

Test report

292050-1TRFWL

Date of issue: September 25, 2015

Applicant:

Otodata Wireless Network Inc.

Product:

Wireless Telematic device

Model:

C5040

FCC ID:

2ADQFC008TR900

IC Registration number:

12649A-C008TR900

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C, §15.247**


Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz

◆ **RSS-247, Issue 1, May 2015, Section 5**

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs)
and Licence-Exempt Local Area Network (LE-LAN) Devices

Test location

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

Tested by	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by	Kevin Rose, Wireless/EMC Specialist
Review date	September 25, 2015
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 Canada's ISO/IEC 17025 accreditation.

Copyright notification

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

© Nemko Canada Inc.

Table of contents

Table of contents	3
Section 1. Report summary	4
1.1 Applicant and manufacturer	4
1.2 Test specifications	4
1.3 Test methods.....	4
1.4 Statement of compliance	4
1.5 Exclusions.....	4
1.6 Test report revision history	4
Section 2. Summary of test results.....	5
2.1 FCC Part 15 Subpart C, general requirements test results.....	5
2.2 FCC Part 15 Subpart C, intentional radiators test results.....	5
2.3 IC RSS-GEN, Issue 4, test results	5
2.4 IC RSS-247, Issue 1, test results	6
Section 3. Equipment under test (EUT) details	7
3.1 Sample information.....	7
3.2 EUT information	7
3.3 Technical information	7
3.4 Product description and theory of operation	7
3.5 EUT exercise details.....	7
3.6 EUT setup diagram	8
Section 4. Engineering considerations.....	9
4.1 Modifications incorporated in the EUT.....	9
4.2 Technical judgment	9
4.3 Deviations from laboratory tests procedures	9
Section 5. Test conditions.....	10
5.1 Atmospheric conditions	10
5.2 Power supply range.....	10
Section 6. Measurement uncertainty	11
6.1 Uncertainty of measurement	11
Section 7. Test equipment	12
7.1 Test equipment list.....	12
Section 8. Testing data	13
8.1 FCC 15.247(a)(1) and RSS-247 5.1(1) Frequency Hopping Systems requirements.....	13
8.2 FCC 15.247(b) and RSS-247 5.4 (1) Transmitter output power and e.i.r.p. requirements	18
8.3 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions	20
Section 9. Block diagrams of test set-ups	26
9.1 Radiated emissions set-up.....	26

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Otodata Wireless Network Inc.
Address	9280 L'Acadie Blvd.
City	Montreal
Province/State	Quebec
Postal/Zip code	H4N 3C5
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.247	Operation in the 902–928 MHz, 2400–2483.5 MHz
RSS-247, Issue 1, May 2015, Section 5	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.3 Test methods

DA 00-705 Released March 30, 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

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

See “Summary of test results” for full details.

1.5 Exclusions

None

1.6 Test report revision history

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

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable
§15.31(e)	Variation of power source	Pass ¹
§15.203	Antenna requirement	Pass ²

Notes: ¹ The EUT was using fully charged battery during the testing

² The Antenna is located within the enclosure of EUT and not user accessible.

2.2 FCC Part 15 Subpart C, intentional radiators test results

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Pass
§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	Not applicable
§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	Pass
§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	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	Not applicable
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

2.3 IC RSS-GEN, Issue 4, test results

Part	Test description	Verdict
7.1.2	Receiver radiated emission limits	Not applicable
7.1.3	Receiver conducted emission limits	Not applicable
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Not applicable

Notes: ¹ According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

2.4 IC RSS-247, Issue 1, test results

Part	Test description	Verdict
5.1	Frequency Hopping Systems (FHSs)	
5.1 (1)	Bandwidth of a frequency hopping channel	Pass
5.1 (2)	Minimum channel spacing for frequency hopping systems	Pass
5.1 (3)	Frequency hopping systems operating in the 902–928 MHz band	Pass
5.1 (4)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.1 (5)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
5.2	Digital Transmission Systems (DTSSs)	
5.2 (1)	Minimum 6 dB bandwidth	Not applicable
5.2 (2)	Maximum power spectral density	Not applicable
5.3	Hybrid Systems	
5.3 (1)	Digital modulation turned off	Not applicable
5.3 (2)	Frequency hopping turned off	Not applicable
5.4	Transmitter output power and e.i.r.p. requirements	
5.4 (1)	Frequency hopping systems operating in the 902–928 MHz band	Pass
5.4 (2)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.4 (3)	Frequency hopping systems operating in the 5725–5850 MHz	Not applicable
5.4 (4)	Systems employing digital modulation techniques	Not applicable
5.4 (5)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (6)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Out-of-band emissions	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	July 27, 2015
Nemko sample ID number	1

3.2 EUT information

Product name	Wireless Telematic device
Model	C5040
Serial number	None

3.3 Technical information

Applicant IC company number	12649A
IC UPN number	C008TR900
All used IC test site(s) Reg. number	2040A-4
RSS number and Issue number	RSS-247 Issue 1, May 2015
Frequency band	902–928 MHz
Frequency Min (MHz)	902.24
Frequency Max (MHz)	927.76
RF power Max (W), Conducted	0.982 (29.92 dBm)
Field strength, Units @ distance	N/A
Measured BW (kHz) (20 dB)	31.41
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	2FSK
Emission classification (F1D, G1D, D1D)	F1D
Transmitter spurious, Units @ distance	39.39 dBμV/m average at 2783 MHz @ 3 m
Power requirements	12 V _{DC} from car battery
Antenna information	Fixed ¼ wave soldered antenna with 2.5 dBi gain The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The C008TR900 transceiver is an autonomous transceiver that is used primarily for the, control, reading and identification management of assets using RF (radio frequencies). The C008TR900 may be used in conjunction with active base station receivers and controllers. The C008TR900 may be affixed to assets with which base stations may communicate in order to collect data.

3.5 EUT exercise details

EUT was powered and special mode of operation was set to transmit on selected channels with predefined power settings

3.6 EUT setup diagram

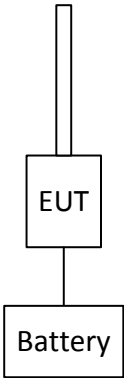


Figure 3.6-1: Setup diagram

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

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

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

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

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

5.2 Power supply range

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



Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of $K = 2$ with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Feb. 25/16
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/16
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 12/16
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 01/16
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	May 05/16

Note: NCR - no calibration required

Section 8. Testing data

8.1 FCC 15.247(a)(1) and RSS-247 5.1(1) Frequency Hopping Systems requirements

8.1.1 Definitions and limits

FCC:

- (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
- (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

IC:

- The bandwidth of a frequency hopping channel is the –20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, whereas the long-term distribution appears evenly distributed.
- FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the –20 dB bandwidth of the hopping channel, whichever is greater. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
- For FHSs in the band 902–928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

8.1.2 Test summary

Test date	July 27, 2015	Temperature	23 °C
Test engineer	Andrey Adelberg	Air pressure	1005 mbar
Verdict	Pass	Relative humidity	35 %

8.1.3 Observations, settings and special notes

Spectrum analyser settings for carrier frequency separation:

Resolution bandwidth	≥ 1 % of the span
Video bandwidth	≥ RBW
Frequency span	wide enough to capture the peaks of two adjacent channels
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for number of hopping frequencies:

Resolution bandwidth	≥ 1 % of the span
Video bandwidth	≥ RBW
Frequency span	the frequency band of operation
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for time of occupancy (dwell time):

Resolution bandwidth	1 MHz
Video bandwidth	≥ RBW
Frequency span	Zero span
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for 20 dB bandwidth:

Resolution bandwidth	≥ 1% of the 20 dB bandwidth
Video bandwidth	≥ RBW
Frequency span	approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

8.1.4 Test data

Table 8.1-1: 20 dB bandwidth results

Frequency, MHz	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz
902.24	31.38	500	468.62
915.00	31.41	500	468.59
927.76	31.25	500	468.75

Table 8.1-2: Carrier frequency separation results

Carrier frequency separation, kHz	Minimum limit, kHz	Margin, kHz
40.06	31.41	8.65

Table 8.1-3: Number of hopping frequencies results

Number of hopping frequencies	Minimum limit	Margin
53	50	3

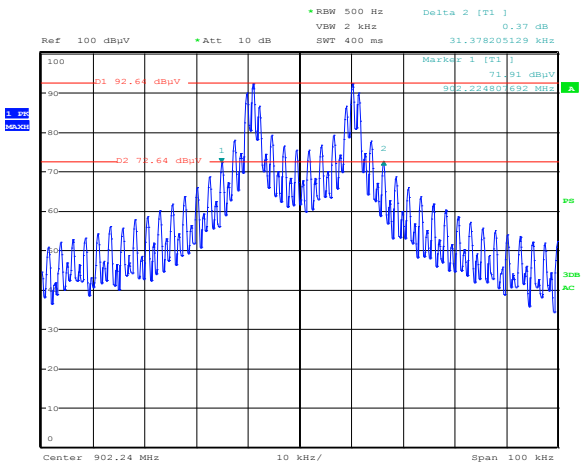
Table 8.1-4: Average time of occupancy results

Dwell time of each pulse, ms	Number of pulses within period	Total dwell time within period, ms	Limit, ms	Margin, ms
385.28	1	385.28	400.00	14.72

Measurement Period is 20 s

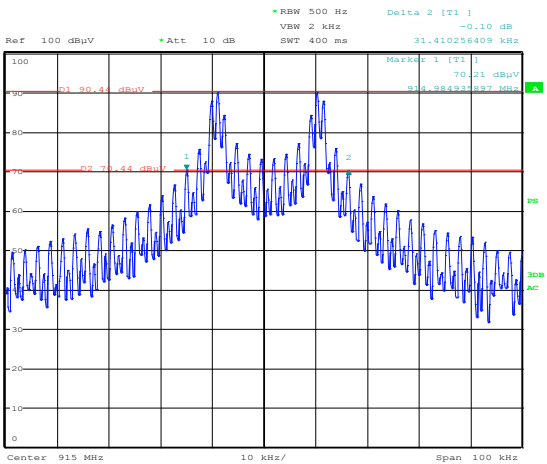
Section 8
Test name
Specification

Testing data
FCC 15.247(a)(1) and RSS-247 5.1(1) Frequency Hopping Systems requirements
FCC Part 15 Subpart C and RSS-247, Issue 1



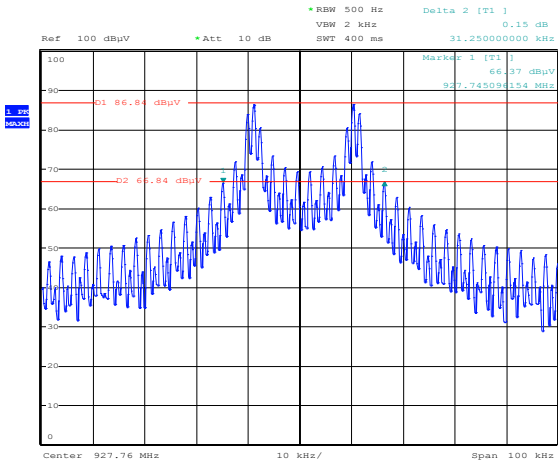
Date: 27.JUL.2015 14:21:32

Figure 8.1-1: 20 dB bandwidth on low channel



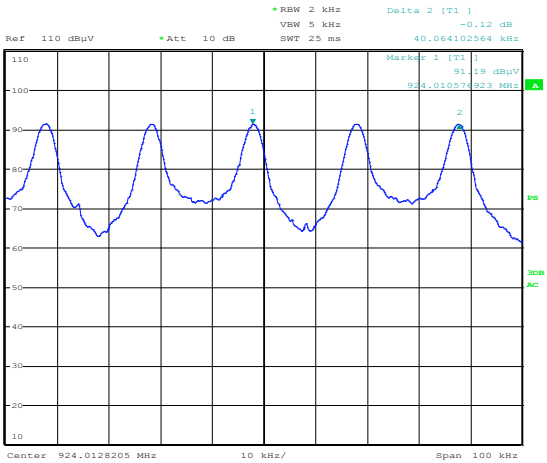
Date: 27.JUL.2015 14:17:37

Figure 8.1-2: 20 dB bandwidth on mid channel



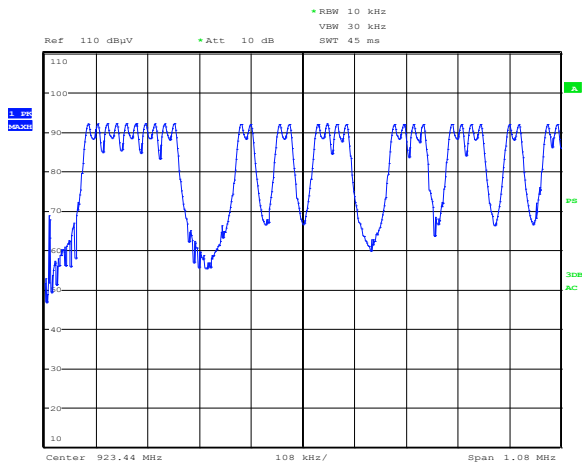
Date: 27.JUL.2015 14:20:23

Figure 8.1-3: 20 dB bandwidth on high channel



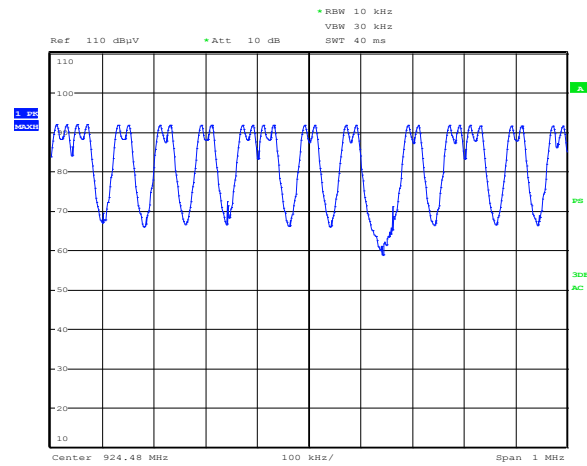
Date: 27.JUL.2015 13:43:35

Figure 8.1-4: Carrier frequency separation



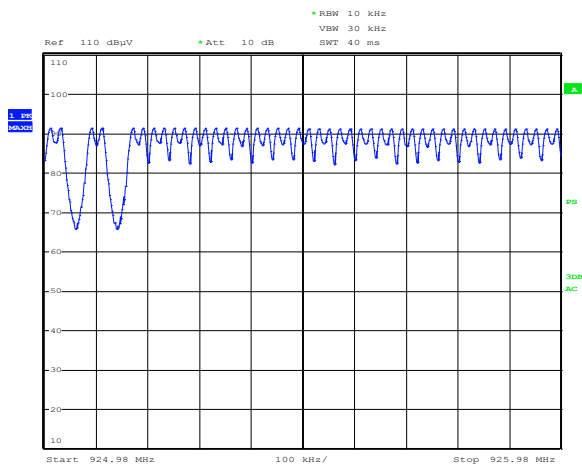
Date: 27.JUL.2015 13:54:20

Figure 8.1-5: Number of hopping channels, part 1, 15 channels



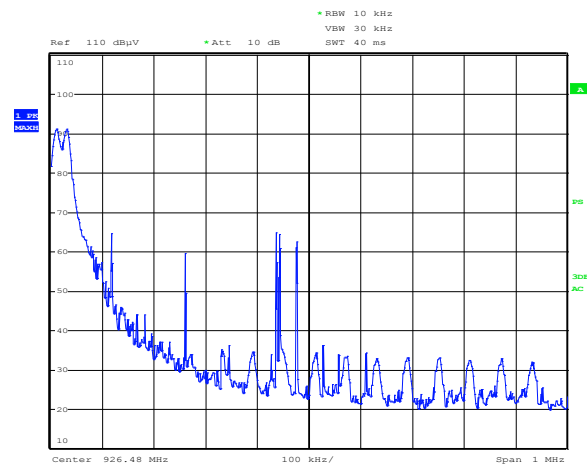
Date: 27.JUL.2015 13:56:41

Figure 8.1-6: Number of hopping channels, part 2, 14 channels



Date: 27.JUL.2015 13:57:47

Figure 8.1-7: Number of hopping channels, part 3, 23 channels

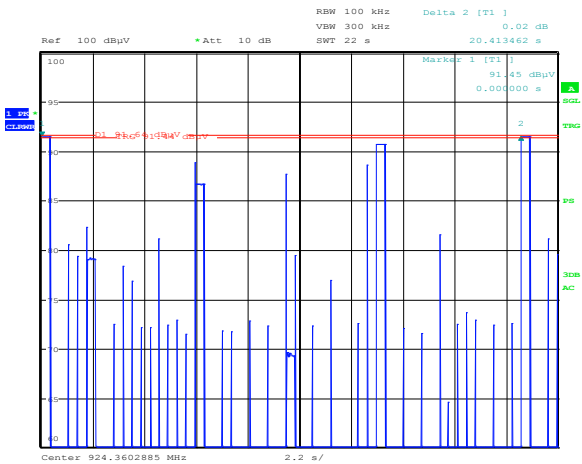


Date: 27.JUL.2015 13:59:36

Figure 8.1-8: Number of hopping channels, part 4, 1 channel

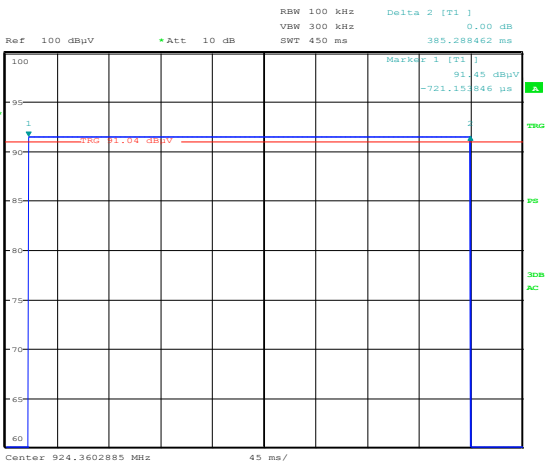
Section 8
Test name
Specification

Testing data
FCC 15.247(a)(1) and RSS-247 5.1(1) Frequency Hopping Systems requirements
FCC Part 15 Subpart C and RSS-247, Issue 1



Date: 27.JUL.2015 14:09:57

Figure 8.1-9: Number of using of the channel within 20 seconds. Only once.



Date: 27.JUL.2015 14:13:06

Figure 8.1-10: Dwell time, 385.28 ms

8.2 FCC 15.247(b) and RSS-247 5.4 (1) Transmitter output power and e.i.r.p. requirements

8.2.1 Definitions and limits

FCC:

- (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
- (2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
 - (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.

IC:

For FHSs operating in the band 902–928 MHz, the maximum peak conducted output power shall not exceed 1.0 W (30 dBm), and the e.i.r.p. shall not exceed 4 W (36 dBm) if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W (24 dBm) and the e.i.r.p. shall not exceed 1 W (30 dBm) if the hopset uses less than 50 hopping channels.

8.2.2 Test summary

Test date	July 27, 2015	Temperature	23 °C
Test engineer	Andrey Adelberg	Air pressure	1005 mbar
Verdict	Pass	Relative humidity	35 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings for output power:

Resolution bandwidth	> the 20 dB bandwidth of the emission being measured
Video bandwidth	≥ RBW
Frequency span	approximately 5 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

8.2.4 Test data

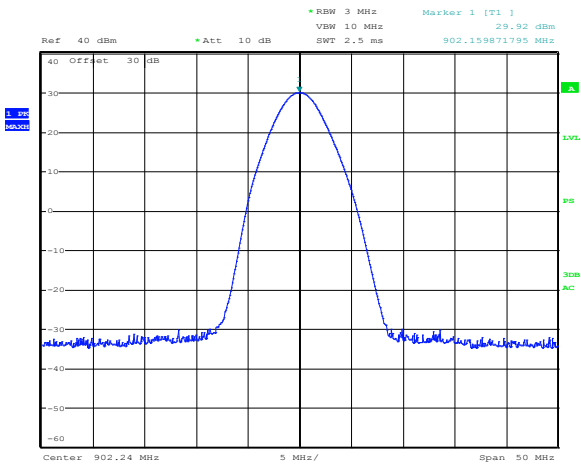
Table 8.2-1: Output power and EIRP results

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
902.24	29.92	30.00	0.08	2.50	32.42	36.00	3.58
915.00	29.54	30.00	0.46	2.50	32.04	36.00	3.96
927.76	29.88	30.00	0.12	2.50	32.38	36.00	3.62

EIRP = Output power + Antenna gain

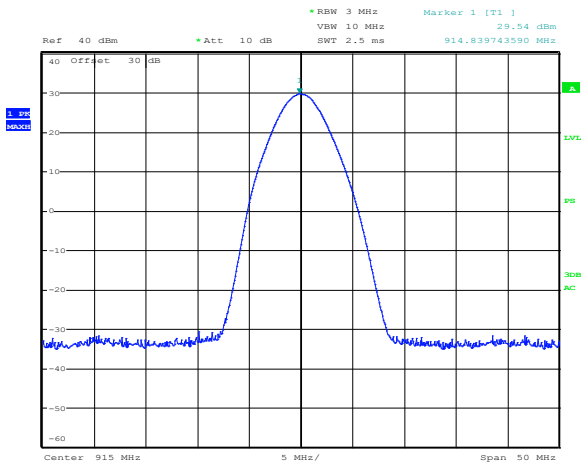
Section 8
Test name
Specification

Testing data
FCC 15.247(b) and RSS-247 5.4 (1) Transmitter output power and e.i.r.p. requirements
FCC Part 15 Subpart C and RSS-247, Issue 1



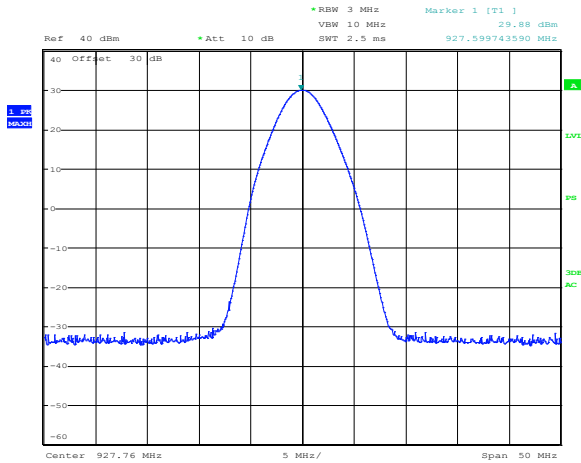
Date: 27.JUL.2015 11:08:48

Figure 8.2-1: Output power on low channel



Date: 27.JUL.2015 10:55:59

Figure 8.2-2: Output power on mid channel



Date: 27.JUL.2015 11:12:23

Figure 8.2-3: Output power on high channel

8.3 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions

8.3.1 Definitions and limits

FCC:

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. 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)).

IC:

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. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.3-1: FCC §15.209 and RSS-Gen – Radiated emission limits

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

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.3-2: IC restricted frequency bands

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

Note: Certain frequency bands listed in Table 8.3-2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.3-3: FCC restricted frequency bands

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

8.3.2 Test summary

Test date	July 27, 2015	Temperature	23 °C
Test engineer	Andrey Adelberg	Air pressure	1005 mbar
Verdict	Pass	Relative humidity	35 %

8.3.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
EUT was set to transmit with 100 % duty cycle.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

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

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

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

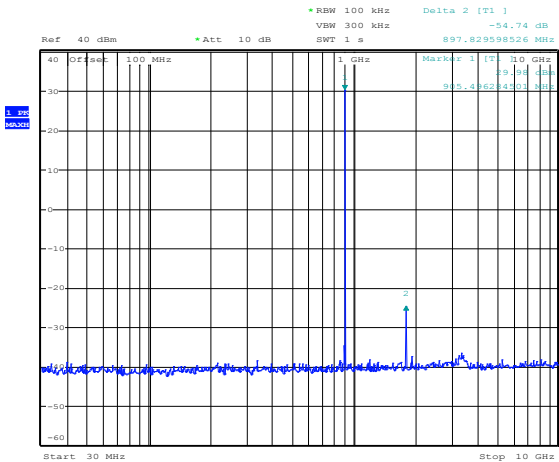
Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for conducted spurious emissions measurements:

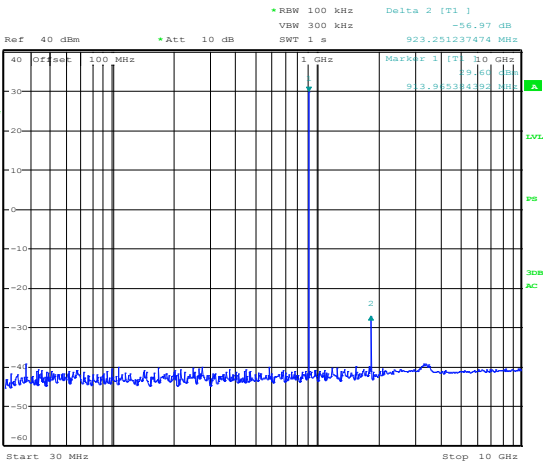
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.3.4 Test data



Date: 27.JUL.2015 11:16:08

Figure 8.3-1: Conducted spurious emissions for low channel

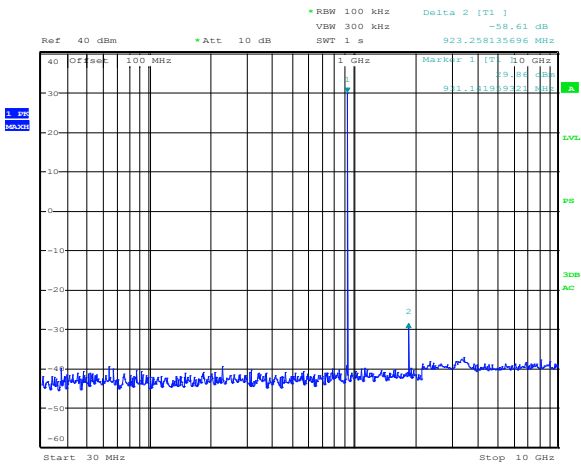


Date: 27.JUL.2015 10:58:12

Figure 8.3-2: Conducted spurious emissions for mid channel

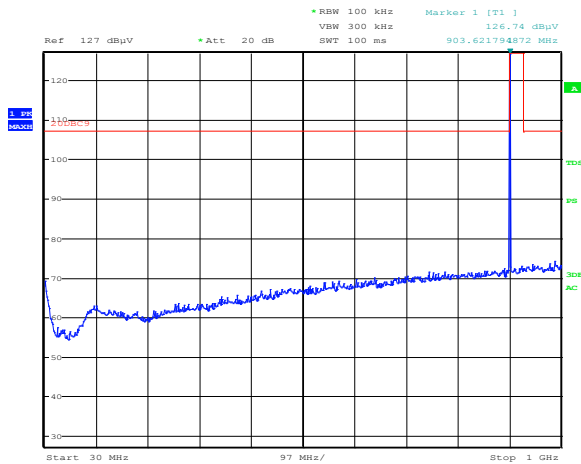
Section 8
Test name
Specification

Testing data
FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions
FCC Part 15 Subpart C and RSS-247, Issue 1



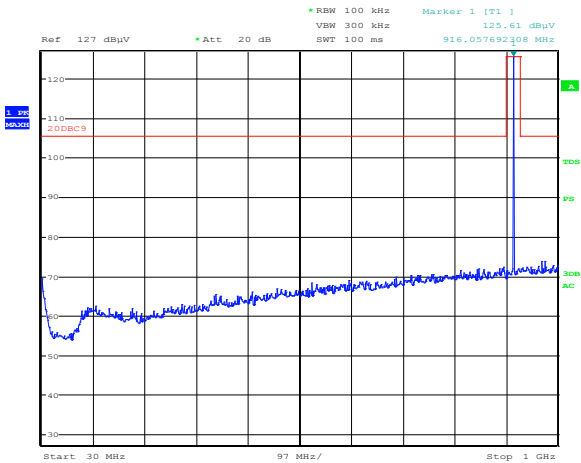
Date: 27.JUL.2015 11:13:32

Figure 8.3-3: Conducted spurious emissions for high channel



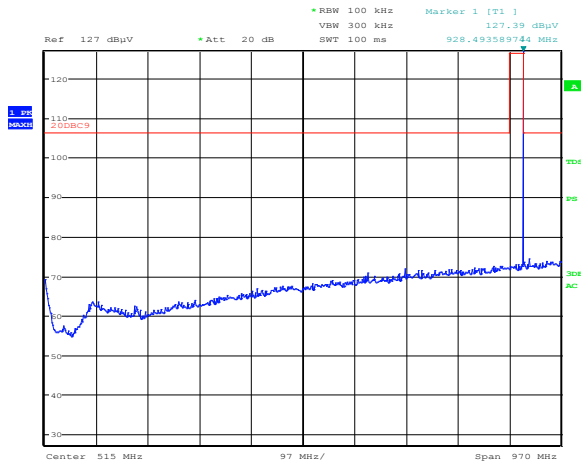
Date: 27.JUL.2015 13:33:05

Figure 8.3-4: Radiated spurious emissions below 1 GHz for low channel with -20 dBc limit



Date: 27.JUL.2015 13:24:16

Figure 8.3-5: Radiated spurious emissions below 1 GHz for mid channel with -20 dBc limit



Date: 27.JUL.2015 13:29:05

Figure 8.3-6: Radiated spurious emissions below 1 GHz for high channel with -20 dBc limit

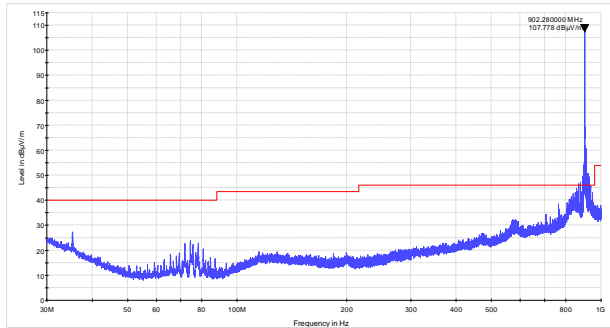


Figure 8.3-7: Radiated spurious emissions for low channel below 1 GHz for restricted band emissions

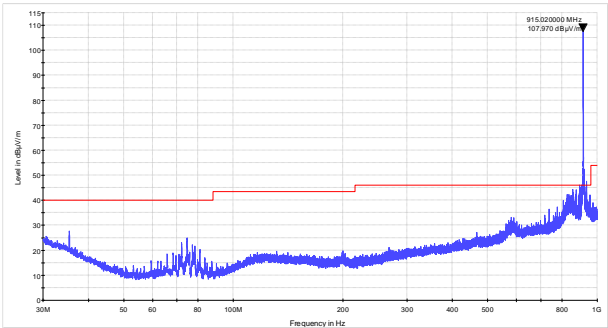


Figure 8.3-8: Radiated spurious emissions for mid channel below 1 GHz for restricted band emissions

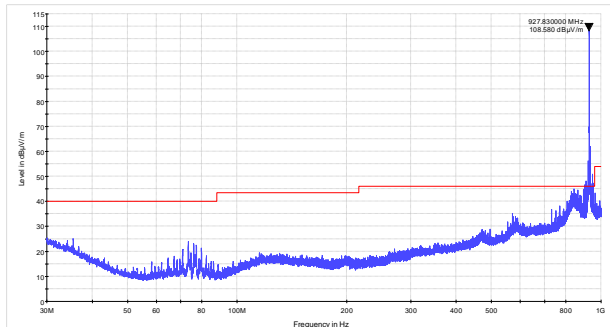


Figure 8.3-9: Radiated spurious emissions for high channel below 1 GHz for restricted band emissions

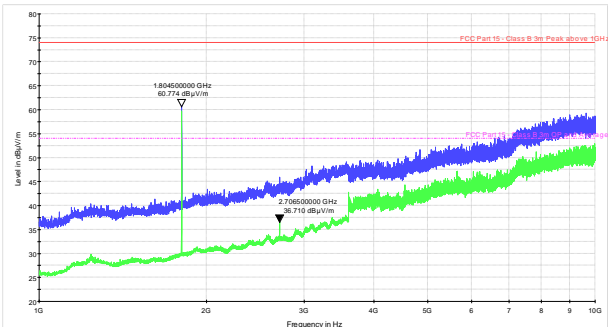


Figure 8.3-10: Radiated spurious emissions for low channel above 1 GHz for restricted band emissions

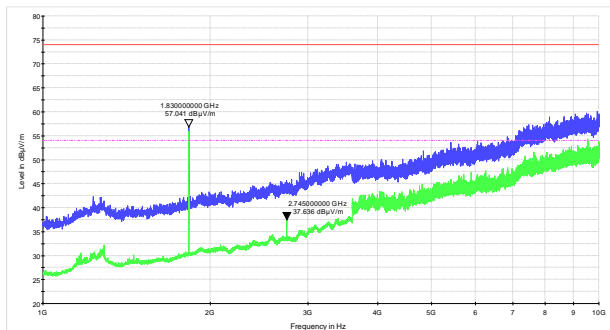


Figure 8.3-11: Radiated spurious emissions for mid channel above 1 GHz for restricted band emissions

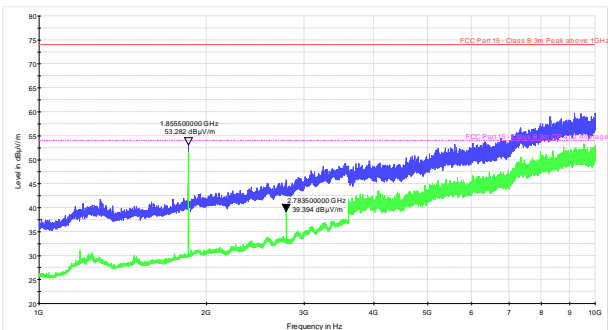
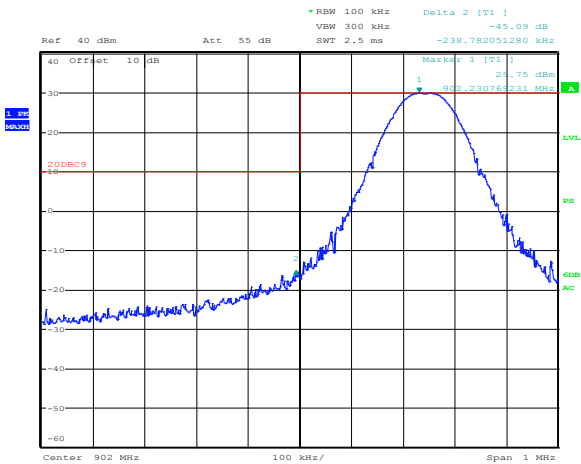


Figure 8.3-12: Radiated spurious emissions for high channel above 1 GHz for restricted band emissions

Note: 1.8 GHz emission is a second harmonic that falls outside restricted bands.

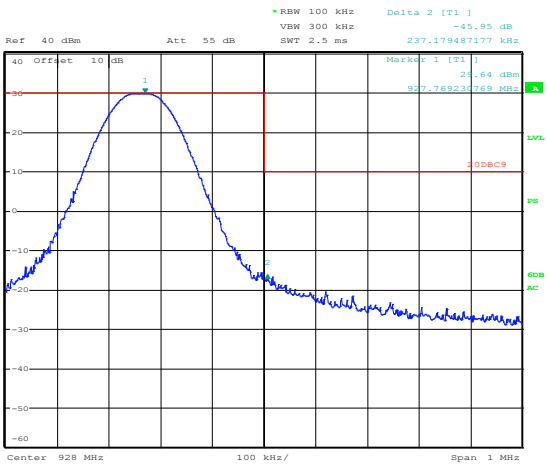
Section 8
Test name
Specification

Testing data
FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions
FCC Part 15 Subpart C and RSS-247, Issue 1



Date: 27.JUL.2015 11:38:37

Figure 8.3-13: Lower band edge emission, hopping off



Date: 27.JUL.2015 11:40:04

Figure 8.3-14: Upper band edge emission, hopping off

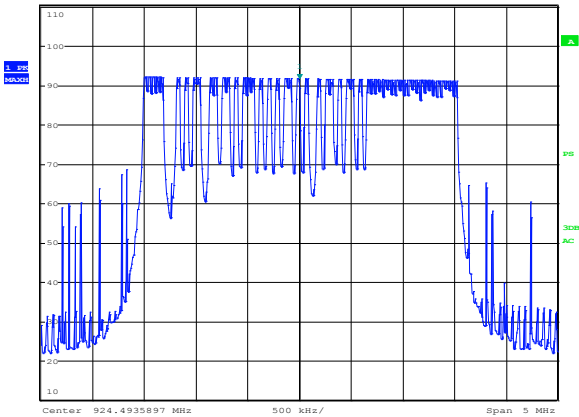


Figure 8.3-15: Lower and upper band edge emissions, hopping on

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up

