

Test report

443623-3TRFWL

Date of issue: August 20, 2021

Applicant:

Panduit Corp.

Product:

Network Management Card

Model:

PAN100

FCC ID:

2AVV3-PAN100

IC certification number:


11688B-PAN100

Specifications:

- ◆ **FCC 47 CFR Part 15, Subpart C – §15.247**
Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz, 5727 – 5850 MHz
- ◆ **Industry Canada RSS-247, Issue 2**
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Lab and test locations

Company name	Nemko USA Inc.
Address	2210 Faraday Ave, Suite 150
City	Carlsbad
State	California
Postal code	92008
Country	USA
Telephone	+1 760 444 3500
Website	www.nemko.com
FCC Site Number	Test Firm Registration Number: 392943 Designation Number: US5058
ISED Test Site	2040B-3

Tested by	David Hewitt, EMC Specialist
Reviewed by	James Cunningham, EMC/MIL/WL Supervisor
Review date	August 20, 2021
Reviewer 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 USA's ISO/IEC 17025 accreditation.
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Section 1 Report summary

1.1 Applicant

Company name	Panduit Corp.
Address	18900 Panduit Drive
City	Tinley Park
Province/State	IL
Postal/Zip code	60487
Country	USA

1.2 Manufacturer

Company name	Panduit Corp.
Address	18900 Panduit Drive
City	Tinley Park
Province/State	IL
Postal/Zip code	60487
Country	USA

1.3 Test specifications

FCC 47 CFR Part 15, Subpart C – §15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
IC RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.4 Test methods

ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
558074 D01 DTS Measurement Guidance v03r02 (June 5, 2014)	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.5 Exclusions

Variation of power source test could not be performed on the EUT because the EUT receives 5 V_{DC} via USB cable from the support laptop. Adjusting the voltage of the AC mains supply to the support laptop would have been irrelevant to the nature of the test because it would not have changed the supply voltage to the EUT itself.

1.6 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 above. 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.

1.7 Test report revision history

Table 1.7-1: Test report revision history

Revision #	Details of changes made to test report
443623-3TRFWL	Original report issued
Notes:	None

Section 2 Summary of test results

2.1 FCC Part 15 Subpart C, general requirements

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Not tested
§15.203	Antenna requirement	Pass

Notes: EUT is DC powered via micro-USB, and voltage could not be varied.
The antenna is located within the protective cover of EUT

2.2 FCC Part 15.247

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	Pass
§15.247(b)(1)	Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	Not applicable
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Pass
§15.247(b)(4)	Transmitting antennas of directional gain greater than 6 dBi	Not applicable
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Pass
§15.247(e)	Power spectral density for digitally modulated devices	Pass
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

2.3 IC RSS-247, Issue 2

Part	Test description	Verdict
5.1 (a)	Bandwidth of a frequency hopping channel	Not applicable
5.1 (b)	Minimum channel spacing for frequency hopping systems	Not applicable
5.1 (c)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.1 (d)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.1 (e)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
5.2 (a)	Minimum 6 dB bandwidth	Pass
5.2 (b)	Maximum power spectral density	Pass
5.3 (a)	Digital modulation turned off	Not applicable
5.3 (b)	Frequency hopping turned off	Not applicable
5.4 (a)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.4 (b)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.4 (c)	Frequency hopping systems operating in the 5725–5850 MHz	Not applicable
5.4 (d)	Systems employing digital modulation techniques	Pass
5.4 (e)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (f)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Out-of-band emissions	Pass

2.4 IC RSS-GEN, Issue 5

Part	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
8.8	Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus	Pass

Section 3 Equipment under test (EUT) details

3.1 Sample information

Receipt date	June 25, 2021
Nemko sample ID number	NEx: 443623

3.2 EUT information

Product name	Network Management Card
Model	irUPS NMC
Serial number	N/A
Part number	ESP32-WROVER-IE

3.3 Technical information

Used IC test site(s) reg. number	2040A
RSS number and issue	RSS-247 issue 2 (February 2017)
Frequency band	2400 – 2483.5 MHz
Minimum frequency (MHz)	2412
Maximum frequency (MHz)	2462
Type of modulation	802.11b 802.11g 802.11n 20 MHz channel bandwidth 802.11n 40 MHz channel bandwidth
Power requirements	5 V _{DC} , 0.5 A
Antenna information	TAOGLAS FXP840 antenna 3.6 dBi gain antenna attached via U.FL connector

3.4 EUT exercise and monitoring details

The EUT was controlled by support laptop running ESP_RF_test_tool_v2.5 and set to transmit WiFi signals at surveyed power levels while on the Low, Middle, and High channels—as applicable per test—using the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

Table 3.4-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number	Rev.
--	--	--	--	--

Table 3.4-2: EUT interface ports

Description	Qty.
USB micro	1

Table 3.4-3: Support equipment

Description	Brand name	Model/Part number	Serial number	Rev.
Support Laptop	Dell	Inspiron 5548	20814012794	--

Table 3.4-4: Inter-connection cables

Cable description	From	To	Length (m)
USB	Support laptop	EUT	1.0

3.5 EUT setup diagram

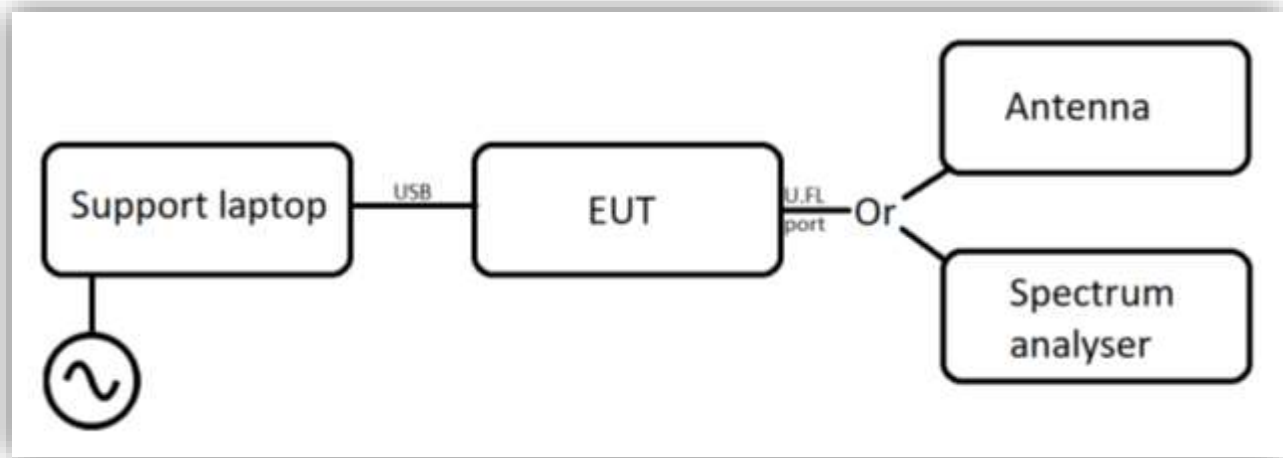


Figure 3.5-1: Setup diagram

Section 4 Engineering considerations

4.1 Surveyed power levels

In order to find an efficient method of comprehensively testing WiFi within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes, the Maximum Peak Conducted Output Power of each modulation and data rate were surveyed and recorded. Each modulation scheme was then tested at the discrete data rate which produced the greatest Maximum Peak Conducted Output Power.

The following 802.11 modulation schemes with the identified data rates were tested through this report:

802.11b 2 Mbs

802.11g 12 Mbs

802.11n MCS1 20 MHz channel bandwidth

802.11n MCS1 40 MHz channel bandwidth

The following table lists all Maximum Peak Conducted Output Power measurements used to identify which data rate per modulation to test:

802.11b

Data Rate	Channel Bandwidth (MHz)	Modulation	Maximum Peak Conducted Output Power (dBm)
1 Mbps	20	DBPSK	17.67
2 Mbps	20	DQPSK	17.73
5.5 Mbps	20	CCK - DQPSK	17.6
11 Mbps	20	CCK - DQPSK	17.69

802.11g

Data Rate	Channel Bandwidth (MHz)	Modulation	Maximum Peak Conducted Output Power (dBm)
6 Mbps	20	BPSK	16.75
9 Mbps	20	BPSK	16.77
12 Mbps	20	QPSK	17.37
18 Mbps	20	QPSK	17.27
24 Mbps	20	16 QAM	14.93
36 Mbps	20	16 QAM	14.95
48 Mbps	20	64 QAM	13.59
54 Mbps	20	64 QAM	12.98

802.11n

MCS Index	Channel Bandwidth (MHz)	Modulation	Maximum Peak Conducted Output Power (dBm)
0	20	BPSK	16.93
1	20	QPSK	17.08
2	20	QPSK	17.06
3	20	16 QAM	14.72
4	20	16 QAM	14.75
5	20	64 QAM	14.01
6	20	64 QAM	13.28
7	20	64 QAM	13.14
0	40	BPSK	17.43
1	40	QPSK	17.72
2	40	QPSK	17.64
3	40	16 QAM	15.11
4	40	16 QAM	15.12
5	40	64 QAM	13.78
6	40	64 QAM	12.84
7	40	64 QAM	11.74

4.2 Modifications incorporated in the EUT

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

4.3 Technical judgment

The following power levels for the 2.4 GHz WiFi modulations schemes listed below were needed to meet FCC 15.247 conformity, and will be needed in the final end-product, as set by the ESP32 Test software:

802.11g with 2.0dB att (8 x 0.25dB)

802.11n 20 MHz channel bandwidth with 2.0dB att (8 x 0.25dB)

802.11n 40 MHz channel bandwidth with 7.0dB att (28 x 0.25dB)

4.4 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	86–106 kPa

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 USA 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 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of $K=2$ with 95% certainty.

Table 6.1-1: Measurement uncertainty calculations

Measurement		U_{cispr} dB	U_{lab} dB
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

Notes: Compliance assessment:

If U_{lab} is less than or equal to U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit

If U_{lab} is greater than U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cispr}})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cispr}})$, exceeds the disturbance limit

V-AMN: V type artificial mains network
 AAN: Asymmetric artificial network
 CP: Current probe
 CVP: Capacitive voltage probe
 SAC: Semi-anechoic chamber
 FAR: Fully anechoic room

Section 7 Test Equipment

Table 6.1-1: Test Equipment List

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESCI 7	E1026	1 yr	24 Feb 2022
Transient Limiter	Hewlett-Packard	11947A	681	1 yr	11 Feb 2022
Two Line V-Network	Rohde & Schwarz	ENV216	E1020	1 yr	2 Sep 2022
Signal and spectrum analyzer	Rohde & Schwarz	FSV40	E1120	2 yr	19 Nov 2021
Signal and spectrum analyzer	Rohde & Schwarz	FSW43	E1302	1 yr	18 Sep 2021
Power sensor	ETS Lindgren	7002-006	E1061	1 yr	20 May 2022
Power sensor	ETS Lindgren	7002-006	E1062	1 yr	14 Oct 2021
EMI Test Receiver	Rohde & Schwarz	ESU40	E1121	1 yr	19 May 2022
System Controller	Sunol Sciences	SC104V	E1191	NCR	NCR
Bilog Antenna (30-1000 MHz)	Schaffner	CBL 6111D	1763	2 yr	18 Feb 2022
DRG Horn (1-18 GHz)	ETS-Lindgren	3117-PA	E1160	1 yr	2 Dec 2021
Horn antenna (18-26 GHz)	SAGE	SAR-2309-42-S2	E1143	2 yr	13 Nov 2022
Low noise amplifier	Sage Millimeter, Inc.	SBL-1834034030-KFKF	E1228	VOU	VOU
2.4GHz notch filter	Micro-Tonics	HPM50110-01	E1142	NCR	NCR

Notes: NCR - no calibration required
VOU - verify on use

Table 6.1-2: Test Software

Manufacturer of Software	Details
Rohde & Schwarz	EMC 32 V10.60.10 (AC conducted emissions)
Rohde & Schwarz	EMC 32 V10.60.15 (radiated emissions)

Notes: None

Section 8 Testing data

8.1 FCC 15.207(a) and IC RSS-GEN, Issue 5 8.8 AC power line conducted emissions

8.1.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.207(a)
RSS-Gen → §8.8

For Low-power radio-frequency devices 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 μ H/50 Ω line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.

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

Verdict	Pass		
Test date	July 22, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1005 mbar
Test location	Ground Plane	Relative humidity	69 %

8.1.3 Notes

Testing was performed with the WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

Testing was performed according to ANSI C63.10 §6.2.

8.1.4 Setup details

Port under test	AC mains of host support laptop
EUT setup configuration	Table top
Measurement details	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:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	– Peak (Preview measurement) – Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak and Average preview measurement) – 5000 ms (Quasi-peak final measurement) – 5000 ms (CAverage final measurement)

8.1.5 Test data

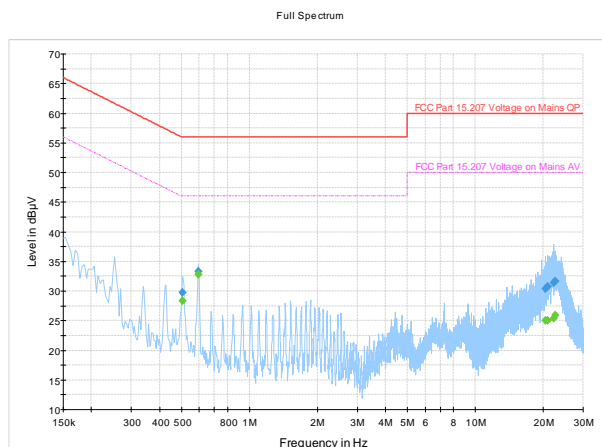


Figure 8.1-1: AC conducted emissions spectral plot, Low channel 802.11b 2Mbps

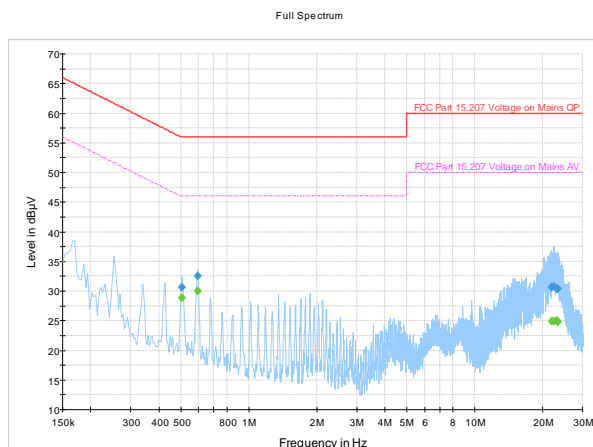


Figure 8.1-2: AC conducted emissions spectral plot, Low channel 802.11g 12Mbps

Table 8.1-2: AC conducted emissions tabular data, 150 kHz – 30 MHz, Low channel 802.11b 2Mbps

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.506000	---	28.29	46.00	17.71	5000.0	9.000	L1	ON	19.4
0.506000	29.72	---	56.00	26.28	5000.0	9.000	L1	ON	19.4
0.594000	---	32.77	46.00	13.23	5000.0	9.000	N	ON	19.4
0.594000	33.37	---	56.00	22.63	5000.0	9.000	N	ON	19.4
20.482000	---	25.09	50.00	24.91	5000.0	9.000	N	ON	20.2
20.482000	30.42	---	60.00	29.58	5000.0	9.000	N	ON	20.2
20.890000	---	25.06	50.00	24.94	5000.0	9.000	N	ON	20.1
20.890000	30.75	---	60.00	29.25	5000.0	9.000	N	ON	20.1
22.166000	---	25.47	50.00	24.53	5000.0	9.000	N	ON	20.1
22.166000	31.38	---	60.00	28.62	5000.0	9.000	N	ON	20.1
22.510000	---	25.96	50.00	24.04	5000.0	9.000	N	ON	20.1
22.510000	31.68	---	60.00	28.32	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

Table 8.1-3: AC conducted emissions tabular data, 150 kHz – 30 MHz, Low channel 802.11g 12Mbps

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.506000	---	28.87	46.00	17.13	5000.0	9.000	N	ON	19.4
0.506000	30.66	---	56.00	25.34	5000.0	9.000	N	ON	19.4
0.594000	---	29.98	46.00	16.02	5000.0	9.000	N	ON	19.4
0.594000	32.53	---	56.00	23.47	5000.0	9.000	N	ON	19.4
21.914000	---	24.87	50.00	25.13	5000.0	9.000	N	ON	20.1
21.914000	30.69	---	60.00	29.31	5000.0	9.000	N	ON	20.1
22.326000	---	24.91	50.00	25.09	5000.0	9.000	N	ON	20.1
22.326000	30.73	---	60.00	29.27	5000.0	9.000	N	ON	20.1
23.114000	---	25.01	50.00	24.99	5000.0	9.000	N	ON	20.0
23.114000	30.39	---	60.00	29.61	5000.0	9.000	N	ON	20.0
23.194000	---	24.79	50.00	25.21	5000.0	9.000	N	ON	20.0
23.194000	30.32	---	60.00	29.68	5000.0	9.000	N	ON	20.0

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

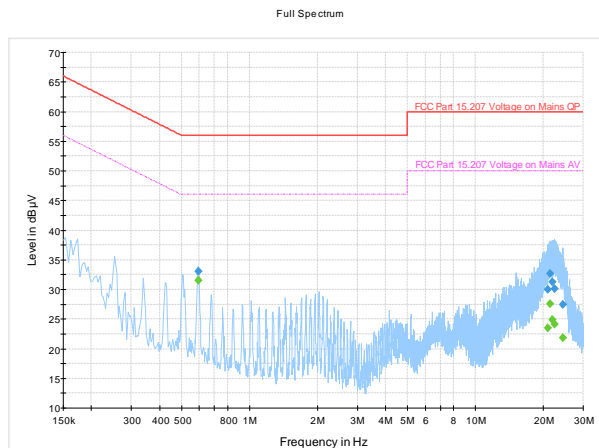


Figure 8.1-3: AC conducted emissions spectral plot, Low channel 802.11n MCS1, 20MHz channel bandwidth

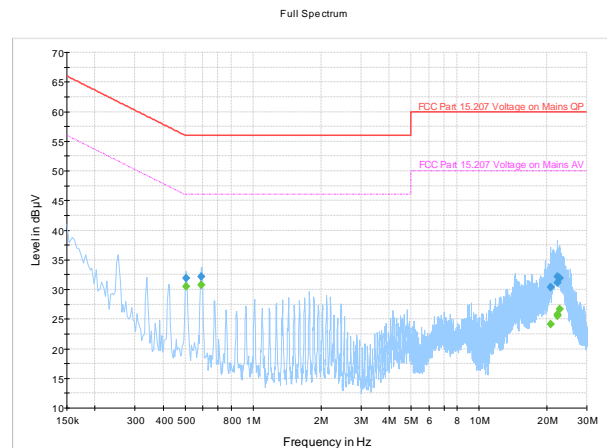


Figure 8.1-4: AC conducted emissions spectral plot, Low channel 802.11n MCS1, 40MHz channel bandwidth

Table 8.1-4: AC conducted emissions tabular data, 150 kHz – 30 MHz, Low channel 802.11n MCS1, 20MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.594000	---	31.58	46.00	14.42	5000.0	9.000	N	ON	19.4
0.594000	33.07	---	56.00	22.93	5000.0	9.000	N	ON	19.4
20.962000	---	23.47	50.00	26.53	5000.0	9.000	N	ON	20.1
20.962000	30.02	---	60.00	29.98	5000.0	9.000	N	ON	20.1
21.386000	---	27.62	50.00	22.38	5000.0	9.000	N	ON	20.1
21.386000	32.66	---	60.00	27.34	5000.0	9.000	N	ON	20.1
21.806000	---	24.94	50.00	25.06	5000.0	9.000	N	ON	20.1
21.806000	31.28	---	60.00	28.72	5000.0	9.000	N	ON	20.1
22.470000	---	24.12	50.00	25.88	5000.0	9.000	N	ON	20.1
22.470000	30.17	---	60.00	29.83	5000.0	9.000	N	ON	20.1
24.338000	---	21.89	50.00	28.11	5000.0	9.000	N	ON	20.0
24.338000	27.40	---	60.00	32.60	5000.0	9.000	N	ON	20.0

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

Table 8.1-5: AC conducted emissions tabular data, 150 kHz – 30 MHz, Low channel 802.11n MCS1, 40MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.506000	---	30.49	46.00	15.51	5000.0	9.000	N	ON	19.4
0.506000	31.86	---	56.00	24.14	5000.0	9.000	N	ON	19.4
0.590000	---	30.82	46.00	15.18	5000.0	9.000	N	ON	19.4
0.590000	32.17	---	56.00	23.83	5000.0	9.000	N	ON	19.4
20.690000	---	24.12	50.00	25.88	5000.0	9.000	N	ON	20.2
20.690000	30.38	---	60.00	29.62	5000.0	9.000	N	ON	20.2
22.202000	---	25.75	50.00	24.25	5000.0	9.000	N	ON	20.1
22.202000	32.13	---	60.00	27.87	5000.0	9.000	N	ON	20.1
22.294000	---	25.49	50.00	24.51	5000.0	9.000	N	ON	20.1
22.294000	31.10	---	60.00	28.90	5000.0	9.000	N	ON	20.1
22.786000	---	26.65	50.00	23.35	5000.0	9.000	N	ON	20.1
22.786000	31.94	---	60.00	28.06	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

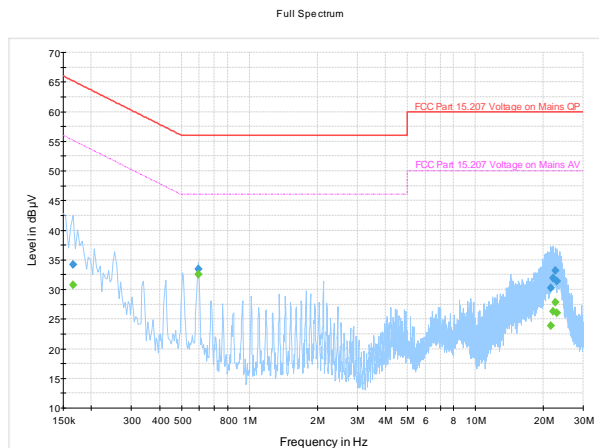


Figure 8.1-5: AC conducted emissions spectral plot, Mid channel 802.11b 2Mbps

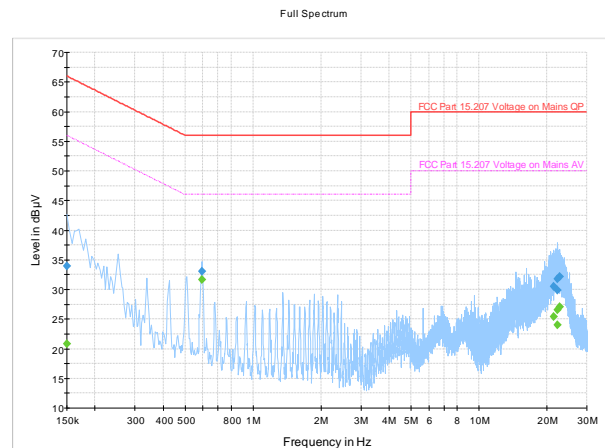


Figure 8.1-6: AC conducted emissions spectral plot, Mid channel 802.11g 12Mbps

Table 8.1-6: AC conducted emissions tabular data, 150 kHz – 30 MHz, Mid channel 802.11b 2Mbps

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.166000	---	30.75	55.16	24.41	5000.0	9.000	N	ON	19.5
0.166000	34.15	---	65.16	31.01	5000.0	9.000	N	ON	19.5
0.594000	---	32.53	46.00	13.47	5000.0	9.000	N	ON	19.4
0.594000	33.38	---	56.00	22.62	5000.0	9.000	N	ON	19.4
21.634000	---	23.95	50.00	26.05	5000.0	9.000	N	ON	20.1
21.634000	30.27	---	60.00	29.73	5000.0	9.000	N	ON	20.1
21.990000	---	26.34	50.00	23.66	5000.0	9.000	N	ON	20.1
21.990000	31.86	---	60.00	28.14	5000.0	9.000	N	ON	20.1
22.490000	---	27.87	50.00	22.13	5000.0	9.000	N	ON	20.1
22.490000	33.16	---	60.00	26.84	5000.0	9.000	N	ON	20.1
23.006000	---	26.04	50.00	23.96	5000.0	9.000	N	ON	20.0
23.006000	31.38	---	60.00	28.62	5000.0	9.000	N	ON	20.0

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

Table 8.1-7: AC conducted emissions tabular data, 150 kHz – 30 MHz, Mid channel 802.11g 12Mbps

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	20.80	56.00	35.20	5000.0	9.000	L1	ON	19.6
0.150000	34.00	---	66.00	32.00	5000.0	9.000	L1	ON	19.6
0.594000	---	31.71	46.00	14.29	5000.0	9.000	N	ON	19.4
0.594000	33.11	---	56.00	22.89	5000.0	9.000	N	ON	19.4
21.410000	---	25.46	50.00	24.54	5000.0	9.000	N	ON	20.1
21.410000	30.56	---	60.00	29.44	5000.0	9.000	N	ON	20.1
22.186000	---	26.62	50.00	23.38	5000.0	9.000	N	ON	20.1
22.186000	31.81	---	60.00	28.19	5000.0	9.000	N	ON	20.1
22.310000	---	24.01	50.00	25.99	5000.0	9.000	N	ON	20.1
22.310000	29.88	---	60.00	30.12	5000.0	9.000	N	ON	20.1
22.690000	---	27.02	50.00	22.98	5000.0	9.000	N	ON	20.1
22.690000	32.18	---	60.00	27.82	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

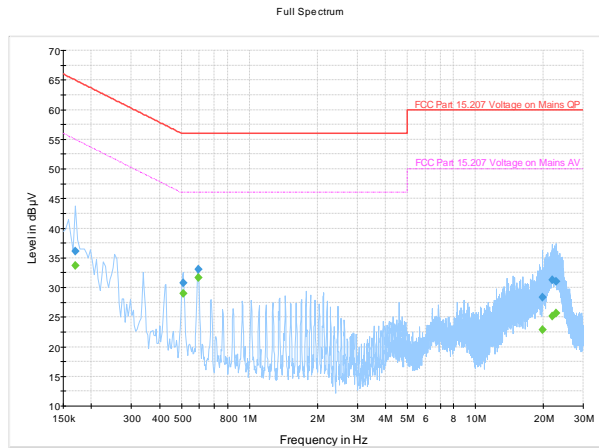


Figure 8.1-7: AC conducted emissions spectral plot, Mid channel 802.11n MCS1, 20MHz channel bandwidth

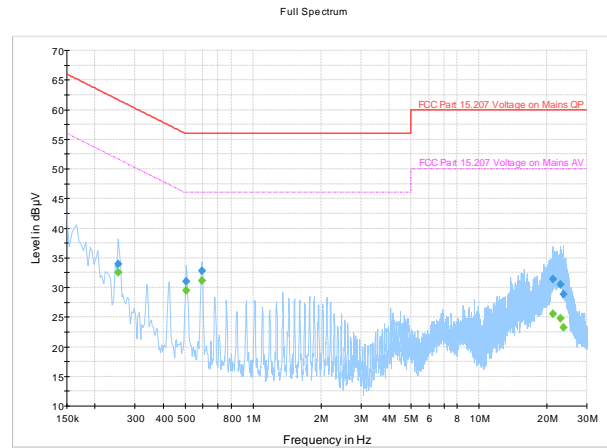


Figure 8.1-8: AC conducted emissions spectral plot, Mid channel 802.11n MCS1, 40MHz channel bandwidth

Table 8.1-8: AC conducted emissions tabular data, 150 kHz – 30 MHz, Mid channel 802.11n MCS1, 20MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.170000	---	33.75	54.96	21.21	5000.0	9.000	N	ON	19.5
0.170000	36.13	---	64.96	28.83	5000.0	9.000	N	ON	19.5
0.510000	---	29.00	46.00	17.00	5000.0	9.000	N	ON	19.4
0.510000	30.76	---	56.00	25.24	5000.0	9.000	N	ON	19.4
0.594000	---	31.60	46.00	14.40	5000.0	9.000	N	ON	19.4
0.594000	33.08	---	56.00	22.92	5000.0	9.000	N	ON	19.4
19.874000	---	22.89	50.00	27.11	5000.0	9.000	N	ON	20.2
19.874000	28.30	---	60.00	31.70	5000.0	9.000	N	ON	20.2
21.834000	---	25.15	50.00	24.85	5000.0	9.000	N	ON	20.1
21.834000	31.24	---	60.00	28.76	5000.0	9.000	N	ON	20.1
22.686000	---	25.65	50.00	24.35	5000.0	9.000	N	ON	20.1
22.686000	31.07	---	60.00	28.93	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

Table 8.1-9: AC conducted emissions tabular data, 150 kHz – 30 MHz, Mid channel 802.11n MCS1, 40MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.254000	---	32.48	51.63	19.14	5000.0	9.000	N	ON	19.4
0.254000	33.98	---	61.63	27.65	5000.0	9.000	N	ON	19.4
0.506000	---	29.51	46.00	16.49	5000.0	9.000	N	ON	19.4
0.506000	31.04	---	56.00	24.96	5000.0	9.000	N	ON	19.4
0.594000	---	31.09	46.00	14.91	5000.0	9.000	N	ON	19.4
0.594000	32.83	---	56.00	23.17	5000.0	9.000	N	ON	19.4
21.242000	---	25.55	50.00	24.45	5000.0	9.000	N	ON	20.1
21.242000	31.42	---	60.00	28.58	5000.0	9.000	N	ON	20.1
22.938000	---	24.79	50.00	25.21	5000.0	9.000	N	ON	20.0
22.938000	30.57	---	60.00	29.43	5000.0	9.000	N	ON	20.0
23.586000	---	23.20	50.00	26.80	5000.0	9.000	N	ON	20.0
23.586000	28.80	---	60.00	31.20	5000.0	9.000	N	ON	20.0

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

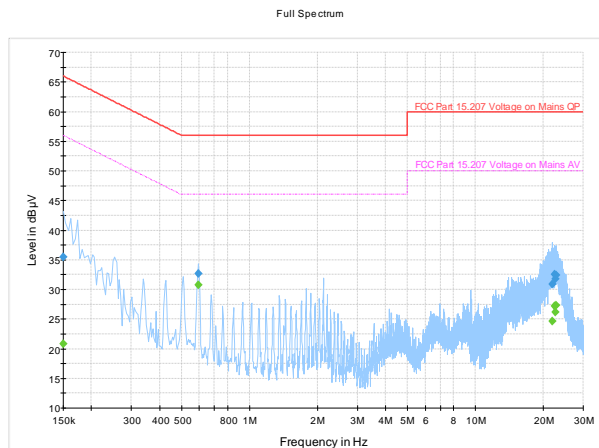


Figure 8.1-9: AC conducted emissions spectral plot, High channel 802.11b 2Mbps

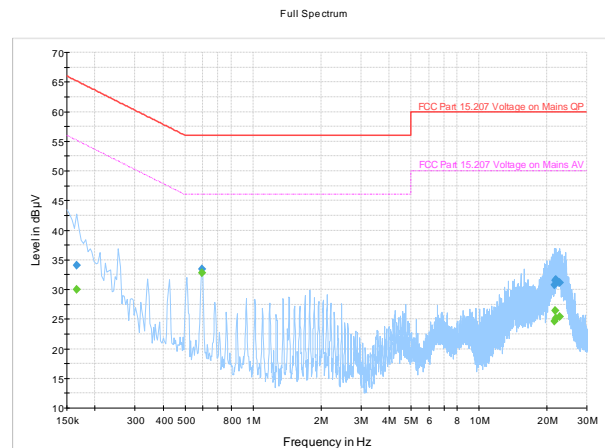


Figure 8.1-10: AC conducted emissions spectral plot, High channel 802.11g 12Mbps

Table 8.1-10: AC conducted emissions tabular data, 150 kHz – 30 MHz, High channel 802.11b 2Mbps

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	20.76	56.00	35.24	5000.0	9.000	N	ON	19.6
0.150000	35.52	---	66.00	30.48	5000.0	9.000	N	ON	19.6
0.594000	---	30.79	46.00	15.21	5000.0	9.000	N	ON	19.4
0.594000	32.72	---	56.00	23.28	5000.0	9.000	N	ON	19.4
21.934000	---	24.63	50.00	25.37	5000.0	9.000	N	ON	20.1
21.934000	30.89	---	60.00	29.11	5000.0	9.000	N	ON	20.1
22.370000	---	27.18	50.00	22.82	5000.0	9.000	N	ON	20.1
22.370000	32.51	---	60.00	27.49	5000.0	9.000	N	ON	20.1
22.514000	---	26.15	50.00	23.85	5000.0	9.000	N	ON	20.1
22.514000	31.75	---	60.00	28.25	5000.0	9.000	N	ON	20.1
22.806000	---	27.34	50.00	22.66	5000.0	9.000	N	ON	20.1
22.806000	32.39	---	60.00	27.61	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

Table 8.1-11: AC conducted emissions tabular data, 150 kHz – 30 MHz, High channel 802.11g 12Mbps

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.166000	---	30.05	55.16	25.11	5000.0	9.000	N	ON	19.5
0.166000	34.12	---	65.16	31.04	5000.0	9.000	N	ON	19.5
0.594000	---	32.81	46.00	13.19	5000.0	9.000	N	ON	19.4
0.594000	33.40	---	56.00	22.60	5000.0	9.000	N	ON	19.4
21.602000	---	24.68	50.00	25.32	5000.0	9.000	N	ON	20.1
21.602000	30.76	---	60.00	29.24	5000.0	9.000	N	ON	20.1
21.786000	---	26.49	50.00	23.51	5000.0	9.000	N	ON	20.1
21.786000	31.52	---	60.00	28.48	5000.0	9.000	N	ON	20.1
21.846000	---	25.13	50.00	24.87	5000.0	9.000	N	ON	20.1
21.846000	31.59	---	60.00	28.41	5000.0	9.000	N	ON	20.1
22.790000	---	25.35	50.00	24.65	5000.0	9.000	N	ON	20.1
22.790000	31.13	---	60.00	28.87	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

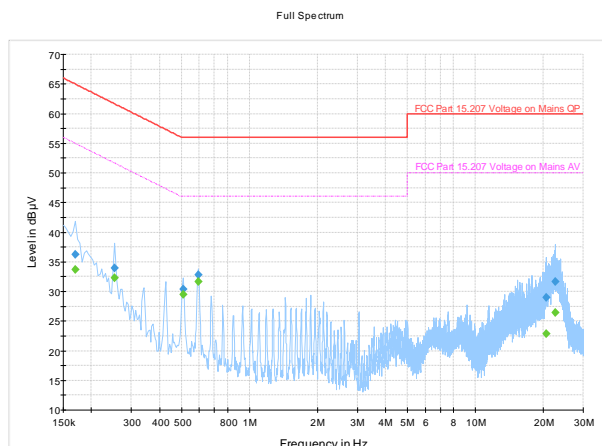


Figure 8.1-11: AC conducted emissions spectral plot, High channel 802.11n MCS1, 20MHz channel bandwidth

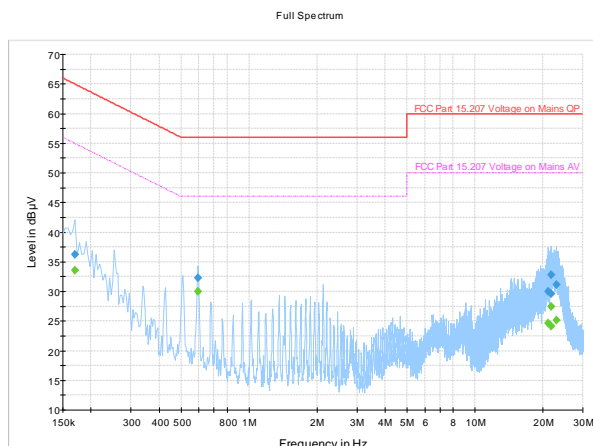


Figure 8.1-12: AC conducted emissions spectral plot, High channel 802.11n MCS1, 40MHz channel bandwidth

Table 8.1-12: AC conducted emissions tabular data, 150 kHz – 30 MHz, High channel 802.11n MCS1, 20MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.170000	36.25	---	64.96	28.71	5000.0	9.000	N	ON	19.5
0.170000	---	33.73	54.96	21.23	5000.0	9.000	N	ON	19.5
0.254000	---	32.25	51.63	19.38	5000.0	9.000	N	ON	19.4
0.254000	33.92	---	61.63	27.70	5000.0	9.000	N	ON	19.4
0.510000	30.37	---	56.00	25.63	5000.0	9.000	L1	ON	19.4
0.510000	---	29.49	46.00	16.51	5000.0	9.000	L1	ON	19.4
0.594000	---	31.63	46.00	14.37	5000.0	9.000	N	ON	19.4
0.594000	32.87	---	56.00	23.13	5000.0	9.000	N	ON	19.4
20.582000	---	22.90	50.00	27.10	5000.0	9.000	N	ON	20.2
20.582000	28.93	---	60.00	31.07	5000.0	9.000	N	ON	20.2
22.542000	---	26.38	50.00	23.62	5000.0	9.000	N	ON	20.1
22.542000	31.61	---	60.00	28.39	5000.0	9.000	N	ON	20.1

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

Table 8.1-13: AC conducted emissions tabular data, 150 kHz – 30 MHz, High channel 802.11n MCS1, 40MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.170000	---	33.55	54.96	21.42	5000.0	9.000	N	ON	19.5
0.170000	36.30	---	64.96	28.66	5000.0	9.000	N	ON	19.5
0.594000	---	30.03	46.00	15.97	5000.0	9.000	N	ON	19.4
0.594000	32.34	---	56.00	23.66	5000.0	9.000	N	ON	19.4
21.122000	---	24.60	50.00	25.40	5000.0	9.000	N	ON	20.1
21.122000	30.05	---	60.00	29.95	5000.0	9.000	N	ON	20.1
21.682000	---	24.12	50.00	25.88	5000.0	9.000	N	ON	20.1
21.682000	29.65	---	60.00	30.35	5000.0	9.000	N	ON	20.1
21.786000	---	27.39	50.00	22.61	5000.0	9.000	N	ON	20.1
21.786000	32.81	---	60.00	27.19	5000.0	9.000	N	ON	20.1
22.882000	---	25.20	50.00	24.80	5000.0	9.000	N	ON	20.0
22.882000	31.13	---	60.00	28.87	5000.0	9.000	N	ON	20.0

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

8.2 FCC 15.247(a)(2) and RSS-247 5.2(1) Minimum 6 dB bandwidth for systems using digital modulation techniques References

8.2.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(a)(2)
RSS-247 → §5.2(a)

- (a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:
- (2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2.2 Test summary

Verdict	Pass		
Test date	July 14, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1006 mbar
Test location	Wireless bench (Conducted)	Relative humidity	71 %
Test date	July 15, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1007 mbar
Test location	Wireless bench (Conducted)	Relative humidity	64 %
Test date	July 20, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1004 mbar
Test location	Wireless bench (Conducted)	Relative humidity	61 %

8.2.3 Notes

None

8.2.4 Setup details

EUT setup configuration	Table top
Test facility	Nemko San Diego
Measurement method	558074 D01 DTS Measurement Guidance §8.2 ANSI C63.10 §11.8.1 using built-in marker function of the spectrum analyzer

Receiver/spectrum analyzer settings:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.2.5 Test data

Table 8.2-1: 6 dB occupied bandwidth test data

Test Frequency (MHz)	Modulation scheme	Bandwidth (MHz)	Limit (kHz)	Margin (MHz)
2412	802.11b 2 Mbs	8.466	> 500	7.966
2412	802.11g 12 Mbs	16.425	> 500	15.925
2412	802.11n MCS1 20 MHz channel bandwidth	16.932	> 500	16.432
2422	802.11n MCS1 40 MHz channel bandwidth	36.469	> 500	35.969
2442	802.11b 2 Mbs	8.466	> 500	7.966
2442	802.11g 12 Mbs	16.353	> 500	15.853
2442	802.11n MCS1 20 MHz channel bandwidth	16.517	> 500	16.017
2442	802.11n MCS1 40 MHz channel bandwidth	36.469	> 500	35.969
2462	802.11b 2 Mbs	8.466	> 500	7.966
2462	802.11g 12 Mbs	16.425	> 500	15.925
2462	802.11n MCS1 20 MHz channel bandwidth	16.715	> 500	16.215
2462	802.11n MCS1 40 MHz channel bandwidth	36.469	> 500	35.969



Figure 8.2-1: 6 dB occupied bandwidth, Low channel, 802.11b 2Mbps

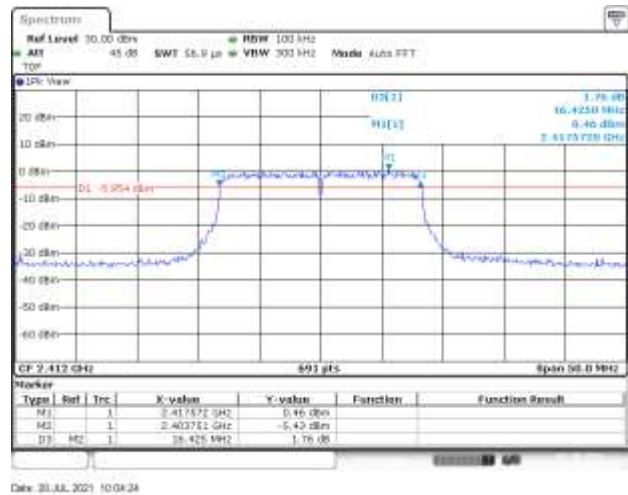


Figure 8.2-2: 6 dB occupied bandwidth, Low channel, 802.11g 12Mbps

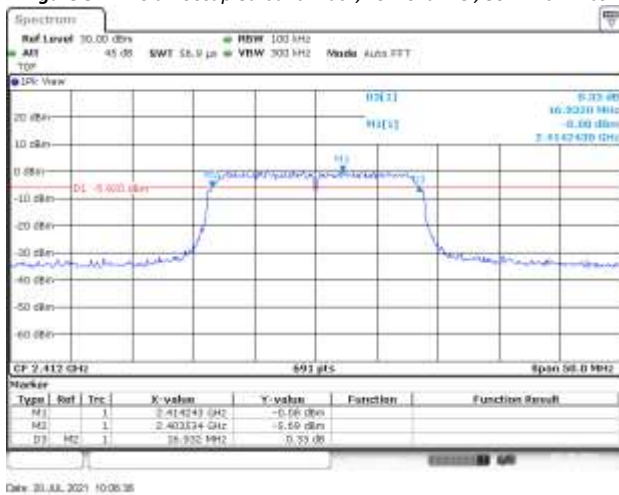


Figure 8.2-3: 6 dB occupied bandwidth, Low channel, 802.11n MCS1 20 MHz channel bandwidth

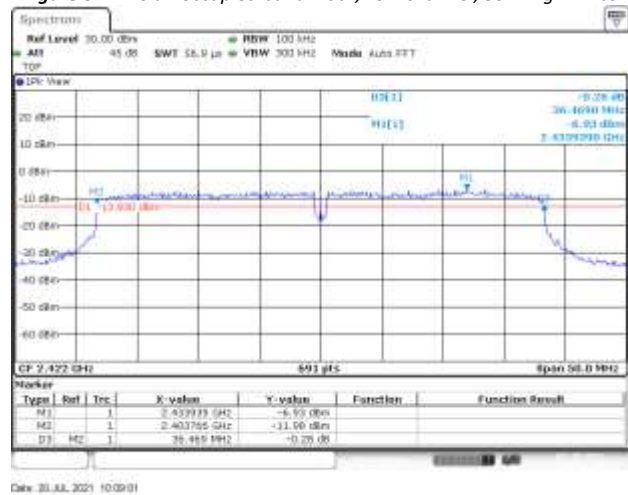


Figure 8.2-4: 6 dB occupied bandwidth, Low channel, 802.11n MCS1 40 MHz channel bandwidth

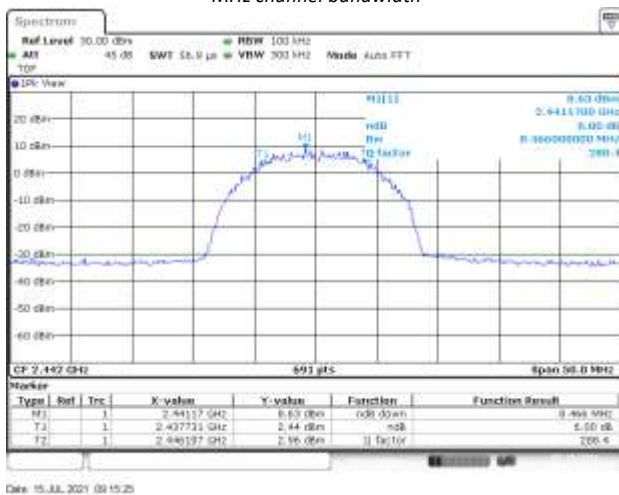


Figure 8.2-5: 6 dB occupied bandwidth, Mid channel, 802.11b 2Mbps

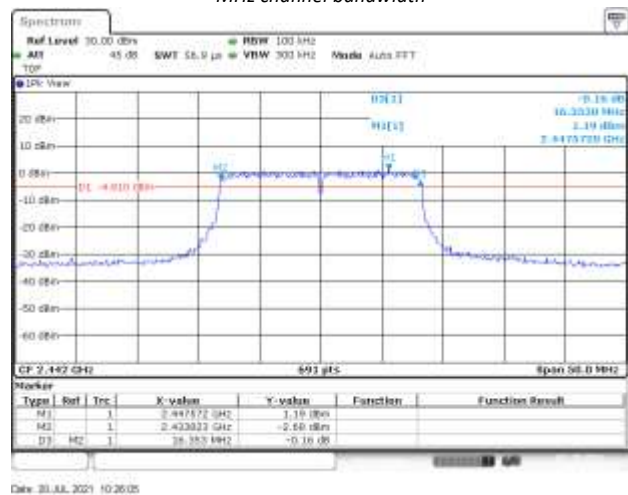
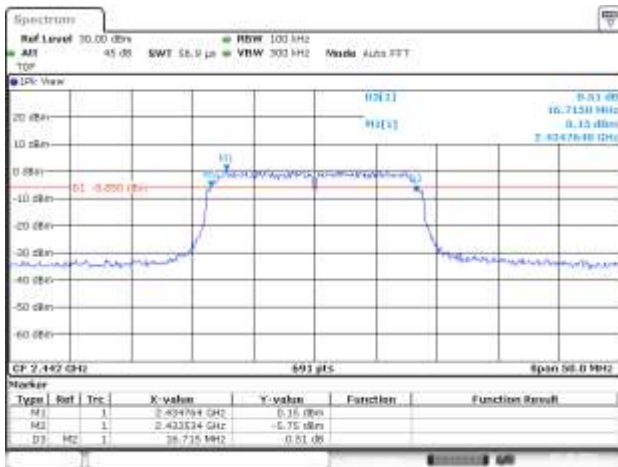


Figure 8.2-6: 6 dB occupied bandwidth, Mid channel, 802.11g 12Mbps



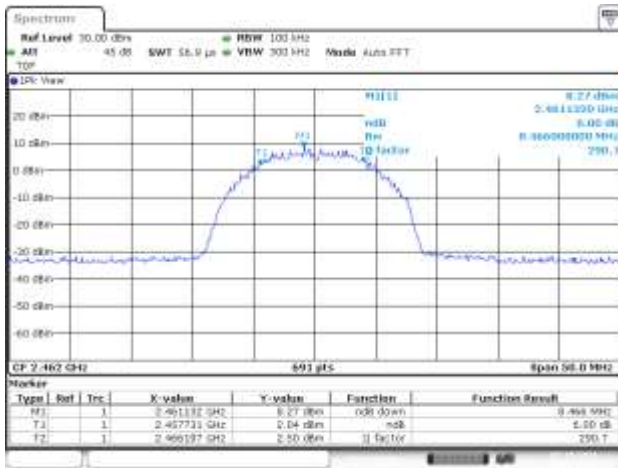
Date: 30.JUL.2021 10:27:49

Figure 8.2-7: 6 dB occupied bandwidth, Mid channel, 802.11n MCS1 20 MHz channel bandwidth



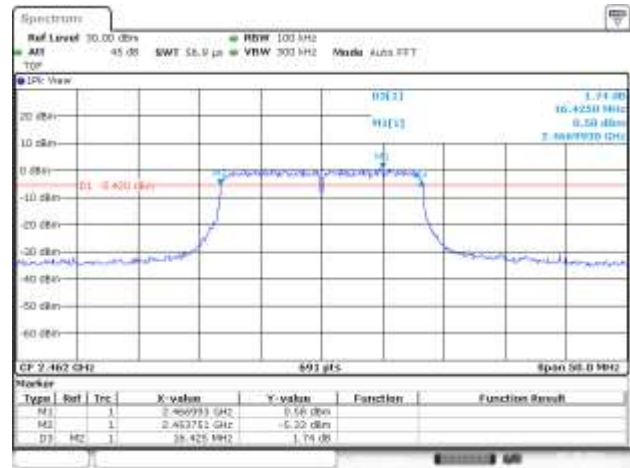
Date: 30.JUL.2021 10:41:37

Figure 8.2-8: 6 dB occupied bandwidth, Mid channel, 802.11n MCS1 40 MHz channel bandwidth



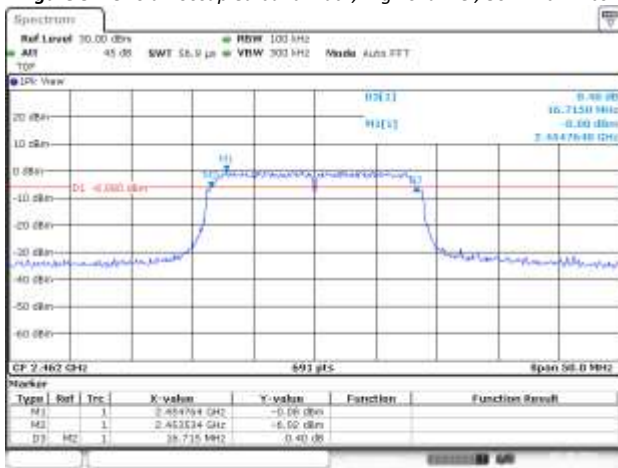
Date: 15.JUL.2021 09:36:35

Figure 8.2-9: 6 dB occupied bandwidth, High channel, 802.11b 2Mbps



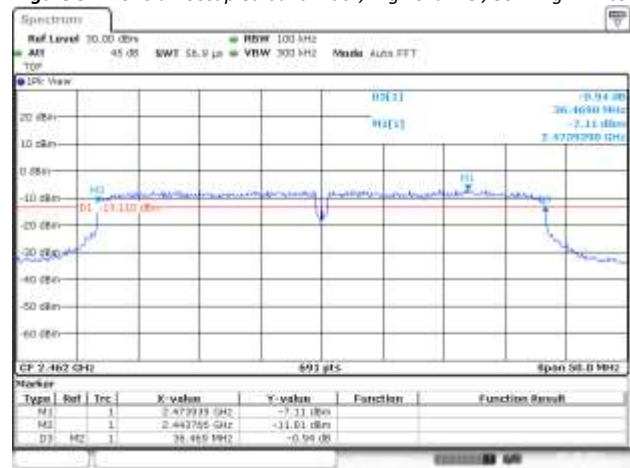
Date: 30.JUL.2021 10:40:43

Figure 8.2-10: 6 dB occupied bandwidth, High channel, 802.11g 12Mbps



Date: 30.JUL.2021 10:45:10

Figure 8.2-11: 6 dB occupied bandwidth, High channel, 802.11n MCS1 20 MHz channel bandwidth



Date: 30.JUL.2021 10:47:51

Figure 8.2-12: 6 dB occupied bandwidth, High channel, 802.11n MCS1 40 MHz channel bandwidth

8.3 FCC 15.247(b) and RSS-247 5.4 (4) Transmitter output power and e.i.r.p. requirements

8.3.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(b)(2) / (3)

- (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
- (3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 W (30 dBm). As an alternative to a peak power measurement, compliance with the one-Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
 - (4) The conducted output power limit specified in paragraph (b) of this Section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this Section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this Section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
 - (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 → §5.4(d)

- (d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

8.3.2 Test summary

Verdict	Pass		
Test date	July 14, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1006 mbar
Test location	Wireless bench (Conducted)	Relative humidity	71 %
Test date	July 20, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1004 mbar
Test location	Wireless bench (Conducted)	Relative humidity	61 %

8.3.3 Notes

Testing was performed with WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

The attenuation of the interconnecting cable was included in the power meter software as a correction factor.

The antenna gain is 3.6 dBi per client declaration.

EIRP = Conducted Power + Declared Antenna Gain

8.3.4 Setup details

EUT setup configuration	Table top
Test facility	Nemko San Diego
Measurement method	ANSI C63.10 §11.9.1.3 PKPM1 (Peak Power Meter) method

8.3.5 Test data

Table 8.3-1: Output power

Test Frequency (MHz)	Modulation scheme	Maximum Peak Conducted Output Power (dBm)	Conducted Limit (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
2412	802.11b 2 Mbs	18.56	30.0	3.6	22.16	36.0
2412	802.11g 12 Mbs	16.57	30.0	3.6	20.17	36.0
2412	802.11n MCS1 20 MHz channel bandwidth	16.22	30.0	3.6	19.82	36.0
2422	802.11n MCS1 40 MHz channel bandwidth	11.28	30.0	3.6	14.88	36.0
2442	802.11b 2 Mbs	17.73	30.0	3.6	21.33	36.0
2442	802.11g 12 Mbs	16.03	30.0	3.6	19.63	36.0
2442	802.11n MCS1 20 MHz channel bandwidth	15.57	30.0	3.6	19.17	36.0
2442	802.11n MCS1 40 MHz channel bandwidth	10.83	30.0	3.6	14.43	36.0
2462	802.11b 2 Mbs	18.30	30.0	3.6	21.9	36.0
2462	802.11g 12 Mbs	16.06	30.0	3.6	19.66	36.0
2462	802.11n MCS1 20 MHz channel bandwidth	15.73	30.0	3.6	19.33	36.0
2462	802.11n MCS1 40 MHz channel bandwidth	10.92	30.0	3.6	14.52	36.0

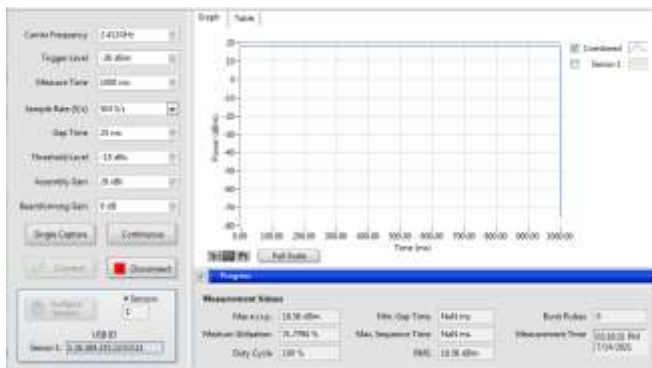


Figure 8.3-1: Output power, Low channel 802.11b 2Mbs

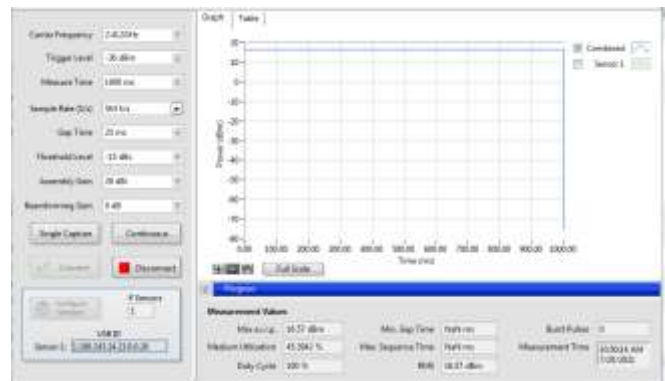


Figure 8.3-2: Output power, Low channel 802.11g 12Mbs

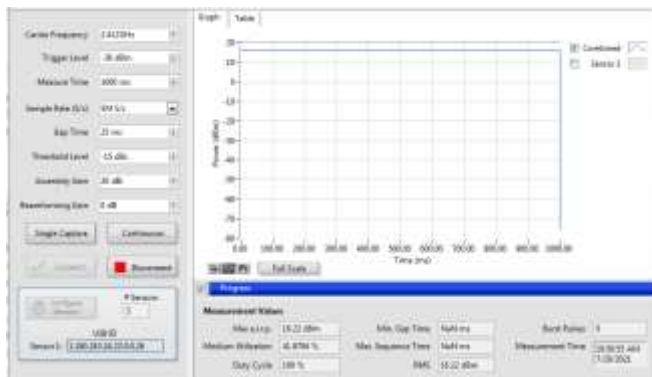


Figure 8.3-3: Output power, Low channel 802.11n MCS1 20 MHz channel bandwidth



Figure 8.3-4: Output power, Low channel 802.11n MCS1 40 MHz channel bandwidth

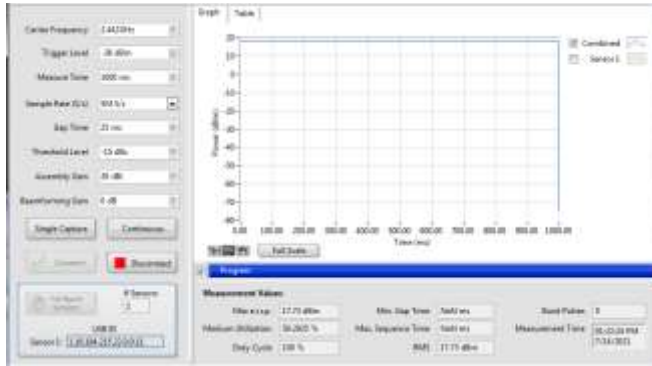


Figure 8.3-5: Output power, Mid channel 802.11b 2Mbps

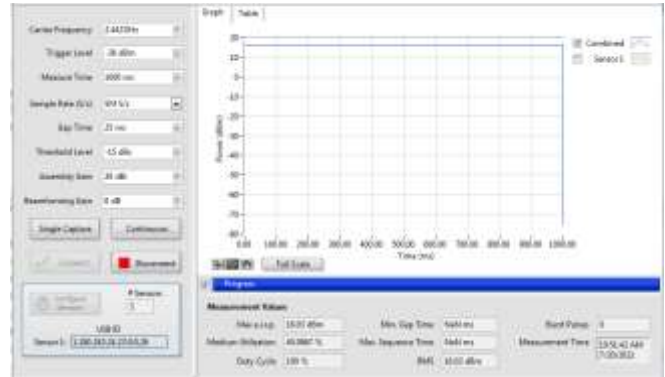


Figure 8.3-6: Output power, Mid channel 802.11g 12Mbps

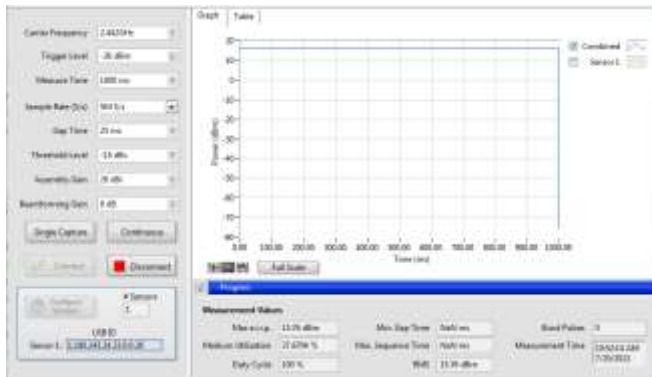


Figure 8.3-7: Output power, Mid channel 802.11n MCS1 20 MHz channel bandwidth

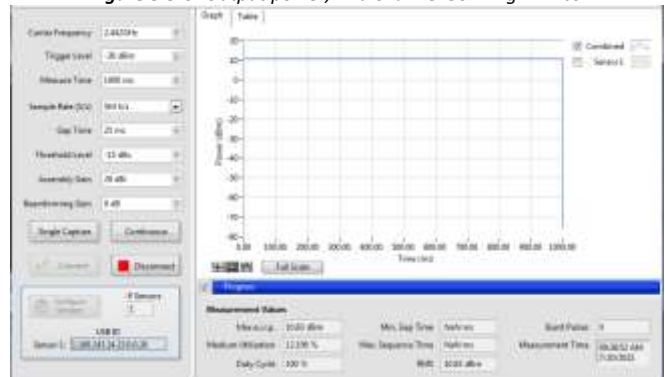


Figure 8.3-8: Output power, Mid channel 802.11n MCS1 40 MHz channel bandwidth

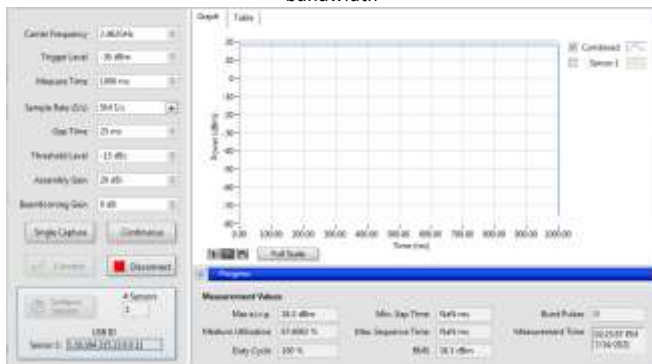


Figure 8.3-9: Output power, High channel 802.11b 2Mbps

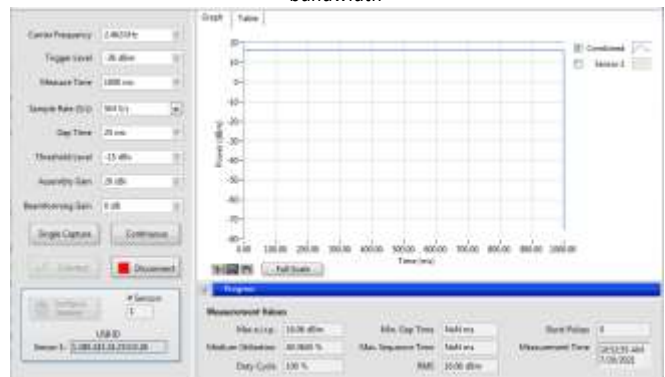


Figure 8.3-10: Output power, High channel 802.11g 12Mbps

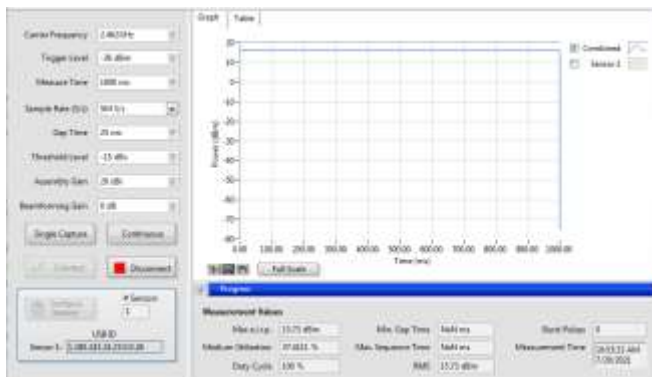


Figure 8.3-11: Output power, High channel 802.11n MCS1 20 MHz channel bandwidth

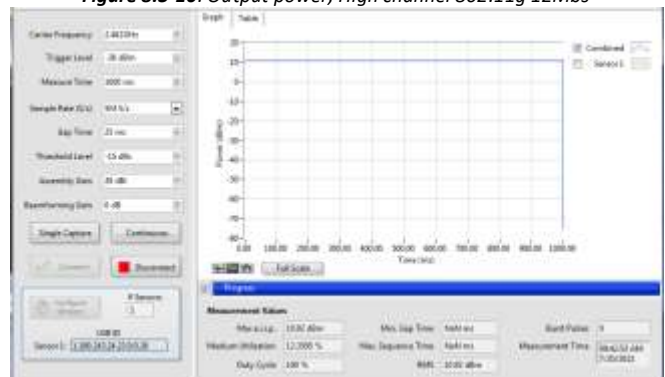


Figure 8.3-12: Output power, High channel 802.11n MCS1 40 MHz channel bandwidth

8.4 FCC Part 15.247(d) and RSS-247 5.5 Conducted band-edge spurious emissions

8.4.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(d)

- (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RSS-247 → §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.4.2 Test summary

Verdict	Pass		
Test date	July 15, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1007 mbar
Test location	Wireless bench (Conducted)	Relative humidity	64 %
Test date	July 20, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1004 mbar
Test location	Wireless bench (Conducted)	Relative humidity	61 %

8.4.3 Notes

Testing was performed with WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

For conducted measurements, the loss of the connected cable and attenuator was input into the spectrum analyzer as a transducer factor.

8.4.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless bench
Measurement details	Conducted band edge measurement performed as per C63.10 §6.10.4

Spectrum analyzer settings for conducted spurious emissions:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.4.5 Test data

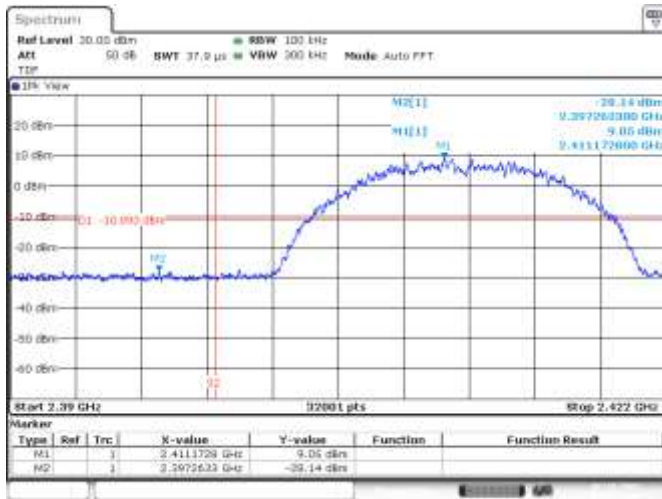


Figure 8.4-1: Band edge measurement, Low channel 802.11b 2Mbps

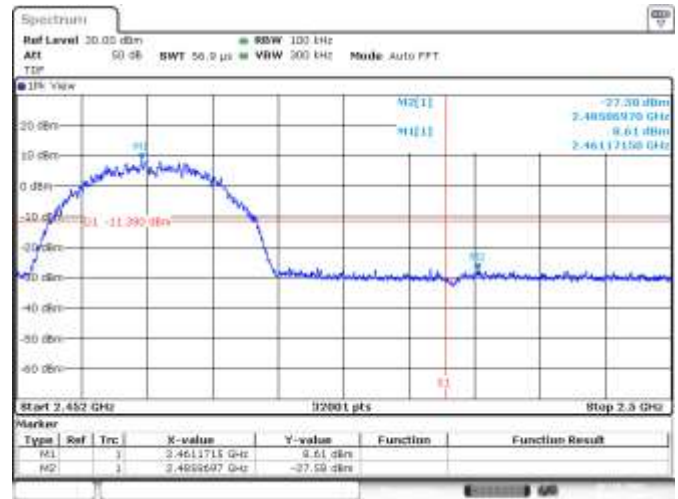


Figure 8.4-2: Band edge measurement, High channel 802.11b 2Mbps

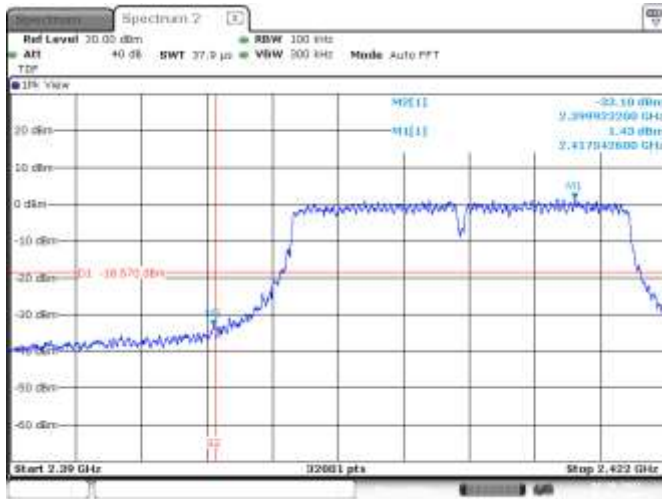


Figure 8.4-3: Band edge measurement, Low channel 802.11g 12Mbps

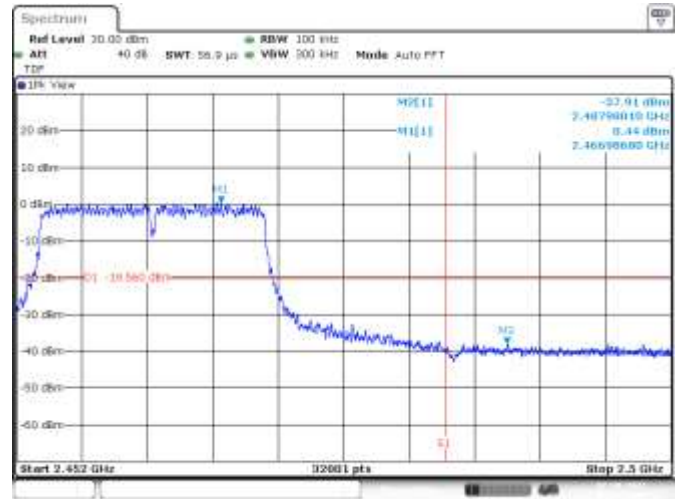
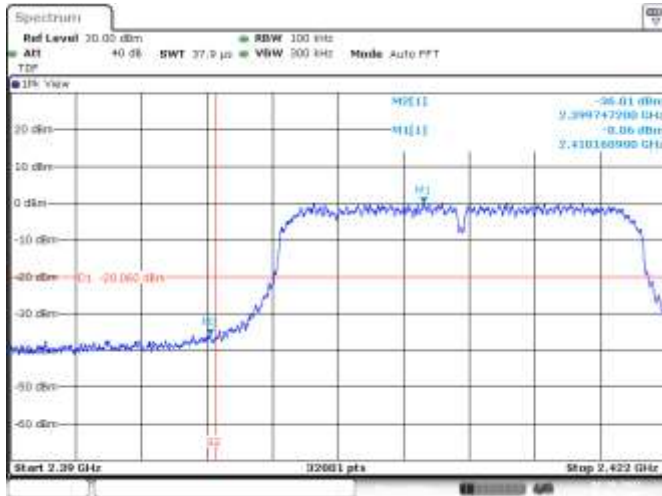
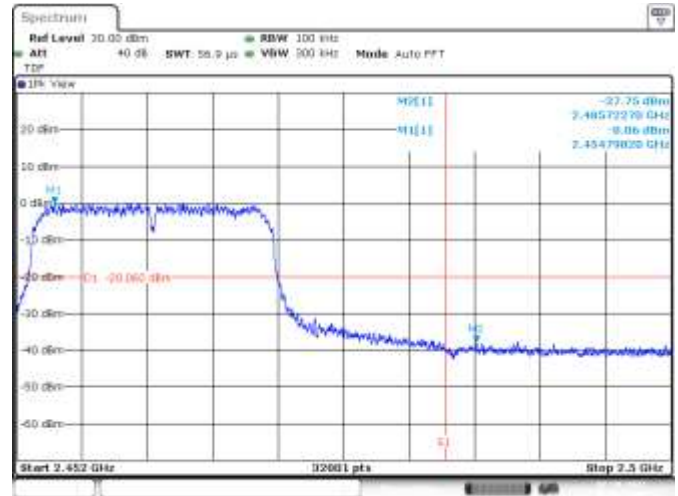


Figure 8.4-4: Band edge measurement, High channel 802.11g 12Mbps



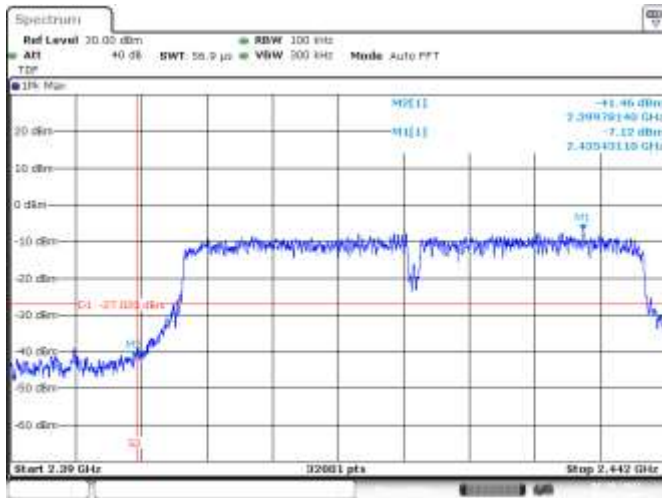
Date: 20 Jul 2021 12:40:14

Figure 8.4-5: Band edge measurement, Low channel 802.11n MCS1 20 MHz channel bandwidth



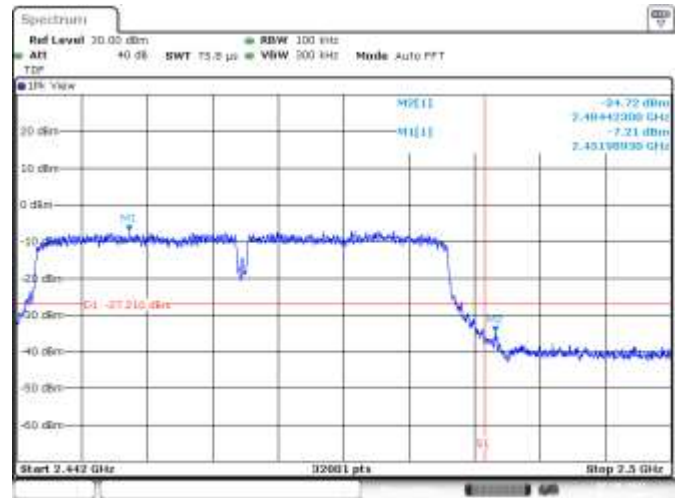
Date: 20 Jul 2021 12:49:54

Figure 8.4-6: Band edge measurement, High channel 802.11n MCS1 20 MHz channel bandwidth



Date: 20 Jul 2021 12:42:51

Figure 8.4-7: Band edge measurement, Low channel 802.11n MCS1 40 MHz channel bandwidth



Date: 20 Jul 2021 12:51:13

Figure 8.4-8: Band edge measurement, High channel 802.11n MCS1 40 MHz channel bandwidth

8.5 FCC 15.247(d) and RSS-247 5.5 Conducted spurious emissions

8.5.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(d)

- (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RSS-247 → §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.5.1 Test summary

Verdict	Pass		
Test date	July 15, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1007 mbar
Test location	Wireless bench (Conducted)	Relative humidity	64 %
Test date	July 20, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1004 mbar
Test location	Wireless bench (Conducted)	Relative humidity	61 %

8.5.2 Notes

Testing was performed with WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

The spectrum was search from 30 MHz to 26 GHz (above the 10th harmonic of the highest transmit frequency of 2462 MHz).

For conducted measurements, the loss of the connected cable and attenuator was input into the spectrum analyzer as a transducer factor.

In each measurement, the limit was derived by subtracting 20 dB from a power spectral density reference measurement.

8.5.3 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless bench
Measurement details	Conducted spurious emissions measurement performed as per C63.10 §11.11.3

Spectrum analyzer settings for conducted spurious emissions:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.5.4 Test data

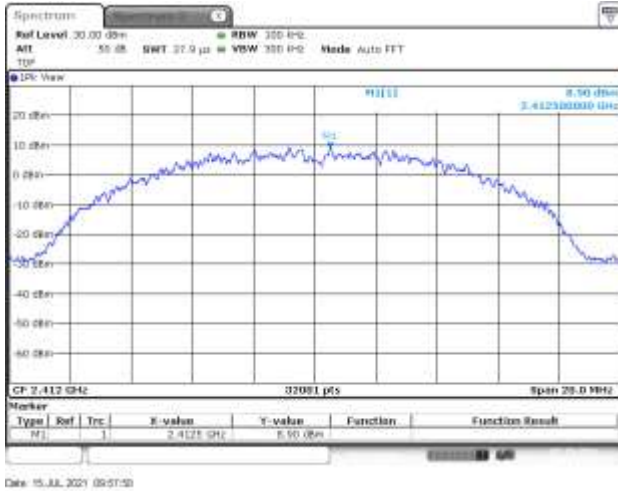


Figure 8.5-1: Conducted spurious reference, Low channel 802.11b 2Mbs

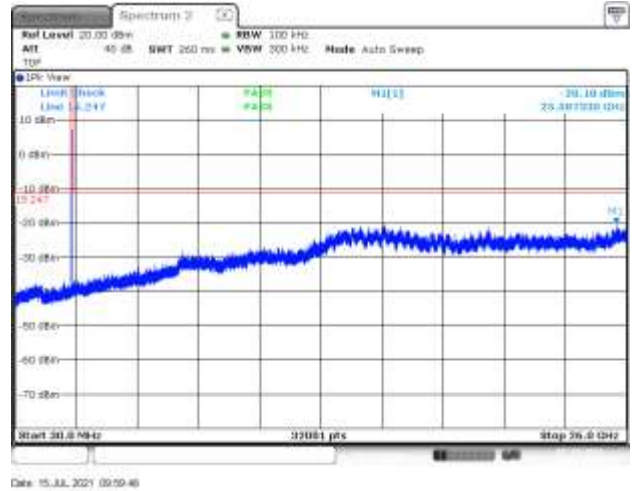


Figure 8.5-2: Conducted spurious emissions, Low channel 802.11b 2Mbs

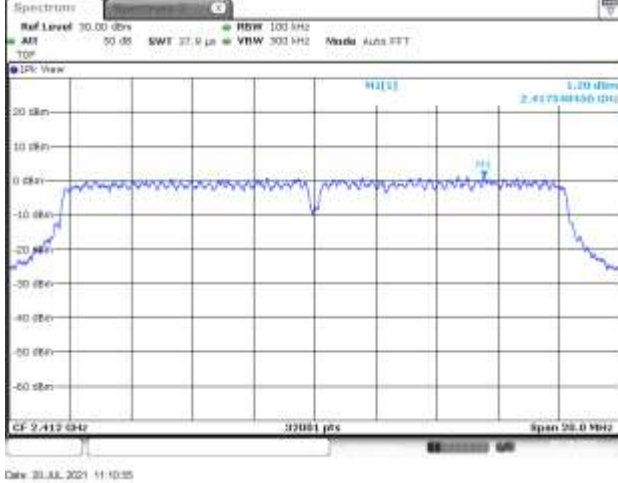


Figure 8.5-3: Conducted spurious reference, Low channel 802.11g 12Mbs

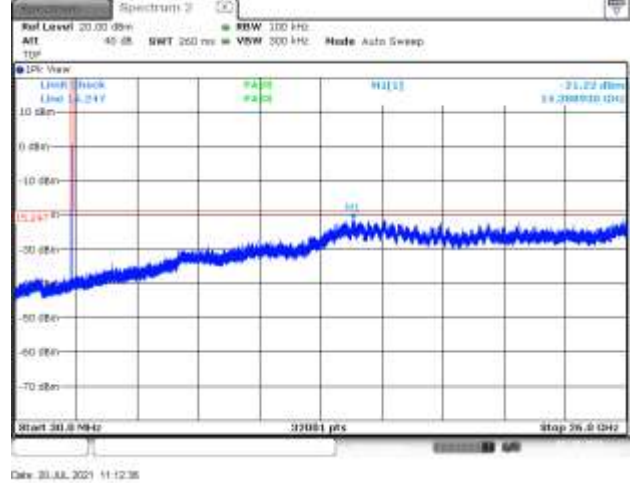


Figure 8.5-4: Conducted spurious emissions, Low channel 802.11g 12Mbs

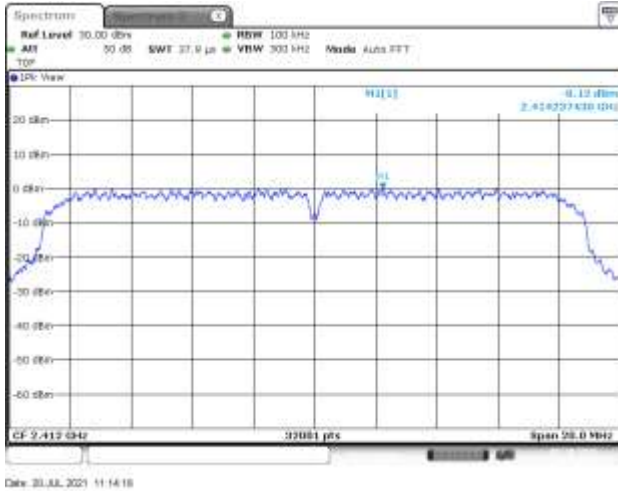


Figure 8.5-5: Conducted spurious reference, Low channel 802.11n MCS1 20 MHz channel bandwidth

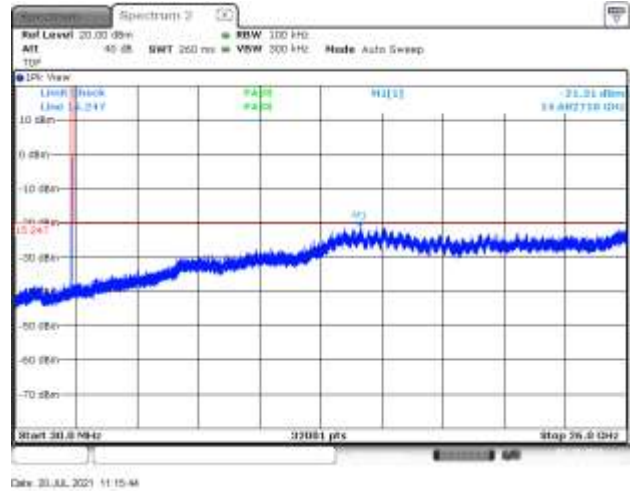
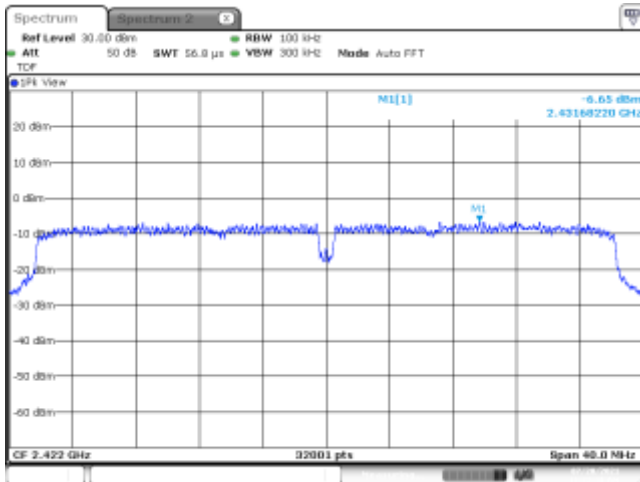
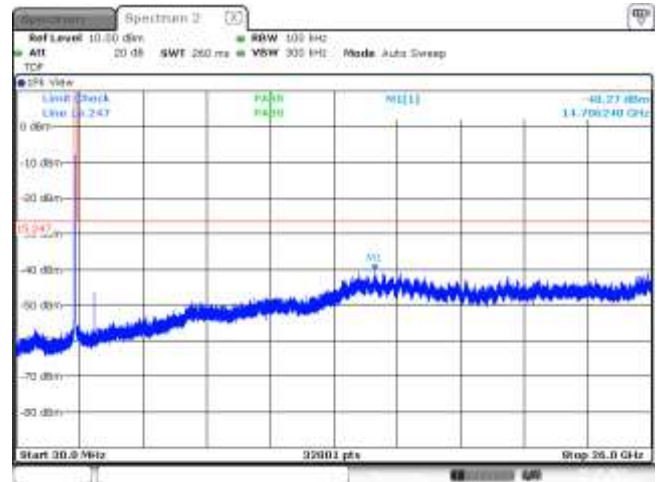


Figure 8.5-6: Conducted spurious emissions, Low channel 802.11n MCS1 20 MHz channel bandwidth



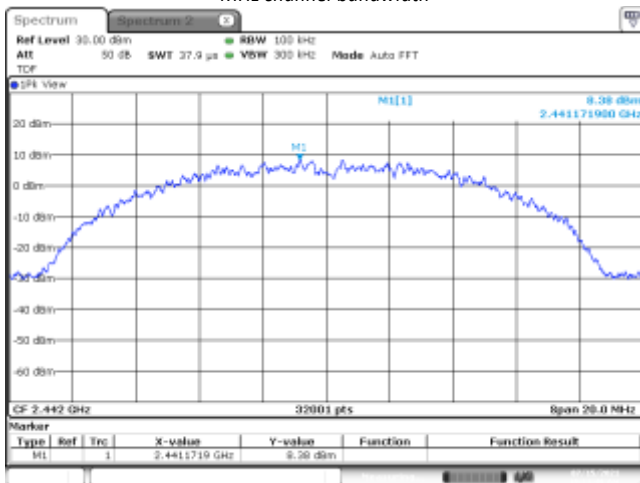
Date: 20.JUL.2021 11:22:19

Figure 8.5-7: Conducted spurious reference, Low channel 802.11n MCS1 40 MHz channel bandwidth



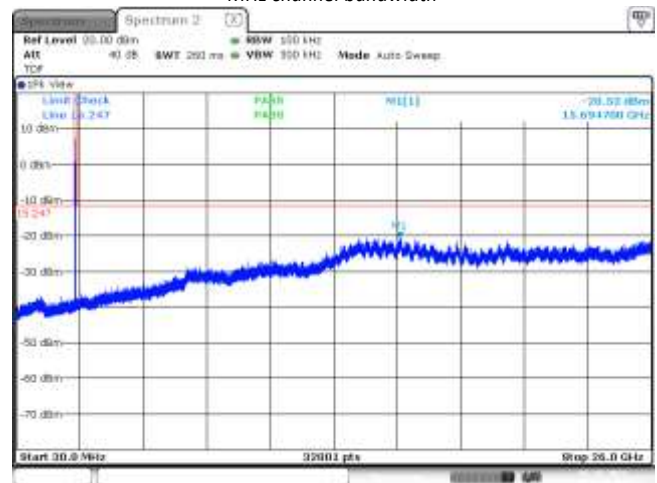
Date: 20.JUL.2021 11:25:41

Figure 8.5-8: Conducted spurious emissions, Low channel 802.11n MCS1 40 MHz channel bandwidth



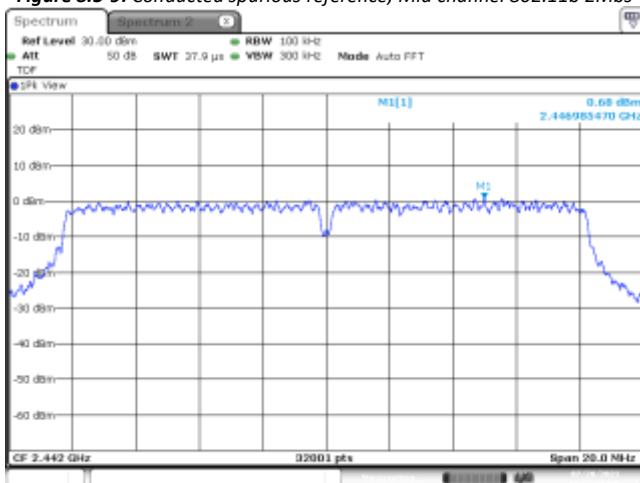
Date: 15.JUL.2021 10:13:40

Figure 8.5-9: Conducted spurious reference, Mid channel 802.11b 2Mbps



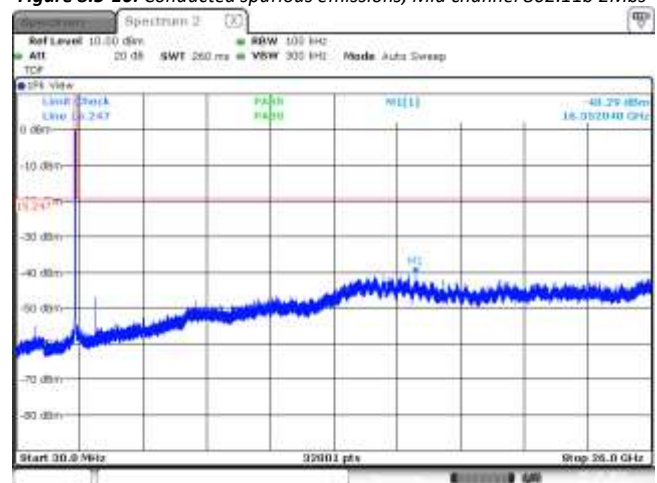
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Figure 8.5-10: Conducted spurious emissions, Mid channel 802.11b 2Mbps



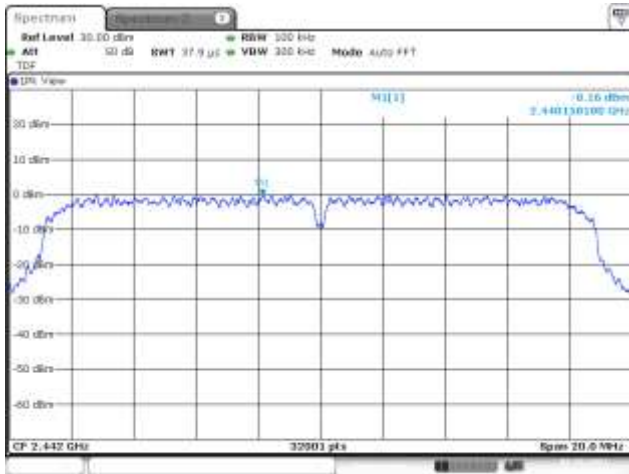
Date: 20.JUL.2021 11:27:29

Figure 8.5-11: Conducted spurious reference, Mid channel 802.11g 12Mbps



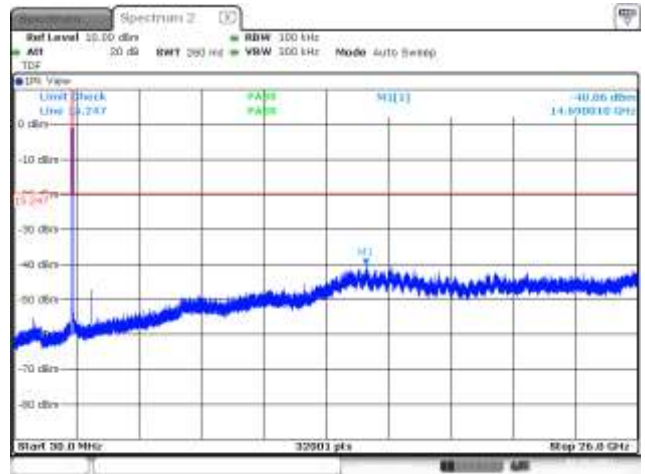
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Figure 8.5-12: Conducted spurious emissions, Mid channel 802.11g 12Mbps



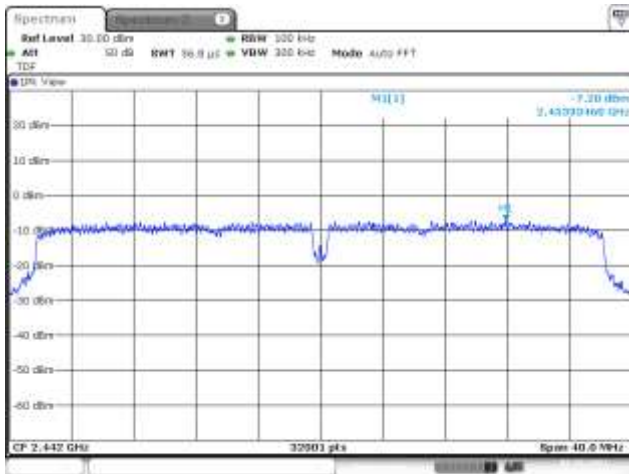
Date: 20 JUL 2021 11:30:25

Figure 8.5-13: Conducted spurious reference, Mid channel 802.11n MCS1 20 MHz channel bandwidth



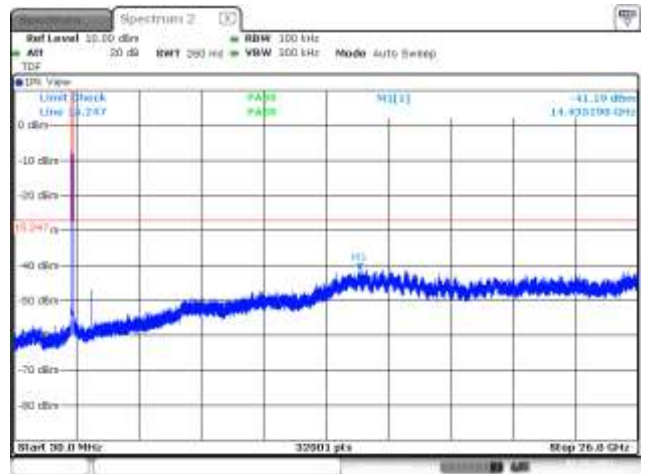
Date: 20 JUL 2021 11:30:18

Figure 8.5-14: Conducted spurious emissions, Mid channel 802.11n MCS1 20 MHz channel bandwidth



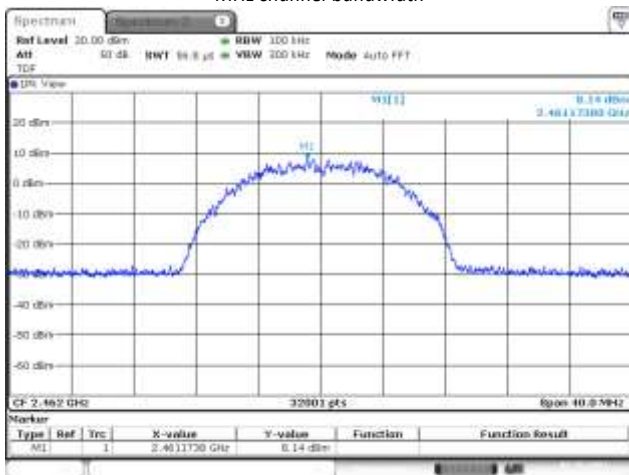
Date: 20 JUL 2021 11:35:29

Figure 8.5-15: Conducted spurious reference, Mid channel 802.11n MCS1 40 MHz channel bandwidth



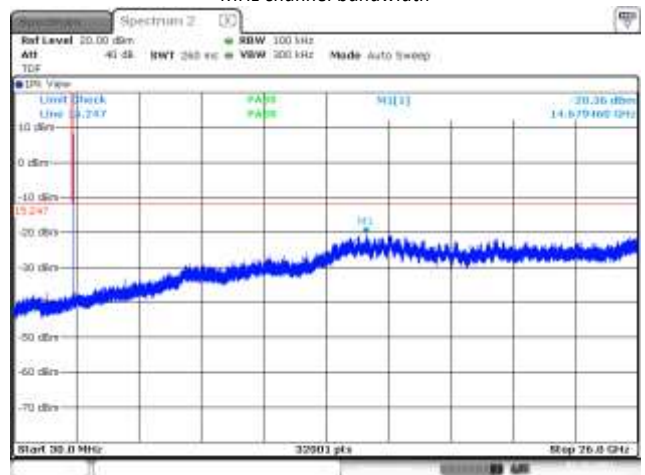
Date: 20 JUL 2021 11:34:45

Figure 8.5-16: Conducted spurious emissions, Mid channel 802.11n MCS1 40 MHz channel bandwidth



Date: 18 JUL 2021 10:29:22

Figure 8.5-17: Conducted spurious reference, High channel 802.11b 2Mbps



Date: 18 JUL 2021 10:30:05

Figure 8.5-18: Conducted spurious emissions, High channel 802.11b 2Mbps

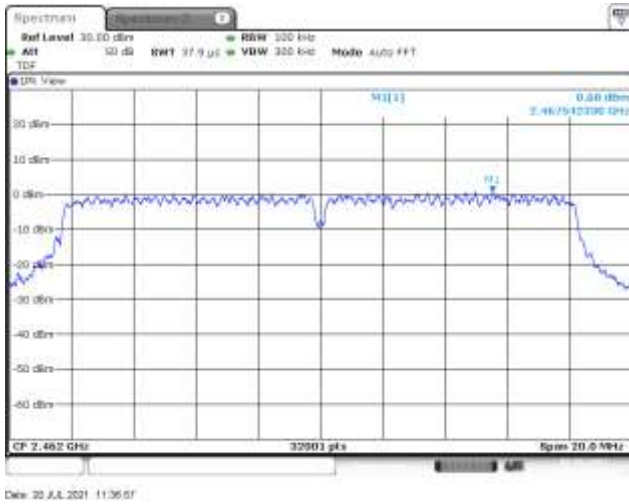


Figure 8.5-19: Conducted spurious reference, High channel 802.11g 12Mbps

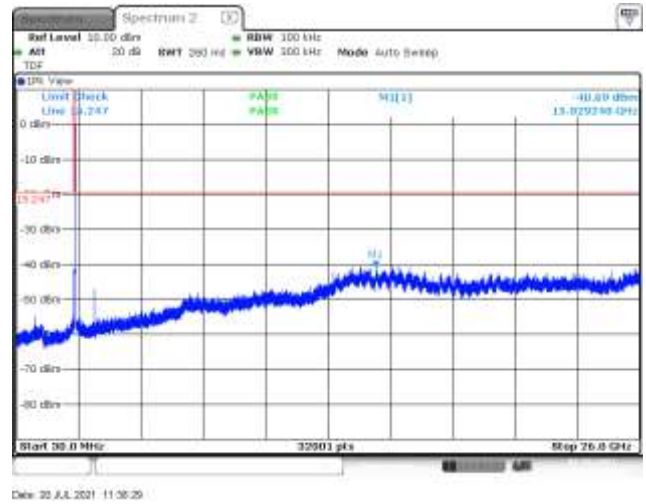


Figure 8.5-20: Conducted spurious emissions, High channel 802.11g 12Mbps

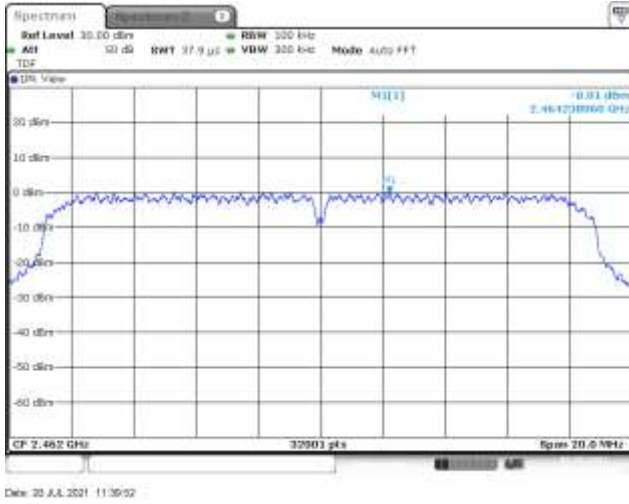


Figure 8.5-21: Conducted spurious reference, High channel 802.11n MCS1 20 MHz channel bandwidth

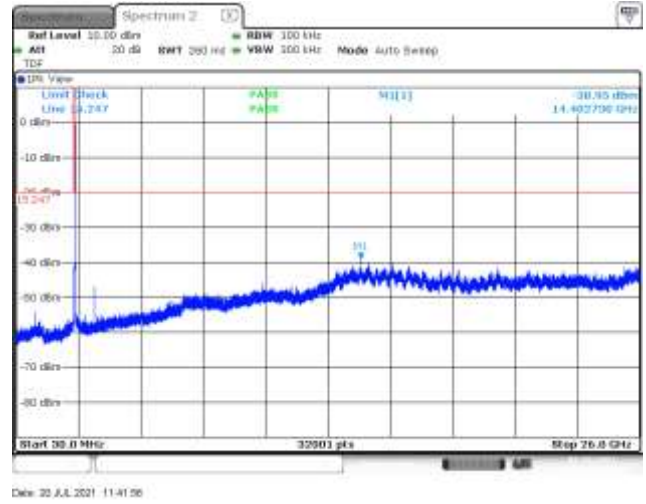


Figure 8.5-22: Conducted spurious emissions, High channel 802.11n MCS1 20 MHz channel bandwidth

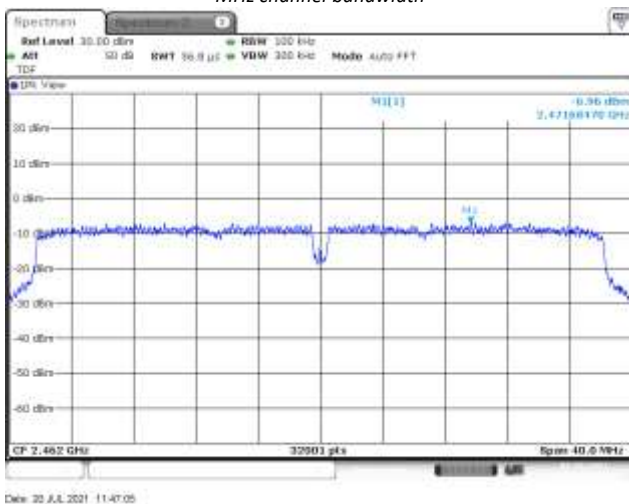


Figure 8.5-23: Conducted spurious reference, High channel 802.11n MCS1 40 MHz channel bandwidth

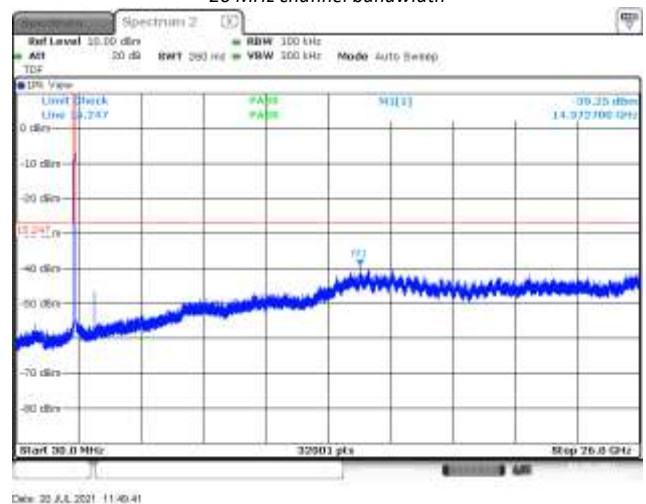


Figure 8.5-24: Conducted spurious emissions, High channel 802.11n MCS1 40 MHz channel bandwidth

8.6 FCC 15.247(d) and RSS-247 5.5 Radiated restricted band-edges and spurious emission

8.6.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(d)

- (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RSS-247 → §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.6-1: FCC §15.209– 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 × log ₁₀ (F)	300
0.490–1.705	24000/F	87.6 – 20 × 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.

Table 8.6-2: 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

Verdict	Pass		
Test date	July 16, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1006 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	64 %
Test date	July 19, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1008 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	61 %
Test date	July 21, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1003 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	63 %
Test date	July 23, 2021	Temperature	24 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1006 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	62 %
Test date	July 26, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1005 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	70 %
Test date	July 27, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1007 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	70 %
Test date	July 29, 2021	Temperature	22 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1005 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	69 %
Test date	July 30, 2021	Temperature	21 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1005 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	71 %
Test date	August 3, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1006 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	63 %

8.6.3 Notes

Testing was performed with WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

The spectrum was search from 30 MHz to 26 GHz (above the 10th harmonic of the highest transmit frequency of 2462 MHz).

Radiated measurements were performed at a 3 m measurement distance.

8.6.4 Setup details

EUT setup configuration	Tabletop
Test facility	Nemko San Diego
Measurement details	Radiated spurious emissions measurement performed as per C63.10 §11.12

Receiver settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurements) Quasi-Peak (final measurements)
Trace mode	Max Hold

Receiver settings for radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Average and peak (final measurements)
Trace mode	Max Hold

8.6.5 Test data

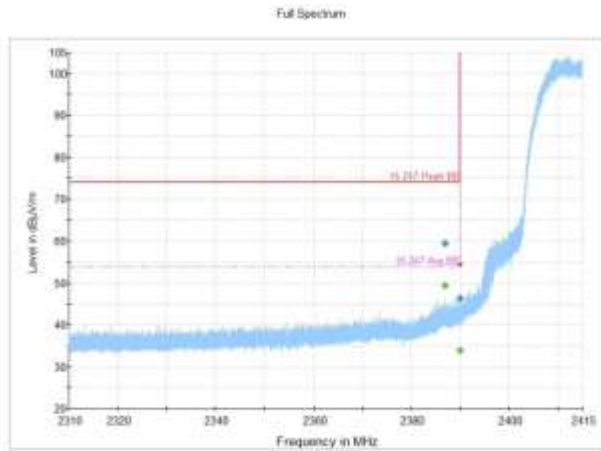


Figure 8.6-1: Restricted band edge spectral plot, Low channel 802.11b 2Mbps

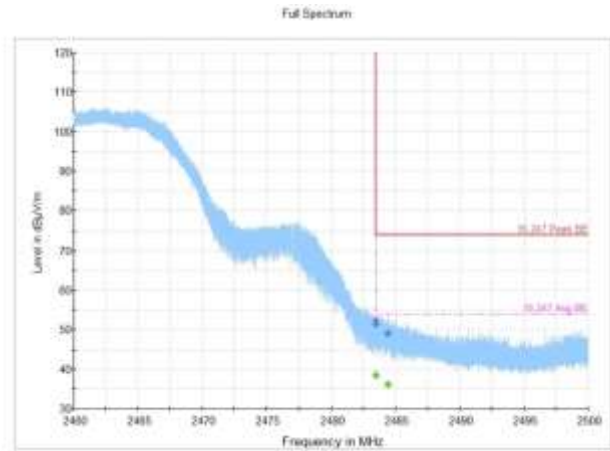


Figure 8.6-2: Restricted band edge spectral plot, High channel 802.11b 2Mbps

Table 8.6-2: Restricted band edge tabular data, Low channel 802.11b 2Mbps

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2386.821500	---	49.47	53.90	4.43	5000.0	1000.000	297.0	H	196.0	-9.1
2386.821500	59.44	---	73.90	14.46	5000.0	1000.000	297.0	H	196.0	-9.1
2390.000000	---	33.83	53.90	20.07	5000.0	1000.000	305.0	H	316.0	-9.1
2390.000000	46.41	---	73.90	27.49	5000.0	1000.000	305.0	H	316.0	-9.1

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

Table 8.6-3: Restricted band edge tabular data, High channel 802.11b 2Mbps

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	---	38.33	53.90	15.57	5000.0	1000.000	281.0	H	188.0	-8.7
2483.500000	51.31	---	73.90	22.59	5000.0	1000.000	281.0	H	188.0	-8.7
2484.384000	---	36.18	53.90	17.72	5000.0	1000.000	124.0	V	85.0	-8.7
2484.384000	49.06	---	73.90	24.84	5000.0	1000.000	124.0	V	85.0	-8.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

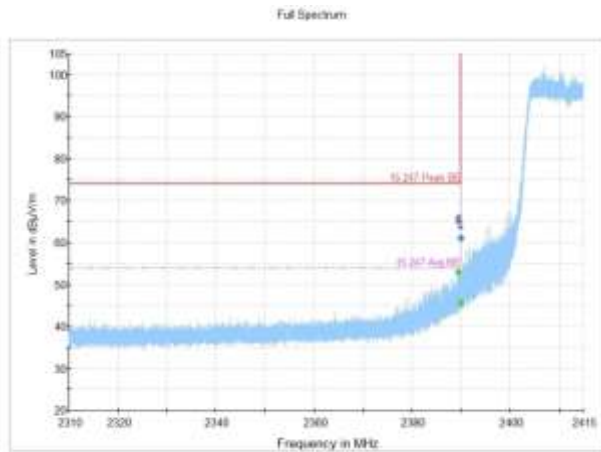


Figure 8.6-3: Restricted band edge spectral plot, Low channel 802.11g 12Mbs

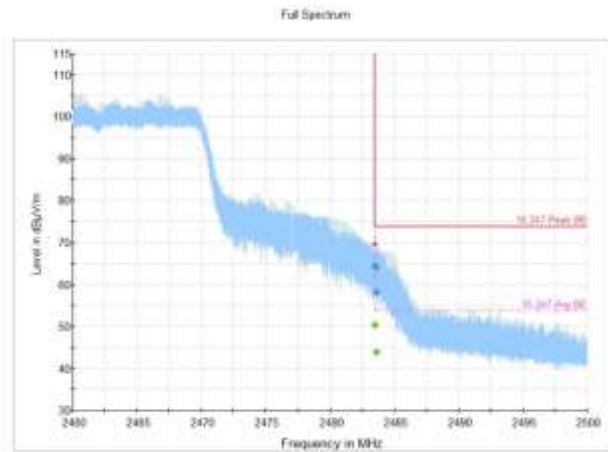


Figure 8.6-4: Restricted band edge spectral plot, High channel 802.11g 12Mbs

Table 8.6-4: Restricted band edge tabular data, Low channel 802.11g 12Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.562000	---	53.10	53.90	0.80	5000.0	1000.000	304.0	H	185.0	-9.1
2389.562000	65.19	---	73.90	8.71	5000.0	1000.000	304.0	H	185.0	-9.1
2390.000000	---	45.68	53.90	8.22	5000.0	1000.000	245.0	H	194.0	-9.1
2390.000000	61.07	---	73.90	12.83	5000.0	1000.000	245.0	H	194.0	-9.1

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

Table 8.6-5: Restricted band edge tabular data, High channel 802.11g 12Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	---	50.31	53.90	3.59	5000.0	1000.000	285.0	H	183.0	-8.7
2483.500000	64.51	---	73.90	9.39	5000.0	1000.000	285.0	H	183.0	-8.7
2483.586667	---	43.94	53.90	9.96	5000.0	1000.000	102.0	V	229.0	-8.7
2483.586667	58.19	---	73.90	15.71	5000.0	1000.000	102.0	V	229.0	-8.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

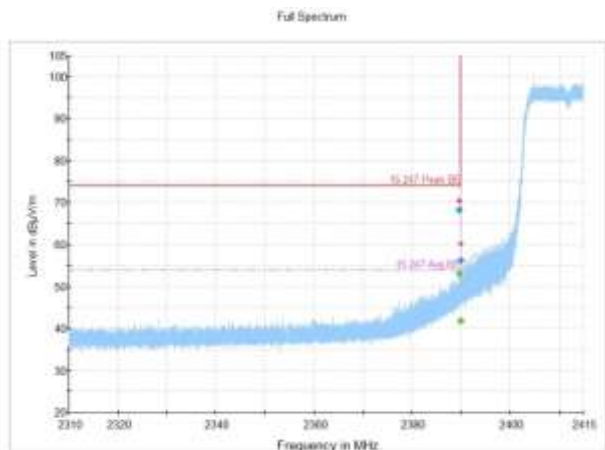


Figure 8.6-5: Restricted band edge spectral plot, Low channel 802.11n MCS1 20 MHz channel bandwidth

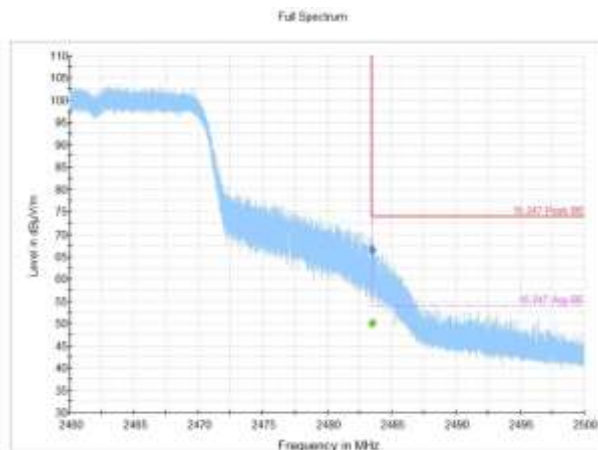


Figure 8.6-6: Restricted band edge spectral plot, High channel 802.11n MCS1 20 MHz channel bandwidth

Table 8.6-6: Restricted band edge tabular data, Low channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.705500	---	53.26	53.90	0.64	5000.0	1000.000	298.0	H	192.0	-9.1
2389.705500	68.22	---	73.90	5.68	5000.0	1000.000	298.0	H	192.0	-9.1
2390.000000	---	41.85	53.90	12.05	5000.0	1000.000	98.0	H	335.0	-9.1
2390.000000	56.24	---	73.90	17.66	5000.0	1000.000	98.0	H	335.0	-9.1

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

Table 8.6-7: Restricted band edge tabular data, High channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	---	49.90	53.90	4.00	5000.0	1000.000	123.0	V	96.0	-8.7
2483.500000	66.42	---	73.90	7.48	5000.0	1000.000	123.0	V	96.0	-8.7
2483.505333	---	50.19	53.90	3.71	5000.0	1000.000	124.0	V	48.0	-8.7
2483.505333	66.45	---	73.90	7.45	5000.0	1000.000	124.0	V	48.0	-8.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

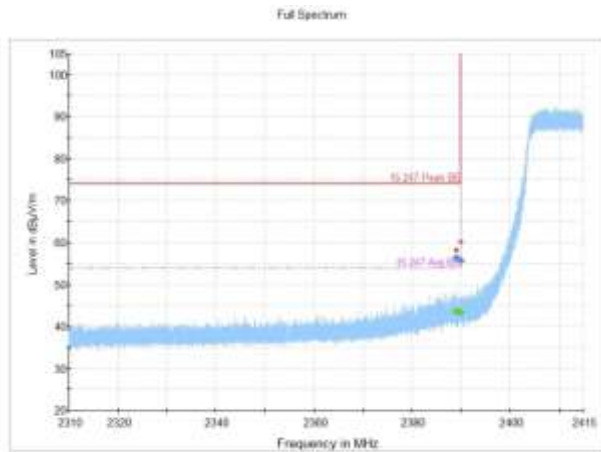


Figure 8.6-7: Restricted band edge spectral plot, Low channel 802.11n MCS1 40 MHz channel bandwidth

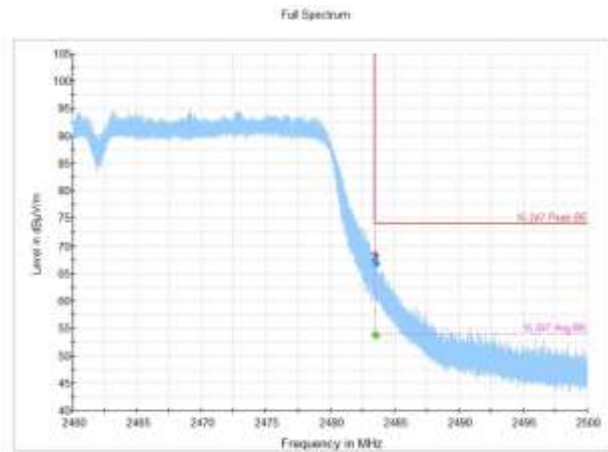


Figure 8.6-8: Restricted band edge spectral plot, High channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-8: Restricted band edge tabular data, Low channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.061500	---	43.57	53.90	10.33	5000.0	1000.000	136.0	V	154.0	-9.1
2389.061500	56.37	---	73.90	17.53	5000.0	1000.000	136.0	V	154.0	-9.1
2390.000000	---	43.40	53.90	10.50	5000.0	1000.000	98.0	V	34.0	-9.1
2390.000000	55.81	---	73.90	18.09	5000.0	1000.000	98.0	V	34.0	-9.1

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

Table 8.6-9: Restricted band edge tabular data, High channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	---	53.77	53.90	0.13	5000.0	1000.000	101.0	V	32.0	-8.7
2483.500000	67.53	---	73.90	6.37	5000.0	1000.000	101.0	V	32.0	-8.7
2483.600000	---	53.69	53.90	0.21	5000.0	1000.000	101.0	V	34.0	-8.7
2483.600000	66.80	---	73.90	7.10	5000.0	1000.000	101.0	V	34.0	-8.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB) - preamp (dB)

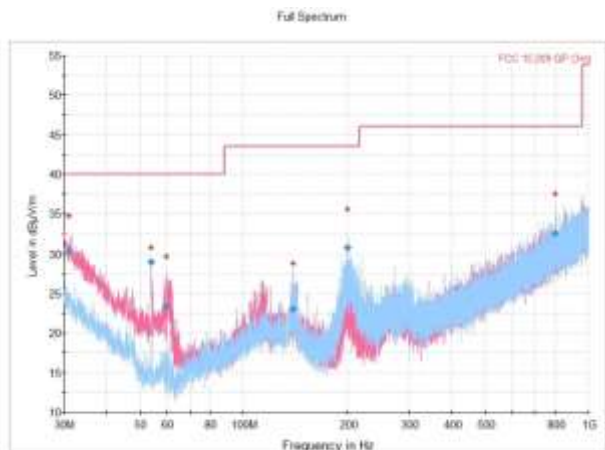


Figure 8.6-9: Radiated spurious emissions 30-1000 MHz, Low channel 802.11b 2Mbs

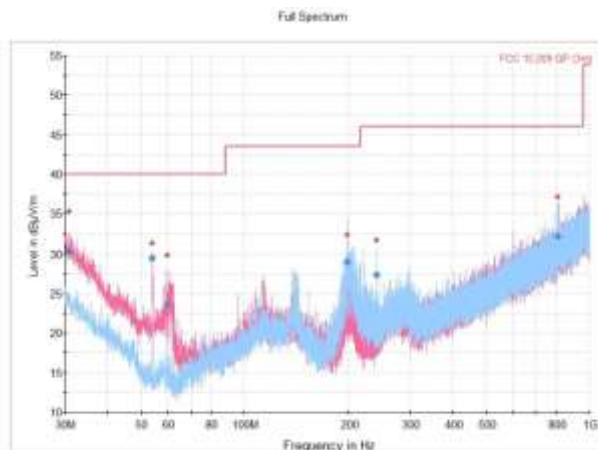


Figure 8.6-10: Radiated spurious emissions 30-1000 MHz, Mid channel 802.11b 2Mbs

Table 8.6-10: Radiated spurious emissions tabular data, Low channel 802.11b 2Mbs

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.061333	30.32	40.00	9.68	5000.0	120.000	113.0	V	198.0	25.9
54.019000	29.04	40.00	10.96	5000.0	120.000	100.0	V	254.0	14.2
59.509667	23.42	40.00	16.58	5000.0	120.000	134.0	V	210.0	12.7
138.643000	23.09	43.50	20.41	5000.0	120.000	186.0	H	30.0	19.6
199.936667	30.86	43.50	12.64	5000.0	120.000	147.0	H	260.0	17.8
802.637667	32.61	46.00	13.39	5000.0	120.000	313.0	H	33.0	31.8

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Table 8.6-11: Radiated spurious emissions tabular data, Mid channel 802.11b 2Mbs

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.967000	30.33	40.00	9.67	5000.0	120.000	100.0	V	220.0	26.0
54.011333	29.51	40.00	10.49	5000.0	120.000	100.0	V	231.0	14.2
59.578667	23.71	40.00	16.29	5000.0	120.000	135.0	V	252.0	12.7
197.818000	28.97	43.50	14.53	5000.0	120.000	154.0	H	265.0	17.7
239.985000	27.38	46.00	18.62	5000.0	120.000	117.0	H	273.0	19.9
810.043667	32.28	46.00	13.72	5000.0	120.000	398.0	H	91.0	31.9

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

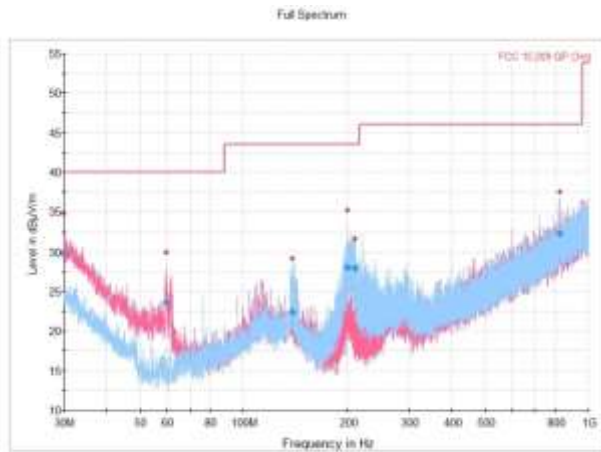


Figure 8.6-11: Radiated spurious emissions 30-1000 MHz, High channel 802.11b 2Mbs

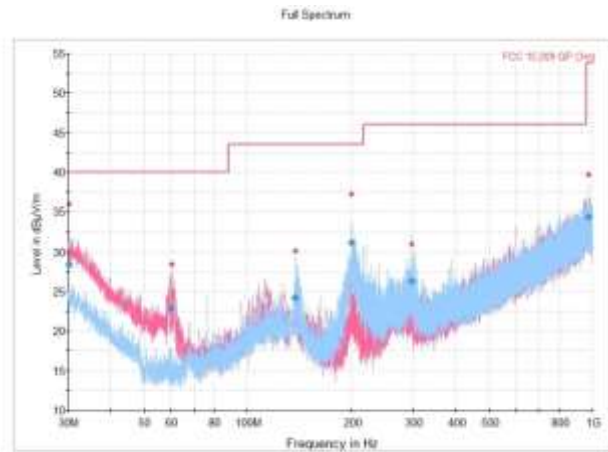


Figure 8.6-12: Radiated spurious emissions 30-1000 MHz, Low channel 802.11g 12Mbs

Table 8.6-12: Radiated spurious emissions tabular data, High channel 802.11b 2Mbs

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.060000	29.90	40.00	10.10	5000.0	120.000	107.0	V	141.0	26.5
59.760667	23.64	40.00	16.36	5000.0	120.000	145.0	V	232.0	12.7
138.042333	22.42	43.50	21.08	5000.0	120.000	260.0	H	20.0	19.7
199.300333	28.09	43.50	15.41	5000.0	120.000	128.0	H	233.0	17.7
209.699000	28.00	43.50	15.50	5000.0	120.000	120.0	H	259.0	18.2
824.655000	32.38	46.00	13.62	5000.0	120.000	258.0	H	244.0	32.5

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Table 8.6-13: Radiated spurious emissions tabular data, Low channel 802.11g 12Mbs

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.300000	28.41	40.00	11.59	5000.0	120.000	202.0	V	196.0	26.4
60.272000	22.90	40.00	17.10	5000.0	120.000	132.0	V	273.0	12.7
137.580333	24.22	43.50	19.28	5000.0	120.000	178.0	H	22.0	19.7
199.259333	31.19	43.50	12.31	5000.0	120.000	104.0	H	252.0	17.7
299.659667	26.34	46.00	19.66	5000.0	120.000	107.0	H	277.0	22.0
973.385000	34.37	53.90	19.53	5000.0	120.000	318.0	H	161.0	34.5

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

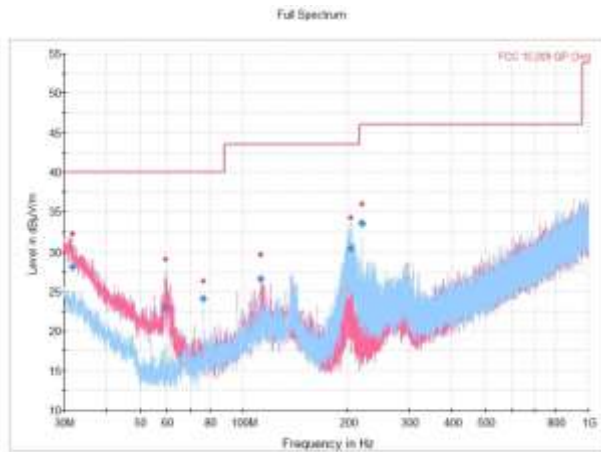


Figure 8.6-13: Radiated spurious emissions 30-1000 MHz, Mid channel 802.11g 12Mbs

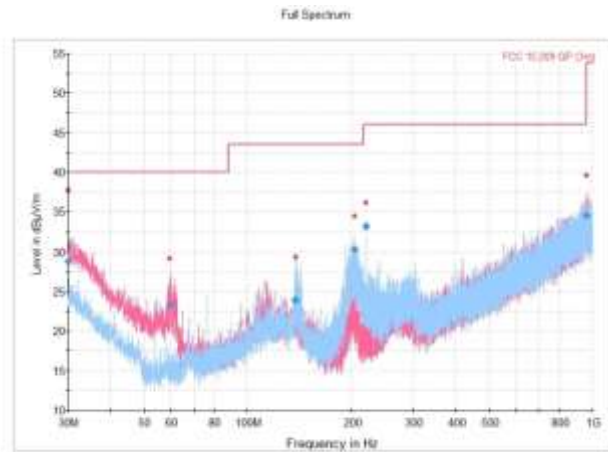


Figure 8.6-14: Radiated spurious emissions 30-1000 MHz, High channel 802.11g 12Mbs

Table 8.6-14: Radiated spurious emissions tabular data, Mid channel 802.11g 12Mbs

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.932000	28.12	40.00	11.88	5000.0	120.000	159.0	V	176.0	25.4
59.474000	23.01	40.00	16.99	5000.0	120.000	135.0	V	44.0	12.7
76.321333	24.13	40.00	15.87	5000.0	120.000	241.0	H	0.0	14.5
112.009667	26.63	43.50	16.87	5000.0	120.000	382.0	V	244.0	18.9
203.730000	30.42	43.50	13.08	5000.0	120.000	145.0	H	269.0	18.0
219.428667	33.60	46.00	12.40	5000.0	120.000	128.0	H	258.0	18.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Table 8.6-15: Radiated spurious emissions tabular data, High channel 802.11g 12Mbs

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.220000	28.78	40.00	11.22	5000.0	120.000	176.0	V	183.0	26.4
59.462000	23.29	40.00	16.71	5000.0	120.000	127.0	V	263.0	12.7
137.272333	23.96	43.50	19.54	5000.0	120.000	234.0	H	0.0	19.7
203.390333	30.38	43.50	13.12	5000.0	120.000	118.0	H	252.0	18.0
219.421000	33.21	46.00	12.79	5000.0	120.000	144.0	H	254.0	18.0
958.118667	34.57	46.00	11.43	5000.0	120.000	187.0	V	345.0	34.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

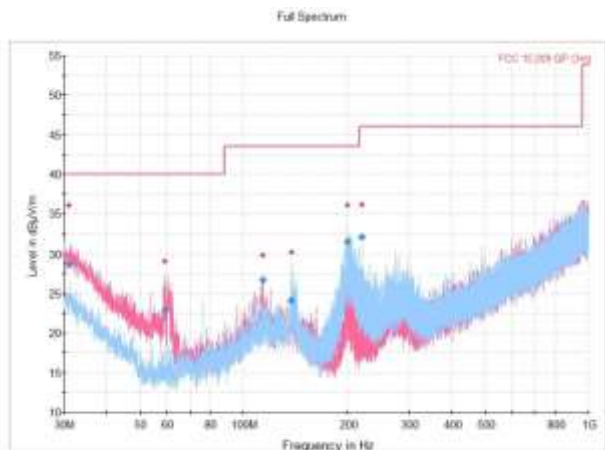


Figure 8.6-15: Radiated spurious emissions 30-1000 MHz, Low channel 802.11n MCS1 20 MHz channel bandwidth

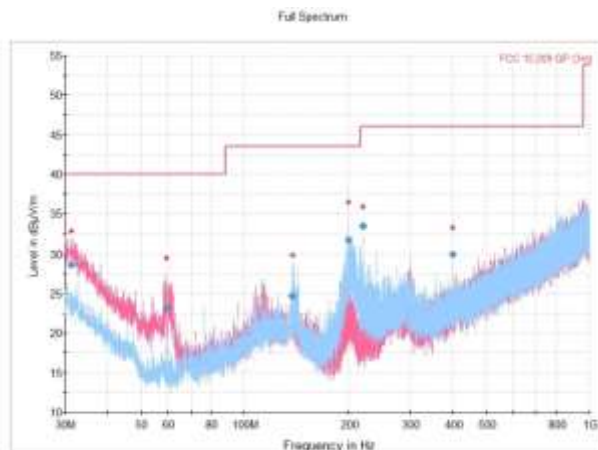


Figure 8.6-16: Radiated spurious emissions 30-1000 MHz, Mid channel 802.11n MCS1 20 MHz channel bandwidth

Table 8.6-16: Radiated spurious emissions tabular data, Low channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.147333	28.74	40.00	11.26	5000.0	120.000	124.0	V	0.0	25.9
59.086000	22.88	40.00	17.12	5000.0	120.000	114.0	V	254.0	12.7
113.634000	26.74	43.50	16.76	5000.0	120.000	365.0	V	161.0	19.1
137.113000	24.16	43.50	19.34	5000.0	120.000	192.0	H	0.0	19.7
199.628000	31.59	43.50	11.91	5000.0	120.000	128.0	H	254.0	17.8
219.436333	32.18	46.00	13.82	5000.0	120.000	118.0	H	243.0	18.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Table 8.6-17: Radiated spurious emissions tabular data, Mid channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.459667	28.62	40.00	11.38	5000.0	120.000	145.0	V	254.0	25.7
59.463000	23.16	40.00	16.84	5000.0	120.000	127.0	V	254.0	12.7
137.571667	24.68	43.50	18.82	5000.0	120.000	201.0	H	11.0	19.7
199.165000	31.75	43.50	11.75	5000.0	120.000	129.0	H	250.0	17.7
219.428667	33.53	46.00	12.47	5000.0	120.000	118.0	H	266.0	18.0
400.010333	29.98	46.00	16.02	5000.0	120.000	250.0	H	160.0	25.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

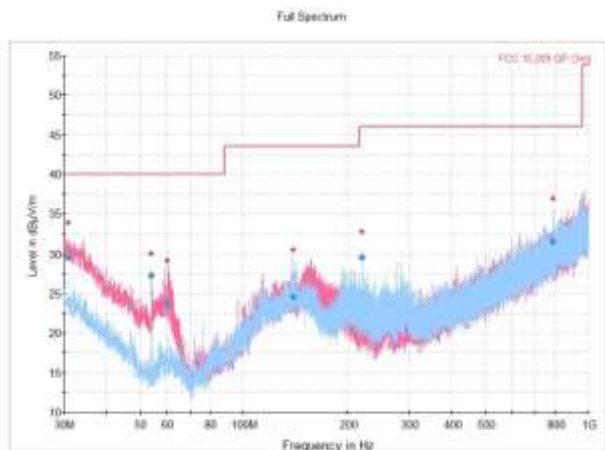


Figure 8.6-17: Radiated spurious emissions 30-1000 MHz, High channel 802.11n MCS1 20 MHz channel bandwidth

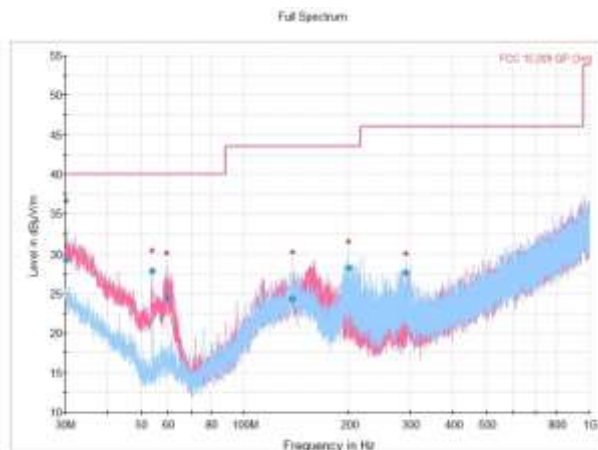


Figure 8.6-18: Radiated spurious emissions 30-1000 MHz, Low channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-18: Radiated spurious emissions tabular data, High channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.973000	29.59	40.00	10.41	5000.0	120.000	120.0	V	206.0	26.0
54.011333	27.29	40.00	12.71	5000.0	120.000	113.0	V	232.0	14.2
59.907000	23.67	40.00	16.33	5000.0	120.000	117.0	V	267.0	12.7
138.723000	24.63	43.50	18.87	5000.0	120.000	236.0	H	10.0	19.6
219.809000	29.63	46.00	16.37	5000.0	120.000	141.0	H	240.0	18.1
789.912000	31.64	46.00	14.36	5000.0	120.000	127.0	H	347.0	31.8

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Table 8.6-19: Radiated spurious emissions tabular data, Low channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.300000	29.27	40.00	10.73	5000.0	120.000	117.0	V	346.0	26.4
54.011333	27.87	40.00	12.13	5000.0	120.000	100.0	V	223.0	14.2
59.409333	24.49	40.00	15.51	5000.0	120.000	134.0	V	299.0	12.7
137.148000	24.30	43.50	19.20	5000.0	120.000	201.0	H	0.0	19.7
199.427000	28.27	43.50	15.23	5000.0	120.000	130.0	H	263.0	17.8
292.819333	27.69	46.00	18.31	5000.0	120.000	107.0	H	10.0	21.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

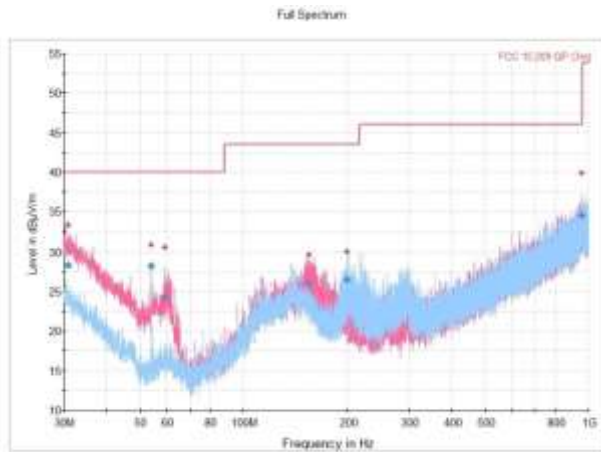


Figure 8.6-19: Radiated spurious emissions 30-1000 MHz, Mid channel 802.11n MCS1 40 MHz channel bandwidth

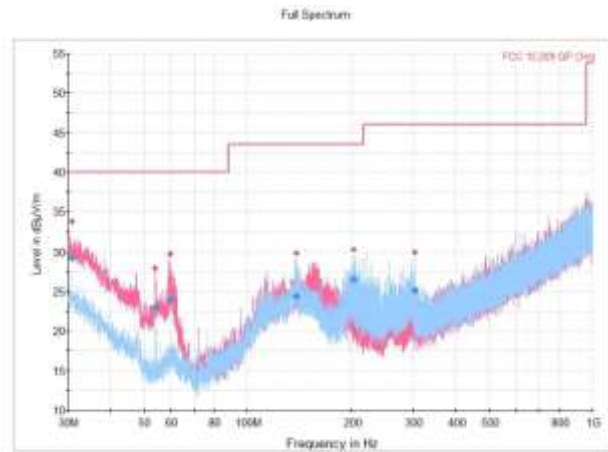


Figure 8.6-20: Radiated spurious emissions 30-1000 MHz, High channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-20: Radiated spurious emissions tabular data, Mid channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.946667	28.30	40.00	11.70	5000.0	120.000	165.0	V	320.0	26.0
54.011333	28.21	40.00	11.79	5000.0	120.000	104.0	V	257.0	14.2
59.110667	24.34	40.00	15.66	5000.0	120.000	101.0	V	299.0	12.7
154.540000	26.01	43.50	17.49	5000.0	120.000	100.0	V	158.0	19.0
198.052000	26.56	43.50	16.94	5000.0	120.000	162.0	H	260.0	17.7
956.638000	34.60	46.00	11.40	5000.0	120.000	110.0	V	302.0	34.8

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Table 8.6-21: Radiated spurious emissions tabular data, High channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.985667	29.29	40.00	10.71	5000.0	120.000	120.0	V	264.0	26.0
54.019000	22.98	40.00	17.02	5000.0	120.000	273.0	V	0.0	14.2
59.744667	23.98	40.00	16.02	5000.0	120.000	121.0	V	227.0	12.7
137.976000	24.44	43.50	19.06	5000.0	120.000	207.0	H	20.0	19.7
202.538000	26.57	43.50	16.93	5000.0	120.000	100.0	H	246.0	18.0
304.868667	25.20	46.00	20.80	5000.0	120.000	110.0	H	256.0	22.1

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB)
³ Limits converted to dBµV/m and an inverse proportionality factor of 20 dB per decade has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

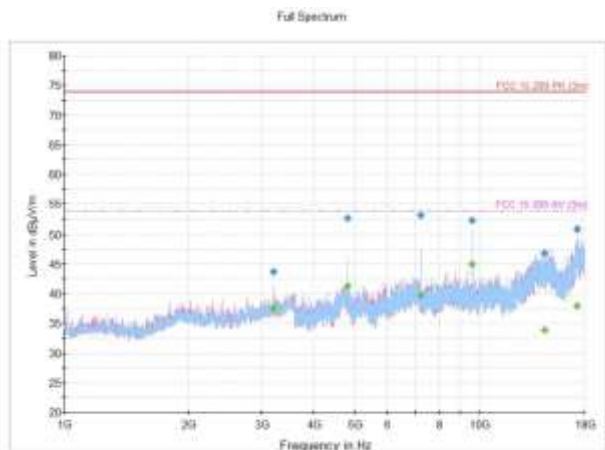


Figure 8.6-21: Radiated spurious emissions 1-18 GHz, Low channel 802.11b 2Mbs

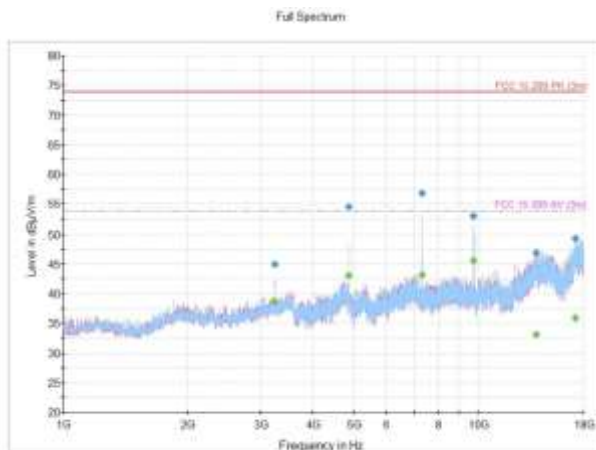


Figure 8.6-22: Radiated spurious emissions 1-18 GHz, Mid channel 802.11b 2Mbs

Table 8.6-22: Radiated spurious emissions tabular data, Low channel 802.11b 2Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3216.066667	43.67	---	73.90	30.23	5000.0	1000.000	134.0	V	118.0	-6.2
3216.066667	---	37.47	53.90	16.43	5000.0	1000.000	134.0	V	118.0	-6.2
4824.055556	52.59	---	73.90	21.31	5000.0	1000.000	240.0	H	296.0	-0.8
4824.055556	---	41.27	53.90	12.63	5000.0	1000.000	240.0	H	296.0	-0.8
7235.477778	53.14	---	73.90	20.76	5000.0	1000.000	209.0	H	298.0	1.5
7235.477778	---	39.80	53.90	14.10	5000.0	1000.000	209.0	H	298.0	1.5
9647.733333	52.26	---	73.90	21.64	5000.0	1000.000	200.0	H	146.0	5.0
9647.733333	---	44.92	53.90	8.98	5000.0	1000.000	200.0	H	146.0	5.0
14396.622222	---	33.95	53.90	19.95	5000.0	1000.000	359.0	H	0.0	12.2
14396.622222	46.88	---	73.90	27.02	5000.0	1000.000	359.0	H	0.0	12.2
17259.766667	---	37.92	53.90	15.98	5000.0	1000.000	337.0	H	192.0	16.4
17259.766667	50.81	---	73.90	23.09	5000.0	1000.000	337.0	H	192.0	16.4

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-23: Radiated spurious emissions tabular data, Mid channel 802.11b 2Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3256.133333	44.92	---	73.90	28.98	5000.0	1000.000	125.0	V	132.0	-6.1
3256.133333	---	38.78	53.90	15.12	5000.0	1000.000	125.0	V	132.0	-6.1
4883.955556	54.51	---	73.90	19.39	5000.0	1000.000	234.0	H	298.0	-1.0
4883.955556	---	43.10	53.90	10.80	5000.0	1000.000	234.0	H	298.0	-1.0
7325.744444	---	43.15	53.90	10.75	5000.0	1000.000	206.0	H	241.0	1.7
7325.744444	56.82	---	73.90	17.08	5000.0	1000.000	206.0	H	241.0	1.7
9767.677778	53.01	---	73.90	20.89	5000.0	1000.000	205.0	H	134.0	5.0
9767.677778	---	45.55	53.90	8.35	5000.0	1000.000	205.0	H	134.0	5.0
13822.866667	46.87	---	73.90	27.03	5000.0	1000.000	191.0	V	88.0	13.0
13822.866667	---	33.15	53.90	20.75	5000.0	1000.000	191.0	V	88.0	13.0
17171.611111	---	35.96	53.90	17.94	5000.0	1000.000	370.0	H	0.0	16.0
17171.611111	49.33	---	73.90	24.57	5000.0	1000.000	370.0	H	0.0	16.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

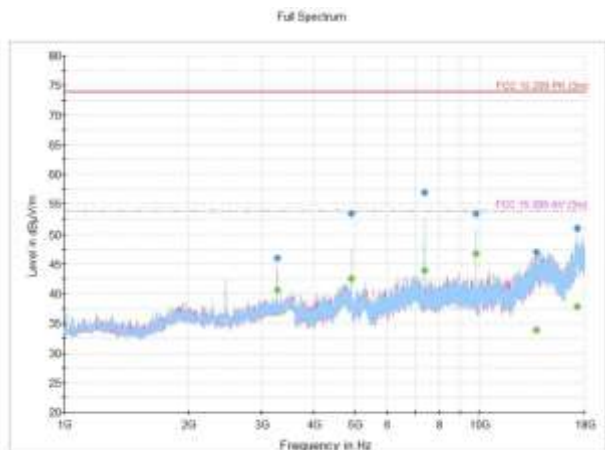


Figure 8.6-23: Radiated spurious emissions 1-18 GHz, High channel 802.11b 2Mbs

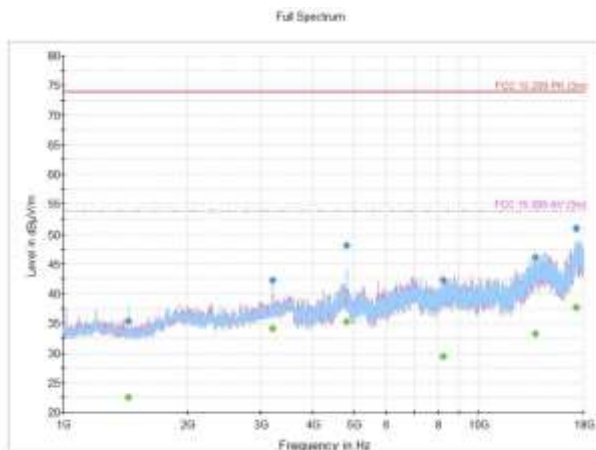


Figure 8.6-24: Radiated spurious emissions 1-18 GHz, Low channel 802.11g 12Mbs

Table 8.6-24: Radiated spurious emissions tabular data, High channel 802.11b 2Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3282.577778	46.03	---	73.90	27.87	5000.0	1000.000	100.0	V	126.0	-6.0
3282.577778	---	40.66	53.90	13.24	5000.0	1000.000	100.0	V	126.0	-6.0
4923.766667	53.40	---	73.90	20.50	5000.0	1000.000	227.0	H	296.0	-1.0
4923.766667	---	42.59	53.90	11.31	5000.0	1000.000	227.0	H	296.0	-1.0
7385.533333	56.95	---	73.90	16.95	5000.0	1000.000	208.0	H	228.0	1.7
7385.533333	---	43.91	53.90	9.99	5000.0	1000.000	208.0	H	228.0	1.7
9847.955556	53.35	---	73.90	20.55	5000.0	1000.000	203.0	H	136.0	5.0
9847.955556	---	46.77	53.90	7.13	5000.0	1000.000	203.0	H	136.0	5.0
13779.200000	---	33.93	53.90	19.97	5000.0	1000.000	165.0	H	0.0	13.1
13779.200000	46.96	---	73.90	26.94	5000.0	1000.000	165.0	H	0.0	13.1
17286.433333	---	37.78	53.90	16.12	5000.0	1000.000	184.0	H	0.0	16.7
17286.433333	50.95	---	73.90	22.95	5000.0	1000.000	184.0	H	0.0	16.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-25: Radiated spurious emissions tabular data, Low channel 802.11g 12Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1439.566667	35.38	---	73.90	38.52	5000.0	1000.000	345.0	H	12.0	-13.7
1439.566667	---	22.51	53.90	31.39	5000.0	1000.000	345.0	H	12.0	-13.7
3215.666667	42.28	---	73.90	31.62	5000.0	1000.000	107.0	V	124.0	-6.2
3215.666667	---	34.20	53.90	19.70	5000.0	1000.000	107.0	V	124.0	-6.2
4828.155556	48.11	---	73.90	25.79	5000.0	1000.000	223.0	H	291.0	-0.8
4828.155556	---	35.28	53.90	18.62	5000.0	1000.000	223.0	H	291.0	-0.8
8247.011111	42.24	---	73.90	31.66	5000.0	1000.000	364.0	H	346.0	3.1
8247.011111	---	29.37	53.90	24.53	5000.0	1000.000	364.0	H	346.0	3.1
13737.944444	46.16	---	73.90	27.74	5000.0	1000.000	163.0	H	244.0	12.8
13737.944444	---	33.24	53.90	20.66	5000.0	1000.000	163.0	H	244.0	12.8
17260.466667	50.99	---	73.90	22.91	5000.0	1000.000	127.0	H	201.0	16.4
17260.466667	---	37.66	53.90	16.24	5000.0	1000.000	127.0	H	201.0	16.4

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

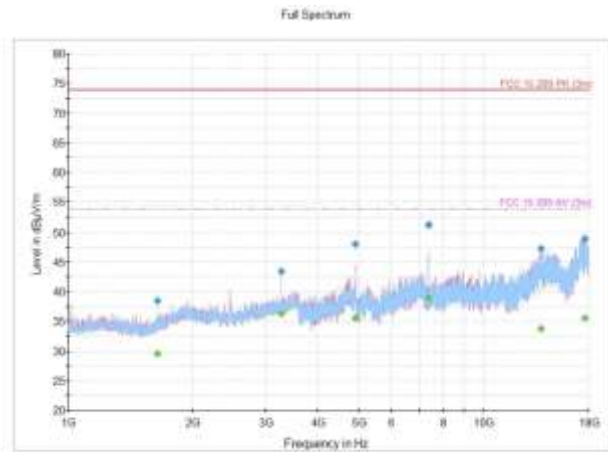
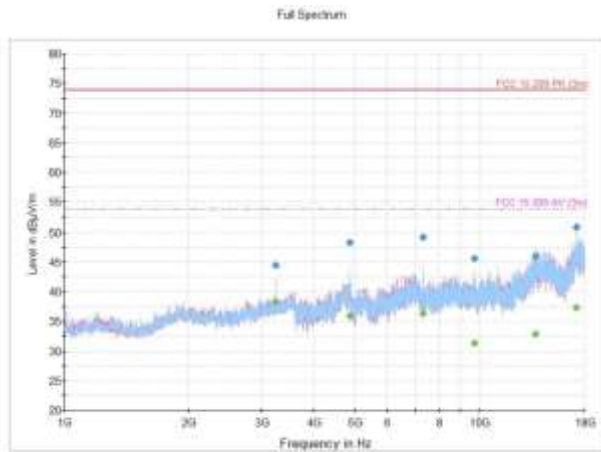


Figure 8.6-25: Radiated spurious emissions 1-18 GHz, Mid channel 802.11g 12Mbs

Figure 8.6-26: Radiated spurious emissions 1-18 GHz, High channel 802.11g 12Mbs

Table 8.6-26: Radiated spurious emissions tabular data, Mid channel 802.11g 12Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3256.133333	44.44	---	73.90	29.46	5000.0	1000.000	139.0	V	128.0	-6.1
3256.133333	---	38.35	53.90	15.55	5000.0	1000.000	139.0	V	128.0	-6.1
4877.922222	---	35.98	53.90	17.92	5000.0	1000.000	217.0	H	291.0	-1.0
4877.922222	48.30	---	73.90	25.60	5000.0	1000.000	217.0	H	291.0	-1.0
7323.200000	---	36.26	53.90	17.64	5000.0	1000.000	201.0	H	229.0	1.7
7323.200000	49.18	---	73.90	24.72	5000.0	1000.000	201.0	H	229.0	1.7
9755.755556	45.61	---	73.90	28.29	5000.0	1000.000	212.0	H	128.0	5.0
9755.755556	---	31.39	53.90	22.51	5000.0	1000.000	212.0	H	128.0	5.0
13704.733333	---	32.89	53.90	21.01	5000.0	1000.000	242.0	H	325.0	12.7
13704.733333	45.98	---	73.90	27.92	5000.0	1000.000	242.0	H	325.0	12.7
17194.311111	---	37.38	53.90	16.52	5000.0	1000.000	178.0	H	146.0	16.5
17194.311111	50.77	---	73.90	23.13	5000.0	1000.000	178.0	H	146.0	16.5

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-27: Radiated spurious emissions tabular data, High channel 802.11g 12Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1650.033333	---	29.59	53.90	24.31	5000.0	1000.000	151.0	H	0.0	-12.7
1650.033333	38.49	---	73.90	35.41	5000.0	1000.000	151.0	H	0.0	-12.7
3282.577778	43.42	---	73.90	30.48	5000.0	1000.000	272.0	H	180.0	-6.0
3282.577778	---	36.28	53.90	17.62	5000.0	1000.000	272.0	H	180.0	-6.0
4923.988889	48.08	---	73.90	25.82	5000.0	1000.000	243.0	V	236.0	-1.0
4923.988889	---	35.49	53.90	18.41	5000.0	1000.000	243.0	V	236.0	-1.0
7389.244444	---	38.94	53.90	14.96	5000.0	1000.000	199.0	H	235.0	1.8
7389.244444	51.19	---	73.90	22.71	5000.0	1000.000	199.0	H	235.0	1.8
13828.466667	---	33.82	53.90	20.08	5000.0	1000.000	155.0	V	302.0	13.0
13828.466667	47.32	---	73.90	26.58	5000.0	1000.000	155.0	V	302.0	13.0
17613.933333	---	35.60	53.90	18.30	5000.0	1000.000	188.0	H	97.0	15.5
17613.933333	48.92	---	73.90	24.98	5000.0	1000.000	188.0	H	97.0	15.5

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

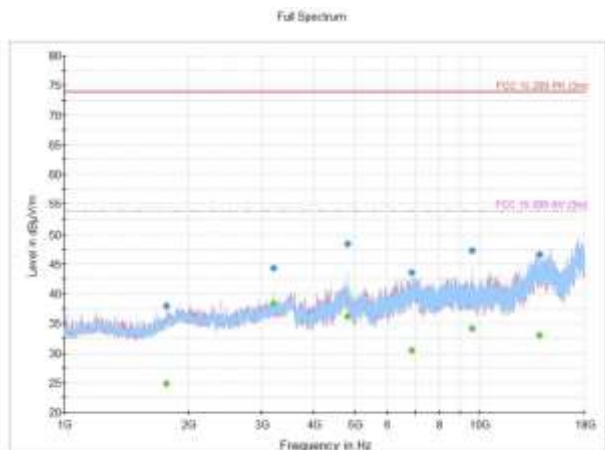


Figure 8.6-27: Radiated spurious emissions 1-18 GHz, Low channel 802.11n MCS1 20 MHz channel bandwidth

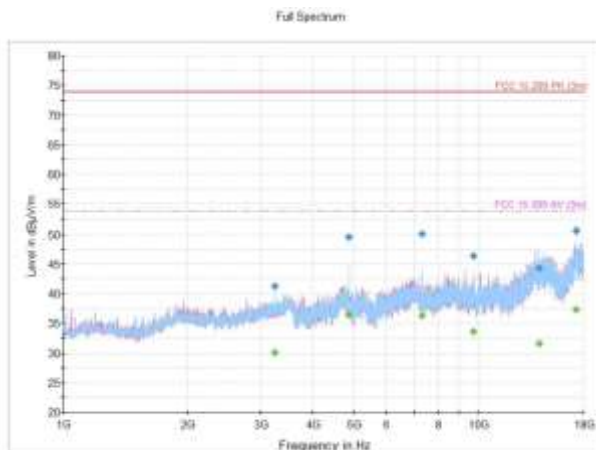


Figure 8.6-28: Radiated spurious emissions 1-18 GHz, Mid channel 802.11n MCS1 20 MHz channel bandwidth

Table 8.6-28: Radiated spurious emissions tabular data, Low channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1769.722222	37.97	---	73.90	35.93	5000.0	1000.000	139.0	H	158.0	-11.1
1769.722222	---	24.83	53.90	29.07	5000.0	1000.000	139.0	H	158.0	-11.1
3216.066667	44.27	---	73.90	29.63	5000.0	1000.000	254.0	H	134.0	-6.2
3216.066667	---	38.37	53.90	15.53	5000.0	1000.000	254.0	H	134.0	-6.2
4823.877778	48.40	---	73.90	25.50	5000.0	1000.000	242.0	H	302.0	-0.8
4823.877778	---	36.24	53.90	17.66	5000.0	1000.000	242.0	H	302.0	-0.8
6881.488889	43.58	---	73.90	30.32	5000.0	1000.000	144.0	H	121.0	1.7
6881.488889	---	30.43	53.90	23.47	5000.0	1000.000	144.0	H	121.0	1.7
9648.133333	---	34.09	53.90	19.81	5000.0	1000.000	199.0	H	137.0	5.0
9648.133333	47.23	---	73.90	26.67	5000.0	1000.000	199.0	H	137.0	5.0
14008.122222	---	33.02	53.90	20.88	5000.0	1000.000	168.0	V	0.0	11.8
14008.122222	46.57	---	73.90	27.33	5000.0	1000.000	168.0	V	0.0	11.8

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-29: Radiated spurious emissions tabular data, Mid channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3255.733333	41.21	---	73.90	32.69	5000.0	1000.000	402.0	H	180.0	-6.1
3255.733333	---	30.05	53.90	23.85	5000.0	1000.000	402.0	H	180.0	-6.1
4884.822222	---	36.37	53.90	17.53	5000.0	1000.000	233.0	H	291.0	-1.0
4884.822222	49.54	---	73.90	24.36	5000.0	1000.000	233.0	H	291.0	-1.0
7327.922222	50.01	---	73.90	23.89	5000.0	1000.000	216.0	H	234.0	1.7
7327.922222	---	36.26	53.90	17.64	5000.0	1000.000	216.0	H	234.0	1.7
9768.177778	46.37	---	73.90	27.53	5000.0	1000.000	213.0	H	133.0	5.0
9768.177778	---	33.59	53.90	20.31	5000.0	1000.000	213.0	H	133.0	5.0
14037.000000	---	31.53	53.90	22.37	5000.0	1000.000	122.0	H	0.0	11.6
14037.000000	44.32	---	73.90	29.58	5000.0	1000.000	122.0	H	0.0	11.6
17290.211111	50.61	---	73.90	23.29	5000.0	1000.000	174.0	H	0.0	16.8
17290.211111	---	37.32	53.90	16.58	5000.0	1000.000	174.0	H	0.0	16.8

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

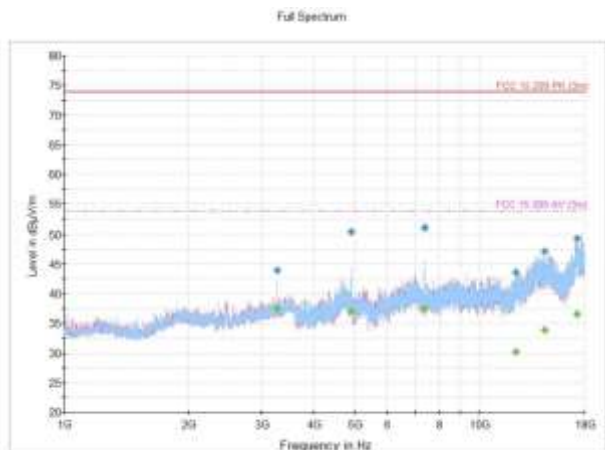


Figure 8.6-29: Radiated spurious emissions 1-18 GHz, High channel 802.11n MCS1 20 MHz channel bandwidth

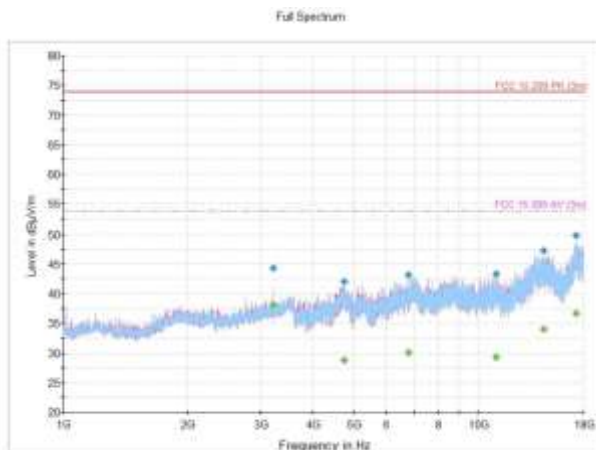


Figure 8.6-30: Radiated spurious emissions 1-18 GHz, Low channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-30: Radiated spurious emissions tabular data, High channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3282.722222	43.94	---	73.90	29.96	5000.0	1000.000	104.0	V	225.0	-6.0
3282.722222	---	37.43	53.90	16.47	5000.0	1000.000	104.0	V	225.0	-6.0
4928.422222	50.46	---	73.90	23.44	5000.0	1000.000	212.0	H	320.0	-1.0
4928.422222	---	37.06	53.90	16.84	5000.0	1000.000	212.0	H	320.0	-1.0
7387.933333	---	37.44	53.90	16.46	5000.0	1000.000	205.0	H	227.0	1.8
7387.933333	51.09	---	73.90	22.81	5000.0	1000.000	205.0	H	227.0	1.8
12270.166667	---	30.21	53.90	23.69	5000.0	1000.000	159.0	V	279.0	8.2
12270.166667	43.56	---	73.90	30.34	5000.0	1000.000	159.0	V	279.0	8.2
14439.122222	---	33.91	53.90	19.99	5000.0	1000.000	185.0	H	0.0	12.2
14439.122222	47.16	---	73.90	26.74	5000.0	1000.000	185.0	H	0.0	12.2
17256.911111	---	36.59	53.90	17.31	5000.0	1000.000	290.0	H	250.0	16.3
17256.911111	49.30	---	73.90	24.60	5000.0	1000.000	290.0	H	250.0	16.3

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-31: Radiated spurious emissions tabular data, Low channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3229.288889	---	38.12	53.90	15.78	5000.0	1000.000	285.0	H	98.0	-6.2
3229.288889	44.35	---	73.90	29.55	5000.0	1000.000	285.0	H	98.0	-6.2
4754.388889	42.07	---	73.90	31.83	5000.0	1000.000	159.0	V	77.0	-0.7
4754.388889	---	28.81	53.90	25.09	5000.0	1000.000	159.0	V	77.0	-0.7
6811.855556	43.20	---	73.90	30.70	5000.0	1000.000	232.0	H	11.0	1.6
6811.855556	---	30.10	53.90	23.80	5000.0	1000.000	232.0	H	11.0	1.6
11086.622222	43.31	---	73.90	30.59	5000.0	1000.000	105.0	H	55.0	5.2
11086.622222	---	29.36	53.90	24.54	5000.0	1000.000	105.0	H	55.0	5.2
14434.466667	---	34.05	53.90	19.85	5000.0	1000.000	249.0	V	78.0	12.2
14434.466667	47.26	---	73.90	26.64	5000.0	1000.000	249.0	V	78.0	12.2
17259.233333	49.87	---	73.90	24.03	5000.0	1000.000	128.0	H	74.0	16.4
17259.233333	---	36.65	53.90	17.25	5000.0	1000.000	128.0	H	74.0	16.4

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

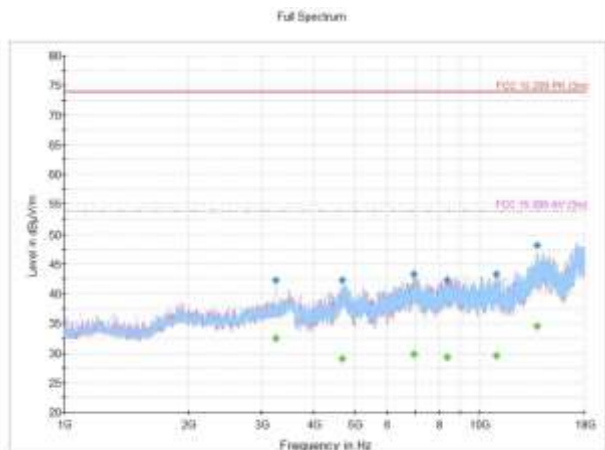


Figure 8.6-31: Radiated spurious emissions 1-18 GHz, Mid channel 802.11n MCS1 40 MHz channel bandwidth

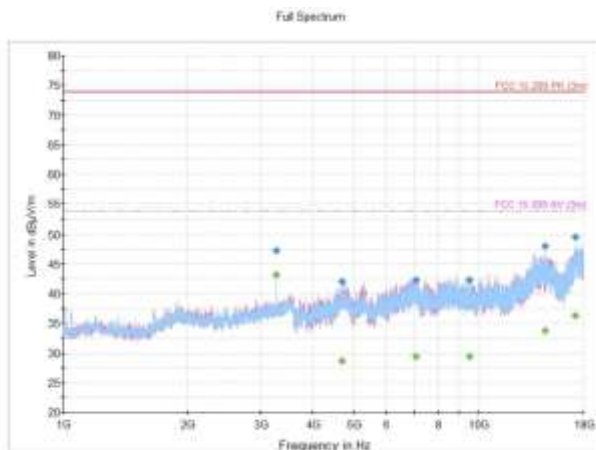


Figure 8.6-32: Radiated spurious emissions 1-18 GHz, High channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-32: Radiated spurious emissions tabular data, Mid channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3256.133333	42.26	---	73.90	31.64	5000.0	1000.000	250.0	H	179.0	-6.1
3256.133333	---	32.54	53.90	21.36	5000.0	1000.000	250.0	H	179.0	-6.1
4677.411111	42.36	---	73.90	31.54	5000.0	1000.000	360.0	H	337.0	-0.8
4677.411111	---	29.05	53.90	24.85	5000.0	1000.000	360.0	H	337.0	-0.8
6983.788889	43.27	---	73.90	30.63	5000.0	1000.000	208.0	V	0.0	2.0
6983.788889	---	29.79	53.90	24.11	5000.0	1000.000	208.0	V	0.0	2.0
8374.877778	42.33	---	73.90	31.57	5000.0	1000.000	249.0	V	334.0	3.5
8374.877778	---	29.33	53.90	24.57	5000.0	1000.000	249.0	V	334.0	3.5
11034.800000	43.37	---	73.90	30.53	5000.0	1000.000	245.0	V	32.0	5.3
11034.800000	---	29.51	53.90	24.39	5000.0	1000.000	245.0	V	32.0	5.3
13800.744444	48.09	---	73.90	25.81	5000.0	1000.000	223.0	V	21.0	13.2
13800.744444	---	34.48	53.90	19.42	5000.0	1000.000	223.0	V	21.0	13.2

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-33: Radiated spurious emissions tabular data, High channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3282.577778	---	43.22	53.90	10.68	5000.0	1000.000	240.0	H	0.0	-6.0
3282.577778	47.21	---	73.90	26.69	5000.0	1000.000	240.0	H	0.0	-6.0
4704.222222	---	28.64	53.90	25.26	5000.0	1000.000	159.0	V	0.0	-0.6
4704.222222	42.05	---	73.90	31.85	5000.0	1000.000	159.0	V	0.0	-0.6
7078.411111	---	29.41	53.90	24.49	5000.0	1000.000	161.0	V	286.0	1.7
7078.411111	42.26	---	73.90	31.64	5000.0	1000.000	161.0	V	286.0	1.7
9571.600000	---	29.44	53.90	24.46	5000.0	1000.000	393.0	V	180.0	4.8
9571.600000	42.33	---	73.90	31.57	5000.0	1000.000	393.0	V	180.0	4.8
14539.300000	48.04	---	73.90	25.86	5000.0	1000.000	233.0	H	157.0	11.3
14539.300000	---	33.73	53.90	20.17	5000.0	1000.000	233.0	H	157.0	11.3
17180.988889	49.61	---	73.90	24.29	5000.0	1000.000	237.0	H	280.0	16.2
17180.988889	---	36.34	53.90	17.56	5000.0	1000.000	237.0	H	280.0	16.2

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

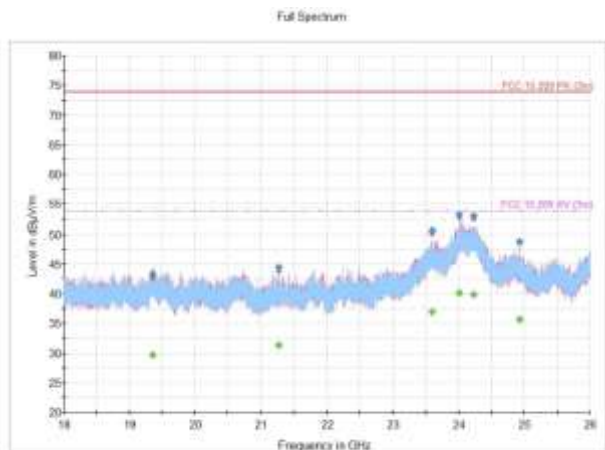


Figure 8.6-33: Radiated spurious emissions 18-26 GHz, Low channel 802.11b 2Mbs

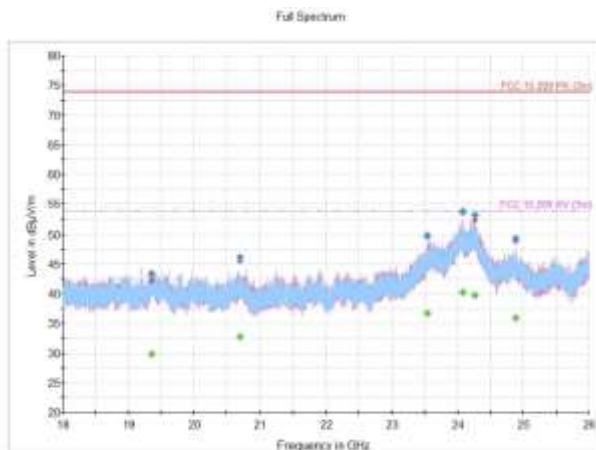


Figure 8.6-34: Radiated spurious emissions 18-26 GHz, Mid channel 802.11b 2Mbs

Table 8.6-34: Radiated spurious emissions tabular data, Low channel 802.11b 2Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19354.100000	---	29.63	53.90	24.27	5000.0	1000.000	195.0	H	42.0	18.5
19354.100000	43.29	---	73.90	30.61	5000.0	1000.000	195.0	H	42.0	18.5
21279.633333	44.48	---	73.90	29.42	5000.0	1000.000	402.0	V	158.0	18.9
21279.633333	---	31.36	53.90	22.54	5000.0	1000.000	402.0	V	158.0	18.9
23601.433333	50.62	---	73.90	23.28	5000.0	1000.000	179.0	V	86.0	25.8
23601.433333	---	36.95	53.90	16.95	5000.0	1000.000	179.0	V	86.0	25.8
24017.033333	53.27	---	73.90	20.63	5000.0	1000.000	241.0	V	165.0	29.7
24017.033333	---	40.11	53.90	13.79	5000.0	1000.000	241.0	V	165.0	29.7
24229.833333	---	39.91	53.90	13.99	5000.0	1000.000	154.0	H	65.0	29.1
24229.833333	53.03	---	73.90	20.87	5000.0	1000.000	154.0	H	65.0	29.1
24925.566667	48.82	---	73.90	25.08	5000.0	1000.000	393.0	V	162.0	24.7
24925.566667	---	35.68	53.90	18.22	5000.0	1000.000	393.0	V	162.0	24.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-35: Radiated spurious emissions tabular data, Mid channel 802.11b 2Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19351.433333	---	29.79	53.90	24.11	5000.0	1000.000	302.0	H	189.0	18.5
19351.433333	43.35	---	73.90	30.55	5000.0	1000.000	302.0	H	189.0	18.5
20701.033333	---	32.68	53.90	21.22	5000.0	1000.000	313.0	V	350.0	20.1
20701.033333	46.11	---	73.90	27.79	5000.0	1000.000	313.0	V	350.0	20.1
23541.300000	49.78	---	73.90	24.12	5000.0	1000.000	366.0	H	101.0	25.6
23541.300000	---	36.74	53.90	17.16	5000.0	1000.000	366.0	H	101.0	25.6
24075.566667	53.78	---	73.90	20.12	5000.0	1000.000	142.0	V	357.0	29.7
24075.566667	---	40.30	53.90	13.60	5000.0	1000.000	142.0	V	357.0	29.7
24259.766667	53.08	---	73.90	20.82	5000.0	1000.000	332.0	H	272.0	29.0
24259.766667	---	39.76	53.90	14.14	5000.0	1000.000	332.0	H	272.0	29.0
24885.366667	49.29	---	73.90	24.61	5000.0	1000.000	283.0	H	277.0	24.7
24885.366667	---	35.87	53.90	18.03	5000.0	1000.000	283.0	H	277.0	24.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

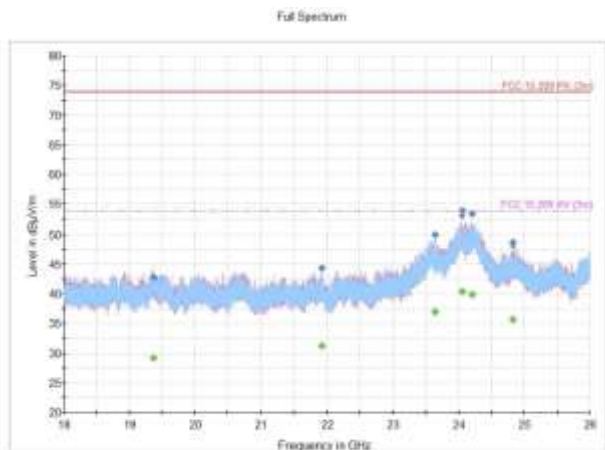


Figure 8.6-35: Radiated spurious emissions 18-26 GHz, High channel 802.11b 2Mbs

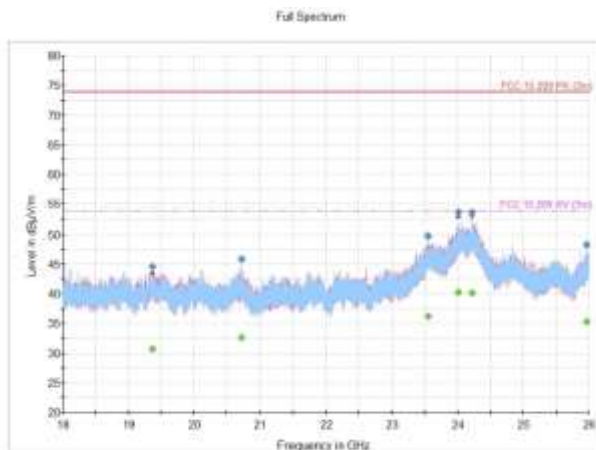


Figure 8.6-36: Radiated spurious emissions 18-26 GHz, Low channel 802.11g 12Mbs

Table 8.6-36: Radiated spurious emissions tabular data, High channel 802.11b 2Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19369.300000	---	29.24	53.90	24.66	5000.0	1000.000	223.0	H	194.0	18.5
19369.300000	42.83	---	73.90	31.07	5000.0	1000.000	223.0	H	194.0	18.5
21916.633333	---	31.16	53.90	22.74	5000.0	1000.000	107.0	V	292.0	19.1
21916.633333	44.31	---	73.90	29.59	5000.0	1000.000	107.0	V	292.0	19.1
23642.233333	---	36.89	53.90	17.01	5000.0	1000.000	402.0	V	0.0	25.7
23642.233333	49.90	---	73.90	24.00	5000.0	1000.000	402.0	V	0.0	25.7
24054.166667	53.88	---	73.90	20.02	5000.0	1000.000	266.0	H	123.0	29.7
24054.166667	---	40.40	53.90	13.50	5000.0	1000.000	266.0	H	123.0	29.7
24204.566667	53.37	---	73.90	20.53	5000.0	1000.000	357.0	H	210.0	29.2
24204.566667	---	39.88	53.90	14.02	5000.0	1000.000	357.0	H	210.0	29.2
24830.233333	---	35.73	53.90	18.17	5000.0	1000.000	321.0	V	126.0	24.7
24830.233333	48.71	---	73.90	25.19	5000.0	1000.000	321.0	V	126.0	24.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-37: Radiated spurious emissions tabular data, Low channel 802.11g 12Mbs

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19365.366667	44.54	---	73.90	29.36	5000.0	1000.000	102.0	V	31.0	18.5
19365.366667	---	30.74	53.90	23.16	5000.0	1000.000	102.0	V	31.0	18.5
20722.233333	45.85	---	73.90	28.05	5000.0	1000.000	347.0	H	212.0	20.1
20722.233333	---	32.59	53.90	21.31	5000.0	1000.000	347.0	H	212.0	20.1
23551.366667	49.62	---	73.90	24.28	5000.0	1000.000	271.0	H	348.0	25.7
23551.366667	---	36.21	53.90	17.69	5000.0	1000.000	271.0	H	348.0	25.7
24010.233333	---	40.24	53.90	13.66	5000.0	1000.000	138.0	H	32.0	29.5
24010.233333	53.64	---	73.90	20.26	5000.0	1000.000	138.0	H	32.0	29.5
24216.900000	---	40.12	53.90	13.78	5000.0	1000.000	364.0	V	136.0	29.1
24216.900000	53.67	---	73.90	20.23	5000.0	1000.000	364.0	V	136.0	29.1
25965.100000	48.24	---	73.90	25.66	5000.0	1000.000	347.0	H	21.0	25.2
25965.100000	---	35.27	53.90	18.63	5000.0	1000.000	347.0	H	21.0	25.2

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

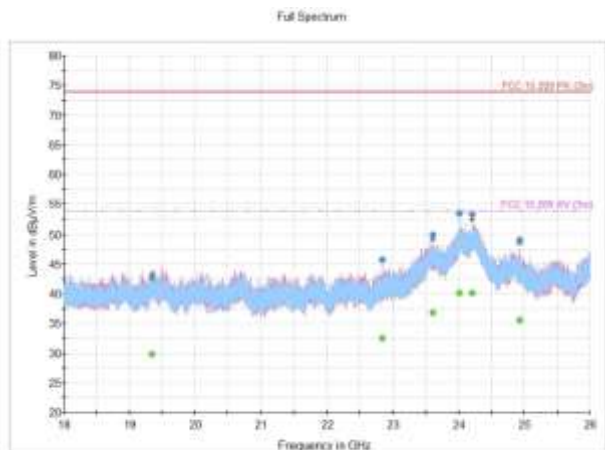


Figure 8.6-37: Radiated spurious emissions 18-26 GHz, Mid channel 802.11g 12Mbps

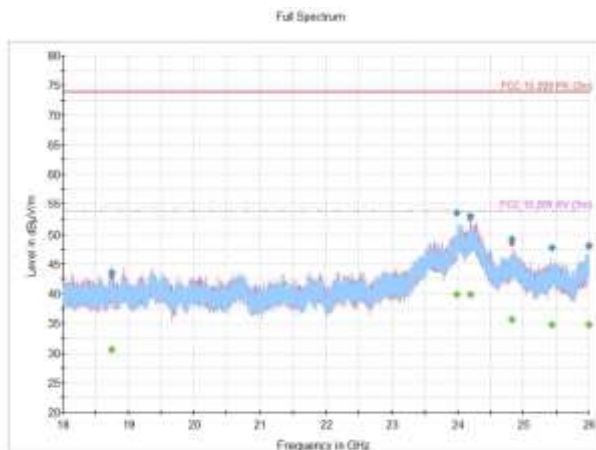


Figure 8.6-38: Radiated spurious emissions 18-26 GHz, High channel 802.11g 12Mbps

Table 8.6-38: Radiated spurious emissions tabular data, Mid channel 802.11g 12Mbps

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19347.966667	---	29.84	53.90	24.06	5000.0	1000.000	186.0	H	11.0	18.5
19347.966667	42.68	---	73.90	31.22	5000.0	1000.000	186.0	H	11.0	18.5
22837.966667	---	32.47	53.90	21.43	5000.0	1000.000	314.0	V	104.0	21.0
22837.966667	45.70	---	73.90	28.20	5000.0	1000.000	314.0	V	104.0	21.0
23609.433333	49.90	---	73.90	24.00	5000.0	1000.000	102.0	H	0.0	25.8
23609.433333	---	36.86	53.90	17.04	5000.0	1000.000	102.0	H	0.0	25.8
24005.833333	53.38	---	73.90	20.52	5000.0	1000.000	203.0	V	155.0	29.4
24005.833333	---	40.10	53.90	13.80	5000.0	1000.000	203.0	V	155.0	29.4
24212.233333	53.30	---	73.90	20.60	5000.0	1000.000	402.0	V	215.0	29.1
24212.233333	---	40.10	53.90	13.80	5000.0	1000.000	402.0	V	215.0	29.1
24934.366667	49.08	---	73.90	24.82	5000.0	1000.000	189.0	V	300.0	24.7
24934.366667	---	35.53	53.90	18.37	5000.0	1000.000	189.0	V	300.0	24.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-39: Radiated spurious emissions tabular data, High channel 802.11g 12Mbps

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18748.100000	43.55	---	73.90	30.35	5000.0	1000.000	312.0	V	31.0	17.6
18748.100000	---	30.55	53.90	23.35	5000.0	1000.000	312.0	V	31.0	17.6
23992.366667	---	39.90	53.90	14.00	5000.0	1000.000	390.0	H	320.0	29.2
23992.366667	53.45	---	73.90	20.45	5000.0	1000.000	390.0	H	320.0	29.2
24198.433333	53.03	---	73.90	20.87	5000.0	1000.000	330.0	V	54.0	29.2
24198.433333	---	39.90	53.90	14.00	5000.0	1000.000	330.0	V	54.0	29.2
24828.633333	---	35.65	53.90	18.25	5000.0	1000.000	152.0	V	66.0	24.6
24828.633333	49.14	---	73.90	24.76	5000.0	1000.000	152.0	V	66.0	24.6
25435.900000	47.71	---	73.90	26.19	5000.0	1000.000	260.0	H	158.0	23.9
25435.900000	---	34.76	53.90	19.14	5000.0	1000.000	260.0	H	158.0	23.9
25997.566667	48.12	---	73.90	25.78	5000.0	1000.000	296.0	H	0.0	25.4
25997.566667	---	34.76	53.90	19.14	5000.0	1000.000	296.0	H	0.0	25.4

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

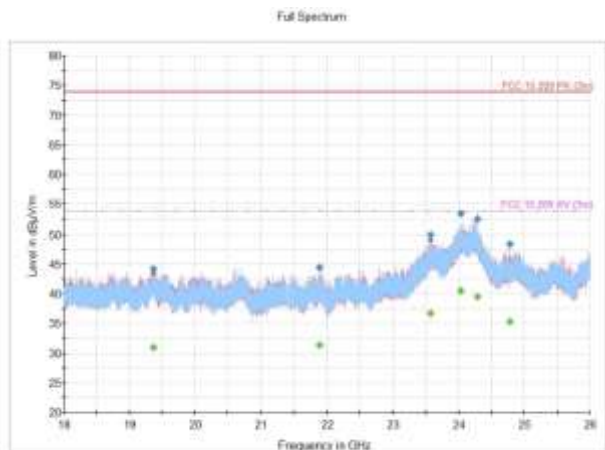


Figure 8.6-39: Radiated spurious emissions 18-26 GHz, Low channel 802.11n MCS1 20 MHz channel bandwidth

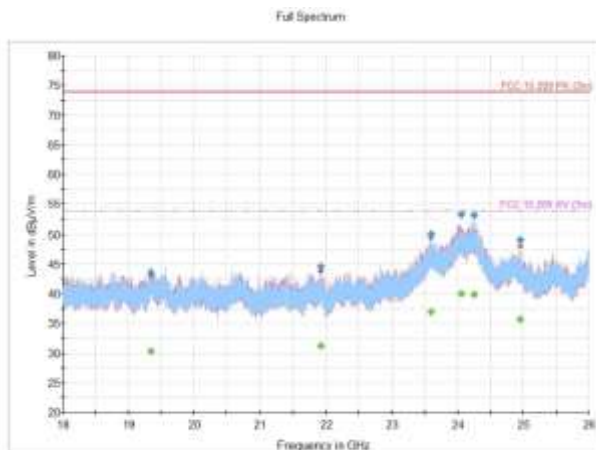


Figure 8.6-40: Radiated spurious emissions 18-26 GHz, Mid channel 802.11n MCS1 20 MHz channel bandwidth

Table 8.6-40: Radiated spurious emissions tabular data, Low channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19365.833333	---	30.89	53.90	23.01	5000.0	1000.000	186.0	V	351.0	18.5
19365.833333	44.26	---	73.90	29.64	5000.0	1000.000	186.0	V	351.0	18.5
21880.100000	---	31.33	53.90	22.57	5000.0	1000.000	161.0	H	80.0	19.2
21880.100000	44.50	---	73.90	29.40	5000.0	1000.000	161.0	H	80.0	19.2
23573.433333	49.99	---	73.90	23.91	5000.0	1000.000	354.0	H	325.0	26.0
23573.433333	---	36.71	53.90	17.19	5000.0	1000.000	354.0	H	325.0	26.0
24029.833333	53.37	---	73.90	20.53	5000.0	1000.000	383.0	H	12.0	29.7
24029.833333	---	40.45	53.90	13.45	5000.0	1000.000	383.0	H	12.0	29.7
24281.966667	52.48	---	73.90	21.42	5000.0	1000.000	112.0	V	170.0	28.5
24281.966667	---	39.51	53.90	14.39	5000.0	1000.000	112.0	V	170.0	28.5
24781.966667	48.37	---	73.90	25.53	5000.0	1000.000	401.0	V	330.0	24.6
24781.966667	---	35.23	53.90	18.67	5000.0	1000.000	401.0	V	330.0	24.6

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-41: Radiated spurious emissions tabular data, Mid channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19340.900000	---	30.31	53.90	23.59	5000.0	1000.000	337.0	V	44.0	18.5
19340.900000	43.62	---	73.90	30.28	5000.0	1000.000	337.0	V	44.0	18.5
21917.966667	---	31.16	53.90	22.74	5000.0	1000.000	265.0	V	347.0	19.1
21917.966667	44.59	---	73.90	29.31	5000.0	1000.000	265.0	V	347.0	19.1
23595.166667	---	36.95	53.90	16.95	5000.0	1000.000	158.0	V	305.0	25.9
23595.166667	50.04	---	73.90	23.86	5000.0	1000.000	158.0	V	305.0	25.9
24058.766667	---	40.02	53.90	13.88	5000.0	1000.000	172.0	H	125.0	29.7
24058.766667	53.26	---	73.90	20.64	5000.0	1000.000	172.0	H	125.0	29.7
24250.900000	53.06	---	73.90	20.84	5000.0	1000.000	314.0	H	171.0	29.0
24250.900000	---	39.93	53.90	13.97	5000.0	1000.000	314.0	H	171.0	29.0
24948.833333	48.99	---	73.90	24.91	5000.0	1000.000	240.0	V	0.0	24.7
24948.833333	---	35.63	53.90	18.27	5000.0	1000.000	240.0	V	0.0	24.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

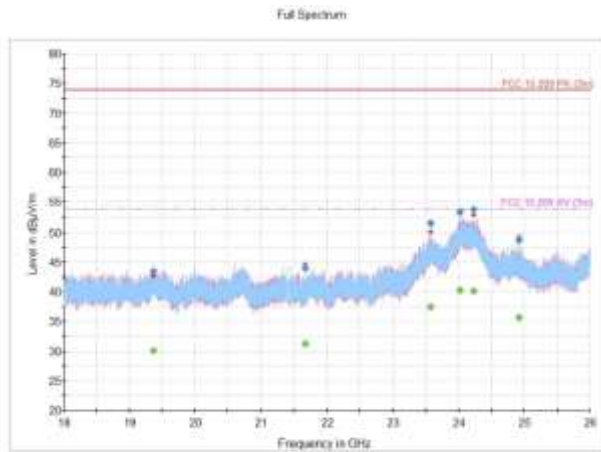


Figure 8.6-41: Radiated spurious emissions 18-26 GHz, High channel 802.11n MCS1 20 MHz channel bandwidth

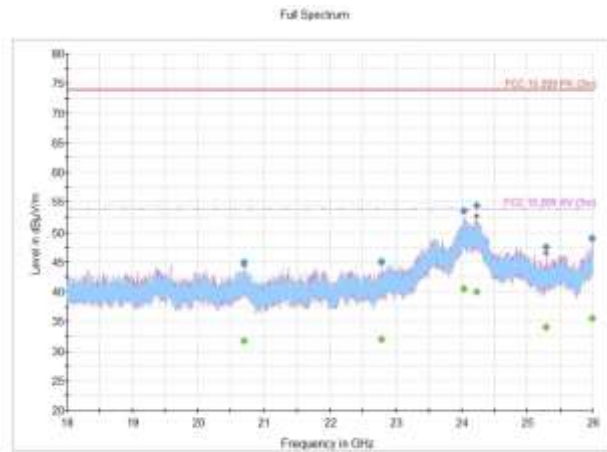


Figure 8.6-42: Radiated spurious emissions 18-26 GHz, Low channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-42: Radiated spurious emissions tabular data, High channel 802.11n MCS1 20 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19370.966667	43.46	---	73.90	30.44	5000.0	1000.000	410.0	H	225.0	18.5
19370.966667	---	30.05	53.90	23.85	5000.0	1000.000	410.0	H	225.0	18.5
21670.100000	---	31.25	53.90	22.65	5000.0	1000.000	280.0	H	188.0	19.1
21670.100000	43.93	---	73.90	29.97	5000.0	1000.000	280.0	H	188.0	19.1
23575.300000	51.50	---	73.90	22.40	5000.0	1000.000	326.0	V	200.0	26.0
23575.300000	---	37.42	53.90	16.48	5000.0	1000.000	326.0	V	200.0	26.0
24019.166667	53.33	---	73.90	20.57	5000.0	1000.000	221.0	H	181.0	29.7
24019.166667	---	40.31	53.90	13.59	5000.0	1000.000	221.0	H	181.0	29.7
24225.433333	---	40.16	53.90	13.74	5000.0	1000.000	265.0	V	88.0	29.1
24225.433333	53.73	---	73.90	20.17	5000.0	1000.000	265.0	V	88.0	29.1
24920.366667	48.70	---	73.90	25.20	5000.0	1000.000	224.0	H	0.0	24.7
24920.366667	---	35.70	53.90	18.20	5000.0	1000.000	224.0	H	0.0	24.7

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-43: Radiated spurious emissions tabular data, Low channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20705.566667	---	31.77	53.90	22.13	5000.0	1000.000	197.0	H	288.0	20.1
20705.566667	45.01	---	73.90	28.89	5000.0	1000.000	197.0	H	288.0	20.1
22781.166667	---	32.01	53.90	21.89	5000.0	1000.000	350.0	H	0.0	20.7
22781.166667	45.03	---	73.90	28.87	5000.0	1000.000	350.0	H	0.0	20.7
24030.500000	---	40.51	53.90	13.39	5000.0	1000.000	126.0	V	242.0	29.7
24030.500000	53.45	---	73.90	20.45	5000.0	1000.000	126.0	V	242.0	29.7
24225.833333	---	40.02	53.90	13.88	5000.0	1000.000	355.0	V	212.0	29.1
24225.833333	54.41	---	73.90	19.49	5000.0	1000.000	355.0	V	212.0	29.1
25290.366667	47.58	---	73.90	26.32	5000.0	1000.000	111.0	V	182.0	23.3
25290.366667	---	34.01	53.90	19.89	5000.0	1000.000	111.0	V	182.0	23.3
25987.633333	49.10	---	73.90	24.80	5000.0	1000.000	378.0	V	30.0	25.4
25987.633333	---	35.57	53.90	18.33	5000.0	1000.000	378.0	V	30.0	25.4

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

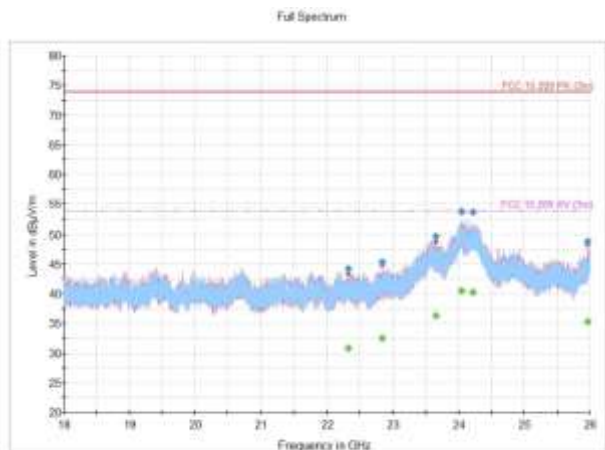


Figure 8.6-43: Radiated spurious emissions 18-26 GHz, Mid channel 802.11n MCS1 40 MHz channel bandwidth

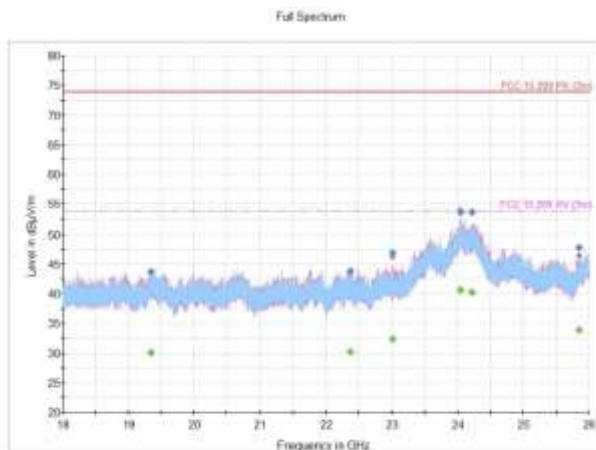


Figure 8.6-44: Radiated spurious emissions 18-26 GHz, High channel 802.11n MCS1 40 MHz channel bandwidth

Table 8.6-44: Radiated spurious emissions tabular data, Mid channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
22318.766667	---	30.77	53.90	23.13	5000.0	1000.000	410.0	H	20.0	19.5
22318.766667	44.21	---	73.90	29.69	5000.0	1000.000	410.0	H	20.0	19.5
22840.700000	45.29	---	73.90	28.61	5000.0	1000.000	212.0	V	278.0	21.0
22840.700000	---	32.44	53.90	21.46	5000.0	1000.000	212.0	V	278.0	21.0
23651.166667	49.64	---	73.90	24.26	5000.0	1000.000	210.0	V	216.0	25.6
23651.166667	---	36.37	53.90	17.53	5000.0	1000.000	210.0	V	216.0	25.6
24043.433333	53.74	---	73.90	20.16	5000.0	1000.000	144.0	H	0.0	29.7
24043.433333	---	40.45	53.90	13.45	5000.0	1000.000	144.0	H	0.0	29.7
24216.900000	---	40.20	53.90	13.70	5000.0	1000.000	410.0	H	217.0	29.1
24216.900000	53.66	---	73.90	20.24	5000.0	1000.000	410.0	H	217.0	29.1
25966.766667	48.77	---	73.90	25.13	5000.0	1000.000	303.0	V	241.0	25.2
25966.766667	---	35.28	53.90	18.62	5000.0	1000.000	303.0	V	241.0	25.2

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

Table 8.6-45: Radiated spurious emissions tabular data, High channel 802.11n MCS1 40 MHz channel bandwidth

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19346.900000	43.66	---	73.90	30.24	5000.0	1000.000	215.0	V	154.0	18.5
19346.900000	---	30.04	53.90	23.86	5000.0	1000.000	215.0	V	154.0	18.5
22363.833333	---	30.21	53.90	23.69	5000.0	1000.000	188.0	H	276.0	19.4
22363.833333	43.83	---	73.90	30.07	5000.0	1000.000	188.0	H	276.0	19.4
23015.033333	---	32.34	53.90	21.56	5000.0	1000.000	343.0	V	0.0	20.9
23015.033333	46.86	---	73.90	27.04	5000.0	1000.000	343.0	V	0.0	20.9
24040.366667	53.60	---	73.90	20.30	5000.0	1000.000	357.0	V	335.0	29.7
24040.366667	---	40.59	53.90	13.31	5000.0	1000.000	357.0	V	335.0	29.7
24217.433333	53.60	---	73.90	20.30	5000.0	1000.000	349.0	V	188.0	29.1
24217.433333	---	40.22	53.90	13.68	5000.0	1000.000	349.0	V	188.0	29.1
25852.300000	47.76	---	73.90	26.14	5000.0	1000.000	232.0	H	110.0	24.3
25852.300000	---	33.95	53.90	19.95	5000.0	1000.000	232.0	H	110.0	24.3

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) - pre amp (dB)

8.7 FCC 15.247(e) and RSS-247 5.2(b) Power spectral density of digital transmission system

8.7.1 References

Title 47 → Chapter 1 → Subchapter A → Part 15 → Subpart C → §15.247(e) / ANSI C63.10: 2013

- (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this Section. The same method of determining the conducted output power shall be used to determine the power spectral density.

RSS-247 → §5.2(b)

- (a) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

8.7.2 Test summary

Verdict	Pass		
Test date	July 15, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1007 mbar
Test location	Wireless bench (Conducted)	Relative humidity	64 %
Test date	July 20, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1004 mbar
Test location	Wireless bench (Conducted)	Relative humidity	61 %

8.7.3 Notes

Testing was performed with WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

The EUT antenna port was connected to the spectrum analyzer via low loss cable and a suitable attenuator. The loss of this assembly was corrected for via a transducer factor in the spectrum analyzer.

8.7.4 Setup details

EUT setup configuration	Table top
Test facility	Nemko San Diego
Measurement details	Measurement performed as per C63.10 §11.10.2 (Method PKPSD)

Receiver/spectrum analyzer settings:

Resolution bandwidth	3 kHz
Video bandwidth	10 kHz ($\geq 3 \times$ RBW)
Frequency span	1 MHz (1.5 \times DTS bandwidth)
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.7.5 Test data

Table 8.7-1: Power spectral density of DTS

Transmitter Frequency (MHz)	Modulation scheme	Measured Level (dBm/3 kHz)	Limit (dBm/3 kHz)
2412	802.11b 2 Mbs	-7.30	8.00
2412	802.11g 12 Mbs	-12.60	8.00
2412	802.11n MCS1 20 MHz channel bandwidth	-13.00	8.00
2422	802.11n MCS1 40 MHz channel bandwidth	-19.92	8.00
2442	802.11b 2 Mbs	-7.29	8.00
2442	802.11g 12 Mbs	-12.76	8.00
2442	802.11n MCS1 20 MHz channel bandwidth	-13.02	8.00
2442	802.11n MCS1 40 MHz channel bandwidth	-19.68	8.00
2462	802.11b 2 Mbs	-7.28	8.00
2462	802.11g 12 Mbs	-12.53	8.00
2462	802.11n MCS1 20 MHz channel bandwidth	-12.84	8.00
2462	802.11n MCS1 40 MHz channel bandwidth	-19.42	8.00

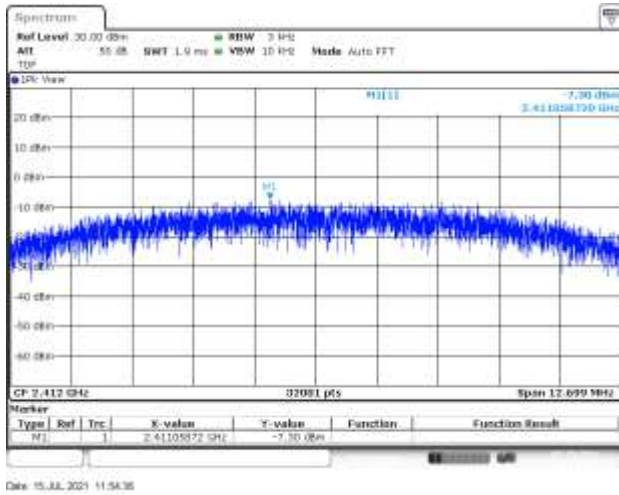


Figure 8.7-1: Power spectral density of digital transmission system, Low channel 802.11b 20 MHz

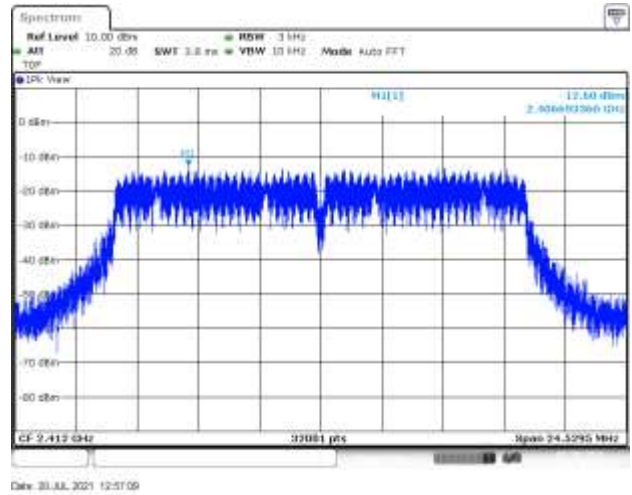


Figure 8.7-2: Power spectral density of digital transmission system, Low channel 802.11g 20 MHz

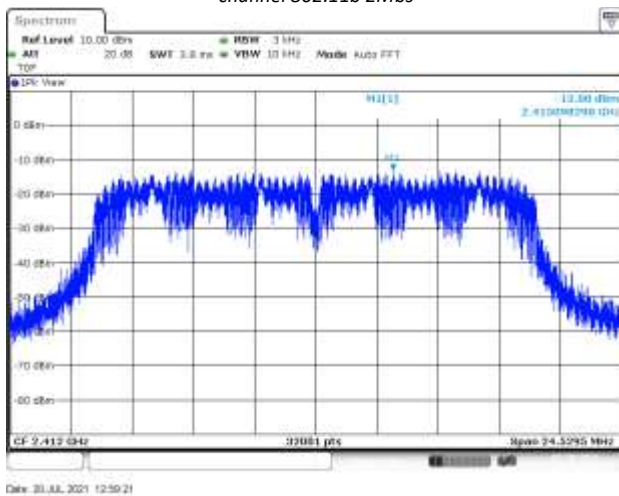


Figure 8.7-3: Power spectral density of digital transmission system, Low channel 802.11n MCS1 20 MHz channel bandwidth

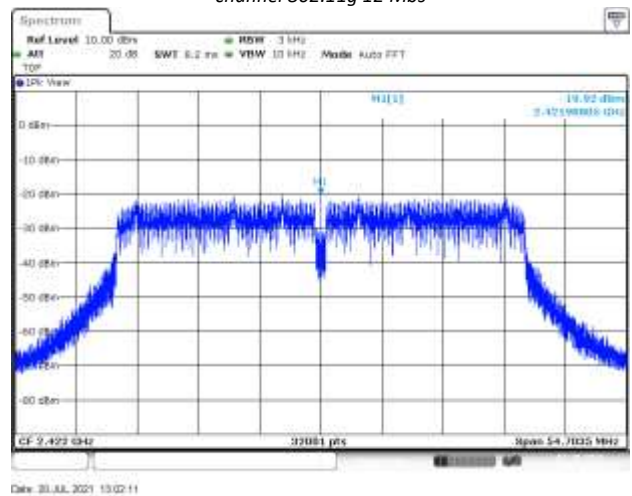


Figure 8.7-4: Power spectral density of digital transmission system, Low channel 802.11n MCS1 40 MHz channel bandwidth

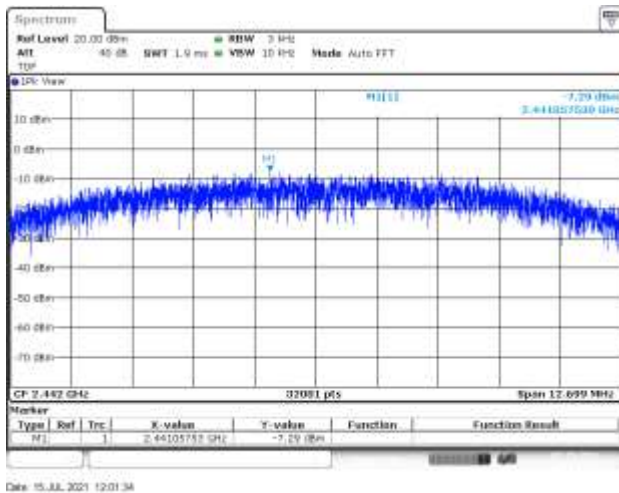


Figure 8.7-5: Power spectral density of digital transmission system, Mid channel 802.11b 20 MHz

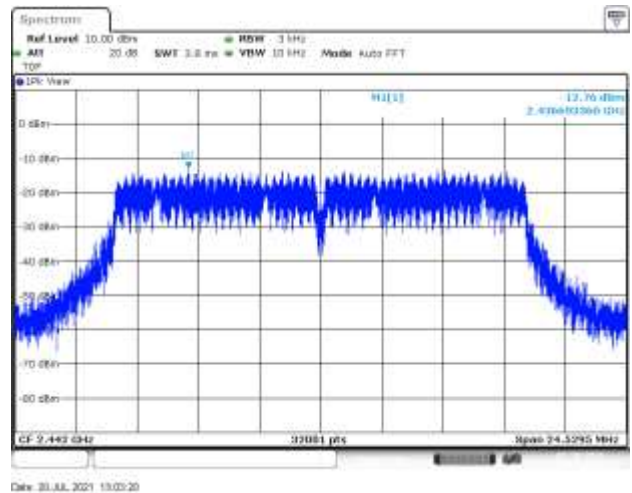


Figure 8.7-6: Power spectral density of digital transmission system, Mid channel 802.11g 20 MHz

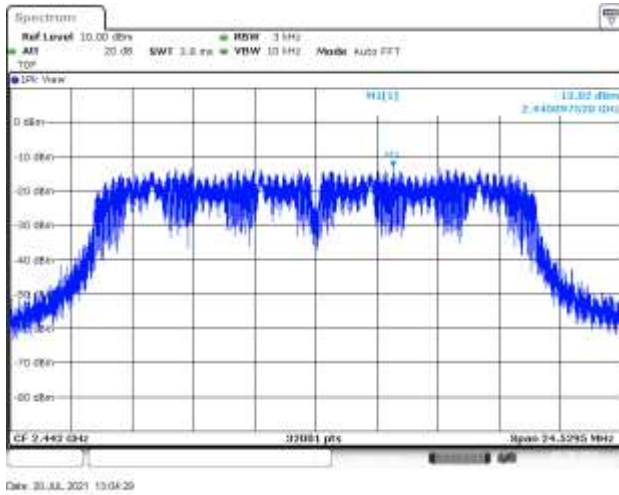


Figure 8.7-7: Power spectral density of digital transmission system, Mid channel 802.11n MCS1 20 MHz channel bandwidth

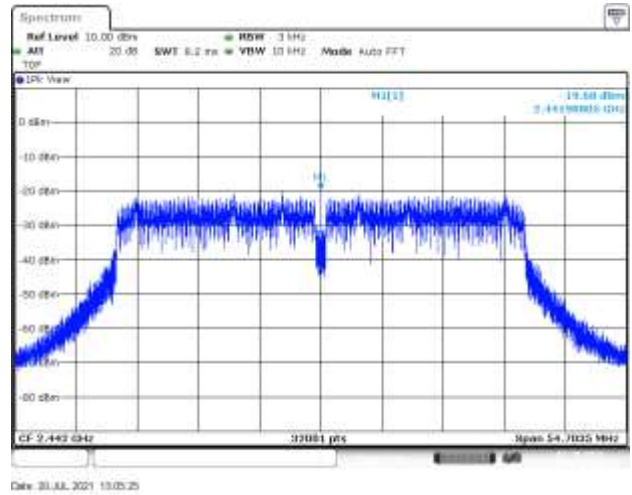


Figure 8.7-8: Power spectral density of digital transmission system, Mid channel 802.11n MCS1 40 MHz channel bandwidth

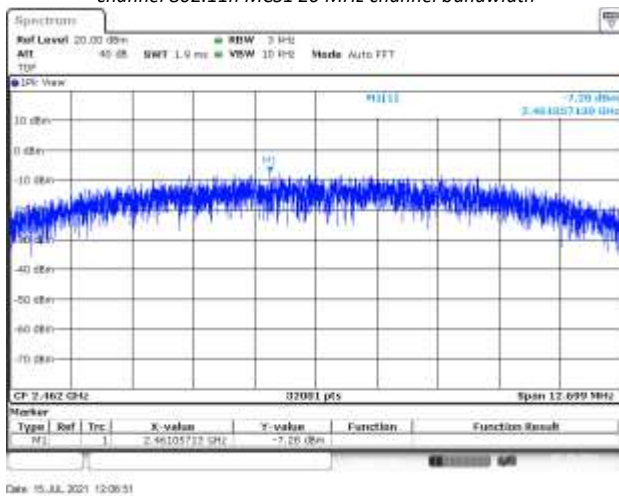


Figure 8.7-9: Power spectral density of digital transmission system, High channel 802.11b 2Mbps

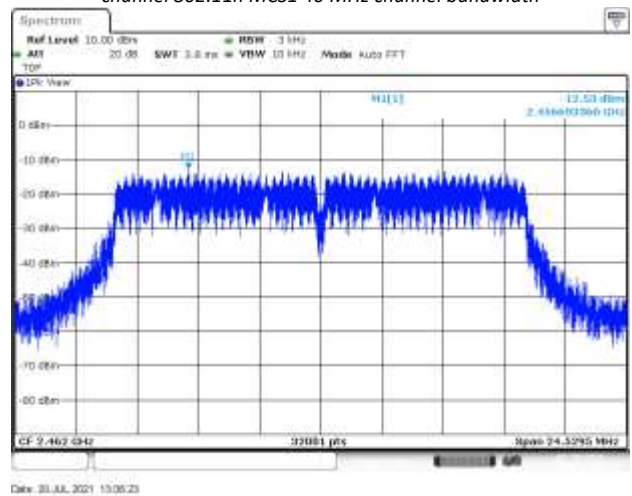


Figure 8.7-10: Power spectral density of digital transmission system, High channel 802.11g 12 Mbps

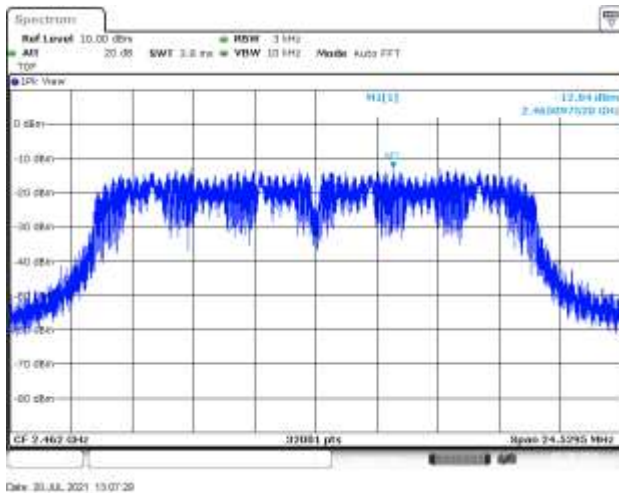


Figure 8.7-11: Power spectral density of digital transmission system, High channel 802.11n MCS1 20 MHz channel bandwidth

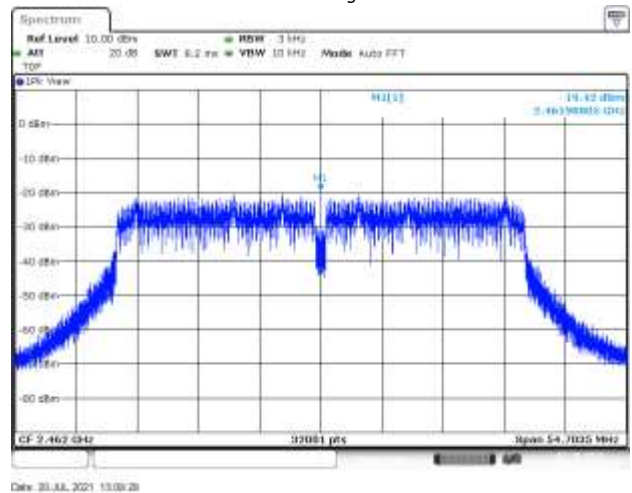


Figure 8.7-12: Power spectral density of digital transmission system, High channel 802.11n MCS1 40 MHz channel bandwidth

8.8 RSS-GEN 6.7 Occupied bandwidth (or 99% emission bandwidth)

8.8.1 References

RSS-Gen → §6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.8.2 Test summary

Test date	July 15, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1007 mbar
Test location	Wireless bench (Conducted)	Relative humidity	64 %
Test date	July 20, 2021	Temperature	23 °C
Test engineer	David Hewitt, EMC Specialist	Air pressure	1004 mbar
Test location	Wireless bench (Conducted)	Relative humidity	61 %

8.8.3 Notes

Testing was performed with WiFi transmitter operating on a fixed channel at surveyed power levels. Low, middle, and high channels were tested within the 802.11b, 802.11g, 802.11n (20 MHz channel bandwidth), and 802.11n (40 MHz channel bandwidth) modulations schemes.

8.8.4 Setup details

EUT setup configuration	Tabletop
Test facility	Nemko San Diego
Measurement details	Measurement performed as per C63.10 §6.9.3 using the built-in function of the spectrum analyzer

Receiver/spectrum analyzer settings:

Resolution bandwidth	100 kHz and 500 kHz
Video bandwidth	300 kHz and 2 MHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.8.5 Test data

Table 8.8-1: 99% Occupied bandwidth

Transmitter Frequency (MHz)	Modulation scheme	M1 (MHz)	T1 (MHz)	T2 (MHz)	99%Bandwidth (MHz)
2412	802.11b 2 Mbs	2411.17128	2405.421768	2418.535108	13.11
2412	802.11g 12 Mbs	2416.83079	2403.680885	2420.307865	16.63
2412	802.11n MCS1 20 MHz channel bandwidth	2416.83079	2403.36027	2420.667845	17.31
2422	802.11n MCS1 40 MHz channel bandwidth	2416.8303	2403.95369	2440.12131	36.17
2442	802.11b 2 Mbs	2441.17128	2435.449892	2448.511672	13.06
2442	802.11g 12 Mbs	2445.35333	2433.691197	2450.295678	16.60
2442	802.11n MCS1 20 MHz channel bandwidth	2447.85732	2433.245899	2450.560042	17.40
2442	802.11n MCS1 40 MHz channel bandwidth	2447.8573	2423.95556	2460.11756	36.16
2462	802.11b 2 Mbs	2461.16846	2455.457392	2468.503234	13.05
2462	802.11g 12 Mbs	2460.61067	2453.69026	2470.262867	16.57
2462	802.11n MCS1 20 MHz channel bandwidth	2460.61067	2453.238399	2470.668792	17.43
2462	802.11n MCS1 40 MHz channel bandwidth	2460.6107	2443.93306	2480.11568	36.18

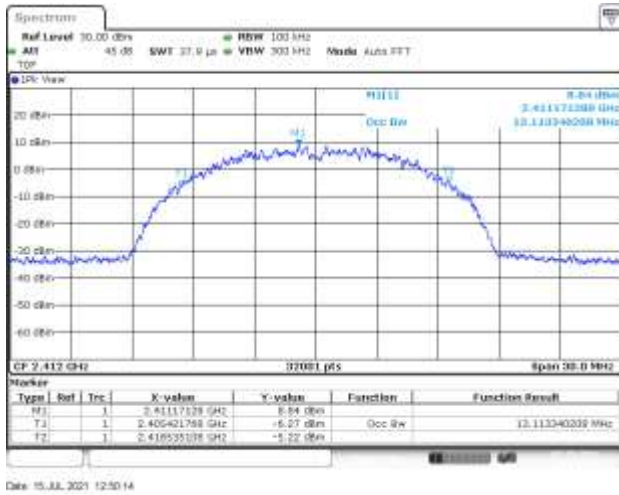


Figure 8.8-1: 99% occupied bandwidth, Low channel 802.11b 2Mbps

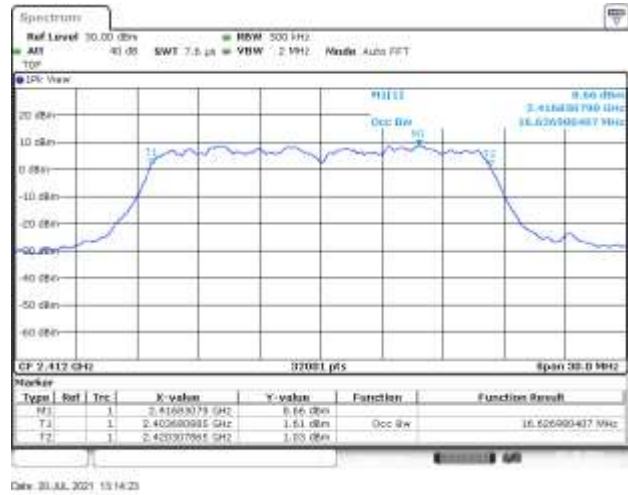


Figure 8.8-2: 99% occupied bandwidth, Low channel 802.11g 12 Mbps

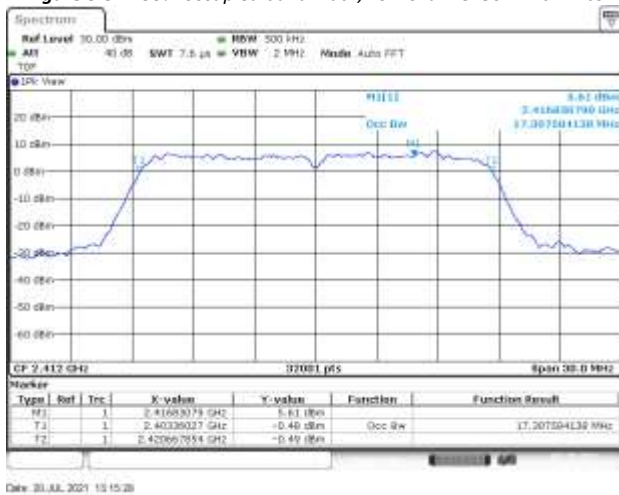


Figure 8.8-3: 99% occupied bandwidth, Low channel 802.11n MCS1 20 MHz channel bandwidth

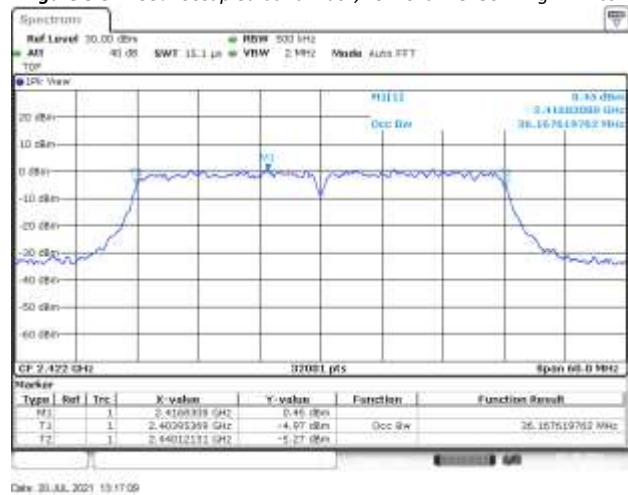


Figure 8.8-4: 99% occupied bandwidth, Low channel 802.11n MCS1 40 MHz channel bandwidth

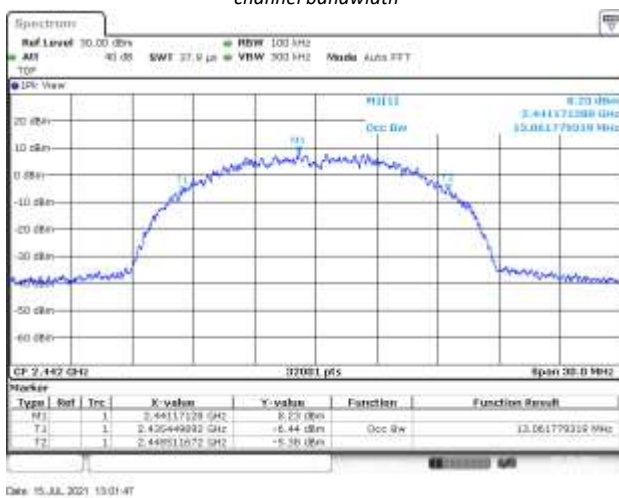


Figure 8.8-5: 99% occupied bandwidth, Mid channel 802.11b 2Mbps

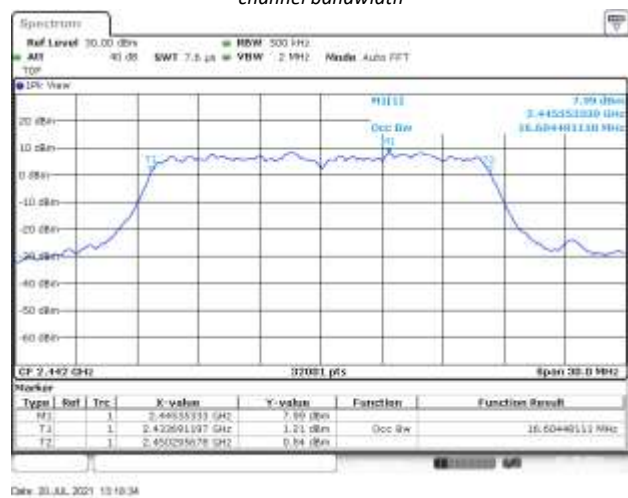


Figure 8.8-6: 99% occupied bandwidth, Mid channel 802.11g 12 Mbps

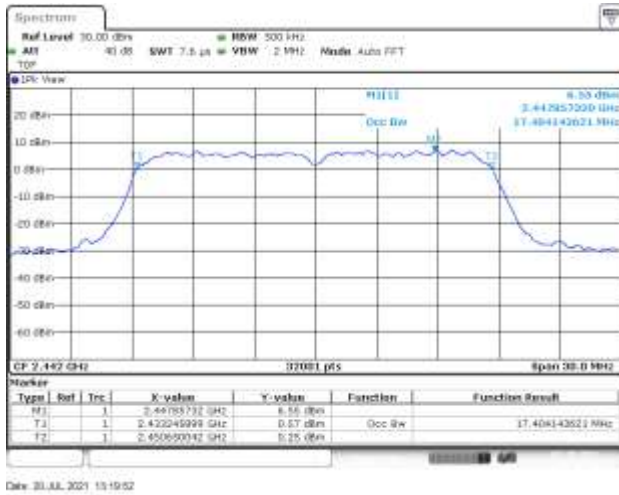


Figure 8.8-7: 99% occupied bandwidth, Mid channel 802.11n MCS1 20 MHz channel bandwidth

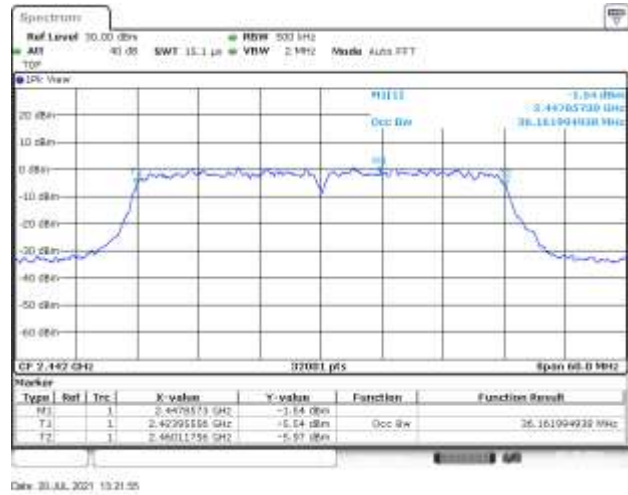


Figure 8.8-8: 99% occupied bandwidth, Mid channel 802.11n MCS1 40 MHz channel bandwidth



Figure 8.8-9: 99% occupied bandwidth, High channel 802.11b 2Mbps



Figure 8.8-10: 99% occupied bandwidth, High channel 802.11g 12 Mbps

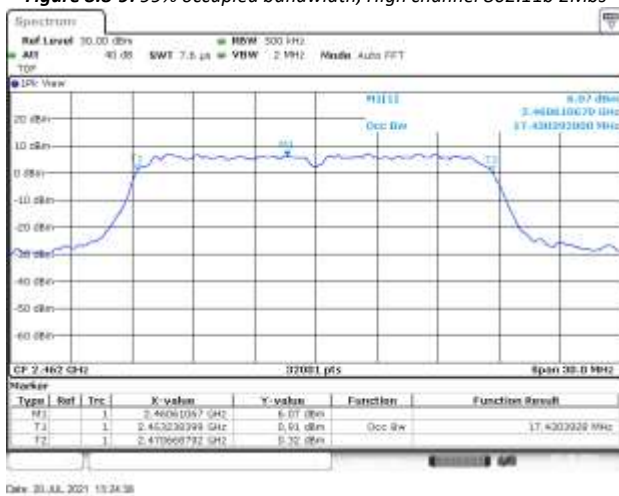


Figure 8.8-11: 99% occupied bandwidth, High channel 802.11n MCS1 20 MHz channel bandwidth

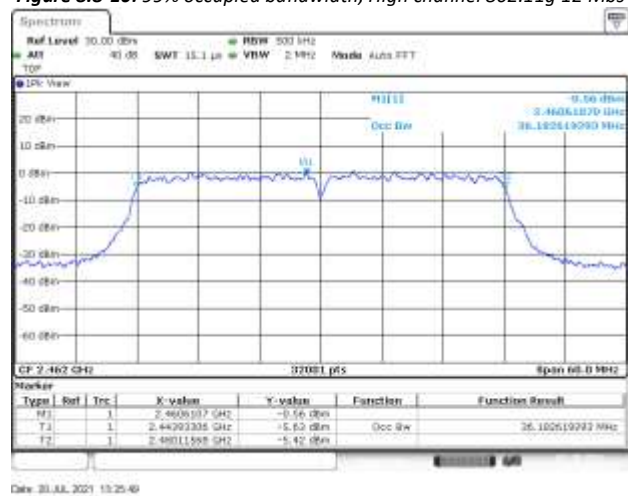


Figure 8.8-12: 99% occupied bandwidth, High channel 802.11n MCS1 40 MHz channel bandwidth

Section 9 Block diagrams of test set-ups

9.1 Radiated emissions set-up

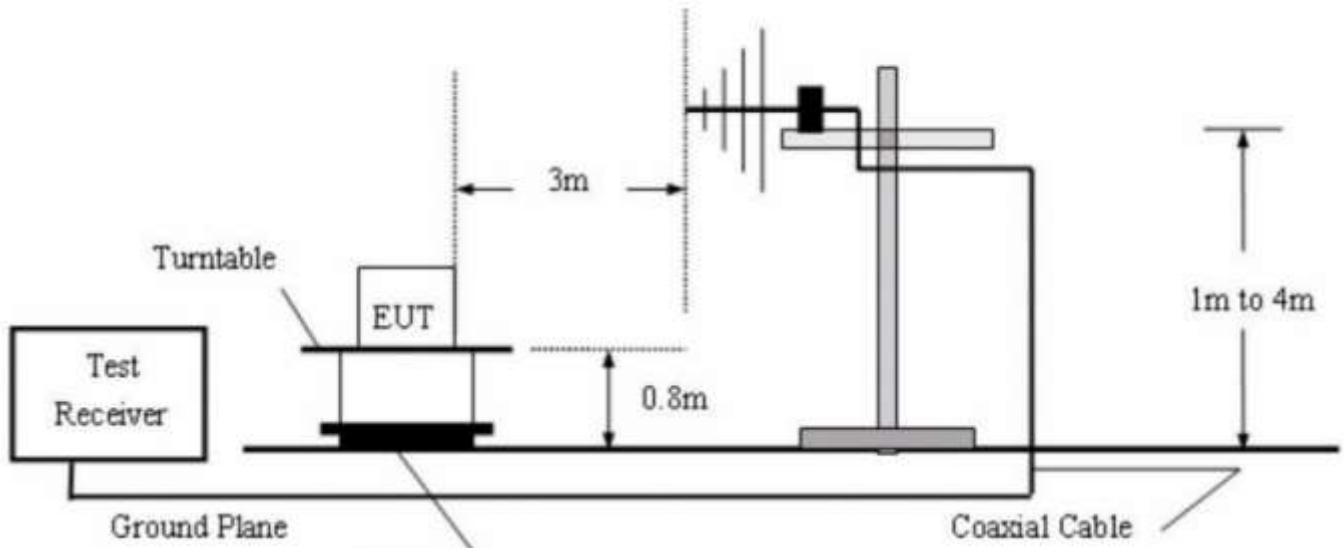


Figure 9.1-1: 30 MHz - 1000 MHz Setup

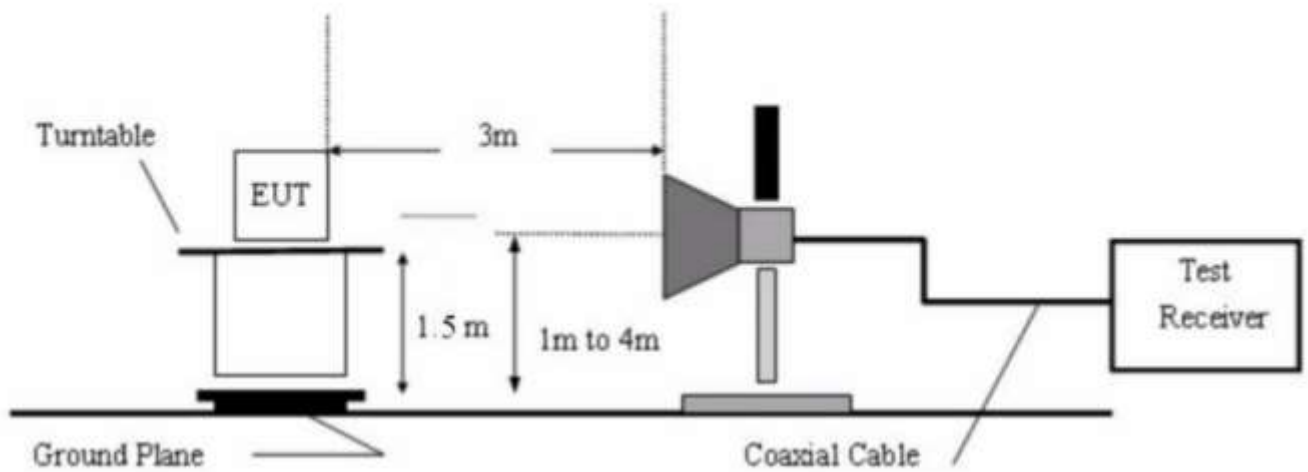


Figure 9.1-2: 1 GHz - 26 GHz Setup

9.2 Conducted emissions set-up

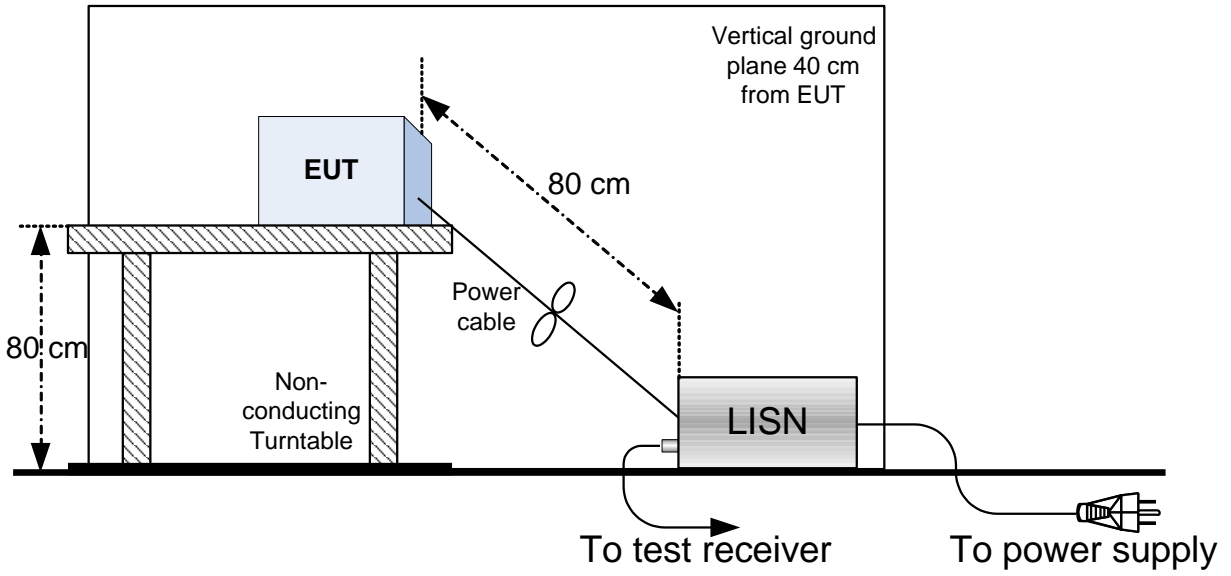


Figure 9.2-1: 150 kHz to 30 MHz Conducted Emissions Setup