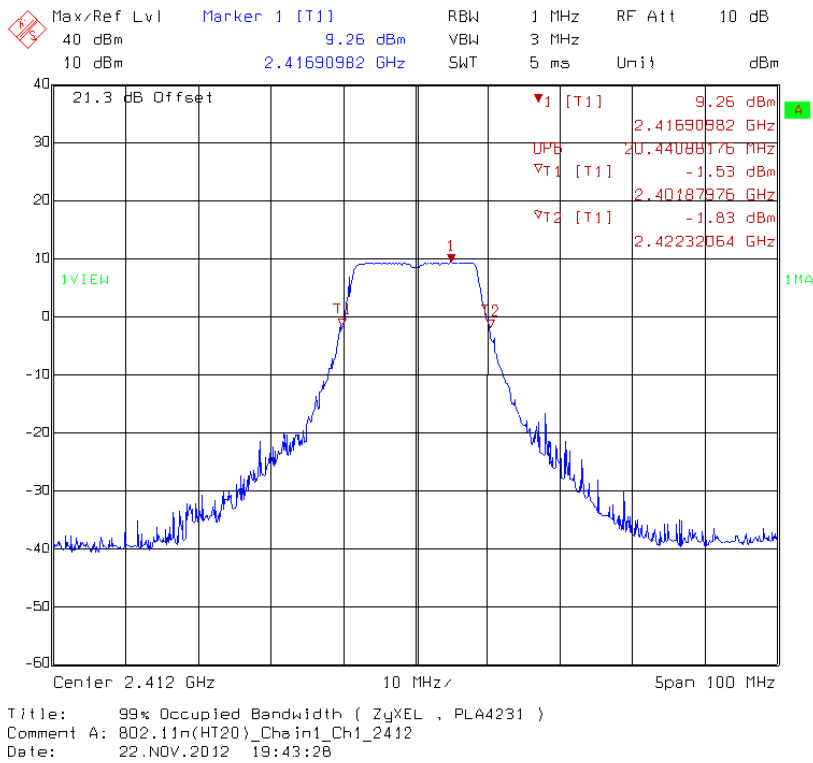
Chain 0: 99% Occupied Bandwidth @ 802.11n (HT40) mode channel 6



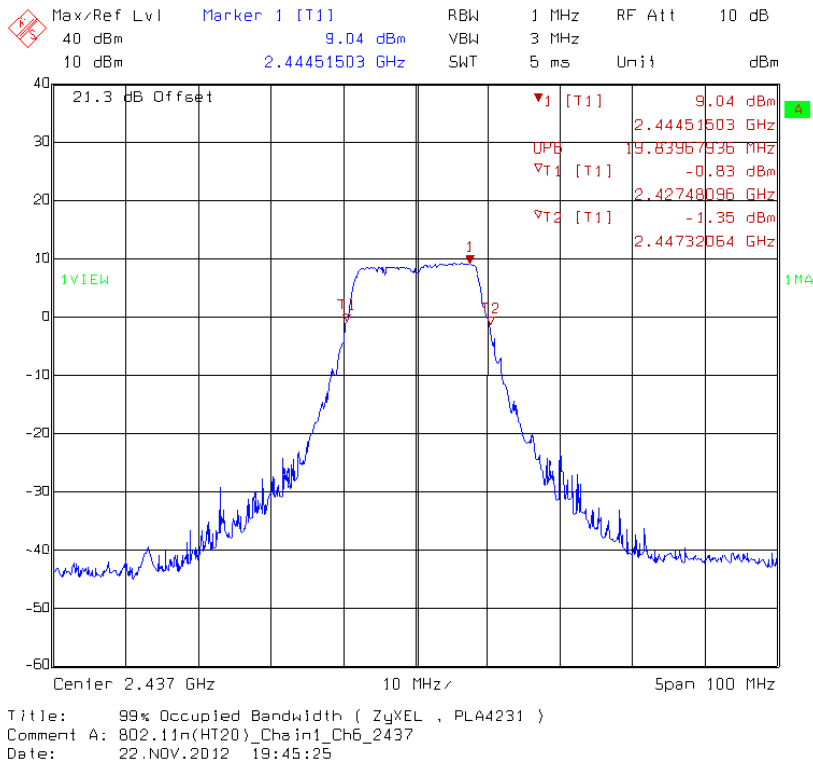
Chain 0: 99% Occupied Bandwidth @ 802.11n (HT40) mode channel 9



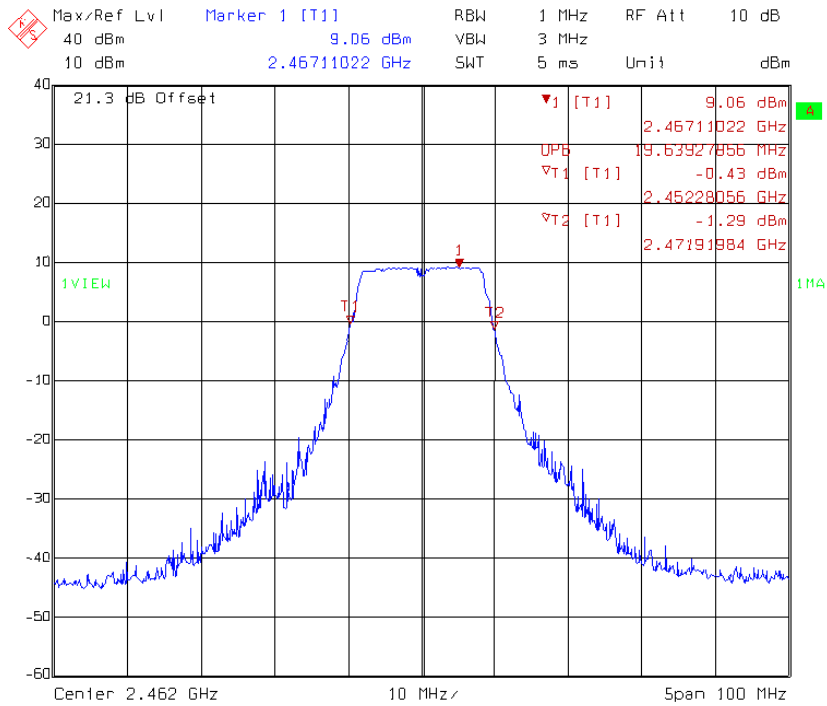
Chain 1: 99% Occupied Bandwidth @ 802.11n (HT20) mode channel 1



Chain 1: 99% Occupied Bandwidth @ 802.11n (HT20) mode channel 6

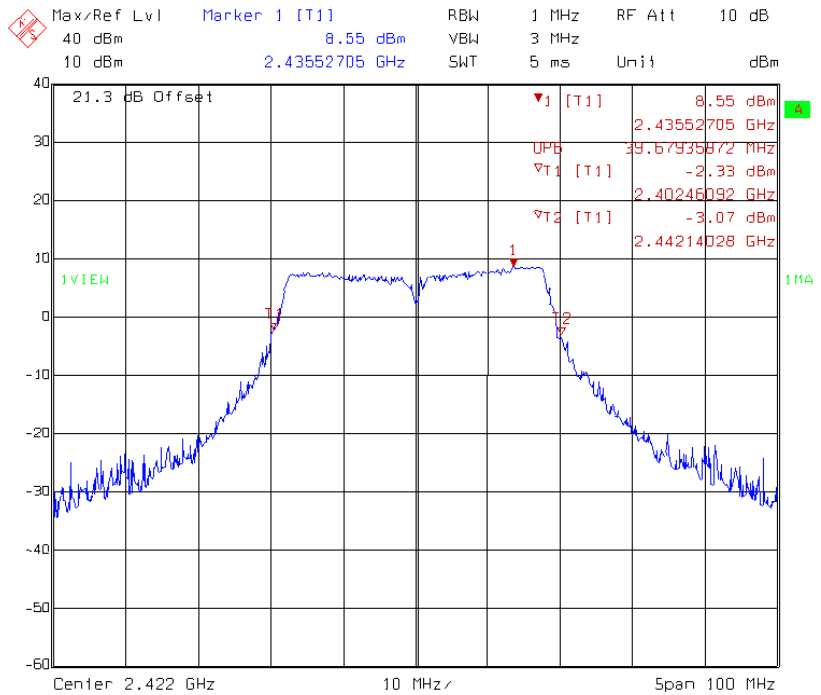


Chain 1: 99% Occupied Bandwidth @ 802.11n (HT20) mode channel 11



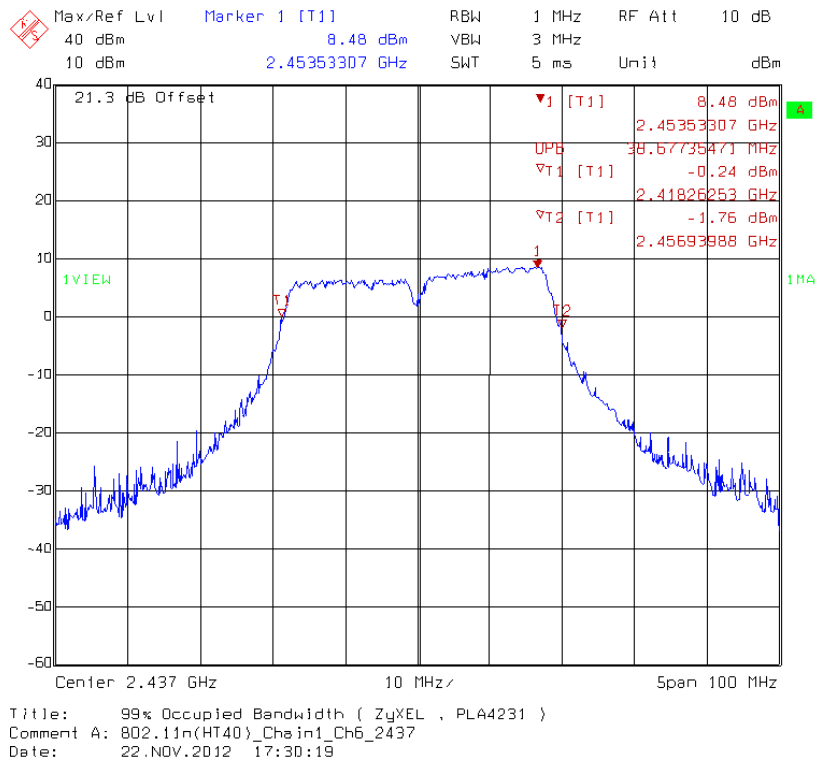
Title: 99% Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain1_Ch11_2462
Date: 22.NOV.2012 19:48:08

Chain 1: 99% Occupied Bandwidth @ 802.11n (HT40) mode channel 3

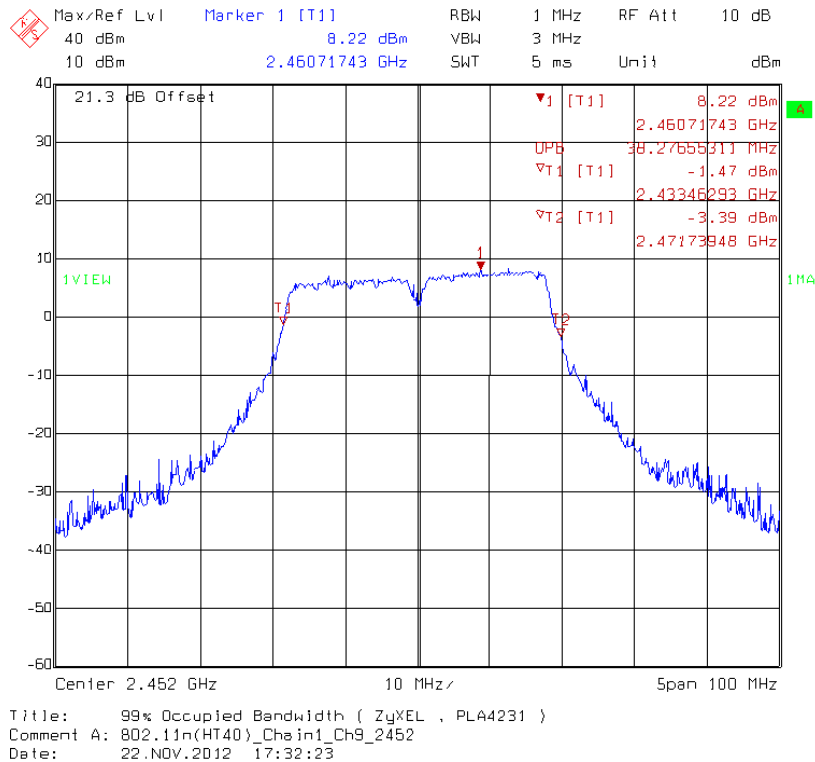


Title: 99% Occupied Bandwidth (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain1_Ch3_2422
Date: 22.NOV.2012 17:28:07

Chain 1: 99% Occupied Bandwidth @ 802.11n (HT40) mode channel 6



Chain 1: 99% Occupied Bandwidth @ 802.11n (HT40) mode channel 9



5. Maximum Output Power

Name of Test	Maximum output power
Base Standard	FCC 15.247(b)

Measurement Uncertainty: ±0.392 dB (k=2)

Test Result: Complies

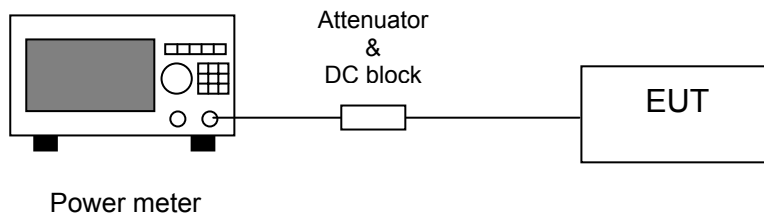
Measurement Data: See Table below

Method of Measurement:

Reference FCC document: KDB558074

The power output was measured on the EUT using a 50 ohm SMA Cable connected to peak power meter via power sensor. Connect the 20 dB attenuator and DC block at the input port of the power sensor. Measure the conducted transmitting power at each antenna port. Power output was measured with the maximum rated input level.

Test Diagram:



Note 1: The EUT was tested while in a continuous transmit mode and the worst case data rates are Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13.5 Mbps data rate for 802.11n HT40 mode. The EUT was tuned to a low, middle and high channel.

Note 2: §15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note 3: §15.247 (b) (4) (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Table 3. Maximum output power

Single Tx

Single Tx

Mode	Channel	Output Power (PK) (dBm) Chain 0	Total Power (PK) (mW)	Limit (dBm)	Margin (dB)
802.11b	1	19.65	92.26	30	-10.35
	6	19.36	86.30	30	-10.64
	11	19.61	91.41	30	-10.39
802.11g	1	21.63	145.55	30	-8.37
	6	21.52	141.91	30	-8.48
	11	21.42	138.68	30	-8.58

2Tx

Mode	Channel	Output Power (dBm)		Total Power (PK)		Limit (dBm)	Margin (dB)
		Chain 0	Chain 1	mW	dBm		
		PK	PK				
802.11n (HT20)	1	22.12	22.35	334.72	25.25	30	-4.75
	6	21.65	21.55	289.11	24.61	30	-5.39
	11	21.78	21.25	284.01	24.53	30	-5.47
802.11n (HT40)	3	21.47	21.63	285.83	24.56	30	-5.44
	6	21.35	21.45	276.10	24.41	30	-5.59
	9	21.52	21.52	283.81	24.53	30	-5.47

6. Power Spectral Density

Name of Test	Power Spectral Density
Base Standard	FCC 15.247(e)

Test Result: Complies
Measurement Data: See Table & plots below

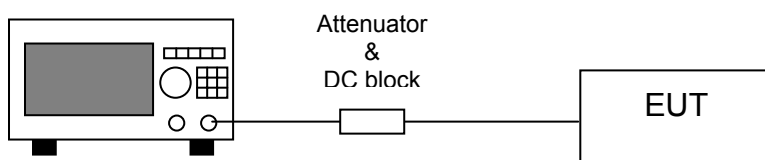
Method of Measurement:

Reference FCC document: KDB558074 D01, KDB 662911 D01

The power spectrum density was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer. Set RBW = 100 kHz, VBW ≥ 300 kHz, sweep= auto couple. The peak level measured must be no greater than + 8 dBm. Power spectrum density was read directly and cable loss (1 dB)/external attenuator (20 dB) correction was added to the reading to obtain power at the EUT antenna terminals.

According to KDB 662911 D01, *Measure and add $10 \log(N_{ANT})$ dB*, where N_{ANT} is the number of outputs. With this technique, spectrum measurements are again performed at each output of the device, but rather than summing the spectra across the outputs, the quantity $10 \log(N_{ANT})$ dB is added to each spectrum value before comparing to the emission limit. The addition of $10 \log(N_{ANT})$ dB serves to apportion the emission limit among the N_{ANT} outputs so that each output is permitted to contribute no more than $1/N_{ANT}^{th}$ of the PSD limit specified in the rules.

Test Diagram:



Spectrum Analyzer

Note: The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13 Mbps data rate for 802.11n HT40 mode. The EUT was tuned to a low, middle and high channel.

Table 4. Power Spectral Density

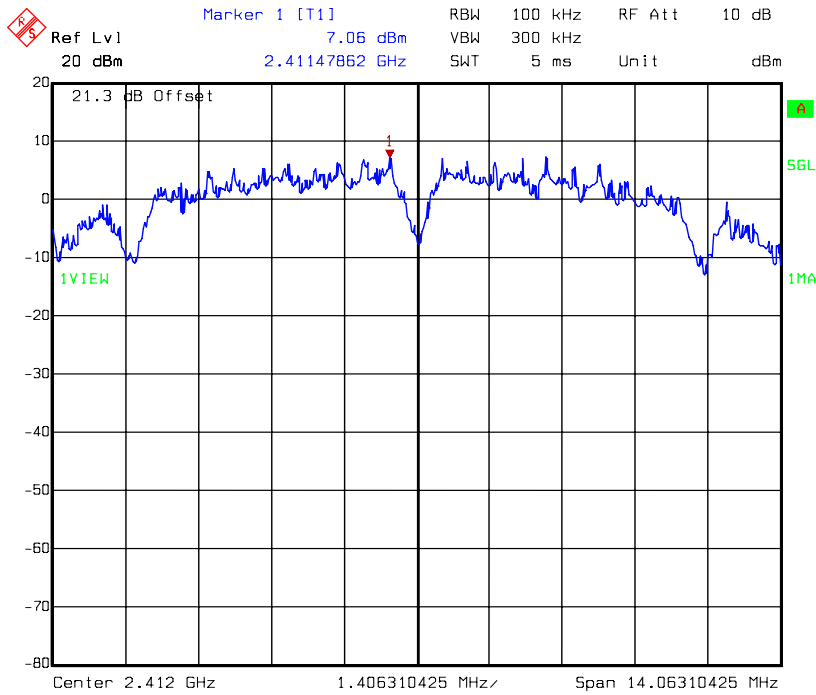
Single TX

Mode	Channel	PSD(dBm)	PSD (mW)	Limit (dBm)	Margin (dB)
		Chain 0			
802.11b	1	7.06	5.08	8	-0.94
	6	7.65	5.82	8	-0.35
	11	6.85	4.84	8	-1.15
802.11g	1	1.14	1.30	8	-6.86
	6	-0.53	0.89	8	-8.53
	11	-0.2	0.95	8	-8.20

2TX

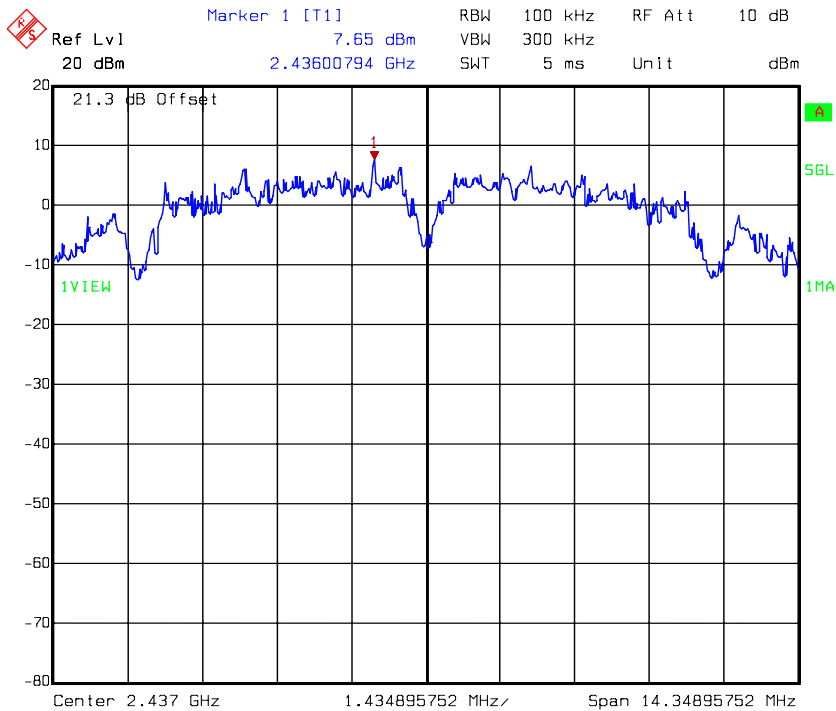
Mode	Channel	PSD (dBm)		Correction PSD(dBm)		Total (dBm)	Limit (dBm)	Margin (dB)
		Chain0	Chain1	Chain0	Chain1			
802.11n (HT20)	1	0.01	0.5	3.02	3.51	6.53	8	-1.47
	6	-0.32	0.06	2.69	3.07	5.76	8	-2.24
	11	-0.84	-1.22	2.17	1.79	3.96	8	-4.04
802.11n (HT40)	3	-2.95	-0.91	0.06	2.10	2.16	8	-5.84
	6	-2.73	-0.9	0.28	2.11	2.39	8	-5.61
	9	-2.74	-1.93	0.27	1.08	1.35	8	-6.65

Chain 0: Power Spectral Density @ 802.11b mode channel 1




Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch01_2412
Date: 03.DEC.2012 18:06:28

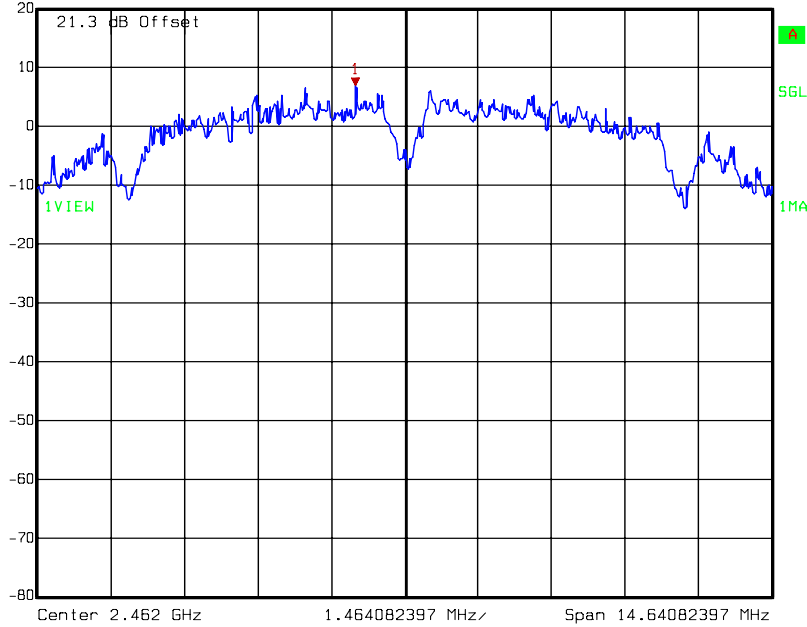
Chain 0: Power Spectral Density @ 802.11b mode channel 6



Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch06_2437
Date: 03.DEC.2012 18:06:56


Chain 0: Power Spectral Density @ 802.11b mode channel 11

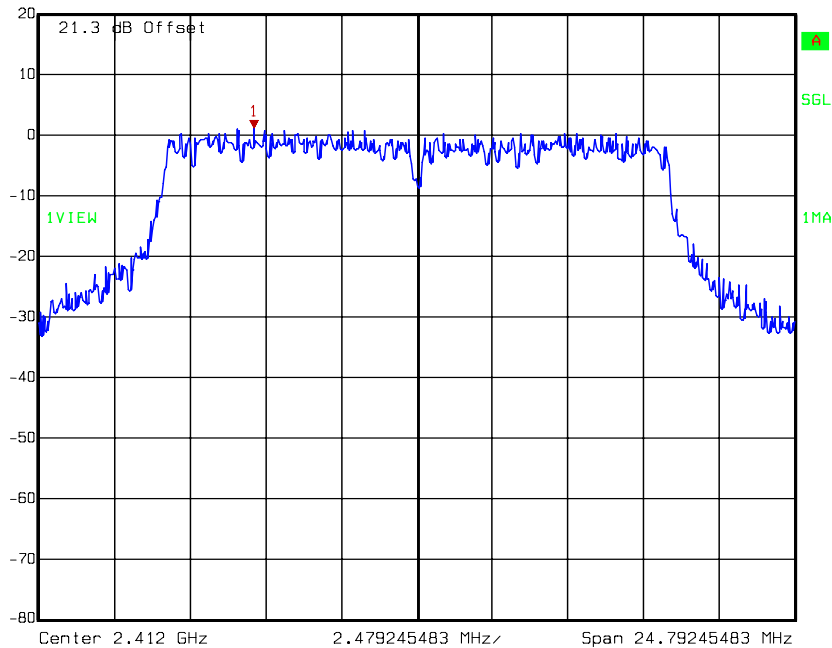

Marker 1 [T1]
RBW 100 kHz
RF Att 10 dB
Ref Lvl 6.89 dBm
VBW 300 kHz
20 dBm
2.46101710 GHz
SWT 5 ms
Unit dBm



Title: Power Density (ZyXEL , PLA4231)
 Comment A: 802.11b_Chain0_Ch11_2462
 Date: 03.DEC.2012 18:11:49

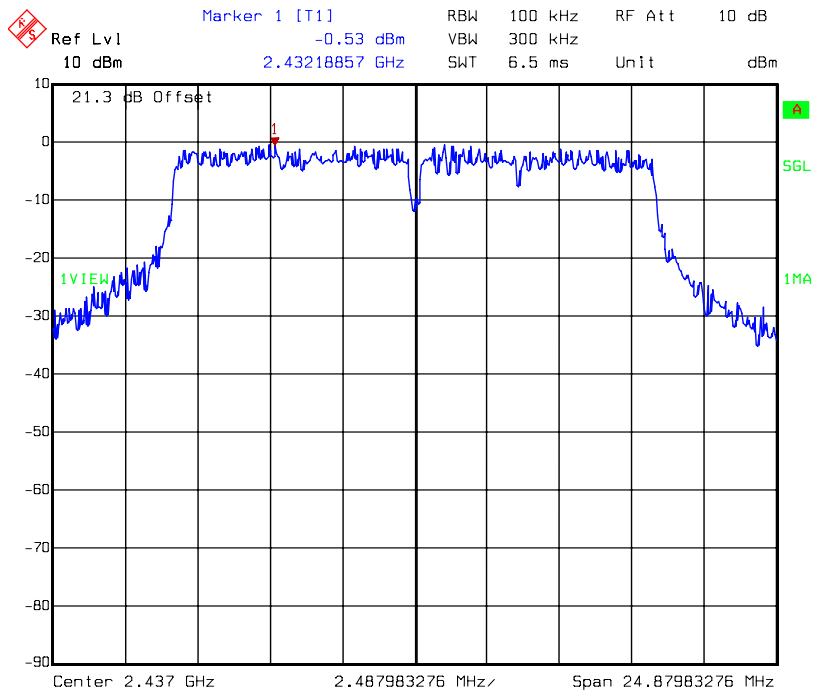
Chain 0: Power Spectral Density @ 802.11g mode channel 1


Marker 1 [T1]
RBW 100 kHz
RF Att 10 dB
Ref Lvl 1.14 dBm
VBW 300 kHz
20 dBm
2.40665894 GHz
SWT 6.5 ms
Unit dBm



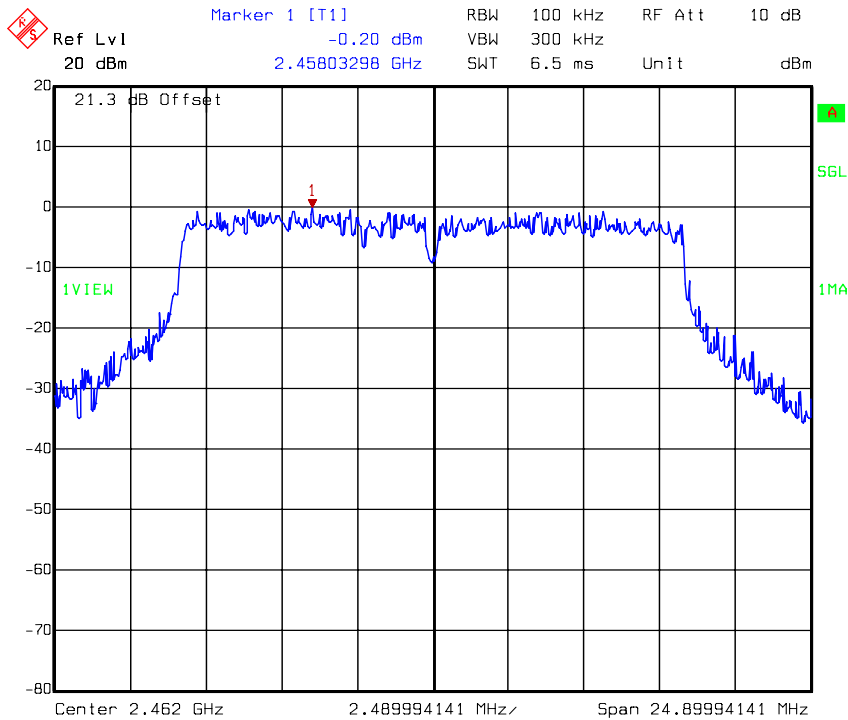
Title: Power Density (ZyXEL , PLA4231)
 Comment A: 802.11g_Chain0_Ch01_2412
 Date: 03.DEC.2012 18:33:52

Chain 0: Power Spectral Density @ 802.11g mode channel 6



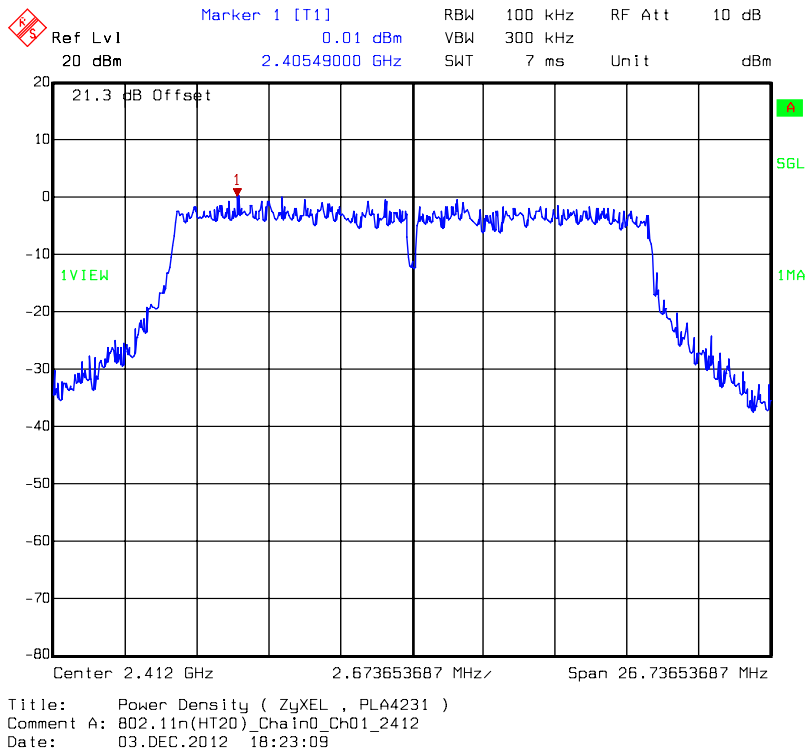
Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch06_2437
Date: 03.DEC.2012 18:21:06

Chain 0: Power Spectral Density @ 802.11g mode channel 11

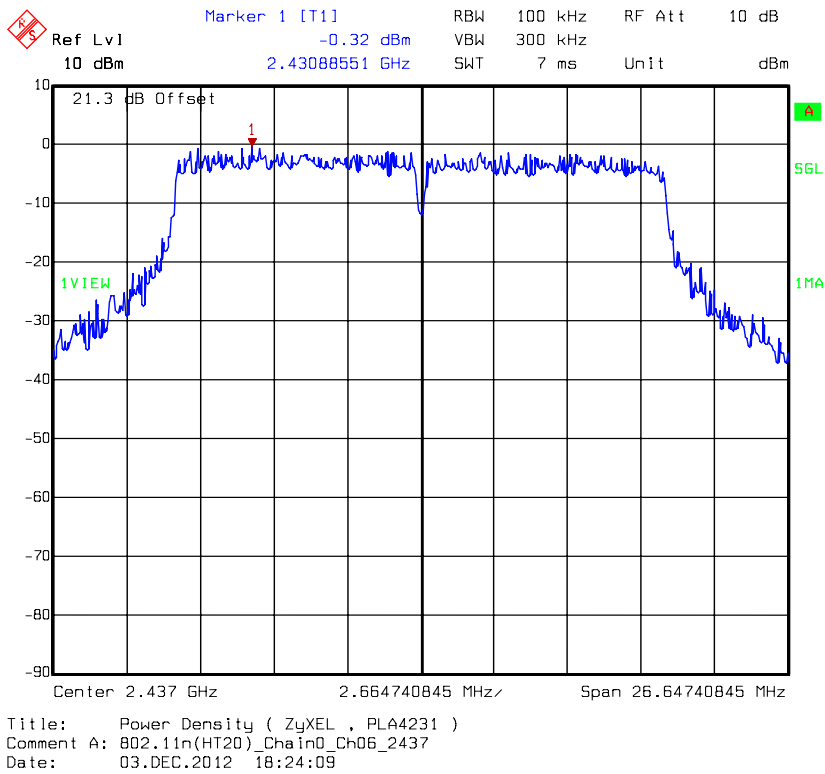


Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch11_2462
Date: 03.DEC.2012 18:21:45

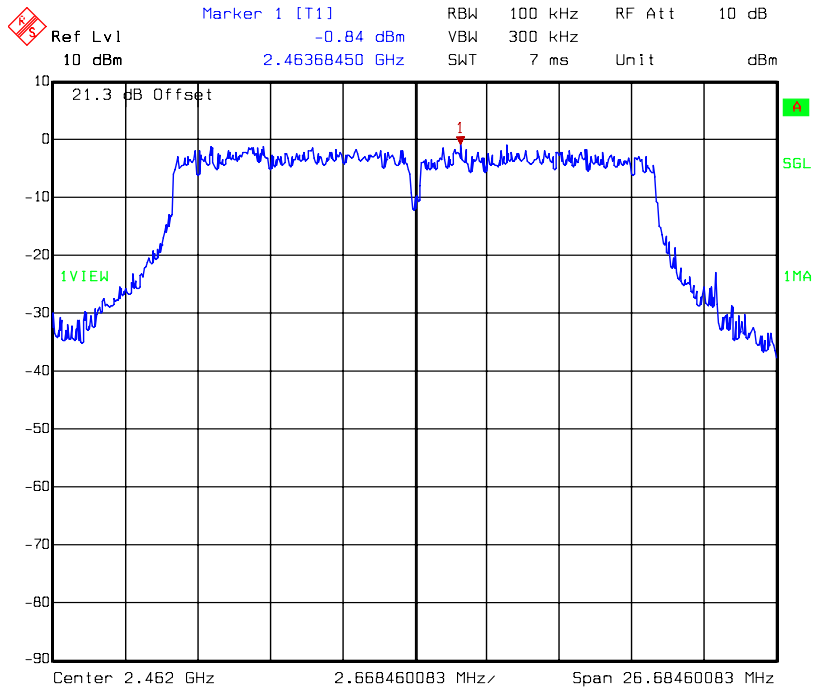
Chain 0: Power Spectral Density @ 802.11n (HT20) mode channel 1



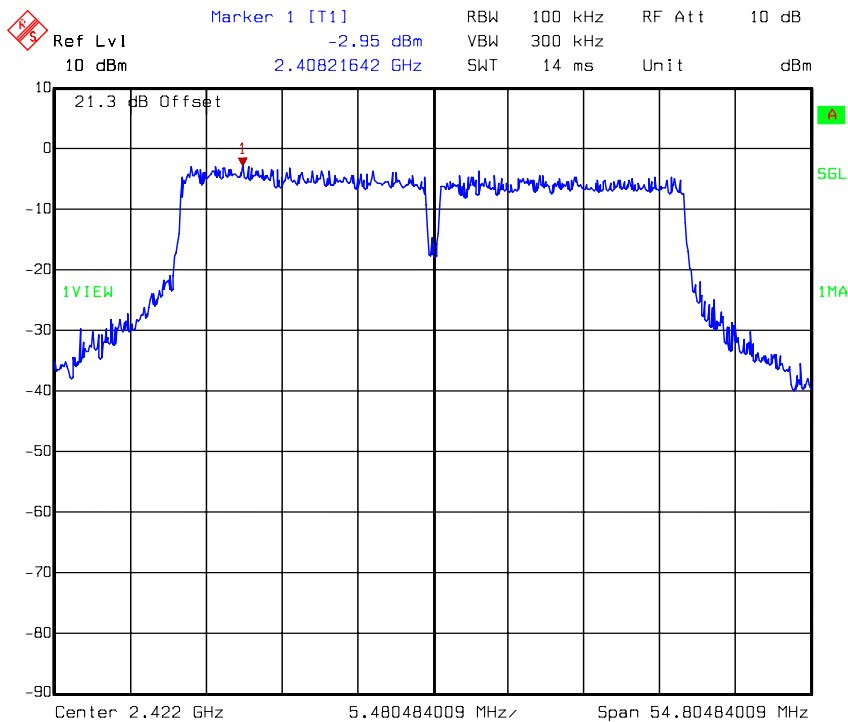
Chain 0: Power Spectral Density @ 802.11n (HT20) mode channel 6



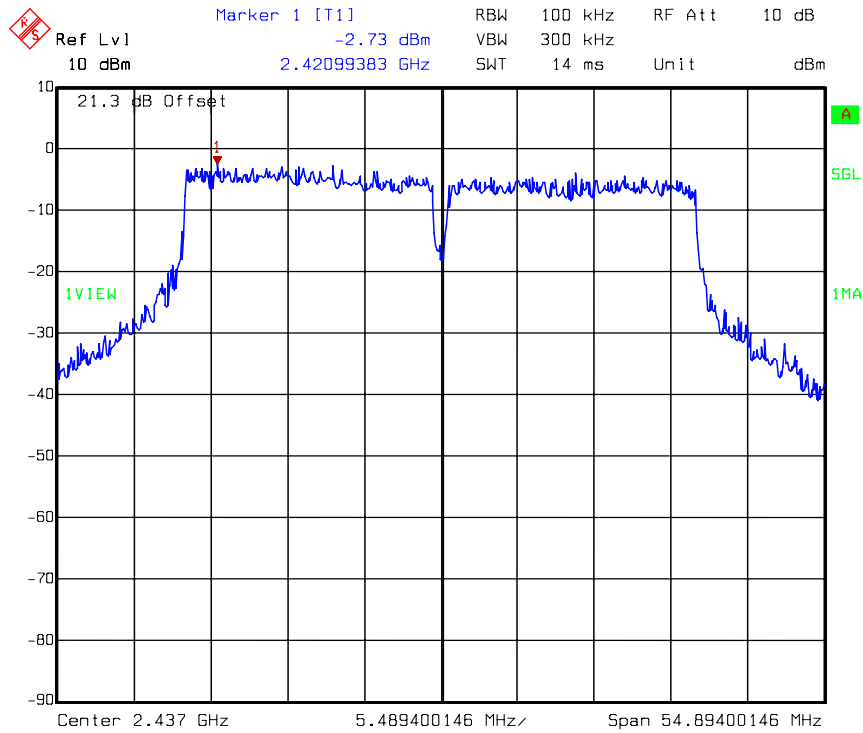
Chain 0: Power Spectral Density @ 802.11n (HT20) mode channel 11



Chain 0: Power Spectral Density @ 802.11n (HT40) mode channel 3

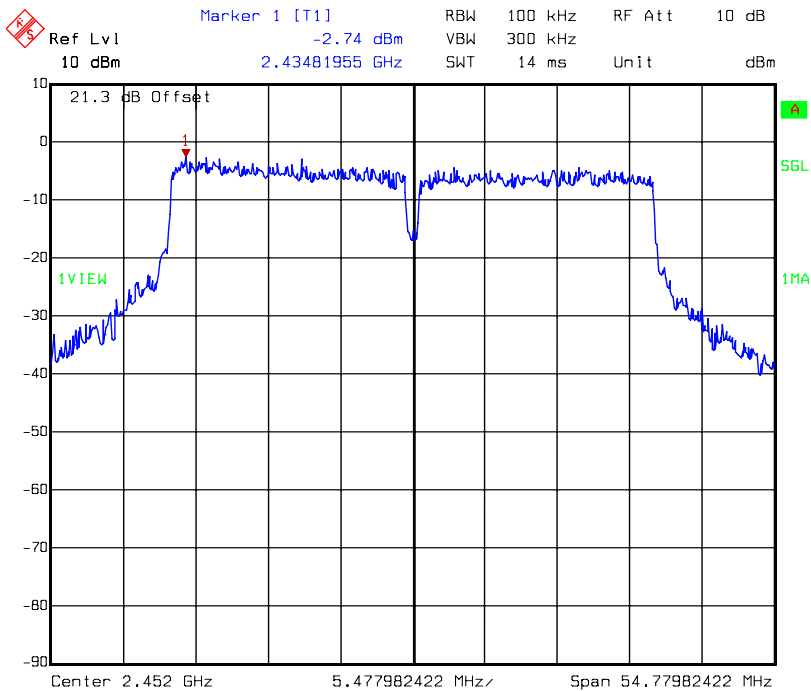


Chain 0: Power Spectral Density @ 802.11n (HT40) mode channel 6



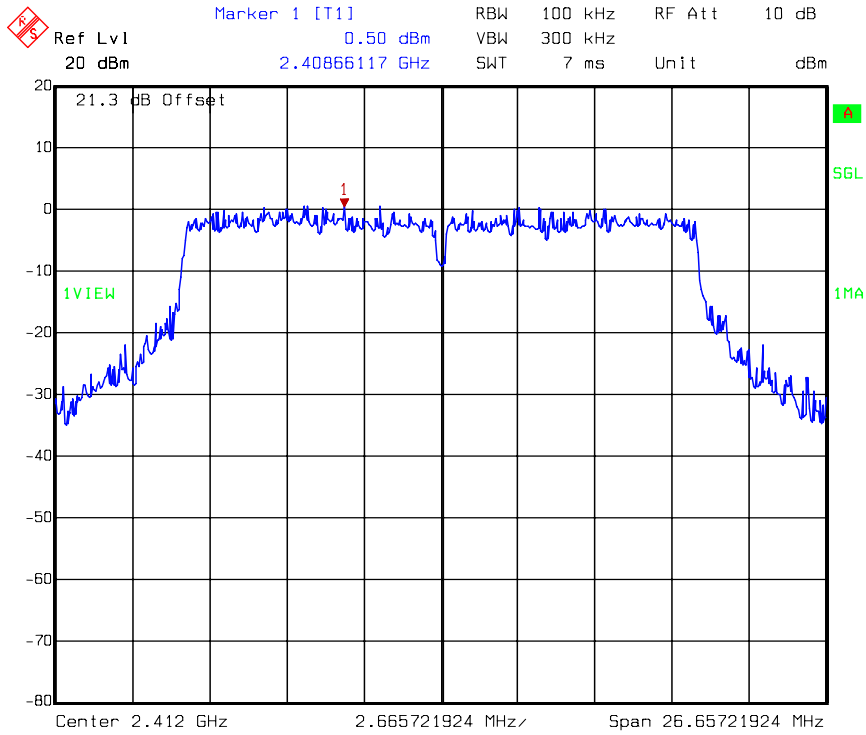
Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain0_Ch06_2437
Date: 03.DEC.2012 18:50:03

Chain 0: Power Spectral Density @ 802.11n (HT40) mode channel 9



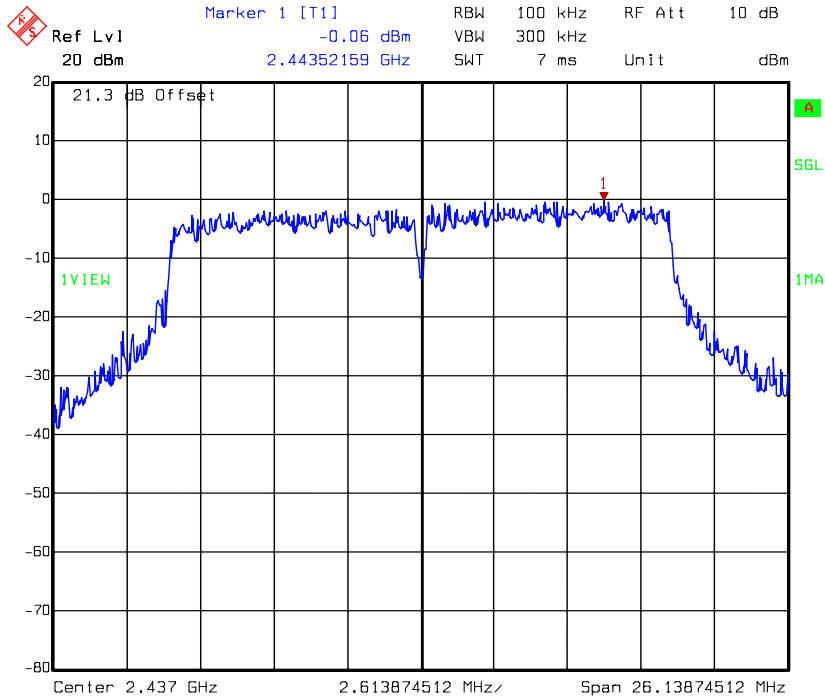
Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain0_Ch09_2452
Date: 03.DEC.2012 18:51:12

Chain 1: Power Spectral Density @ 802.11n (HT20) mode channel 1



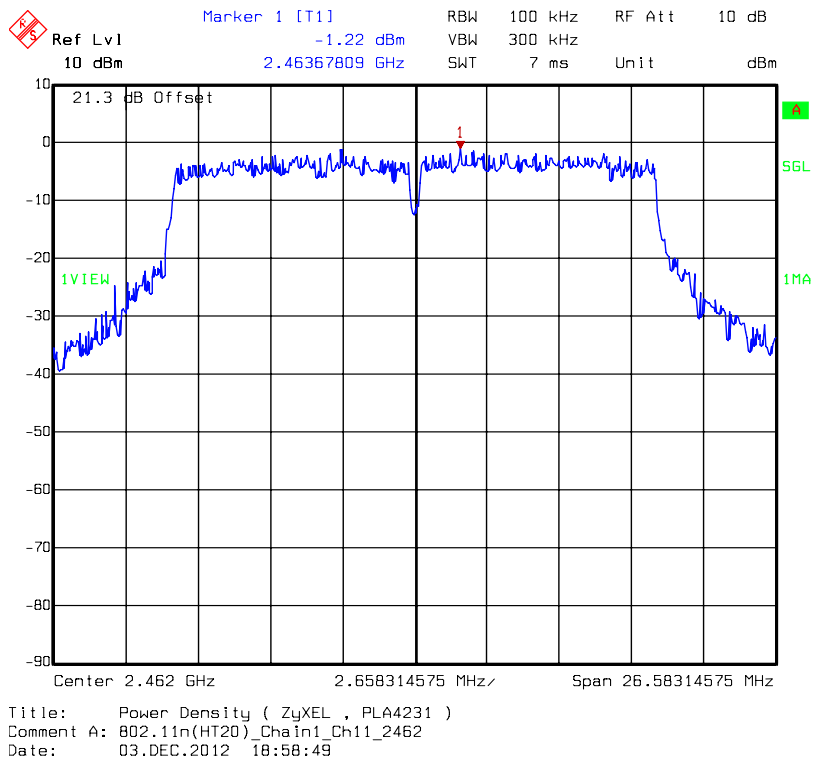
Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain1_Ch01_2412
Date: 03.DEC.2012 18:57:46

Chain 1: Power Spectral Density @ 802.11n (HT20) mode channel 6

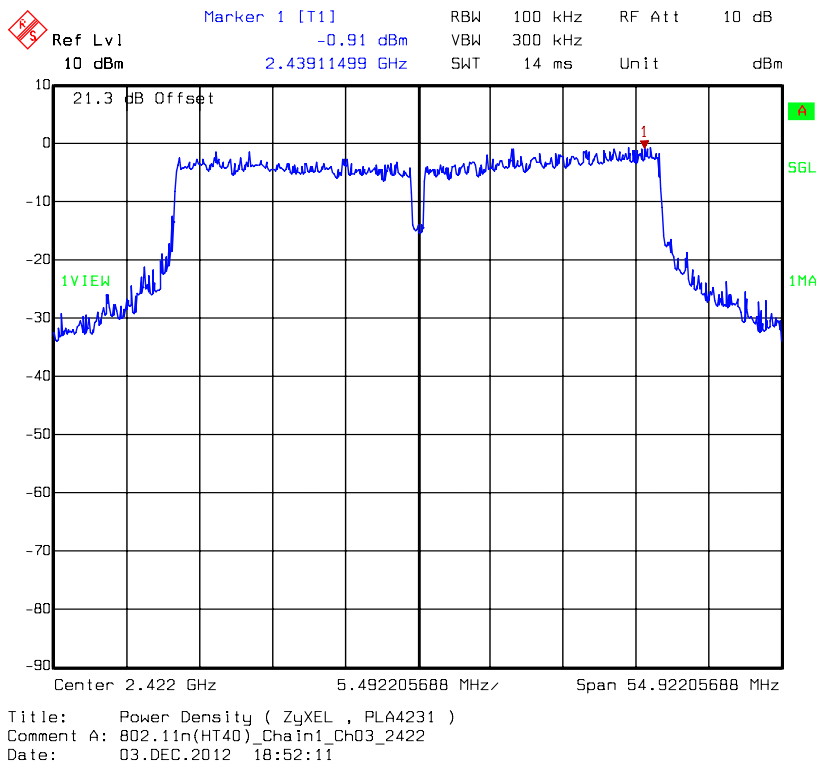


Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain1_Ch06_2437
Date: 03.DEC.2012 18:58:20

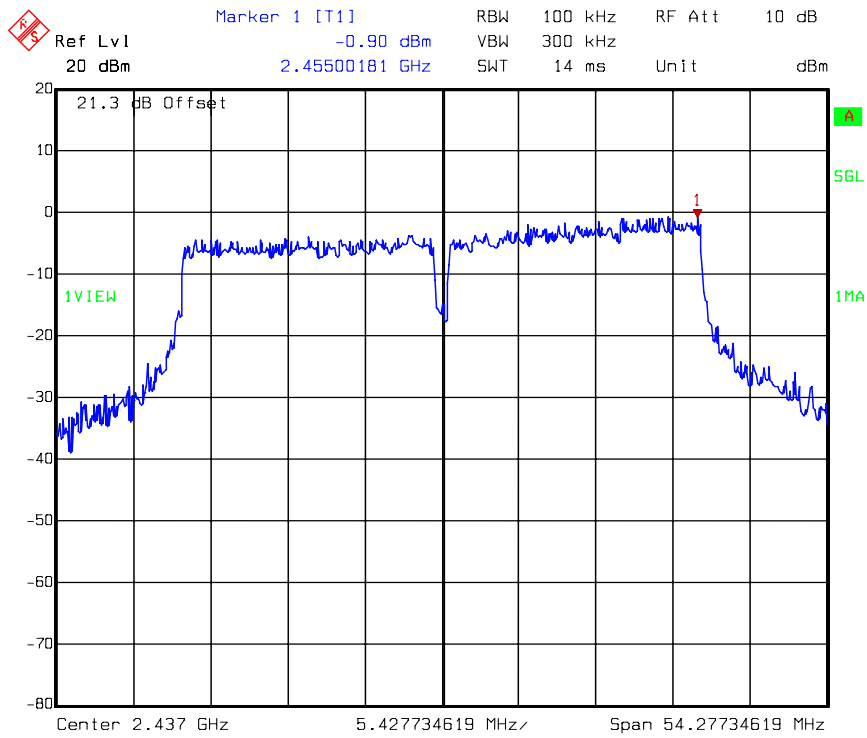
Chain 1: Power Spectral Density @ 802.11n (HT20) mode channel 11



Chain 1: Power Spectral Density @ 802.11n (HT40) mode channel 3

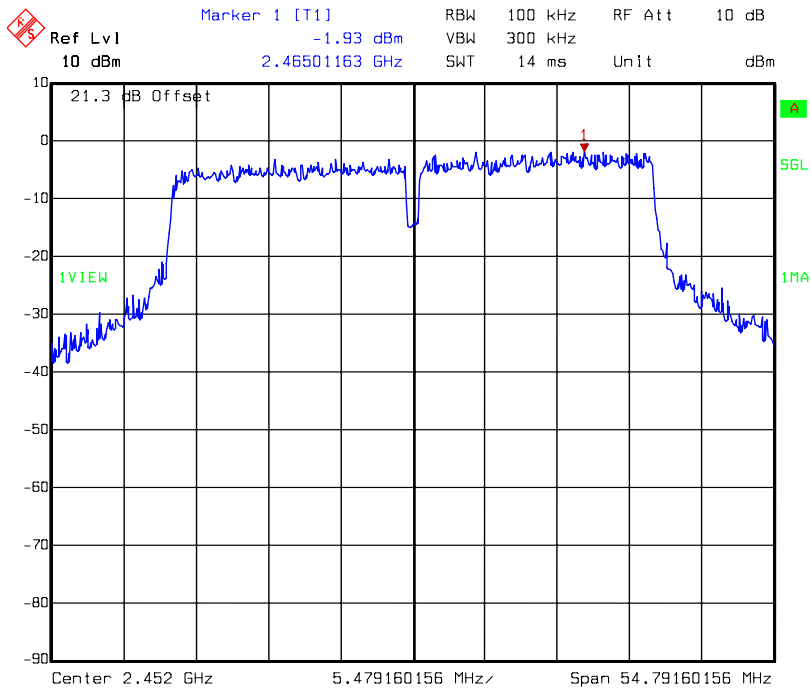


Chain 1: Power Spectral Density @ 802.11n (HT40) mode channel 6



Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain1_Ch06_2437
Date: 03.DEC.2012 18:55:00

Chain 1: Power Spectral Density @ 802.11n (HT40) mode channel 9



Title: Power Density (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain1_Ch09_2452
Date: 03.DEC.2012 18:55:27

7. RF Antenna conducted Spurious

Name of Test	RF Antenna Conducted Spurious
Base Standard	FCC 15.247(d)

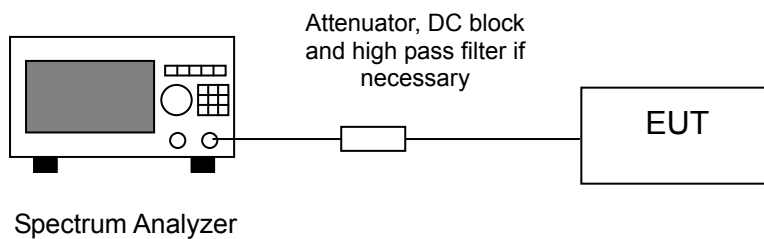
Test Result: Complies
Measurement Data: See plots below

Method of Measurement:

Reference FCC document: KDB558074

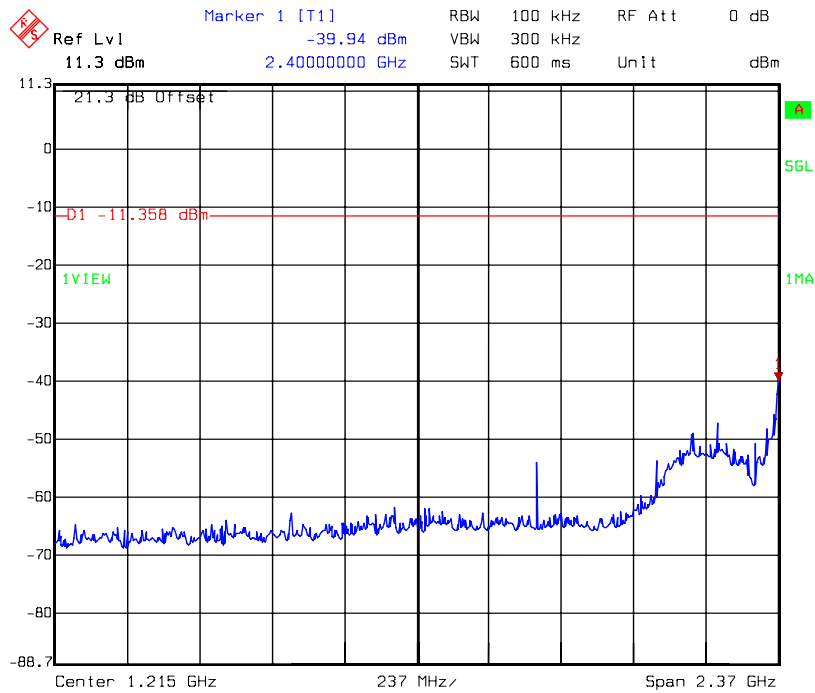
The measurements were performed from 30 MHz to 25 GHz(for 2.4G) and 30 MHz to 40 GHz(for 5.8G)RF antenna conducted per FCC 15.247 (d) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. Harmonics and spurious noise must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

Test Diagram:



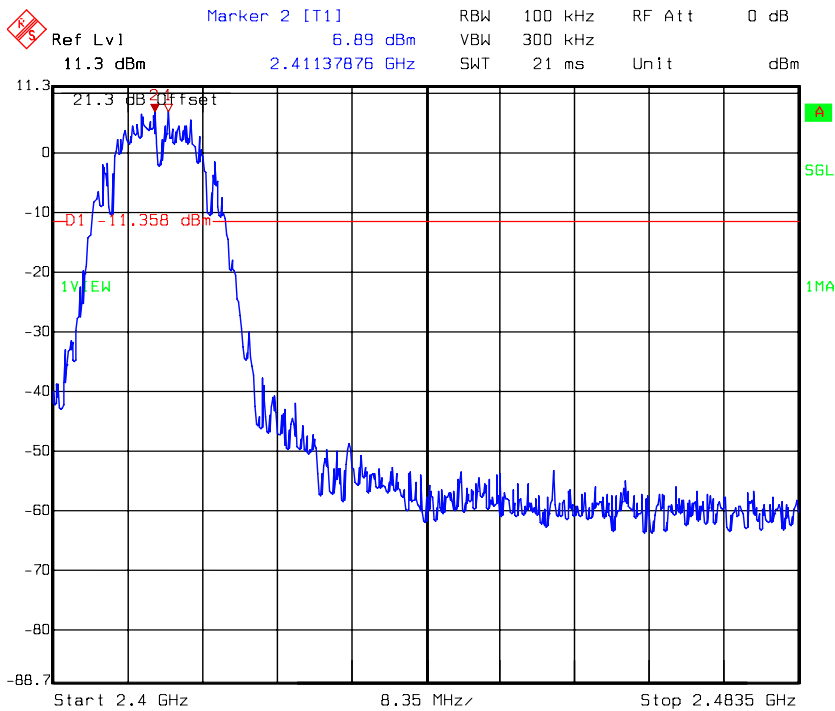
- Note:**
- (1) The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b, 6 Mbps for 802.11a/ 11g, 6.5 MHz for 802.11n HT20 and 13.5 MHz for 802.11n HT40. The EUT was tuned to a low, middle and high channel.
 - (2) The EUT operating at 2.4 GHz ISM band. Frequency Range scanned from 30 MHz to 25 GHz.

Chain 0: Conducted spurious @ 802.11b mode channel 1 (1 of 3)



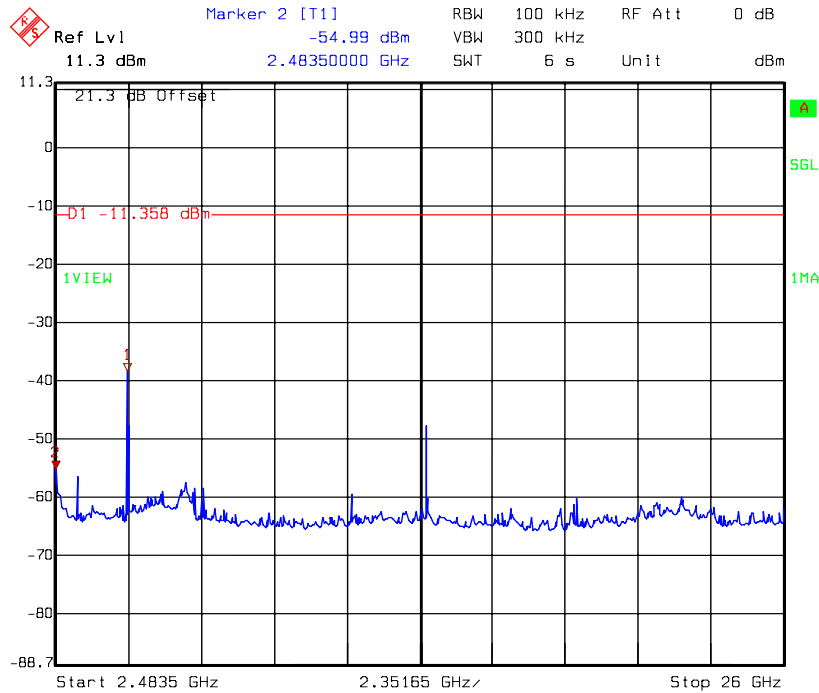
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11b_Chain0_Ch01_2412
 Date: 03.DEC.2012 16:42:39

Chain 0: Conducted spurious @ 802.11b mode channel 1 (2 of 3)



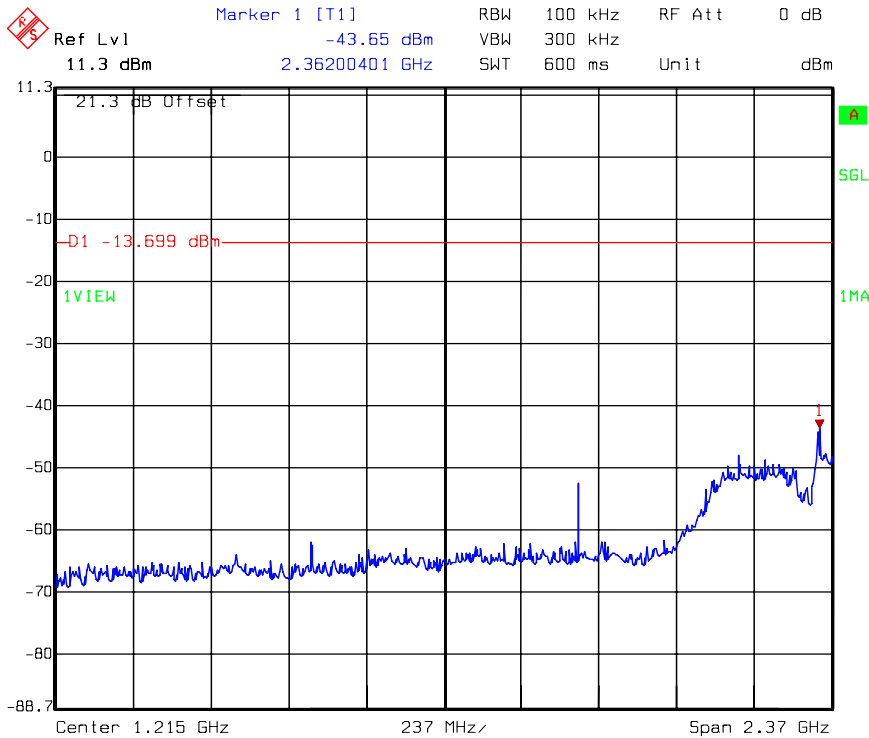
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11b_Chain0_Ch01_2412

Chain 0: Conducted spurious @ 802.11b mode channel 1 (3 of 3)



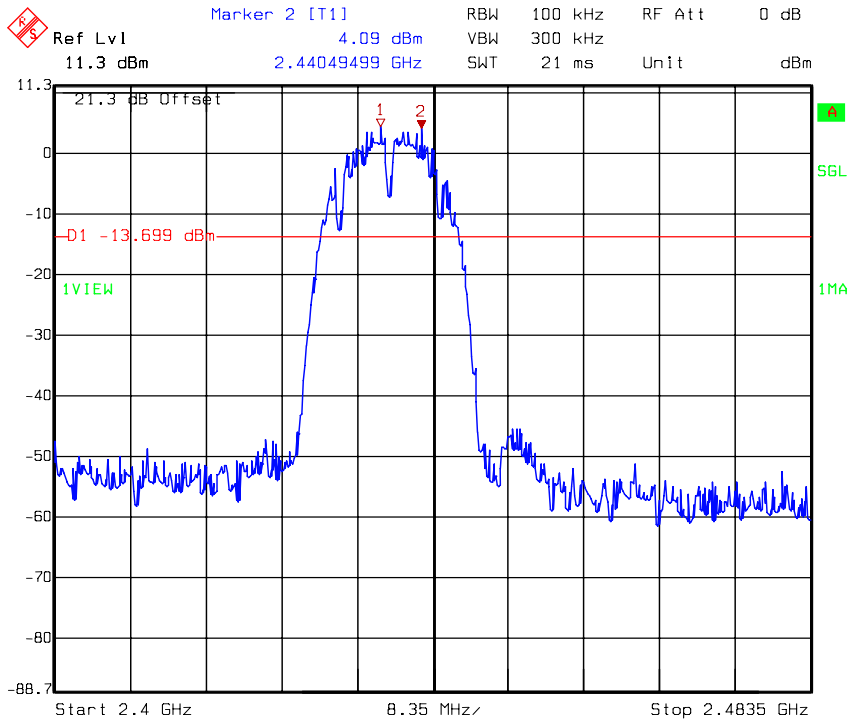
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11b_Chain0_Ch01_2412
 Date: 03.DEC.2012 16:42:54

Chain 0: Conducted spurious @ 802.11b mode channel 6 (1 of 3)



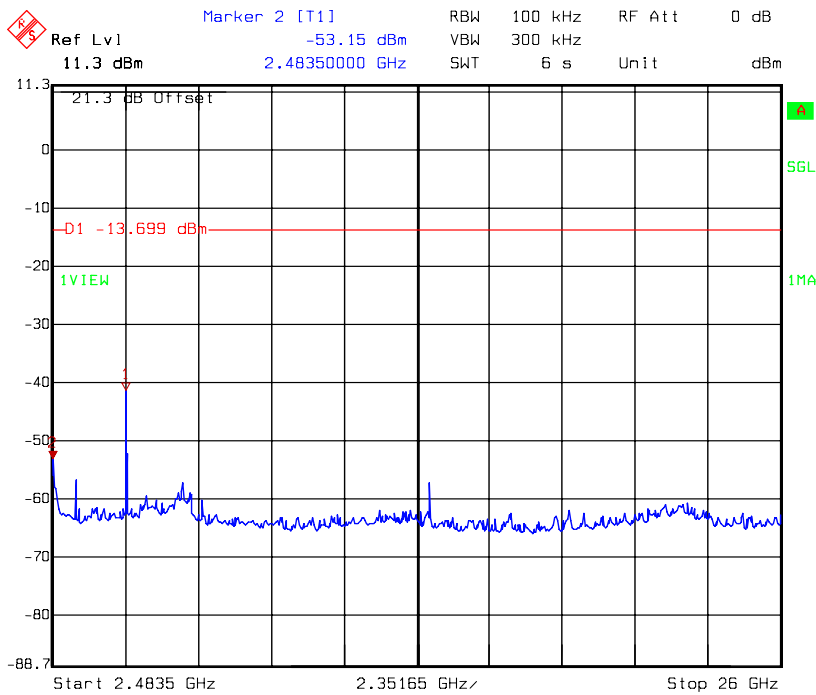
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11b_Chain0_Ch06_2437
 Date: 03.DEC.2012 16:46:07

Chain 0: Conducted spurious @ 802.11b mode channel 6 (2 of 3)



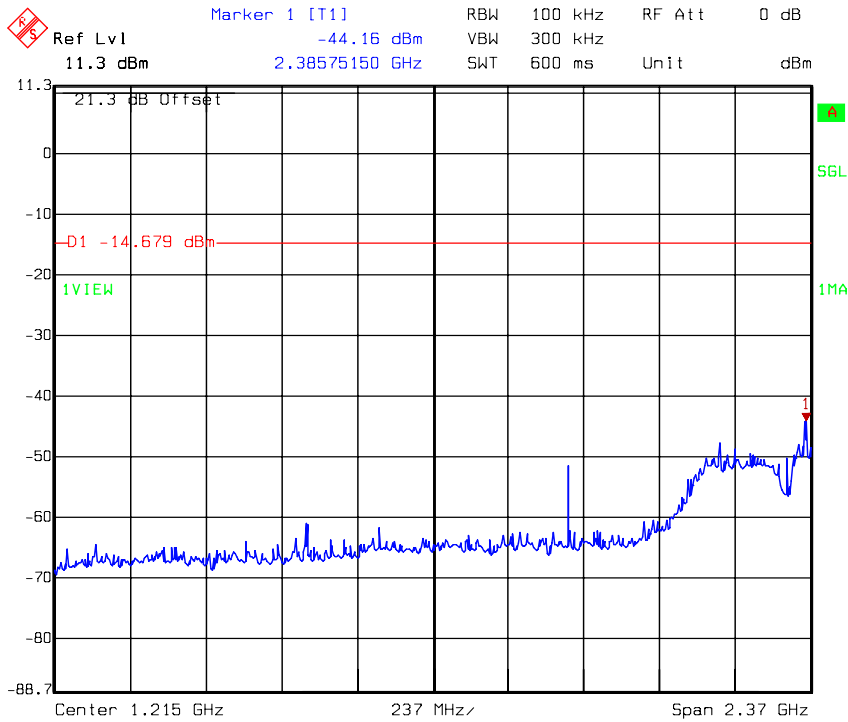
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch06_2437
Date: 03.DEC.2012 16:46:11

Chain 0: Conducted spurious @ 802.11b mode channel 6 (3 of 3)



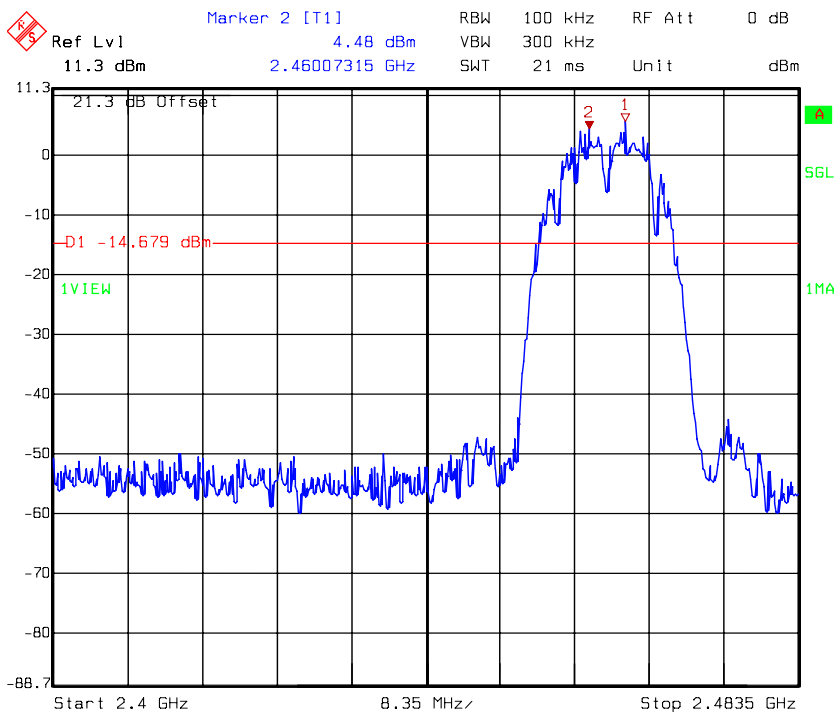
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch06_2437
Date: 03.DEC.2012 16:46:22

Chain 0: Conducted spurious @ 802.11b mode channel 11 (1 of 3)



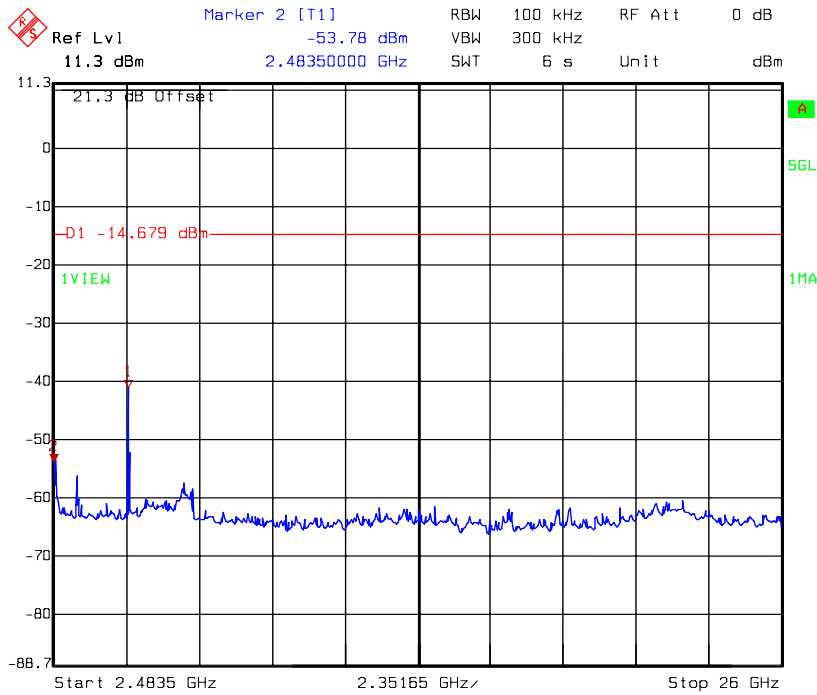
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch11_2462
Date: 03.DEC.2012 16:46:57

Chain 0: Conducted spurious @ 802.11b mode channel 11 (2 of 3)



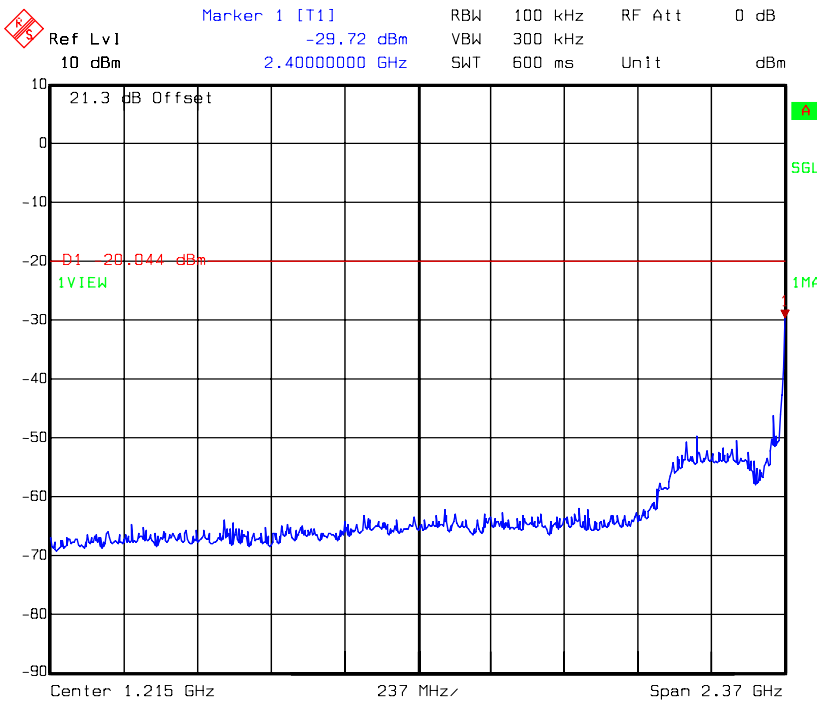
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch11_2462
Date: 03.DEC.2012 16:47:01

Chain 0: Conducted spurious @ 802.11b mode channel 11 (3 of 3)



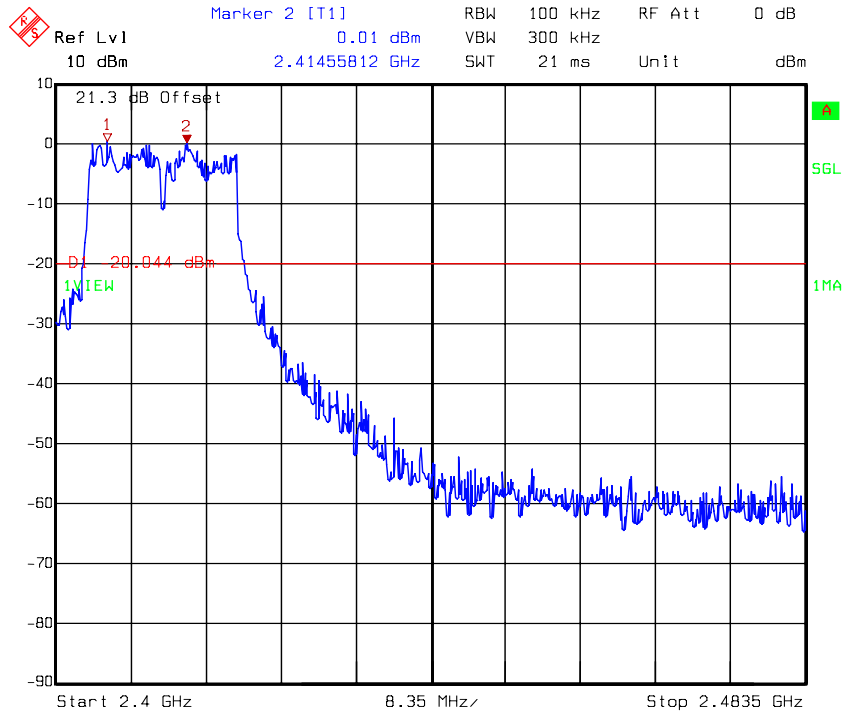
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11b_Chain0_Ch11_2462
Date: 03.DEC.2012 16:47:11

Chain 0: Conducted spurious @ 802.11g mode channel 1 (1 of 3)



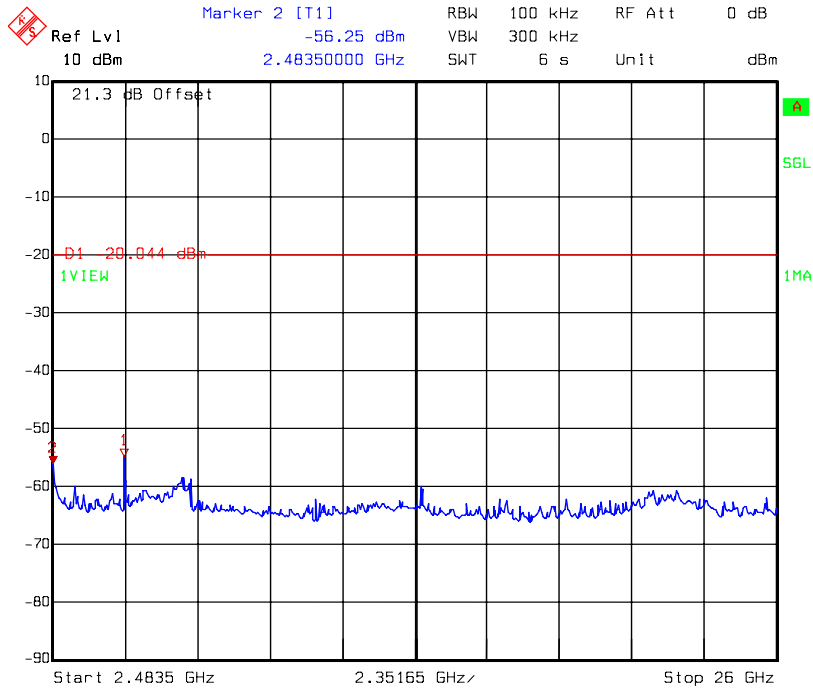
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch01_2412
Date: 03.DEC.2012 17:05:02

Chain 0: Conducted spurious @ 802.11g mode channel 1 (2 of 3)



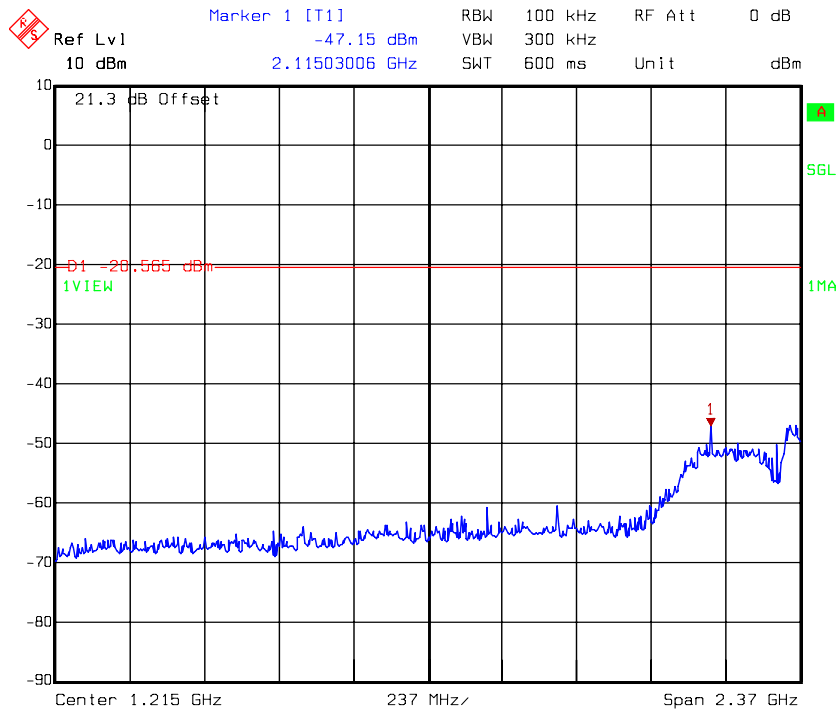
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11g_Chain0_Ch01_2412
 Date: 03.DEC.2012 17:05:06

Chain 0: Conducted spurious @ 802.11g mode channel 1 (3 of 3)



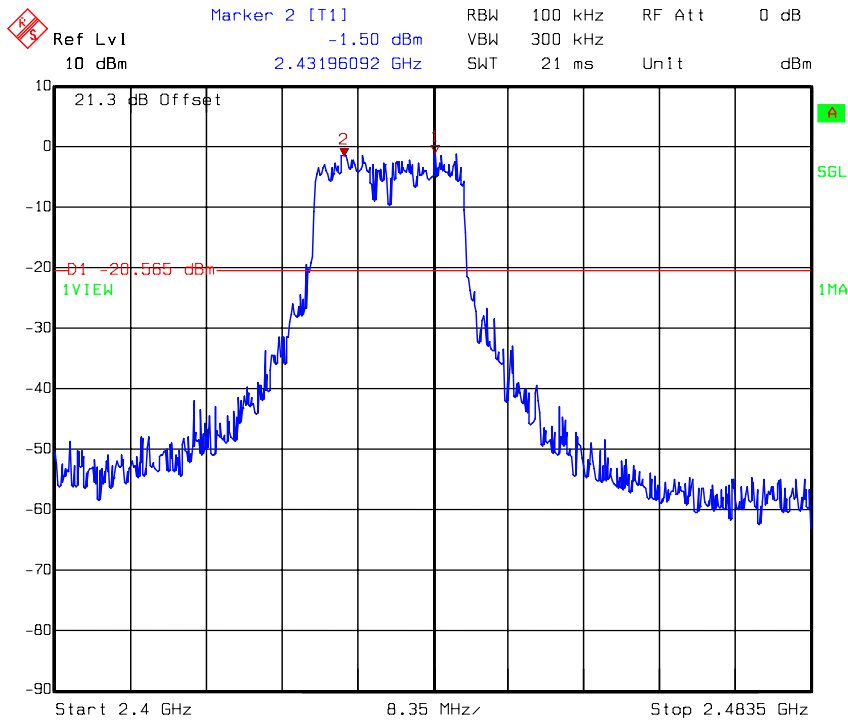
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11g_Chain0_Ch01_2412
 Date: 03.DEC.2012 17:05:17

Chain 0: Conducted spurious @ 802.11g mode channel 6 (1 of 3)



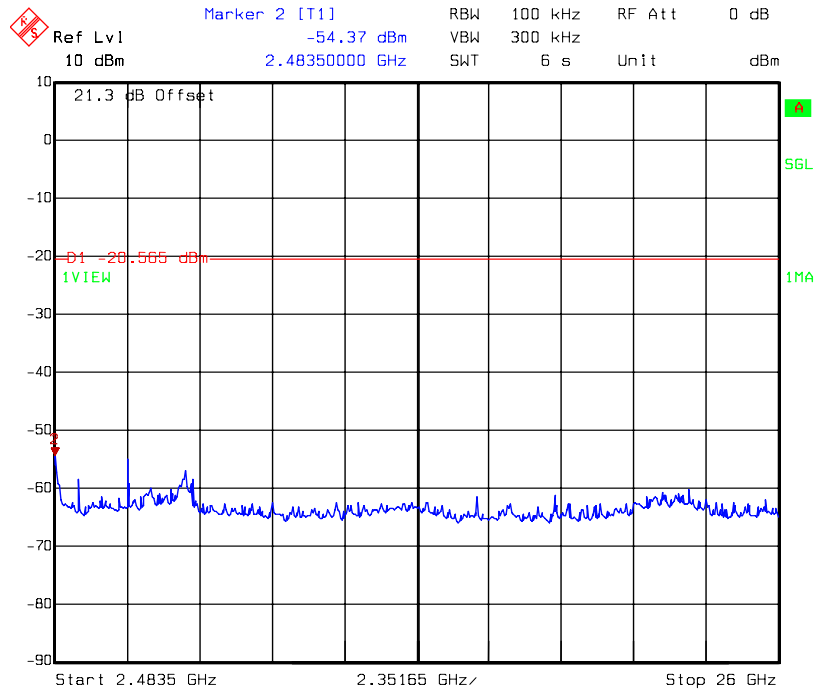
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11g_Chain0_Ch06_2437
 Date: 03.DEC.2012 17:06:48

Chain 0: Conducted spurious @ 802.11g mode channel 6 (2 of 3)



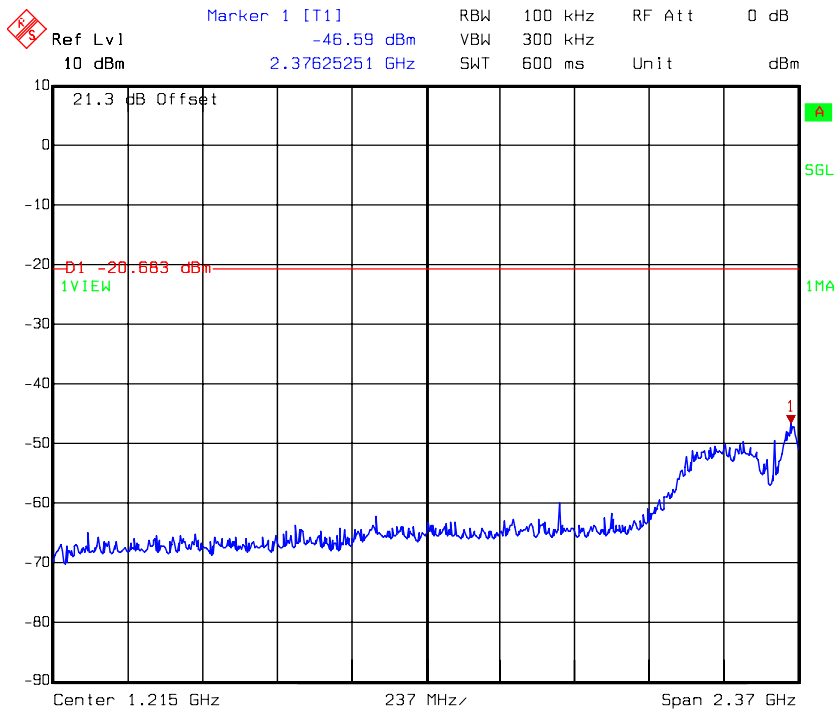
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11g_Chain0_Ch06_2437
 Date: 03.DEC.2012 17:06:52

Chain 0: Conducted spurious @ 802.11g mode channel 6 (3 of 3)



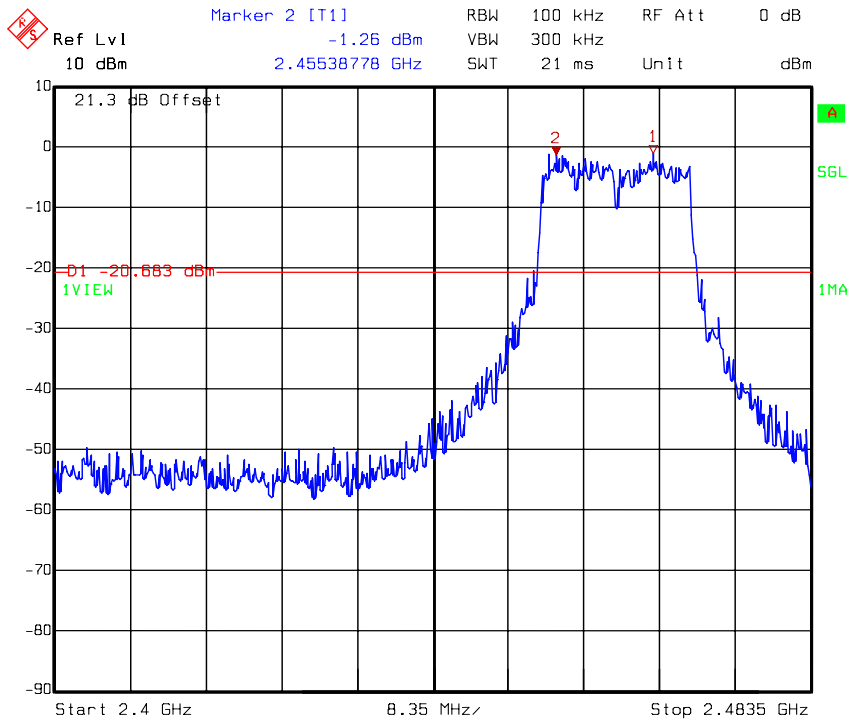
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch06_2437
Date: 03.DEC.2012 17:07:03

Chain 0: Conducted spurious @ 802.11g mode channel 11 (1 of 3)



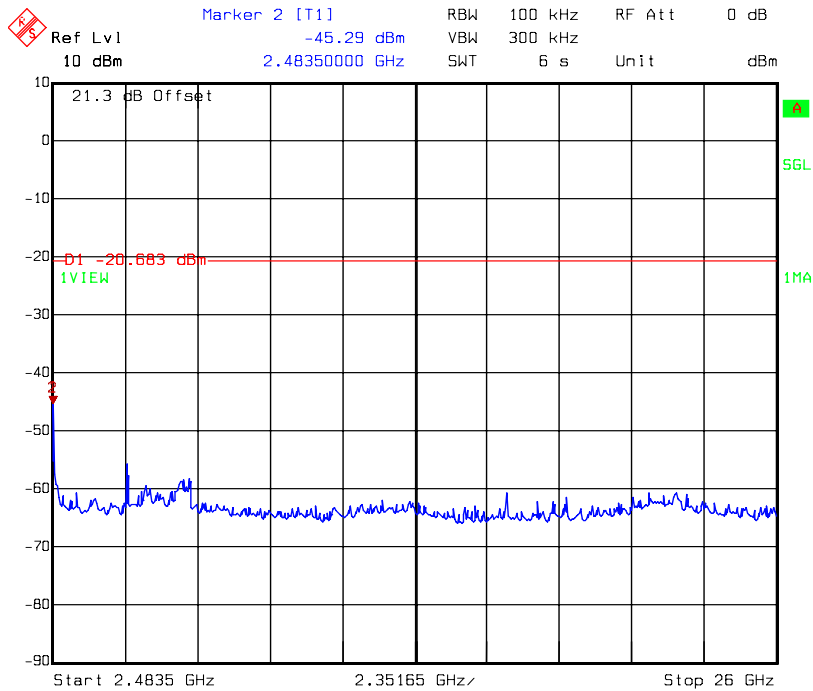
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch11_2462
Date: 03.DEC.2012 17:08:09

Chain 0: Conducted spurious @ 802.11g mode channel 11 (2 of 3)



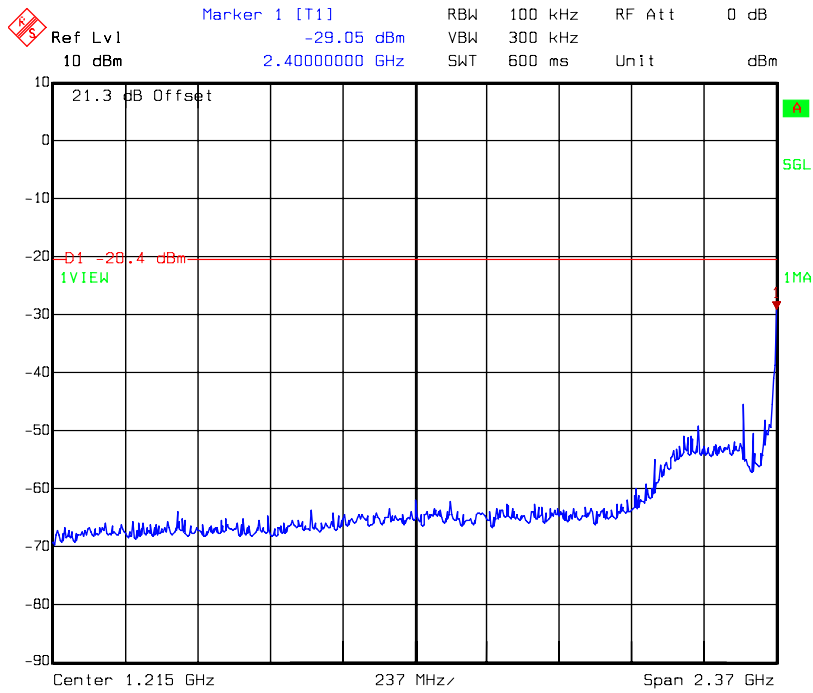
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch11_2462
Date: 03.DEC.2012 17:08:13

Chain 0: Conducted spurious @ 802.11g mode channel 11 (3 of 3)



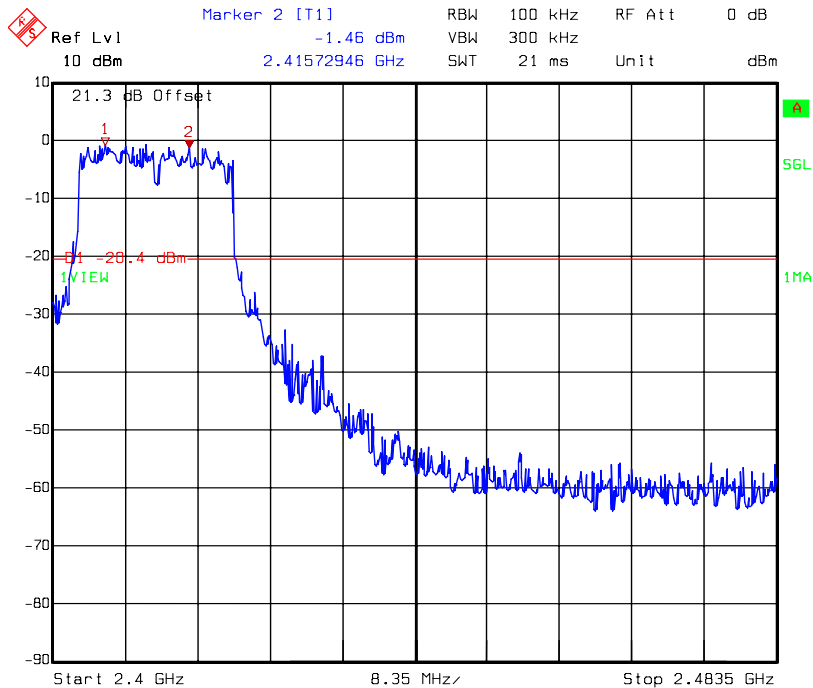
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11g_Chain0_Ch11_2462
Date: 03.DEC.2012 17:08:24

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 1 (1 of 3)



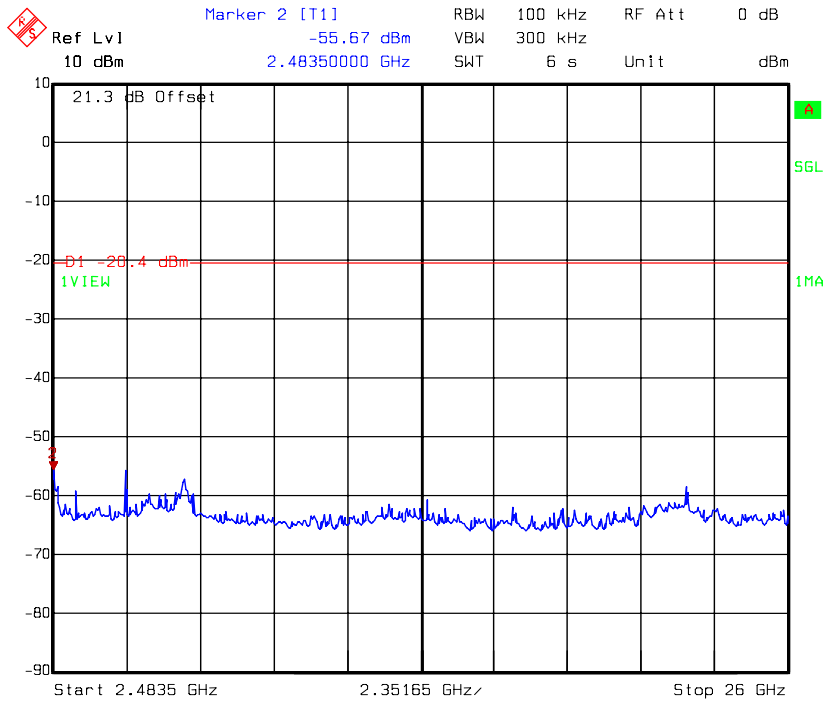
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain0_Ch01_2412
Date: 03.DEC.2012 17:18:49

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 1 (2 of 3)



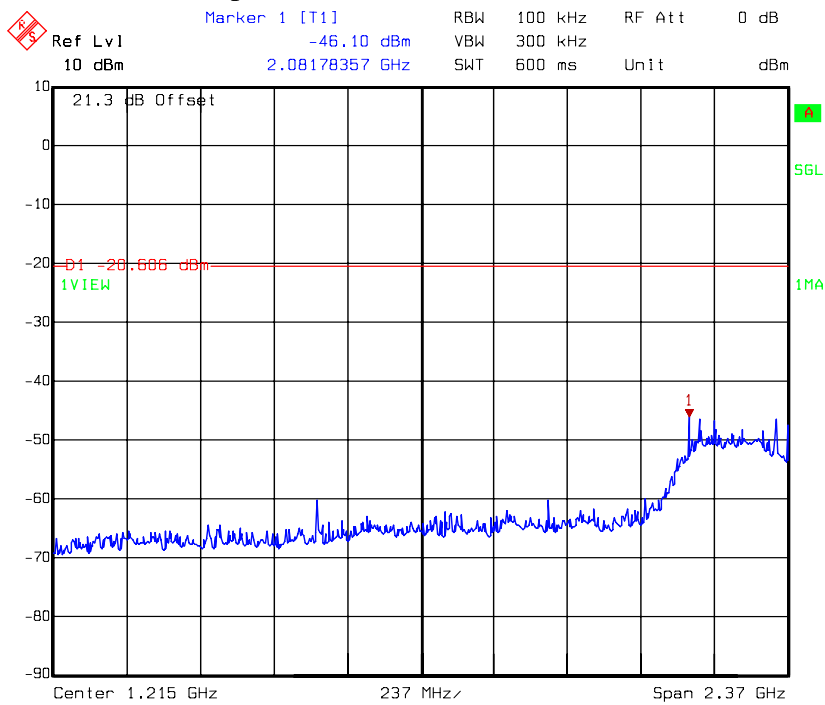
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain0_Ch01_2412
Date: 03.DEC.2012 17:18:53

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 1 (3 of 3)



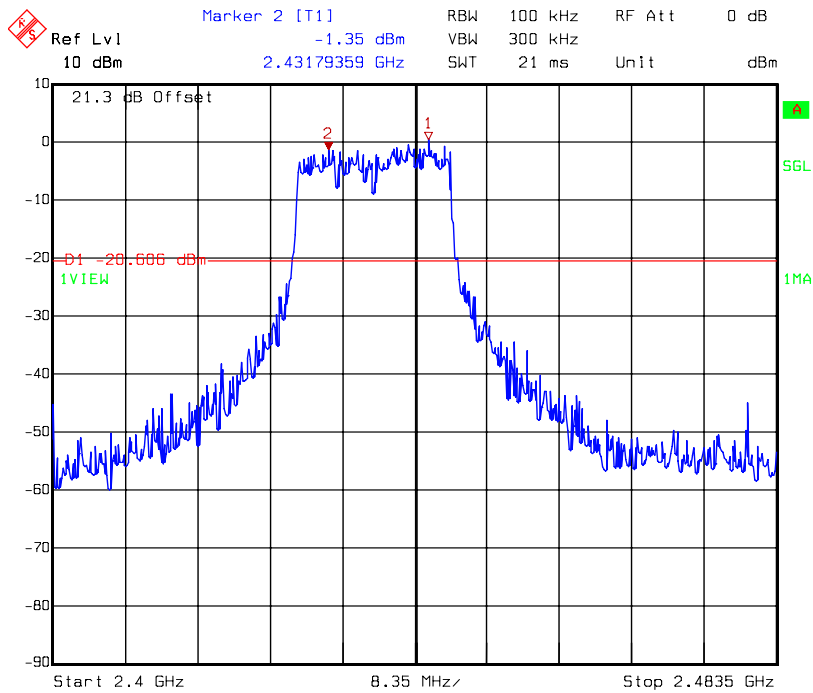
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain0_Ch01_2412
 Date: 03.DEC.2012 17:19:04

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 6 (1 of 3)



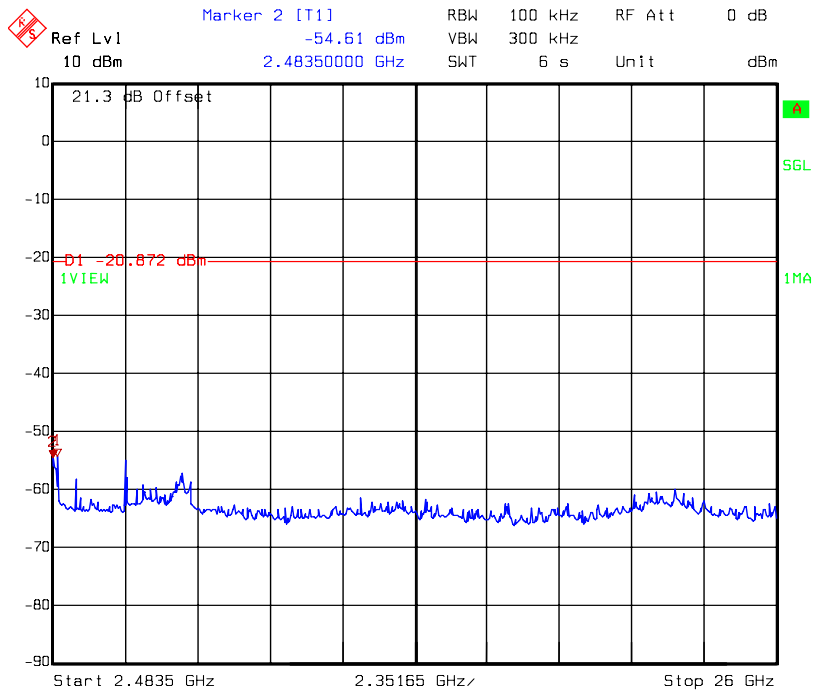
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain1_Ch06_2437
 Date: 03.DEC.2012 17:26:02

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 6 (2 of 3)



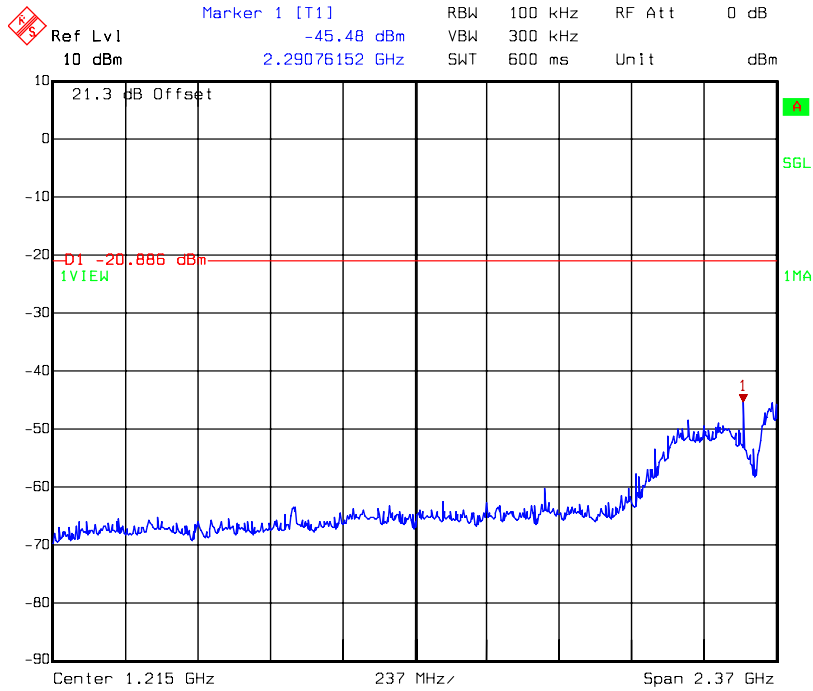
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain1_Ch06_2437
Date: 03.DEC.2012 17:26:06

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 6 (3 of 3)



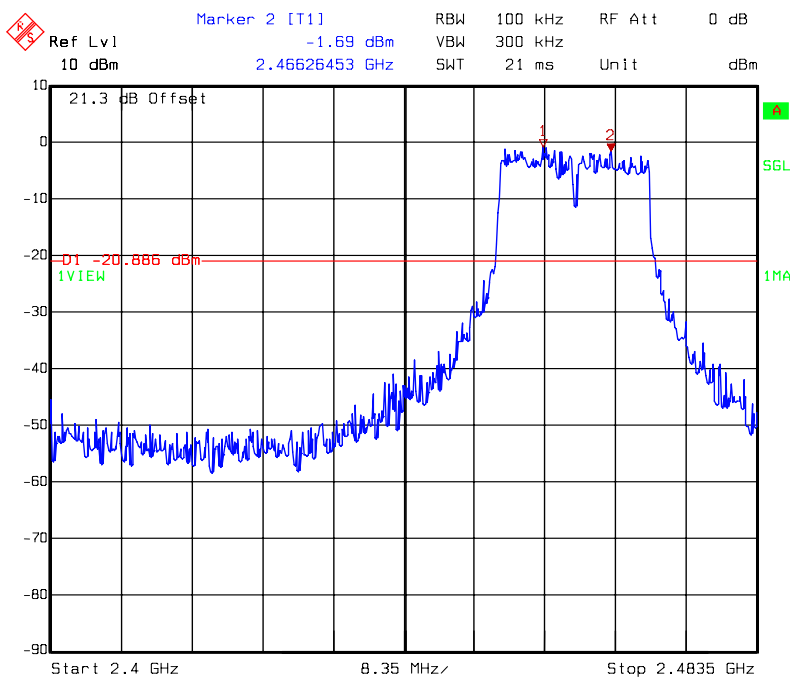
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain0_Ch06_2437
Date: 03.DEC.2012 17:19:49

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 11 (1 of 3)



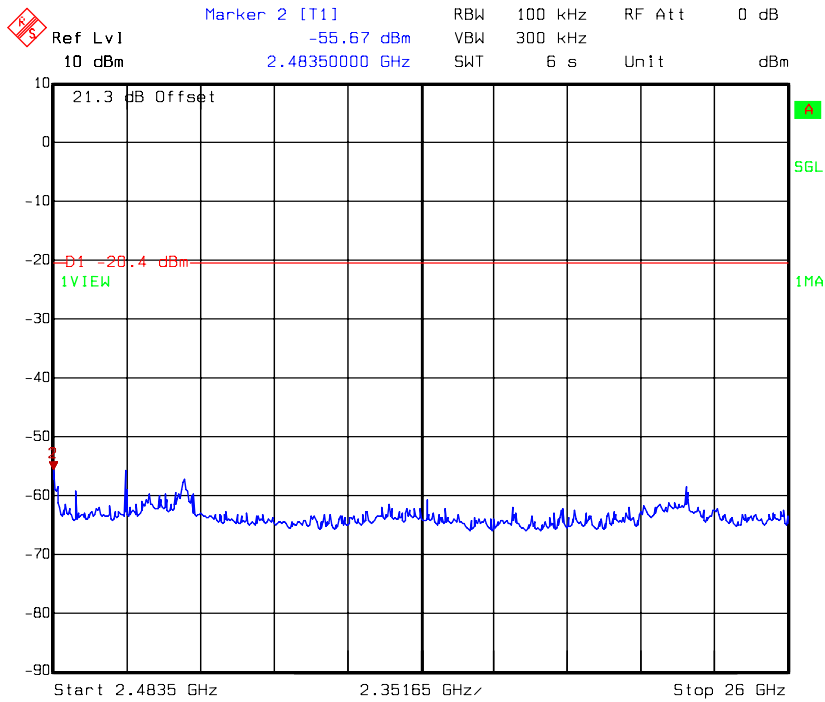
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain0_Ch11_2462
Date: 03.DEC.2012 17:20:22

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 11 (2 of 3)



Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT20)_Chain0_Ch11_2462
Date: 03.DEC.2012 17:20:26

Chain 0: Conducted spurious @ 802.11n (HT20) mode channel 11 (3 of 3)



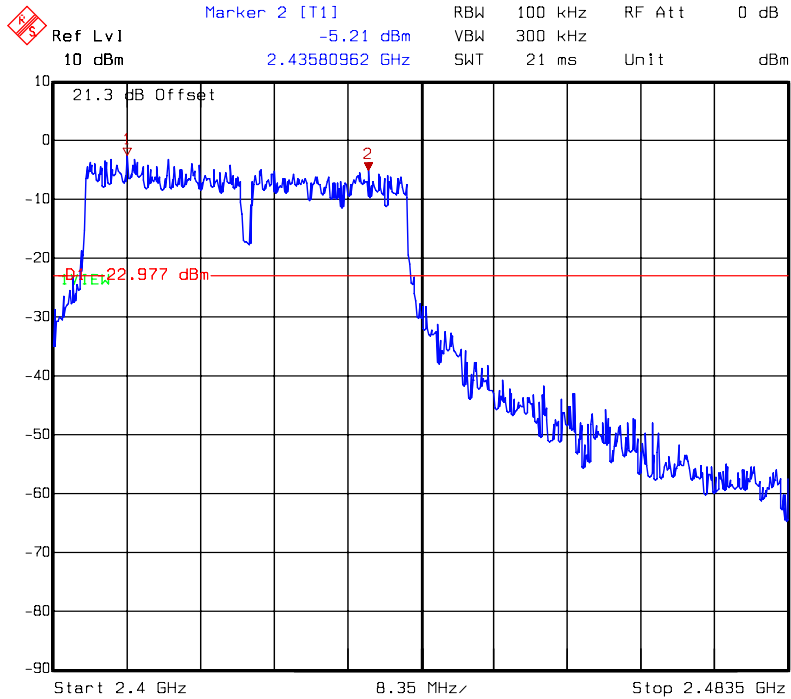
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain0_Ch01_2412
 Date: 03.DEC.2012 17:19:04

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 3 (1 of 3)



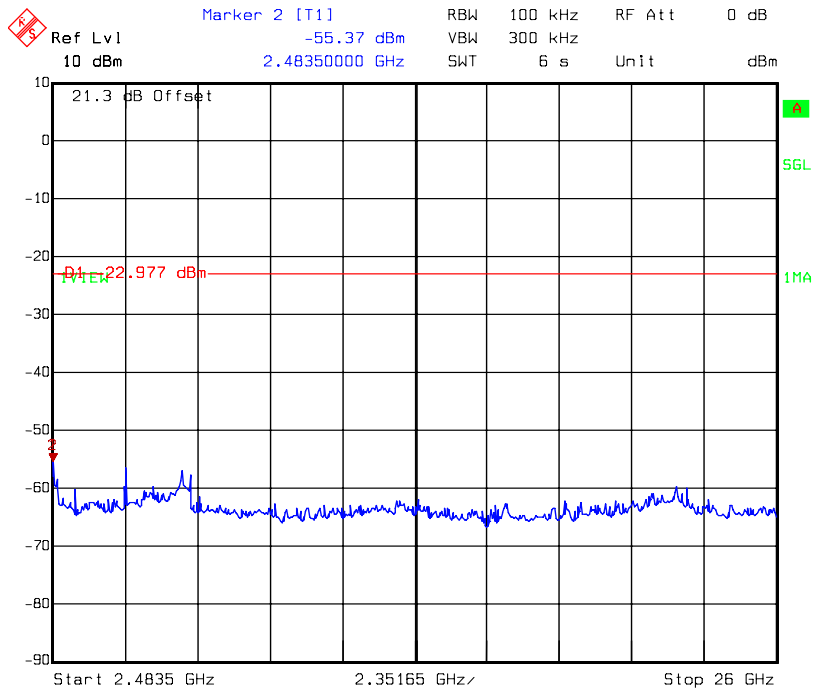
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch03_2422
 Date: 03.DEC.2012 17:48:49

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 3 (2 of 3)



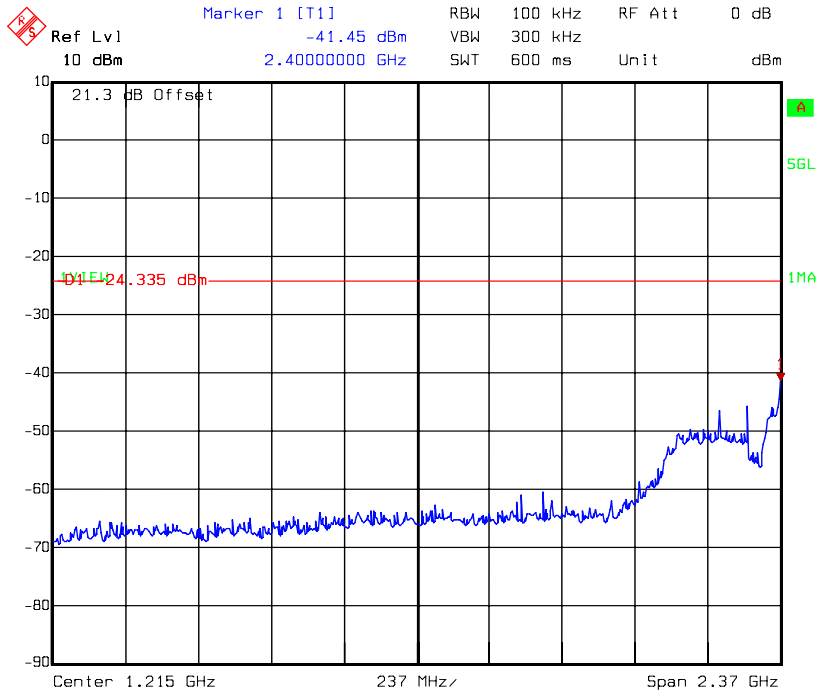
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch03_2422
 Date: 03.DEC.2012 17:48:53

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 3 (3 of 3)



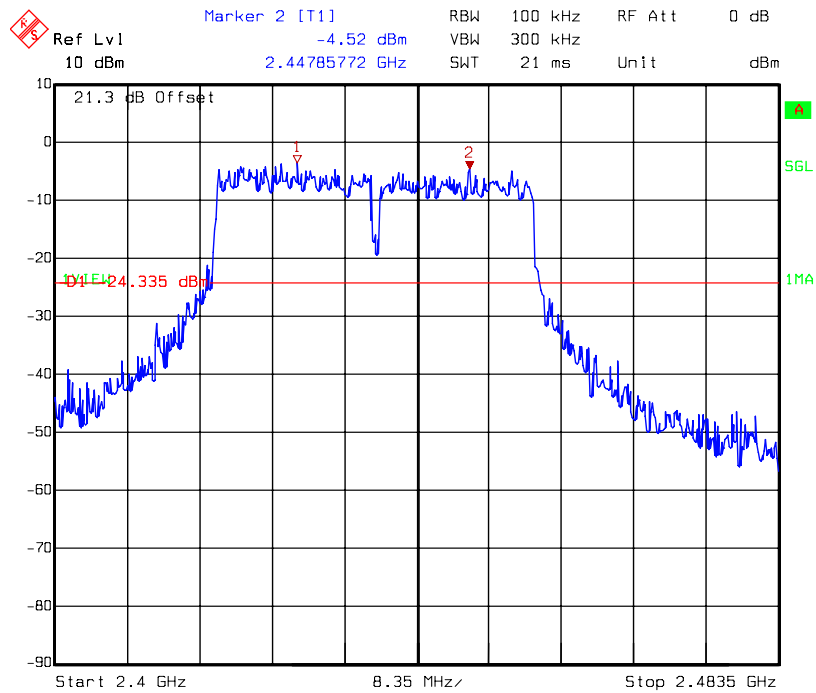
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch03_2422
 Date: 03.DEC.2012 17:49:04

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 6 (1 of 3)



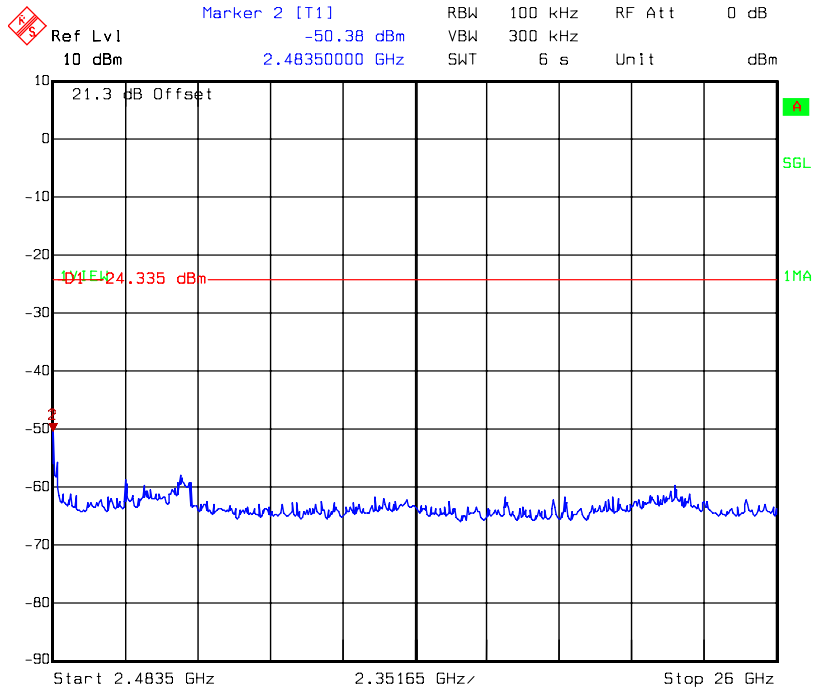
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch06_2437
 Date: 03.DEC.2012 17:52:23

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 6 (2 of 3)



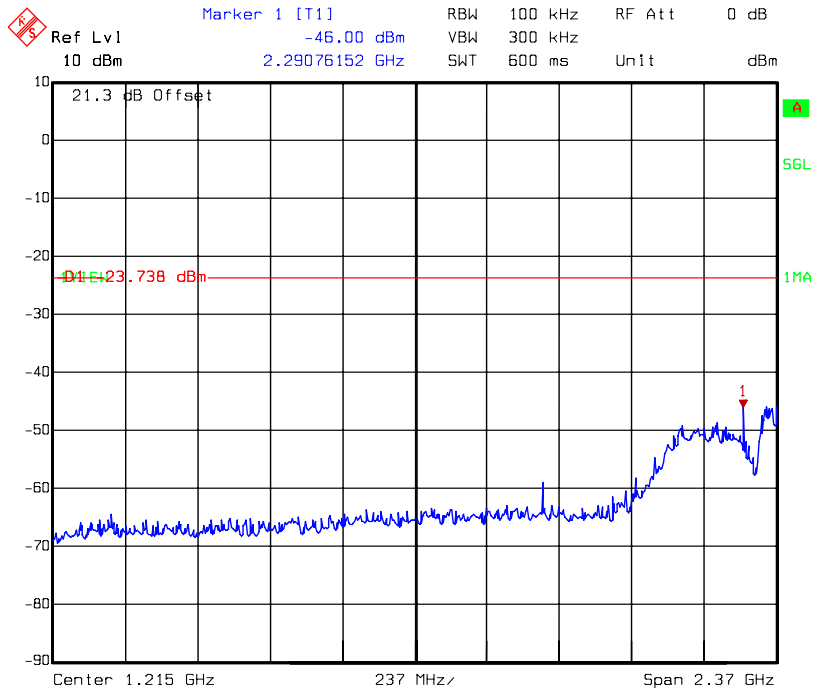
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch06_2437
 Date: 03.DEC.2012 17:52:27

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 6 (3 of 3)



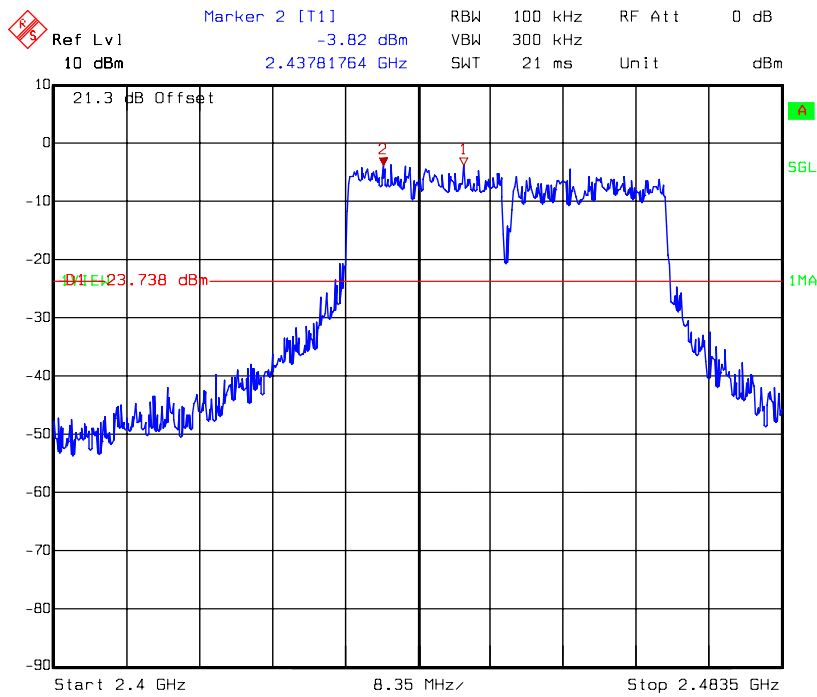
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain0_Ch06_2437
Date: 03.DEC.2012 17:52:38

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 9 (1 of 3)



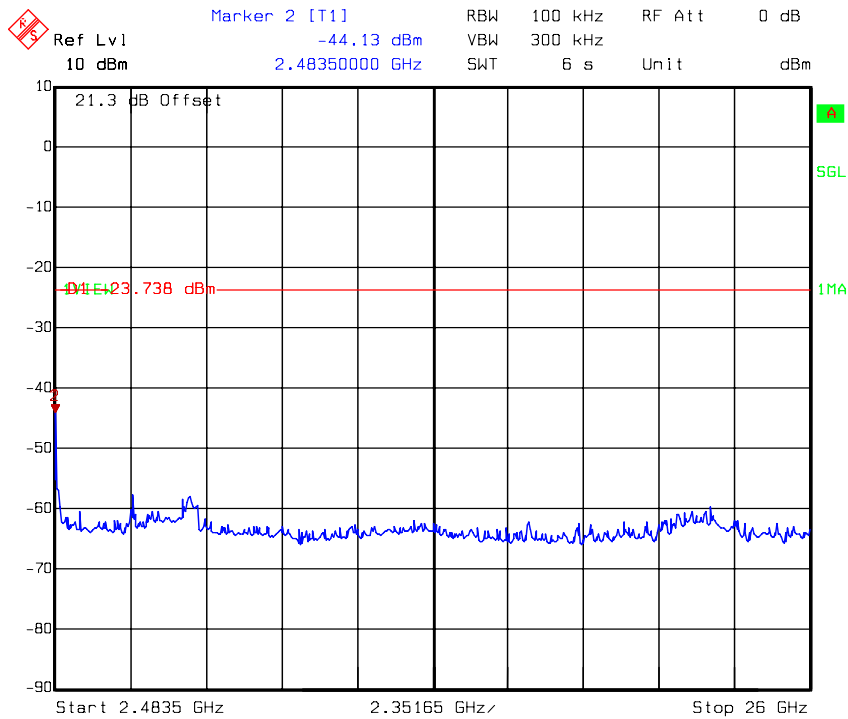
Title: Conducted Spurious (ZyXEL , PLA4231)
Comment A: 802.11n(HT40)_Chain0_Ch09_2452
Date: 03.DEC.2012 17:51:06

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 9 (2 of 3)



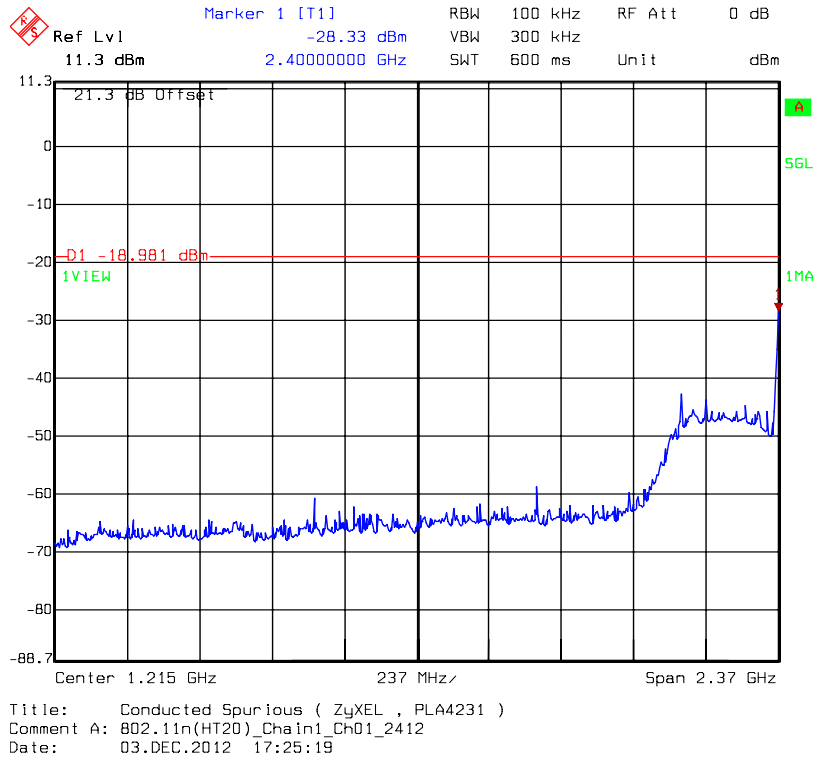
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch09_2452
 Date: 03.DEC.2012 17:51:10

Chain 0: Conducted spurious @ 802.11n (HT40) mode channel 9 (3 of 3)

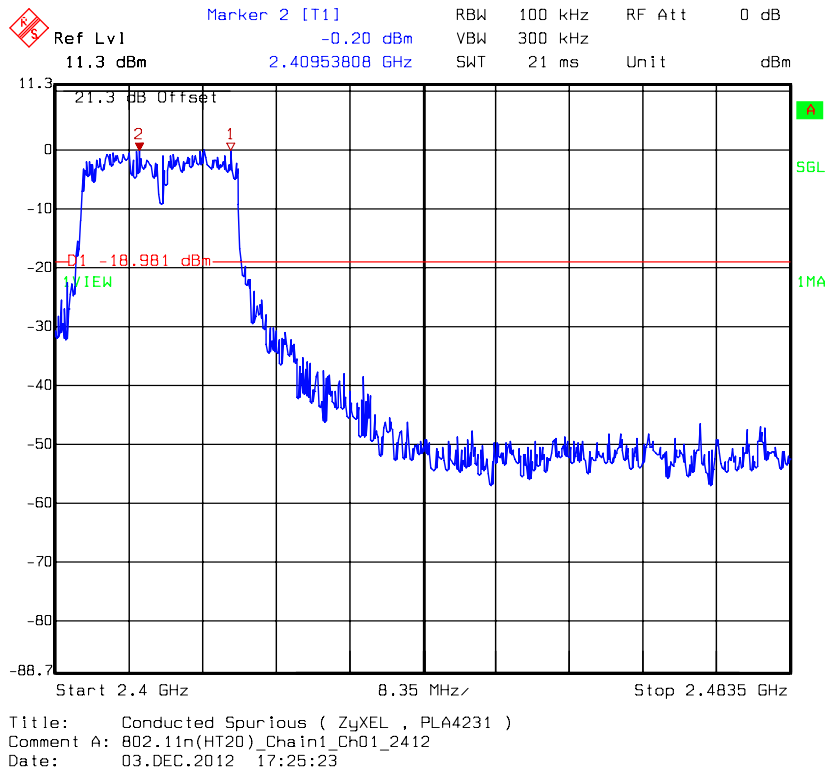


Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain0_Ch09_2452
 Date: 03.DEC.2012 17:51:21

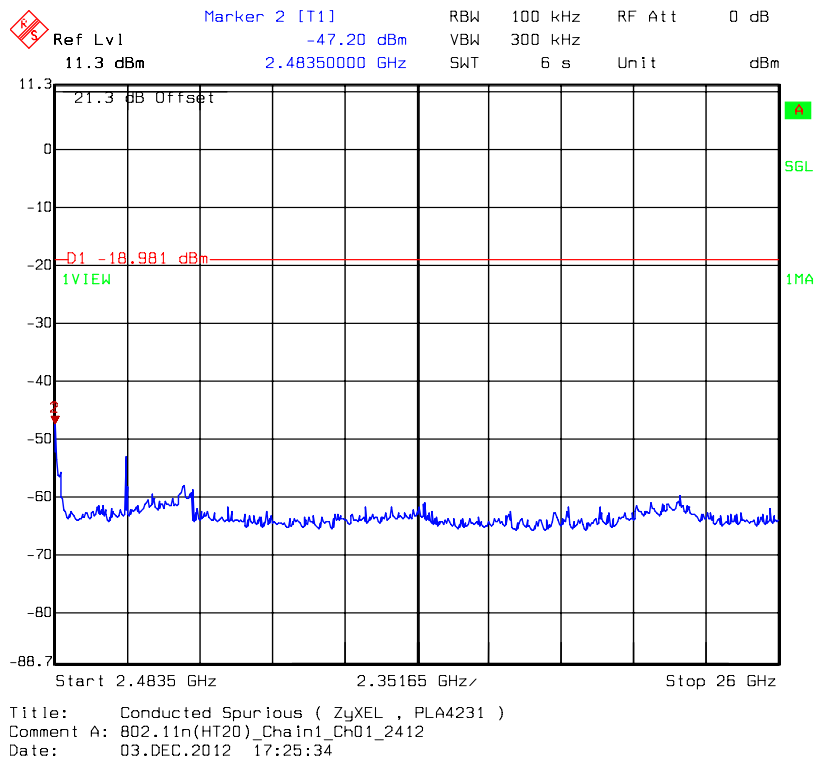
Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 1 (1 of 3)



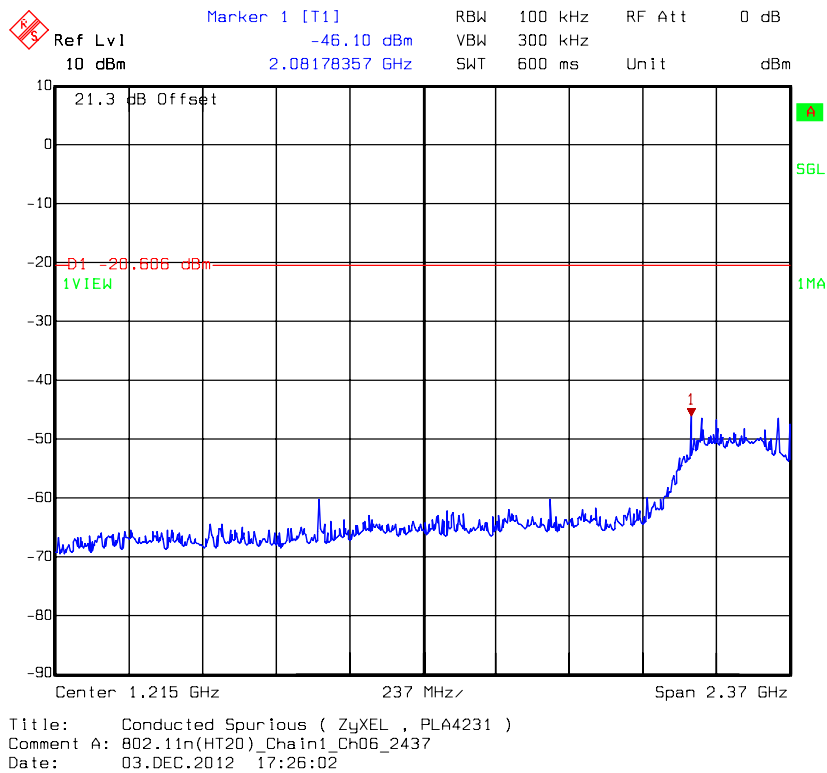
Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 1 (2 of 3)



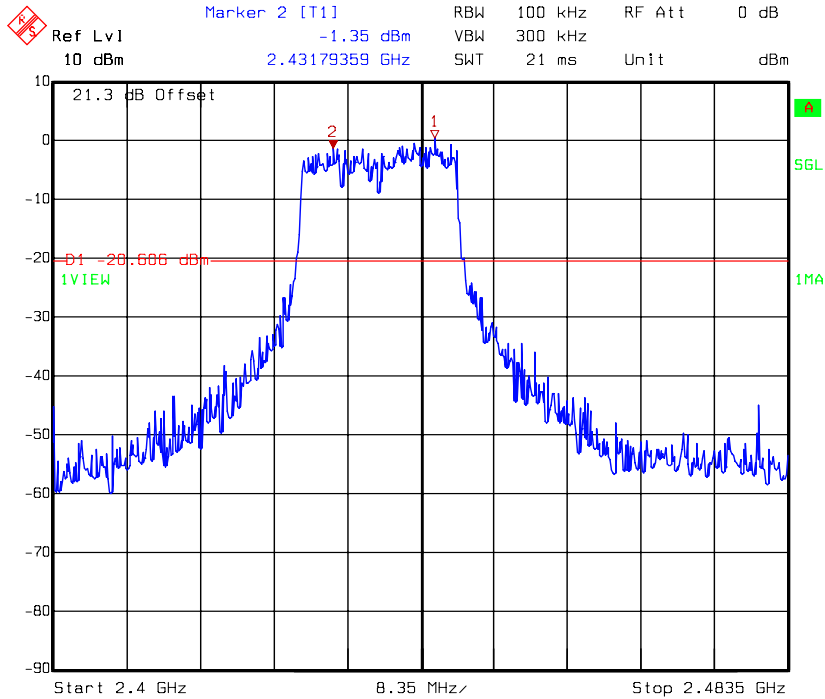
Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 1 (3 of 3)



Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 6 (1 of 3)

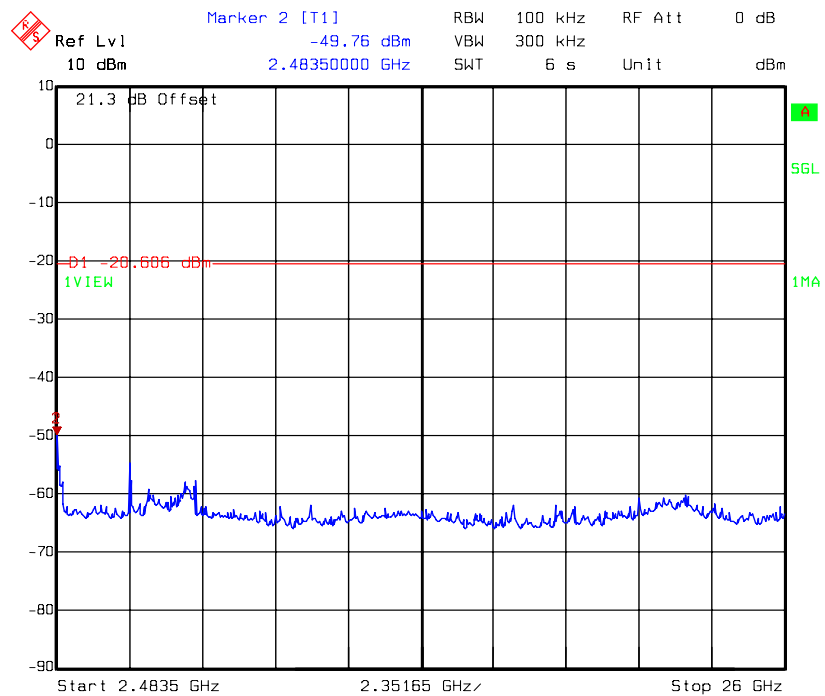


Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 6 (2 of 3)



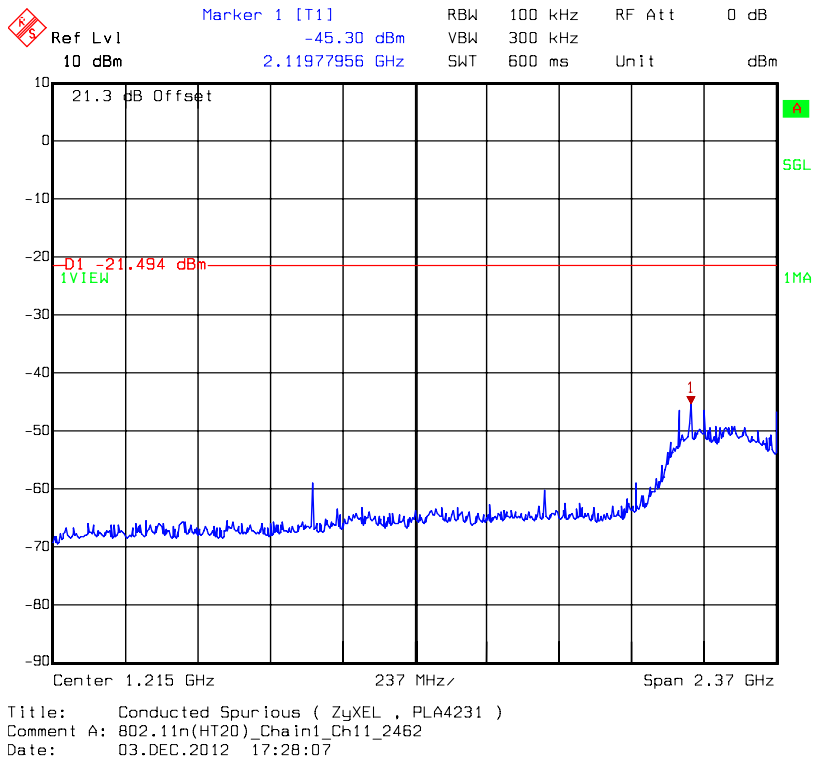
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain1_Ch06_2437
 Date: 03.DEC.2012 17:26:06

Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 6 (3 of 3)

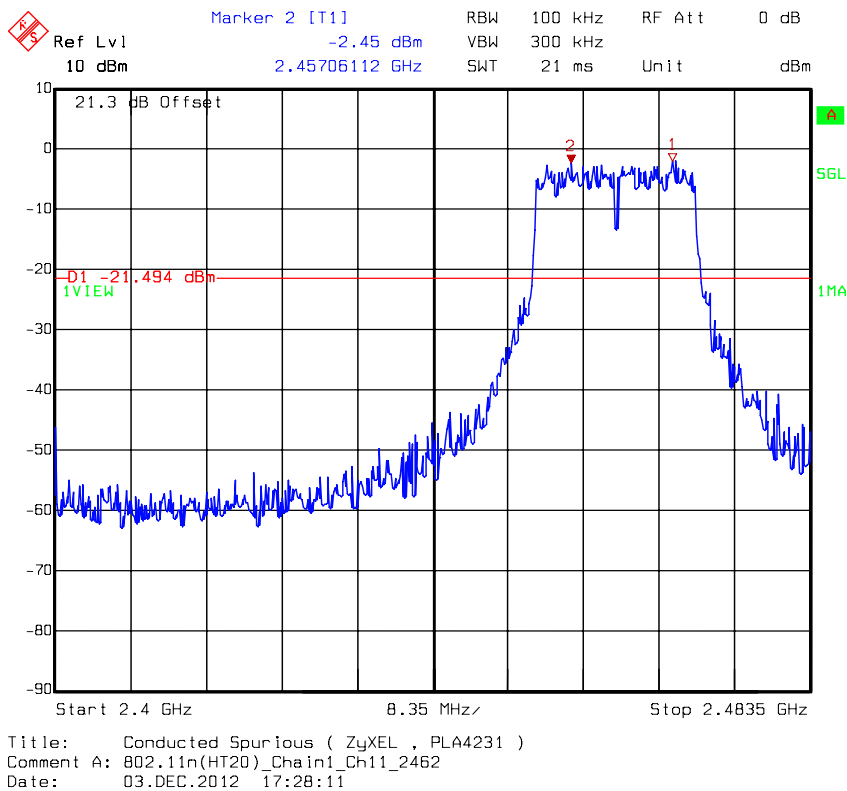


Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain1_Ch06_2437
 Date: 03.DEC.2012 17:26:17

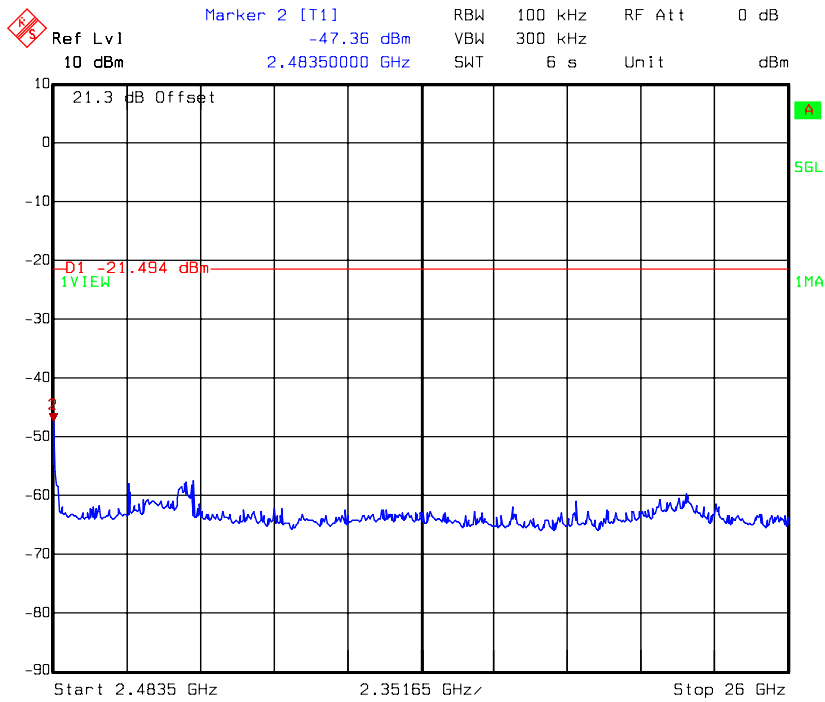
Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 11 (1 of 3)



Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 11 (2 of 3)

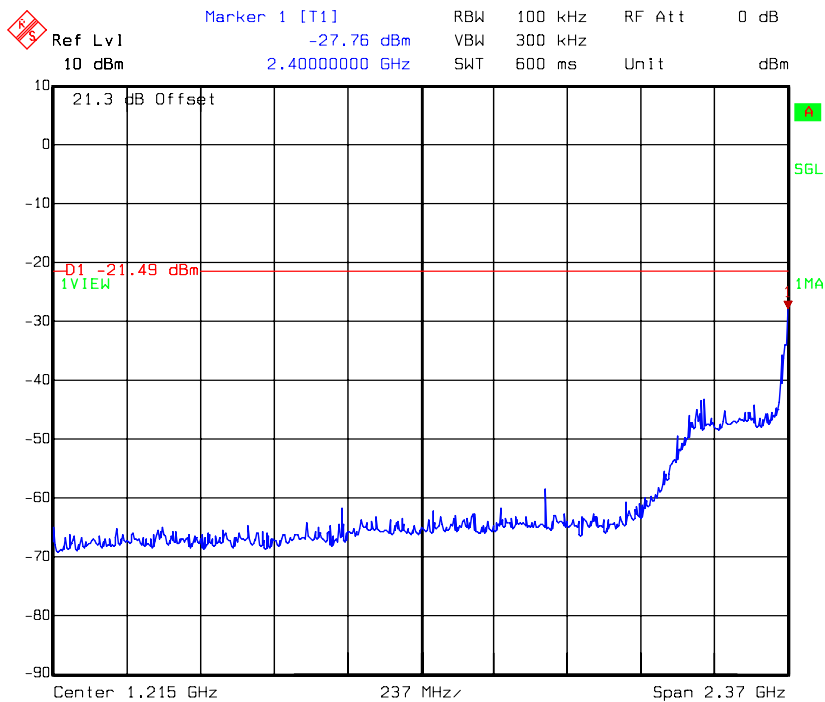


Chain 1: Conducted spurious @ 802.11n (HT20) mode channel 11 (3 of 3)



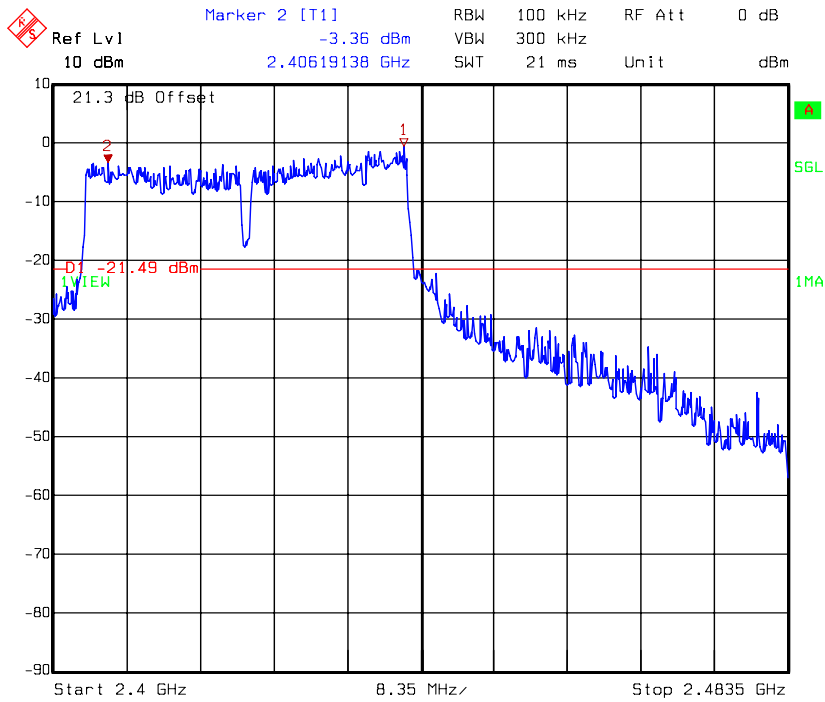
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT20)_Chain1_Ch11_2462
 Date: 03.DEC.2012 17:28:22

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 3 (1 of 3)



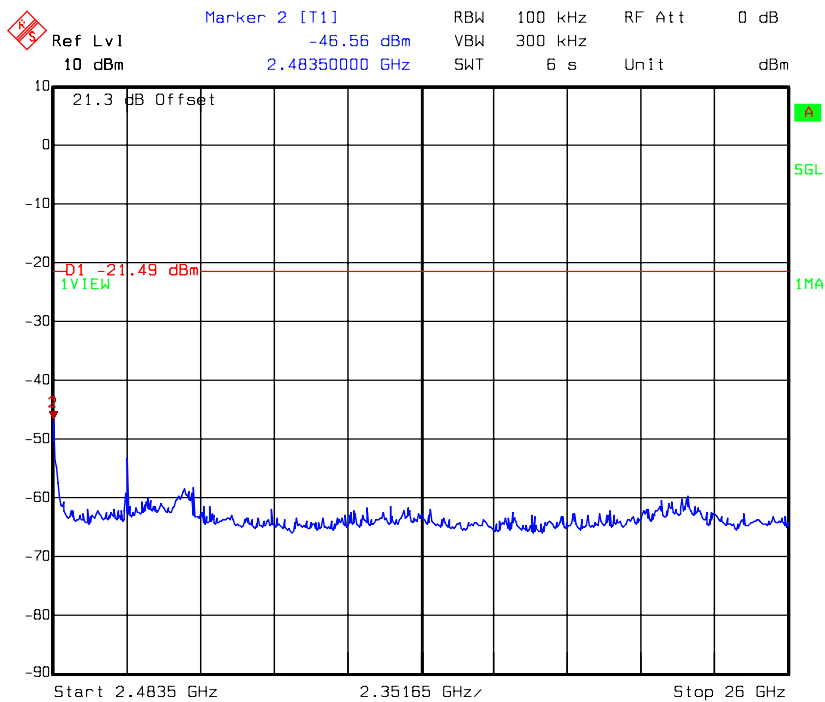
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch03_2422
 Date: 03.DEC.2012 17:30:38

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 3 (2 of 3)



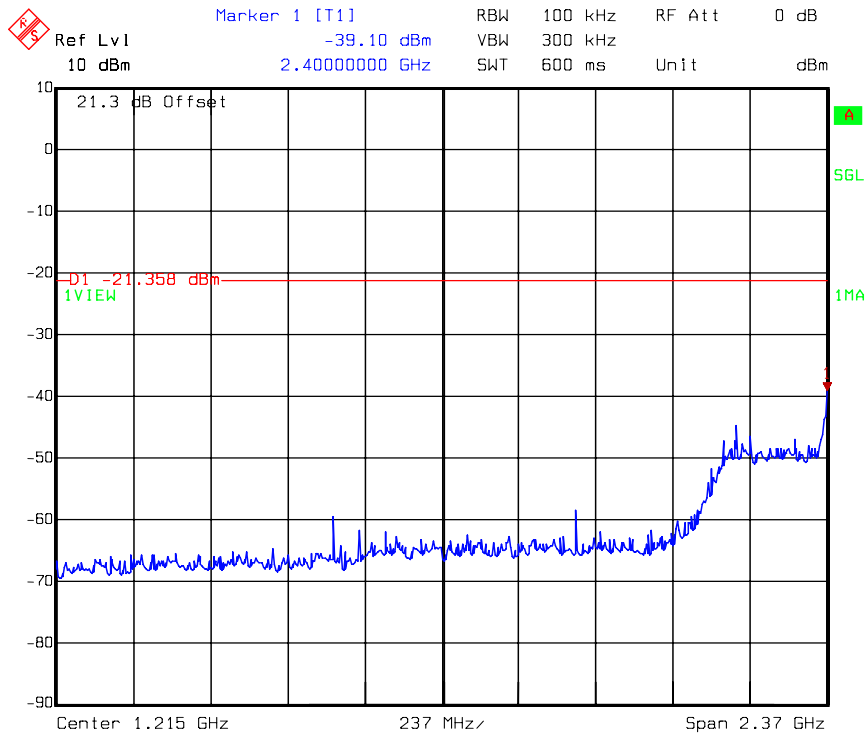
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch03_2422
 Date: 03.DEC.2012 17:30:42

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 3 (3 of 3)



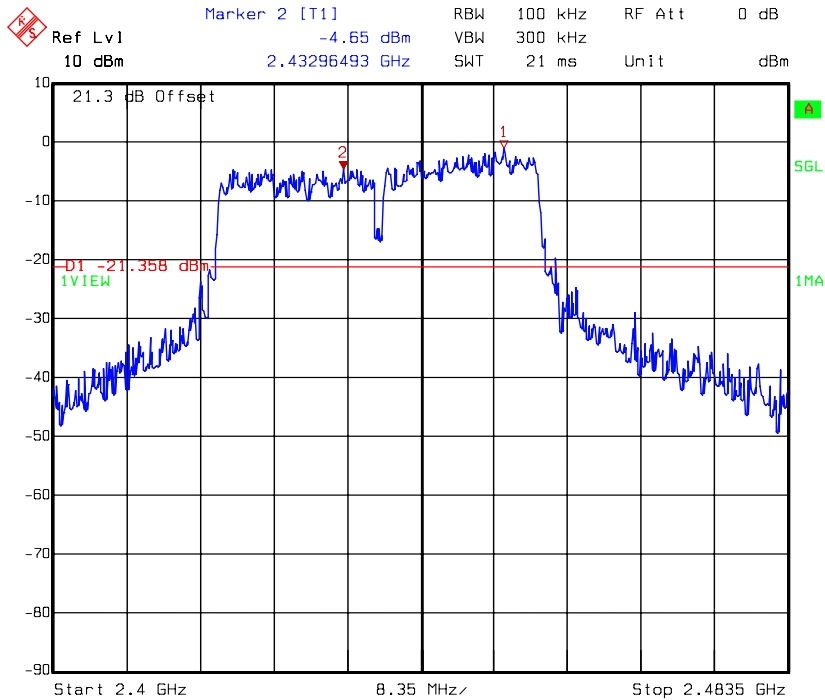
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch03_2422
 Date: 03.DEC.2012 17:30:53

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 6 (1 of 3)



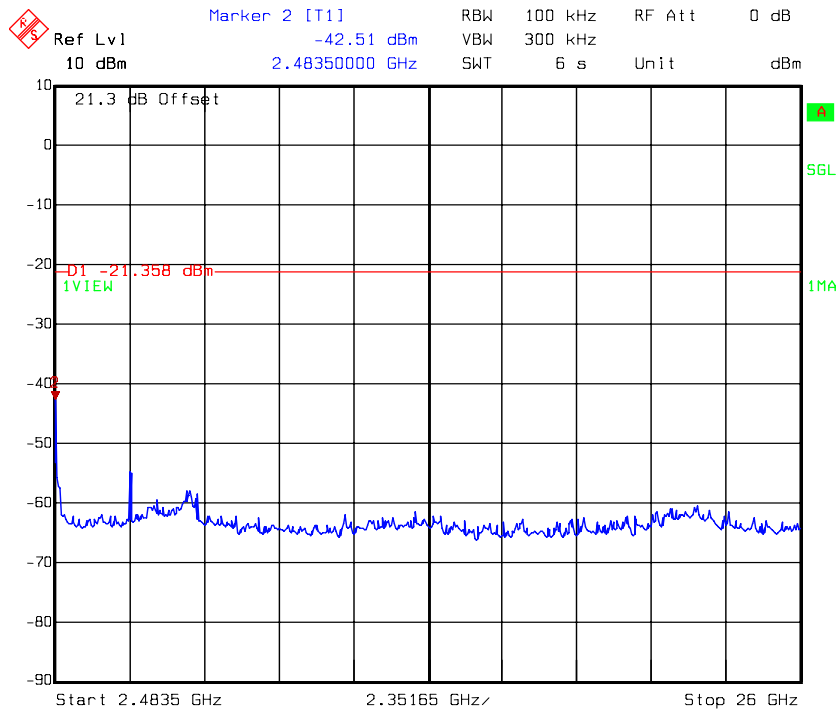
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch06_2437
 Date: 03.DEC.2012 17:31:24

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 6 (2 of 3)



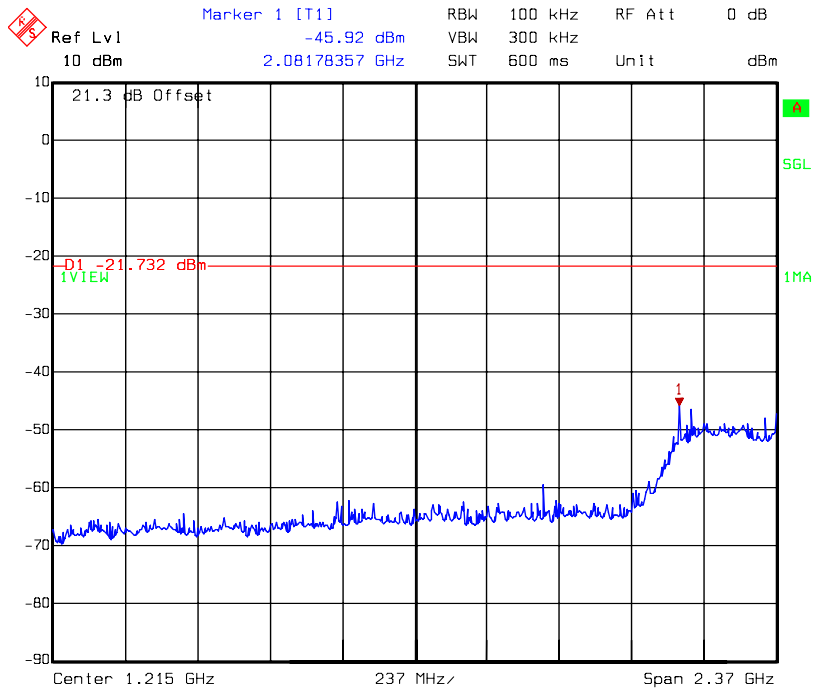
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch06_2437
 Date: 03.DEC.2012 17:31:28

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 6 (3 of 3)



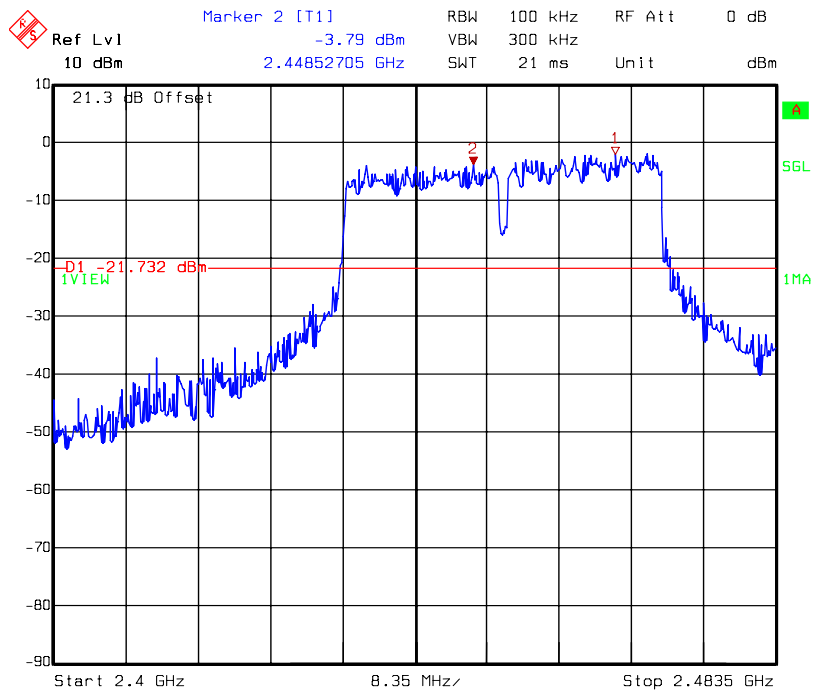
Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch06_2437
 Date: 03.DEC.2012 17:31:39

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 9 (1 of 3)



Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch09_2452
 Date: 03.DEC.2012 17:32:09

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 9 (2 of 3)



Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch09_2452
 Date: 03.DEC.2012 17:32:13

Chain 1: Conducted spurious @ 802.11n (HT40) mode channel 9 (3 of 3)



Title: Conducted Spurious (ZyXEL , PLA4231)
 Comment A: 802.11n(HT40)_Chain1_Ch09_2452
 Date: 03.DEC.2012 17:32:24

8. Radiated Spurious Emission

Name of Test	Radiated Spurious Emission
Base Standard	FCC 15.247(d), 15.209, 15.205

Test Result: Complies
Measurement Data: See Tables below

Method of Measurement:

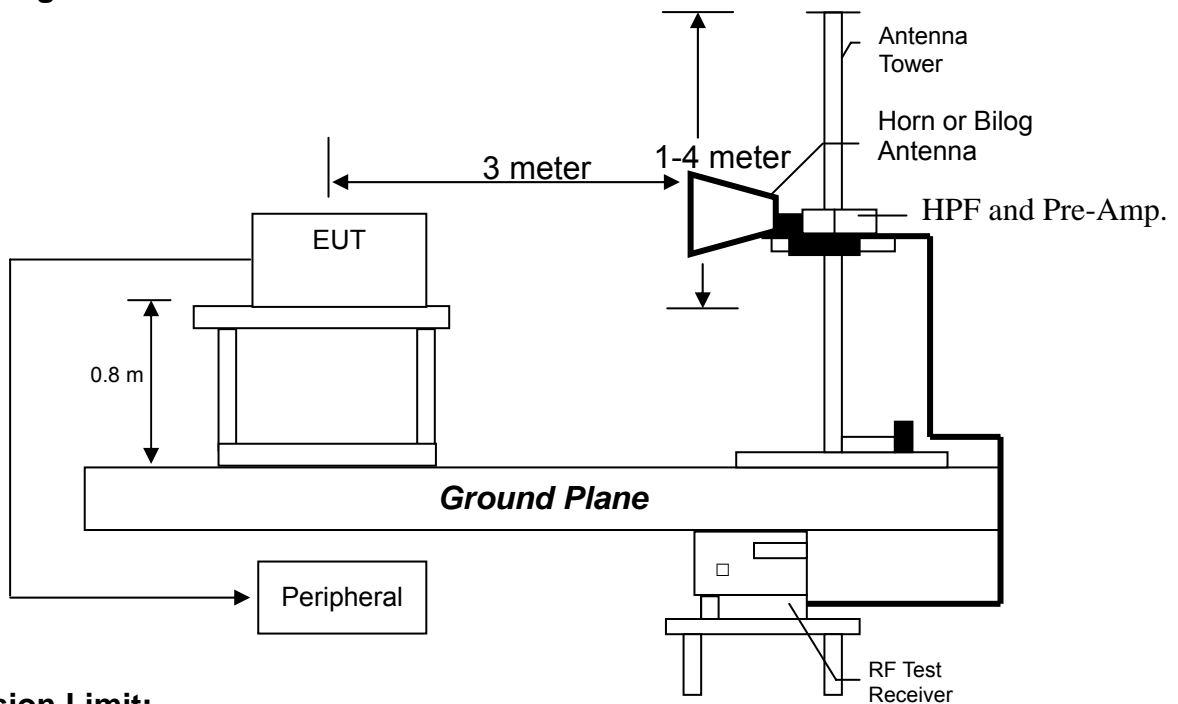
Reference FCC document: KDB558074, ANSI C63.4

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.
The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were investigated 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 (1 MHz RBW/VBW) recorded also on the report. 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 3 meters reading using inverse scaling with distance.

The EUT configuration please refer to the "Spurious set-up photo.pdf".

Test Diagram:



Emission Limit:

The spurious Emission shall test through the 10th harmonic. 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 (dBµV/m@ 3 meter)
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

- Note:**
- (1) The EUT was tested while in a continuous transmit mode and the worst case data rates are Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13 Mbps data rate for 802.11n HT40 mode. The EUT was tuned to a low, middle and high channel.
 - (2) The EUT operating at 2.4 GHz ISM band. Frequency Range scanned from 30 MHz to 25 GHz.

Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under 802.11b/g/n continuously transmitting mode. The worst case occurred at 802.11n (HT20) Tx channel 6.

EUT : PLA4231
Worst Case : 802.11n (HT20) Tx channel 6

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)
Vertical	792.42	QP	23.19	17.78	40.97	46.00	-5.03
Vertical	844.80	QP	23.62	17.82	41.44	46.00	-4.56
Vertical	852.56	QP	23.70	18.23	41.93	46.00	-4.07
Vertical	887.48	QP	24.35	17.60	41.94	46.00	-4.06
Vertical	901.06	QP	24.32	19.71	44.02	46.00	-1.98
Vertical	932.10	QP	25.13	17.40	42.52	46.00	-3.48
Horizontal	600.36	QP	20.88	19.18	40.05	46.00	-5.95
Horizontal	738.10	QP	22.95	17.35	40.30	46.00	-5.70
Horizontal	862.26	QP	24.12	18.14	42.25	46.00	-3.75
Horizontal	885.54	QP	24.62	17.83	42.44	46.00	-3.56
Horizontal	922.40	QP	24.59	17.18	41.76	46.00	-4.24
Horizontal	937.92	QP	25.33	18.02	43.35	46.00	-2.65

Remark:

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

Measurement results: frequency above 1GHz

EUT : PLA4231
Test Condition : Chain 0 802.11b Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824	PK	V	35.1	38.54	43.04	46.48	54	-7.52
7236	PK	V	33.0	44.60	35.77	47.37	54	-6.63
4824	PK	H	35.1	38.54	44.03	47.47	54	-6.53
7236	PK	H	33.0	44.60	39.94	51.54	54	-2.46

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0 802.11b Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874	PK	V	35.1	38.54	45.43	48.87	54	-5.13
7311	PK	V	33.0	44.60	35.83	47.43	54	-6.57
4874	PK	H	35.1	38.54	45.07	48.51	54	-5.49
7311	PK	H	33.0	44.60	40.89	52.49	54	-1.51

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0 802.11b Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924	PK	V	35.1	38.54	49.11	52.55	54	-1.45
7386	PK	V	33.0	44.60	37.42	49.02	54	-4.98
4924	PK	H	35.1	38.54	48.25	51.69	54	-2.31
7386	PK	H	33.0	44.60	43.74	55.34	74	-18.66
7386	AV	H	33.0	44.60	37.90	49.50	54	-4.50

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0 802.11g Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824	PK	V	35.1	38.54	38.89	42.33	54	-11.67
7236	PK	V	33.0	44.60	33.55	45.15	54	-8.85
4824	PK	H	35.1	38.54	38.50	41.94	54	-12.06
7236	PK	H	33.0	44.60	38.92	50.52	54	-3.48

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0 802.11g Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874	PK	V	35.1	38.54	41.33	44.77	54	-9.23
7311	PK	V	33.0	44.60	34.55	46.15	54	-7.85
7311	PK	H	33.0	44.60	32.08	43.68	54	-10.32
7311	PK	H	33.0	44.60	40.65	52.25	54	-1.75

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0 802.11g Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924	PK	V	35.1	38.54	43.3	46.74	54	-7.26
7386	PK	V	33.0	44.60	36.34	47.94	54	-6.06
4924	PK	H	35.1	38.54	42.31	45.75	54	-8.25
7386	PK	H	33.0	44.60	43.14	54.74	74	-19.26
7386	AV	H	33.0	44.60	28.70	40.30	54	-13.70

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0+Chain 1 802.11n (HT20) Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824	PK	V	35.1	38.54	44.3	47.74	54	-6.26
7236	PK	V	33.0	44.60	37.24	48.84	54	-5.16
4824	PK	H	35.1	38.54	43.06	46.50	54	-7.50
7236	PK	H	33.0	44.60	40.75	52.35	54	-1.65

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0+Chain 1 802.11n (HT20) Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874	PK	V	35.1	38.54	44.46	47.9	54	-6.10
7311	PK	V	33.0	44.60	35.99	47.59	54	-6.41
4874	PK	H	35.1	38.54	45.06	48.50	54	-5.50
7311	PK	H	33.0	44.60	40.97	52.57	54	-1.43

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0+Chain 1 802.11n (HT20) Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924	PK	V	35.1	38.54	44.41	47.85	54	-6.15
7386	PK	V	33.0	44.60	37.38	48.98	54	-5.02
4924	PK	H	35.1	38.54	44.25	47.69	54	-6.31
7386	PK	H	33.0	44.60	41.28	52.88	54	-1.12

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0+Chain 1 802.11n (HT40) Tx at channel 3

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4844	PK	V	35.1	38.54	43.56	47.00	54	-7.00
7266	PK	H	33.0	44.60	37.19	48.79	54	-5.21
4844	PK	V	35.1	38.54	41.79	45.23	54	-8.77
7266	PK	H	33.0	44.60	37.70	49.30	54	-4.70

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0+Chain 1 802.11n (HT40) Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874	PK	V	35.1	38.54	42.72	46.16	54	-7.84
7311	PK	H	33.0	44.60	34.84	46.44	54	-7.56
4874	PK	V	35.1	38.54	42.70	46.14	54	-7.86
7311	PK	H	33.0	44.60	37.28	48.88	54	-5.12

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

EUT : PLA4231
Test Condition : Chain 0+Chain 1 802.11n (HT40) Tx at channel 9

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4904	PK	V	35.1	38.54	43.13	46.57	54	-7.43
7356	PK	H	33.0	44.60	35.40	47.00	54	-7.00
4904	PK	V	35.1	38.54	42.19	45.63	54	-8.37
7356	PK	H	33.0	44.60	37.46	49.06	54	-4.94

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the system noise floor.

9. Emission on Band Edge

Name of Test	Emission Band Edge
Base Standard	FCC 15.247(d)

Test Result: Complies
Measurement Data: See Tables & plots below

Method of Measurement:

Reference FCC document: KDB558074, ANSI C63.4

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.
The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were investigated 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 (1 MHz RBW/VBW) recorded also on the report.

Note: The EUT was tested while in a continuous transmit mode and the worst case data rates are Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13.5 Mbps data rate for 802.11n HT40 mode. The EUT was tuned to a low, middle and high channel.

Test Mode: Chain 0 802.11b

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	60.36	74	-13.64
		AV	49.16	54	-4.84
11 (highest)	2483.5-2500	PK	59.55	74	-14.45
		AV	47.96	54	-6.04

Test Mode: Chain 802.11g

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	59.62	74	-14.38
		AV	48.25	54	-5.75
11 (highest)	2483.5-2500	PK	64.58	74	-9.42
		AV	48.82	54	-5.18

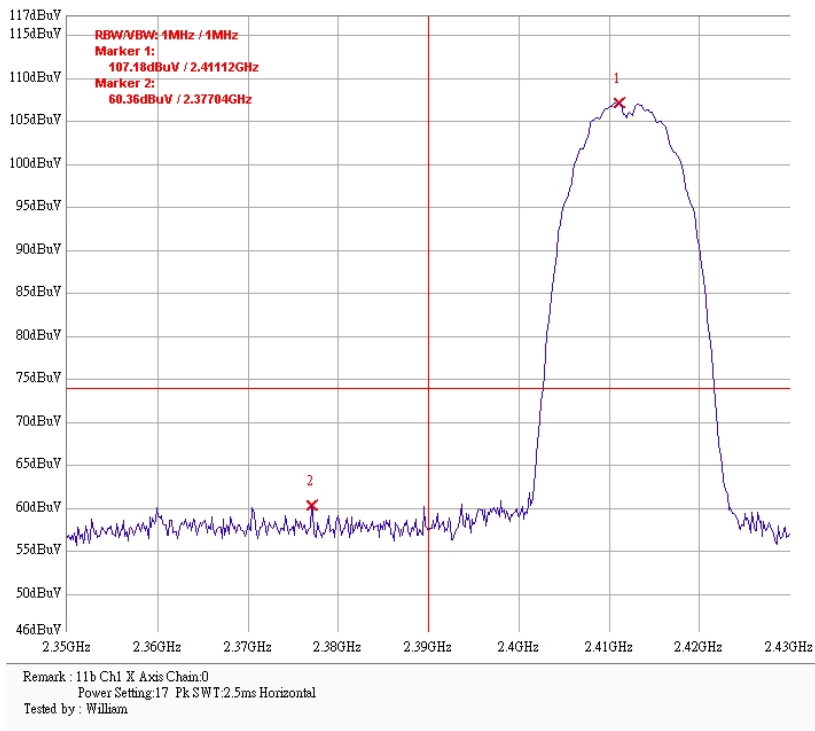
Test Mode: Chain 0+ Chain 1 802.11n HT20

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	66.92	74	-7.08
		AV	50.86	54	-3.14
11 (highest)	2483.5-2500	PK	62.98	74	-11.02
		AV	49.50	54	-4.50

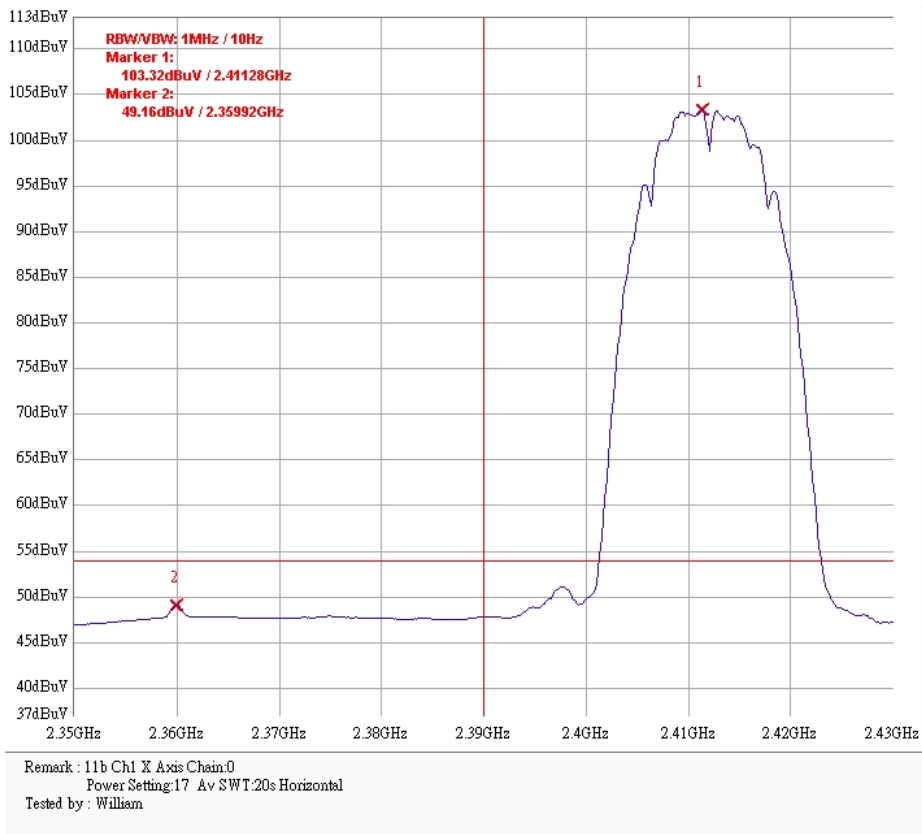
Test Mode: Chain 0+ Chain 1 802.11n HT40

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3 (lowest)	2310-2390	PK	69.38	74	-4.62
		AV	52.68	54	-1.32
9 (highest)	2483.5-2500	PK	69.95	74	-4.05
		AV	52.45	54	-1.55

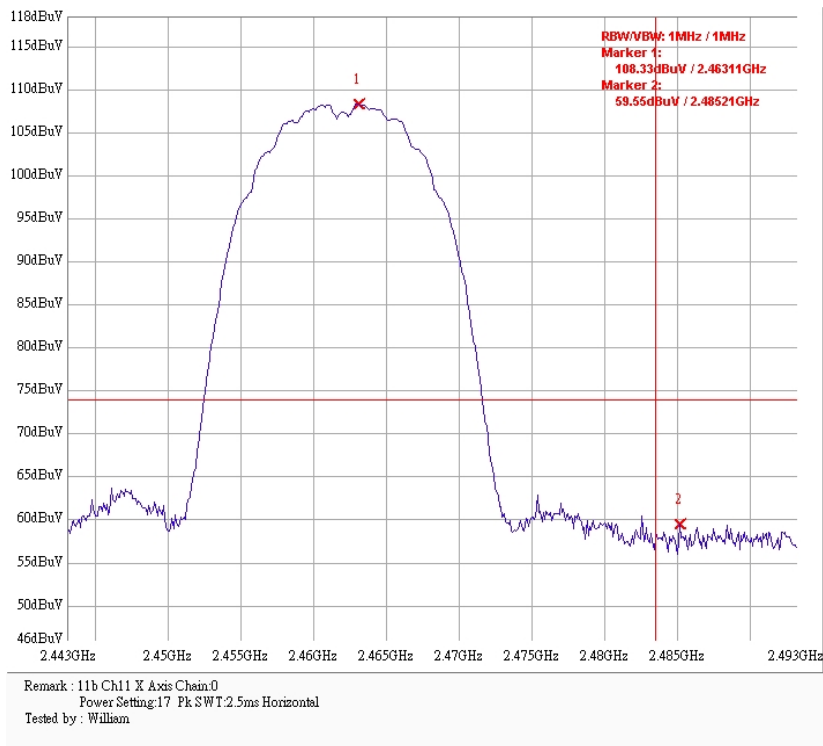
Chain 0: Bandage @ 802.11b mode channel 1 (PK)



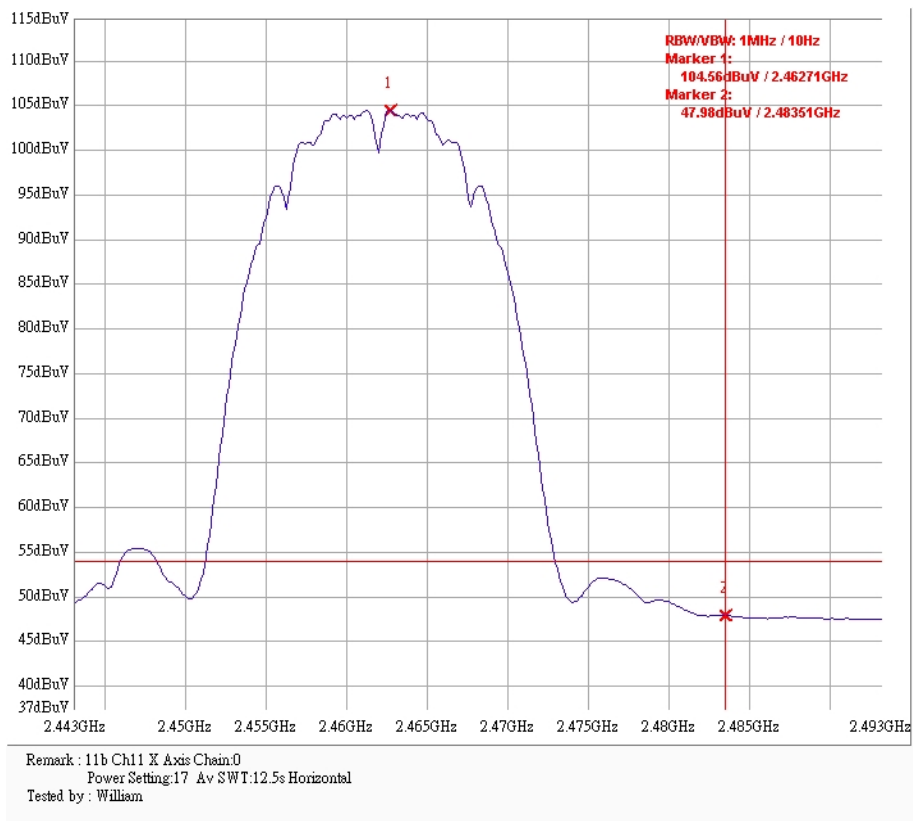
Chain 0: Bandage @ 802.11b mode channel 1 (AV)



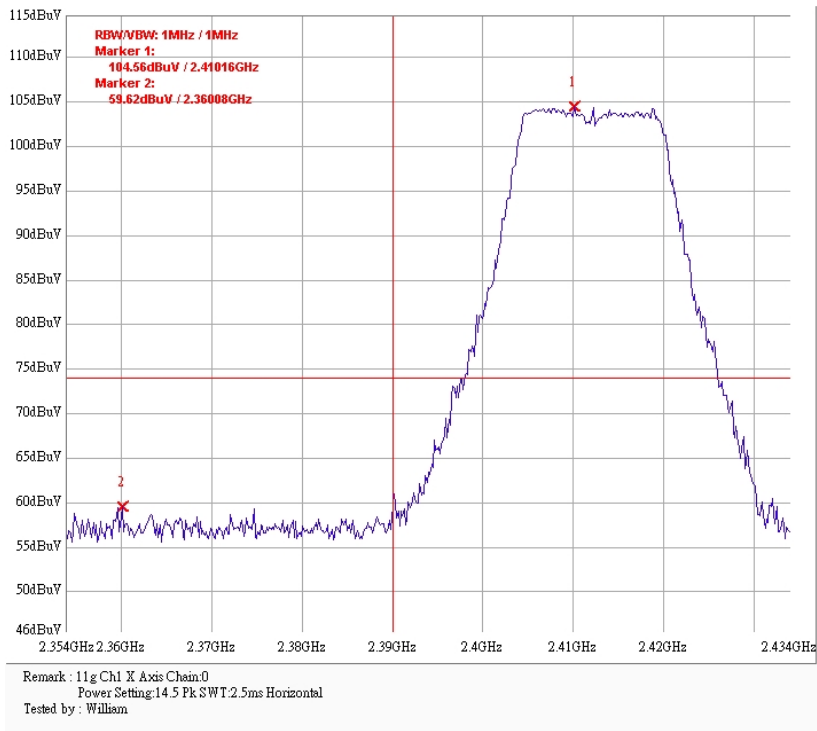
Chain 0: Bandage @ 802.11b mode channel 11 (PK)



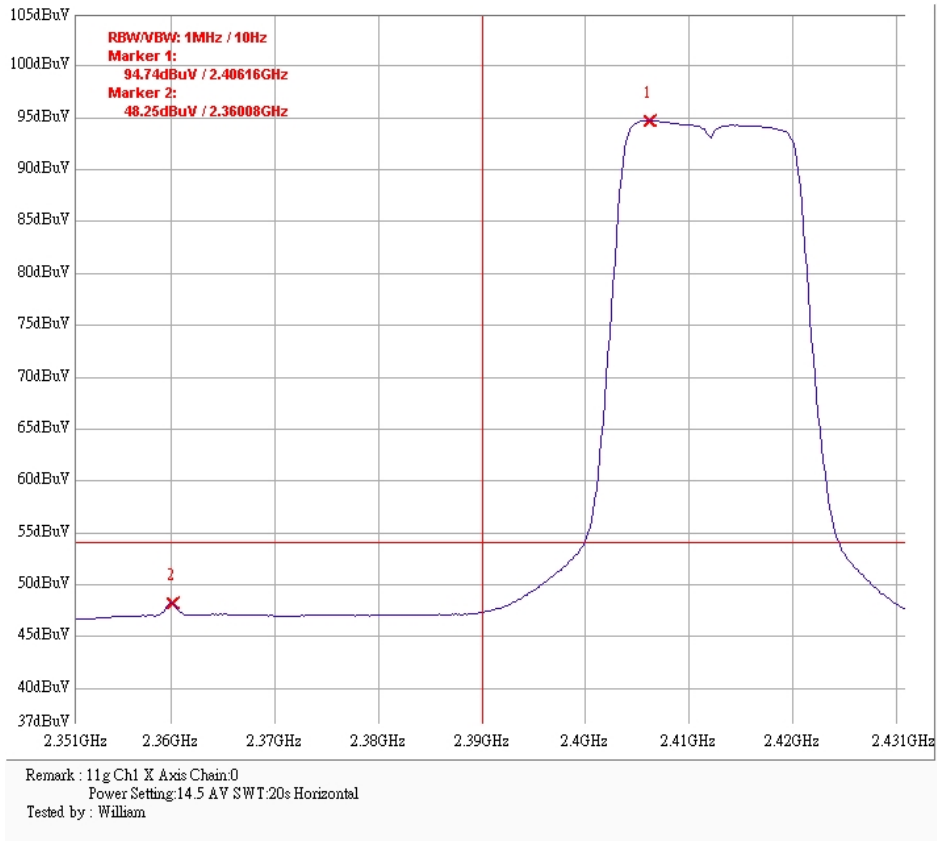
Chain 0: Bandage @ 802.11b mode channel 11 (AV)



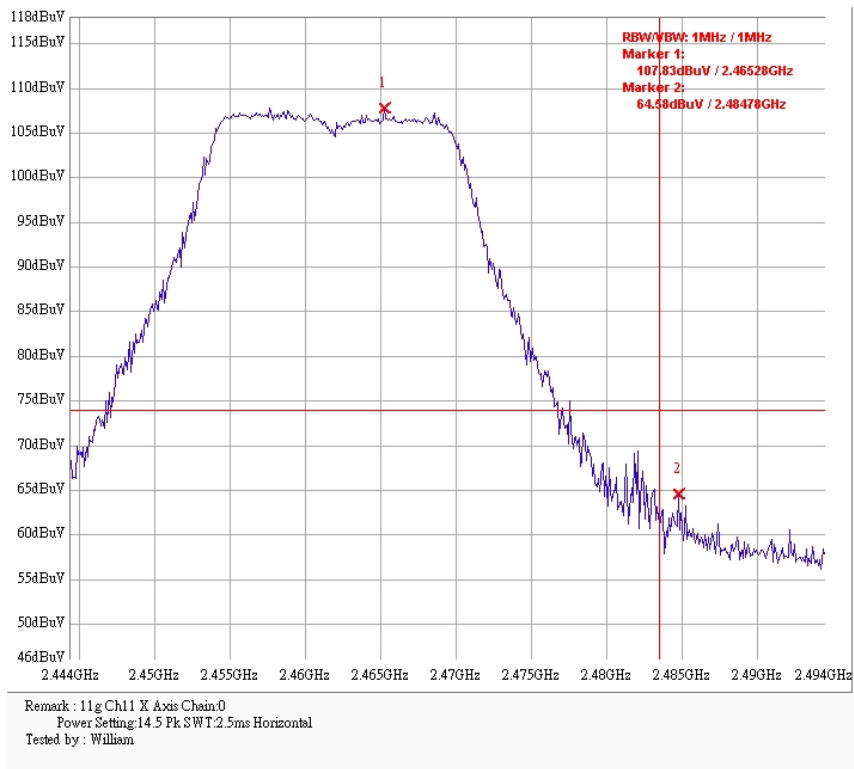
Chain 0: Bandage @ 802.11g mode channel 1 (PK)



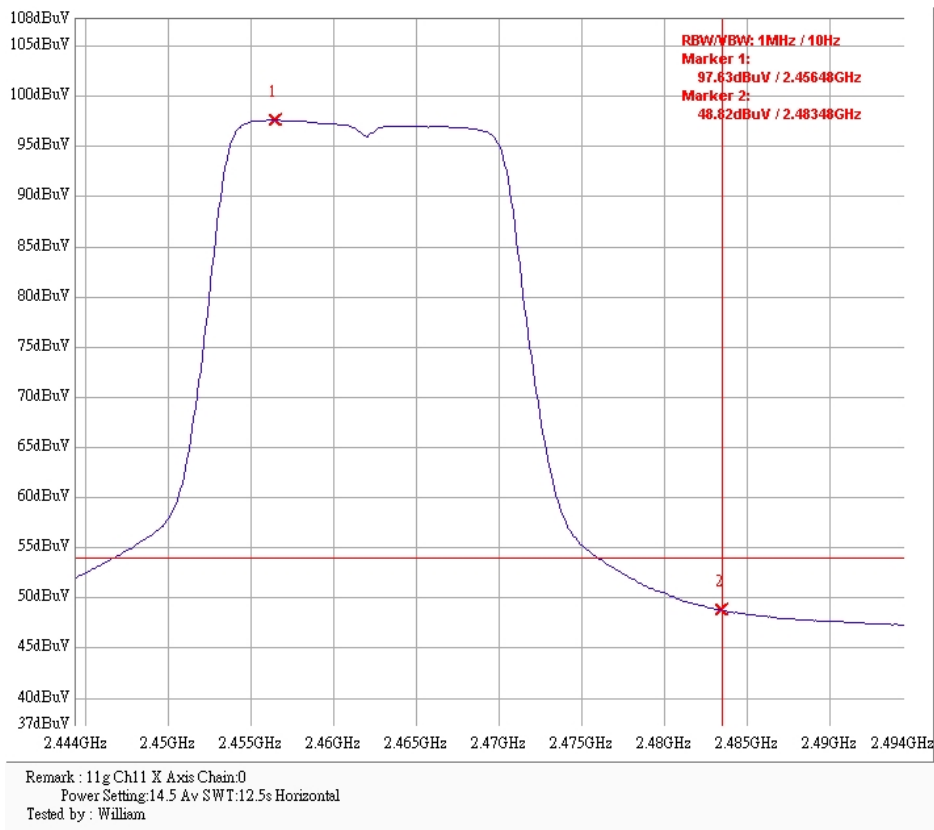
Chain 0: Bandage @ 802.11g mode channel 1 (AV)



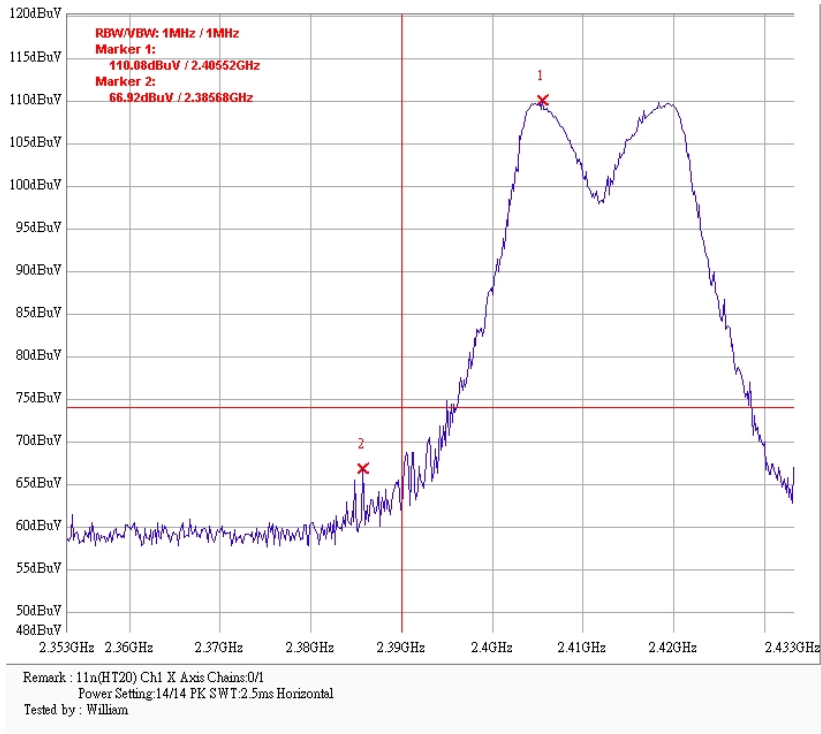
Chain 0: Bandage @ 802.11g mode channel 11 (PK)



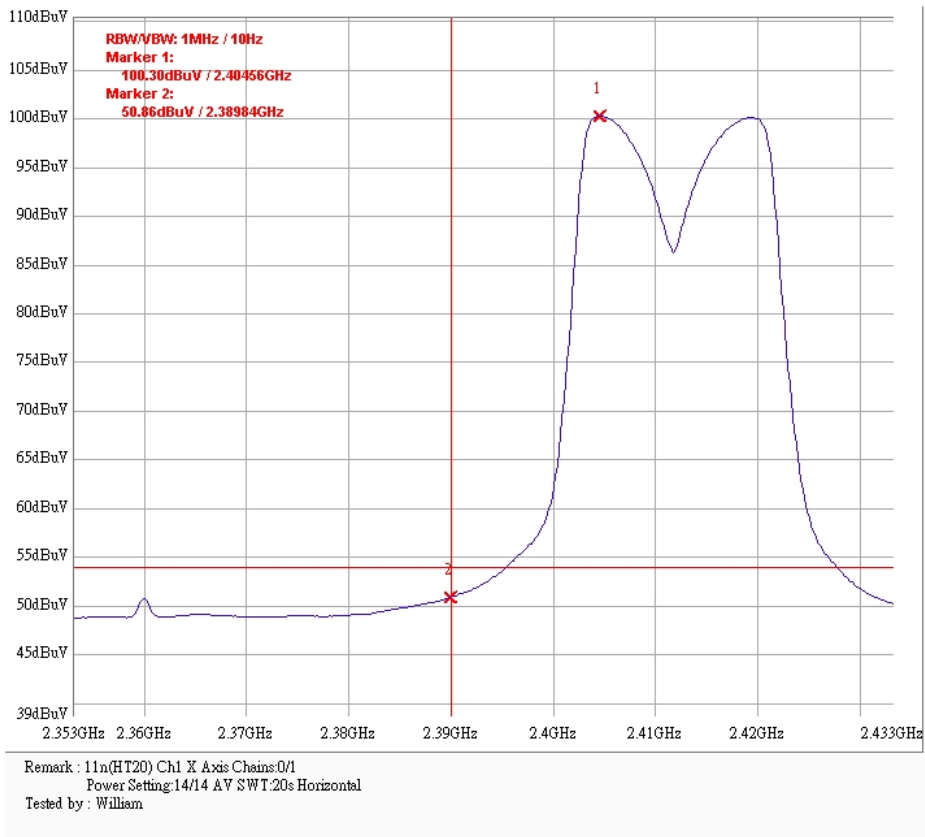
Chain 0: Bandage @ 802.11g mode channel 11 (AV)



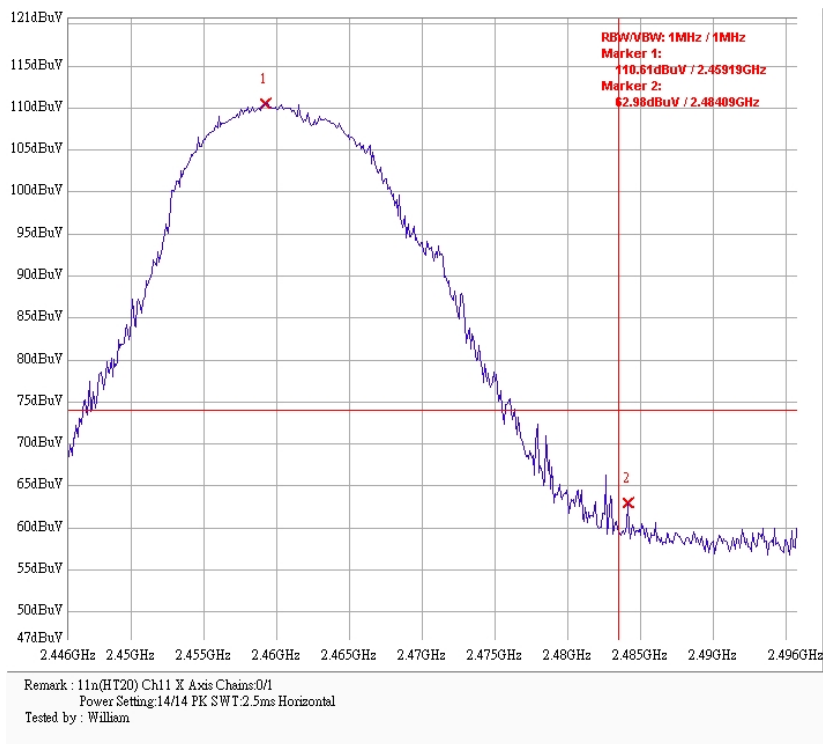
Chain 0+Chain 1: Bandage @ 802.11n (HT20) mode channel 1 (PK)



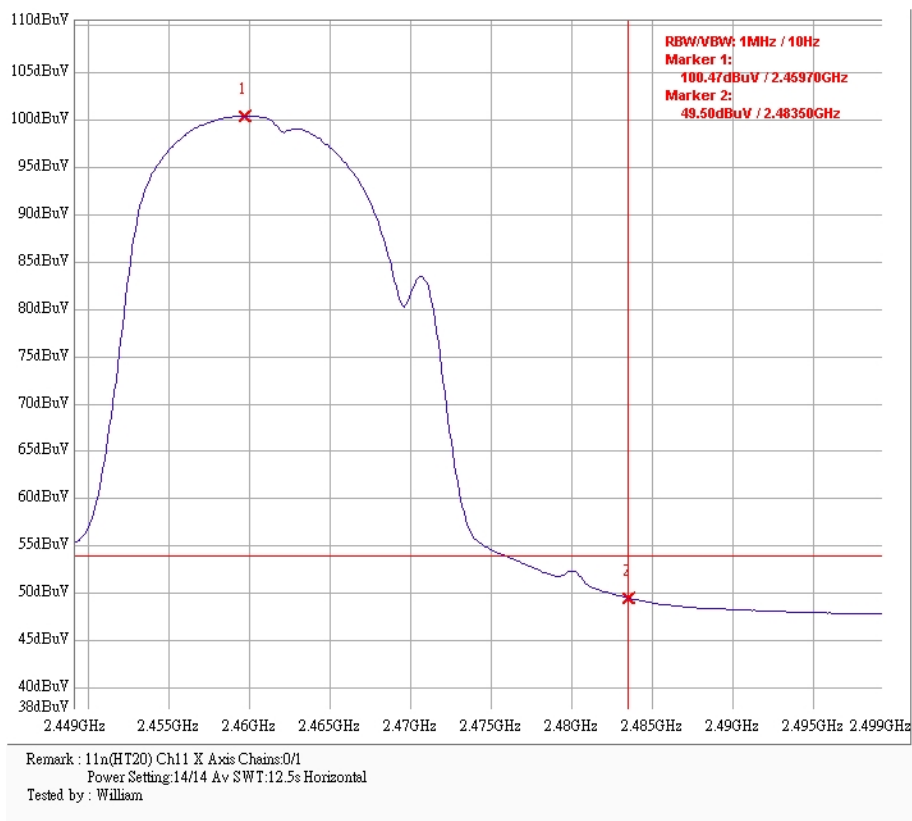
Chain 0+Chain 1: Bandage @ 802.11n (HT20) mode channel 1 (AV)



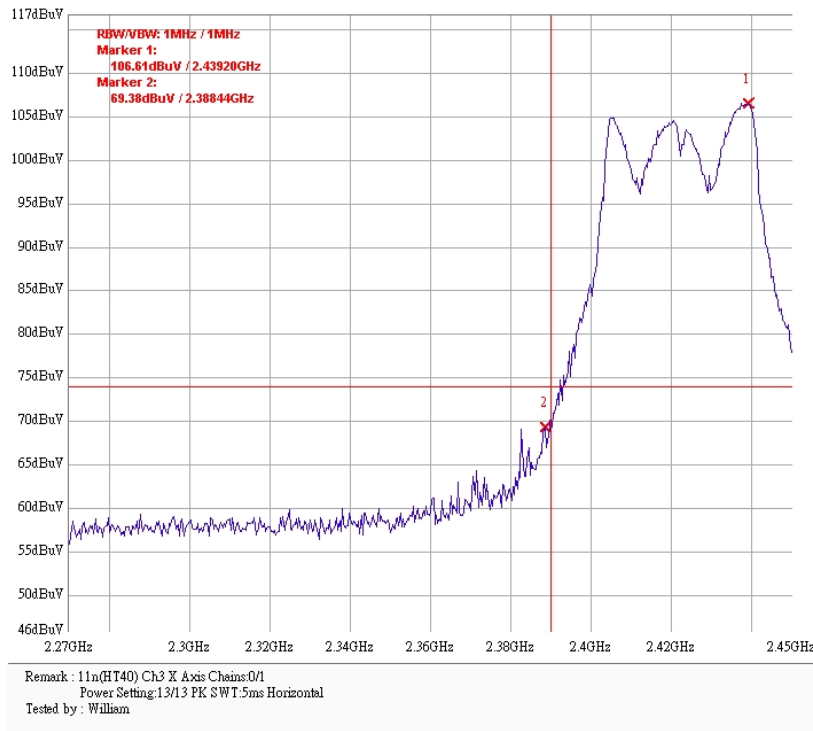
Chain 0+Chain 1: Bandage @ 802.11n (HT20) mode channel 11 (PK)



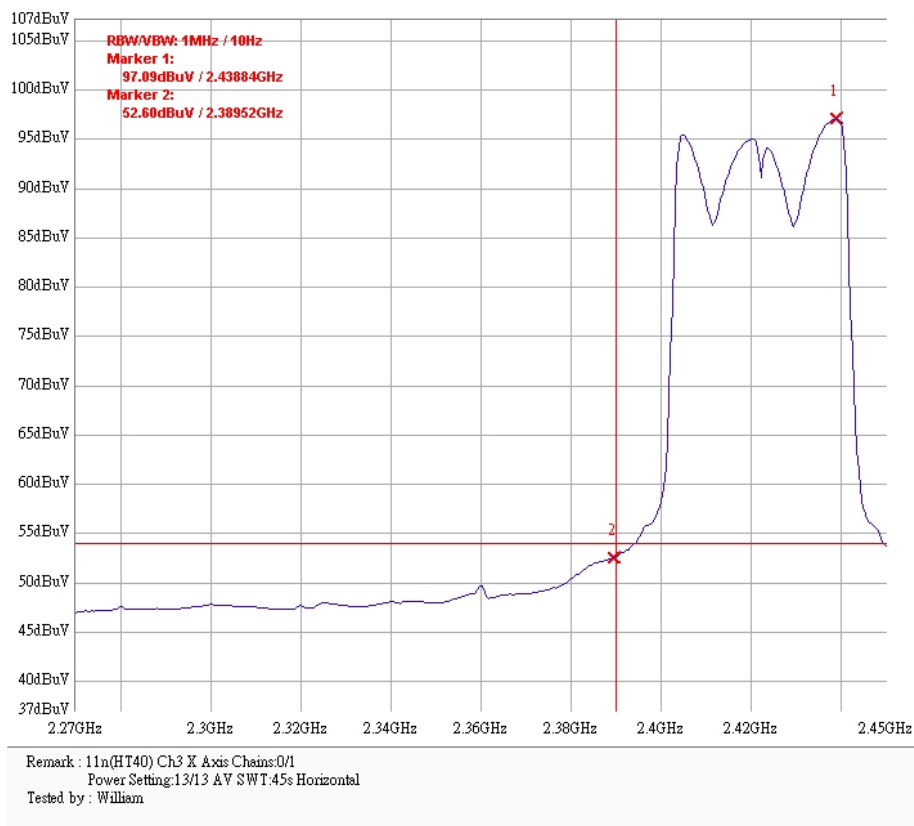
Chain 0+Chain 1: Bandage @ 802.11n (HT20) mode channel 11 (AV)



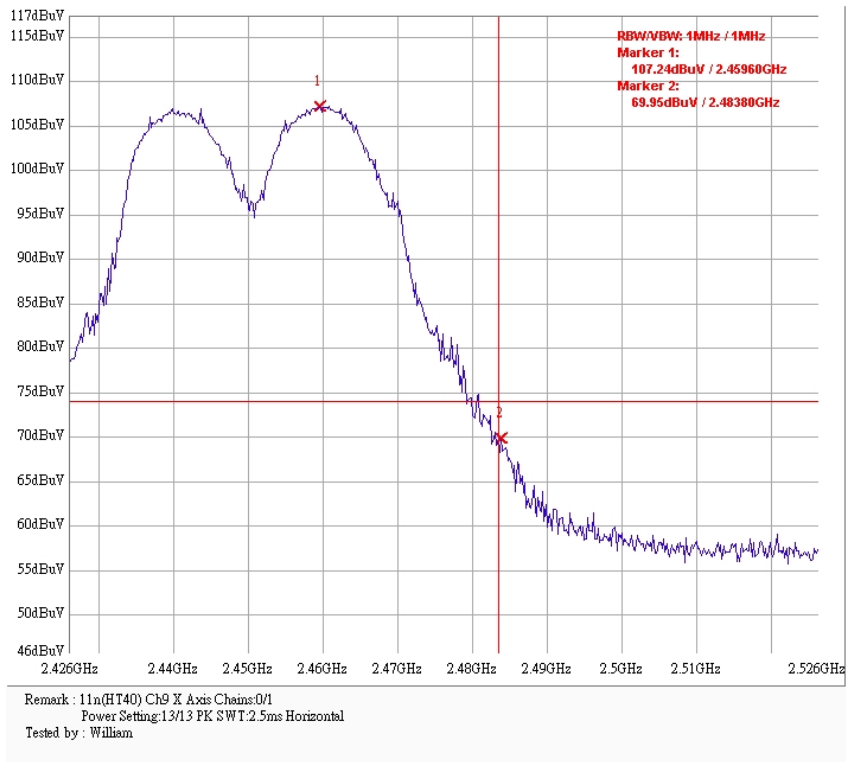
Chain 0+Chain 1: Bandage @ 802.11n (HT40) mode channel 3 (PK)



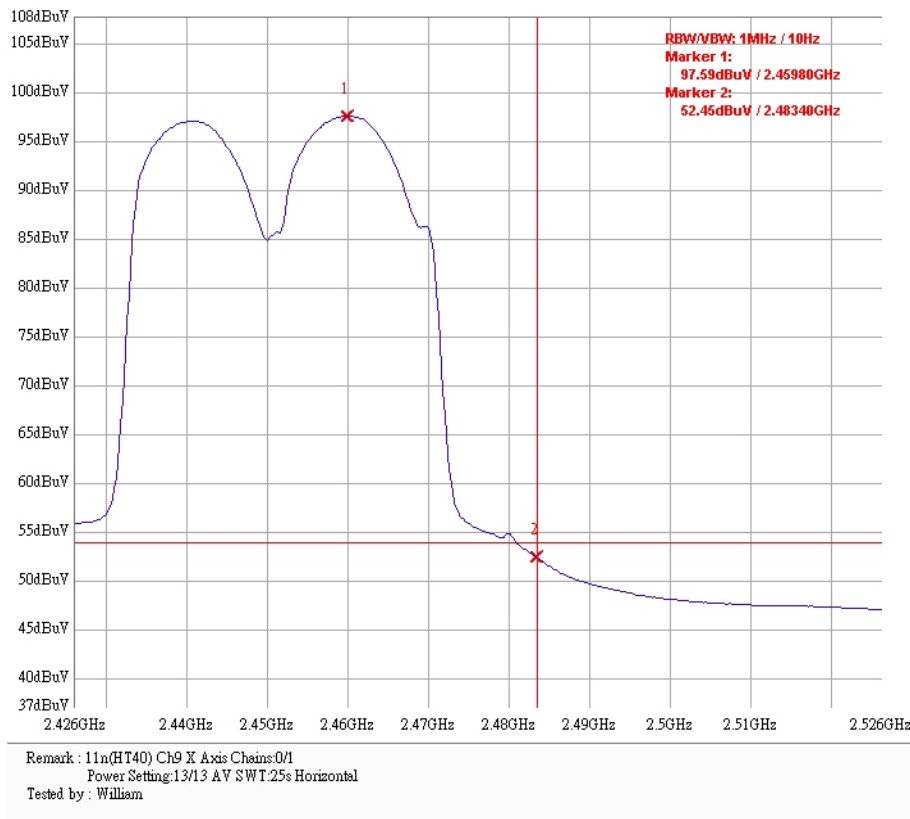
Chain 0+Chain 1: Bandage @ 802.11n (HT40) mode channel 3 (AV)



Chain 0+Chain 1: Bandage @ 802.11n (HT40) mode channel 9 (PK)



Chain 0+Chain 1: Bandage @ 802.11n (HT40) mode channel 9 (AV)



10. 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

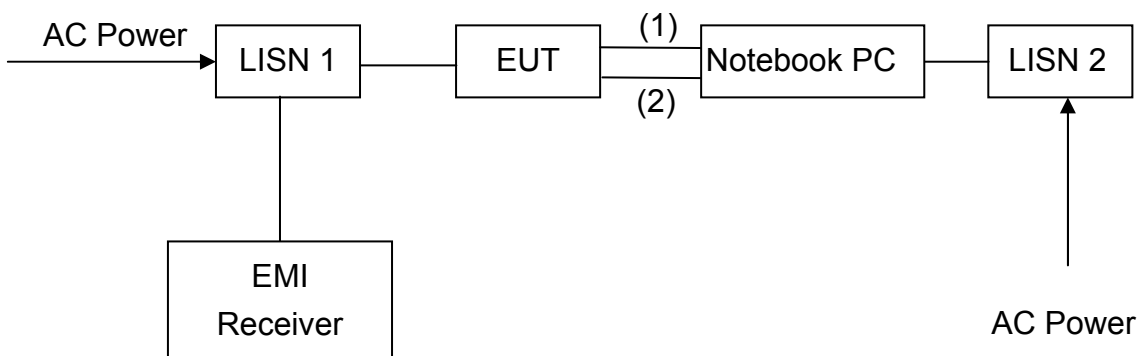
The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/ 50 uH coupling impedance with 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:



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

(3) RJ-45 STP Cat.5 2 meter

Emission Limit:

Section 15.107(c)(2) for Class B device operating below 30 MHz of unintentional Carrier current radiators.

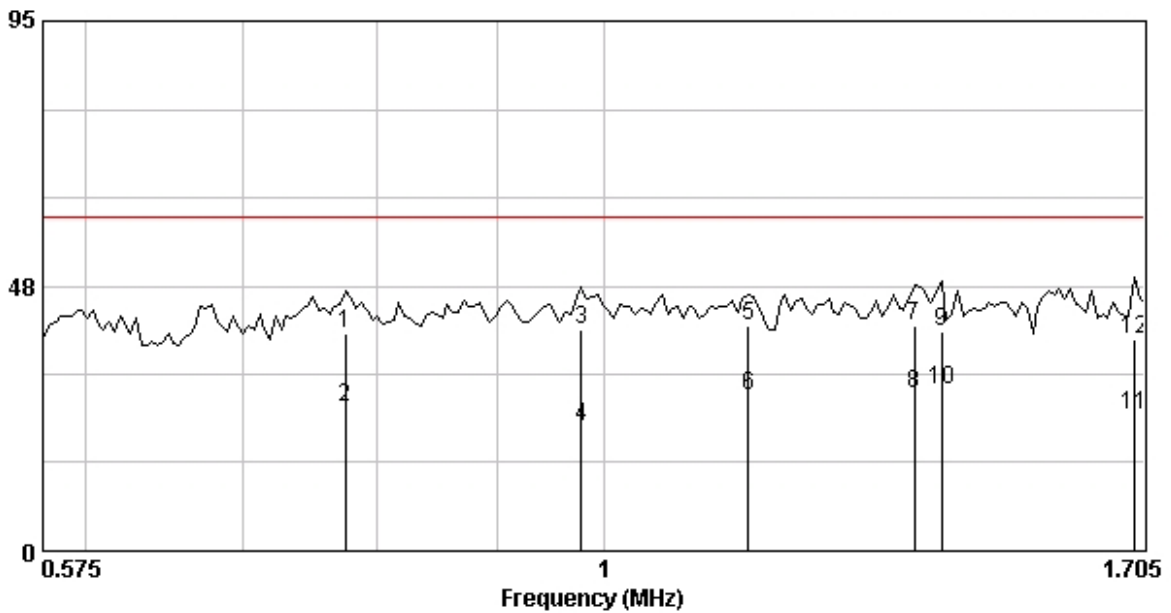
Freq. (MHz)	Maximum RF Line Voltage	
	QUASI-PEAK (μ V)	AVERAGE (dB μ V)
0.535 ~ 1.705	1000	60

Phase : Line
EUT : PLA4231
Test Condition : Current on mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.775	0.17	39.03	60.00	25.75	60.00	-20.97	-34.25
0.979	0.18	39.58	60.00	22.43	60.00	-20.42	-37.57
1.153	0.19	40.48	60.00	27.80	60.00	-19.52	-32.20
1.359	0.19	40.42	60.00	28.22	60.00	-19.58	-31.78
1.396	0.19	39.24	60.00	28.77	60.00	-20.76	-31.23
1.689	0.20	38.09	60.00	24.48	60.00	-21.91	-35.52

Remark:

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

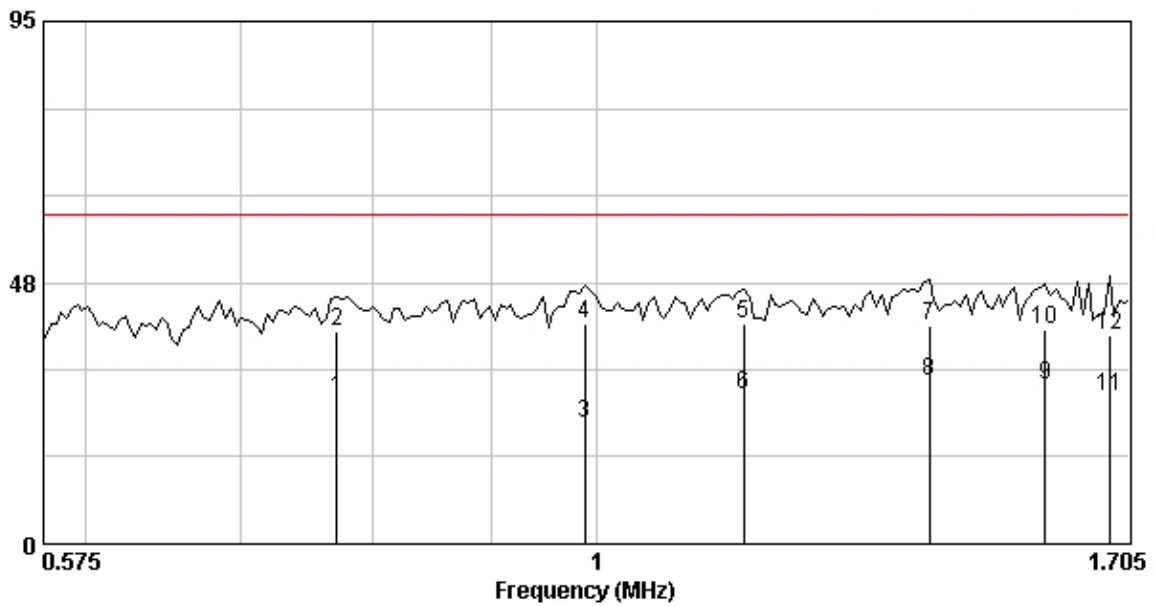


Phase : Neutral
 EUT : PLA4231
 Test Condition : Current on mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.771	0.27	38.64	60.00	26.39	60.00	-21.36	-33.61
0.989	0.27	39.95	60.00	22.02	60.00	-20.05	-37.98
1.160	0.28	40.17	60.00	27.24	60.00	-19.83	-32.76
1.396	0.28	39.51	60.00	29.61	60.00	-20.49	-30.39
1.568	0.29	39.11	60.00	28.84	60.00	-20.89	-31.16
1.671	0.29	37.76	60.00	26.86	60.00	-22.24	-33.14

Remark:

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



Appendix A: Test Equipment List

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Receiver	Rohde & Schwarz	ESCS30	833364/011	2012/06/15	2013/06/15
Spectrum Analyzer	Rohde&schwarz	FSP30	100137	2012/6/25	2013/6/25
Spectrum Analyzer	Rohde&schwarz	FSEK30	100186	2012/2/6	2013/2/5
Horn Antenna (1-18G)	Schwarzbeck	BBHA 9120 D	9120D-456	2012/9/3	2014/9/3
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2012/9/5	2014/9/5
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-172	2011/7/26	2013/7/25
Pre-Amplifier	MITEQ	AFS44-001026 50--42-10P-44	1495287	2011/10/27	2013/10/26
Pre-Amplifier	MITEQ	JS4-26004000-- 27-8A	828825	2012/9/18	2014/9/18
Power Meter	Anritsu	ML2495A	0844001	2012/10/9	2013/10/9
Power Sensor	Anritsu	MA2411B	0738452	2012/10/9	2013/10/9
Temperature&Humidity Test Chamber	TERCHY	MHU-225LRU (SA)	950838	2012/6/15	2013/6/15
Two-Line V-Network	Rohde&schwarz	ESH3-Z5	838979/014	2012/10/29	2013/10/29

Note: The above equipments are within the valid calibration period.

Measurement Uncertainty:

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.