

Test report

261299-3TRFWL

Date of issue: June 20, 2014

Applicant:

Ericsson WiFi Inc.

Product:

Wi-Fi Access Point

Model:

20EO-11x

Model variant:

20EO-11A, 20EO-11B, 20EO-11C, 20EO-11D, 20EO-11E

FCC ID:

RAR80005000

IC Registration number:

4674A-40005011

Specifications:

- ◆ **FCC 47 CFR Part 15 Subpart E, §15.407**
Unlicensed National Information Infrastructure Devices
- ◆ **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:	June 20, 2014
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

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. © Nemko Canada Inc.

Table of contents

Table of contents	3
Section 1. Report summary	4
1.1 Applicant and manufacturer	4
1.2 Test specifications	4
1.3 Test methods.....	4
1.4 Statement of compliance	4
1.5 Exclusions.....	4
1.6 Test report revision history	4
Section 2. Summary of test results.....	5
2.1 FCC Part 15 Subpart C, general requirements test results.....	5
2.2 FCC Part 15 Subpart E, test results	5
2.3 RSS-Gen, Issue 3, test results.....	5
2.4 IC RSS-210, Issue 8, test results	6
Section 3. Equipment under test (EUT) details	7
3.1 Sample information.....	7
3.2 EUT information	7
3.3 Technical information	7
3.4 Product description and theory of operation	7
3.5 EUT exercise details.....	7
3.6 EUT setup diagram	8
3.7 EUT sub assemblies	8
Section 4. Engineering considerations.....	9
4.1 Modifications incorporated in the EUT.....	9
4.2 Technical judgment	9
4.3 Deviations from laboratory tests procedures	9
Section 5. Test conditions	10
5.1 Atmospheric conditions	10
5.2 Power supply range.....	10
Section 6. Measurement uncertainty	11
6.1 Uncertainty of measurement	11
Section 7. Test equipment	12
7.1 Test equipment list.....	12
Section 8. Testing data	13
8.1 FCC 15.407(b)(6) and RSS-Gen 7.2.4 AC power line conducted emissions limits	13
8.2 FCC 15.403(i) Emission bandwidth	16
8.3 FCC 15.403(e) Minimum 6 dB bandwidth.....	18
8.4 RSS-Gen 4.6.1 Occupied bandwidth	20
8.5 FCC 15.407(a)(3) and RSS-210 A9.2(4) 5.725–5.850 GHz band output power, EIRP and spectral density limits	22
8.6 FCC 15.407(b) and RSS-210 A9.2(3) Spurious (out-of-band) emissions	28
8.7 FCC 15.407(g) Frequency stability	59
8.8 RSS-210 A9.4(2) PSD-to-average ratio	61
Section 9. Block diagrams of test set-ups	63
9.1 Radiated emissions set-up.....	63
9.2 Conducted emissions set-up	63

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 Devices
RSS-210, Issue 8, December 2010, Annex 9	Local Area Network Devices

1.3 Test methods

789033 D01 General UNII Test Procedures v01r04 (June 6, 2014)	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
905642 UNII DFS DR01 - 41759	DFS requirements for UNII bands
662911 D01 Multiple Transmitter Output v02r01	Emissions testing of transmitters with multiple outputs in the same band (MIMO)
662911 D02 MIMO with Cross Polarized Antenna v01	Emissions testing of transmitters with multiple outputs in the same band (MIMO) with Cross Polarized Antenna
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
§15.31(e)	Variation of power source	Pass ¹
§15.203	Antenna requirement	Pass ²

Notes: ¹Measurements 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

²The 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	Pass
§15.407(a)(1)	5.15–5.25 GHz band power and density limits	Not applicable
§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)	5.725–5.850 GHz band power and density limits	Pass
§15.407(b)(1)	5.15–5.25 GHz band undesired emission limits	Not applicable
§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)	5.725–5.850 GHz band undesired emission limits	Pass
§15.407(b)(6)	Unwanted emissions below 1 GHz	Pass
§15.407(b)(6)	Conducted limits	Pass
§15.407(b)(7)	Radiated emissions within restricted bands	Pass
§15.407(e)	Minimum 6 dB BW within 5.725–5.850 GHz band	Pass
§15.407(g)	Frequency stability	Pass
§15.407(h)(1)	Transmit power control (TPC)	Pass
§15.407(h)(2)	Dynamic Frequency Selection (DFS)	Not applicable ¹

Note: ¹The DFS requirements is for 5.25–5.35 GHz and 5.47–5.725 GHz bands only.

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: ¹According 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	Not applicable
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	Pass
A9.2	Out-of-band emission limits	
A9.2 (1)	5150–5250 MHz band	Not applicable
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	Pass
A9.3	Dynamic Frequency Selection (DFS) for devices operating in the bands 5250–5350 MHz, 5470–5600 MHz and 5650–5725 MHz	Not applicable ¹
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) and DFS 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 DFS and 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	June 18, 2013
Nemko sample ID number	1

3.2 EUT information

Product name	Wi-Fi Access Point
Model	BeAir20EO-11x
Model variant	20EO-11A, 20EO-11B, 20EO-11C, 20EO-11D, 20EO-11E
Serial number	201352811810

3.3 Technical information

Operating band (IC)	5725–5825 MHz
Operating band (FCC)	5725–5850 MHz
Operating frequency (IC)	5745–5805 MHz (20 MHz channel) and 5755–5795 MHz (40 MHz channel)
Operating frequency (FCC)	5745–5825 MHz (20 MHz channel) and 5755–5815 MHz (40 MHz channel)
Modulation type	802.11a/n
Occupied bandwidth (99 %)	17.07 MHz (802.11a); 18.22 MHz (802.11n HT20); 37.02 MHz (802.11n HT40)
Emission designator	W7D
Power requirements	48 V _{DC} via PoE at 120 V _{AC} , 60 Hz or direct AC mains connection to 120 V _{AC} , 60 Hz
Antenna information	20EO-11A: Two internal, omni-directional antennas with 6.7 dBi gain 20EO-11B: Two internal directional, cross polarized antennas with 11.5 dBi gain 20EO-11C: Two external directional, cross polarized antennas with 11.5 dBi gain 20EO-11D: Two internal directional, cross polarized antennas with 11.5 dBi gain 20EO-11E: Two internal directional, cross polarized antennas with 12 dBi gain The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

Note: cross polarized antennas are such as one of the transmitter's outputs is a 90-degree phase-shifted replica of the other and the phase centers of the two antennas are co-located.

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. The system can be configured at P2P or P2MP mode. There are two independent radio units. This report covers only the 5.8 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

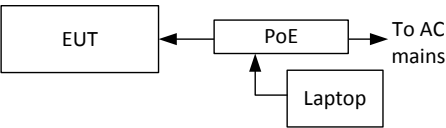


Figure 3.6-1: Setup diagram

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
PoE adapter	Cincon Electronics Co., Ltd.	TRG60A-POE-L	RD Sample 4 1127

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 $\pm 5\%$, 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. 09/15
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	May 20/15
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	May 30/15
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Jan 06/15
Bilog antenna	Sunol	JB3	FA002108	1 year	Feb. 21/15
Horn antenna #1	EMCO	3115	FA000649	1 year	Mar. 25/15
1–18 GHz pre-amplifier	JCA	JCA118-503	FA002091	1 year	June 21/15
Temperature chamber	Thermotron	SM-16C	FA001030	1 year	NCR
Horn antenna 18–40 GHz	EMCO	3116	FA001847	1 year	Sept. 06/14
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 15.407(b)(6) and RSS-Gen 7.2.4 AC power line conducted emissions limits

8.1.1 Definitions and limits

FCC definitions	Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207 15.207(a) 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 definitions	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 the table below. 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 (dB μ V)	
	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	June 3, 2014	Temperature	24 °C
Test engineer	Andrey Adelberg	Air pressure	1008 mbar
Verdict	Pass	Relative humidity	30 %

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.

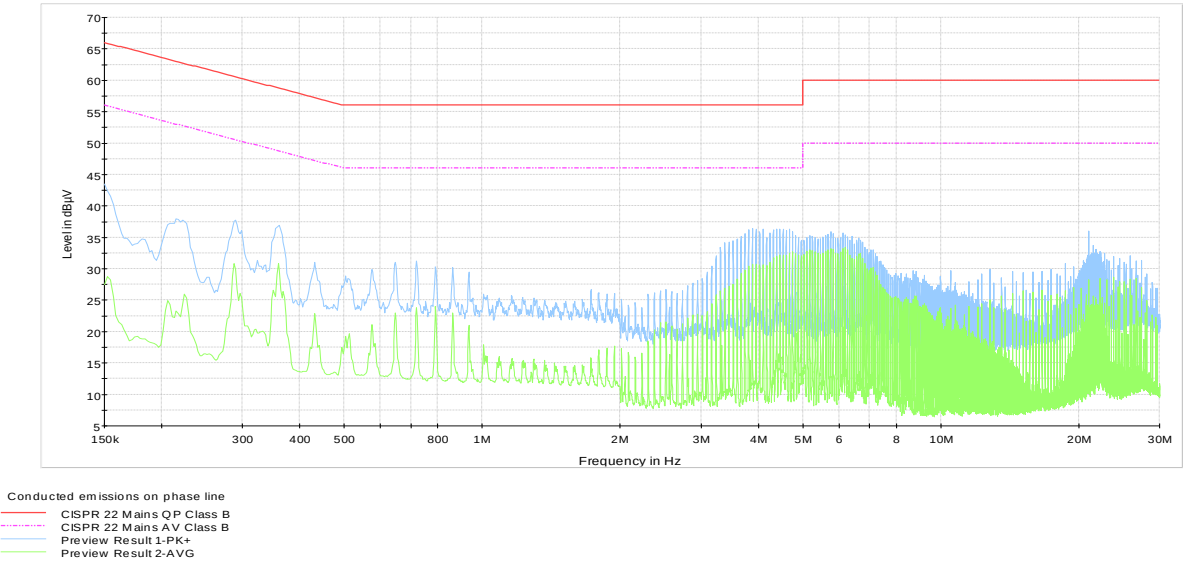
Receiver settings for preview measurements:

Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Detector mode:	Peak and Average
Trace mode:	Max Hold
Measurement time:	1000 ms

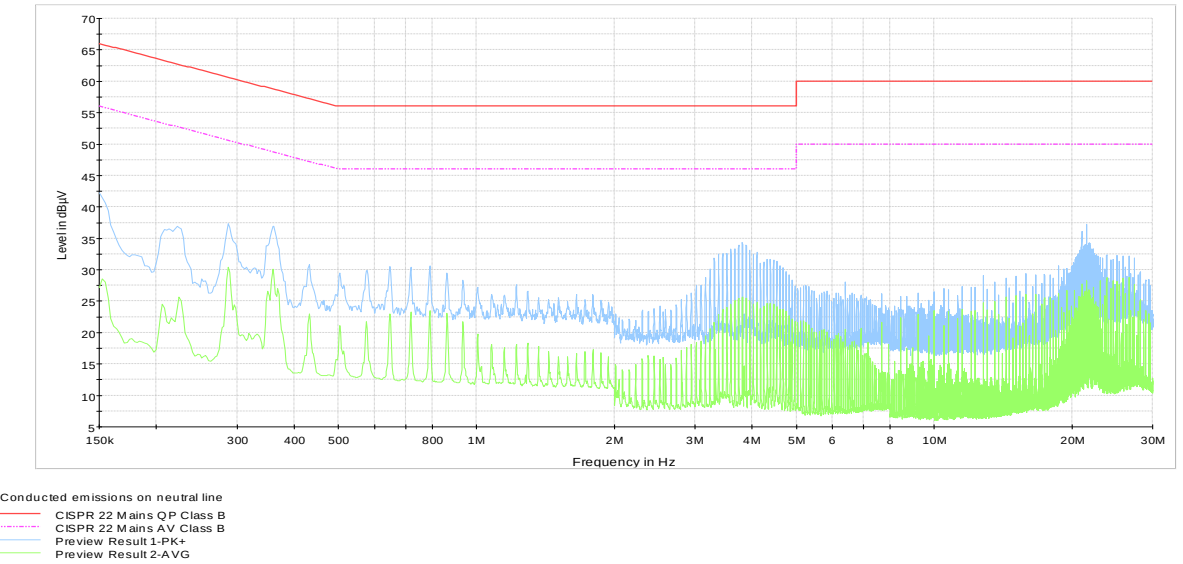
Receiver settings for final measurements:

Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Detector mode:	Quasi-Peak and Average
Trace mode:	Max Hold
Measurement time:	1000 ms

8.1.4 Test data



Plot 8.1-1: Conducted emissions on phase line



Plot 8.1-2: Conducted emissions on neutral line

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:	June 3, 2014	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	32 %

8.2.3 Observations/special notes

Spectrum analyser settings:

Resolution bandwidth:	≥ 1 % of emission BW
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

8.2.4 Test data

Table 8.2-1: 26 dB bandwidth results

Antenna chain	Modulation	Frequency, MHz	26 dB bandwidth, MHz
ch0	802.11a	5745	23.41
		5785	23.56
		5825	23.46
	802.11n HT20	5745	23.99
		5785	24.33
		5825	24.13
	802.11n HT40	5755	48.85
		5785	48.47
		5815	48.08
ch1	802.11a	5745	23.03
		5785	23.32
		5825	23.56
	802.11n HT20	5745	24.18
		5785	23.94
		5825	23.92
	802.11n HT40	5755	48.17
		5785	48.61
		5815	49.04

Maximum 26 dB BW for 802.11a is 23.56 MHz, for 802.11n HT20 is 24.33 MHz and for 802.11n HT40 is 49.04 MHz.

8.2.4 Test data, continued

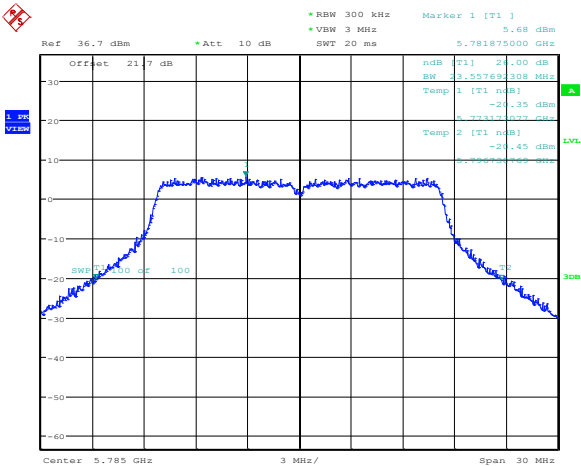


Figure 8.2-1: 26 dB bandwidth on 802.11a, sample plot

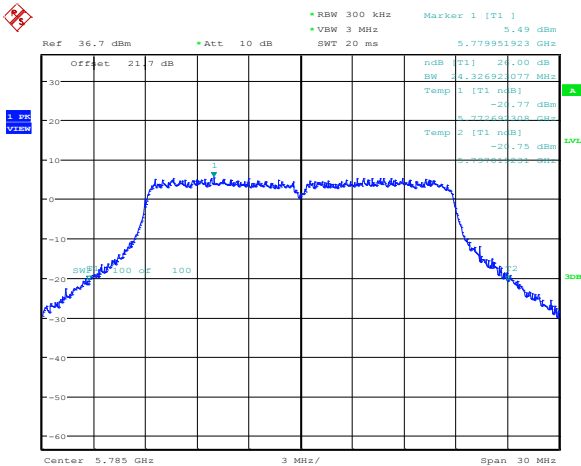


Figure 8.2-2: 26 dB bandwidth on 802.11n HT20, sample plot

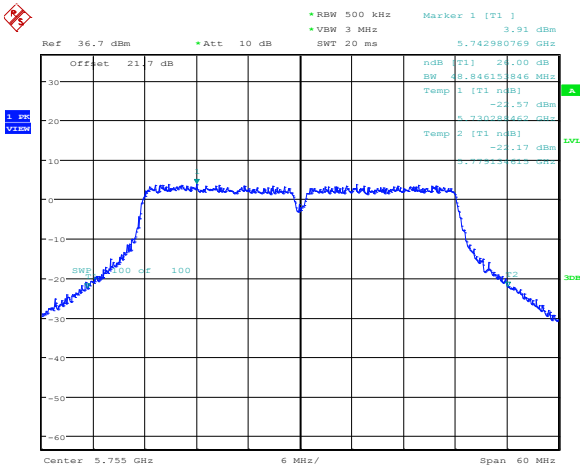


Figure 8.2-3: 26 dB bandwidth on 802.11n HT40, sample plot

8.3 FCC 15.403(e) Minimum 6 dB bandwidth

8.3.1 Definitions and limits

Within the 5.725–5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

8.3.2 Test summary

Test date:	June 3, 2014	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	32 %

8.3.3 Observations/special notes

Spectrum analyser settings:

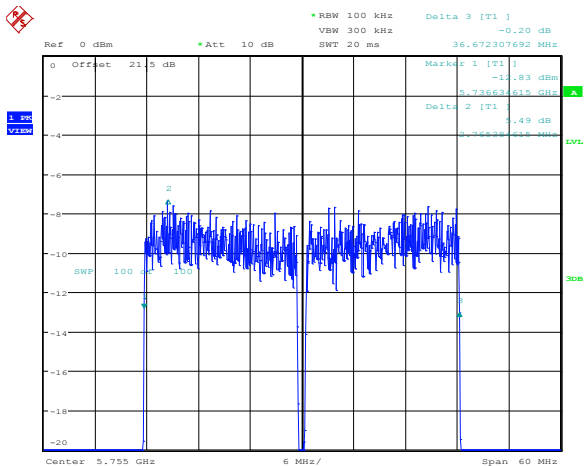
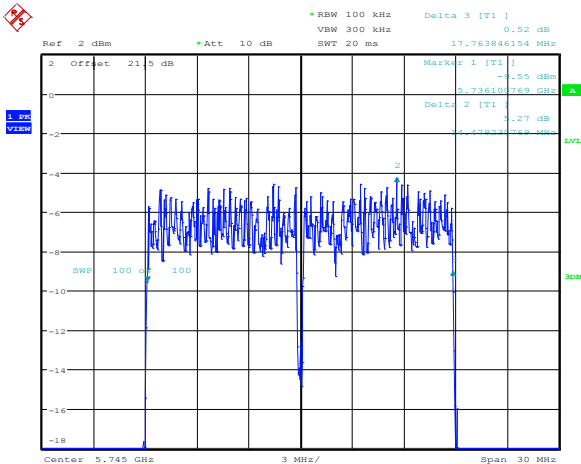
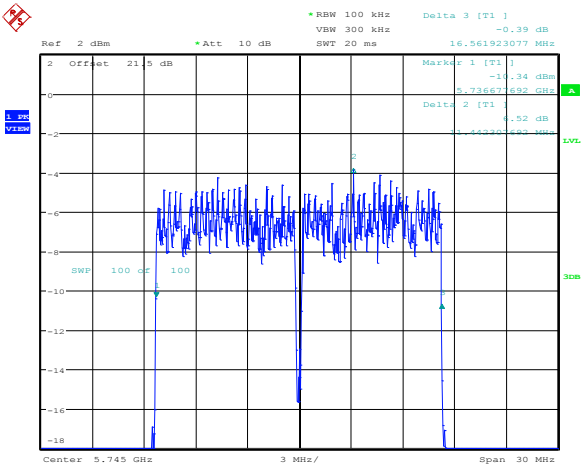
Resolution bandwidth:	1–5 % of DTS BW (no wider than 100 kHz)
Video bandwidth:	$\geq 3 \times$ RBW
Frequency span:	30 MHz for 20 MHz channel; 60 MHz for 40 MHz channel
Detector mode:	Peak
Trace mode:	Max Hold

8.3.4 Test data

Table 8.3-1: 6 dB bandwidth results

Antenna chain	Modulation	Frequency, MHz	6 dB bandwidth, MHz	Minimum limit, MHz	Margin, MHz
ch0	802.11a	5745	16.56	0.50	16.06
		5785	16.61	0.50	16.11
		5825	16.61	0.50	16.11
	802.11n HT20	5745	17.76	0.50	17.26
		5785	17.81	0.50	17.31
		5825	17.81	0.50	17.31
	802.11n HT40	5755	36.72	0.50	36.22
		5785	36.67	0.50	36.17
		5815	36.58	0.50	36.08
	ch1	802.11a	5745	16.54	0.50
5785			16.54	0.50	16.04
5825			16.61	0.50	16.11
802.11n HT20		5745	17.79	0.50	17.29
		5785	17.84	0.50	17.34
		5825	17.81	0.50	17.31
802.11n HT40		5755	36.62	0.50	36.12
		5785	36.63	0.50	36.13
		5815	36.67	0.50	36.17

8.3.5 Test data, continued



8.4 RSS-Gen 4.6.1 Occupied bandwidth

8.4.1 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.

8.4.2 Test summary

Test date:	June 2, 2014	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	32 %

8.4.3 Observations/special notes

Spectrum analyser settings:

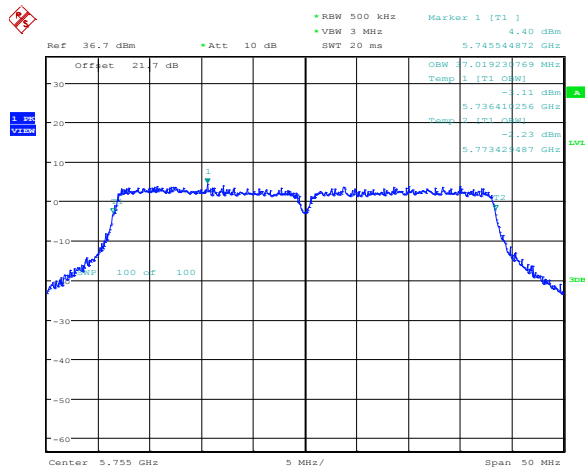
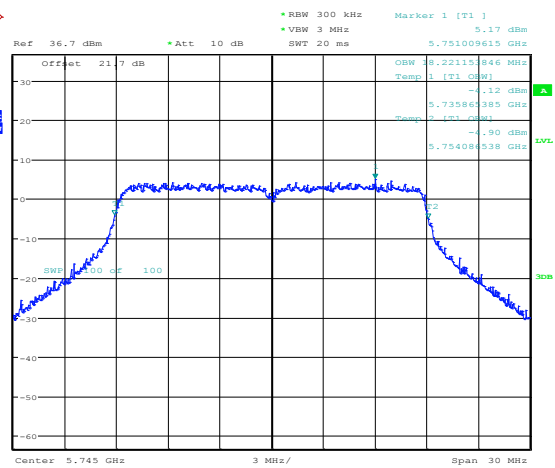
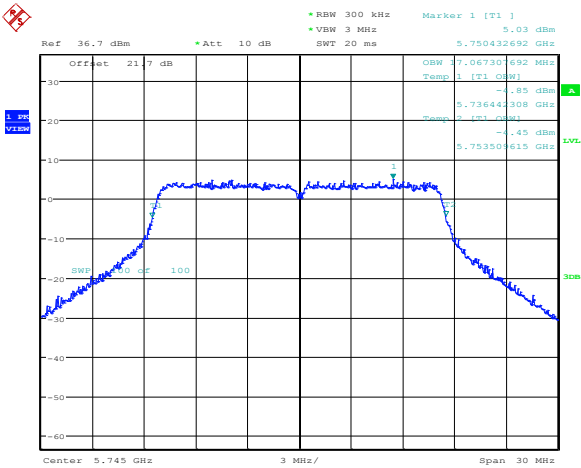
Resolution bandwidth:	≥ 1 % of span
Video bandwidth:	≥ 3 × RBW
Frequency span:	30 MHz for 20 MHz channel; 50 MHz for 40 MHz channel
Detector mode:	Peak
Trace mode:	Max Hold

8.4.4 Test data

Table 8.4-1: 99 % bandwidth results

Modulation	99 % bandwidth, MHz
802.11a	17.07
802.11n HT20	18.22
802.11n HT40	37.02

8.4.4 Test data, continued



8.5 FCC 15.407(a)(3) and RSS-210 A9.2(4) 5.725–5.850 GHz band output power, EIRP and spectral density limits

8.5.1 Definitions and limits

FCC definitions	(3) For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations. (4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS-equivalent voltage. (5) The maximum 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 in the 5.725–5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15–5.25 GHz, 5.25–5.35 GHz, and the 5.47–5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.
IC definitions	For the band 5.725–5.825 GHz band the maximum conducted output power shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 17 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. Fixed point-to-point systems for this band are permitted to have an e.i.r.p. greater than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain antennas, but not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p. However, remote stations of point-to-multipoint systems shall be permitted to operate at greater than 4 W e.i.r.p. under the same conditions as for point-to-point systems.

8.5.2 Test summary

Test date:	June 6, 2014	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1006 mbar
Verdict:	Pass	Relative humidity:	32 %

8.5.3 Observations/special notes

The test was performed according to UNII guidelines section C) 4) Method PM: maximum conducted (average) output power using wideband RF average power meter with a thermocouple detector.

The PPSD test was performed according to 789033 D01 General UNII Test Procedures section F.

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

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

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

Directional gain for MIMO Correlated 2×2 (CDD/TXBF) with 6.7 dBi antenna = 6.7 dBi + $10 \times \log_{10}(N)$ dB = 6.7 dBi + 3 dB = 9.7 dBi, where “N” is number of antennae.

Directional gain for MIMO Uncorrelated (cross polarized) 2×2 = 11.5 and 12 dBi.

The 26 dB measured bandwidth for 802.11a was 23.56 MHz, for 802.11n HT20 was 24.33 MHz and for 802.11n HT40 was 49.04 MHz.

6.7 dBi antenna FCC limits calculations	For 802.11a: 26.30 dBm = $30 - (9.7 - 6)$ For 802.11n 26.30 dBm = $30 - (9.7 - 6)$ For 802.11n 26.30 dBm = $30 - (9.7 - 6)$ FCC PPSD limit: $30 - (9.7 - 6) = \mathbf{26.3 \text{ dBm/500 kHz}}$
11.5 dBi antenna FCC limits calculations	For 802.11a: 24.5 dBm = $30 - (11.5 - 6)$ For 802.11n HT20: 24.5 dBm = $30 - (11.5 - 6)$ For 802.11n HT40: 24.5 dBm = $30 - (11.5 - 6)$ FCC PPSD limit: $30 - (11.5 - 6) = \mathbf{24.5 \text{ dBm/500 kHz}}$
12 dBi antenna FCC limits calculations	For 802.11a: 24 dBm = $30 - (12 - 6)$ For 802.11n HT20: 24 dBm = $30 - (12 - 6)$ For 802.11n HT40: 24 dBm = $30 - (12 - 6)$ FCC PPSD limit: $30 - (12 - 6) = \mathbf{24 \text{ dBm/500 kHz}}$
FCC limits calculations for P2P applications	For 802.11a: 30 dBm For 802.11n HT20: 30 dBm For 802.11n HT40: 30 dBm FCC PPSD limit is as follows: 30 dBm/500 kHz

Note: Final limits in the table above are indicated in **bold** font.

The 99 % measured occupied bandwidth for 802.11a was 17.07 MHz, for 802.11n HT20 was 18.22 MHz and for 802.11n HT40 was 37.02 MHz.

The IC limits were calculated as follows:

For 802.11a	Output power limit: $17 + 10 \times \log_{10}(17.07) = \mathbf{29.32 \text{ dBm}} < 30 \text{ dBm}$ EIRP limit: $23 + 10 \times \log_{10}(17.07) = \mathbf{35.32 \text{ dBm}} < 36 \text{ dBm}$
For 802.11n HT20	Output power limit: $17 + 10 \times \log_{10}(18.22) = \mathbf{29.61 \text{ dBm}} < 30 \text{ dBm}$ EIRP limit: $23 + 10 \times \log_{10}(18.22) = \mathbf{35.61 \text{ dBm}} < 36 \text{ dBm}$
For 802.11n HT40	Output power limit: $17 + 10 \times \log_{10}(37.02) = 32.68 \text{ dBm} > \mathbf{30 \text{ dBm}}$ EIRP limit: $23 + 10 \times \log_{10}(37.02) = 38.68 \text{ dBm} > \mathbf{36 \text{ dBm}}$

Note: Final limits in the table above are indicated in **bold** font.

Section 8

Test name

Specification

Testing data

FCC 15.407(a)(3) and RSS-210 A9.2(4) 5.725–5.85 GHz band output power, EIRP and spectral density limits

FCC Part 15 Subpart E and RSS-210, Issue 8



8.5.4 Test data

Table 8.5-1: Output power measurements, FCC results for 6.7 dBi, P2MP antenna configuration

Modulation	Frequency, MHz	Measured average power, dBm			Output power limit, dBm	Output power margin, dB	Total antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
		On ch0	On ch1	Combined						
802.11a	5745	16.92	16.52	19.73	26.30	6.57	9.70	29.43	36.00	6.57
	5785	22.63	22.05	25.36	26.30	0.94	9.70	35.06	36.00	0.94
	5825	22.08	20.99	24.58	26.30	1.72	9.70	34.28	36.00	1.72
802.11n HT20	5745	15.89	16.54	19.24	26.30	7.06	9.70	28.94	36.00	7.06
	5785	23.63	21.87	25.85	26.30	0.45	9.70	35.55	36.00	0.45
	5825	21.64	20.39	24.07	26.30	2.23	9.70	33.77	36.00	2.23
802.11n HT40	5755	13.99	10.20	15.51	26.30	10.79	9.70	25.21	36.00	10.79
	5785	23.23	22.12	25.72	26.30	0.58	9.70	35.42	36.00	0.58
	5815	18.34	17.31	20.87	26.30	5.43	9.70	30.57	36.00	5.43

Table 8.5-2: PPSD measurements, FCC results for 6.7 dBi, P2MP antenna configuration

Modulation	Frequency, MHz	Measured Peak Power Spectral Density (PPSD), dBm/500 kHz			PPSD limit, dBm/500 kHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	1.46	3.38	5.54	26.3	20.76
	5785	8.89	7.81	11.39	26.3	14.91
	5825	7.65	6.61	10.17	26.3	16.13
802.11n HT20	5745	0.77	3.07	5.08	26.3	21.22
	5785	9.42	7.75	11.68	26.3	14.62
	5825	7.03	5.98	9.55	26.3	16.75
802.11n HT40	5755	-4.05	-7.47	-2.42	26.3	28.72
	5785	6.22	4.75	8.56	26.3	17.74
	5815	0.93	-0.22	3.40	26.3	22.90

Table 8.5-3: Output power measurements, FCC results for 11.5 dBi, P2MP antenna configurations

Modulation	Frequency, MHz	Measured average power, dBm			Output power limit, dBm	Output power margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
		On ch0	On ch1	Combined						
802.11a	5745	15.55	15.60	18.59	24.50	5.91	11.50	30.09	36.00	5.91
	5785	21.68	21.13	24.42	24.50	0.08	11.50	35.92	36.00	0.08
	5825	19.37	19.09	22.24	24.50	2.26	11.50	33.74	36.00	2.26
802.11n HT20	5745	14.97	15.69	18.36	24.50	6.14	11.50	29.86	36.00	6.14
	5785	21.60	21.22	24.42	24.50	0.08	11.50	35.92	36.00	0.08
	5825	18.80	18.22	21.53	24.50	2.97	11.50	33.03	36.00	2.97
802.11n HT40	5755	10.42	11.56	14.04	24.50	10.46	11.50	25.54	36.00	10.46
	5785	21.34	21.47	24.42	24.50	0.08	11.50	35.92	36.00	0.08
	5815	14.47	15.12	17.82	24.50	6.68	11.50	29.32	36.00	6.68

8.5.4 Test data, continued

Table 8.5-4: PPSP measurements, FCC results for 11.5 dBi, P2MP antenna configurations

Modulation	Frequency, MHz	Measured Peak Power Spectral Density (PPSP), dBm/500 kHz			PPSP limit, dBm/500 kHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	0.29	2.44	4.51	24.5	19.99
	5785	7.68	6.85	10.30	24.5	14.20
	5825	4.85	4.77	7.82	24.5	16.68
802.11n HT20	5745	-0.41	2.20	4.10	24.5	20.40
	5785	7.27	6.86	10.08	24.5	14.42
	5825	4.03	3.98	7.02	24.5	17.48
802.11n HT40	5755	-7.59	-5.90	-3.65	24.5	28.15
	5785	3.84	4.25	7.06	24.5	17.44
	5815	-2.85	-2.50	0.34	24.5	24.16

Table 8.5-5: Output power measurements, FCC results for 12 dBi, P2MP antenna configurations

Modulation	Frequency, MHz	Measured average power, dBm			Output power limit, dBm	Output power margin, dB	Total antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
		On ch0	On ch1	Combined						
802.11a	5745	15.04	15.60	18.34	24.00	5.66	12.00	30.34	36.00	5.66
	5785	20.99	20.81	23.91	24.00	0.09	12.00	35.91	36.00	0.09
	5825	14.88	14.79	17.85	24.00	6.15	12.00	29.85	36.00	6.15
802.11n HT20	5745	14.97	15.13	18.06	24.00	5.94	12.00	30.06	36.00	5.94
	5785	20.99	20.77	23.89	24.00	0.11	12.00	35.89	36.00	0.11
	5825	14.17	15.08	17.66	24.00	6.34	12.00	29.66	36.00	6.34
802.11n HT40	5755	9.92	11.00	13.50	24.00	10.50	12.00	25.50	36.00	10.50
	5785	21.03	20.72	23.89	24.00	0.11	12.00	35.89	36.00	0.11
	5815	13.49	14.67	17.13	24.00	6.87	12.00	29.13	36.00	6.87

Table 8.5-6: PPSP measurements, FCC results for 12 dBi, P2MP antenna configurations

Modulation	Frequency, MHz	Measured Peak Power Spectral Density (PPSP), dBm/500 kHz			PPSP limit, dBm/500 kHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	0.10	2.44	4.44	24.00	19.56
	5785	6.92	6.61	9.78	24.00	14.22
	5825	0.27	0.29	3.29	24.00	20.71
802.11n HT20	5745	-0.41	1.22	3.49	24.00	20.51
	5785	6.71	6.37	9.55	24.00	14.45
	5825	-0.66	0.05	2.72	24.00	21.28
802.11n HT40	5755	-7.95	-6.45	-4.13	24.00	28.13
	5785	3.58	3.23	6.42	24.00	17.58
	5815	-3.75	-2.93	-0.31	24.00	24.31

Section 8

Test name

Specification

Testing data

FCC 15.407(a)(3) and RSS-210 A9.2(4) 5.725–5.85 GHz band output power, EIRP and spectral density limits

FCC Part 15 Subpart E and RSS-210, Issue 8



8.5.4 Test data, continued

Table 8.5-7: Output power measurements, FCC results for P2P configuration

Modulation	Frequency, MHz	Conducted average output power, dBm				Margin, dB
		On ch0	On ch1	Combined	Limit	
802.11a	5745	16.92	16.52	19.73	30.00	10.27
	5785	22.63	22.05	25.36	30.00	4.64
	5825	22.08	20.99	24.58	30.00	5.42
802.11n HT20	5745	15.89	16.54	19.24	30.00	10.76
	5785	23.63	21.87	25.85	30.00	4.15
	5825	21.64	20.39	24.07	30.00	5.93
802.11n HT40	5755	13.99	10.20	15.51	30.00	14.49
	5785	23.23	22.12	25.72	30.00	4.28
	5815	18.34	17.31	20.87	30.00	9.13

Table 8.5-8: PPSD measurements, FCC results for P2P configuration

Modulation	Frequency, MHz	Measured Peak Power Spectral Density (PPSD), dBm/500 kHz			PPSD limit, dBm/500 kHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	1.46	3.38	5.54	30.00	24.46
	5785	8.89	7.81	11.39	30.00	18.61
	5825	7.65	6.61	10.17	30.00	19.83
802.11n HT20	5745	0.77	3.07	5.08	30.00	24.92
	5785	9.42	7.75	11.68	30.00	18.32
	5825	7.03	5.98	9.55	30.00	20.45
802.11n HT40	5755	-4.05	-7.47	-2.42	30.00	32.42
	5785	6.22	4.75	8.56	30.00	21.44
	5815	0.93	-0.22	3.40	30.00	26.60

Table 8.5-9: Output power measurements and EIRP calculations results for IC with 6.7 dBi antenna configuration

Modulation	Frequency, MHz	Conducted average output power, dBm				Margin, dB	Total antenna gain, dBi	EIRP, dBm		Margin, dB
		On ch0	On ch1	Combined	Limit			Calculated	Limit	
802.11a	5745	16.92	16.52	19.73	29.32	9.59	9.70	29.43	35.32	5.89
	5785	23.14	21.89	25.57	29.32	3.75	9.70	35.27	35.32	0.05
	5805	19.81	18.99	22.43	29.32	6.89	9.70	32.13	35.32	3.19
802.11n HT20	5745	15.89	16.54	19.24	29.61	10.37	9.70	28.94	35.61	6.67
	5785	23.63	21.87	25.85	29.61	3.76	9.70	35.55	35.61	0.06
	5805	19.42	18.54	22.01	29.61	7.60	9.70	31.71	35.61	3.90
802.11n HT40	5755	13.99	10.20	15.51	30.00	14.49	9.70	25.21	36.00	10.79
	5795	16.65	16.44	19.56	30.00	10.44	9.70	29.26	36.00	6.74

Table 8.5-10: PSD measurements results for IC with 6.7 dBi antenna configuration

Modulation	Frequency, MHz	Measured Power Spectral Density (PSD), dBm/MHz			PSD limit, dBm/MHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	5.78	5.50	8.65	17.00	8.35
	5785	12.13	10.01	14.21	17.00	2.79
	5805	8.77	7.85	11.34	17.00	5.66
802.11n HT20	5745	4.48	5.30	7.92	17.00	9.08
	5785	12.29	10.65	14.56	17.00	2.44
	5805	8.17	7.20	10.72	17.00	6.28
802.11n HT40	5755	-0.52	-4.02	1.08	17.00	15.92
	5795	2.34	2.36	5.36	17.00	11.64

8.5.4 Test data, continued

Table 8.5-11: Output power measurements and EIRP calculations results for IC with 11.5 antenna configuration

Modulation	Frequency, MHz	Conducted average output power, dBm				Margin, dB	Antenna gain, dBi	EIRP, dBm		Margin, dB
		On ch0	On ch1	Combined	Limit			Calculated	Limit	
802.11a	5745	15.55	15.60	18.59	29.32	10.73	11.50	30.09	35.32	5.23
	5785	20.55	20.68	23.63	29.32	5.69	11.50	35.13	35.32	0.19
	5805	18.94	18.57	21.77	29.32	7.55	11.50	33.27	35.32	2.05
802.11n HT20	5745	14.97	15.69	18.36	29.61	11.25	11.50	29.86	35.61	5.75
	5785	20.76	20.81	23.80	29.61	5.81	11.50	35.30	35.61	0.31
	5805	18.77	18.13	21.47	29.61	8.14	11.50	32.97	35.61	2.64
802.11n HT40	5755	10.42	11.56	14.04	30.00	15.96	11.50	25.54	36.00	10.46
	5795	15.48	15.86	18.68	30.00	11.32	11.50	30.18	36.00	5.82

Table 8.5-12: PSD measurements results for IC with 11.5 dBi antenna configuration

Modulation	Frequency, MHz	Measured Power Spectral Density (PSD), dBm/MHz			PSD limit, dBm/MHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	4.42	4.53	7.49	17.00	9.51
	5785	9.30	9.49	12.41	17.00	4.59
	5805	7.85	7.45	10.66	17.00	6.34
802.11n HT20	5745	3.56	4.42	7.02	17.00	9.98
	5785	9.46	9.51	12.50	17.00	4.50
	5805	7.41	6.81	10.13	17.00	6.87
802.11n HT40	5755	-4.06	-2.61	-0.26	17.00	17.26
	5795	1.19	1.57	4.39	17.00	12.61

Table 8.5-13: Output power measurements and EIRP calculations results for IC with 12 dBi antenna configuration

Modulation	Frequency, MHz	Conducted average output power, dBm				Margin, dB	Antenna gain, dBi	EIRP, dBm		Margin, dB
		On ch0	On ch1	Combined	Limit			Calculated	Limit	
802.11a	5745	15.04	15.60	18.34	29.32	10.98	12.00	30.34	35.32	4.98
	5785	20.55	20.04	23.31	29.32	6.01	12.00	35.31	35.32	0.01
	5805	15.42	17.74	19.74	29.32	9.58	12.00	31.74	35.32	3.58
802.11n HT20	5745	14.97	15.13	18.06	29.61	11.55	12.00	30.06	35.61	5.55
	5785	20.57	20.58	23.59	29.61	6.02	12.00	35.59	35.61	0.02
	5805	14.25	17.31	19.05	29.61	10.56	12.00	31.05	35.61	4.56
802.11n HT40	5755	9.92	11.00	13.50	30.00	16.50	12.00	25.50	36.00	10.50
	5795	11.88	13.15	15.57	30.00	14.43	12.00	27.57	36.00	8.43

Table 8.5-14: PSD measurements results for IC with 12 dBi antenna configuration

Modulation	Frequency, MHz	Measured Power Spectral Density (PSD), dBm/MHz			PSD limit, dBm/MHz	Margin, dB
		On ch0	On ch1	Combined		
802.11a	5745	3.89	4.53	7.23	17.00	9.77
	5785	9.51	9.29	12.41	17.00	4.59
	5805	4.29	6.68	8.66	17.00	8.34
802.11n HT20	5745	3.56	3.85	6.72	17.00	10.28
	5785	9.16	9.22	12.20	17.00	4.80
	5805	2.93	6.00	7.74	17.00	9.26
802.11n HT40	5755	-4.52	-3.15	-0.77	17.00	17.77
	5795	-2.46	-1.16	1.25	17.00	15.75

8.6 FCC 15.407(b) and RSS-210 A9.2(3) Spurious (out-of-band) emissions

8.6.1 Definitions and limits

FCC definitions	(4) For transmitters operating in the 5.725–5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions 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 definitions	For the band 5725–5825 MHz, emissions within the frequency range from the band edges to 10 MHz above or below the band edges shall not exceed –17 dBm/MHz e.i.r.p. For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed –27 dBm/MHz. 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 8.6-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/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: 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

8.6.1 Definitions and limits, continued

Table 8.6-2: 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 this table 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 8.6-3: 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			

8.6.2 Test summary

Test date:	July 8, 2013	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	33 %

8.6.3 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.

No radiated emissions falling within restricted bands above system noise floor were detected.

Directional gain for MIMO Correlated 2×2 (CDD/TXBF) with 6.7 dBi antenna = 6.7 dBi + $10 \times \log_{10}(N)$ dB = 6.7 dBi + 3 dB = 9.7 dBi, where "N" is number of antennae. Directional gain for MIMO Uncorrelated (cross polarized) 2×2 = 11.5 dBi and 12 dBi.

Spectrum analyser settings 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 for measurements within restricted bands below 1 GHz was set as follows:

For 6.7 dBi antenna: 54 dB μ V/m – 95.23 dB – 9.7 dBi – 4.7 dB – 3 dB = –58.63 dBm

For 11.5 dBi antenna: 54 dB μ V/m – 95.23 dB – 11.5 dBi – 4.7 dB – 3 dB = –60.43 dBm

For 12 dBi antenna: 54 dB μ V/m – 95.23 dB – 12.0 dBi – 4.7 dB – 3 dB = –60.93 dBm

Note: 3 dB is a multiple antenna ports compensation: $10 \times \log_{10}(2)$ and 4.7 dB is a ground reflection factor

Spectrum analyser settings 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 for measurements within restricted bands above 1 GHz was set as follows:

For 6.7 dBi antenna 54 dB μ V/m – 95.23 dB – 9.7 dBi – 3 dB = –53.93 dBm/MHz

For 11.5 dBi antenna 54 dB μ V/m – 95.23 dB – 11.5 dBi – 3 dB = –55.73 dBm/MHz

For 12 dBi antenna 54 dB μ V/m – 95.23 dB – 12.0 dBi – 3 dB = –56.23 dBm/MHz

Note: 3 dB is a multiple antenna ports compensation: $10 \times \log_{10}(2)$

Spectrum analyser settings for average* conducted measurements within restricted bands above 1 GHz for frequencies:

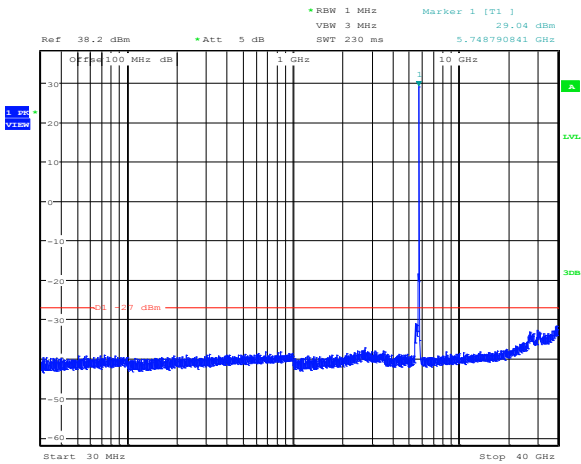
Resolution bandwidth	1 MHz
Video bandwidth	10 MHz
Detector mode	RMS
Trace mode	Power average
Number of averaging traces	100

Note: * if peak results were above the average limit. Peak limit is 20 dB higher than the average limit was applied

Spectrum analyser settings for peak conducted measurements outside restricted bands:

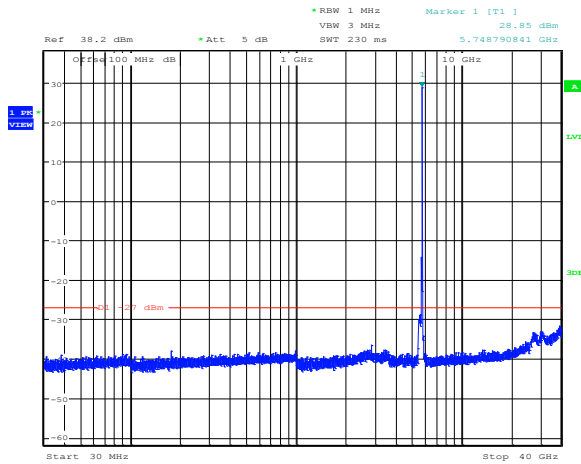
Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold

8.6.4 Test data, continued



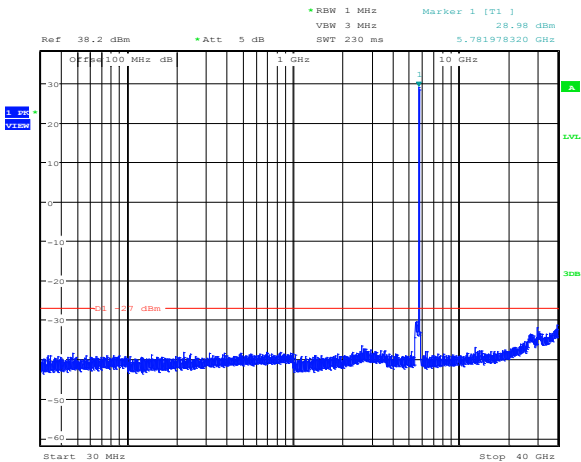
Date: 9.JUN.2014 15:17:50

Figure 8.6-1: Peak spurious emissions outside restricted bands at low channel, 802.11a, cho



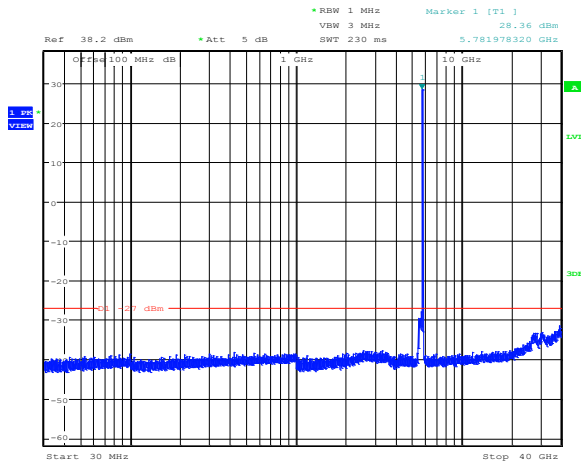
Date: 9.JUN.2014 15:08:56

Figure 8.6-2: Peak spurious emissions outside restricted bands at low channel, 802.11a, ch1



Date: 9.JUN.2014 15:16:35

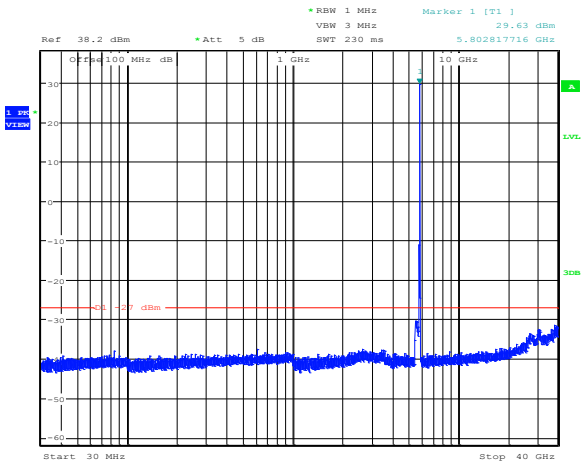
Figure 8.6-3: Peak spurious emissions outside restricted bands at mid channel, 802.11a, cho



Date: 9.JUN.2014 15:11:14

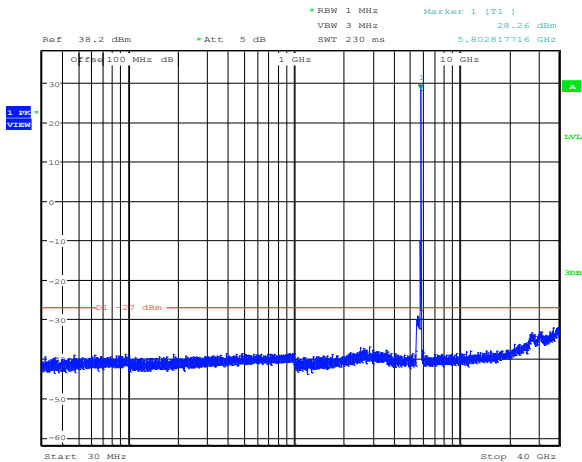
Figure 8.6-4: Peak spurious emissions outside restricted bands at mid channel, 802.11a, ch1

8.6.4 Test data, continued



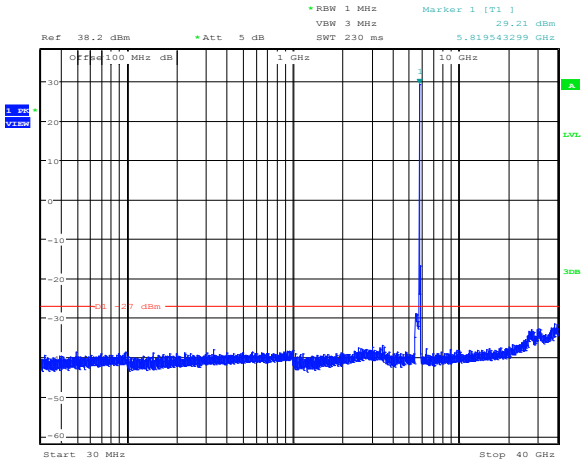
Date: 9.JUN.2014 15:16:09

Figure 8.6-5: Peak spurious emissions outside restricted bands at IC high channel, 802.11a, cho



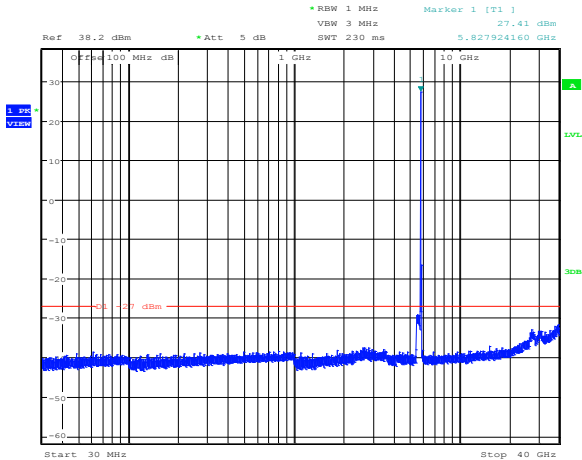
Date: 9.JUN.2014 15:12:09

Figure 8.6-6: Peak spurious emissions outside restricted bands at IC high channel, 802.11a, ch1



Date: 9.JUN.2014 15:15:51

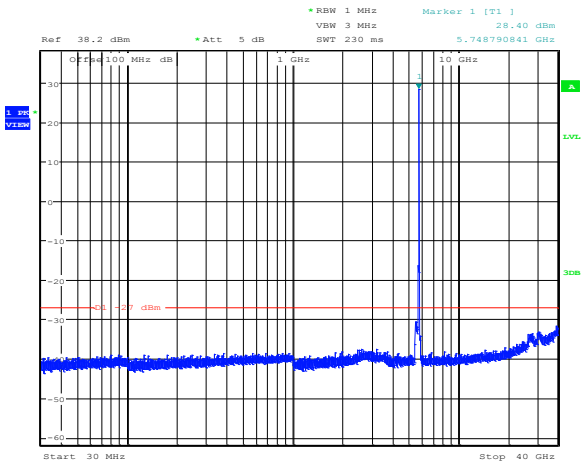
Figure 8.6-7: Peak spurious emissions outside restricted bands at FCC high channel, 802.11a, cho



Date: 9.JUN.2014 15:12:39

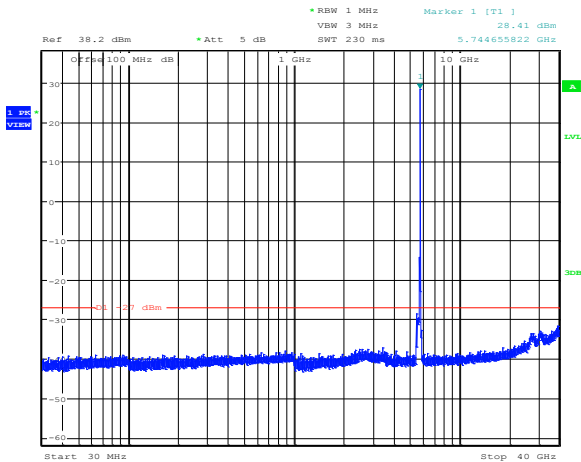
Figure 8.6-8: Peak spurious emissions outside restricted bands at FCC high channel, 802.11a, ch1

8.6.4 Test data, continued



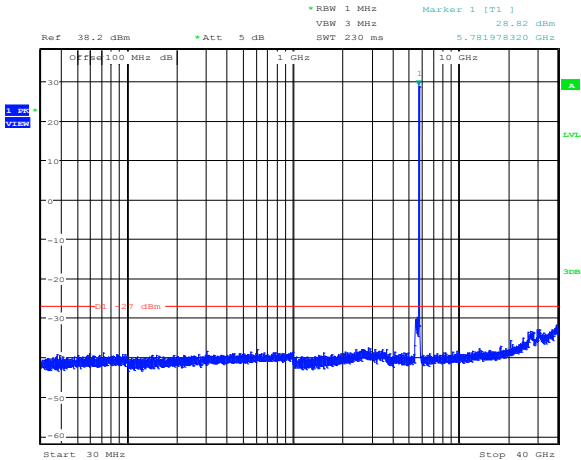
Date: 9.JUN.2014 15:17:30

Figure 8.6-9: Peak spurious emissions outside restricted bands at low channel, 802.11n HT20, cho



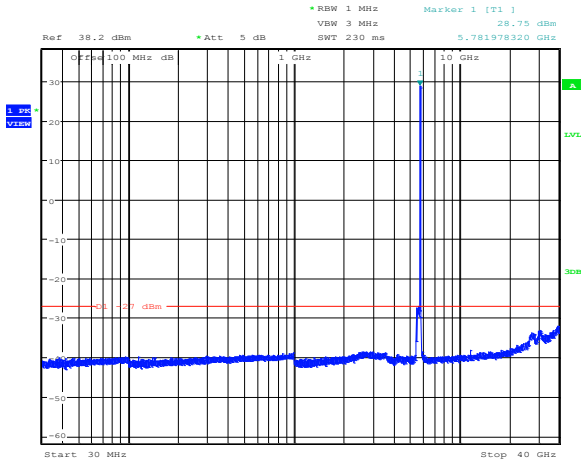
Date: 9.JUN.2014 15:09:20

Figure 8.6-10: Peak spurious emissions outside restricted bands at low channel, 802.11n HT20, ch1



Date: 9.JUN.2014 15:17:03

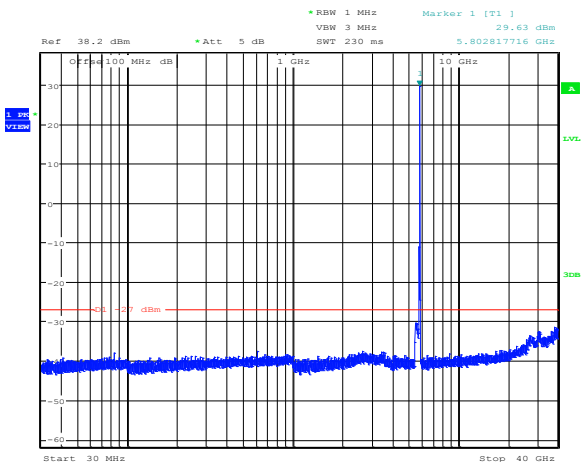
Figure 8.6-11: Peak spurious emissions outside restricted bands at mid channel, 802.11n HT20, cho



Date: 9.JUN.2014 15:10:16

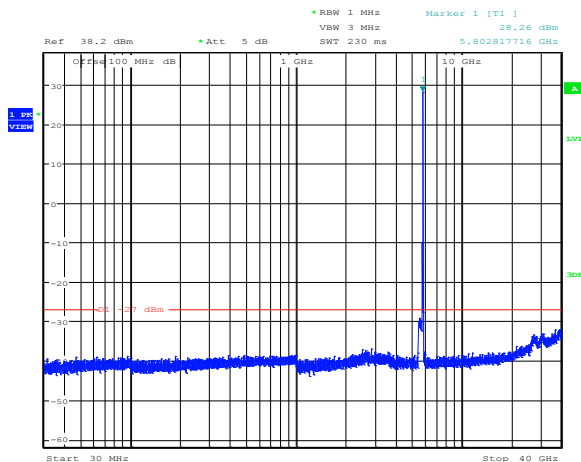
Figure 8.6-12: Peak spurious emissions outside restricted bands at mid channel, 802.11n HT20, ch1

8.6.4 Test data, continued



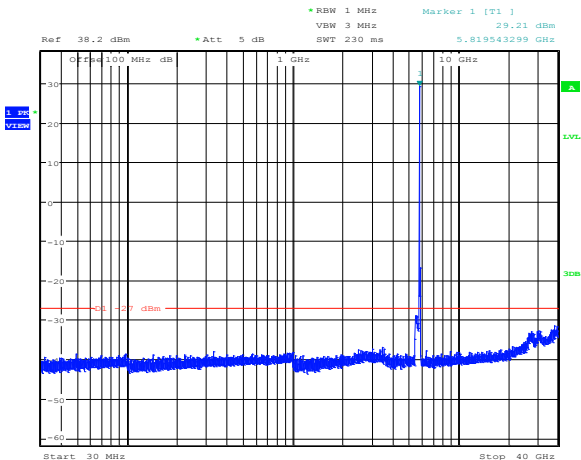
Date: 9.JUN.2014 15:16:09

Figure 8.6-13: Peak spurious emissions outside restricted bands at IC high channel, 802.11n HT20, cho



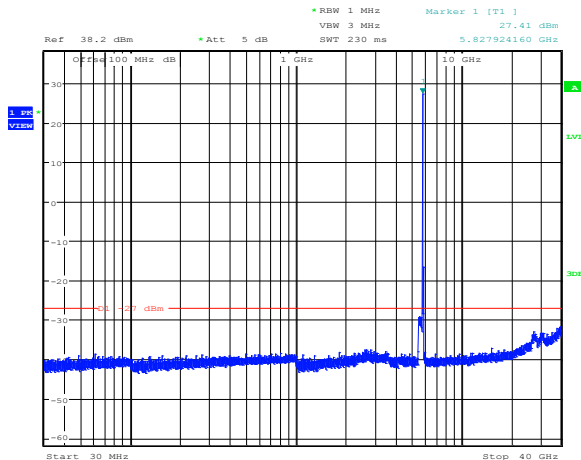
Date: 9.JUN.2014 15:12:09

Figure 8.6-14: Peak spurious emissions outside restricted bands at IC high channel, 802.11n HT20, ch1



Date: 9.JUN.2014 15:15:51

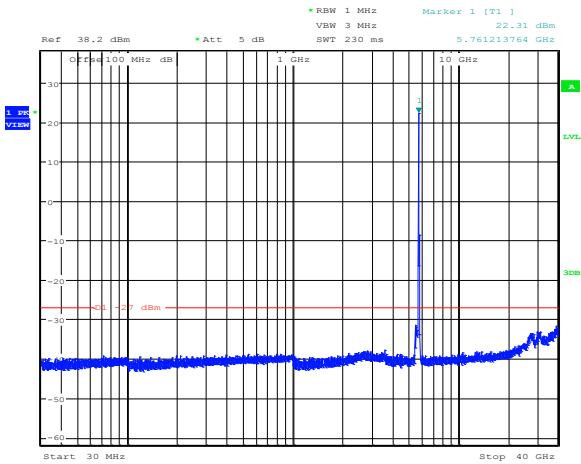
Figure 8.6-15: Peak spurious emissions outside restricted bands at FCC high channel, 802.11n HT20, cho



Date: 9.JUN.2014 15:12:39

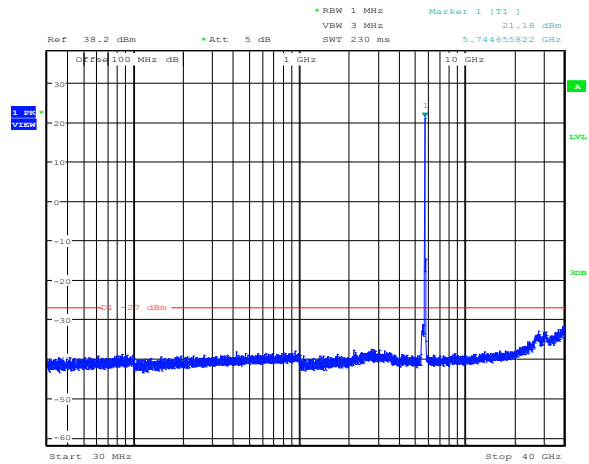
Figure 8.6-16: Peak spurious emissions outside restricted bands at FCC high channel, 802.11n HT20, ch1

8.6.4 Test data, continued



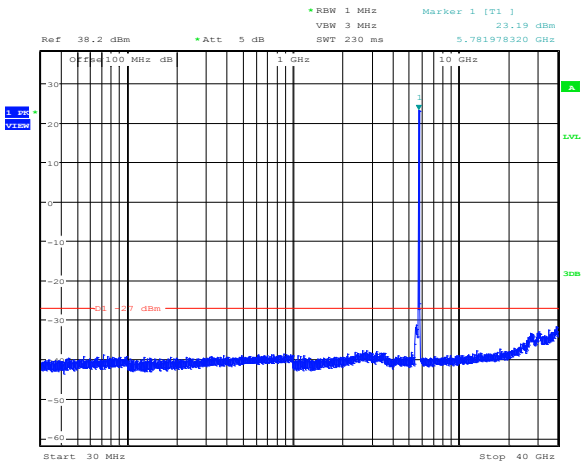
Date: 9.JUN.2014 15:06:43

Figure 8.6-17: Peak spurious emissions outside restricted bands at low channel, 802.11n HT40, cho



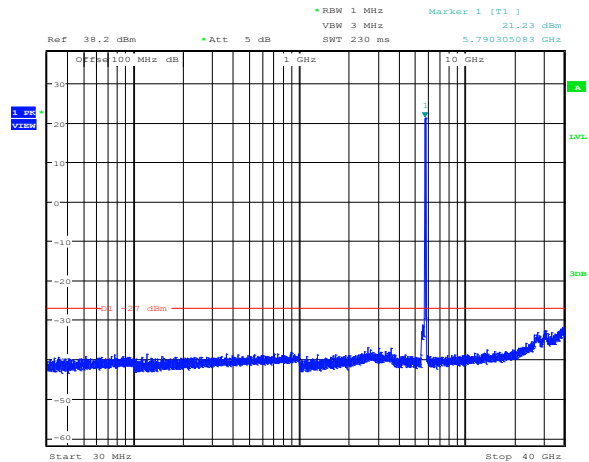
Date: 9.JUN.2014 15:04:44

Figure 8.6-18: Peak spurious emissions outside restricted bands at low channel, 802.11n HT40, ch1



Date: 9.JUN.2014 15:06:15

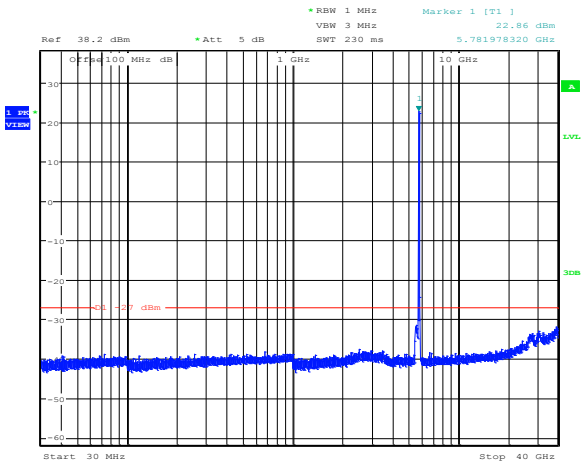
Figure 8.6-19: Peak spurious emissions outside restricted bands at FCC mid channel, 802.11n HT40, cho



Date: 9.JUN.2014 15:05:42

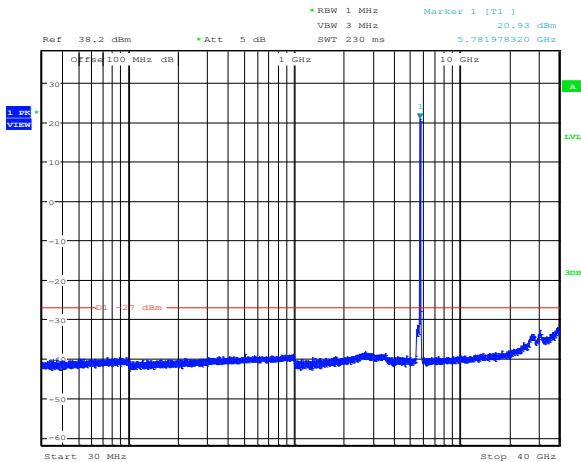
Figure 8.6-20: Peak spurious emissions outside restricted bands at FCC mid channel, 802.11n HT40, ch1

8.6.4 Test data, continued



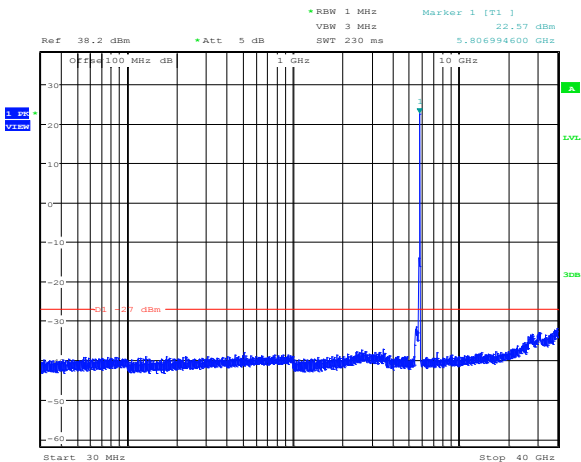
Date: 9.JUN.2014 15:07:14

Figure 8.6-21: Peak spurious emissions outside restricted bands at IC high channel, 802.11n HT40, cho



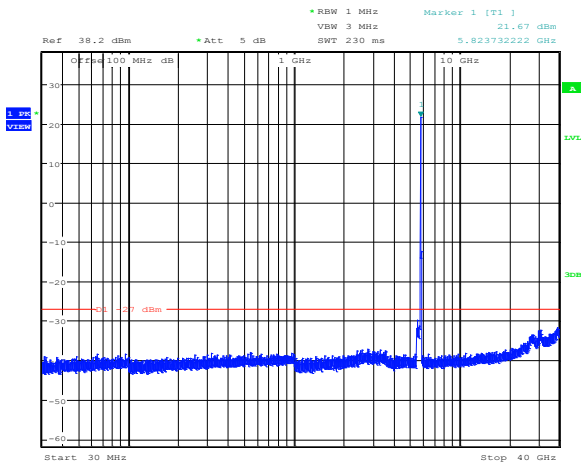
Date: 9.JUN.2014 15:03:50

Figure 8.6-22: Peak spurious emissions outside restricted bands at IC high channel, 802.11n HT40, ch1



Date: 9.JUN.2014 15:07:38

Figure 8.6-23: Peak spurious emissions outside restricted bands at FCC high channel, 802.11n HT40, cho



Date: 9.JUN.2014 15:08:01

Figure 8.6-24: Peak spurious emissions outside restricted bands at FCC high channel, 802.11n HT40, ch1

8.6.4 Test data, continued

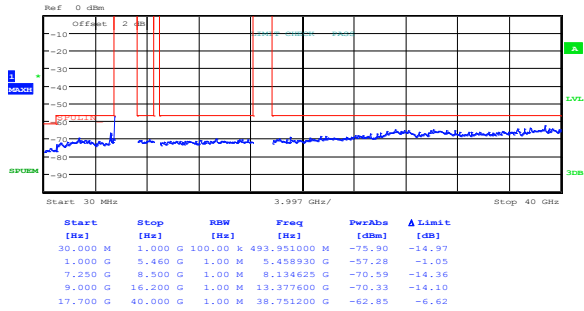


Figure 8.6-25: Peak spurious emissions within restricted bands at low channel, 802.11a, cho

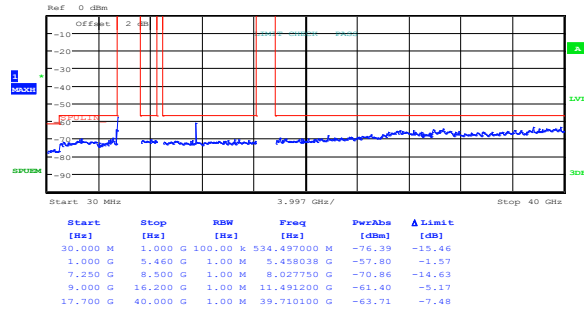


Figure 8.6-26: Peak spurious emissions within restricted bands at low channel, 802.11a, ch1

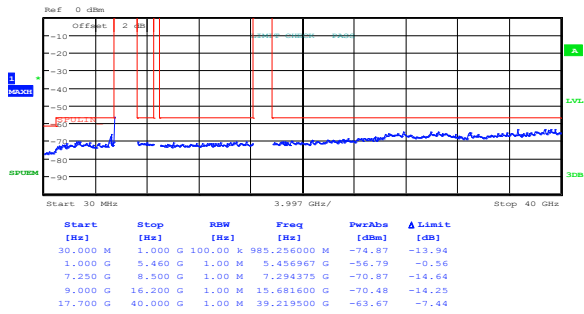


Figure 8.6-27: Peak spurious emissions within restricted bands at mid channel, 802.11a, cho

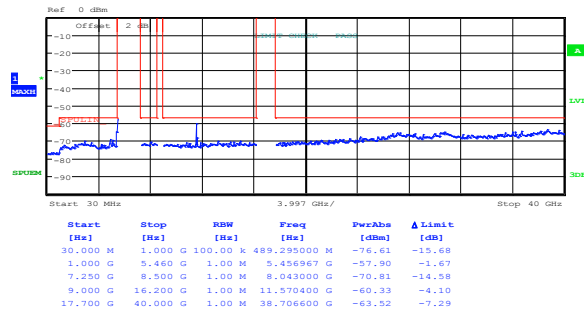


Figure 8.6-28: Peak spurious emissions within restricted bands at mid channel, 802.11a, ch1

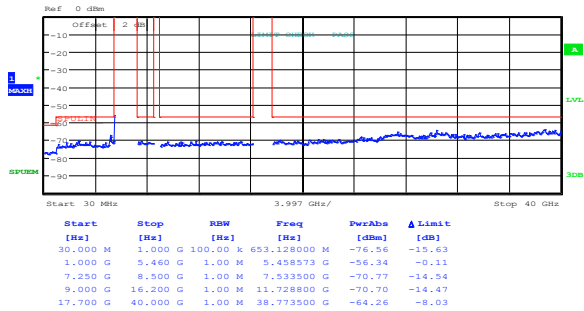


Figure 8.6-29: Peak spurious emissions within restricted bands at IC high channel, 802.11a, cho

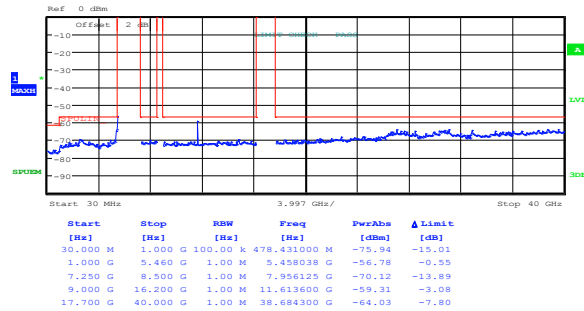


Figure 8.6-30: Peak spurious emissions within restricted bands at IC high channel, 802.11a, ch1

8.6.4 Test data, continued

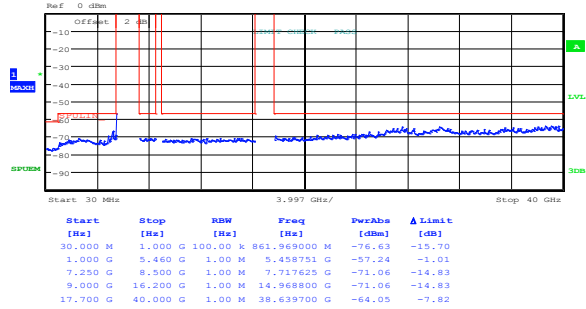


Figure 8.6-31: Peak spurious emissions within restricted bands at FCC high channel, 802.11a, cho

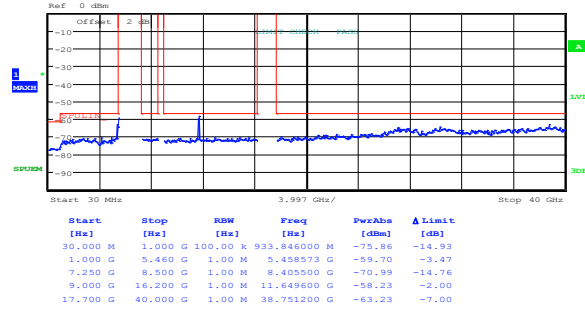


Figure 8.6-32: Peak spurious emissions within restricted bands at FCC high channel, 802.11a, ch1

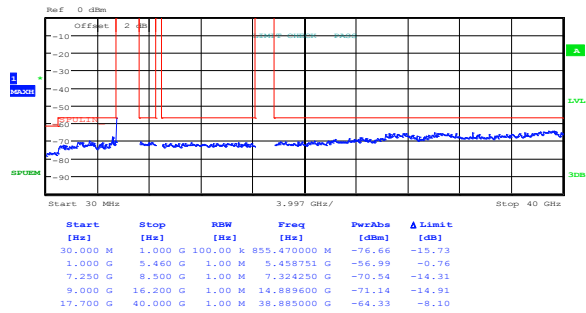


Figure 8.6-33: Peak spurious emissions within restricted bands at low channel, 802.11n HT20, cho

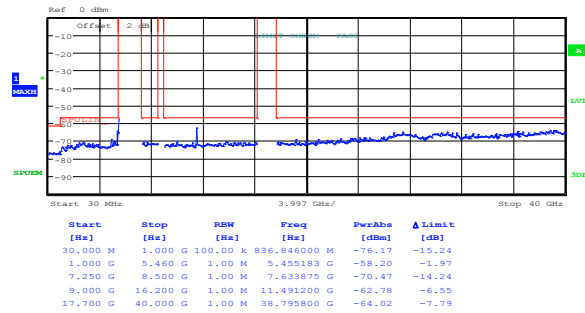


Figure 8.6-34: Peak spurious emissions within restricted bands at low channel, 802.11n HT20, ch1

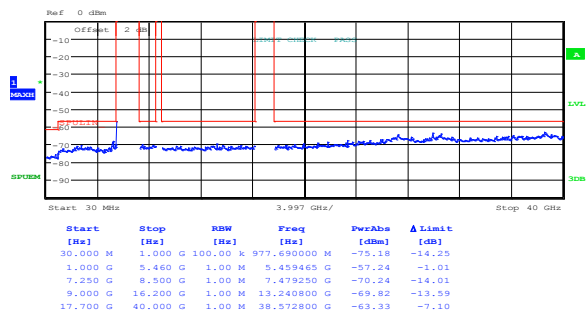


Figure 8.6-35: Peak spurious emissions within restricted bands at mid channel, 802.11n HT20, cho

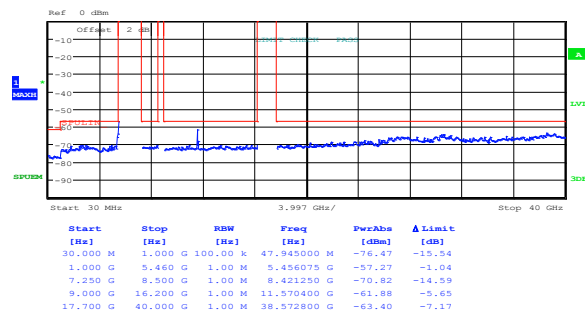


Figure 8.6-36: Peak spurious emissions within restricted bands at mid channel, 802.11n HT20, ch1

8.6.4 Test data, continued

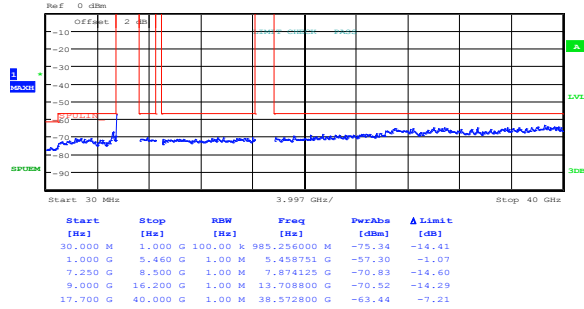


Figure 8.6-37: Peak spurious emissions within restricted bands at IC high channel, 802.11n HT20, cho

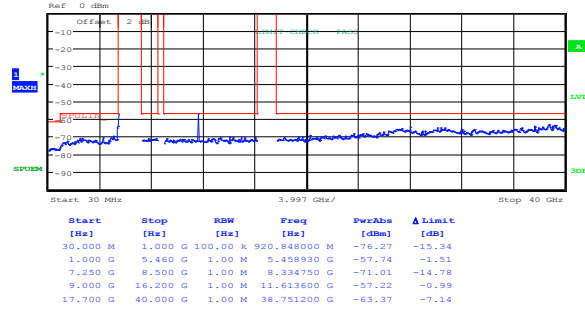


Figure 8.6-38: Peak spurious emissions within restricted bands at IC high channel, 802.11n HT20, ch1

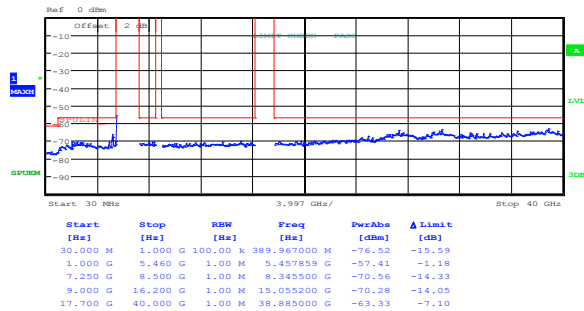


Figure 8.6-39: Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT20, cho

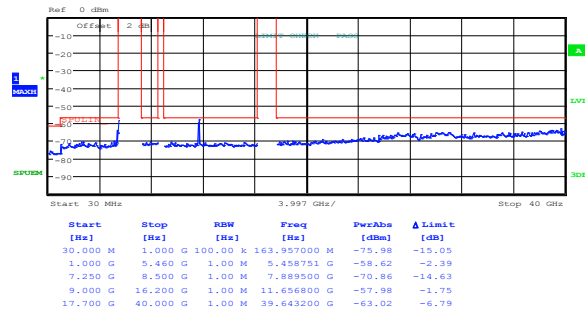


Figure 8.6-40: Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT20, ch1

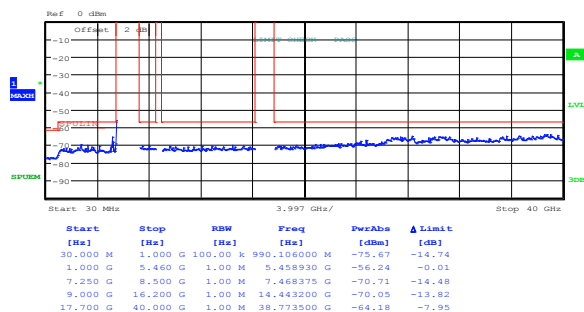


Figure 8.6-41: Peak spurious emissions within restricted bands at low channel, 802.11n HT40, cho

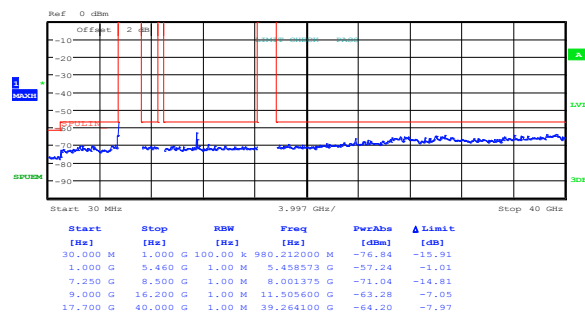


Figure 8.6-42: Peak spurious emissions within restricted bands at low channel, 802.11n HT40, ch1

8.6.4 Test data, continued

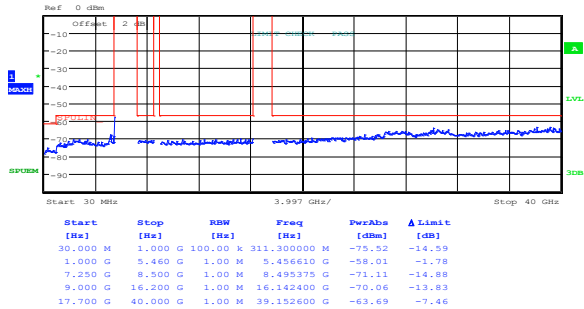


Figure 8.6-43: Peak spurious emissions within restricted bands at FCC mid channel, 802.11n HT40, cho

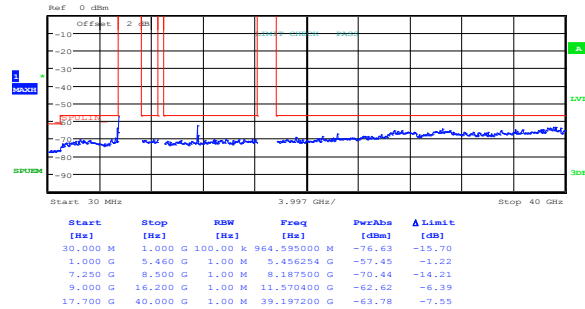


Figure 8.6-44: Peak spurious emissions within restricted bands at FCC mid channel, 802.11n HT40, ch1

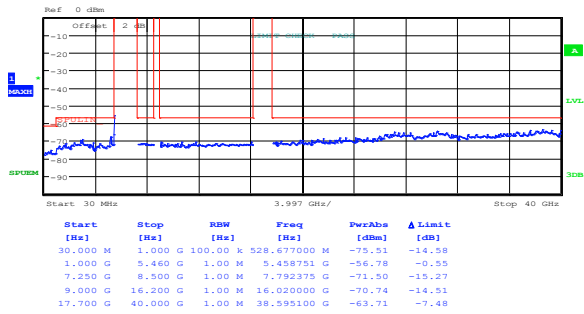


Figure 8.6-45: Peak spurious emissions within restricted bands at IC high channel, 802.11n HT40, cho

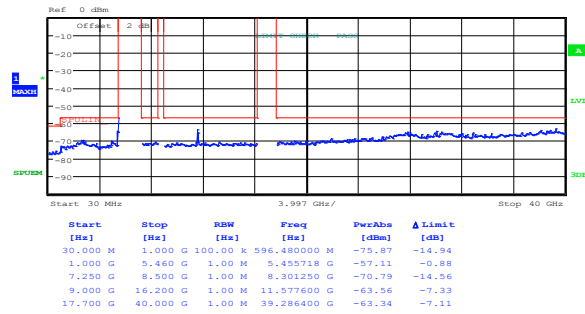


Figure 8.6-46: Peak spurious emissions within restricted bands at IC high channel, 802.11n HT40, ch1

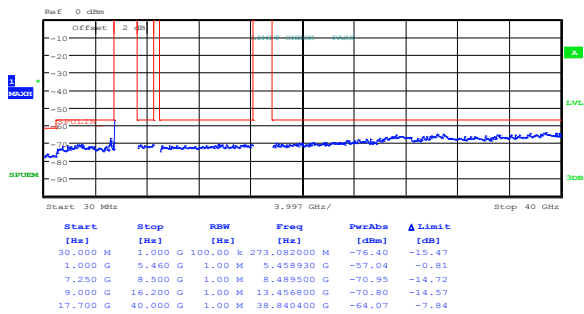


Figure 8.6-47: Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT40, cho

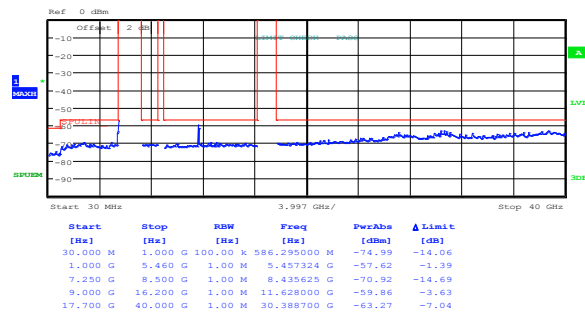


Figure 8.6-48: Peak spurious emissions within restricted bands at FCC high channel, 802.11n HT40, ch1

8.6.5 Test data, continued

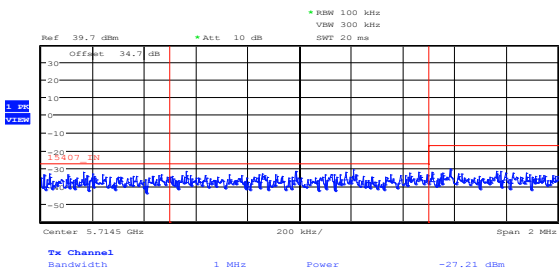


Figure 8.6-49: Lower band edge emission at 5.715 GHz, 802.11a, 6.7 dBi antenna, cho

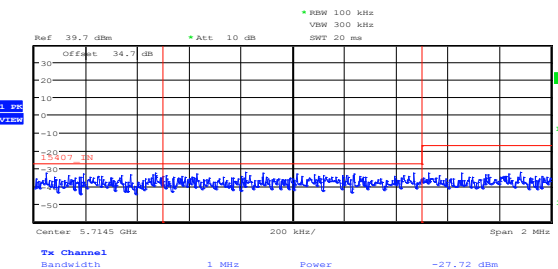


Figure 8.6-50: Lower band edge emission at 5.715 GHz, 802.11a, 6.7 dBi antenna, ch1

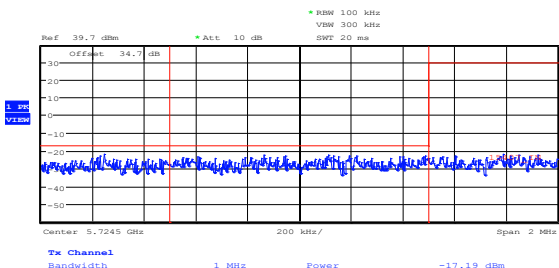


Figure 8.6-51: Lower band edge emission at 5.725 GHz, 802.11a, 6.7 dBi antenna, cho

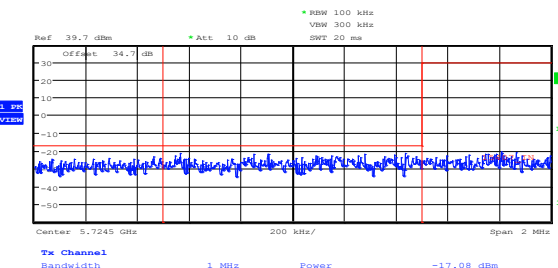


Figure 8.6-52: Lower band edge emission at 5.725 GHz, 802.11a, 6.7 dBi antenna, ch1

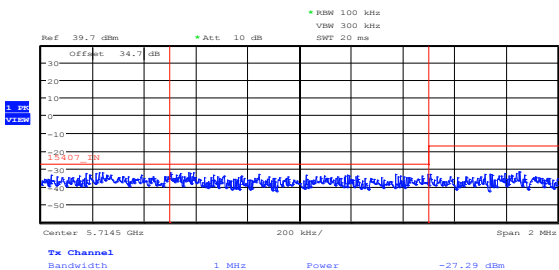


Figure 8.6-53: Lower band edge emission at 5.715 GHz, 802.11n HT20, 6.7 dBi antenna, cho

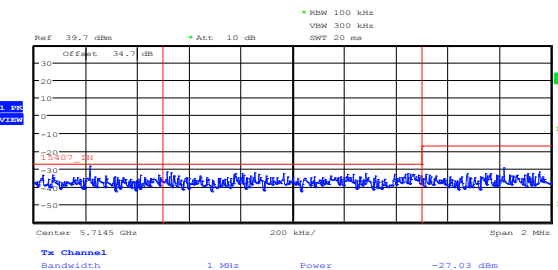


Figure 8.6-54: Lower band edge emission at 5.715 GHz, 802.11n HT20, 6.7 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

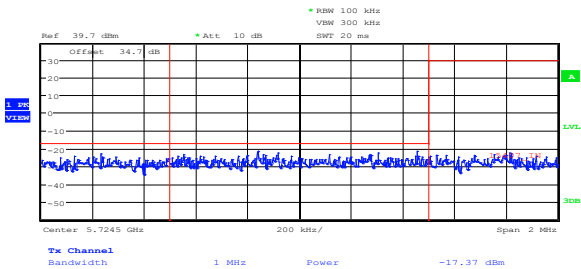


Figure 8.6-55: Lower band edge emission at 5.725 GHz, 802.11n HT20, 6.7 dBi antenna, cho

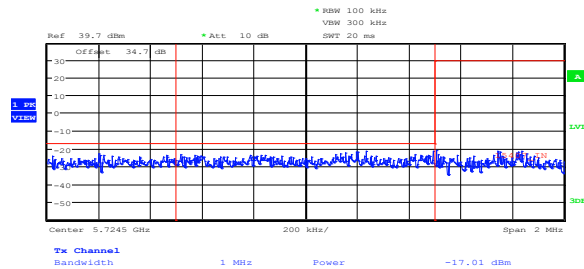


Figure 8.6-56: Lower band edge emission at 5.725 GHz, 802.11n HT20, 6.7 dBi antenna, ch1

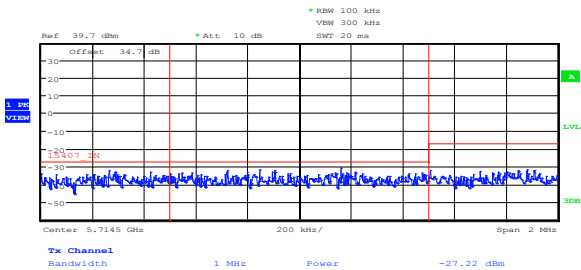


Figure 8.6-57: Lower band edge emission at 5.715 GHz, 802.11n HT40, 6.7 dBi antenna, cho

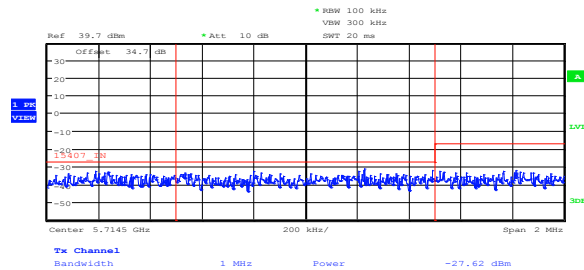


Figure 8.6-58: Lower band edge emission at 5.715 GHz, 802.11n HT40, 6.7 dBi antenna, ch1

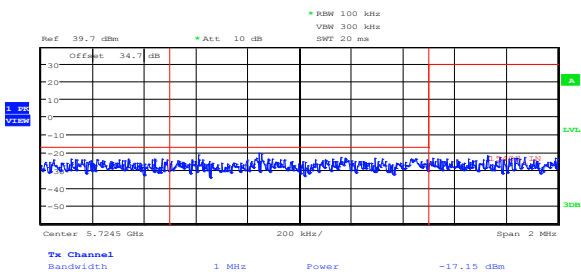


Figure 8.6-59: Lower band edge emission at 5.725 GHz, 802.11n HT40, 6.7 dBi antenna, cho

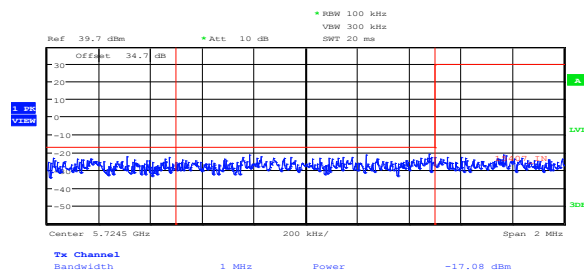


Figure 8.6-60: Lower band edge emission at 5.725 GHz, 802.11n HT40, 6.7 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

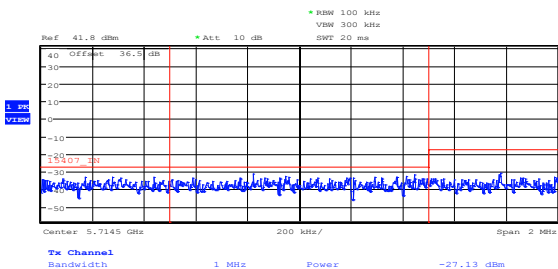


Figure 8.6-61: Lower band edge emission at 5.715 GHz, 802.11a, 11.5 dBi antenna, cho

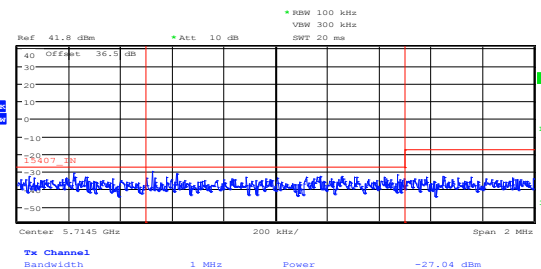


Figure 8.6-62: Lower band edge emission at 5.715 GHz, 802.11a, 11.5 dBi antenna, ch1

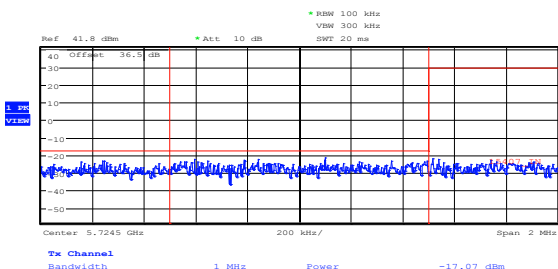


Figure 8.6-63: Lower band edge emission at 5.725 GHz, 802.11a, 11.5 dBi antenna, cho

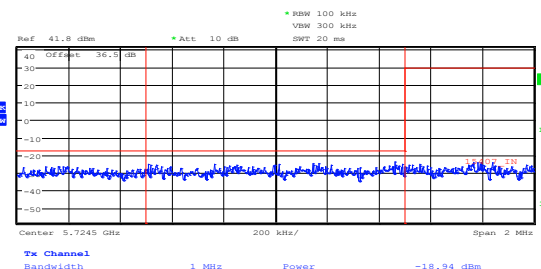


Figure 8.6-64: Lower band edge emission at 5.725 GHz, 802.11a, 11.5 dBi antenna, ch1

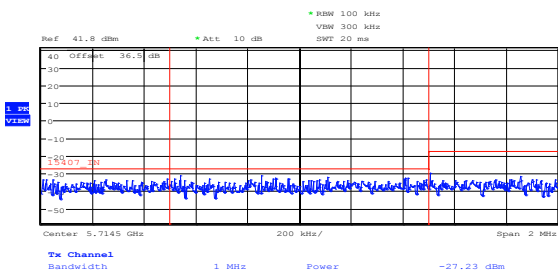


Figure 8.6-65: Lower band edge emission at 5.715 GHz, 802.11n HT20, 11.5 dBi antenna, cho

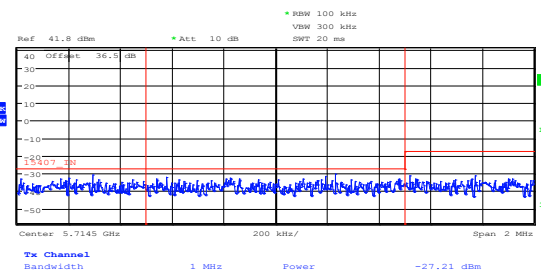


Figure 8.6-66: Lower band edge emission at 5.715 GHz, 802.11n HT20, 11.5 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

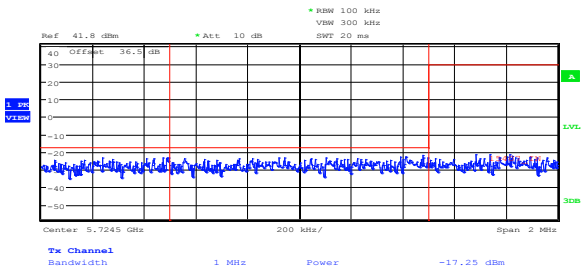


Figure 8.6-67: Lower band edge emission at 5.725 GHz, 802.11n HT20, 11.5 dBi antenna, cho

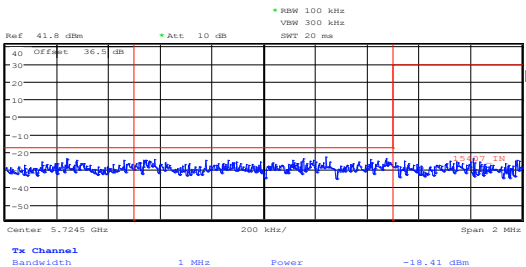


Figure 8.6-68: Lower band edge emission at 5.725 GHz, 802.11n HT20, 11.5 dBi antenna, ch1

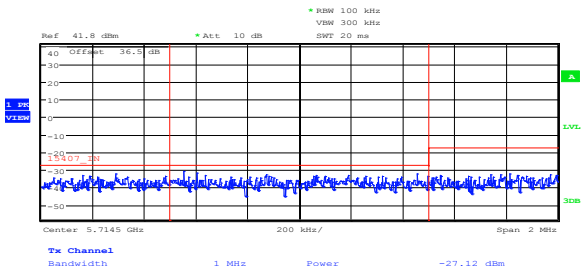


Figure 8.6-69: Lower band edge emission at 5.715 GHz, 802.11n HT40, 11.5 dBi antenna, cho

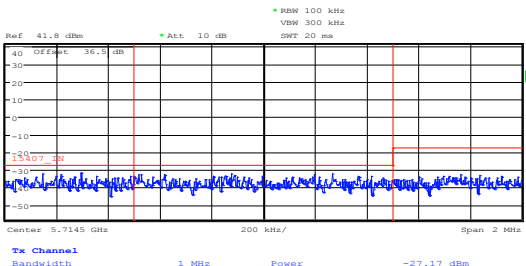


Figure 8.6-70: Lower band edge emission at 5.715 GHz, 802.11n HT40, 11.5 dBi antenna, ch1

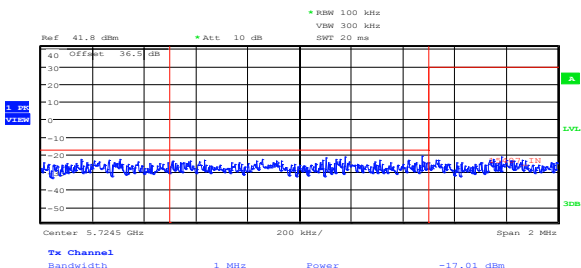


Figure 8.6-71: Lower band edge emission at 5.725 GHz, 802.11n HT40, 11.5 dBi antenna, cho

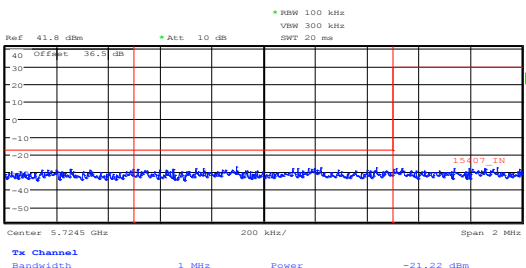


Figure 8.6-72: Lower band edge emission at 5.725 GHz, 802.11n HT40, 11.5 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

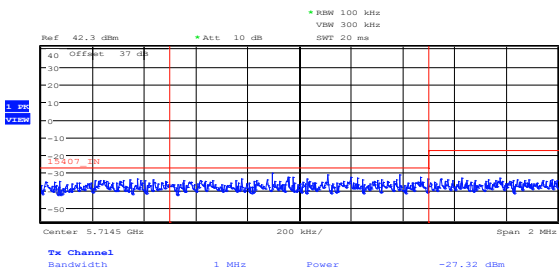


Figure 8.6-73: Lower band edge emission at 5.715 GHz, 802.11a, 12 dBi antenna, cho

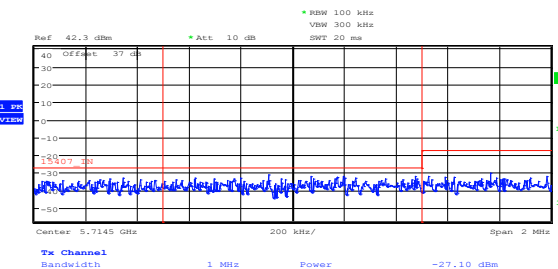


Figure 8.6-74: Lower band edge emission at 5.715 GHz, 802.11a, 12 dBi antenna, ch1

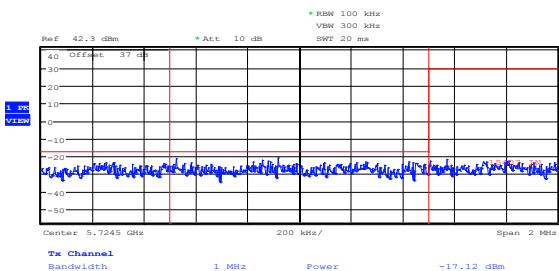


Figure 8.6-75: Lower band edge emission at 5.725 GHz, 802.11a, 12 dBi antenna, cho

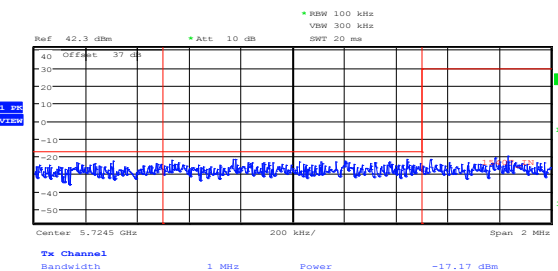


Figure 8.6-76: Lower band edge emission at 5.725 GHz, 802.11a, 12 dBi antenna, ch1

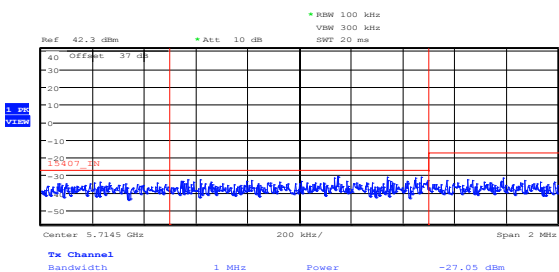


Figure 8.6-77: Lower band edge emission at 5.715 GHz, 802.11n HT20, 12 dBi antenna, cho

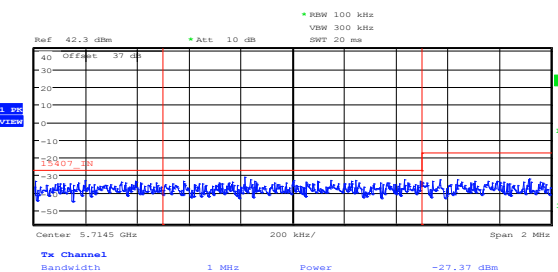


Figure 8.6-78: Lower band edge emission at 5.715 GHz, 802.11n HT20, 12 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

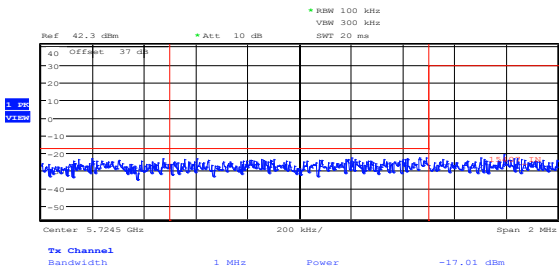


Figure 8.6-79: Lower band edge emission at 5.725 GHz, 802.11n HT20, 12 dBi antenna, cho

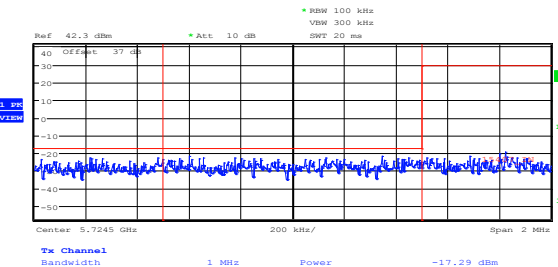


Figure 8.6-80: Lower band edge emission at 5.725 GHz, 802.11n HT20, 12 dBi antenna, ch1

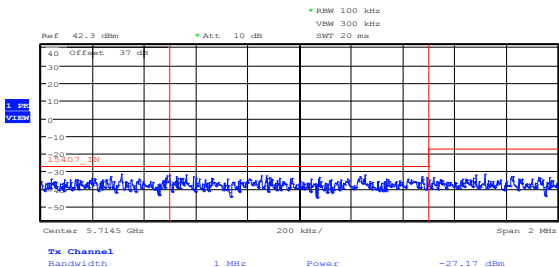


Figure 8.6-81: Lower band edge emission at 5.715 GHz, 802.11n HT40, 12 dBi antenna, cho

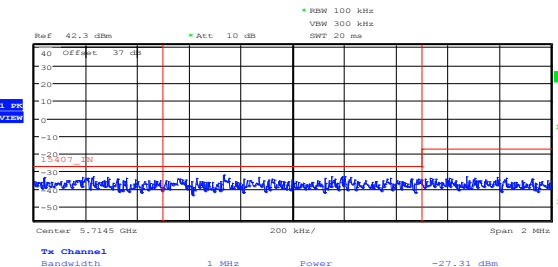


Figure 8.6-82: Lower band edge emission at 5.715 GHz, 802.11n HT40, 12 dBi antenna, ch1

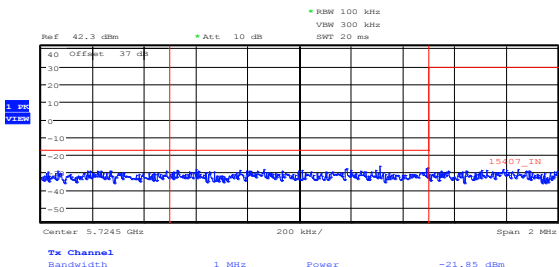


Figure 8.6-83: Lower band edge emission at 5.725 GHz, 802.11n HT40, 12 dBi antenna, cho

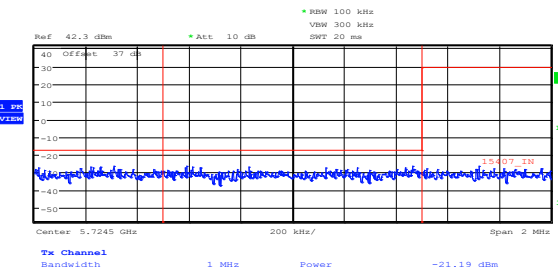


Figure 8.6-84: Lower band edge emission at 5.725 GHz, 802.11n HT40, 12 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

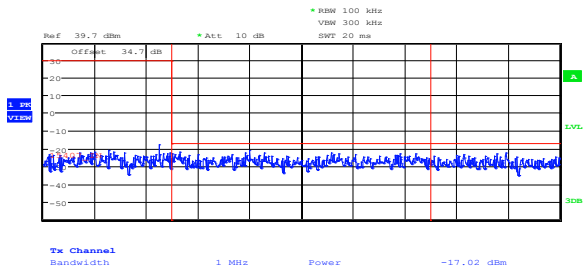


Figure 8.6-85: Upper FCC band edge emission at 5.85 GHz, 802.11a, 6.7 dBi antenna, cho

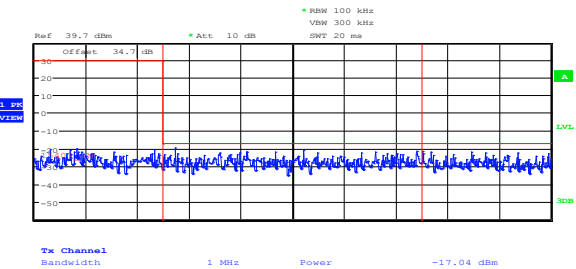


Figure 8.6-86: Upper FCC band edge emission at 5.85 GHz, 802.11a, 6.7 dBi antenna, ch1

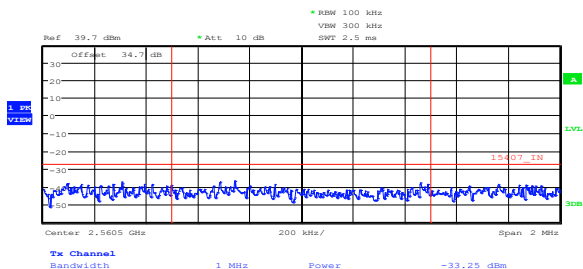


Figure 8.6-87: Upper FCC band edge emission at 5.86 GHz, 802.11a, 6.7 dBi antenna, cho

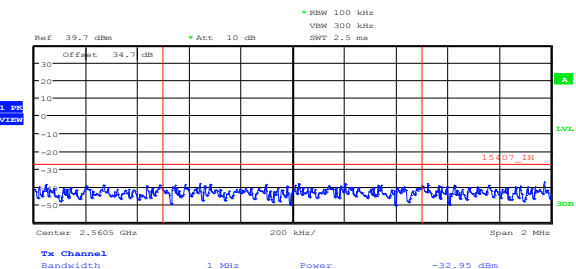


Figure 8.6-88: Upper FCC band edge emission at 5.86 GHz, 802.11a, 6.7 dBi antenna, ch1

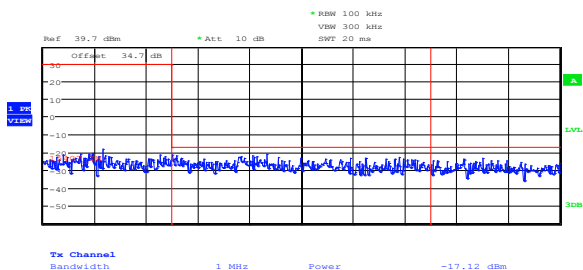


Figure 8.6-89: Upper FCC band edge emission at 5.85 GHz, 802.11n HT20, 6.7 dBi antenna, cho

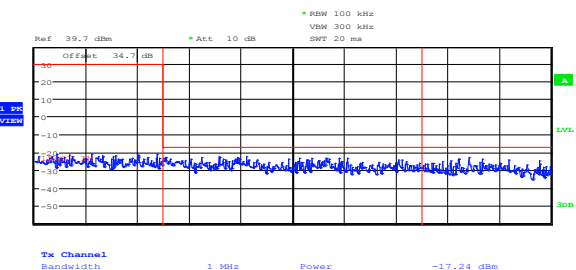


Figure 8.6-90: Upper FCC band edge emission at 5.85 GHz, 802.11n HT20, 6.7 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

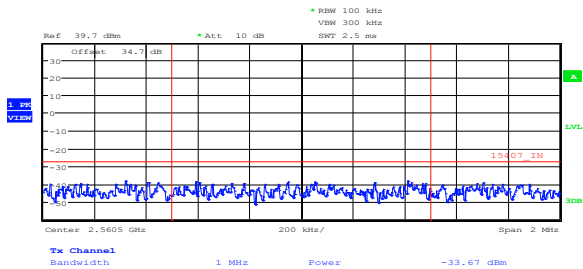


Figure 8.6-91: Upper FCC band edge emission at 5.86 GHz, 802.11n HT20, 6.7 dBi antenna, cho

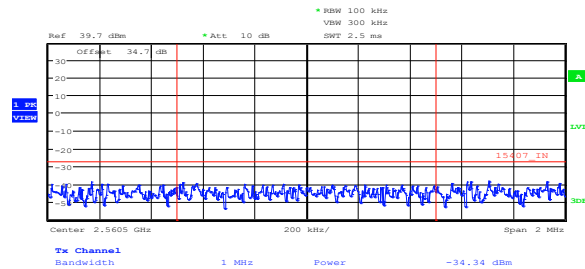


Figure 8.6-92: Upper FCC band edge emission at 5.86 GHz, 802.11n HT20, 6.7 dBi antenna, ch1

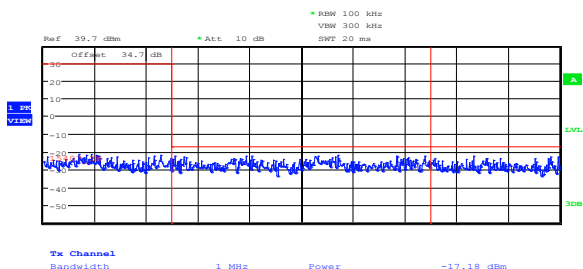


Figure 8.6-93: Upper FCC band edge emission at 5.85 GHz, 802.11n HT40, 6.7 dBi antenna, cho

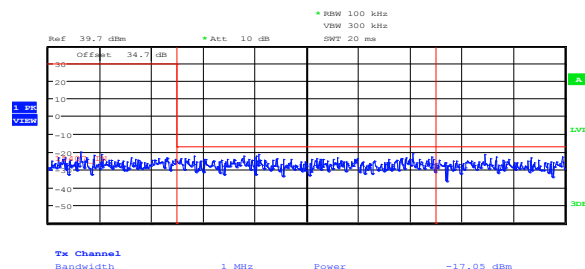


Figure 8.6-94: Upper FCC band edge emission at 5.85 GHz, 802.11n HT40, 6.7 dBi antenna, ch1

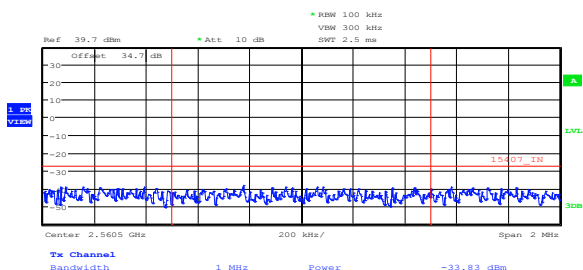


Figure 8.6-95: Upper FCC band edge emission at 5.86 GHz, 802.11n HT40, 6.7 dBi antenna, cho

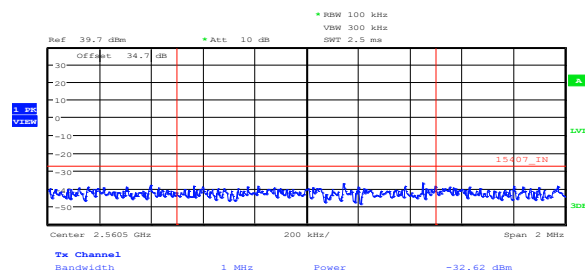


Figure 8.6-96: Upper FCC band edge emission at 5.86 GHz, 802.11n HT40, 6.7 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

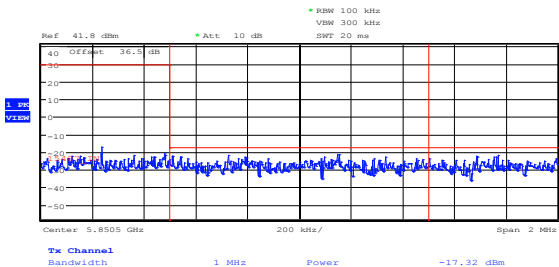


Figure 8.6-97: Upper FCC band edge emission at 5.85 GHz, 802.11a, 11.5 dBi antenna, cho

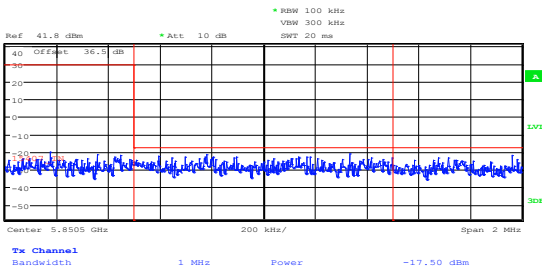


Figure 8.6-98: Upper FCC band edge emission at 5.85 GHz GHz, 802.11a, 11.5 dBi antenna, ch1

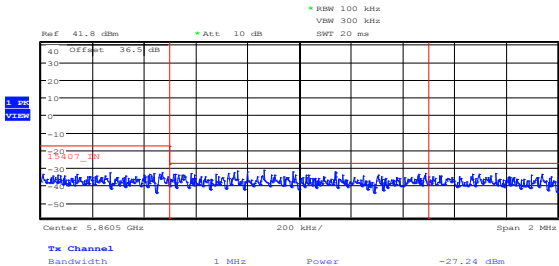


Figure 8.6-99: Upper FCC band edge emission at 5.86 GHz, 802.11a, 11.5 dBi antenna, cho

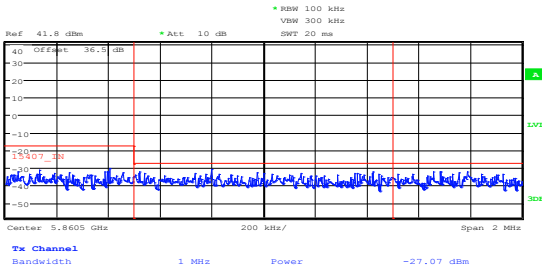


Figure 8.6-100: Upper FCC band edge emission at 5.86 GHz, 802.11a, 11.5 dBi antenna, ch1

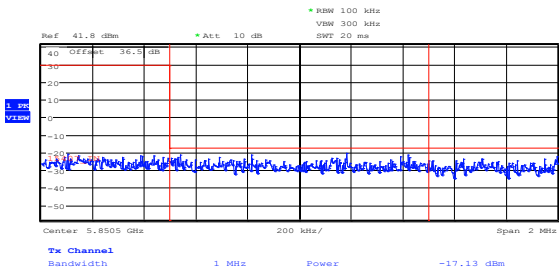


Figure 8.6-101: Upper FCC band edge emission at 5.85 GHz, 802.11n HT20, 11.5 dBi antenna, cho

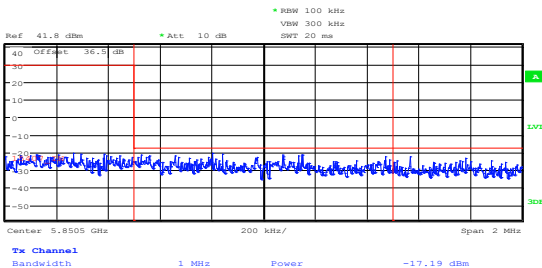


Figure 8.6-102: Upper FCC band edge emission at 5.85 GHz, 802.11n HT20, 11.5 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

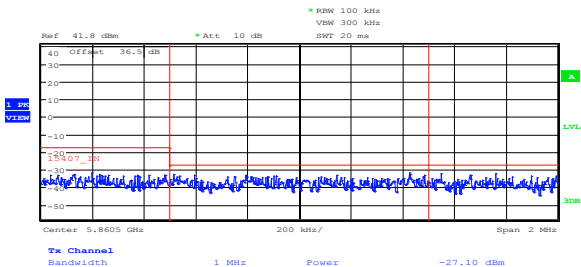


Figure 8.6-103: Upper FCC band edge emission at 5.86 GHz, 802.11n HT20, 11.5 dBi antenna, cho

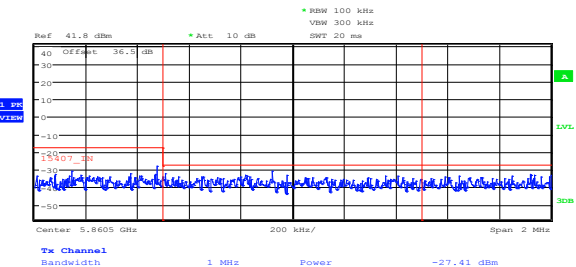


Figure 8.6-104: Upper FCC band edge emission at 5.86 GHz, 802.11n HT20, 11.5 dBi antenna, ch1

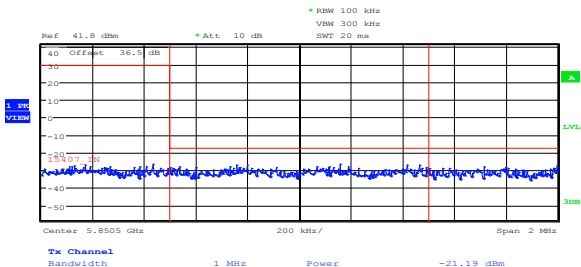


Figure 8.6-105: Upper FCC band edge emission at 5.85 GHz, 802.11n HT40, 11.5 dBi antenna, cho

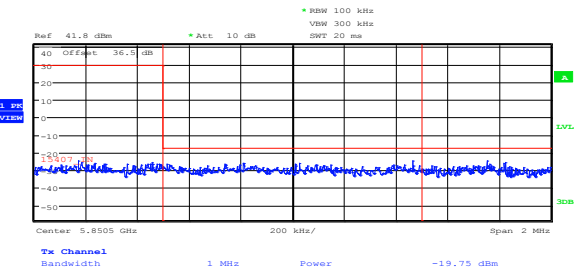


Figure 8.6-106: Upper FCC band edge emission at 5.85 GHz, 802.11n HT40, 11.5 dBi antenna, ch1

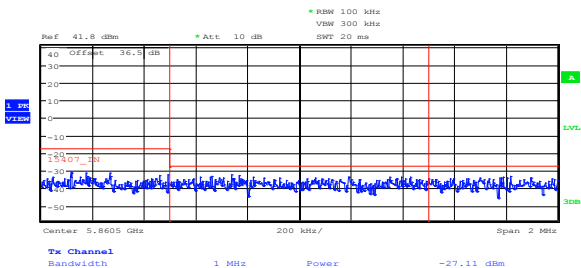


Figure 8.6-107: Upper FCC band edge emission at 5.86 GHz, 802.11n HT40, 11.5 dBi antenna, cho

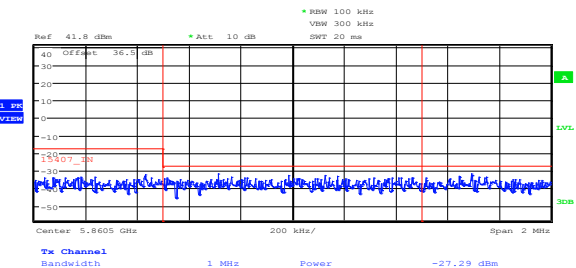


Figure 8.6-108: Upper FCC band edge emission at 5.86 GHz, 802.11n HT40, 11.5 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

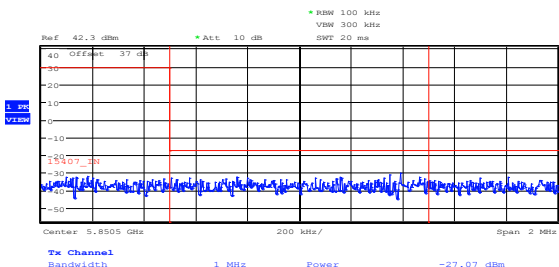


Figure 8.6-109: Upper FCC band edge emission at 5.85 GHz, 802.11a, 12 dBi antenna, cho

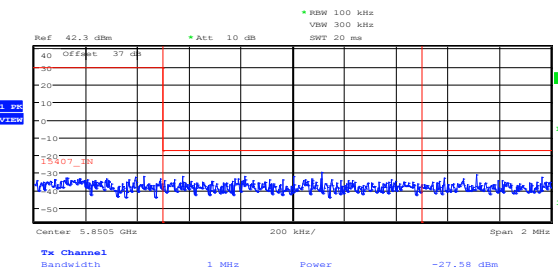


Figure 8.6-110: Upper FCC band edge emission at 5.85 GHz, 802.11a, 12 dBi antenna, ch1

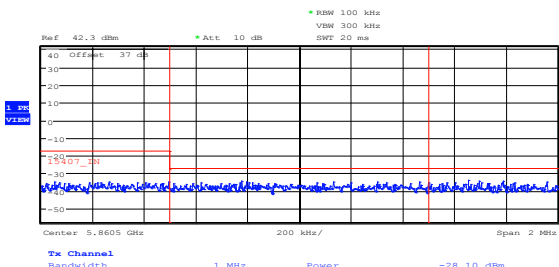


Figure 8.6-111: Upper FCC band edge emission at 5.86 GHz, 802.11a, 12 dBi antenna, cho

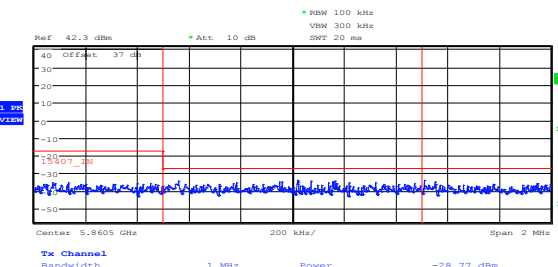


Figure 8.6-112: Upper FCC band edge emission at 5.86 GHz, 802.11a, 12 dBi antenna, ch1

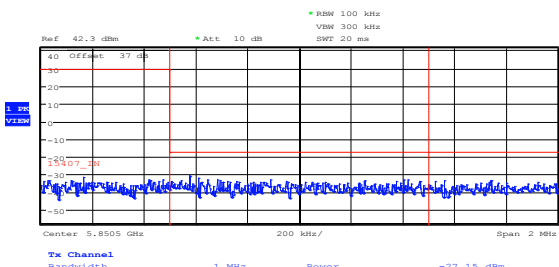


Figure 8.6-113: Upper FCC band edge emission at 5.85 GHz, 802.11n HT20, 12 dBi antenna, cho

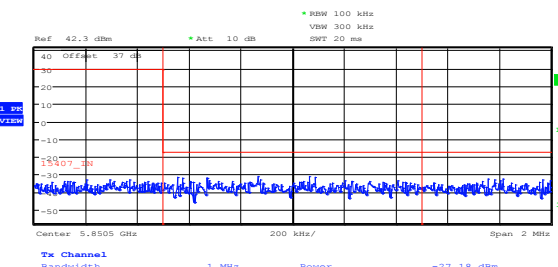


Figure 8.6-114: Upper FCC band edge emission at 5.85 GHz, 802.11n HT20, 12 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

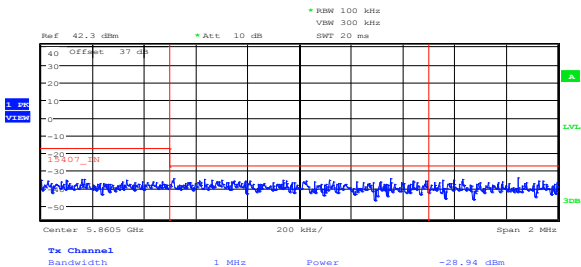


Figure 8.6-115: Upper FCC band edge emission at 5.86 GHz, 802.11n HT20, 12 dBi antenna, cho

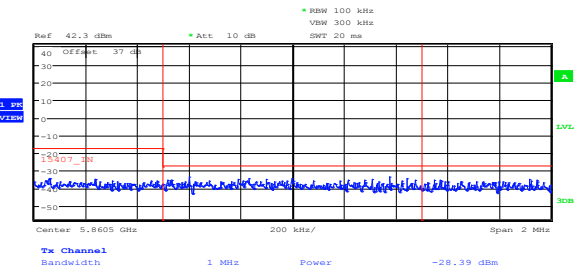


Figure 8.6-116: Upper FCC band edge emission at 5.86 GHz, 802.11n HT20, 12 dBi antenna, ch1

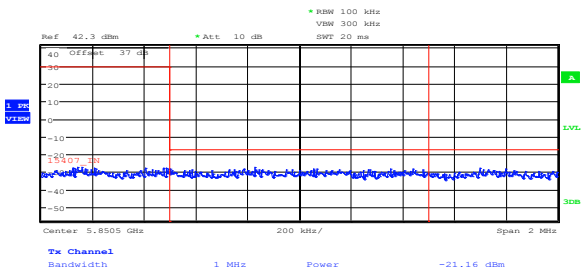


Figure 8.6-117: Upper FCC band edge emission at 5.85 GHz, 802.11n HT40, 12 dBi antenna, cho

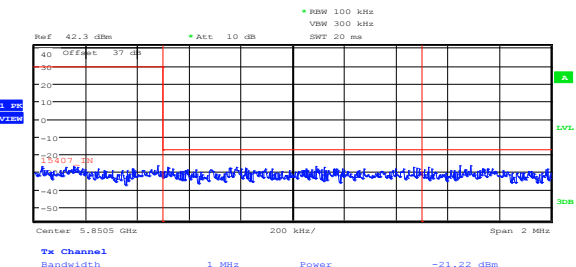


Figure 8.6-118: Upper FCC band edge emission at 5.85 GHz, 802.11n HT40, 12 dBi antenna, ch1

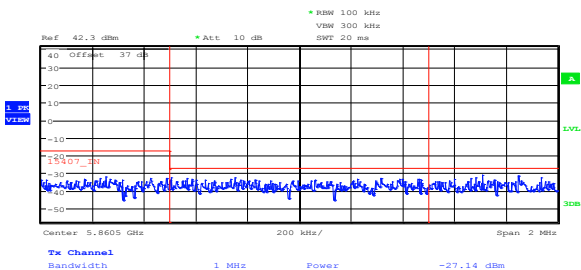


Figure 8.6-119: Upper FCC band edge emission at 5.86 GHz, 802.11n HT40, 12 dBi antenna, cho

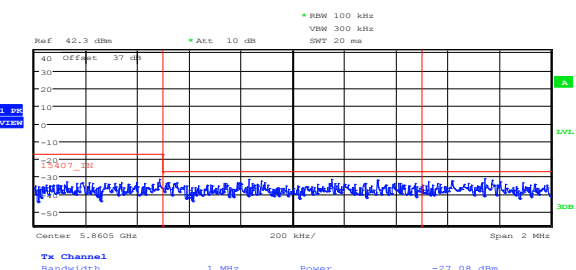


Figure 8.6-120: Upper FCC band edge emission at 5.86 GHz, 802.11n HT40, 12 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

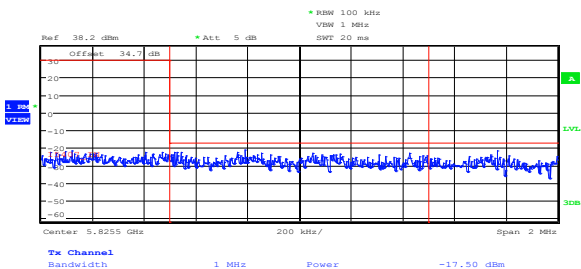


Figure 8.6-121: Upper IC band edge emission at 5.825 GHz, 802.11a, 6.7 dBi antenna, cho

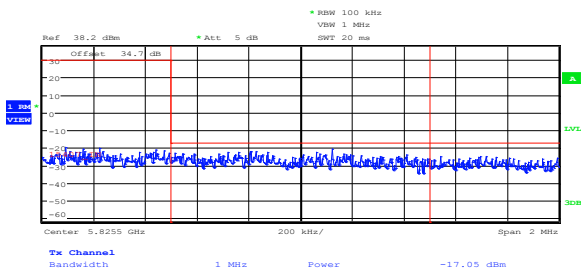


Figure 8.6-122: Upper IC band edge emission at 5.825 GHz, 802.11a, 6.7 dBi antenna, ch1

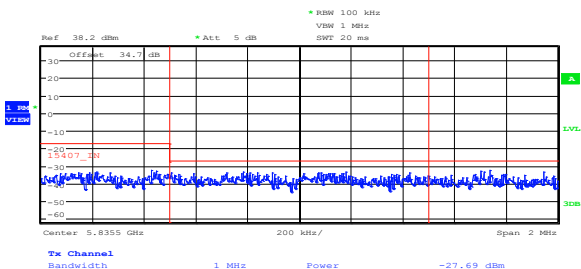


Figure 8.6-123: Upper IC band edge emission at 5.835 GHz, 802.11a, 6.7 dBi antenna, cho

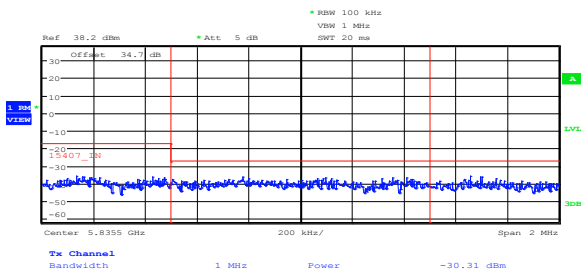


Figure 8.6-124: Upper IC band edge emission at 5.835 GHz, 802.11a, 6.7 dBi antenna, ch1

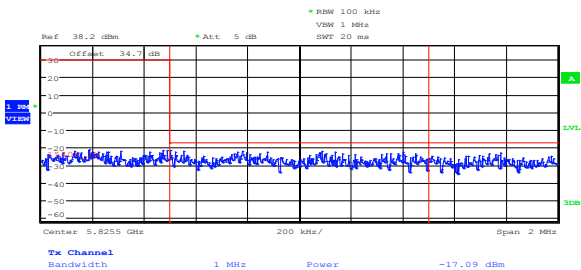


Figure 8.6-125: Upper IC band edge emission at 5.825 GHz, 802.11n HT20, 6.7 dBi antenna, cho

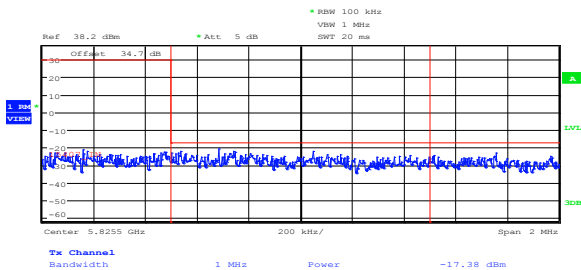


Figure 8.6-126: Upper IC band edge emission at 5.825 GHz, 802.11n HT20, 6.7 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

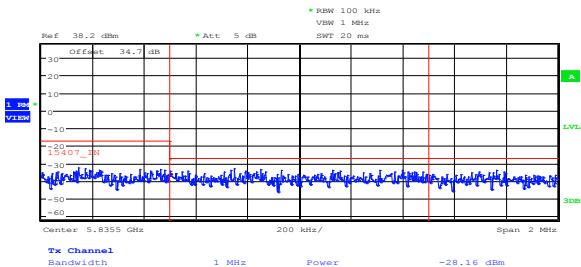


Figure 8.6-127: Upper IC band edge emission at 5.835 GHz, 802.11n HT20, 6.7 dBi antenna, cho

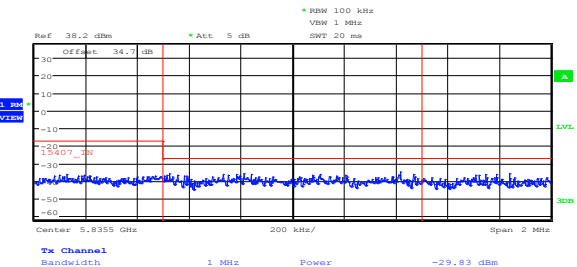


Figure 8.6-128: Upper IC band edge emission at 5.835 GHz, 802.11n HT20, 6.7 dBi antenna, ch1

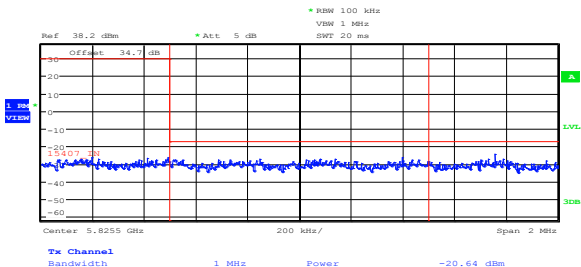


Figure 8.6-129: Upper IC band edge emission at 5.825 GHz, 802.11n HT40, 6.7 dBi antenna, cho

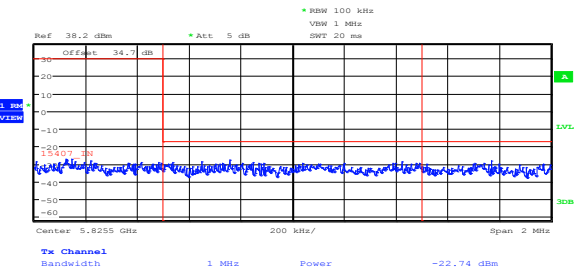


Figure 8.6-130: Upper IC band edge emission at 5.825 GHz, 802.11n HT40, 6.7 dBi antenna, ch1

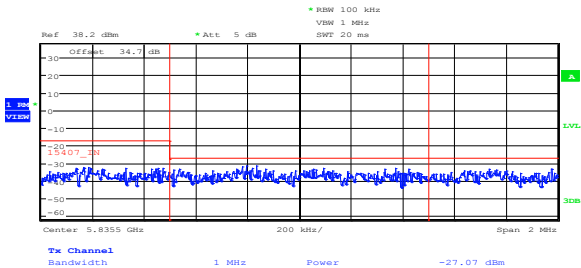


Figure 8.6-131: Upper IC band edge emission at 5.835 GHz, 802.11n HT40, 6.7 dBi antenna, cho

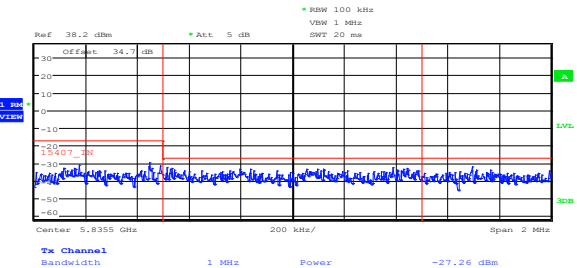


Figure 8.6-132: Upper IC band edge emission at 5.835 GHz, 802.11n HT40, 6.7 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

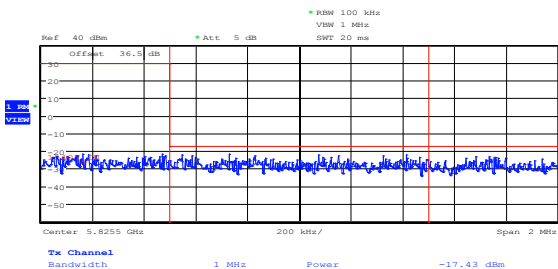


Figure 8.6-133: Upper IC band edge emission at 5.825 GHz, 802.11a, 11.5 dBi antenna, cho

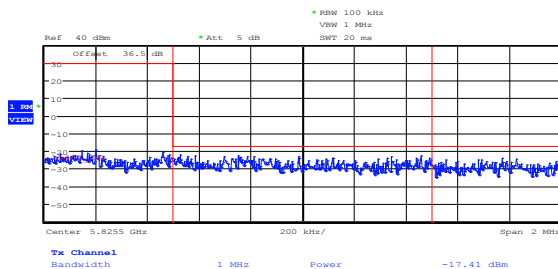


Figure 8.6-134: Upper IC band edge emission at 5.825 GHz, 802.11a, 11.5 dBi antenna, ch1

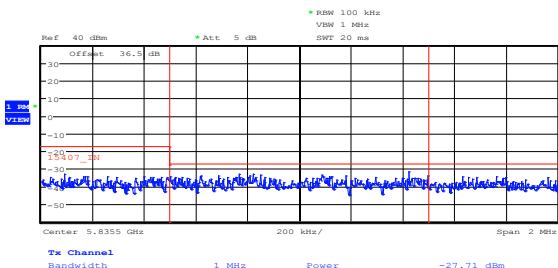


Figure 8.6-135: Upper IC band edge emission at 5.835 GHz, 802.11a, 11.5 dBi antenna, cho

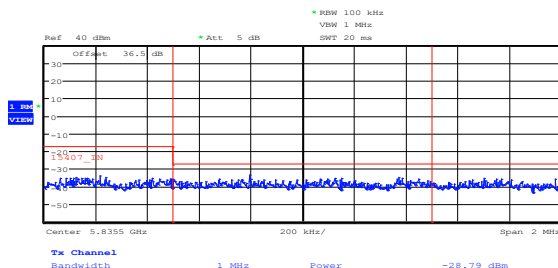


Figure 8.6-136: Upper IC band edge emission at 5.835 GHz, 802.11a, 11.5 dBi antenna, ch1

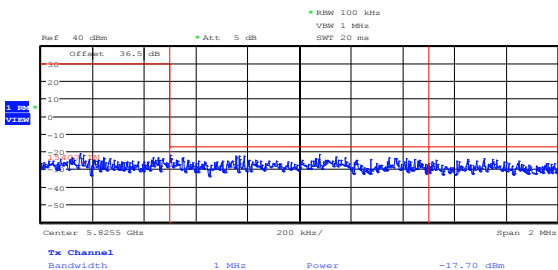


Figure 8.6-137: Upper IC band edge emission at 5.825 GHz, 802.11n HT20, 11.5 dBi antenna, cho

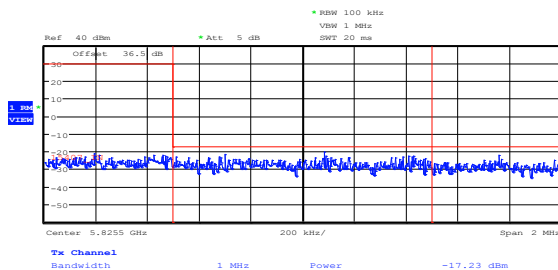


Figure 8.6-138: Upper IC band edge emission at 5.825 GHz, 802.11n HT20, 11.5 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

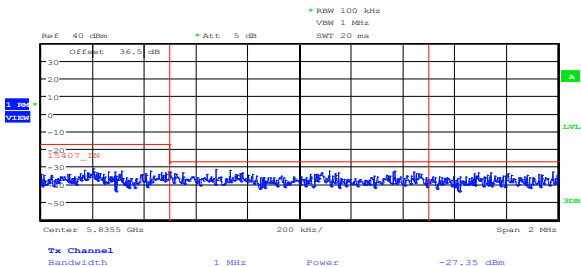


Figure 8.6-139: Upper IC band edge emission at 5.835 GHz, 802.11n HT20, 11.5 dBi antenna, cho

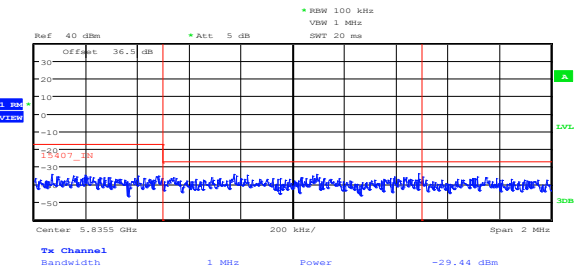


Figure 8.6-140: Upper IC band edge emission at 5.835 GHz, 802.11n HT20, 11.5 dBi antenna, ch1

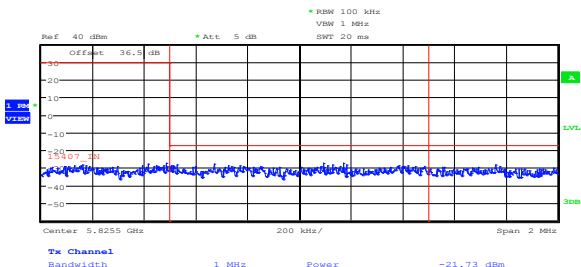


Figure 8.6-141: Upper IC band edge emission at 5.825 GHz, 802.11n HT40, 11.5 dBi antenna, cho

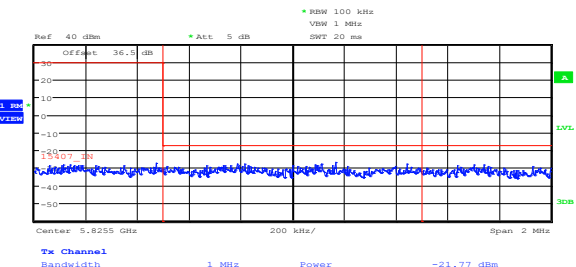


Figure 8.6-142: Upper IC band edge emission at 5.825 GHz, 802.11n HT40, 11.5 dBi antenna, ch1

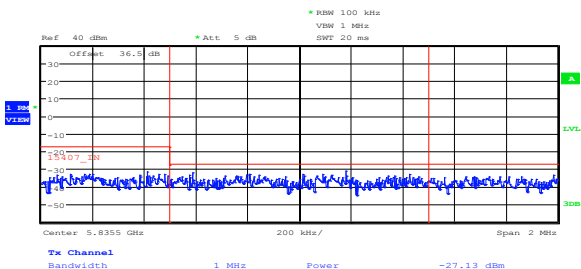


Figure 8.6-143: Upper IC band edge emission at 5.835 GHz, 802.11n HT40, 11.5 dBi antenna, cho

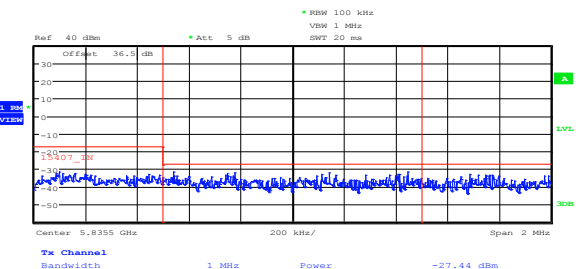


Figure 8.6-144: Upper IC band edge emission at 5.835 GHz, 802.11n HT40, 11.5 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

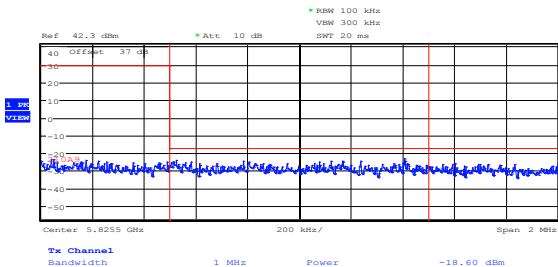


Figure 8.6-145: Upper IC band edge emission at 5.825 GHz, 802.11a, 12 dBi antenna, cho

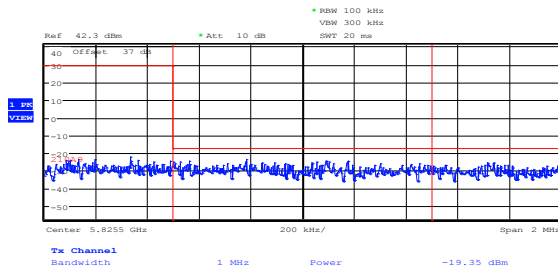


Figure 8.6-146: Upper IC band edge emission at 5.825 GHz, 802.11a, 12 dBi antenna, ch1

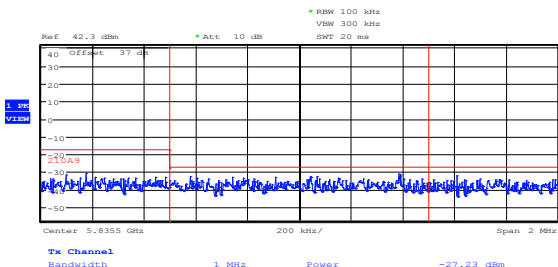


Figure 8.6-147: Upper IC band edge emission at 5.835 GHz, 802.11a, 12 dBi antenna, cho

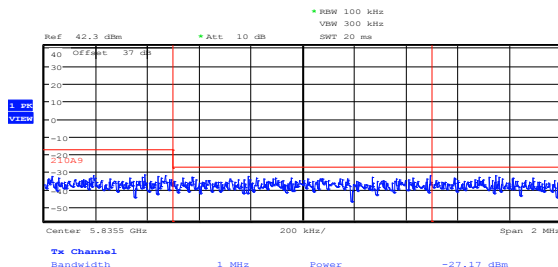


Figure 8.6-148: Upper IC band edge emission at 5.835 GHz, 802.11a, 12 dBi antenna, ch1

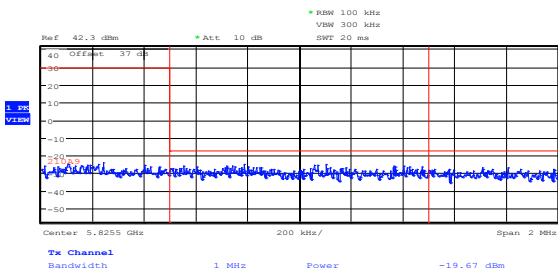


Figure 8.6-149: Upper IC band edge emission at 5.825 GHz, 802.11n HT20, 12 dBi antenna, cho

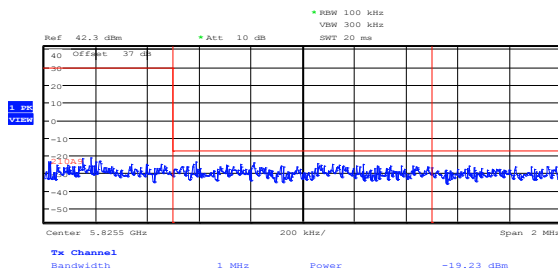


Figure 8.6-150: Upper IC band edge emission at 5.825 GHz, 802.11n HT20, 12 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.6.4 Test data, continued

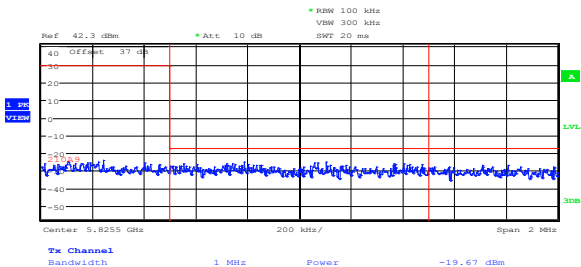


Figure 8.6-151: Upper IC band edge emission at 5.835 GHz, 802.11n HT20, 12 dBi antenna, cho

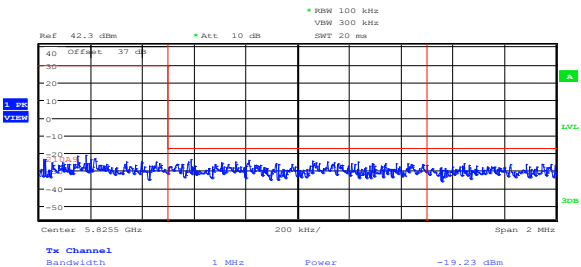


Figure 8.6-152: Upper IC band edge emission at 5.835 GHz, 802.11n HT20, 12 dBi antenna, ch1

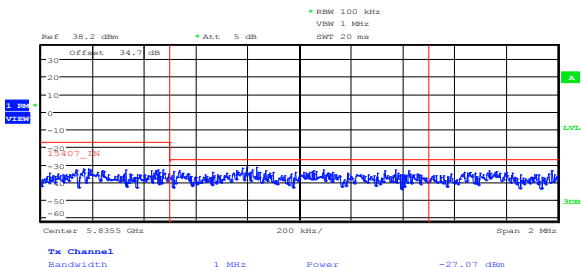


Figure 8.6-153: Upper IC band edge emission at 5.825 GHz, 802.11n HT40, 12 dBi antenna, cho

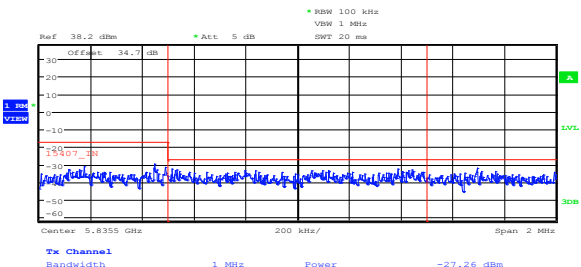


Figure 8.6-154: Upper IC band edge emission at 5.825 GHz, 802.11n HT40, 12 dBi antenna, ch1

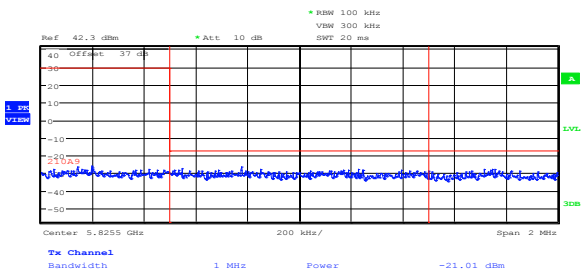


Figure 8.6-155: Upper IC band edge emission at 5.835 GHz, 802.11n HT40, 12 dBi antenna, cho

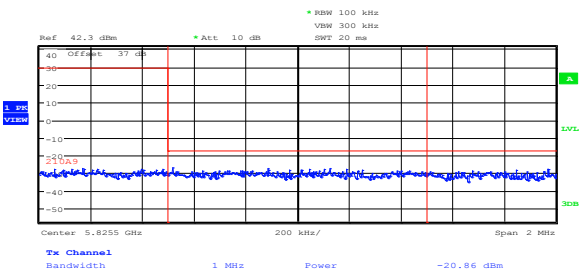


Figure 8.6-156: Upper IC band edge emission at 5.835 GHz, 802.11n HT40, 12 dBi antenna, ch1

Note: band edge emissions plots have been corrected to include total antenna gain, so the measurement results represent EIRP levels

8.7 FCC 15.407(g) Frequency stability

8.7.1 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.

8.7.2 Test summary

Test date:	June 8, 2014	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	36 %

8.7.3 Observations, settings and special notes

Spectrum analyser settings:

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

8.7.4 Test data

Table 8.7-1: Frequency drift measurement

Test conditions	Frequency, GHz	Drift, Hz
+50 °C, Nominal	5.744980329	-131
+40 °C, Nominal	5.744980398	-62
+30 °C, Nominal	5.744980412	-48
+20 °C, +15 %	5.744980433	-27
+20 °C, Nominal	5.744980460	<i>Reference</i>
+20 °C, -15 %	5.744980469	9
+10 °C, Nominal	5.744980487	27
0 °C, Nominal	5.744980512	52
-10 °C, Nominal	5.744980439	-21
-20 °C, Nominal	5.744980401	-59
-30 °C, Nominal	5.744980337	-123

8.7.4 Test data, continued

Table 8.7-2: 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	5.733269231	131	5.733269100	5.725	8.27
802.11n HT20	5.732980769	131	5.732980638	5.725	7.98
802.11n HT40	5.730288462	131	5.730288331	5.725	5.29

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

Table 8.7-3: 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	5.841647030	52	5.841647082	5.850	8.35
802.11n HT20	5.841995591	52	5.841995643	5.850	8.00
802.11n HT40	5.844297023	52	5.844297075	5.850	5.70

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

8.8 RSS-210 A9.4(2) PSD-to-average ratio

8.8.1 Definitions and limits

Definition	Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average ($10 \times \log_{10}$ (99% OBW)) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.
------------	--

8.8.2 Test summary

Test date:	June 9, 2014	Temperature:	21 °C
Test engineer:	Andrey Adelberg	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	32 %

8.8.3 Observations/special notes

For power spectral density and average power results please refer to Section 8.4 of this document.
In the tables below Ratio was calculated as follows: PSD result – Average result.

8.8.4 Test data

Table 8.8-1: PSD-to-average calculations results for 6.7 dBi antenna configuration.

Modulation	Frequency, MHz	PSD result, dBm/MHz	Average result, dBm	PSD to average, dB		
				Ratio	Limit	Margin
802.11a	5745	8.65	19.73	-11.08	3.00	14.08
	5785	14.21	25.57	-11.36	3.00	14.36
	5805	11.34	22.43	-11.09	3.00	14.09
802.11n HT20	5745	7.92	19.24	-11.32	3.00	14.32
	5785	14.56	25.85	-11.29	3.00	14.29
	5805	10.72	22.01	-11.29	3.00	14.29
802.11n HT40	5755	1.08	15.51	-14.42	3.00	17.42
	5795	5.36	19.56	-14.20	3.00	17.20

Table 8.8-2: PSD-to-average calculations results for 11.5 dBi antenna configuration.

Modulation	Frequency, MHz	PSD result, dBm/MHz	Average result, dBm	PSD to average, dB		
				Ratio	Limit	Margin
802.11a	5745	7.49	18.59	-11.10	3.00	14.10
	5785	12.41	23.63	-11.22	3.00	14.22
	5805	10.66	21.77	-11.10	3.00	14.10
802.11n HT20	5745	7.02	18.36	-11.33	3.00	14.33
	5785	12.50	23.80	-11.30	3.00	14.30
	5805	10.13	21.47	-11.34	3.00	14.34
802.11n HT40	5755	-0.26	14.04	-14.30	3.00	17.30
	5795	4.39	18.68	-14.29	3.00	17.29

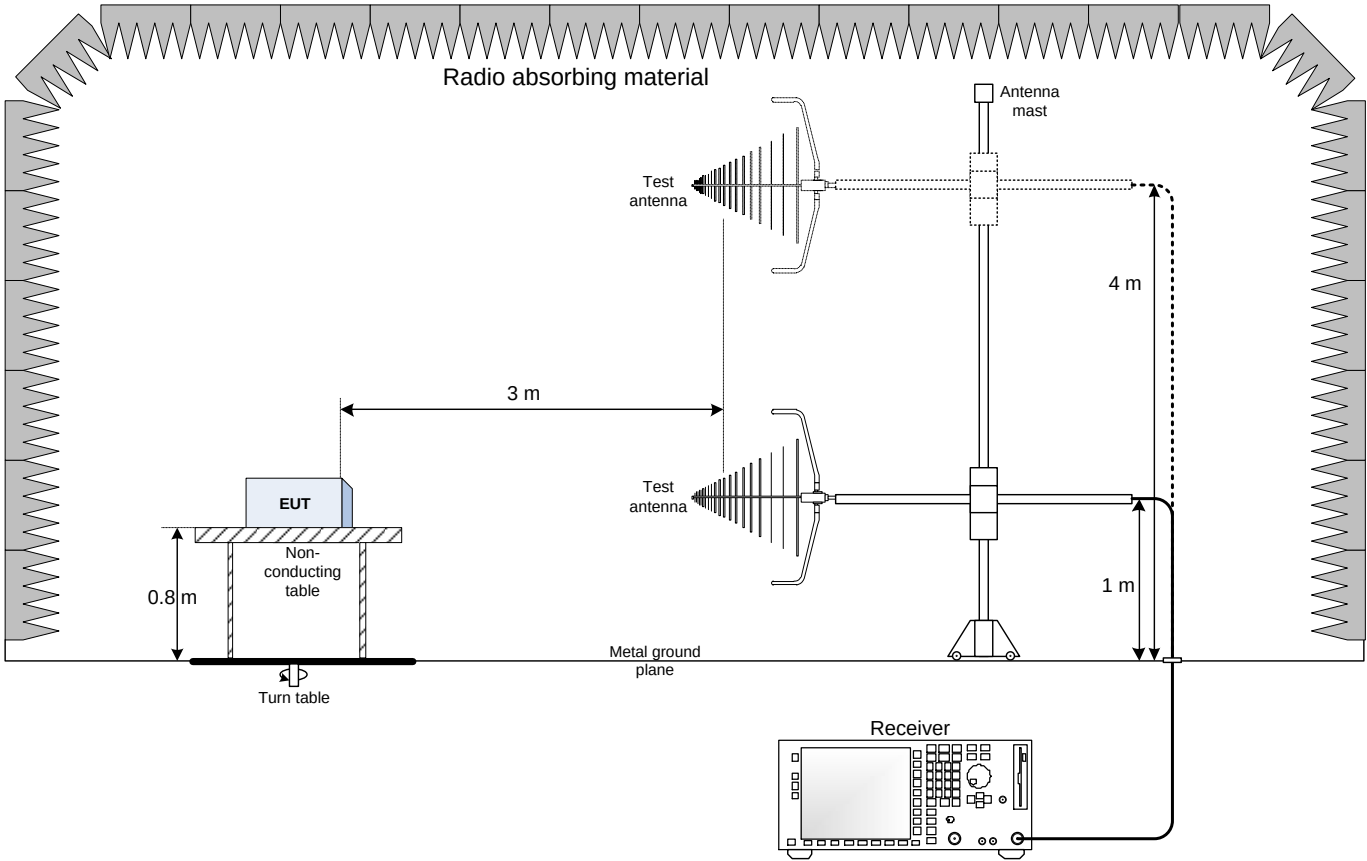
8.8.4 Test data, continued

Table 8.8-3: PSD-to-average calculations results for 12 dBi antenna configuration.

Modulation	Frequency, MHz	PSD result, dBm/MHz	Average result, dBm	PSD to average, dB		
				Ratio	Limit	Margin
802.11a	5745	7.23	18.34	-11.11	3.00	14.11
	5785	12.41	23.31	-10.90	3.00	13.90
	5805	8.66	19.74	-11.09	3.00	14.09
802.11n HT20	5745	6.72	18.06	-11.34	3.00	14.34
	5785	12.20	23.59	-11.38	3.00	14.38
	5805	7.74	19.05	-11.31	3.00	14.31
802.11n HT40	5755	-0.77	13.50	-14.27	3.00	17.27
	5795	1.25	15.57	-14.32	3.00	17.32

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 Conducted emissions set-up

