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Test report

231485-4TRFWL

Date of issue: July 5, 2013

Applicant:

Ericsson WiFi Inc.

Product:

AP6401

Model:

KRC 161 393/2

FCC ID:

RAR40025002

IC Registration number:

4674A-40025002

Specifications:

- FCC 47 CFR Part 15 Subpart E, §15.407
  Unlicensed National Information Infrastructure Devises
- RSS-210, Issue 8, December 2010, Annex 9
  Local Area Network Devices

Test location

Company name:	Nemko Canada Inc.
Address:	303 River Road
City:	Ottawa
Province:	Ontario
Postal code:	K1V 1H2
Country:	Canada
Telephone:	+1 613 737 9680
Facsimile:	+1 613 737 9691
Toll free:	+1 800 563 6336
Website:	www.nemko.com
Site number:	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by:	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by:	Kevin Rose, Wireless/EMC Specialist
Date:	July 5, 2013
Signature:	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name:	Ericsson WiFi Inc.
Address:	6300 Legacy Drive
City:	Plano
Province/State:	TX
Postal/Zip code:	75024
Country:	USA

1.2 Test specifications

FCC 47 CFR Part 15, Subpart E, Clause 15.407	Unlicensed National Information Infrastructure Devises
RSS-210, Issue 8, December 2010, Annex 9	Local Area Network Devices

1.3 Test methods

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E	789033 D01 General UNII Test Procedures v01r03 (April 8, 2013)
Emissions testing of transmitters with multiple outputs in the same band (MIMO)	662911 D01 Multiple Transmitter Output v02 (May 28, 2013)
Emissions testing of transmitters with multiple outputs in the same band (MIMO) with Cross Polarized Antenna	662911 D02 MIMO with Cross Polarized Antenna v01
ANSI C64.3 v 2003	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

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.5 Exclusions

None

1.6 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass[1]
§15.203	Antenna requirement	Pass[2]

Notes: [1]Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed

[2]The Antennas are located within the enclosure of EUT and not user accessible.

2.2 FCC Part 15 Subpart E, test results

Part	Test description	Verdict
§15.403(i)	Emission bandwidth	Not applicable
§15.407(a)(1)	5.15–5.25 GHz band power and density limits	Pass
§15.407(a)(2)	5.25–5.35 GHz and 5.47–5.725 GHz bands power and density limits	Not applicable
§15.407(a)(3)	5.725–5.825 GHz band power and density limits	Not applicable
§15.407(a)(6)	Peak excursion	Not applicable
§15.407(b)(1)	5.15–5.25 GHz band undesired emission limits	Pass
§15.407(b)(2)	5.25–5.35 GHz band undesired emission limits	Not applicable
§15.407(b)(3)	5.47–5.725 GHz band undesired emission limits	Not applicable
§15.407(b)(4)	5.725–5.825 GHz band undesired emission limits	Not applicable
§15.407(b)(6)	Unwanted emissions below 1 GHz	Pass
§15.407(b)(7)	Radiated emissions within restricted bands	Pass
§15.407(e)	5.15–5.25 GHz band operational restriction	Pass[1]
§15.407(g)	Frequency stability	Pass
§15.407(h)(1)	Transmit power control (TPC)	Not applicable
§15.407(h)(2)	Dynamic Frequency Selection (DFS)	Not applicable

Note: [1] Within the 5.15–5.25 GHz band, U-NII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations. The EUT operating within 5.15–5.25 GHz band is restricted to indoor operations only as declared by the applicant.

2.3 RSS-Gen, Issue 3, test results

Part	Test description	Verdict
4.6.1	Occupied bandwidth	Pass
6.1	Receiver spurious emissions limits (radiated)	Not applicable
6.2	Receiver spurious emissions limits (antenna conducted)	Not applicable
7.2.4	AC power lines conducted emission limits	Pass

Notes: [1]According to Notice 2012-DRS0126 (from January 2012) section 2.2 of RSS-Gen, Issue 3 has been revised. The EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

2.4 IC RSS-210, Issue 8, test results

Part	Test description	Verdict
A9.2	Transmitter power, e.i.r.p., TPC[1] and spectral power density limits	
A9.2 (1)	5150–5250 MHz band	Pass
A9.2 (2)	5250–5350 MHz band	Not applicable
A9.2 (3)	5470–5600 MHz and 5650–5725 MHz bands	Not applicable
A9.2 (4)	5725–5825 MHz band	Not applicable
A9.2	Out-of-band emission limits	
A9.2 (1)	5150–5250 MHz band	Pass
A9.2 (2)	5250–5350 MHz band	Not applicable
A9.2 (3)	5470–5600 MHz and 5650–5725 MHz bands	Not applicable
A9.2 (4)	5725–5825 MHz band	Not applicable
A9.3	Dynamic Frequency Selection (DFS) for devices operating in the bands 5250–5350 MHz, 5470–5600 MHz and 5650–5725 MHz	Not applicable
A9.4	Other Requirements for all bands	
A9.4 (1)	Digital modulation	Pass[2]
A9.4 (2)	PSD to average power ratio	Pass
A9.4 (3)	Test frequencies	Pass
A9.4 (4)	Discontinuation of transmission	Not tested[3]

Notes: [1] Transmit Power Control (TPC) requirement is applicable only for 5250–5350 MHz, 5470–5600 MHz and 5650–5725 MHz bands

[2] The EUT uses digital modulations, such as: 802.11a, 802.11n HT20 and 802.11n HT40

[3] It is up to applicant to fulfill the requirement of discontinuation of the transmission in case of absence of information to transmit

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	April 2, 2013
Nemko sample ID number	1

3.2 EUT information

Product name	AP6401
Model	KRC 161 393/2
Serial number	M1531F0159

3.3 Technical information

Operating band	5150–5250 MHz
Operating frequency (FCC)	5180–5240 MHz (20 MHz channel) and 5190–5230 MHz (40 MHz channel)
Operating frequency (IC)	5180–5220 MHz (20 MHz channel) and 5190–5210 MHz (40 MHz channel)
Modulation type	802.11a/n
Occupied bandwidth (99 %)	16.83 MHz (802.11a); 17.88 MHz (802.11n HT20); 36.54 MHz (802.11n HT40)
Emission designator	W7D
Power requirements	48 V_{DC}
Antenna information	2 internal 7.2 dBi antennas The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The EUT is device designed to operate in the 2.4 GHz band, and 5 GHz 2×2 MIMO ISM and UNII bands.
There are two independent radio units. This report covers only the 5.2 GHz UNII band radio.

3.5 EUT exercise details

The EUT was controlled to transmit at desired frequency and modulation from laptop using Art GUI software and telnet session.

3.6 EUT setup diagram

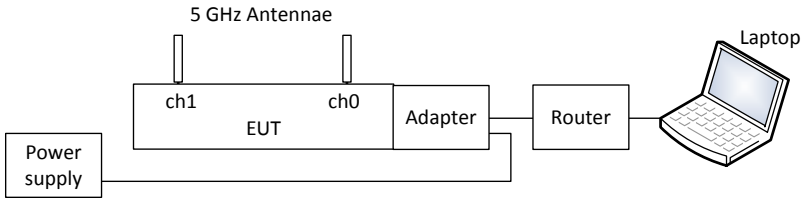


Figure 3.6-1: *Setup diagram*

3.7 EUT sub assemblies

Table 3.7-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
Laptop	Toshiba	Satellite	Asset number: 441
Switching power supply	Absopulse	PWI 99-P2419	B7481020
Power adapter	BelAir Networks	B2CG164AA-B	M6431G0075
Router	DLink	DGS-1008G	QB2H1B9002679

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/14
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Power supply	California Inst.	3001I	FA001021	1 year	Feb 08/14
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	May 16/13
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Jan. 16/14
Biconical antenna	Sunol	BC2	FA002078	1 year	Jan. 14/14
Log periodic antenna	Sunol	LP5	FA002077	1 year	Jan. 16/14
Horn antenna #1	EMCO	3115	FA000649	1 year	Mar. 08/14
1–18 GHz pre-amplifier	JCA	JCA118-503	FA002091	1 year	July 03/13
Temperature chamber	Thermotron	SM-16C	FA001030	1 year	NCR
Power meter	Agilent	N1911A	FA001946	1 year	Feb. 13/14
Power sensor	Agilent	N1922A	FA001947	1 year	Feb. 13/14
Temperature chamber	Thermotron	SM-16C	FA001030	1 year	NCR
Horn antenna 18–40 GHz	EMCO	3116	FA001847	1 year	Sept. 06/13
26–40 GHz pre-amplifier	Narda	DBL-2640N610	FA001556	—	VOU
18–26 GHz pre-amplifier	Narda	BBS-1826N612	FA001550	—	VOU

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 15.207(a) and RSS-Gen 7.2.4 AC power line conducted emissions limits

8.1.1 Definitions and limits

FCC:
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:
The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 Ω/50 µH line impedance stabilization network (LISN).

Table 8.1-1: *Conducted emissions limit*

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Note: * - Decreases with the logarithm of the frequency.

8.1.2 Test summary

Test date:	April 10, 2013	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1006 mbar
Verdict:	Pass	Relative humidity:	32 %

8.1.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

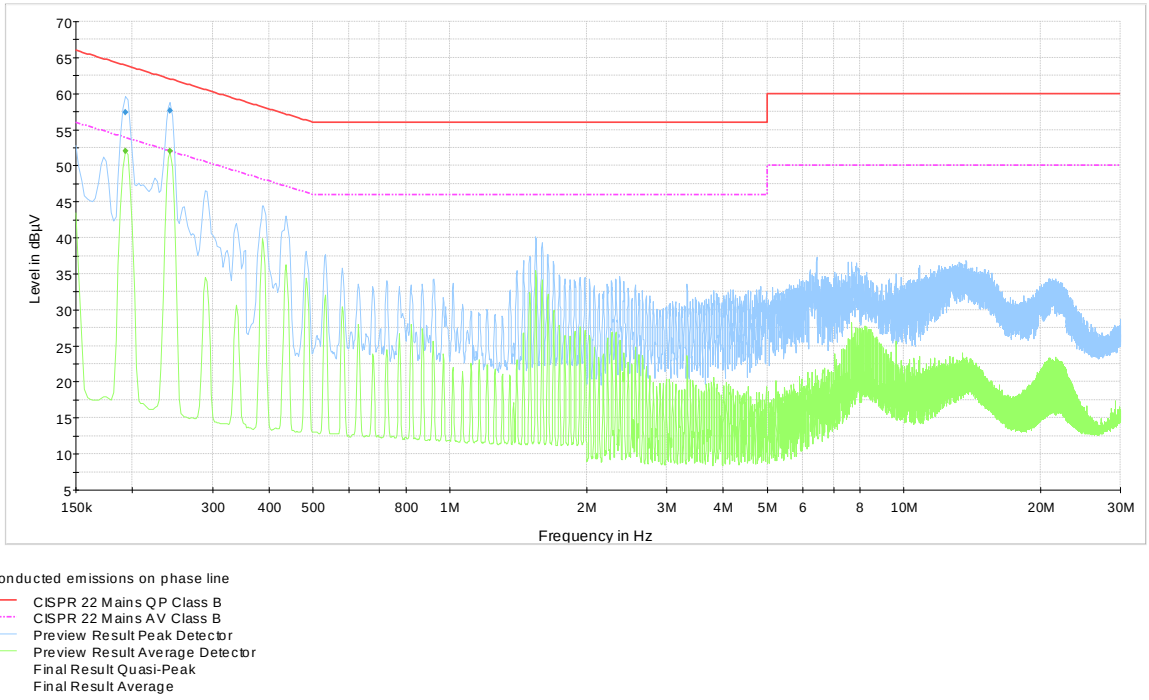
Receiver settings for preview measurements:

Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Detector mode:	Peak and Average
Trace mode:	Max Hold
Measurement time:	100 ms

Receiver settings for final measurements:

Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Detector mode:	Quasi-Peak and Average
Trace mode:	Max Hold
Measurement time:	100 ms

8.1.4 Test data



Plot 8.1-1: *Conducted emissions on phase line*

Table 8.1-2: *Quasi-Peak conducted emissions results on phase line*

Frequency, MHz	Q-Peak result, dBµV	Meas. Time, ms	Bandwidth, kHz	Filter	Correction, dB	Margin, dB	Limit, dBµV
0.192750	**57.4**	100	9	On	10.0	**6.5**	**63.9**
0.242250	**57.6**	100	9	On	9.7	**4.4**	**62.0**

Note: 43.5 dBµV = 23.2 dBµV (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

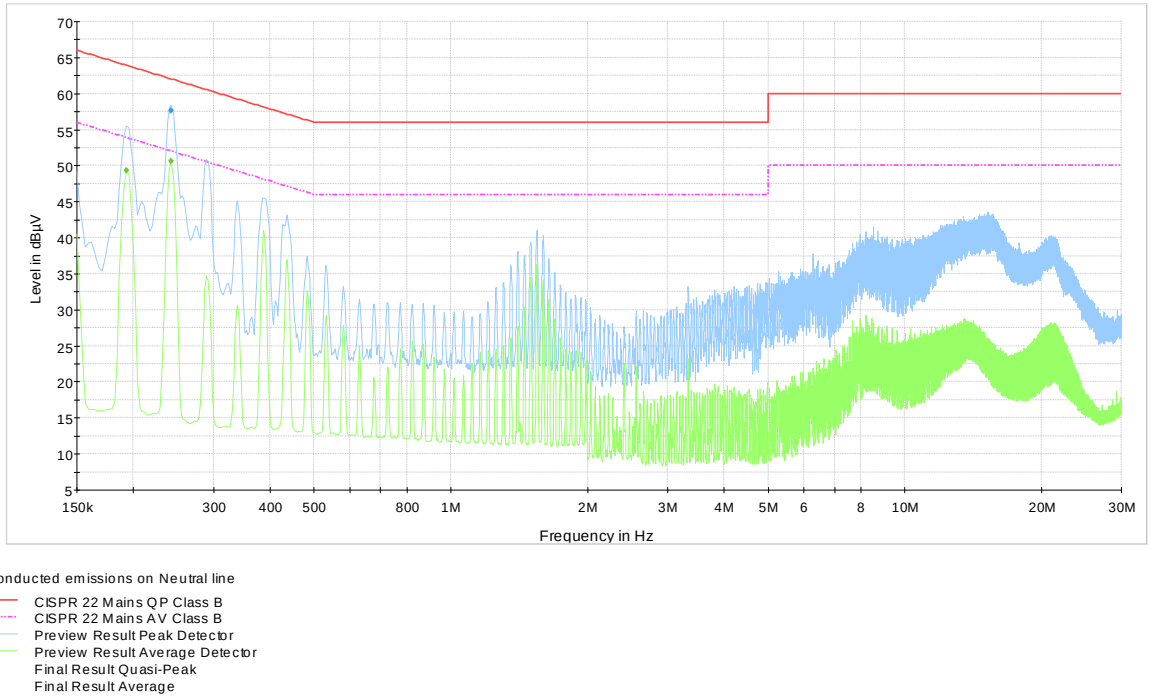
Table 8.1-3: *Average conducted emissions results on phase line*

Frequency, MHz	Average result, dBµV	Meas. Time, ms	Bandwidth, kHz	Filter	Correction, dB	Margin, dB	Limit, dBµV
0.192750	**52.1**	100	9	On	10.0	**1.8**	**53.9**
0.242250	**52.0**	100	9	On	9.7	**0.0**	**52.0**

Sample calculation:
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
Result (dBµV) = XX dBµV (reading from receiver) + XX dB (Correction factor)

Example:
43.5 dBµV = 23.2 dBµV (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

8.1.4 Test data, continued



Plot 8.1-2: *Conducted emissions on neutral line*

Table 8.1-4: *Quasi-Peak conducted emissions results on neutral line*

Frequency, MHz	Q-Peak result, dBµV	Meas. Time, ms	Bandwidth, kHz	Filter	Correction, dB	Margin, dB	Limit, dBµV
0.242250	**57.7**	100	9	On	9.7	**4.3**	**62.0**

Note: 43.5 dBµV = 23.2 dBµV (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

Table 8.1-5: *Average conducted emissions results on neutral line*

Frequency, MHz	Average result, dBµV	Meas. Time, ms	Bandwidth, kHz	Filter	Correction, dB	Margin, dB	Limit, dBµV
0.192750	**49.4**	100	9	On	10.0	**4.5**	**53.9**
0.242250	**50.6**	100	9	On	9.7	**1.4**	**52.0**

Sample calculation:
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
Result (dBµV) = XX dBµV (reading from receiver) + XX dB (Correction factor)

Example:
43.5 dBµV = 23.2 dBµV (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

8.2 FCC 15.403(i) Emission bandwidth

8.2.1 Definitions and limits

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

8.2.2 Test summary

Test date:	April 22, 2013	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1002 mbar
Verdict:	Pass	Relative humidity:	32 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	≥ 1 % of emission BW
Video bandwidth:	≥3 × RBW
Frequency span:	30 MHz for 20 MHz channel; 60 MHz for 40 MHz channel
Detector mode:	Peak
Trace mode:	Max Hold

8.2.4 Test data

Table 8.2-1: *26 dB bandwidth results*

Antenna chain	Modulation	Frequency, MHz	26 dB bandwidth, MHz
ch0	802.11a	5180	**21.20**
		5200	**21.59**
		5240	**21.92**
	802.11n HT20	5180	**22.45**
		5200	**22.36**
		5240	**22.79**
	802.11n HT40	5190	**44.14**
		5230	**45.19**
ch1	802.11a	5180	**21.44**
		5200	**21.25**
		5240	**21.97**
	802.11n HT20	5180	**22.31**
		5200	**22.50**
		5240	**22.16**
	802.11n HT40	5190	**44.23**
		5230	**44.42**

Maximum 26 dB BW for 802.11a is 21.97 MHz, for 802.11n HT20 is 22.79 MHz and for 802.11n HT40 is 45.19 MHz

8.2.4 Test data, continued

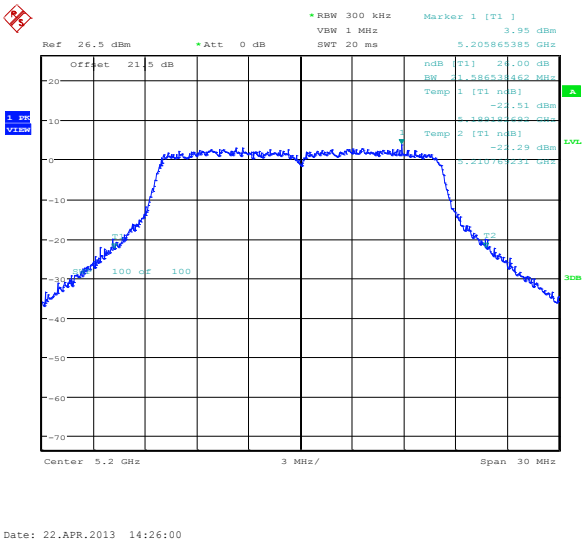


Figure 8.2-1: *26 dB bandwidth on 802.11a, sample plot*

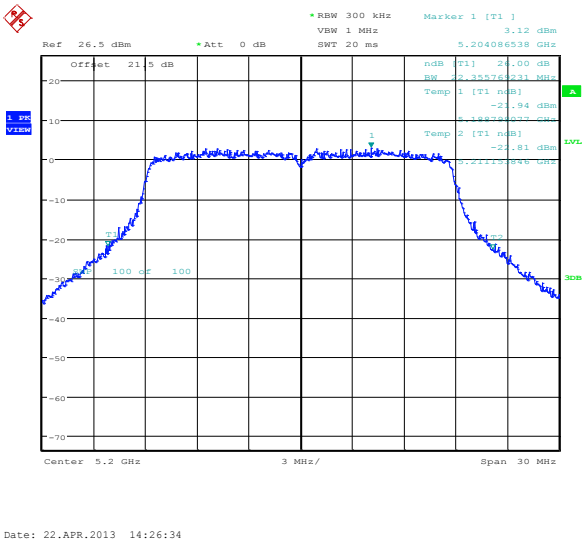


Figure 8.2-2: *26 dB bandwidth on 802.11n HT20, sample plot*

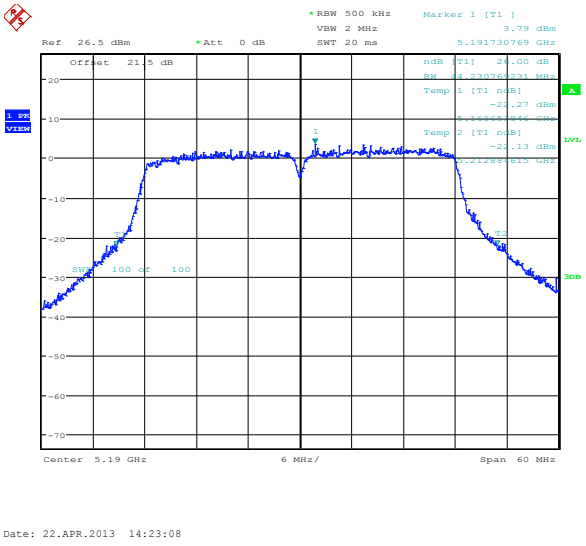


Figure 8.2-3: *26 dB bandwidth on 802.11n HT40, sample plot*

8.3 RSS-Gen 4.6.1 Occupied bandwidth

8.3.1 Definitions and limits

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

8.3.2 Test summary

Test date:	April 22, 2013	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1004 mbar
Verdict:	Pass	Relative humidity:	34 %

8.3.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	≥ 1 % of span
Video bandwidth:	≥3 × RBW
Frequency span:	30 MHz for 20 MHz channel; 50 MHz for 40 MHz channel
Detector mode:	Peak
Trace mode:	Max Hold

8.3.4 Test data

Table 8.3-1: *99 % bandwidth results*

Modulation	99 % bandwidth, MHz
802.11a	**16.83**
802.11n HT20	**17.88**
802.11n HT40	**36.54**

8.3.4 Test data, continued

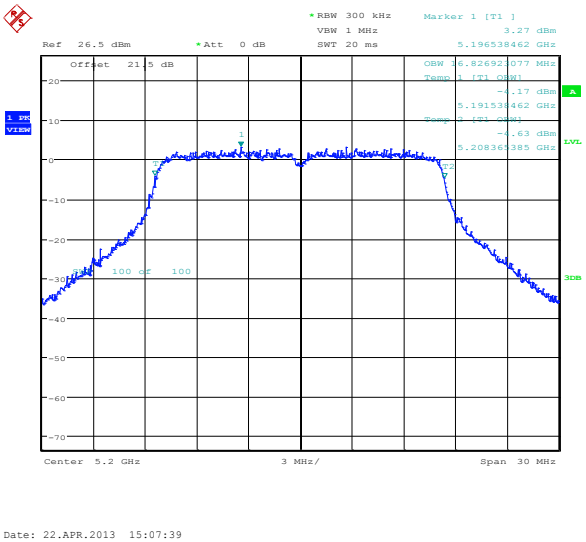


Figure 8.3-1: *99 % bandwidth on 802.11a, sample plot*

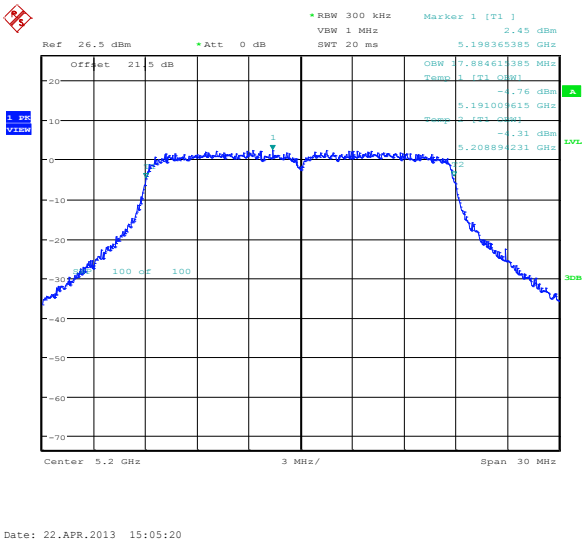


Figure 8.3-2: *99 % bandwidth on 802.11n HT20, sample plot*

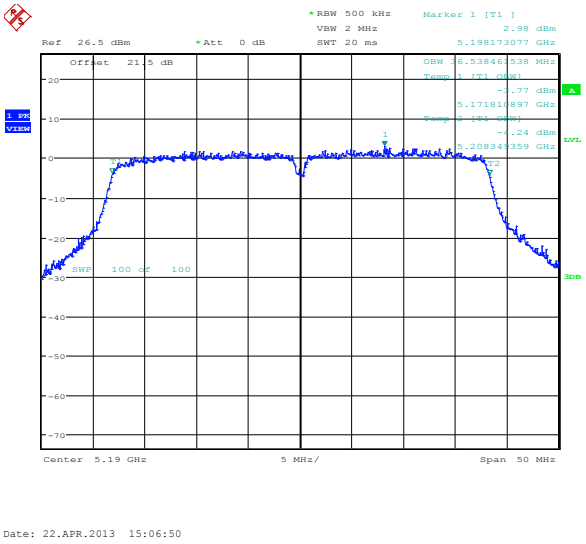


Figure 8.3-3: *99 % bandwidth on 802.11n HT40, sample plot*

8.4 FCC 15.407(a)(1) and RSS-210 A9.2(1) 5.15–5.25 GHz band output power, EIRP and spectral density limits

8.4.1 Definitions and limits

FCC:

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the above definitions for the emission in question.

The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

IC:

i. The maximum e.i.r.p. shall not exceed 200 mW (23 dBm) or 10 + 10 $\log_{10}$ (B), dBm, whichever power is less. B is the 99 % emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1 MHz band.

8.4.2 Test summary

Test date:	April 23, 2013	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	32 %

8.4.3 Observations, settings and special notes

The test was performed according to 789033 D01 General UNII Test Procedures section E) 3) a) Method PM: maximum conducted (average) output power using wideband RF average power meter with a thermocouple detector.

Combined average output power was calculated as follows: $P_{combined} = 10 \times log_{10}\left(\left(10^{P_{ch0}/10}\right) + \left(10^{P_{ch1}/10}\right)\right)$

EIRP was calculated as follows: $EIRP = P_{combined} + antenna\ gain$

Combined PPSD was calculated as follows: $PPSD_{combined} = 10 \times log_{10}\left(\left(10^{PSD_{ch0}/10}\right) + \left(10^{PSD_{ch1}/10}\right)\right)$

Directional gain for cross-polarized MIMO 2 × 2 is 7.2 dBi. No summation of gain is needed for cross-polarized antennas as per manufacturer's definition of the cross-polarized MIMO type.

The 26 dB measured bandwidth for 802.11a was 21.97 MHz, for 802.11n HT20 was 22.79 MHz and for 802.11n HT40 was 45.19 MHz.
FCC output power limit for 802.11a was calculated as follows: 4 + 10 × Log_{10} (21.97) – (7.2 – 6) = 16.21 dBm > 15.80 dBm = 17 – (7.2 – 6)
FCC output power limit for 802.11n HT20 was calculated as follows: 4 + 10 × Log_{10} (22.79) – (7.2 – 6) = 16.38 dBm > 15.80 dBm = 17 – (7.2 – 6)
FCC output power limit for 802.11n HT40 was calculated as follows: 4 + 10 × Log_{10} (45.19) – (7.2 – 6) = 19.35 dBm > 15.80 dBm = 17 – (7.2 – 6)
FCC PPSD limit was calculated as follows: 4 – (7.2 – 6) = 2.8 dBm/MHz

The 99 % measured occupied bandwidth for 802.11a was 16.83 MHz, for 802.11n HT20 was 17.88 MHz and for 802.11n HT40 was 36.54 MHz.
IC EIRP limit for 802.11a was calculated as follows: 10 + 10 × Log_{10} (16.83) = 22.26 dBm < 23 dBm
IC EIRP limit for 802.11n HT20 was calculated as follows: 10 + 10 × Log_{10} (17.88) = 22.52 dBm < 23 dBm
IC EIRP limit for 802.11n HT40 was calculated as follows: 10 + 10 × Log_{10} (36.54) = 25.63 dBm > 23 dBm, therefore the limit is 23 dBm

8.4.4 Test data

Table 8.4-1: *Output power measurements results for FCC*

Modulation	Frequency, MHz	Measured average conducted output power, dBm			Power limit, dBm	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5180	10.20	10.45	**13.34**	**15.80**	**2.46**
	5200	10.57	10.73	**13.66**	**15.80**	**2.14**
	5240	10.44	11.23	**13.86**	**15.80**	**1.94**
802.11n HT20	5180	10.56	10.82	**13.70**	**15.80**	**2.10**
	5200	11.08	10.60	**13.86**	**15.80**	**1.94**
	5240	10.89	11.15	**14.03**	**15.80**	**1.77**
802.11n HT40	5190	11.78	11.71	**14.76**	**15.80**	**1.04**
	5230	12.67	12.82	**15.76**	**15.80**	**0.04**

Table 8.4-2: *PPSD measurements results for FCC*

Modulation	Frequency, MHz	Measured Peak Power Spectral Density (PPSD), dBm/MHz			PPSD limit, dBm/MHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5180	-0.49	-0.34	**2.60**	**2.80**	**0.20**
	5200	-0.43	-0.04	**2.78**	**2.80**	**0.02**
	5240	-0.66	0.17	**2.79**	**2.80**	**0.01**
802.11n HT20	5180	-0.37	-0.15	**2.75**	**2.80**	**0.05**
	5200	-0.22	-0.44	**2.68**	**2.80**	**0.12**
	5240	-0.45	-0.17	**2.70**	**2.80**	**0.10**
802.11n HT40	5190	-2.21	-1.98	**0.92**	**2.80**	**1.88**
	5230	-1.68	-1.30	**1.52**	**2.80**	**1.28**

Table 8.4-3: *Output power measurements and EIRP calculations results for IC*

Modulation	Frequency, MHz	Measured average conducted output power, dBm			Antenna gain, dBi	Equivalent Isotropically Radiated Power, dBm		
		On ch0	On ch1	Combined		Calculated	Limit	Margin*
802.11a	5180	10.20	10.45	13.34	7.20	**20.54**	**22.26**	**2.87**
	5200	10.57	10.73	13.66	7.20	**20.86**	**22.26**	**2.55**
	5220	10.63	10.72	13.69	7.20	**20.89**	**22.26**	**2.35**
802.11n HT20	5180	10.56	10.82	13.70	7.20	**20.90**	**22.52**	**2.68**
	5200	11.08	10.60	13.86	7.20	**21.06**	**22.52**	**2.52**
	5220	11.03	10.69	13.87	7.20	**21.07**	**22.52**	**2.35**
802.11n HT40	5190	11.78	11.71	14.76	7.20	**21.96**	**23.00**	**1.04**
	5210	12.47	12.69	15.59	7.20	**22.79**	**23.00**	**0.18**

Notes: * - Margin obtained in dB units

Table 8.4-4: *PSD measurements results for IC*

Modulation	Frequency, MHz	Measured power spectral density (PSD), dBm/MHz			Antenna gain, dBi	EIRP PSD, dBm/MHz		
		On ch0	On ch1	Combined		Calculated	Limit	Margin*
802.11a	5180	-0.49	-0.34	2.60	7.20	**9.80**	**10.00**	**0.20**
	5200	-0.43	-0.04	2.78	7.20	**9.98**	**10.00**	**0.02**
	5220	-0.45	-0.18	2.70	7.20	**9.90**	**10.00**	**0.10**
802.11n HT20	5180	-0.37	-0.15	2.75	7.20	**9.95**	**10.00**	**0.05**
	5200	-0.22	-0.44	2.68	7.20	**9.88**	**10.00**	**0.12**
	5220	-0.30	-0.47	2.63	7.20	**9.83**	**10.00**	**0.17**
802.11n HT40	5190	-2.21	-1.98	0.92	7.20	**8.12**	**10.00**	**1.88**
	5210	-1.90	-1.18	1.49	7.20	**8.69**	**10.00**	**1.31**

Notes: * - Margin obtained in dB units

8.4.4 Test data, continued

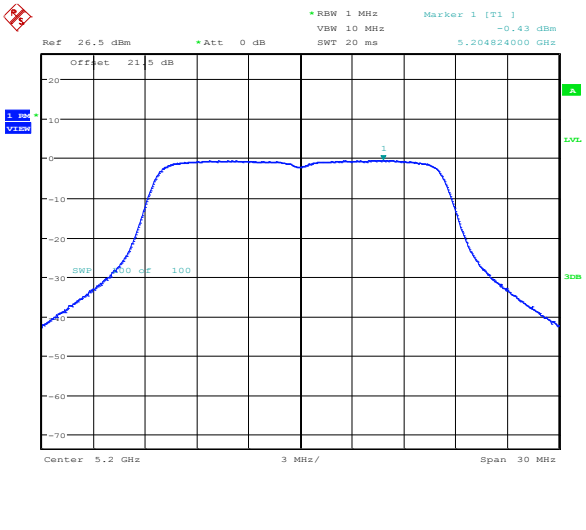


Figure 8.4-1: *Sample plot for PPSD on 802.11a*

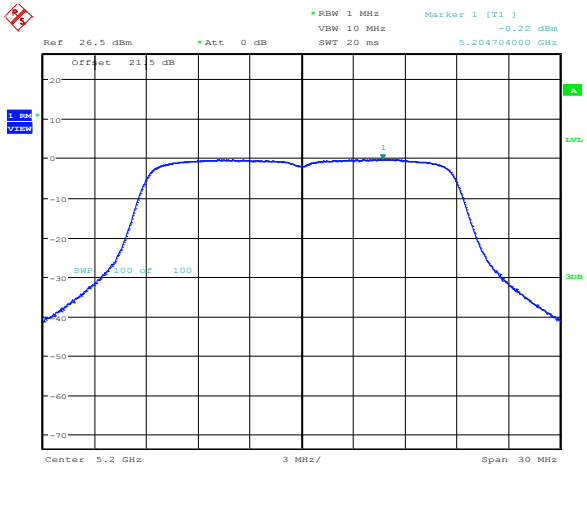


Figure 8.4-2: *Sample plot for PPSD on 802.11n HT20*

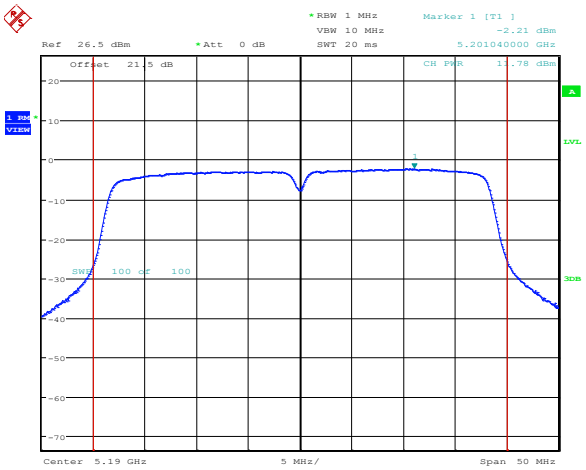


Figure 8.4-3: *Sample plot for PPSD on 802.11n HT40*

8.5 FCC 15.407(b) and RSS-210 A9.2(1) Spurious (out-of-band) emissions

8.5.1 Definitions and limits

FCC:
(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz.
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.
(7) The provisions of § 15.205 apply to intentional radiators operating under this section.
(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

IC:
Emissions outside the band 5150–5250 MHz shall not exceed −27 dBm/MHz e.i.r.p.
The outermost carrier frequencies or channels, as permitted by the design of the equipment, shall be used when measuring unwanted emissions. Such carrier or channel center frequencies are to be indicated in the test report.

RSS-Gen 7.2.2 Emissions falling within restricted frequency bands
Restricted bands, identified in below, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:
(a) fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of below;
(b) unwanted emissions falling into restricted bands of below shall comply with the limits specified in RSS-Gen;
(c) unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

Table 8.5-1: *FCC §15.209 and RSS-Gen – Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance,
	µV/m	dBµV/m	m
0.009–0.490*	2400/F	$67.6 – 20 \times \log_{10}(F)$	300
0.490–1.705*	24000/F	$87.6 – 20 \times \log_{10}(F)$	30
1.705–30.0*	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: * - Applicable only to FCC requirements
In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

8.5.1 Definitions and limits, continued

Table 8.5-2: *IC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677-5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5
12.29–12.293	322–335.4	4500–5150	Above 38.6

Note: Certain frequency bands listed in Table 8.5-2 and above 38.6 GHz are designated for low-power license-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.5-3: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.5.2 Test summary

Test date:	April 22, 2013	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	32 %

8.5.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m, the EUT was transmitting on both MIMO chains simultaneously. Radiated emissions were performed while both antenna connectors were terminated with 50 Ω load.

Spectrum analyser for peak conducted measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Average limit line was set as follows: 54 dBµV/m – 95.23 dB – 7.2 dBi − 4.7 dB – 3 dB = −56.13 dBm

Spectrum analyser for peak conducted measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Average limit line was set as follows: 54 dBµV/m – 95.23 dB – 7.2 dBi – 3 dB = −51.43 dBm/MHz where 3 dB is a multiple antenna ports compensation: $10 \times \log_{10}(2) = 3$ dB

Spectrum analyser for average conducted measurements within restricted bands above 1 GHz for frequencies where peak results were above the average limit:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 MHz
Detector mode:	RMS
Trace mode:	Power average
Number of averaging traces:	100

Peak limit is 20 dB higher than the average limit: −51.43 dBm/MHz + 20 dB = −31.43 dBm/MHz

Spectrum analyser for peak conducted measurements outside restricted bands:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Conducted emissions measurements outside restricted bands and on the band edges were performed on each individual MIMO chain. The limit line was adjusted to include antenna directional gain of 7.2 dBi and a compensation of two antenna ports: -27 dBm/MHz $- 10 \times \log_{10}(2) - 7.2$ dBi = −37.2 dBm/MHz. In the plots with the band edge measurements the reference level offset of 10.2 dB was added to include antenna directional gain of 7.2 dBi and a compensation of two antenna ports (3 dB). The band edge limits on these plots are actual limits as per specification: −27 dBm/MHz.

8.5.4 Test data

Table 8.5-4: *Conducted band edge emissions results.*

Chain	Modulation	Channel	Frequency, MHz	Measured level, dBm/MHz	Limit, dBm/MHz	Margin, dB
ch0	802.11a	Low	5150	-51.70	-37.20	14.50
		High	5250	-44.27	-37.20	7.07
	802.11n HT20	Low	5150	-54.34	-37.20	17.14
		High	5250	-46.91	-37.20	9.71
	802.11n HT40	Low	5150	-42.25	-37.20	5.05
		High	5250	-40.73	-37.20	3.53
ch1	802.11a	Low	5150	-53.29	-37.20	16.09
		High	5250	-44.65	-37.20	7.45
	802.11n HT20	Low	5150	-53.50	-37.20	16.30
		High	5250	-44.86	-37.20	7.66
	802.11n HT40	Low	5150	-42.03	-37.20	4.83
		High	5250	-39.39	-37.20	2.19

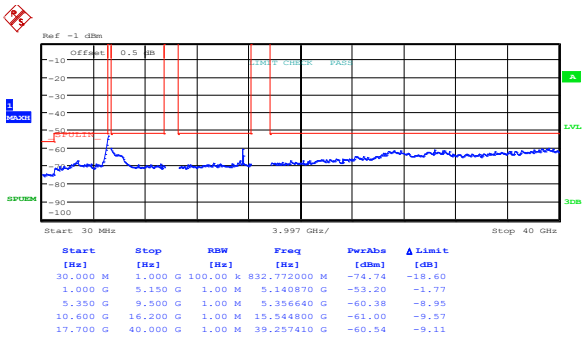


Figure 8.5-1: *Peak spurious emissions within restricted bands at low channel, 802.11a, cho*

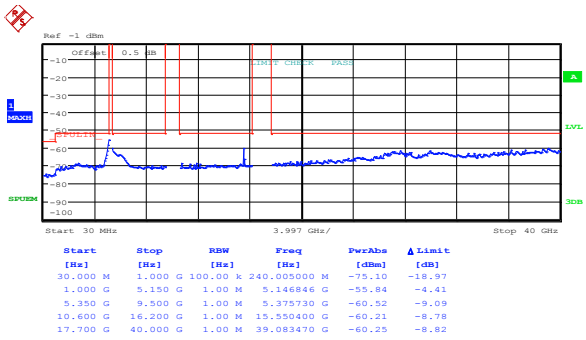


Figure 8.5-2: *Peak spurious emissions within restricted bands at low channel, 802.11n HT20, cho*

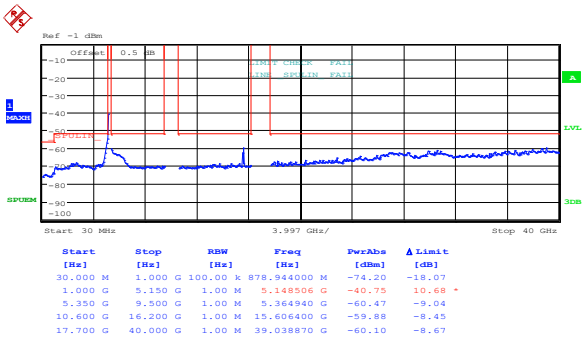


Figure 8.5-3: *Peak spurious emissions within restricted bands at low channel, 802.11n HT40, cho*

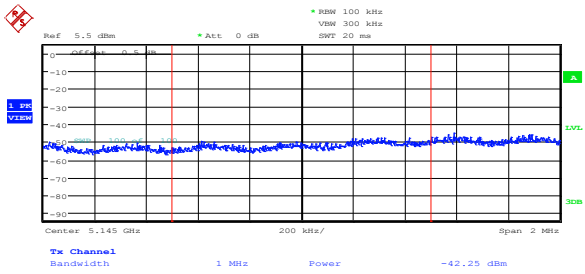


Figure 8.5-4: *Peak spurious emission at 5.15 GHz on low channel, 802.11n HT40, cho*

Note: In the above plots there are two traces present; the red trace indicates the average limit as defined within the specification, the blue trace is a peak detector measurement of the spurious emissions from the EUT. Peak emissions meeting the average limit are deemed to satisfy both the peak and average limits. Tabular measurements above indicate the highest measured peak levels within defined ranges. Any peak measurements exceeding the average limit are re-measured using an average detector (on the following plots); the average measurement results are then compared to the average limit and peak results to the peak limit.

8.5.4 Test data, continued

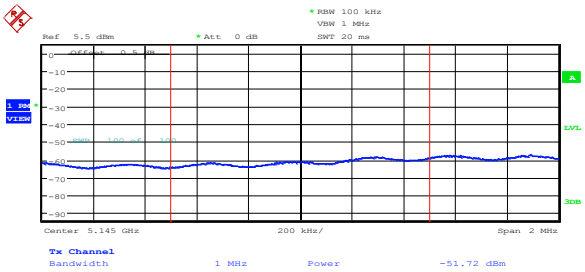


Figure 8.5-5: *Average spurious emission at 5.15 GHz on low channel, 802.11n HT40, ch0*

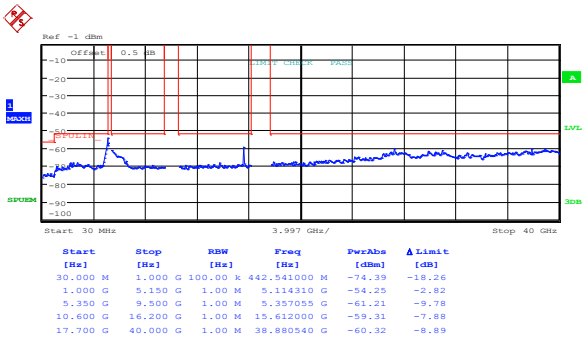


Figure 8.5-6: *Peak spurious emissions within restricted bands at mid channel, 802.11a, ch0*

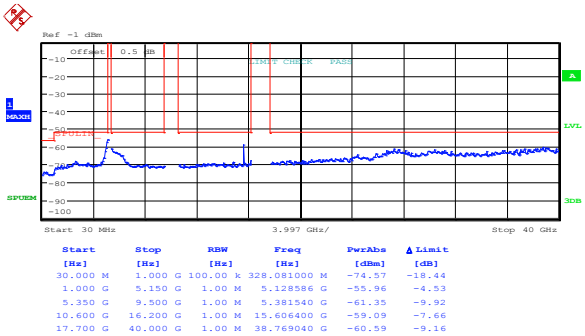


Figure 8.5-7: *Peak spurious emissions within restricted bands at mid channel, 802.11n HT20, ch0*

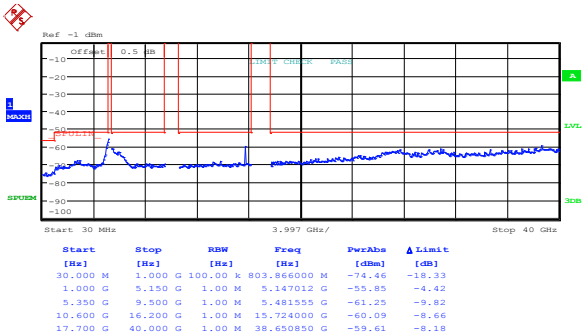


Figure 8.5-8: *Peak spurious emissions within restricted bands at FCC high channel, 802.11a, ch0*

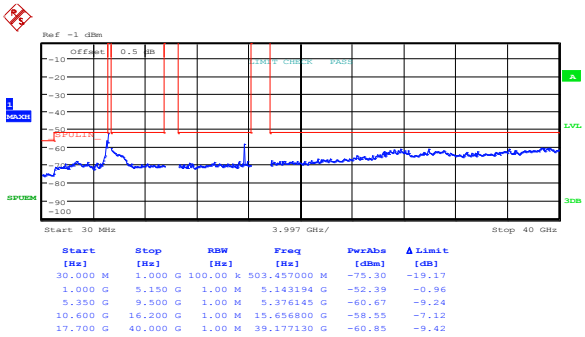


Figure 8.5-9: *Peak spurious emissions within restricted bands at IC high channel, 802.11a, ch0*

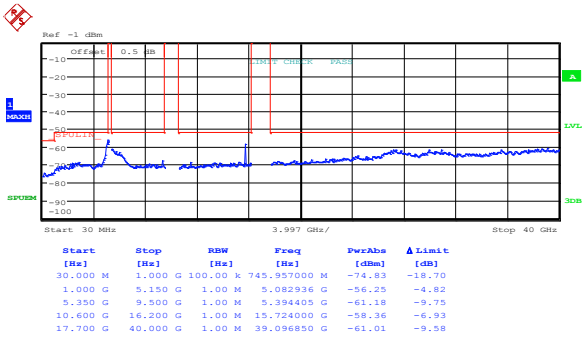


Figure 8.5-10: *Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT20, ch0*

8.5.4 Test data, continued

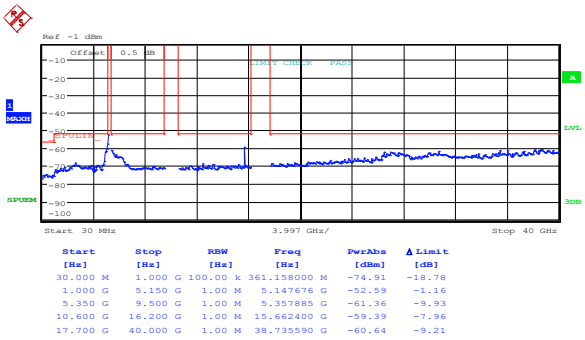


Figure 8.5-11: *Peak spurious emissions within restricted bands at IC high channel, 802.11n HT20, cho*

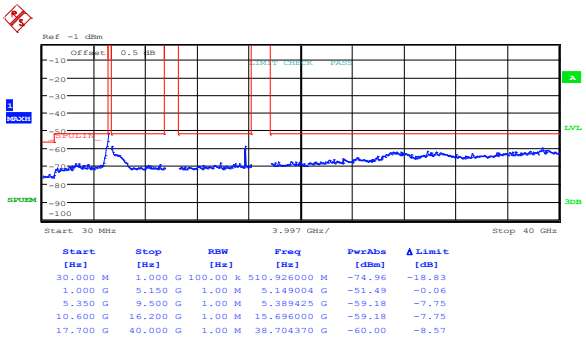


Figure 8.5-12: *Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT40, cho*

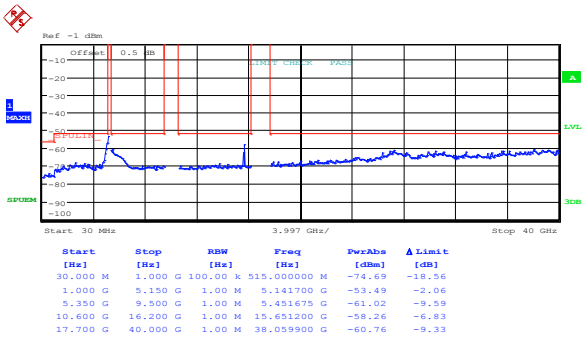


Figure 8.5-13: *Peak spurious emissions within restricted bands at IC high channel, 802.11n HT40, cho*

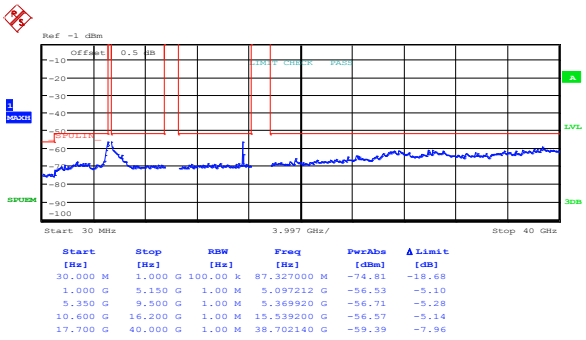


Figure 8.5-14: *Peak spurious emissions within restricted bands at low channel, 802.11a, ch1*

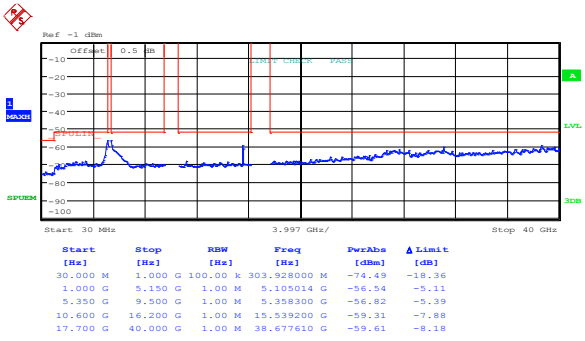


Figure 8.5-15: *Peak spurious emissions within restricted bands at low channel, 802.11n HT20, ch1*

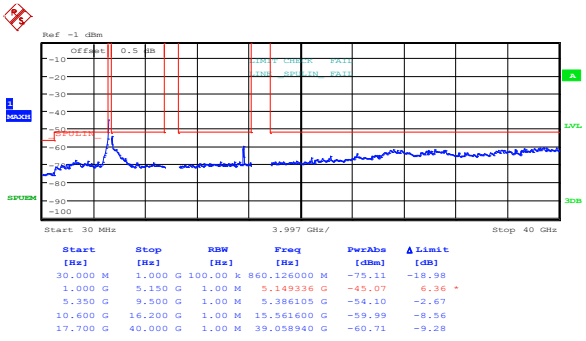


Figure 8.5-16: *Peak spurious emissions within restricted bands at low channel, 802.11n HT40, ch1*

Note: In the above plots there are two traces present; the red trace indicates the average limit as defined within the specification, the blue trace is a peak detector measurement of the spurious emissions from the EUT. Peak emissions meeting the average limit are deemed to satisfy both the peak and average limits. Tabular measurements above indicate the highest measured peak levels within defined ranges. Any peak measurements exceeding the average limit are re-measured using an average detector (on the following plots); the average measurement results are then compared to the average limit and peak results to the peak limit.

8.5.4 Test data, continued

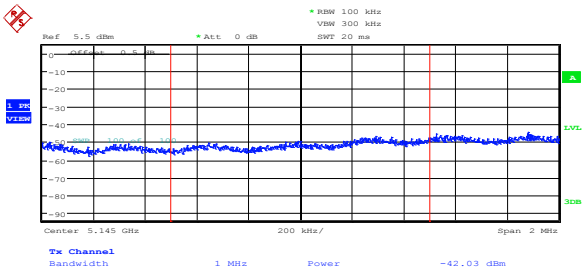


Figure 8.5-17: *Peak spurious emission at 5.15 GHz on low channel, 802.11n HT40, ch1*

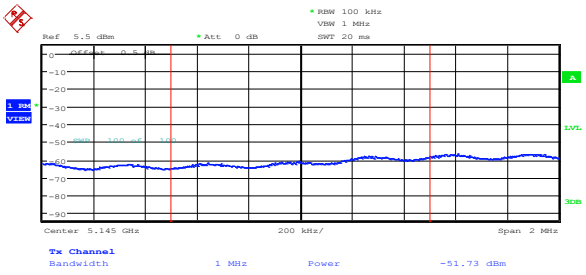


Figure 8.5-18: *Average spurious emission at 5.15 GHz on low channel, 802.11n HT40, ch1*

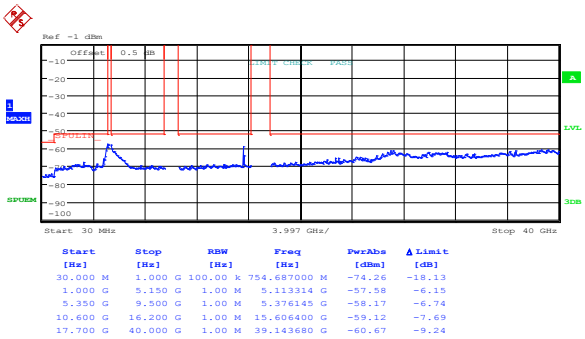


Figure 8.5-19: *Peak spurious emissions within restricted bands at mid channel, 802.11a, ch1*

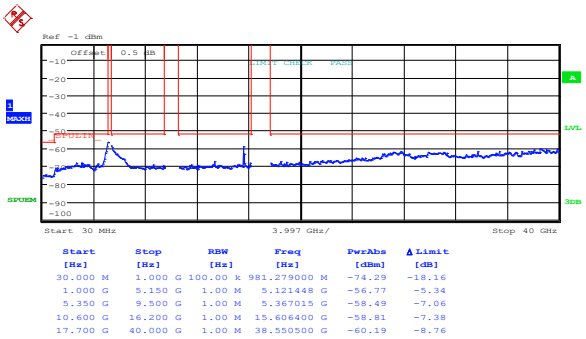


Figure 8.5-20: *Peak spurious emissions within restricted bands at mid channel, 802.11n HT20, ch1*

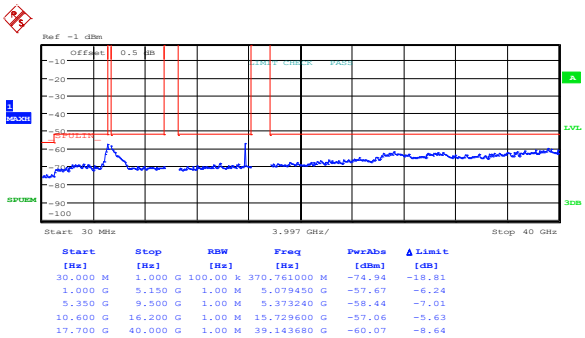


Figure 8.5-21: *Peak spurious emissions within restricted bands at FCC high channel, 802.11a, ch1*

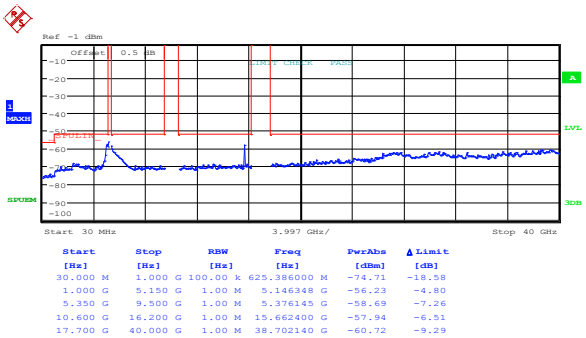


Figure 8.5-22: *Peak spurious emissions within restricted bands at IC high channel, 802.11a, ch1*

8.5.4 Test data, continued

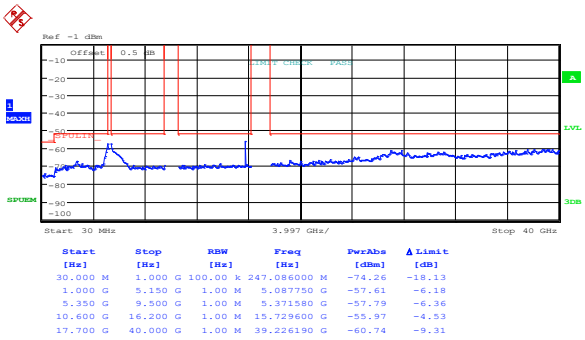


Figure 8.5-23: *Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT20, ch1*

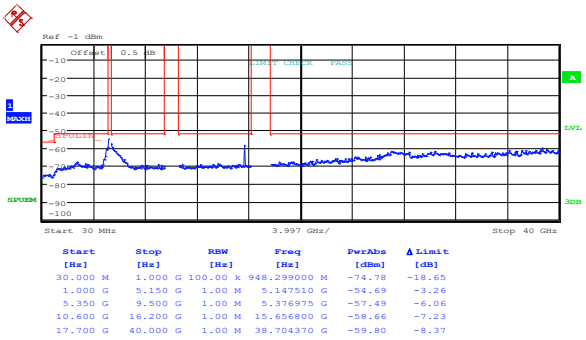


Figure 8.5-24: *Peak spurious emissions within restricted bands at IC high channel, 802.11n HT 20, ch1*

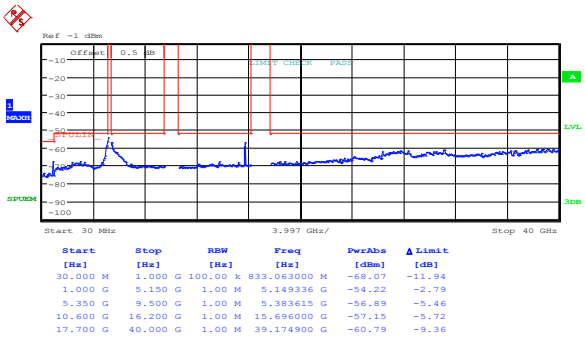


Figure 8.5-25: *Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT40, ch1*

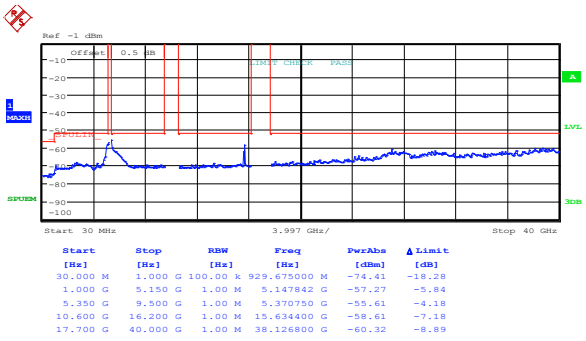


Figure 8.5-26: *Peak spurious emissions within restricted bands at IC high channel, 802.11n HT40, ch1*

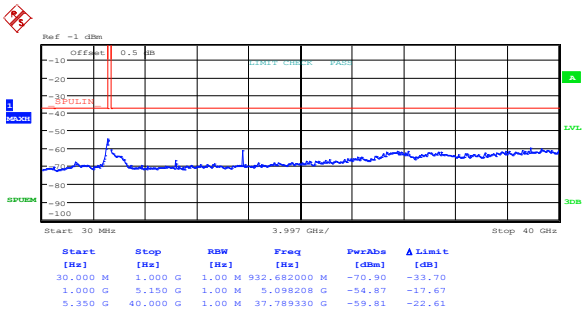


Figure 8.5-27: *Spurious FCC out-of-band emissions outside restricted bands low channel, 802.11a, cho*

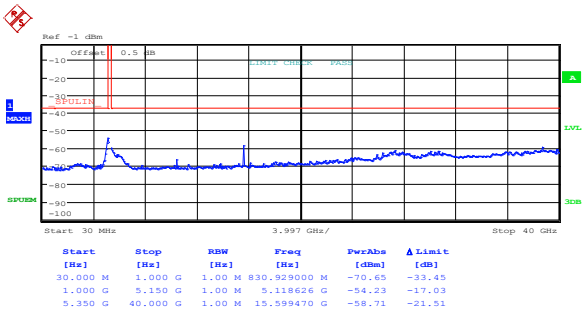


Figure 8.5-28: *Spurious FCC out-of-band emissions outside restricted bands mid channel, 802.11a, cho*

8.5.4 Test data, continued

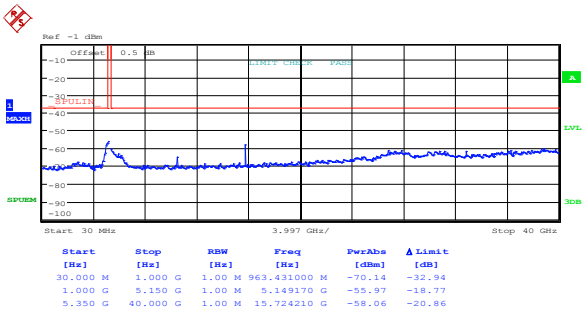


Figure 8.5-29: *Spurious FCC out-of-band emissions outside restricted bands high channel, 802.11a, cho*

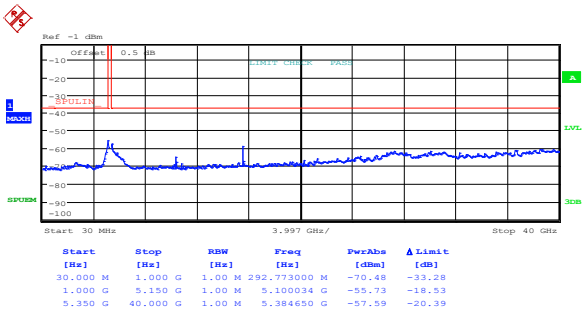


Figure 8.5-30: *Spurious FCC out-of-band emissions outside restricted bands low channel, 802.11a, ch1*

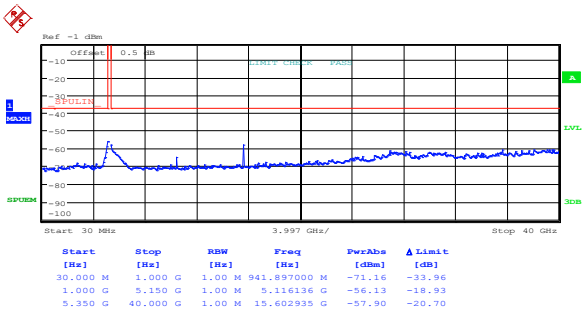


Figure 8.5-31: *Spurious FCC out-of-band emissions outside restricted bands mid channel, 802.11a, ch1*

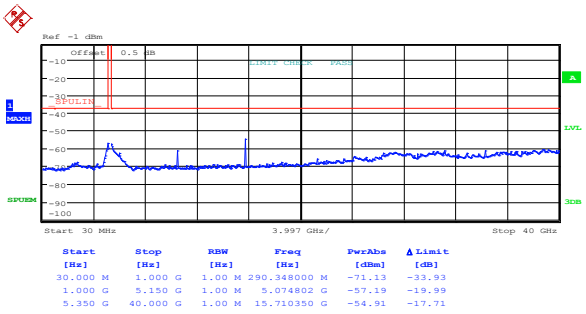


Figure 8.5-32: *Spurious FCC out-of-band emissions outside restricted bands high channel, 802.11a, ch1*

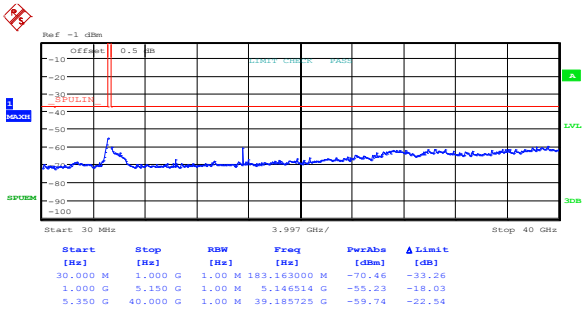


Figure 8.5-33: *Spurious FCC out-of-band emissions outside restricted bands low channel, 802.11n HT20, cho*

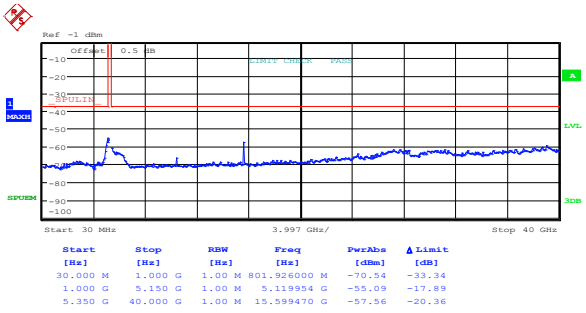


Figure 8.5-34: *Spurious FCC out-of-band emissions outside restricted bands mid channel, 802.11n HT20, cho*

8.5.4 Test data, continued

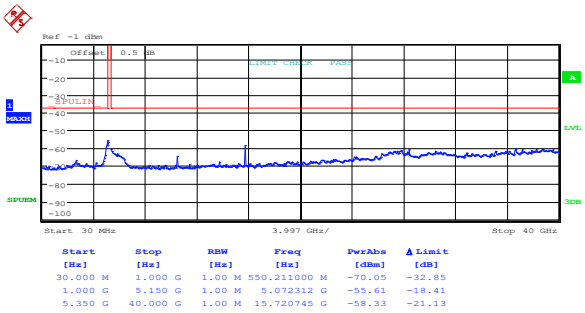


Figure 8.5-35: *Spurious FCC out-of-band emissions outside restricted bands high channel, 802.11n HT20, cho*

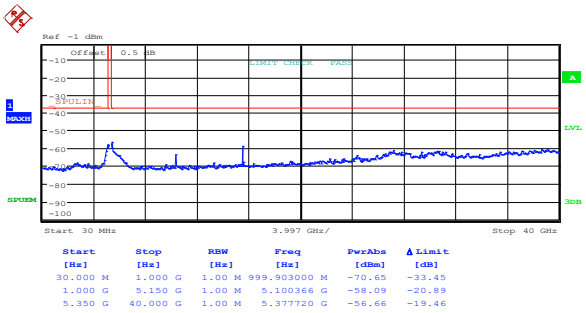


Figure 8.5-36: *Spurious FCC out-of-band emissions outside restricted bands low channel, 802.11n HT20, ch1*

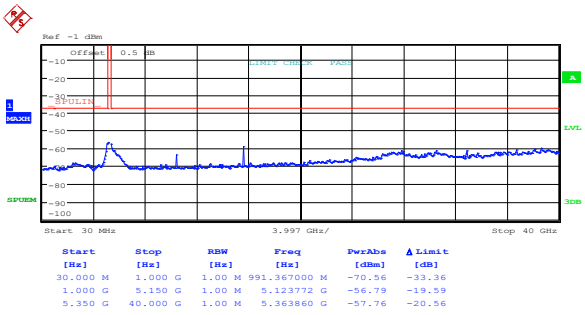


Figure 8.5-37: *Spurious FCC out-of-band emissions outside restricted bands mid channel, 802.11n HT20, ch1*

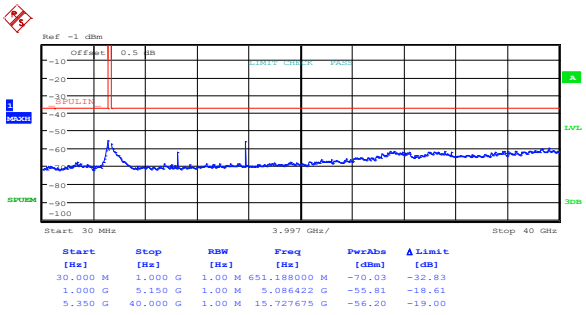


Figure 8.5-38: *Spurious FCC out-of-band emissions outside restricted bands high channel, 802.11n HT20, ch1*

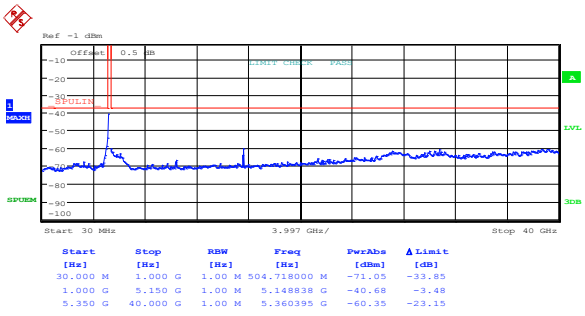


Figure 8.5-39: *Spurious FCC out-of-band emissions outside restricted bands low channel, 802.11n HT40, cho*

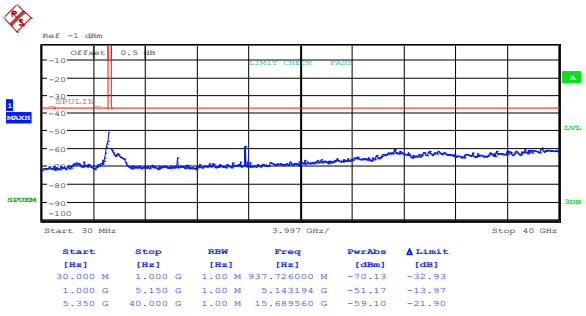


Figure 8.5-40: *Spurious FCC out-of-band emissions outside restricted bands high channel, 802.11n HT40, cho*

8.5.4 Test data, continued

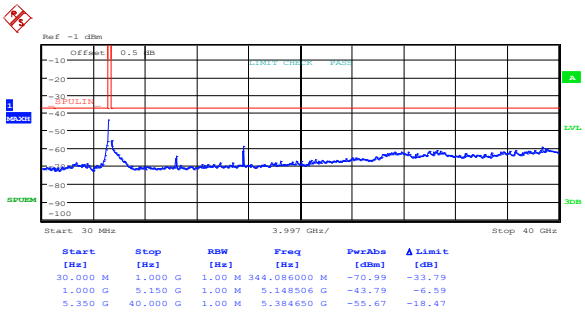


Figure 8.5-41: *Spurious FCC out-of-band emissions outside restricted bands low channel, 802.11n HT40, ch1*

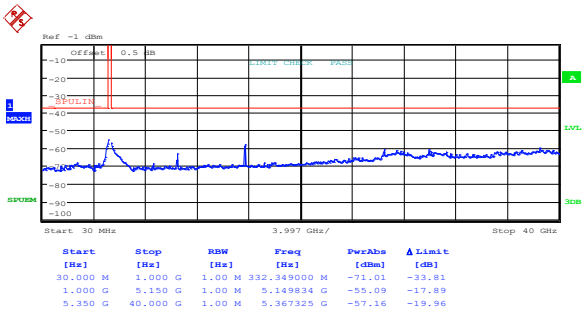


Figure 8.5-42: *Spurious FCC out-of-band emissions outside restricted bands high channel, 802.11n HT40, ch1*

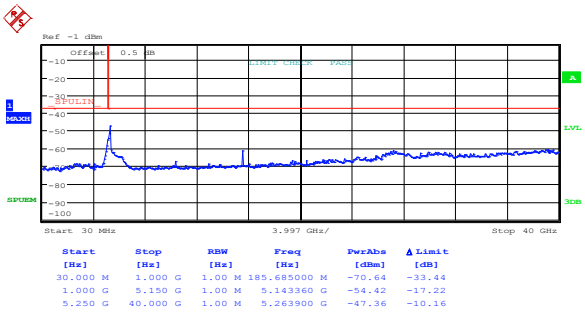


Figure 8.5-43: *Spurious IC out-of-band emissions outside restricted bands low channel, 802.11a, ch0*

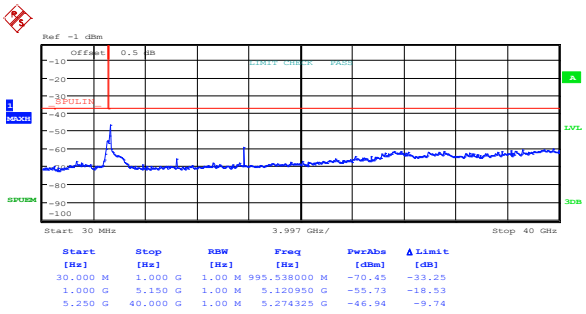


Figure 8.5-44: *Spurious IC out-of-band emissions outside restricted bands mid channel, 802.11a, ch0*

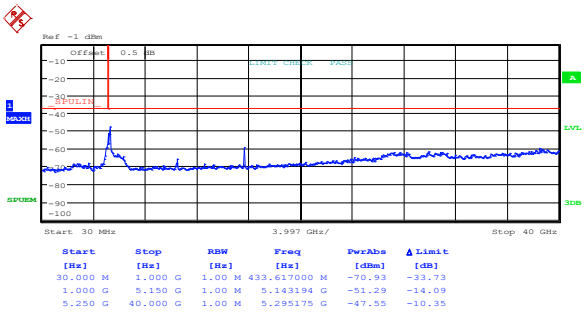


Figure 8.5-45: *Spurious IC out-of-band emissions outside restricted bands high channel, 802.11a, ch0*

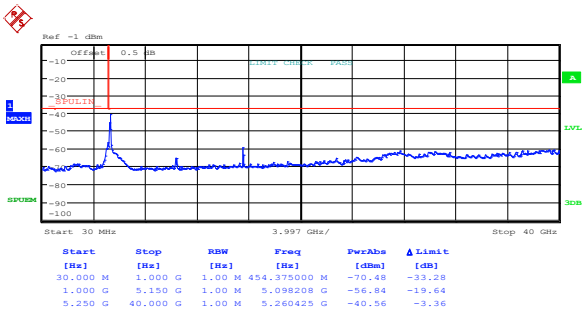


Figure 8.5-46: *Spurious IC out-of-band emissions outside restricted bands low channel, 802.11a, ch1*

8.5.4 Test data, continued

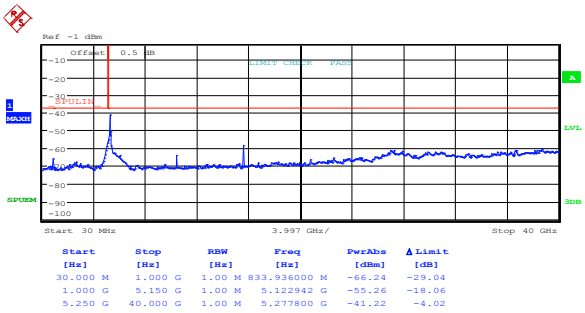


Figure 8.5-47: *Spurious IC out-of-band emissions outside restricted bands mid channel, 802.11a, ch1*

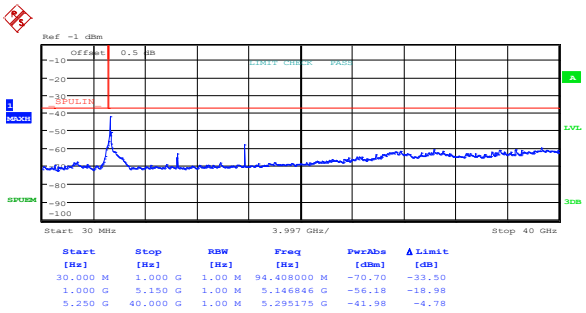


Figure 8.5-48: *Spurious IC out-of-band emissions outside restricted bands high channel, 802.11a, ch1*

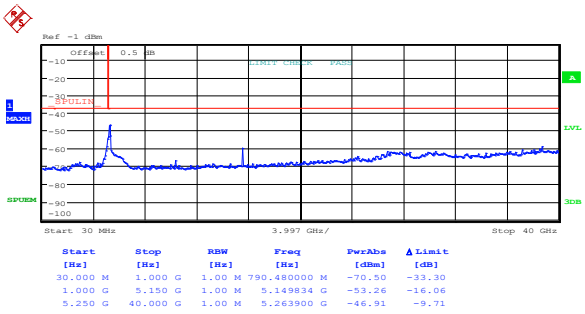


Figure 8.5-49: *Spurious IC out-of-band emissions outside restricted bands low channel, 802.11n HT20, cho*

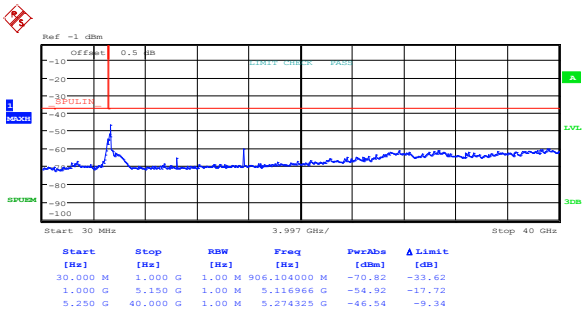


Figure 8.5-50: *Spurious IC out-of-band emissions outside restricted bands mid channel, 802.11n HT20, cho*

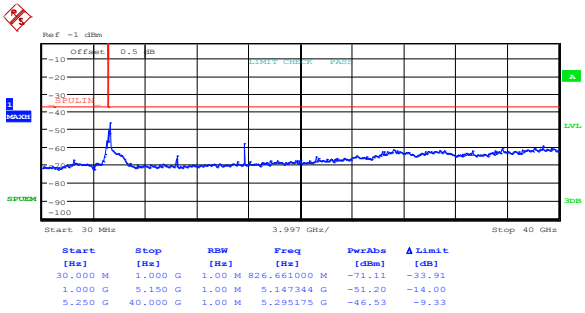


Figure 8.5-51: *Spurious IC out-of-band emissions outside restricted bands high channel, 802.11n HT20, cho*

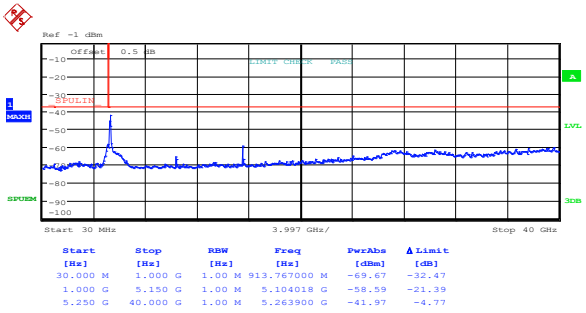


Figure 8.5-52: *Spurious IC out-of-band emissions outside restricted bands low channel, 802.11n HT20, ch1*

8.5.4 Test data, continued

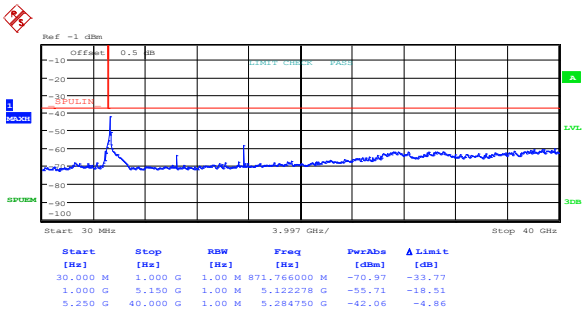


Figure 8.5-53: *Spurious IC out-of-band emissions outside restricted bands mid channel, 802.11n HT20, ch1*

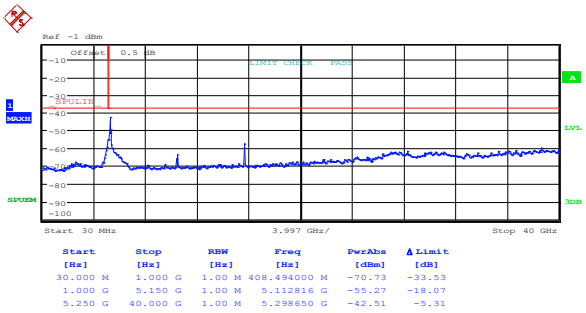


Figure 8.5-54: *Spurious IC out-of-band emissions outside restricted bands high channel, 802.11n HT20, ch1*

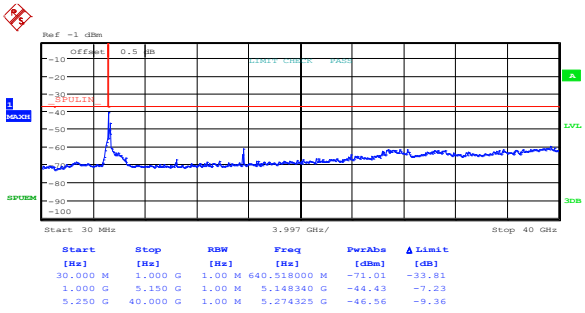


Figure 8.5-55: *Spurious IC out-of-band emissions outside restricted bands low channel, 802.11n HT40, cho*

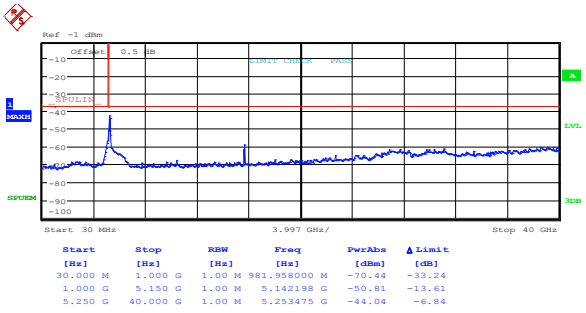


Figure 8.5-56: *Spurious IC out-of-band emissions outside restricted bands high channel, 802.11n HT40, cho*

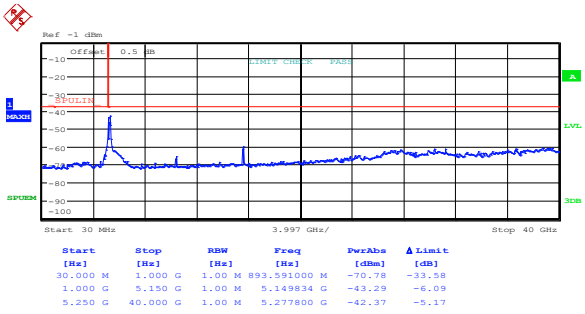


Figure 8.5-57: *Spurious IC out-of-band emissions outside restricted bands low channel, 802.11n HT40, ch1*

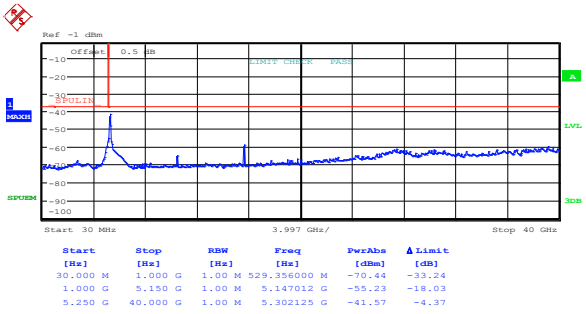


Figure 8.5-58: *Spurious IC out-of-band emissions outside restricted bands high channel, 802.11n HT40, ch1*

Table 8.5-5: *Radiated field strength measurement results*

Frequency, MHz	Peak Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
128.47	**32.93**	**43.50**	**10.57**
169.48	**33.42**	**43.50**	**10.08**
250.02	**33.79**	**47.50**	**13.71**

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable. The spectrum was swept from 30 MHz to 40 GHz. There were no spurious emissions originating from the RF module detected except for those listed in the table above.

8.6 FCC 15.407(g) Frequency stability

8.6.1 Definitions and limits

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

8.6.2 Test summary

Test date:	April 23, 2013	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1002 mbar
Verdict:	Pass	Relative humidity:	35 %

8.6.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.6.4 Test data

Table 8.6-1: *Frequency drift measurement*

Test conditions	Frequency, GHz	Drift, Hz
+50 °C, Nominal	5.17996017	**-144**
+40 °C, Nominal	5.17996004	**-16**
+30 °C, Nominal	5.17995982	**207**
+20 °C, +15 %	5.17996020	**-180**
+20 °C, Nominal	5.17996002	***Reference***
+20 °C, −15 %	5.17995997	**51**
+10 °C, Nominal	5.17995995	**72**
0 °C, Nominal	5.17996017	**-148**
−10 °C, Nominal	5.17995982	**201**
−20 °C, Nominal	5.17995984	**187**
−30 °C, Nominal	5.17995979	**230**

8.6.4 Test data, continued

Table 8.6-2: *Lower band edge drift calculation*

Modulation	−26 dBc lower cross point, GHz	Max negative drift, Hz	Drifted lower cross point, GHz	Band edge, GHz	Margin, MHz
802.11a	5.169286891	230	**5.1692867**	**5.15**	**19.286661**
802.11n HT20	5.168902276	230	**5.1689020**	**5.15**	**18.902046**
802.11n HT40	5.168605769	230	**5.1686055**	**5.15**	**18.605539**

Notes: Drifted lower cross point = −26 dBc lower cross point – max negative drift.

Table 8.6-3: *Upper band edge drift calculation*

Modulation	−26 dBc upper cross point, GHz	Max positive drift, Hz	Drifted upper cross point, GHz	Band edge, GHz	Margin, MHz
802.11a	5.247913462	180	**5.247913642**	**5.25**	**2.086358**
802.11n HT20	5.248298077	180	**5.248298257**	**5.25**	**1.701743**
802.11n HT40	5.249676282	180	**5.249676462**	**5.25**	**0.323538**

Notes: Drifted upper cross point = −26 dBc upper cross point + max positive drift.

8.7 FCC 15.407(a)(6) and RSS-210 A9.4(2) Peak excursion and PSD-to-average ratio

8.7.1 Definitions and limits

FCC:
(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.
IC:
Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average (10 $\log_{10}$ (B)) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.

8.7.2 Test summary

Test date:	April 24, 2013	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	34 %

8.7.3 Observations, settings and special notes

FCC test was performed using method described in 789033 D01 General UNII Test Procedures v01r03 under sections G.
For power spectral density and average power results please refer to Section 8.4 of this document

8.7.4 Test data

Table 8.7-1: *FCC peak excursion measurements results*

Chain	Modulation	Frequency, MHz	Peak max-hold measurement, dBm	PPSD measurement, dBm/MHz	Peak excursion, dB		
					Ratio	Limit	Margin
ch0	802.11a	5180	10.84	-0.49	**11.33**	**13.00**	**1.67**
		5200	10.94	-0.43	**11.37**	**13.00**	**1.63**
		5240	10.65	-0.66	**11.31**	**13.00**	**1.69**
	802.11n HT20	5180	10.40	-0.37	**10.77**	**13.00**	**2.23**
		5200	10.73	-0.22	**10.95**	**13.00**	**2.05**
		5240	10.94	-0.45	**11.39**	**13.00**	**1.61**
	802.11n HT40	5190	8.80	-2.21	**11.01**	**13.00**	**1.99**
		5230	10.30	-1.68	**11.98**	**13.00**	**1.02**
ch1	802.11a	5180	10.34	-0.34	**10.68**	**13.00**	**2.32**
		5200	11.06	-0.04	**11.10**	**13.00**	**1.90**
		5240	11.51	0.17	**11.34**	**13.00**	**1.66**
	802.11n HT20	5180	10.91	-0.15	**11.06**	**13.00**	**1.94**
		5200	10.33	-0.44	**10.77**	**13.00**	**2.23**
		5240	11.06	-0.17	**11.23**	**13.00**	**1.77**
	802.11n HT40	5190	9.06	-1.98	**11.04**	**13.00**	**1.96**
		5230	11.57	-1.30	**12.87**	**13.00**	**0.13**

Note: Ratio is calculated as follows: Peak max-hold value – PPSD value.

8.7.4 Test data, continued

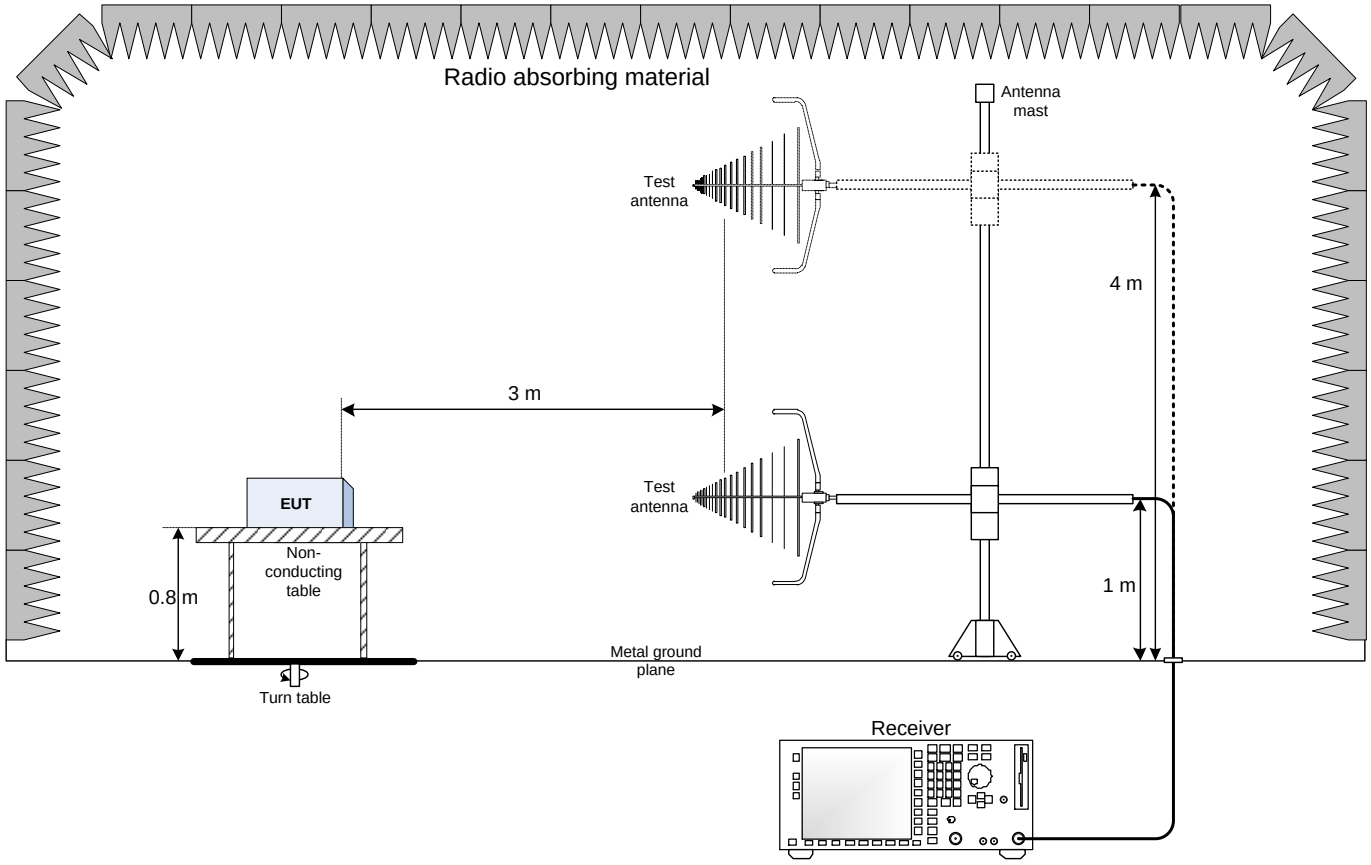
Table 8.7-2: *IC PSD-to-average calculations results*

Modulation	Frequency, MHz	PSD result, dBm/MHz	Average result, dBm	PSD to average, dB		
				Ratio	Limit	Margin
802.11a	5180	2.60	13.34	**-10.74**	**3.00**	**13.74**
	5200	2.78	13.66	**-10.88**	**3.00**	**13.88**
	5220	2.70	13.69	**-10.99**	**3.00**	**13.99**
802.11n HT20	5180	2.75	13.70	**-10.95**	**3.00**	**13.95**
	5200	2.68	13.86	**-11.18**	**3.00**	**14.18**
	5220	2.63	13.87	**-11.25**	**3.00**	**14.25**
802.11n HT40	5190	0.92	14.76	**-13.84**	**3.00**	**16.84**
	5210	1.49	15.59	**-14.11**	**3.00**	**17.11**

Note: Ratio is calculated as follows: PSD result – Average result.

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 Conducted emissions set-up