Excellence in Compliance Testing

Certification Test Report

FCC ID: AZ489FT7077
IC: 109U-89FT7077

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-247

ACS Report Number: 16-2008.W06.3B

Applicant: Motorola Solutions Sdn Bhd
Model(s): H98QDH9PW7BN

Test Begin Date: **March 7, 2016**
Test End Date: **April 1, 2016**

Report Issue Date: April 6, 2016

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 65 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 Industry Canada's Radio Standards Specification RSS-247.

1.2 Applicant Information

Motorola Solutions Sdn Bhd
Plot 2 Bayan Lepas Innoplex,
Industrial Park Mukim 12 SWD
11900 Bayan Lepas, Penang Malaysia

1.3 Product Description

The APX6000 UHF R1 model H98QDH9PW7BN is a two way portable radio capable of analog FM, digital C4FM and TDMA. This radio includes Bluetooth 2.0+EDR, Bluetooth Low Energy (BLE), WLAN 802.11 b/g/n and GPS features. This test report documents compliance of the WLAN IEEE 802.11b/g/n transceiver.

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
	802.11b/n: OFDM
Antenna Type/Gain:	PIFA, 2.58 dBi
Input Power:	7.4 V Lithium Ion Battery

Model Number: H98QDH9PW7BN

Test Sample Serial Number(s): 756TRZ0368 (RF Conducted Emissions), 756TRX0603 (Radiated and Power Line Conducted Emissions).

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 radiated, RF conducted and power line conducted emissions for the IEEE 802.11b/g/n WLAN transceiver. Preliminary power measurements were performed for all data rates for all modes of operation. The data rate leading to the highest output power was used as provided in the table below.

Preliminary radiated emission evaluation was performed for the EUT standalone, set in three orthogonal orientations as well as for the EUT set on a single unit charger, the EUT set on a multi-unit charger and the unit connected to a laptop computer via a GCAI cable. The worst case configuration was obtained with the EUT standalone, lying on one side.

The EUT was also evaluated for radiated intermodulation product for the WLAN radio transmitting at the same time as the land mobile radio. All intermodulation products were observed to be compliant to the limits of the FCC Section 15.209 and RSS-Gen.

The RF conducted measurements were performed on a sample modified with a temporary connector at the antenna port for direct coupling to the spectrum analyzer.

For power line conducted emissions, preliminary measurements were performed on the unit powered via a multi-unit charger and the unit set on a single unit charger. The multi-unit charger was fully loaded during the evaluation and led to the worst case configuration as reported in this document.

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	18	1 Mbps
	2437	6	18	
	2462	11	18	
802.11g	2412	1	13	6 Mbps
	2437	6	13	
	2462	11	13	
802.11n 20 MHz	2412	1	11.5	6.5 Mbps (MCS0)
	2437	6	11.5	
	2462	11	11.5	

The EUT was also evaluated for unintentional emissions. The results are documented separately in a Declaration of Conformity/Verification test report.

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
Industry 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 1050 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:

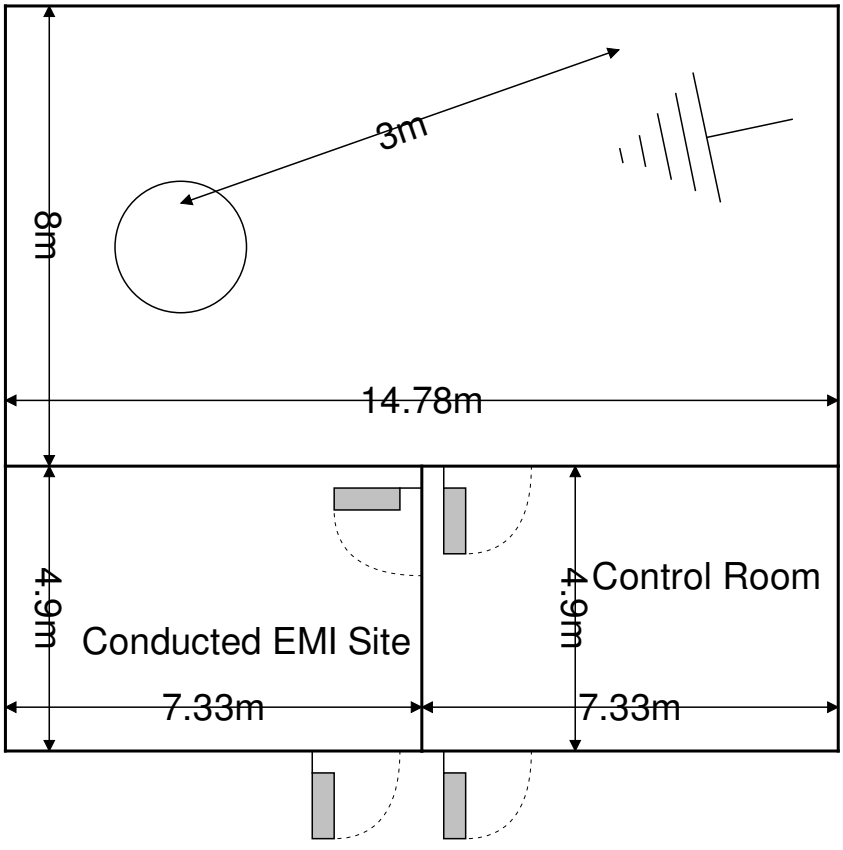


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

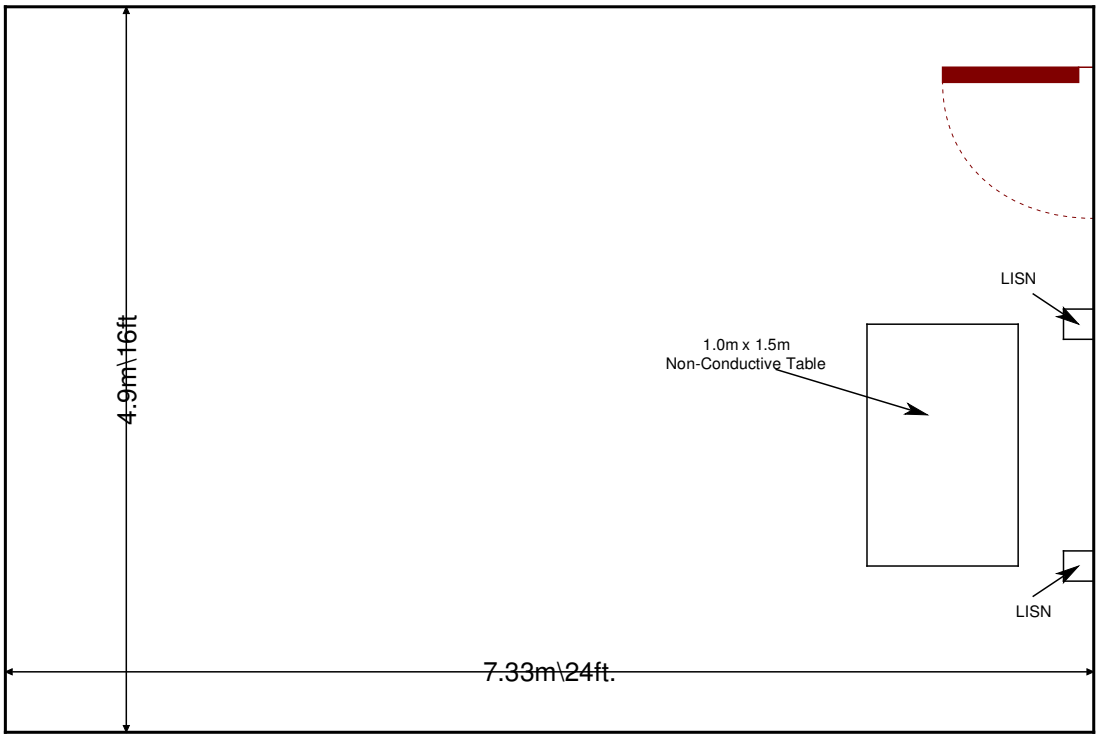


Figure 2.3.2-1: AC Mains Conducted EMI Site

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
- Industry 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.
- Industry 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
479	Electro-Metrics	ALP-70	Antennas	158	12/3/2015	12/3/2017
523	Agilent	E7405	Spectrum Analyzers	MY45103293	12/26/2014	12/26/2016
653	Suhner	SF-102A	Cables	0944/2A	4/13/2015	4/13/2016
2002	EMCO	3108	Antennas	2147	11/19/2015	11/19/2017
2004	EMCO	3146	Antennas	1385	11/19/2015	11/19/2017
2006	EMCO	3115	Antennas	2573	4/14/2015	4/14/2017
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	11/18/2015	11/18/2016
2022	EMCO	LISN3825/2R	LISN	1095	9/14/2015	9/14/2017
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	11/11/2015	11/11/2016
2070	Mini Circuits	VHF-8400+	Filter	2070	11/17/2015	11/17/2016
2072	Mini Circuits	VHF-3100+	Filter	30737	11/17/2015	11/17/2016
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	11/16/2015	11/16/2016
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/9/2015	12/9/2016
2111	Aeroflex Inmet	40AH2W-20	Attenuator	2111	7/22/2015	7/22/2016
2112	Teledyne Storm Products	921-0101-036	Cables	12-06-698	11/13/2015	11/13/2016
2121	ACS Boca	Radiated Cable Set	Cable Set	2121	8/22/2015	8/22/2016
3004	Teseq	CFL 9206A	Attenuators	34720	10/7/2015	10/7/2016

Note: NCR=No Calibration Required

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment (Radiated Emissions)

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Motorola Solutions	H98QDH9PW7BN	756TRX0603

Note: The EUT was evaluated standalone without any support equipment

Table 5-2: EUT and Support Equipment (Power Line Conducted Emissions)

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Motorola Solutions	H98QDH9PW7BN	756TRX0603
2	Multi-Unit Charger	Motorola Solutions	NNTN8844A	N/A
3	SRX2200 UHF1 ULP Two-Way Radio	Motorola Solutions	H99QDH9PW7BN	756TSB0792
4	APX6000 UHF2 Two-Way Radio	Motorola Solutions	H98SDH9PW7BN	756TSB0824
5	APX6000 7/800 Two-Way Radio	Motorola Solutions	H98UCH9PW7BN	756TSD0459
6	APX6000 UHF1 Two-Way Radio	Motorola Solutions	H98QDH9PW7BN	756TRX0633
7	APX6000 7/800 Two-Way Radio	Motorola Solutions	H98UCH9PW7BN	756TSD0467
8	6 x Resistive Loads	Motorola Solutions	N/A	N/A

Table 5-3: Cable Description (Power Line Conducted Emissions)

Cable #	Cable Type	Length	Shield	Termination
A	Power	2.2 m	No	Charger to AC Mains
B	6 x USB	0.2 m	Yes	Charger to Resistive Load

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

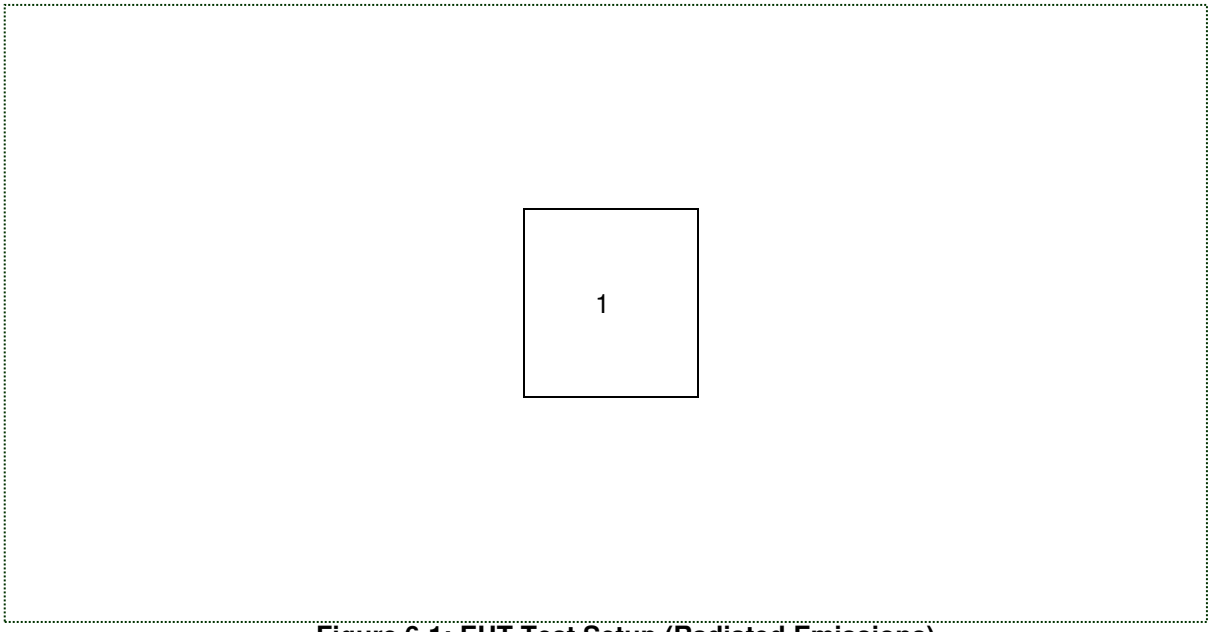


Figure 6-1: EUT Test Setup (Radiated Emissions)

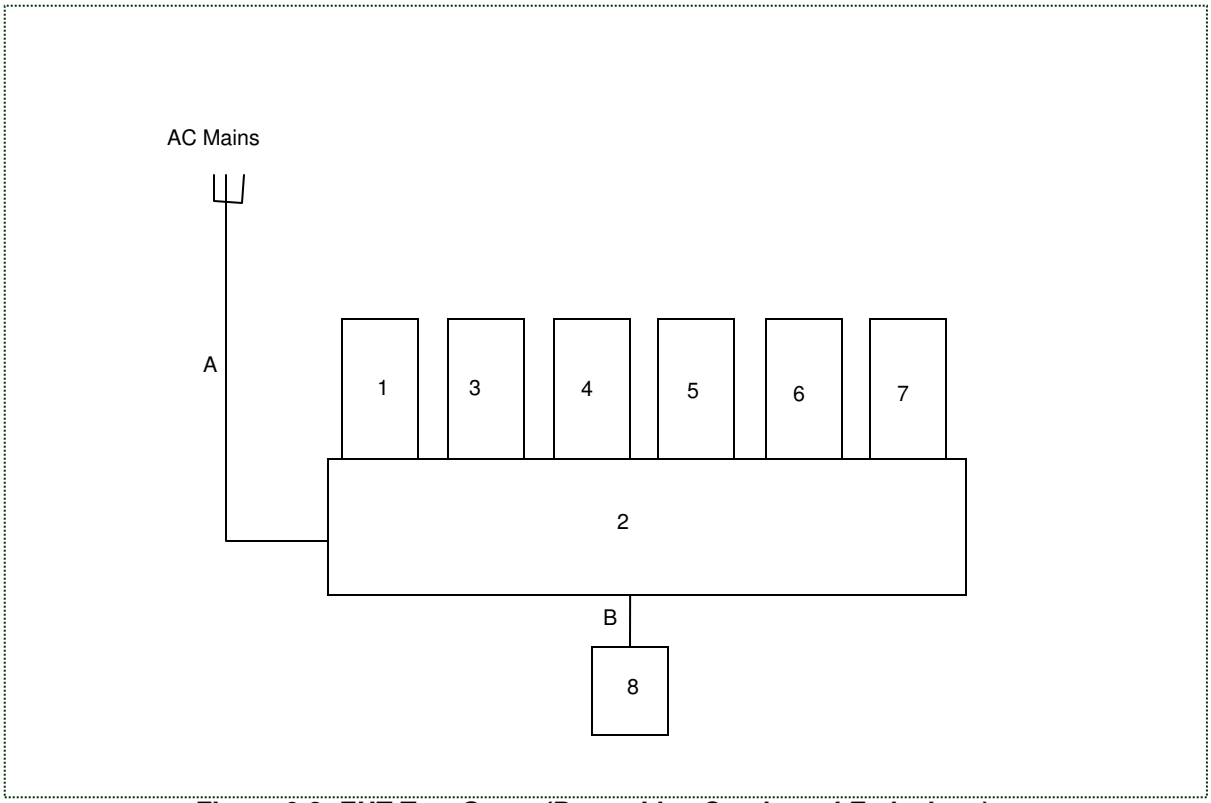


Figure 6-2: EUT Test Setup (Power Line Conducted Emissions)

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 2.58 dBi internal PIFA which connects to the RF port via a spring contact. The EUT meets the requirements of FCC Section 15.203.

7.2 6 dB Bandwidth - FCC: Section 15.247(a)(2) IC: RSS-247 5.5(1); 99% Bandwidth IC: RSS-GEN 6.6

7.2.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with ANSI C63.10:2013 Section 11.8 DTS Bandwidth 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.

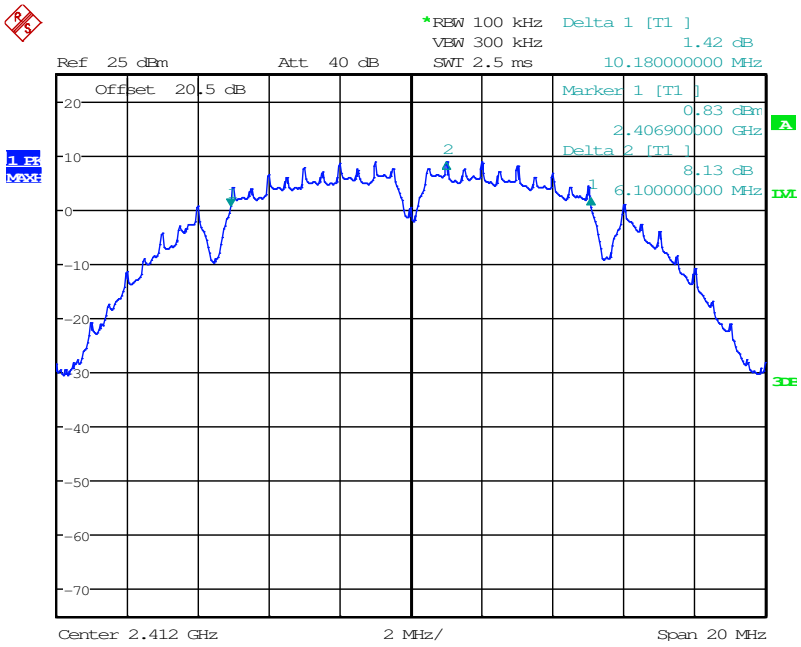
7.2.2 Measurement Results

Results are shown below.

802.11b

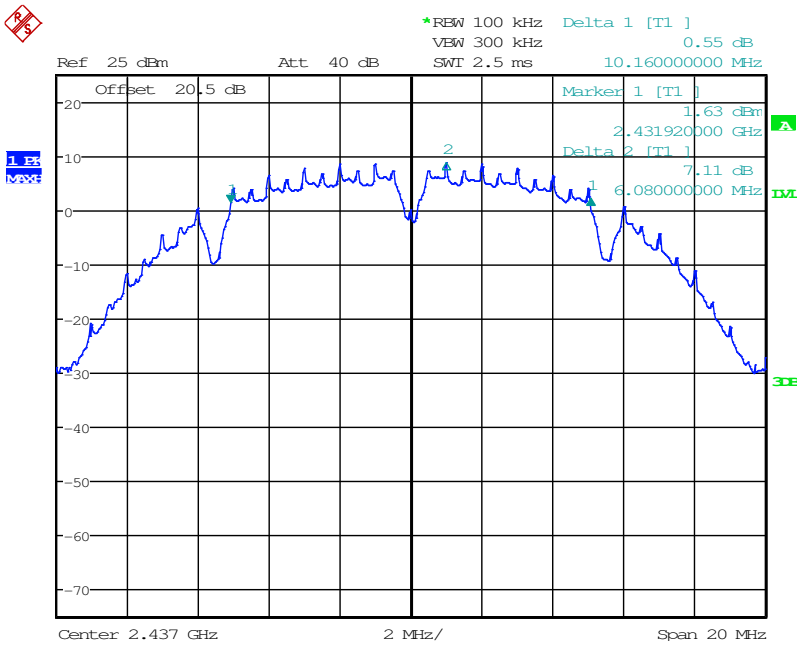
Table 7.2.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth (MHz)
2412	10.18	13.80
2437	10.16	13.80
2462	10.16	13.80



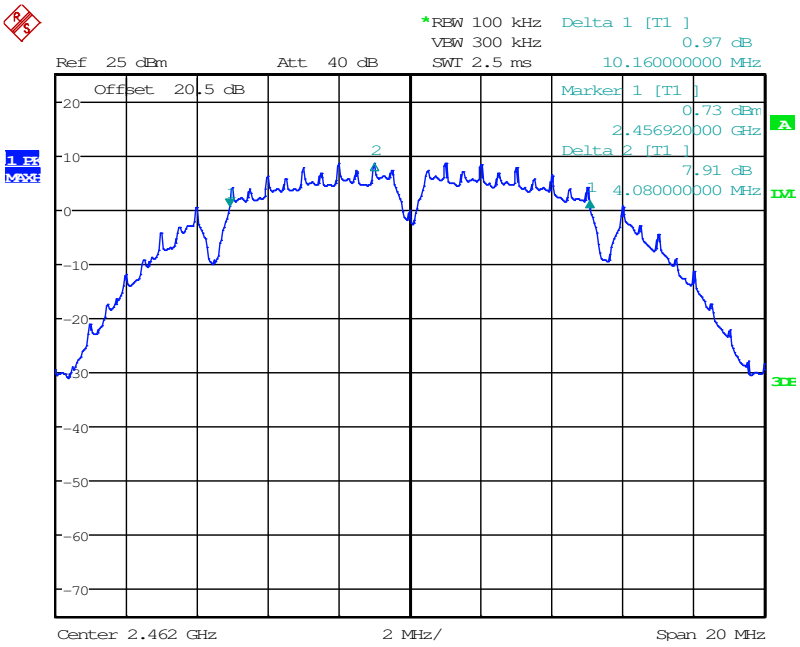
Date: 22.MAR.2016 14:22:32

Figure 7.2.2-1: 6dB BW - Low Channel



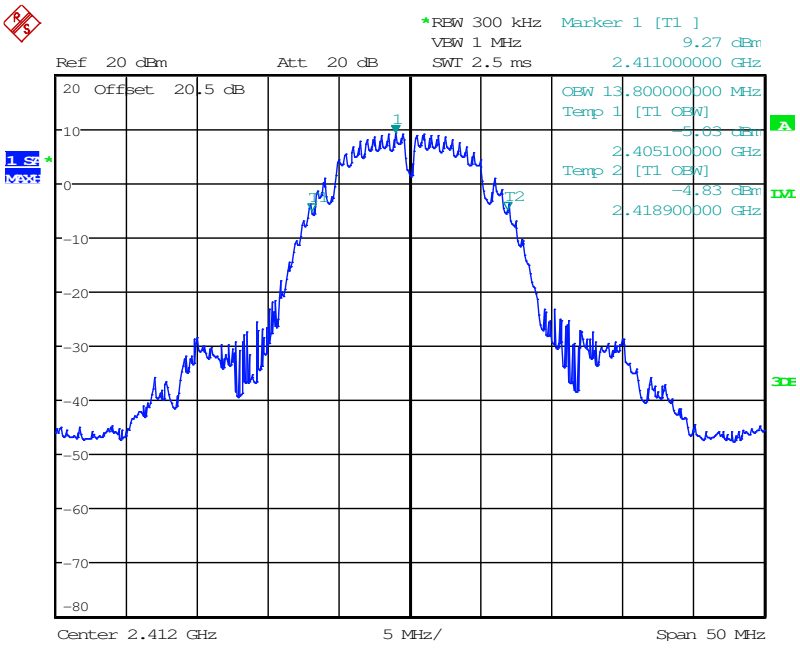
Date: 22.MAR.2016 15:04:30

Figure 7.2.2-2: 6dB BW - Middle Channel



Date: 22.MAR.2016 15:43:53

Figure 7.2.2-3: 6dB BW - High Channel



Date: 21.MAR.2016 16:08:08

Figure 7.2.2-4: 99% OBW - Low Channel

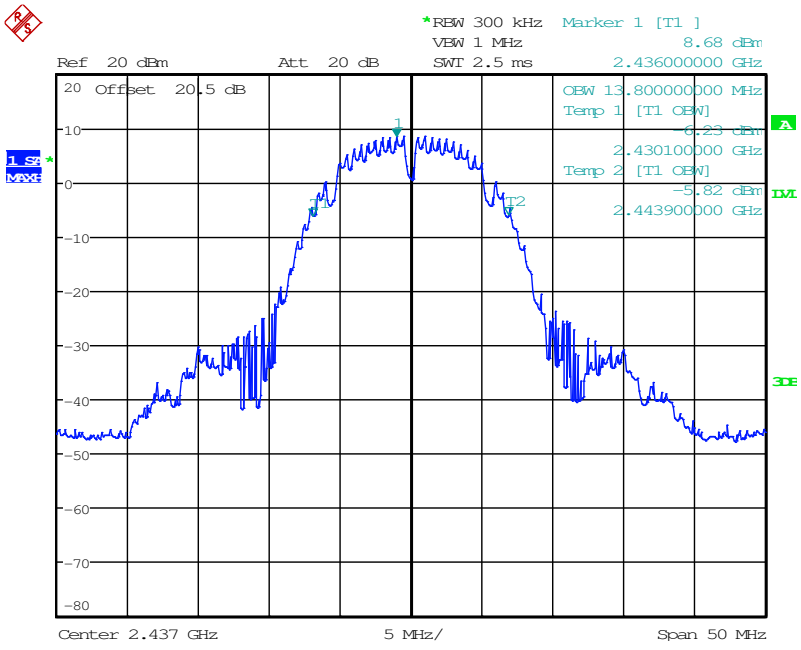


Figure 7.2.2-5: 99% OBW - Middle Channel

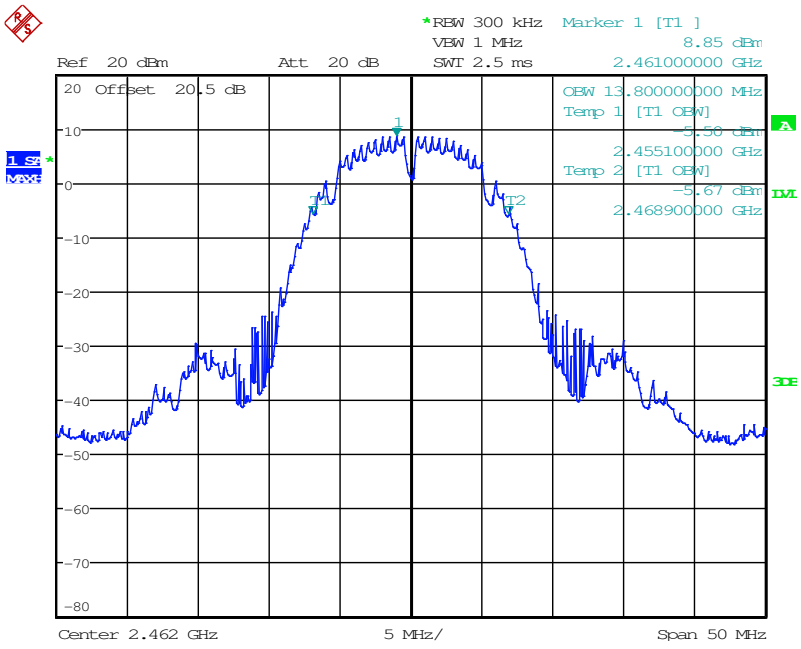


Figure 7.2.2-6: 99% OBW - High Channel

802.11g

Table 7.2.2-2: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth (MHz)
2412	16.50	17.10
2437	16.50	17.10
2462	16.56	17.10

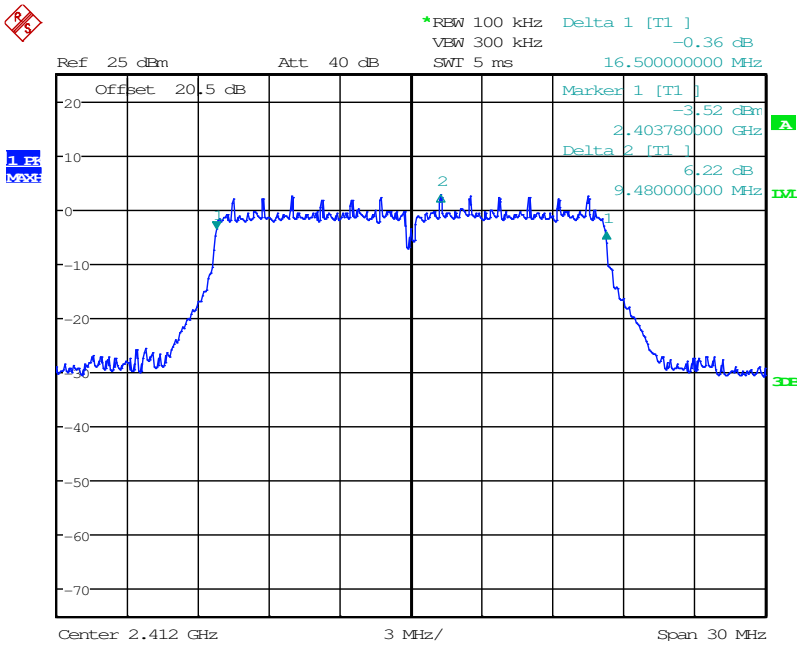
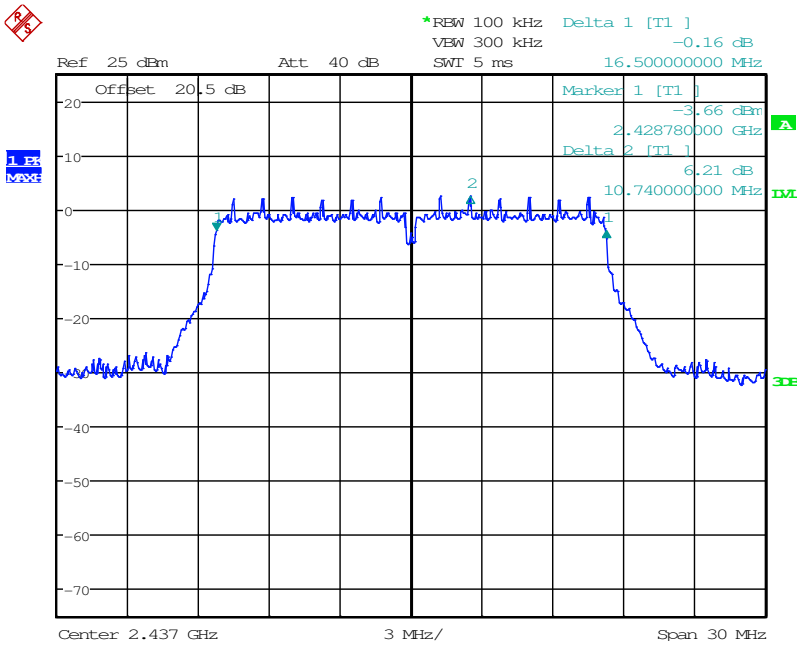
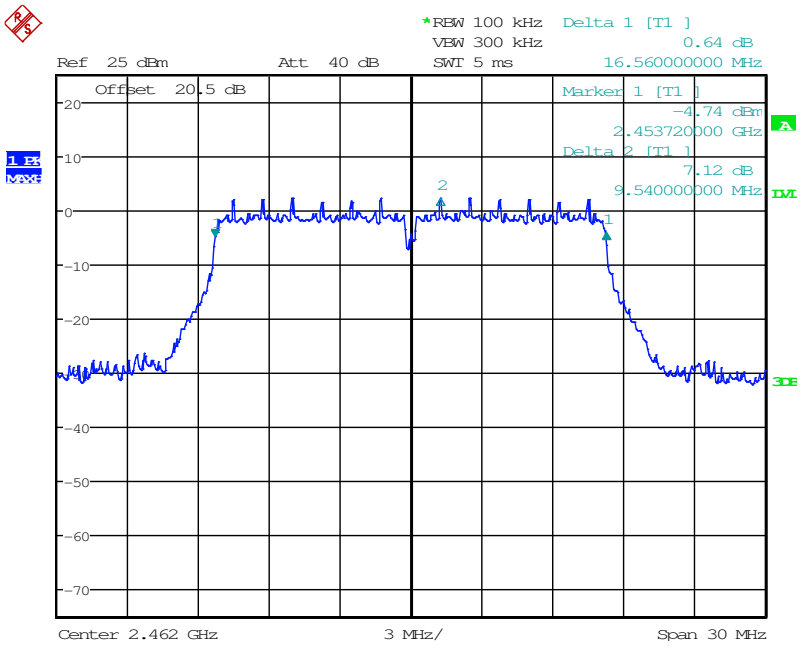


Figure 7.2.2-7: 6dB BW - Low Channel



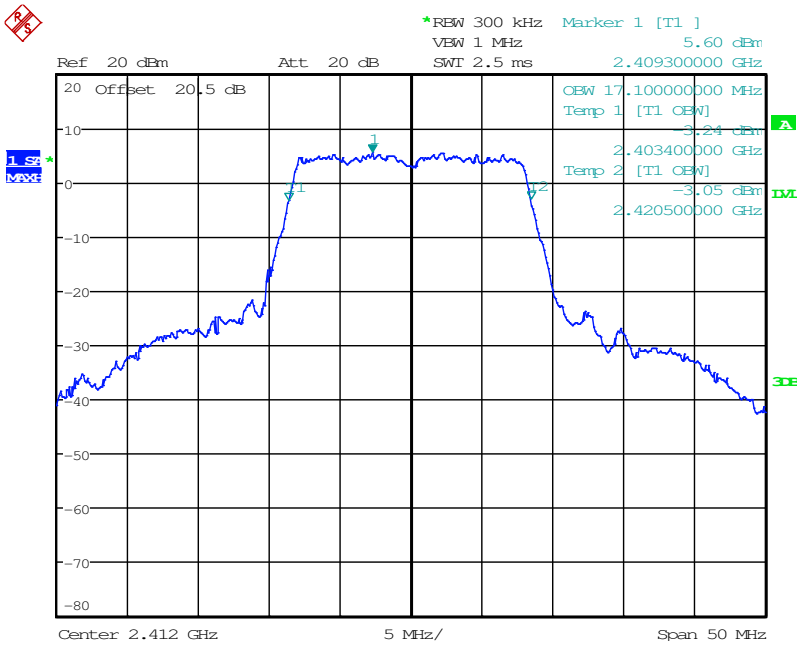
Date: 22.MAR.2016 17:04:23

Figure 7.2.2-8: 6dB BW - Middle Channel



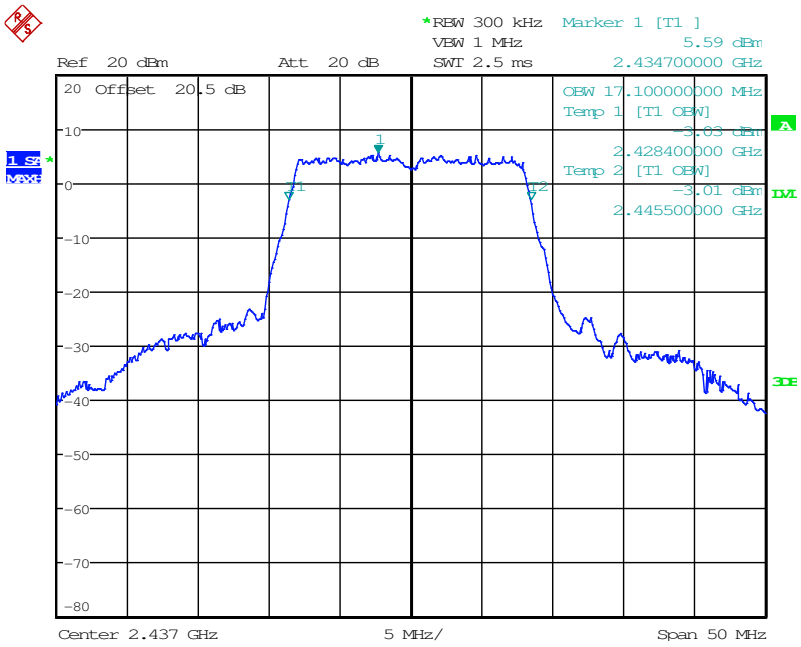
Date: 22.MAR.2016 17:39:01

Figure 7.2.2-9: 6dB BW - High Channel



Date: 22.MAR.2016 08:17:33

Figure 7.2.2-10: 99% OBW - Low Channel



Date: 21.MAR.2016 16:34:22

Figure 7.2.2-11: 99% OBW - Middle Channel

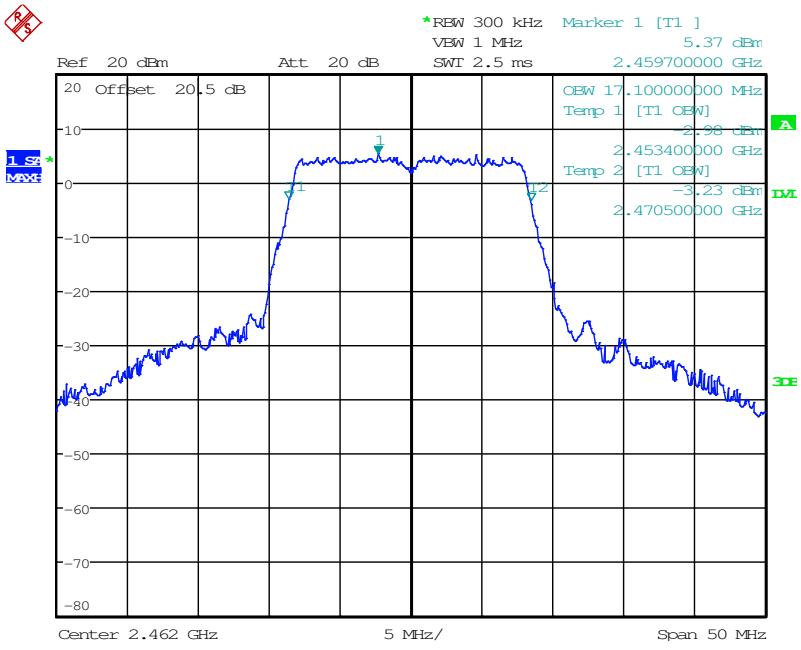


Figure 7.2.2-12: 99% OBW - High Channel

802.11n 20 MHz

Table 7.2.2-3: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth (MHz)
2412	17.76	18.10
2437	17.76	18.10
2462	17.76	18.10

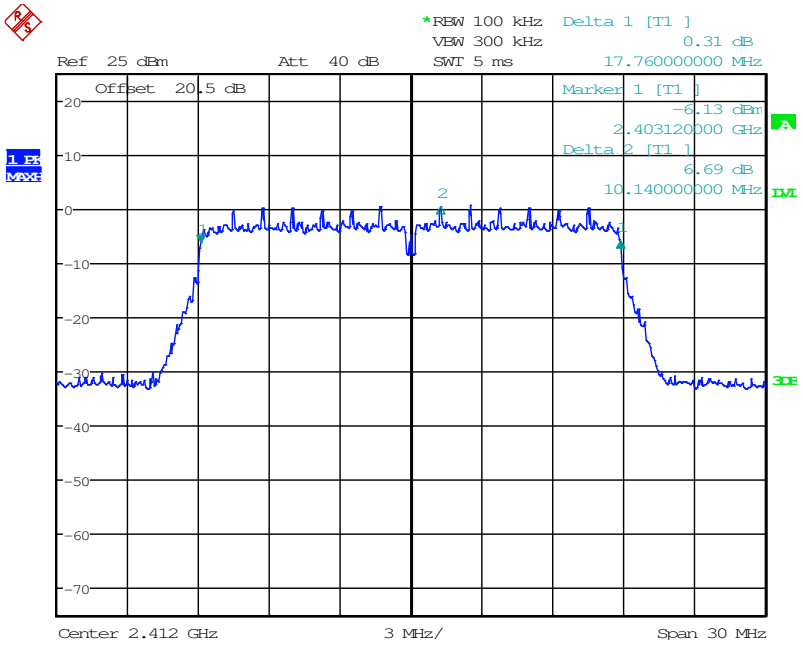


Figure 7.2.2-13: 6dB BW - Low Channel

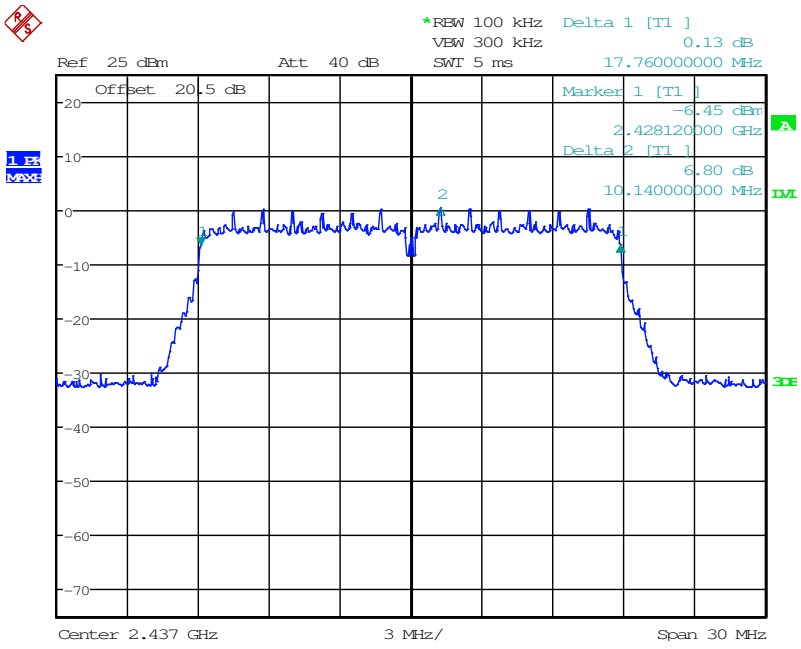


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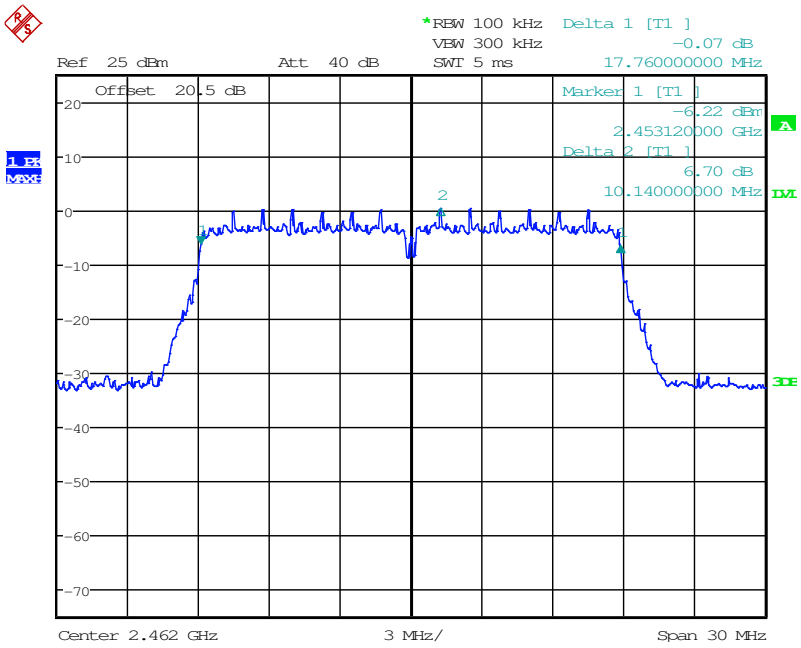
Figure 7.2.2-14: 6dB BW - Middle Channel



Date: 22.MAR.2016 18:26:38

Figure 7.2.2-15: 6dB BW - High Channel

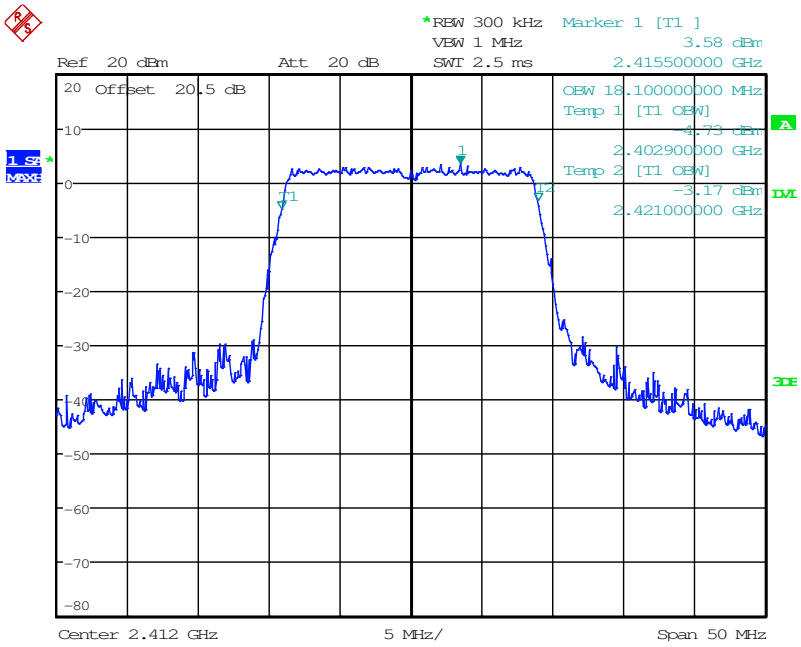


Figure 7.2.2-16: 99% OBW - Low Channel

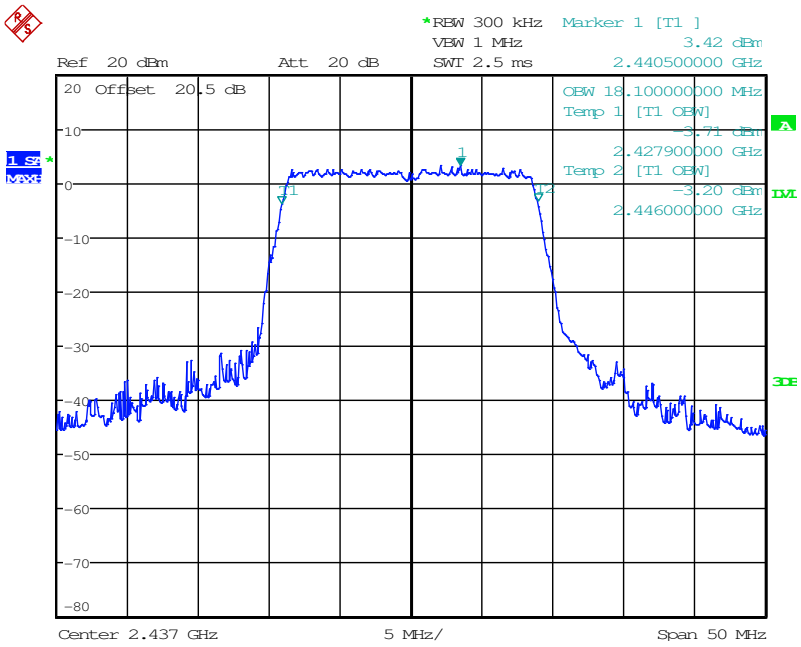


Figure 7.2.2-17: 99% OBW - Middle Channel

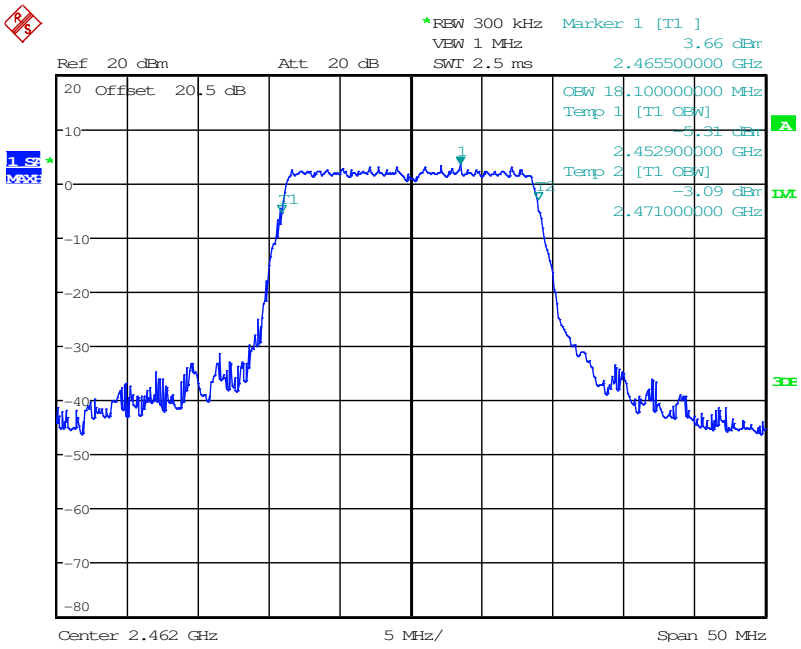


Figure 7.2.2-18: 99% OBW - High Channel

7.3 Maximum Conducted Output Power - FCC Section 15.247(b)(3) IC: RSS-247 5.4(4)

7.3.1 Measurement Procedure (Conducted Method)

The fundamental emission output power was measured in accordance with ANSI C63.10:2013 Section 11.9.2.2.2 Method AVGSA-1. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer through suitable attenuation.

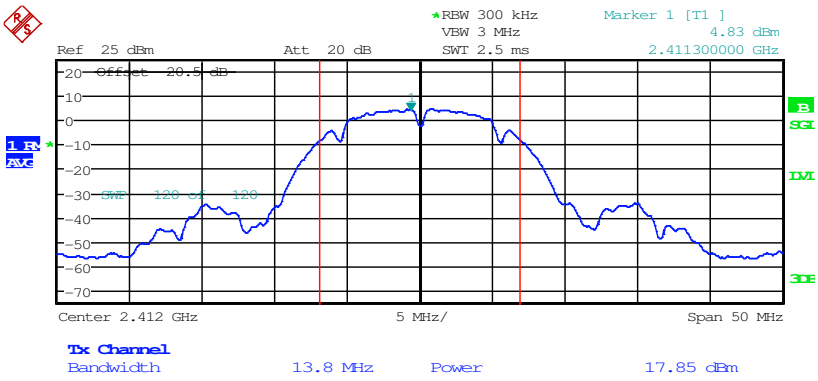
7.3.2 Measurement Results

Results are shown below.

802.11b

Table 7.3.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
2412	17.85
2437	17.22
2462	17.42



Date: 21.MAR.2016 16:09:36

Figure 7.3.2-1: RF Output Power - Low Channel

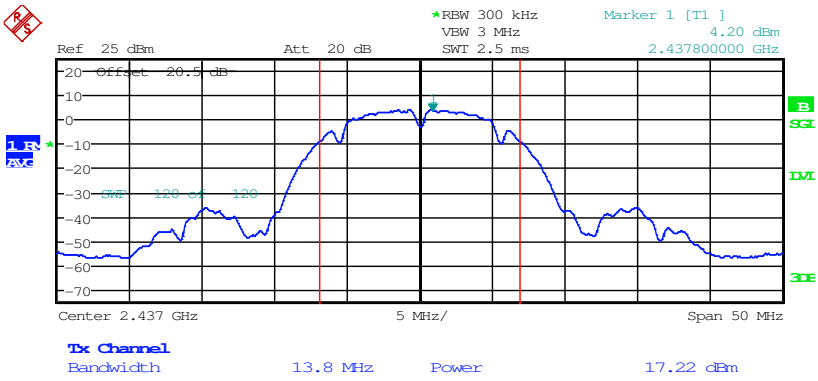


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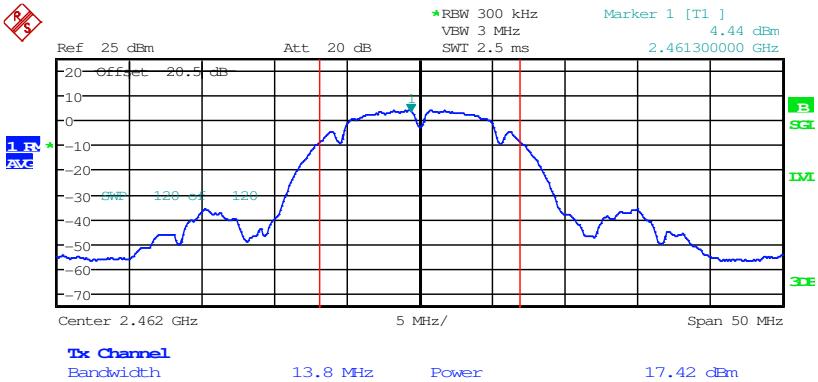
Figure 7.3.2-2: RF Output Power - Middle Channel



Date: 21.MAR.2016 16:18:17

Figure 7.3.2-3: RF Output Power - High Channel

802.11g

Table 7.3.2-2: RF Output Power

Frequency [MHz]	Level [dBm]
2412	13.83
2437	13.74
2462	13.71

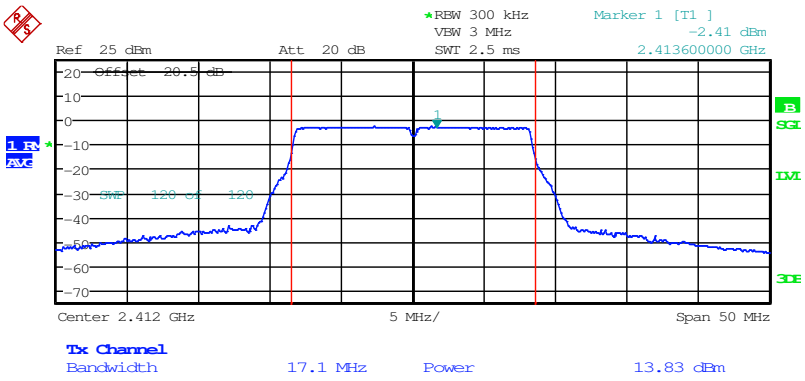
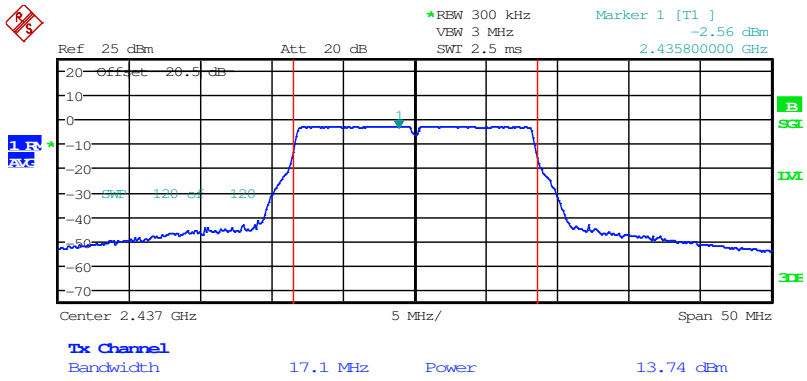
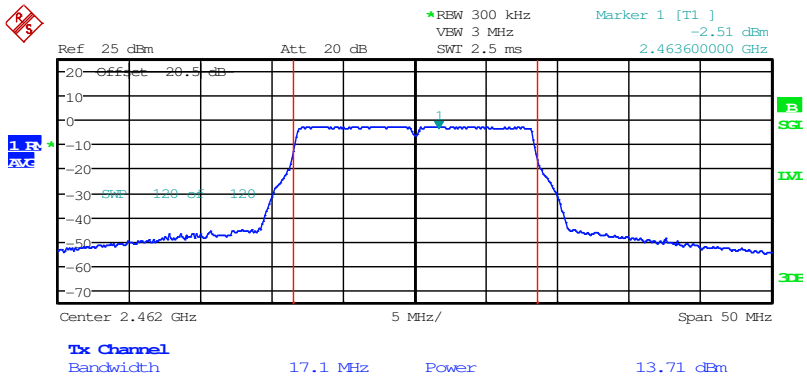


Figure 7.3.2-4: RF Output Power - Low Channel



Date: 21.MAR.2016 16:36:07

Figure 7.3.2-5: RF Output Power - Middle Channel



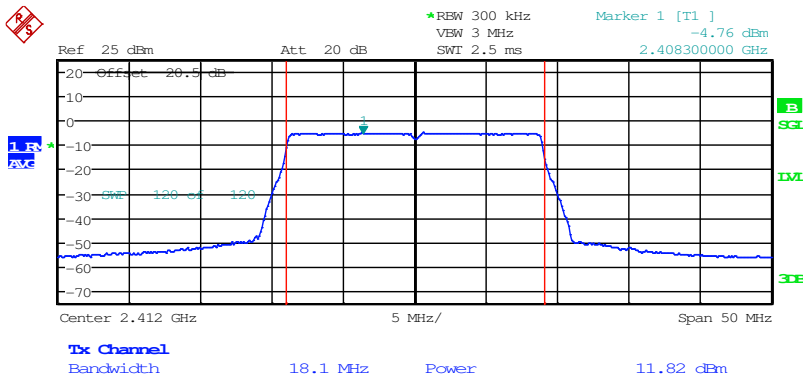
Date: 22.MAR.2016 08:27:19

Figure 7.3.2-6: RF Output Power - High Channel

802.11n 20 MHz

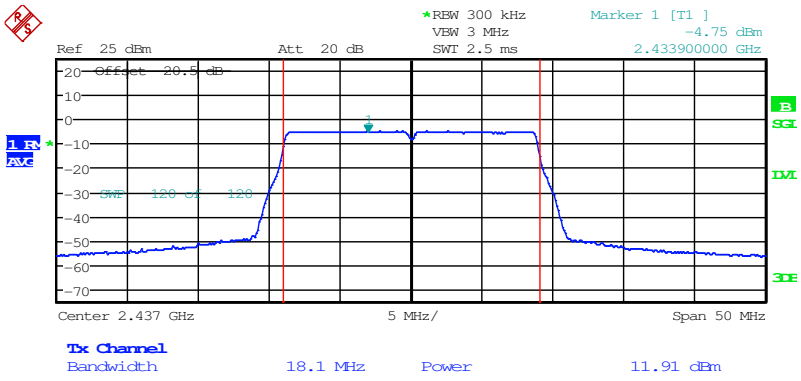
Table 7.3.2-3: RF Output Power

Frequency [MHz]	Level [dBm]
2412	11.82
2437	11.91
2462	11.69



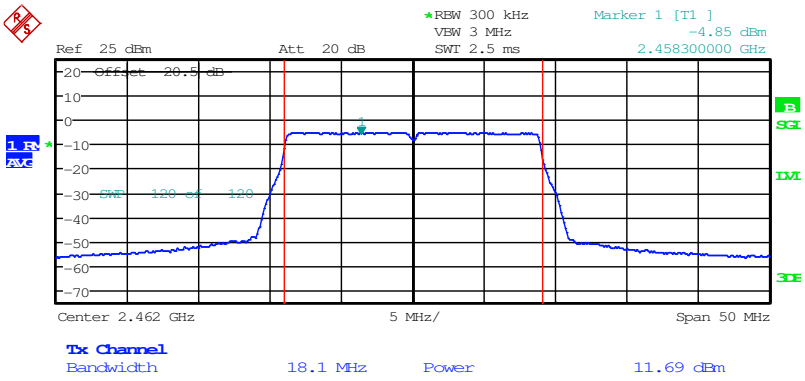
Date: 22.MAR.2016 10:28:39

Figure 7.3.2-7: RF Output Power - Low Channel



Date: 22.MAR.2016 08:42:59

Figure 7.3.2-8: RF Output Power - Middle Channel



Date: 22.MAR.2016 11:07:03

Figure 7.3.2-9: RF Output Power - High Channel

7.4 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC: RSS-247 5.5

7.4.1 Band-Edge Compliance of RF Conducted Emissions

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

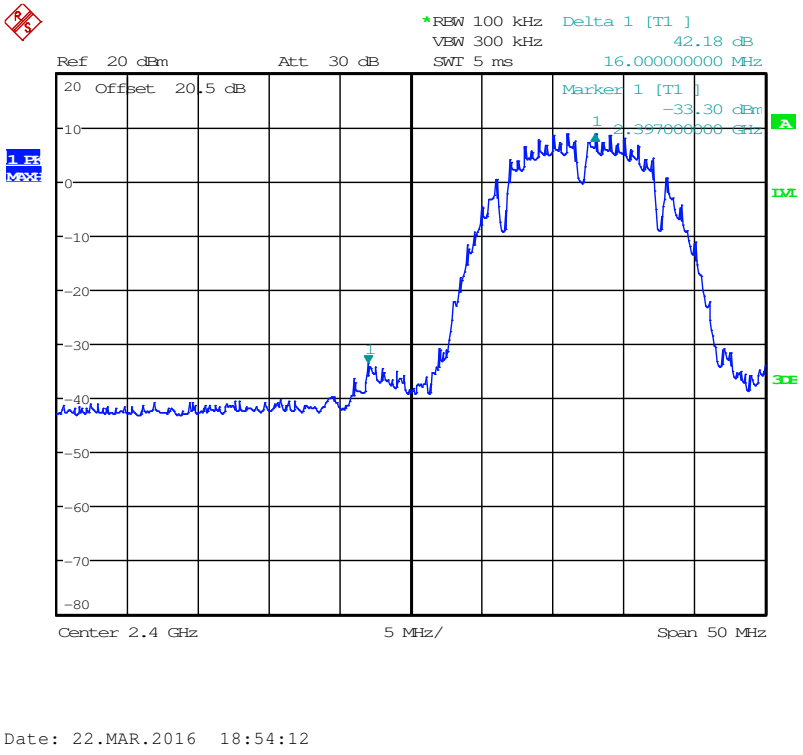


Figure 7.4.1.2-1: Lower Band-edge

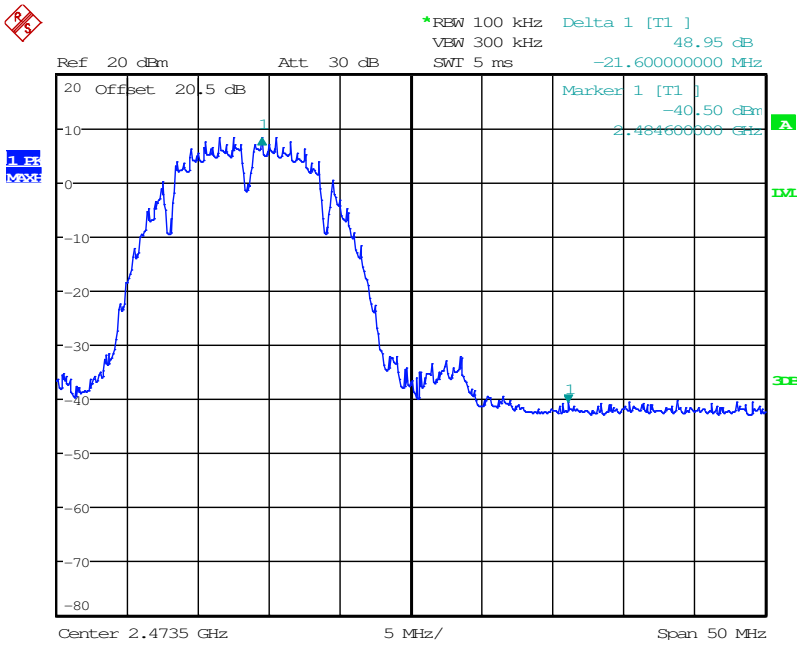


Figure 7.4.1.2-2: Upper Band-edge

802.11g

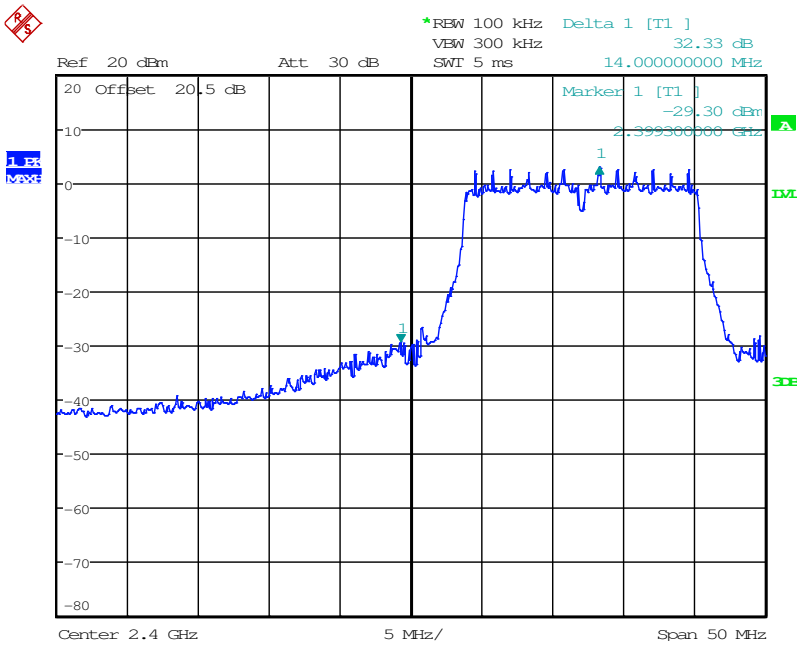


Figure 7.4.1.2-3: Lower Band-edge

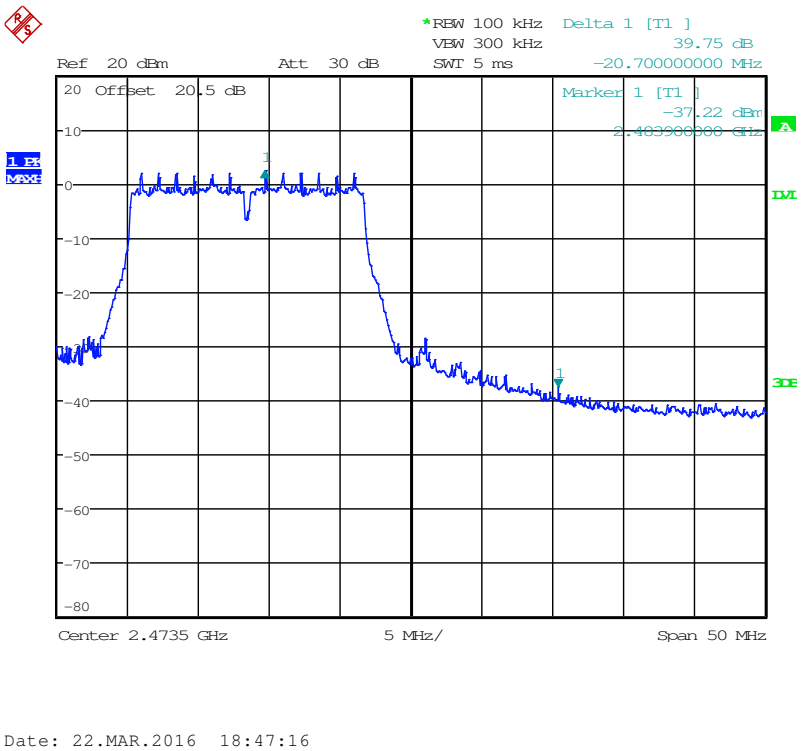
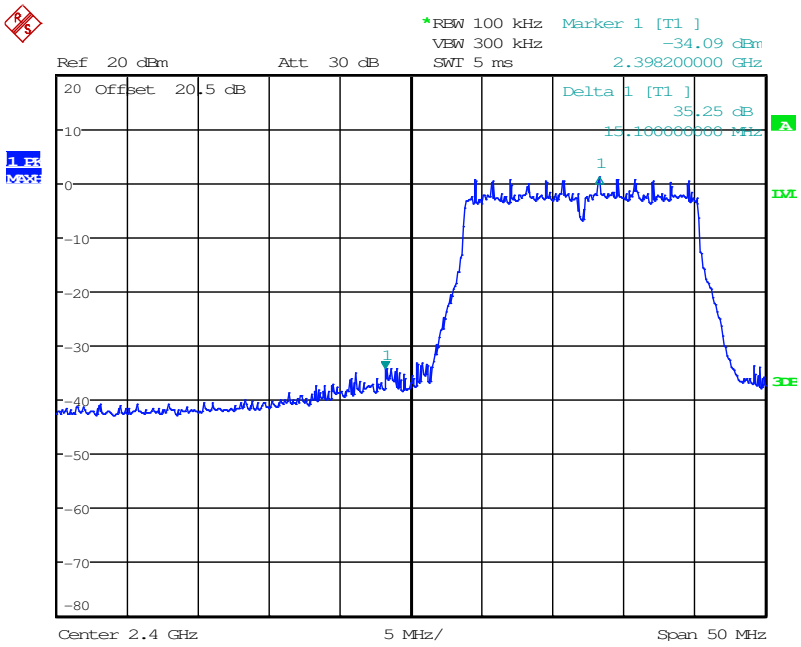


Figure 7.4.1.2-4: Upper Band-edge

802.11n 20 MHz



Date: 22.MAR.2016 19:02:30

Figure 7.4.1.2-5: Lower Band-edge

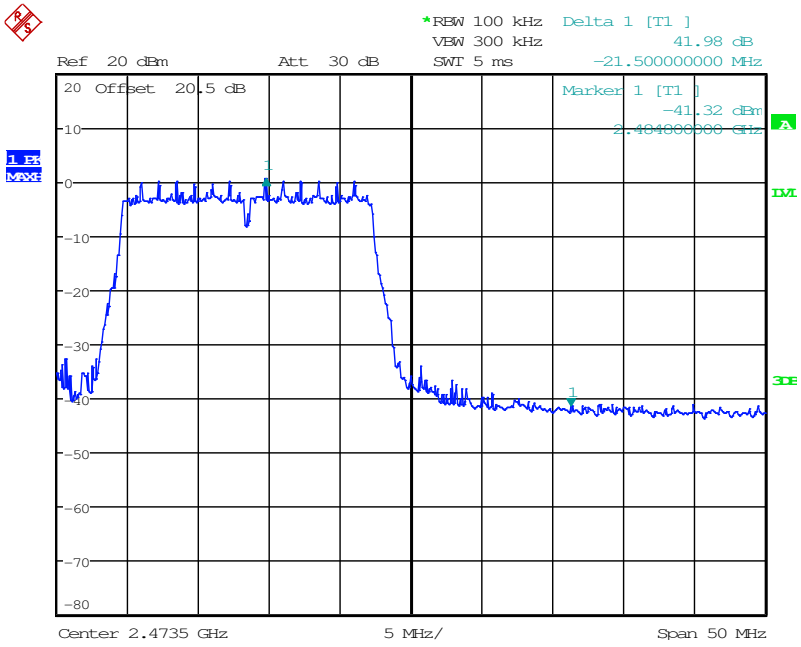


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Figure 7.4.1.2-6: Upper Band-edge

7.4.2 RF Conducted Spurious Emissions

7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with ANSI C63.10:2013 Section 11.11 Emissions in non-restricted frequency bands. 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

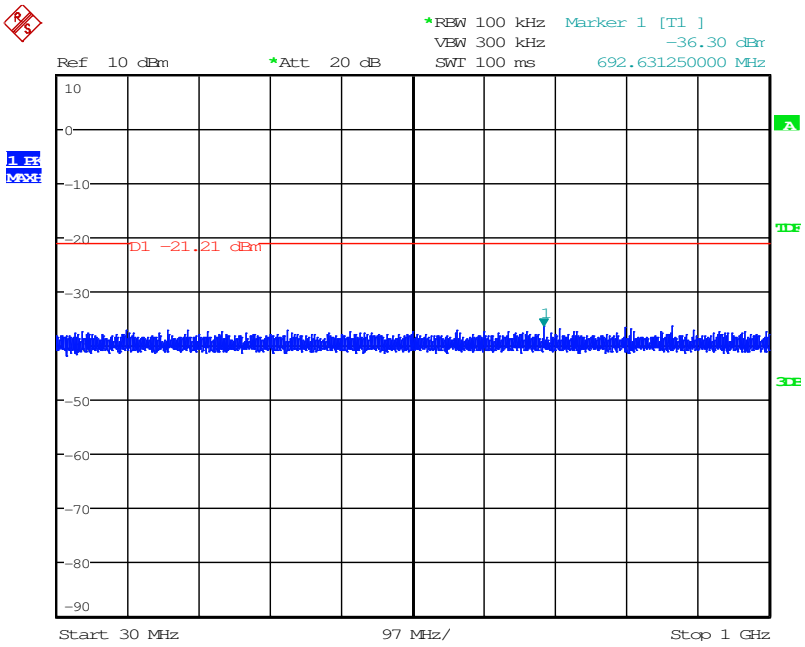
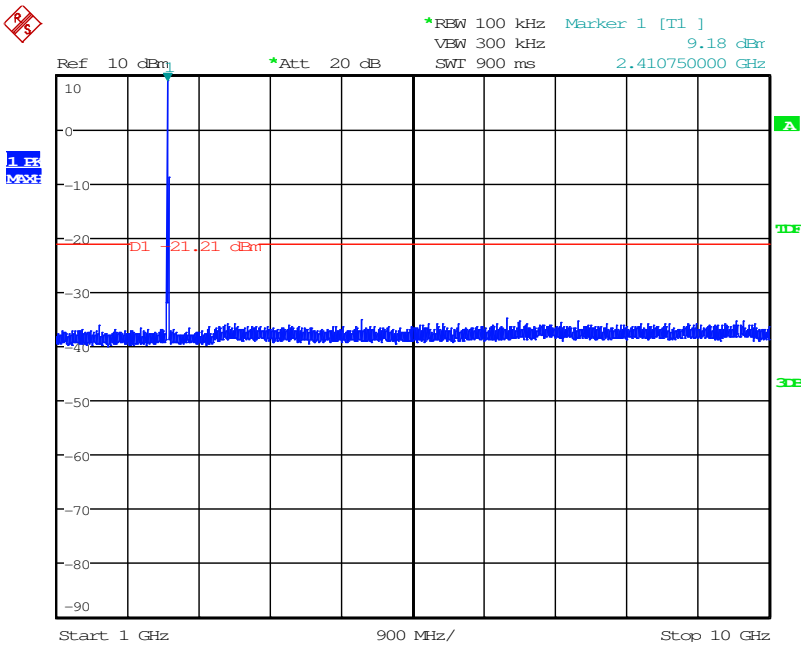
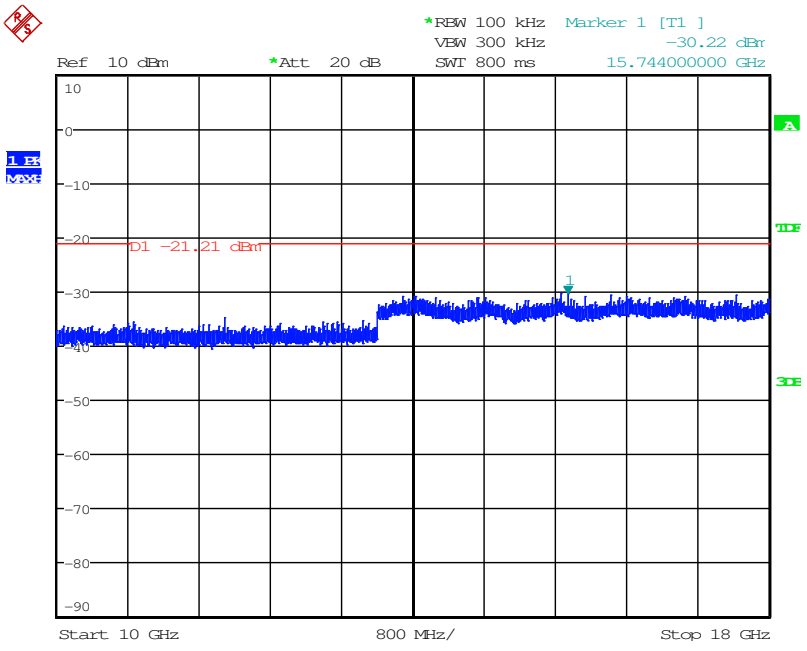


Figure 7.4.2.2-1: 30 MHz – 1 GHz – Low Channel



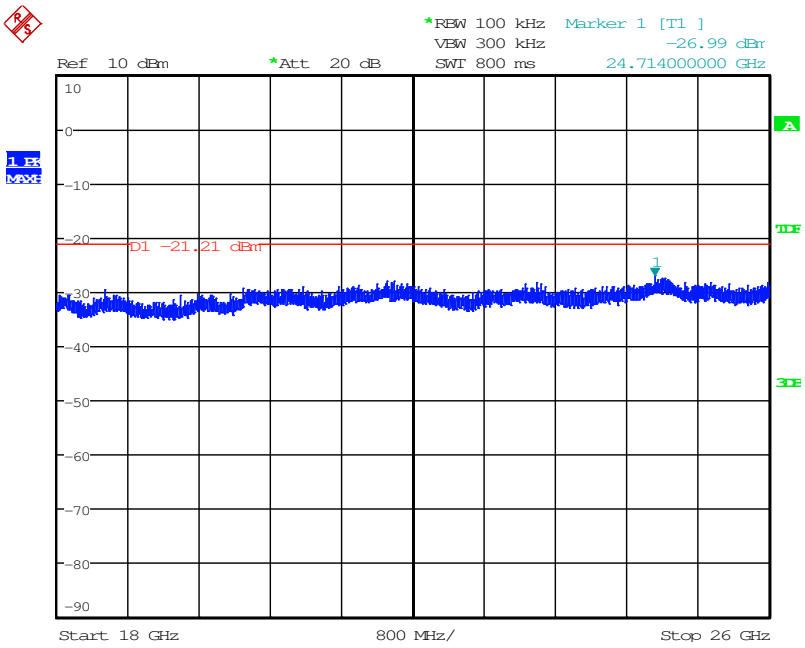
Date: 28.MAR.2016 17:21:26

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



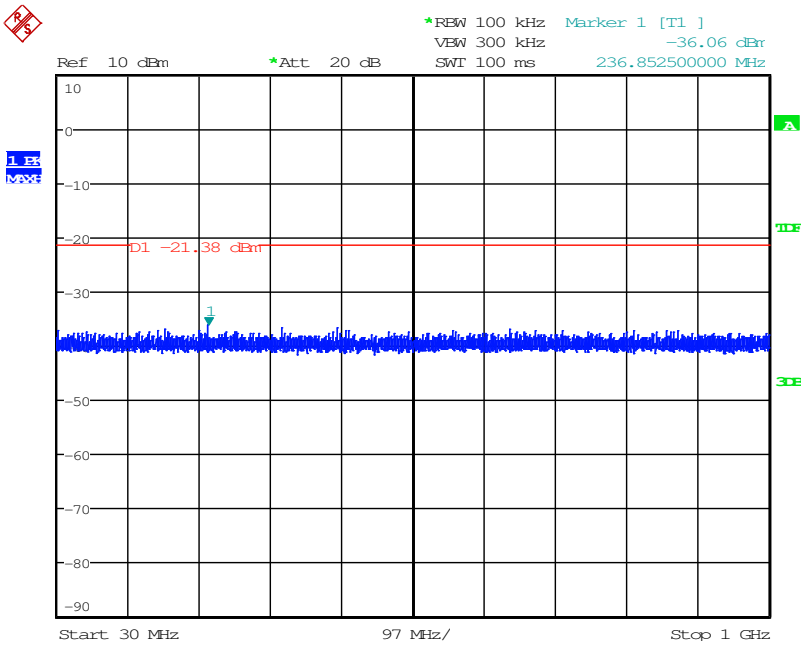
Date: 28.MAR.2016 17:25:47

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



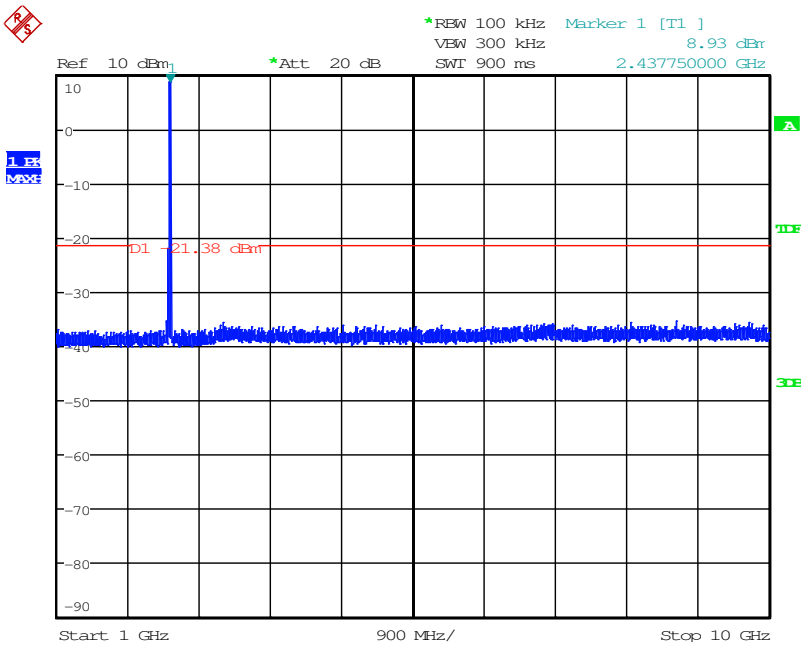
Date: 28.MAR.2016 17:28:47

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



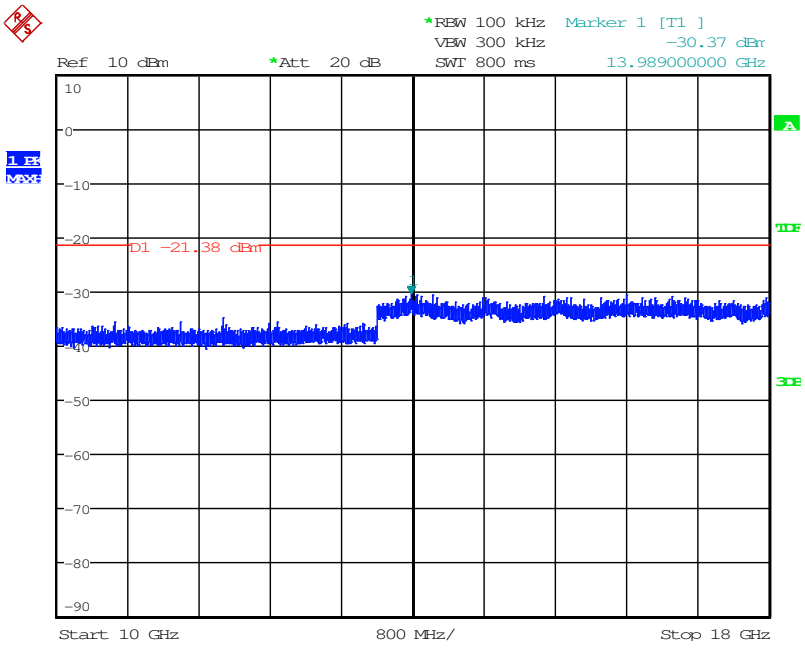
Date: 28.MAR.2016 17:32:44

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



Date: 28.MAR.2016 17:42:10

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



Date: 28.MAR.2016 17:44:06

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

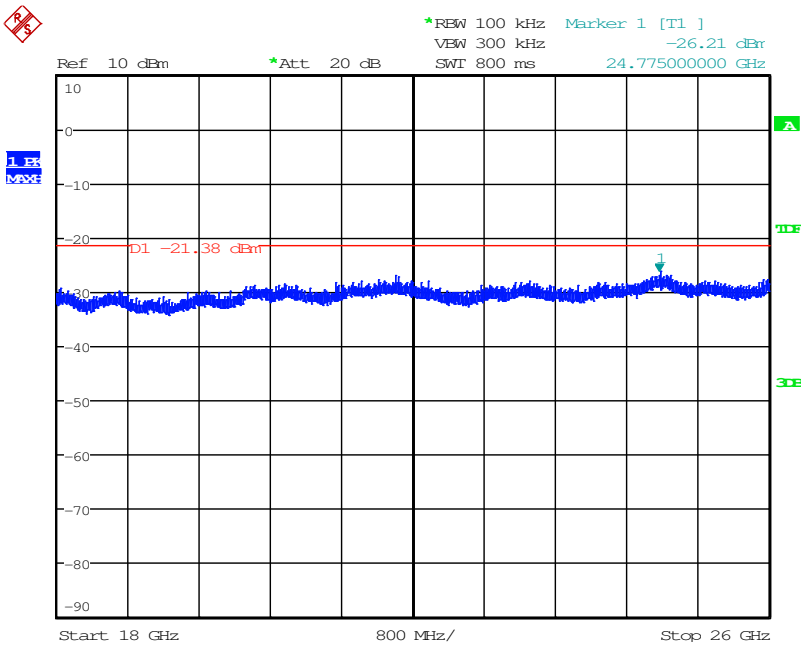


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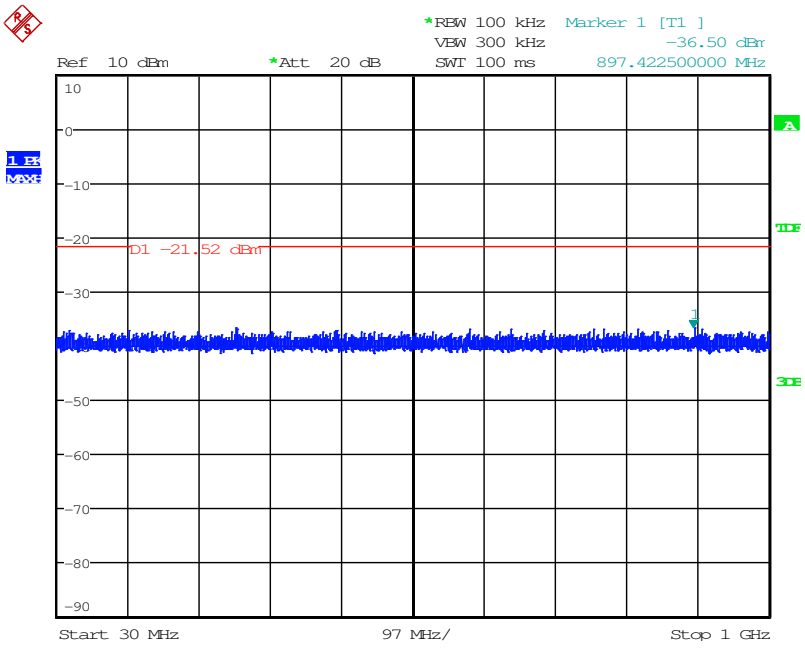
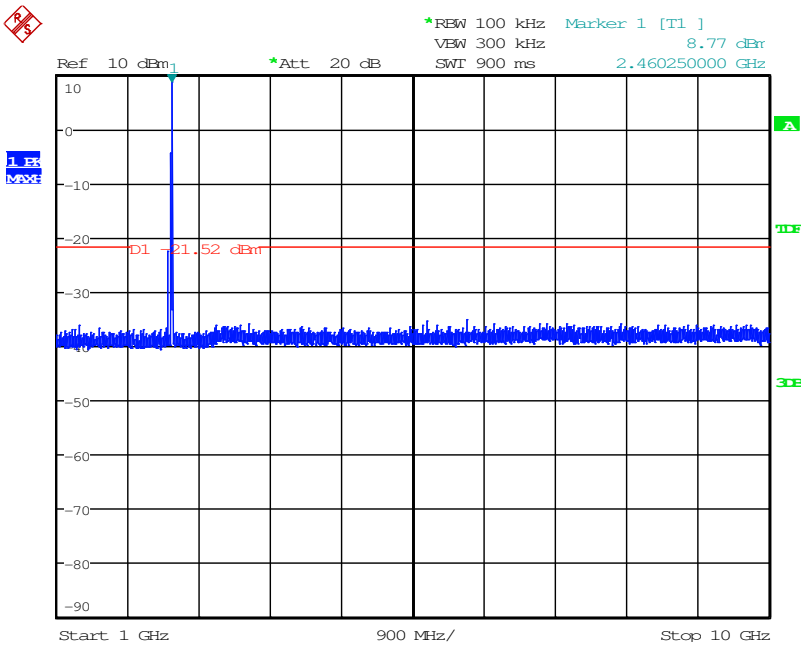
Figure 7.4.2.2-8: 18 GHz – 26 GHz – Middle Channel



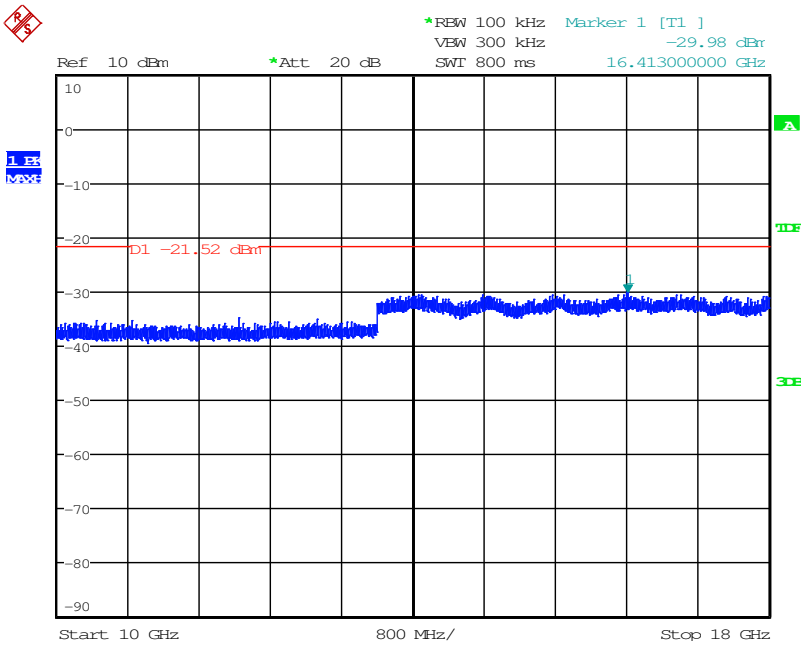
Date: 28.MAR.2016 18:17:33

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



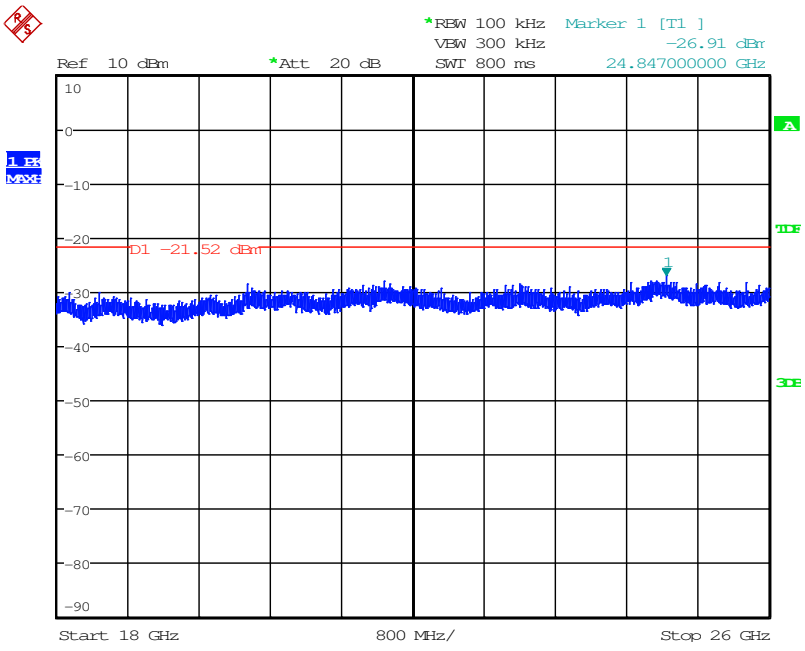
Date: 28.MAR.2016 18:14:48

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



Date: 28.MAR.2016 18:09:05

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



Date: 28.MAR.2016 18:01:56

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

802.11g

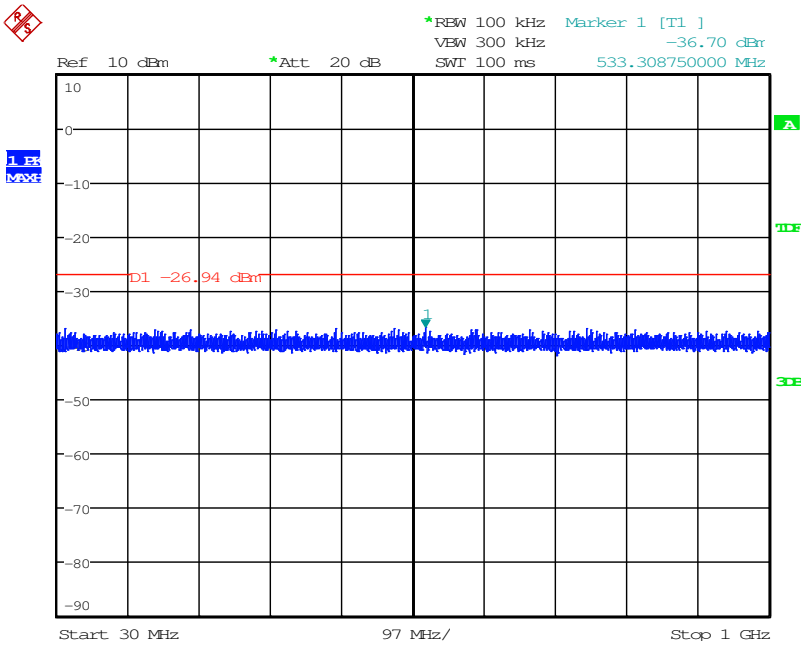


Figure 7.4.2.2-13: 30 MHz – 1 GHz – Low Channel

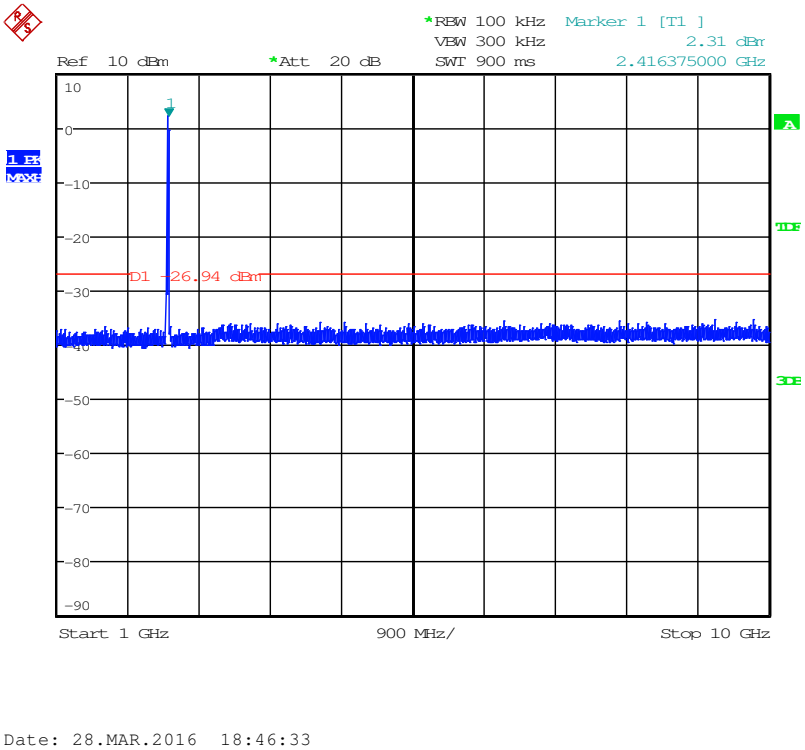
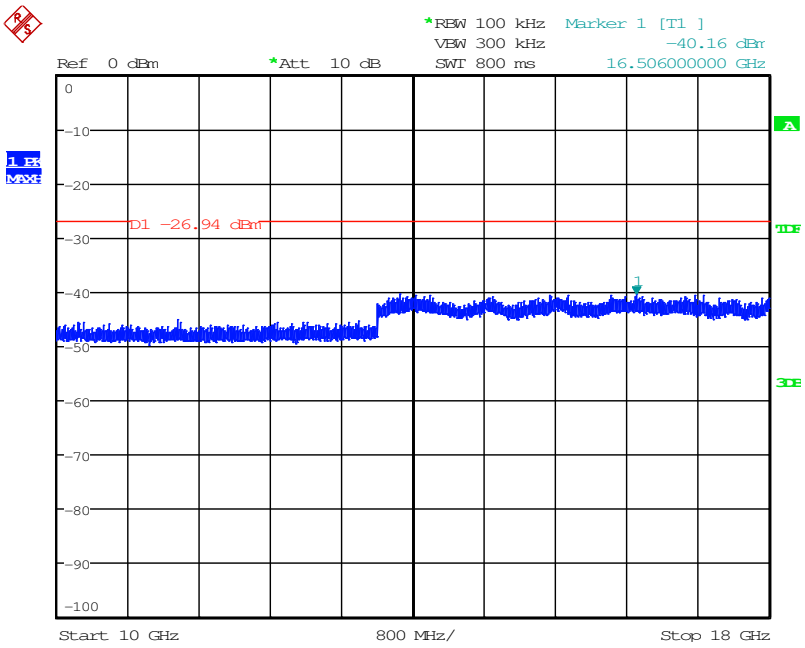
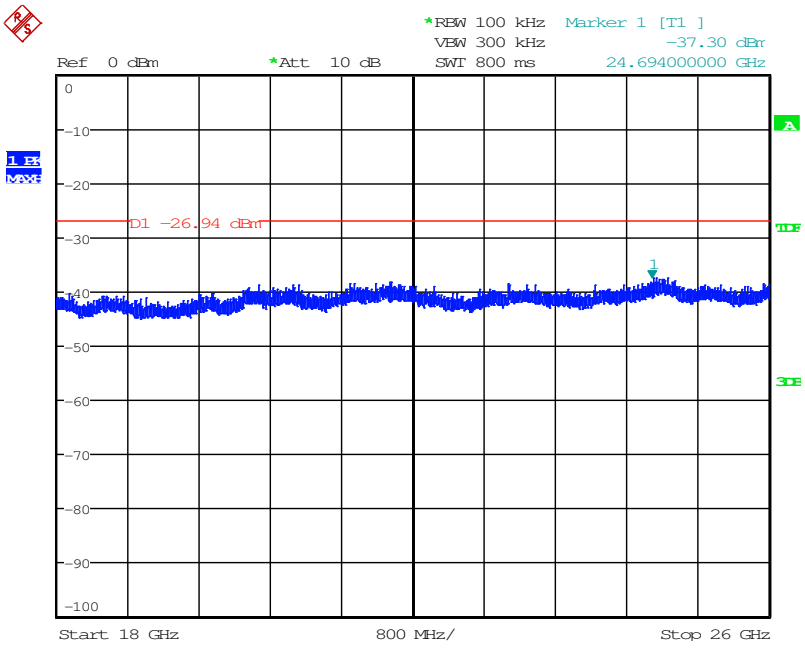


Figure 7.4.2.2-14: 1 GHz –10 GHz – Low Channel



Date: 28.MAR.2016 18:29:17

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



Date: 28.MAR.2016 18:24:27

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

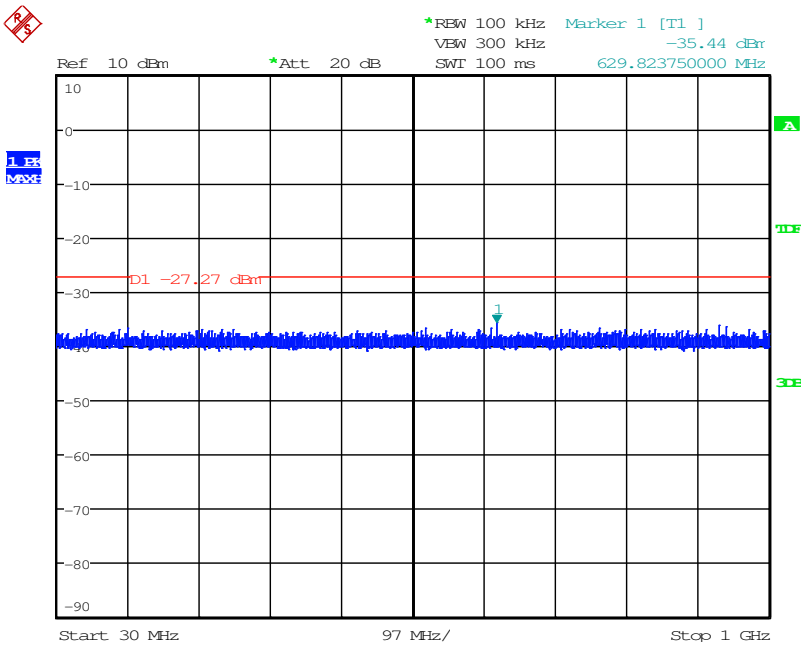


Figure 7.4.2.2-17: 30 MHz – 1 GHz –Middle Channel

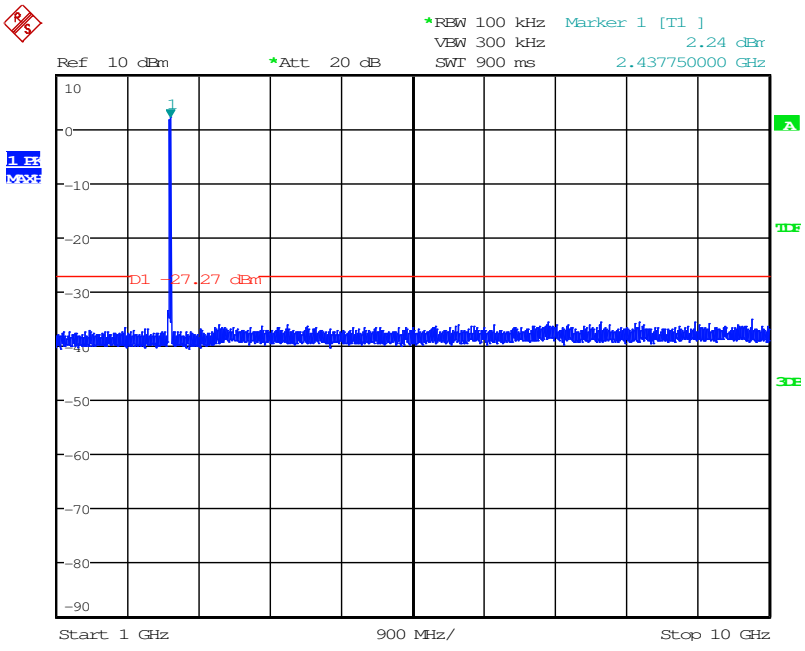
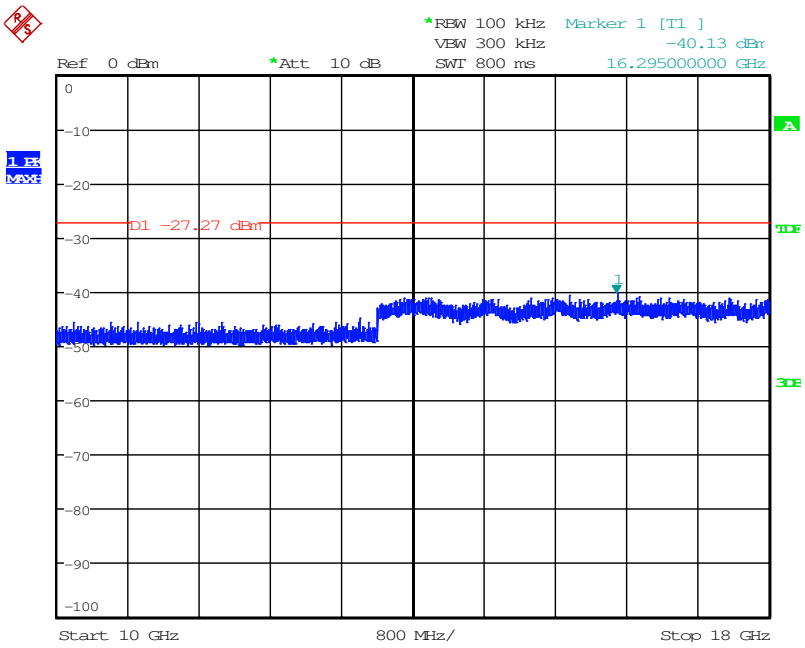
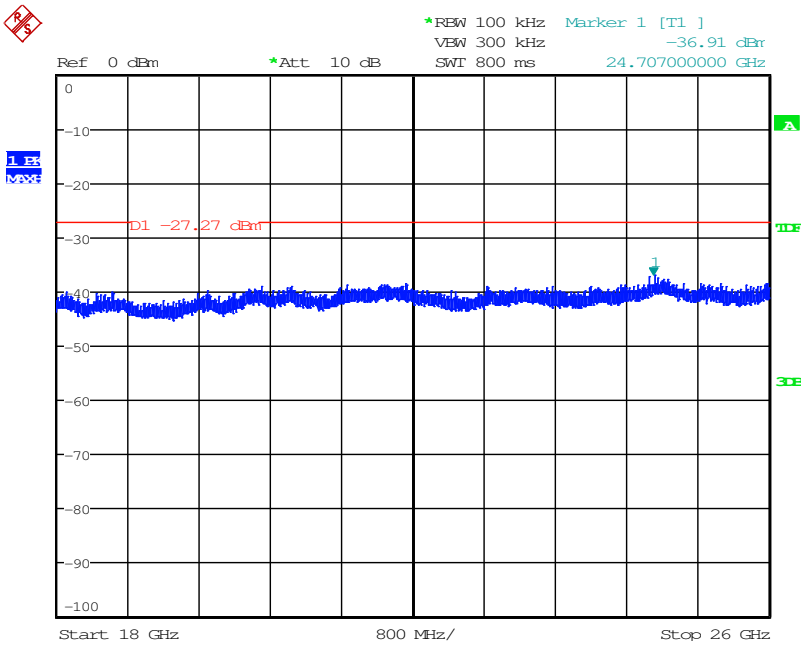


Figure 7.4.2.2-18: 1 GHz – 10 GHz – Middle Channel



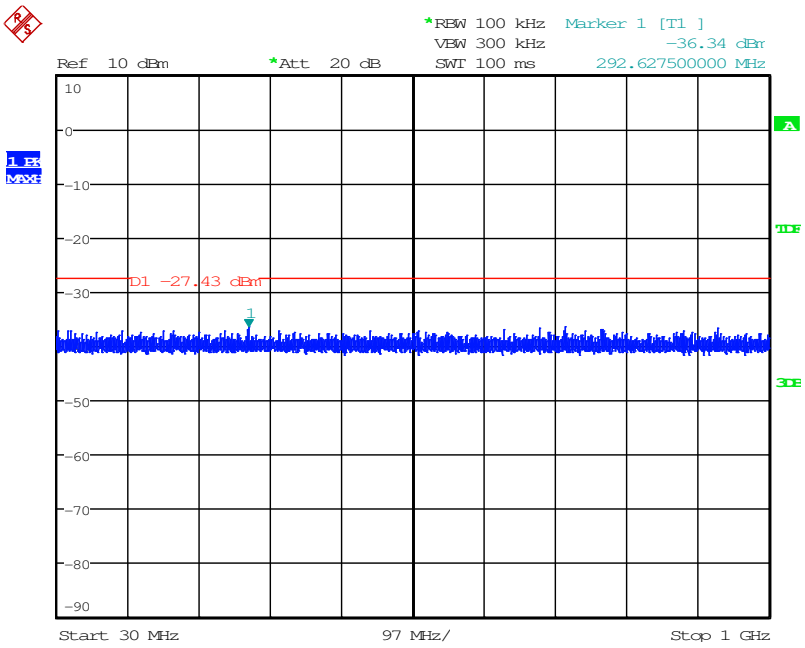
Date: 28.MAR.2016 19:05:56

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



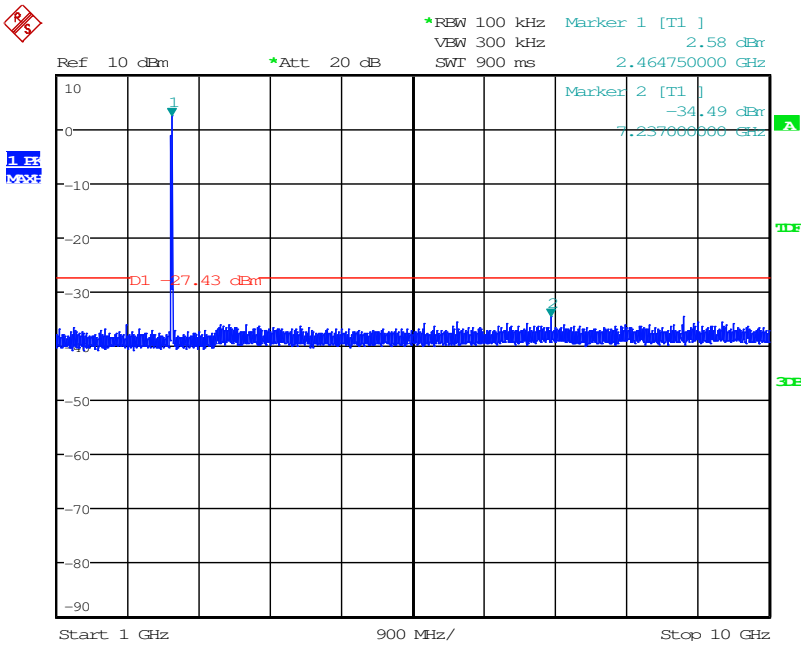
Date: 28.MAR.2016 19:09:25

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



Date: 28.MAR.2016 19:23:01

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



Date: 28.MAR.2016 19:20:57

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

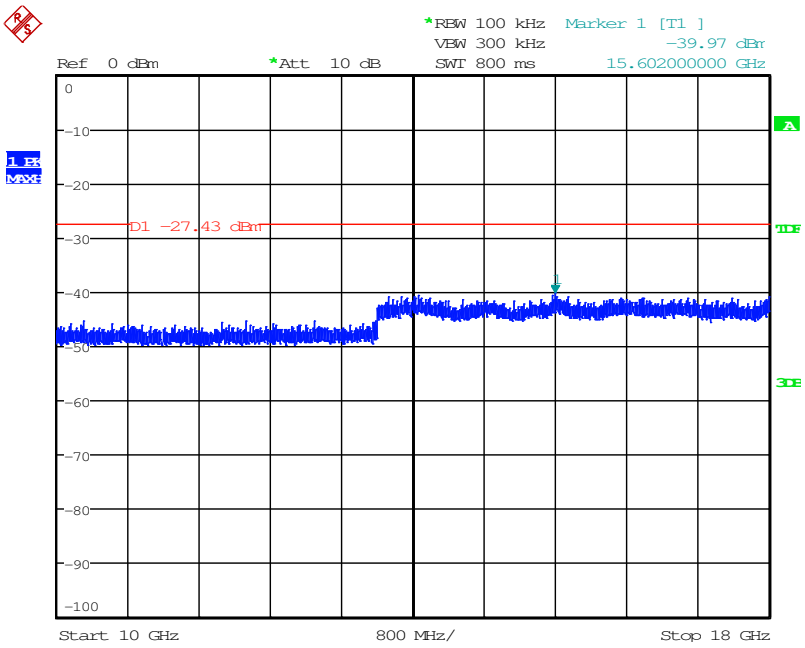


Figure 7.4.2.2-23: 10 GHz – 18 GHz –High Channel

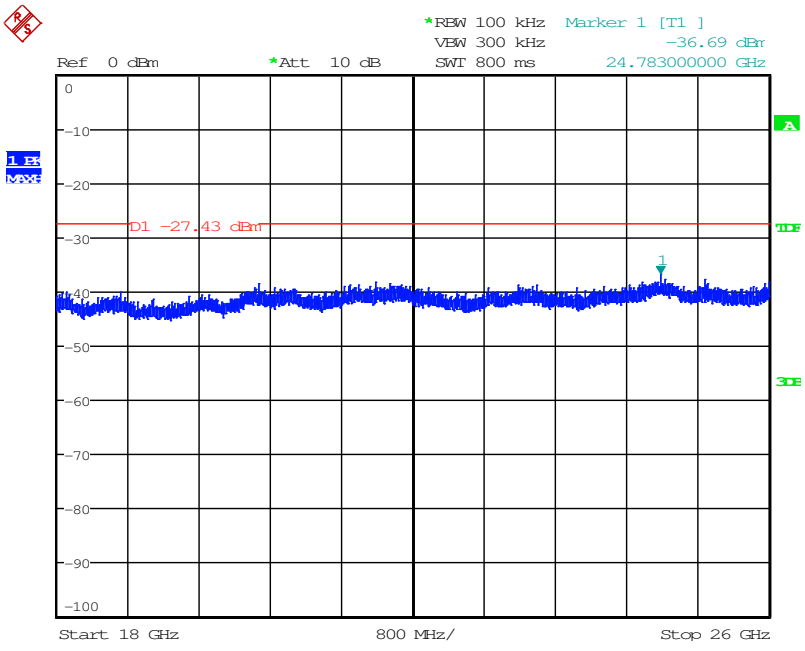
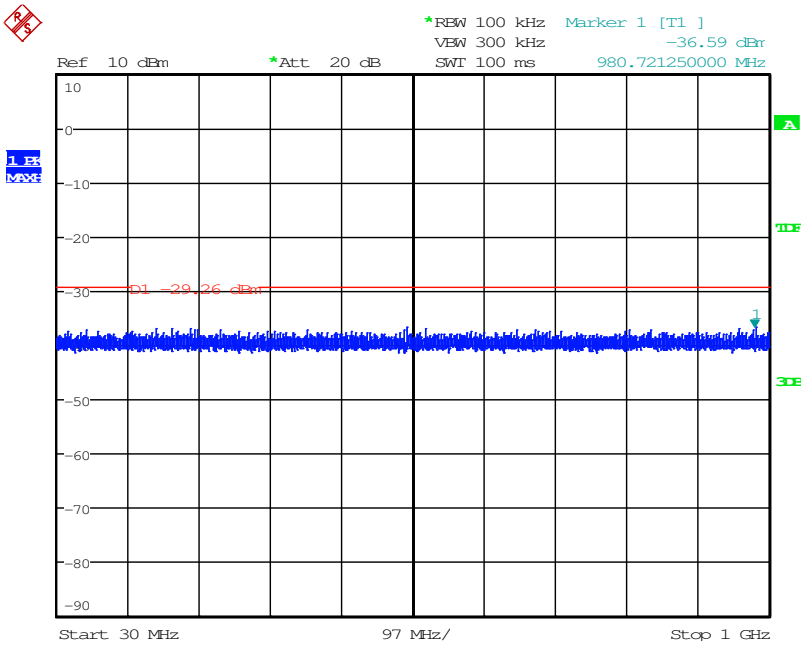


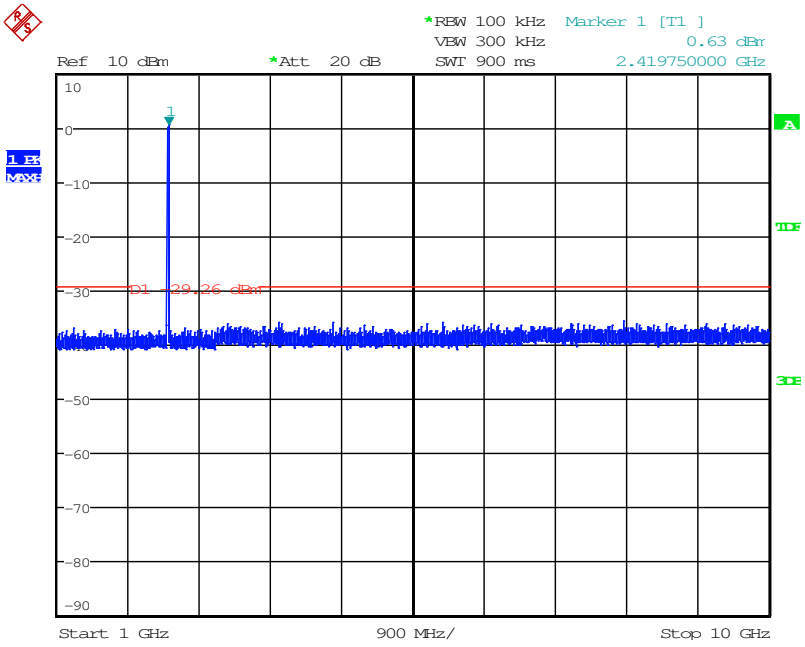
Figure 7.4.2.2-24: 18 GHz – 26 GHz –High Channel

802.11n 20MHz



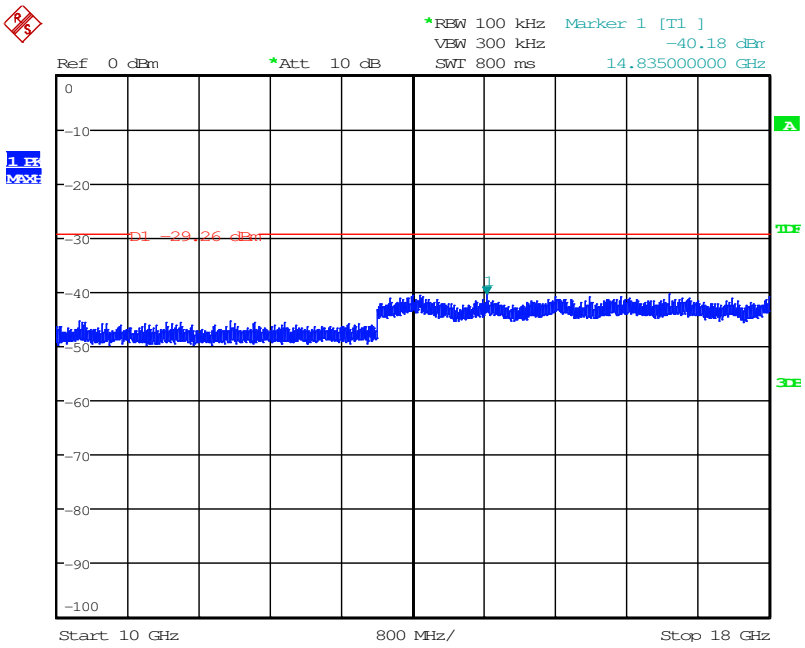
Date: 28.MAR.2016 19:28:50

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



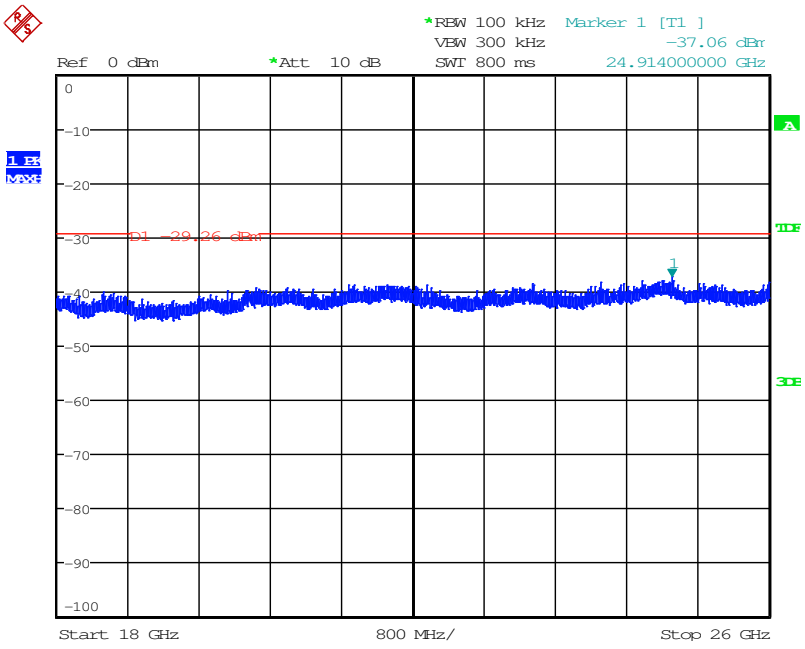
Date: 28.MAR.2016 19:32:00

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



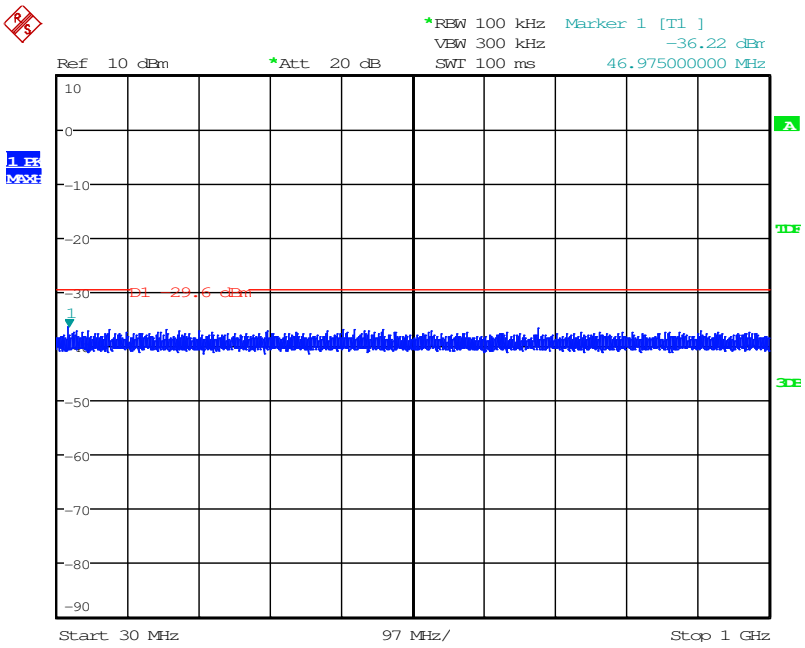
Date: 28.MAR.2016 19:35:21

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



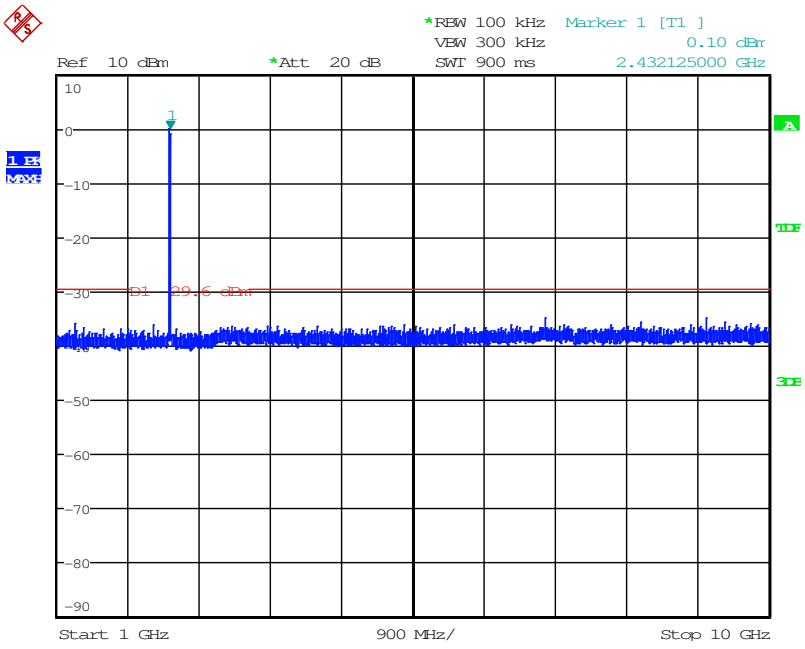
Date: 28.MAR.2016 19:38:18

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



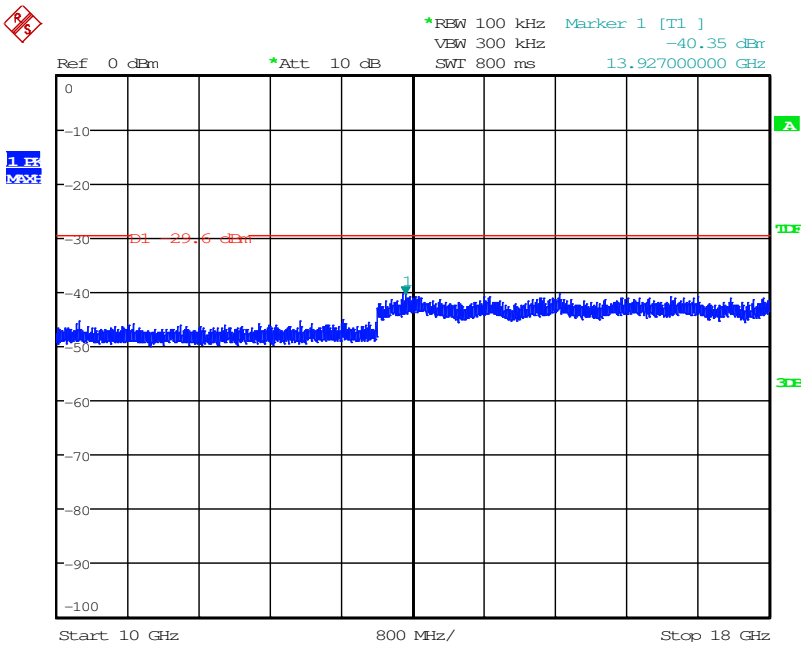
Date: 28.MAR.2016 19:55:30

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



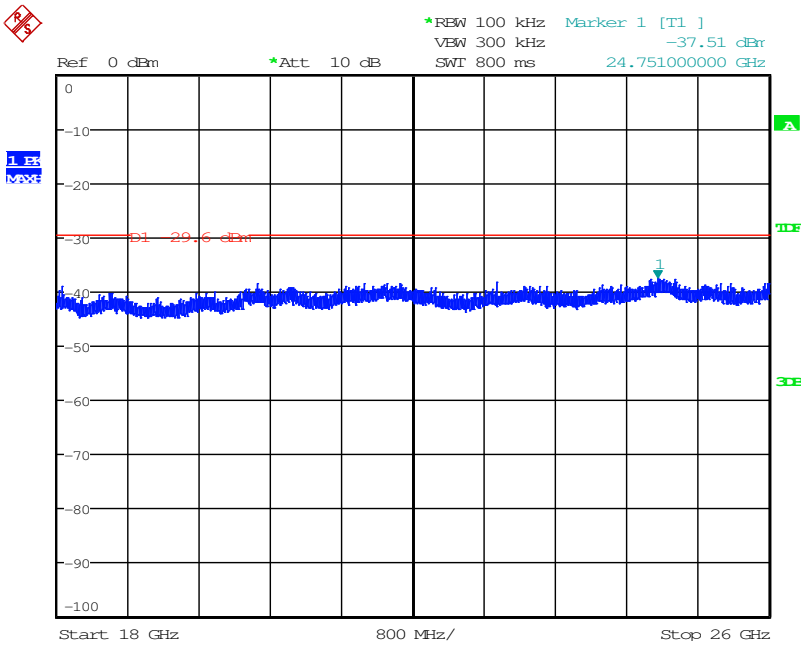
Date: 28.MAR.2016 19:51:46

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



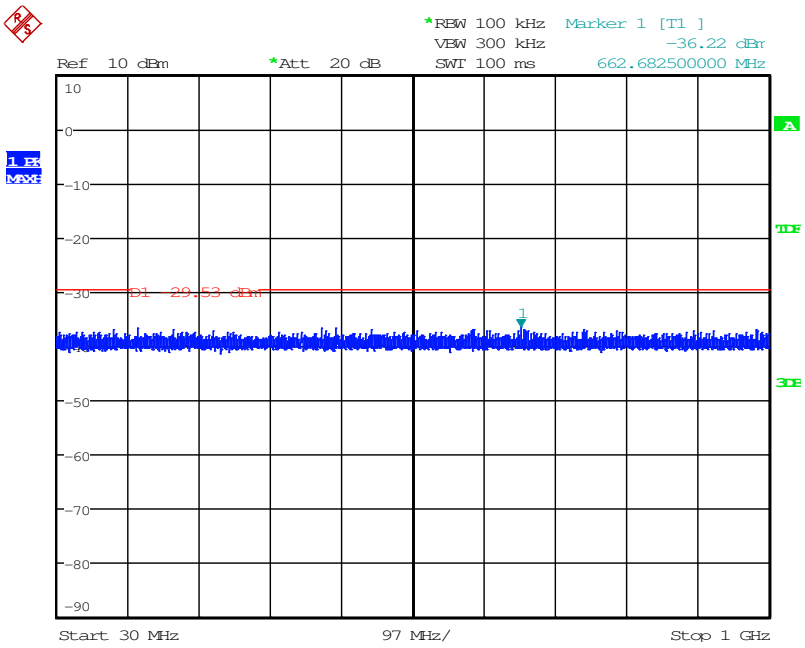
Date: 28.MAR.2016 19:45:59

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



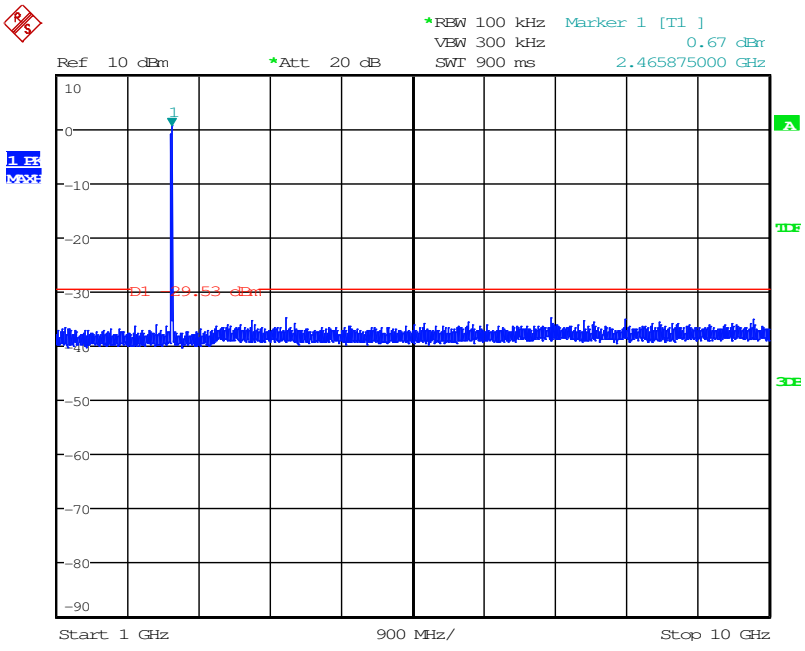
Date: 28.MAR.2016 19:42:57

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



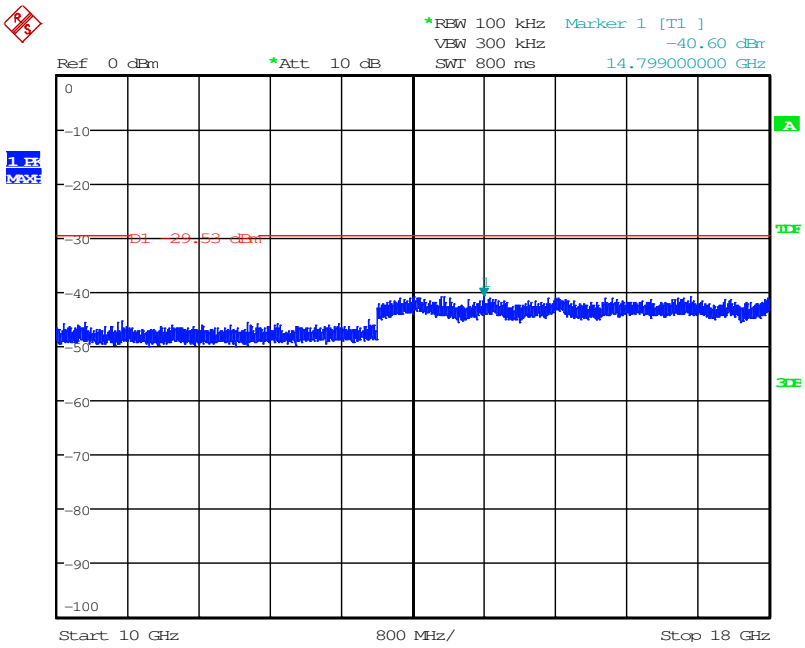
Date: 28.MAR.2016 20:01:17

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



Date: 28.MAR.2016 20:10:00

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



Date: 28.MAR.2016 20:13:19

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

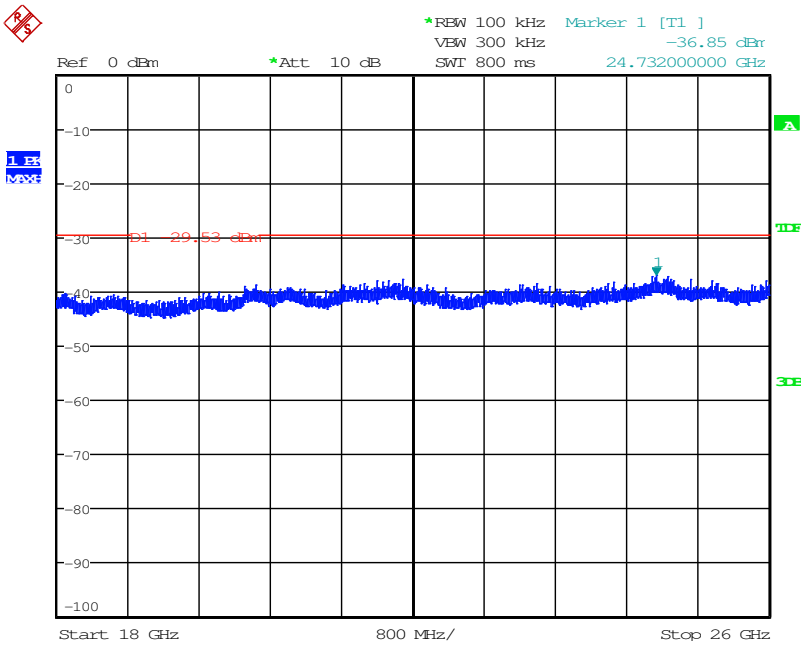


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Figure 7.4.2.2-36: 18 GHz – 26 GHz –High Channel

7.4.3 Radiated Spurious Emissions into Restricted Frequency Bands - FCC 15.205, 15.209; IC: RSS-210 2.2, RSS-Gen 8.9, 8.10

7.4.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 26 GHz, 10 times the highest fundamental frequency. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

For measurements below 30 MHz, the receive antenna height was set to 1m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements are made with RBW of 1 MHz and VBW of 3 MHz. Average measurements are performed in the linear scale using VBW of 30 Hz over a 5 second sweep.

7.4.3.2 Measurement Results

Radiated band-edge and spurious emissions found in the restricted frequency bands of 9 kHz to 26 GHz are reported in the tables below.

802.11b

Table 7.4.3.2-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2412 MHz										
2390	63.59	51.51	H	-5.60	57.99	45.91	74.0	54.0	16.0	8.1
Middle Channel = 2437 MHz										
7311	45.46	37.92	H	8.80	54.26	46.72	74.0	54.0	19.7	7.3
7311	44.03	34.28	V	8.80	52.83	43.08	74.0	54.0	21.2	10.9
High Channel = 2462 MHz										
2483.5	59.68	46.50	H	-5.15	54.53	41.35	74.0	54.0	19.5	12.7
7386	47.68	39.82	H	9.13	56.81	48.95	74.0	54.0	17.2	5.0
7386	45.38	34.95	V	9.13	54.51	44.08	74.0	54.0	19.5	9.9

Note: The emissions above 7.39 GHz were attenuated below the limits and the noise floor of the measurement equipment.

802.11g

Table 7.4.3.2-2: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2412 MHz										
2390	77.22	59.19	H	-5.60	71.62	53.59	74.0	54.0	2.4	0.4
2390	62.56	46.46	V	-5.60	56.96	40.86	74.0	54.0	17.0	13.1
Middle Channel = 2437 MHz										
7311	45.49	30.58	H	8.80	54.29	39.38	74.0	54.0	19.7	14.6
7311	43.33	29.67	V	8.80	52.13	38.47	74.0	54.0	21.9	15.5
High Channel = 2462 MHz										
2483.5	73.25	49.61	H	-5.15	68.10	44.46	74.0	54.0	5.9	9.5
2483.5	63.80	44.43	V	-5.15	58.65	39.28	74.0	54.0	15.4	14.7
7386	46.44	30.87	H	9.13	55.57	40.00	74.0	54.0	18.4	14.0
7386	42.33	29.89	V	9.13	51.46	39.02	74.0	54.0	22.5	15.0

Note: The emissions above 7.39 GHz were attenuated below the limits and the noise floor of the measurement equipment.

802.11n 20 MHz

Table 7.4.3.2-3: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2412 MHz										
2390	77.91	53.69	H	-5.60	72.31	48.09	74.0	54.0	1.7	5.9
2390	61.9	43.93	V	-5.60	56.30	38.33	74.0	54.0	17.7	15.7
Middle Channel = 2437 MHz										
7311	42.38	29.51	H	8.80	51.18	38.31	74.0	54.0	22.8	15.7
7311	42.32	29.30	V	8.80	51.12	38.10	74.0	54.0	22.9	15.9
High Channel = 2462 MHz										
2483.5	65.35	46.06	H	-5.15	60.20	40.91	74.0	54.0	13.8	13.1
2483.5	56.48	43.38	V	-5.15	51.33	38.23	74.0	54.0	22.7	15.8
7386	43.61	30.01	H	9.13	52.74	39.14	74.0	54.0	21.3	14.9
7386	42.99	29.74	V	9.13	52.12	38.87	74.0	54.0	21.9	15.1

Note: The emissions above 7.39 GHz were attenuated below the limits and the noise floor of the measurement equipment.

7.4.3.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak
Corrected Level: 63.59+ (-5.6) = 57.99 dBµV/m
Margin: 74 dBµV/m – 57.99 dBµV/m = 16.0 dB

Example Calculation: Average
Corrected Level: 51.51 + (-5.6) = 45.91 dBµV/m
Margin: 54 dBµV/m – 45.91 dBµV/m = 8.1 dB

7.5 Power Spectral Density - FCC Section 15.247(e) IC: RSS-247 5.2(2)

7.5.1 PSD Measurement Procedure (Conducted Method)

The power spectral density was measured in accordance with ANSI C63.10:2013 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	-5.71	8.0	13.71
2437	-6.17	8.0	14.17
2462	-6.13	8.0	14.13

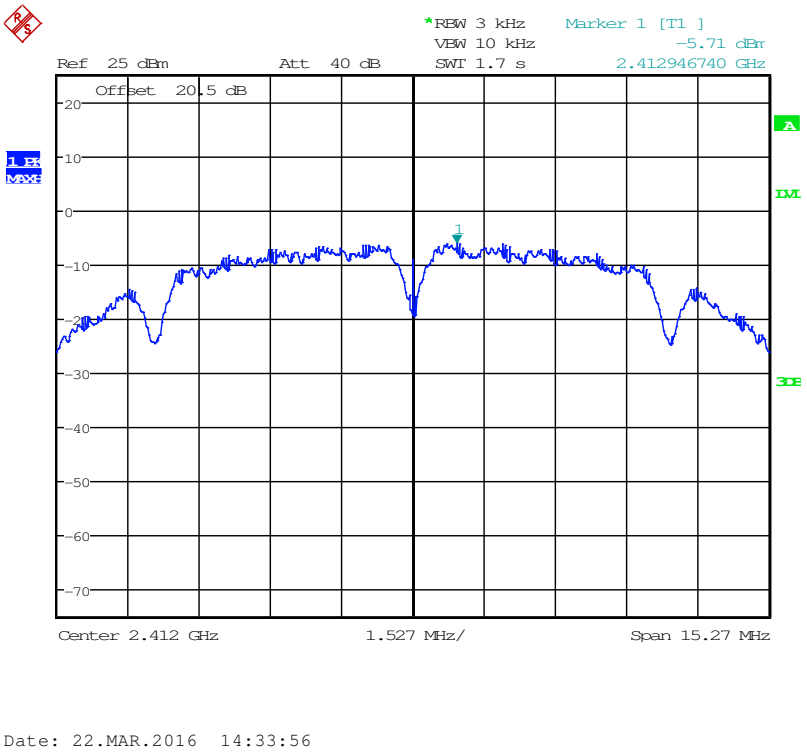

Figure 7.5.2-1: Power Spectral Density - Low Channel

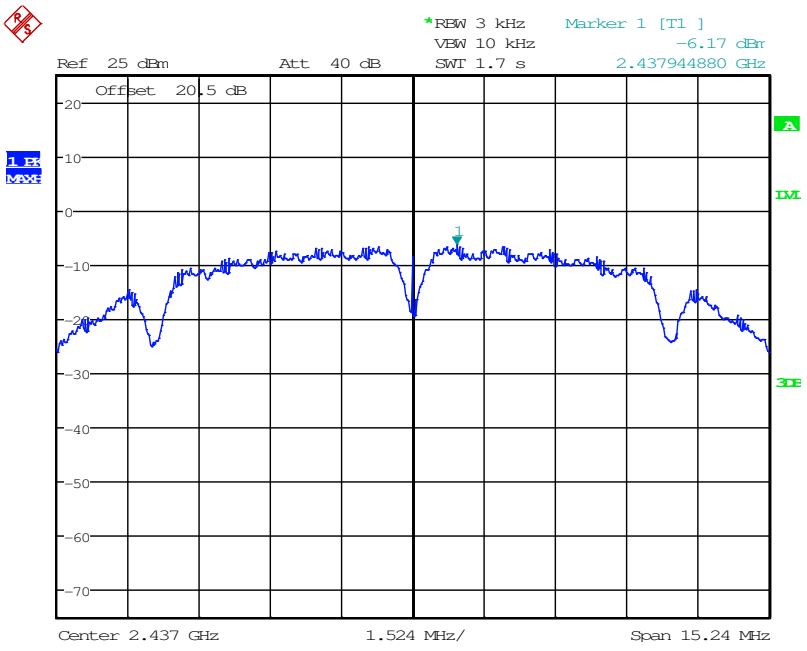

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Figure 7.5.2-2: Power Spectral Density - Middle Channel

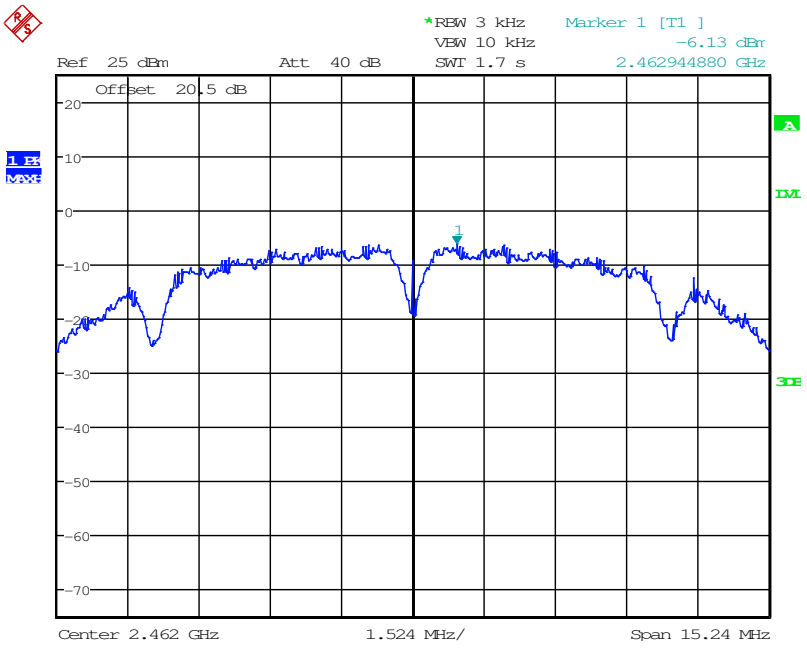

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Figure 7.5.2-3: Power Spectral Density – High Channel

802.11g

Table 7.5.2-2: Power Spectral Density

Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
2412	-9.76	8.0	17.76
2437	-9.78	8.0	17.78
2462	-9.41	8.0	17.41

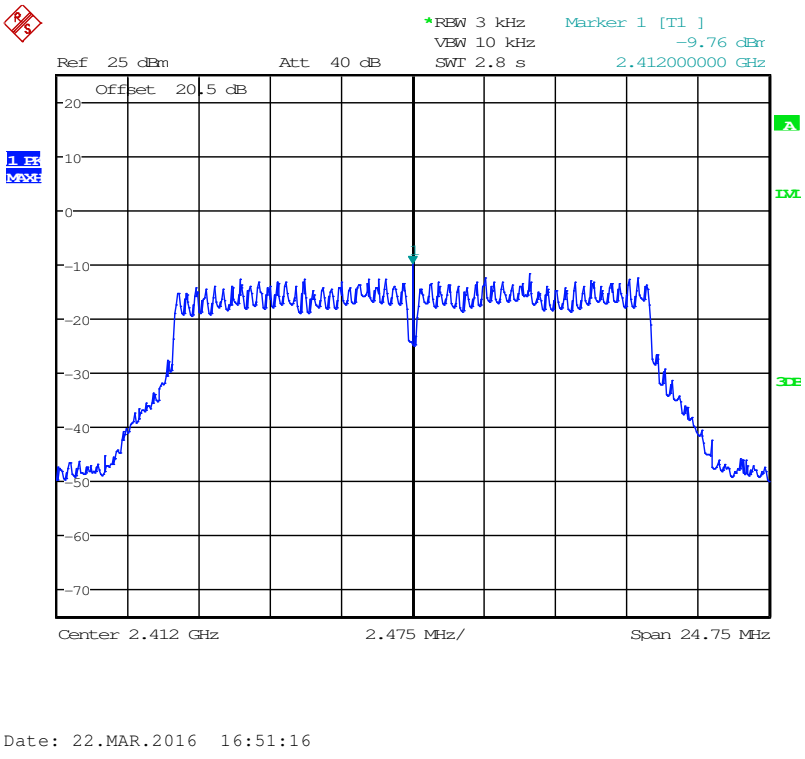

Figure 7.5.2-4: Power Spectral Density - Low Channel

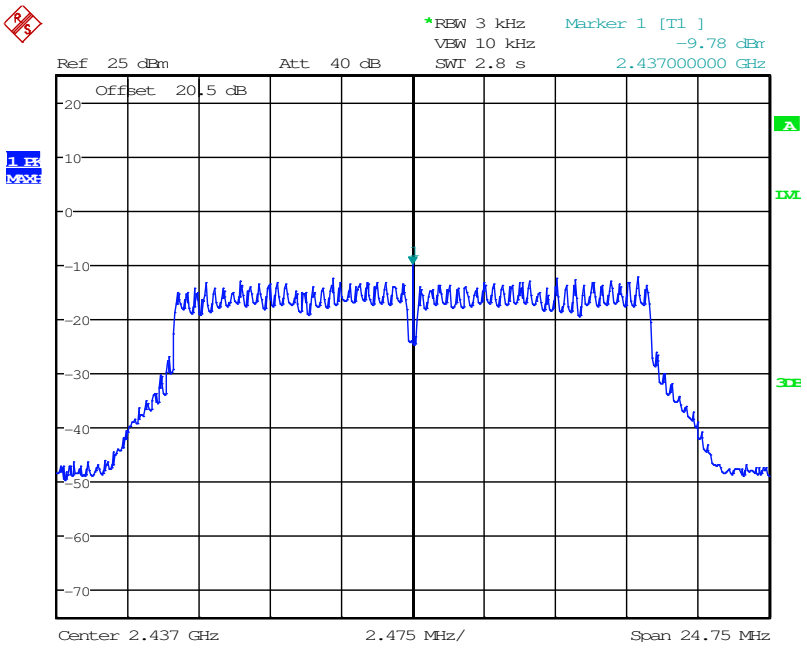

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Figure 7.5.2-5: Power Spectral Density - Middle Channel

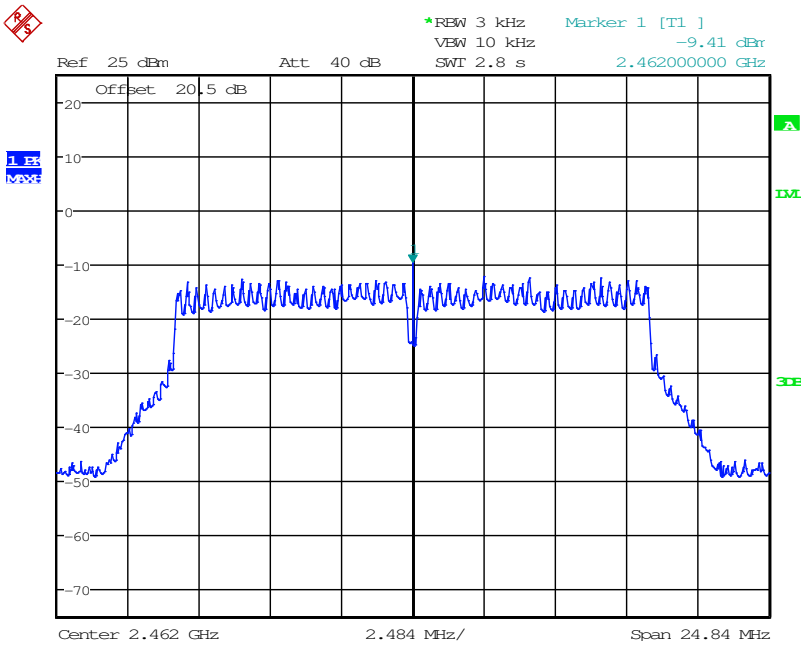

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Figure 7.5.2-6: Power Spectral Density – High Channel

802.11n 20MHz

Table 7.5.2-3: Power Spectral Density

Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
2412	-10.85	8.0	18.85
2437	-10.76	8.0	18.76
2462	-10.69	8.0	18.69

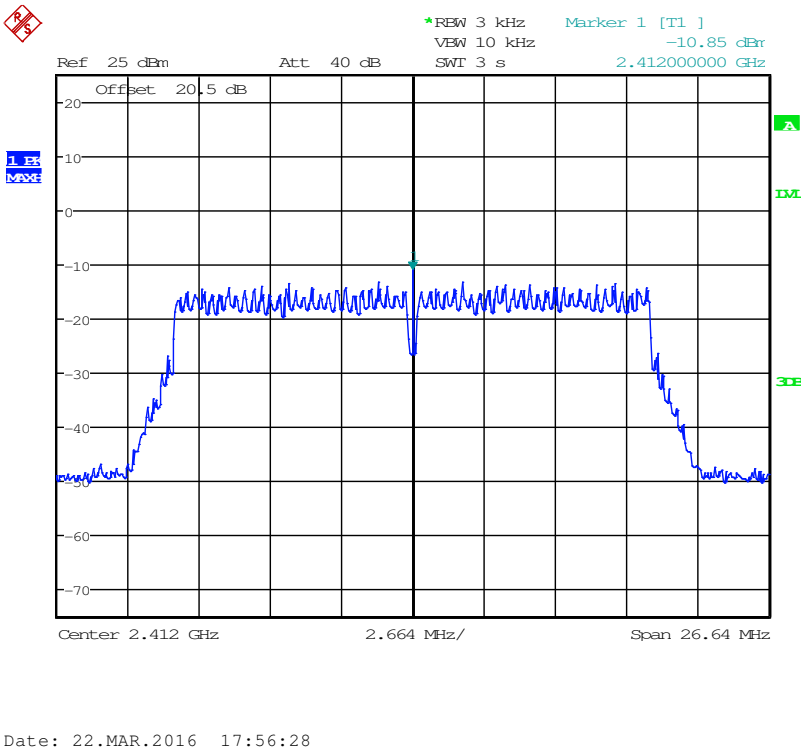

Figure 7.5.2-7: Power Spectral Density - Low Channel

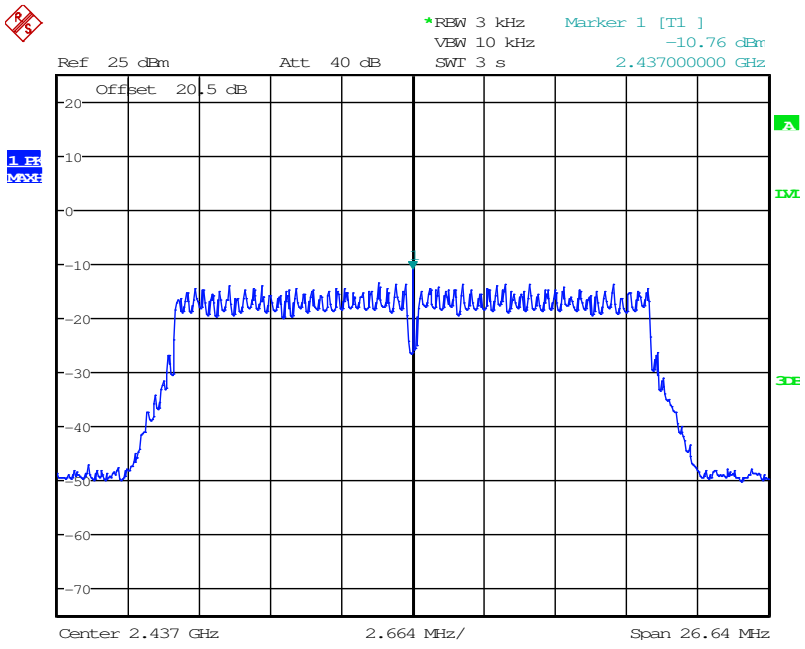

Figure 7.5.2-8: Power Spectral Density - Middle Channel

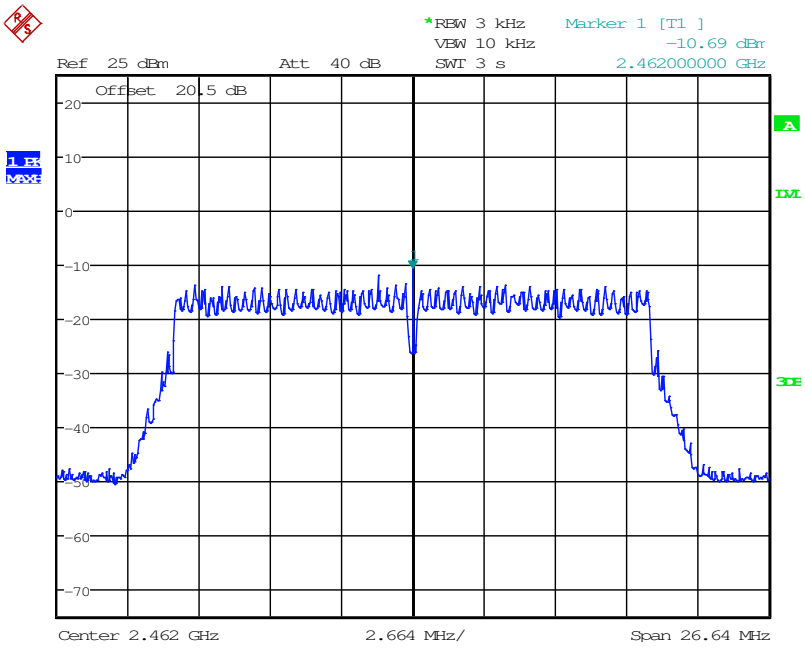

Figure 7.5.2-9: Power Spectral Density – High Channel

7.6 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 8.8

7.6.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.6.2 Measurement Results

Results are shown below.

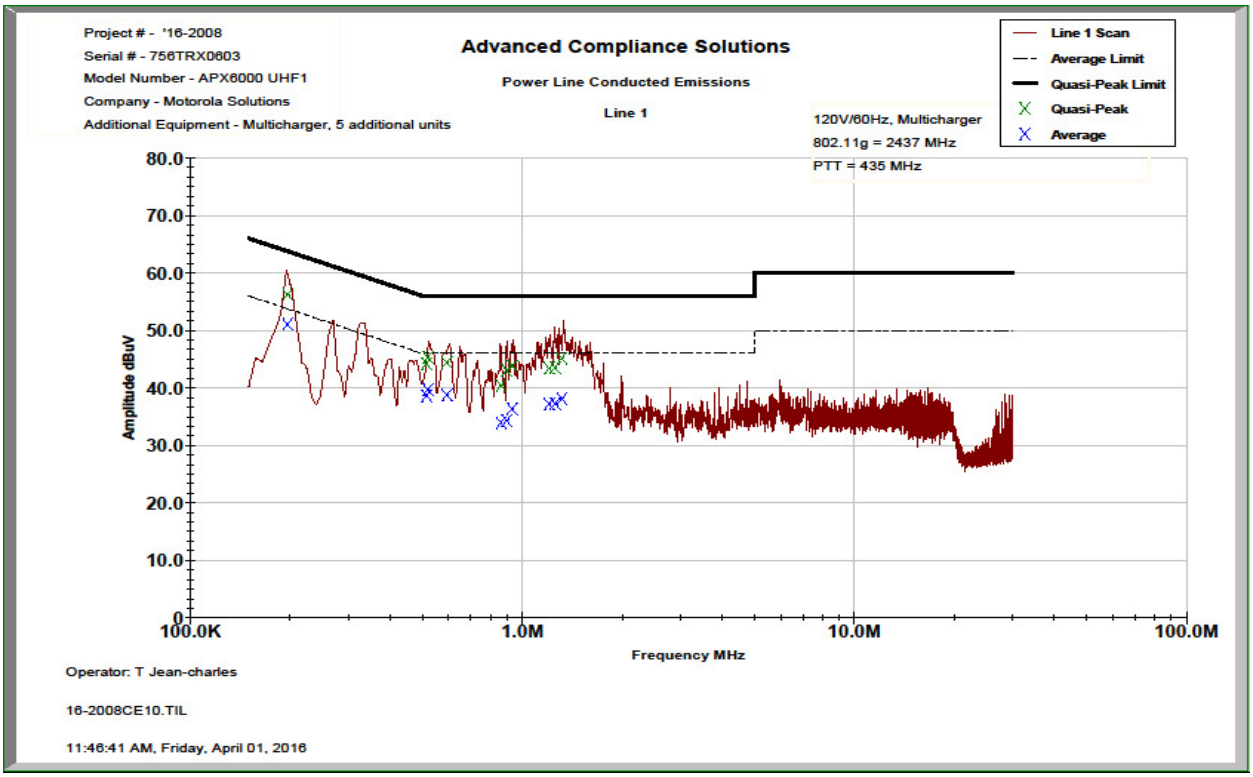

Figure 7.6.2-1: Conducted Emissions Results – Line 1

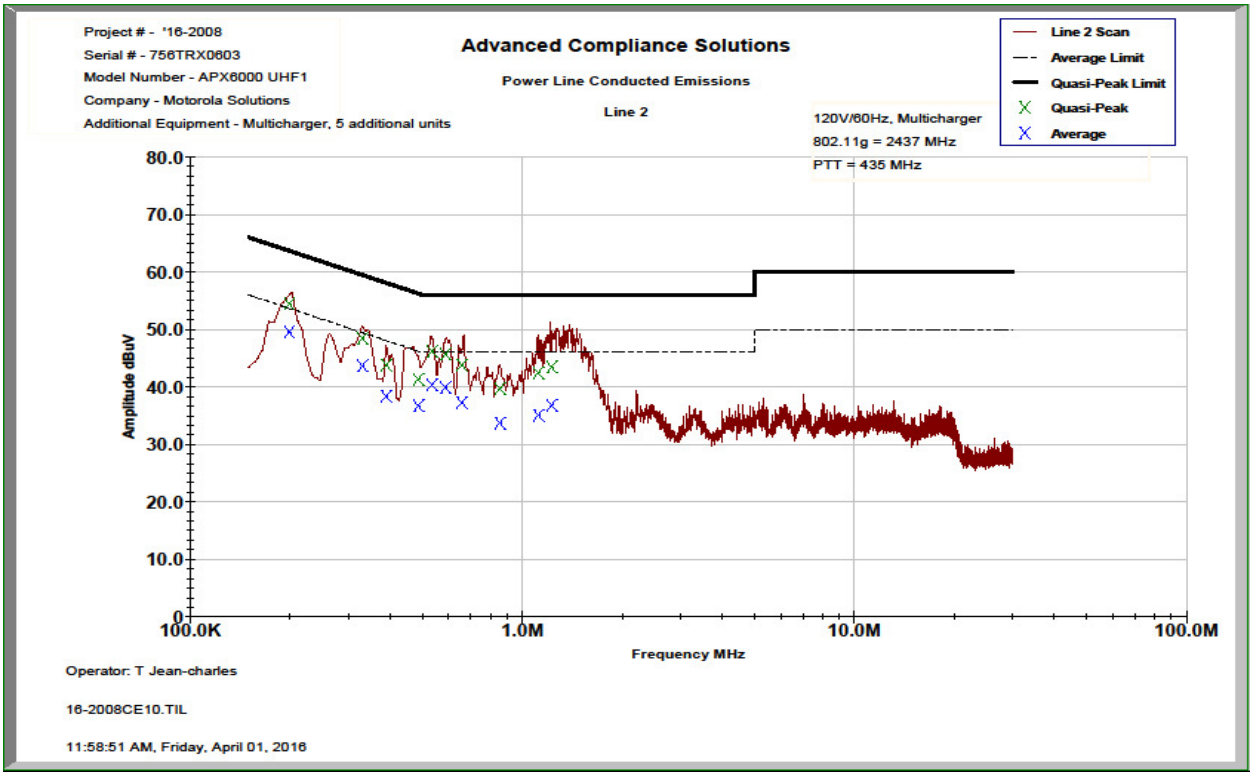

Figure 7.6.2-2: Conducted Emissions Results – Line 2

Table 7.6.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3
☐ Line 4
☒ To Ground ☐ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: 16-2008CE10
Power Supply Description: NA

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.196975	46.045	40.866	10.20	56.25	51.07	63.74	53.74	7.5	2.7
0.51595	34.011	28.485	10.20	44.21	38.69	56.00	46.00	11.8	7.3
0.520474	35.091	29.511	10.20	45.29	39.71	56.00	46.00	10.7	6.3
0.593862	34.218	28.538	10.20	44.42	38.74	56.00	46.00	11.6	7.3
0.864638	30.222	23.778	10.19	40.41	33.97	56.00	46.00	15.6	12.0
0.89935	32.894	24.127	10.19	43.08	34.32	56.00	46.00	12.9	11.7
0.933124	33.617	26.205	10.19	43.81	36.39	56.00	46.00	12.2	9.6
1.20677	33.215	26.971	10.20	43.42	37.17	56.00	46.00	12.6	8.8
1.25814	33.32	27.108	10.20	43.52	37.31	56.00	46.00	12.5	8.7
1.31838	34.911	27.928	10.20	45.11	38.13	56.00	46.00	10.9	7.9
Line 2									
0.199238	44.243	39.359	10.22	54.47	49.58	63.64	53.64	9.2	4.1
0.33085	38.219	33.466	10.21	48.43	43.68	59.43	49.43	11.0	5.8
0.39035	33.614	28.187	10.20	43.82	38.39	58.06	48.06	14.2	9.7
0.4875	31.133	26.481	10.21	41.34	36.69	56.21	46.21	14.9	9.5
0.535638	35.961	30.185	10.21	46.17	40.39	56.00	46.00	9.8	5.6
0.588538	35.486	29.687	10.21	45.70	39.90	56.00	46.00	10.3	6.1
0.658862	33.594	27.064	10.21	43.80	37.27	56.00	46.00	12.2	8.7
0.857225	29.506	23.519	10.21	39.72	33.73	56.00	46.00	16.3	12.3
1.11892	32.205	24.827	10.25	42.46	35.08	56.00	46.00	13.5	10.9
1.22754	33.143	26.583	10.25	43.39	36.83	56.00	46.00	12.6	9.2

8 CONCLUSION

In the opinion of ACS, Inc., the model H98QDH9PW7BN manufactured by Motorola Solutions Sdn Bhd meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-247 for the test procedures documented in the test report.

END REPORT