Excellence in Compliance Testing

Certification Test Report

FCC ID: VPYLB1CK982
IC: 772C-LB1CK982

FCC Rule Part: 15.247
ISED Canada Radio Standards Specification: RSS-247

ACS Report Number: 16-2033.W06.3B

Applicant: Murata Manufacturing Co., Ltd.
Model(s): LBEE5ZZ1CK-982

Test Begin Date: **June 02, 2016**
Test End Date: **June 11, 2016**

Report Issue Date: December 15, 2016

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, ANSI, or any agency of the Federal Government.

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This report contains 60 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247.

1.2 Applicant Information

Murata Electronics, N.A. Inc.
2200 Lake Park Drive
Smyrna, GA. 30080

1.3 Product Description

The Murata Electronics, N.A. Inc. model LBEE5ZZ1CK-982 is an IEEE 802.11a/b/g/n/ac WLAN + Bluetooth 4.0 wireless transceiver module. The test report documents the compliance of the 2.4 GHz WLAN mode of operation.

Technical Details

Mode of Operation:	WLAN IEEE 802.11b/g/n
Frequency Range:	802.11b/g/n 20 MHz: 2412 MHz - 2462 MHz
Number of Channels:	11
Channel Separation:	5 MHz
Modulations:	802.11b: DSSS 802.11g/n: OFDM
Antenna Type/Gain:	PCB Trace Antenna, 0 dBi
Input Power:	3.6 VDC

Model Number: LBEE5ZZ1CK-982

Test Sample Serial Number(s): 433900071FAC

Test Sample Condition: The equipment was provided in good condition without any physical damage.

1.4 Test Methodology and Considerations

The EUT was evaluated for RF conducted emissions for the 2.4 GHz 802.11b/g/n WLAN mode of operation. The EUT provides a proprietary switched connector that adapts to an SMA connector for the RF conducted measurements.

Compliance to the radiated and power line conducted emissions requirements is documented in a separate test report.

Table 1.4-1: IEEE 802.11b/g/n Radio Test Configuration

Mode of Operation	Frequency (MHz)	Channel	Test Software Power Setting	Data Rate Setting
802.11b	2412	1	17 dBm	11 Mbps
	2437	6		
	2462	11		
802.11g	2412	1	14 dBm	48 Mbps
	2437	6		
	2462	11		
802.11n 20 MHz	2412	1	13 dBm	65 Mbps (MCS7)
	2437	6		
	2462	11		

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Innovation, Science and Economic Development Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1060 Multi-device controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

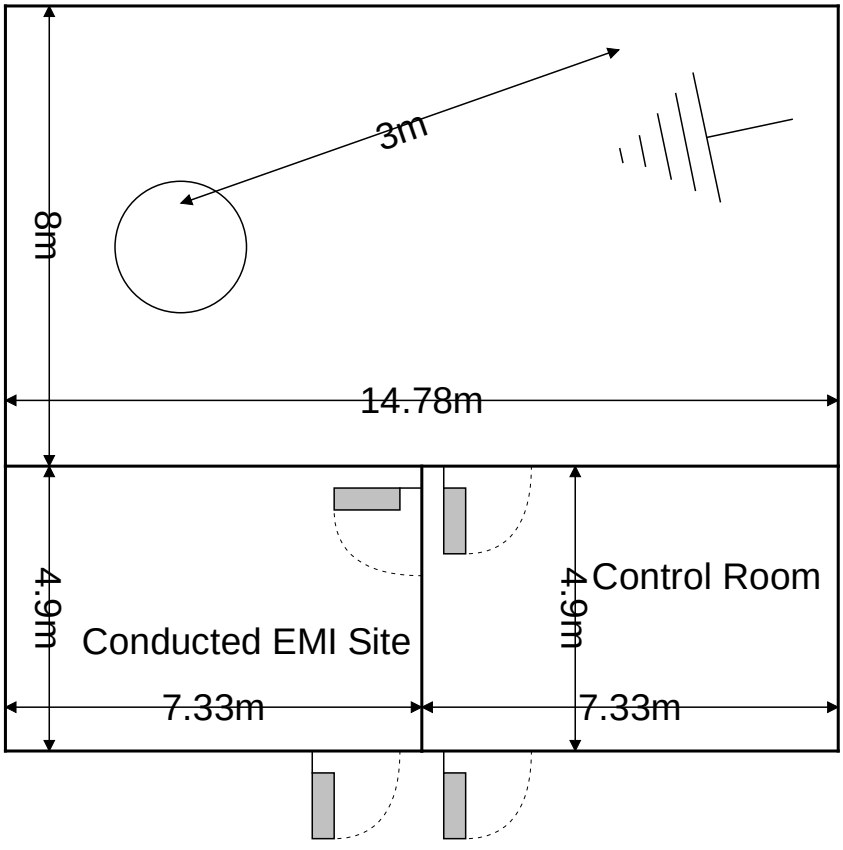


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

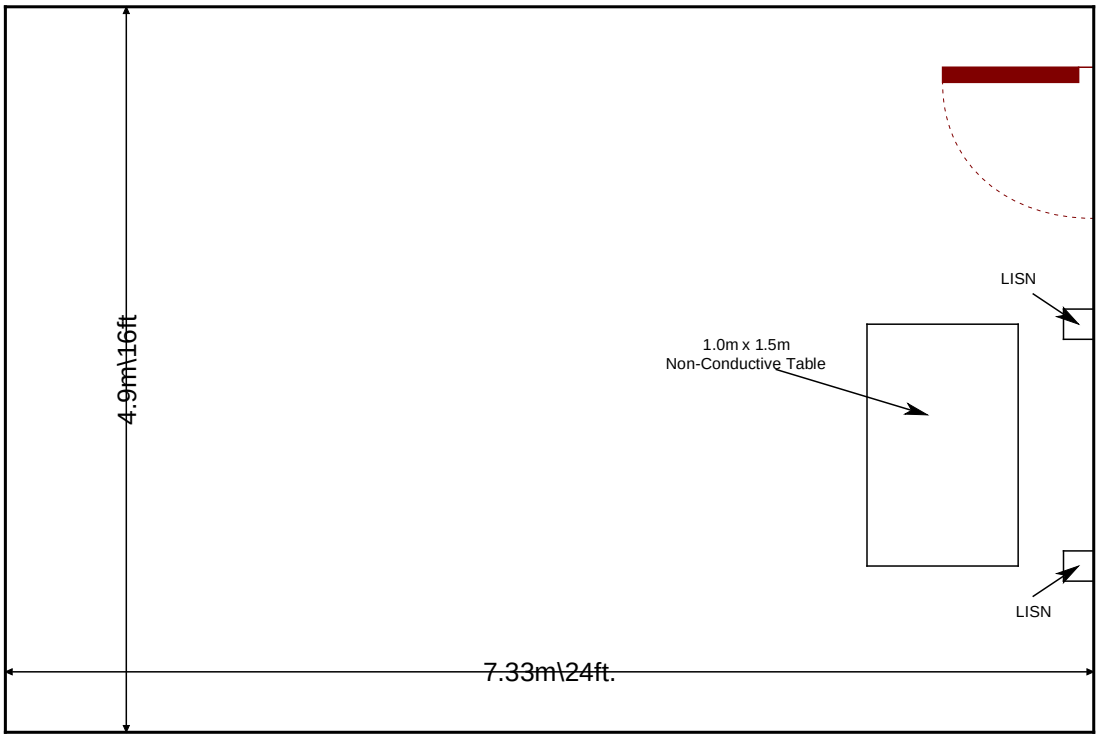


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2014: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 40 GHz.
- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2016.
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2016
- FCC KDB 558074 D01 DTS Meas Guidance v03r05 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 8, 2016.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-247 — Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 1, May 2015.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, November 2014.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment List

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	7/1/2015	7/1/2016
2111	Aeroflex Inmet	40AH2W-20	Attenuator	2111	7/22/2015	7/22/2016
RE578	MPJA	HY5003	Power Supplies	3700278	NCR	NCR

Note: NCR=No Calibration Required

5 SUPPORT EQUIPMENT

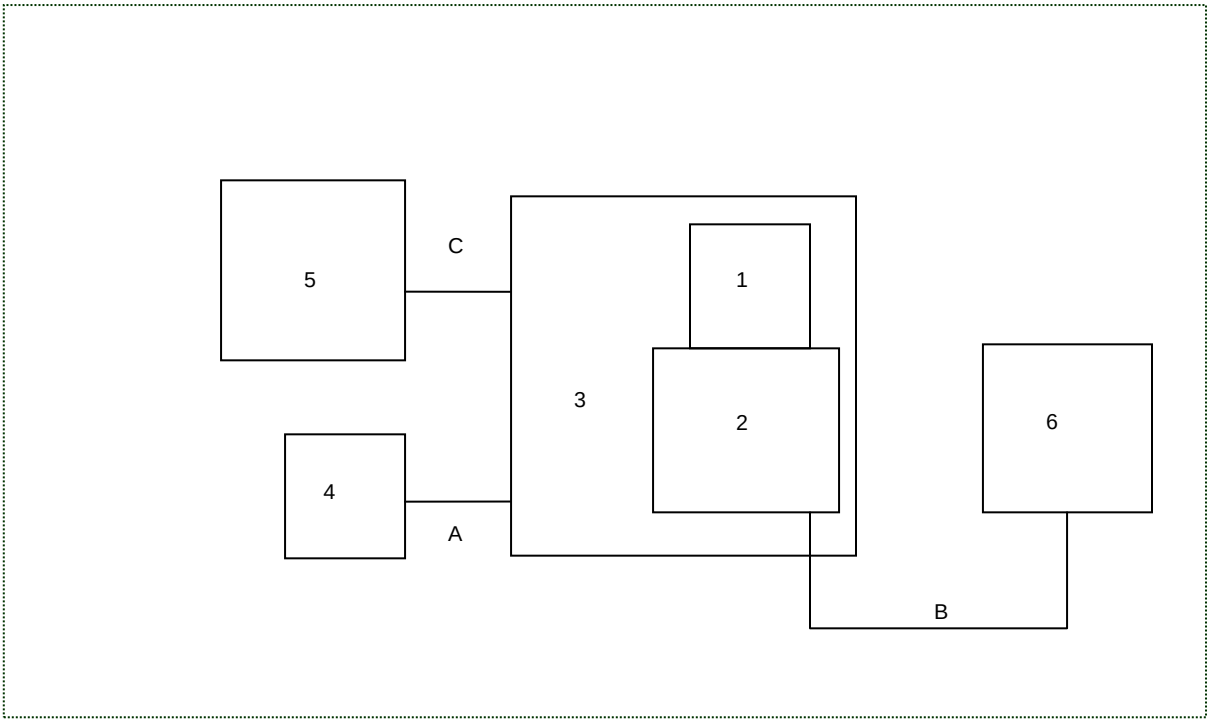
Table 5-1: EUT and Support Equipment Description

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Murata Electronics North America, Inc..	LBEE5ZZ1CK-982	433900071FAC
2	SDIO Interface Board	Murata Electronics North America, Inc..	N/A	ACS#8
3	Evaluation Board	NXP	MCIMX6UL-BB	TR15360422
4	5 VDC Power Supply	Spectre Power	XA012AM0500240	ACS#9
5	Laptop Computer	Dell	Latitude E6430s	N/A
6	Power Supply	MPJA	HY5003	003700278

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power Cord	1.83 m	No	Power Supply to Evaluation Board
B	Twisted Pair	1.22 m	No	SDIO Interface Board to Power Supply
C	USB	0.84 m	No	Evaluation Board to Laptop

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses a printed trace antenna etched on the transceiver module PCB. The antenna is not detachable, thus meeting the requirements of FCC Section 15.203.

7.2 6 dB Bandwidth - FCC: Section 15.247(a)(2); ISED Canada: RSS-247 5.2(1); 99% Bandwidth ISED Canada: RSS-GEN 6.6

7.2.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with FCC KDB 558074 D01 DTS Meas Guidance v03r05 Section 8.1 Option 1. The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the emissions and >> RBW.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission. The RBW was set to 1% to 5% of the approximated bandwidth. The occupied 99% bandwidth was measured by using 99% bandwidth equipment function of the spectrum analyzer.

7.2.2 Measurement Results

Results are shown below.

802.11b

Table 7.2.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2412	8.120	11.200
2437	8.000	11.200
2462	7.880	11.300

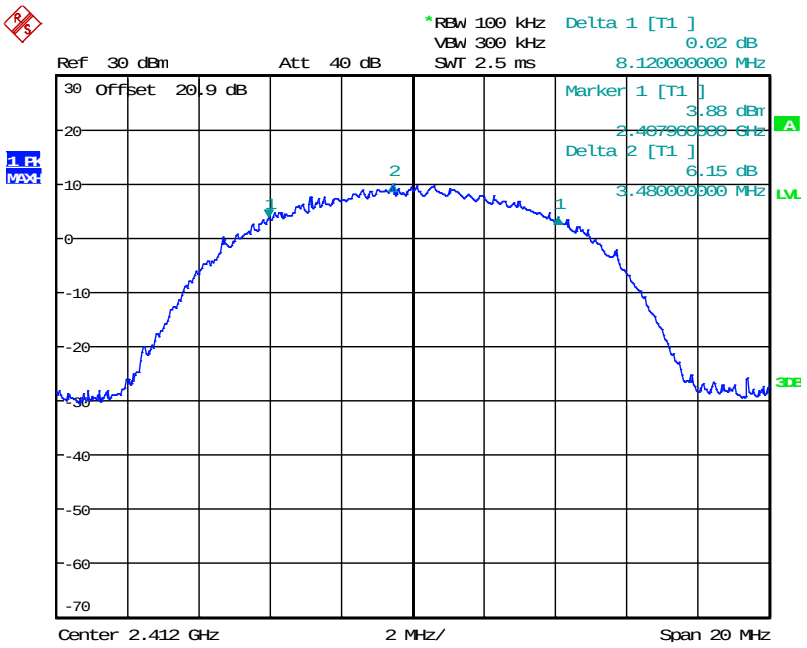


Figure 7.2.2-1: 6dB BW - Low Channel

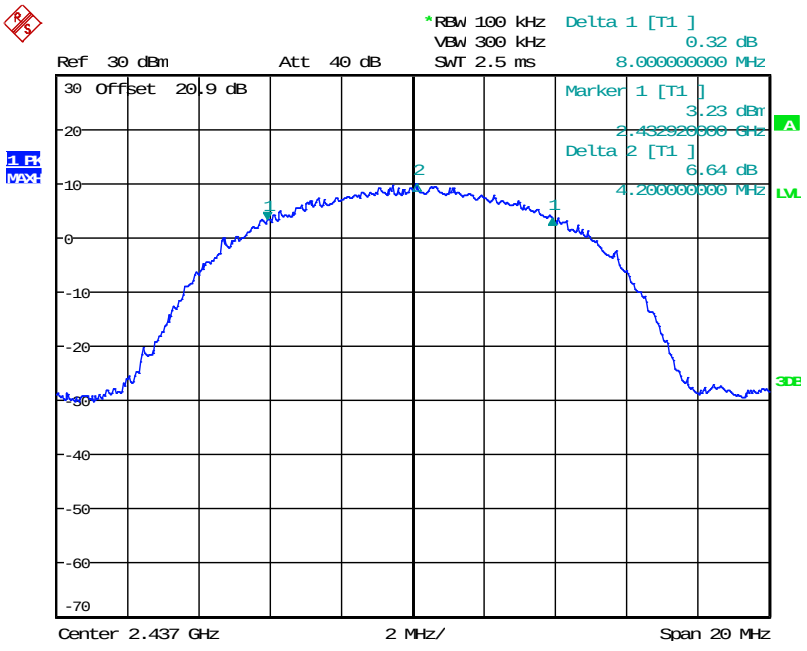


Figure 7.2.2-2: 6dB BW - Middle Channel

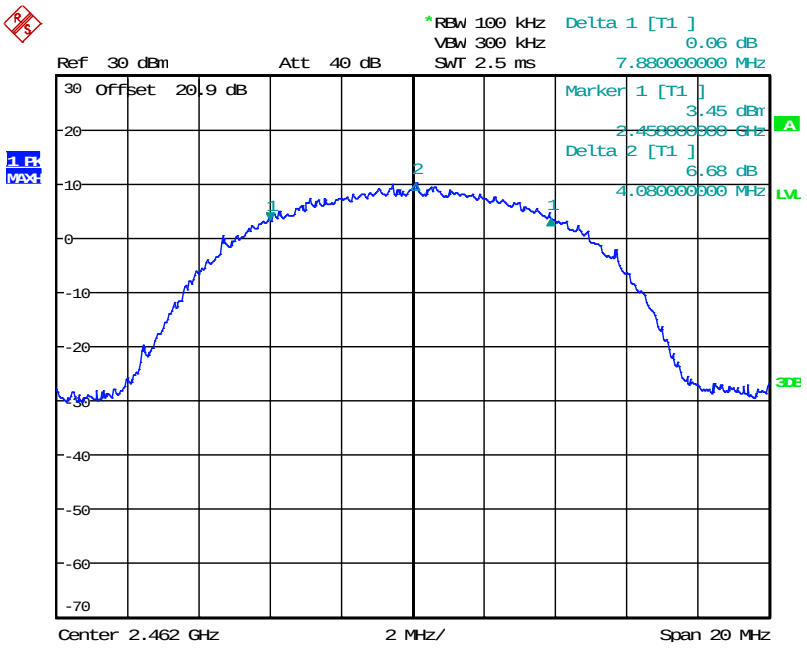


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Figure 7.2.2-3: 6dB BW - High Channel

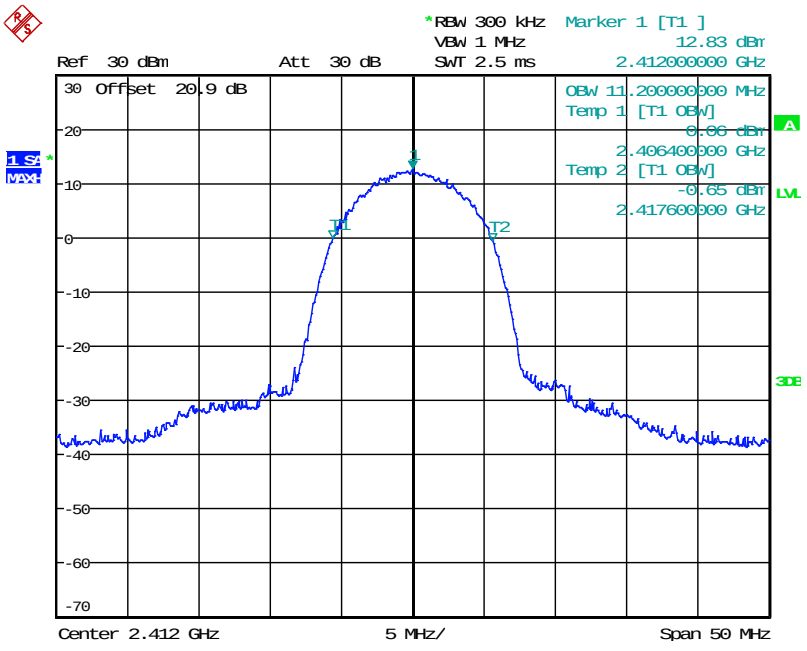

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Figure 7.2.2-4: 99% OBW - Low Channel

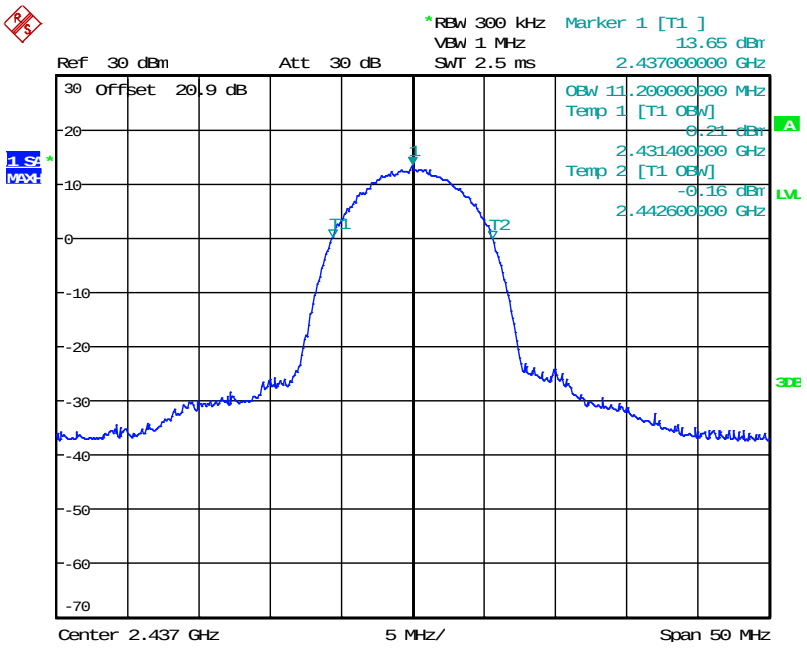

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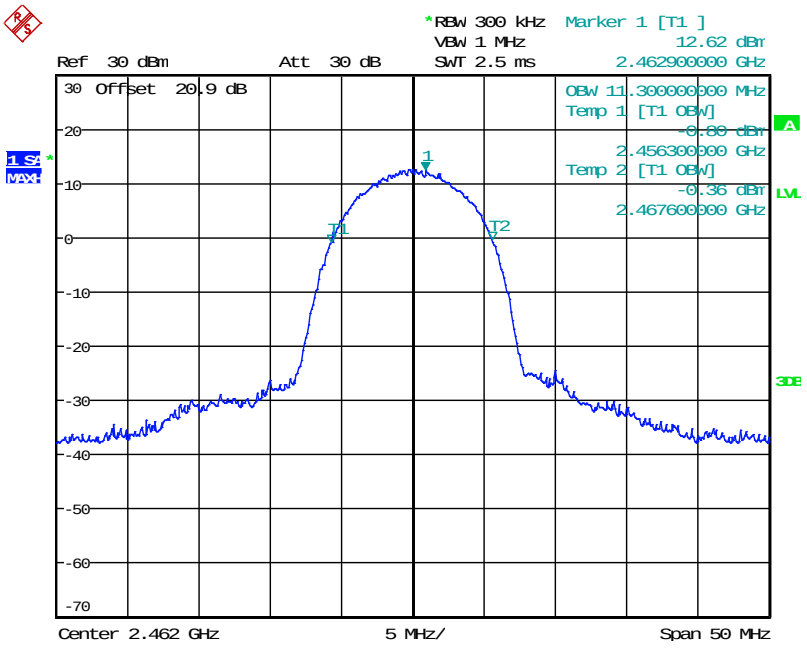
Figure 7.2.2-5: 99% OBW - Middle Channel



Date: 10.JUN.2016 18:37:39

Figure 7.2.2-6: 99% OBW - High Channel

802.11g

Table 7.2.2-2: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2412	16.560	17.100
2437	16.560	17.000
2462	16.560	17.100

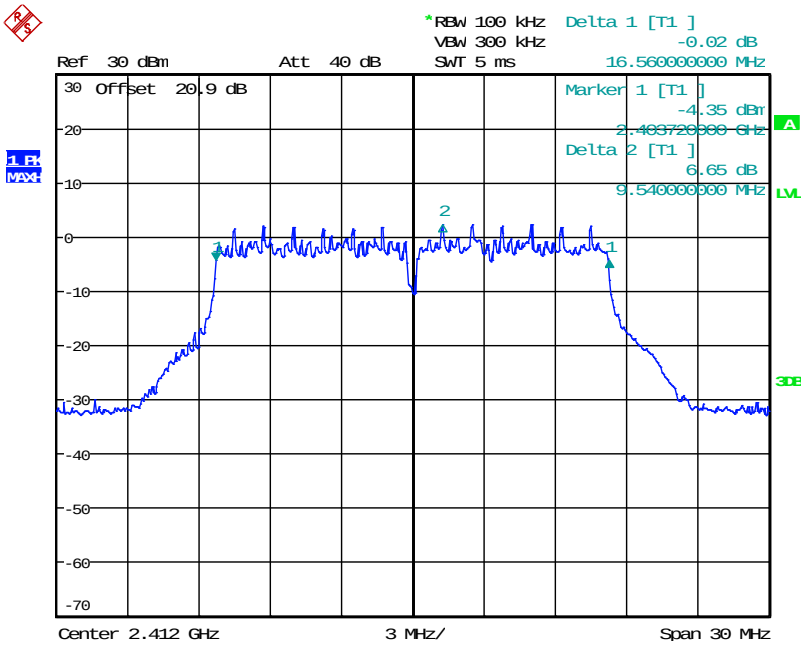


Figure 7.2.2-7: 6dB BW - Low Channel

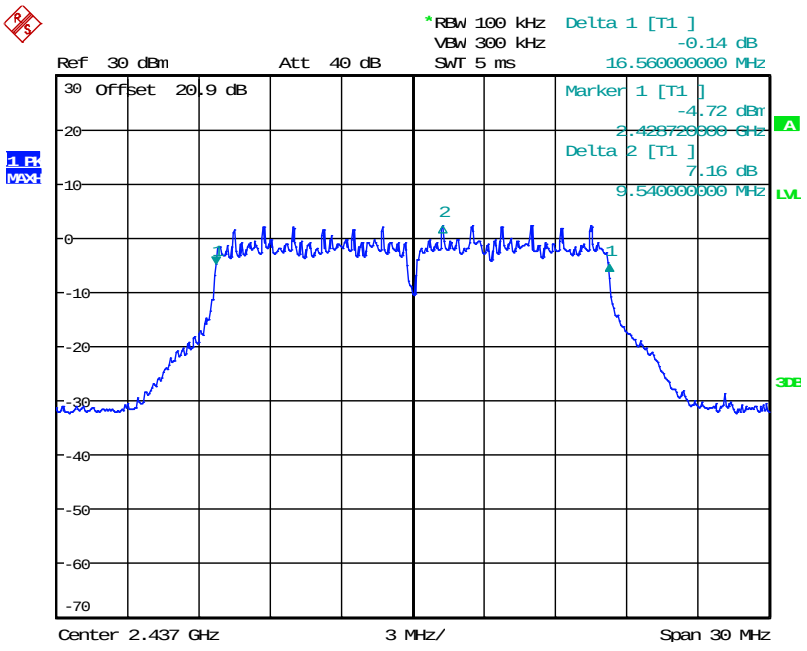


Figure 7.2.2-8: 6dB BW - Middle Channel

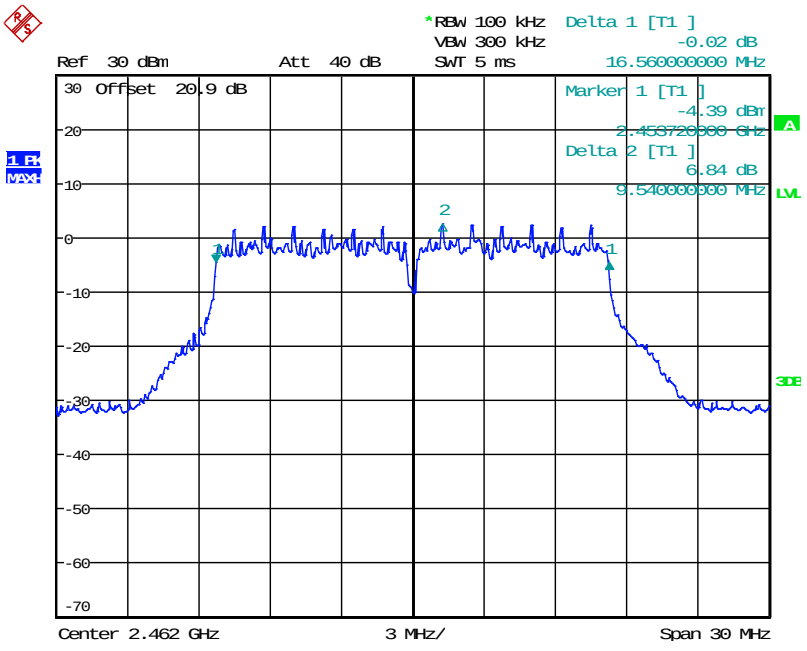


Figure 7.2.2-9: 6dB BW - High Channel

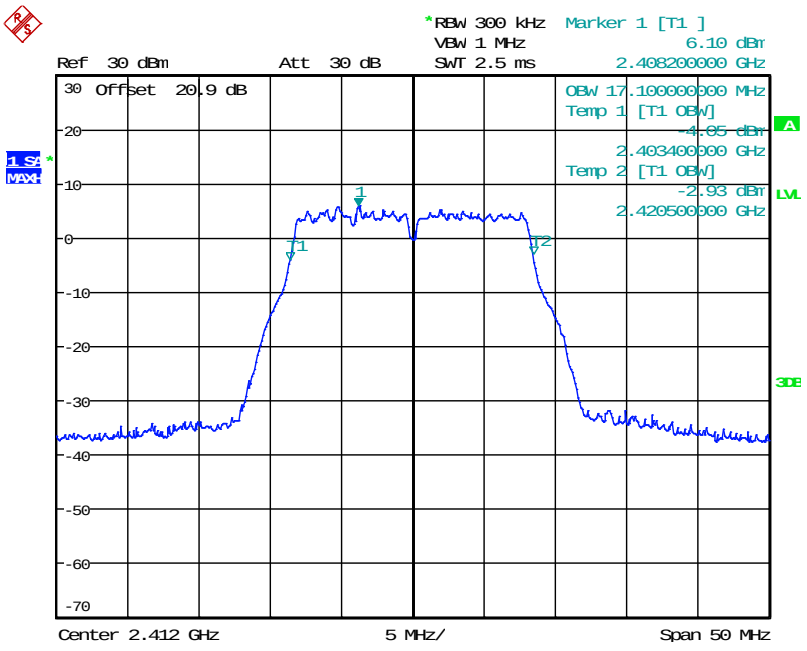


Figure 7.2.2-10: 99% OBW - Low Channel

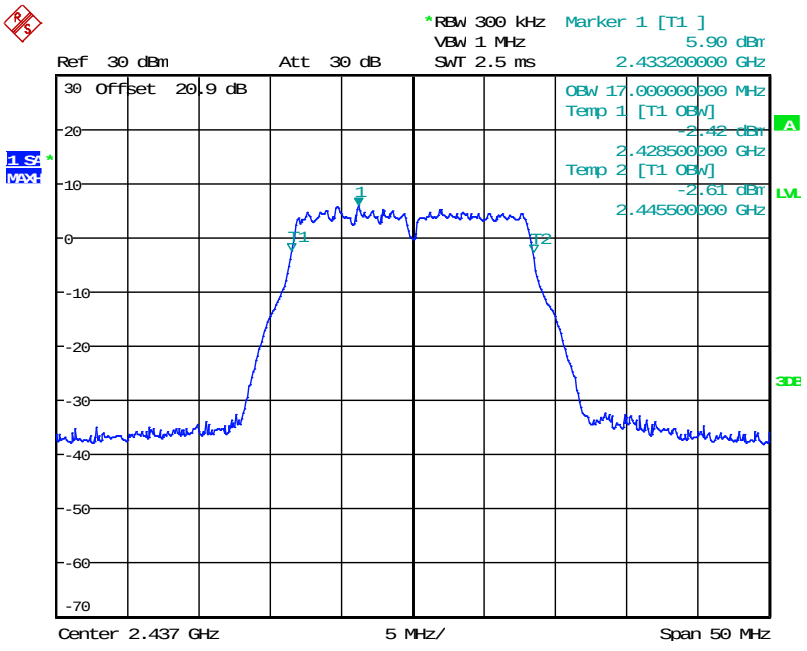


Figure 7.2.2-11: 99% OBW - Middle Channel

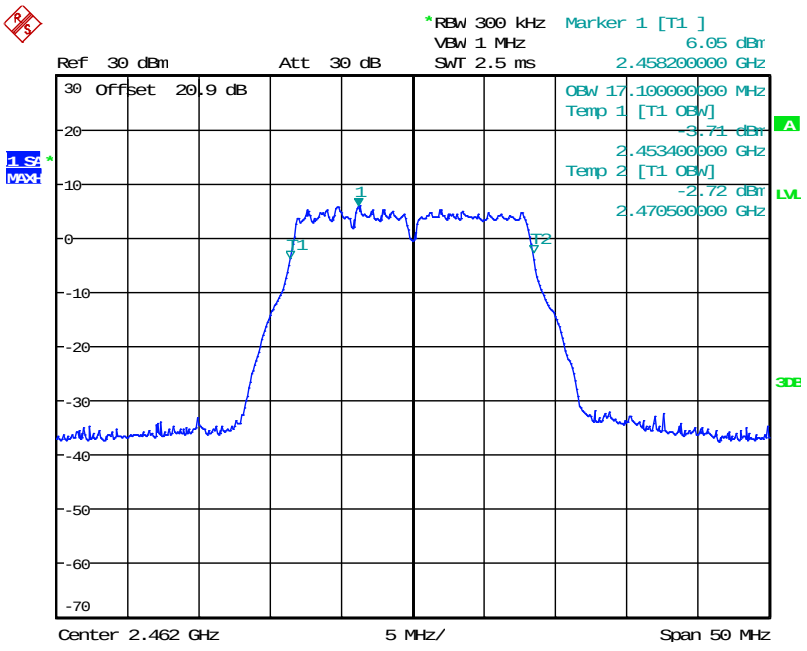


Figure 7.2.2-12: 99% OBW - High Channel

802.11n 20 MHz

Table 7.2.2-3: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2412	17.880	18.200
2437	17.880	18.200
2462	17.880	18.100

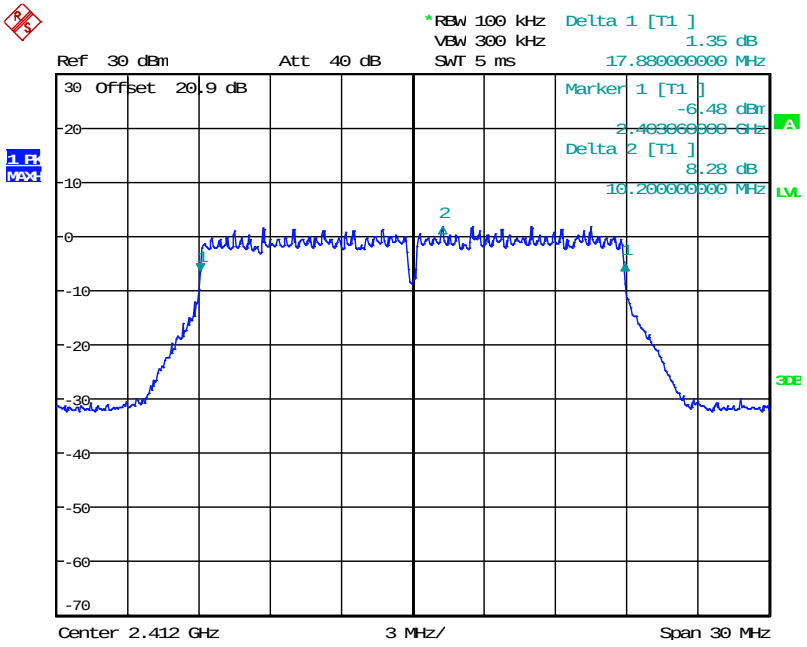


Figure 7.2.2-13: 6dB BW - Low Channel

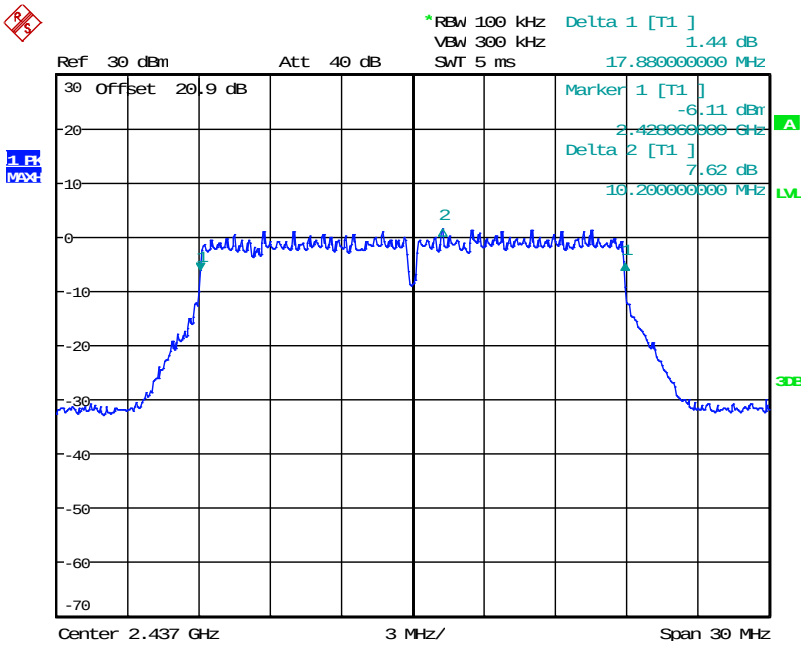


Figure 7.2.2-14: 6dB BW - Middle Channel

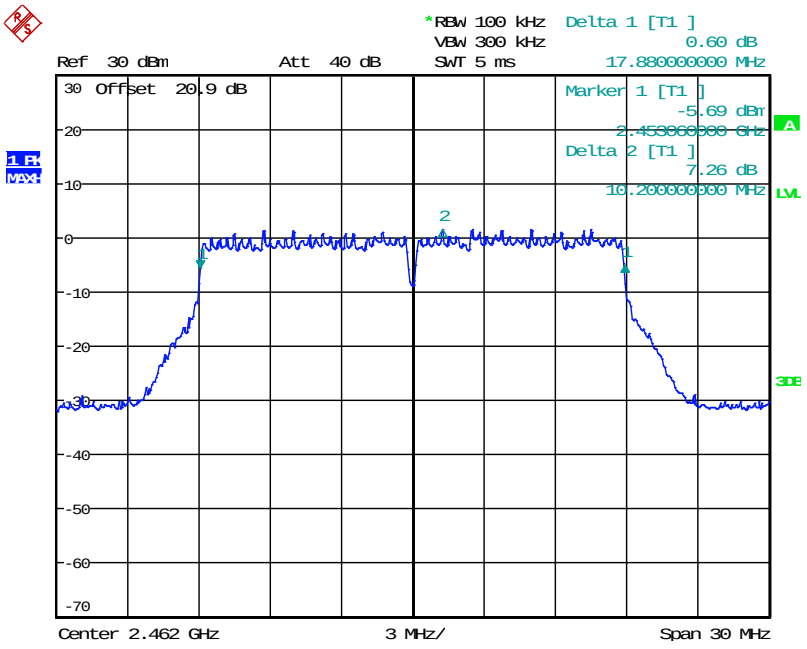


Figure 7.2.2-15: 6dB BW - High Channel

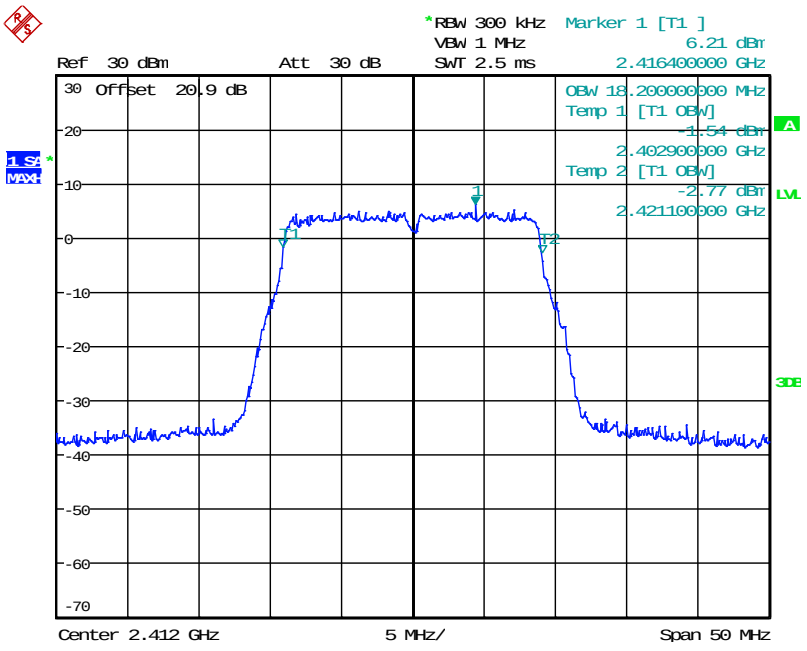


Figure 7.2.2-16: 99% OBW - Low Channel

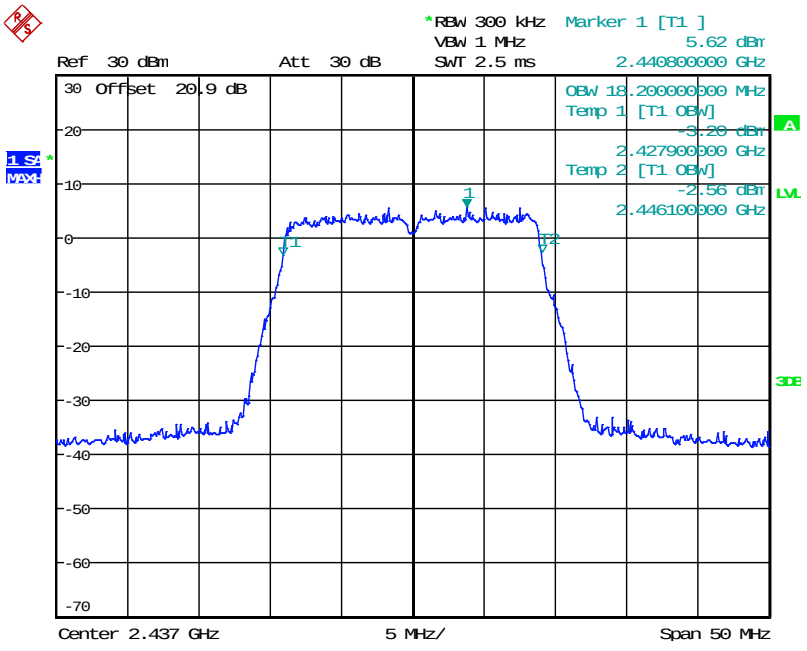


Figure 7.2.2-17: 99% OBW - Middle Channel

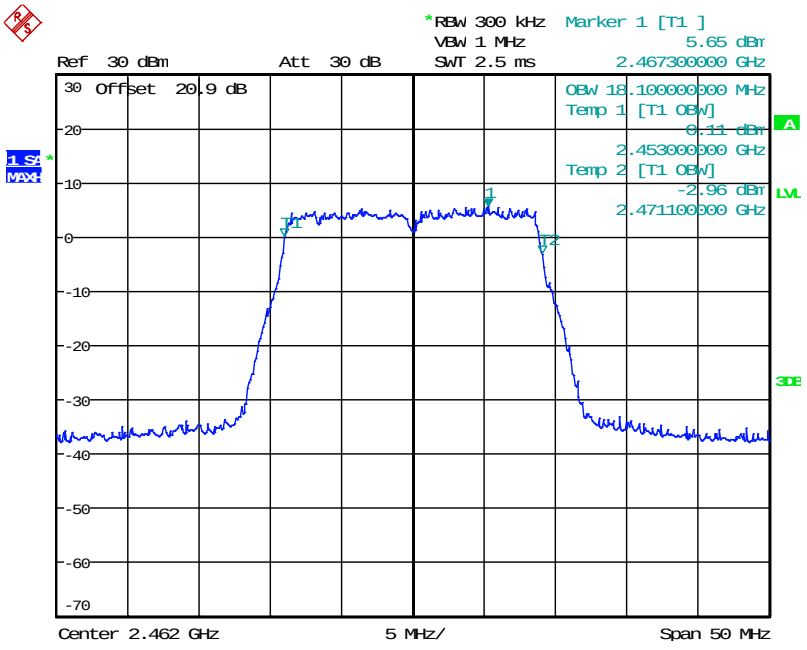


Figure 7.2.2-18: 99% OBW - High Channel

7.3 Fundamental Emission Output Power - FCC Section 15.247(b)(3); ISED Canada: RSS-247 5.4(4)

7.3.1 Measurement Procedure (Conducted Method)

The fundamental emission output power was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05 Section 9.2.2.4. Justification for the Duty Cycle correction factor used in provide is Section 7.6. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer through suitable attenuation.

7.3.2 Measurement Results

Results are shown below.

802.11b

Table 7.3.2-1: RF Output Power

Frequency [MHz]	Level [dBm]	Duty Cycle Correction Factor [dB]	Corrected Level [dBm]
2412	16.55	0.85	17.40
2437	16.58	0.85	17.43
2462	16.61	0.85	17.46

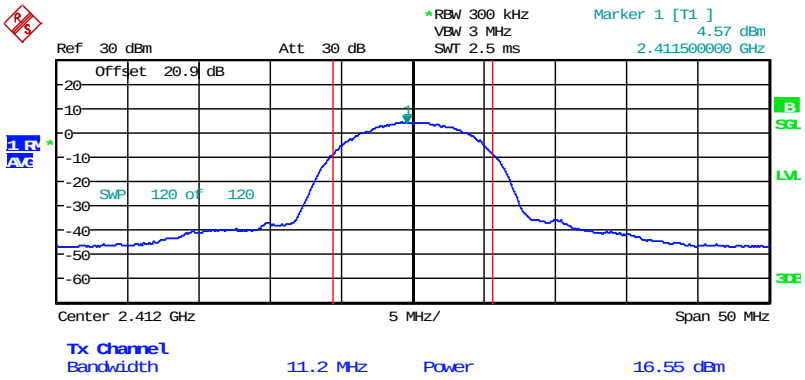


Figure 7.3.2-1: RF Output Power - Low Channel

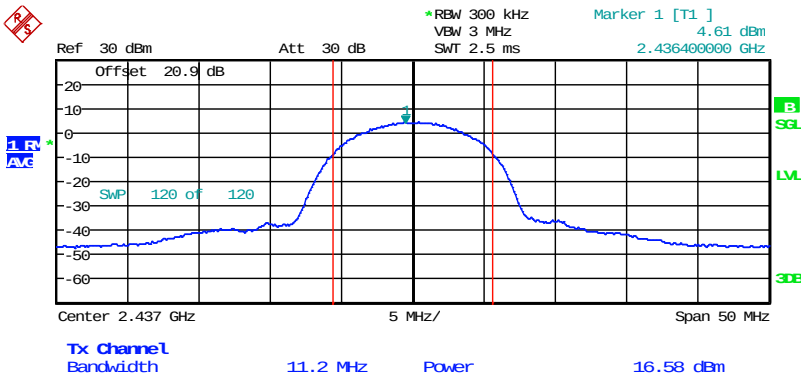


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Figure 7.3.2-2: RF Output Power - Middle Channel

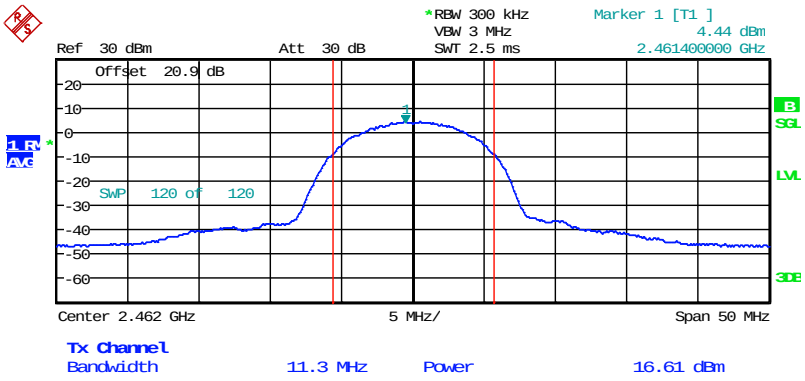

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Figure 7.3.2-3: RF Output Power - High Channel

802.11g

Table 7.3.2-2: RF Output Power

Frequency [MHz]	Level [dBm]	Duty Cycle Correction Factor [dB]	Corrected Level [dBm]
2412	12.20	1.83	14.03
2437	12.12	1.83	13.95
2462	12.15	1.83	13.98

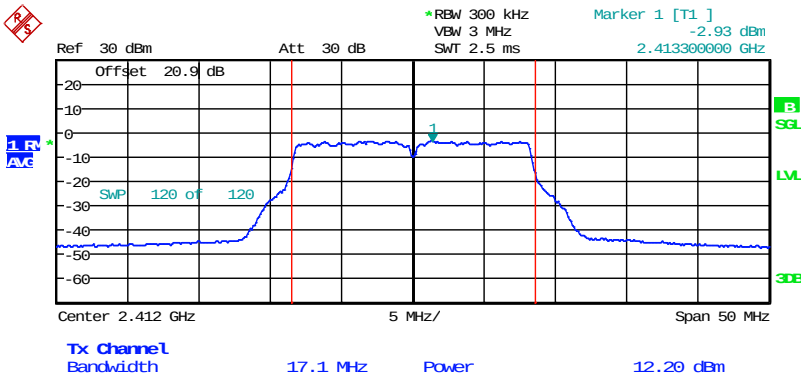

Figure 7.3.2-4: RF Output Power - Low Channel

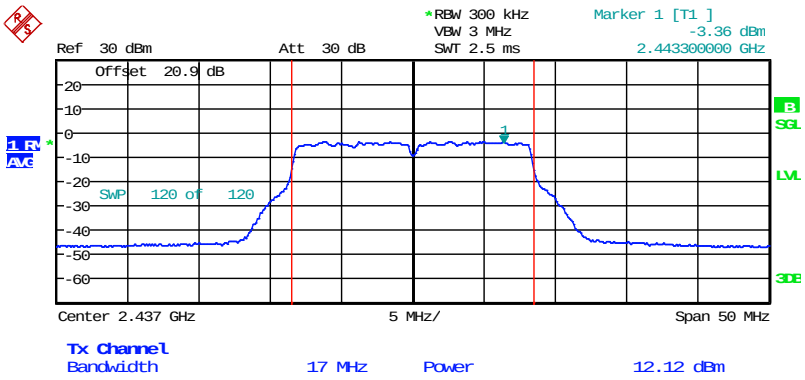

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Figure 7.3.2-5: RF Output Power - Middle Channel

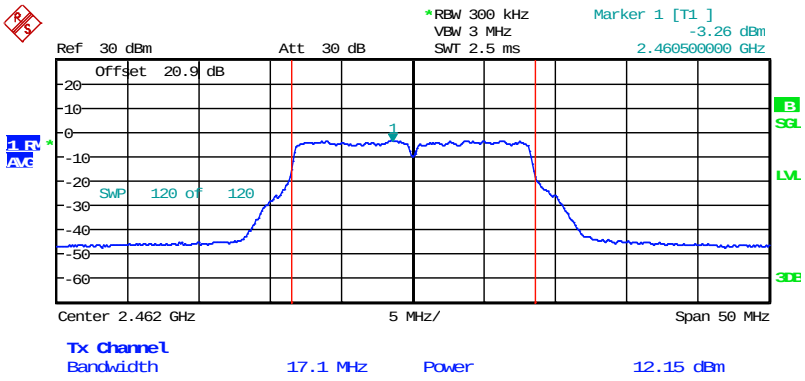

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Figure 7.3.2-6: RF Output Power - High Channel

802.11n 20 MHz

Table 7.3.2-3: RF Output Power

Frequency [MHz]	Level [dBm]	Duty Cycle Correction Factor [dB]	Corrected Level [dBm]
2412	11.02	2.04	13.06
2437	10.86	2.04	12.90
2462	10.99	2.04	13.03

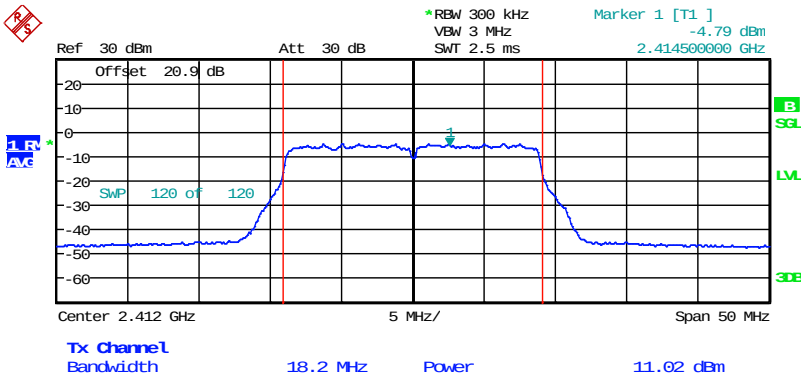

Figure 7.3.2-7: RF Output Power - Low Channel

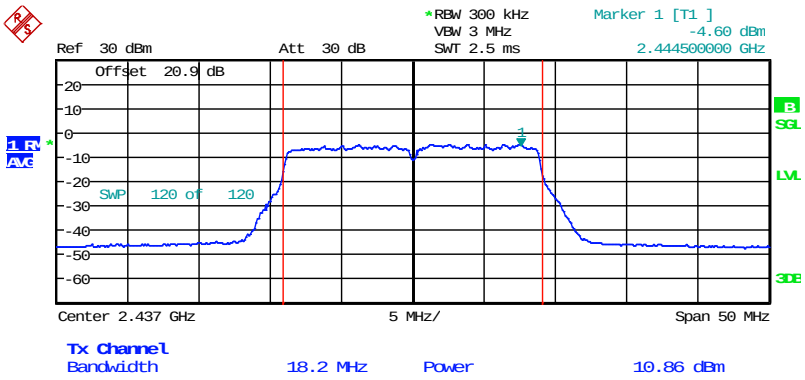

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Figure 7.3.2-8: RF Output Power - Middle Channel

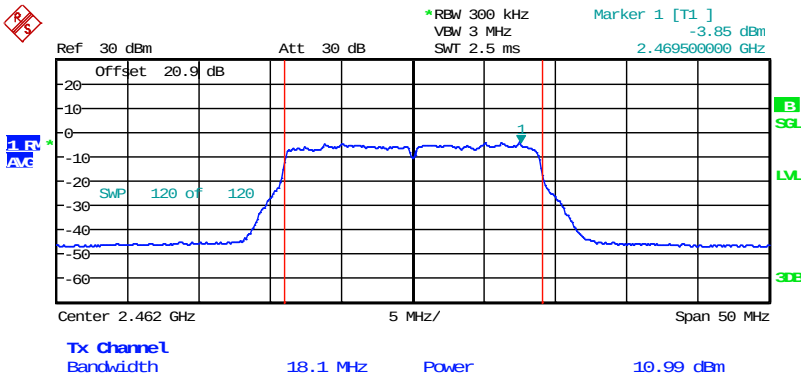

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Figure 7.3.2-9: RF Output Power - High Channel

7.4 Band-Edge and Spurious Emissions

7.4.1 Band-Edge Compliance of RF Conducted Emissions - FCC Section 15.247(d); ISED Canada: RSS-247 5.5

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer via suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 100 kHz, and the VBW was set to 300 kHz.

7.4.1.2 Measurement Results

Results are shown below.

802.11b

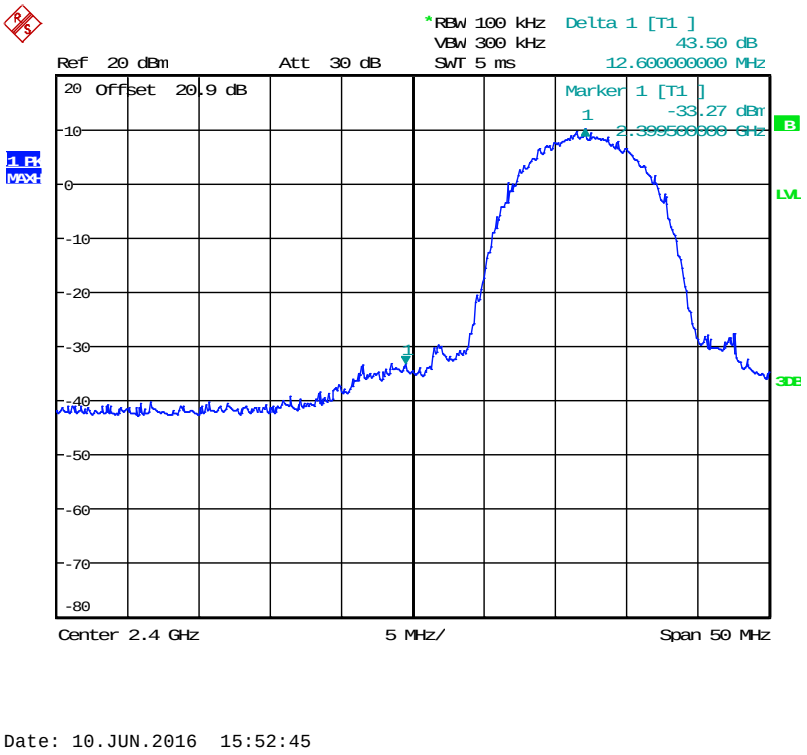


Figure 7.4.1.2-1: Lower Band-edge

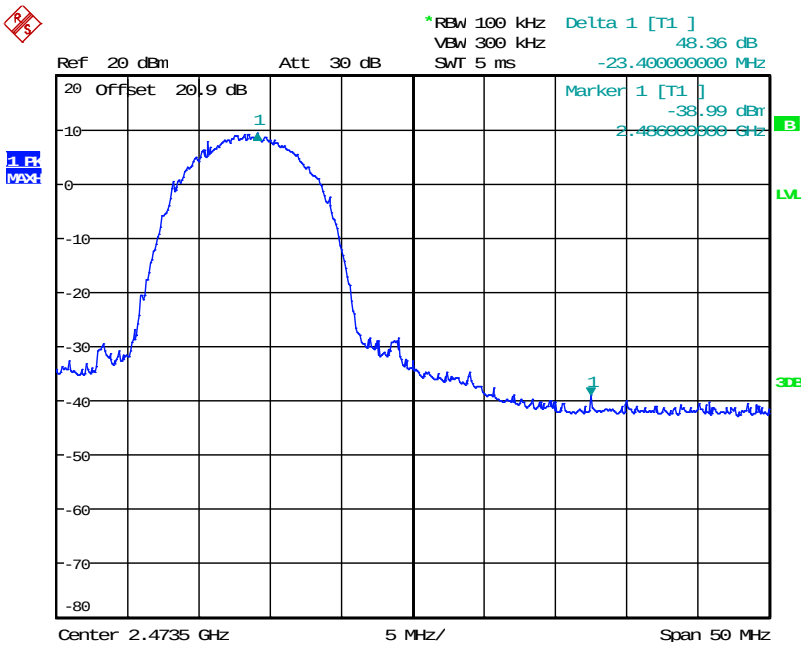


Figure 7.4.1.2-2: Upper Band-edge

802.11g

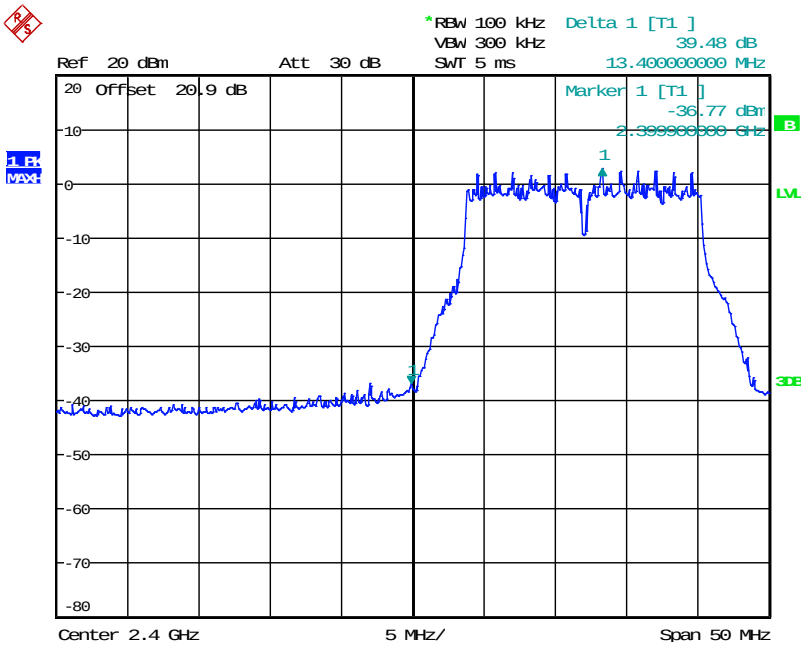


Figure 7.4.1.2-3: Lower Band-edge

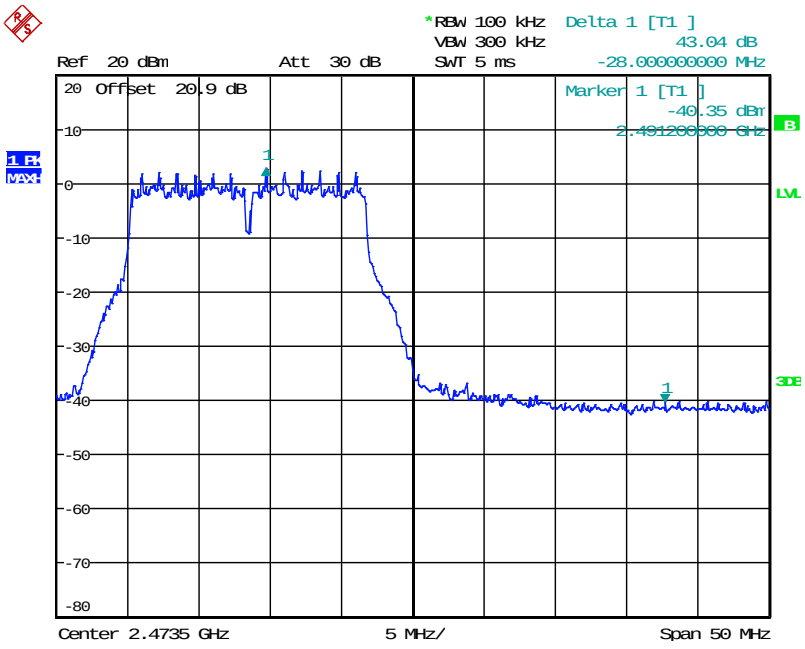


Figure 7.4.1.2-4: Upper Band-edge

802.11n 20 MHz

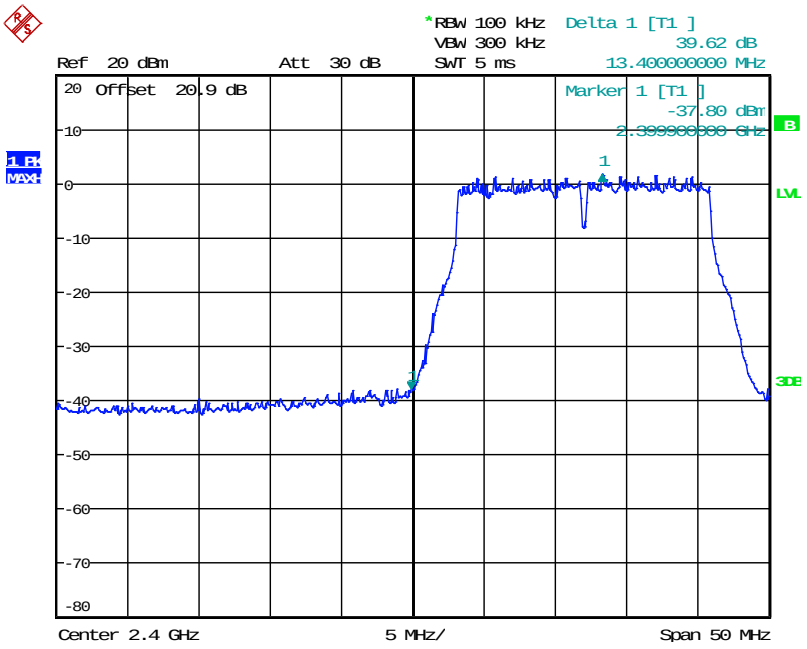


Figure 7.4.1.2-5: Lower Band-edge

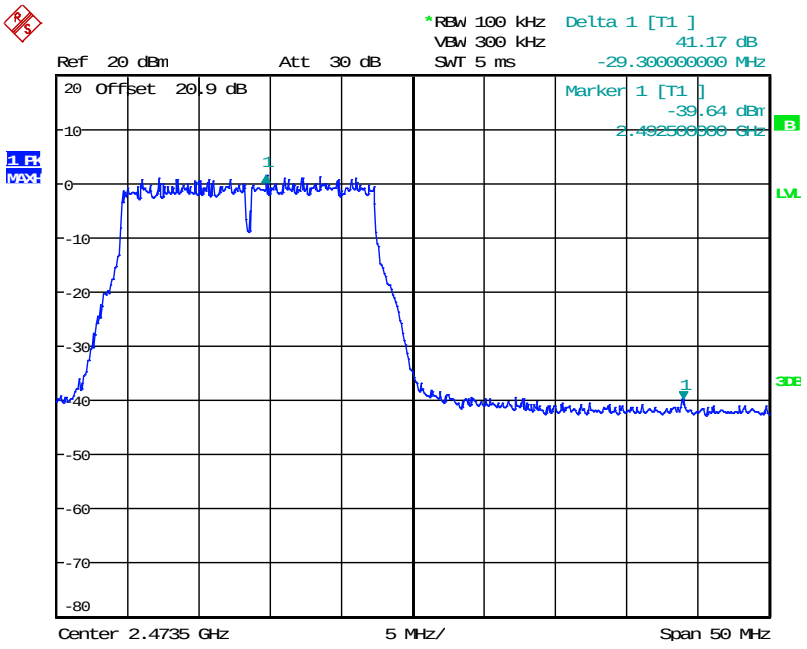


Figure 7.4.1.2-6: Upper Band-edge

7.4.2 RF Conducted Spurious Emissions - FCC Section 15.247(d); ISED Canada: RSS-247 5.5

7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05 Section 11.3 Emission level measurement. The RF output port of the equipment under test was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30 MHz to 26 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak Max Hold function of the analyzer was utilized. The reference level was determined by measuring the Peak PSD level in any 100 kHz bandwidth within the DTS channel bandwidth.

7.4.2.2 Measurement Results

Results are shown below.

802.11b

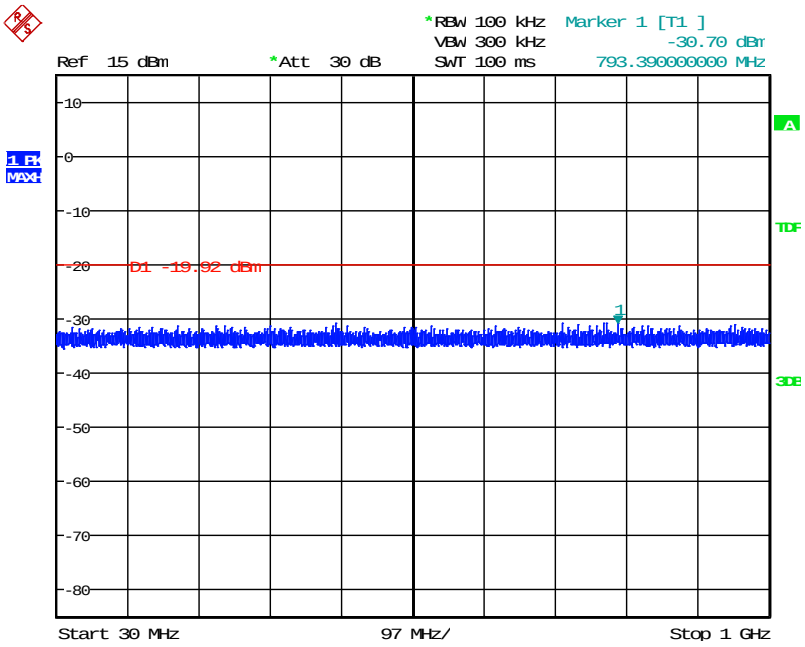
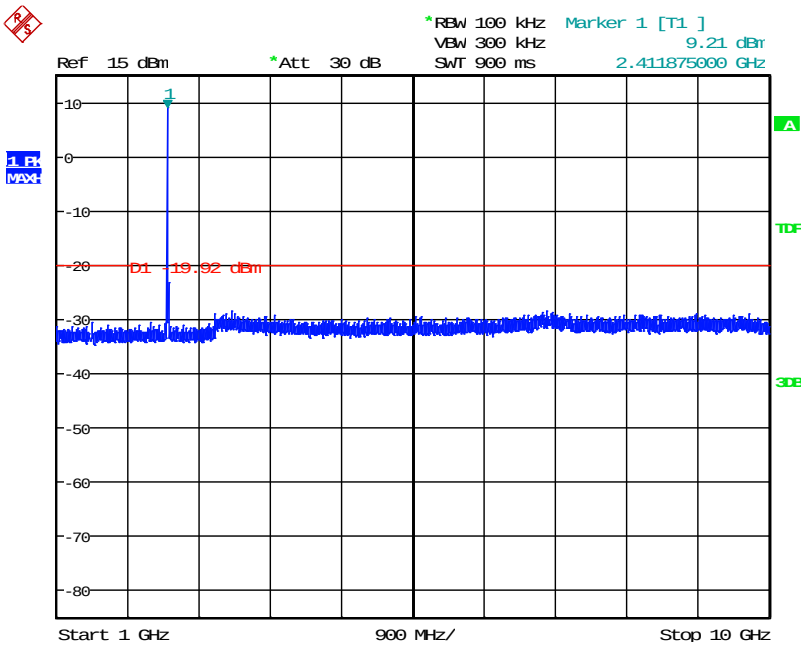
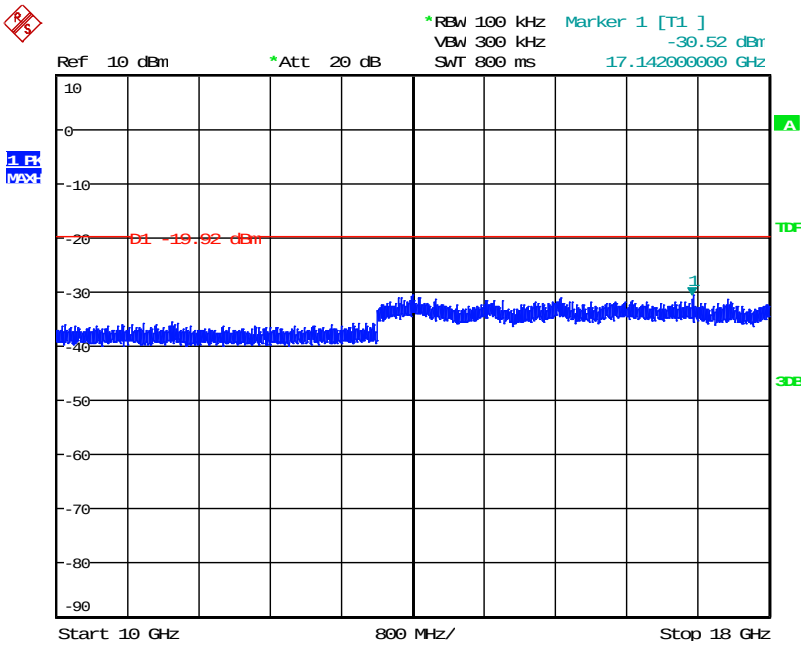


Figure 7.4.2.2-1: 30 MHz – 1 GHz – Low Channel



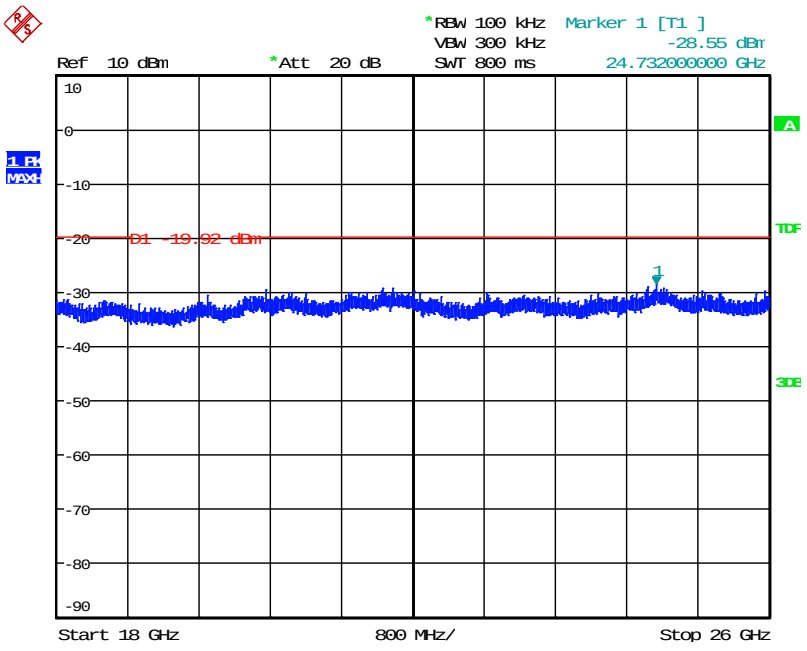
Date: 10.JUN.2016 19:29:47

Figure 7.4.2.2-2: 1 GHz –10 GHz – Low Channel



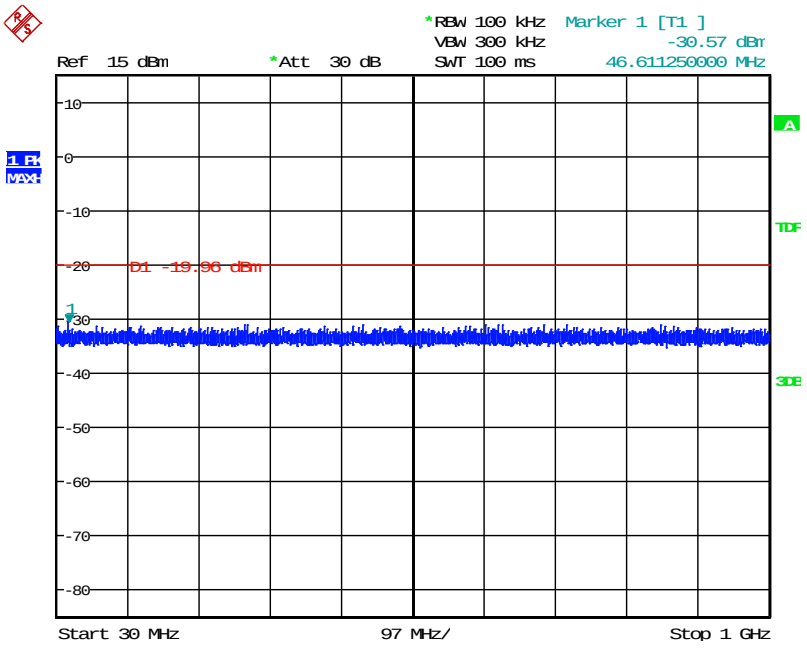
Date: 10.JUN.2016 19:32:18

Figure 7.4.2.2-3: 10 GHz –18 GHz – Low Channel



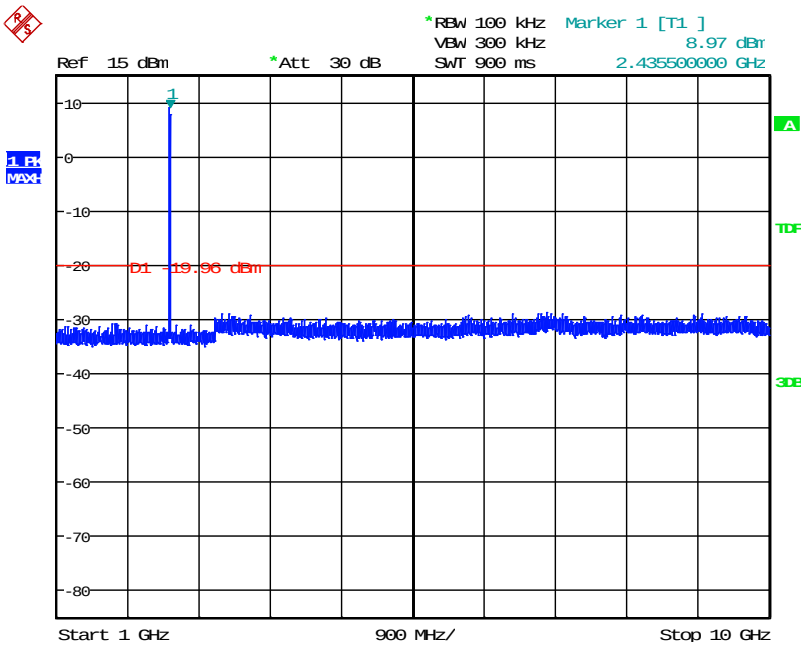
Date: 10.JUN.2016 19:34:48

Figure 7.4.2.2-4: 18 GHz – 26 GHz – Low Channel



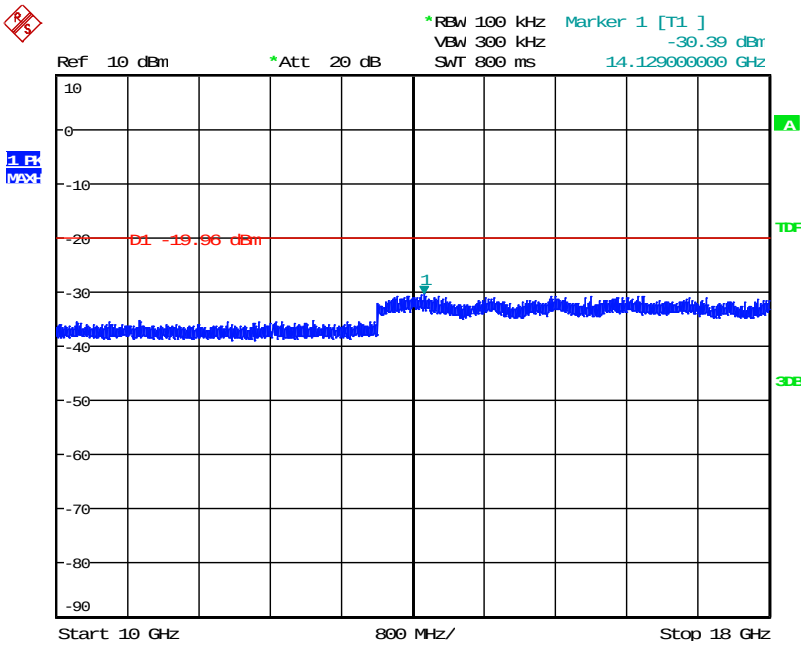
Date: 10.JUN.2016 19:18:20

Figure 7.4.2.2-5: 30 MHz – 1 GHz –Middle Channel



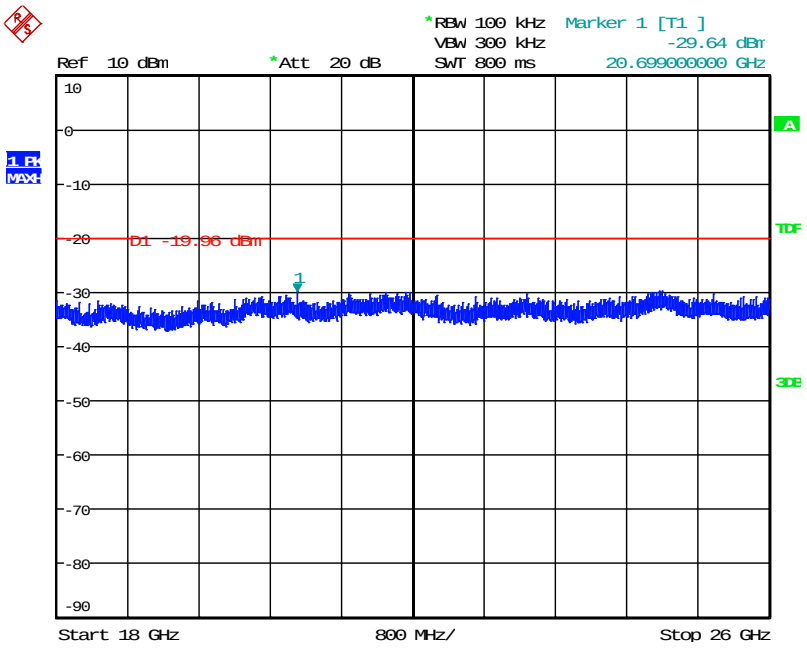
Date: 10.JUN.2016 19:14:09

Figure 7.4.2.2-6: 1 GHz –10 GHz – Middle Channel



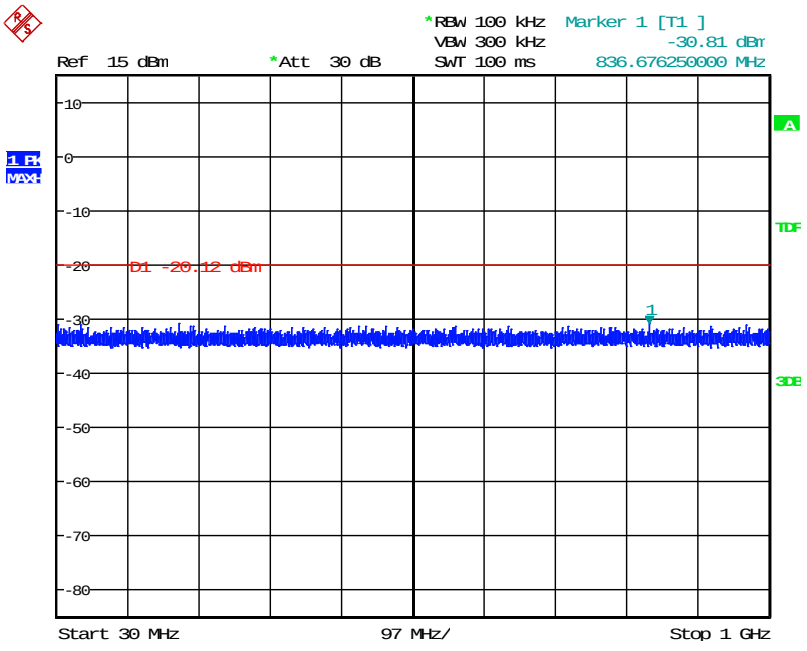
Date: 10.JUN.2016 19:10:09

Figure 7.4.2.2-7: 10 GHz –18 GHz – Middle Channel



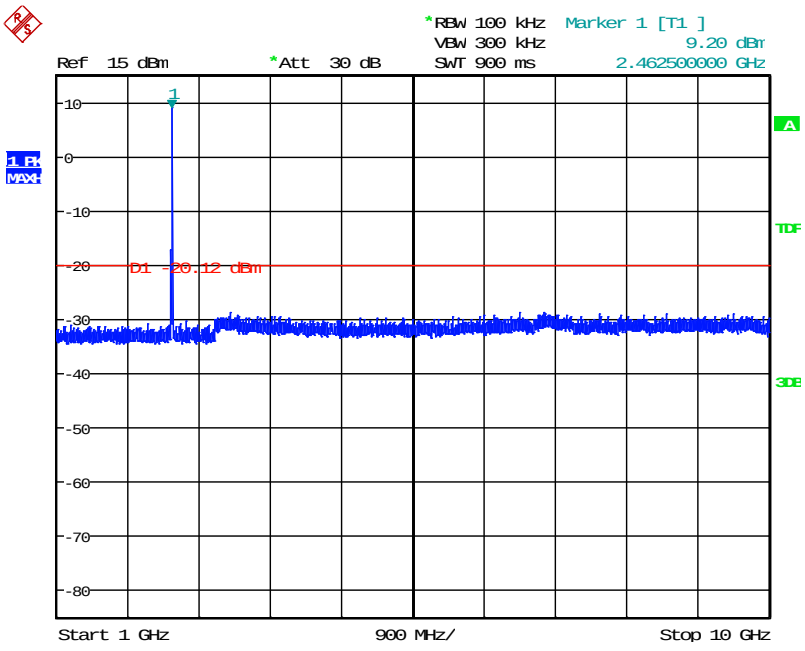
Date: 10.JUN.2016 18:59:10

Figure 7.4.2.2-8: 18 GHz – 26 GHz – Middle Channel



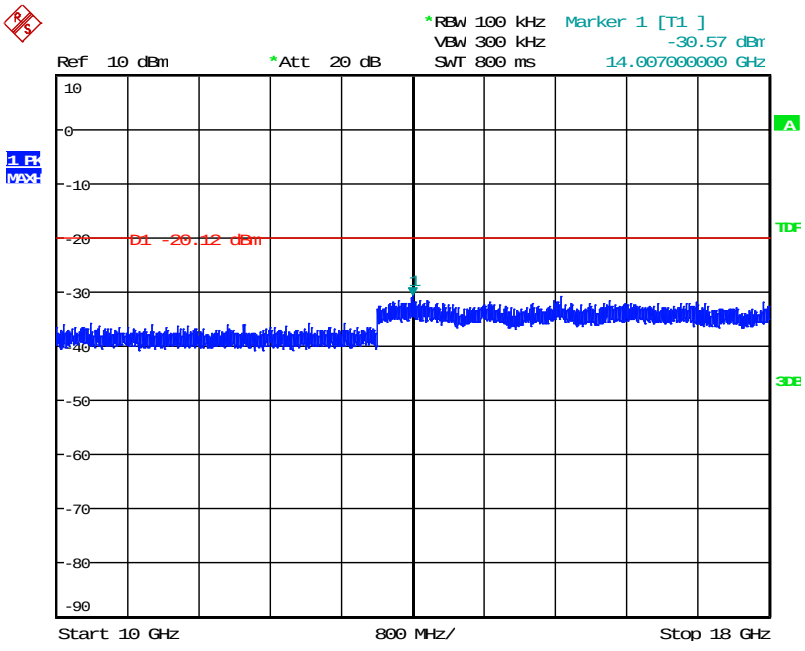
Date: 10.JUN.2016 18:48:04

Figure 7.4.2.2-9: 30 MHz – 1 GHz – High Channel



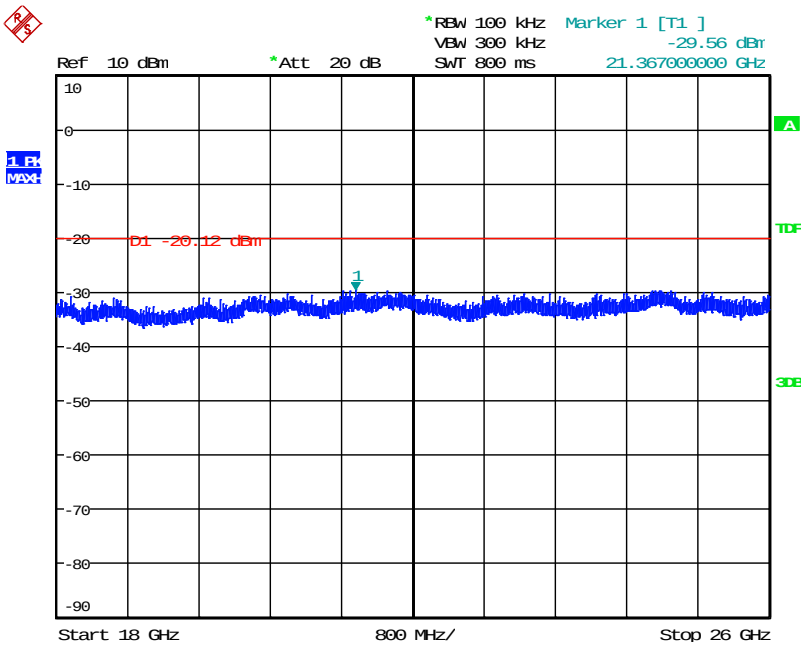
Date: 10.JUN.2016 18:54:10

Figure 7.4.2.2-10: 1 GHz –10 GHz –High Channel



Date: 10.JUN.2016 18:55:41

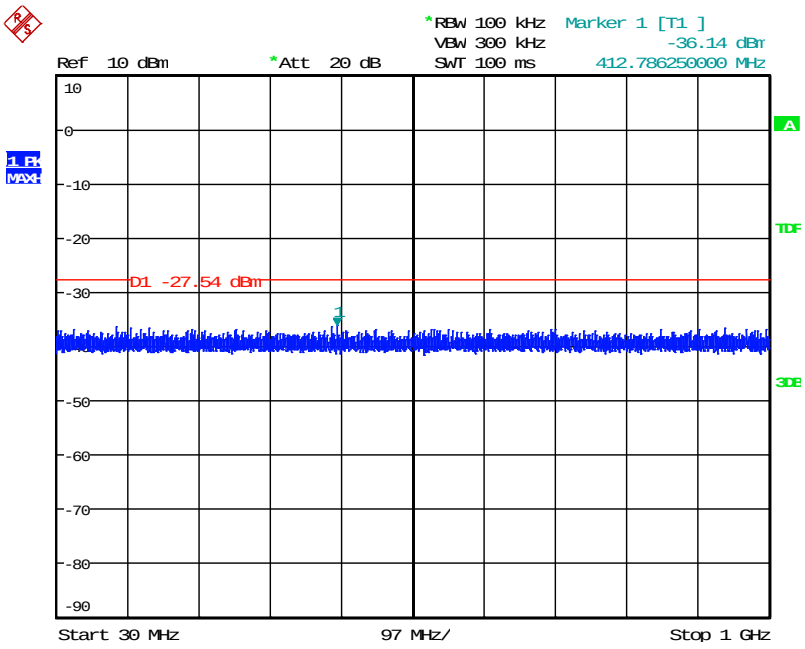
Figure 7.4.2.2-11: 10 GHz – 18 GHz –High Channel



Date: 10.JUN.2016 18:57:33

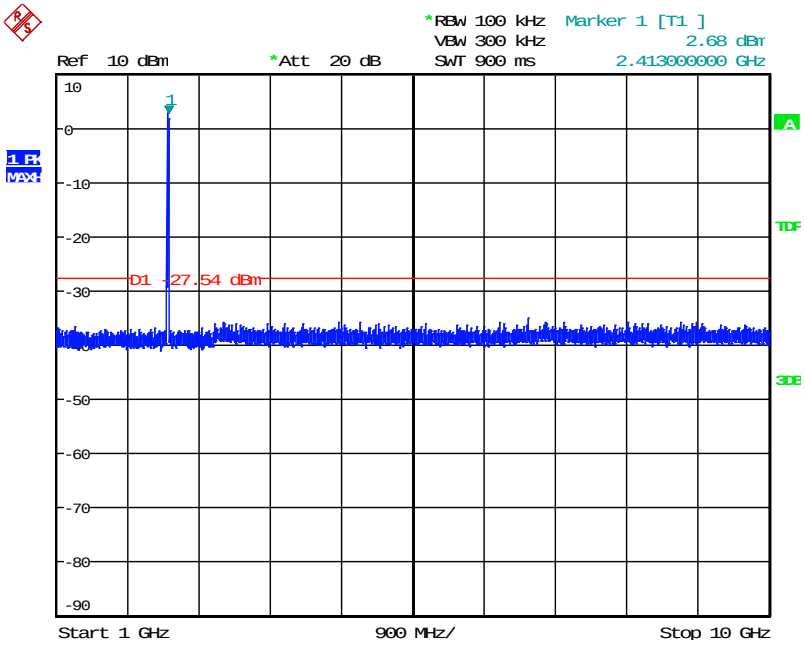
Figure 7.4.2.2-12: 18 GHz – 26 GHz –High Channel

802.11g



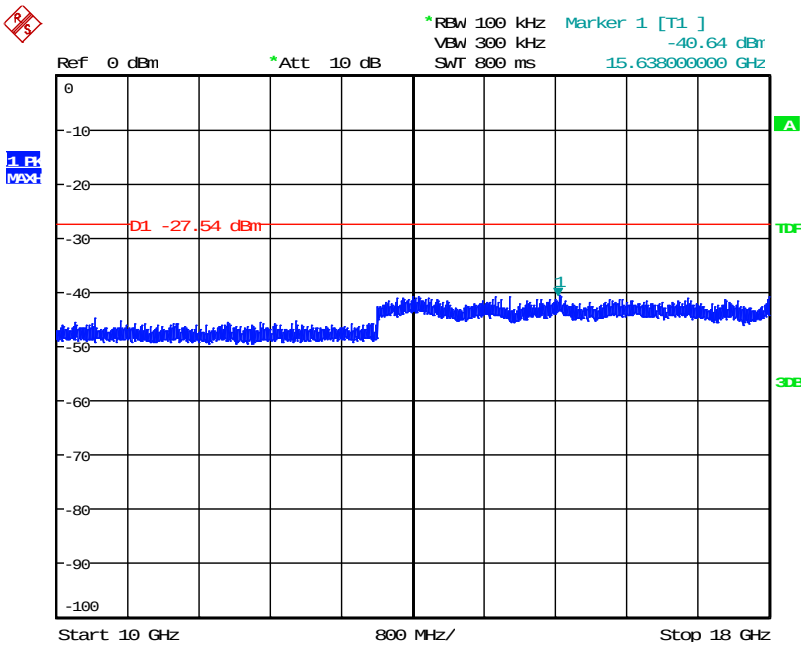
Date: 11.JUN.2016 12:15:51

Figure 7.4.2.2-13: 30 MHz – 1 GHz – Low Channel



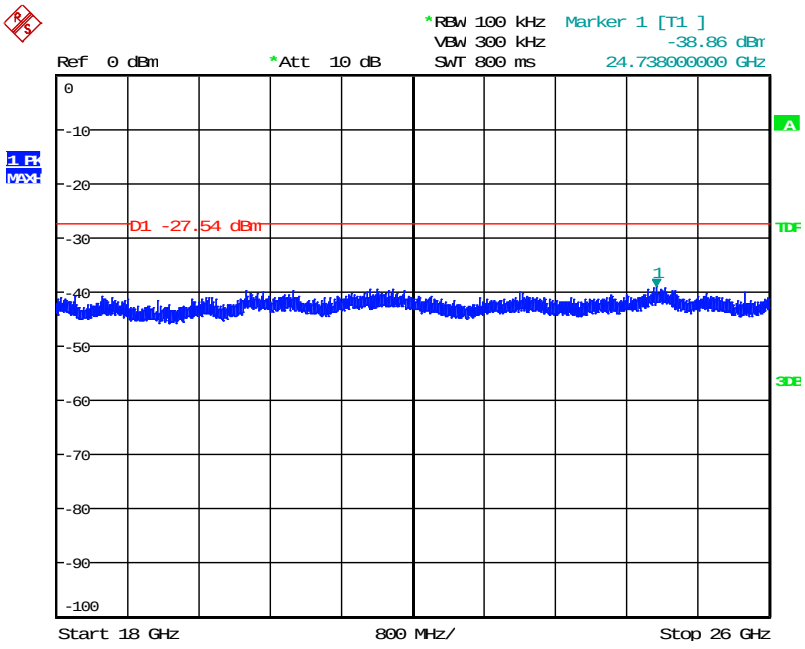
Date: 11.JUN.2016 12:14:25

Figure 7.4.2.2-14: 1 GHz –10 GHz – Low Channel



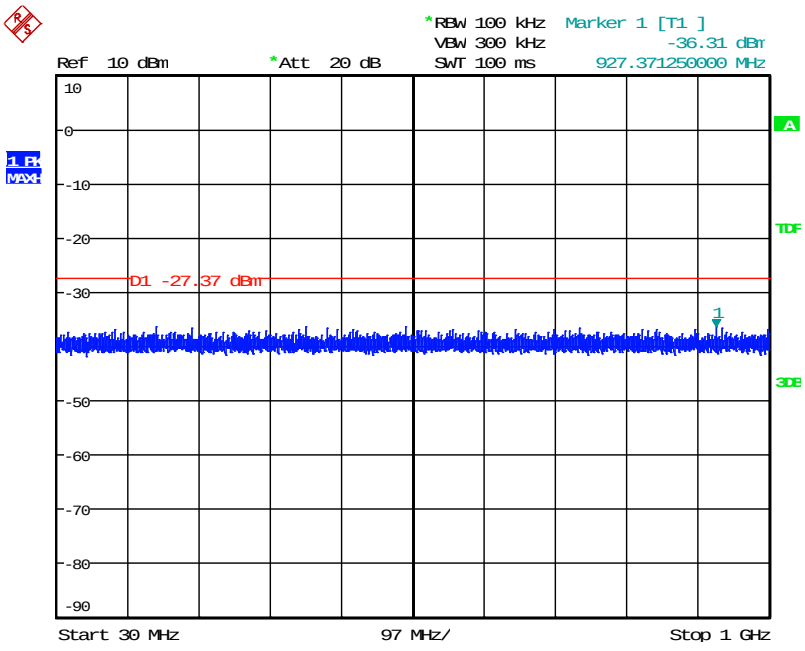
Date: 11.JUN.2016 12:12:14

Figure 7.4.2.2-15: 10 GHz –18 GHz – Low Channel



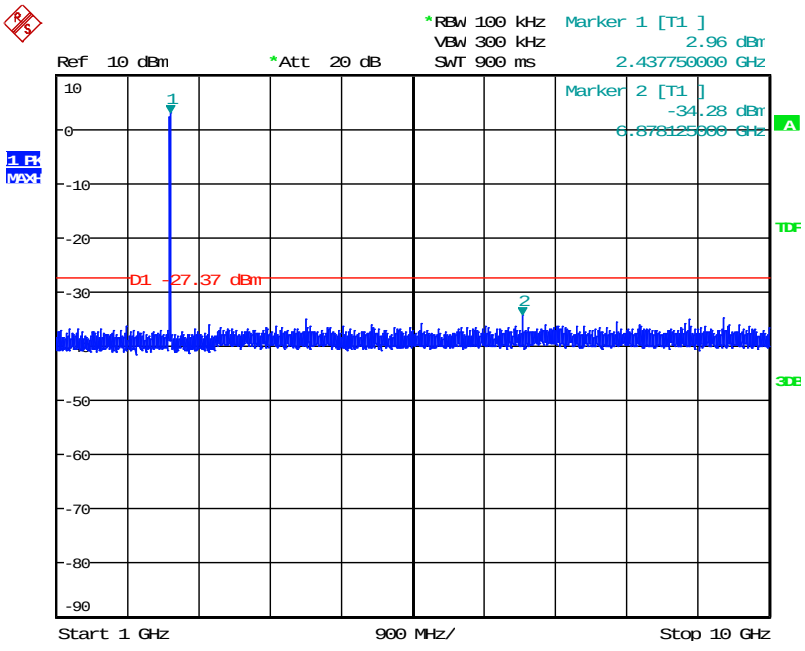
Date: 11.JUN.2016 12:07:45

Figure 7.4.2.2-16: 18 GHz – 26 GHz – Low Channel



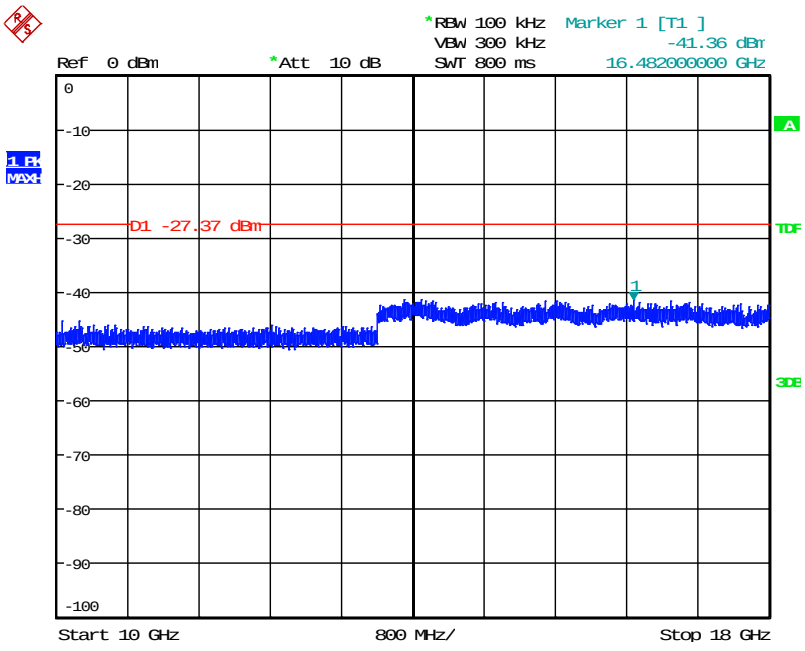
Date: 11.JUN.2016 12:17:38

Figure 7.4.2.2-17: 30 MHz – 1 GHz –Middle Channel



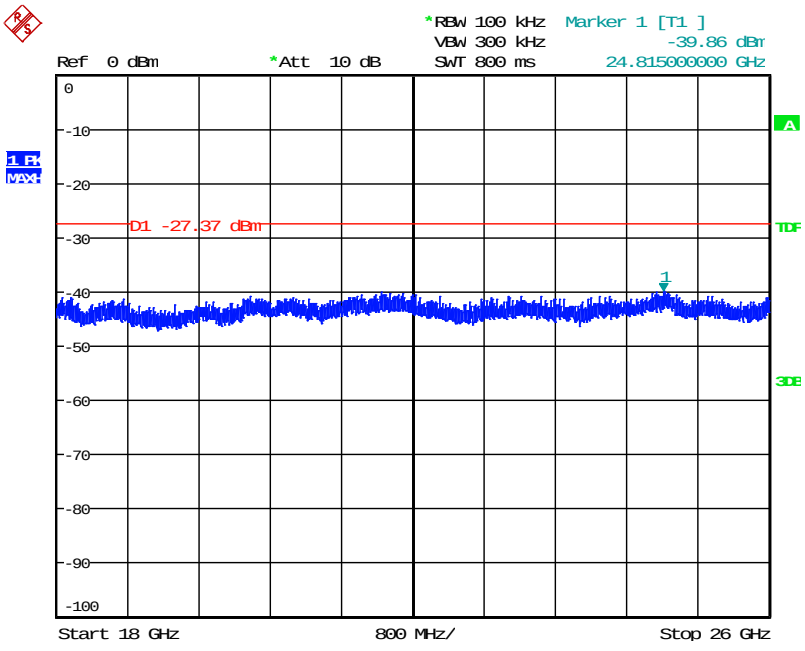
Date: 11.JUN.2016 12:18:55

Figure 7.4.2.2-18: 1 GHz – 10 GHz – Middle Channel



Date: 11.JUN.2016 12:20:36

Figure 7.4.2.2-19: 10 GHz – 18 GHz – Middle Channel



Date: 11.JUN.2016 12:21:45

Figure 7.4.2.2-20: 18 GHz – 26 GHz – Middle Channel

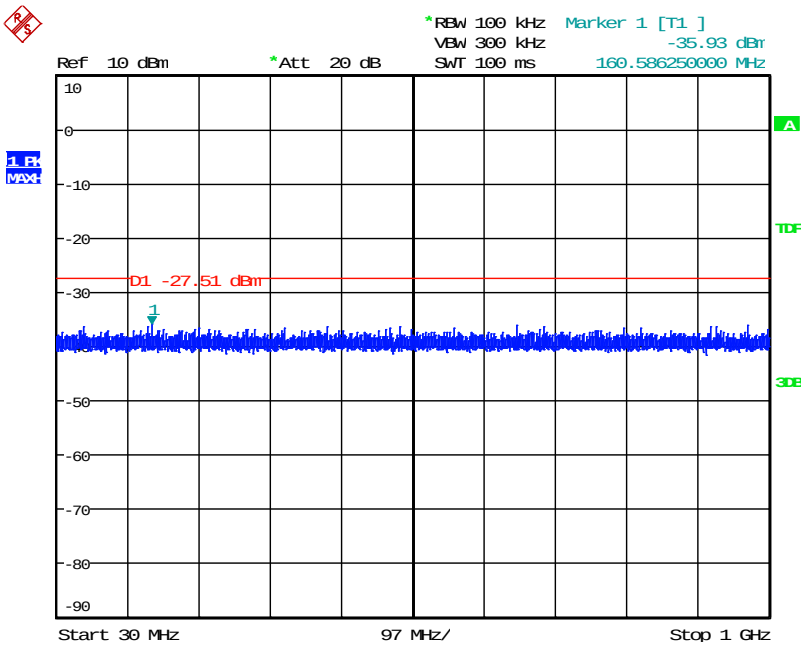


Figure 7.4.2.2-21: 30 MHz – 1 GHz – High Channel

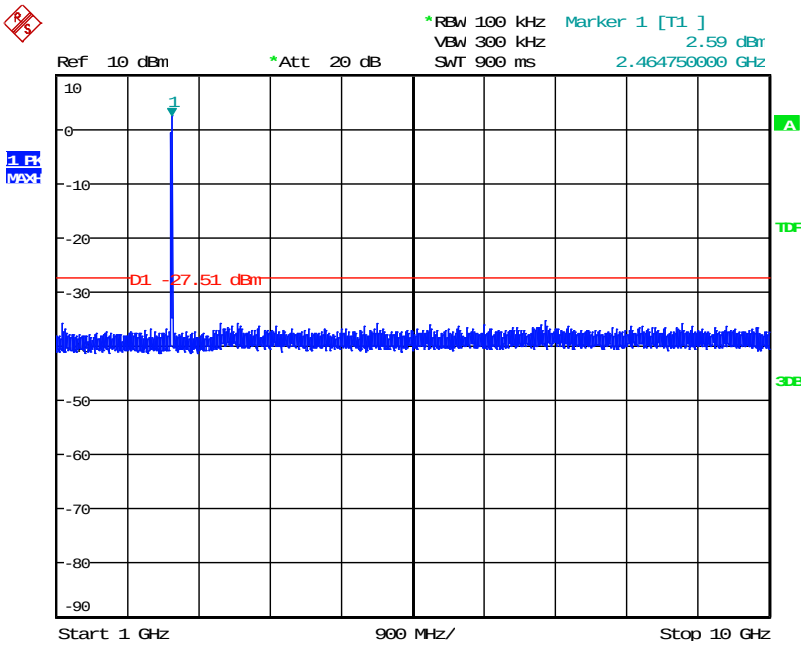
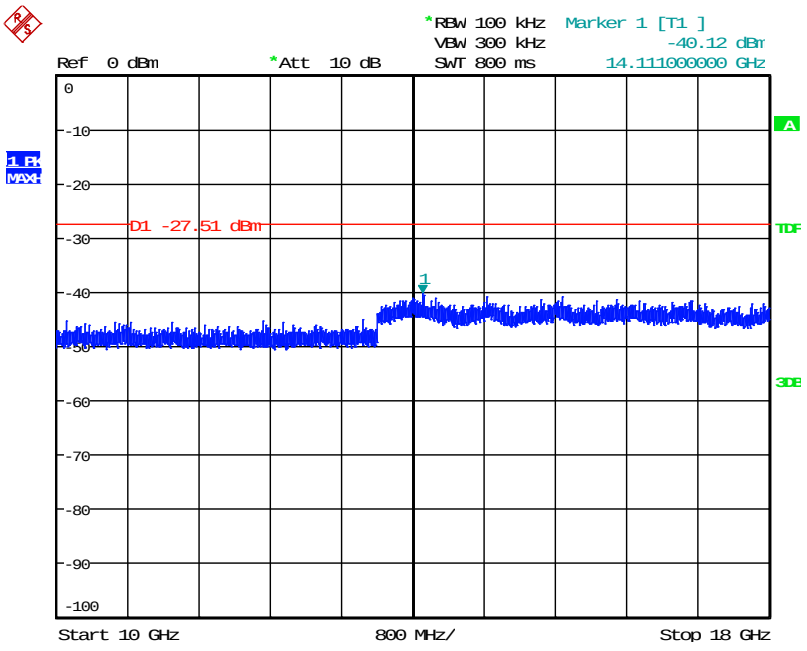
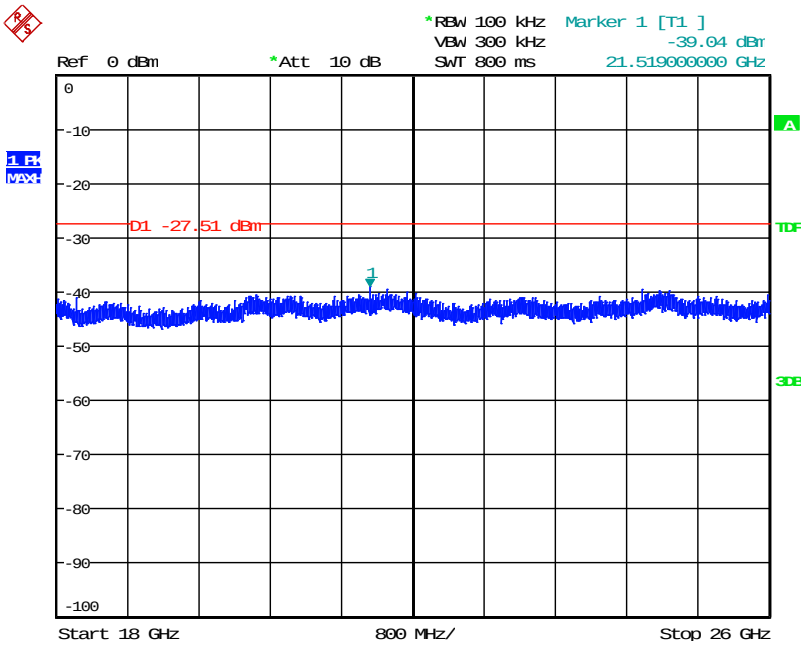


Figure 7.4.2.2-22: 1 GHz – 10 GHz –High Channel



Date: 11.JUN.2016 12:24:48

Figure 7.4.2.2-23: 10 GHz – 18 GHz –High Channel



Date: 11.JUN.2016 12:23:30

Figure 7.4.2.2-24: 18 GHz – 26 GHz –High Channel

802.11n 20MHz

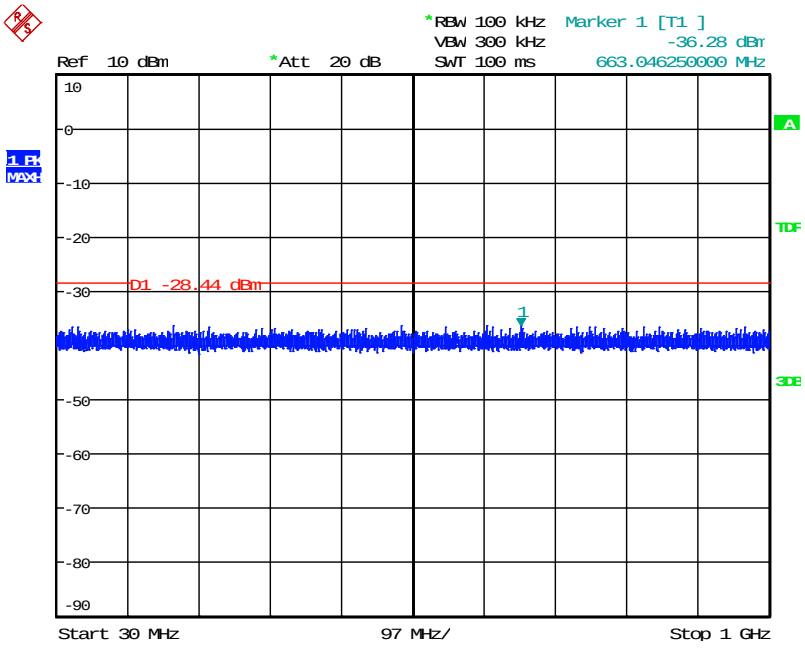


Figure 7.4.2.2-25: 30 MHz – 1 GHz – Low Channel

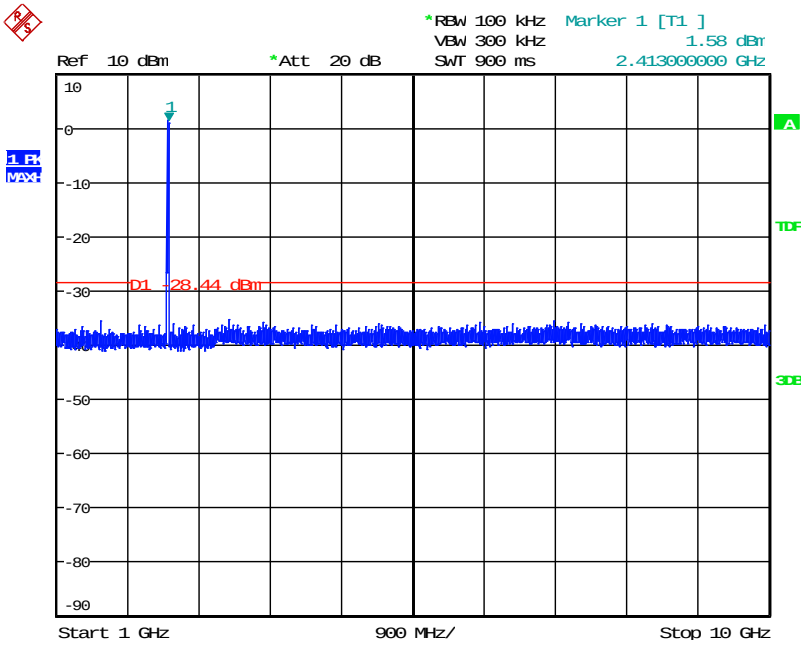
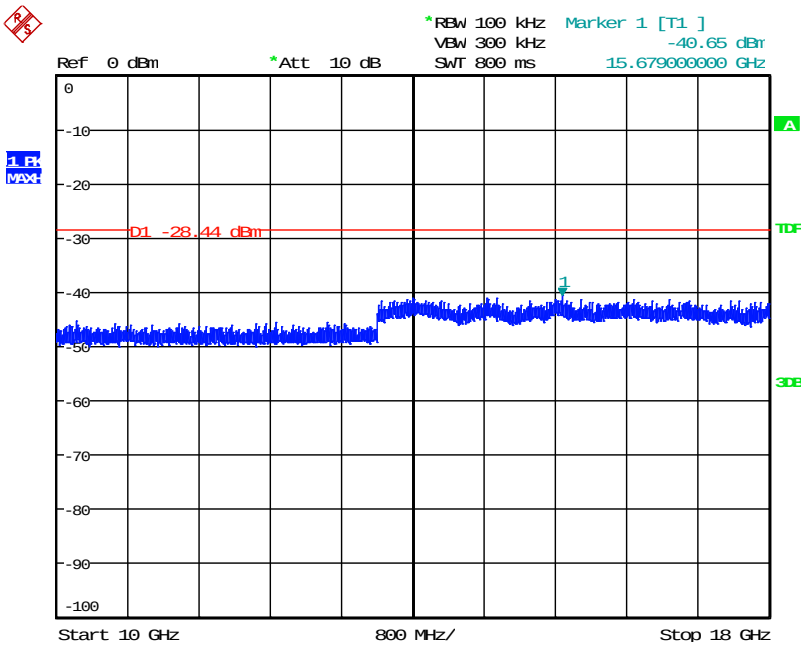
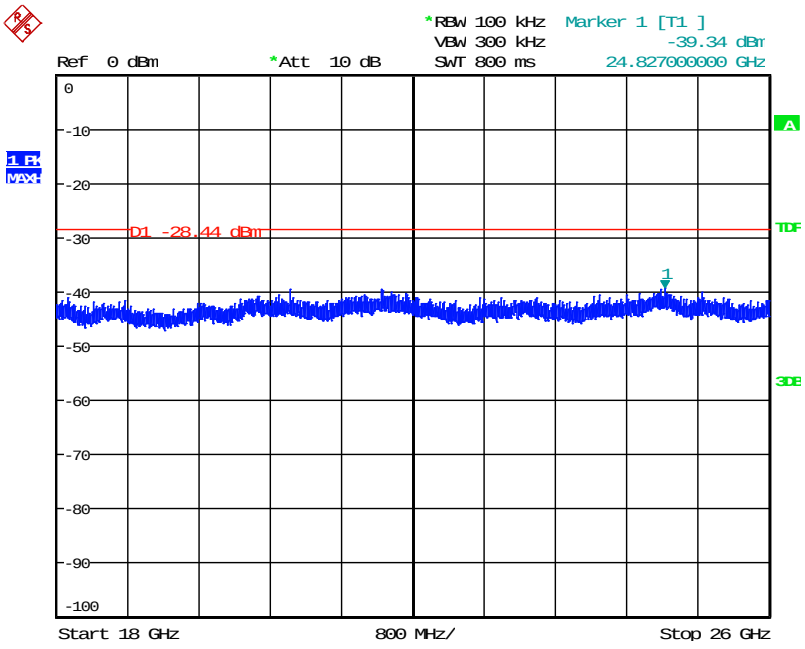


Figure 7.4.2.2-26: 1 GHz –10 GHz – Low Channel



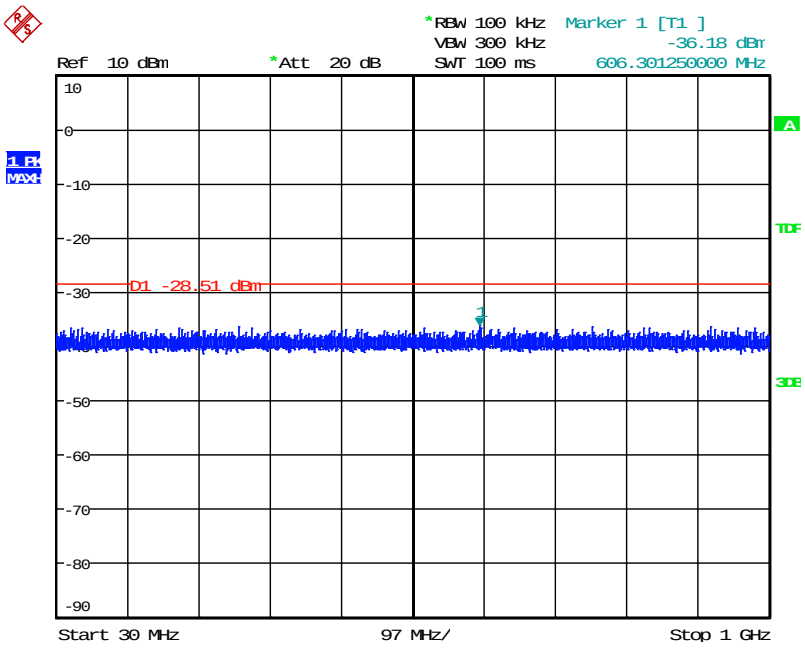
Date: 11.JUN.2016 12:34:37

Figure 7.4.2.2-27: 10 GHz –18 GHz – Low Channel



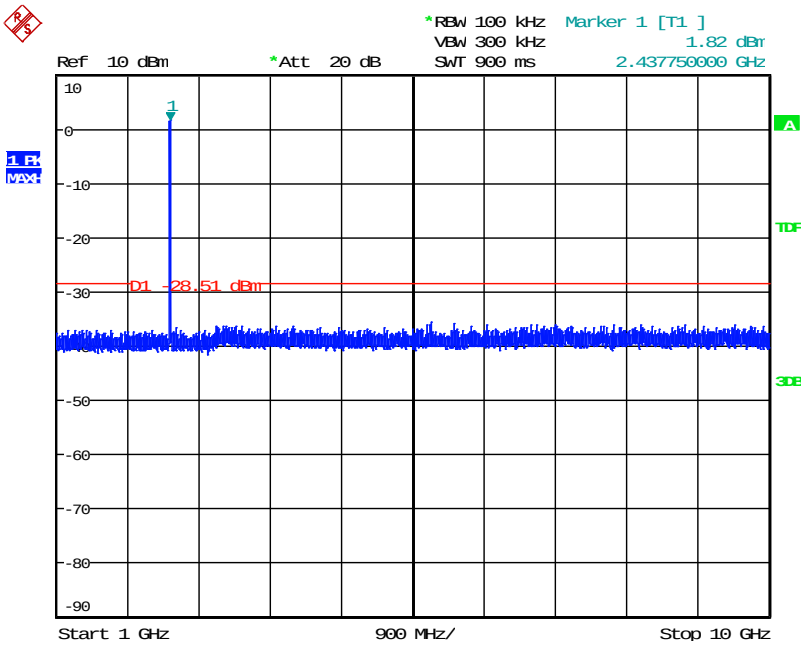
Date: 11.JUN.2016 12:35:47

Figure 7.4.2.2-28: 18 GHz – 26 GHz – Low Channel



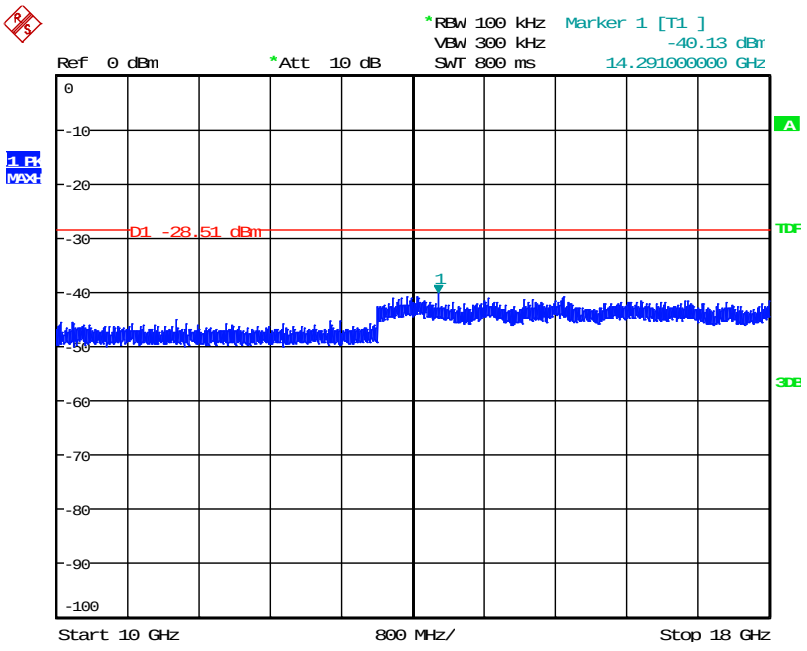
Date: 11.JUN.2016 12:45:11

Figure 7.4.2.2-29: 30 MHz – 1 GHz –Middle Channel



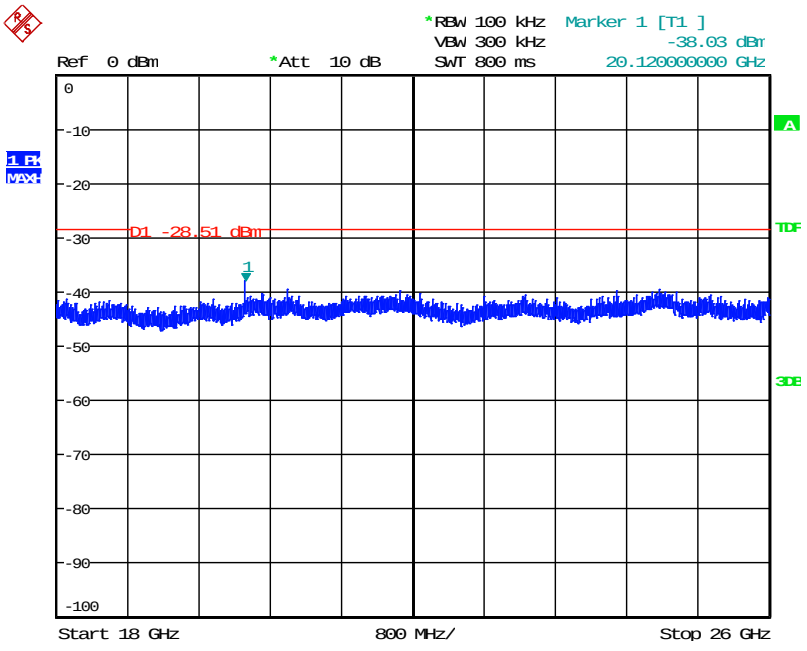
Date: 11.JUN.2016 12:43:21

Figure 7.4.2.2-30: 1 GHz –10 GHz – Middle Channel



Date: 11.JUN.2016 12:40:46

Figure 7.4.2.2-31: 10 GHz –18 GHz – Middle Channel



Date: 11.JUN.2016 12:41:59

Figure 7.4.2.2-32: 18 GHz – 26 GHz – Middle Channel

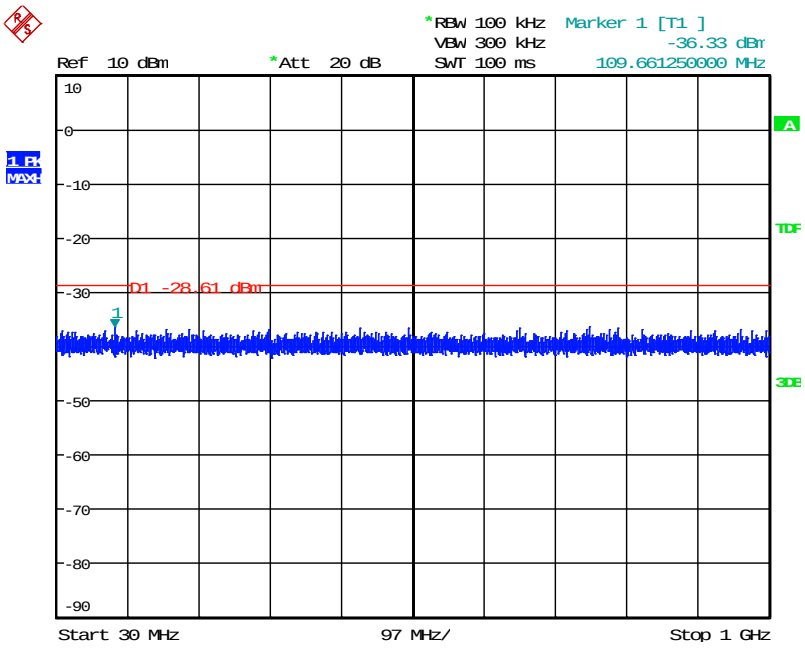


Figure 7.4.2.2-33: 30 MHz – 1 GHz – High Channel

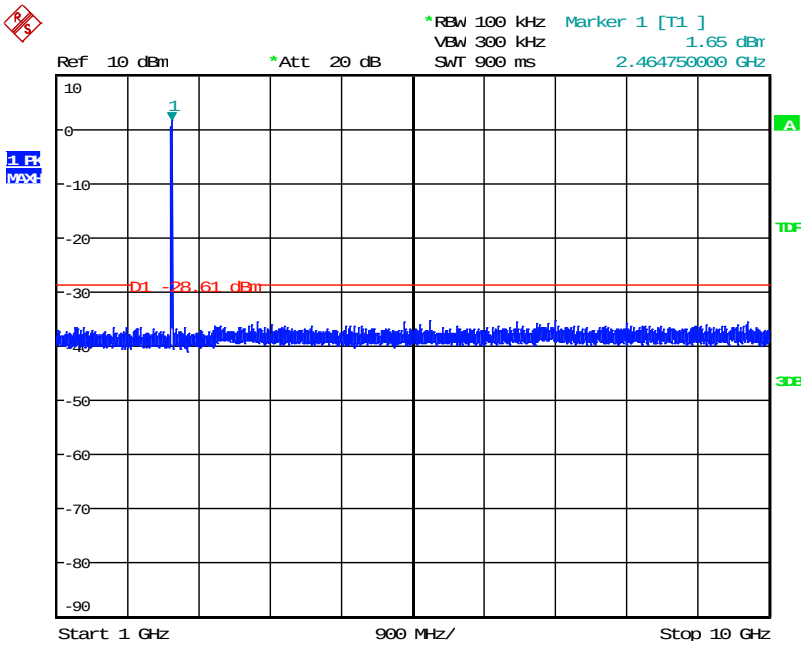
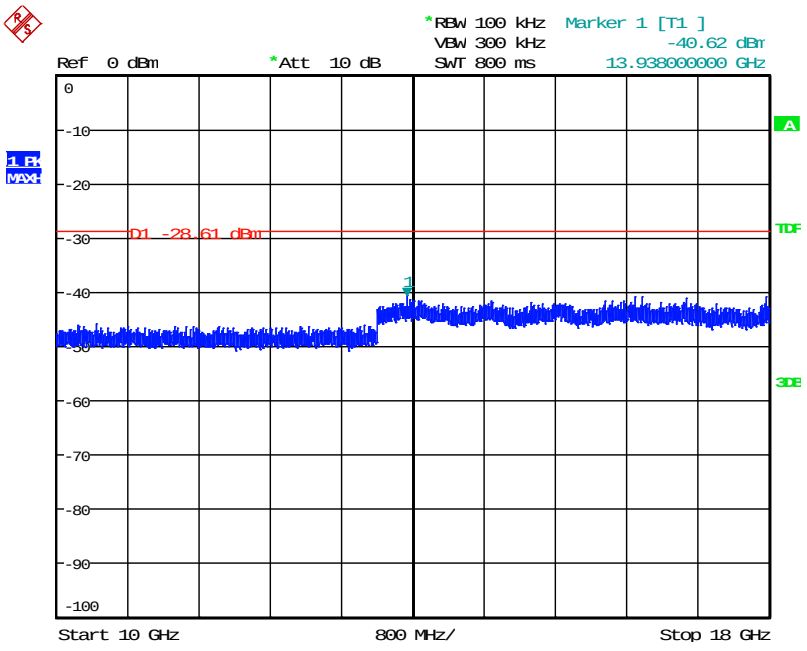
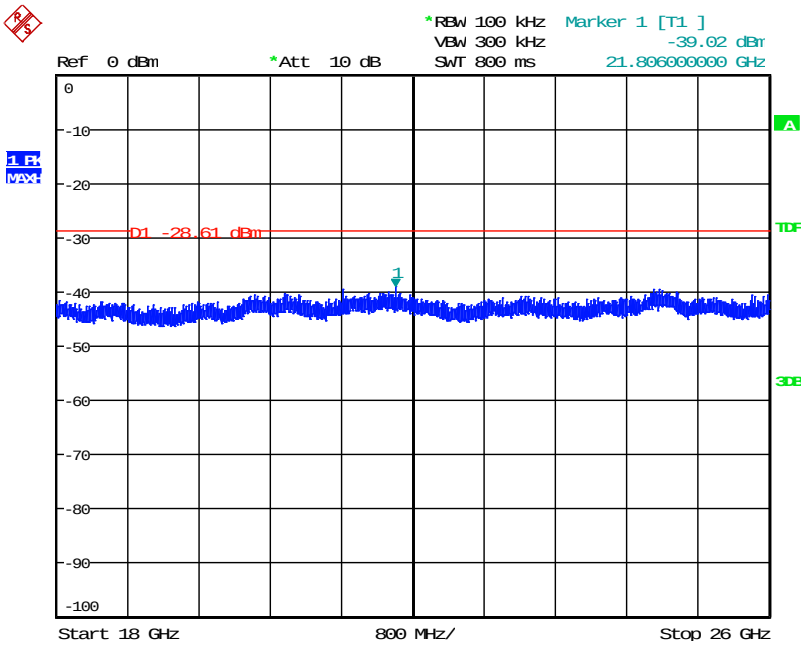


Figure 7.4.2.2-34: 1 GHz –10 GHz –High Channel



Date: 11.JUN.2016 12:50:47

Figure 7.4.2.2-35: 10 GHz – 18 GHz –High Channel



Date: 11.JUN.2016 12:52:35

Figure 7.4.2.2-36: 18 GHz – 26 GHz –High Channel

7.5 Power Spectral Density – FCC Section 15.247(e); ISED Canada: RSS-247 5.2(2)

7.5.1 PSD Measurement Procedure (Conducted Method)

The power spectral density was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05 Section 10.2 Method PKPSD (peak PSD). The RF output port of the EUT was directly connected to the input of the spectrum analyzer. Offset values were input for cable and external attenuation. The spectrum analyzer RBW was set to 3 kHz and VBW 10 kHz. Span was adjusted to 1.5 times the 6 dB bandwidth and the sweep time was set to auto.

7.5.2 Measurement Results

Results are shown below.

802.11b

Table 7.5.2-1: Power Spectral Density

Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
2412	-4.19	8.0	12.19
2437	-4.33	8.0	12.33
2462	-4.12	8.0	12.12

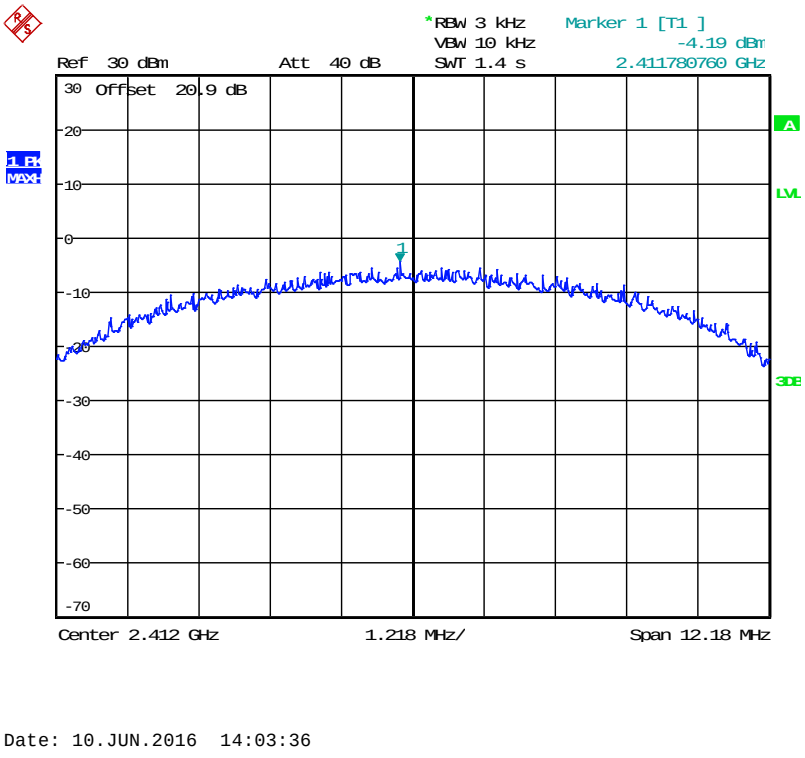
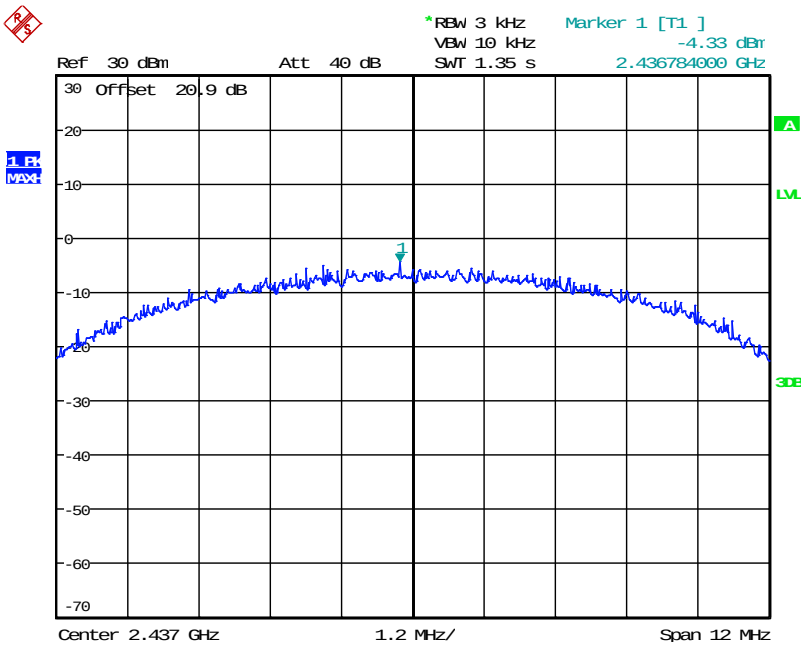


Figure 7.5.2-1: Power Spectral Density - Low Channel



Date: 10.JUN.2016 13:02:42

Figure 7.5.2-2: Power Spectral Density - Middle Channel

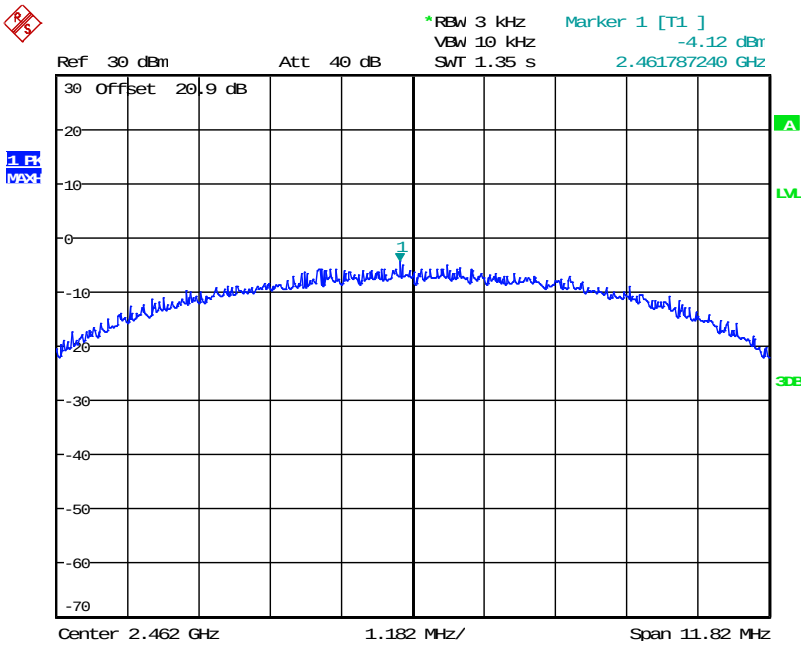


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Figure 7.5.2-3: Power Spectral Density – High Channel

802.11g

Table 7.5.2-2: Power Spectral Density

Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
2412	-13.12	8.0	21.12
2437	-13.08	8.0	21.08
2462	-13.06	8.0	21.06

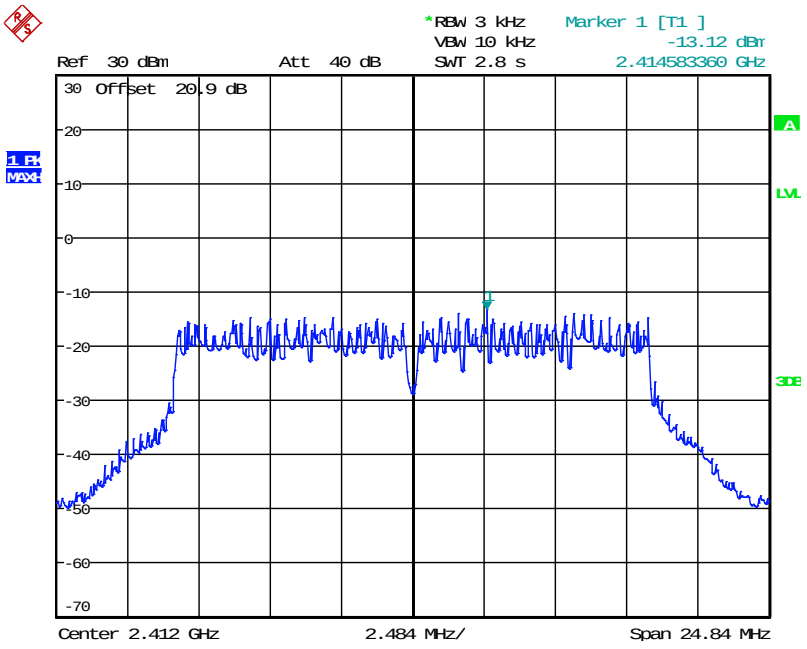

Figure 7.5.2-4: Power Spectral Density - Low Channel

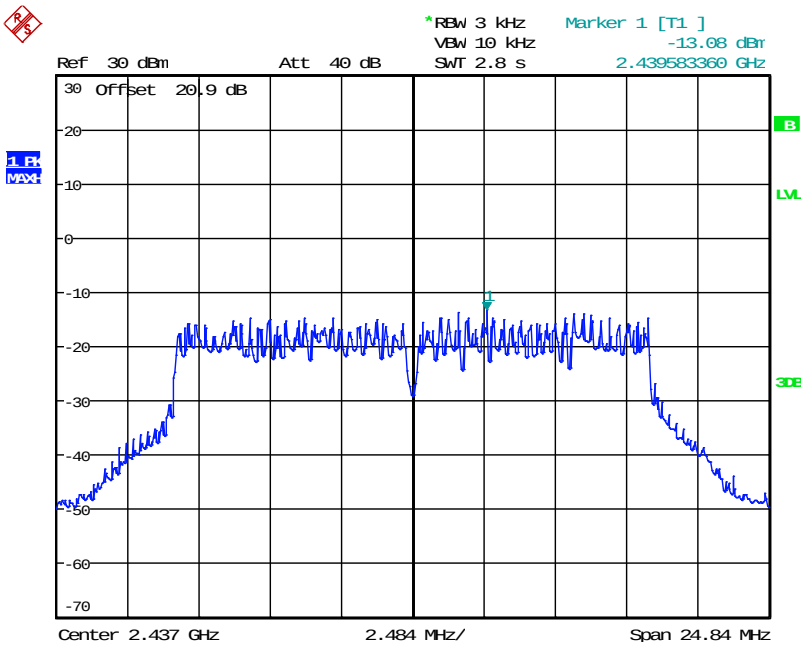

Figure 7.5.2-5: Power Spectral Density - Middle Channel

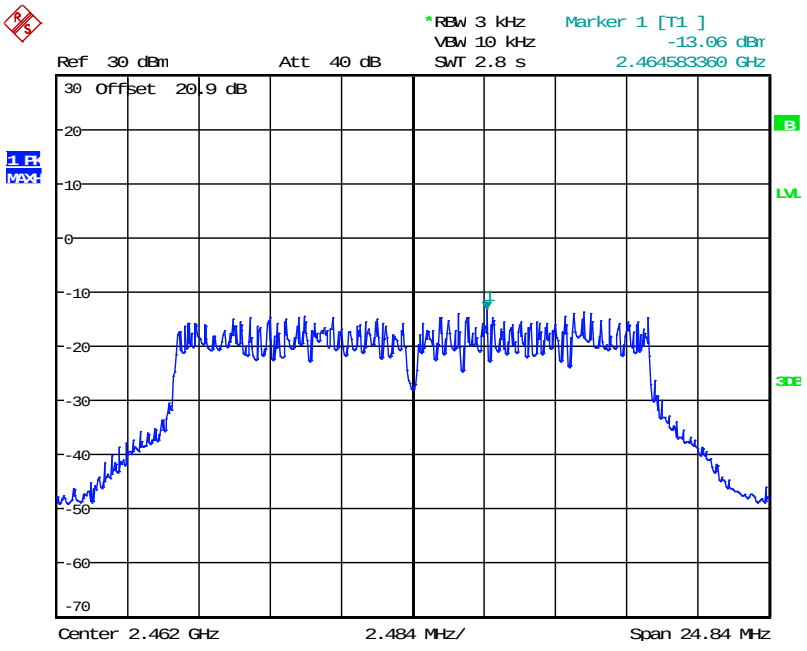

Figure 7.5.2-6: Power Spectral Density – High Channel

802.11n 20MHz

Table 7.5.2-3: Power Spectral Density

Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
2412	-13.10	8.0	21.10
2437	-12.81	8.0	20.81
2462	-12.79	8.0	20.79

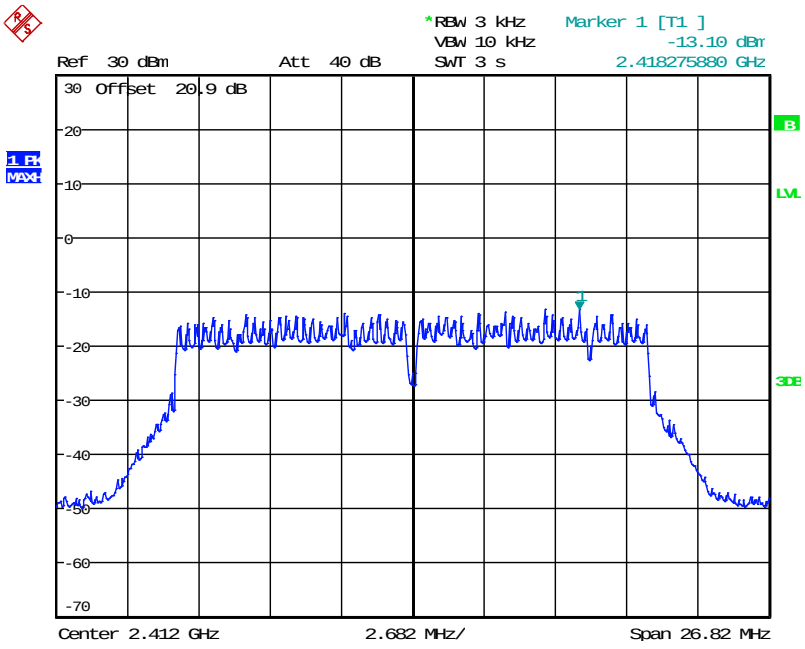

Figure 7.5.2-7: Power Spectral Density - Low Channel

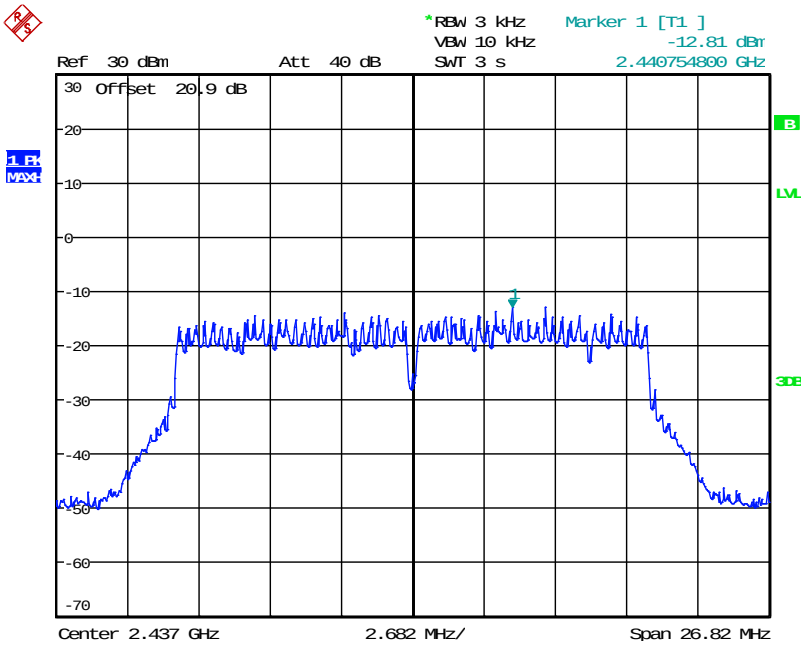

Figure 7.5.2-8: Power Spectral Density - Middle Channel

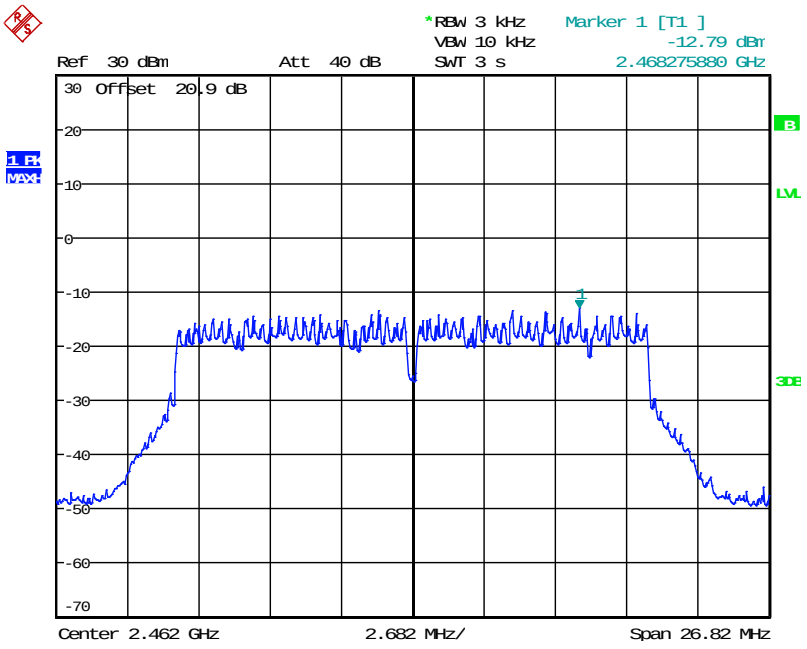

Figure 7.5.2-9: Power Spectral Density – High Channel

7.6 Duty Cycle

7.6.1 Measurement Procedure

The duty cycle was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05 Section Duty Cycle, Transmission Duration and Maximum Power Control Level. The unit was connected directly to the input of the spectrum analyzer via suitable attenuation. The RBW and VBW were set to 10 MHz and the number of sweep points across duration T was set to exceed 100.

7.6.2 Measurement Results

The results for all the modes of operation are provided below.

Table 7.6.2-1 Duty Cycle Correction Factor

Mode	Time On [ms]	Period [ms]	Duty Cycle %	Correction Factor [dB]
802.11b	0.862179487	1.047756	82.288	0.85
802.11g	0.196314103	0.298878205	65.684	1.83
802.11n 20 MHz	0.168896154	0.270032051	62.547	2.04

Note: The correction factor was calculated as 10*log (1/(Time on/Period))

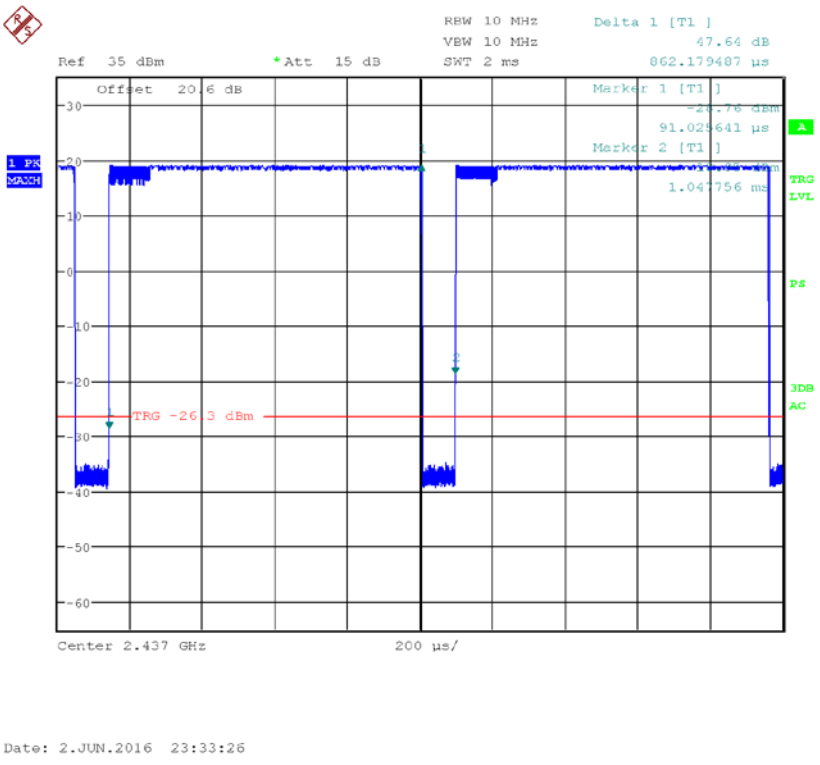

Figure 7.6.2-1: Duty Cycle 802.11b

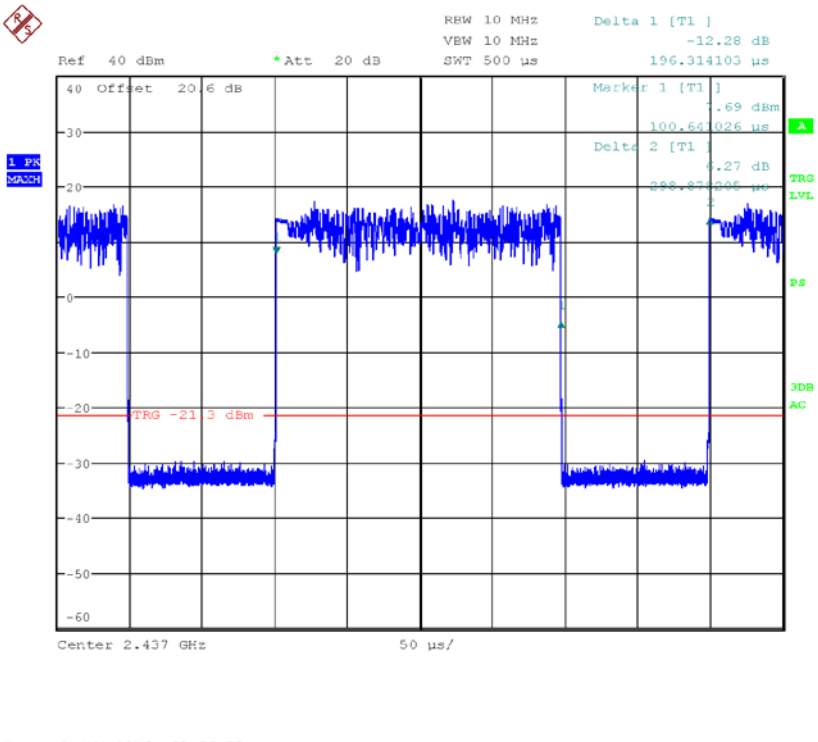

Figure 7.6.2-2: Duty Cycle 802.11g

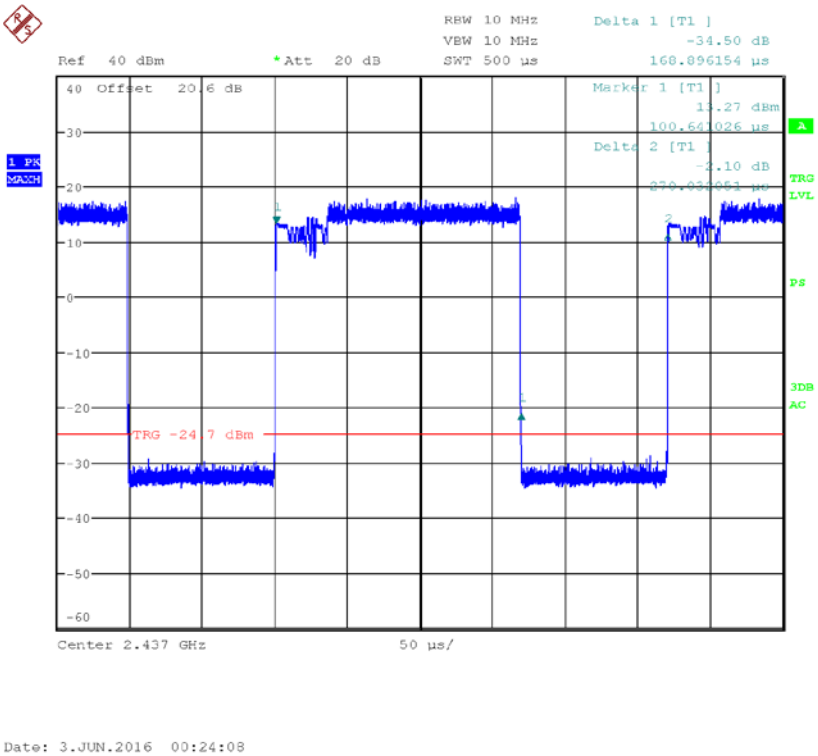

Figure 7.8.2-3: Duty Cycle 802.11n 20 MHz

8 CONCLUSION

In the opinion of ACS, Inc., the model LBEE5ZZ1CK-982 manufactured by Murata Manufacturing Co., Ltd. meets the requirements of FCC Part 15 subpart C and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247 for the test procedures documented in the test report.

END REPORT