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Report On

FCC Testing of the Vertex Telecom, Inc. DW33D Damai WiFi AC1750M
Dual Band Gigabit Router in accordance with FCC CFR 47 Part 15,
Subpart C

COMMERCIAL-IN-CONFIDENCE

FCC ID: 2AE7MRDW33D-E2

Document 57015092 Report 02 Issue 1

September 2015





Product Service

REPORT ON

FCC Testing of the
Vertex Telecom, Inc.
DW33D Damai WiFi AC1750M Dual Band Gigabit Router

Document 57015092 Report 02 Issue 1

September 2015

PREPARED FOR

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PREPARED BY

A handwritten signature in black ink, appearing to read "Zhao Guiying".

G Zhao
Engineer

APPROVED BY

A handwritten signature in black ink, appearing to read "Zhang Chengxin".

C Zhang
Manager

DATED

07 September 2015

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on two sample equipments to demonstrate limited compliance with FCC CFR 47 Part 15, Subpart C. These samples tested were found to comply with the requirements defined in the applied rules.

Test Engineer(s);

A handwritten signature in black ink, appearing to read "Zhao Guiying".

G Zhao



CONTENTS

Section	Page No
1	REPORT SUMMARY 3
1.1	Introduction 4
1.2	Brief Summary of Results 5
1.3	Declaration of Build Status..... 6
1.4	Product Information 7
1.5	Test Conditions..... 8
1.6	Deviations From the Standard..... 8
1.7	Modification Record..... 8
1.8	Alternative Test Site..... 8
2	TEST DETAILS 9
2.1	Conducted Emissions 10
2.2	6dB Bandwidth 14
2.3	Maximum Conducted Output Power - Peak..... 22
2.4	Power Spectral Density..... 24
2.5	Band Edge and Conducted Spurious Emissions 32
2.6	Radiated Emissions 57
3	TEST EQUIPMENT USED..... 61
3.1	Test Equipment Used 62
3.2	Measurement Uncertainty..... 63
4	DISCLAIMERS AND COPYRIGHT..... 64
4.1	Disclaimers and Copyright 65



Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the Vertex Telecom, Inc.
DW33D Damai WiFi AC1750M Dual Band Gigabit Router
in accordance with FCC CFR 47 Part 15, Subpart C



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Vertex Telecom, Inc. DW33D Damai WiFi AC1750M Dual Band Gigabit Router to the requirements of FCC CFR 47 Part 15 Subpart C.

Testing was carried out in support of an application for FCC Grant of DW33D Damai WiFi AC1750M Dual Band Gigabit Router.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Vertex Telecom, Inc.
Product Name	Damai WiFi AC1750M Dual Band Gigabit Router
Product Type	DW33D
Serial Number(s)	RDW33DI0121150400025 RDW33DI0121150400012
Software Version	00.00.00.01
Hardware Version	DW33D V1.0
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15, Subpart C: 2014
Start of Test	15 July 2015
Finish of Test	28 August 2015
Name of Engineer(s)	G Zhao



Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 15, Subpart C.

Test	Spec Clause	Test Description	Result
2.1	15.207	Conducted Emission AC Power Port	Pass
2.2	15.247(a)(2)	6dB Bandwidth	Pass
2.3	15.247(b)(3)	Maximum Conducted Output Power - Peak	Pass
2.4	15.247(e)	Power Spectral Density	Pass
2.5	15.205, 15.209,15.247(d)	Band Edge Emissions	Pass
		Conducted Spurious Emissions	Pass
2.6	15.205, 15.209,15.247(d)	Radiated Emissions	Pass



1.3 DECLARATION OF BUILD STATUS

MAIN EUT		
Manufacture	Vertex Telecom, Inc.	
Product Name	Damai WiFi AC1750M Dual Band Gigabit Router	
Product Type	DW33D	
Serial Number	RDW33DI0121150400025 RDW33DI0121150400012	
Radio Access Technology	WLAN	
Hardware Version	DW33D V1.0	
Software Version	00.00.00.01	
Operating Frequency	2400MHz to 2483.5MHz, 5725MHz to 5850MHz	
Transfer Rate	802.11b: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps 802.11a/g: 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps 802.11n: up to 450Mbps 802.11ac: up to 1299.9Mbps	
Number of channel	For 2400MHz to 2483.5MHz 802.11b/g/n(20MHz): 11 802.11n(40MHz): 7	
	For 5725MHz to 5850MHz: 802.11a/11n(20MHz)/11ac(20MHz): 5 802.11n(40MHz)/11ac(40MHz): 2 802.11ac(80MHz): 1	
Modulation Type	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11a/g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)	
Maximum Output Power (dBm)	Band 2400MHz to 2483.5MHz: 25dBm Band 5725MHz to 5850MHz: 19dBm	
Antenna Gain (dBi)	Band 2400MHz to 2483.5MHz: 3dBi Band 5725MHz to 5850MHz: 5dBi	
Antenna Number	3	
FCC ID	2AE7MRDW33D-E2	
Environment temperature range(s)	Minimum	Maximum
	0 °C	+40 °C
DC Power source	12.0V	
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	This Damai WiFi AC1750M Dual Band Gigabit Router is an indoor access, which operates on the frequency band 2400MHz to 2483.5MHz and band 5725MHz to 5850MHz.	

No responsibility will be accepted by TÜV SÜD Certification and Testing (China) Co., Ltd. Beijing Branch as to the accuracy of the information declared in this document by the manufacturer.



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) DW33D is Damai WiFi AC1750M Dual Band Gigabit Router from Vertex Telecom, Inc.

There is only one model with Damai WiFi AC1750M Dual Band Gigabit Router for approval, which is DW33D. This Damai WiFi AC1750M Dual Band Gigabit Router is an indoor access, which operates on the frequency band 2400MHz to 2483.5MHz and band 5725MHz to 5825MHz. Only the test results of frequency band 2400MHz to 2483.5MHz were shown in this report. A full technical description is held by Vertex Telecom, Inc.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



1.4.2 Test Configuration

Configuration: 2.4GHz WLAN

The worst configurations were representative for all traffic scenarios after different data rates for each operating mode were measured. The settings below were used for all measurements if not otherwise noted.

Operating Mode	Data Rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(HT20)	MCS5
802.11n(HT40)	MCS0

The EUT was powered by a 12.0VDC power supply.

1.4.3 Modes of Operation

Modes of operation of the EUT during testing were shown as follows:

Test Mode 1 – 2412 MHz (TX)
 Test Mode 2 – 2437 MHz (TX)
 Test Mode 3 – 2462 MHz (TX)
 Test Mode 4 – 2422 MHz (TX)
 Test Mode 5 – 2452 MHz (TX)

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.8 ALTERNATIVE TEST SITE

The testing was conducted at following site registrations:

FCC Accreditation 910917:
 The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.



Product Service

SECTION 2

TEST DETAILS

FCC Testing of the Vertex Telecom, Inc.
DW33D Damai WiFi AC1750M Dual Band Gigabit Router
in accordance with FCC CFR 47 Part 15 Subpart C



Product Service

2.1 CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.207

2.1.2 Equipment Under Test

DW33D, S/N: RDW33DI0121150400025

2.1.3 Date of Test and Modification State

17 July 2015 – Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements in clause 15.207 of FCC CFR 47 Part 15, Subpart C.

The test was performed in a shield room, and EUT was placed on a table, which was 0.8m above ground plane. The power line of the EUT was connected to the AC mains through a line Impedance Stabilization Network (LISN). The EUT was control to operate at traffic mode with maximum output power on MIMO mode.

A EMI test receiver was used to test the emissions from both sides of AC line. The conducted emission is scanned over the frequency from 150kHz to 30MHz with peak detector. A final measurement is performed with quasi-peak detector and average detector.

2.1.6 Environmental Conditions

Ambient Temperature 25.5°C

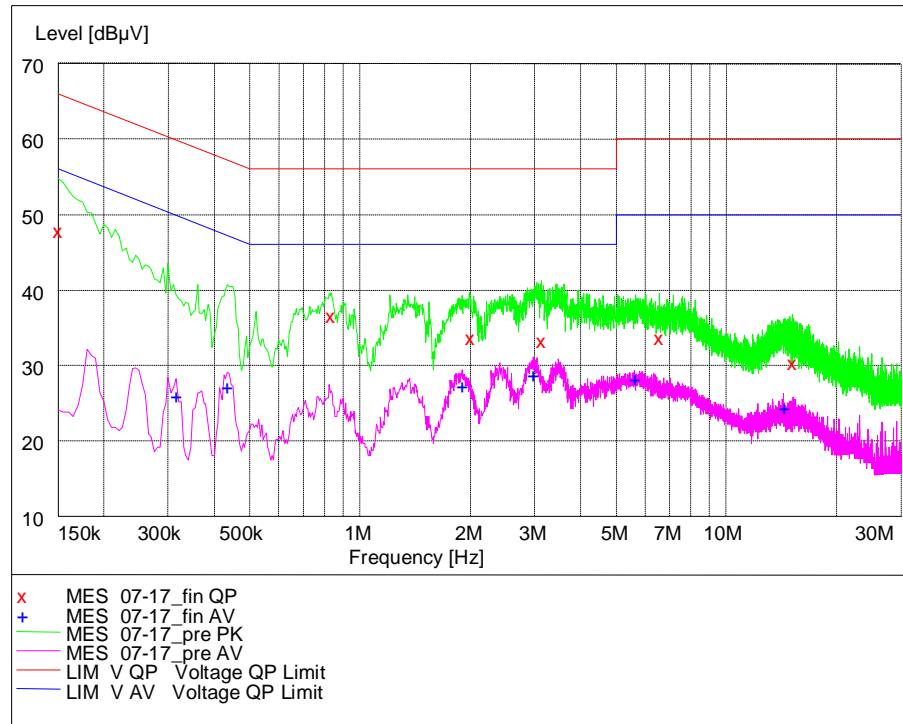
Relative Humidity 50.5%



2.1.7 Test Results

The test results are shown below.

L Line:

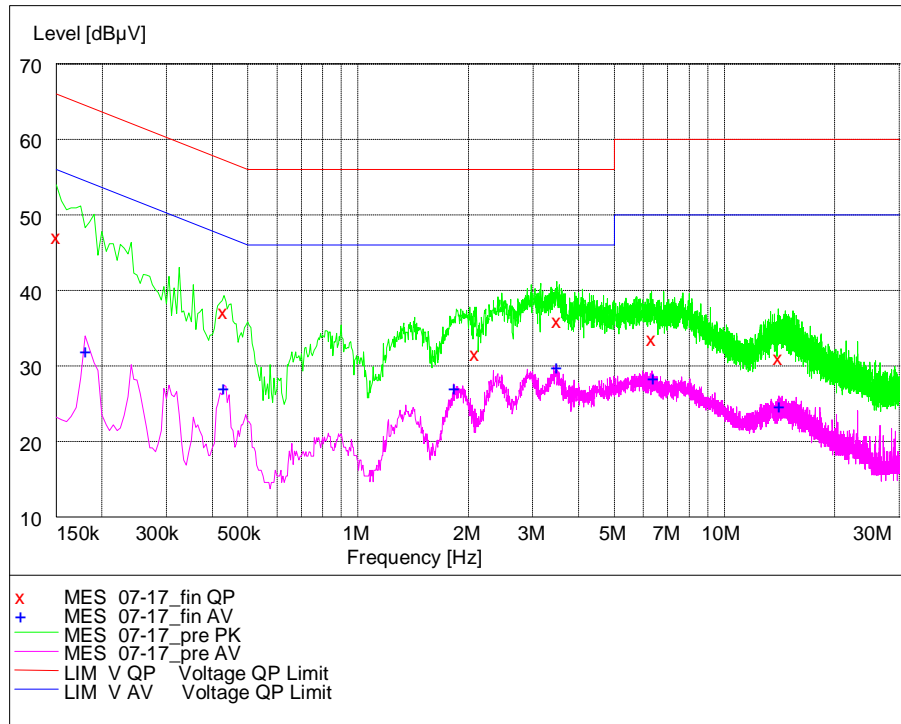


MEASUREMENT RESULT: "07-17_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB
0.150000	48.10	20.1	66	17.9
0.835000	36.80	20.2	56	19.2
1.995000	34.00	20.3	56	22.0
3.130000	33.60	20.3	56	22.4
6.565000	34.00	20.4	60	26.0
15.150000	30.70	20.7	60	29.3

MEASUREMENT RESULT: "07-17_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB
0.315000	26.20	20.1	50	23.7
0.435000	27.40	20.1	47	19.7
1.900000	27.60	20.2	46	18.4
2.975000	29.10	20.3	46	16.9
5.610000	28.50	20.4	50	21.5
14.335000	24.70	20.7	50	25.3

N Line:**MEASUREMENT RESULT: "07-17_fin QP"**

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB
0.150000	47.30	20.1	66	18.7
0.430000	37.40	20.1	57	19.9
2.080000	31.90	20.3	56	24.1
3.485000	36.20	20.3	56	19.8
6.320000	33.90	20.4	60	26.1
14.030000	31.30	20.7	60	28.7

MEASUREMENT RESULT: "MOBILE_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB
0.180000	32.30	20.2	55	22.2
0.430000	27.30	20.1	47	19.9
1.825000	27.40	20.1	46	18.6
3.480000	30.20	20.3	46	15.8
6.350000	28.70	20.4	50	21.3
14.065000	25.00	20.7	50	25.0



Product Service

Frequency (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V)
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency

Remarks

The result of test did not exceed the limits at the measured frequencies.



Product Service

2.2 6DB BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(a)(2)

2.2.2 Equipment Under Test

DW33D, S/N: RDW33DI0121150400025

2.2.3 Date of Test and Modification State

04 August 2015 – Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements in clause 15.247 of FCC CFR 47 Part 15 Subpart C.

The EUT was connected to the spectrum analyzer, and transmitting on its maximum output power.

Test procedures refer to KDB 558074 D01.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3
 - Mode 4
 - Mode 5

2.2.6 Environmental Conditions

Ambient Temperature 24.5°C

Relative Humidity 53.0%



2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 for 6dB Emission Bandwidth.

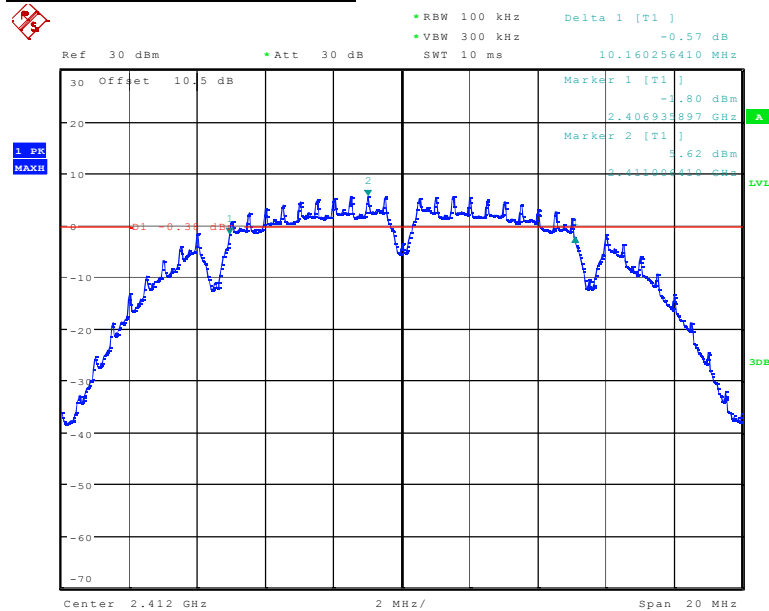
The test results are shown below.

Operating Mode	Data Rate	Frequency (MHz)	Test Result (MHz)		
			ANT1	ANT2	ANT3
11b	1Mbps	2412	10.16	10.16	10.16
11b	1Mbps	2437	10.16	10.16	10.16
11b	1Mbps	2462	10.16	10.16	10.16
11g	6Mbps	2412	16.44	16.44	16.44
11g	6Mbps	2437	16.44	16.44	16.44
11g	6Mbps	2462	16.44	16.44	16.44
11n (HT20)	MCS5	2412	17.79	17.82	17.79
11n (HT20)	MCS5	2437	17.79	17.79	17.82
11n (HT20)	MCS5	2462	17.79	17.79	17.82
11n (HT40)	MCS0	2422	36.18	36.42	36.35
11n (HT40)	MCS0	2437	36.18	36.49	36.49
11n (HT40)	MCS0	2452	36.18	36.49	36.49

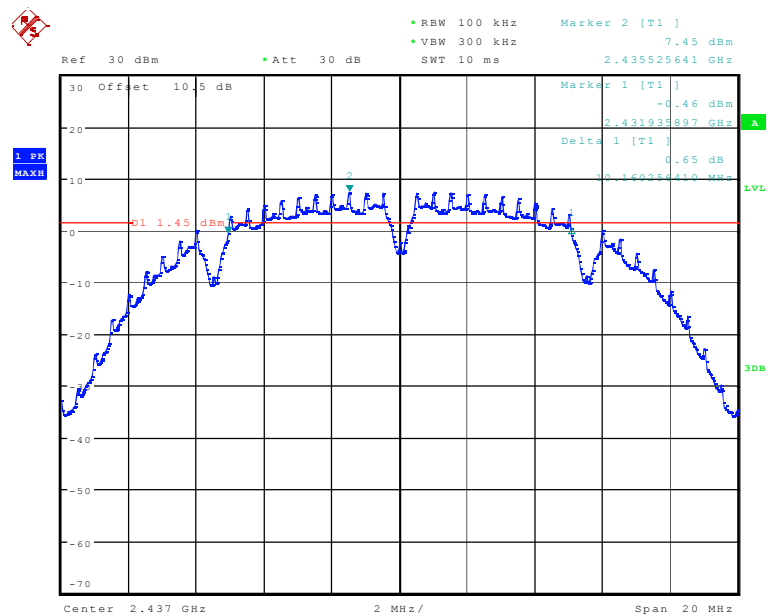
Only The Test Plots of ANT1 are shown below

802.11b

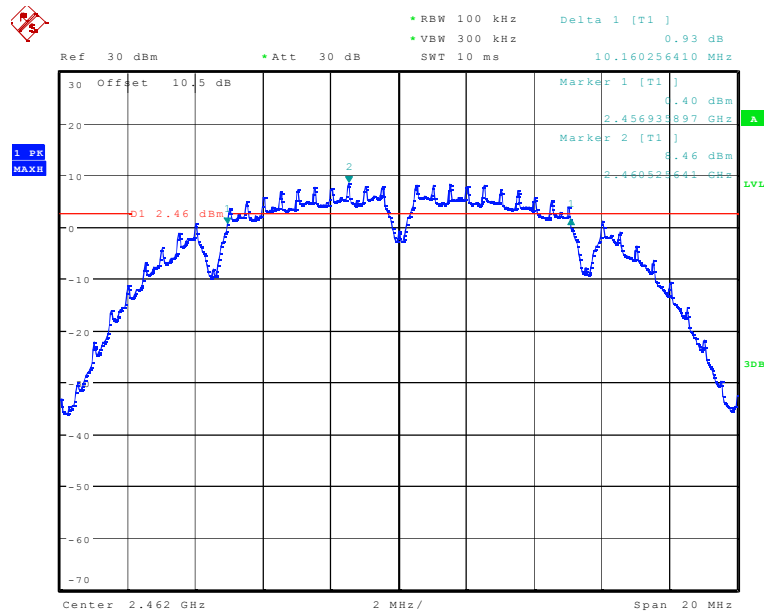
Configuration 1 - Mode 1, 2 & 3



Date: 4.AUG.2015 17:48:53



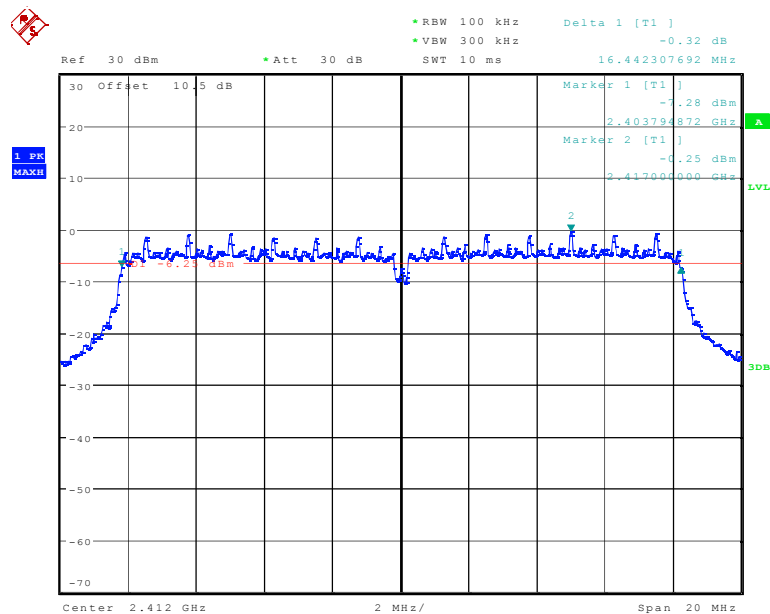
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Date: 4.AUG.2015 18:02:04

802.11g

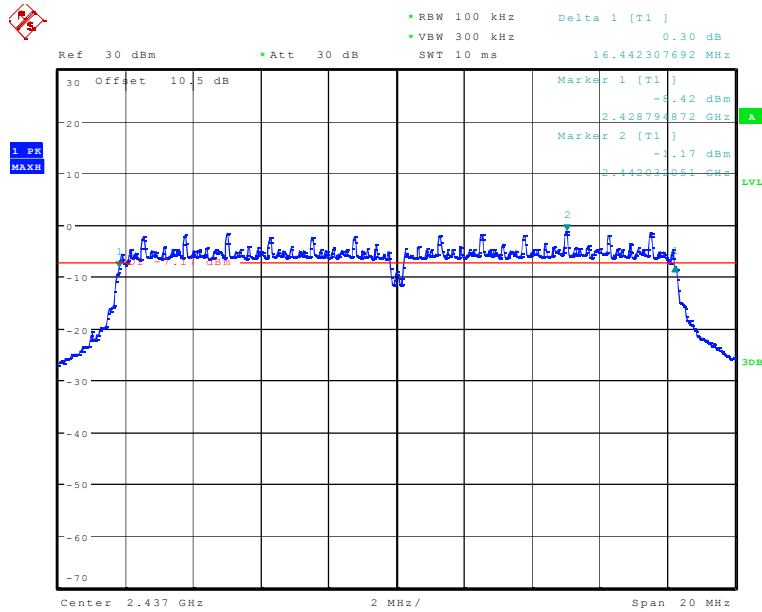
Configuration 1 - Mode 1, 2 & 3



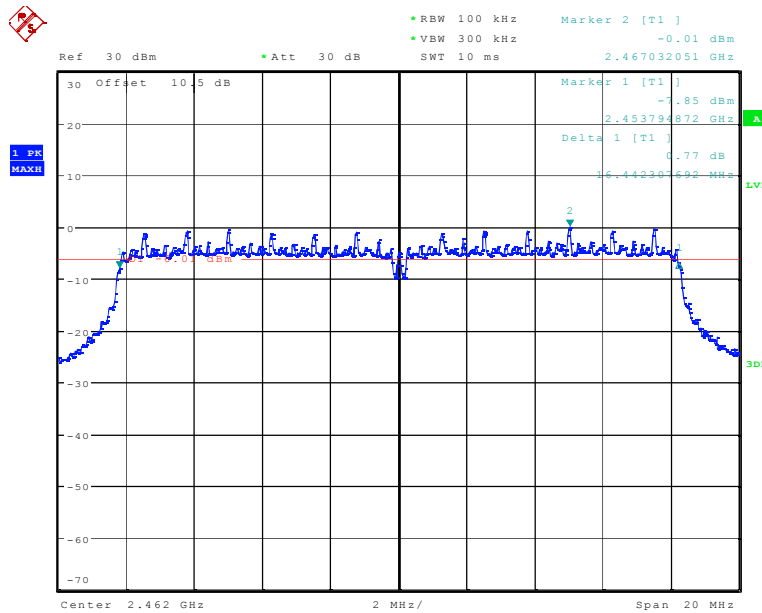
Date: 4.AUG.2015 18:15:49



Product Service



Date: 4.AUG.2015 18:13:33

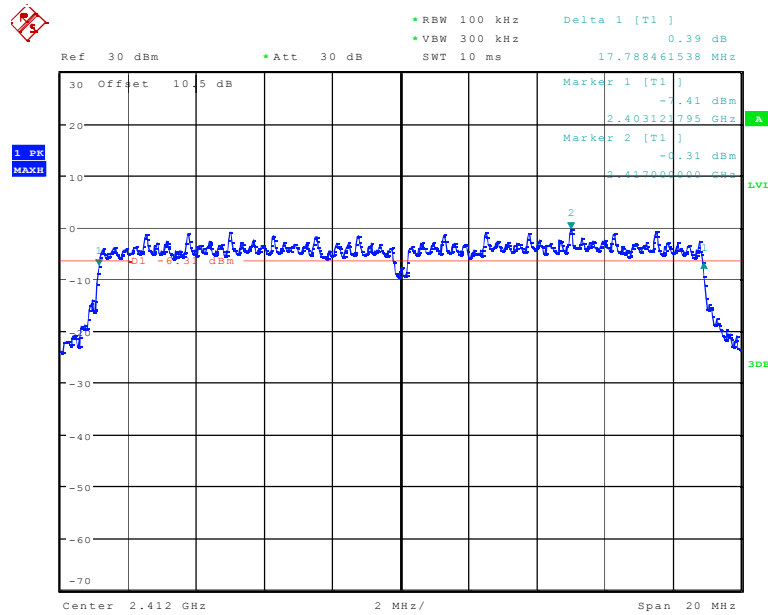


Date: 4.AUG.2015 18:03:39

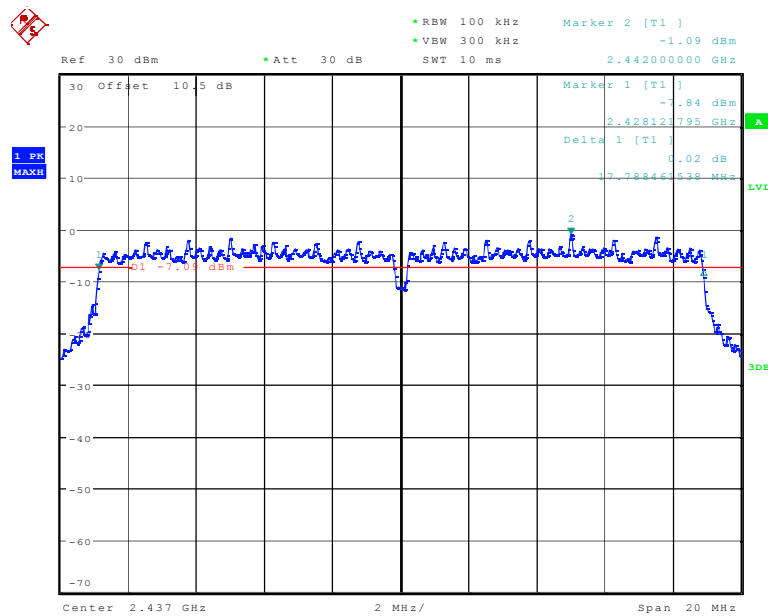


802.11n(HT20)

Configuration 1 - Mode 1, 2 & 3



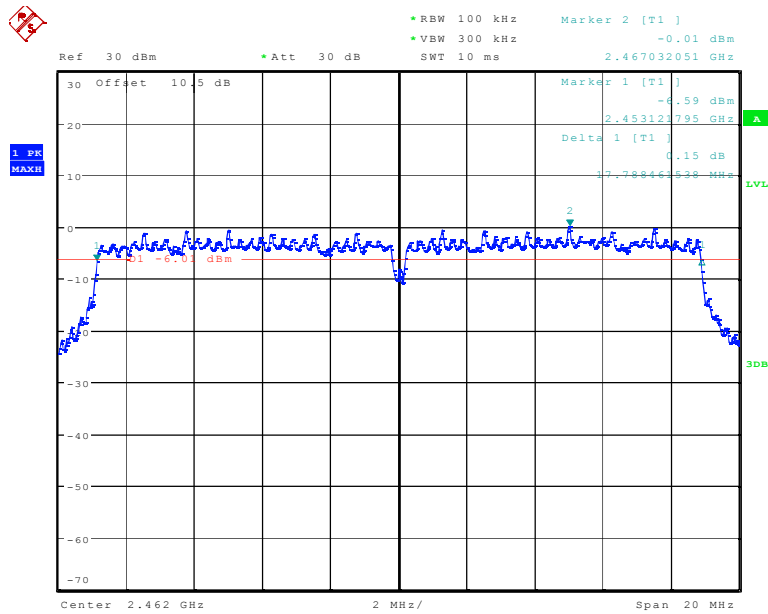
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Date: 4.AUG.2015 18:59:39



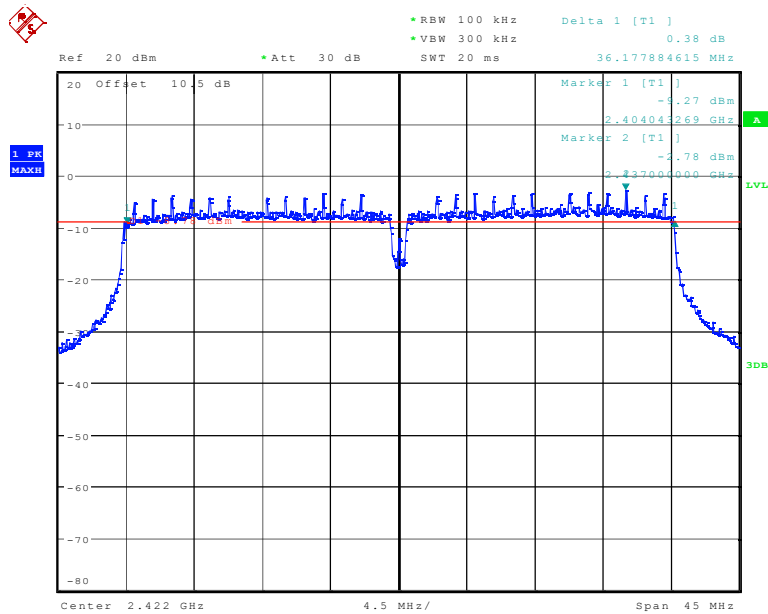
Product Service



Date: 4.AUG.2015 19:01:02

802.11n(HT40)

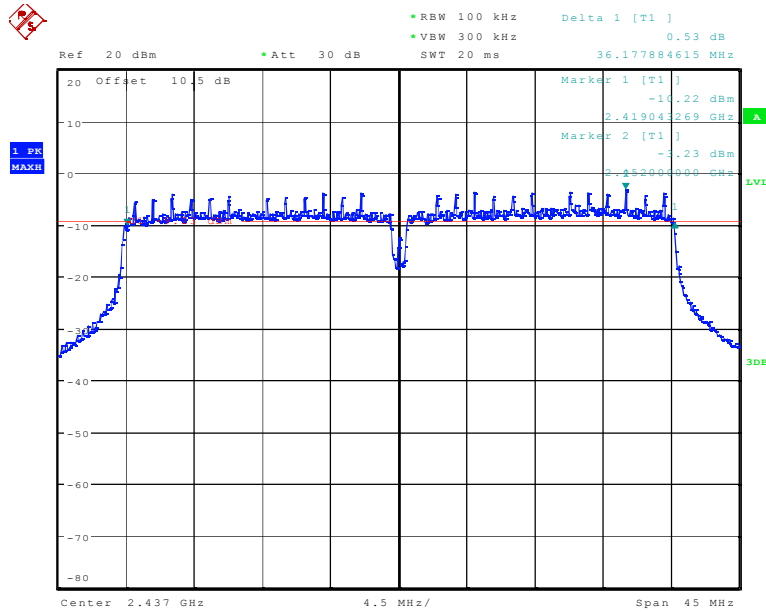
Configuration 1 - Mode 4, 2 & 5



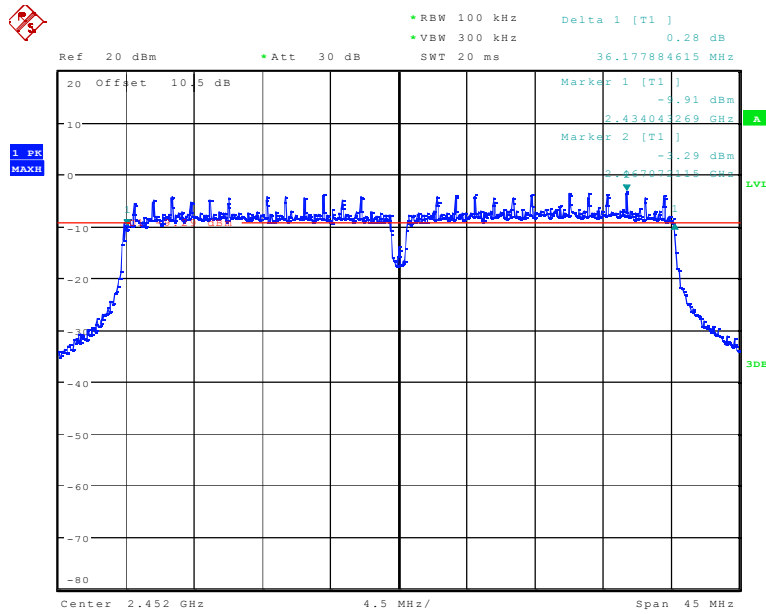
Date: 4.AUG.2015 19:04:08



Product Service



Date: 4.AUG.2015 19:06:19



Date: 4.AUG.2015 19:08:09

Limit	≥ 500kHz
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Remarks

The results of test did not exceed the limits at the measured frequencies.



Product Service

2.3 MAXIMUM CONDUCTED OUTPUT POWER - PEAK

2.3.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(b)(3)

2.3.2 Equipment Under Test

DW33D, S/N: RDW33DI0121150400025

2.3.3 Date of Test and Modification State

15 July 2015 – Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the requirements in clause 15.247 of FCC CFR 47 Part 15 Subpart C.

The EUT was connected to the power meter via an RF cable. The path loss of the cable was measured and entered as an offset. The peak level was recorded and compared with the test limits. Test procedures refer to KDB 558074 D01.

The path loss was measured and entered as a reference level offset.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration1 - Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5

2.3.6 Environmental Conditions

Ambient Temperature 24.5°C

Relative Humidity 57.0%



2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 for Maximum Peak Output Power.

The test results are shown below.

Configuration 1 - Mode 1, 2, 3, 4 & 5

Operating Mode	Data Rate	Frequency (MHz)	Peak Output Power				
			dBm				mW
			ANT1	ANT2	ANT3	Total	Total
11b	1Mbps	2412	19.18	19.00	18.63	23.71	235.17
11b	1Mbps	2437	19.29	18.76	18.41	23.61	229.42
11b	1Mbps	2462	19.49	19.29	19.31	24.14	259.15
11g	6Mbps	2412	19.05	19.09	18.82	23.76	237.66
11g	6Mbps	2437	19.35	19.22	19.22	24.03	253.22
11g	6Mbps	2462	19.51	19.29	19.33	24.15	259.95
11n (HT20)	MCS5	2412	19.50	19.09	19.28	24.06	254.94
11n (HT20)	MCS5	2437	19.49	19.30	19.43	24.18	261.73
11n (HT20)	MCS5	2462	19.78	19.29	19.05	24.16	260.33
11n (HT40)	MCS0	2422	18.74	18.32	17.46	22.98	198.46
11n (HT40)	MCS0	2437	18.27	17.83	17.52	22.66	184.31
11n (HT40)	MCS0	2452	18.21	18.10	17.83	22.82	191.46

Operating Mode	Data Rate	Frequency (MHz)	Average Output Power				
			dBm				mW
			ANT1	ANT2	ANT3	Total	Total
11b	1Mbps	2412	16.76	16.92	15.96	21.34	136.07
11b	1Mbps	2437	17.25	15.96	15.83	21.17	130.82
11b	1Mbps	2462	16.83	16.79	16.75	21.56	143.26
11g	6Mbps	2412	9.39	9.67	9.29	14.22	26.45
11g	6Mbps	2437	9.32	9.89	9.62	14.39	27.46
11g	6Mbps	2462	10.00	9.45	9.62	14.47	27.97
11n (HT20)	MCS5	2412	8.86	8.84	8.73	13.58	22.81
11n (HT20)	MCS5	2437	9.23	8.52	9.54	13.89	24.48
11n (HT20)	MCS5	2462	9.31	8.64	8.86	13.72	23.53
11n (HT40)	MCS0	2422	10.49	10.26	9.49	14.87	30.70
11n (HT40)	MCS0	2437	10.22	9.51	9.51	14.53	28.39
11n (HT40)	MCS0	2452	10.26	9.98	9.77	14.78	30.06

Limit	≤30dBm or ≤1000mW (Directional Antenna Gain ≤ 6dBi)
	≤28.2dBm* (Directional Antenna Gain > 6dBi)

*Note: The directional antenna gain = $3\text{dBi} + 10\log(3) = 7.8\text{dBi}$, so the limit = $30\text{dBm} - (7.8\text{dBi} - 6\text{dBi}) = 28.2\text{dBm}$.

Remarks

The total maximum peak output power of EUT did not exceed the limit 28.2dBm at the measured frequencies.



Product Service

2.4 POWER SPECTRAL DENSITY

2.4.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(e)

2.4.2 Equipment Under Test

DW33D, S/N: RDW33DI0121150400025

2.4.3 Date of Test and Modification State

05 August 2015 – Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Method and Operating Modes

The test was applied in accordance with the requirements in clause 15.247 of FCC CFR 47 Part 15, Subpart C.

The EUT was connected to the spectrum analyzer via an RF cable, and controlled to transmit on its maximum output power. The peak detector and Max Hold trace were used for measurement. The peak level was recorded and compared with the test limits.

Test procedures refer to KDB 558074 D01, and the test span was set to 1.5*DTS bandwidth (6dB Bandwidth).

The path loss was measured and entered as a reference level offset.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration1 - Mode 1
 - Mode 2
 - Mode 3
 - Mode 4
 - Mode 5

2.4.6 Environmental Conditions

Ambient Temperature 23.5°C

Relative Humidity 51.8%



2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 for Power Spectral Density.

The test results are shown below.

Configuration 1 - Mode 1, 2, 3, 4 & 5

Operating Mode	Data Rate	Frequency (MHz)	Peak Power Spectral Density				
			dBm/3kHz				mW/3kHz
			ANT1	ANT2	ANT3	Total	Total
11b	1Mbps	2412	-6.45	-6.85	-7.03	-2.00	0.63
11b	1Mbps	2437	-6.52	-7.28	-6.80	-2.08	0.62
11b	1Mbps	2462	-5.46	-6.08	-6.22	-1.14	0.77
11g	6Mbps	2412	-13.54	-15.05	-15.39	-9.81	0.10
11g	6Mbps	2437	-14.82	-15.09	-15.45	-10.34	0.09
11g	6Mbps	2462	-14.01	-14.55	-14.32	-9.52	0.11
11n (HT20)	MCS5	2412	-15.76	-15.25	-15.75	-10.81	0.08
11n (HT20)	MCS5	2437	-16.28	-15.51	-15.02	-10.80	0.08
11n (HT20)	MCS5	2462	-14.39	-15.64	-15.22	-10.28	0.09
11n (HT40)	MCS0	2422	-15.92	-17.01	-16.46	-11.67	0.07
11n (HT40)	MCS0	2437	-16.69	-16.90	-17.97	-12.38	0.06
11n (HT40)	MCS0	2452	-17.57	-17.19	-17.61	-12.68	0.05

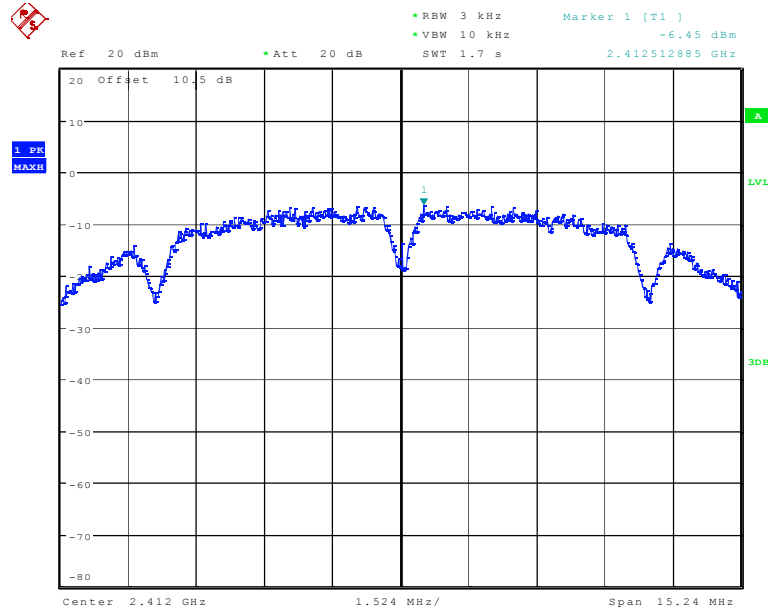


Product Service

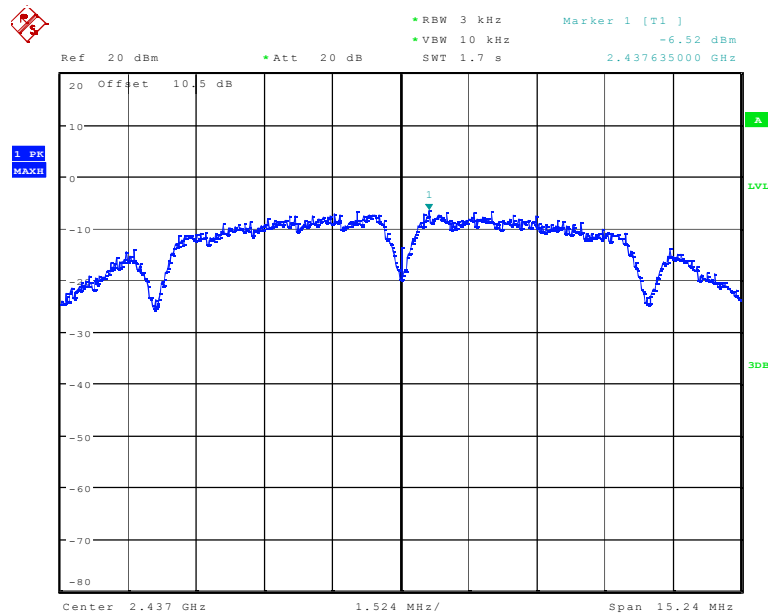
Only The Test Plots of ANT1 are shown below.

802.11b

Configuration 1 - Mode 1, 2 & 3



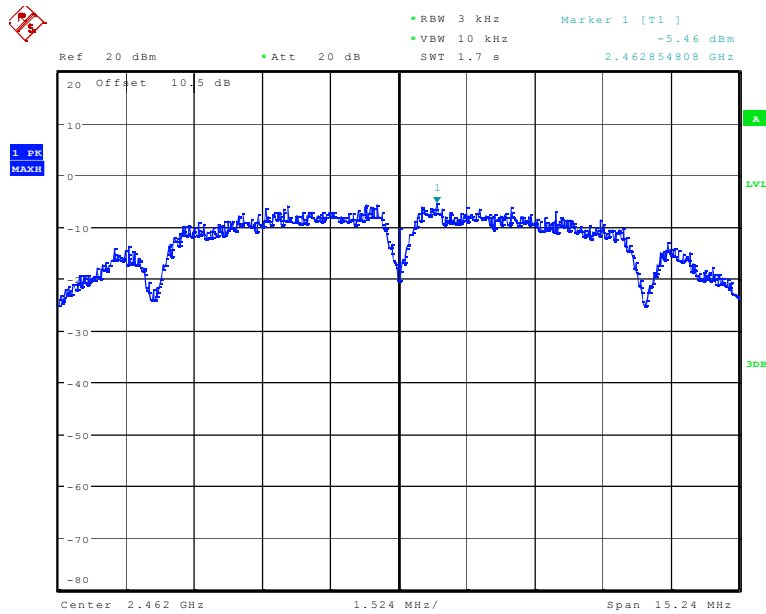
Date: 5.AUG.2015 10:31:42



Date: 5.AUG.2015 10:22:54



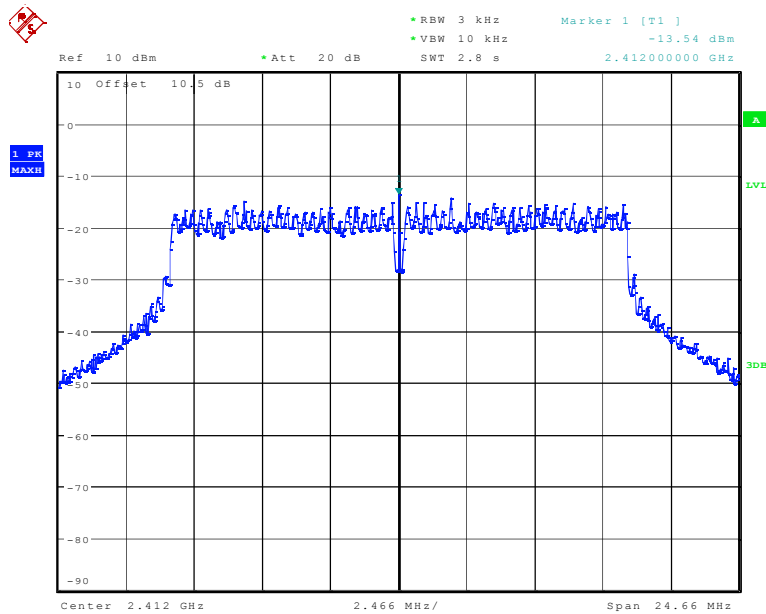
Product Service



Date: 5.AUG.2015 10:33:14

802.11g

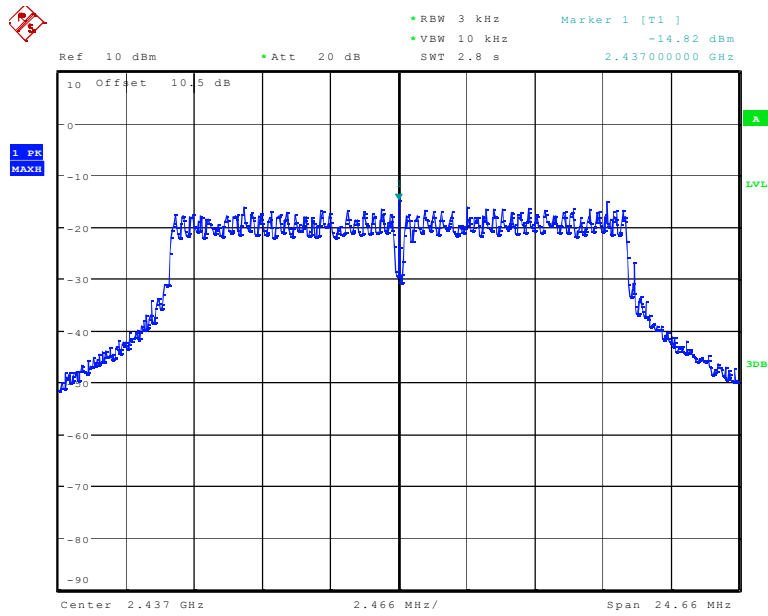
Configuration 1 - Mode 1, 2 & 3



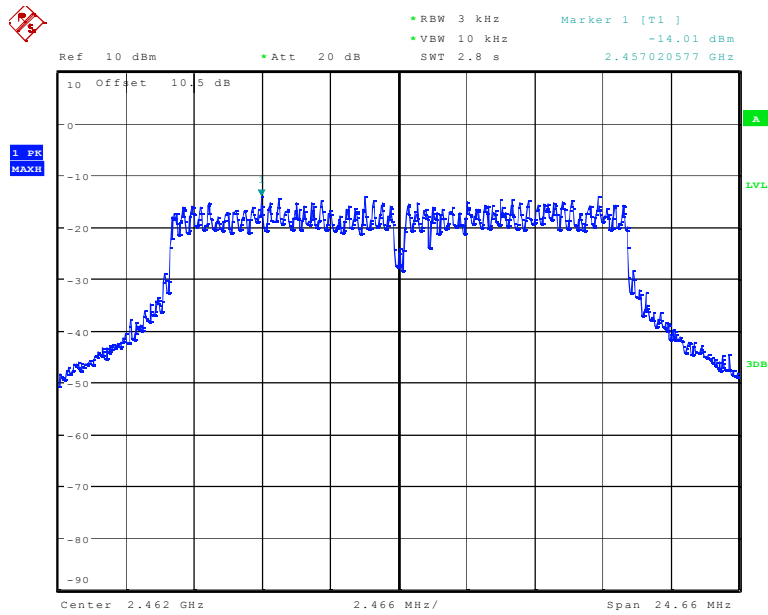
Date: 5.AUG.2015 10:37:01



Product Service



Date: 5.AUG.2015 10:38:28



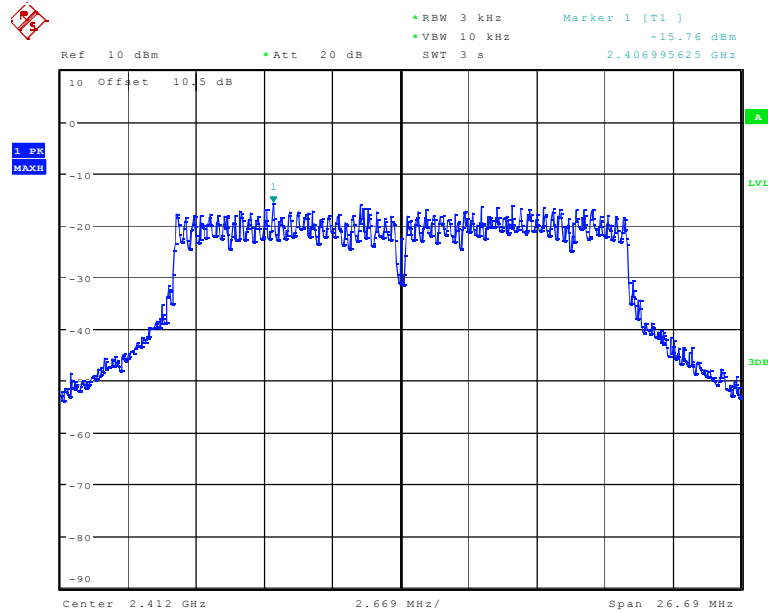
Date: 5.AUG.2015 10:39:35



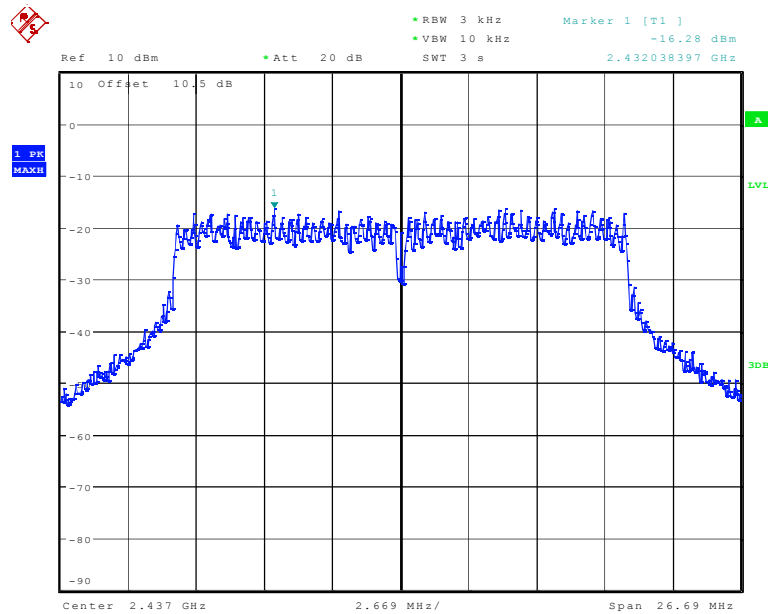
Product Service

802.11n(HT20)

Configuration 1 - Mode 1, 2 & 3



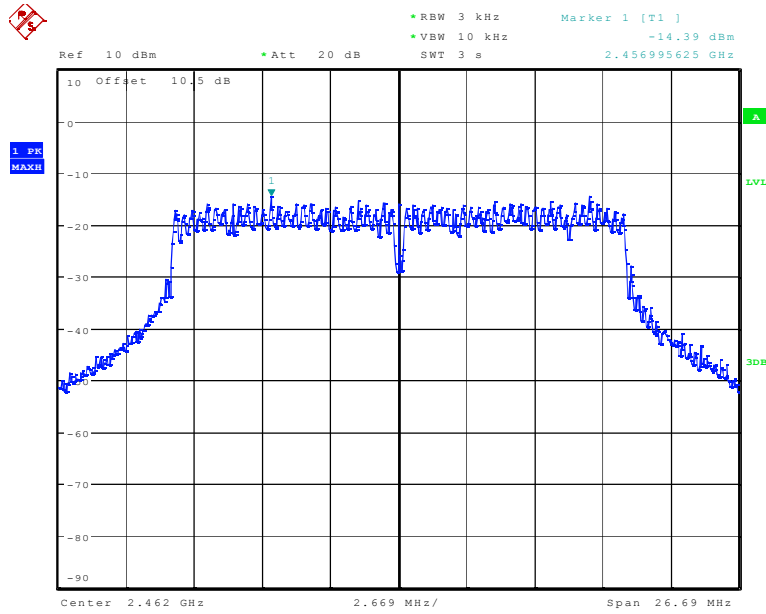
Date: 5.AUG.2015 10:44:24



Date: 5.AUG.2015 10:43:03



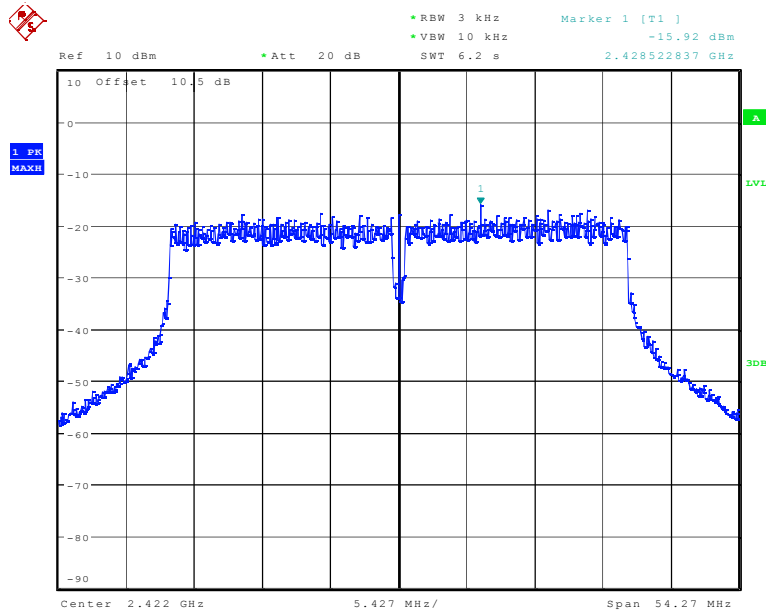
Product Service



Date: 5.AUG.2015 10:45:54

802.11n(HT40)

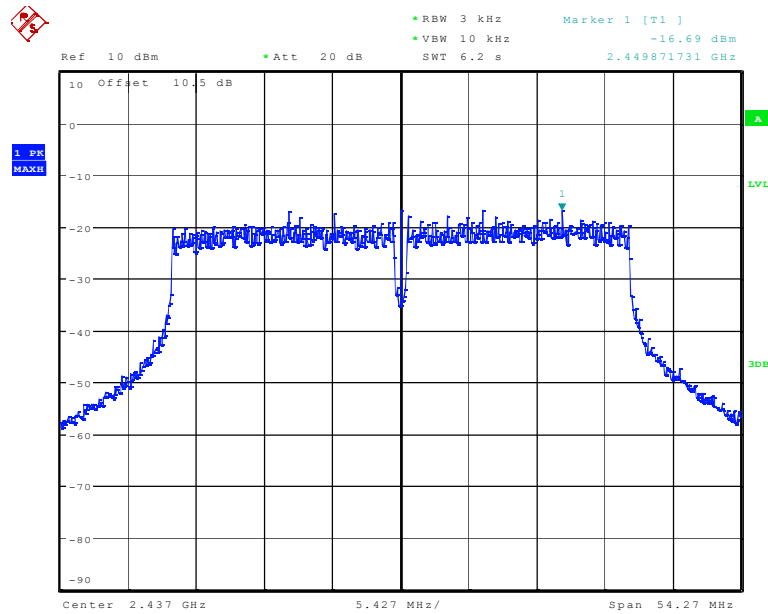
Configuration 1 - Mode 4, 2 & 5



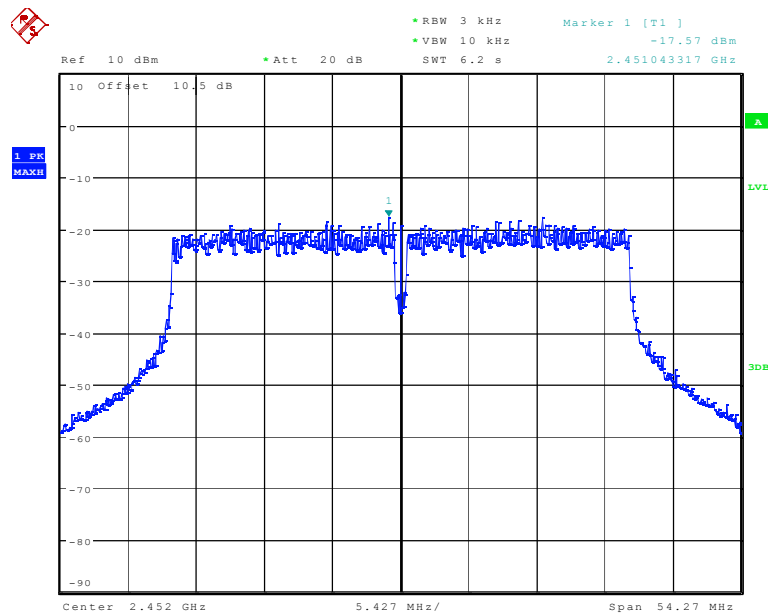
Date: 5.AUG.2015 10:56:47



Product Service



Date: 5.AUG.2015 10:59:02



Date: 5.AUG.2015 11:08:17

Limit	≤8dBm/3kHz
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Remarks

The test results of EUT did not exceed the limit at all measured frequencies.



Product Service

2.5 BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.205, 15.209, 15.247(d)

2.5.2 Equipment Under Test

DW33D, S/N: RDW33DI0121150400025

2.5.3 Date of Test and Modification State

05 August 2015 – Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test requirements in clause 15.247 of FCC CFR 47 Part 15, Subpart C.

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 20dB 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.

The Spurious Conducted Emissions from the antenna terminal were measured. The frequency spectrum investigated from 9kHz to 25 GHz. The EUT was transmitted at maximum power to the Spectrum Analyser. The test span was set to 1.5*DTSS bandwidth (6dB bandwidth). The detector and trace of spectrum analyser were set to Peak and Max Hold respectively. The peak point of the trace was measured and the markers positioned to give the -20dBc points of the displayed spectrum. The antenna 1 was chosen to perform the measurements according to the conducted output power measurements.

The test was performed with the EUT in the following configurations and modes of operation:

- Configuration 1
- Mode 1
 - Mode 2 (for Conducted Spurious Emissions test only)
 - Mode 3
 - Mode 4
 - Mode 5

2.5.6 Environmental Conditions

Ambient Temperature 23.5°C

Relative Humidity 51.8%



2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 for Band Edge Compliance and Spurious Emissions.

The test results are shown below.

Operating Mode	Data Rate	Channel	Frequency (MHz)	Peak Power Spectral Density (dBm/100kHz)	Limits for Unwanted Emissions (dBm/100kHz)
11b	1Mbps	1	2412	7.42	-12.58
11b	1Mbps	6	2437	6.83	-13.17
11b	1Mbps	11	2462	8.08	-11.92
11g	36Mbps	1	2412	-1.16	-21.16
11g	36Mbps	6	2437	-1.90	-21.90
11g	36Mbps	11	2462	-1.07	-21.07
11n (HT20)	MCS6	1	2412	-0.48	-20.48
11n (HT20)	MCS6	6	2437	-0.87	-20.87
11n (HT20)	MCS6	11	2462	-0.36	-20.36
11n (HT40)	MCS0	3	2422	-3.67	-23.67
11n (HT40)	MCS0	6	2437	-4.09	-24.09
11n (HT40)	MCS0	9	2452	-4.07	-24.07

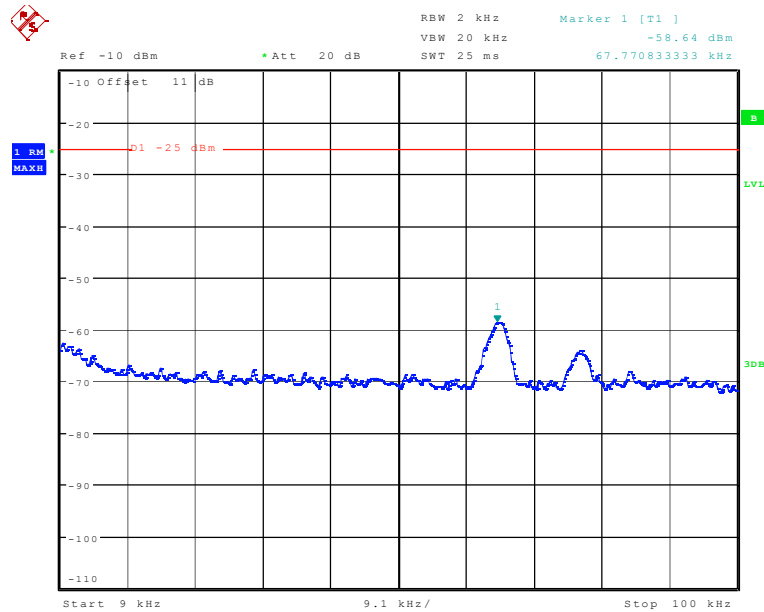


Product Service

Test Plots are shown below.

Remark:

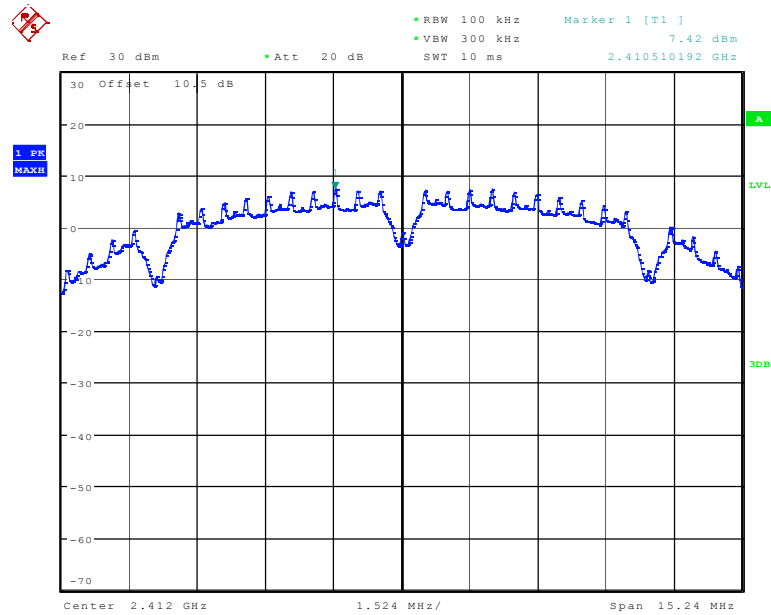
The emission at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller span showed that it was related to the LO feedthrough.



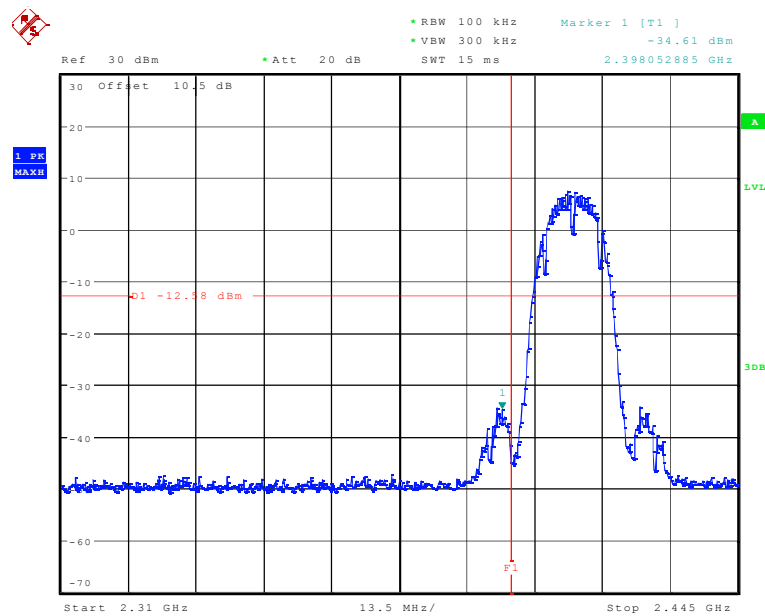
Date: 5.AUG.2015 16:29:08



Product Service

802.11bConfiguration 1 - Mode 1

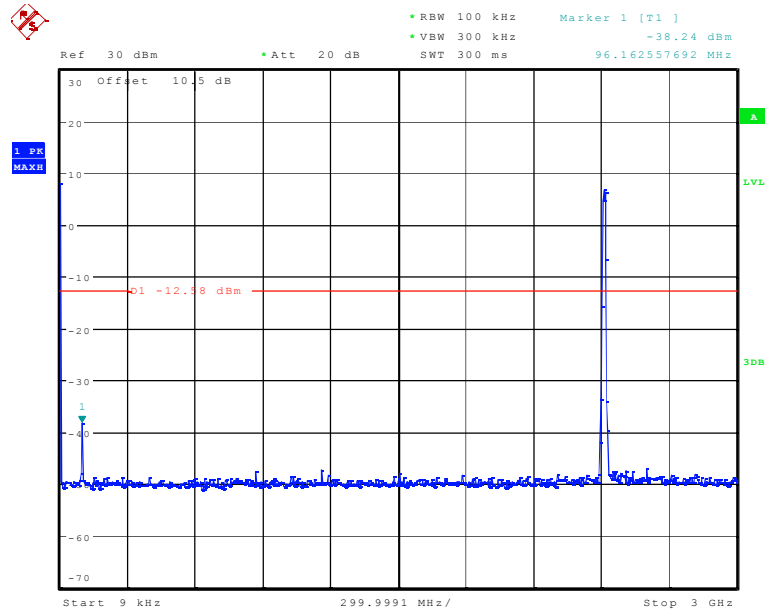
Date: 5.AUG.2015 14:35:32



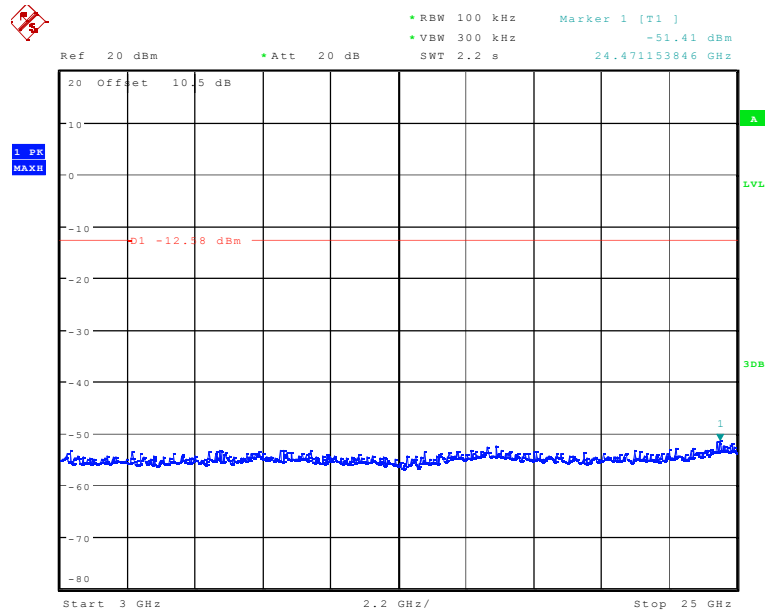
Date: 5.AUG.2015 14:40:52



Product Service



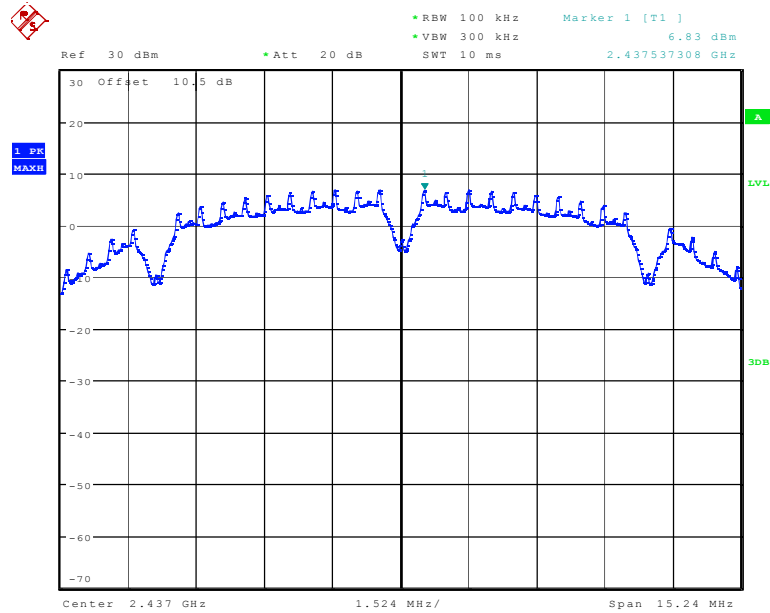
Date: 5.AUG.2015 15:28:30



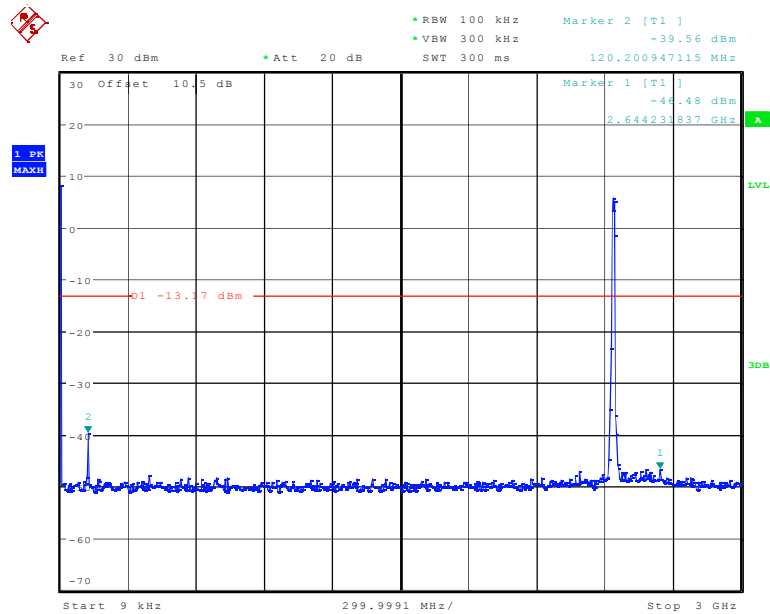
Date: 5.AUG.2015 14:38:19



Product Service

802.11bConfiguration 1 - Mode 2

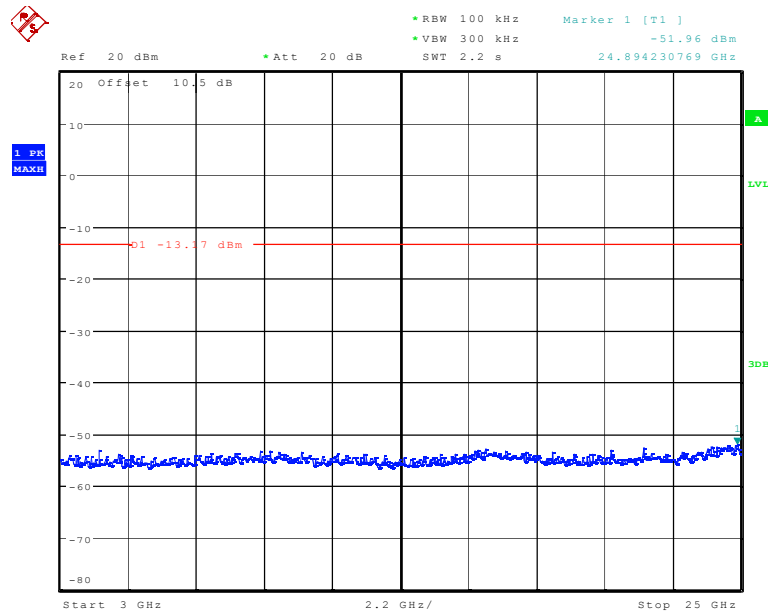
Date: 5.AUG.2015 14:42:41



Date: 5.AUG.2015 15:27:14



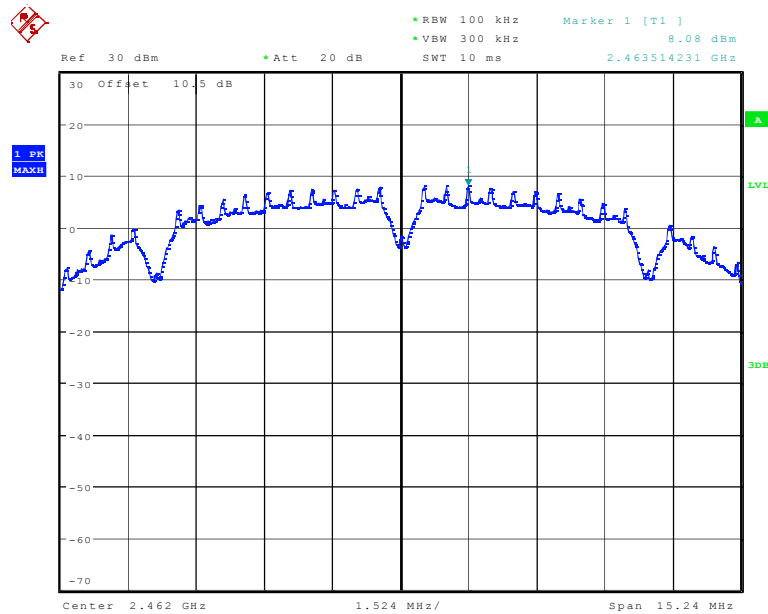
Product Service



Date: 5.AUG.2015 14:47:23

802.11b

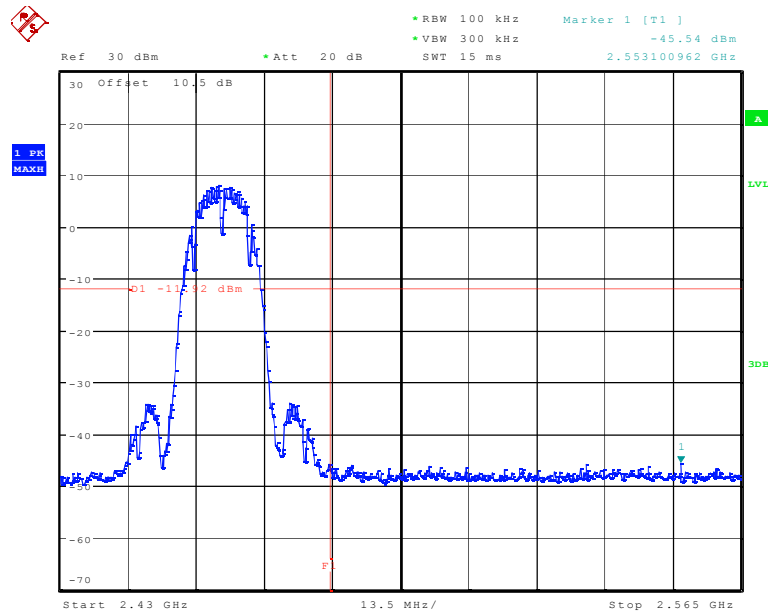
Configuration 1 - Mode 3



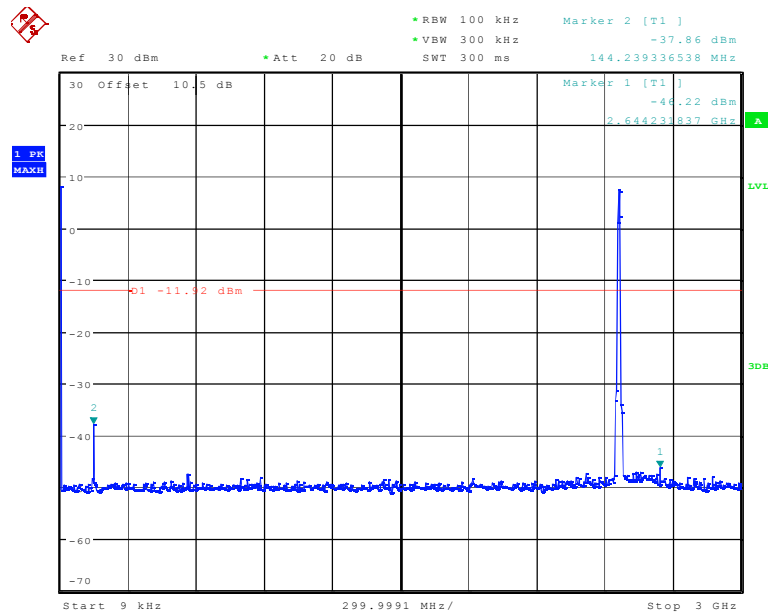
Date: 5.AUG.2015 14:48:04



Product Service



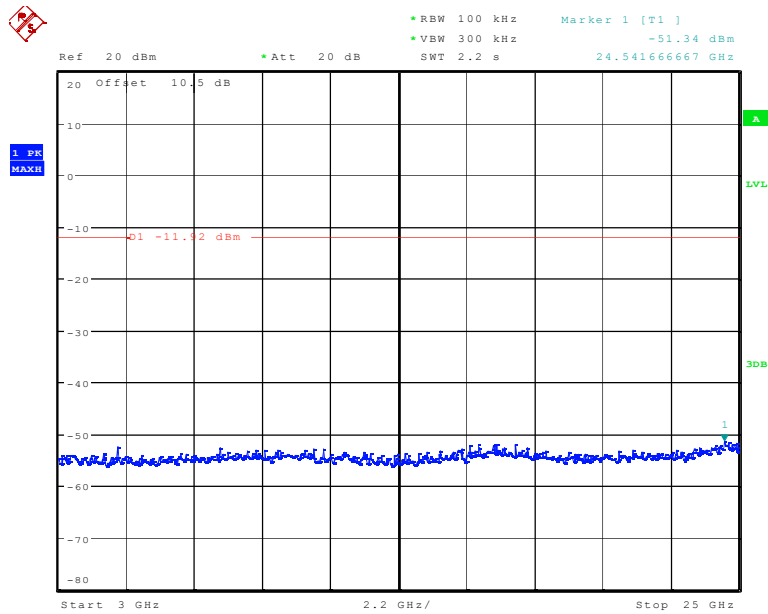
Date: 5.AUG.2015 14:53:32



Date: 5.AUG.2015 15:26:21



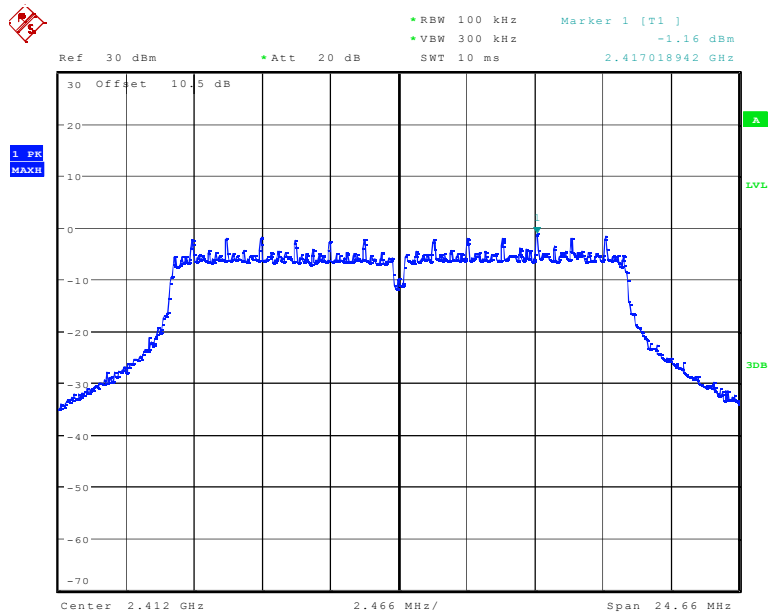
Product Service



Date: 5.AUG.2015 14:50:48

802.11g

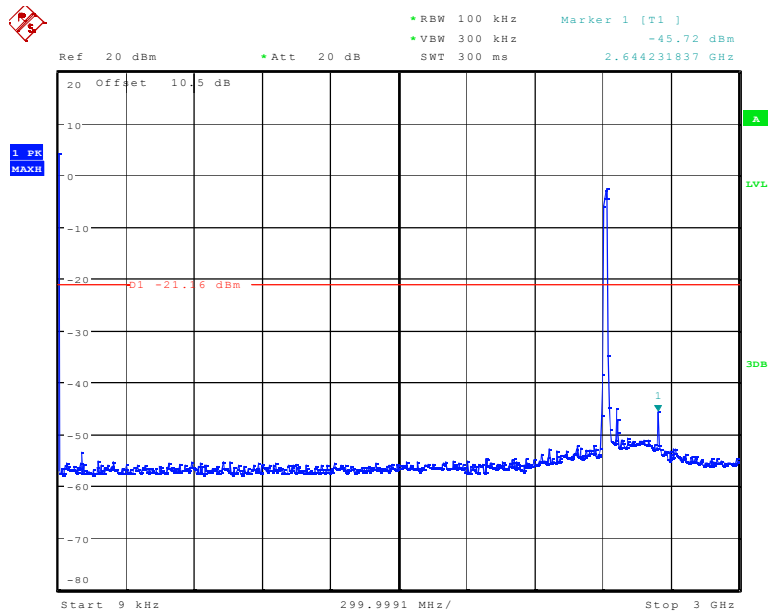
Configuration 1 - Mode 1



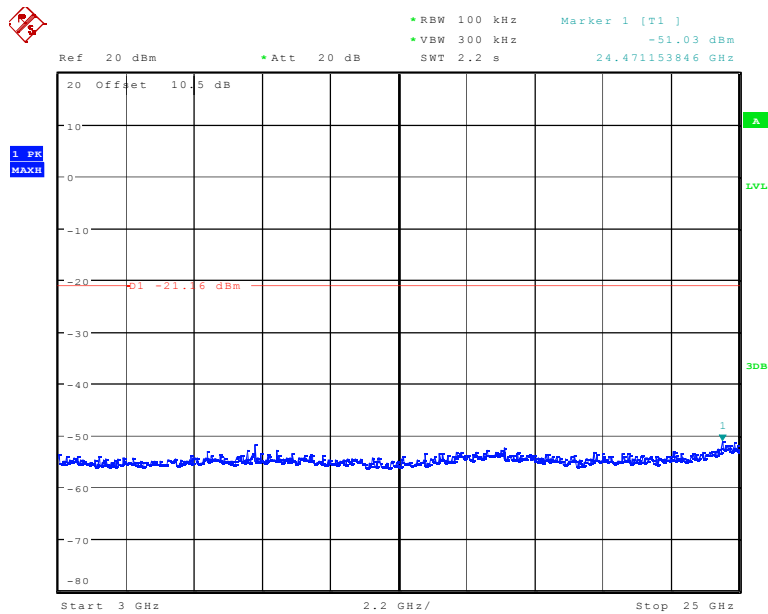
Date: 5.AUG.2015 15:04:58



Product Service



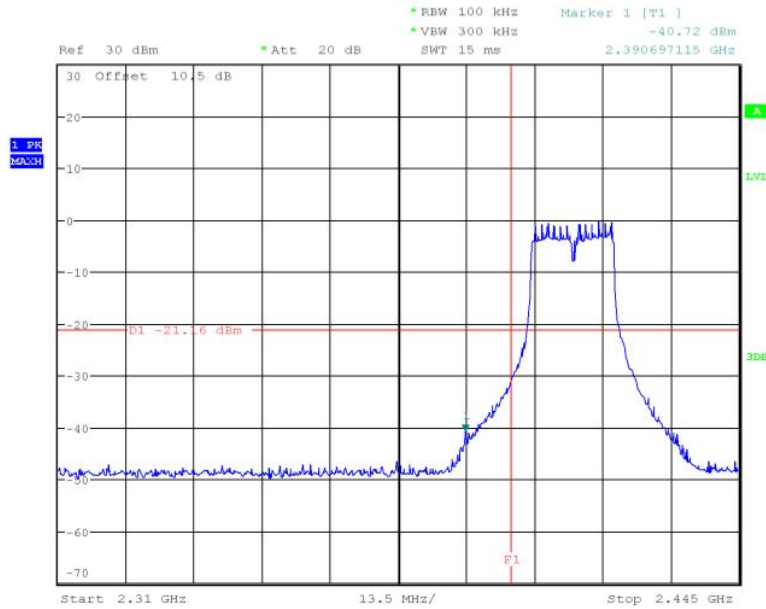
Date: 5.AUG.2015 15:07:02



Date: 5.AUG.2015 15:07:38



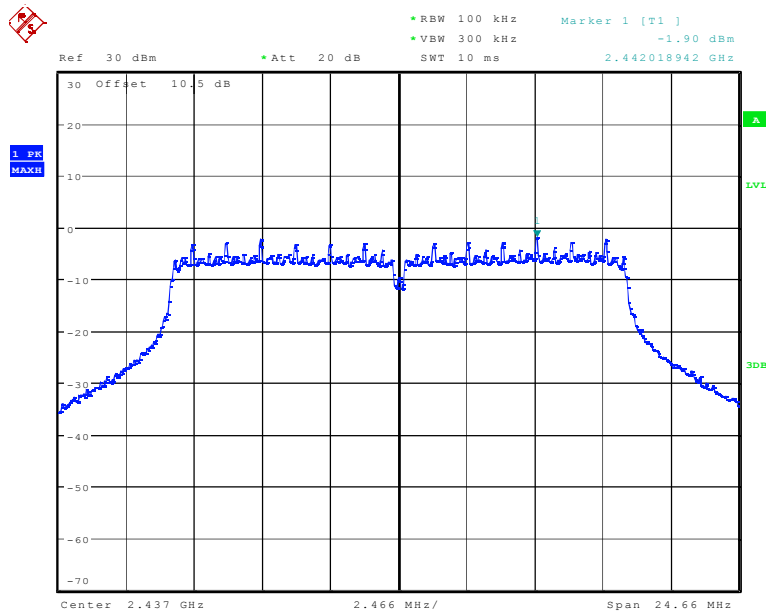
Product Service



Date: 5.AUG.2015 15:05:41

802.11g

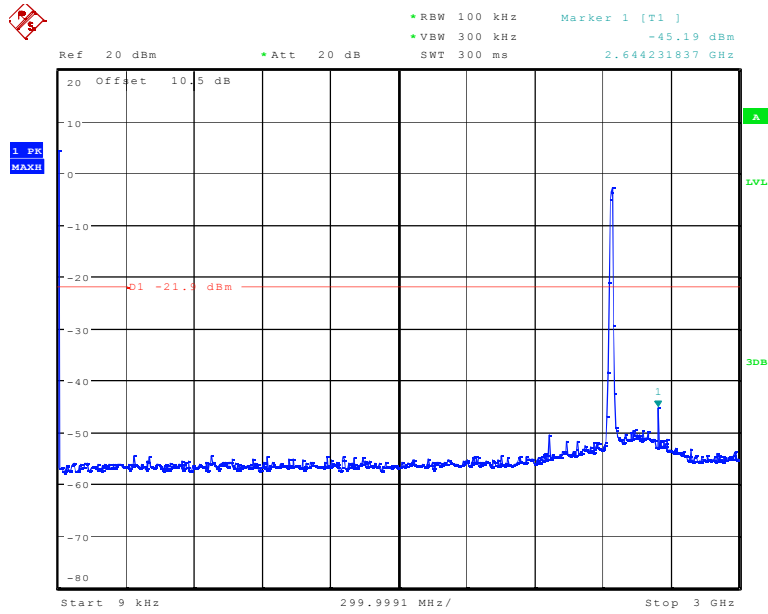
Configuration 1 - Mode 2



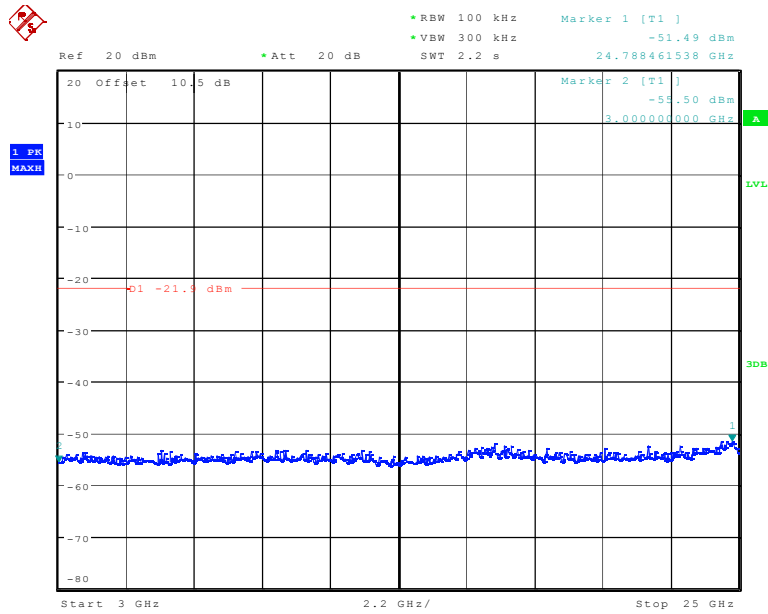
Date: 5.AUG.2015 15:01:27



Product Service



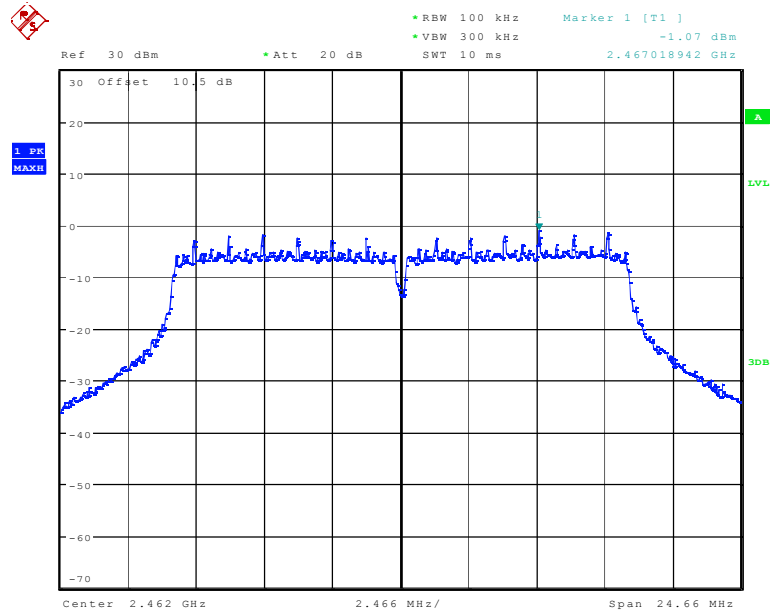
Date: 5.AUG.2015 15:21:59



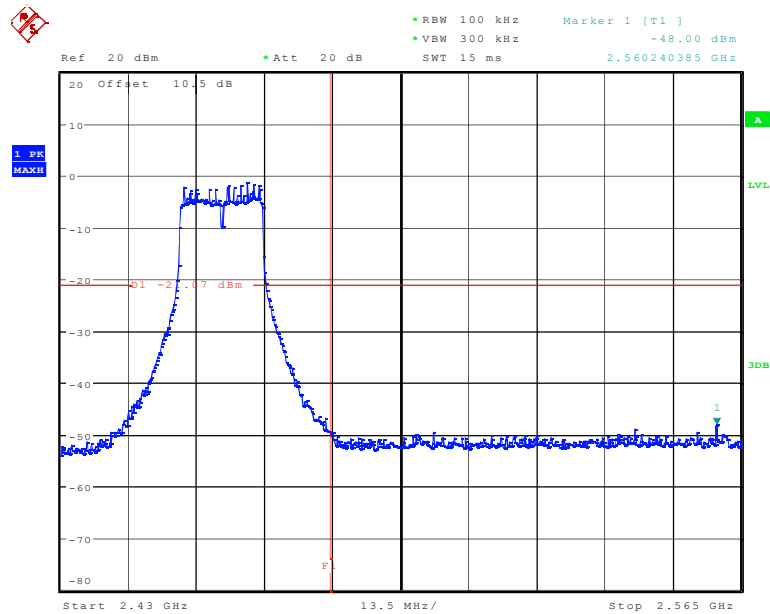
Date: 5.AUG.2015 15:04:10



Product Service

802.11gConfiguration 1 - Mode 3

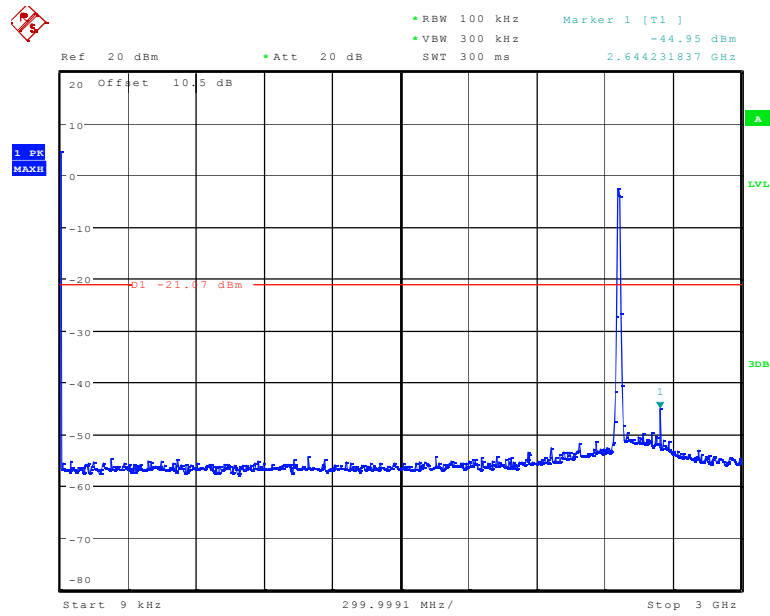
Date: 5.AUG.2015 15:13:57



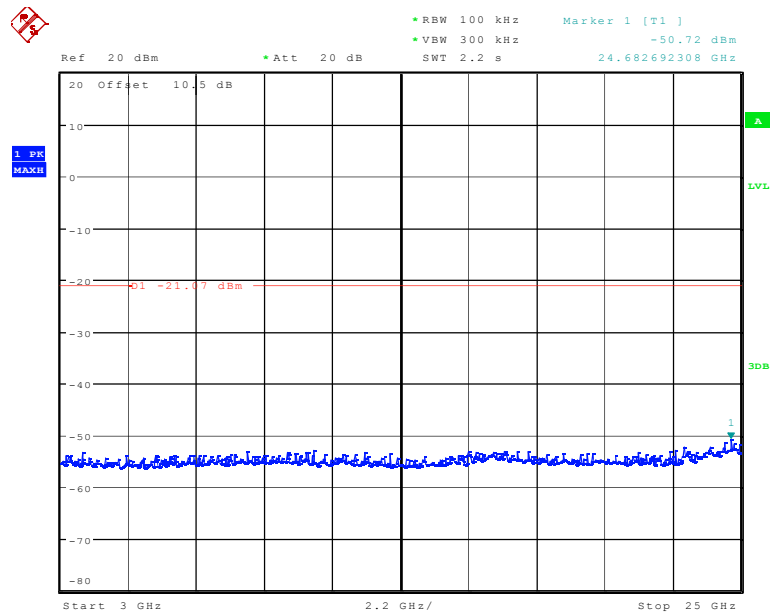
Date: 5.AUG.2015 15:16:47



Product Service



Date: 5.AUG.2015 15:15:41



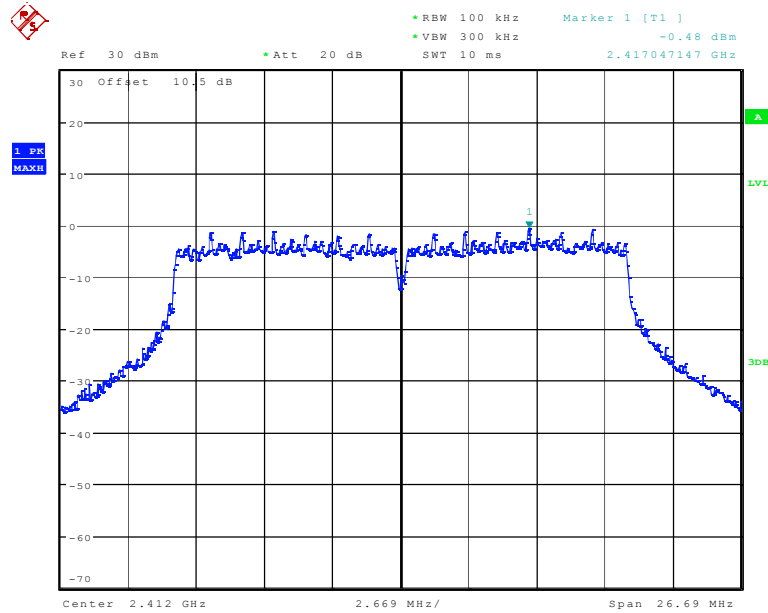
Date: 5.AUG.2015 15:16:10



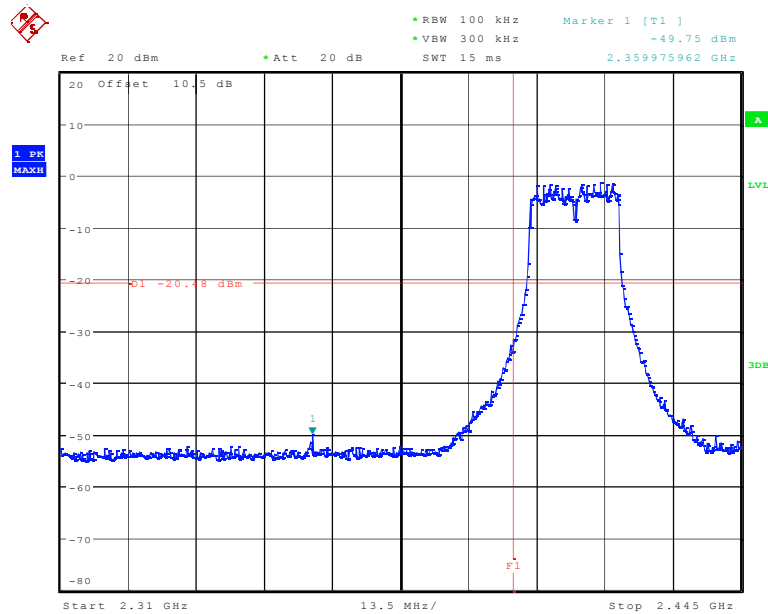
Product Service

802.11n(HT20)

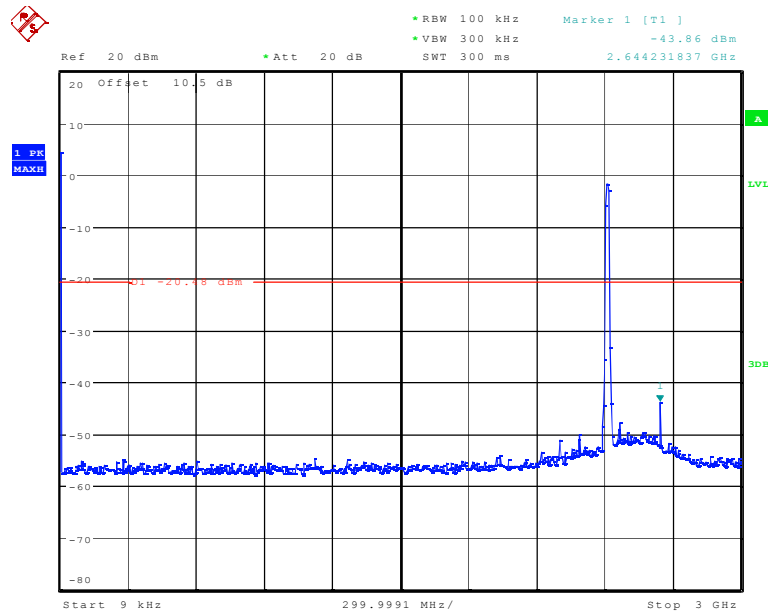
Configuration 1 - Mode 1



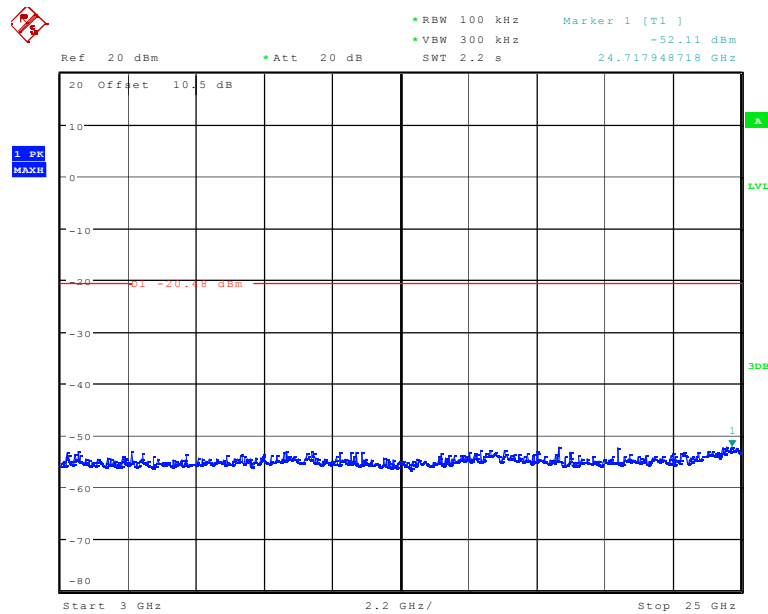
Date: 5.AUG.2015 15:29:50



Date: 5.AUG.2015 15:32:24



Date: 5.AUG.2015 15:30:47



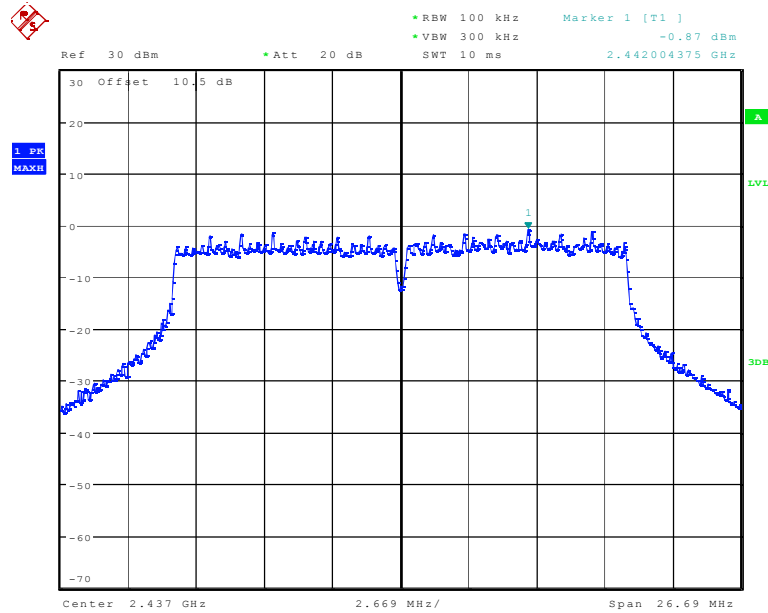
Date: 5.AUG.2015 15:31:23



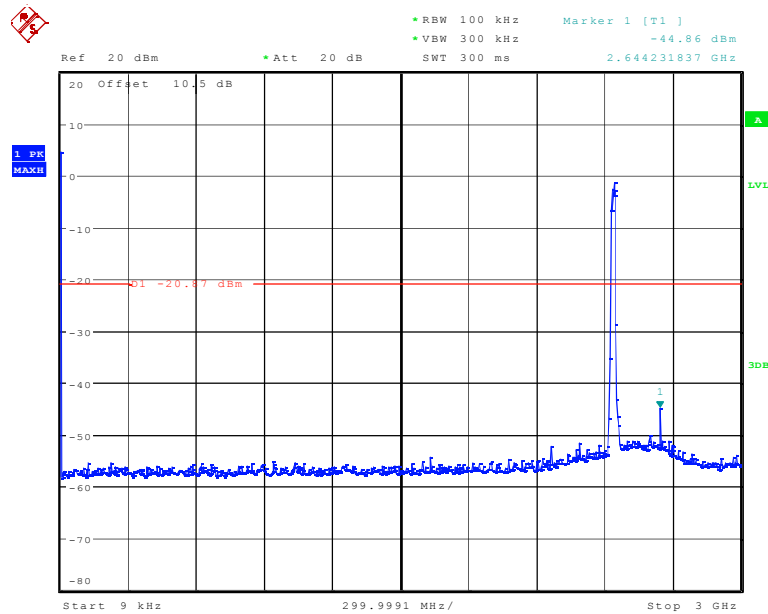
Product Service

802.11n(HT20)

Configuration 1 - Mode 2



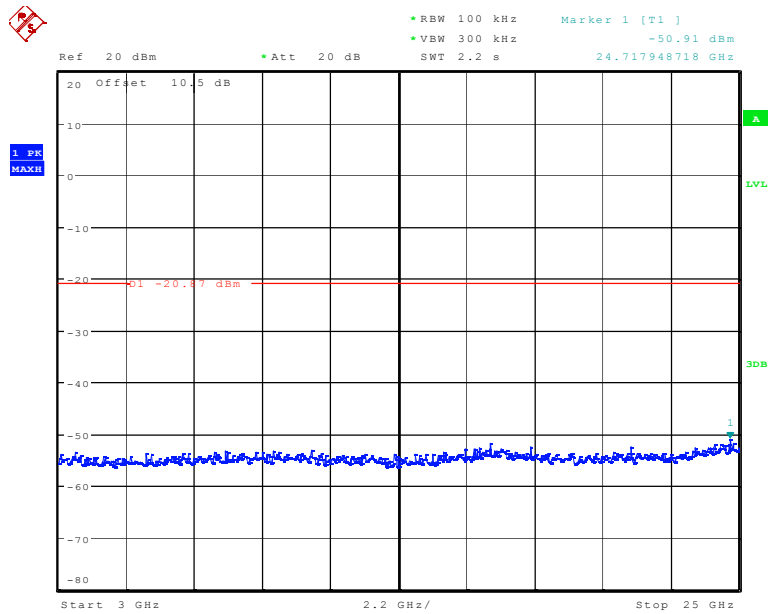
Date: 5.AUG.2015 15:43:30



Date: 5.AUG.2015 15:44:54



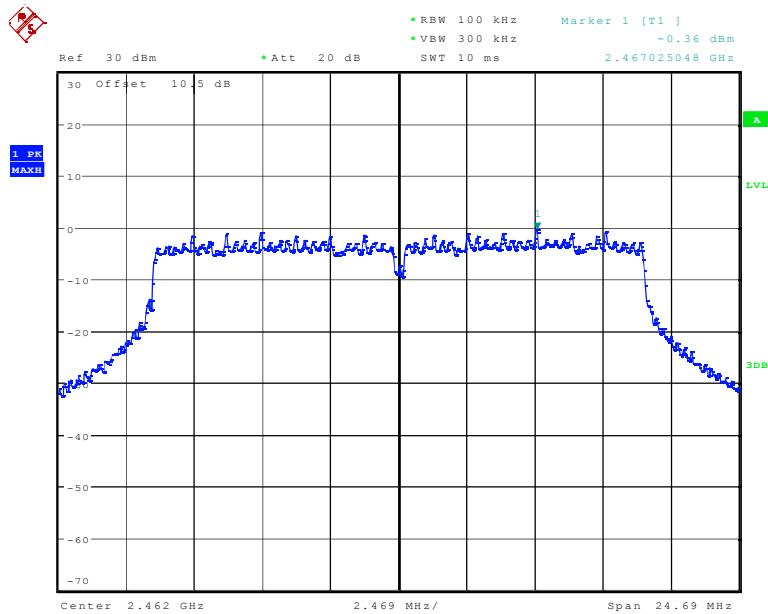
Product Service



Date: 5.AUG.2015 15:45:35

802.11n(HT20)

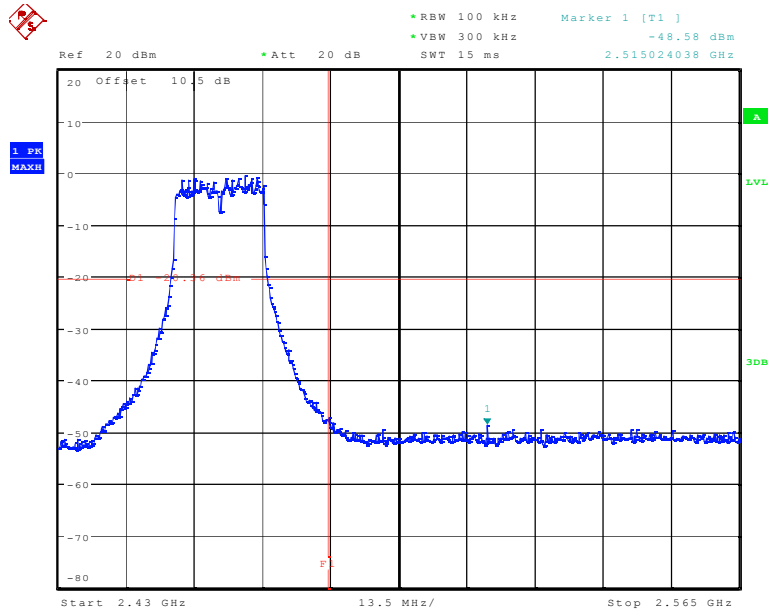
Configuration 1 - Mode 3



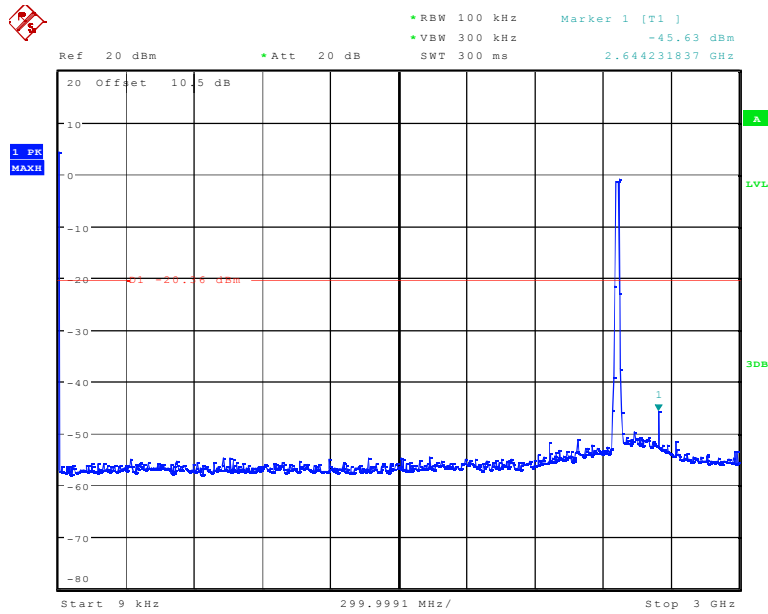
Date: 5.AUG.2015 15:39:13



Product Service



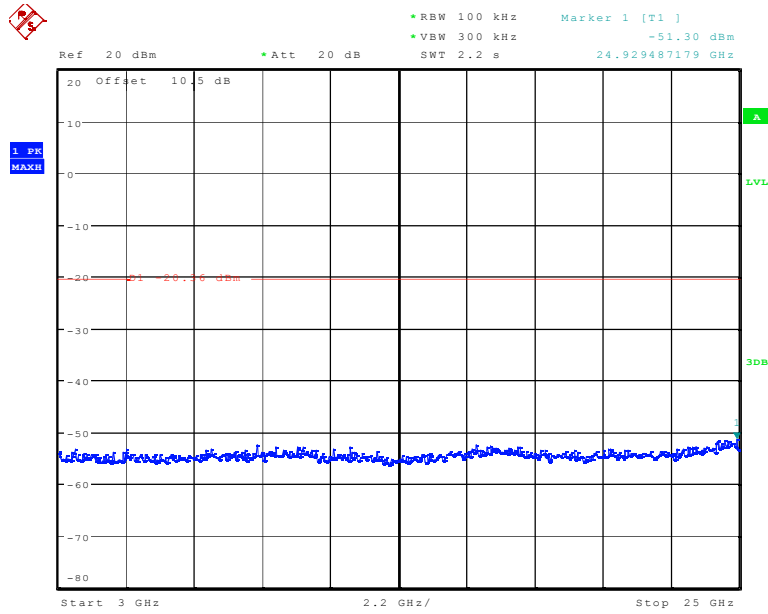
Date: 5.AUG.2015 15:41:49



Date: 5.AUG.2015 15:39:51



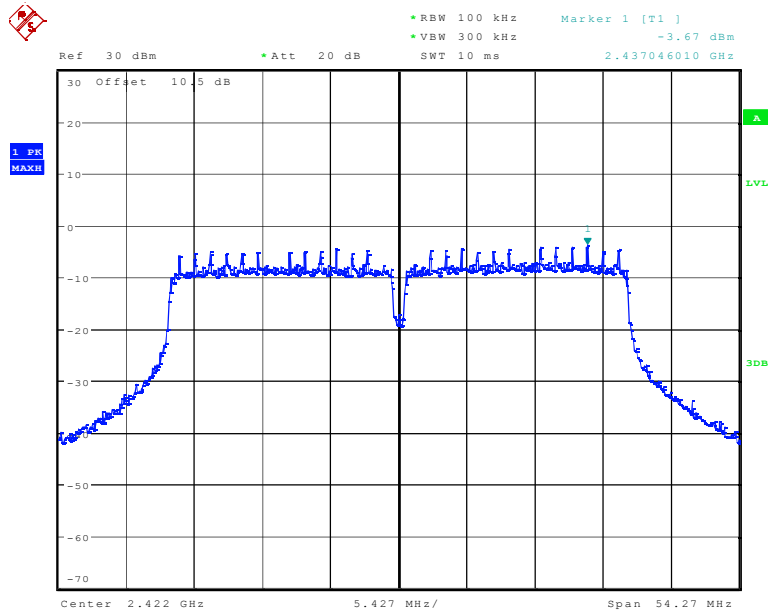
Product Service



Date: 5.AUG.2015 15:40:48

802.11n(HT40)

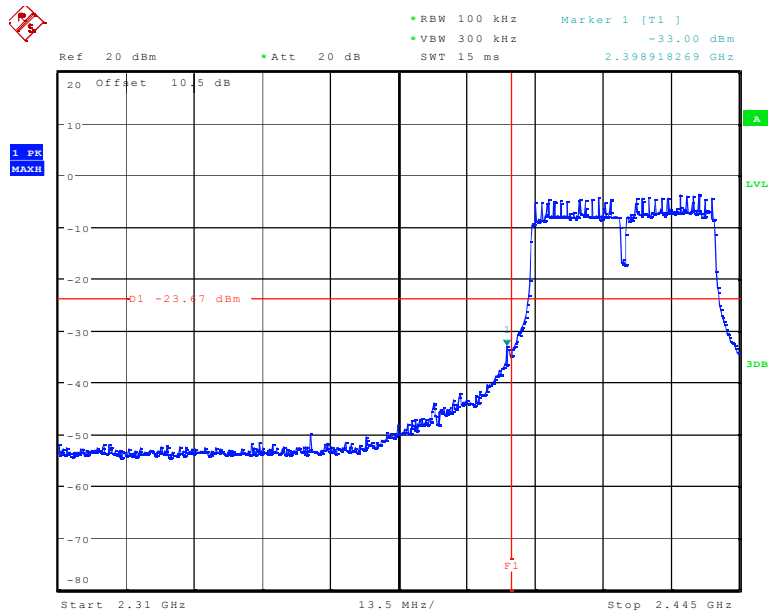
Configuration 1 - Mode 4



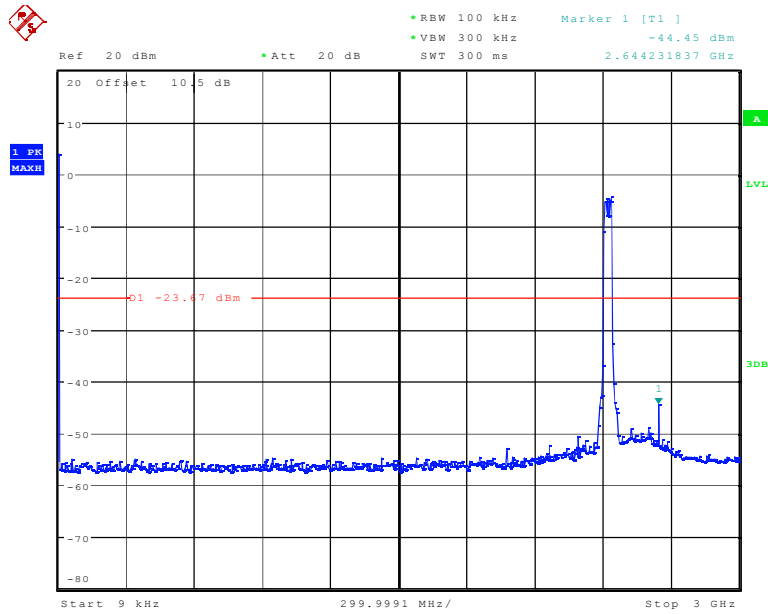
Date: 5.AUG.2015 16:21:12



Product Service



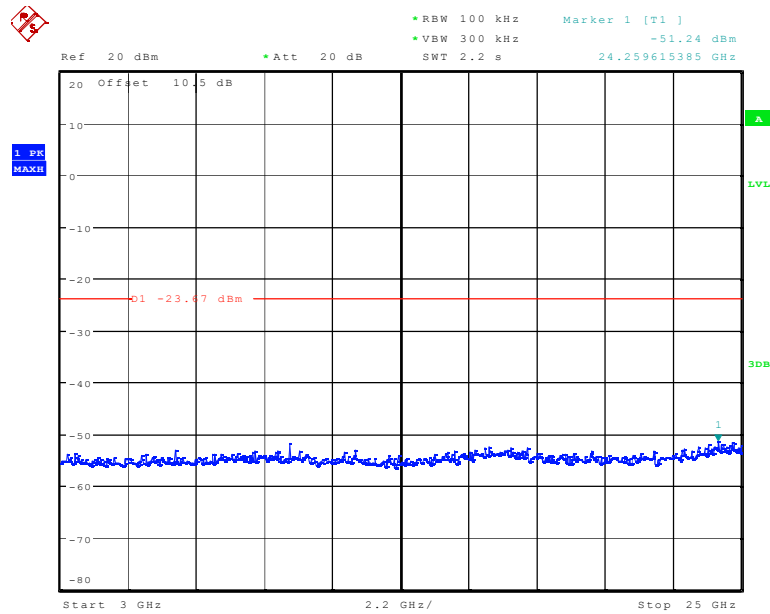
Date: 5.AUG.2015 16:25:40



Date: 5.AUG.2015 16:23:00



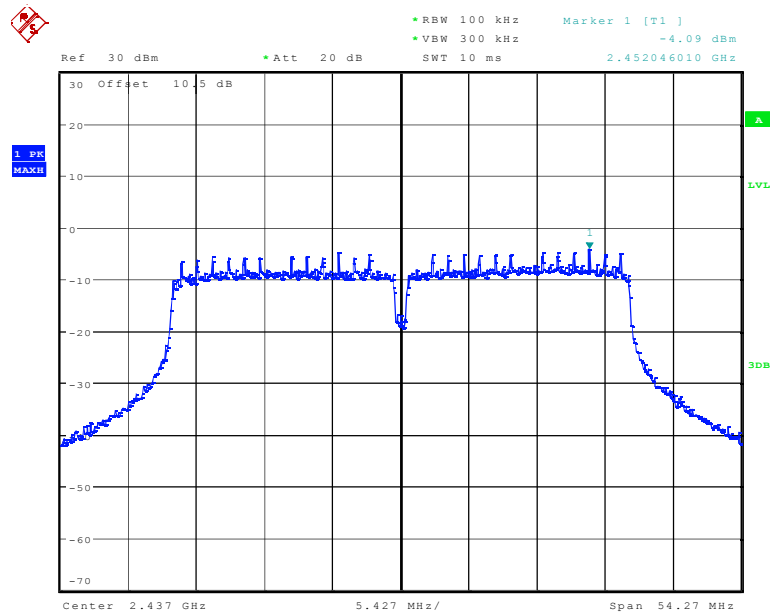
Product Service



Date: 5.AUG.2015 16:23:34

802.11n(HT40)

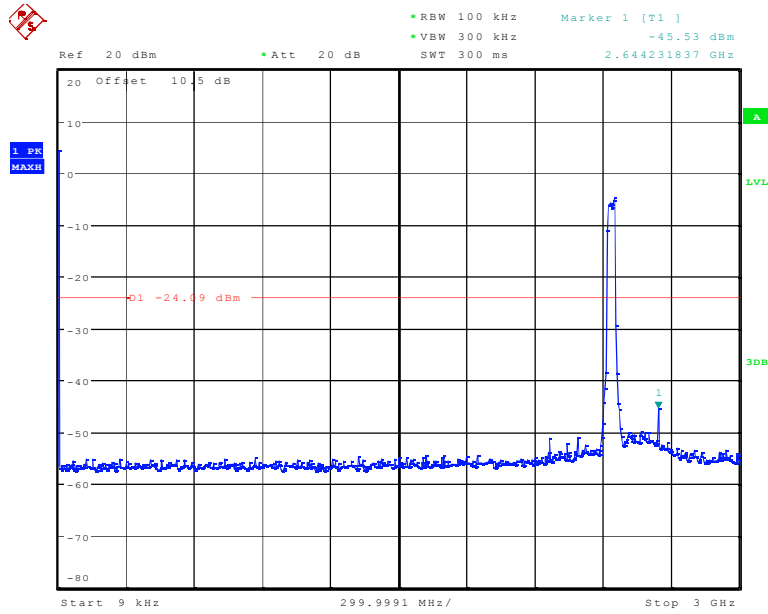
Configuration 1 - Mode 2



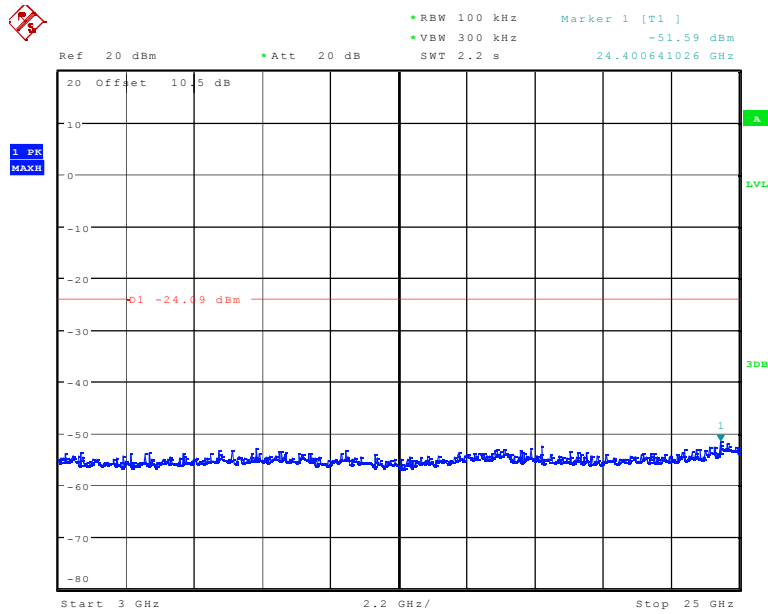
Date: 5.AUG.2015 16:01:34



Product Service



Date: 5.AUG.2015 16:02:26



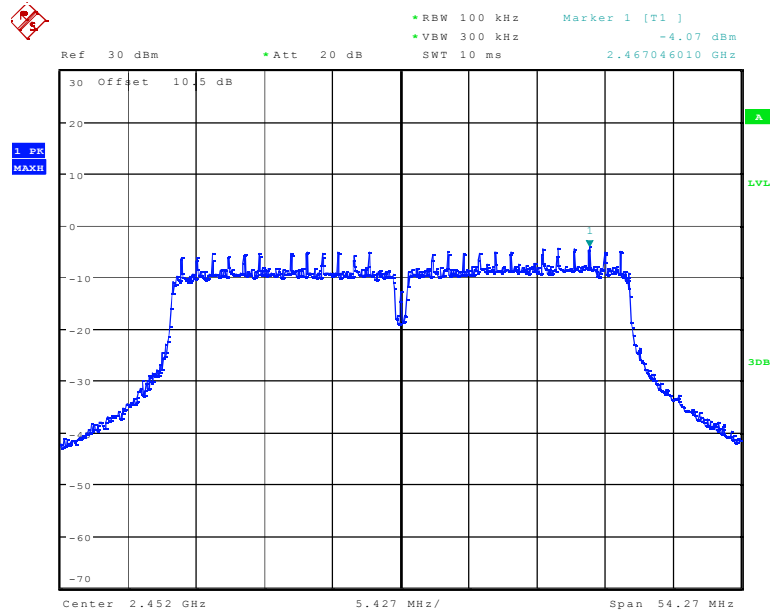
Date: 5.AUG.2015 16:02:49



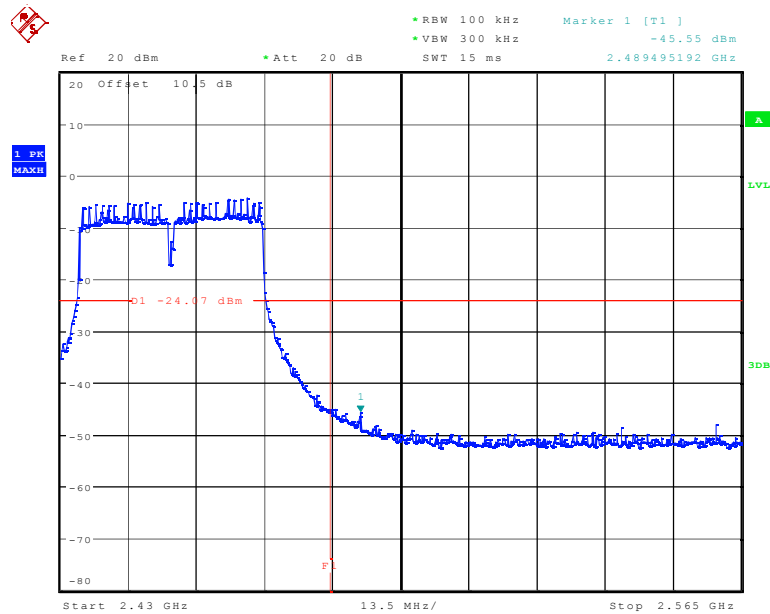
Product Service

802.11n(HT40)

Configuration 1 - Mode 5



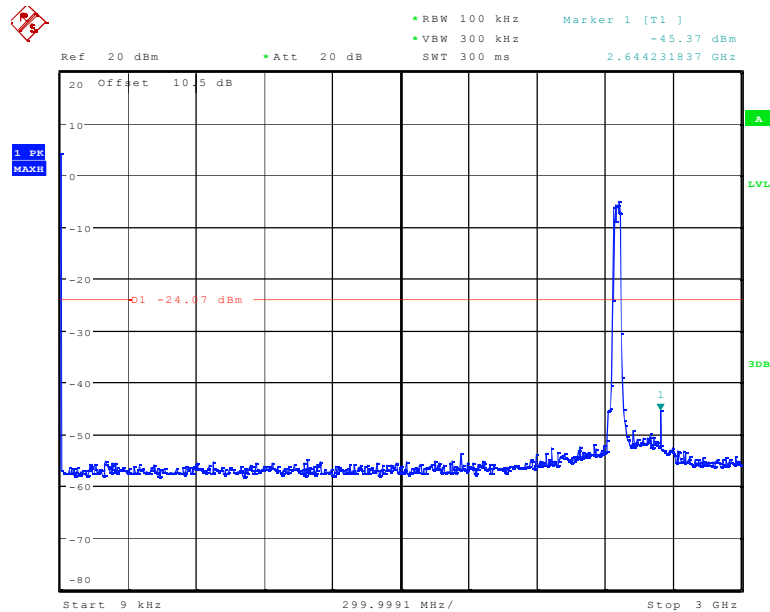
Date: 5.AUG.2015 16:04:38



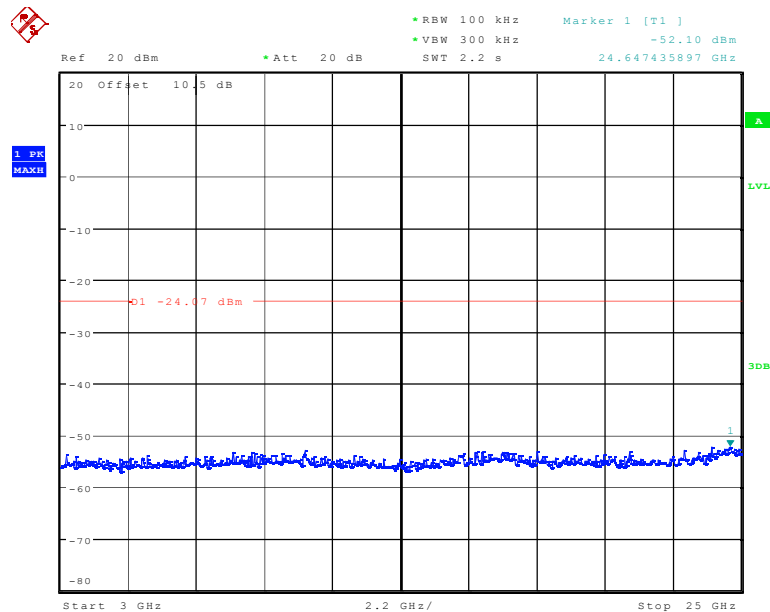
Date: 5.AUG.2015 16:06:15



Product Service



Date: 5.AUG.2015 16:05:13



Date: 5.AUG.2015 16:05:36

Remarks

The test results of EUT did not exceed the limit at all measured frequencies.



Product Service

2.6 RADIATED EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.205, 15.209, 15.247(d)

2.6.2 Equipment Under Test

DW33D, S/N: RDW33DI0121150400012

2.6.3 Date of Test and Modification State

21 and 22 July 2015 – Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Method and Operating Modes

The test was applied in accordance with the requirements in clause 15.247 of FCC CFR 47 Part 15 Subpart C.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

Emissions identified within the range 30MHz – 26.5GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 26.5GHz, the measurement was performed with a resolution bandwidth of 1MHz.

The measurements were performed at a 3m distance unless otherwise stated.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5

2.6.6 Environmental Conditions

Ambient Temperature 23.9 - 24.5°C

Relative Humidity 53.0 - 56.0%



2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 Radiated Spurious Emissions.

Note: Only the worst test results plots have been included as all of the emissions are greater than 10dB below the limit. A set of plots have been included to show the measurement system noise floor.

The test results are shown below.

802.11b

Configuration 1 - Mode 1

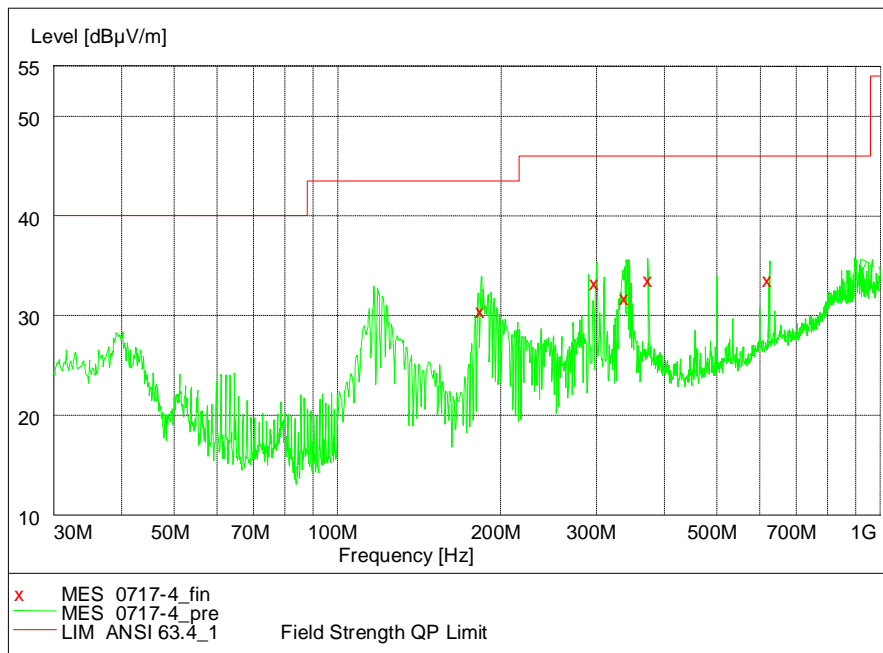
No emissions were detected within 10dB of the limit.

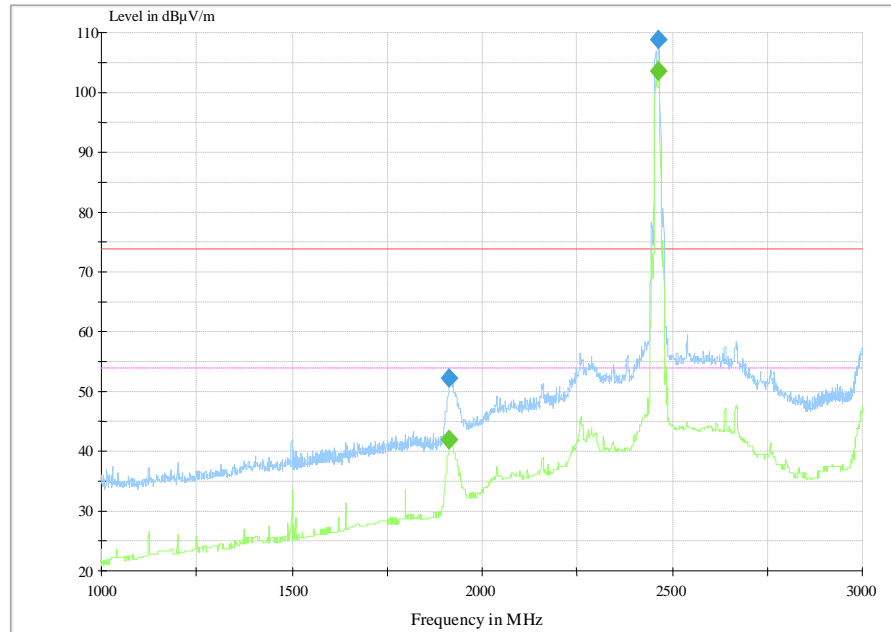
Configuration 1 - Mode 2

No emissions were detected within 10dB of the limit.

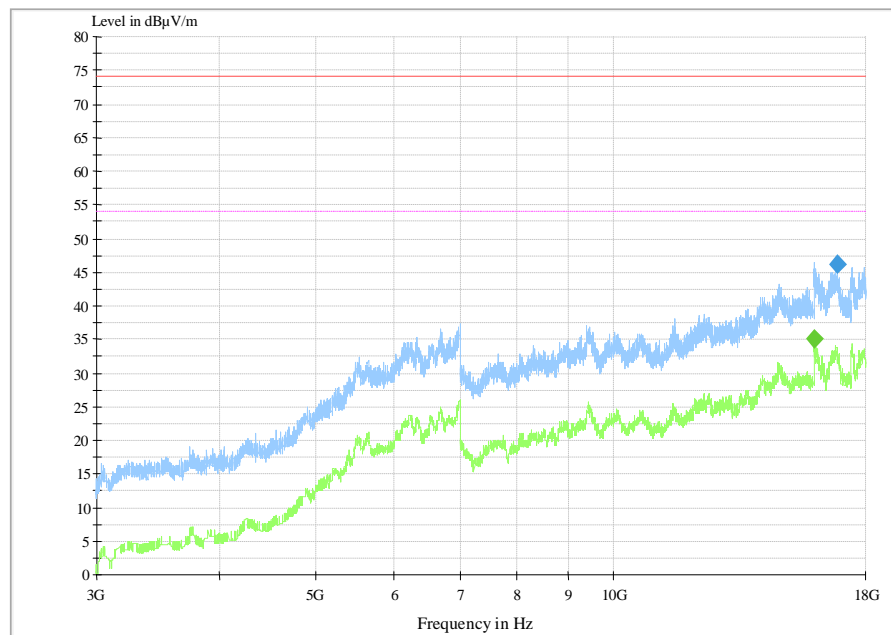
Configuration 1 - Mode 3

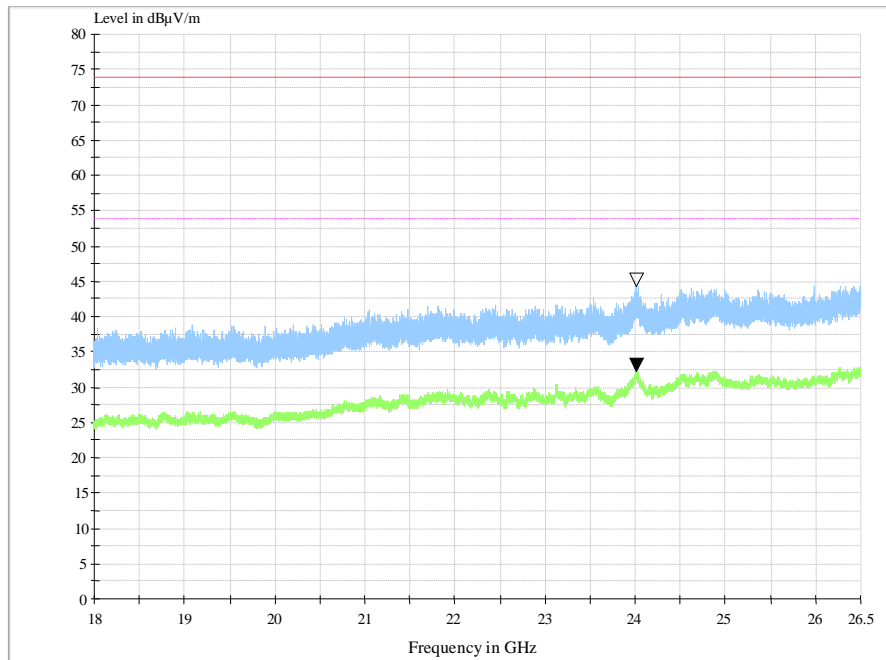
30MHz – 1GHz



1GHz – 3GHz

Note: The emission beyond the limit is the operating frequency.

3GHz – 18GHz

18GHz – 26.5GHz802.11gConfiguration 1 - Mode 2

No emissions were detected within 10dB of the limit.

802.11n(HT20)Configuration 1 - Mode 2

No emissions were detected within 10dB of the limit.

802.11n(HT40)Configuration 1 - Mode 2

No emissions were detected within 10dB of the limit.

Frequency range	Limit
30 MHz to 88 MHz	40dBμV/m
88 MHz to 216 MHz	43.5dBμV/m
216 MHz to 960 MHz	46dBμV/m
>960MHz	Average:54dBμV/m, Peak:74dBμV/m

Remarks

The test result of EUT did not exceed the limit during the test.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Section 2.1 Conducted Emission					
EMI Receiver	Rohde & Schwarz	ESIB7	100280	12	15-Aug-2016
LISN	AFJ	LS16C	16011306281	12	01-Apr-2016
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Section 2.2, 2.3 2.4 and 2.5 – 6dB Bandwidth, Maximum Conducted Output Power-Peak, Band Edge Emissions and Conducted Spurious Emissions.					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101065	12	19-Aug-2016
Power Meter	Agilent	E9327A	MY52420006	12	29-Feb-2016
Power Sensor	Agilent	E4416A	MY52370013	12	29-Feb-2016
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Section 2.5 – Radiated Spurious Emissions					
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2016
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2016
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2016
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2016
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18mx16.88 mx 9.60m	-	12	19-Aug-2016
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015

TU - Traceability Unscheduled.



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Discipline	Frequency / Parameter	MU
Conducted RF Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	QP detector	3.34 dB
	AV detector	3.39 dB
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10 ⁶		

* In accordance with CISPR 16-4



Product Service

SECTION 4

DISCLAIMERS AND COPYRIGHT



Product Service

4.1 DISCLAIMERS AND COPYRIGHT

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