



**EMC TEST REPORT for Intentional Radiator**  
**No. SH12020032-002**

Applicant : Aruba Networks, Inc.  
1322 Crossman Ave., Sunnyvale CA 94089 USA

Manufacturer : Aruba Networks, Inc.  
1322 Crossman Ave., Sunnyvale CA 94089 USA

Product Name : Wireless Mesh Router

Type/Model : MSR4K43N3XXX (Where X=A to Z, Blank or  
Symbol for marketing purpose)

**SUMMARY**

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

**47CFR Part 15 (2010):** Radio Frequency Devices

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

**ANSI C63.10 (2009):** American National Standard for Testing Unlicensed Wireless Devices

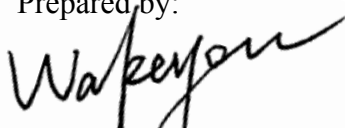
**RSS-210 Issue 8 (December 2010):** Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

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


**ICES-003 Issue 4 (February 2004):** Digital Apparatus

Date of issue: Feb 16, 2012

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**FCC ID: Q9DMSR4000AC**  
**IC: 4675A-MSR4000AC**

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## 1. General Information

### 1.1 Applicant Information

Applicant: Aruba Networks, Inc.  
1322 Crossman Ave., Sunnyvale CA 94089 USA

Name of contact: Ivaylo Tankov

Tel: 408-754-3035

Fax: 408-227-4550

Manufacturer: Aruba Networks, Inc.  
1322 Crossman Ave., Sunnyvale CA 94089 USA

Sample received date : Feb 1, 2012

Sample Identification No : \*0120201-13-001\*

Date of test : Feb 1, 2012 ~ Feb 16, 2012

### 1.2 Identification of the EUT

Equipment: Wireless Mesh Router

Type/model: MSR4K43N3XXX(Where X=A to Z, Blank or Symbol for marketing purpose)

FCC ID: Q9DMSR4000AC

IC: 4675A-MSR4000AC



### 1.3 Technical specification

Operation Frequency Band: 2412 - 2462 MHz , 2422 – 2452MHz  
5745 – 5825 MHz, 5755 – 5795MHz

Modulation: DBPSK @1Mbps  
DQPSK@2Mbp  
CCK@5.5/11Mbps  
BPSK@6/9 Mbps  
QPSK@12/18Mbps  
16-QAM@24Mbps  
64-QAM@48/54Mpb and above

Gain of Antenna: Ap-ANT-80D (8dBi for 2.4GHz)  
Ap-ANT-85 (15dBi for 2.4GHz)  
Ap-ANT-2\*2-5614 (14dBi for 5.8GHz)  
Ap-ANT-86 (9dBi for 5.8GHz)

Rating: 100-240Vac, 0.75A, 50-60Hz

Description of EUT: Here are a series of models. They are electrically identical except for different model names.  
Among the EUT, there are four same RF cards, namely card 0, card 1, card 2 and card 3. Each card has two chains, namely chain 1 and chain 2.

Port identification:

Port	Description	Type	Number
1	Console	USB2.0	1
3	RF connector	Female-N	8
4	Ethernet	RJ45	1

Dimension: 30cm \* 30cm \*13cm

Declared Temperature range: -30°C ~ 55°C

Category of EUT: Class B

EUT type:  Table top  
 Floor standing

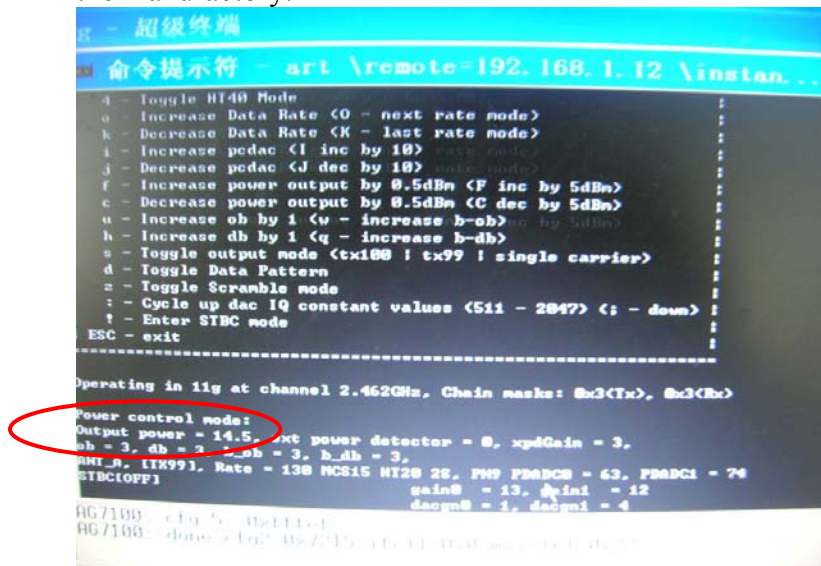
Channel Description:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	149	5745
2	2417	153	5765
3	2422	157	5785
4	2427	161	5805
5	2432	165	5825
6	2437	151	5755
7	2442	159	5795
8	2447	/	/
9	2452		
10	2457		
11	2462		

**1.4 Mode of operation during the test / Test peripherals used**

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

While the antenna Ap-ANT-80D with gain of 8dBi & Ap-ANT-86 with gain of 9dBi are applied, the power level setting for 802.11a/b/g/n is “14.5” indicated in software offered by the manufactory.



While the antenna Ap-ANT-2\*2-5614 with gain of 14dBi is applied, the power level setting for 802.11a/n is “11.0”.

While the antenna Ap-ANT-85 with gain of 15dBi is applied, power level setting for 802.11b/g/n is “10.0”.



Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	FUJITSU SIMENS, LIFEBOOK	NA

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

*For 802.11a----- lowest, 5745MHz; middle, 5785MHz; highest, 5825MHz.*

*For 802.11b----- lowest, 2412MHz; middle, 2437MHz; highest, 2462MHz.*

*For 802.11g----- lowest, 2412MHz; middle, 2437MHz; highest, 2462MHz.*

*For 802.11n 2.4GHz HT20 ----- lowest, 2412MHz; middle, 2437MHz; highest, 2462MHz.*

*For 802.11n 2.4GHz HT40 ----- lowest, 2422MHz; middle, 2437MHz; highest, 2452MHz.*

*For 802.11n 5.8GHz HT20 ----- lowest, 5745MHz; middle, 5785MHz; highest, 5825MHz.*

*For 802.11n 5.8GHz HT40 ----- lowest, 5755MHz; highest, 5795MHz.*



## 2. Test Specification

### 2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2011-10-21	2012-10-20
Semi-anechoic chamber	-	Albatross project	EC 3048	2011-5-21	2012-5-20
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2011-5-16	2013-5-15
Horn antenna	HF 906	R&S	EC 3049	2011-5-13	2013-5-12
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2011-4-12	2012-4-11
Test Receiver	ESCS 30	R&S	EC 2107	2011-10-21	2012-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2012-1-9	2013-1-8
A.M.N.	ESH3-Z5	R&S	EC 2109	2012-1-10	2013-1-9
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2012-2-8	2013-2-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2012-2-8	2013-2-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2012-2-8	2013-2-7
Band Reject Filter	WRCGV 2400/2483- 2390/2493- 35/10SS	Wainwright	EC4297-4	2012-2-8	2013-2-7
Test Receiver	FSV40	R&S	/	2011-10-21	2012-10-20
Preamplifier	AP-025C	Quietek	QT-AP003	2011-11-25	2012-11-24
Preamplifier	AP-180C	Quietek	CHM-0602013	2011-11-25	2012-11-24
Broad-Band Horn Antenna	BBHA9120D	Schwarzbeck	496	2011-11-25	2012-11-24
Broad-Band Horn Antenna	BBHA9170	Schwarzbeck	294	2011-11-25	2012-11-24
Power Splitter/Combiner	ZN2PD2-63	Mini-Circuits	815	2011-12-3	2012-12-2

### 2.2 Test Standard

47CFR Part 15 (2010)  
ANSIC63.4 (2009)  
ANSI C63.10 (2009)  
RSS-210 Issue 8 (December 2010)  
RSS-Gen Issue 3 (December 2010)  
ICES-003 Issue 4 (February 2004)



### 2.3 Test Summary

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

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-210 Issue 8 Annex 8	Pass
Maximum peak output power	15.247(b)	RSS-210 Issue 8 Annex 8	Pass
Power spectrum density	15.247(e)	RSS-210 Issue 8 Annex 8	Pass
Radiated emission from the EUT cabinet	15.205 & 15.209	RSS-210 Issue 8 Clause 2	Pass
Unwanted Emissions per Antenna-Port Conducted Measurements	15.205 & 15.209	RSS-210 Issue 8 Clause 2	Pass
Emission outside the frequency band	15.247(d)	RSS-210 Issue 8 Annex 8	Pass
Power line conducted emission	15.207	RSS-Gen Issue 3 Clause 7.2.4	Pass
Channel number of hopping system	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	NA
Average time of occupancy in any channel	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	NA
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested
Conducted emission	15B	ICES-003	Pass
Radiated emission	15B	ICES-003	Pass



2.4 RF cards VS Power

Mode	Chain	CH	Output Power (dBm)
802.11a	0-1	M	20.42
	0-2	M	20.35
	1-1	M	20.25
	1-2	M	20.30
	2-1	M	20.19
	2-2	M	20.31
	3-1	M	20.26
	3-2	M	20.13
802.11b	0-1	M	19.71
	0-2	M	19.36
	1-1	M	19.22
	1-2	M	19.29
	2-1	M	19.06
	2-2	M	19.24
	3-1	M	19.46
	3-2	M	19.55
802.11na,HT40	0-1	M	19.76
	0-2	M	19.58
	1-1	M	19.63
	1-2	M	19.37
	2-1	M	19.20
	2-2	M	19.35
	3-1	M	19.66
	3-2	M	19.09
802.11ng, HT20	0-1	M	22.49
	0-2	M	22.46
	1-1	M	22.09
	1-2	M	22.31



	2-1	M	22.14
	2-2	M	22.00
	3-1	M	22.37
	3-2	M	22.32

Based on the test data above, in this report, the card 0 with the highest output power is chosen to perform all tests.

### 2.5 Data rate VS power

Mode	Data Rate	CH	Level at Chain 0-1 (dBm)
802.11a	MCS0	M	20.03
	MCS1	M	19.92
	MCS2	M	19.96
	MCS3	M	19.85
	MCS4	M	20.28
	MCS5	M	20.28
	MCS6	M	20.30
	MCS7	M	<b>20.42</b>
802.11b	MCS0	M	16.92
	MCS1	M	16.87
	MCS2	M	16.86
	MCS3	M	18.14
	MCS4	M	18.17
	MCS5	M	19.67
	MCS6	M	<b>19.71</b>
802.11na, HT40	MCS0	M	19.40
	MCS1	M	19.24
	MCS2	M	19.29
	MCS3	M	19.67
	MCS4	M	19.62

	MCS5	M	19.70
	MCS6	M	19.70
	MCS7	M	<b>19.76</b>
802.11ng, HT20	MCS0	M	21.74
	MCS1	M	21.72
	MCS2	M	21.72
	MCS3	M	22.13
	MCS4	M	22.24
	MCS5	M	22.33
	MCS6	M	22.41
	MCS7	M	<b>22.49</b>

**Based on the test data above, in this report, the highest speed is applied for all tests in every mode.**

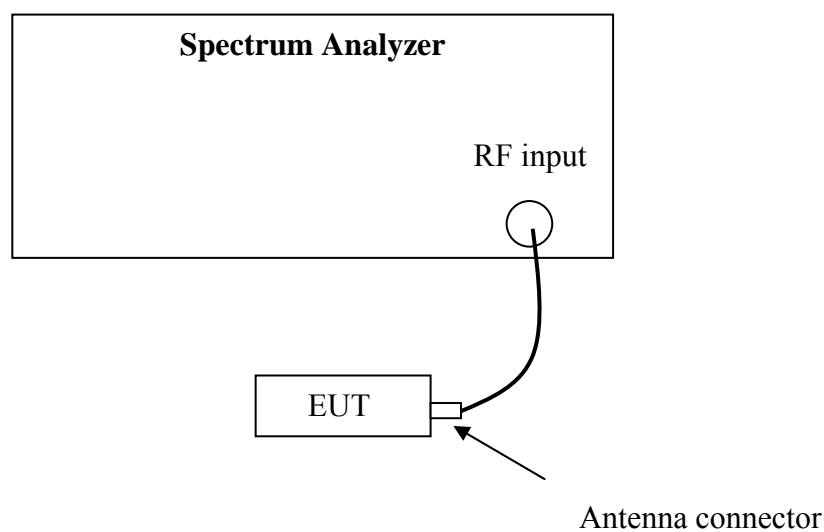
### 3. Minimum 6dB Bandwidth

Test result: PASS

#### 3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.2 Test Configuration



#### 3.3 Test Procedure and test setup

The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v01" for compliance to FCC 47CFR 15.247 requirements.

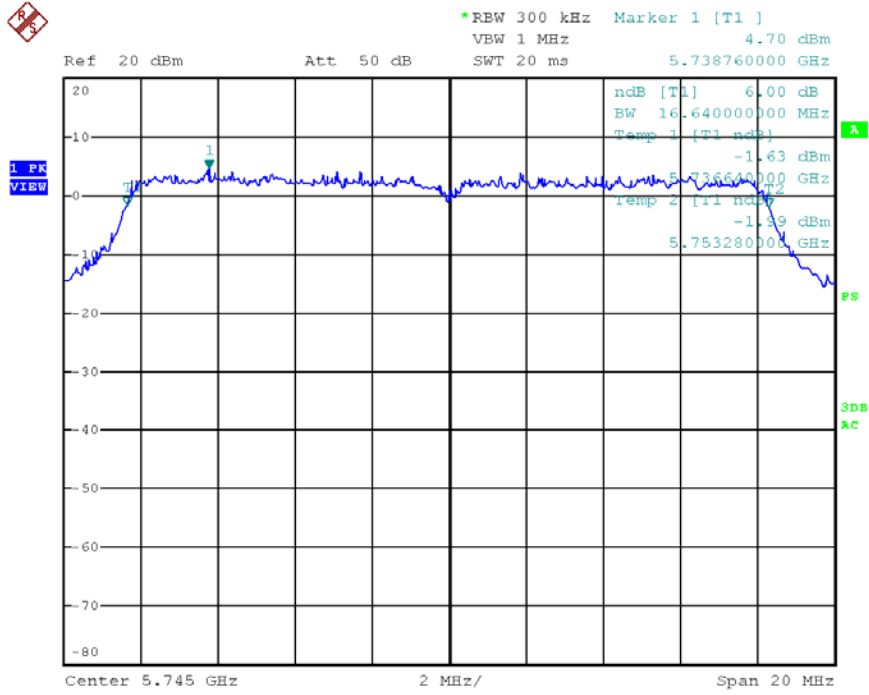
### 3.4 Test Protocol

Temperature : 22°C  
Relative Humidity : 43%

#### Single Chain

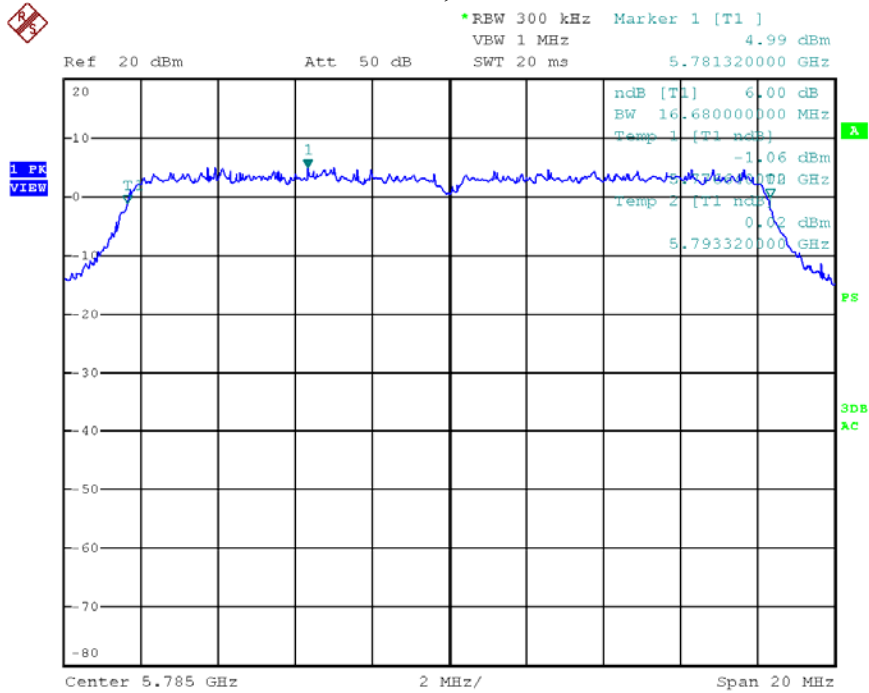
Mode	CH	Chain 0-1 (MHz)	Limit (MHz)
11a	L	16.64	$\geq 0.5$
	M	16.68	
	H	16.72	
11b	L	12.40	
	M	12.08	
	H	12.52	
11g	L	16.64	
	M	16.76	
	H	16.72	
11ng, HT20	L	17.92	
	M	17.92	
	H	17.84	
11ng, HT40	L	36.48	
	M	36.56	
	H	36.40	
11na, HT20	L	17.92	
	M	17.88	
	H	17.96	
11na, HT40	L	36.88	
	H	36.24	

**11a, Channel L**



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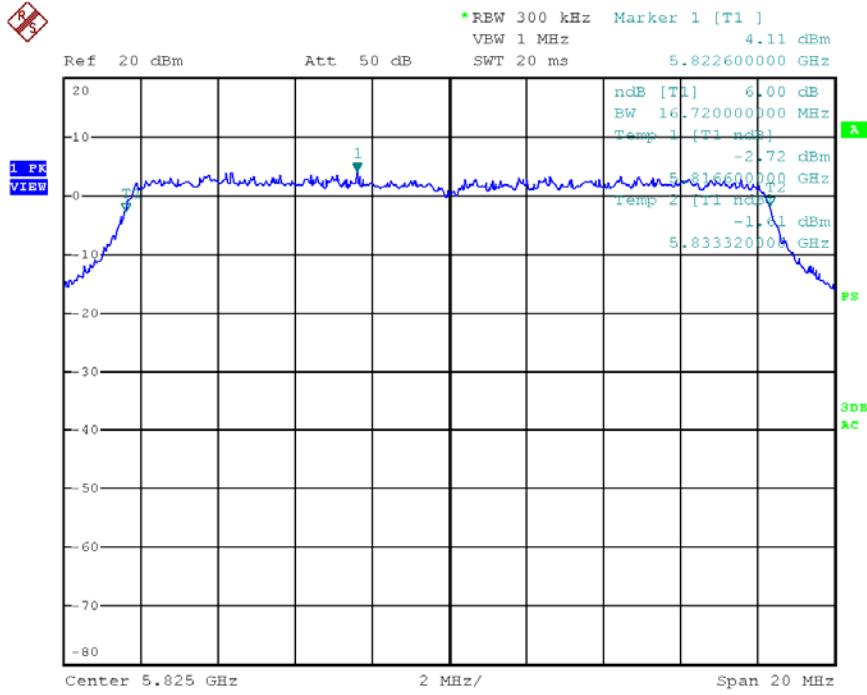
**11a, Channel M**



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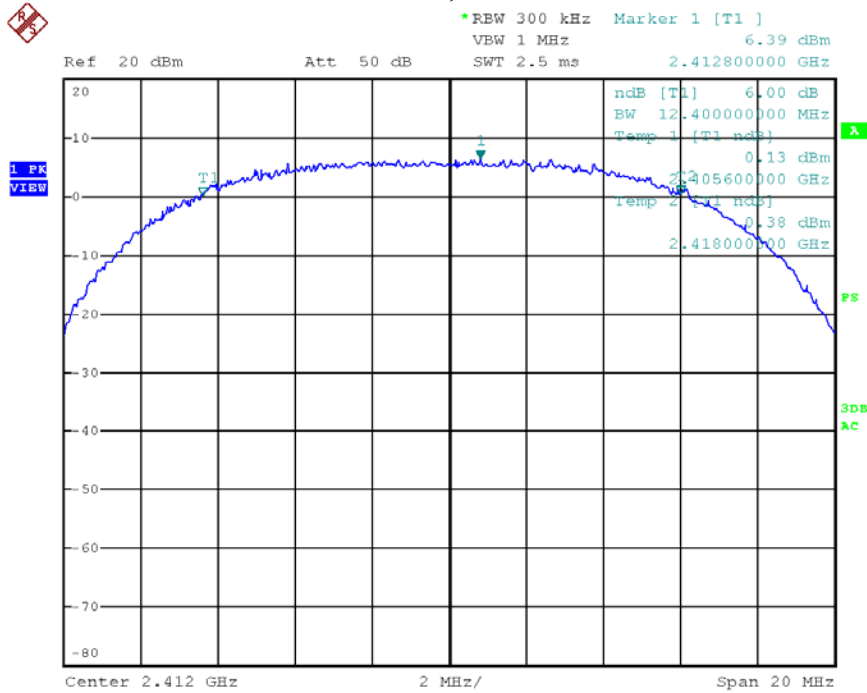


**11a, Channel H**



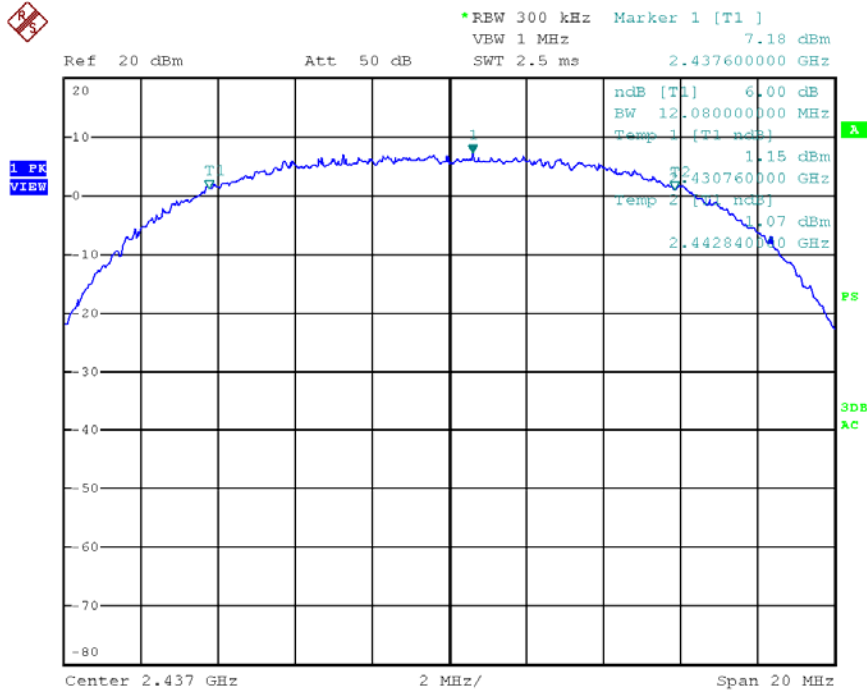
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**11b, Channel L**



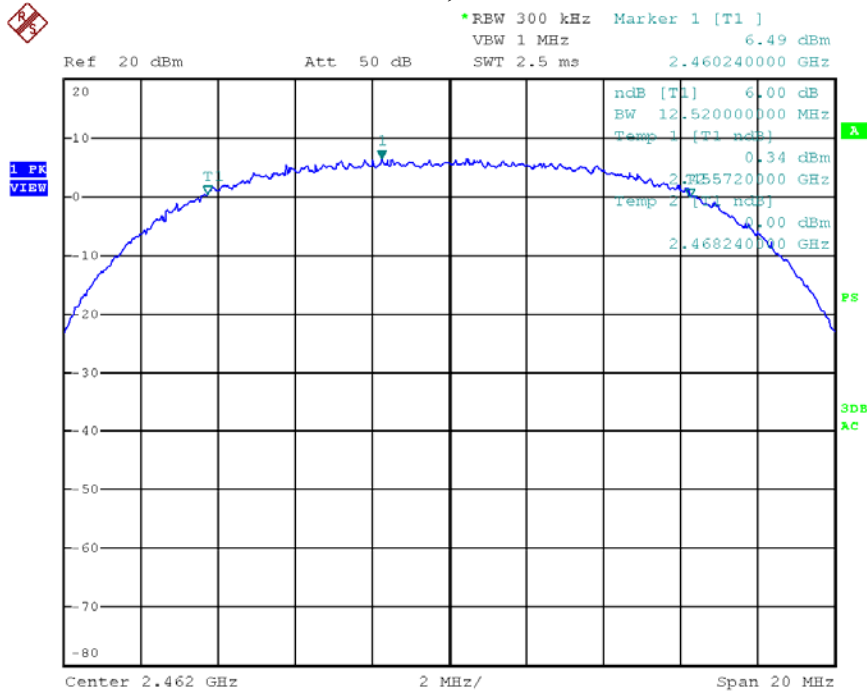
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**11b, Channel M**



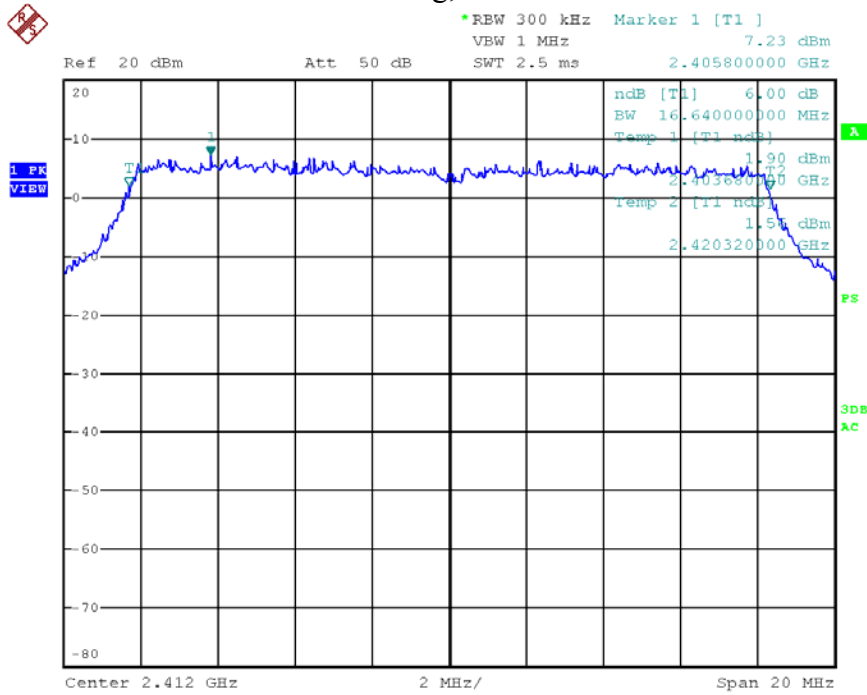
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**11b, Channel H**



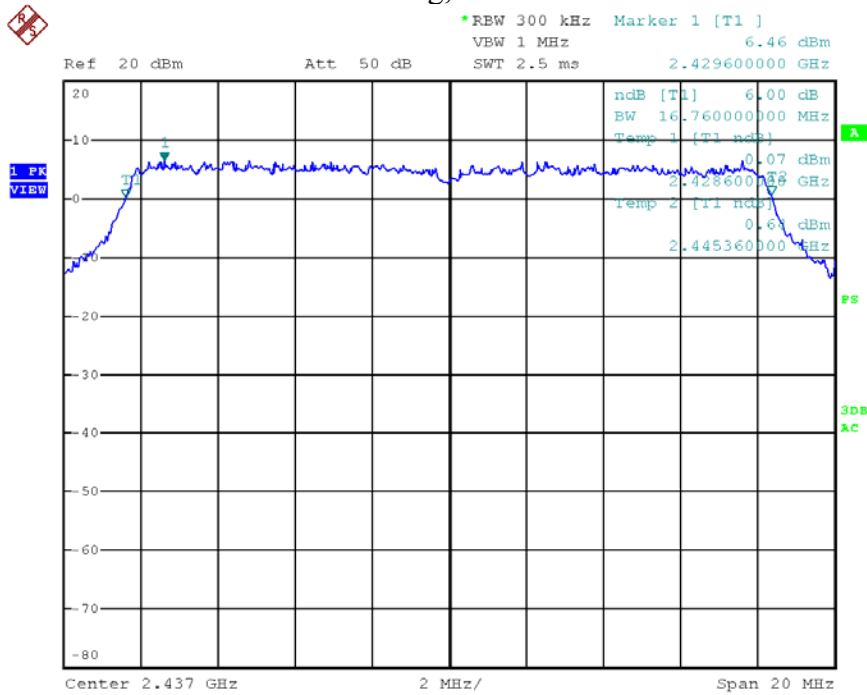
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**11g, Channel L**



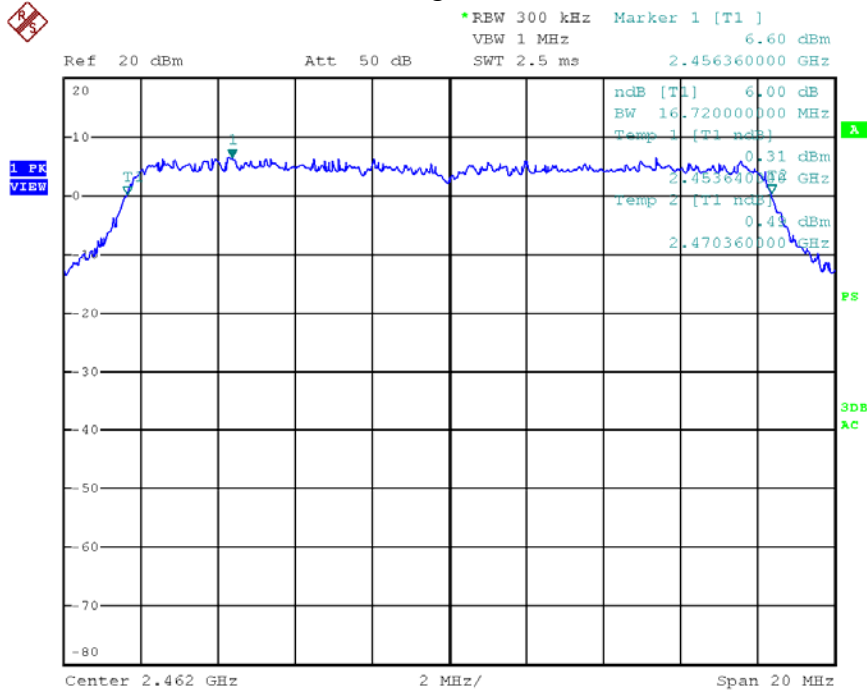
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**11g, Channel M**



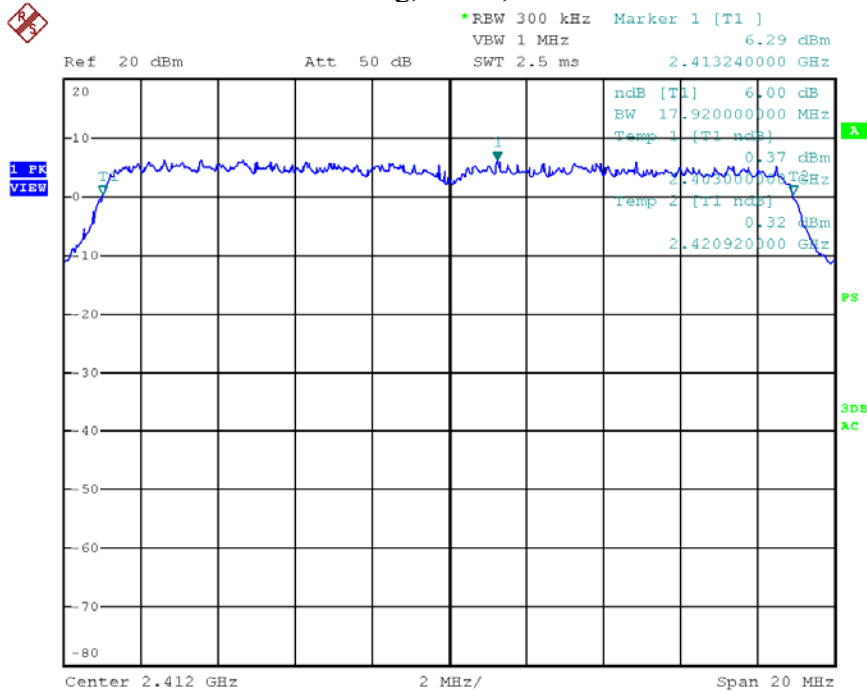
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**11g, Channel H**



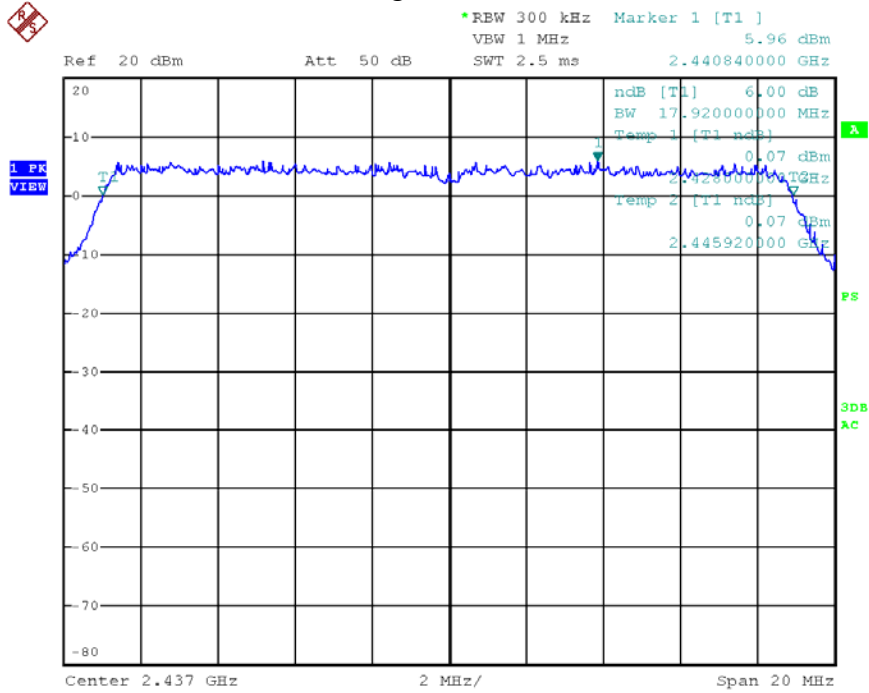
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**11ng, HT20, Channel L**



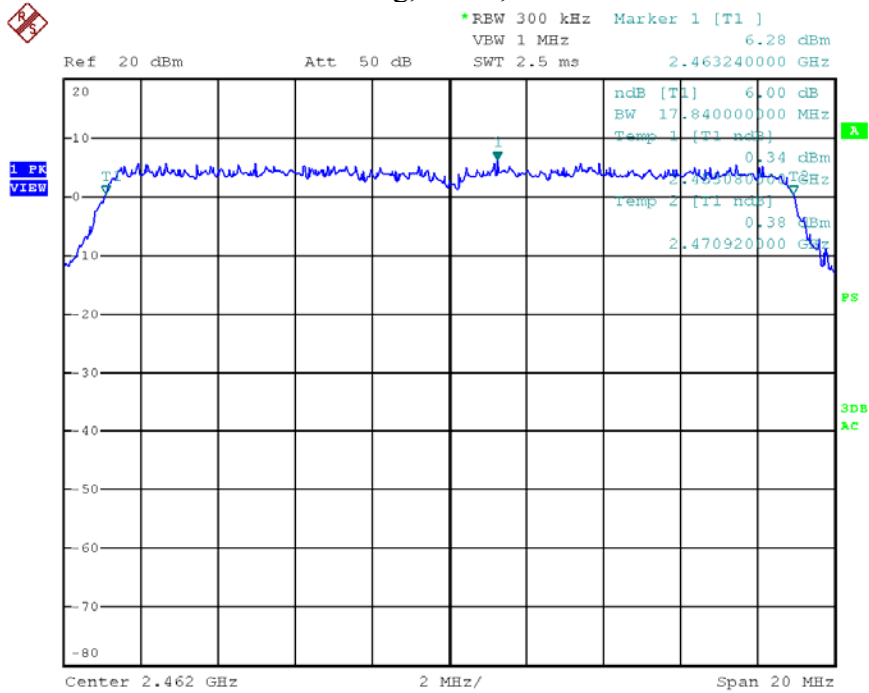
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11ng, HT20, Channel M



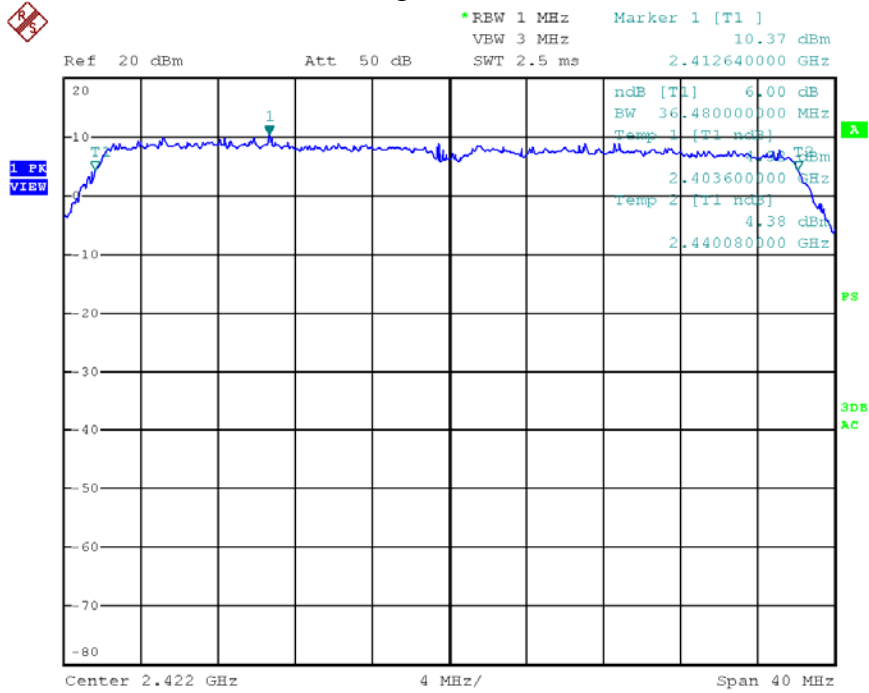
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11ng, HT20, Channel H



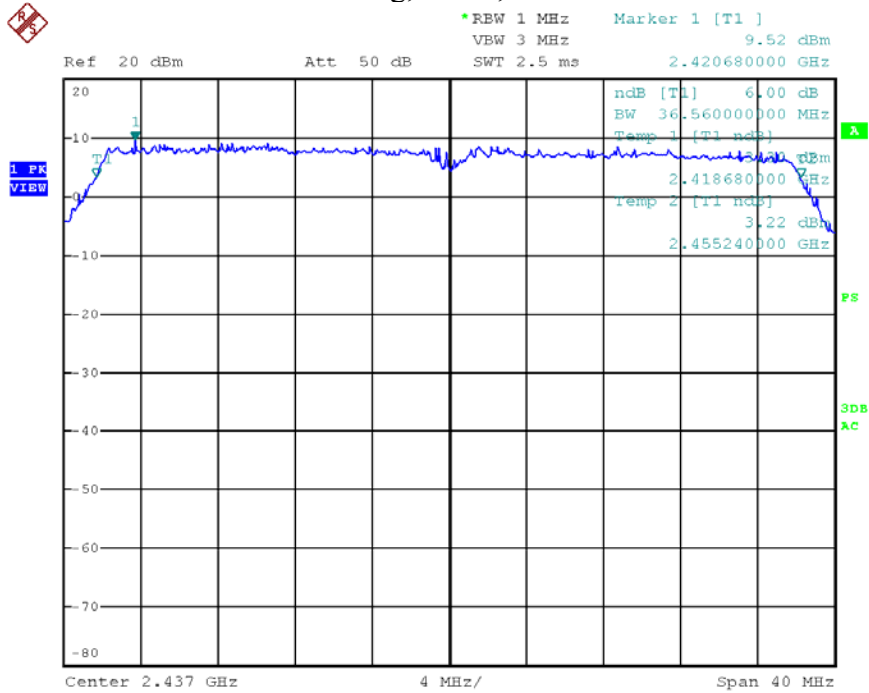
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11ng, HT40, Channel L



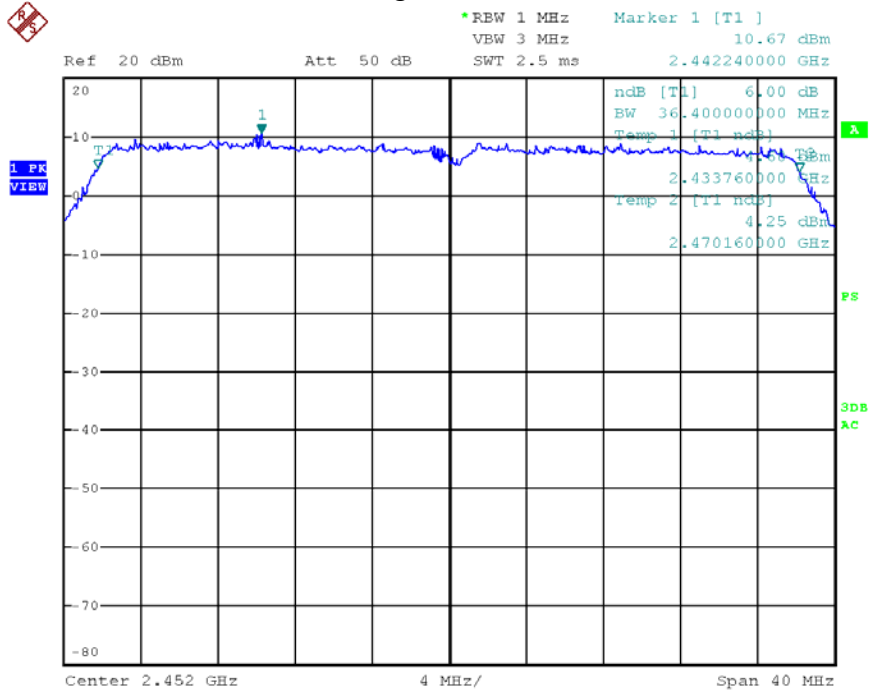
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11ng, HT40, Channel M



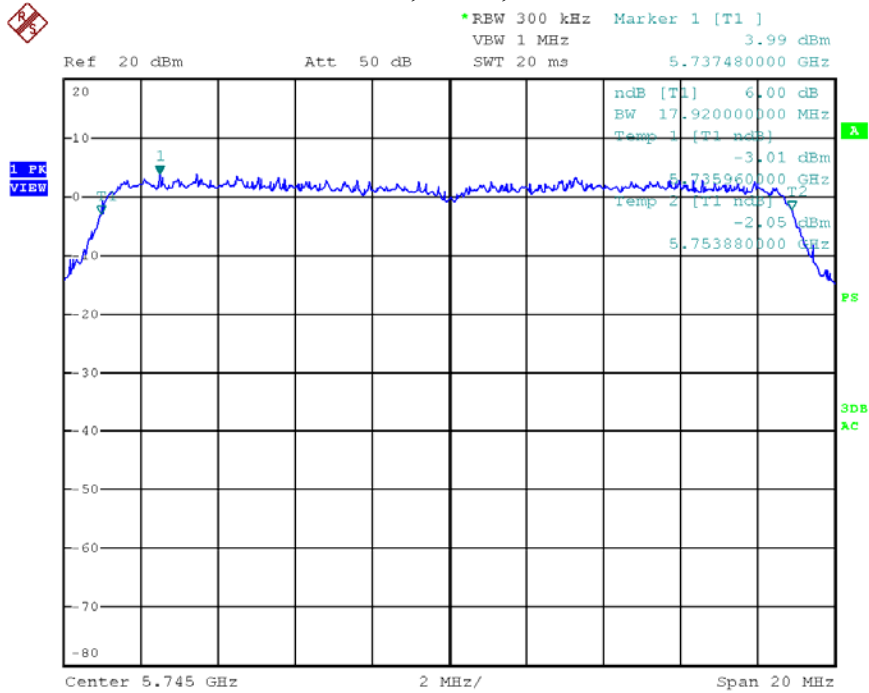
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11ng, HT40, Channel H



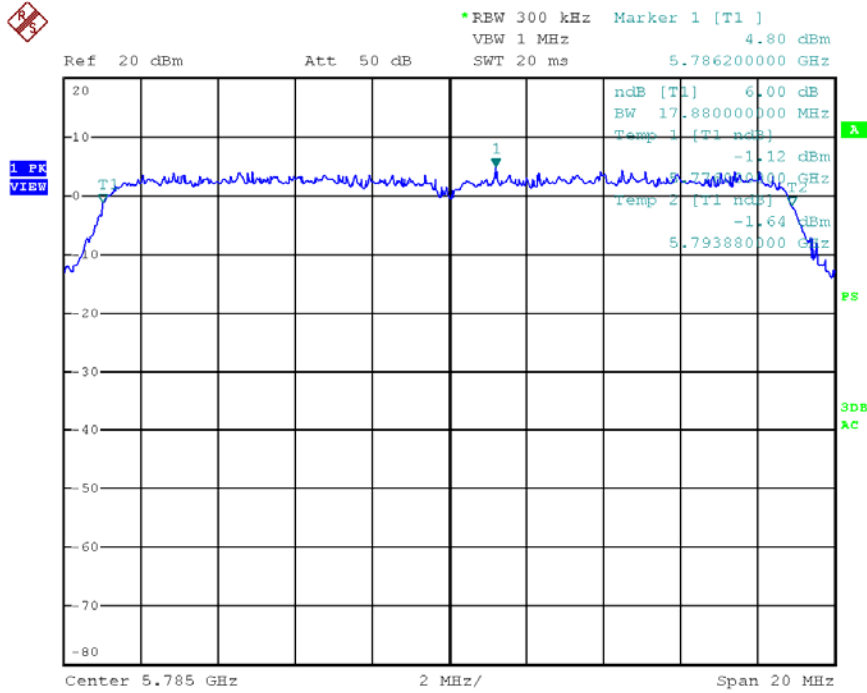
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11na, HT20, Channel L



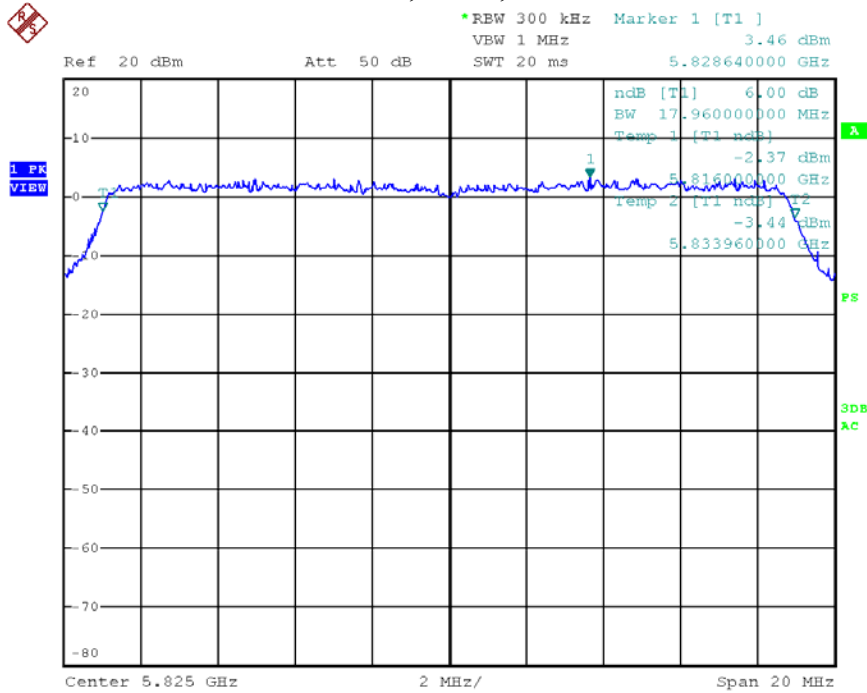
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11na, HT20, Channel M



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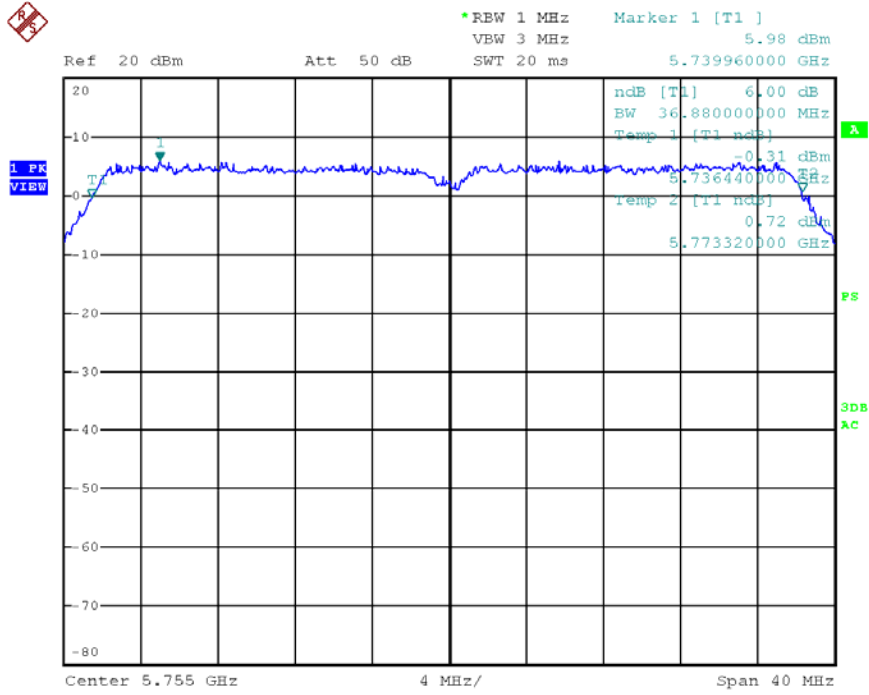
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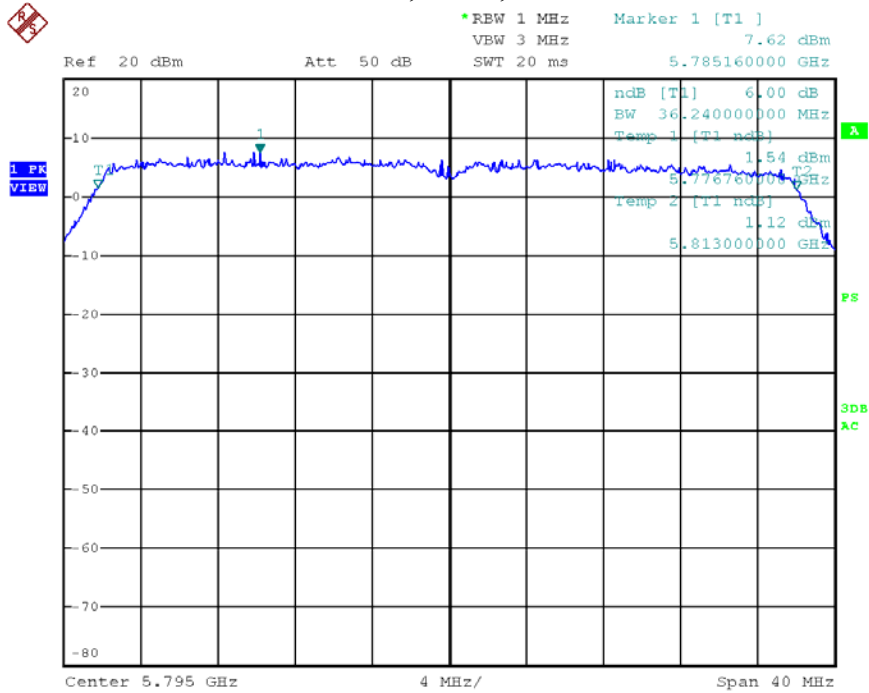


11na, HT40, Channel L



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11na, HT40, Channel H



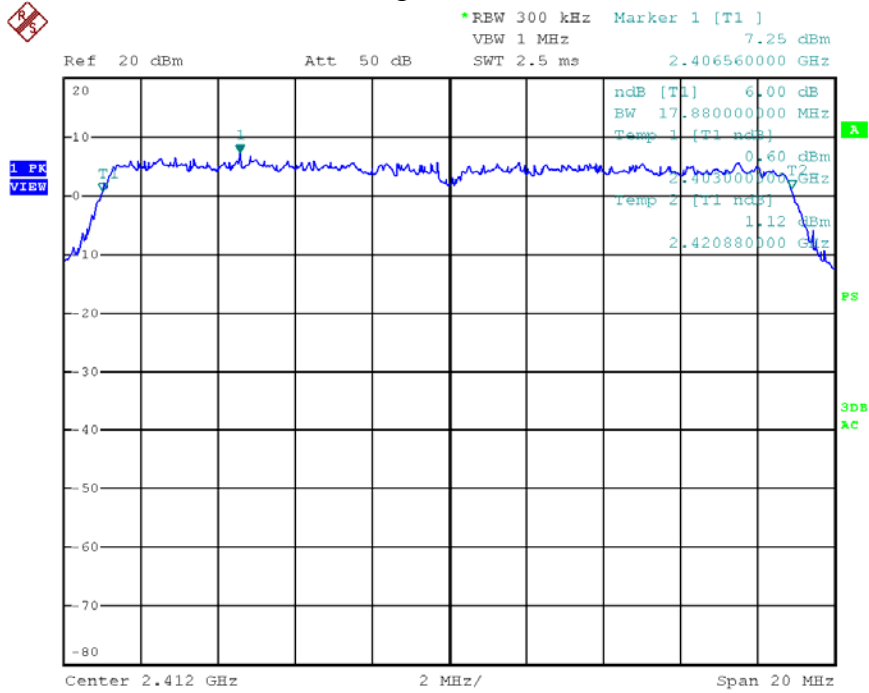
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Dual Chain

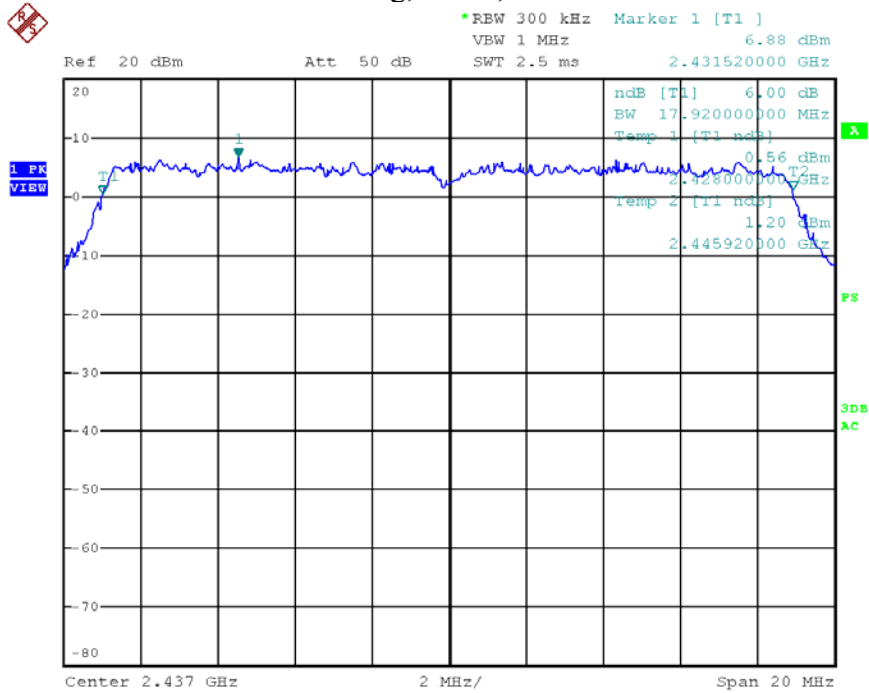
Mode	CH	Chain 0-1 (MHz)	Limit (MHz)
11ng, HT20	L	17.88	≥0.5
	M	17.92	
	H	17.96	
11ng, HT40	L	36.80	
	M	36.80	
	H	36.88	
11na, HT20	L	17.92	
	M	17.88	
	H	17.88	
11na, HT40	L	37.12	
	H	36.64	

11ng, HT20, Channel L



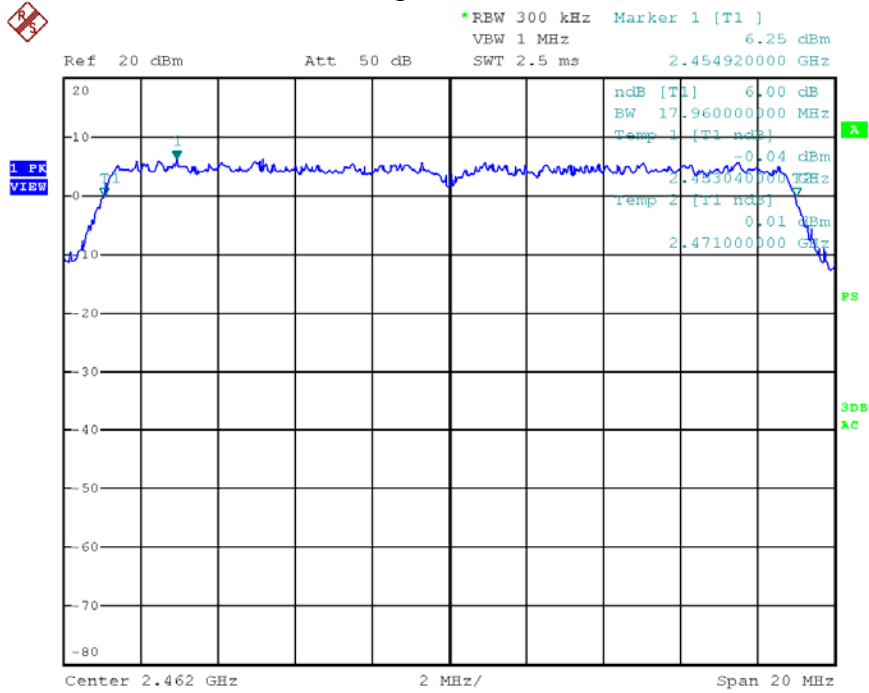
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11ng, HT20, Channel M



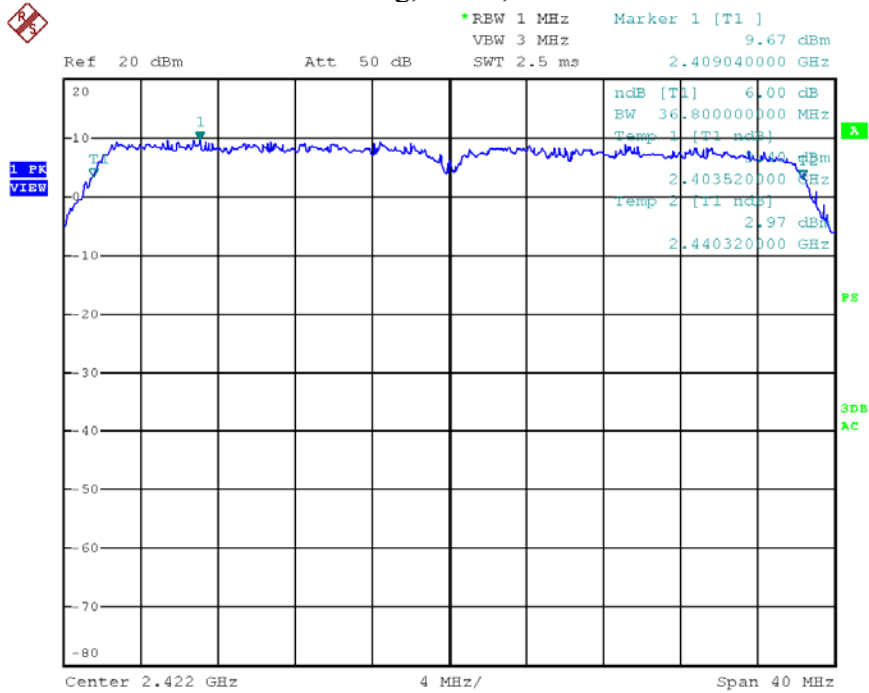
Date: 6.FEB.2012 15:55:13

11ng, HT20, Channel H



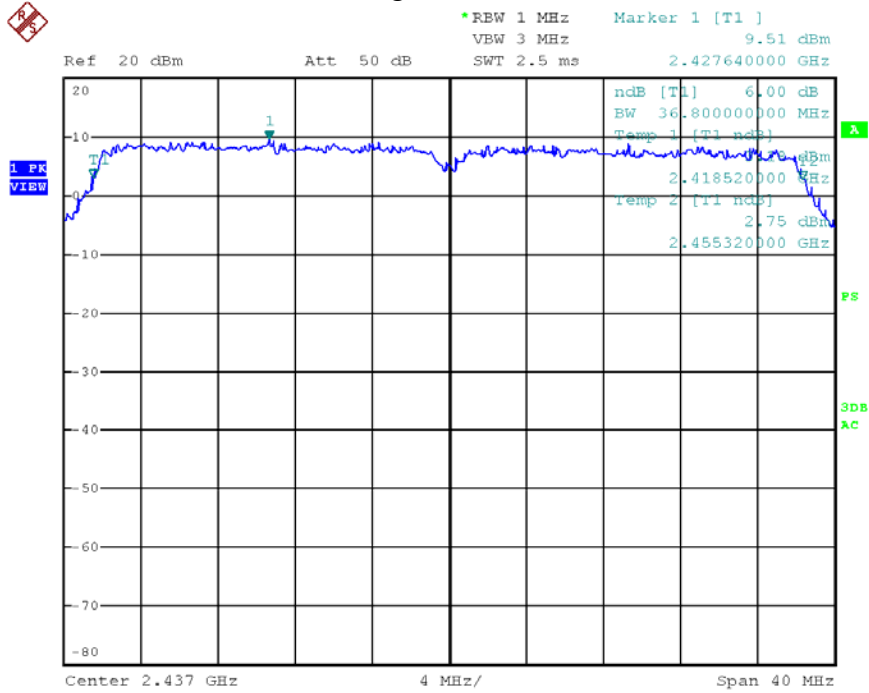
Date: 6.FEB.2012 15:54:41

11ng, HT40, Channel L



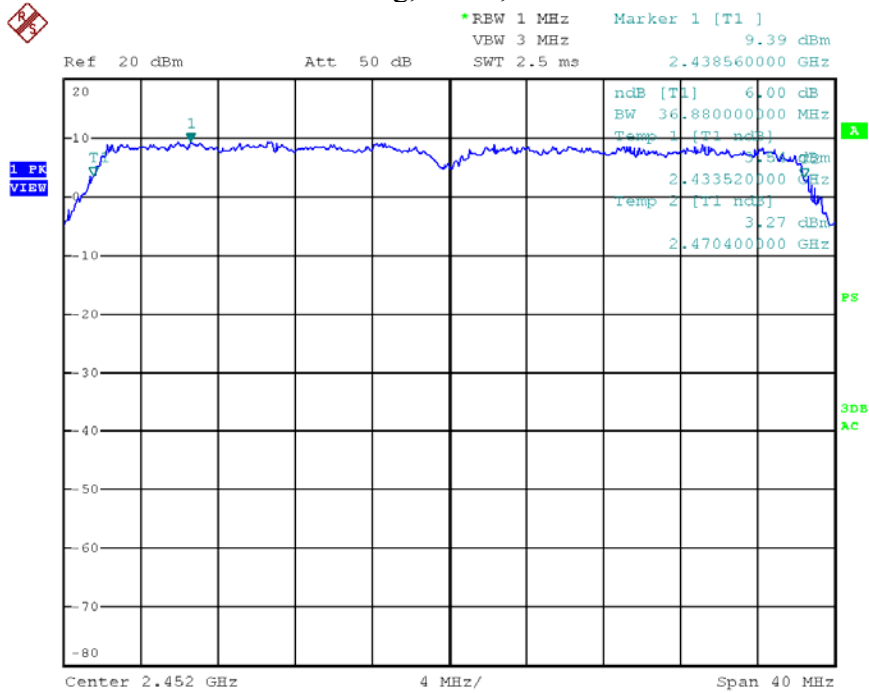
Date: 6.FEB.2012 16:02:51

**11ng, HT40, Channel M**



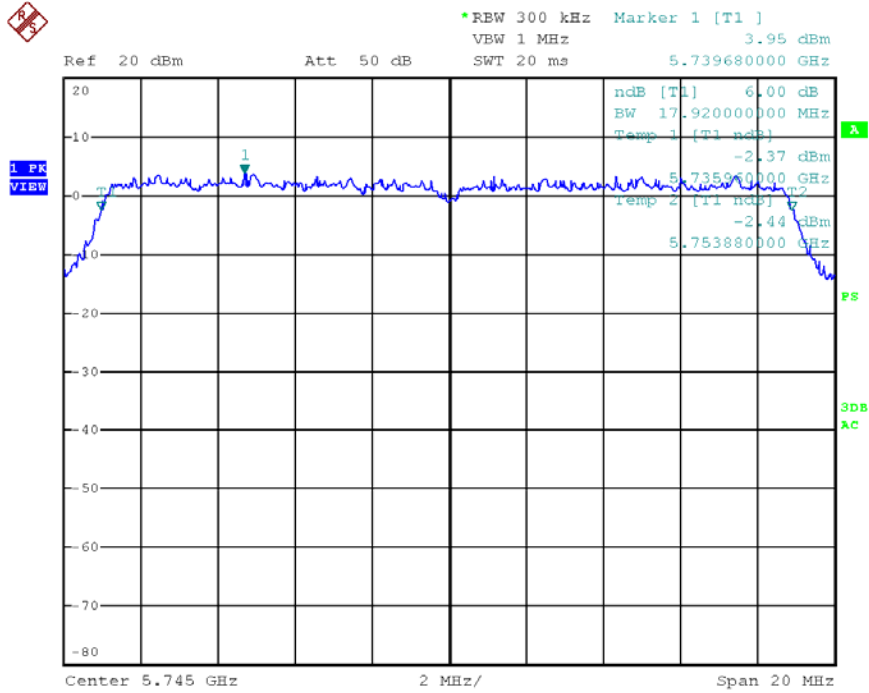
Date: 6.FEB.2012 16:02:18

**11ng, HT40, Channel H**



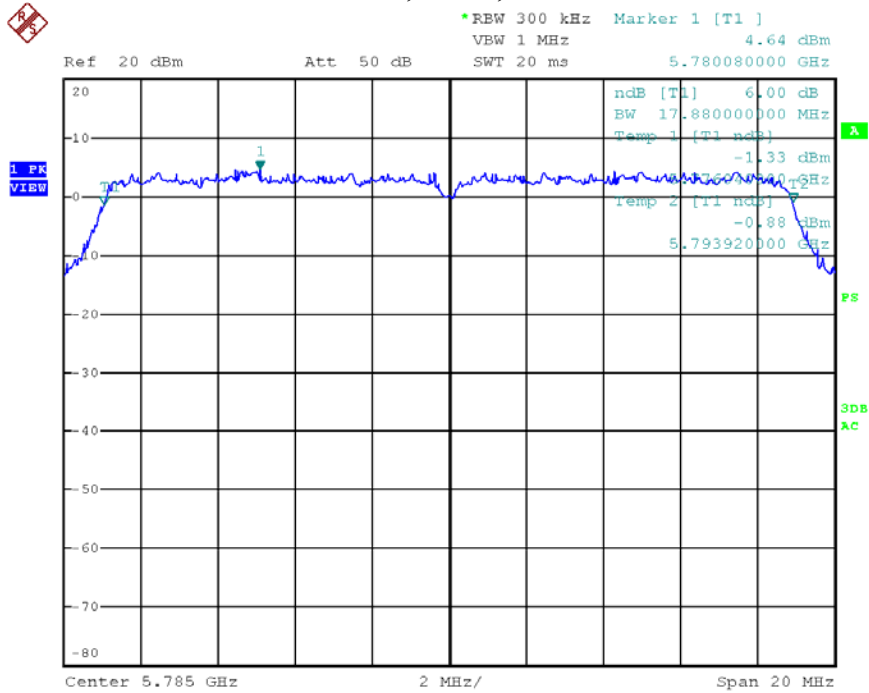
Date: 6.FEB.2012 16:01:47

11na, HT20, Channel L



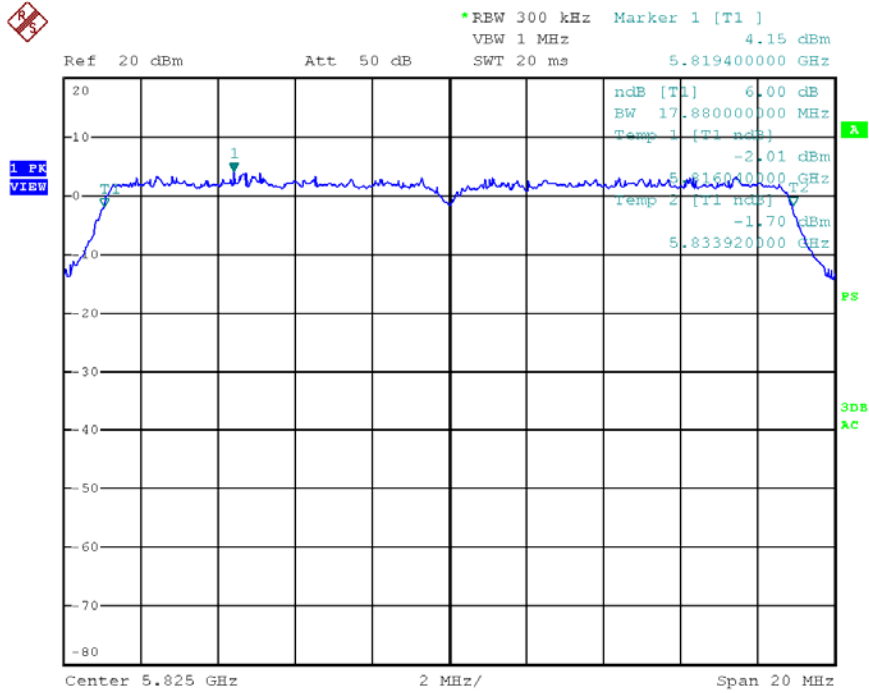
Date: 6.FEB.2012 16:12:39

11na, HT20, Channel M



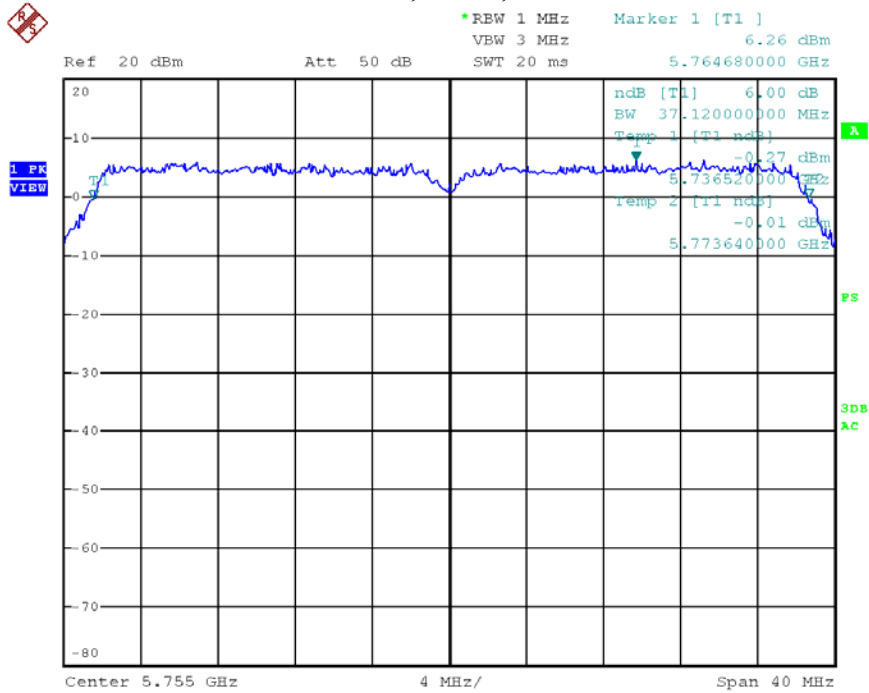
Date: 6.FEB.2012 16:13:13

11na, HT20, Channel H



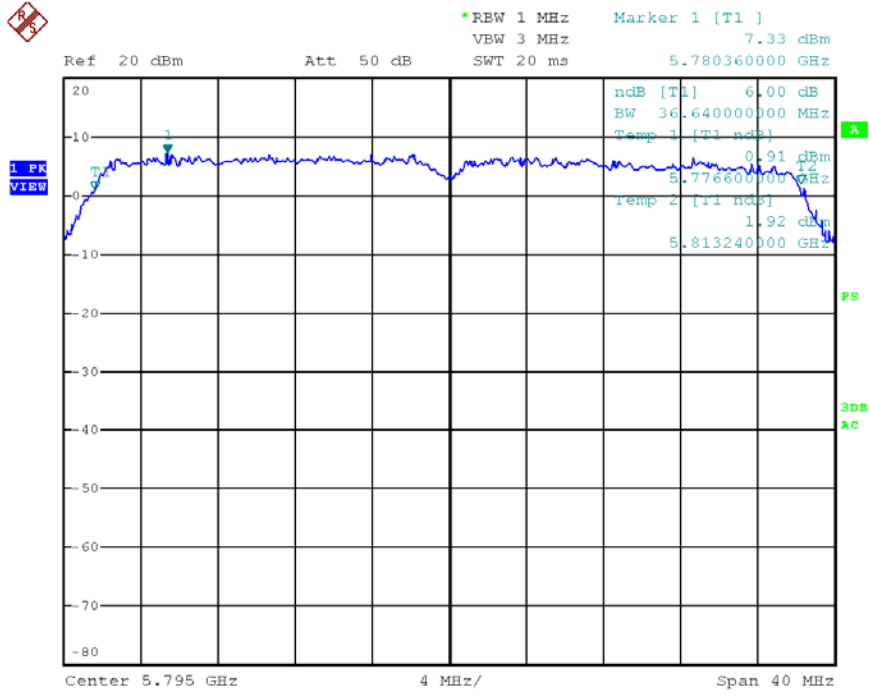
Date: 6.FEB.2012 16:13:39

11na, HT40, Channel L



Date: 6.FEB.2012 16:18:28

11na, HT40, Channel H



Date: 6.FEB.2012 16:19:04



#### 4. Maximum peak output power

Test result: Pass

##### 4.1 Test limit

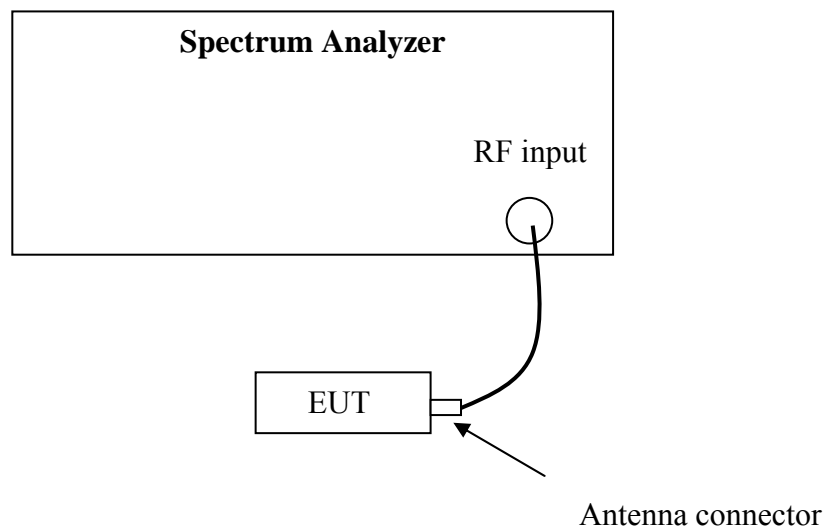
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts

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

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

##### 4.2 Test Configuration



##### 4.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v01" for compliance to FCC 47CFR 15.247 requirements (Measurement Procedure PK2).

#### 4.4 Test protocol

Temperature: 22 °C

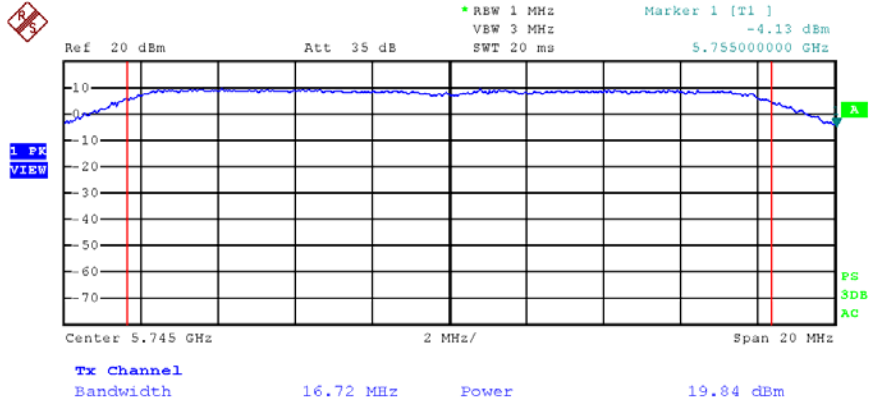
Relative Humidity: 43 %

If antennas Ap-ANT-80D with gain of 8dBi & Ap-ANT-86 with gain of 9dBi are applied, the limit should be 30dBm – (9dBi – 6dBi) = 27dBm.

#### Single Chain

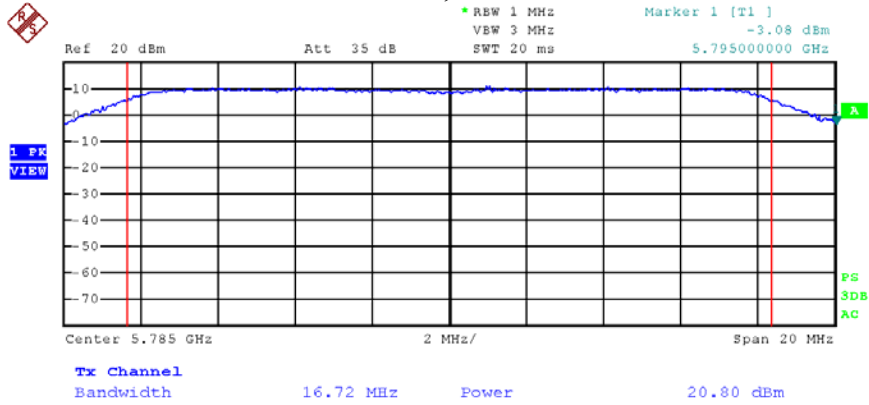
Mode	CH	Chain 0-1 (dBm)	Limit (dBm)
11a	L	19.84	≤27
	M	20.80	
	H	19.85	
11b	L	19.00	
	M	19.36	
	H	19.34	
11g	L	22.08	
	M	22.06	
	H	21.96	
11ng, HT20	L	21.87	
	M	22.10	
	H	22.00	
11ng, HT40	L	22.29	
	M	22.29	
	H	22.30	
11na, HT20	L	19.99	
	M	20.69	
	H	19.73	
11na, HT40	L	19.18	
	H	19.94	

**11a, Channel L**



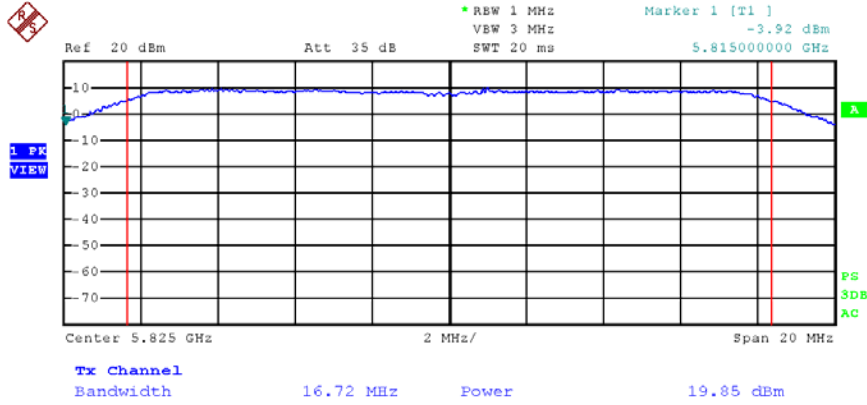
Date: 7.FEB.2012 09:50:49

**11a, Channel M**



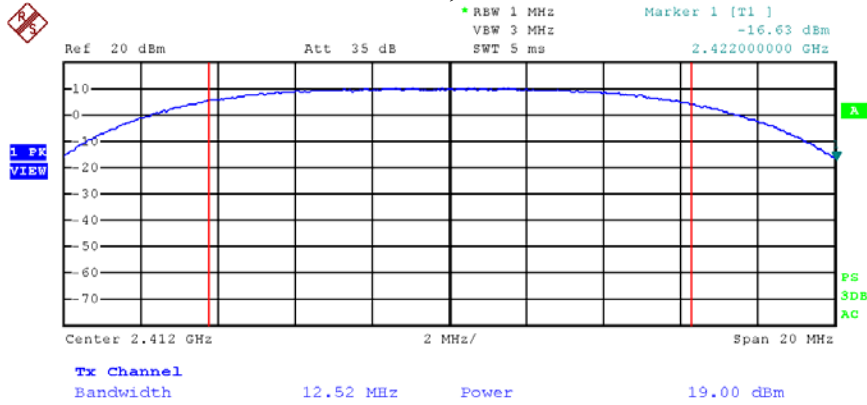
Date: 7.FEB.2012 09:50:17

### 11a, Channel H



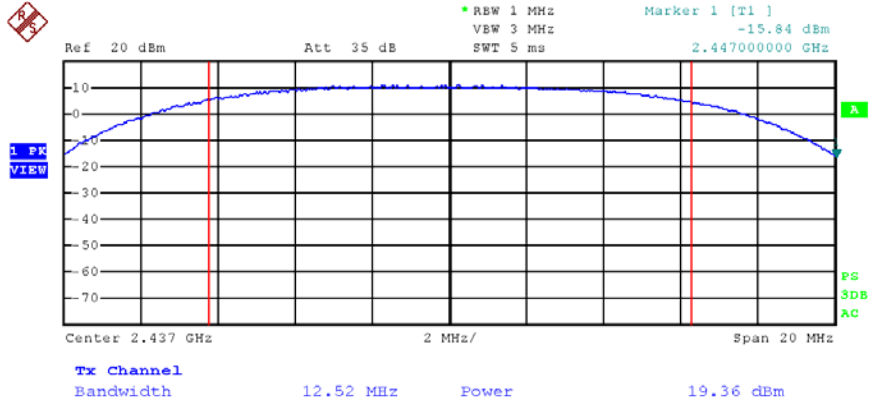
Date: 7.FEB.2012 09:49:36

### 11b, Channel L



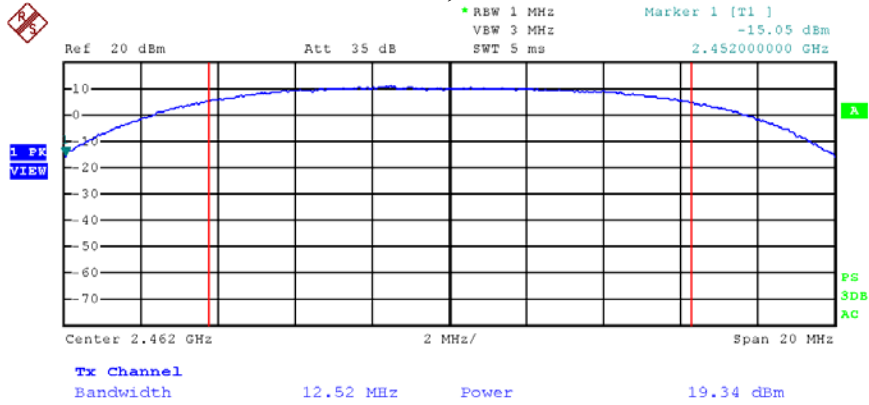
Date: 7.FEB.2012 10:40:25

11b, Channel M



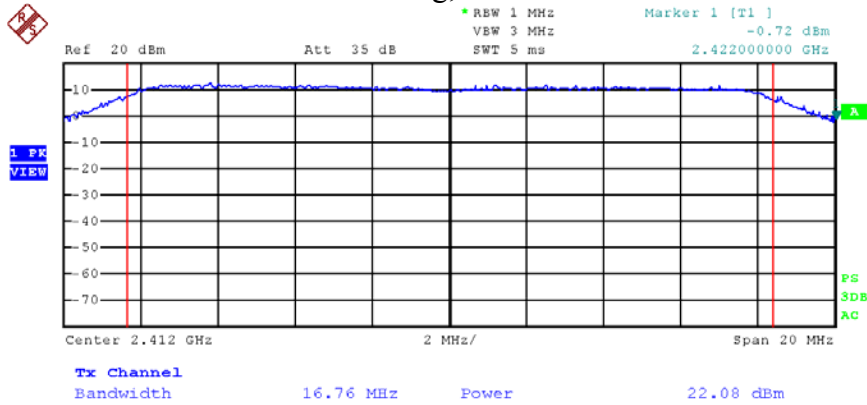
Date: 7.FEB.2012 10:41:12

11b, Channel H



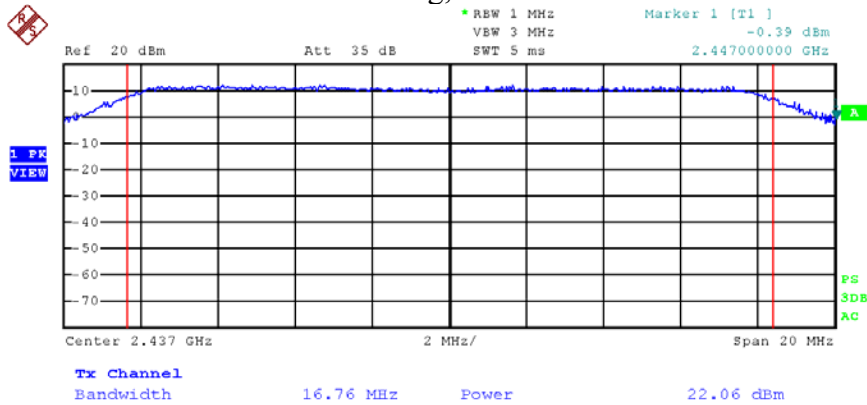
Date: 7.FEB.2012 10:41:38

### 11g, Channel L



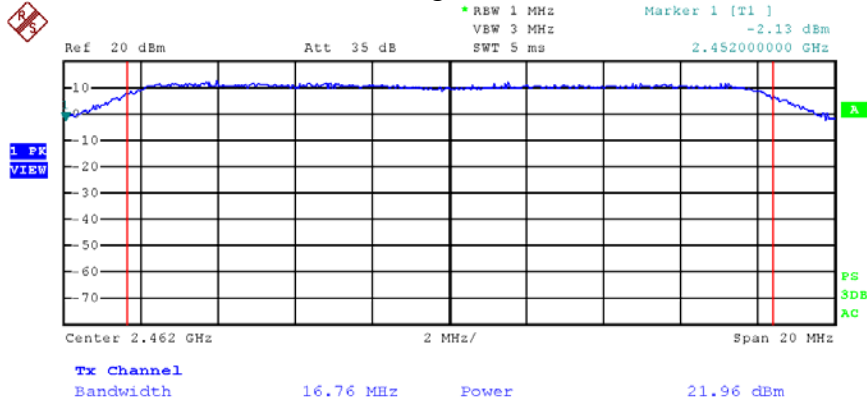
Date: 7.FEB.2012 10:45:10

### 11g, Channel M



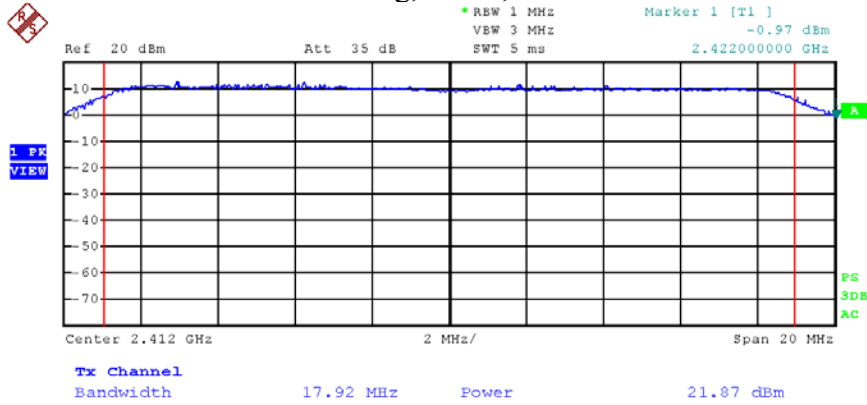
Date: 7.FEB.2012 10:44:09

**11g, Channel H**



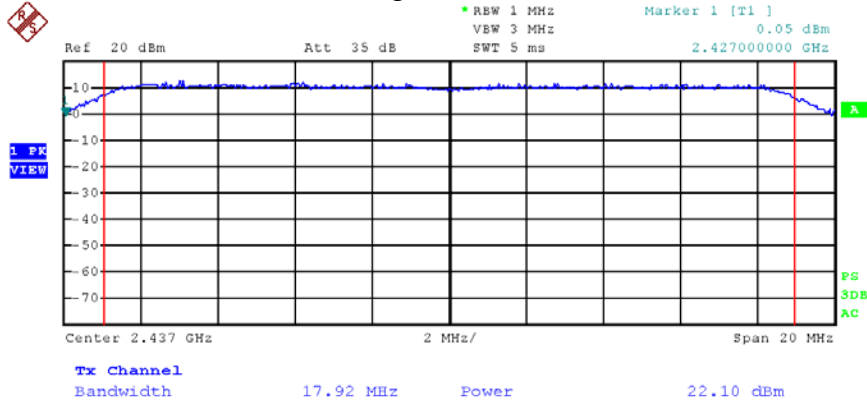
Date: 7.FEB.2012 10:43:10

**11ng, HT20, Channel L**



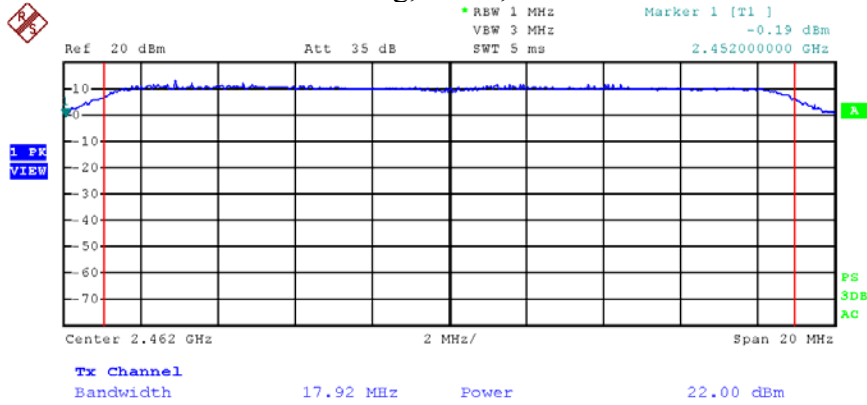
Date: 7.FEB.2012 10:47:37

11ng, HT20, Channel M



Date: 7.FEB.2012 10:48:20

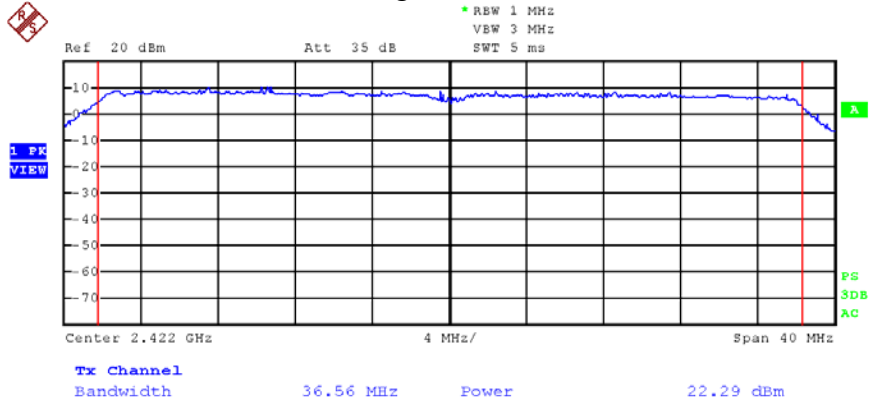
11ng, HT20, Channel H



Date: 7.FEB.2012 10:50:02

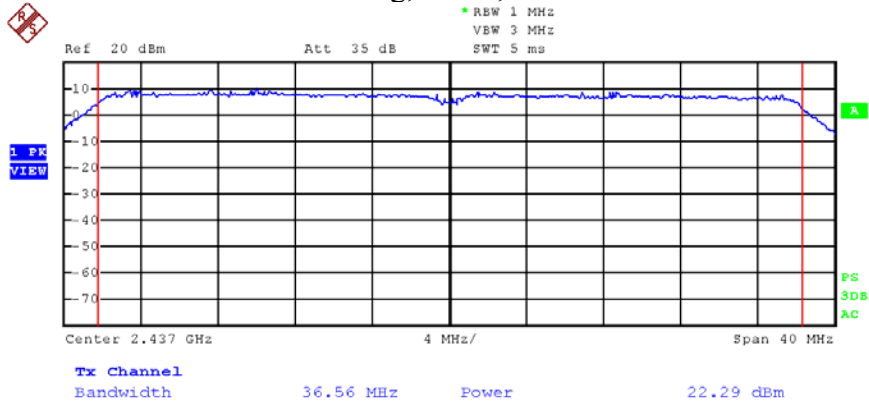


**11ng, HT40, Channel L**



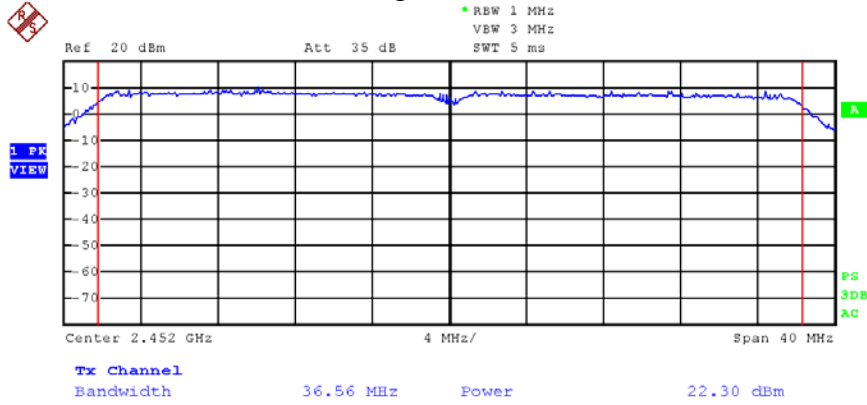
Date: 7.FEB.2012 11:17:38

**11ng, HT40, Channel M**



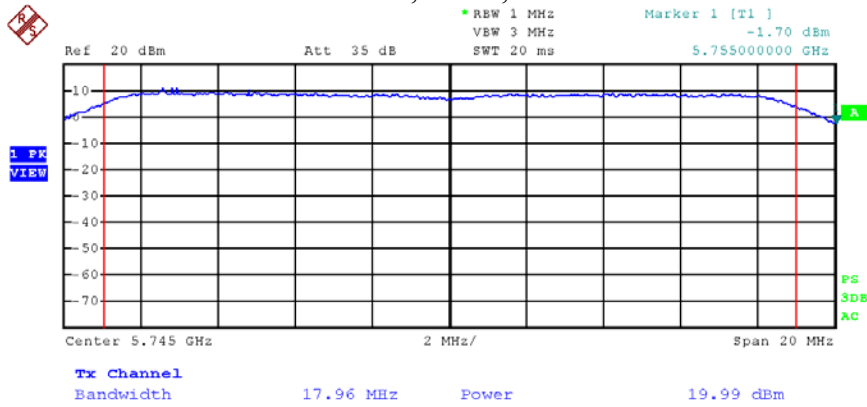
Date: 7.FEB.2012 11:17:07

**11ng, HT40, Channel H**



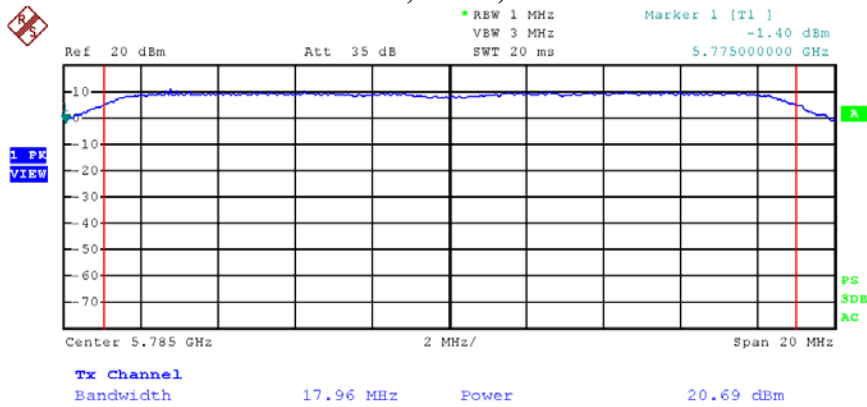
Date: 7.FEB.2012 11:15:45

**11na, HT20, Channel L**



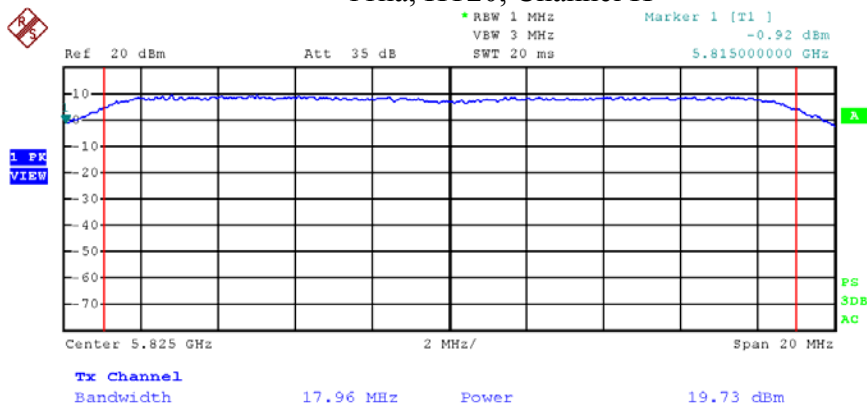
Date: 7.FEB.2012 09:53:47

11na, HT20, Channel M



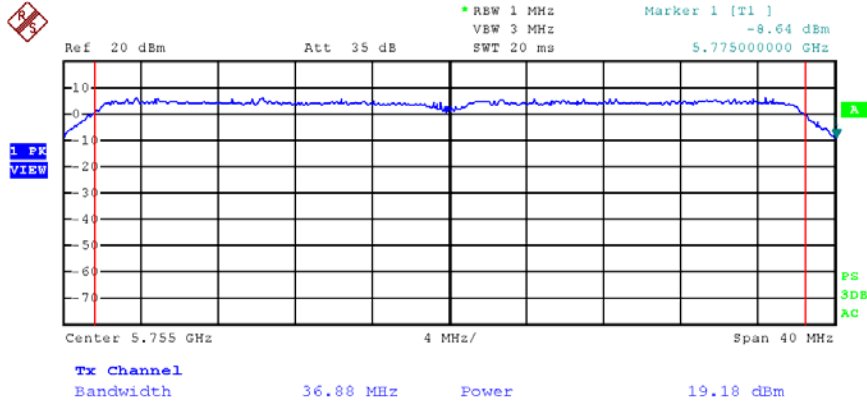
Date: 7.FEB.2012 10:16:48

11na, HT20, Channel H



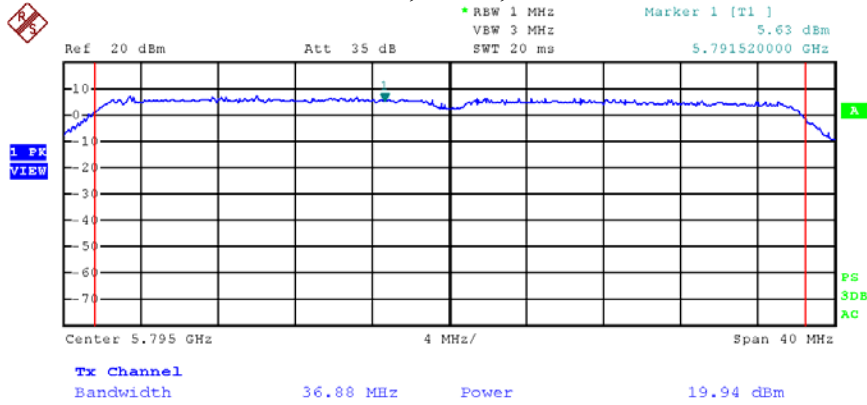
Date: 7.FEB.2012 10:17:35

**11na, HT40, Channel L**



Date: 7.FEB.2012 10:35:04

**11na, HT40, Channel H**



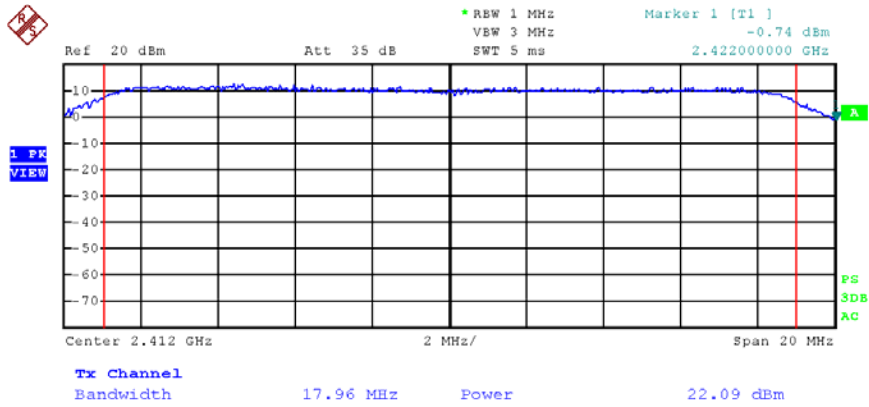
Date: 7.FEB.2012 10:34:23



**Dual Chain**

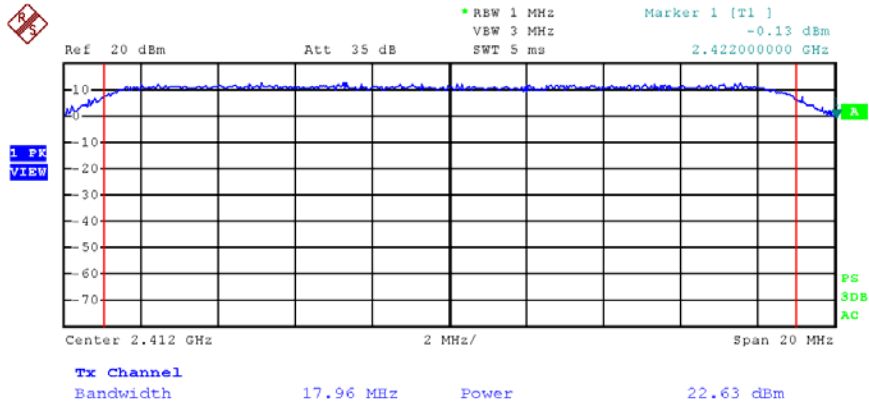
Mode	CH	Chain 0-1 (dBm)	Chain 0-2 (dBm)	Total Power (dBm)	Limit (dBm)
11ng, HT20	L	22.09	22.63	25.38	$\leq 27$
	M	22.41	22.52	25.48	
	H	22.42	22.31	25.38	
11ng, HT40	L	22.44	23.28	25.89	
	M	22.59	22.83	25.72	
	H	22.54	22.46	25.51	
11na, HT20	L	19.75	22.02	24.04	
	M	20.56	21.04	23.82	
	H	19.75	20.92	23.38	
11na, HT40	L	19.38	21.40	23.52	
	H	20.06	20.98	23.55	

11ng, HT20, Channel L  
Chain 0-1



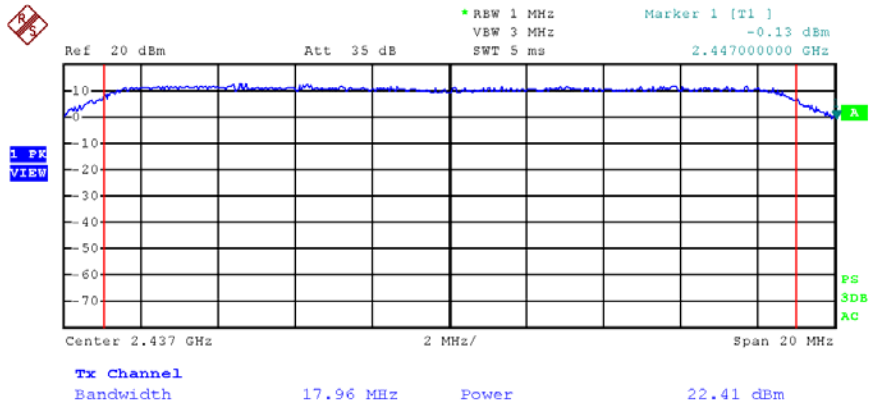
Date: 7.FEB.2012 11:03:58

Chain 0-2



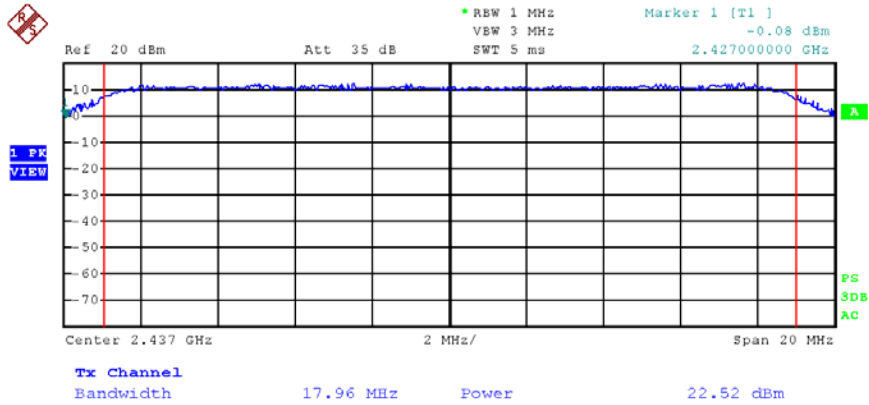
Date: 7.FEB.2012 11:04:50

11ng, HT20, Channel M  
Chain 0-1



Date: 7.FEB.2012 11:03:26

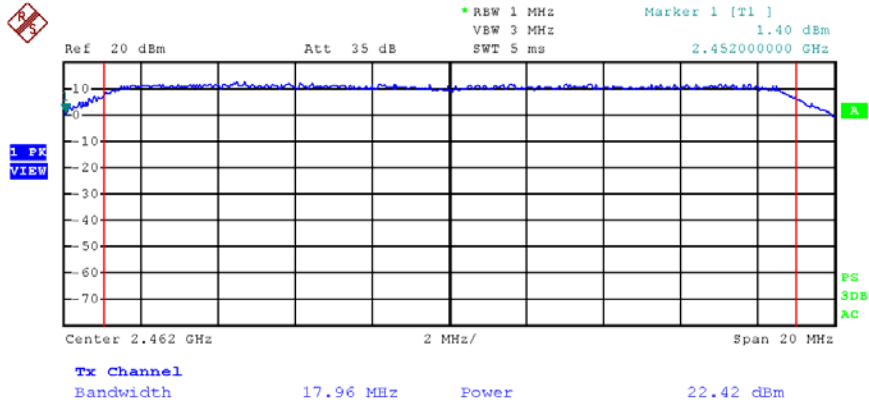
Chain 0-2



Date: 7.FEB.2012 11:05:26

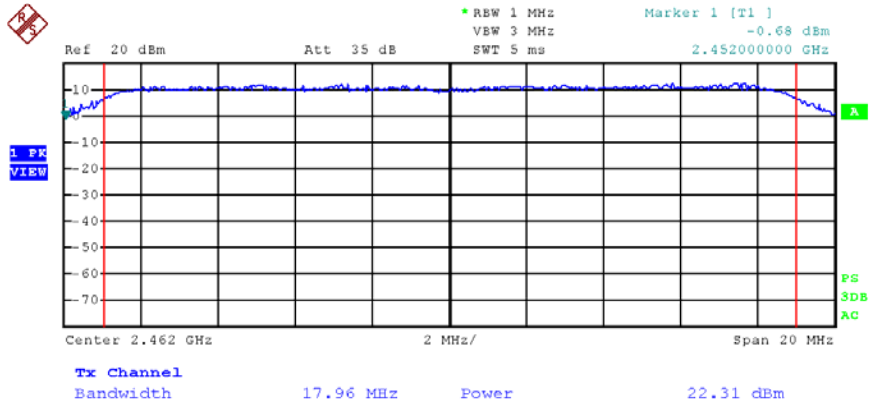


11ng, HT20, Channel H  
Chain 0-1



Date: 7.FEB.2012 11:02:43

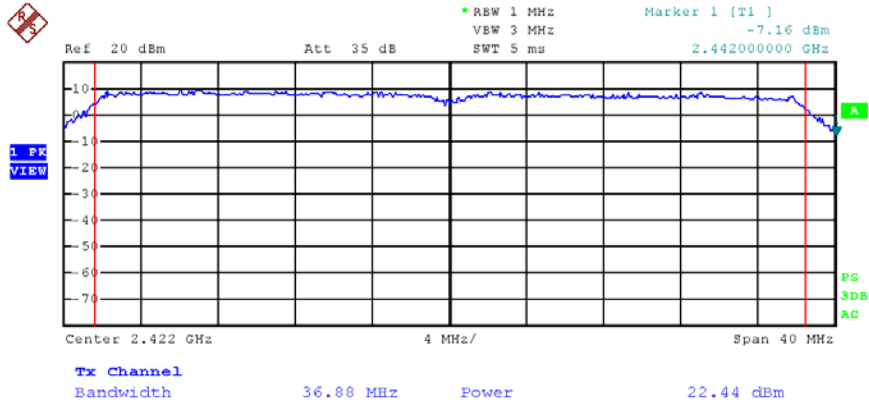
Chain 0-2



Date: 7.FEB.2012 11:06:02

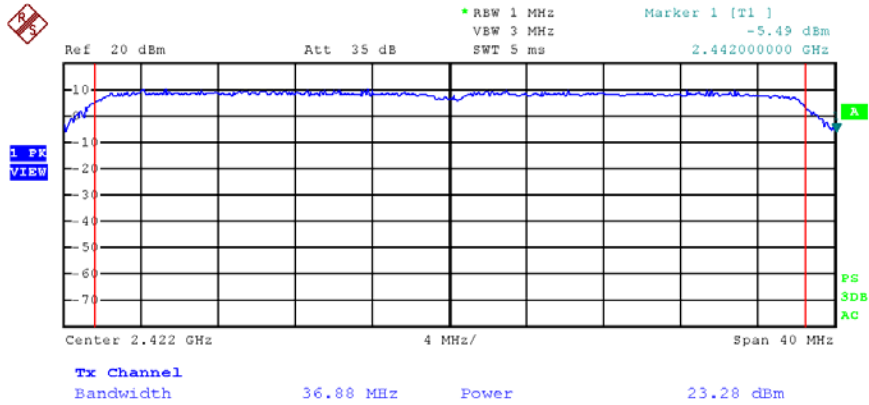


11ng, HT40, Channel L  
Chain 0-1



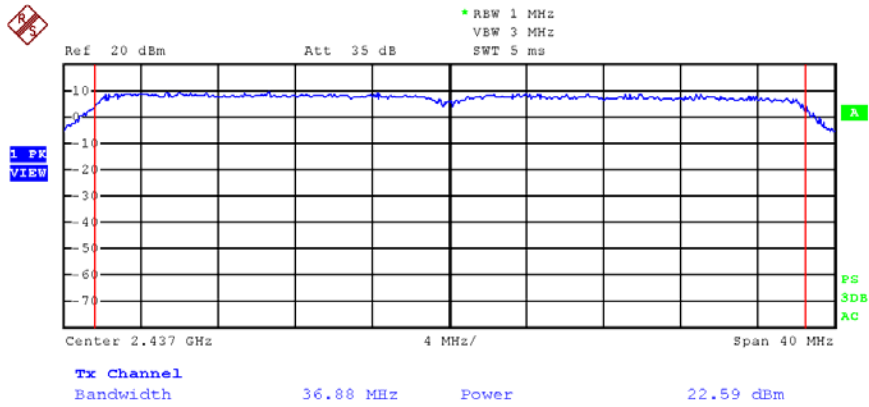
Date: 7.FEB.2012 11:12:52

Chain 0-2



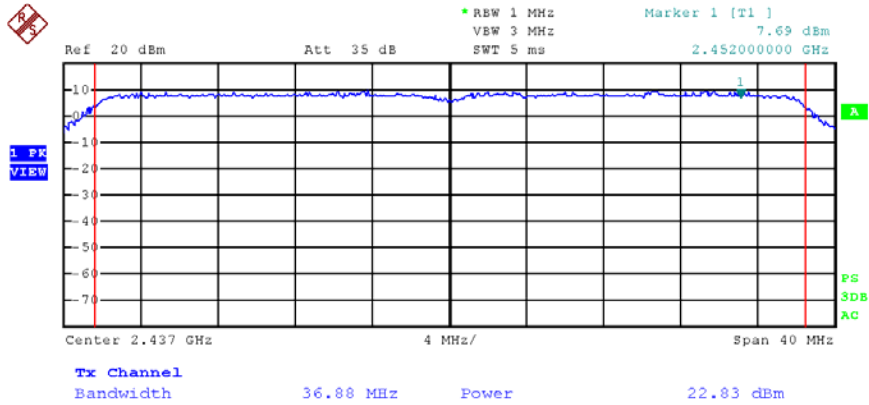
Date: 7.FEB.2012 11:11:49

11ng, HT40, Channel M  
Chain 0-1



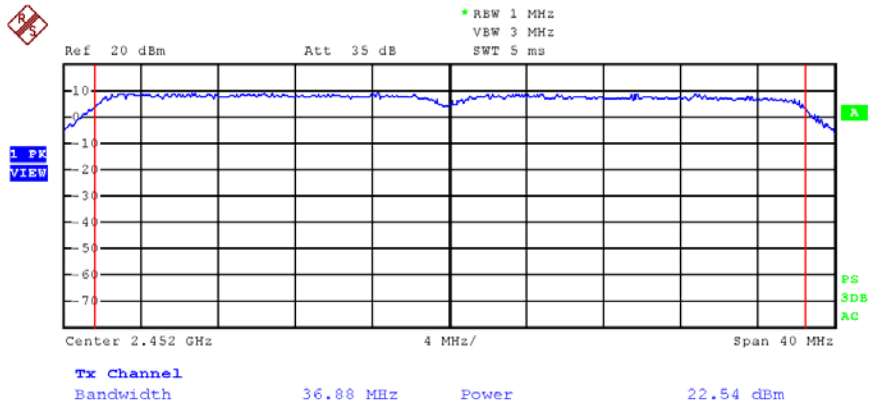
Date: 7.FEB.2012 11:13:31

Chain 0-2



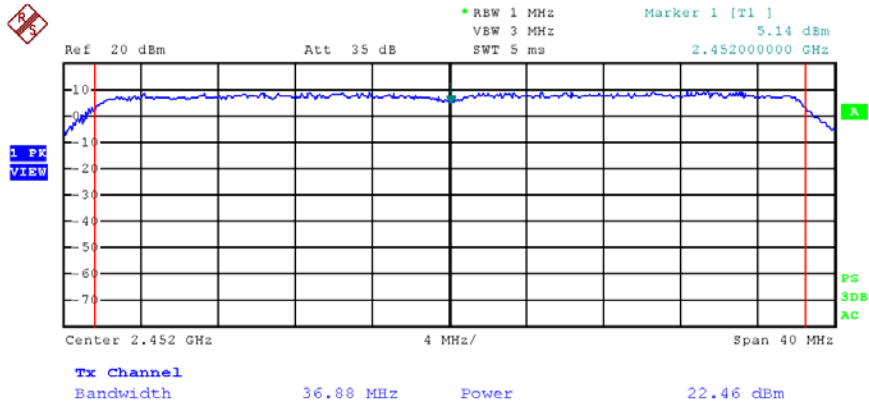
Date: 7.FEB.2012 11:11:03

11ng, HT40, Channel H  
Chain 0-1



Date: 7.FEB.2012 11:14:03

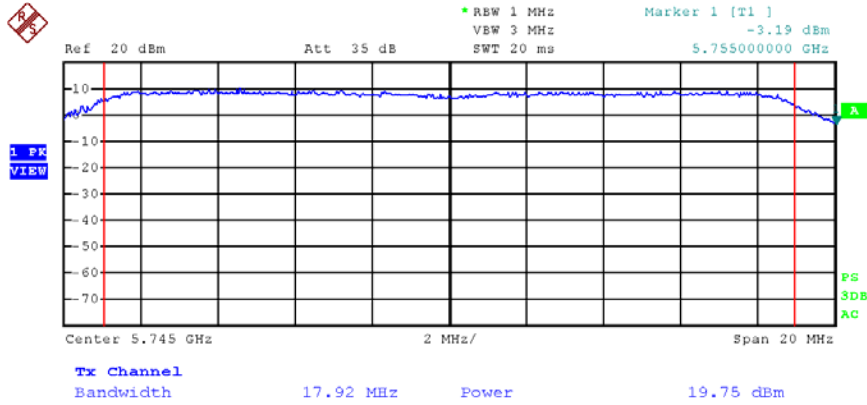
Chain 0-2



Date: 7.FEB.2012 11:10:23

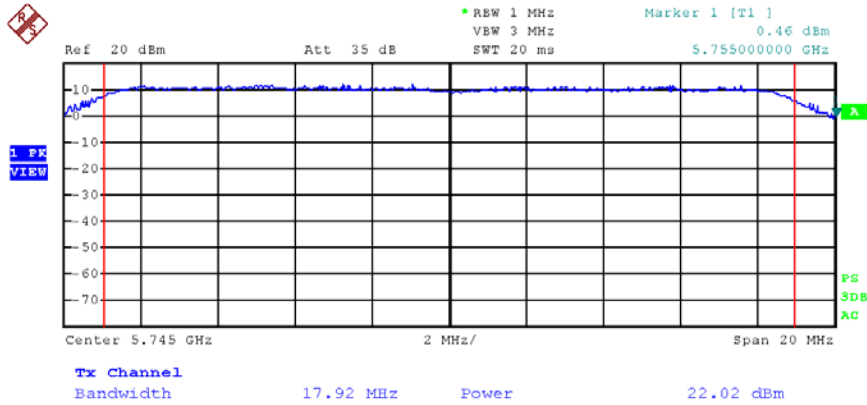


### 11na, HT20, Channel L Chain 0-1



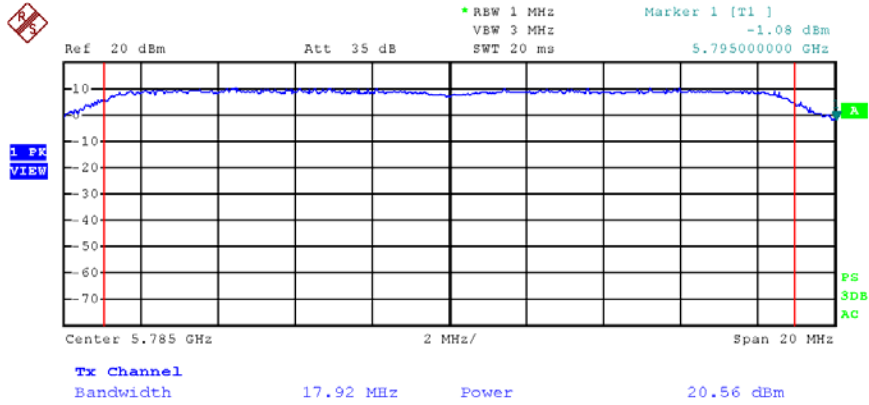
Date: 7.FEB.2012 10:20:59

### Chain 0-2



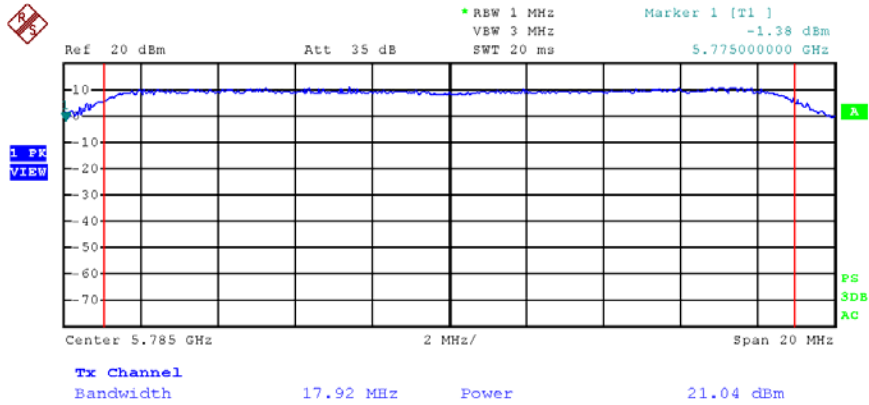
Date: 7.FEB.2012 10:22:02

11na, HT20, Channel M  
Chain 0-1



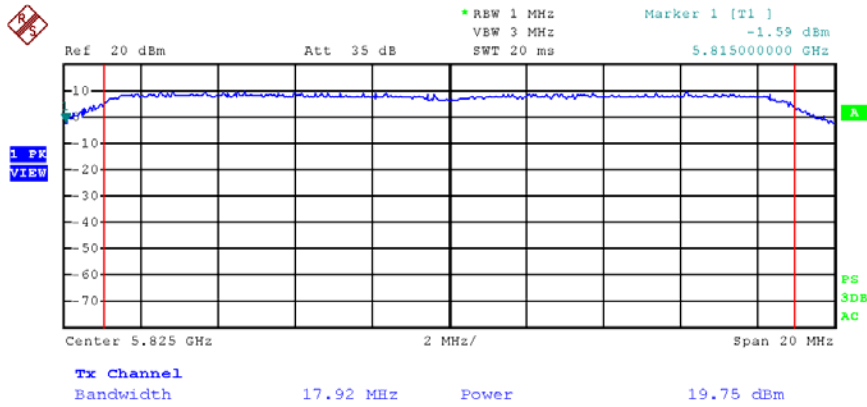
Date: 7.FEB.2012 10:20:30

Chain 0-2



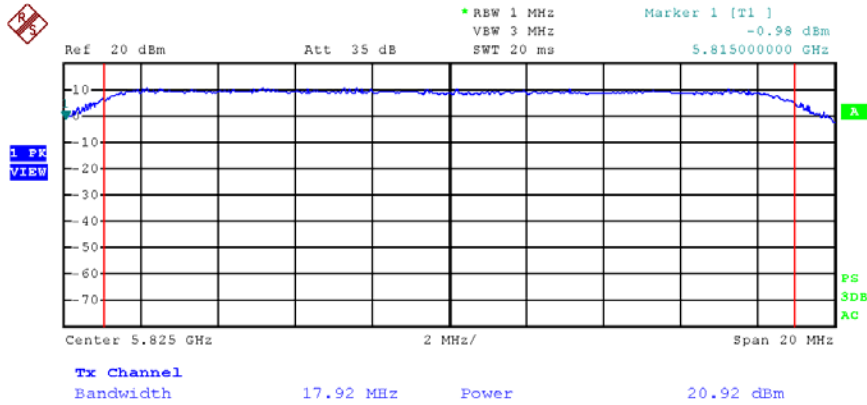
Date: 7.FEB.2012 10:22:40

11na, HT20, Channel H  
Chain 0-1



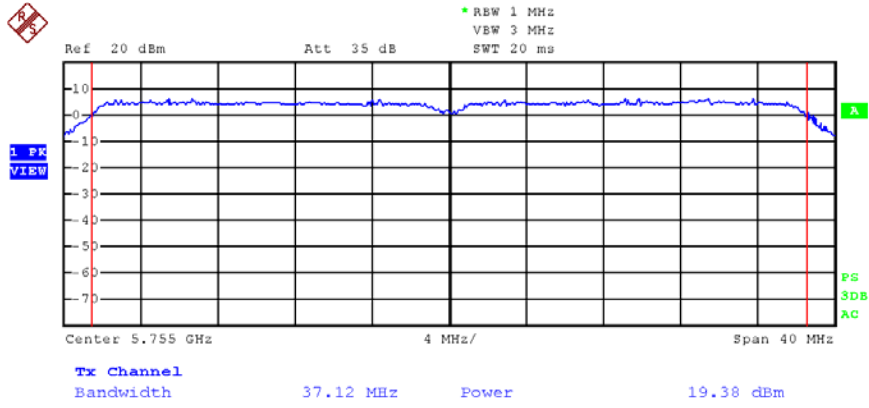
Date: 7.FEB.2012 10:20:01

Chain 0-2



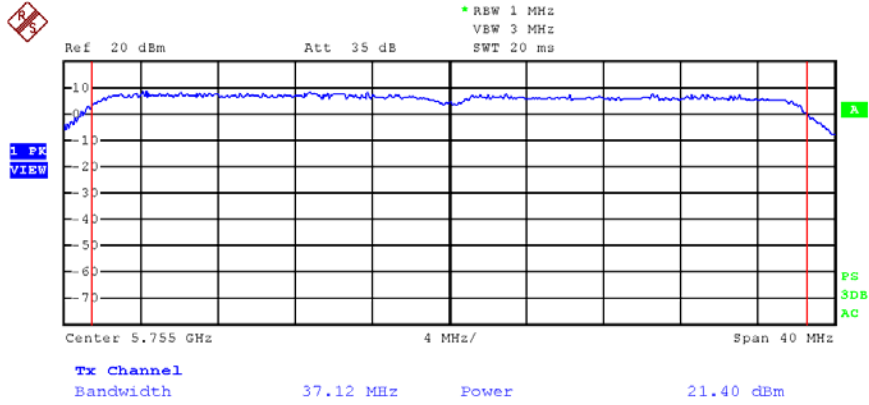
Date: 7.FEB.2012 10:23:19

11na, HT40, Channel L  
Chain 0-1



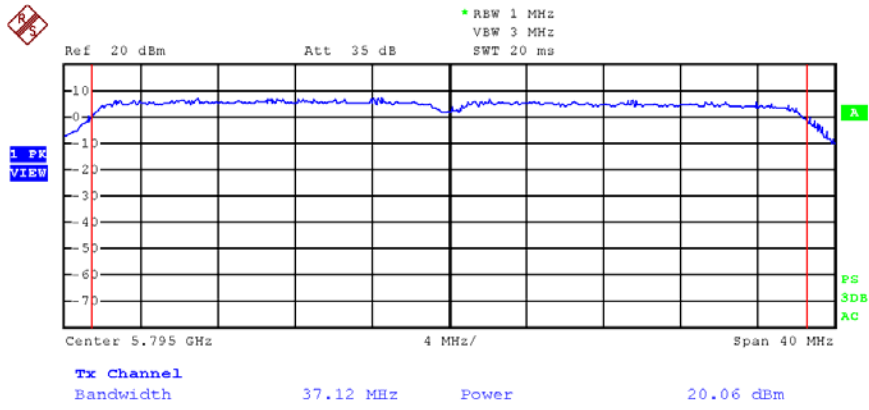
Date: 7.FEB.2012 10:30:57

Chain 0-2



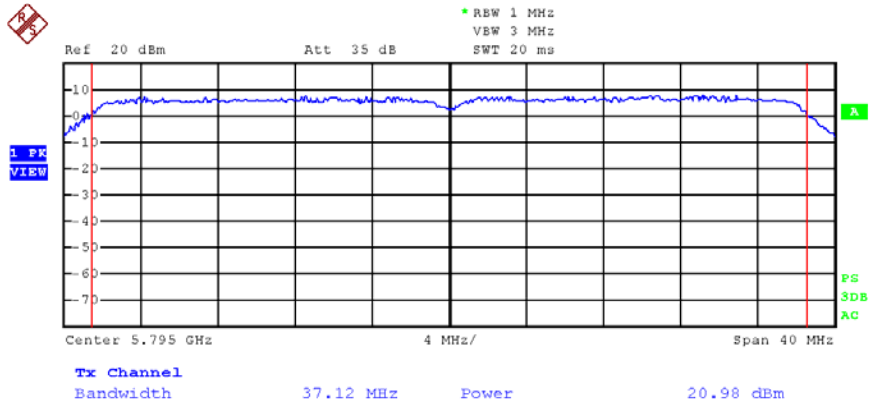
Date: 7.FEB.2012 10:29:54

### 11na, HT40, Channel H Chain 0-1



Date: 7.FEB.2012 10:31:35

### Chain 0-2



Date: 7.FEB.2012 10:29:08

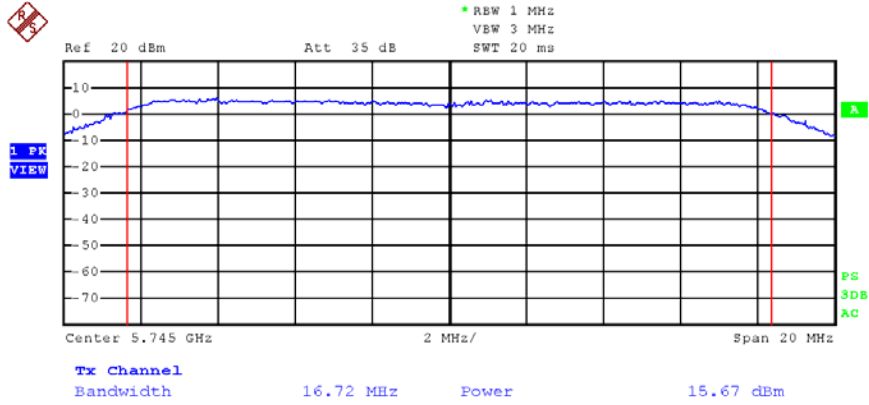


If antennas Ap-ANT-5614 with gain of 14dBi & Ap-ANT-85 with gain of 15dBi are applied, the limit should be 30dBm – (15dBi – 6dBi) = 21dBm

**Single Chain**

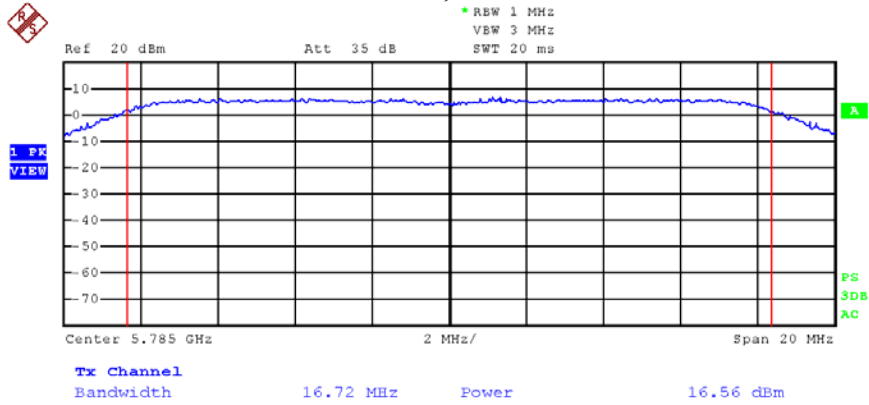
Mode	CH	Chain 0-1 (dBm)	Limit (dBm)
11a	L	15.67	≤21
	M	16.56	
	H	16.24	
11b	L	13.84	
	M	14.35	
	H	14.05	
11g	L	16.90	
	M	16.88	
	H	16.86	
11ng, HT20	L	16.87	
	M	17.02	
	H	16.64	
11ng, HT40	L	17.44	
	M	17.87	
	H	17.92	
11na, HT20	L	15.45	
	M	16.72	
	H	16.01	
11na, HT40	L	15.80	
	H	16.42	

11a, Channel L



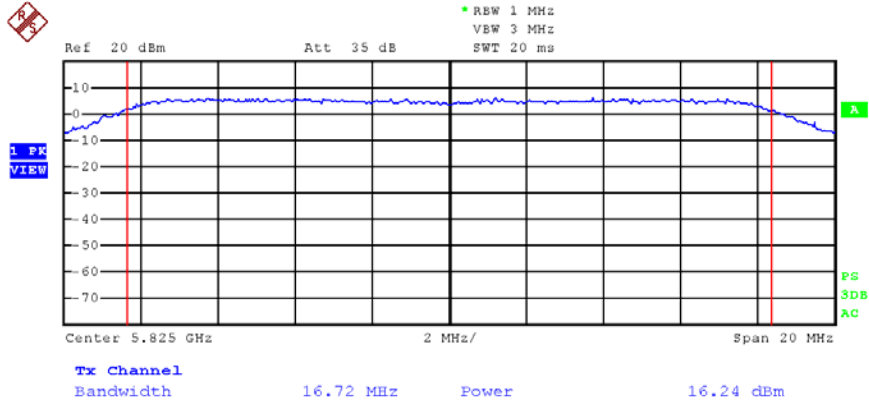
Date: 14.FEB.2012 14:27:09

11a, Channel M



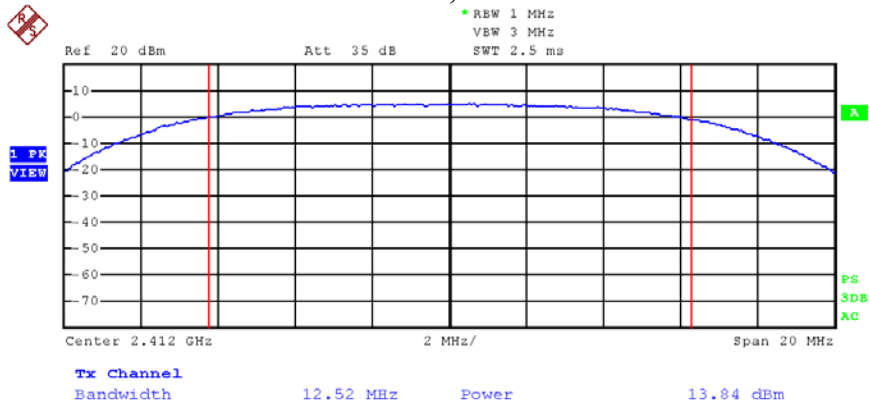
Date: 14.FEB.2012 14:27:46

### 11a, Channel H



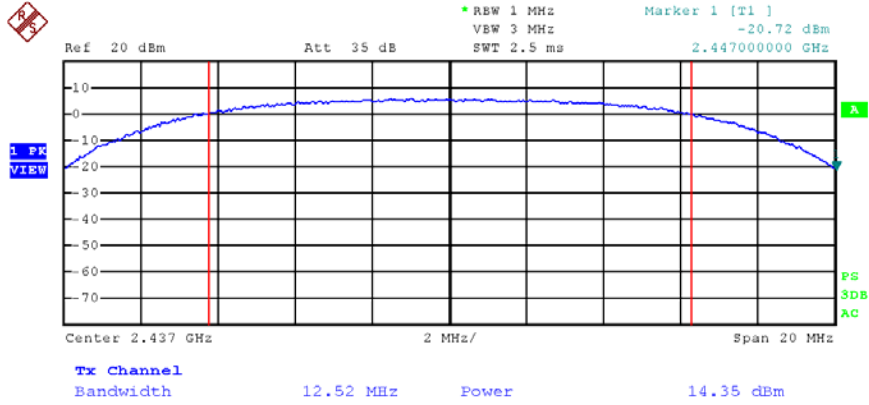
Date: 14.FEB.2012 14:28:16

### 11b, Channel L



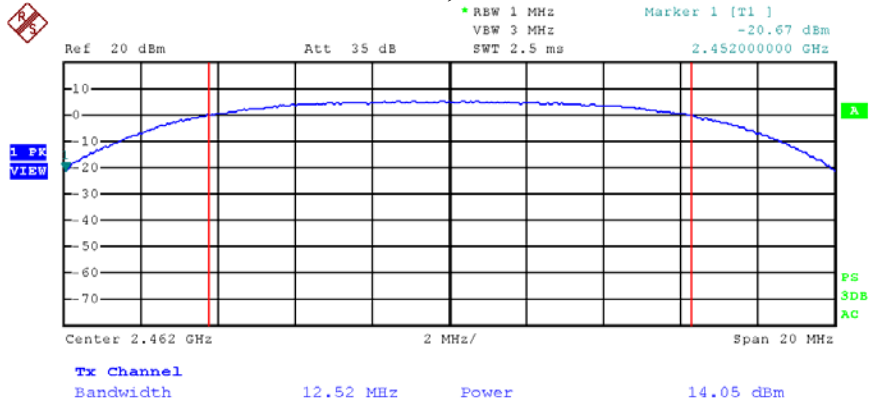
Date: 14.FEB.2012 15:25:00

11b, Channel M



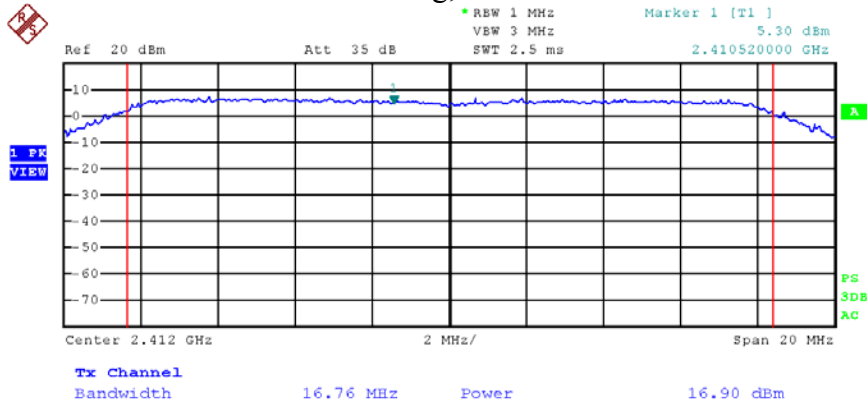
Date: 14.FEB.2012 15:24:38

11b, Channel H



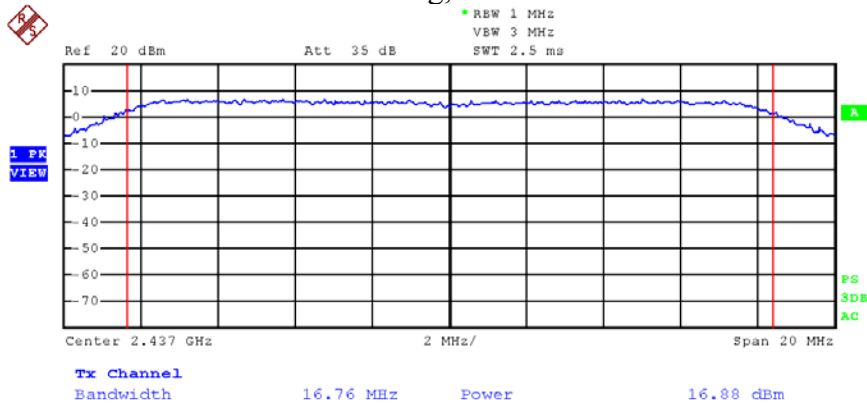
Date: 14.FEB.2012 15:23:52

### 11g, Channel L



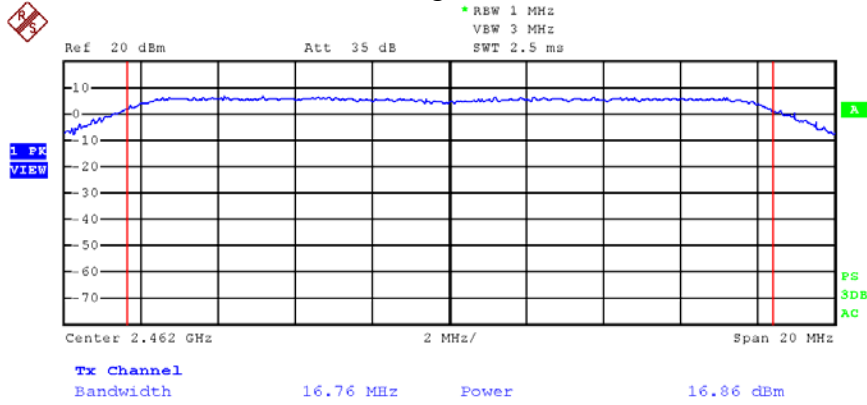
Date: 14.FEB.2012 15:26:06

### 11g, Channel M



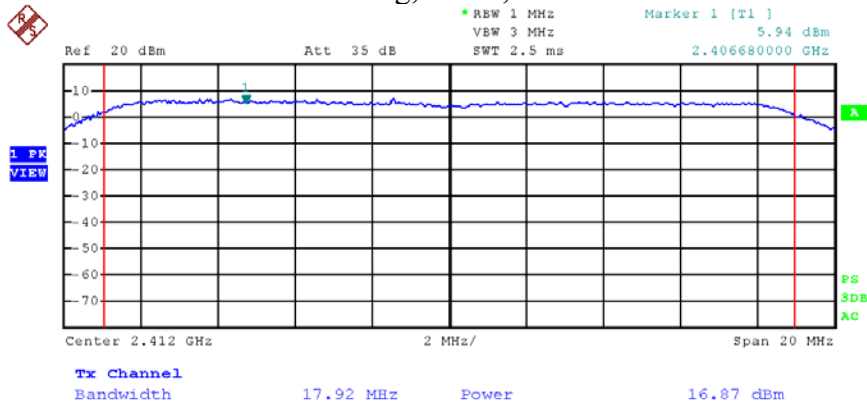
Date: 14.FEB.2012 15:26:30

11g, Channel H



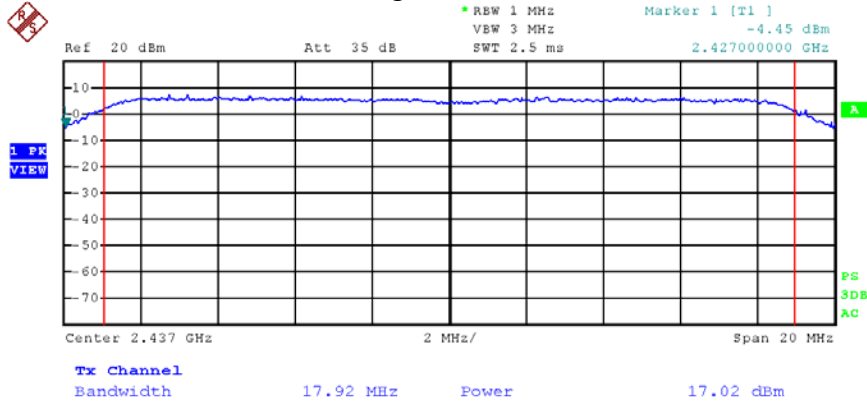
Date: 14.FEB.2012 15:26:53

11ng, HT20, Channel L



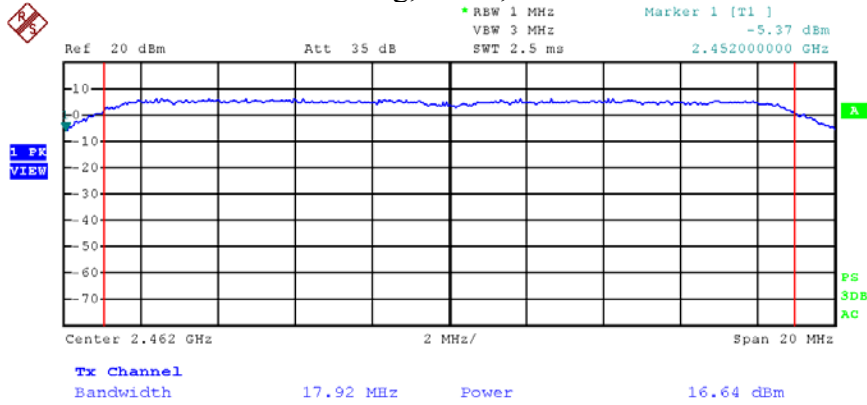
Date: 14.FEB.2012 15:20:05

11ng, HT20, Channel M



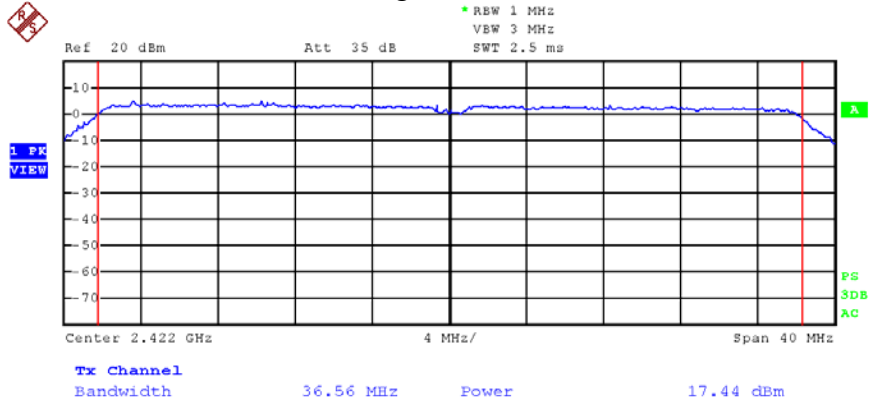
Date: 14.FEB.2012 15:20:29

11ng, HT20, Channel H



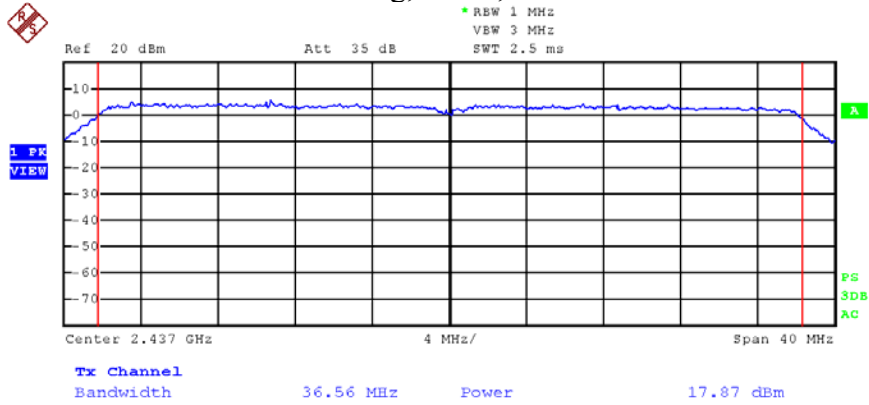
Date: 14.FEB.2012 15:20:53

11ng, HT40, Channel L



Date: 14.FEB.2012 15:30:54

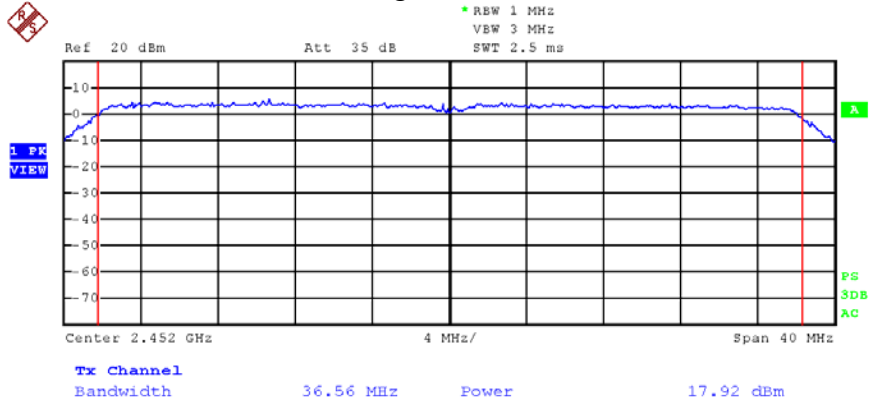
11ng, HT40, Channel M



Date: 14.FEB.2012 15:30:35

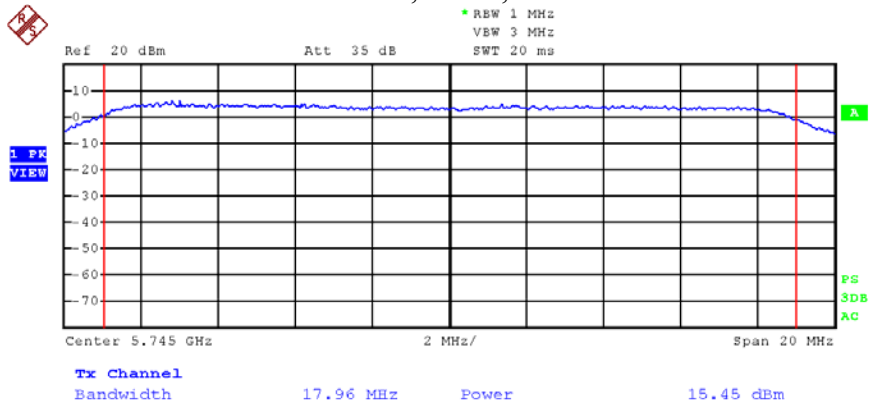


**11ng, HT40, Channel H**



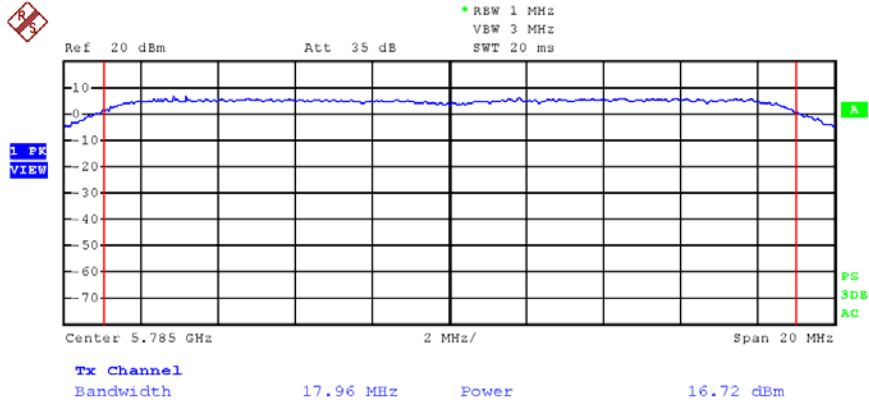
Date: 14.FEB.2012 15:29:58

**11na, HT20, Channel L**



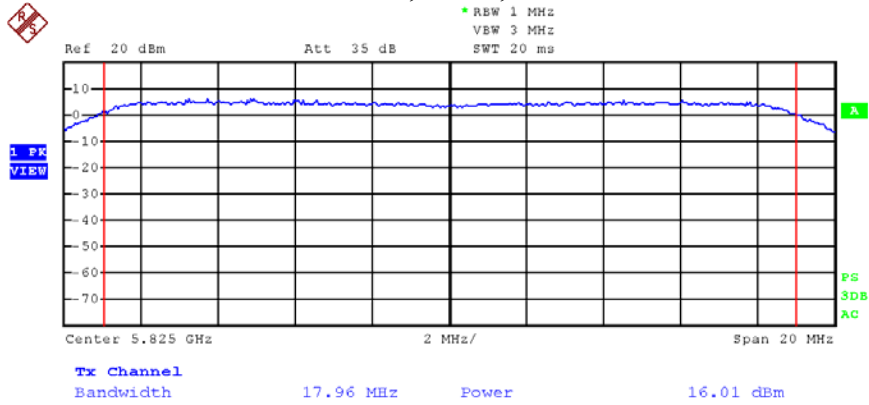
Date: 14.FEB.2012 14:32:04

**11na, HT20, Channel M**



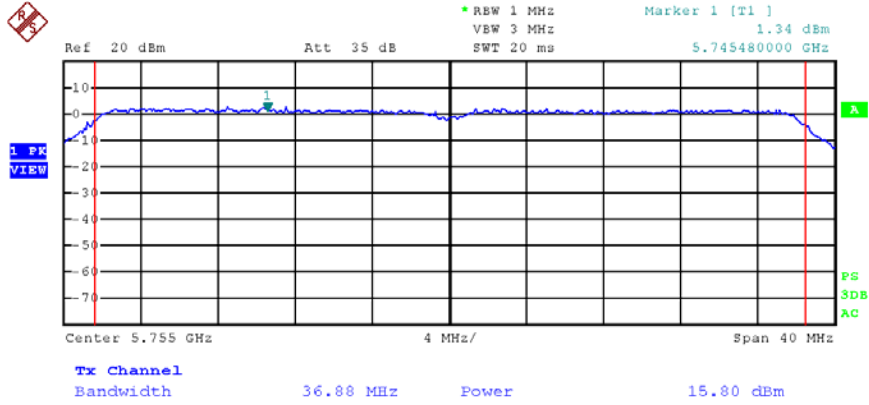
Date: 14.FEB.2012 14:31:35

**11na, HT20, Channel H**



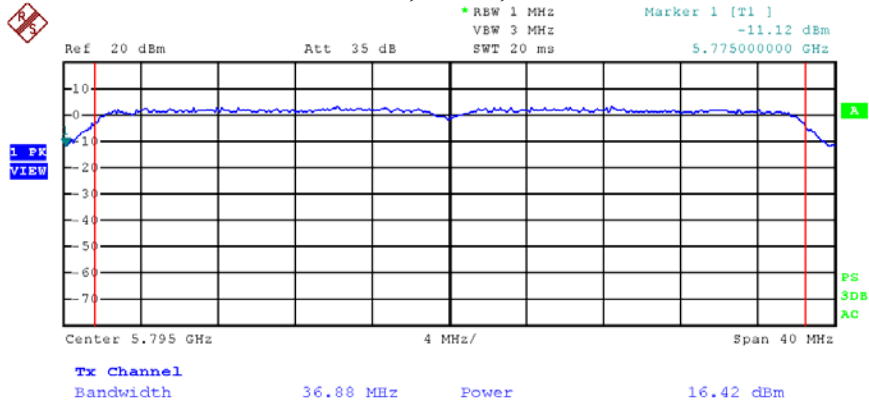
Date: 14.FEB.2012 14:31:04

11na, HT40, Channel L



Date: 14.FEB.2012 15:07:24

11na, HT40, Channel H



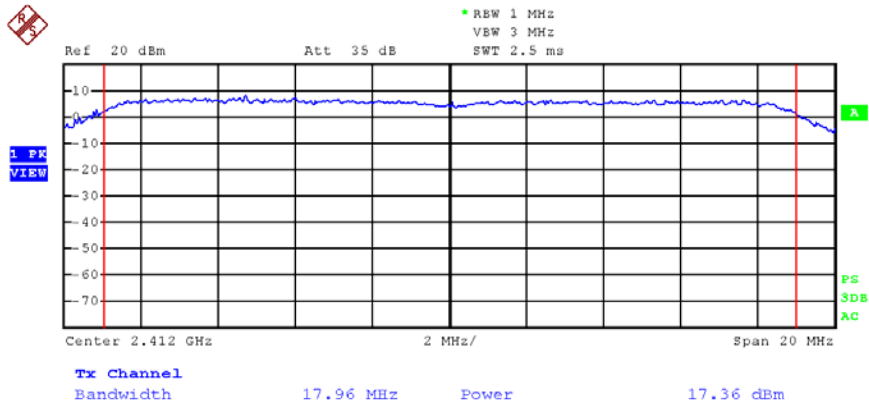
Date: 14.FEB.2012 15:07:57



**Dual Chain**

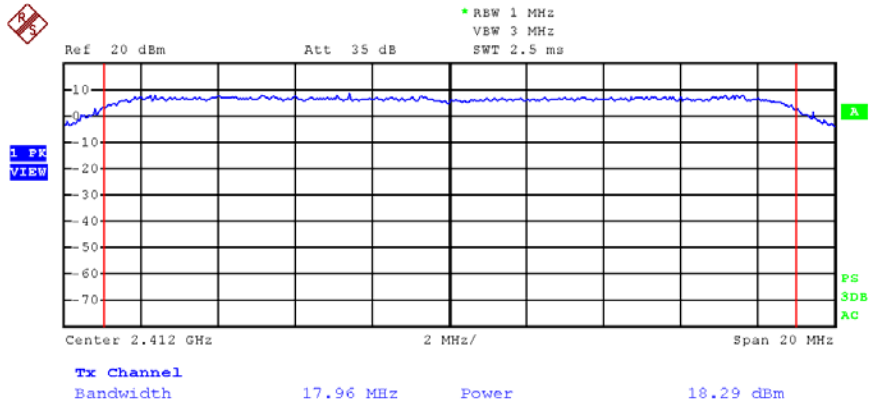
<b>Mode</b>	<b>CH</b>	<b>Chain 0-1 (dBm)</b>	<b>Chain 0-2 (dBm)</b>	<b>Total Power (dBm)</b>	<b>Limit (dBm)</b>
11ng, HT20	L	17.36	18.29	20.86	≤21
	M	17.53	17.29	20.42	
	H	17.13	17.02	20.09	
11ng, HT40	L	17.80	17.89	20.86	
	M	17.95	17.94	20.96	
	H	17.96	17.83	20.91	
11na, HT20	L	15.55	19.02	20.63	
	M	16.83	18.08	20.51	
	H	16.14	18.34	20.39	
11na, HT40	L	15.91	17.90	20.03	
	H	16.60	17.33	19.99	

11ng, HT20, Channel L  
Chain 0-1



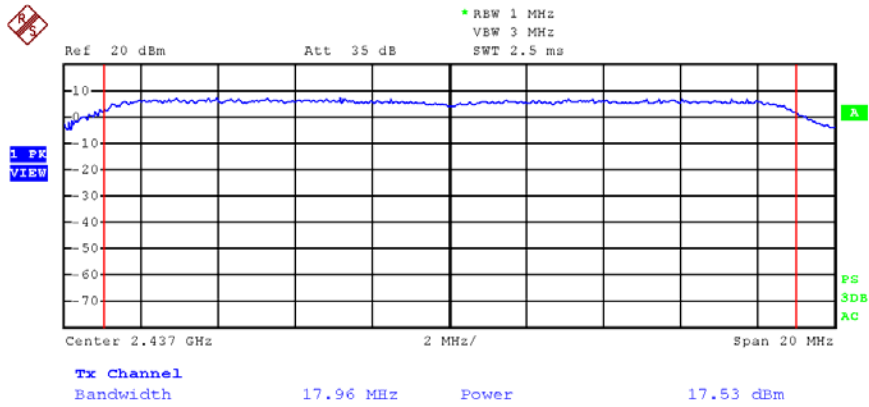
Date: 14.FEB.2012 15:19:07

Chain 0-2



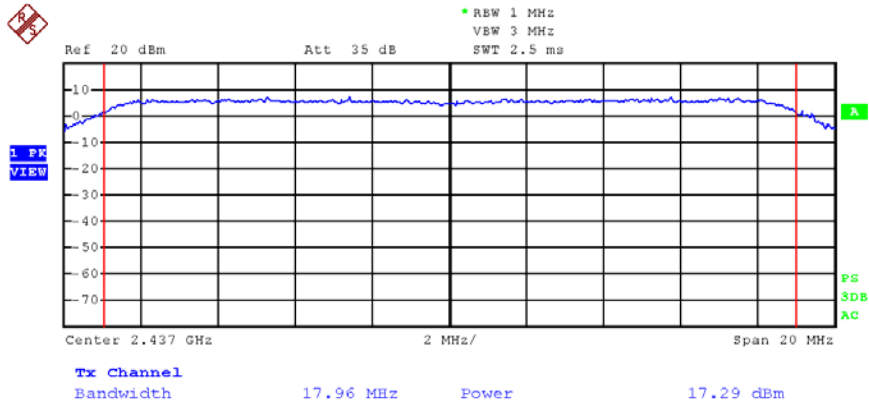
Date: 14.FEB.2012 15:15:36

11ng, HT20, Channel M  
Chain 0-1



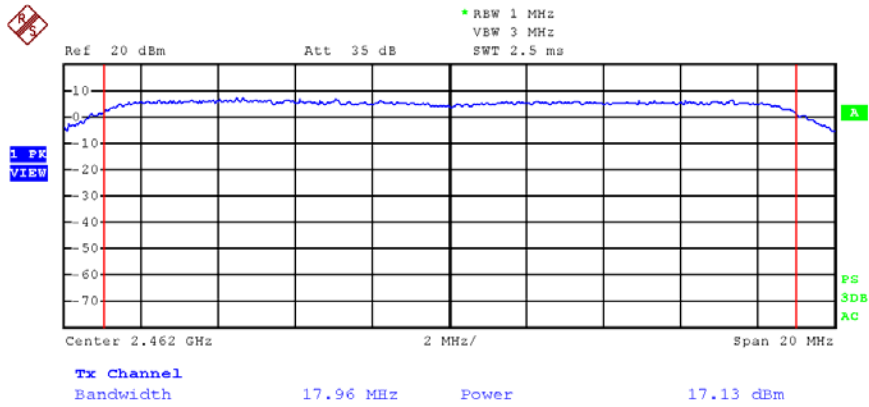
Date: 14.FEB.2012 15:18:42

Chain 0-2



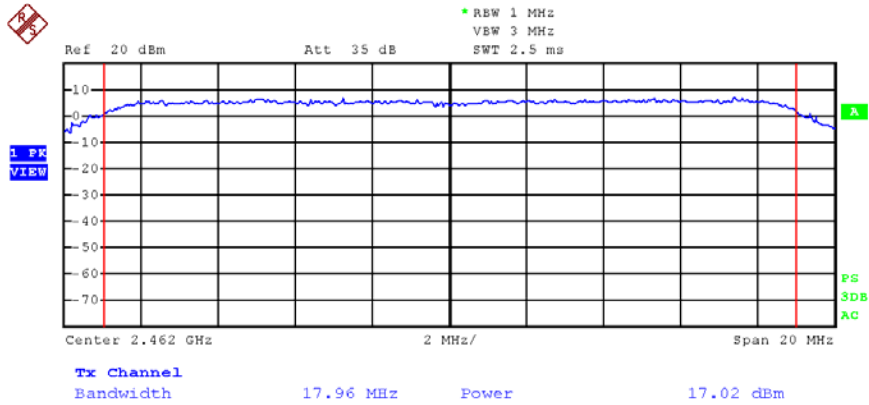
Date: 14.FEB.2012 15:16:18

11ng, HT20, Channel H  
Chain 0-1



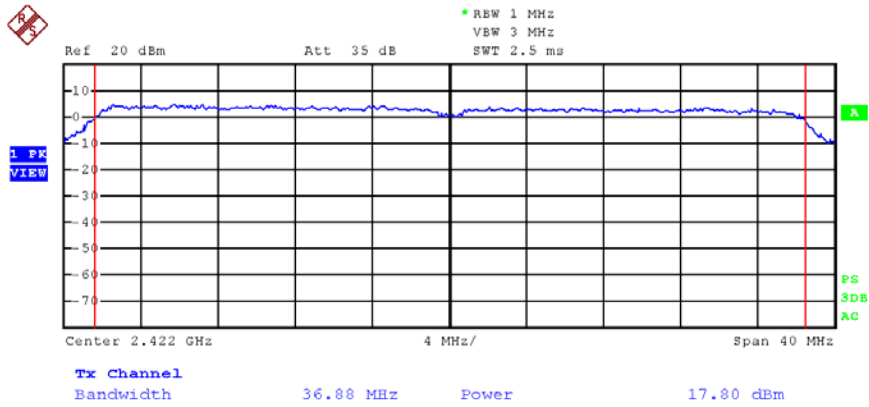
Date: 14.FEB.2012 15:18:18

Chain 0-2



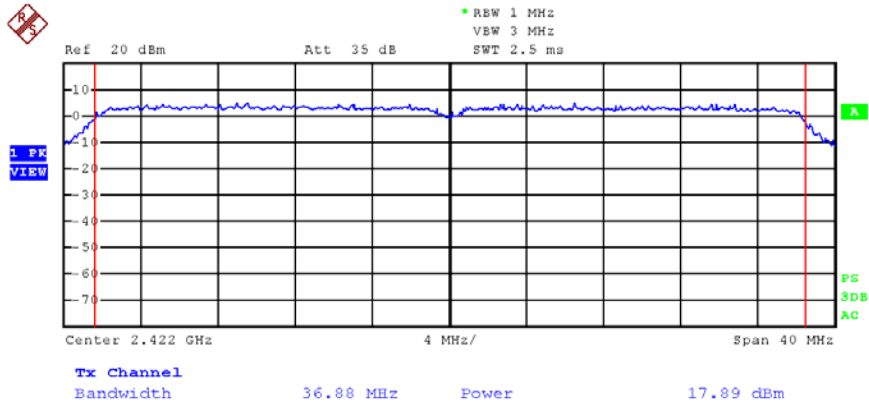
Date: 14.FEB.2012 15:17:22

11ng, HT40, Channel L  
Chain 0-1



Date: 14.FEB.2012 15:31:56

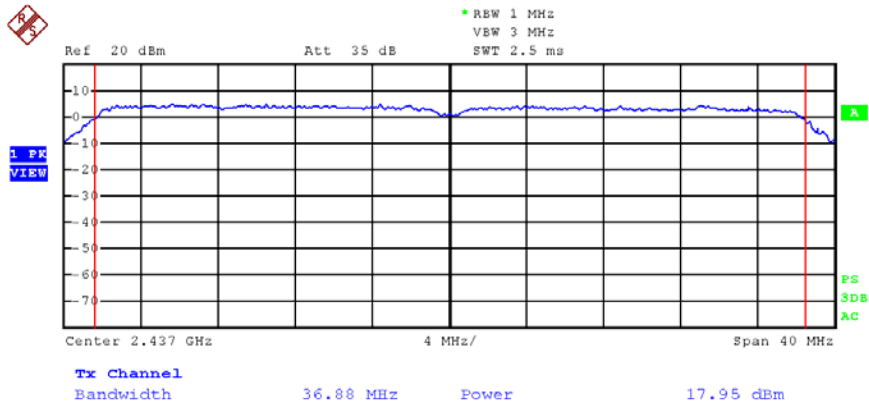
Chain 0-2



Date: 14.FEB.2012 15:37:00

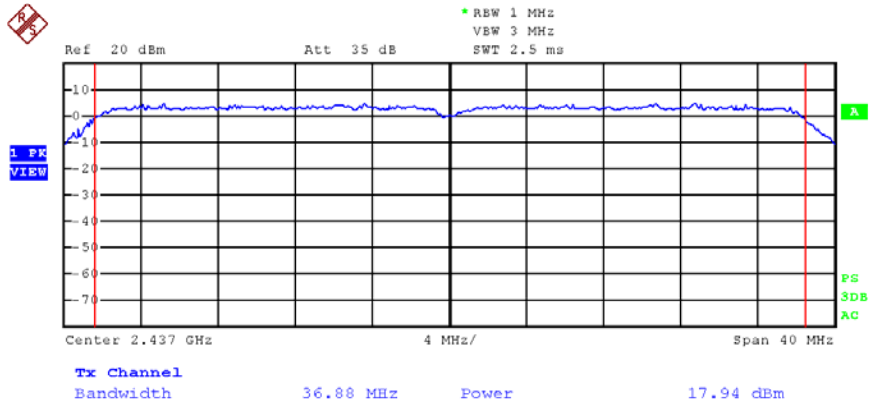


11ng, HT40, Channel M  
Chain 0-1



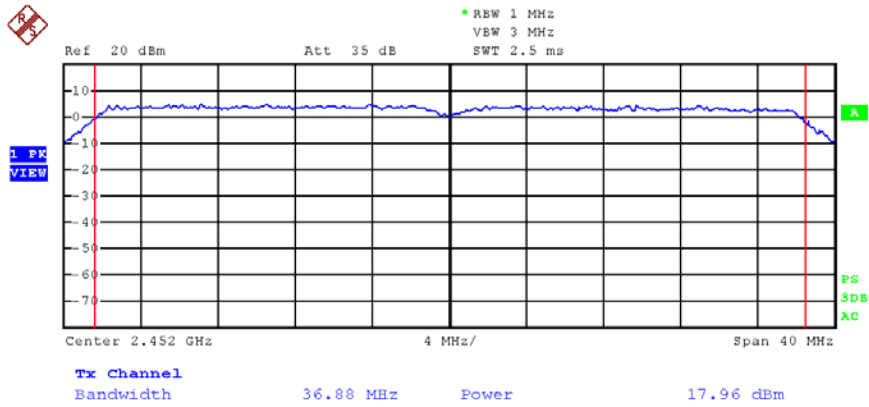
Date: 14.FEB.2012 15:32:32

Chain 0-2



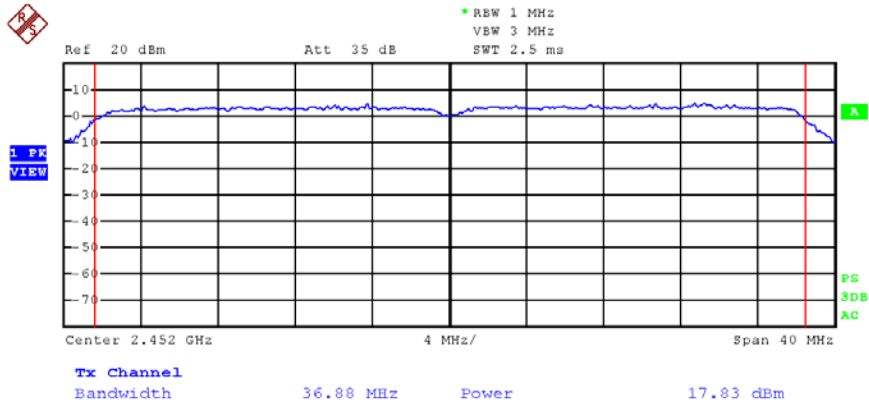
Date: 14.FEB.2012 15:34:04

11ng, HT40, Channel H  
Chain 0-1



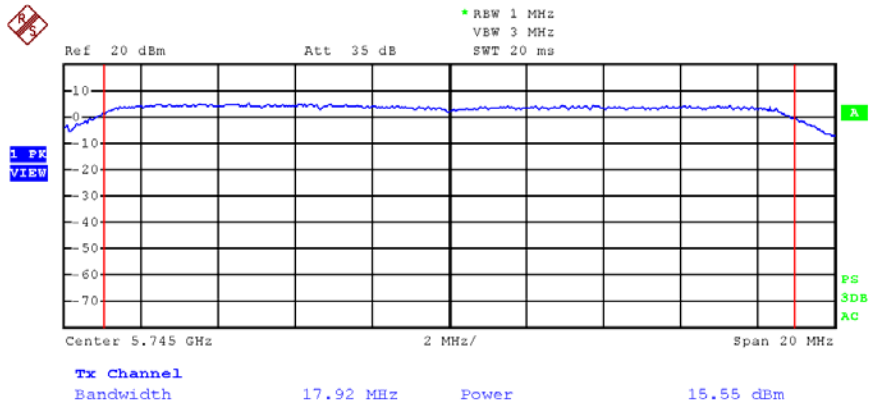
Date: 14.FEB.2012 15:32:53

Chain 0-2



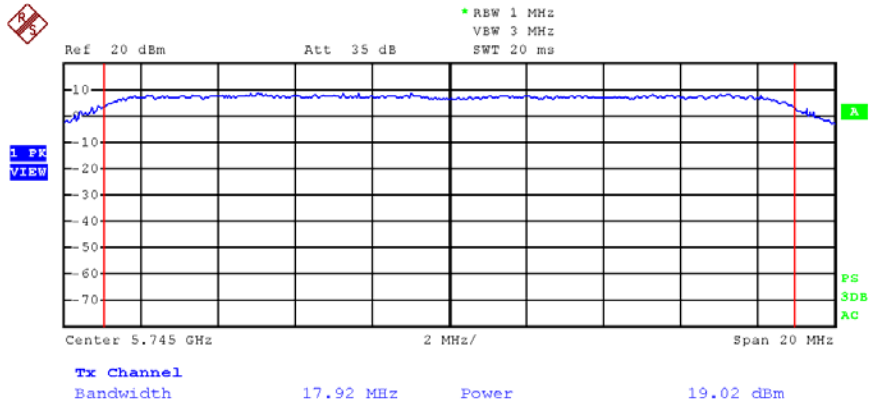
Date: 14.FEB.2012 15:33:46

11na, HT20, Channel L  
Chain 0-1



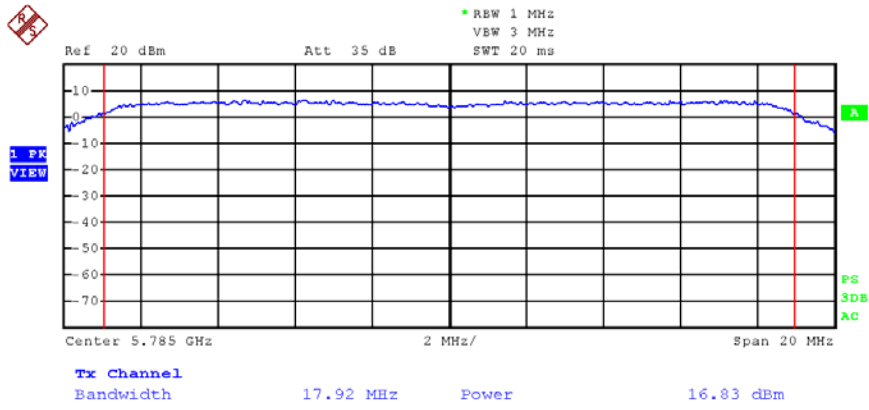
Date: 14.FEB.2012 14:33:10

Chain 0-2



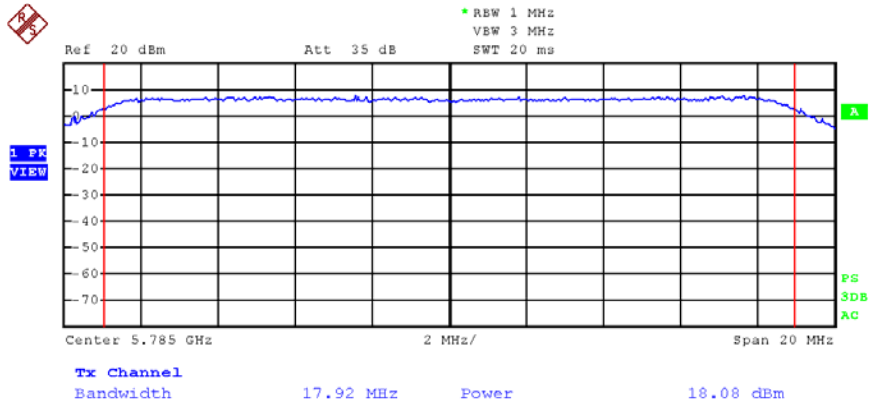
Date: 14.FEB.2012 14:37:19

11na, HT20, Channel M  
Chain 0-1



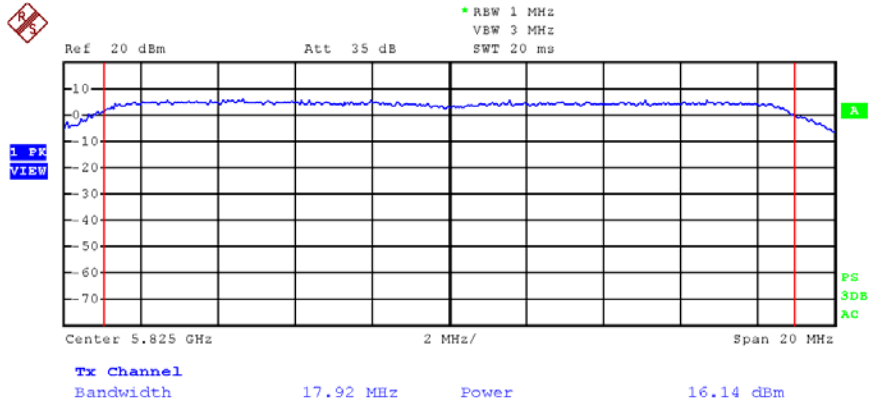
Date: 14.FEB.2012 14:33:45

Chain 0-2



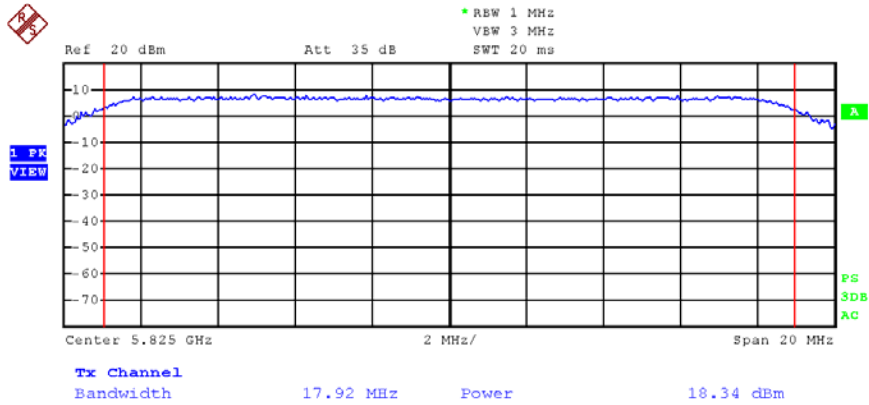
Date: 14.FEB.2012 14:36:29

11na, HT20, Channel H  
Chain 0-1



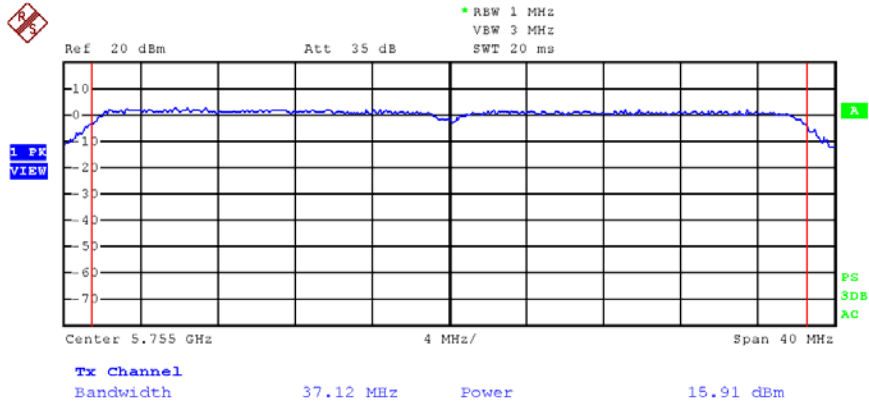
Date: 14.FEB.2012 14:34:13

Chain 0-2



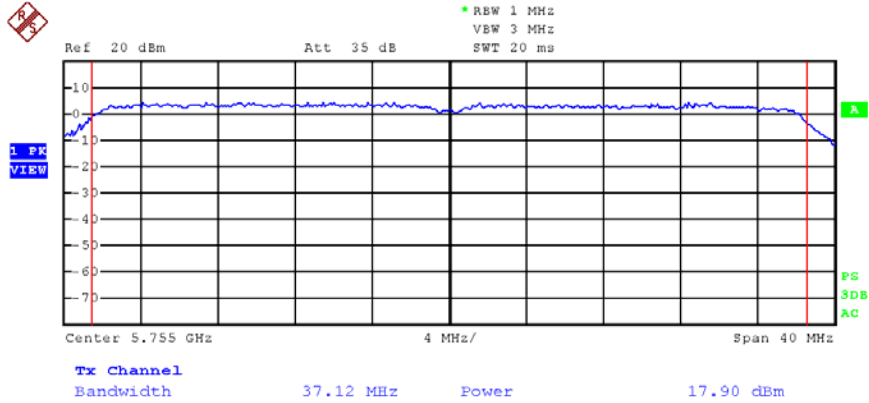
Date: 14.FEB.2012 14:35:35

11na, HT40, Channel L  
Chain 0-1



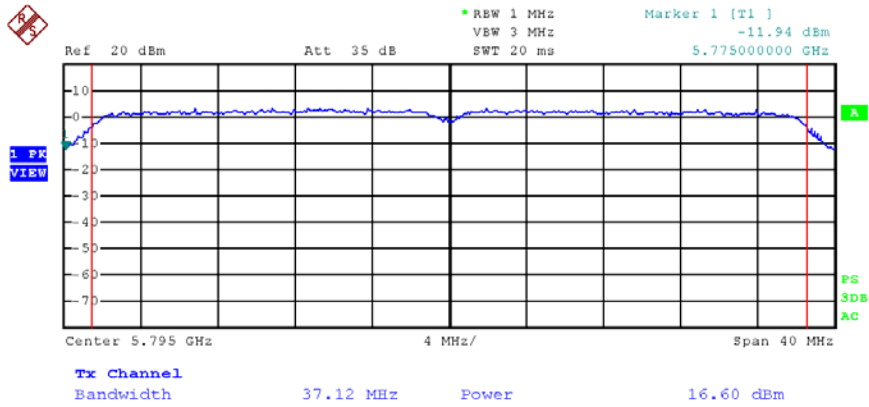
Date: 14.FEB.2012 15:09:39

Chain 0-2



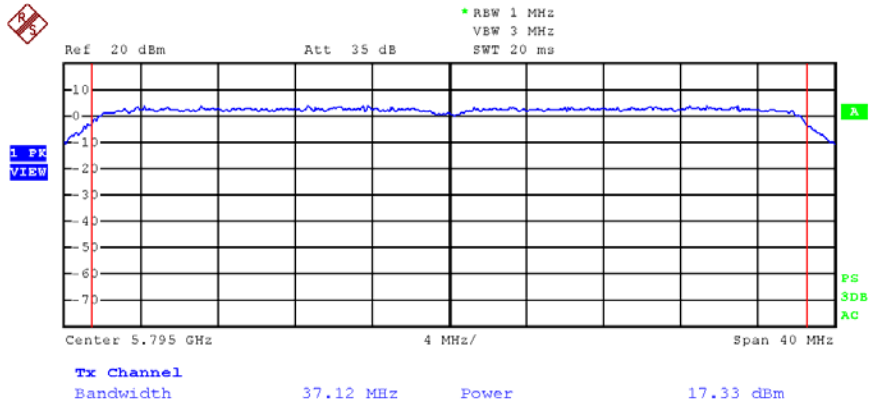
Date: 14.FEB.2012 15:10:36

11na, HT40, Channel H  
Chain 0-1



Date: 14.FEB.2012 15:09:09

Chain 0-2



Date: 14.FEB.2012 15:11:11

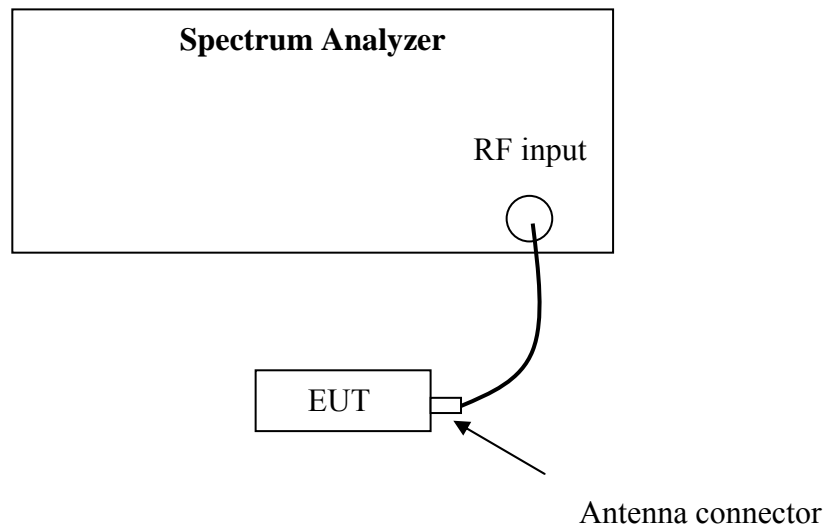
## 5. Power spectrum density

Test result: Pass

### 5.1 Test limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.2 Test Configuration



### 5.3 Test procedure and test setup

The power output per FCC §15.247(e) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v01” for compliance to FCC 47CFR 15.247 requirements.



### 5.4 Test Protocol

Temperature: 22 °C

Relative Humidity: 43 %

The power level setting is “14.5” indicated in software offered by the manufactory. The maximum gain of all applied antennas is 15dBi, therefore, the strictest limit should be 8dBm/3kHz – (15dBi – 6dBi) = -1dBm/3kHz.

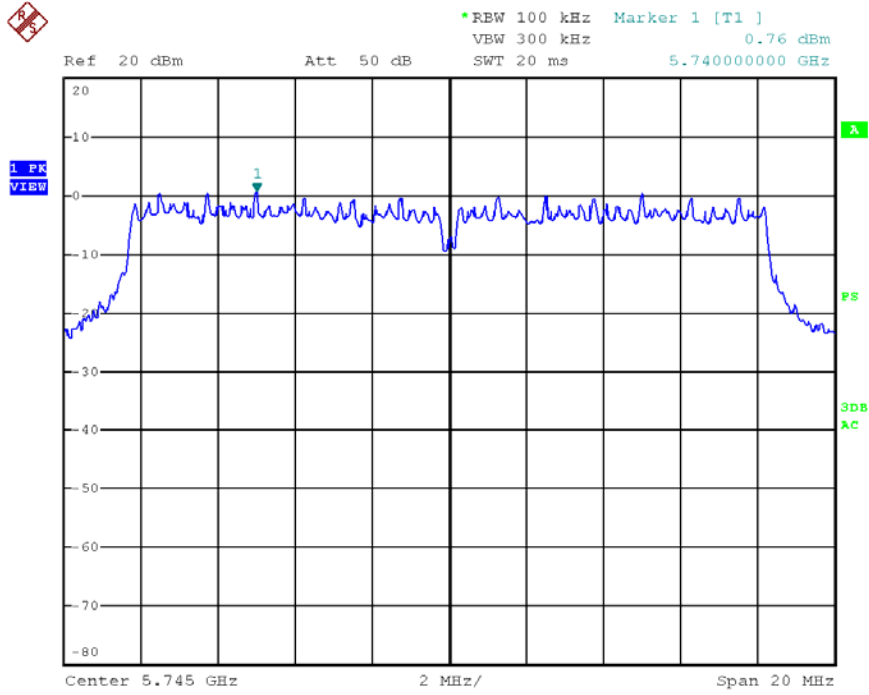
#### Single Chain

Mode	CH	Chain 0-1 (dBm/100kHz)	Chain 0-1 (dBm/3kHz)	Limit (dBm/3kHz)
11a	L	0.76	-14.44	$\leq -1$
	M	0.91	-14.29	
	H	0.47	-14.73	
11b	L	2.42	-12.78	
	M	3.13	-12.07	
	H	2.56	-12.64	
11g	L	2.40	-12.80	
	M	2.21	-12.99	
	H	1.90	-13.30	
11ng, HT20	L	2.26	-12.94	
	M	2.17	-13.03	
	H	1.79	-13.41	
11ng, HT40	L	-0.12	-15.32	
	M	-0.46	-15.66	
	H	-0.57	-15.77	
11na, HT20	L	0.92	-14.28	
	M	0.87	-14.33	
	H	0.46	-14.74	

11na, HT40	L	-3.77	-18.97	
	H	-2.06	-17.26	

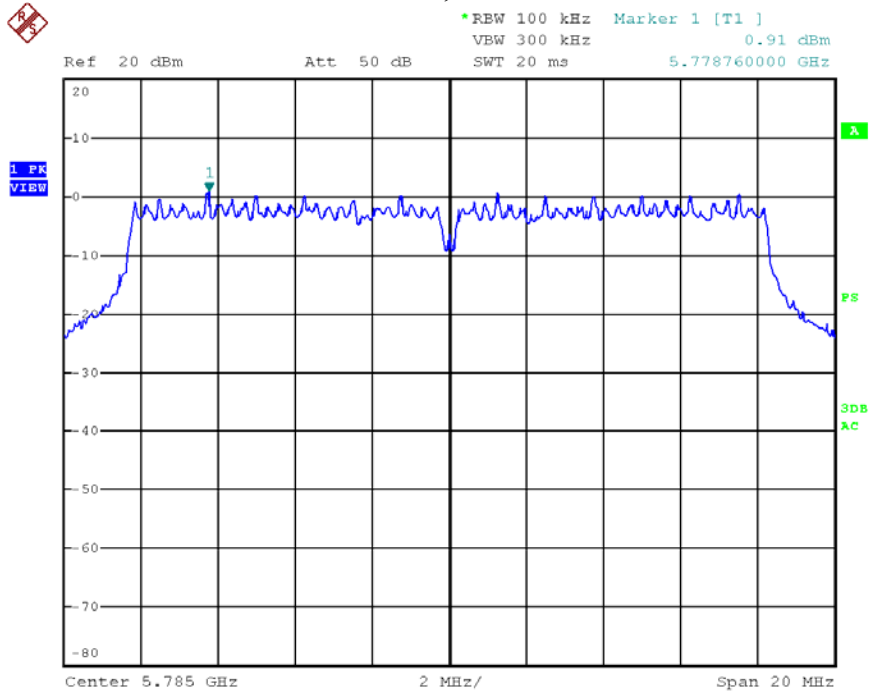
Note: power spectrum density of 3kHz is -15.20dB lower than that of 100kHz.

11a, Channel L



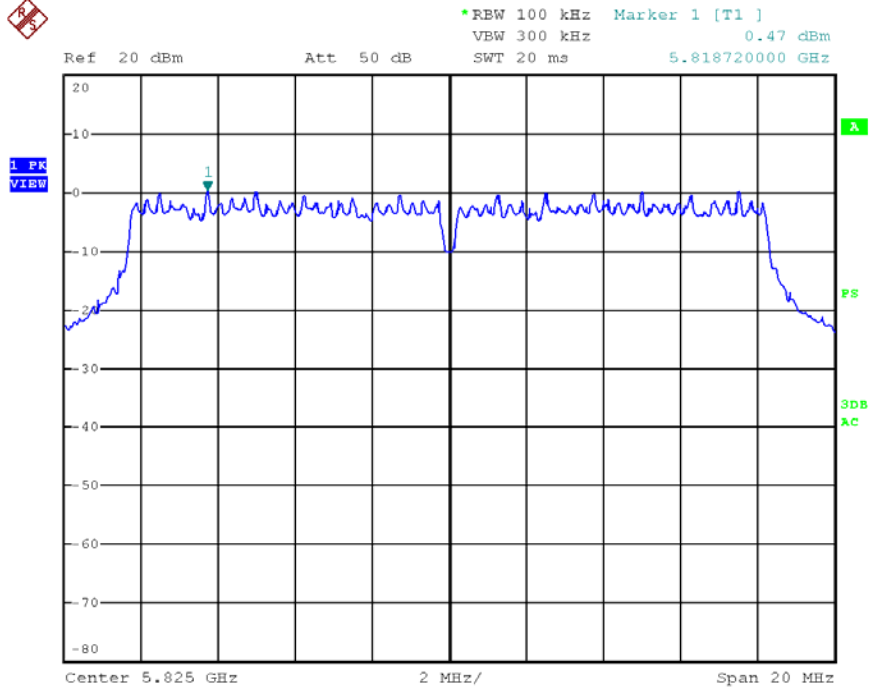
Date: 8.FEB.2012 10:00:11

11a, Channel M



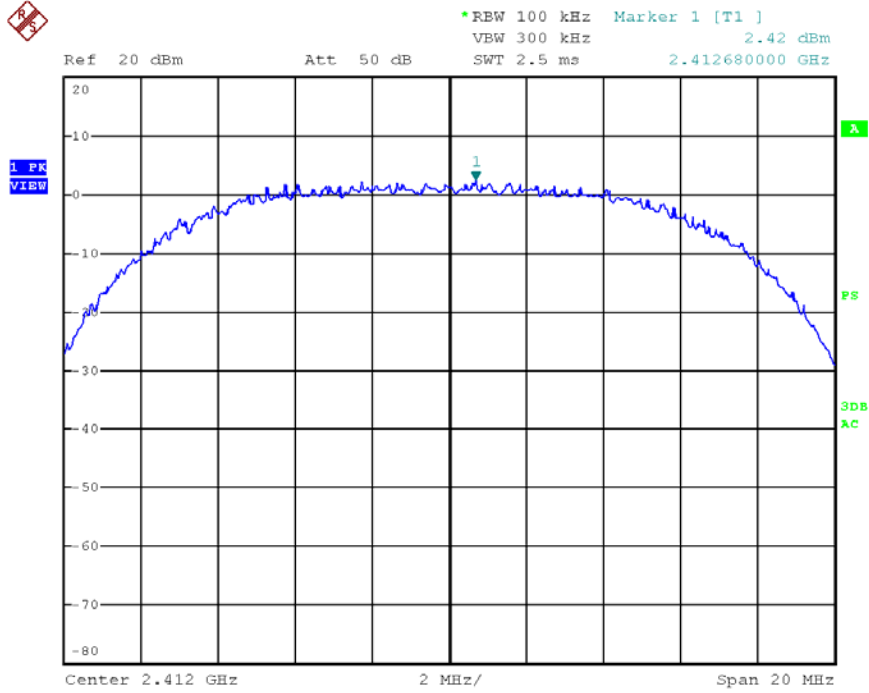
Date: 8.FEB.2012 10:00:43

11a, Channel H



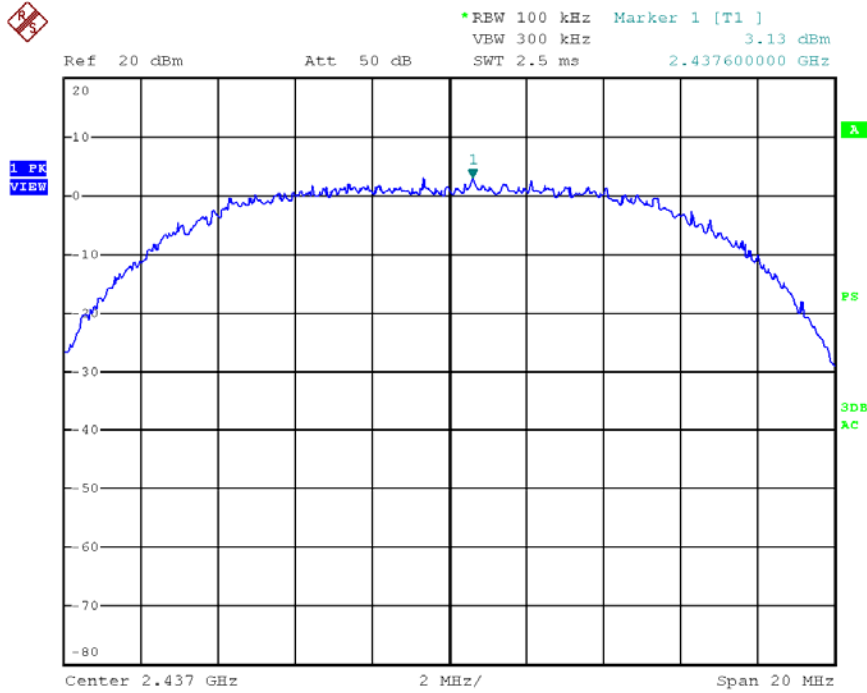
Date: 8.FEB.2012 10:01:18

11b, Channel L



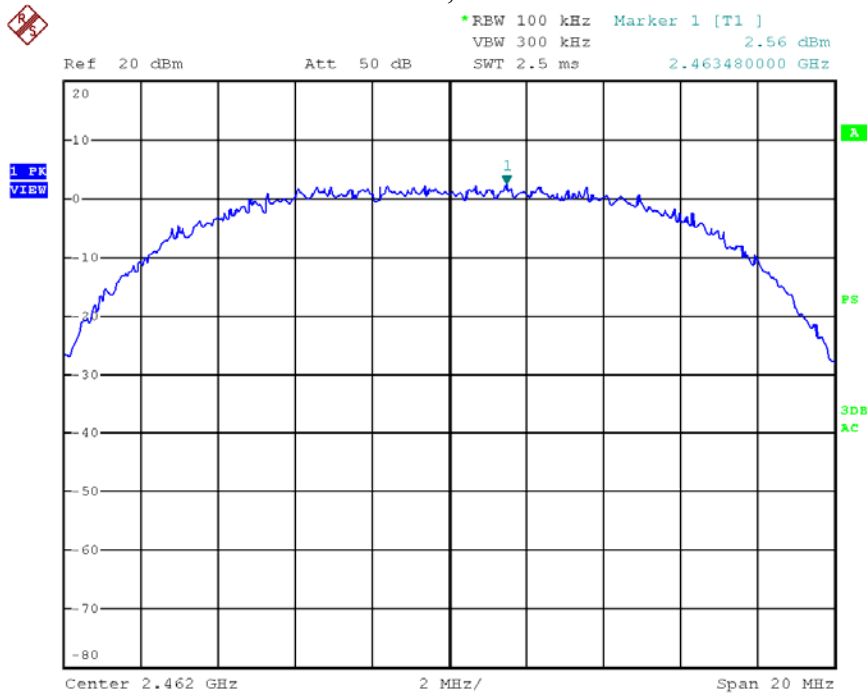
Date: 8.FEB.2012 10:21:20

11b, Channel M



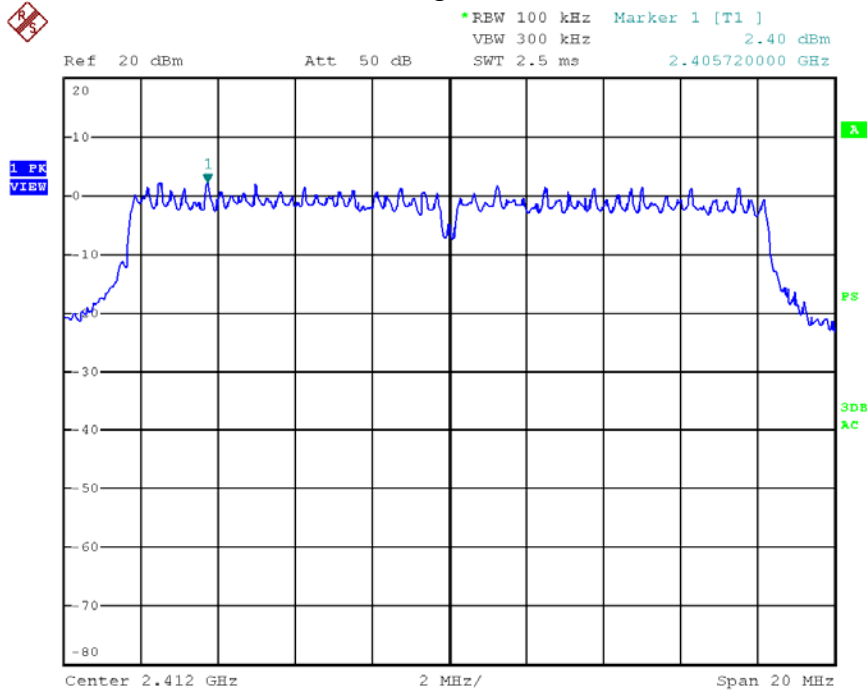
Date: 8.FEB.2012 10:21:48

11b, Channel H



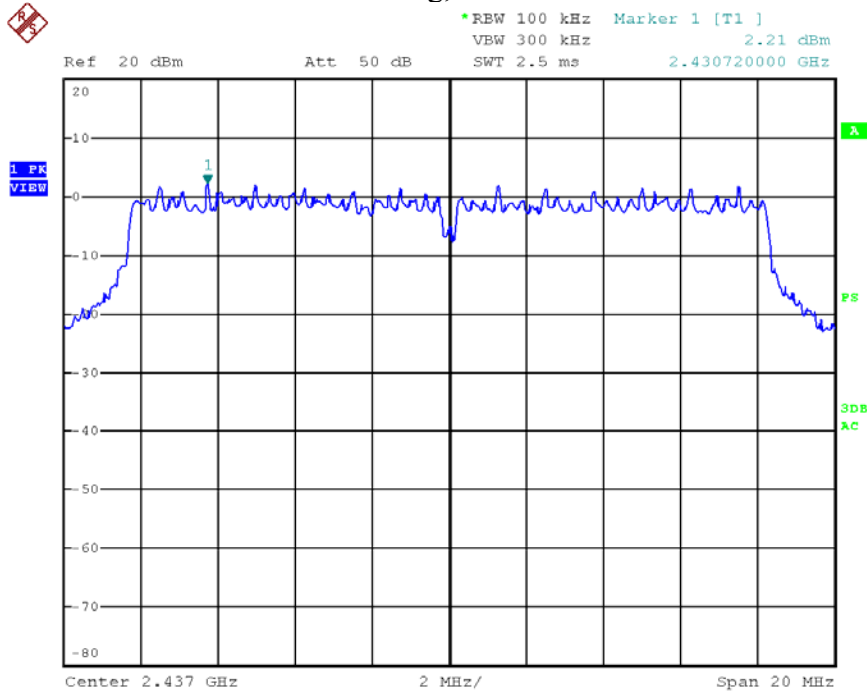
Date: 8.FEB.2012 10:22:10

### 11g, Channel L



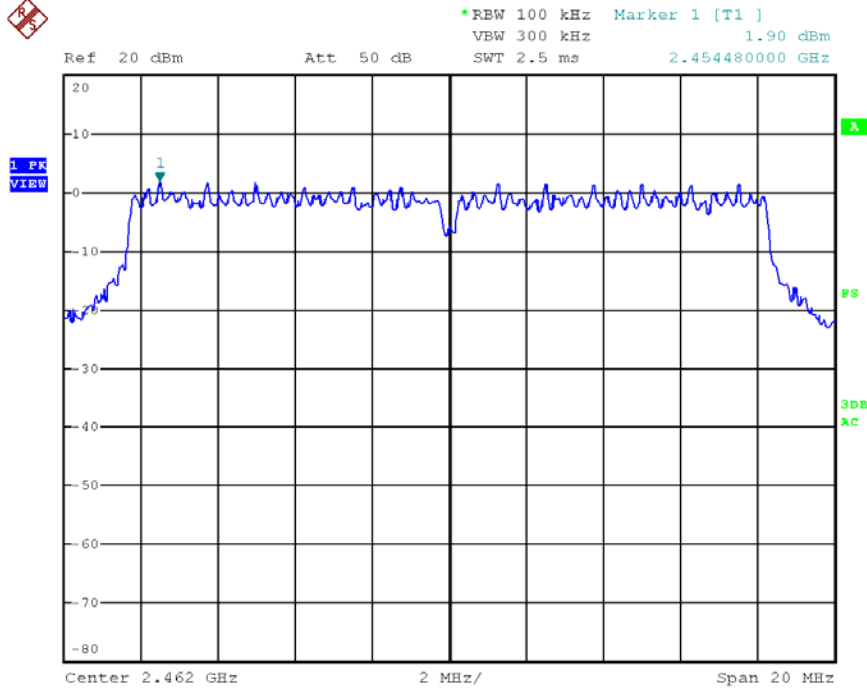
Date: 8.FEB.2012 10:24:30

### 11g, Channel M



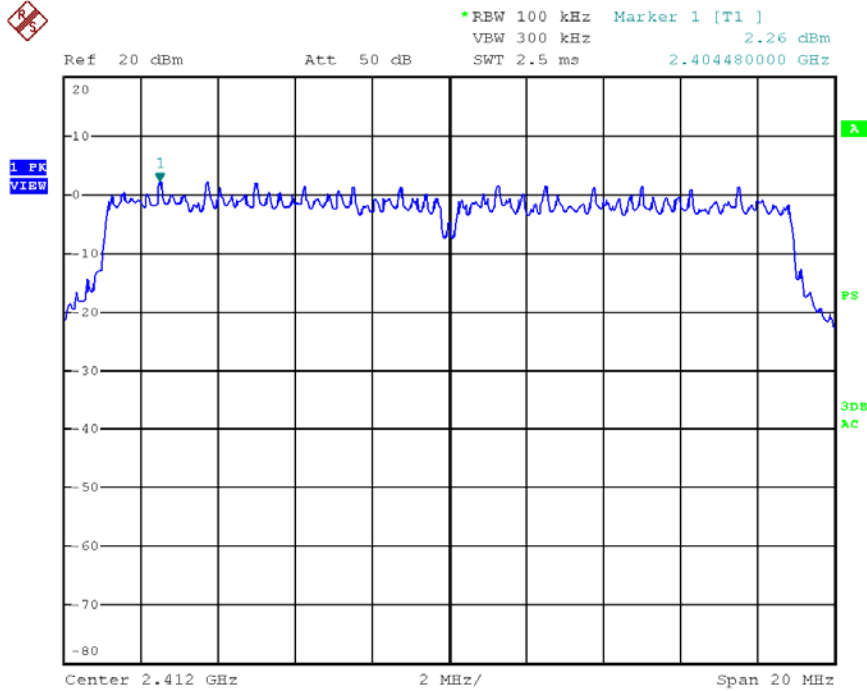
Date: 8.FEB.2012 10:24:00

11g, Channel H



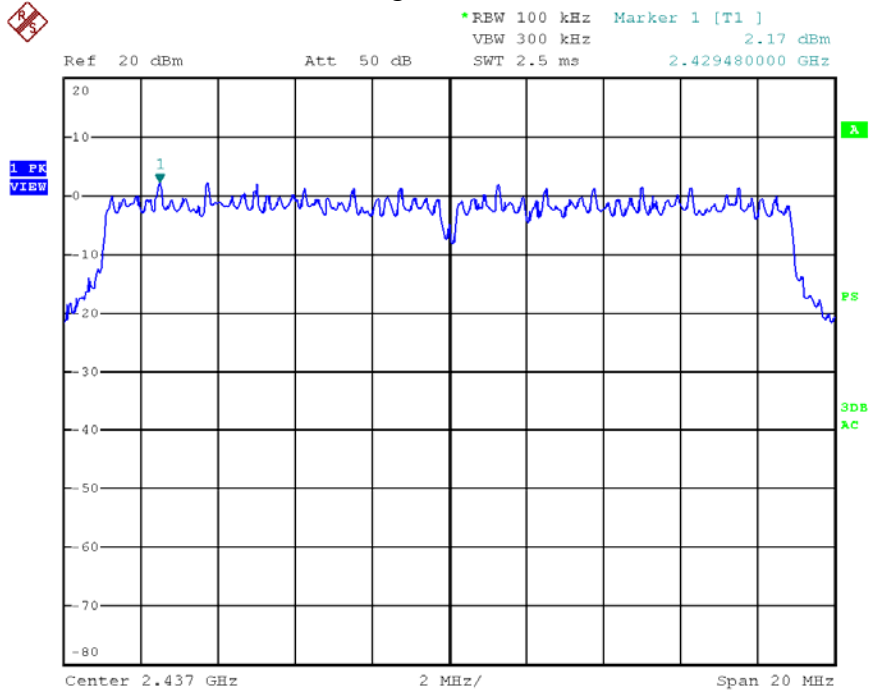
Date: 8.FEB.2012 10:22:59

11ng, HT20, Channel L



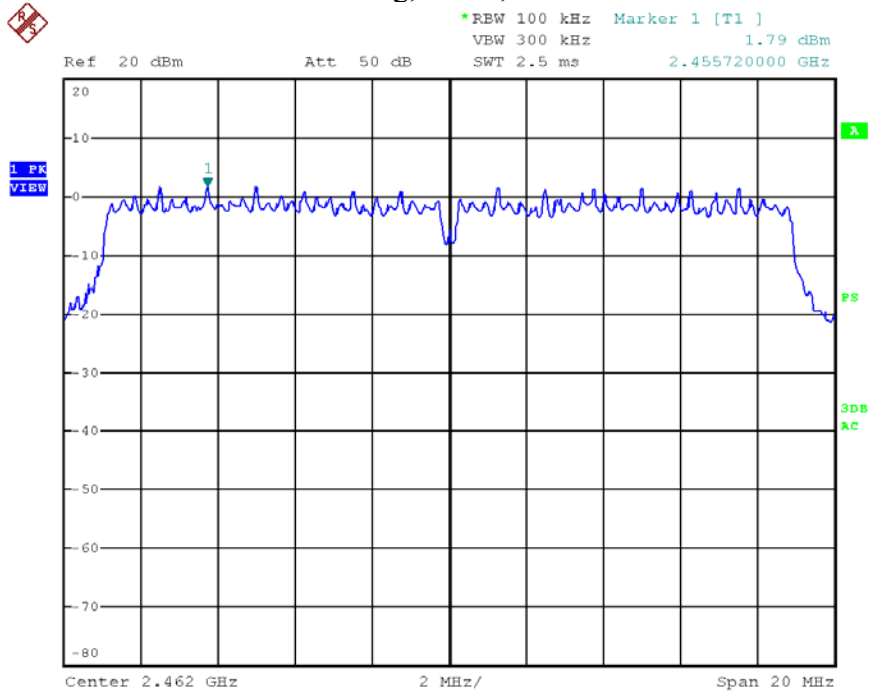
Date: 8.FEB.2012 10:26:33

11ng, HT20, Channel M



Date: 8.FEB.2012 10:26:57

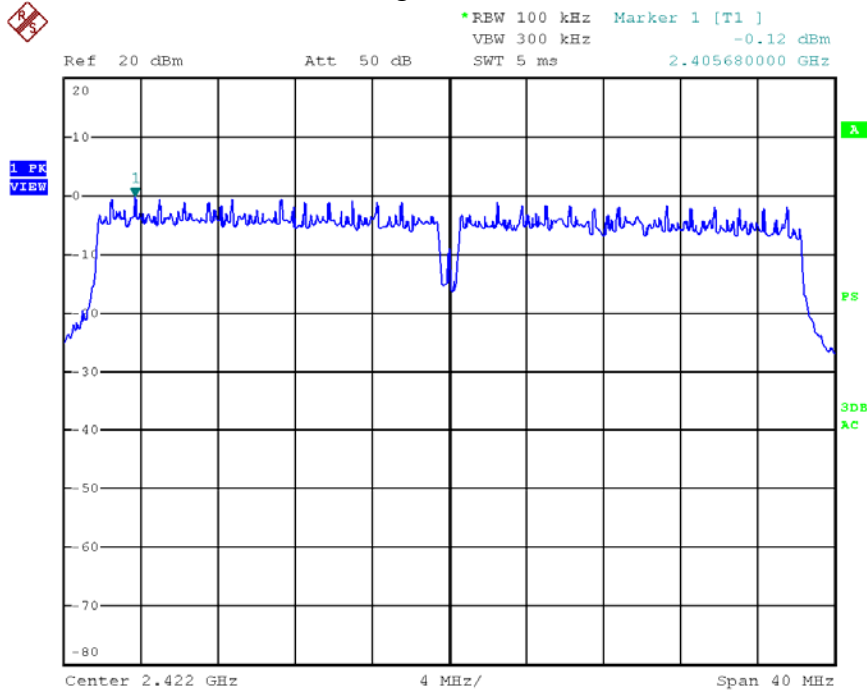
11ng, HT20, Channel H



Date: 8.FEB.2012 10:27:41

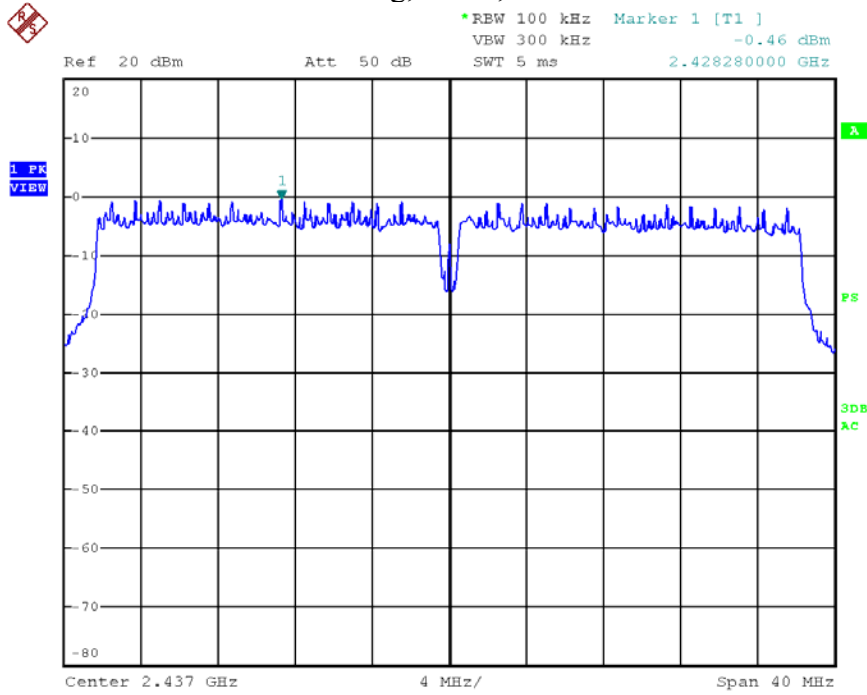


11ng, HT40, Channel L



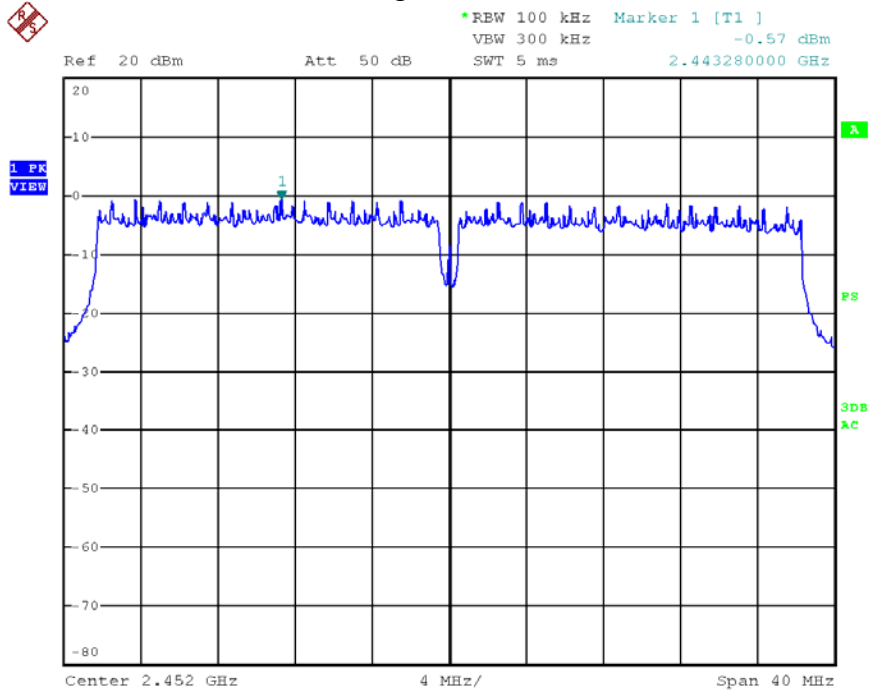
Date: 8.FEB.2012 10:39:59

11ng, HT40, Channel M



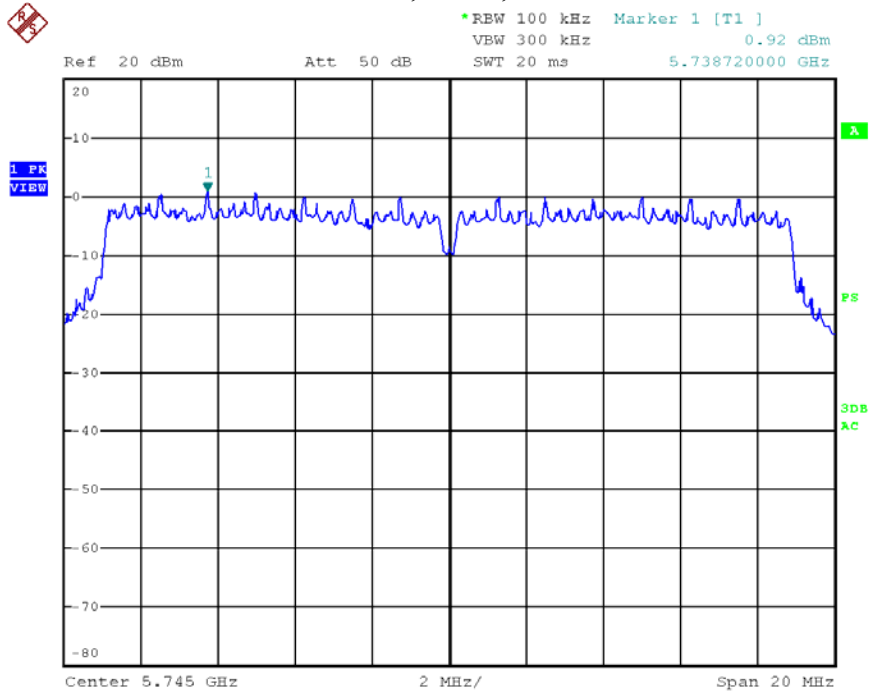
Date: 8.FEB.2012 10:39:43

11ng, HT40, Channel H



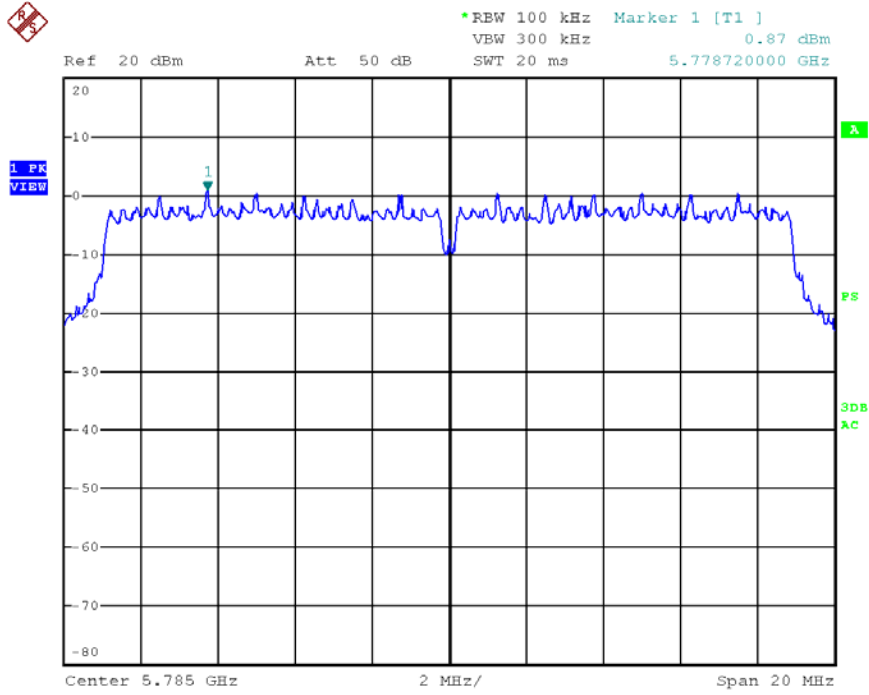
Date: 8.FEB.2012 10:39:24

11na, HT20, Channel L



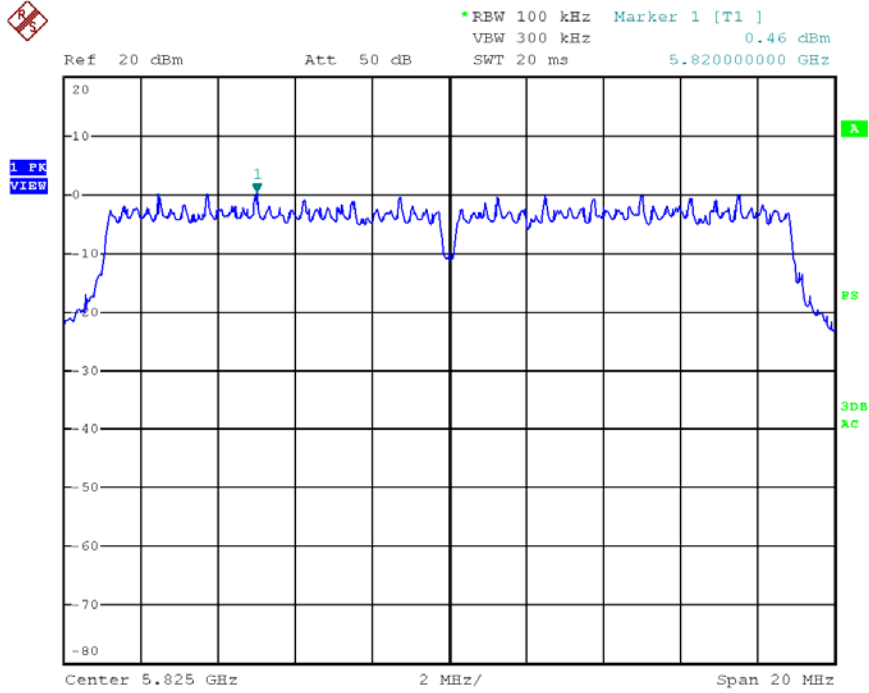
Date: 8.FEB.2012 10:03:35

11na, HT20, Channel M



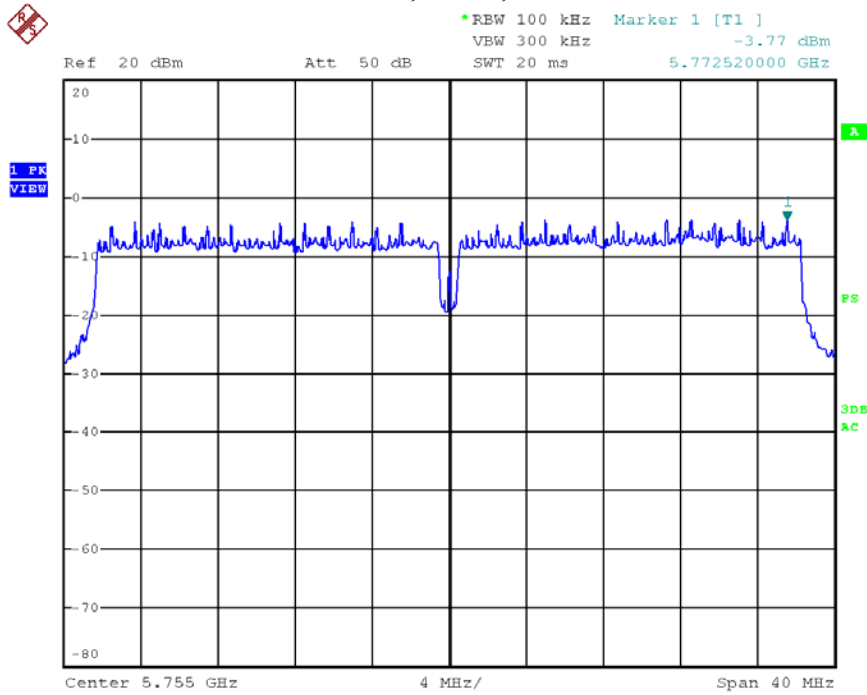
Date: 8.FEB.2012 10:03:07

11na, HT20, Channel H



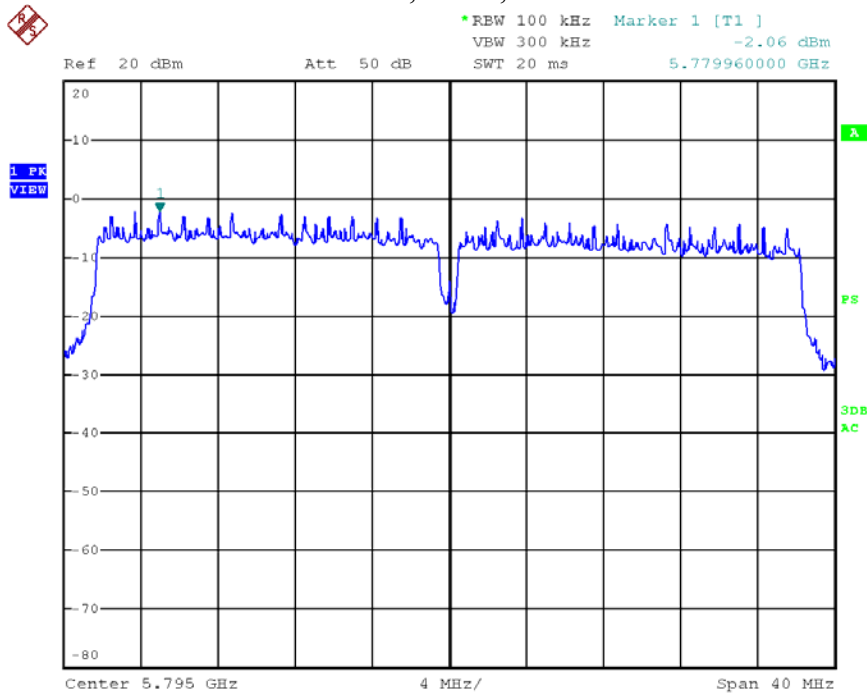
Date: 8.FEB.2012 10:02:40

11na, HT40, Channel L



Date: 8.FEB.2012 10:16:49

11na, HT40, Channel H



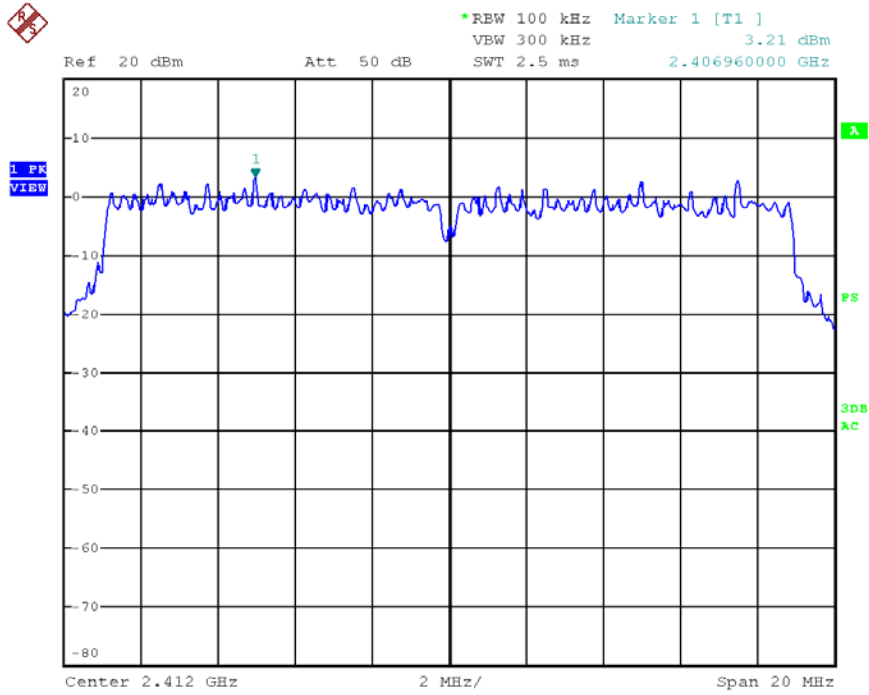
Date: 8.FEB.2012 10:17:16

**Dual Chain**

Mode	CH	Chain 0-1 (dBm/100kHz)	Chain 0-2 (dBm/100kHz)	Total power density (dBm/3kHz)	Limit (dBm/3kHz)
11ng, HT20	L	3.21	2.91	-9.13	≤-1
	M	3.10	2.61	-9.33	
	H	2.83	2.65	-9.45	
11ng, HT40	L	0.48	0.81	-11.54	
	M	0.49	0.14	-11.87	
	H	0.36	0.19	-11.91	
11na, HT20	L	1.37	3.28	-9.76	
	M	1.60	2.22	-10.27	
	H	1.66	2.09	-10.31	
11na, HT40	L	-2.62	0.18	-13.19	
	H	-1.48	-0.75	-13.29	

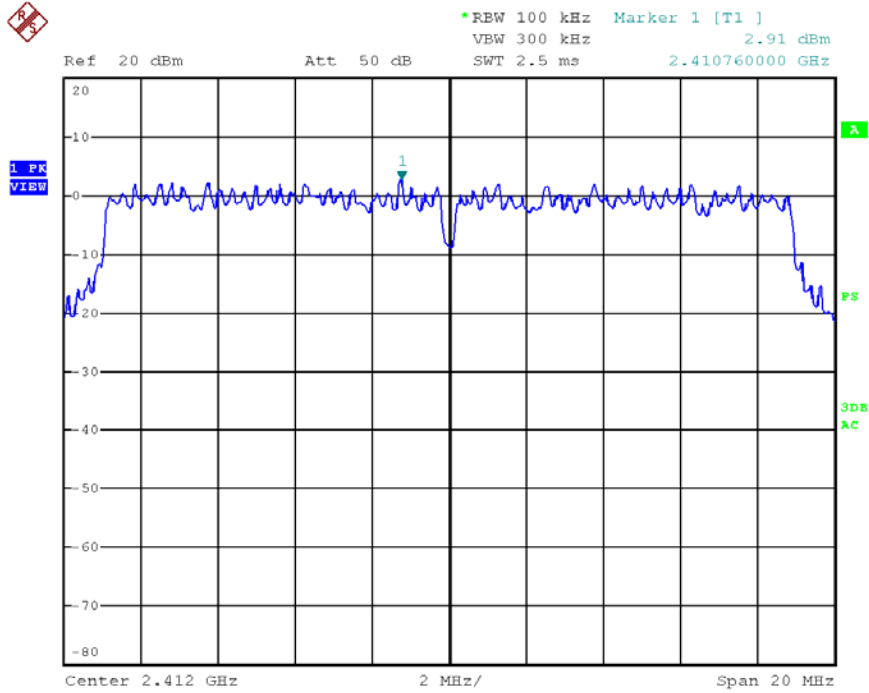
Note: power spectrum density of 3kHz is -15.20dB lower than that of 100kHz.

11ng, HT20, Channel L  
Chain 0-1



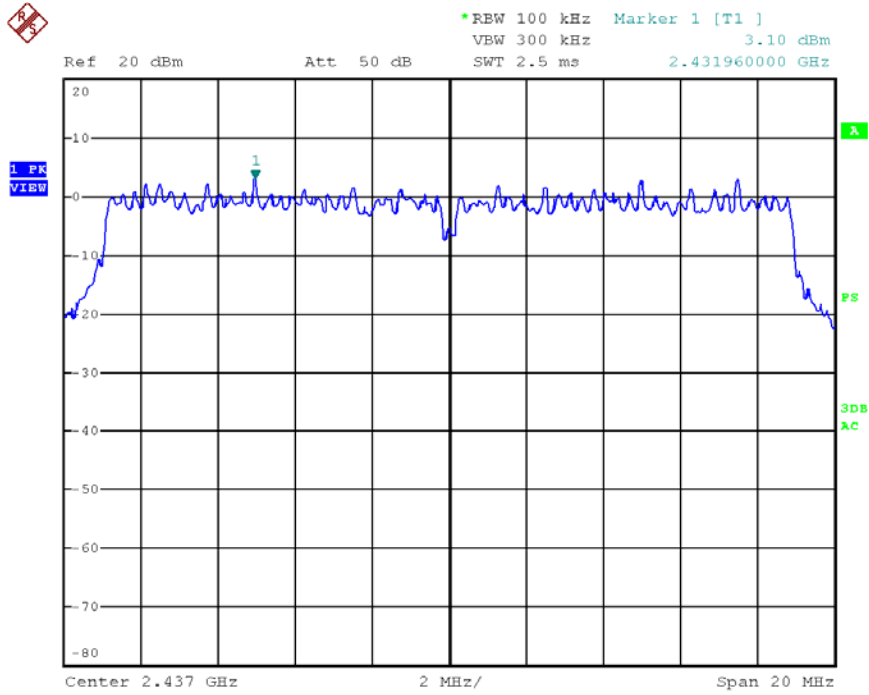
Date: 8.FEB.2012 10:28:48

Chain 0-2



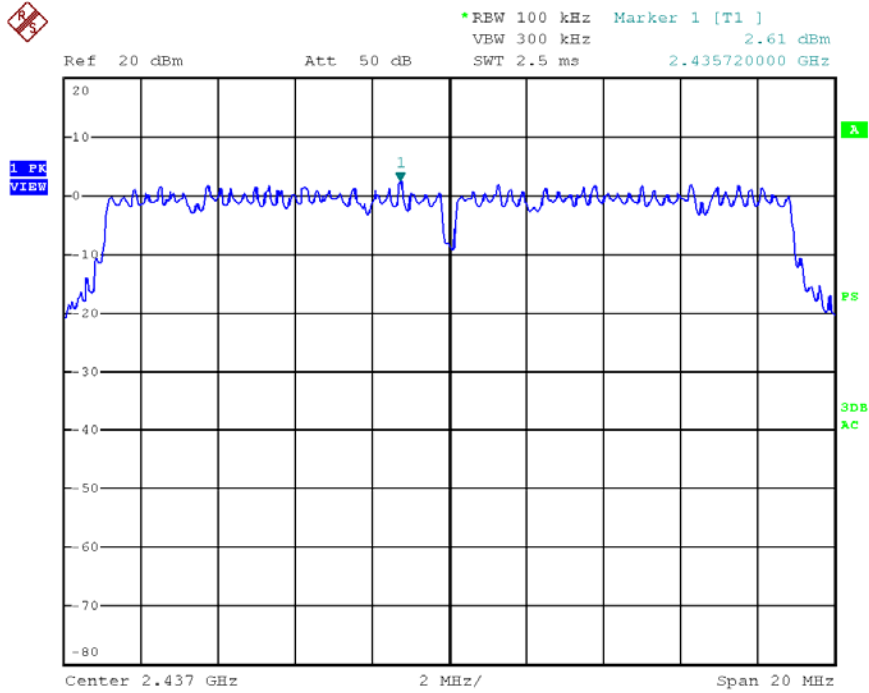
Date: 8.FEB.2012 10:30:17

11ng, HT20, Channel M  
Chain 0-1



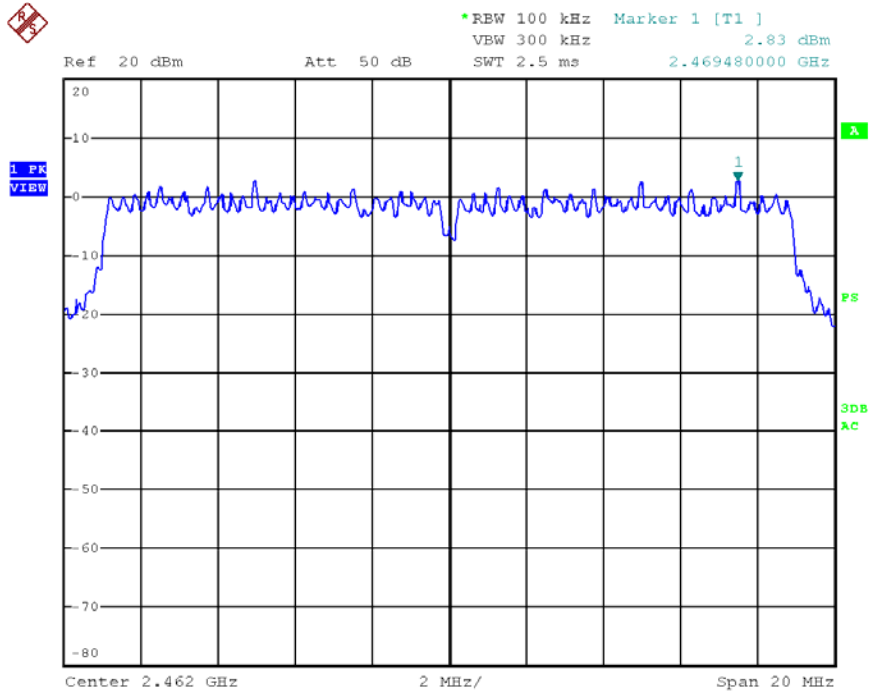
Date: 8.FEB.2012 10:28:28

Chain 0-2



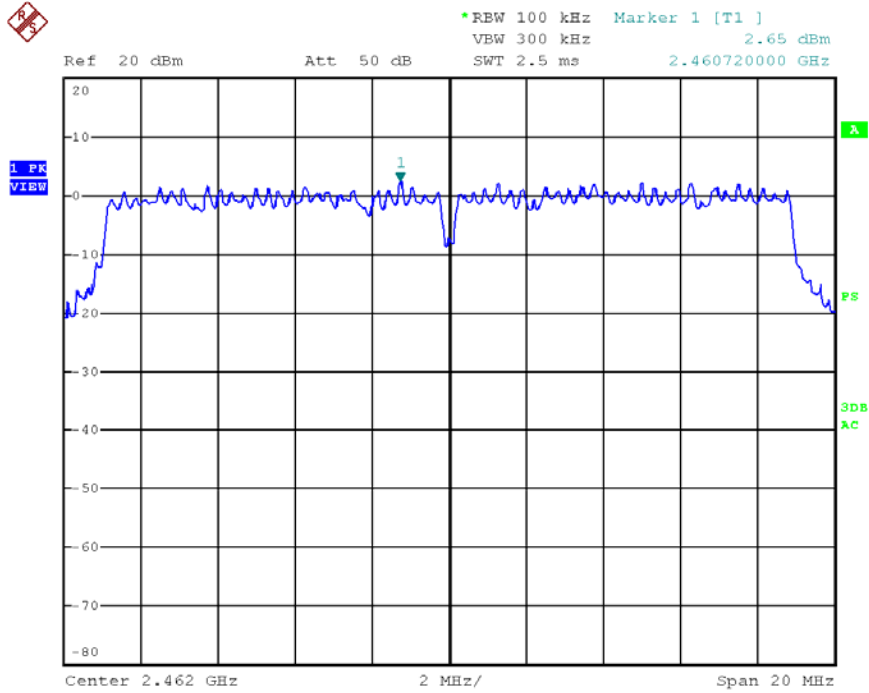
Date: 8.FEB.2012 10:31:01

11ng, HT20, Channel H  
Chain 0-1



Date: 8.FEB.2012 10:28:06

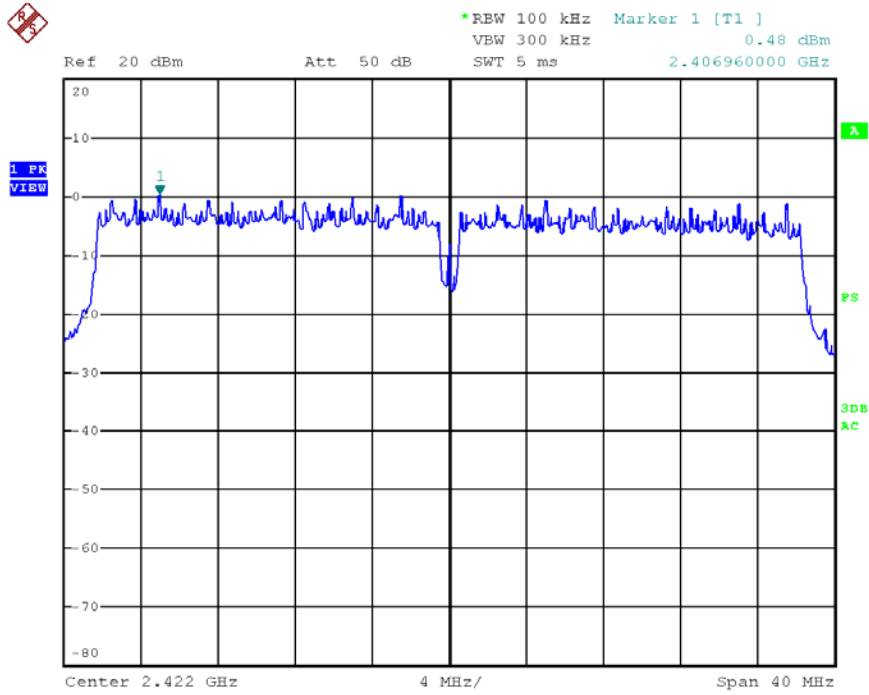
Chain 0-2



Date: 8.FEB.2012 10:32:12

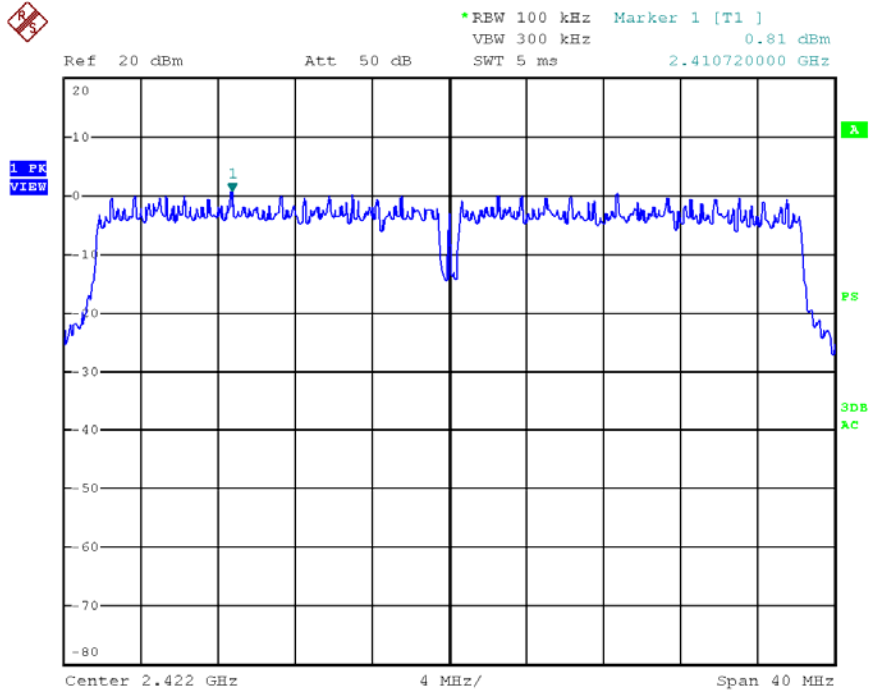


11ng, HT40, Channel L  
Chain 0-1



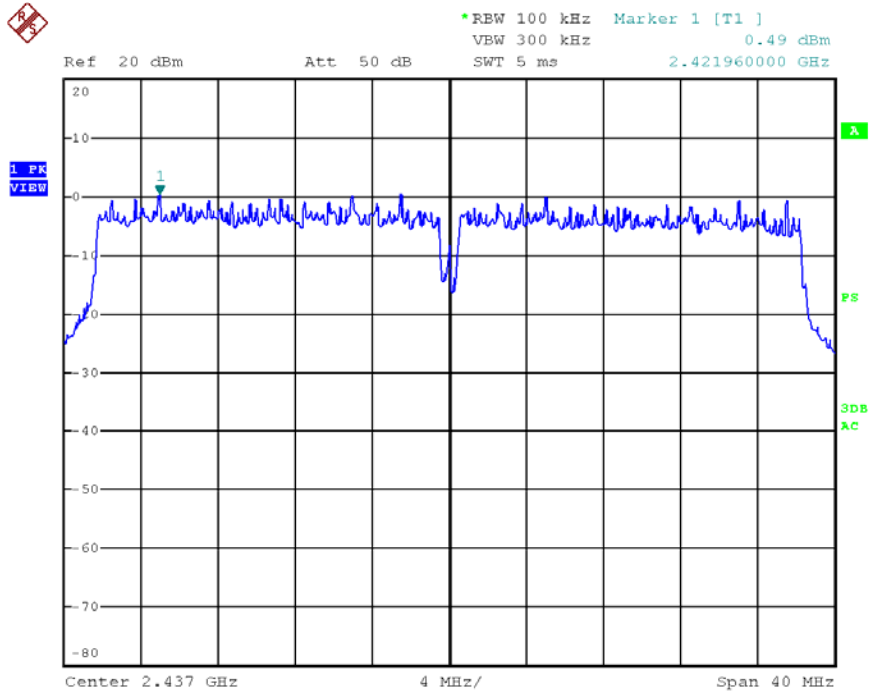
Date: 8.FEB.2012 10:37:43

Chain 0-2



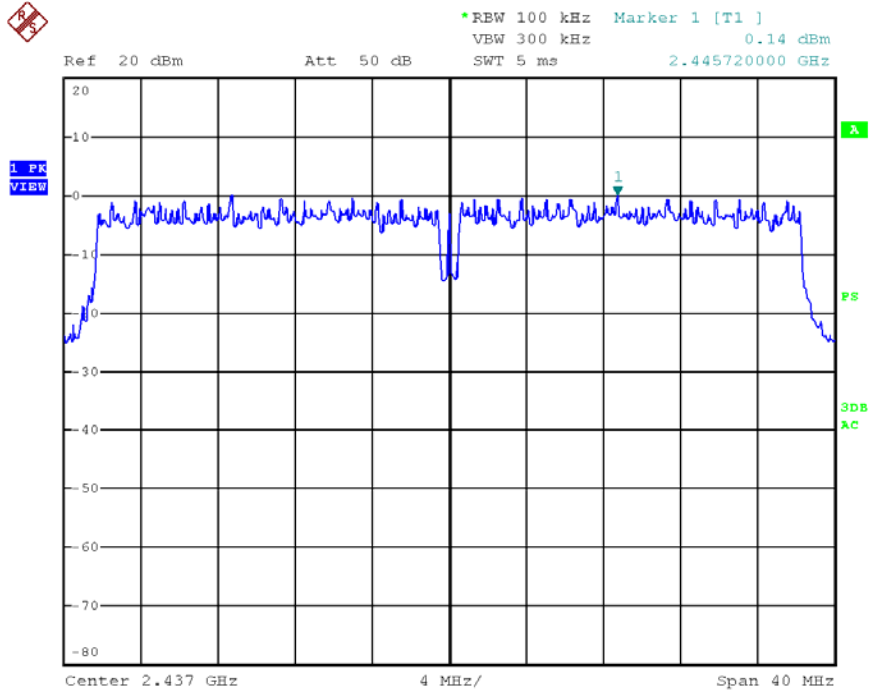
Date: 8.FEB.2012 10:36:41

11ng, HT40, Channel M  
Chain 0-1



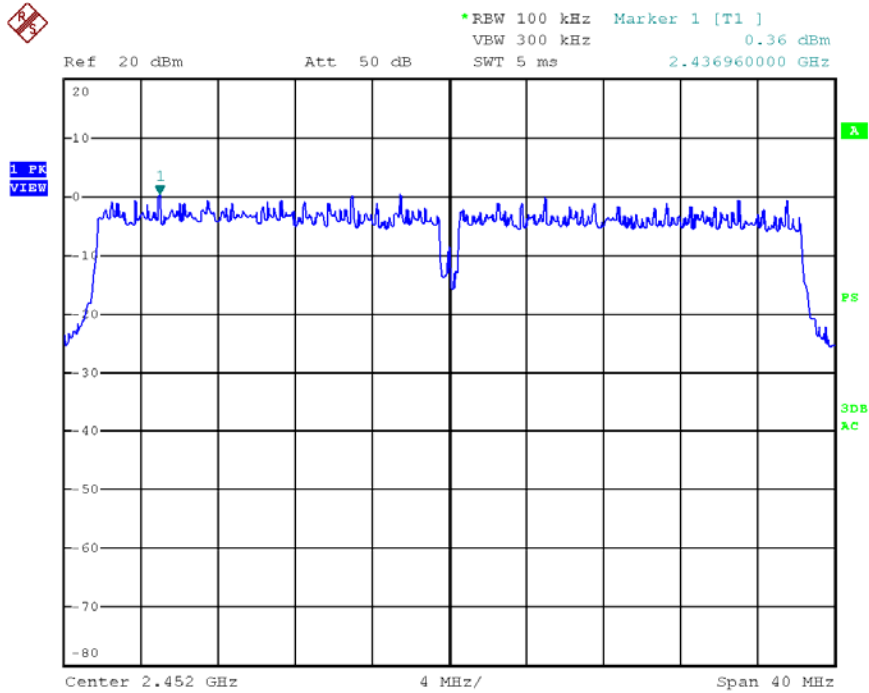
Date: 8.FEB.2012 10:38:31

Chain 0-2



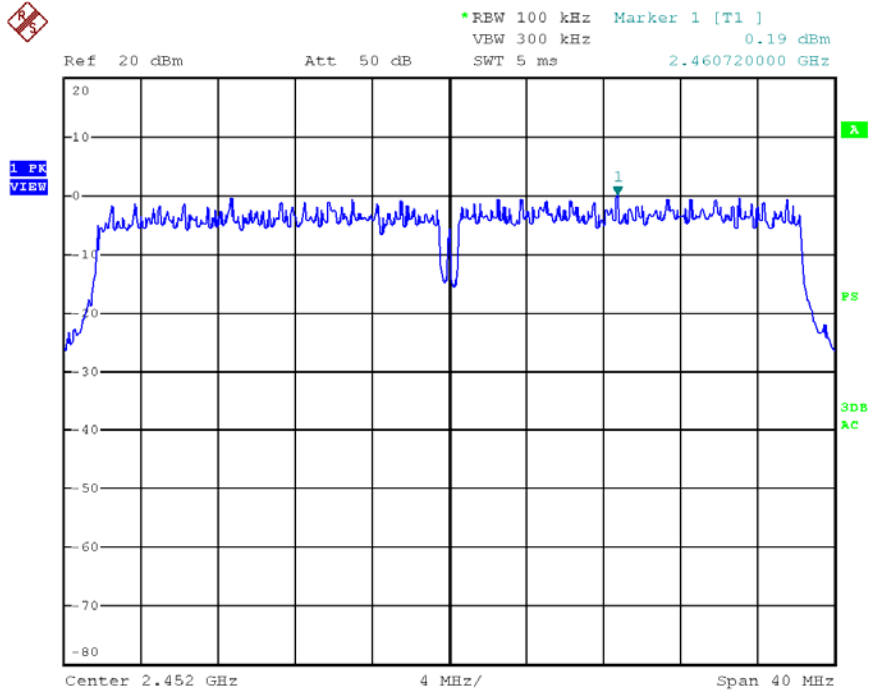
Date: 8.FEB.2012 10:36:21

11ng, HT40, Channel H  
Chain 0-1



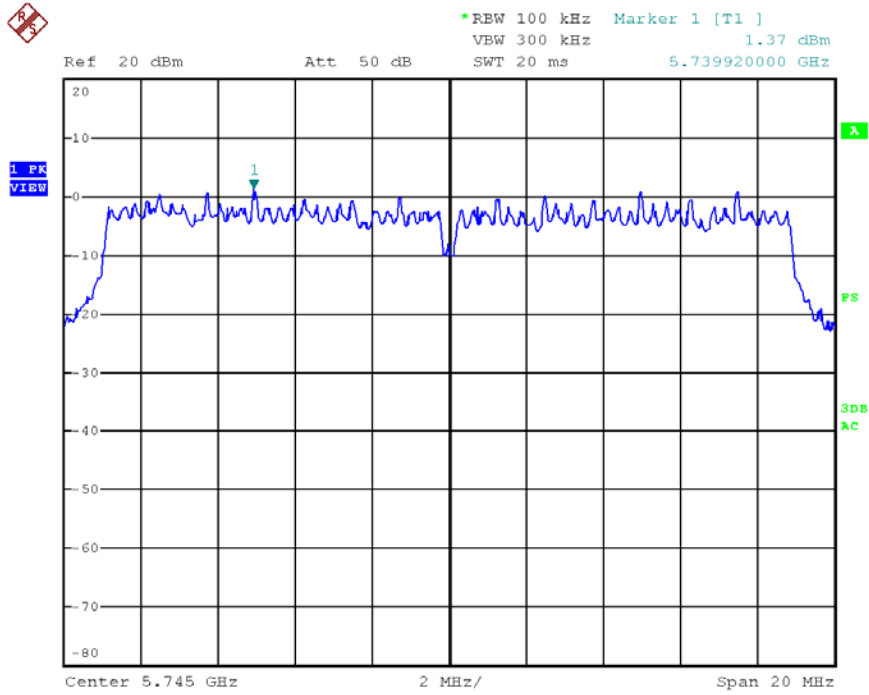
Date: 8.FEB.2012 10:38:51

Chain 0-2



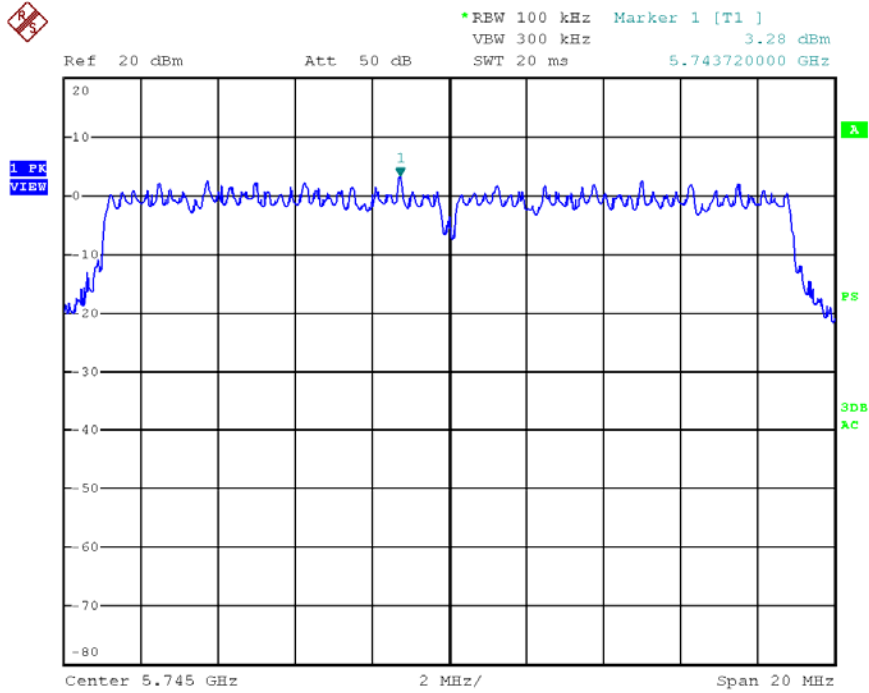
Date: 8.FEB.2012 10:35:54

11na, HT20, Channel L  
Chain 0-1



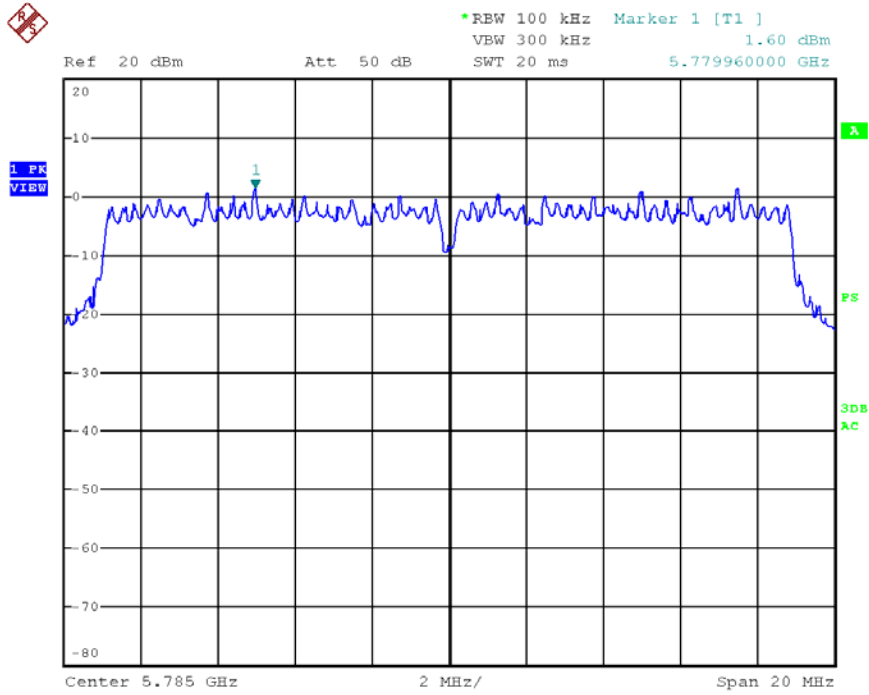
Date: 8.FEB.2012 10:05:25

Chain 0-2



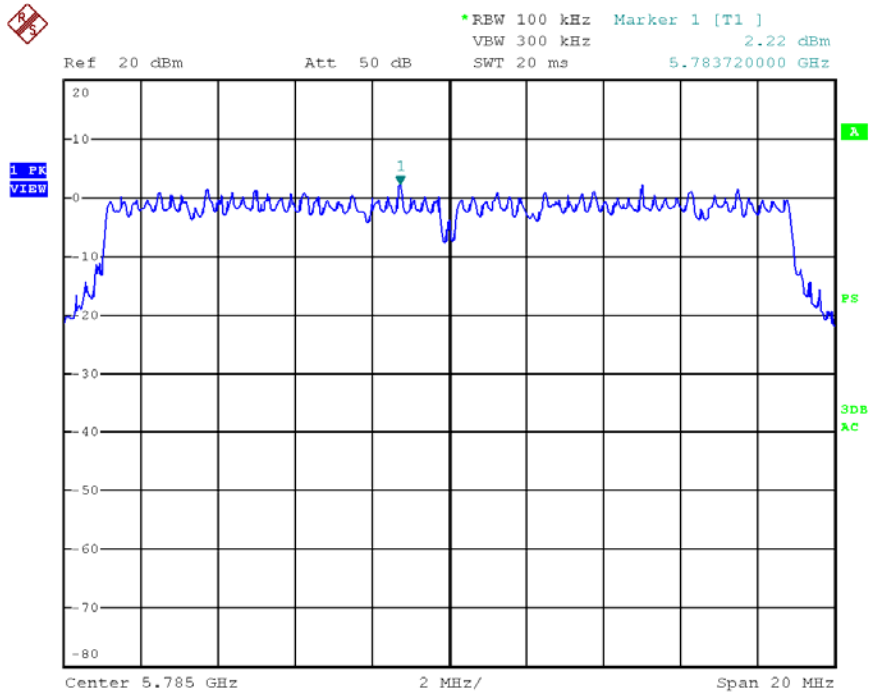
Date: 8.FEB.2012 10:10:18

11na, HT20, Channel M  
Chain 0-1



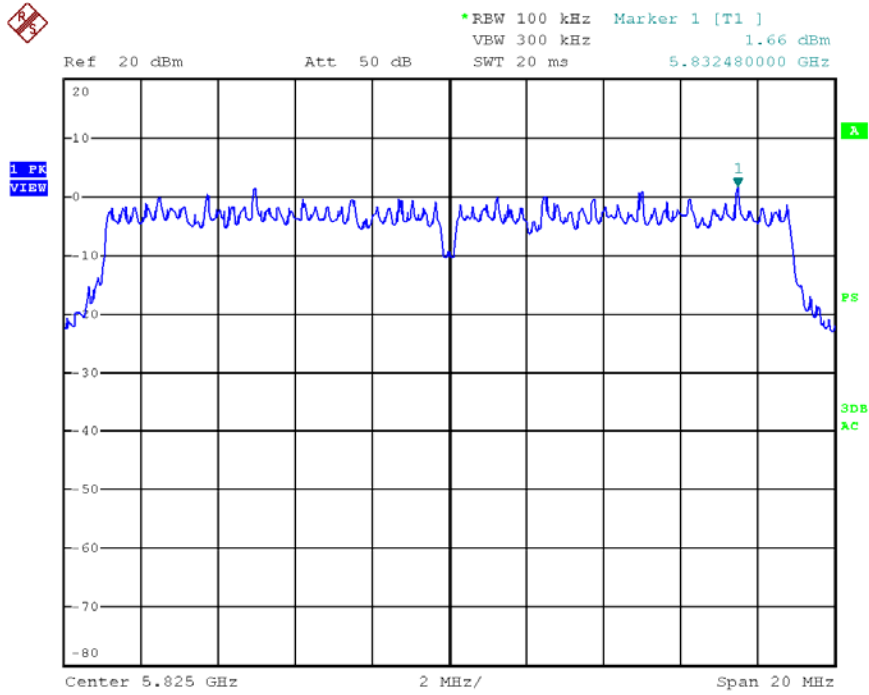
Date: 8.FEB.2012 10:05:53

Chain 0-2



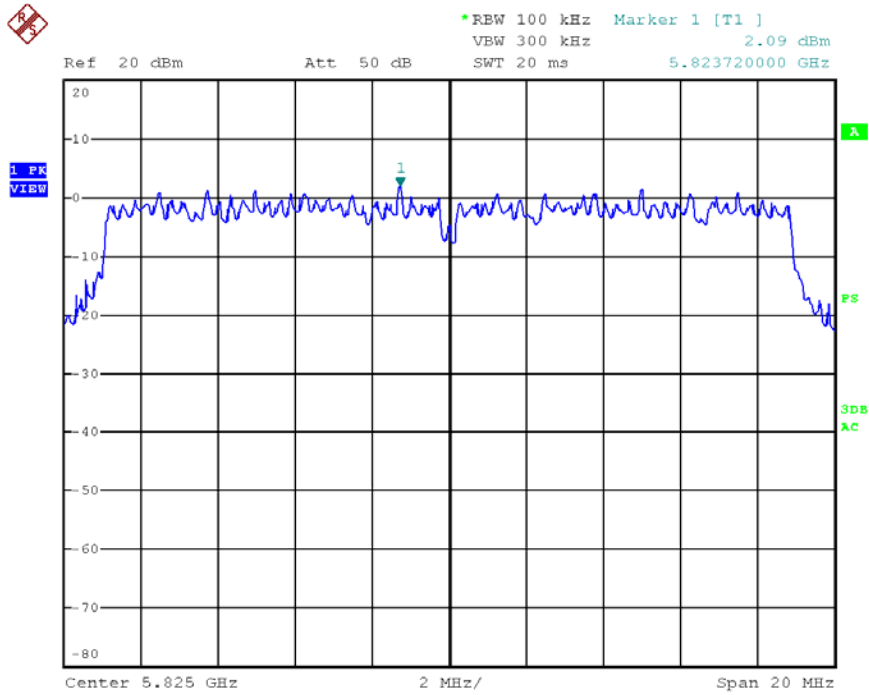
Date: 8.FEB.2012 10:09:44

11na, HT20, Channel H  
Chain 0-1



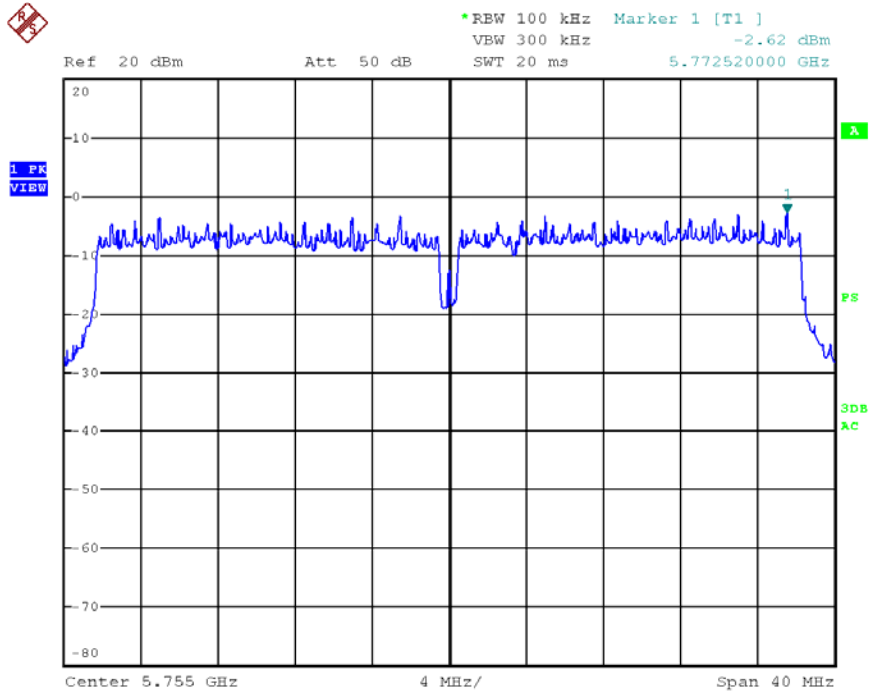
Date: 8.FEB.2012 10:07:09

Chain 0-2



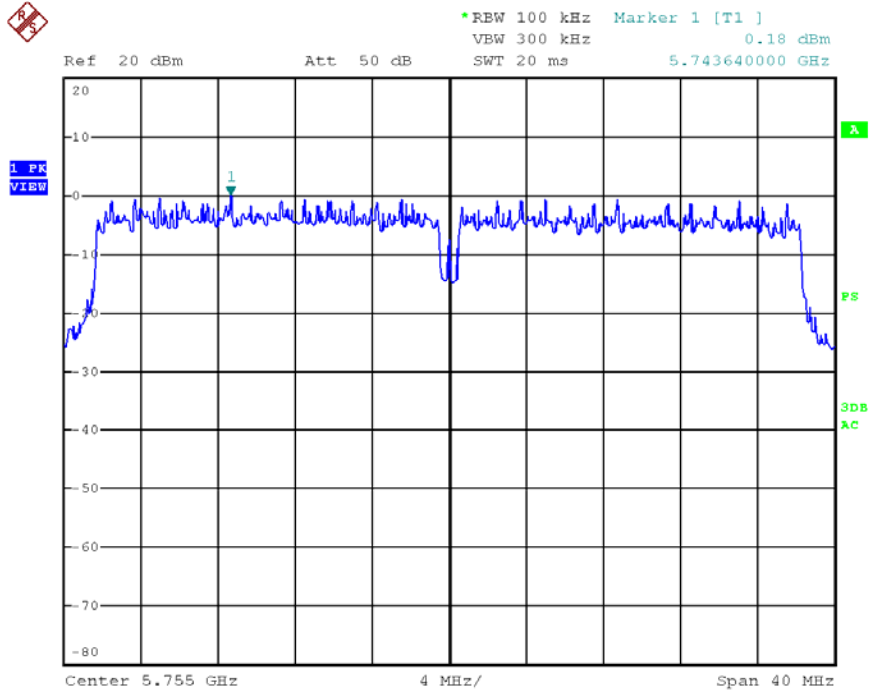
Date: 8.FEB.2012 10:09:15

11na, HT40, Channel L  
Chain 0-1



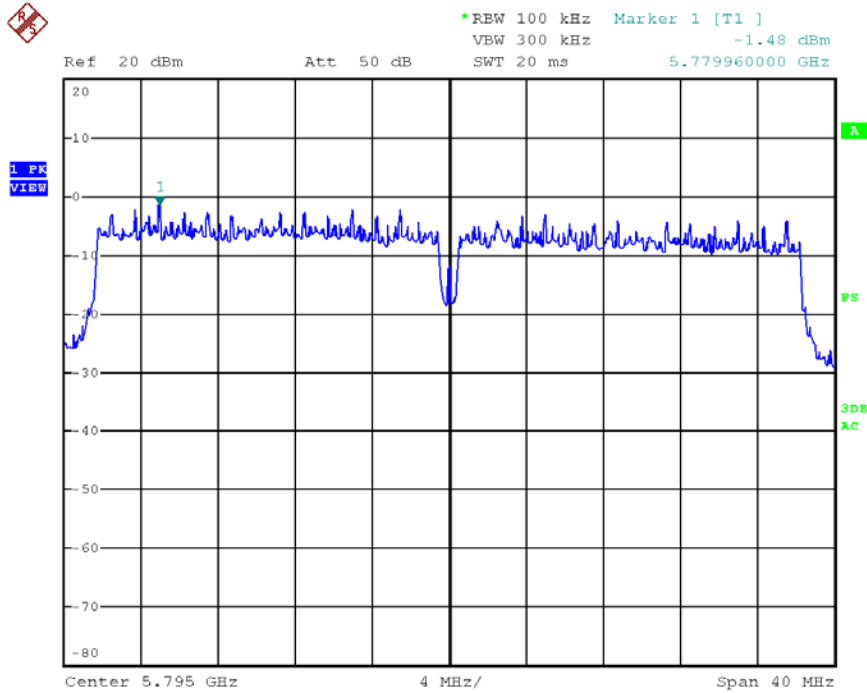
Date: 8.FEB.2012 10:16:00

Chain 0-2



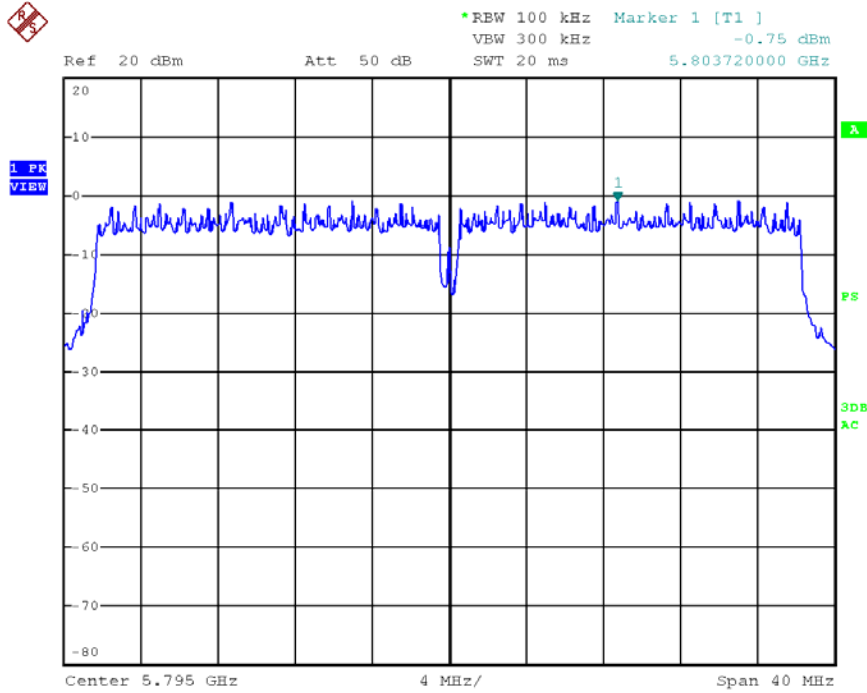
Date: 8.FEB.2012 10:13:30

11na, HT40, Channel H  
Chain 0-1



Date: 8.FEB.2012 10:15:25

Chain 0-2



Date: 8.FEB.2012 10:14:24



## 6. Radiated emission from the EUT Cabinet

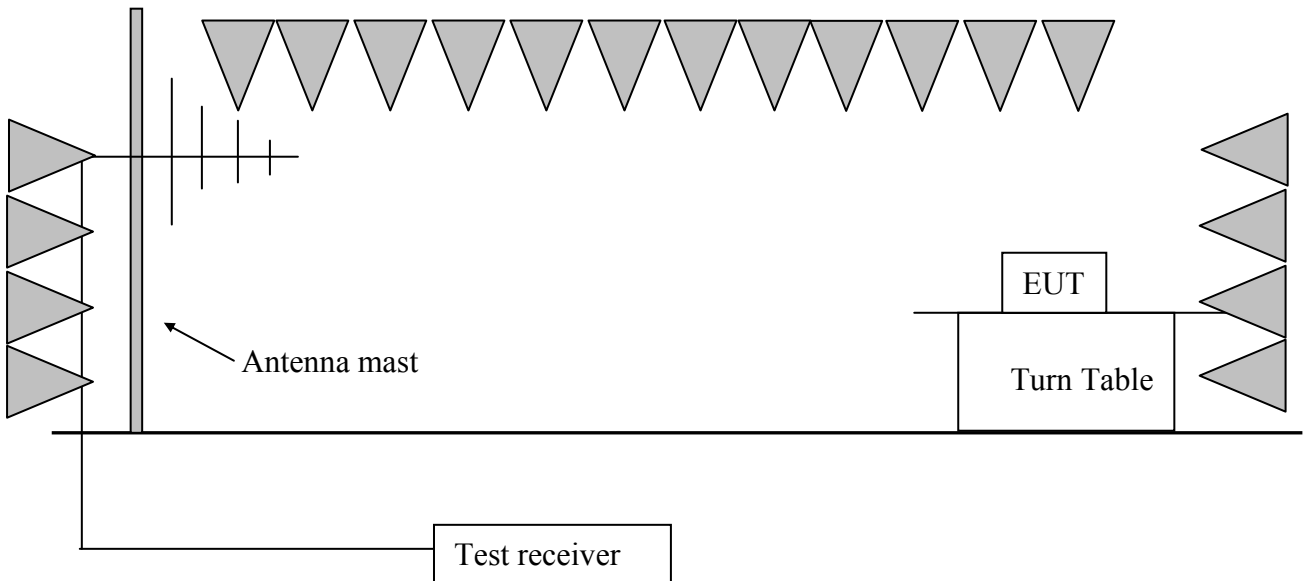
Test result: **PASS**

### 6.1 Test limit

The 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) showed as below:

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

### 6.2 Test Configuration



### 6.3 Test procedure and test setup

The RF output port of EUT is terminated with termination matching the nominal impedance of the antenna.

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to DTS test procedure of KDB558074 D01 DTS “Meas Guidance v01” for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz-1GHz)

RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

### 6.4 Test protocol

Dual chain, 11ng, HT40 mode (which mode with max. 2.4GHz output power):

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2422.13	-7.80	73.30	Fundamental	/	PK
	V	111.64	15.60	34.30	43.50	9.20	PK
	V	125.25	15.10	39.60	43.50	3.90	PK
	H	1705.43	-10.50	48.60	54.00	5.40	PK
	V	2390.00	-7.80	60.40	74.00	13.60	PK
	V	2390.00	-7.80	51.20	54.00	2.80	AV
	V	2483.50	-7.80	44.60	54.00	9.40	PK
	V	4850.16	-2.10	51.30	54.00	2.70	PK
M	V	2443.37	-7.80	73.80	Fundamental	/	PK
	V	111.64	15.60	34.30	43.50	9.20	PK
	V	125.25	15.10	39.60	43.50	3.90	PK
	H	1706.05	-10.50	48.10	54.00	5.90	PK
	V	2390.00	-7.80	44.20	54.00	9.80	PK
	V	2483.50	-7.80	43.90	54.00	10.10	PK
	V	4884.57	-2.10	51.80	54.00	2.20	PK
H	V	2461.70	-7.80	73.60	Fundamental	/	PK
	V	111.64	15.60	34.30	43.50	9.20	PK
	V	125.25	15.10	39.60	43.50	3.90	PK
	H	1705.07	-10.50	48.50	54.00	5.50	PK
	V	2390.00	-7.80	44.00	54.00	10.00	PK
	V	2483.53	-7.80	58.60	74.00	15.40	PK
	V	2483.65	-7.80	50.30	54.00	3.70	AV
	V	4930.26	-2.10	51.70	54.00	2.30	PK

Dual chain, 11na, HT20 mode (which mode with max. 5.8GHz output power):

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	5743.81	0.40	74.50	Fundamental	/	PK
	V	111.64	15.60	34.30	43.50	9.20	PK
	V	125.25	15.10	39.60	43.50	3.90	PK
	H	1704.88	-10.50	48.40	54.00	5.60	PK
	V	2705.44	-7.50	42.60	54.00	11.40	PK
	H	4513.87	-2.90	43.10	54.00	10.90	PK
	V	11450.13	12.90	56.20	74.00	17.80	PK
	V	11449.56	12.90	49.80	54.00	4.20	AV
M	V	5782.29	0.60	74.10	Fundamental	/	PK
	V	111.64	15.60	34.30	43.50	9.20	PK
	V	125.25	15.10	39.60	43.50	3.90	PK
	H	1705.06	-10.50	49.10	54.00	4.90	PK
	V	2705.86	-7.50	42.50	54.00	11.50	PK
	H	4513.87	-2.90	43.30	54.00	10.70	PK
	V	11566.32	13.30	55.80	74.00	18.20	PK
	V	11566.60	13.30	49.30	54.00	4.70	AV
H	V	5820.53	0.60	74.40	Fundamental	/	PK
	V	111.64	15.60	34.30	43.50	9.20	PK
	V	125.25	15.10	39.60	43.50	3.90	PK
	H	1705.92	-10.50	48.90	54.00	5.10	PK
	V	2705.62	-7.50	42.30	54.00	11.70	PK
	H	4513.87	-2.90	43.60	54.00	10.40	PK
	V	11645.19	13.70	56.10	74.00	17.90	PK
	V	11644.85	13.70	49.50	54.00	4.50	AV



- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)  
2. Corrected Reading = Original Receiver Reading + Correct Factor  
3. Margin = limit – Corrected Reading  
4. If the PK reading is lower than AV limit, the AV test can be elided.

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

## 7. Unwanted Emissions per Antenna-Port Conducted Measurements

Test result: **PASS**

### 7.1 Test limit

The unwanted emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the limits specified in §15.209(a) showed as below:

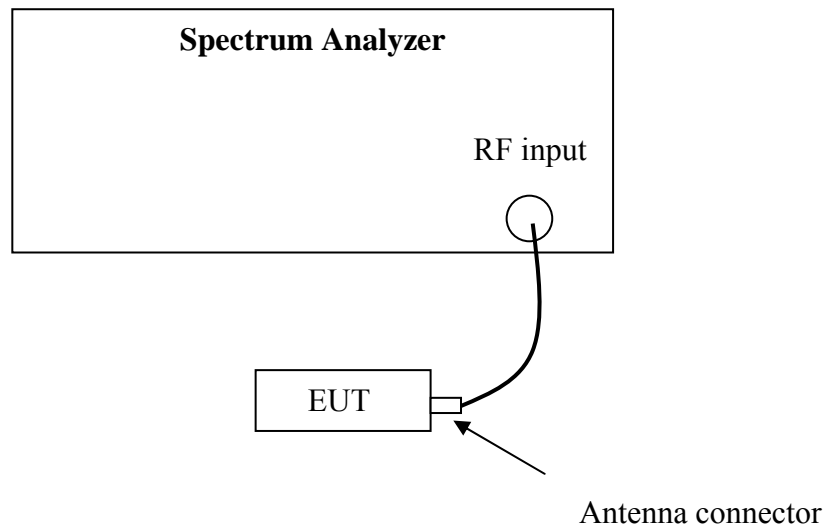
Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

The correspondent EIRP level can be determined from the following relationship:  
 $EIRP = E + 20\log(d) - 104.8$

Then the unwanted emissions which fall in the restricted bands should comply with the EIRP limits as below:

Frequency (MHz)	EIRP (dBm)
30 - 88	-55.20
88 - 216	-51.70
216 - 960	-49.20
Above 960	-41.20 (AV)
Above 960	-21.20 (PK)

## 7.2 Test Configuration



## 7.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of KDB558074 D01 DTS “Meas Guidance v01” for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with setting as:

RBW = 100kHz, VBW = 300kHz (30MHz-1GHz) or QP detector

RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

RBW = 1MHz, VBW = 3MHz, Trace Averaging (>1GHz for AV);

### 7.4 Test protocol

Dual chain, 11ng, HT40 mode (which mode with max. 2.4GHz output power):

CH	Freq (MHz)	Antenna-Port (dBm)	Factor (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Method
L	165.35	-76.90	22.70	-54.20	-51.70	2.50	QP
	610.22	-75.40	22.70	-52.70	-49.20	3.50	QP
	2215.94	-58.70	18.00	-40.70	-21.20	19.50	PK
	2215.91	-67.10	18.00	-49.10	-41.20	7.90	AV
	2390.00	-50.60	18.00	-32.60	-21.20	11.40	PK
	2390.00	-62.30	18.00	-44.30	-41.20	3.10	AV
	2483.50	-58.50	18.00	-40.50	-21.20	19.30	PK
	2483.50	-67.50	18.00	-49.50	-41.20	8.30	PK
	4852.62	-49.20	18.00	-31.20	-21.20	10.00	PK
	4851.81	-61.80	18.00	-43.80	-41.20	2.60	AV
M	165.73	-77.30	22.70	-54.60	-51.70	2.90	QP
	250.45	-76.60	22.70	-53.90	-49.20	4.70	QP
	2224.97	-59.60	18.00	-41.60	-21.20	20.40	PK
	2224.36	-68.30	18.00	-50.30	-41.20	9.10	AV
	2390.00	-59.20	18.00	-41.20	-21.20	20.00	PK
	2390.00	-67.60	18.00	-49.60	-41.20	8.40	AV
	2483.50	-59.50	18.00	-41.50	-21.20	20.30	PK
	2483.50	-68.20	18.00	-50.20	-41.20	9.00	AV
	4885.70	-48.90	18.00	-30.90	-21.20	9.70	PK
	4884.04	-61.40	18.00	-43.40	-41.20	2.20	PK
H	165.33	-76.80	22.70	-54.10	-51.70	2.40	QP
	610.25	-76.20	22.70	-53.50	-49.20	4.30	QP
	2250.56	-59.30	18.00	-41.30	-21.20	20.10	PK
	2250.42	-68.40	18.00	-50.40	-41.20	9.20	AV
	2390.00	-59.50	18.00	-41.50	-21.20	20.30	PK
	2390.00	-68.10	18.00	-50.10	-41.20	8.90	AV



	2483.53	-51.20	18.00	-33.20	-21.20	12.00	PK
	2483.65	-62.40	18.00	-44.40	-41.20	3.20	AV
	4932.37	-49.30	18.00	-31.30	-21.20	10.10	PK
	4931.44	-61.70	18.00	-43.70	-41.20	2.50	AV

- Note: 1. For all frequencies, the factor is the maximum gain of all applied antenna. For dual chain mode, the gain of MIMO antenna is calculated as gain of single chain +3dB.  
 2. For 30MHz < frequency ≤ 1GHz, the ground reflections factor is 4.70dB as KDB558074 D01 DTS “Meas Guidance v01” showing. The total factor is 4.70dB + 18dBi = 22.70dBi.  
 3. EIRP = Antenna-Port + factor, Margin = limit - EIRP

Dual chain, 11na, HT20 mode (which mode with max. 5.8GHz output power):

CH	Freq (MHz)	Antenna-Port (dBm)	Factor (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Method
L	165.42	-77.90	22.70	-55.20	-51.70	3.50	QP
	252.36	-76.10	22.70	-53.40	-49.20	4.20	QP
	400.00	-76.80	22.70	-54.10	-49.20	4.90	QP
	981.30	-72.30	22.70	-49.60	-41.20	8.40	QP
	5460.00	-57.70	18.00	-39.70	-21.20	18.50	PK
	5460.00	-68.40	18.00	-50.40	-41.20	9.20	AV
	11451.36	-47.50	18.00	-29.50	-21.20	8.30	PK
	11451.36	-60.60	18.00	-42.60	-41.20	1.40	AV
M	165.40	-77.20	22.70	-54.50	-51.70	2.80	QP
	262.75	-75.50	22.70	-52.80	-49.20	3.60	QP
	400.00	-76.80	22.70	-54.10	-49.20	4.90	QP
	985.03	-73.00	22.70	-50.30	-41.20	9.10	QP
	5460.00	-57.60	18.00	-39.60	-21.20	18.40	PK
	5460.00	-68.20	18.00	-50.20	-41.20	9.00	AV
	11562.16	-47.80	18.00	-29.80	-21.20	8.60	PK
	11563.77	-60.90	18.00	-42.90	-41.20	1.70	AV
H	171.29	-78.20	22.70	-55.50	-51.70	3.80	QP

	255.46	-78.60	22.70	-55.90	-49.20	6.70	QP
	400.00	-76.40	22.70	-53.70	-49.20	4.50	QP
	985.65	-72.70	22.70	-50.00	-41.20	8.80	QP
	5460.00	-57.90	18.00	-39.90	-21.20	18.70	PK
	5460.00	-68.20	18.00	-50.20	-41.20	9.00	AV
	11646.81	-47.90	18.00	-29.90	-21.20	8.70	PK
	11643.58	-60.70	18.00	-42.70	-41.20	1.50	AV

- Note: 1. For all frequencies, the factor is the maximum gain of all applied antenna. For dual chain mode, the gain of MIMO antenna is calculated as gain of single chain +3dB.
2. For  $30\text{MHz} < \text{frequency} \leq 1\text{GHz}$ , the ground reflections factor is 4.70dB as KDB558074 D01 DTS "Meas Guidance v01" showing. The total factor is 4.70dB + 18dBi = 22.70dBi.
3.  $\text{EIRP} = \text{Antenna-Port} + \text{factor}$ ,  $\text{Margin} = \text{limit} - \text{EIRP}$

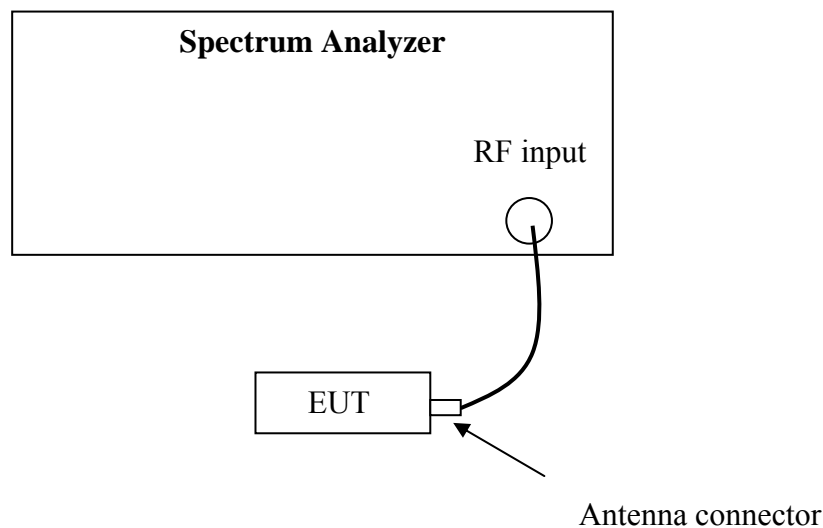
## 8. Emission outside the frequency Band

Test result: PASS

### 8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

### 8.2 Test Configuration



### 8.3 Test procedure and test setup

The Emission outside the frequency Band per FCC §15.247(d) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v01” for compliance to FCC 47CFR 15.247 requirements.

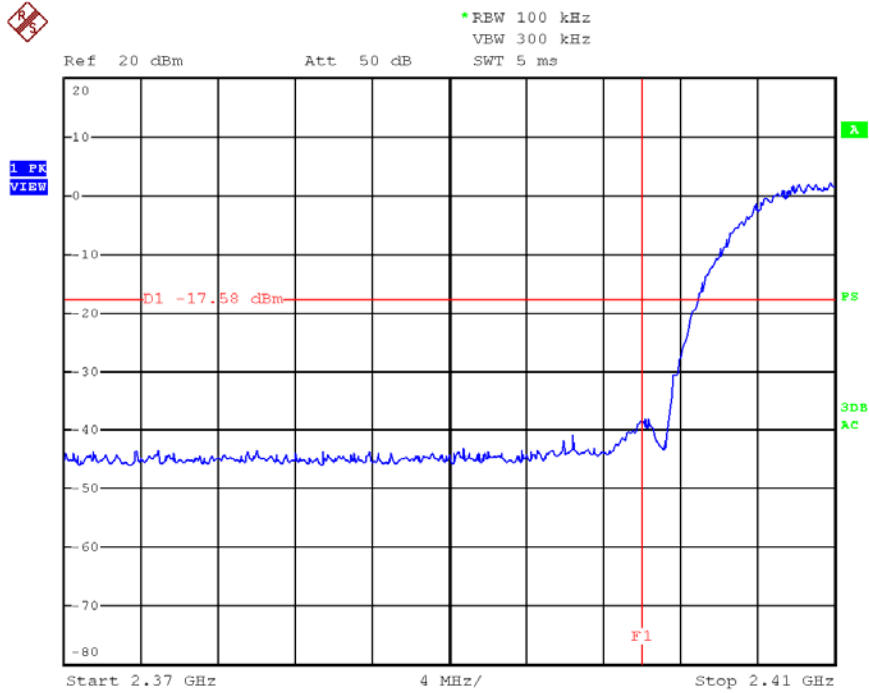
### 8.4 Test protocol

#### Single Chain

Mode	CH	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
11a	L	0.76	42.92	≥20
	M	0.91	43.26	
	H	0.47	43.04	
11b	L	2.42	41.65	
	M	3.13	42.21	
	H	2.56	41.53	
11g	L	2.40	29.28	
	M	2.21	42.97	
	H	1.90	42.11	
11ng, HT20	L	2.26	28.53	
	M	2.17	42.38	
	H	1.79	41.60	
11ng, HT40	L	-0.12	28.24	
	M	-0.46	40.39	
	H	-0.57	38.97	
11na, HT20	L	0.92	40.81	
	M	0.87	40.66	
	H	0.46	40.66	
11na, HT40	L	-3.77	38.63	
	H	-2.06	39.34	

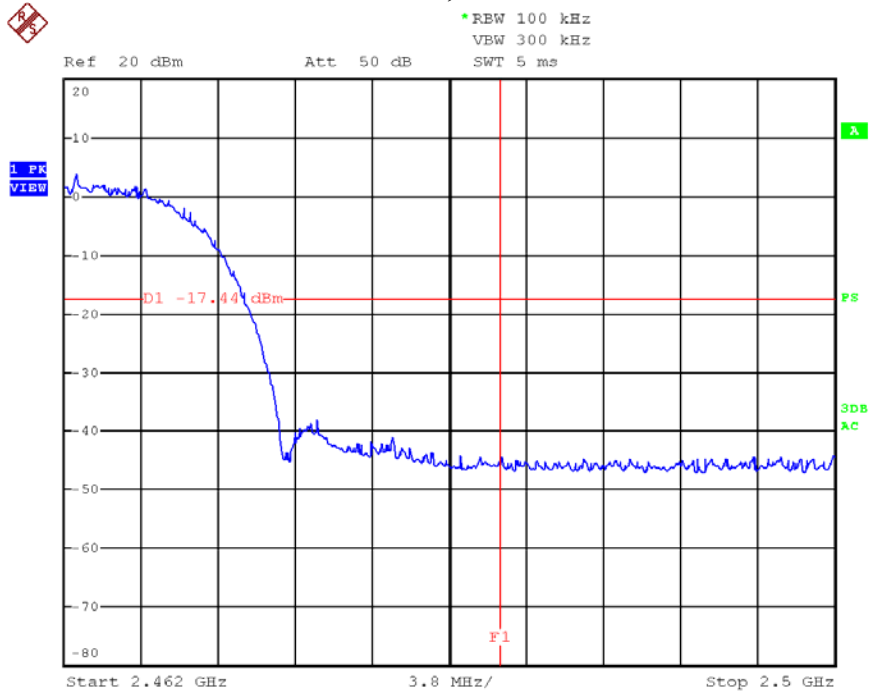
Note: the test data for band edge is listed below:

### 11b, Channel L



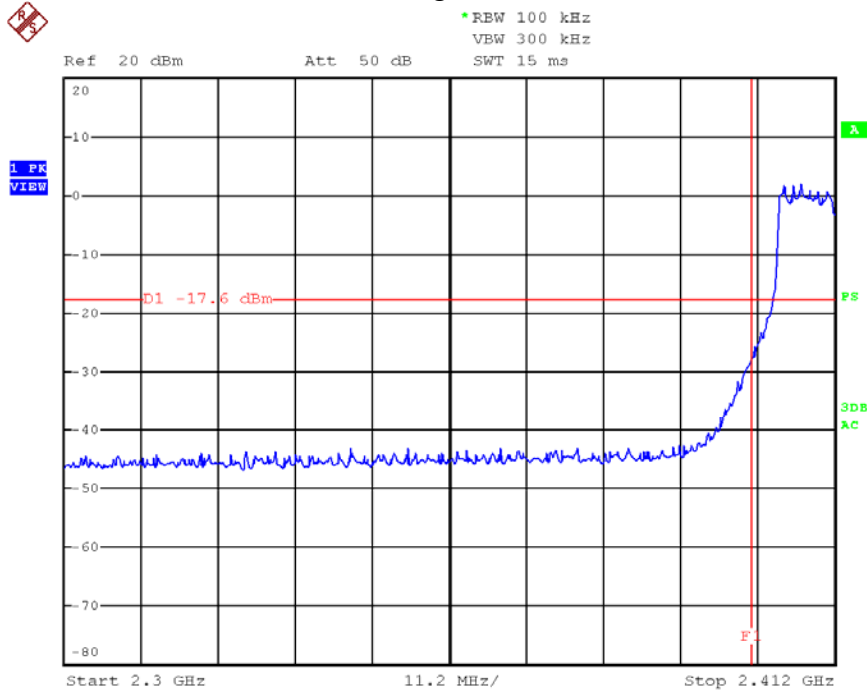
Date: 8.FEB.2012 10:55:40

### 11b, Channel H



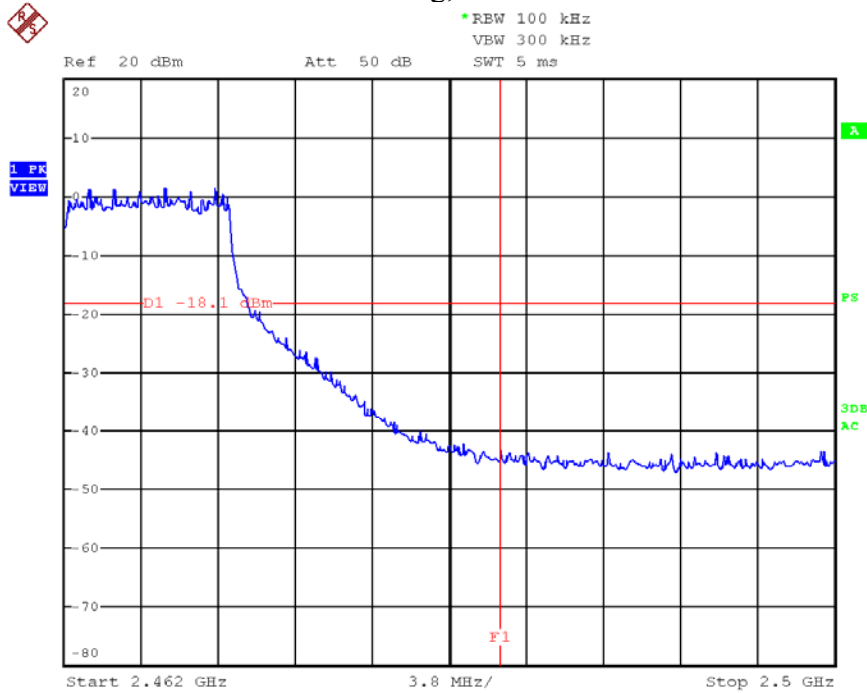
Date: 8.FEB.2012 10:57:03

### 11g, Channel L



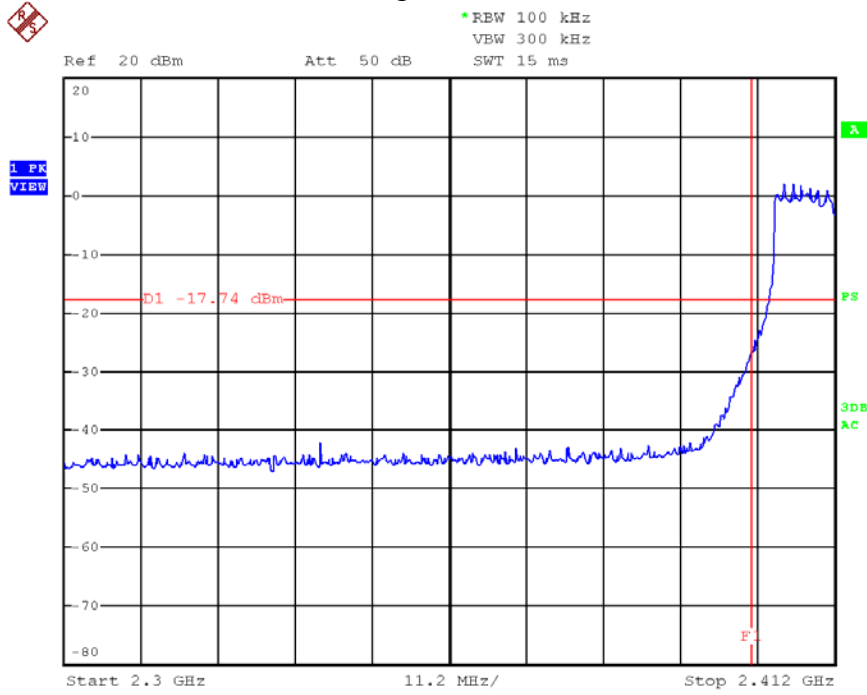
Date: 9.FEB.2012 14:47:30

### 11g, Channel H



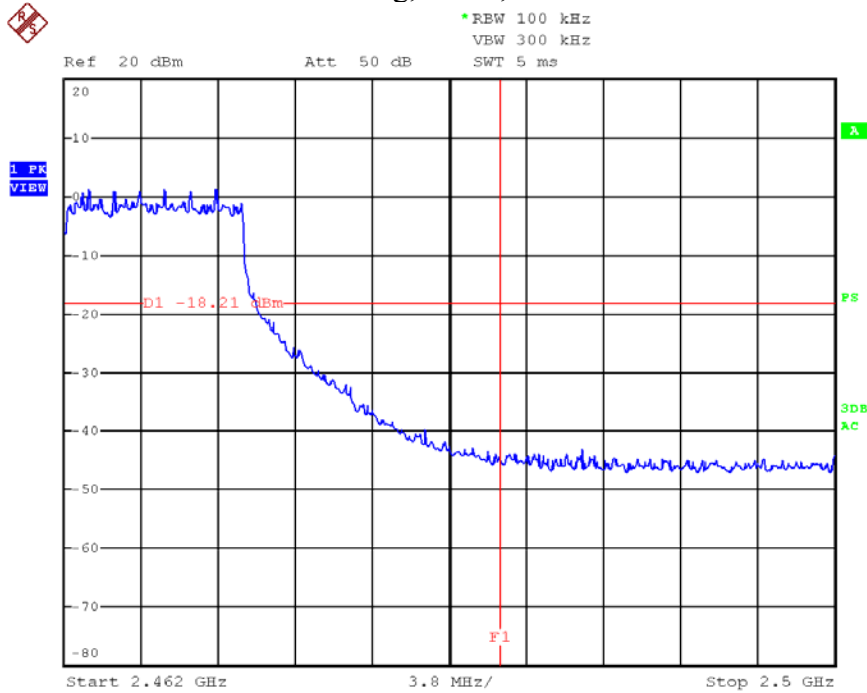
Date: 9.FEB.2012 14:49:09

11ng, HT20, Channel L



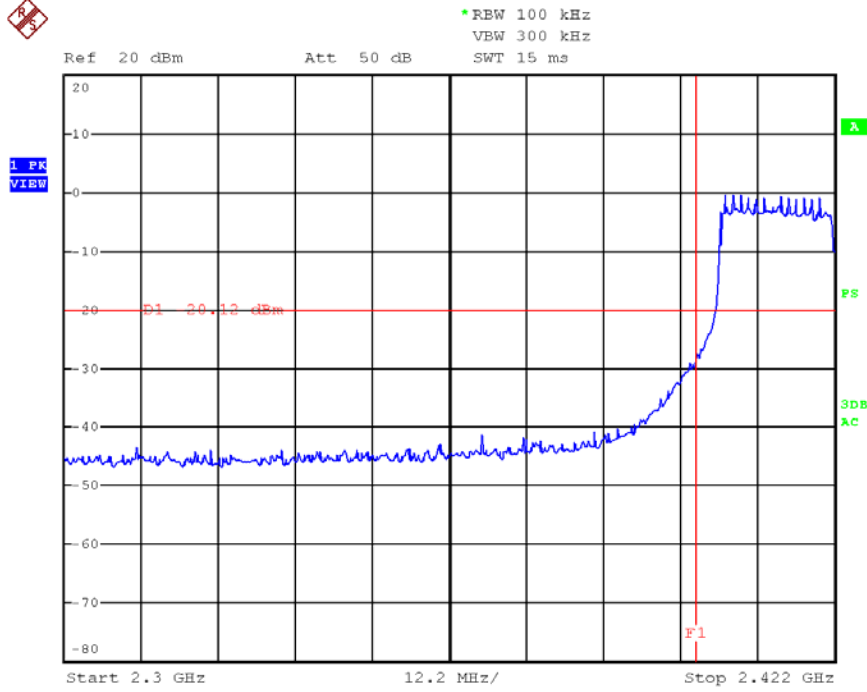
Date: 9.FEB.2012 14:54:18

11ng, HT20, Channel H



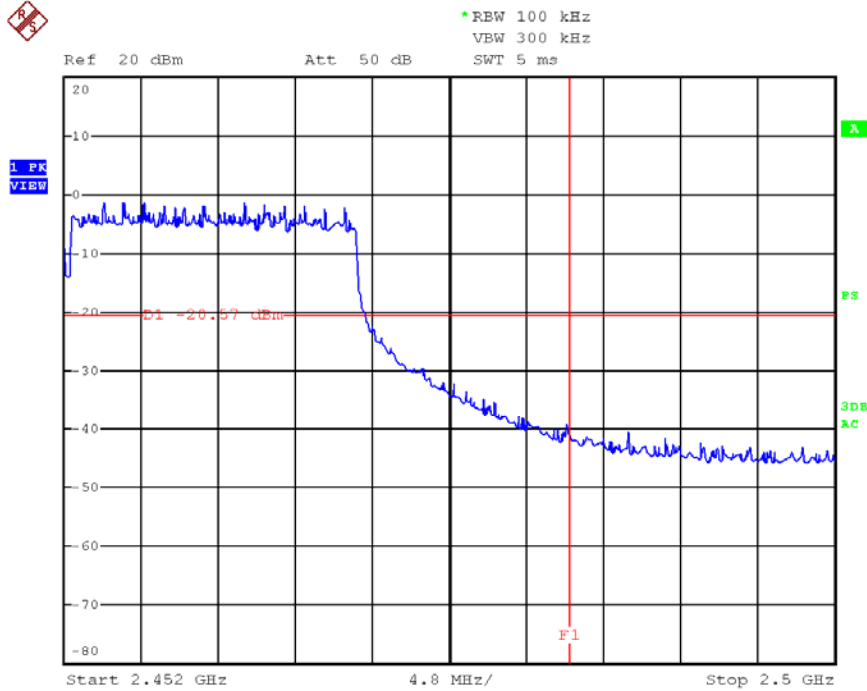
Date: 9.FEB.2012 14:52:59

11ng, HT40, Channel L



Date: 9.FEB.2012 15:16:39

11ng, HT40, Channel H



Date: 9.FEB.2012 15:15:21

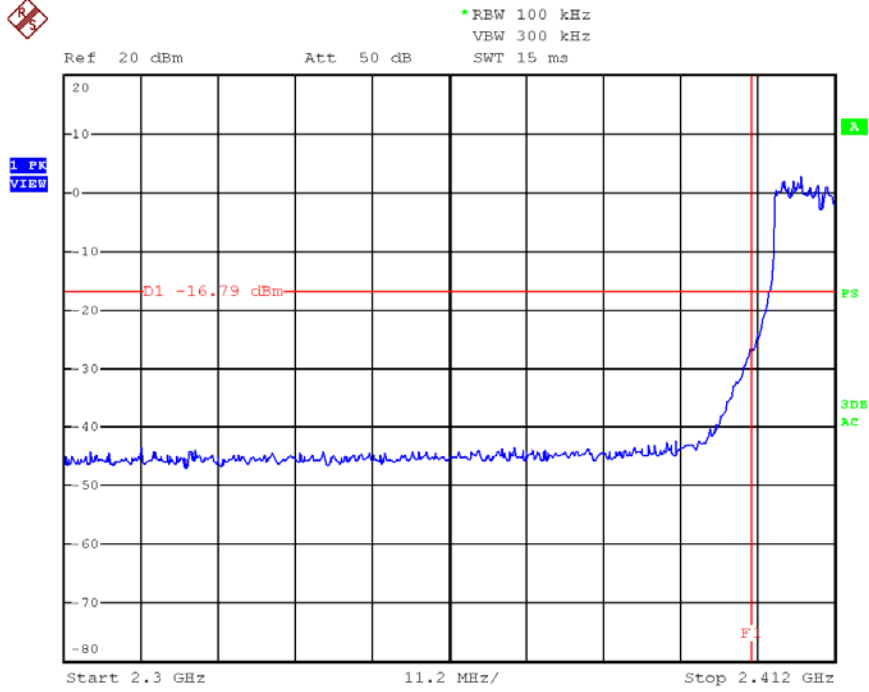


**Dual Chain, Chain 0-1**

Mode	CH	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
11ng, HT20	L	3.21	28.83	≥20
	M	3.10	43.66	
	H	2.83	43.18	
11ng, HT40	L	0.48	28.06	
	M	0.49	41.39	
	H	0.36	40.27	
11na, HT20	L	1.37	41.73	
	M	1.60	41.66	
	H	1.66	42.04	
11na, HT40	L	-2.62	41.11	
	H	-1.48	40.25	

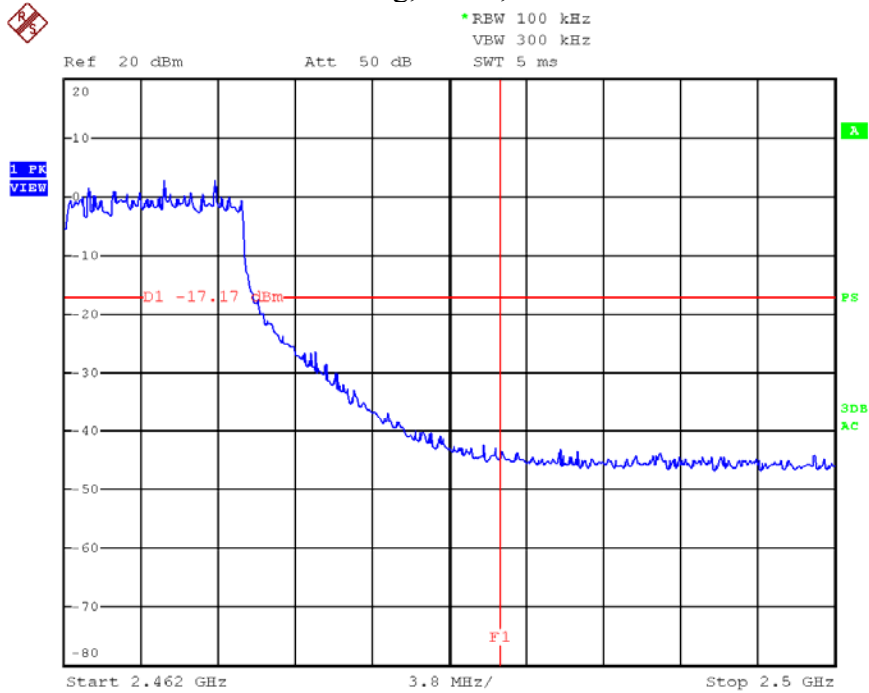
Note: the test data for band edge is listed below:

11ng, HT20, Channel L



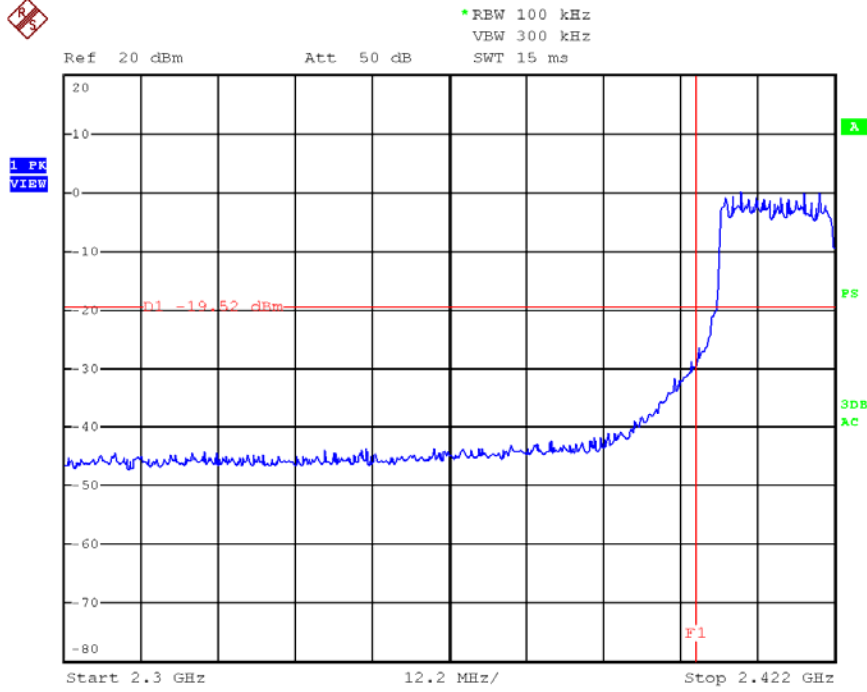
Date: 9.FEB.2012 14:55:44

11ng, HT20, Channel H



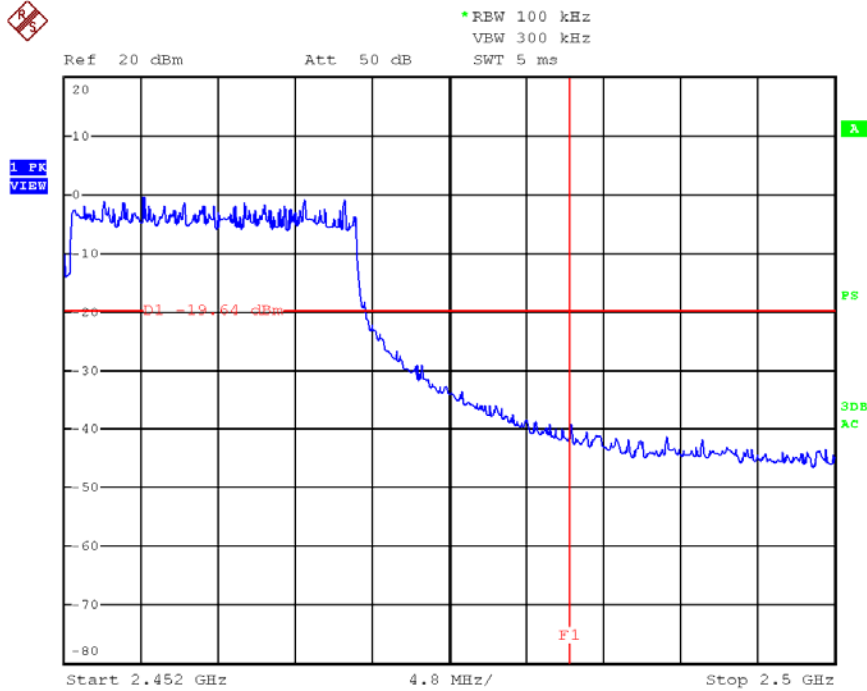
Date: 9.FEB.2012 14:57:09

11ng, HT40, Channel L



Date: 9.FEB.2012 15:12:58

11ng, HT40, Channel H



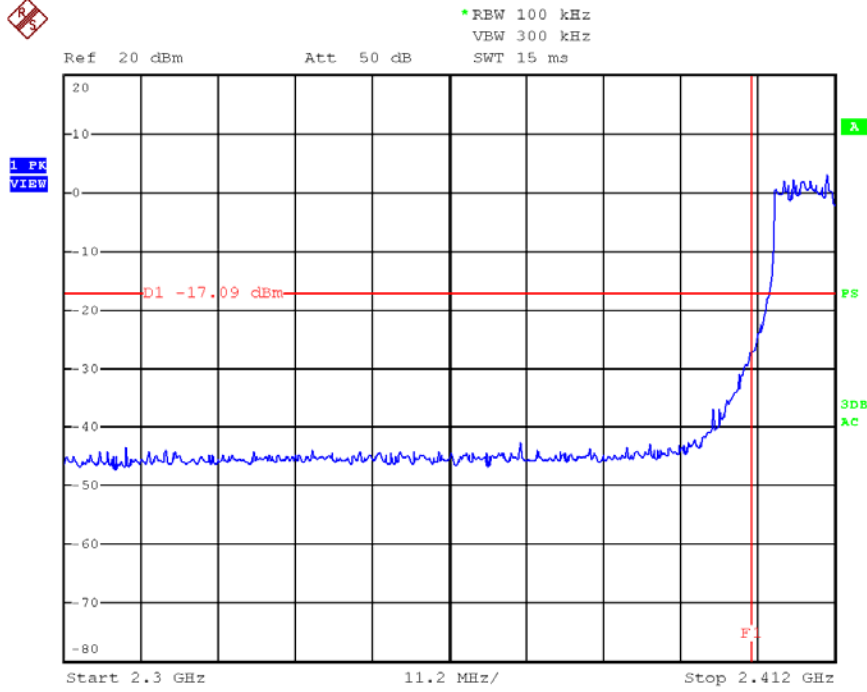
Date: 9.FEB.2012 15:13:52

**Dual Chain, Chain 0-2**

Mode	CH	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
11ng, HT20	L	2.91	28.32	≥20
	M	2.61	41.64	
	H	2.65	42.09	
11ng, HT40	L	0.81	28.81	
	M	0.14	41.17	
	H	0.19	35.90	
11na, HT20	L	3.28	42.24	
	M	2.22	42.58	
	H	2.09	41.71	
11na, HT40	L	0.18	40.98	
	H	-0.75	40.26	

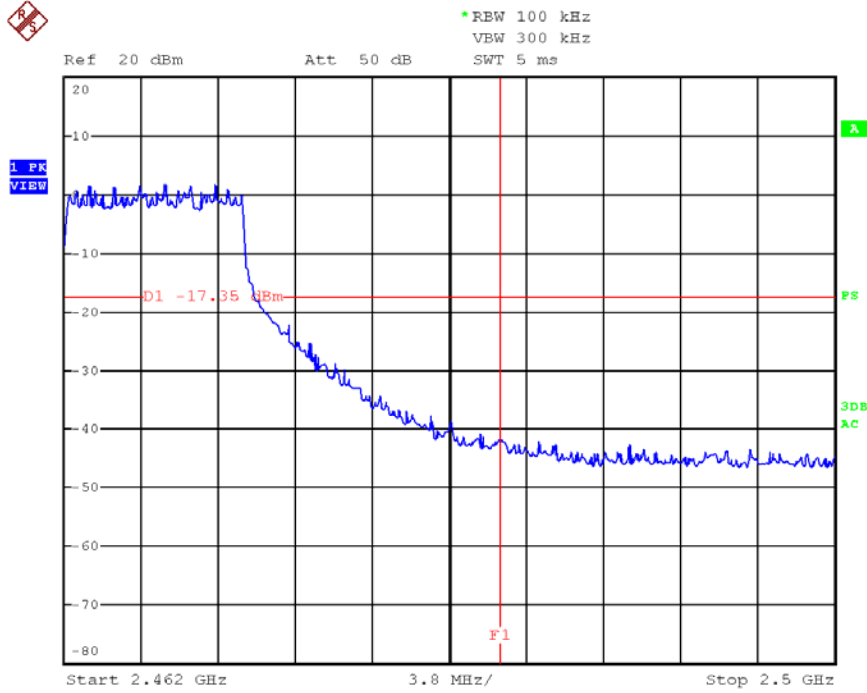
Note: the test data for band edge is listed below:

11ng, HT20, Channel L



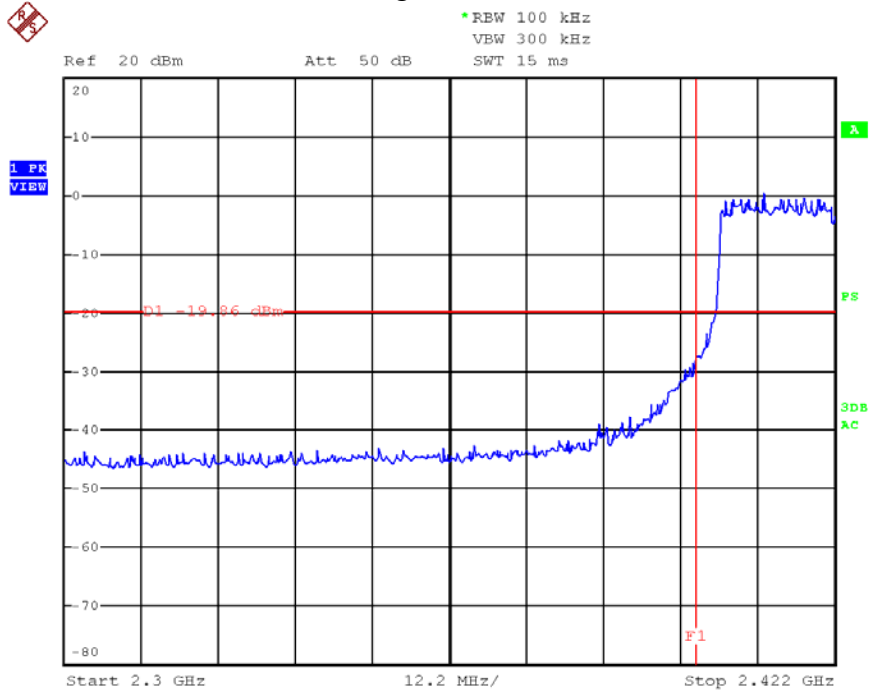
Date: 9.FEB.2012 15:00:19

11ng, HT20, Channel H



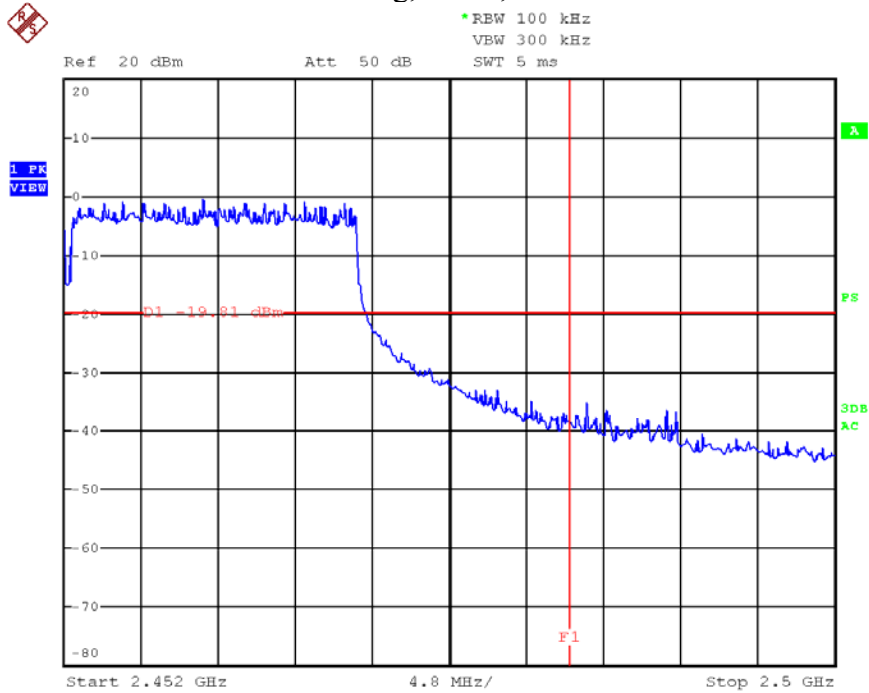
Date: 9.FEB.2012 14:59:08

11ng, HT40, Channel L



Date: 9.FEB.2012 15:06:05

11ng, HT40, Channel H



Date: 9.FEB.2012 15:07:54

## 9. Power line conducted emission

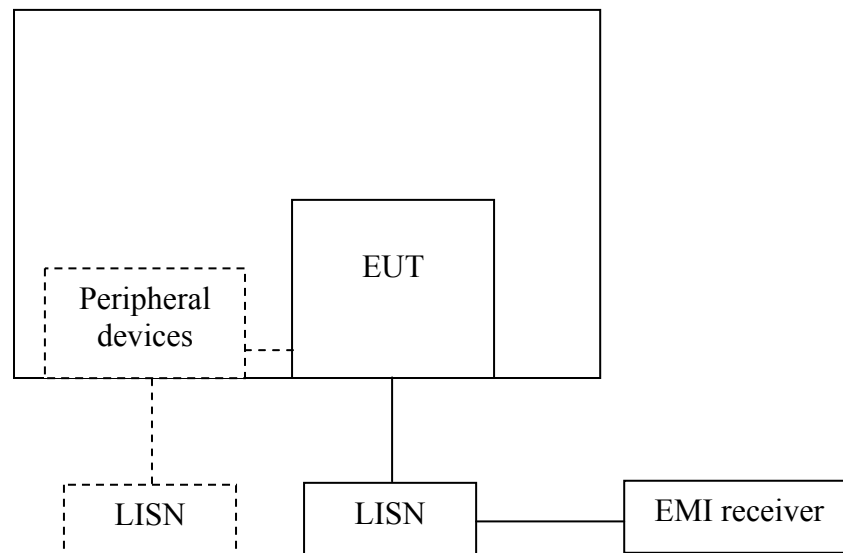
Test result: Pass

### 9.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### 9.2 Test configuration



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

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

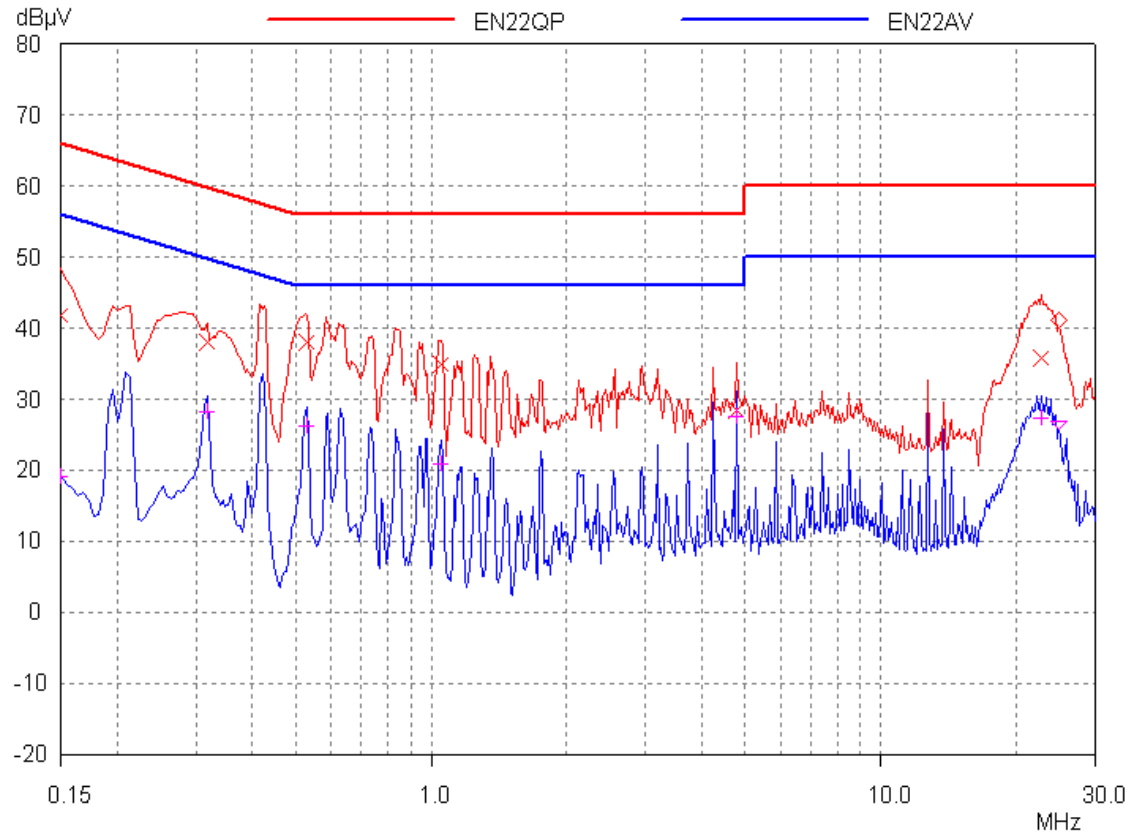
### **9.3 Test procedure and test set up**

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a  $50\Omega/50\mu\text{H}$  coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a  $50\Omega/50\mu\text{H}$  coupling impedance with  $50\Omega$  termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement. The bandwidth of the test receiver is set at 9 kHz.



### 9.4 Test protocol



Frequency	Level (dBuV)		Limit (dBuV)		Margin (dB)	
	QP	AV	QP	AV	QP	AV
0.15 (N)	41.86	19.09	66.00	56.00	24.14	36.91
0.32 (L)	38.06	28.28	59.80	49.80	21.74	21.52
0.53 (N)	38.06	26.12	56.00	46.00	17.94	19.88
1.05 (L)	34.88	20.88	56.00	46.00	21.12	25.12
4.75 (L)	28.55	27.49	56.00	46.00	27.45	18.51
22.65 (N)	35.81	27.23	60.00	50.00	24.19	22.77

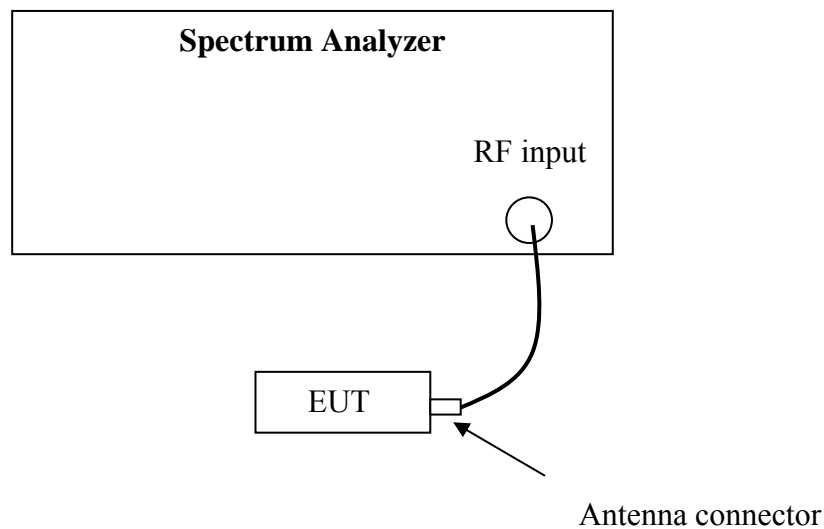
## 10. Channel Number of hopping system

Test result: NA

### 10.1 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 10.2 Test Configuration



### 10.3 Test procedure and test setup

The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.

The RF passband of the EUT was divided into 3 appropriate bands to test.

### 10.4 Test protocol

Channel Number	Limit
-	$\geq 15$

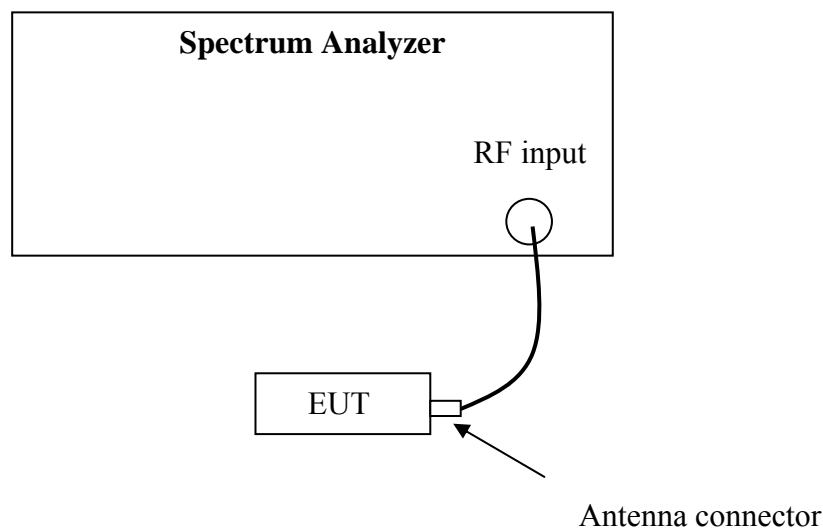
## 11. Average time of occupancy in any channel

**Test result:** NA

### 11.1 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 11.2 Test Configuration



### 11.3 Test procedure and test setup

Average time of occupancy in any channel per FCC § 15.247(a)(1)(iii) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN set to be 0Hz to test in time domain. The test is performed at the middle channel.

### 11.4 Test protocol

Packet	Observed period (s) <b>P</b>	Time of occupancy for single hopping (ms) <b>O</b>	Hops among the interval of 3.6 s <b>I</b>	Average time of occupancy (s) <b>T</b>	Limit (s)
Packet Type 4	-	-	-	-	≤0.4
Packet Type 11	-	-	-	-	≤0.4
Packet Type 15	-	-	-	-	≤0.4

Remark: 1. There are 79 channels in all. So the observed period  $P = 0.4 * 79 = 31.6$  s.  
2. Average time of occupancy  $T = O * I * P / 3.6$

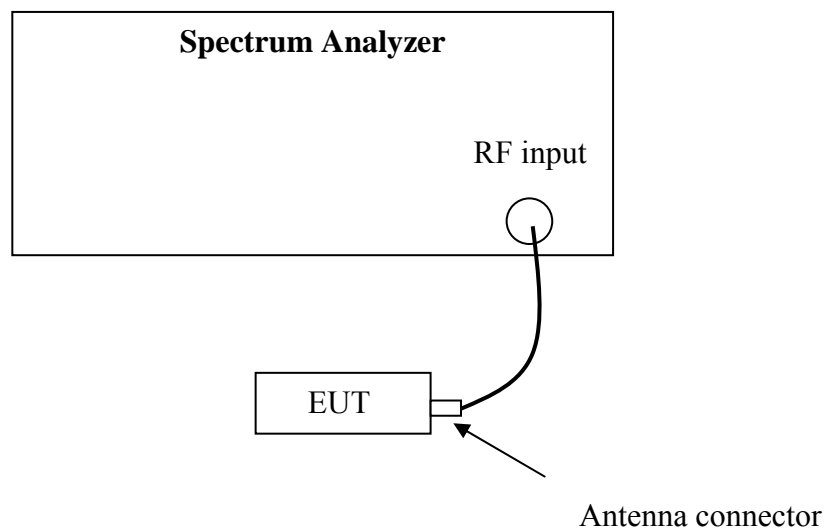
## 12. Occupied Bandwidth

Test Status: Tested

### 12.1 Test limit

None

### 12.2 Test Configuration



### 12.3 Test procedure and test setup

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

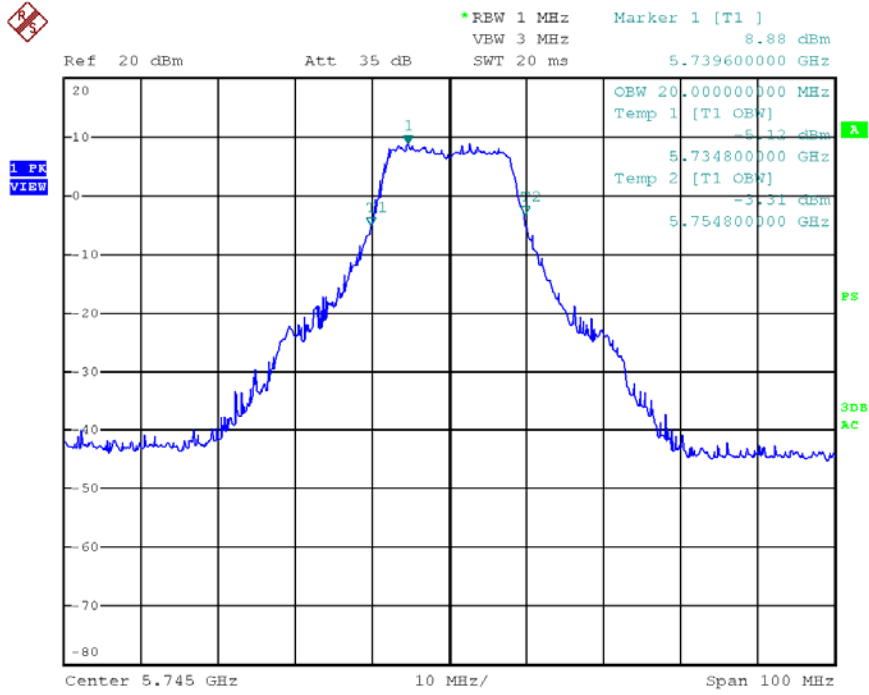
### 12.4 Test protocol

Temperature : 22 °C  
Relative Humidity : 43 %

#### Single Chain

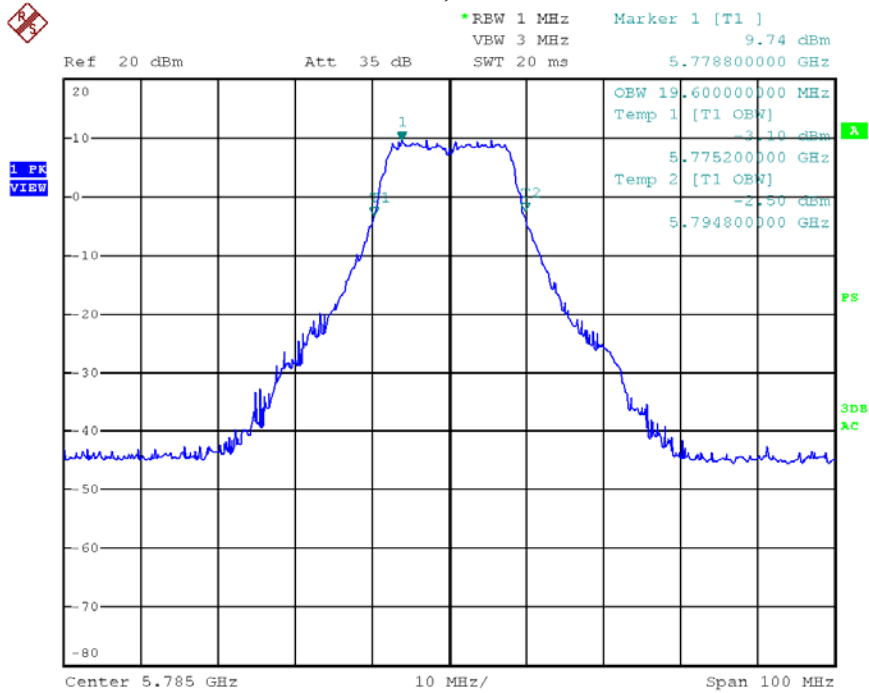
Mode	CH	99% Bandwidth (MHz)
11a	L	20.00
	M	19.60
	H	19.80
11b	L	16.00
	M	16.00
	H	16.00
11g	L	19.40
	M	19.60
	H	19.60
11ng, HT20	L	20.20
	M	20.20
	H	20.40
11ng, HT40	L	38.20
	M	38.40
	H	38.20
11na, HT20	L	20.40
	M	20.20
	H	20.40
11na, HT40	L	38.80
	H	38.00

**11a, Channel L**



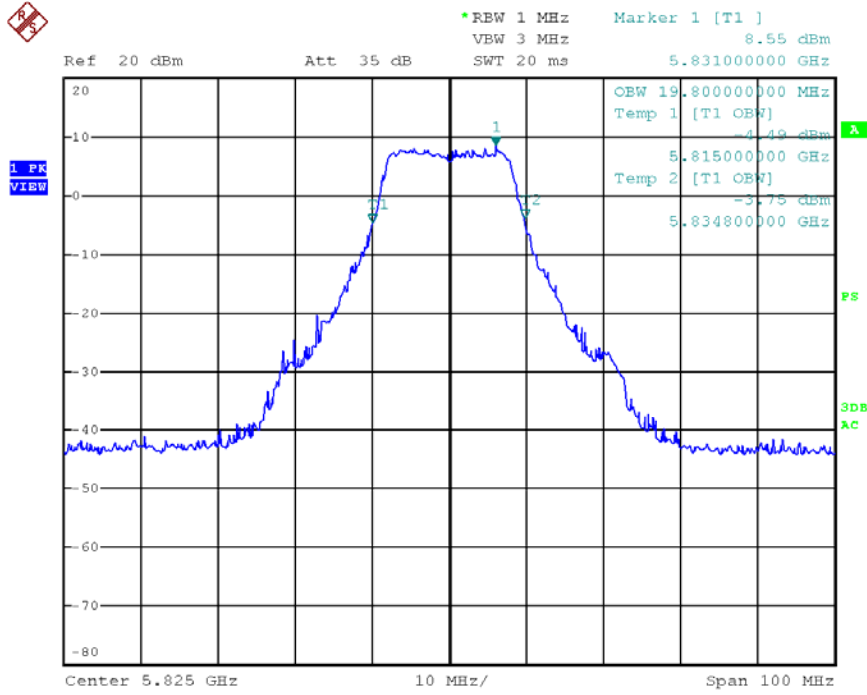
Date: 9.FEB.2012 15:35:36

**11a, Channel M**



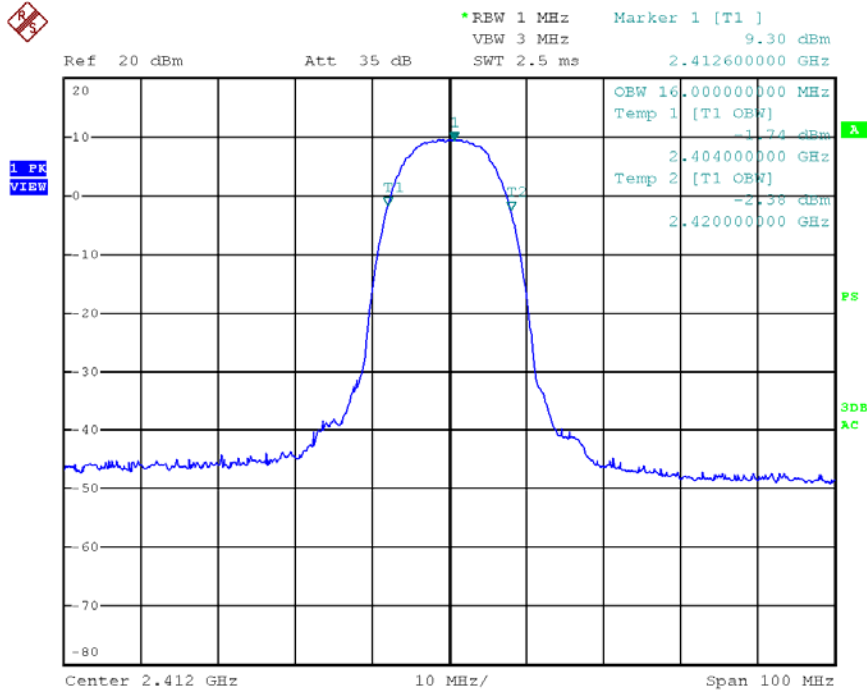
Date: 9.FEB.2012 15:36:09

**11a, Channel H**



Date: 9.FEB.2012 15:36:44

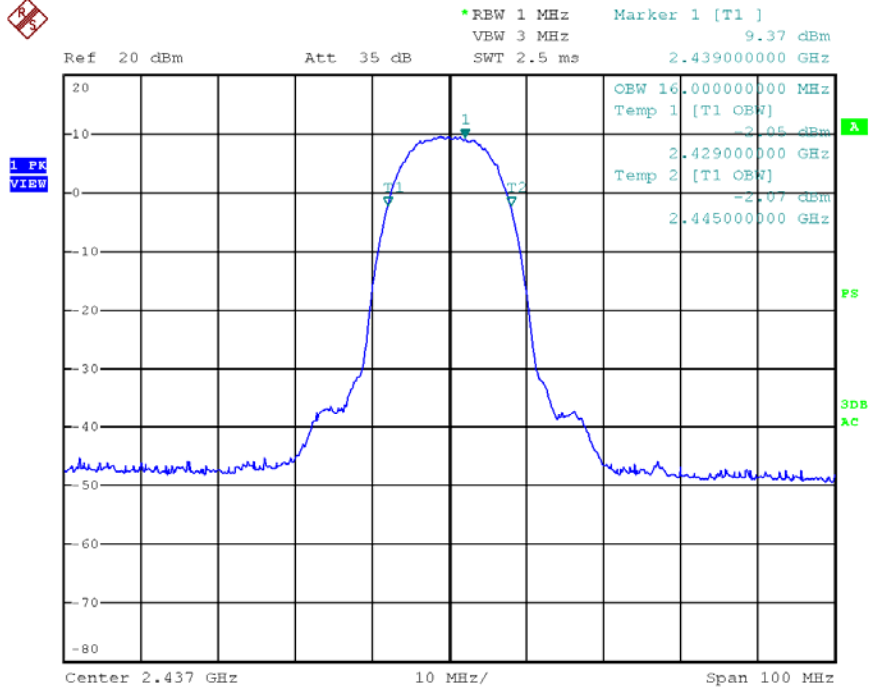
**11b, Channel L**



Date: 9.FEB.2012 15:21:33

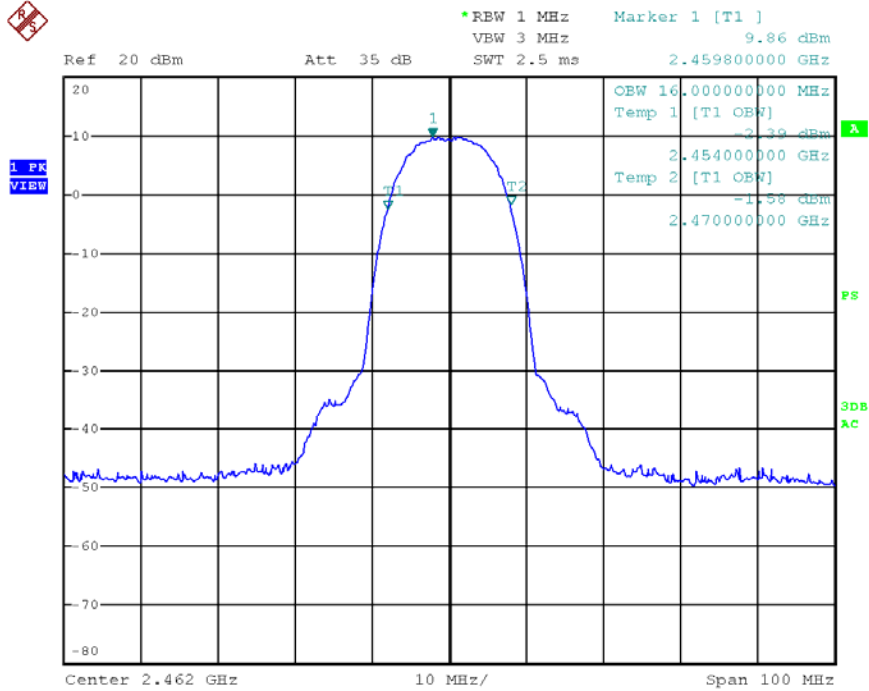


**11b, Channel M**



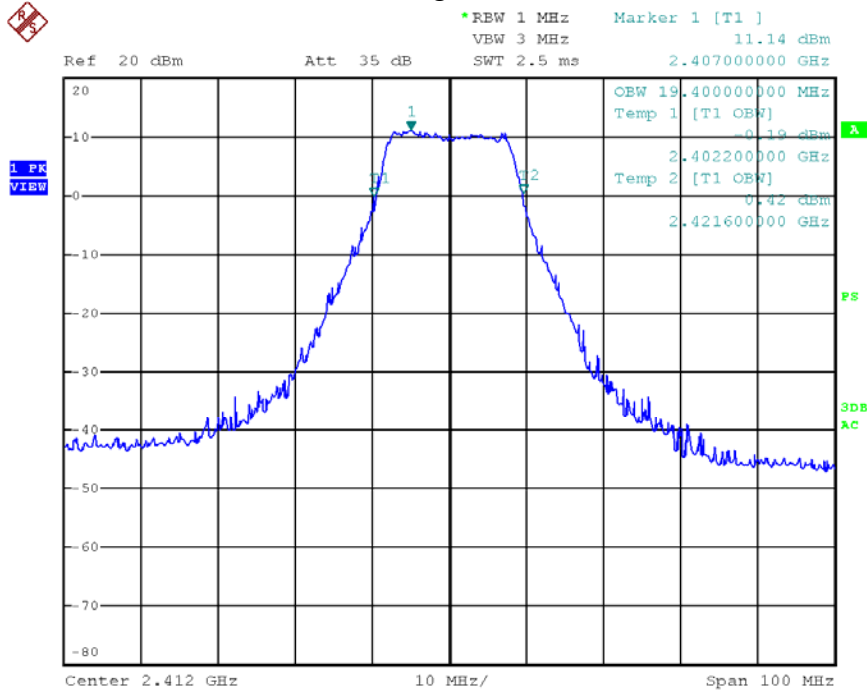
Date: 9.FEB.2012 15:21:59

**11b, Channel H**



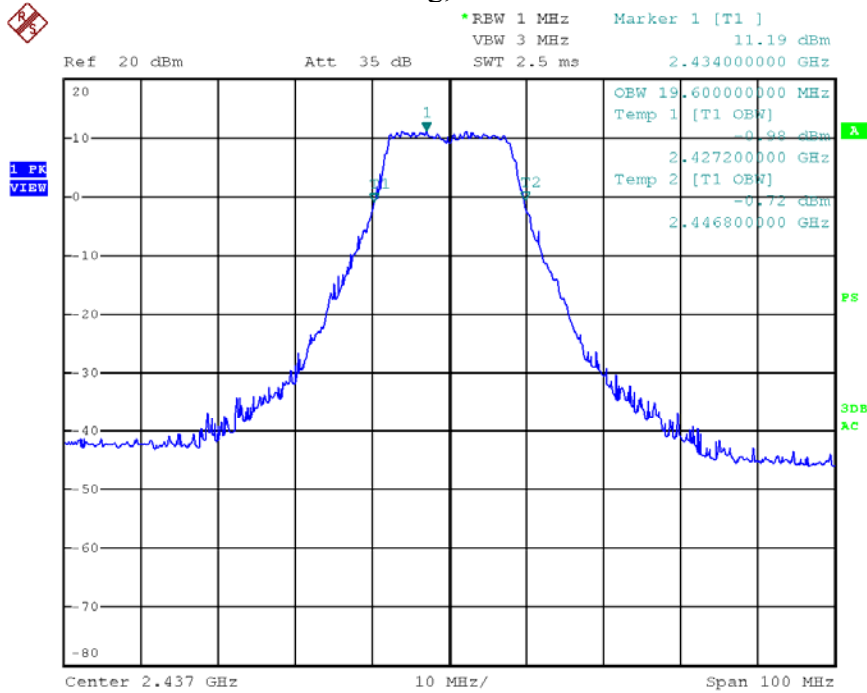
Date: 9.FEB.2012 15:22:24

**11g, Channel L**



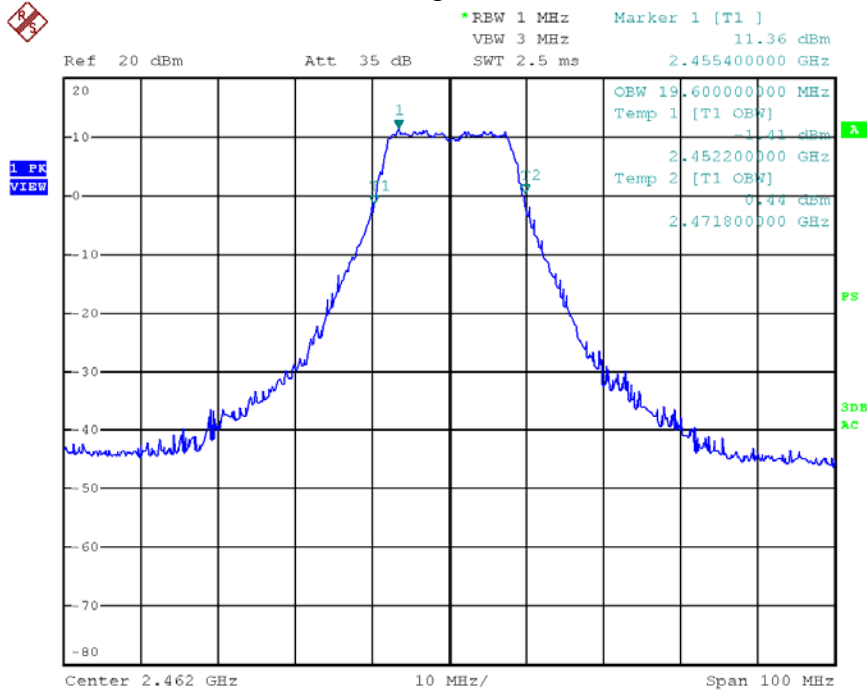
Date: 9.FEB.2012 15:23:47

**11g, Channel M**



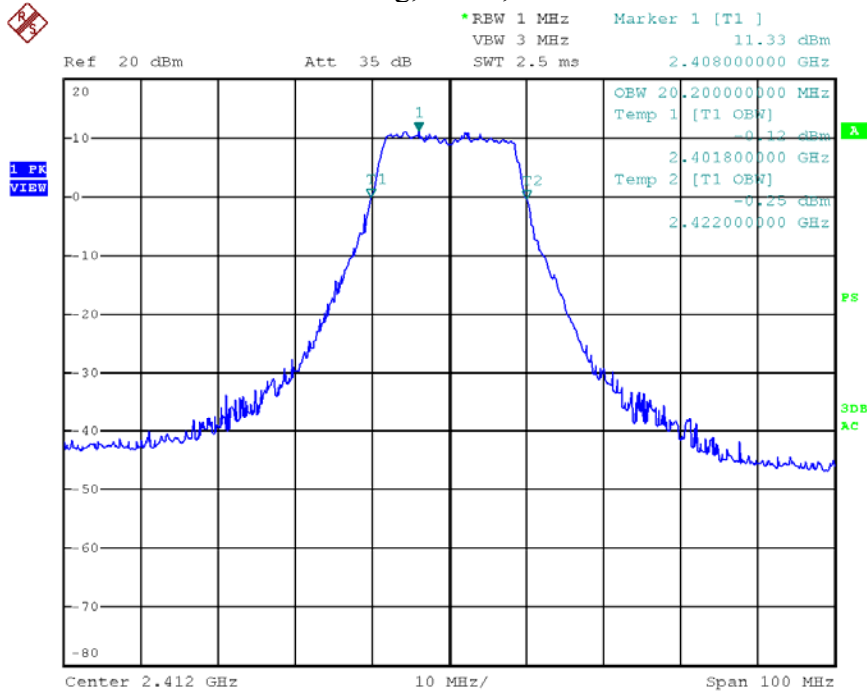
Date: 9.FEB.2012 15:23:23

**11g, Channel H**



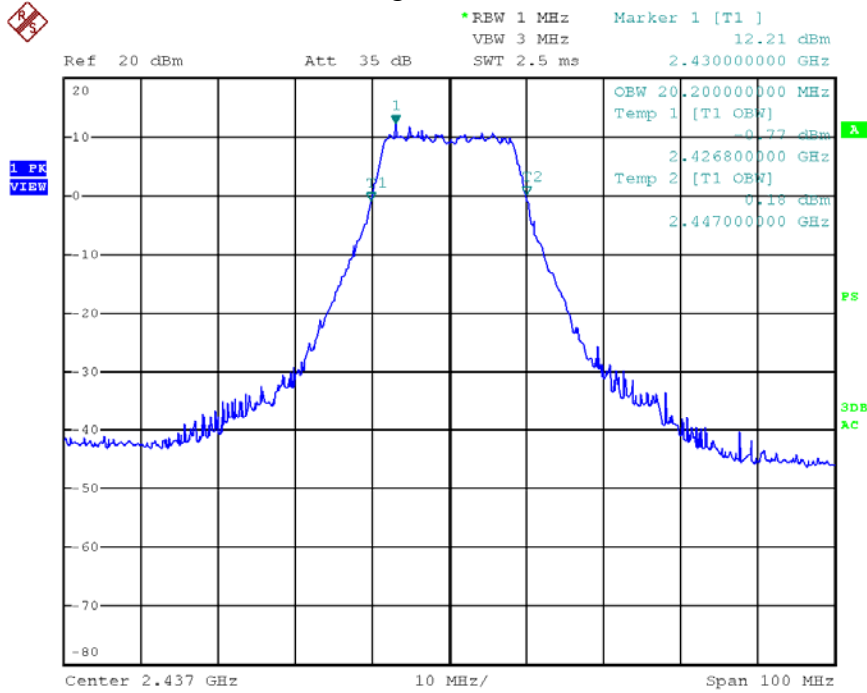
Date: 9.FEB.2012 15:22:57

**11ng, HT20, Channel L**



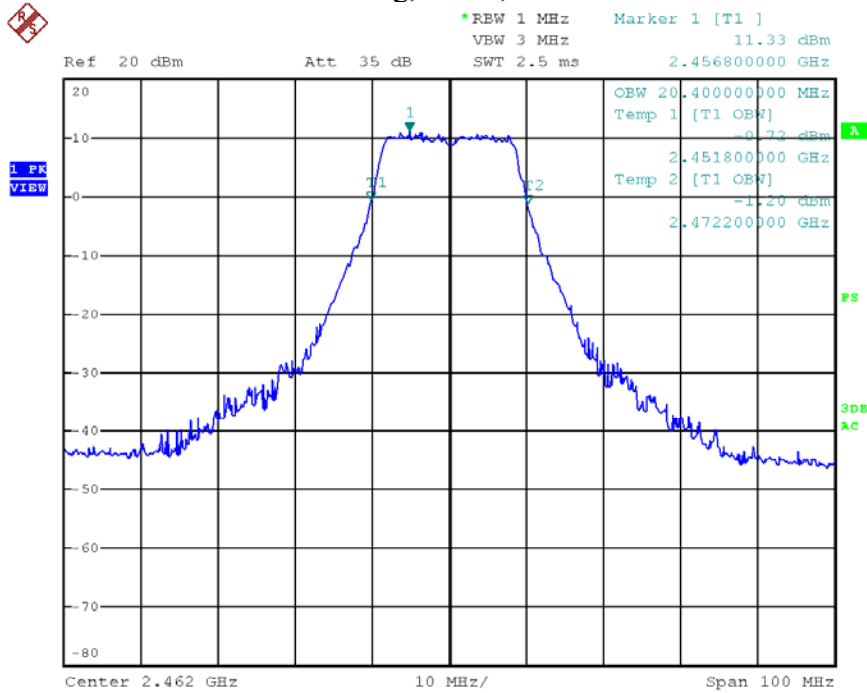
Date: 9.FEB.2012 15:25:53

11ng, HT20, Channel M



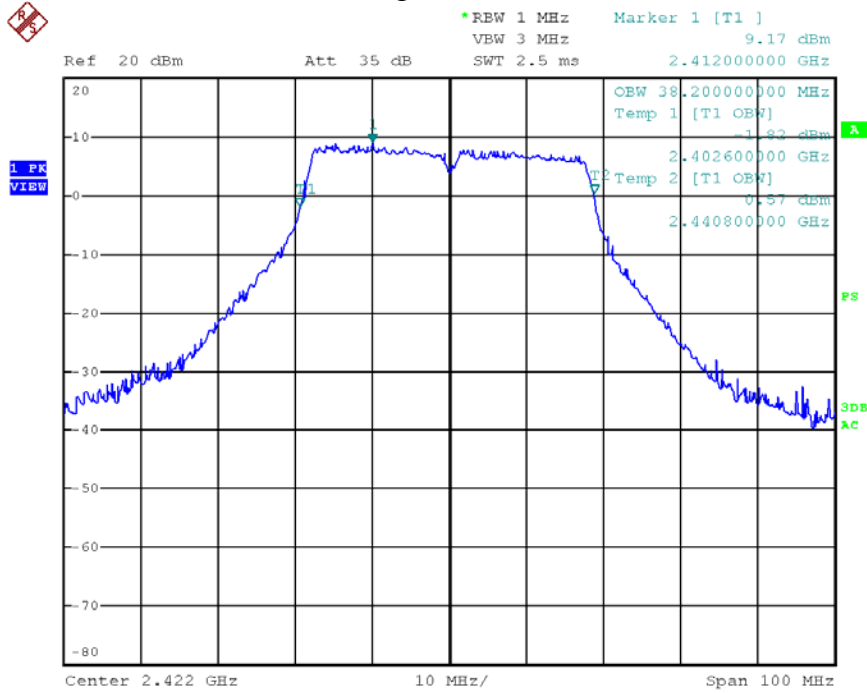
Date: 9.FEB.2012 15:26:13

11ng, HT20, Channel H



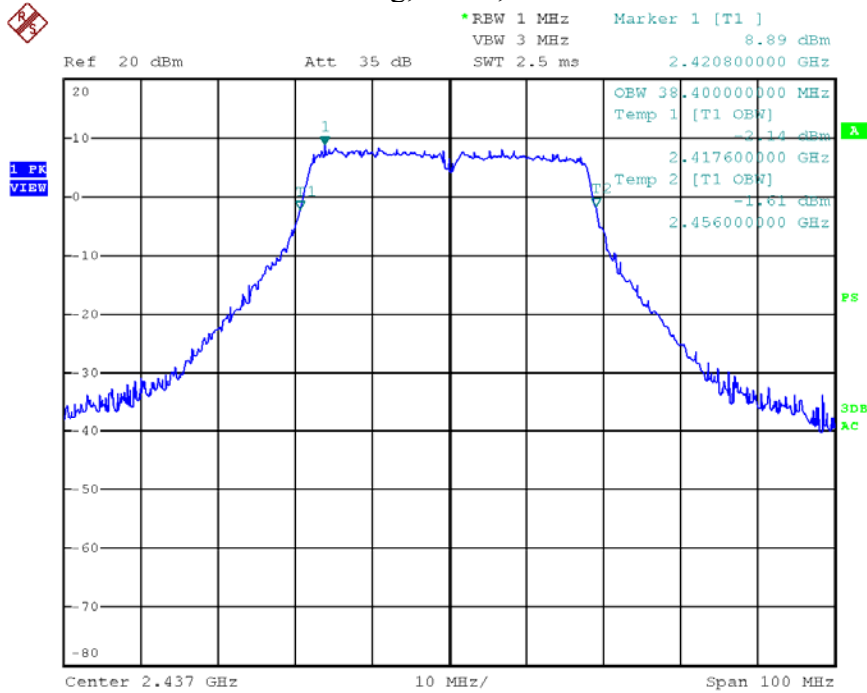
Date: 9.FEB.2012 15:26:41

**11ng, HT40, Channel L**



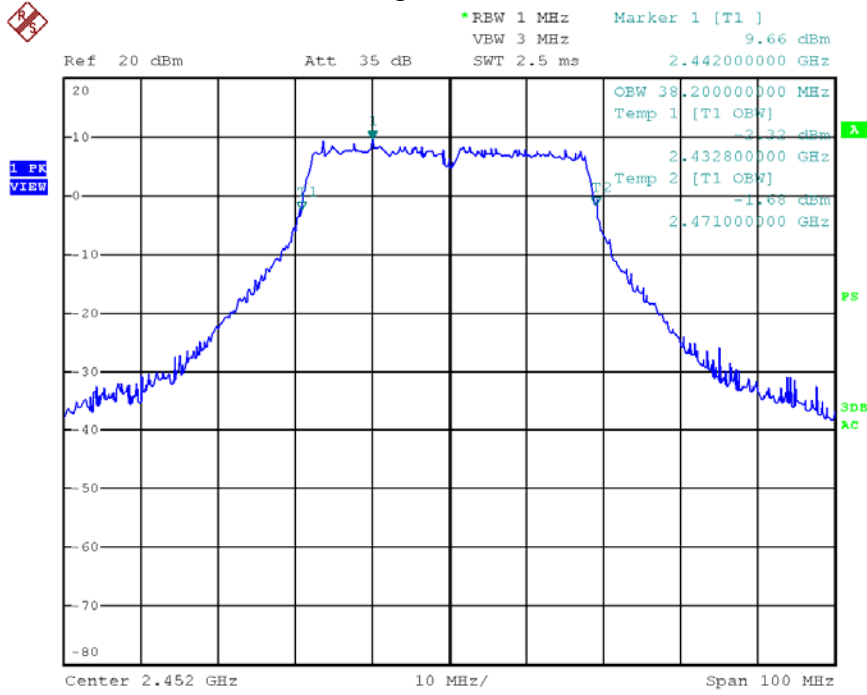
Date: 9.FEB.2012 15:30:52

**11ng, HT40, Channel M**



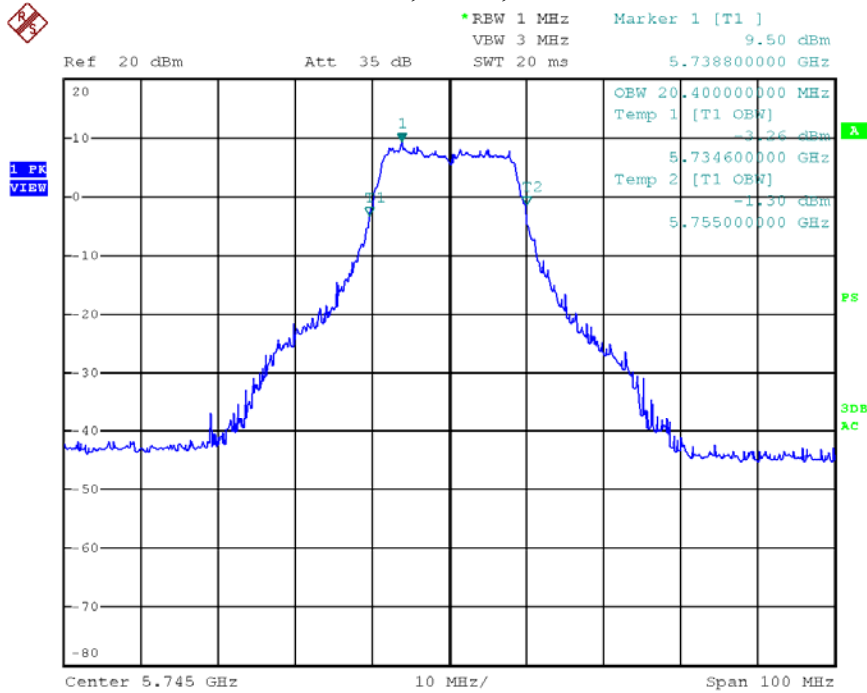
Date: 9.FEB.2012 15:31:21

**11ng, HT40, Channel H**



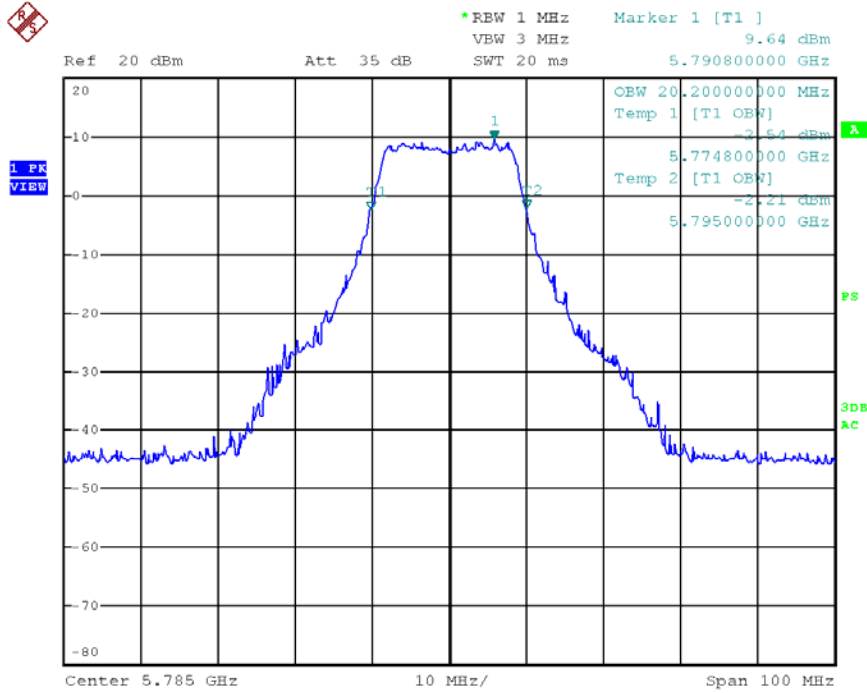
Date: 9.FEB.2012 15:31:40

**11na, HT20, Channel L**



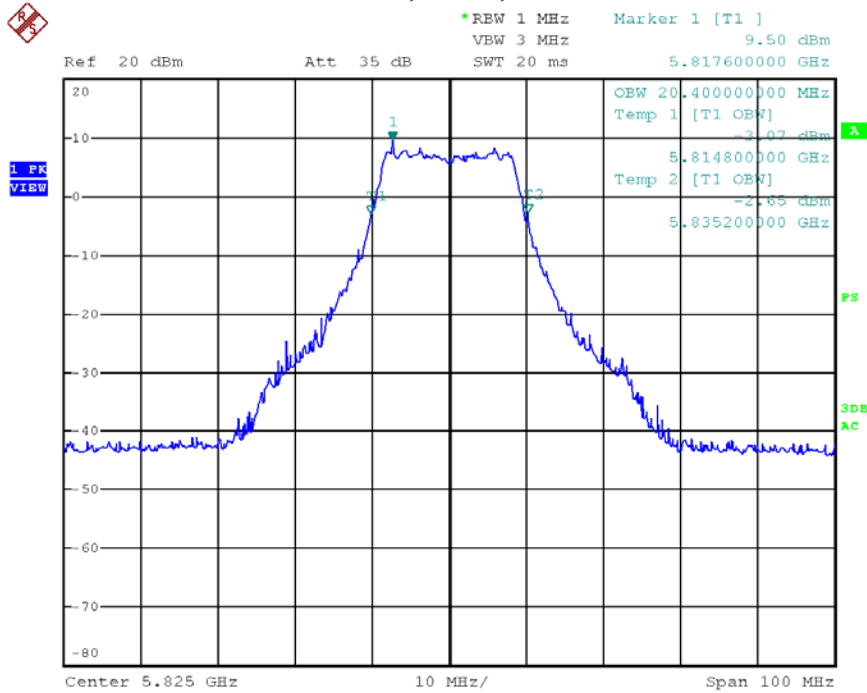
Date: 9.FEB.2012 15:37:50

11na, HT20, Channel M



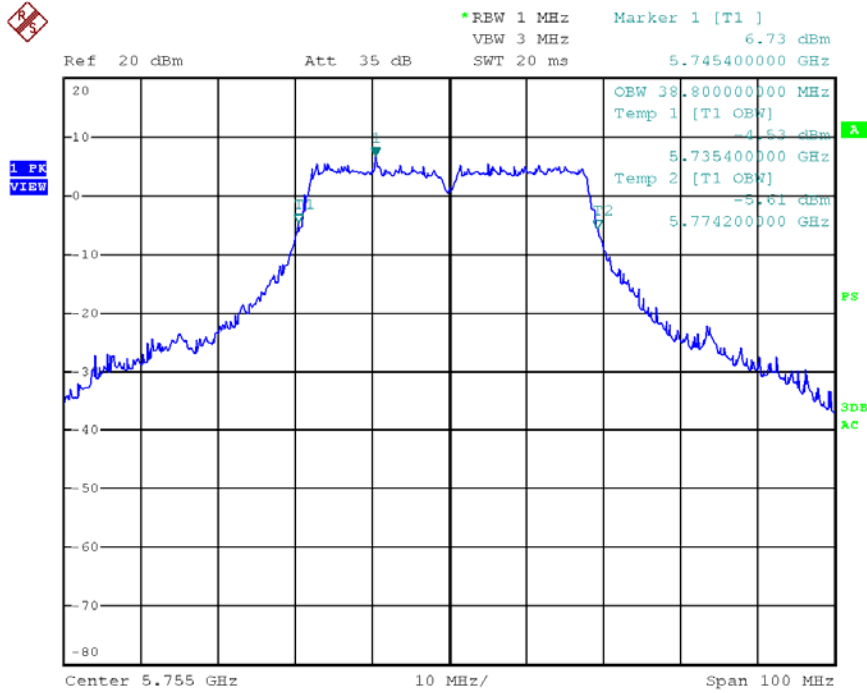
Date: 9.FEB.2012 15:37:29

11na, HT20, Channel H



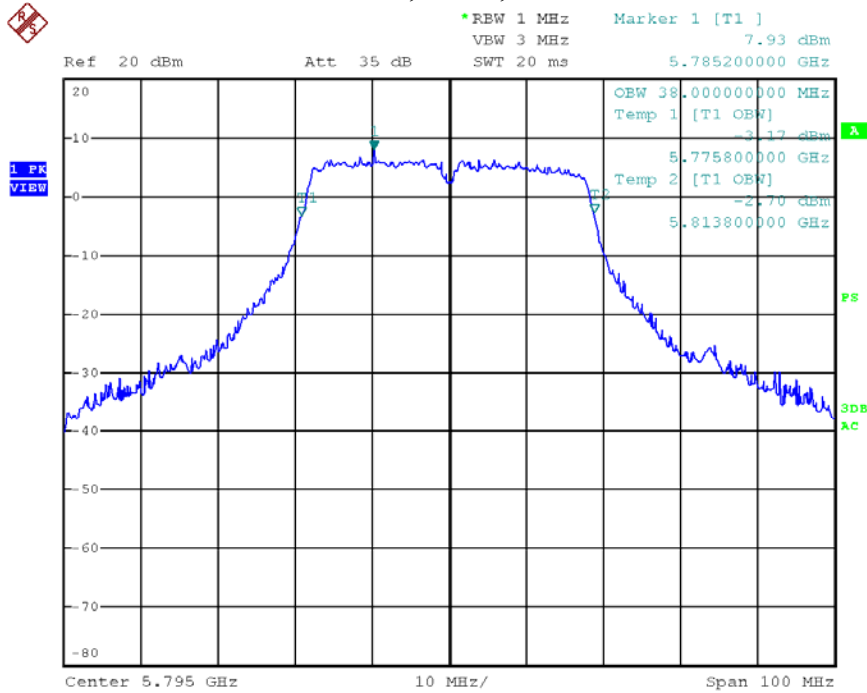
Date: 9.FEB.2012 15:37:08

**11na, HT40, Channel L**



Date: 9.FEB.2012 15:43:56

**11na, HT40, Channel H**



Date: 9.FEB.2012 15:43:18

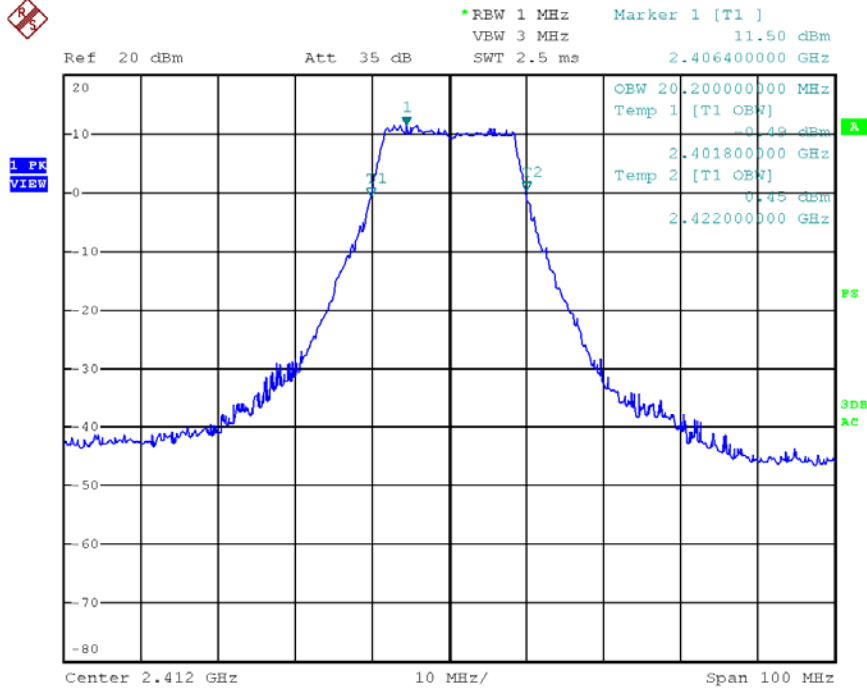




**Dual Chain**

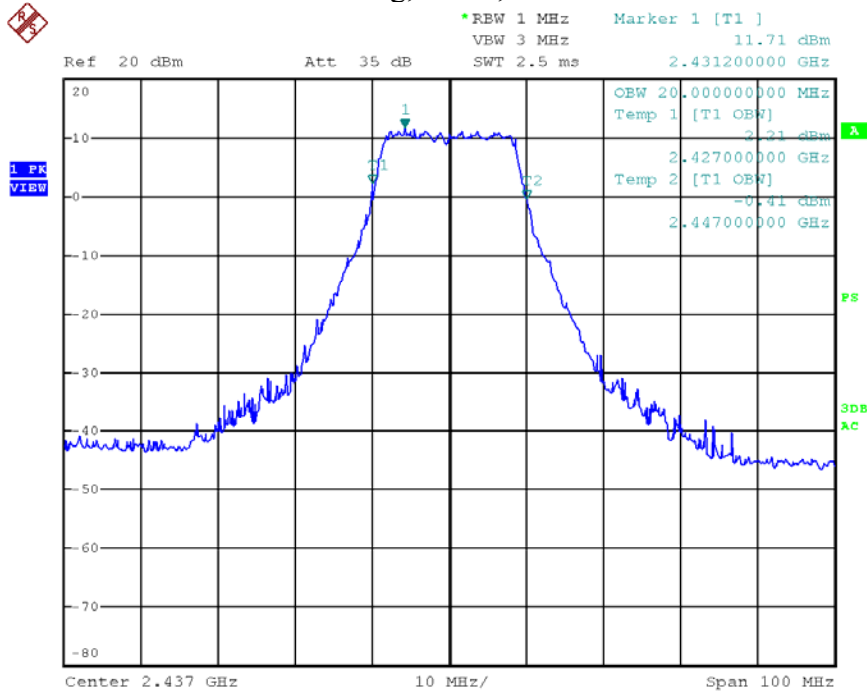
<b>Mode</b>	<b>CH</b>	<b>99% Bandwidth (MHz)</b>
11ng, HT20	L	20.20
	M	20.00
	H	20.20
11ng, HT40	L	38.00
	M	38.20
	H	38.20
11na, HT20	L	20.40
	M	20.20
	H	20.20
11na, HT40	L	38.80
	H	37.80

11ng, HT20, Channel L



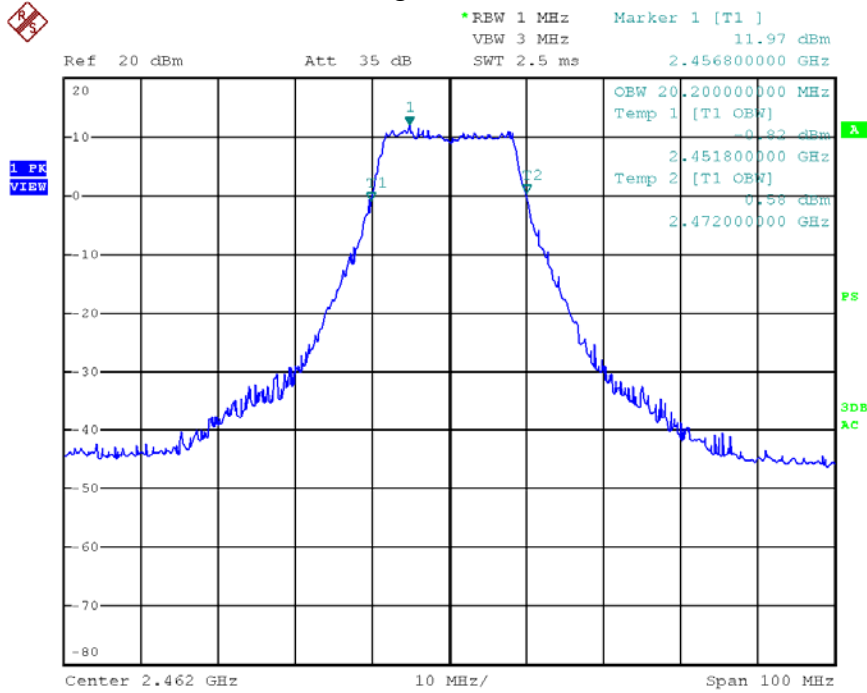
Date: 9.FEB.2012 15:28:50

11ng, HT20, Channel M



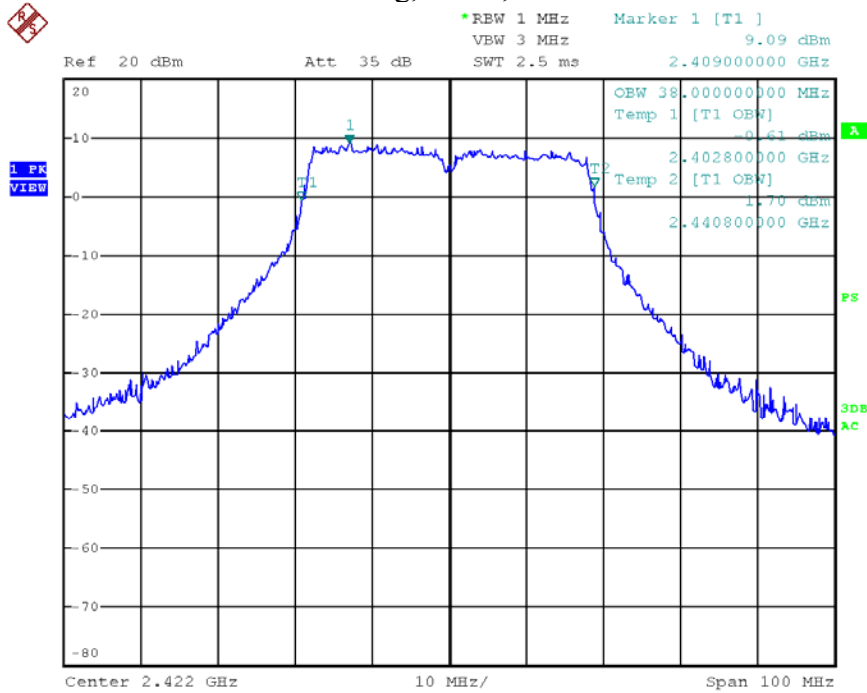
Date: 9.FEB.2012 15:28:27

**11ng, HT20, Channel H**



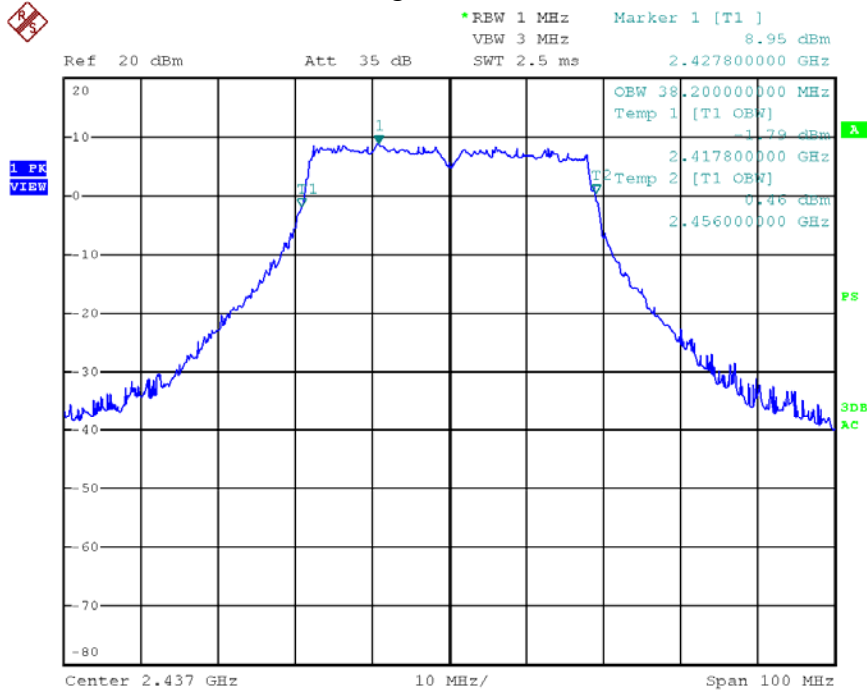
Date: 9.FEB.2012 15:28:02

**11ng, HT40, Channel L**



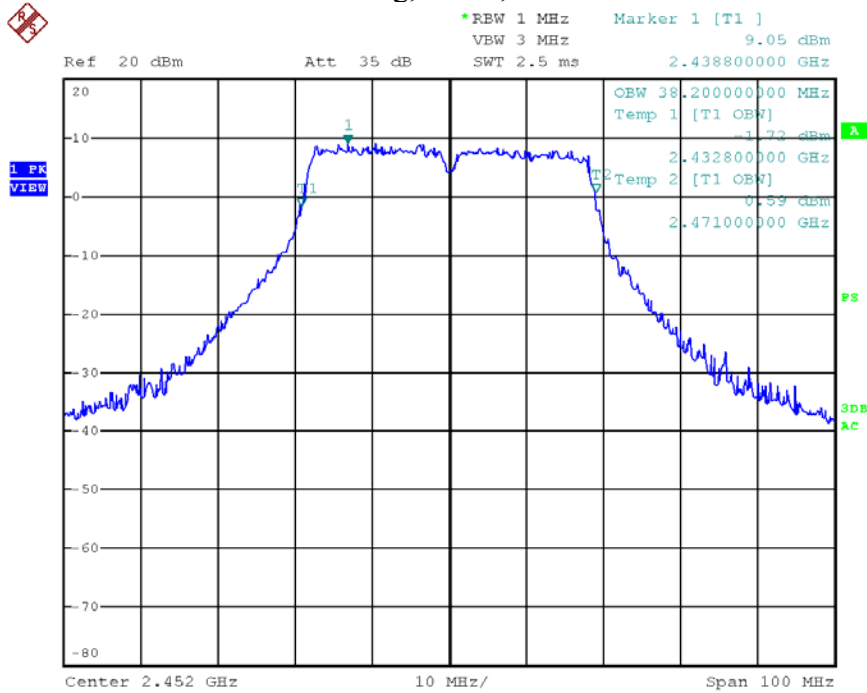
Date: 9.FEB.2012 15:32:52

11ng, HT40, Channel M



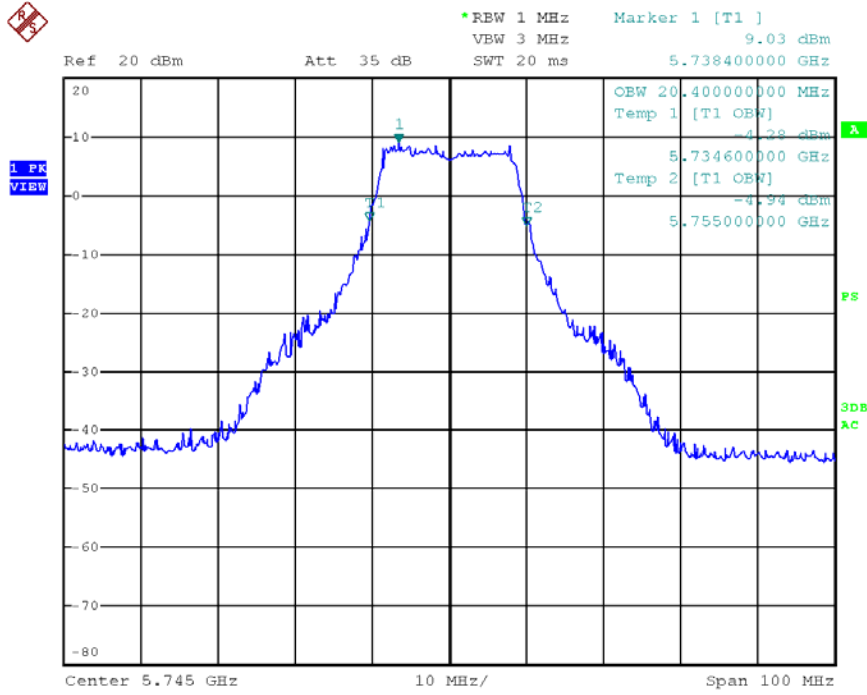
Date: 9.FEB.2012 15:32:32

11ng, HT40, Channel H



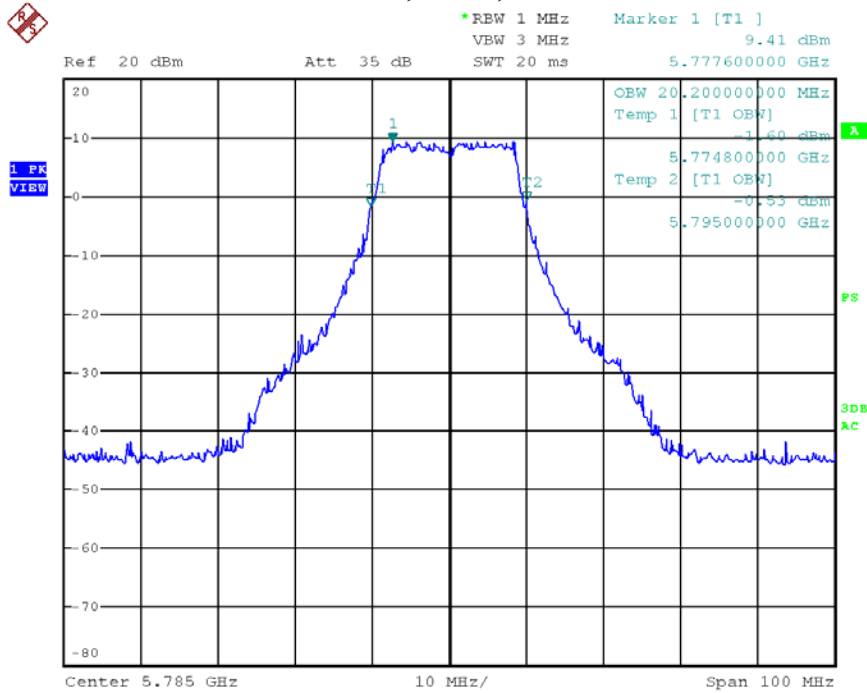
Date: 9.FEB.2012 15:32:10

11na, HT20, Channel L



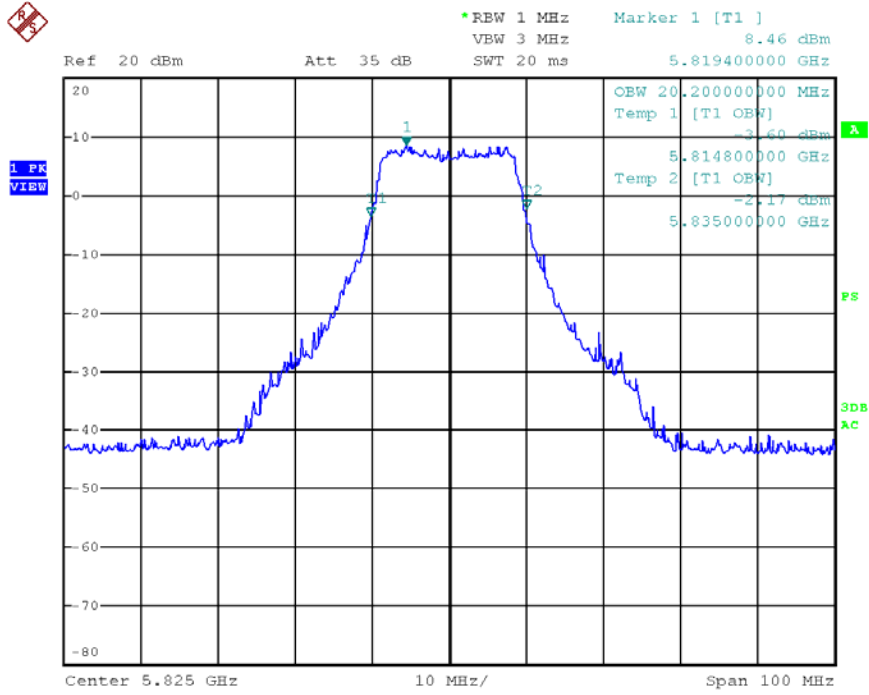
Date: 9.FEB.2012 15:39:07

11na, HT20, Channel M



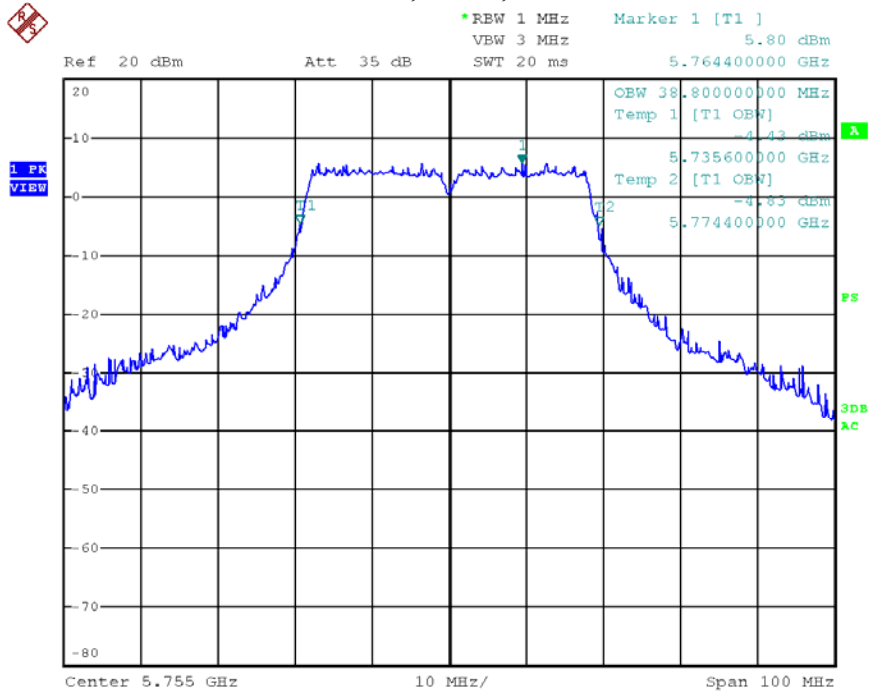
Date: 9.FEB.2012 15:39:30

11na, HT20, Channel H



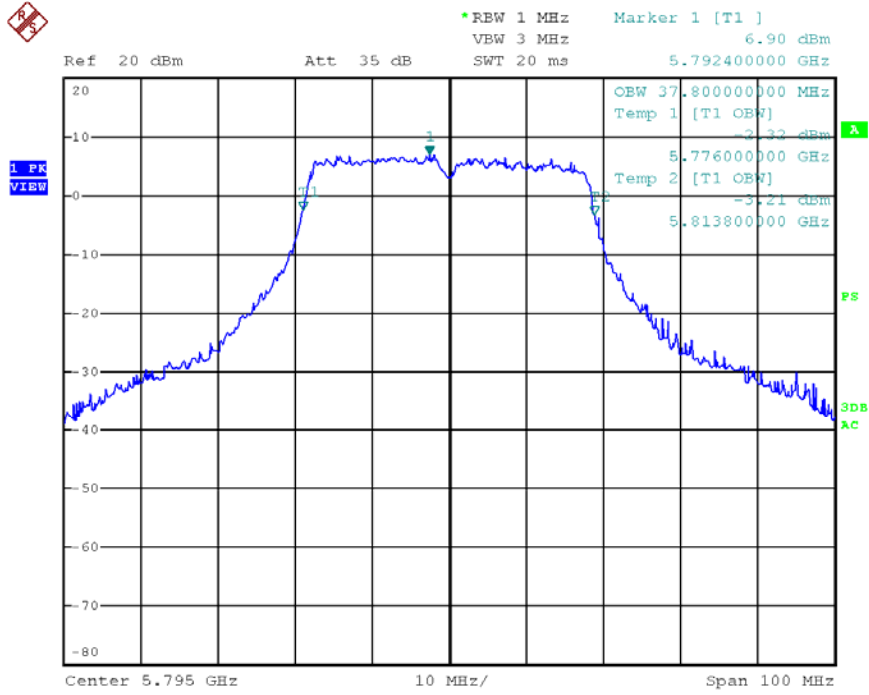
Date: 9.FEB.2012 15:40:03

11na, HT40, Channel L



Date: 9.FEB.2012 15:44:18

11na, HT40, Channel H



Date: 9.FEB.2012 15:44:44

### 13. Conducted disturbance voltage at mains terminals

Test result: PASS

#### 13.1 Limits

##### 13.1.1 Limits for conducted disturbance voltage at the mains ports of class A device

Frequency range (MHz)	Limits dB( $\mu$ V)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

##### 13.1.2 Limits for conducted disturbance voltage at the mains ports of class B device

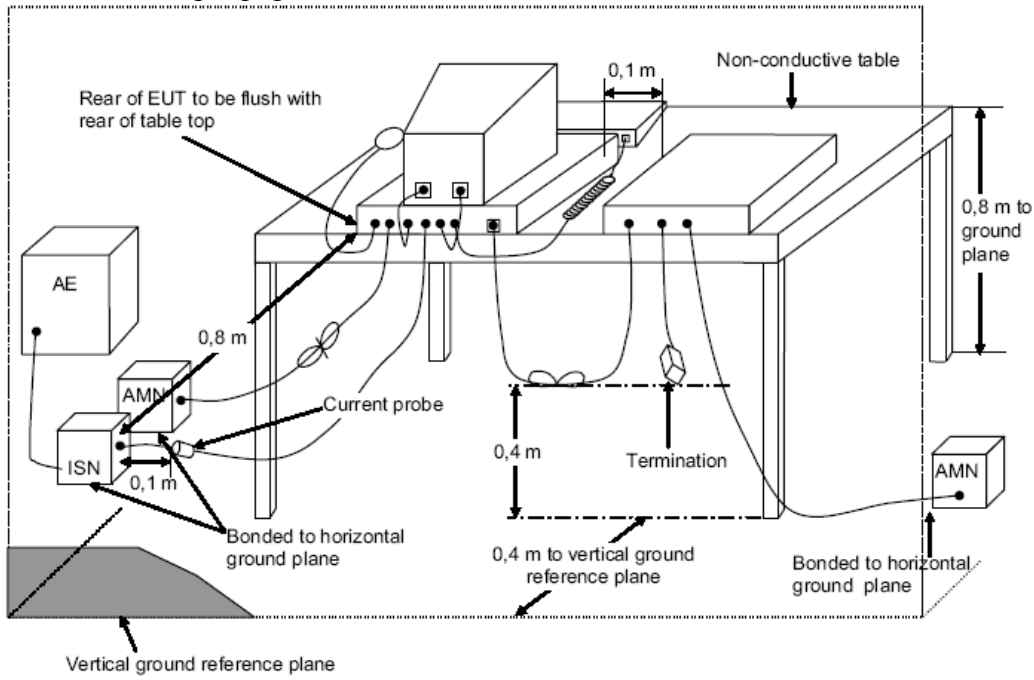
Frequency range (MHz)	Limits dB( $\mu$ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

Note: 1. \* Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz  
2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

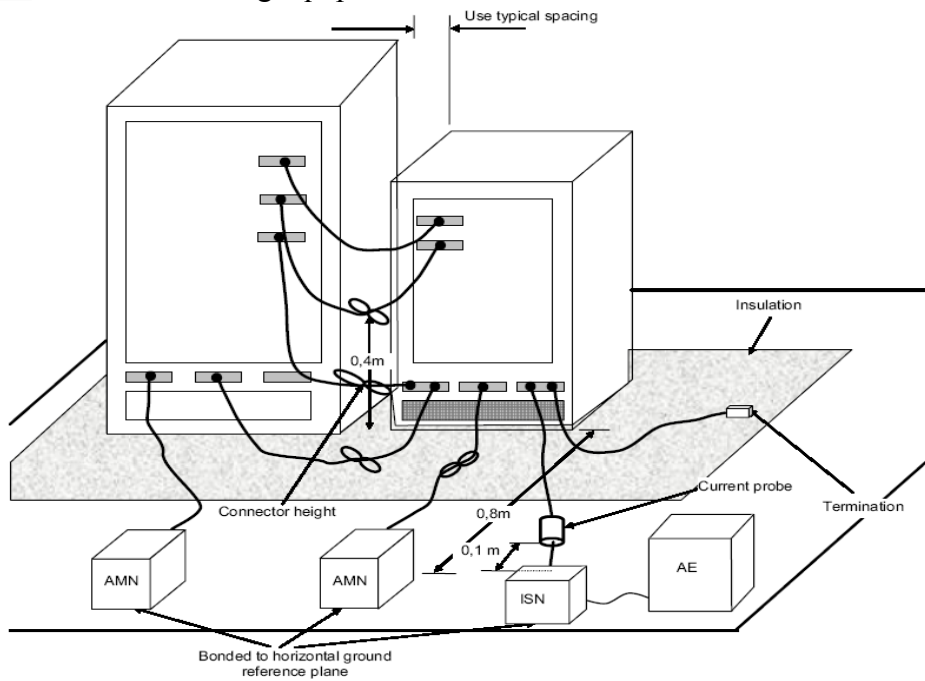


**13.2 Test setup**

For table top equipment



For floor standing equipment





### **13.3 Test Setup and Test Procedure**

Measurement was performed in shielded room, and instruments used were following clause 4 and clause 5 of ANSI 63.4.

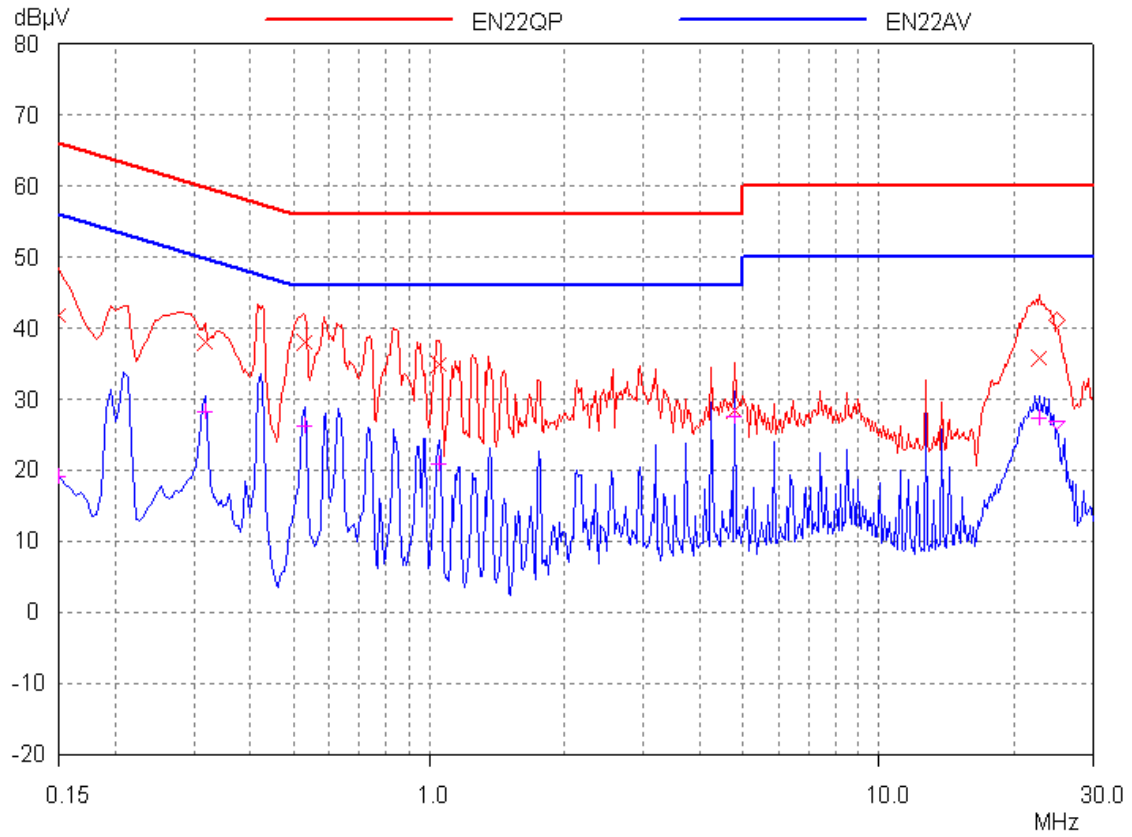
Detailed test procedure was following clause 7.2 of ANSI 63.4.

EUT arrangement and operation conditions were according to clause 6 and clause 7 of ANSI 63.4.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

### 13.4 Test Protocol

Temperature : 22 °C  
Relative Humidity : 43 %



Frequency	Level (dBµV)		Limit (dBµV)		Margin (dB)	
	QP	AV	QP	AV	QP	AV
0.15 (N)	41.86	19.09	66.00	56.00	24.14	36.91
0.32 (L)	38.06	28.28	59.80	49.80	21.74	21.52
0.53 (N)	38.06	26.12	56.00	46.00	17.94	19.88
1.05 (L)	34.88	20.88	56.00	46.00	21.12	25.12
4.75 (L)	28.55	27.49	56.00	46.00	27.45	18.51
22.65 (N)	35.81	27.23	60.00	50.00	24.19	22.77

## 14. Radiated emission

Test result: Pass

### 14.1 Radiated emission limits

#### 14.1.1 Limits for radiated disturbance of class A device

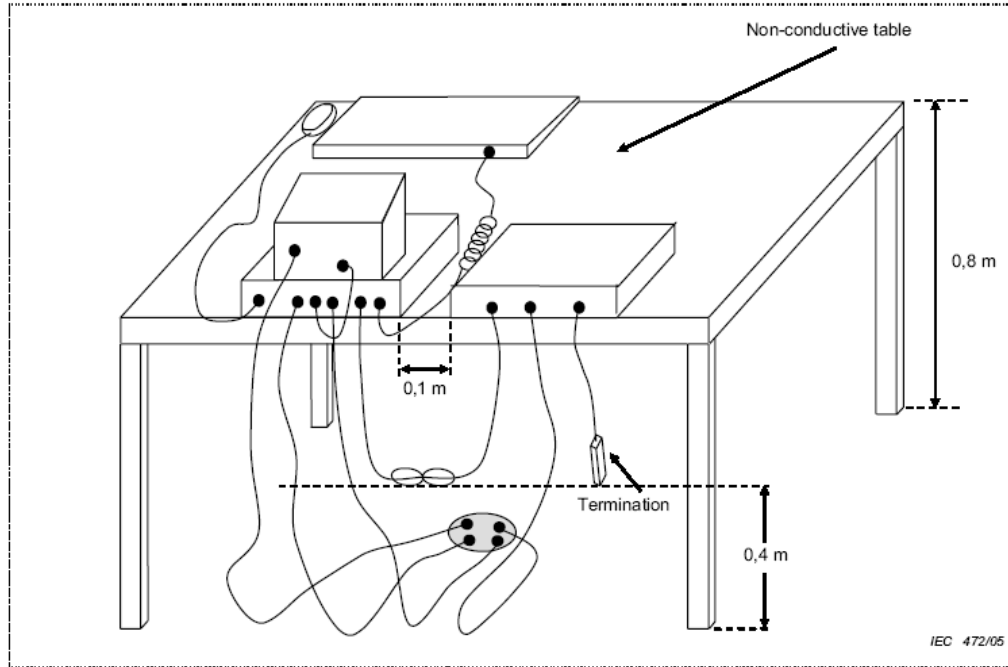
Frequency (MHz)	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 10m
30 – 88	39
88 – 216	43.5
216 – 960	46.4
Above 960	49.5
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.	

#### 14.1.1 Limits for radiated disturbance of class B device

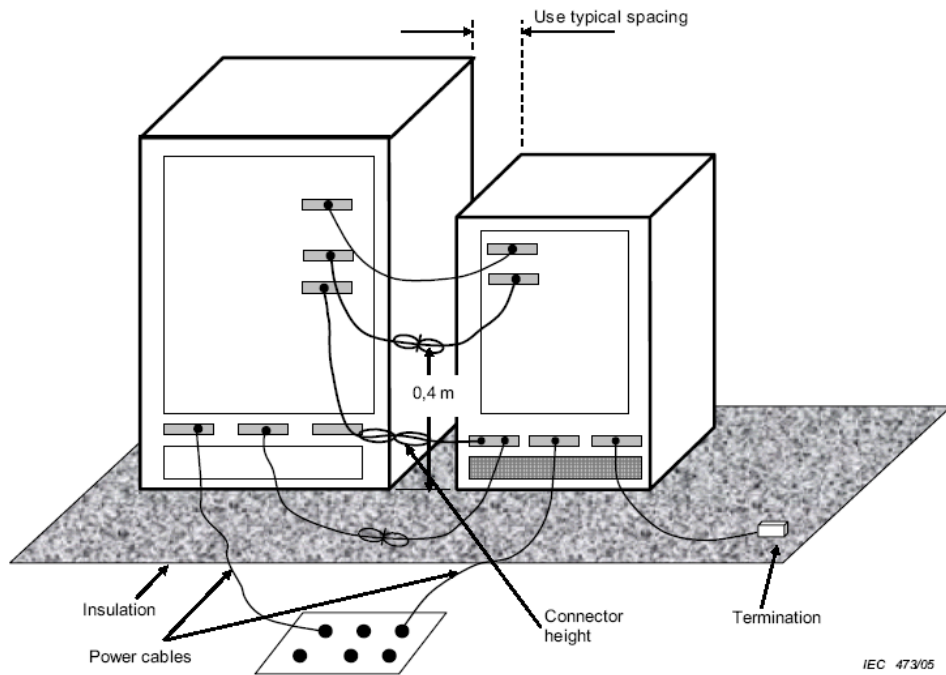
Frequency (MHz)	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 3m
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
Above 960	54.0
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.	

**14.2 Block diagram and test set up**

For table top equipment



For floor standing equipment





### **14.3 Test Setup and Test Procedure**

The measurement was performed in a semi-anechoic chamber.

The distance from EUT to receiving antenna is **3 meter**.

Measurement was performed according to clause 4 and clause 5 of ANSI 63.4.

Test procedure was according to clause 8.3 of ANSI 63.4.

EUT arrangement and operate condition were according to clause 6 and clause 8 of ANSI 63.4.

The bandwidth setting on R&S Test Receiver ESI26 was 120 kHz.

The required measurement frequency range was checked.

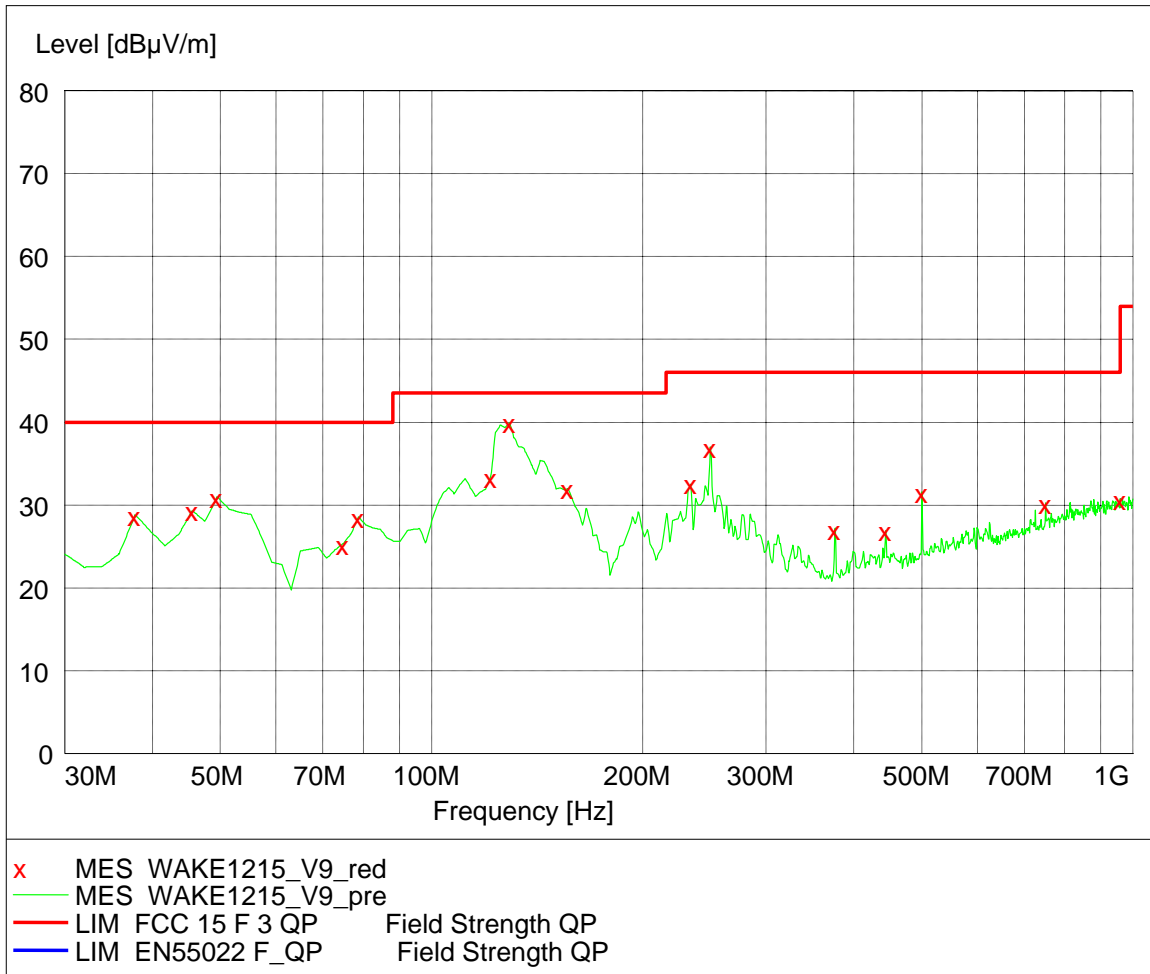
### 14.4 Test Protocol

Temperature : 22 °C  
Relative Humidity : 43 %

#### Horizontal



Vertical





Ant	Frequency (MHz)	Emission level (dB $\mu$ V/m)	Transducer (dB/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
H	121.36	34.60	15.20	43.50	8.90	PK
	125.25	39.80	15.10	43.50	3.70	PK
	156.35	29.10	13.50	43.50	14.40	PK
	199.59	27.30	12.50	43.50	16.20	PK
	249.65	35.00	13.00	46.00	11.00	PK
	376.01	31.20	17.50	46.00	14.80	PK
	1242.06	49.30	-13.00	54.00	4.70	PK
V	49.44	31.00	10.90	40.00	9.00	PK
	121.36	33.40	15.20	43.50	10.10	PK
	129.14	40.00	15.00	43.50	3.50	PK
	156.35	32.00	13.50	43.50	11.50	PK
	234.11	32.60	11.90	46.00	13.40	PK
	249.66	37.00	13.00	46.00	9.00	PK
	1242.06	50.90	-13.00	54.00	3.10	PK

- Remark: 1. Transducer = Antenna Factor + Cable Loss (-Amplifier, is employed)  
 2. Corrected Reading = Original Receiver Reading + Transducer  
 3. Margin = limit – Corrected Reading  
 4. The test is performed from 30MHz to 40GHz.

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