telefication bv
The Netherlands
Chamber of Commerce
09076358
www.telefication.com

telefication

Radio test report
20082954301 - rev 1.0

based on:
- FCC Part 15 Subpart E, section 15.407 (excl. § 15.407 (h)) (10-1-07 Edition)
- IC RSS-210, Issue 7 (June 2007 edition)
- IC RSS-Gen, Issue 2 (June 2007 edition)

Dual band 802.11n Wireless LAN Module
NuTune
MRX2010

Contents

This report comprises of five modules. The total number of pages is: 69

Main module

1 Introduction

This report contains the result of tests performed by:

Telefication B.V.
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie). The contents of this test report, if reproduced, shall be copied in full, unless special consent in writing for reproduction in part is granted by Telefication. Copyright of this test report is reserved to Telefication.

Ordering party:

Company name	:	NuTune
Address	:	High Tech Campus 32 room 2.38
Zipcode	:	5656 AE
City/town	:	Eindhoven
Country	:	The Netherlands
Date of order	:	22 July 2008

2 Product

A sample of the following product was submitted for testing:

Product description	:	Dual band 802.11n Wireless LAN Module
Manufacturer	:	NuTune
Trade mark	:	NuTune
Type designation	:	MRX2010
FCC ID	:	WOPMRX2010C2
Hardware version	:	C2
Serial number	:	HV.11.2222.01262
Software release	:	2.3.5

3 Test schedule

Tests are carried out in accordance with the specification detailed in chapter 7 “Summary” of this report.

Tests are carried out at the following location:

- Telefication, Zevenaar

  Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18.
  The Registration Number is: 282250.

The samples of the product were received on:

- 4 August 2008

Tests are carried out from:

- 7 August 2008 to 21 August 2008

4 Product documentation

For production of this report the following product documentation is used:

Description	**Date**	**Identification**
Performance specification	07-12-05	MRX2010_description&spec.doc

The above mentioned documentation will be filed at Telefication for a period of 10 years.

5 Observations and comments

The MRX2010 is a LAN transceiver module with IEEE 802.11a/b/g/n capability. It operates in the 2400 – 2483.5 MHz ISM band as well as the 5150 – 5350 MHz, 5470 – 5725 MHz and 5700 – 5850 MHz bands. This report comprises measurements under the provision of section 15.407. Measurement results of the module under the provisions of section 15.247 are recorded in Telefication test report 20082954300.

To control the module during measurements, it was supplied with a host. Normal operational modes were controlled by means of a web interface. Special radio-measurement modes were controlled by means of the METALINK software tool: DUT GUI version 4.52.

All measurements are carried out as conducted tests, except for:
- restricted band measurements,
- receiver spurious emissions.

Output power, power spectral density and bandwidth tests are carried out with a combiner.

All radiated measurements are valid for the vertical polarization direction, except for emissions below 1 GHz, which are measured for both orthogonal directions.

Measurements below 1 GHz in IEEE 802.11n (40 MHz) mode, while transmitting on channel 52, are worst case of all implemented modes.

6 Modifications to the sample

No modifications are made to the sample.

7 Summary

The product is intended for use in the following application area(s):

INTENTIONAL RADIATOR OPERATING IN THE 5 GHz FREQUENCY BAND
INTENTIONAL RADIATOR OPERATING IN THE 2.4 GHz FREQUENCY BAND*)

*) The 2.4 GHz band test results under the provision of section 15.247 are laid down in Telefication test report 20082954300.

The sample is tested according to the following specification(s):

FCC Part 15 Subpart E, section 15.407 (excl. § 15.407 (h)) (10-01-07 Edition);
RSS-210, Issue 7 (June 2007 edition);
RSS-Gen, Issue 7 (June 2007 edition).

8 Conclusions

The samples of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 7 of this report.

The results of the tests as stated in this report, are exclusively applicable to the product items as identified in this test report. Telefication does not accept any responsibility for the results stated in this test report, with respect to the properties of product items not involved in these tests.

All tests are performed by:

name : P.A. Suringa

function : Senior Engineer Radio/EMC

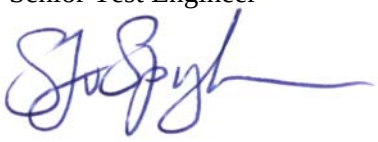
signature :

Review of test report by:

name : S.J. van Spijker

function : Senior Test Engineer

signature :



The above conclusions have been verified by the following signatory:

Date : 14 October 2008

name : J.P. van de Poll

function : Co-ordinator Test Group

signature :

Test results module

1.1 Equipment information

Type designation	MRX2010
Type of equipment	WIFI access point
Operating frequency range	2400 – 2483.5 MHz 5150 – 5350 MHz 5470 – 5725 MHz 5725 – 5850 MHz
Possible modulation types	OFDM WITH BPSK, QPSK, 16QAM And 64QAM DBPSK, DQPSK, CCK
Antenna type	External Dual-Band Omni-Directional Antenna
Antenna gain	5.5 dBi @ 5 GHz

1.2 Channel test frequencies (MHz) and power settings (*dBm*)

Mode	Ch 36	Ch 52	Ch 60	Ch 64	Ch 100	Ch 116	Ch 120	Ch 136	Ch 140
IEEE 802.11a	5180 *7*	5260 *20*	--	5320 *18*	5500 *18*	--	5600 *18*	--	5700 *18*
IEEE 802.11n (20 MHz)	5180 *15*	5260 *20*	--	5320 *18*	5500 *18*	--	5600 *18*	--	5700 *18*
IEEE 802.11n (40 MHz)	5190 *14*	5270 *20*	5310 *14*	--	5510 *18*	5590 *20*	--	5690 *18*	--

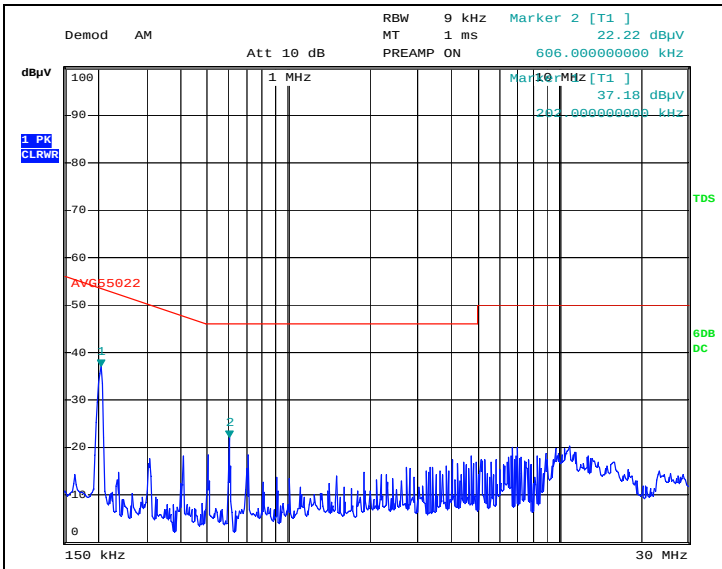
1.3 Test modulation

802.11a	QAM64 3/4 Rank1: 54 Mbps
802.11n	QAM64 5/6 Rank1: 135 Mbps

2 Emission tests below 1 GHz

2.1 Power line conducted emissions

Compliance standard	:	FCC part 15, subpart C, section 15.407 (b)(6)
Method of test	:	ANSI C63.4-2003, sections 7 & 11.5
Ambient temperature	:	24 °C
Relative humidity	:	50 %
EUT condition	:	transmitting on channel 52 (802.11n (40 MHz) mode)

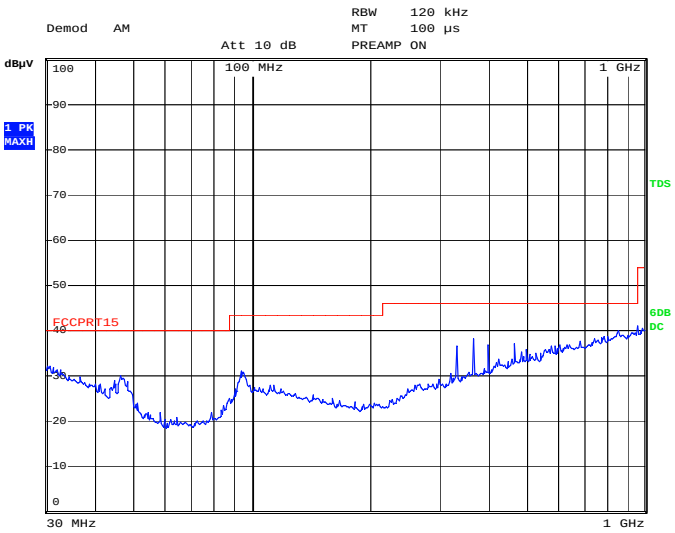


Neutral and phase conductors: peak detector measurement

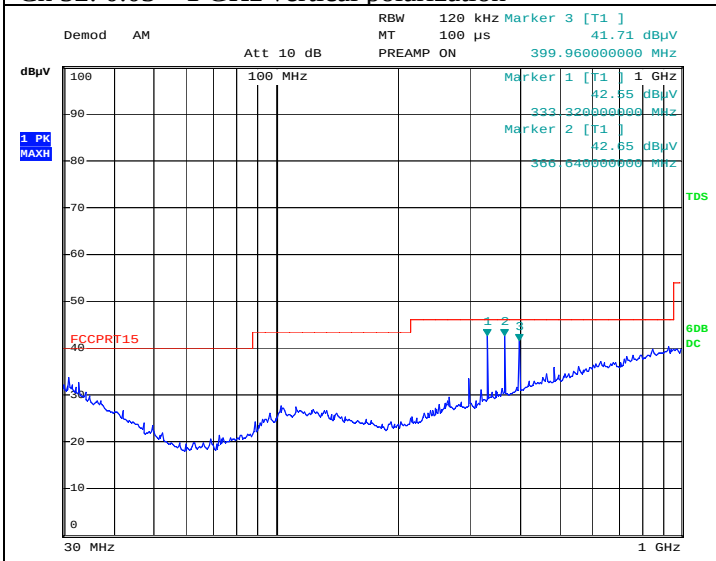
Measurement uncertainty: +3.7/-3.7 dB

2.2 Radiated emissions

Compliance standard	:	FCC part 15, subpart C, section 15.407 (b)(6)
Method of test	:	ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2
Ambient temperature	:	24 °C
Relative humidity	:	50 %
EUT condition	:	transmitting on channel 52 (802.11n (40 MHz) mode)



Ch 52: 0.03 – 1 GHz vertical polarization



Ch 52: 0.03 – 1 GHz horizontal polarization

3 Emission tests 802.11a: 5150 – 5350 MHz band

3.1 Peak power output

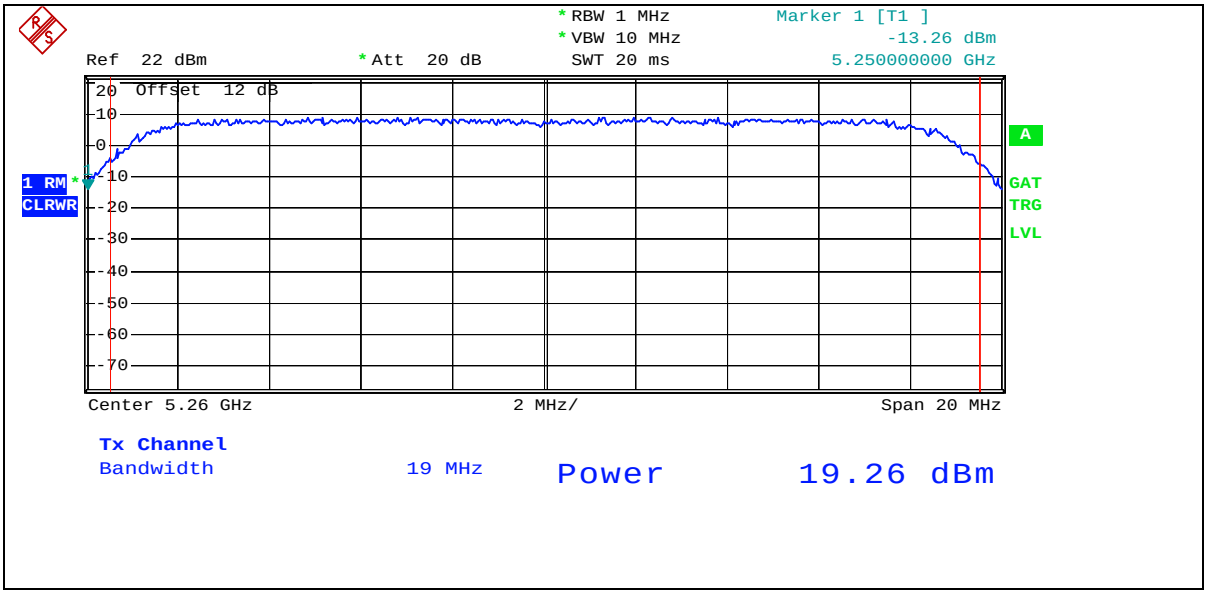
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(1) and (a)(2)
Method of test : FCC Public Notice DA 02-2138, Appendix A, method #1

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 36	Channel 52	Channel 64	
$B_{(26dB)}$ = 20.6 MHz 4 + 10logB = 17.1 dBm	$B_{(26dB)}$ = 20.6 MHz 11 + 10logB = 24.1 dBm	$B_{(26dB)}$ = 20.6 MHz 11 + 10logB = 24.1 dBm	Limit (conducted)
23.1 dBm	30.1 dBm	30.1 dBm	Limit (radiated)
16.6 dBm	18.7 dBm	17.0 dBm	Measured. value (conducted)
22.1 dBm e.i.r.p.	24.2 dBm e.i.r.p.	22.5 dBm e.i.r.p.	Calculated value (radiated)

Channel 52 plot



Measurement uncertainty: + 2.4/ -2.7 dB

3.2 Peak power spectral density

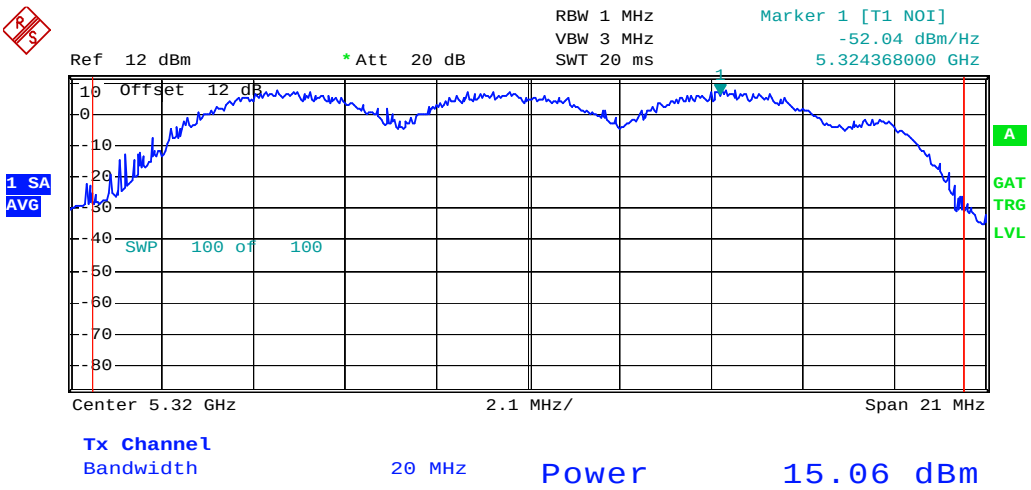
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(1) and (a)(2)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 36	Channel 44	Channel 52	Channel 64	
4 dBm/MHz	4 dBm/MHz	11 dBm/MHz	11 dBm/MHz	Limit (conducted)
10 dBm/MHz	10 dBm/MHz	17 dBm/MHz	17 dBm/MHz	Limit (radiated)
1.1 dBm/MHz	3.0 dBm/MHz	9.7 dBm/MHz	8.2 dBm/MHz	Measured. value (conducted)
6.6 dBm/MHz e.i.r.p.	8.5 dBm/MHz e.i.r.p.	15.2 dBm/MHz e.i.r.p.	13.7 dBm/MHz e.i.r.p.	Calculated value (radiated)

Channel 64 plot

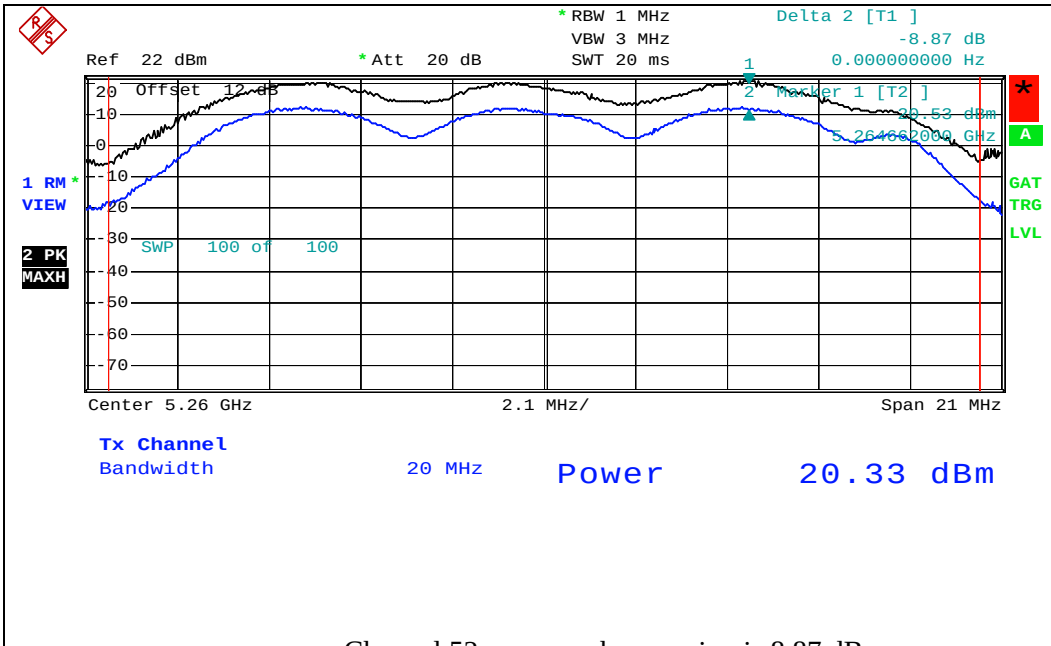


Measurement uncertainty: + 2.4/ -2.7 dB

3.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a) (6)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %



Channel 52: max. peak excursion is 8.87 dB

Measurement uncertainty: + 5.1/ -5.1 dB

3.4 Field strength of unwanted emissions 30 – 1000 MHz

Compliance standard	:	FCC part 15, subpart E, section 15.407(b)(6)
Method of test	:	ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

See section 2.2 for test results in 802.11n (40 MHz) mode.

3.5 Field strength of unwanted emissions > 1000 MHz

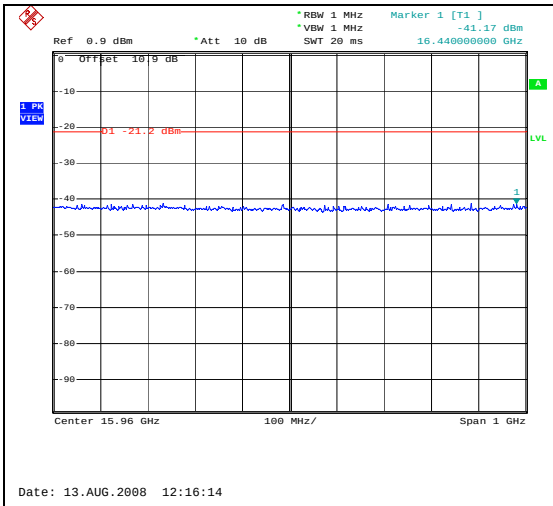
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (1)
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Test results :

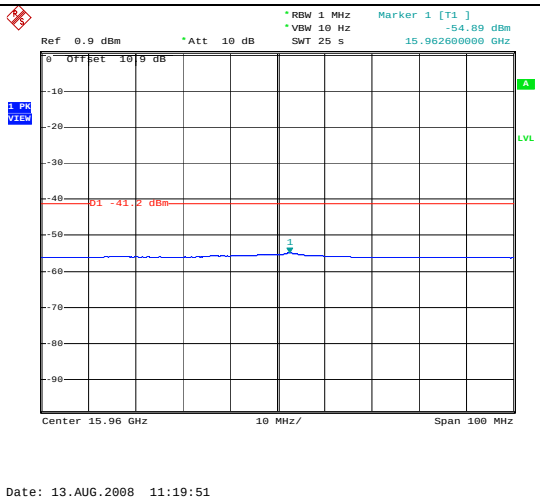
Not performed.
This phenomenon is covered with the sample in 802-11 n (20 MHz) mode, see section 5.5.

3.6 Field strength of unwanted emissions in non-adjacent restricted bands

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %



Ch 64: third harmonic (Pk det.)



Ch 64: third harmonic (Av det.)

3.7 Field strength of unwanted emissions in adjacent restricted bands

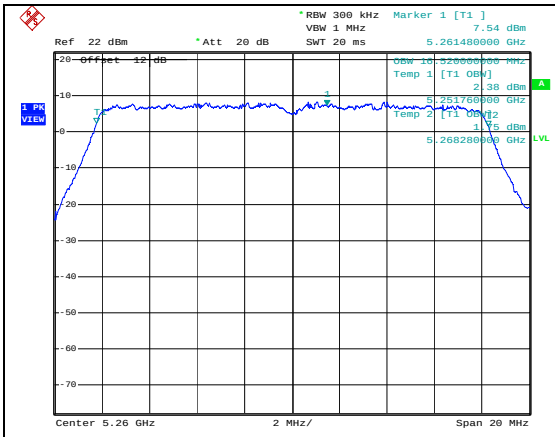
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11 n (40 MHz) mode, see section 7.5.

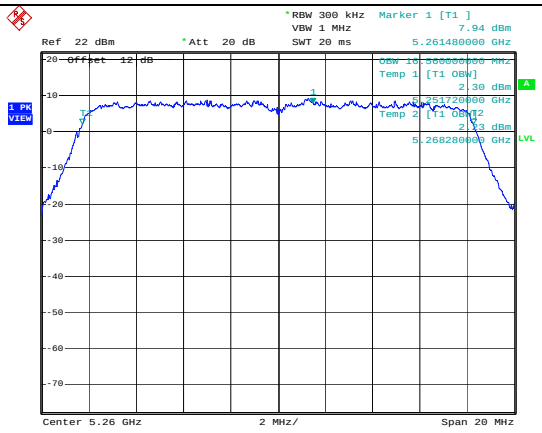
3.8 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %



Tx 0: Ch 52: occ bw = 16.52 MHz



Tx 2 Ch 52: occ bw = 16.56 MHz

Measurement uncertainty: +23 / -23 kHz

3.9 Rx spurious emissions

Compliance standard	:	IC RSS-Gen, section 2.3
Method of test	:	IC RSS-Gen, section 4.10 & 7.2.3.1
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed
This phenomenon is covered with the sample in 802-11 n (40 MHz) mode, see section 8.8.

4 Emission tests 802.11a: 5470 – 5725 MHz band

4.1 Peak power output

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138, Appendix A, method #1

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 100	Channel 120	Channel 140	
$B_{(26dB)}$ = 19.2 MHz 11 + 10logB = 23.8 dBm	$B_{(26dB)}$ = 19.2 MHz 11 + 10logB = 23.8 dBm	$B_{(26dB)}$ = 19.2 MHz 11 + 10logB = 23.8 dBm	Limit (conducted)
29.8 dBm	29.8 dBm	29.8 dBm	Limit (radiated)
17.3 dBm	17.3 dBm	17.6 dBm	Measured. value (conducted)
22.8 dBm e.i.r.p.	22.8 dBm e.i.r.p.	23.1 dBm e.i.r.p.	Calculated value (radiated)

4.2 Peak power spectral density

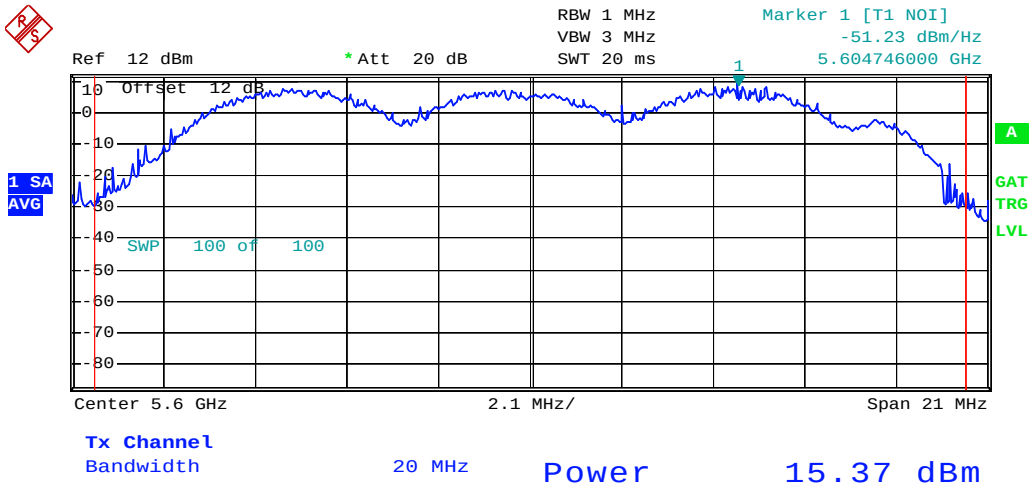
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 100	Channel 120	Channel 140	
11 dBm/MHz	11 dBm/MHz	11 dBm/MHz	Limit (conducted)
17 dBm/MHz	17 dBm/MHz	17 dBm/MHz	Limit (radiated)
8.0 dBm/MHz	8.7 dBm/MHz	8.5 dBm/MHz	Measured. value (conducted)
13.5 dBm/MHz e.i.r.p.	14.2 dBm/MHz e.i.r.p.	14.0 dBm/MHz e.i.r.p.	Calculated value (radiated)

Channel 120 plot

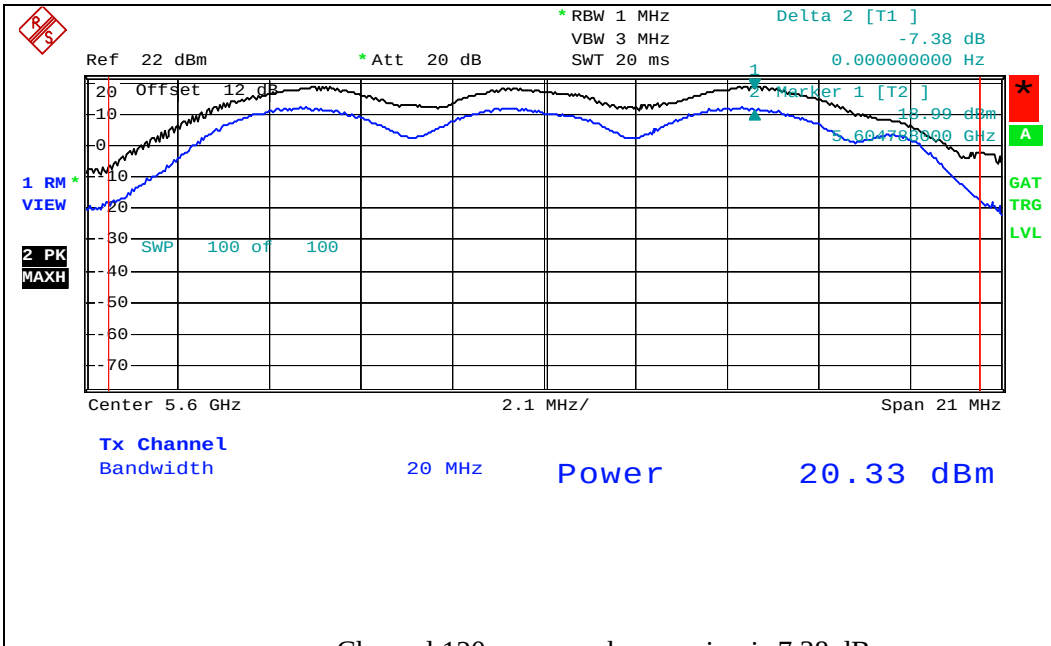


Measurement uncertainty: + 2.4/ -2.7 dB

4.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a) (6)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %



Channel 120: max. peak excursion is 7.38 dB

Measurement uncertainty: + 5.1/ -5.1 dB

4.4 Field strength of unwanted emissions 30 – 1000 MHz

Compliance standard	:	FCC part 15, subpart E, section 15.407(b)(6)
Method of test	:	ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

See section 2.2 for test results in 802.11n (40 MHz) mode.

4.5 Field strength of unwanted emissions > 1000 MHz

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (1)
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %
Test results	:	

Not performed.
This phenomenon is covered with the sample in 802-11 n (20 MHz) mode, see section 6.5.

4.6 Field strength of unwanted emissions in non-adjacent restricted bands

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11 n (20 MHz) mode, see section 6.6.

4.7 Field strength of unwanted emissions in adjacent restricted bands

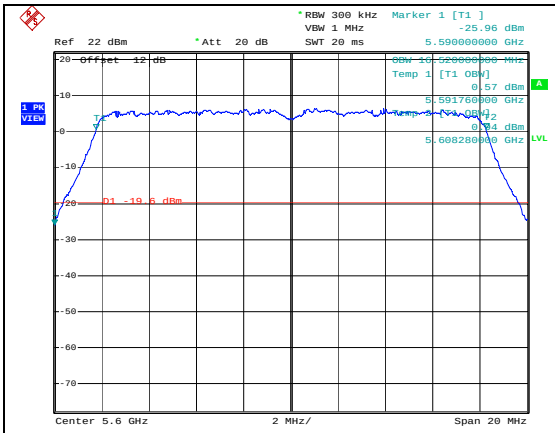
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11 n (40 MHz) mode, see section 8.6.

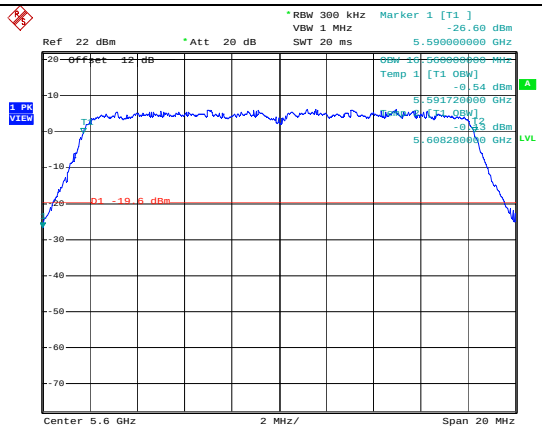
4.8 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %



Tx 0: Ch 120: occ bw = 16.52 MHz



Tx 2 Ch 120: occ bw = 16.56 MHz

Measurement uncertainty: +23 / -23 kHz

4.9 Rx spurious emissions

Compliance standard	:	IC RSS-Gen, section 2.3
Method of test	:	IC RSS-Gen, section 4.10 & 7.2.3.1
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11n (40 MHz) mode, see section 8.8.

5 Emission tests 802.11n (20 MHz): 5150 – 5350 MHz band

5.1 Peak power output

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(1) and (a)(2)
Method of test : FCC Public Notice DA 02-2138, Appendix A, method #1

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 36	Channel 52	Channel 64	
$B_{(26dB)}$ = 20.6 MHz 4 + 10logB = 17.1 dBm	$B_{(26dB)}$ = 20.6 MHz 11 + 10logB = 24.1 dBm	$B_{(26dB)}$ = 20.6 MHz 11 + 10logB = 24.1 dBm	Limit (conducted)
23.1 dBm	30.1 dBm	30.1 dBm	Limit (radiated)
16.4 dBm	18.8 dBm	17.2 dBm	Measured. value (conducted)
21.9 dBm e.i.r.p.	24.3 dBm e.i.r.p.	22.7 dBm e.i.r.p.	Calculated value (radiated)

Measurement uncertainty: + 2.4/ -2.7 dB

5.2 Peak power spectral density

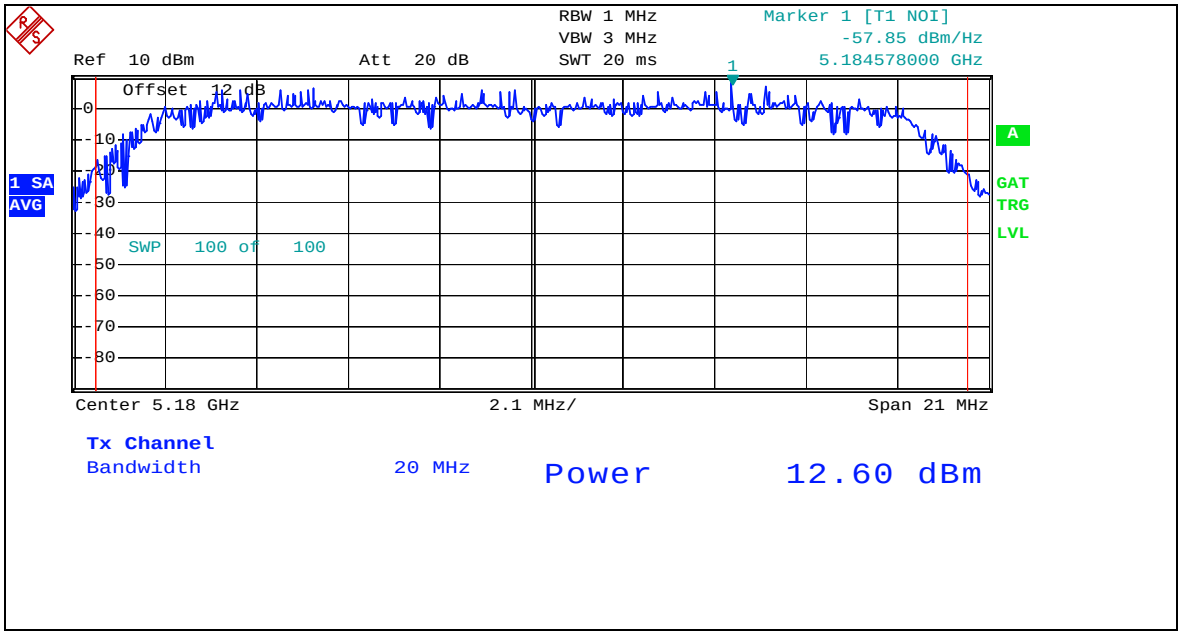
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(1) and (a)(2)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %
\

Test results :

Channel 36	Channel 44	Channel 52	Channel 64	
4 dBm/MHz	4 dBm/MHz	11 dBm/MHz	11 dBm/MHz	Limit (conducted)
10 dBm/MHz	10 dBm/MHz	17 dBm/MHz	17 dBm/MHz	Limit (radiated)
0.4 dBm/MHz	2.5 dBm/MHz	8.0 dBm/MHz	5.6 dBm/MHz	Measured. value (conducted)
5.9 dBm/MHz e.i.r.p.	8.0 dBm/MHz e.i.r.p.	13.5 dBm/MHz e.i.r.p.	11.1 dBm/MHz e.i.r.p.	Calculated value (radiated)

Channel 36 plot

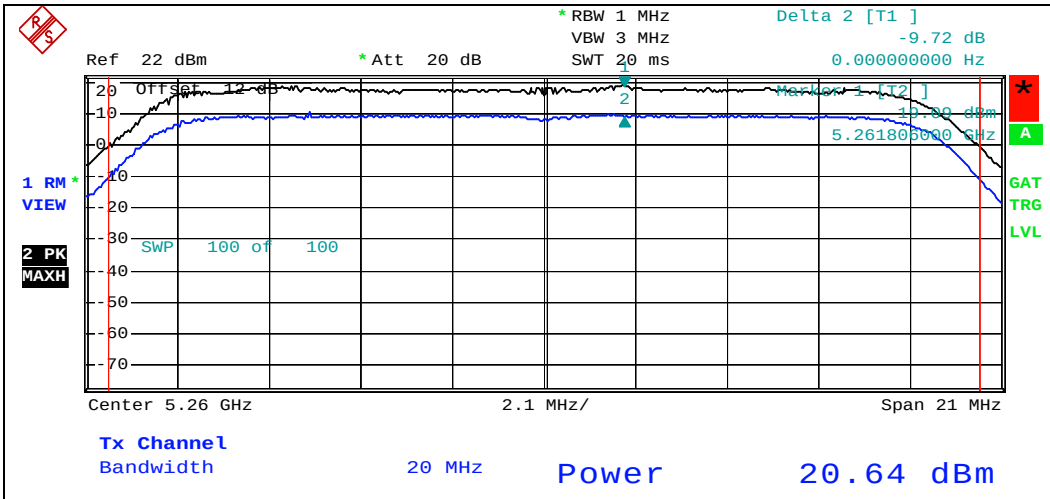


Measurement uncertainty: + 2.4/ -2.7 dB

5.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a) (6)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %



Channel 52: peak excursion is 9.72 dB

Measurement uncertainty: + 5.1/ -5.1 dB

5.4 Field strength of unwanted emissions 30 – 1000 MHz

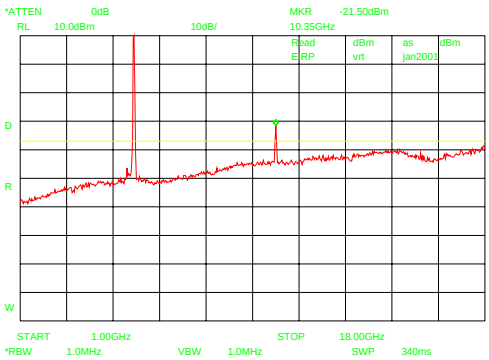
Compliance standard	:	FCC part 15, subpart E, section 15.407(b)(6)
Method of test	:	ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

See section 2.2 for test results in 802.11n (40 MHz) mode.

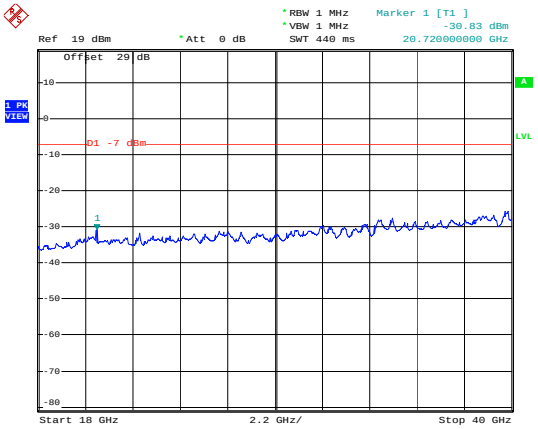
5.5 Field strength of unwanted emissions > 1000 MHz

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (1)
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Test results :

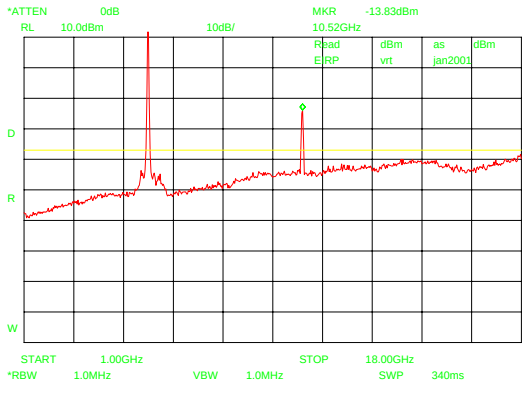


CH 36 1 - 18 GHz

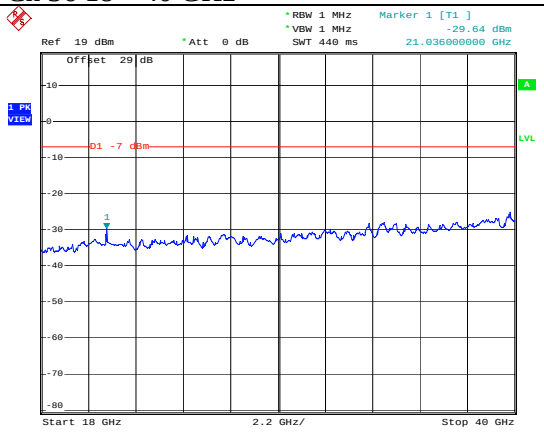


Date: 12.AUG.2008 13:52:41

Ch 36 18 – 40 GHz

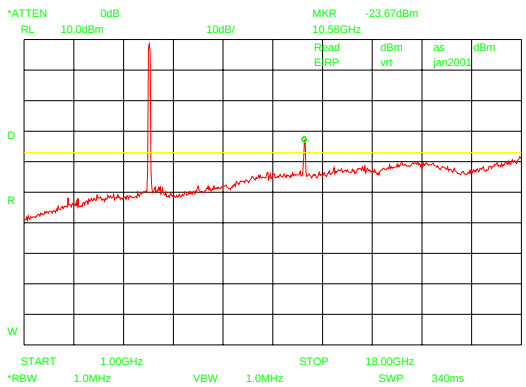


CH 52 1 - 18 GHz

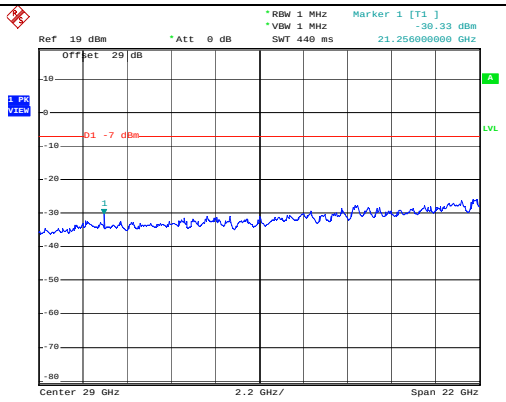


Date: 12.AUG.2008 14:04:19

CH 52 18 - 40 GHz



Ch 60 1 – 18 GHz



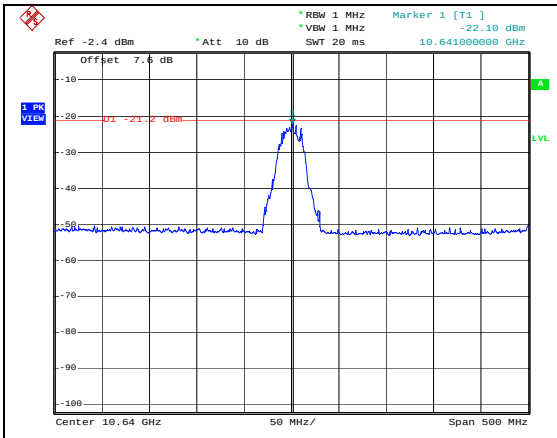
Date: 12.AUG.2008 14:17:13

Ch 60 18 – 40 GHz

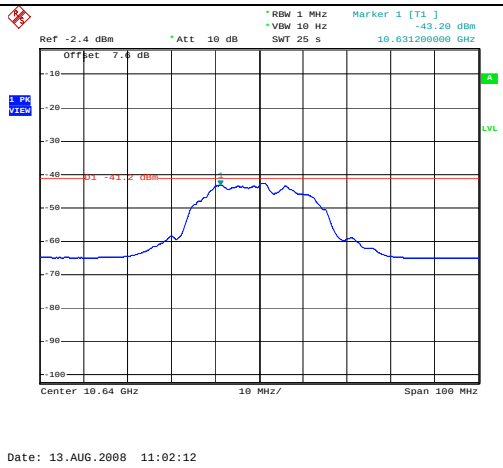
Measurement uncertainty: +4.5 dB / -6.0 dB(f < 18 GHz)
+3.3 dB/-3.3 dB(18 GHz ≥ f < 26 GHz)
+5.5 dB/ -8.1 dB(26 GHz ≥ f < 40 GHz)

5.6 Field strength of unwanted emissions in non-adjacent restricted bands

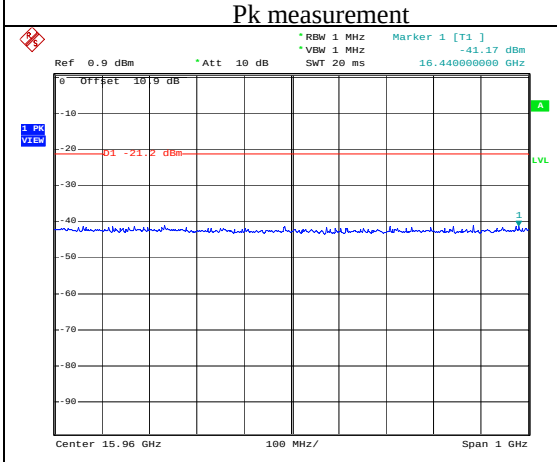
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %



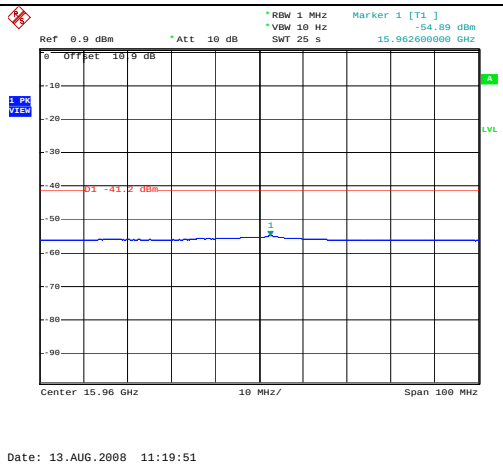
Channel 64, second harmonic
Pk measurement



Channel 64, second harmonic
Av measurement



channel 64, third harmonic
Pk measurement

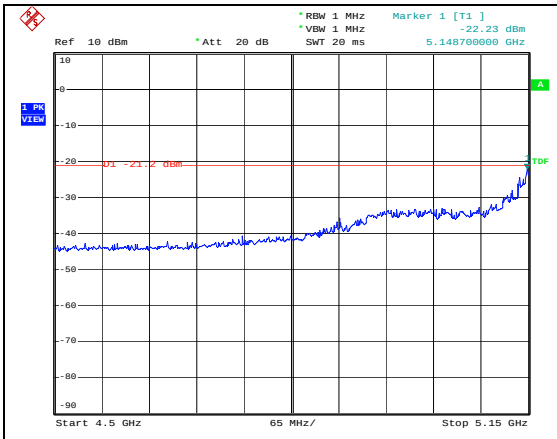


channel 64, third harmonic
Av measurement

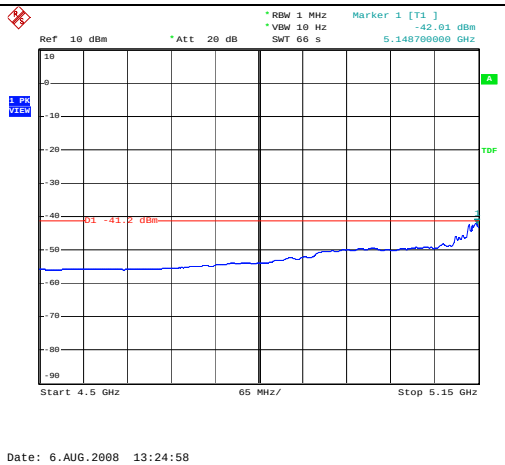
Measurement uncertainty: +4.5 dB / -6.1 dB

5.7 Field strength of unwanted emissions in adjacent restricted bands

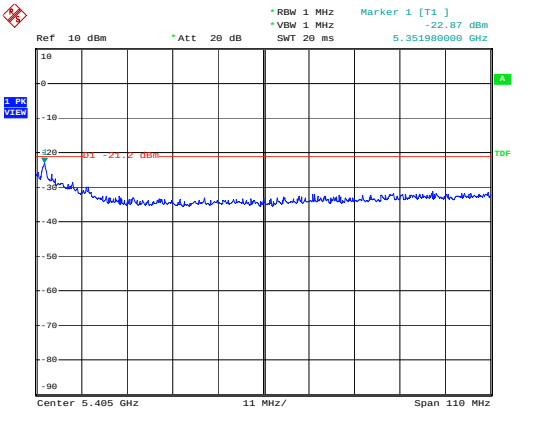
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %



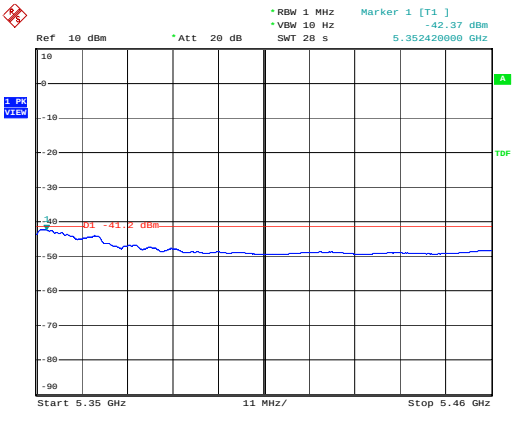
Lower adjacent restricted band (Pk det.)



Lower adjacent restricted band (Av det.)



Upper adjacent restricted band (Pk det.)



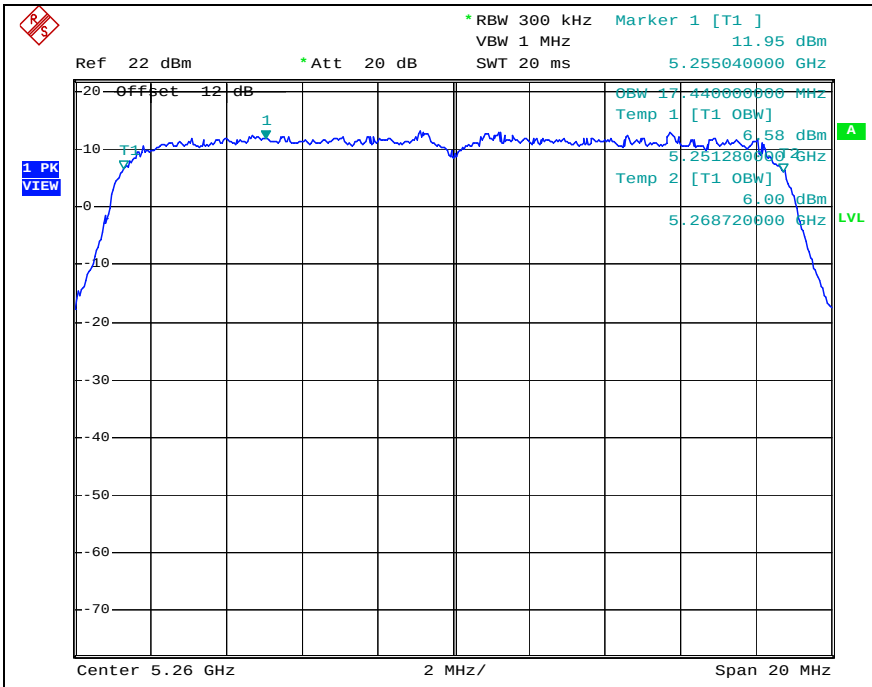
Upper adjacent restricted band (Av det.)

Measurement uncertainty: +4.5 dB / -6.1 dB

5.8 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %



Ch 52: occ bw = 17.44 MHz

Measurement uncertainty: +23 / -23 kHz

5.9 Rx spurious emissions

Compliance standard	:	IC RSS-Gen, section 2.3
Method of test	:	IC RSS-Gen, section 4.10 & 7.2.3.1
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11n (40 MHz) mode, see section 7.8.

6 Emission tests 802.11n (20 MHz): 5470 – 5725 MHz band

6.1 Peak power output

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138, Appendix A, method #1

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 100	Channel 120	Channel 140	
$B_{(26dB)}$ = 21.4 MHz 11 + 10logB = 24.3 dBm	$B_{(26dB)}$ = 21.4 MHz 11 + 10logB = 24.3 dBm	$B_{(26dB)}$ = 21.4 MHz 11 + 10logB = 24.3 dBm	Limit (conducted)
30.3 dBm	30.3 dBm	30.3 dBm	Limit (radiated)
17.6 dBm	17.4 dBm	17.8 dBm	Measured. value (conducted)
23.2 dBm e.i.r.p.	22.9 dBm e.i.r.p.	23.3 dBm e.i.r.p.	Calculated value (radiated)

Measurement uncertainty: + 2.4/ -2.7 dB

6.2 Peak power spectral density

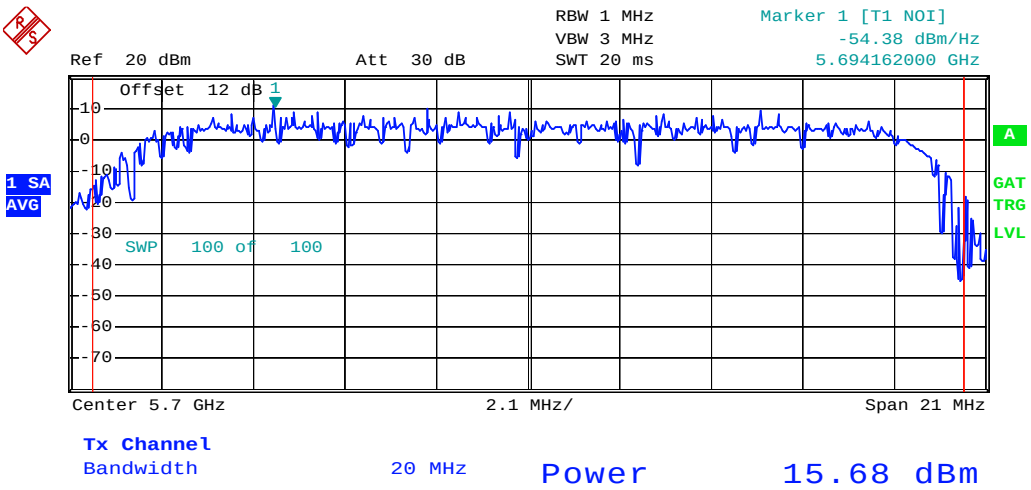
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 100	Channel 120	Channel 140	
11 dBm/MHz	11 dBm/MHz	11 dBm/MHz	Limit (conducted)
17 dBm/MHz	17 dBm/MHz	17 dBm/MHz	Limit (radiated)
6.4 dBm/MHz	6.1 dBm/MHz	6.3 dBm/MHz	Measured. value (conducted)
11.9 dBm/MHz e.i.r.p.	11.6 dBm/MHz e.i.r.p.	11.8 dBm/MHz e.i.r.p.	Calculated value (radiated)

Channel 140 plot

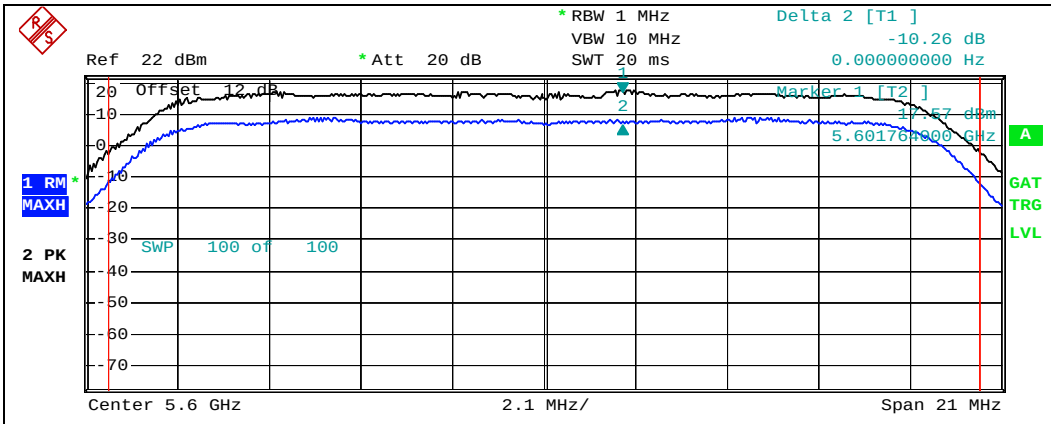


Measurement uncertainty: + 2.4/ -2.7 dB

6.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a) (6)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %



channel 120: peak excursion is 10.26 dB

Measurement uncertainty: + 5.1/ -5.1 dB

6.4 Field strength of unwanted emissions 30 – 1000 MHz

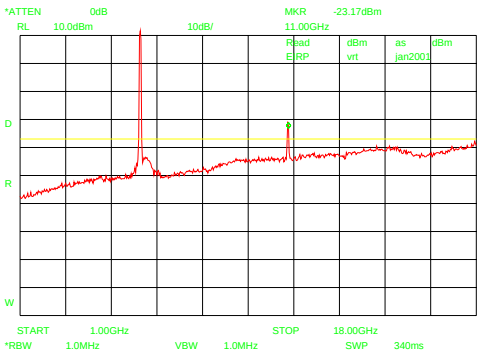
Compliance standard	:	FCC part 15, subpart E, section 15.407(b)(6)
Method of test	:	ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

See section 2.2 for test results in 802.11n (40 MHz) mode.

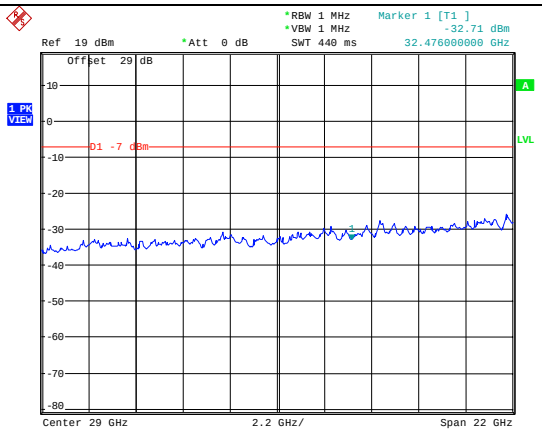
6.5 Field strength of unwanted emissions > 1000 MHz

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (1)
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

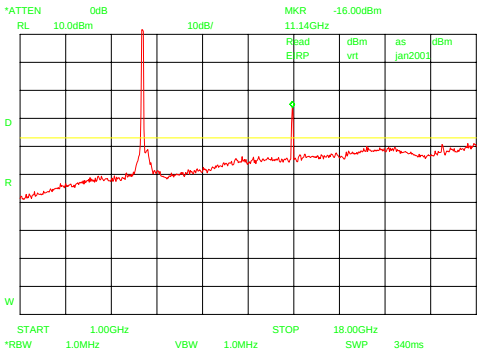
Test results :



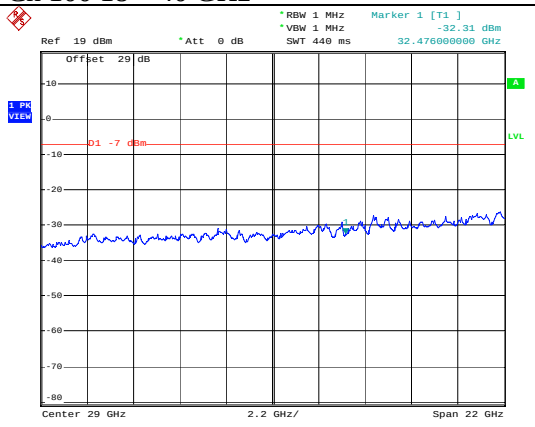
CH 100 1 - 18 GHz



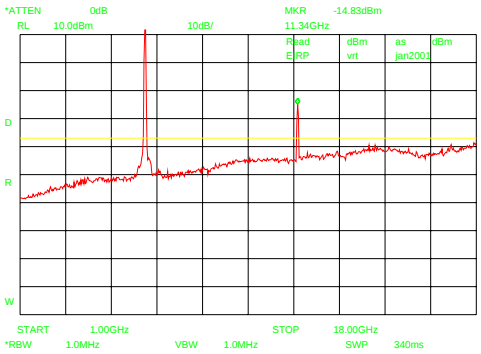
Ch 100 18 – 40 GHz



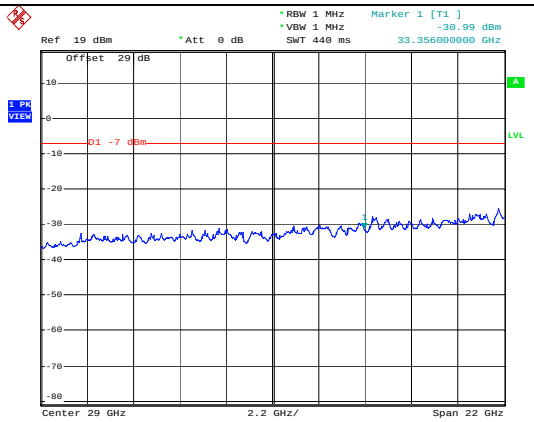
CH 116 1 - 18 GHz



CH 116 18 - 40 GHz



CH 136 1 - 18 GHz

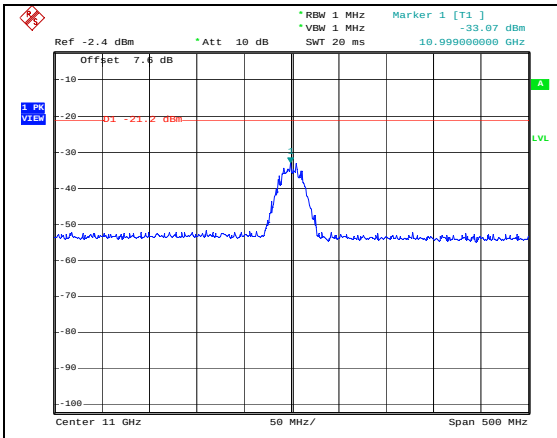


Ch 136 18 – 40 GHz

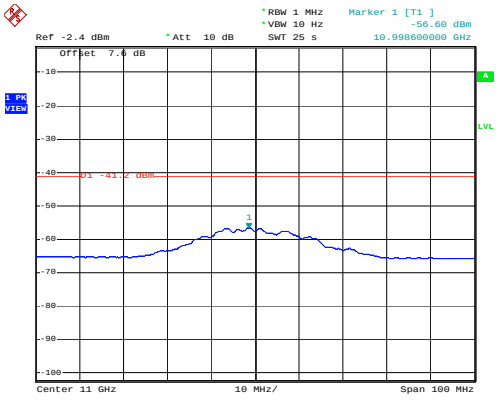
Measurement uncertainty: +4.5 dB / -6.0 dB(f < 18 GHz)
+3.3 dB/-3.3 dB(18 GHz ≥ f < 26 GHz)
+5.5 dB/ -8.1 dB(26 GHz ≥ f < 40 GHz)

6.6 Field strength of unwanted emissions in non-adjacent restricted bands

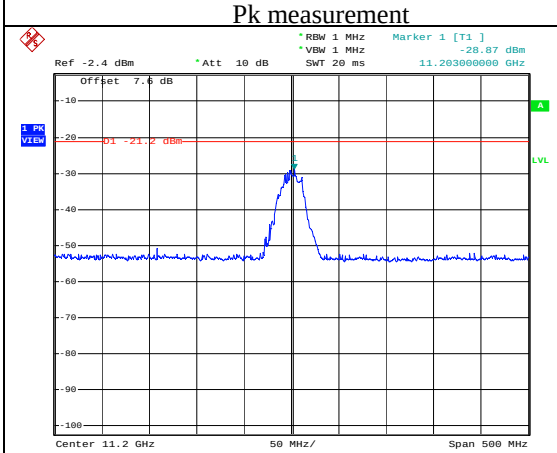
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %



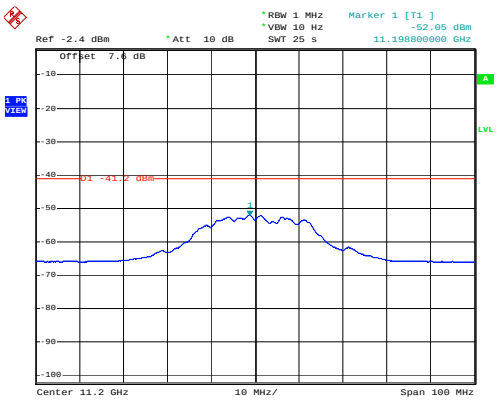
Channel 100, second harmonic
Pk measurement



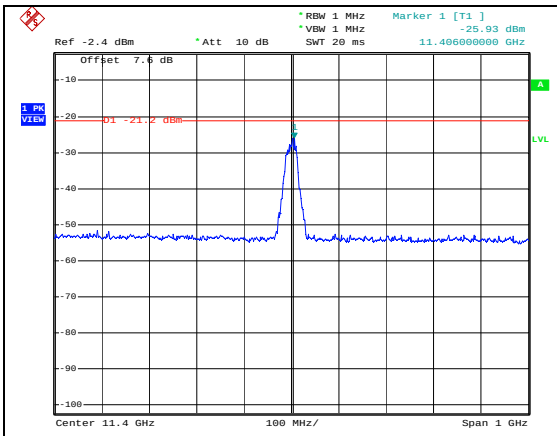
Channel 100, second harmonic
Av measurement



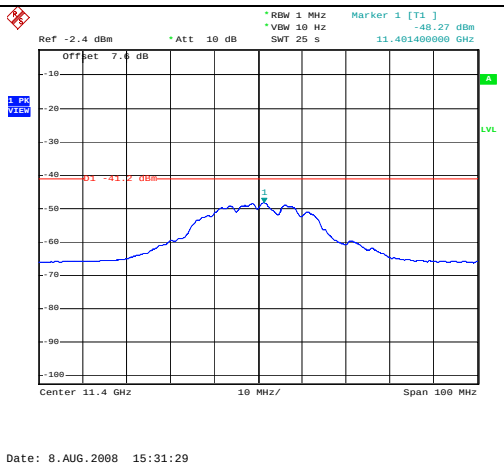
channel 120, second harmonic
Pk measurement



channel 120, third harmonic
Av measurement



channel 140, second harmonic
Pk measurement



channel 140, second harmonic
Av measurement

Measurement uncertainty: +4.5 dB / -6.1 dB

6.7 Field strength of unwanted emissions in adjacent restricted bands

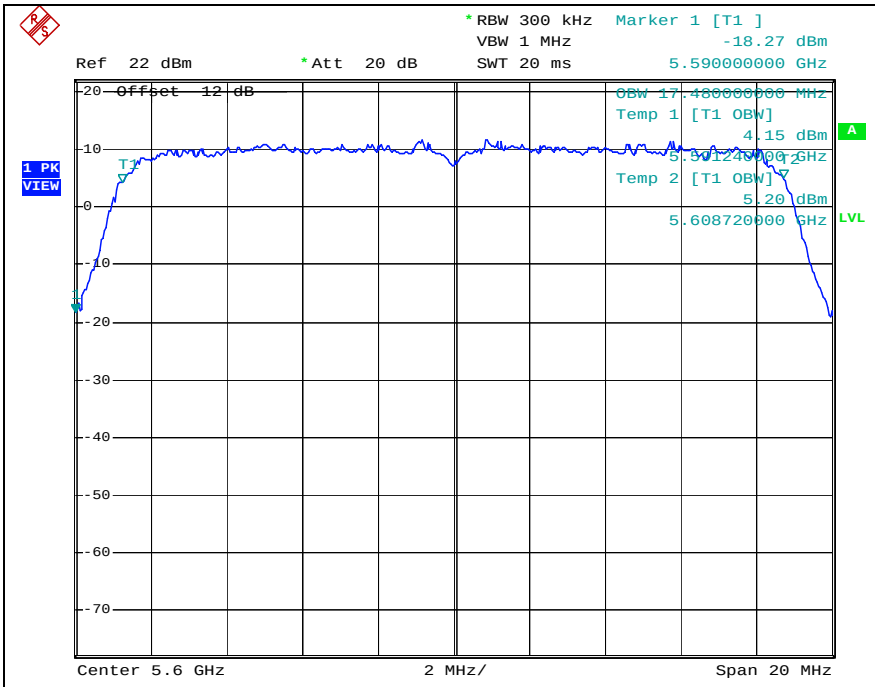
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11n (40 MHz) mode, see section 8.6.

6.8 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %



Ch 120: occ bw = 17.48 MHz

Measurement uncertainty: +23 / -23 kHz

6.9 Rx spurious emissions

Compliance standard	:	IC RSS-Gen, section 2.3
Method of test	:	IC RSS-Gen, section 4.10 & 7.2.3.1
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Not performed.
This phenomenon is covered with the sample in 802-11 n (40 MHz) mode, see section 8.8.

7 Emission tests 802.11n (40 MHz): 5150 – 5350 MHz band

7.1 Peak power output

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138, Appendix A, method #1

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 36	Channel 52	Channel 60	
$B_{(26dB)}$ = 40.6 MHz 4 + 10logB = 20.1 dBm	$B_{(26dB)}$ = 40.6 MHz 11 + 10logB = 27.1 dBm	$B_{(26dB)}$ = 40.6 MHz 11 + 10logB = 27.1 dBm	Limit (conducted)
26.1 dBm	33.1 dBm	33.1 dBm	Limit (radiated)
15.0 dBm	19.6 dBm	14.1 dBm	Measured. value (conducted)
20.5 dBm e.i.r.p.	25.1 dBm e.i.r.p.	19.6 dBm e.i.r.p.	Calculated value (radiated)

Measurement uncertainty: + 2.4/ -2.7 dB

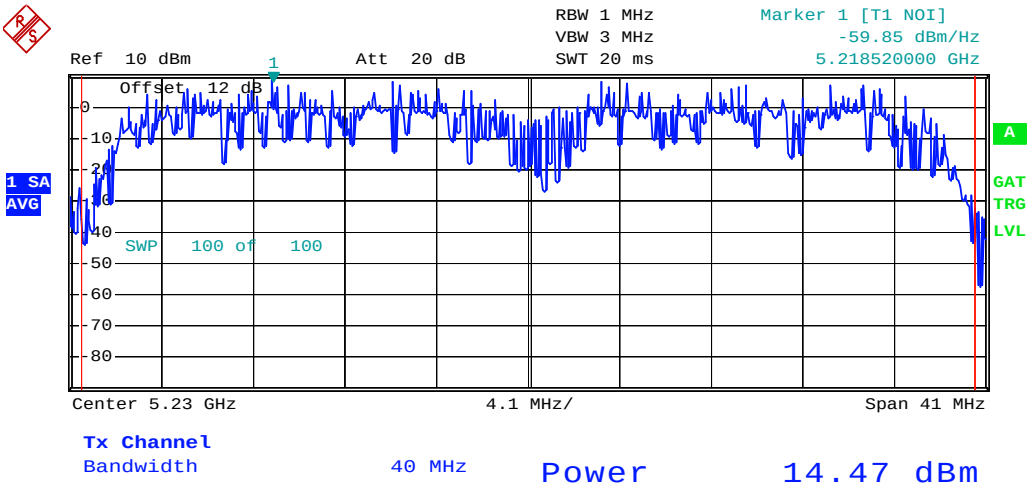
7.2 Peak power spectral density

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(1) and (a)(2)
Method of test : FCC Public Notice DA 02-2138
Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 36	Channel 44	Channel 52	Channel 60	
11 dBm/MHz	11 dBm/MHz	11 dBm/MHz	11 dBm/MHz	Limit (conducted)
17 dBm/MHz	17 dBm/MHz	17 dBm/MHz	17 dBm/MHz	Limit (radiated)
1.0 dBm/MHz	0 dBm/MHz	6.8 dBm/MHz	1.3 dBm/MHz	Measured. value (conducted)
6.5 dBm/MHz e.i.r.p.	5.5 dBm/MHz e.i.r.p.	12.3 dBm/MHz e.i.r.p.	6.8 dBm/MHz e.i.r.p.	Calculated value (radiated)

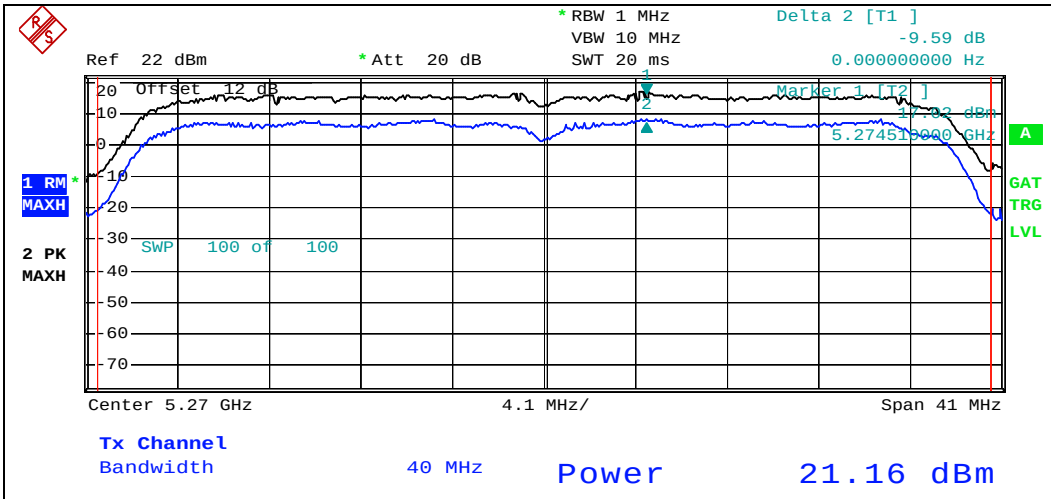
Channel 44 plot



7.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(6)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %



channel 52: peak excursion is 9.59 dB

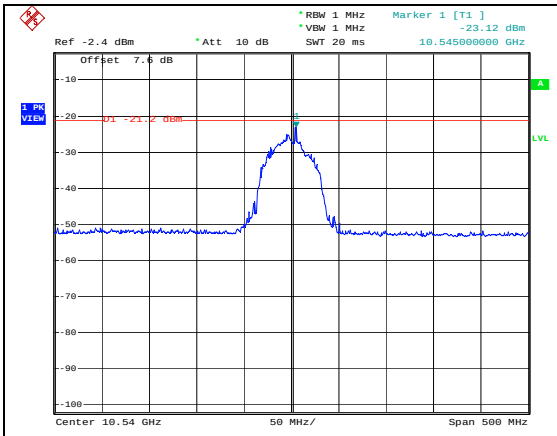
7.4 Field strength of unwanted emissions > 1000 MHz

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (1)
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %
Test results	:	

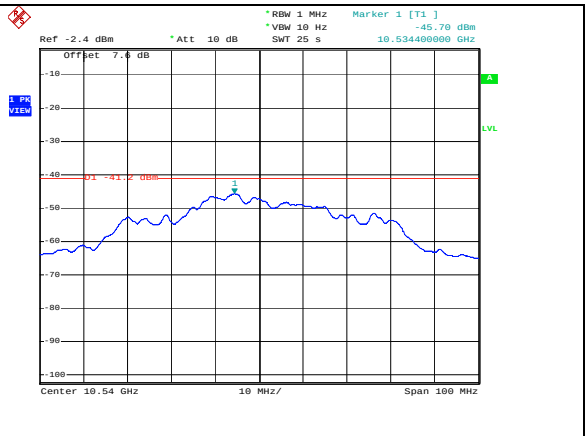
Not performed.
This phenomenon is covered with the sample in 802-11 n (20 MHz) mode, see section 5.5.

7.5 Field strength of unwanted emissions in non-adjacent restricted bands

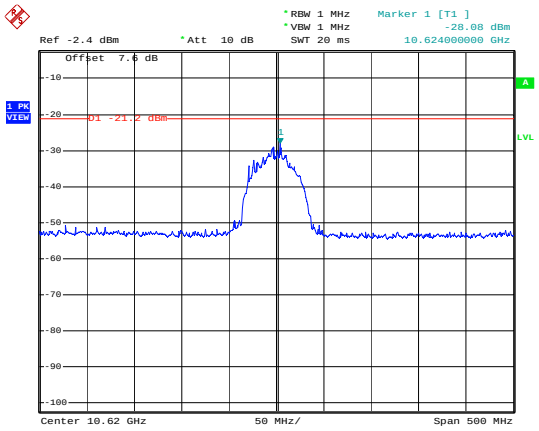
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %



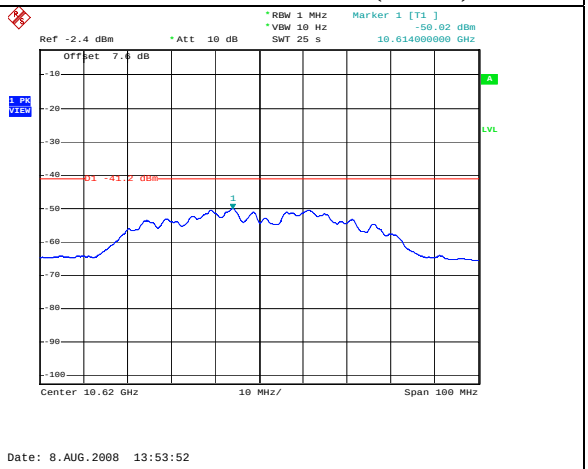
Ch 52: second harmonic (Pk det.)



Ch 52: second harmonic (Av det.)



Ch 60: second harmonic (Pk det.)

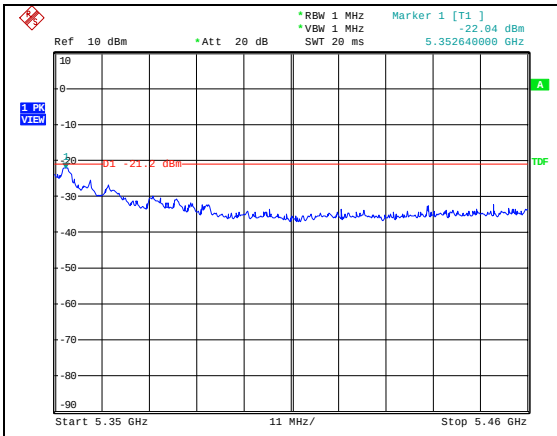


Ch 60: second harmonic (Av det.)

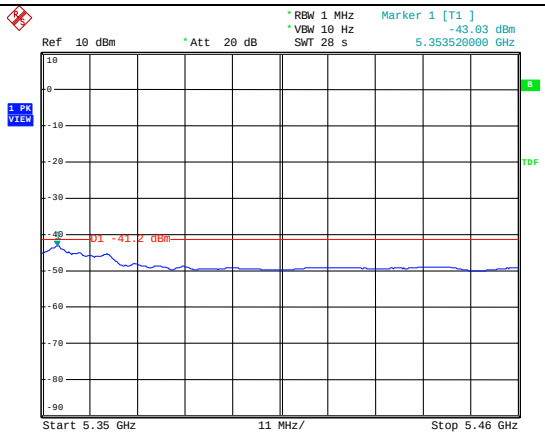
Measurement uncertainty: +4.5 dB / -6.1 dB

7.6 Field strength of unwanted emissions in adjacent restricted bands

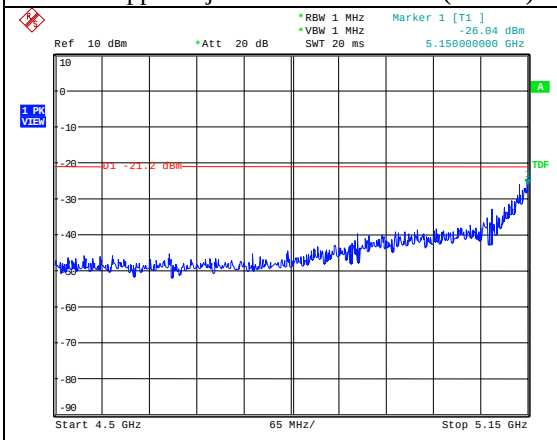
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %



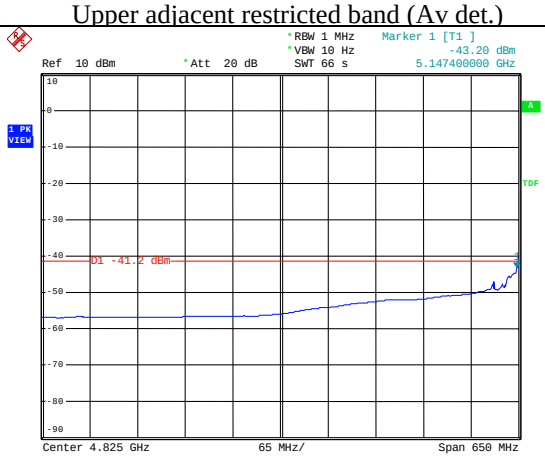
Upper adjacent restricted band (Pk det.)



Upper adjacent restricted band (Av det.)



Lower adjacent restricted band (Pk det.)



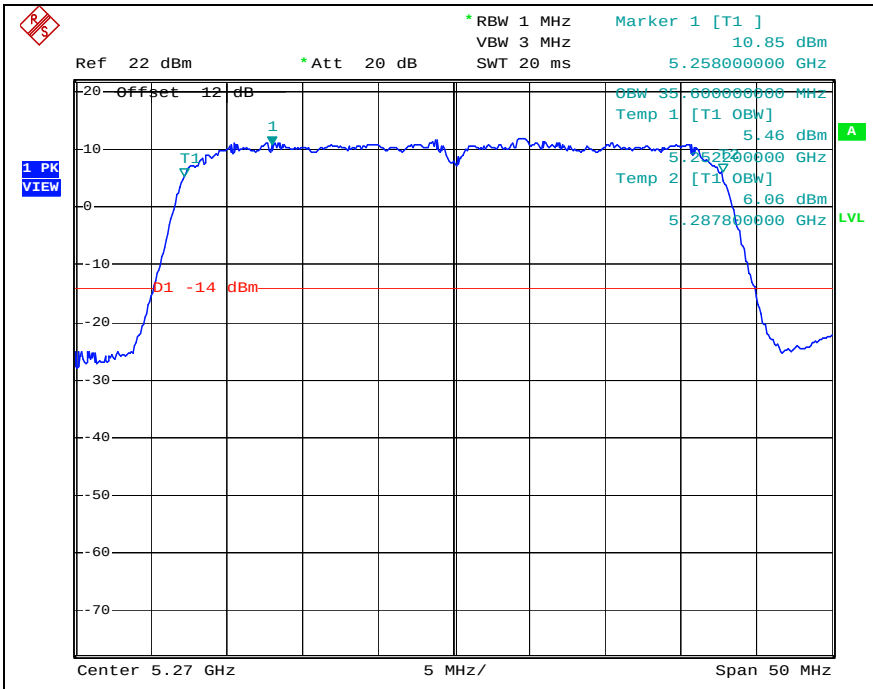
Lower adjacent restricted band (Av det.)

Measurement uncertainty: +4.5 dB / -6.1 dB

7.7 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %



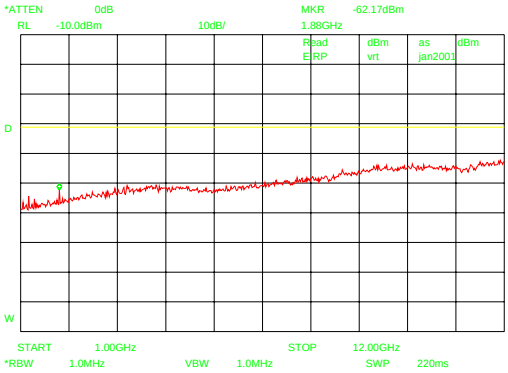
Ch 52: occ bw = 35.60 MHz

Measurement uncertainty: +23 / -23 kHz

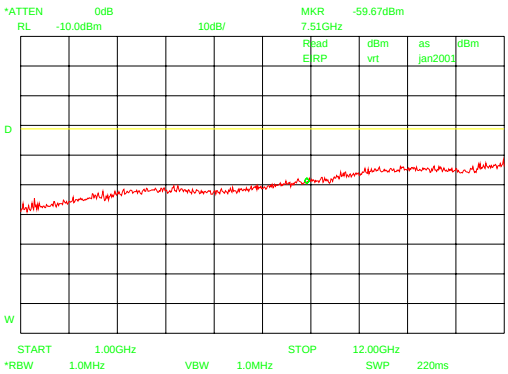
7.8 Rx spurious emissions

Compliance standard : IC RSS-Gen, section 2.3
Method of test : IC RSS-Gen, section 4.10 & 7.2.3.1

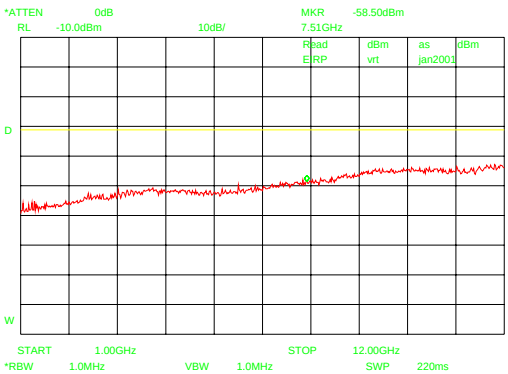
Ambient temperature : 24 °C
Relative humidity : 50 %



Ch 36 1 – 12 GHz



Ch 52 1-12 GHz



Ch 60 1 – 12 GHz

Measurement uncertainty: +4.5 dB / -6.1 dB

8 Emission tests 802.11n (40 MHz): 5470 – 5725 MHz band

8.1 Peak power output

Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138, Appendix A, method #1

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 100	Channel 116	Channel 136	
$B_{(26dB)}$ = 41.3 MHz 11 + 10logB = 27.2 dBm	$B_{(26dB)}$ = 41.3 MHz 11 + 10logB = 27.2 dBm	$B_{(26dB)}$ = 41.3 MHz 11 + 10logB = 27.2 dBm	Limit (conducted)
33.2 dBm	33.2 dBm	33.2 dBm	Limit (radiated)
18.5 dBm	20.1 dBm	19.1 dBm	Measured. value (conducted)
24.0 dBm e.i.r.p.	25.6 dBm e.i.r.p.	24.6 dBm e.i.r.p.	Calculated value (radiated)

8.2 Peak power spectral density

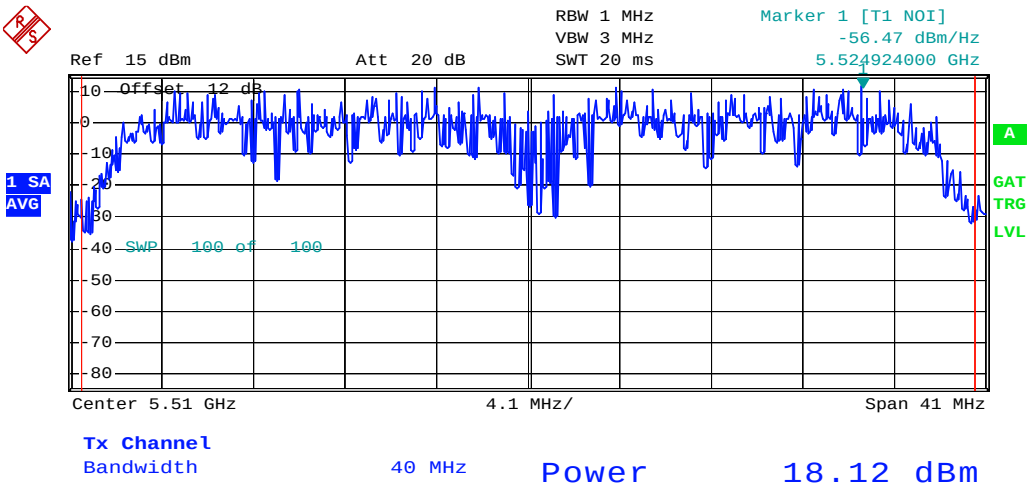
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(2)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Channel 100	Channel 116	Channel 136	
11 dBm/MHz	11 dBm/MHz	11 dBm/MHz	Limit (conducted)
17 dBm/MHz	17 dBm/MHz	17 dBm/MHz	Limit (radiated)
3.7 dBm/MHz	6.4 dBm/MHz	4.7 dBm/MHz	Measured. value (conducted)
9.2 dBm/MHz e.i.r.p.	11.9 dBm/MHz e.i.r.p.	10.2 dBm/MHz e.i.r.p.	Calculated value (radiated)

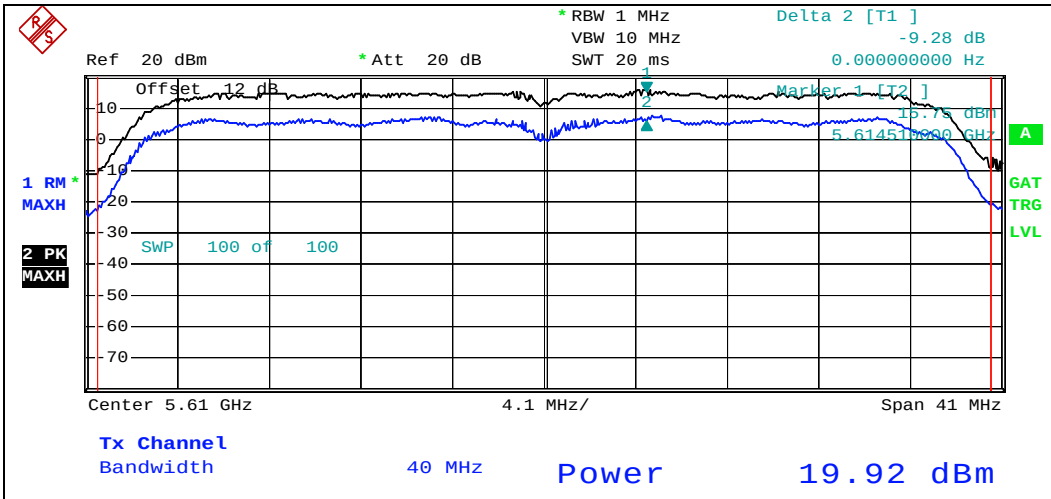
Channel 100 plot



8.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a) (6)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %



Channel 120: peak excursion is 9.28 dB

8.4 Field strength of unwanted emissions > 1000 MHz

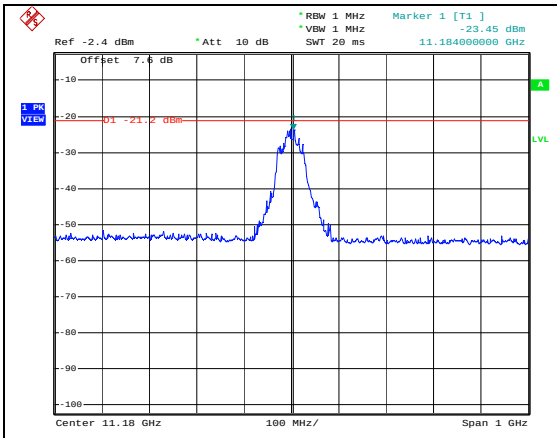
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (1)
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Ambient temperature	:	24 °C
Relative humidity	:	50 %

Test results :

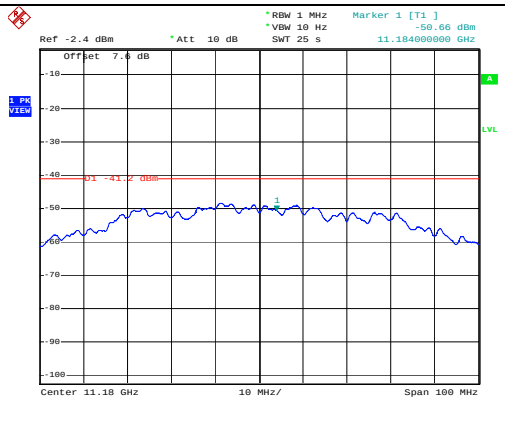
Not performed.
This phenomenon is covered with the sample in 802-11 n (20 MHz) mode, see section 6.5.

8.5 Field strength of unwanted emissions in non-adjacent restricted bands

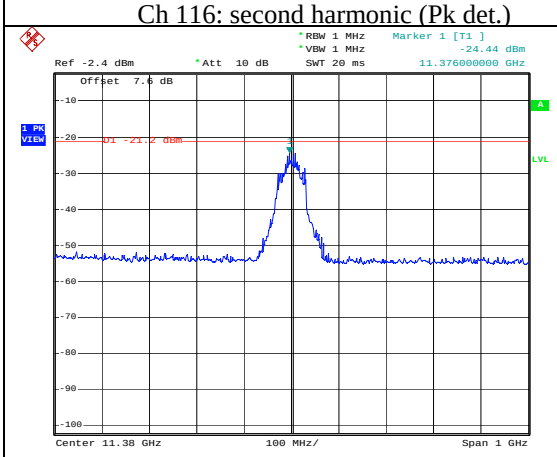
Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
Ambient temperature	:	24 °C
Relative humidity	:	50 %



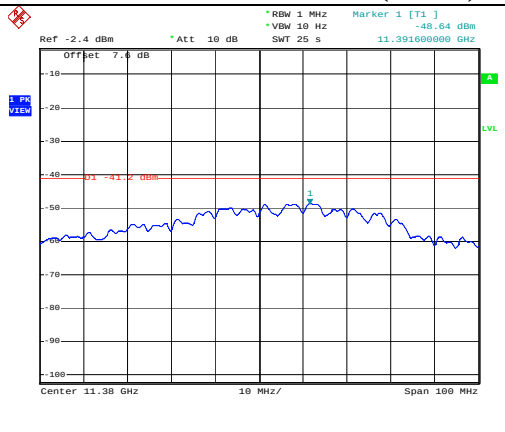
Ch 116: second harmonic (Pk det.)



Ch 116: second harmonic (Av det.)



Ch 136: second harmonic (Pk det.)

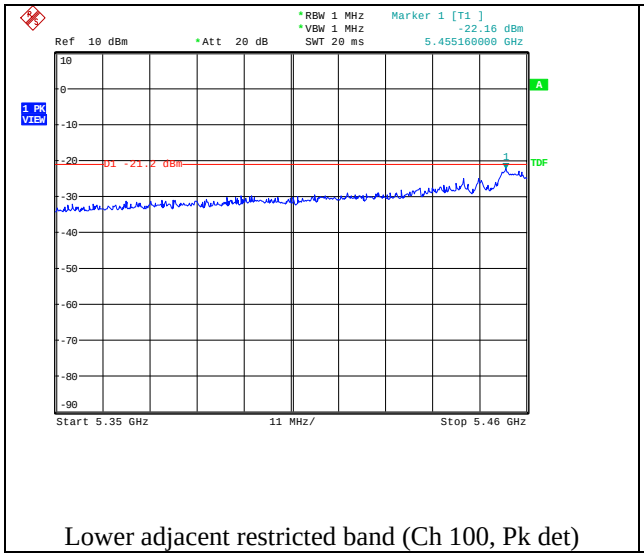


Ch 136; second harmonic (Av det.)

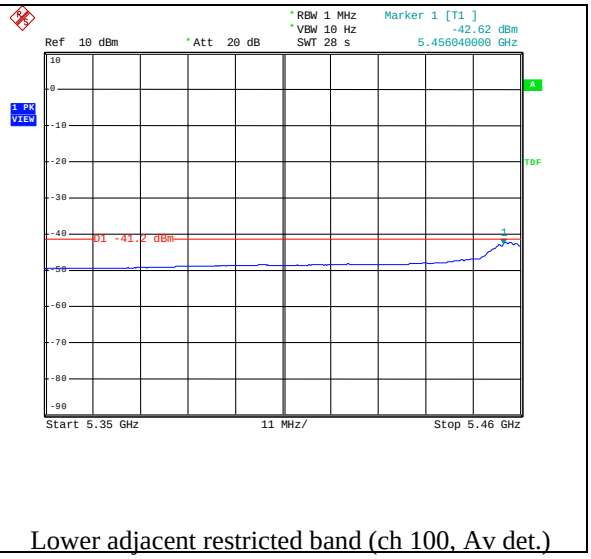
Measurement uncertainty: +4.5 dB / -6.1 dB

8.6 Field strength of unwanted emissions in adjacent restricted bands

Compliance standard	:	FCC part 15, subpart E, section 15.407 (b) (7)
Method of test	:	FCC Public Notice DA 00-705
EUT config	:	
Ambient temperature	:	24 °C
Relative humidity	:	50 %



Lower adjacent restricted band (Ch 100, Pk det)



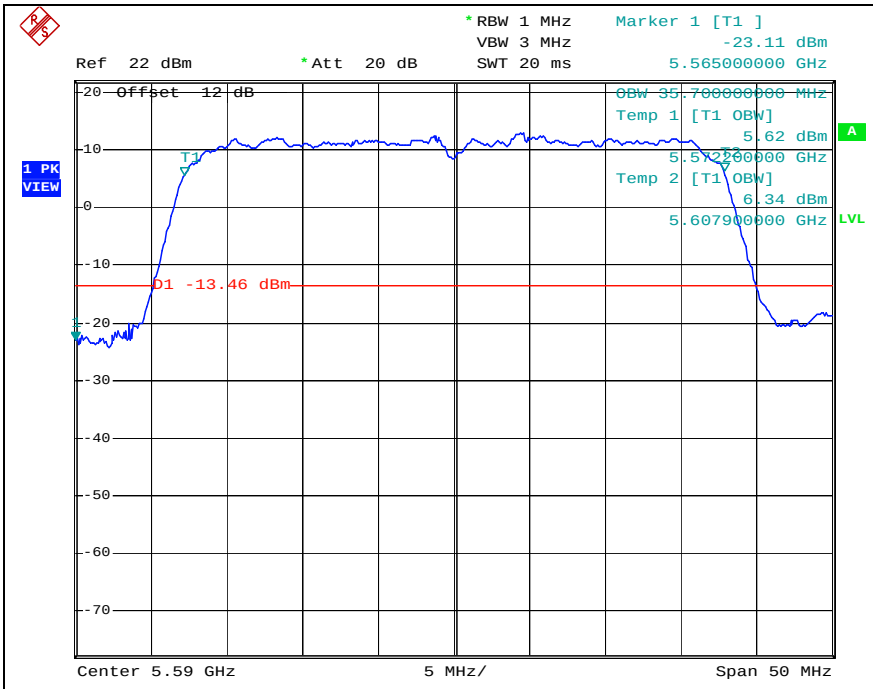
Lower adjacent restricted band (ch 100, Av det.)

Measurement uncertainty: +4.5 dB / -6.1 dB

8.7 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %



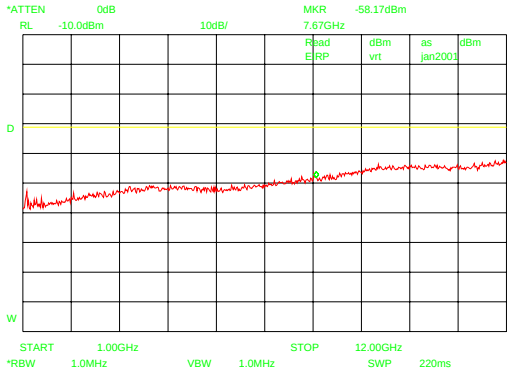
Ch 116: occ bw = 35.7 MHz

Measurement uncertainty: +23 / -23 kHz

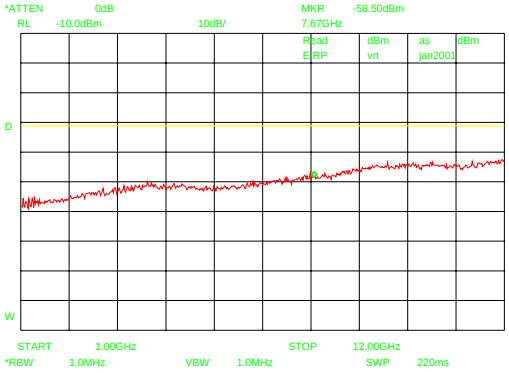
8.8 Rx spurious emissions

Compliance standard : IC RSS-Gen, section 2.3
Method of test : IC RSS-Gen, section 4.10 & 7.2.3.1

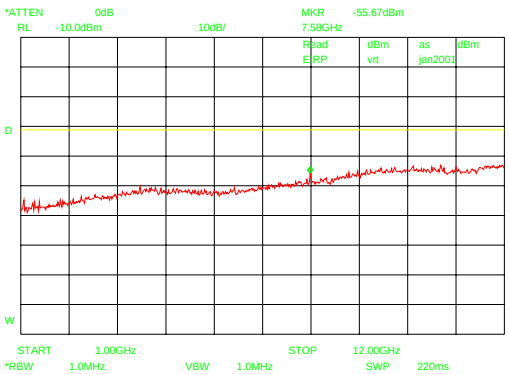
Ambient temperature : 24 °C
Relative humidity : 50 %



Ch 100 1 – 12 GHz



Ch 116 1-12 GHz



Ch 136 1 – 12 GHz

Measurement uncertainty: +4.5 dB / -6.1 dB

9 Maximum permissible exposure

Compliance standard : FCC part 1, section 1.1307(b)(1)
IC safety Code 6, section 2.2.1 (a)

Power density with 100 % reflection:

Mode	Band	MPE Distance (cm)	Output power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)	IC power Density (W/m^2)
802.11a	5.3 GHz	20	18.7	5.5	0.208	2.08
802.11a	5.6 GHz	20	17.6	5.5	0.164	1.64
802.11n (20 MHz)	5.3 GHz	20	18.8	5.5	0.212	2.12
802.11n (20 MHz)	5.6 GHz	20	17.8	5.5	0.172	1.72
802.11n (40 MHz)	5.3 GHz	20	19.6	5.5	0.256	2.56
802.11n (40 MHz)	5.6 GHz	20	20.1	5.5	0.288	2.88

Power density with 0 % reflection:

Mode	Band	MPE distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC power Density (mW/cm^2)	IC power Density (W/m^2)
802.11a	5.3 GHz	20	18.7	5.5	0.052	0.52
802.11a	5.6 GHz	20	17.6	5.5	0.041	0.41
802.11n (20 MHz)	5.3 GHz	20	18.8	5.5	0.053	0.53
802.11n (20 MHz)	5.6 GHz	20	17.8	5.5	0.043	0.43
802.11n (40 MHz)	5.3 GHz	20	19.6	5.5	0.064	0.64
802.11n (40 MHz)	5.6 GHz	20	20.1	5.5	0.072	0.72

Used test equipment module

Description	Telef. ID	Manufacturer	Model
Spectrum Analyzer	TE 00481	Hewlett Packard	HP 8563E
Spectrum Analyzer	TE 11125	Rohde & Schwarz	FSP 40
EMI test receiver	TE 11128	Rohde & Schwarz	ESCI
BiLog antenna	TE 00967	Chase	CBL6112A
Artificial mains network	TE 00208	Rohde & Schwarz	ESH3-Z5
RF Pre-amplifier up to 1000 MHz	TE 00098	Rohde & Schwarz	ESV-Z3
RF Pre-amplifier 1 – 20.0 GHz	TE 00092	Hewlett Packard	HP 8349A
RF Pre-amplifier 1 - 26.5 GHz	TE 00093	Hewlett Packard	HP 8449B
Anechoic chamber	TE 01064	Euroshield	RFD-F-100
Biconilog antenna	TE 00700	Emco	3143
DRG Antenna	TE 00531	Emco	3115
Horn Antenna	TE 00607	Scientific Atlanta	12-12
Horn Antenna	TE 00611	Scientific Atlanta	12-5.8
Horn antenna	TE00610	Scientific Atlanta	12-8.2
Horn antenna	TE00612	Scientific Atlanta	12-3.9
DRG antenna	TE00533	Emco	3116
Pre amplfier	TE11131	Miteq	JS4-18004000
Antenna tower	--	HD	AS 620p
Turntable	--	HD	DS 412
Turntable controller	--	HD	HD 050
Attenuator	TE 00500	Hewlett Packard	HP 8459D
Laptop		Dell	

Cross reference table

Transmitter	
IC RSS-210 Issue 7, Annex 9	**FCC 47 CFR Ch. 1 part 15, subpart E (10-1-06 Edition)**
A9.2 (1)	§ 15.407 (a) (1)
A9.2 (3)	§ 15.407 (a) (3)
--	§ 15.407 (a) (6)
A9.3 (1)	§ 15.407 (b) (1)
A9.3 (4)	§ 15.407 (b) (3)
A9.3 (4)	§ 15.407 (b) (4)
IC RSS-Gen Issue 2	
§ 4.6.1	--
Receiver	
IC RSS-Gen Issue 2	
§ 7.2.3	--
IC RSS-Gen Issue 2	**FCC 47 CFR Ch. 1 part 15, subpart C (10-1-06 Edition)**
§ 7.2.2	§ 15.207 (a)

Revision history

REVISION	DATE	REMARKS
1.0	14 October 2008	- Corrected power settings in table “Channel test frequencies”, page 8; - Added test modulation / data rate overview on page 8; - Corrected E.I.R.P. values on page 11; - Corrected MPE values on page 66; - Added MPE values for 100 % reflection; - Added –26 dB emission bandwidth results w.r.t. output power limit; - Peak power output test results tables completed with limits; - Peak power spectral density test results tables completed with limits; - FCC registration number added in section 3 of ‘Main module’.