TEST REPORT

Report Number: 102971715MPK-001
Project Number: G102971715
May 26, 2017

Testing performed on the
M445-403-01-NAA-4
Model: M400 WIFI/BT
FCC ID: B32M400WIFIBT
IC: 787C-M400WIFIBT

to

FCC Part 15 Subpart C (15.247)
Industry Canada RSS-247, Issue 2

For

Verifone, Inc.

Test Performed by:	Test Authorized by:
Intertek	Verifone, Inc.
1365 Adams Court	1400 W Stanford Ranch Rd.
Menlo Park, CA 94025 USA	Rocklin, CA 95765 USA

Prepared by: _____ **Date:** May 26, 2017
Anderson Soungpanya

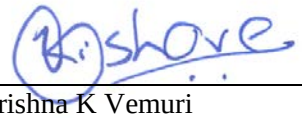
Reviewed by: _____ **Date:** May 26, 2017
Krishna K Vemuri

Report No. 102971715MPK-001

Equipment Under Test:	M445-403-01-NAA-4
Trade Name:	Verifone, Inc
Model Number:	M400 WIFI/BT
Applicant:	Verifone, Inc.
Contact:	Edwin Mandapat
Address:	Verifone, Inc. 1400 W Stanford Ranch Rd. Rocklin, CA 95765
Country	USA
Tel. Number:	(916) 630-0550
Email:	Edwin_M1@Verifone.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) Industry Canada RSS-247 Issue 2
Date of Test:	April 12-May 26, 2017

We attest to the accuracy of this report:

Anderson Soungpanya
Project Engineer



Krishna K Vemuri
Engineering Team Lead

TABLE OF CONTENTS

1.0 Summary of Tests

Test	Reference FCC	Reference Industry Canada	Result
RF Output Power	15.247(b)(3)	RSS-247, 5.4	Complies
6 dB Bandwidth	15.247(a)(2)	RSS-247, 5.2	Complies
Power Density	15.247(e)	RSS-247, 5.2	Complies
Out of Band Antenna Conducted Emission	15.247(d)	RSS-247, 5.5	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	RSS-247, 5.5	Complies
AC Line Conducted Emission	15.207	RSS-GEN	Complies
Antenna Requirement	15.203	RSS-GEN	Complies (Unique Connector & Internal Antenna)
RF Exposure	15.247(i), 2.1093(d)	RSS-102	Complies

EUT receive date: April 07, 2017

EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.

Test start date: April 12, 2017

Test completion date: May 26, 2017

The test results in this report pertain only to the item tested.

2.0 General Information

2.1 Product Description

Verifone, Inc. supplied the following description of the EUT:

The M400 WIFI/BT is an Electronic Payment/POS Terminal for Retail.

For more information, see user's manual provided by the manufacturer.

This test report covers only the 2.4GHz WiFi radio.

Information about the WiFi radio is presented below:

The EUT supports a wide range of data rates in the 2.4GHz band:
IEEE 802.11b
IEEE 802.11g
IEEE 802.11n

Applicant	Verifone, Inc.
Model Number	M400 WIFI/BT
FCC Identifier	B32M400WIFIBT
IC Identifier	787C-M400WIFIBT
Modulation Technique	DSSS (BPSK, QPSK, CCK), OFDM (BPSK, QPSK, 16QAM, 64QAM)
Rated RF Output	802.11b: 15.22 dBm 802.11g: 12.16 dBm 802.11n: 11.92 dBm
Frequency Range	2412 – 2462 MHz, 802.11b/g/n
Type of modulation	BPSK, QPSK, 16QAM, 64QAM
Number of Channel(s)	11 for 802.11b/g/n
Antenna(s) & Gain	Internal Antenna, 1.48 dBi peak gain
Applicant Name & Address	Verifone, Inc. 1400 W Stanford Ranch Rd. Rocklin, CA 95765 USA

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

Antenna conducted measurements were performed according to the FCC documents “Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247” (KDB 558074 D01 DTS MEAS GUIDANCE V04), and RSS-247, RSS-GEN, and

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10: 2013. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

2.4 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn’t take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)			
	0.15 MHz – 30MHz	30 – 200 MHz	200 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	4.6	5.1 dB
AC mains conducted emissions	2.1 dB	-	-	-

3.0 System Test Configuration

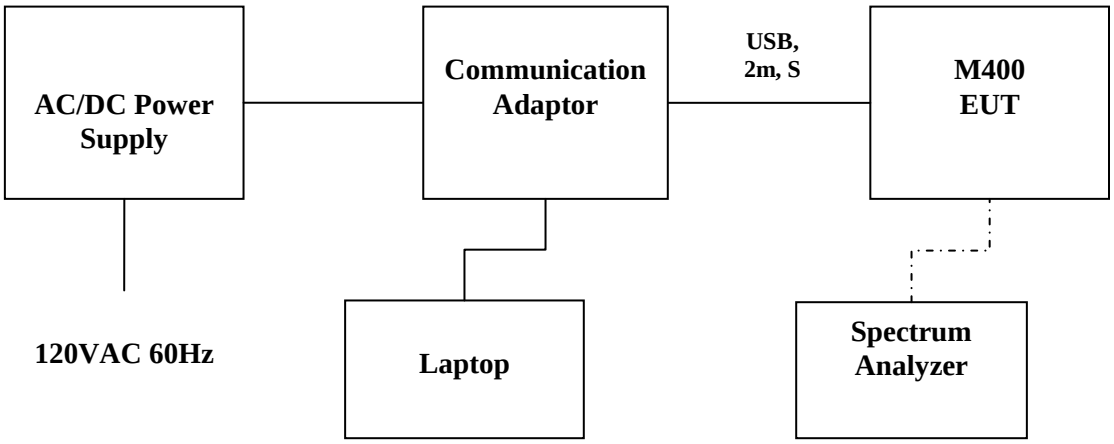
3.1 Support Equipment and description

Description	Manufacturer	Model No./ Part No.
Laptop	HP	EliteBook 8470p
Communication Adapter	Verifone	NA
AC/DC Power Adapter	I.T.E Power Supply	AU112106u

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	**Manufacturer**	**Model Number**	**Serial Number**
Electronic Payment Terminal	Verifone	M400	401-148-349

Antenna was removed and co-axial connector with a cable was installed for Conducted Measurements.



S = Shielded **U** = Unshielded	**F** = With Ferrite **M** = Meter

3.3 Justification

Preliminary testing was performed for all modulation/data rate modes. The worse-case data rate with highest power and widest spectrum were selected for final measurements:

CCK 1 Mbps – for 802.11b
OFDM 6 Mbps – for 802.11g
OFDM MCS0 – for 802.11n

Unless otherwise stated in this report, measurements made for Power Density, Bandwidth, Conducted Spurious, Radiated Spurious (Cabinet Radiation) were made with the worst case power setting (mid channel power).

3.4 Mode of Operation During Test

During transmitter testing, the transmitter was setup to transmit continuously using the maximum RF power setting provided by the manufacturers via test scripts. Their corresponding output power in dBm can be found in section 4.2 of this report.

3.5 Modifications Required for Compliance

No modifications were made by the manufacturer or Intertek to the EUT in order to bring the EUT into compliance.

3.6 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

4.0 Measurement Results

4.1 6-dB Bandwidth and 99% Occupied Bandwidth
FCC Rule: 15.247(a)(2); RSS-247 A8.2 and RSS-GEN;

4.1.1 Requirement

The minimum 6-dB bandwidth shall be at least 500 kHz

4.1.2 Procedure

A spectrum analyzer was connected to the antenna port of the transmitter.

For FCC 6dB Channel Bandwidth the Procedure described in the FCC Publication 558074 D01 DTS Meas Guidance v04 was used to determine the DTS occupied bandwidth. Section 8.1 Option 1 was used.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

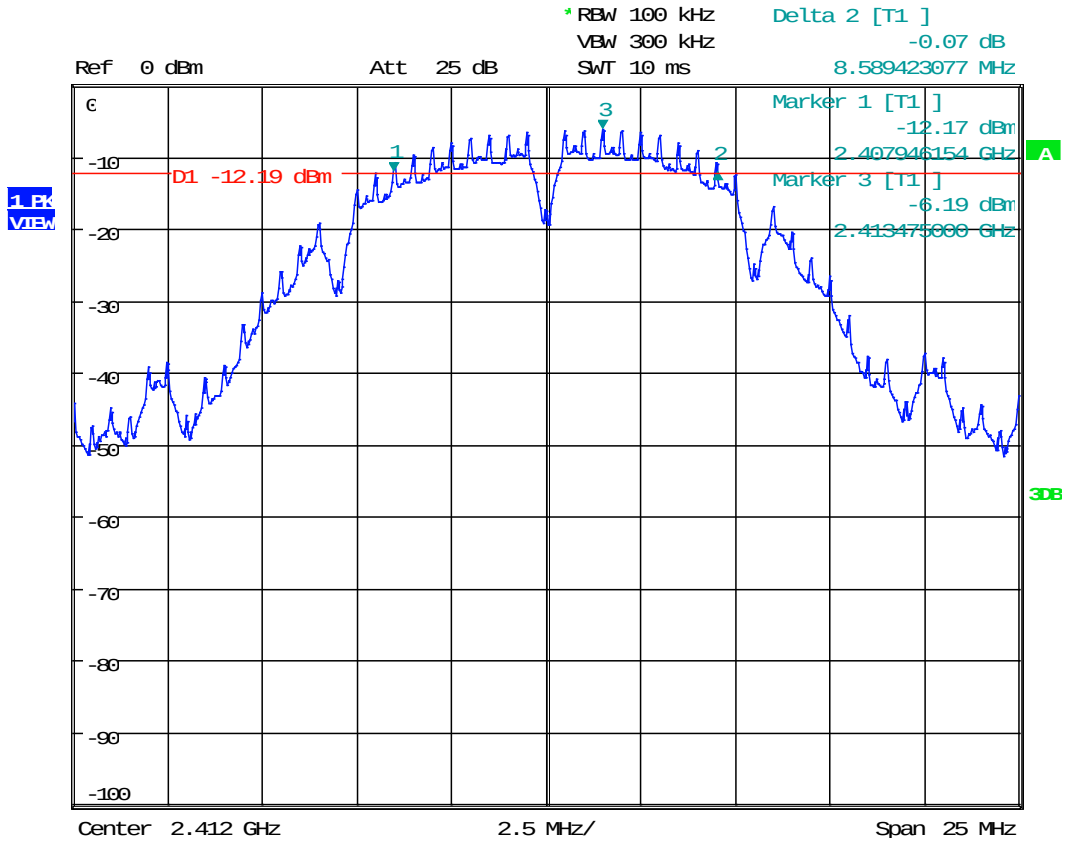
For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer. The resolution bandwidth is set to 1% of the selected span as is without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Test Date:	April 12 & 18, 2017

4.1.3 Test Result

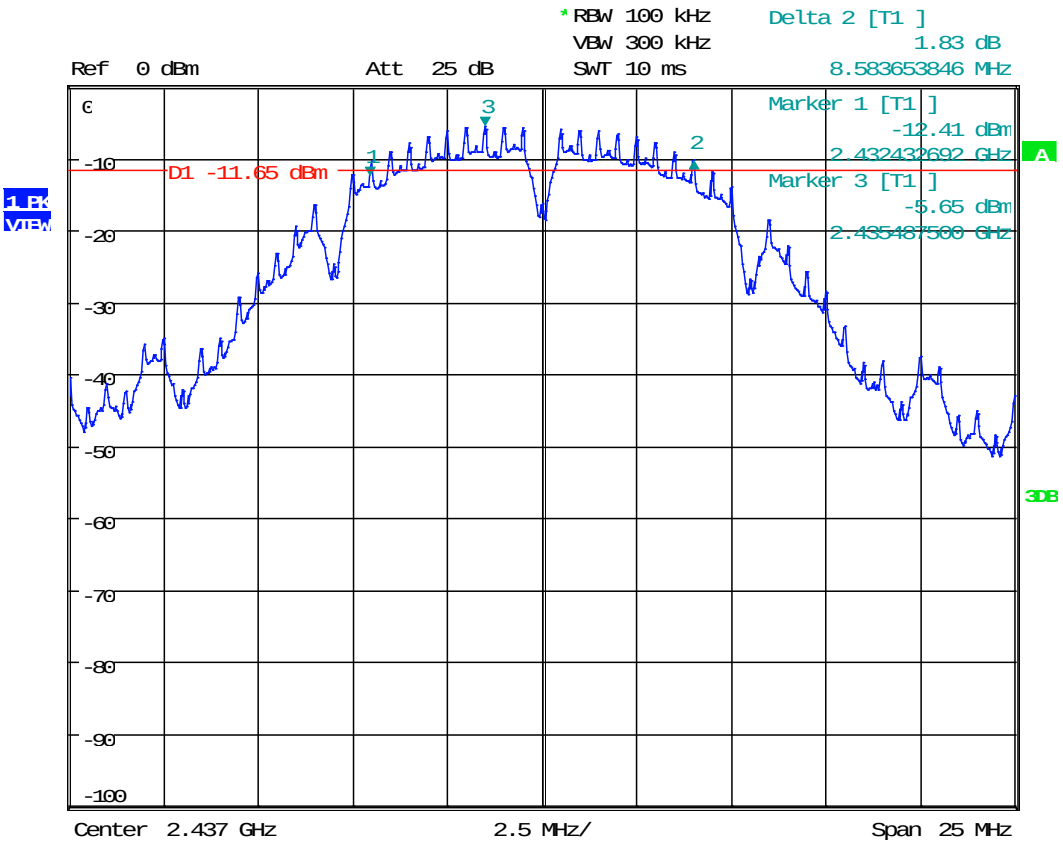
Frequency MHz	Ch.	Frequency MHz	6 dB FCC Bandwidth, MHz	Plot #	99% Bandwidth, MHz	Plot #
802.11b	1	2412	8.589	1.1	12.288	1.10
	6	2437	8.584	1.2	12.375	1.11
	11	2462	8.103	1.3	11.788	1.12
802.11g	1	2412	15.769	1.4	17.325	1.13
	6	2437	16.327	1.5	17.460	1.14
	11	2462	15.699	1.6	16.755	1.15
802.11n	1	2412	16.346	1.7	18.300	1.16
	6	2437	17.163	1.8	18.375	1.17
	11	2462	16.058	1.9	17.910	1.18

Plot 1.1 – 6dB Bandwidth (FCC)



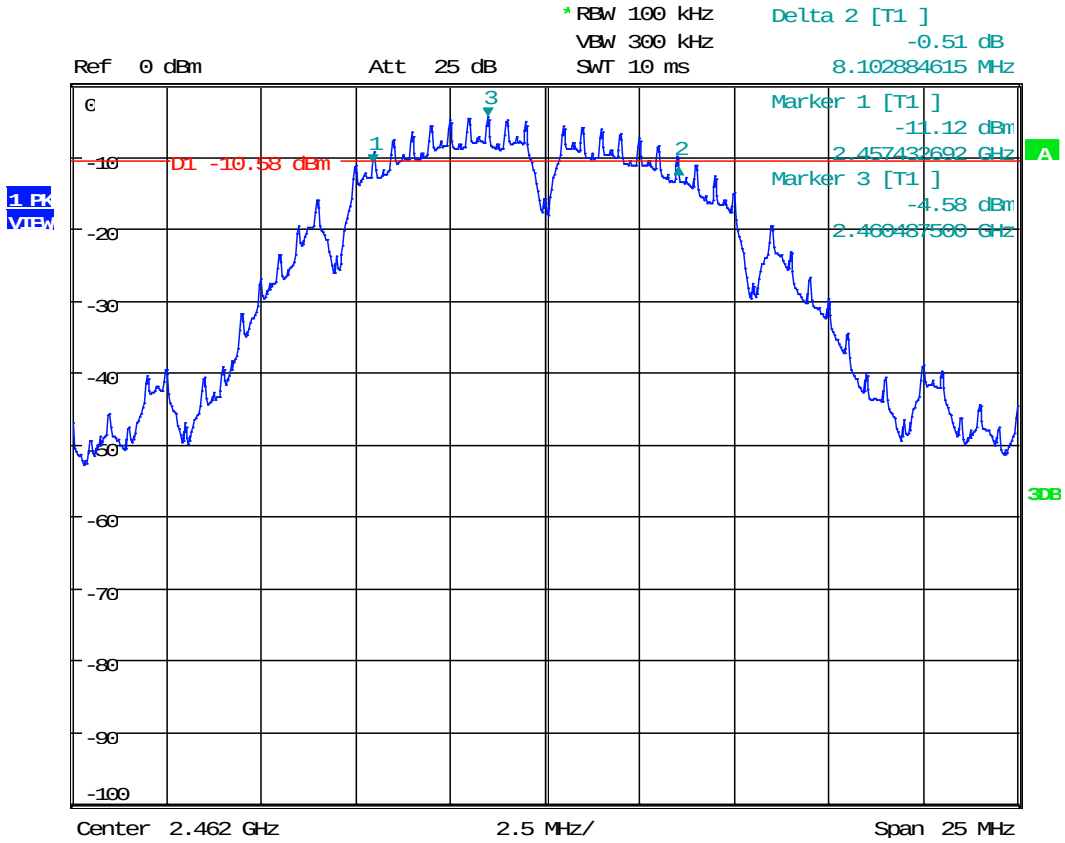
Date: 18.APR.2017 06:49:53

Plot 1.2 – 6dB Bandwidth (FCC)



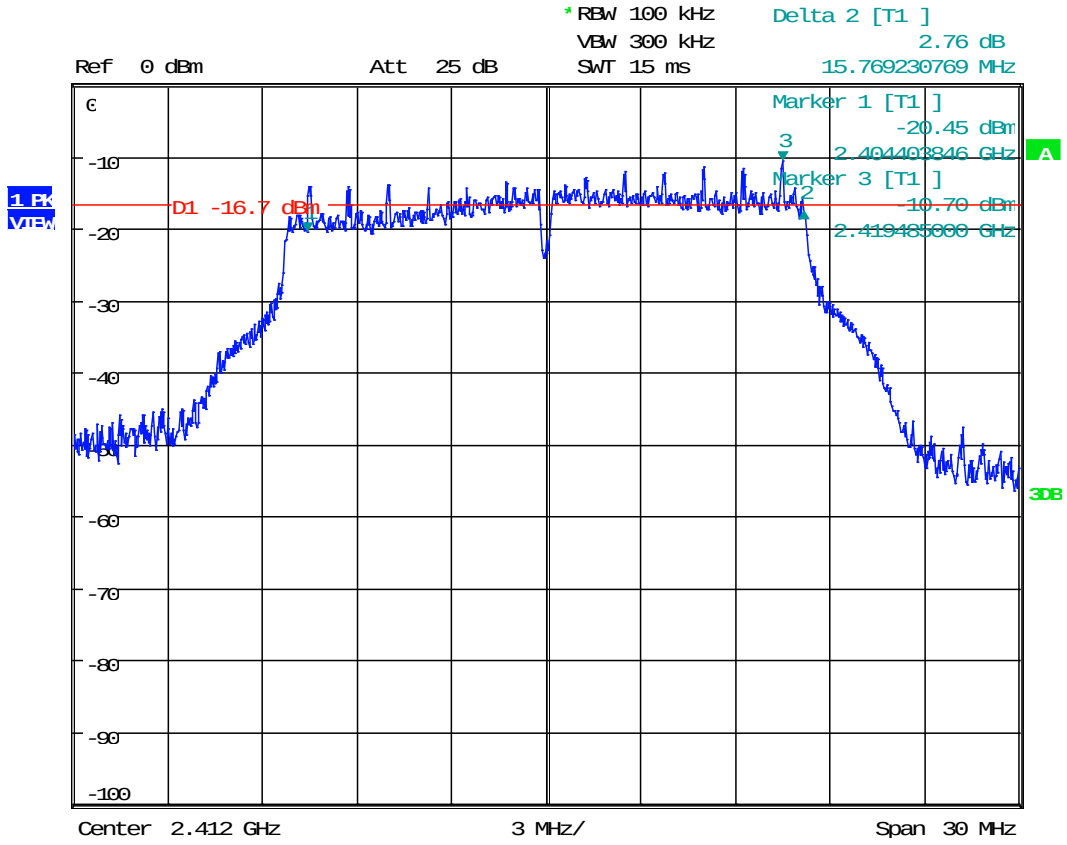
Date: 18.APR.2017 07:26:15

Plot 1 3 – 6dB Bandwidth (FCC)



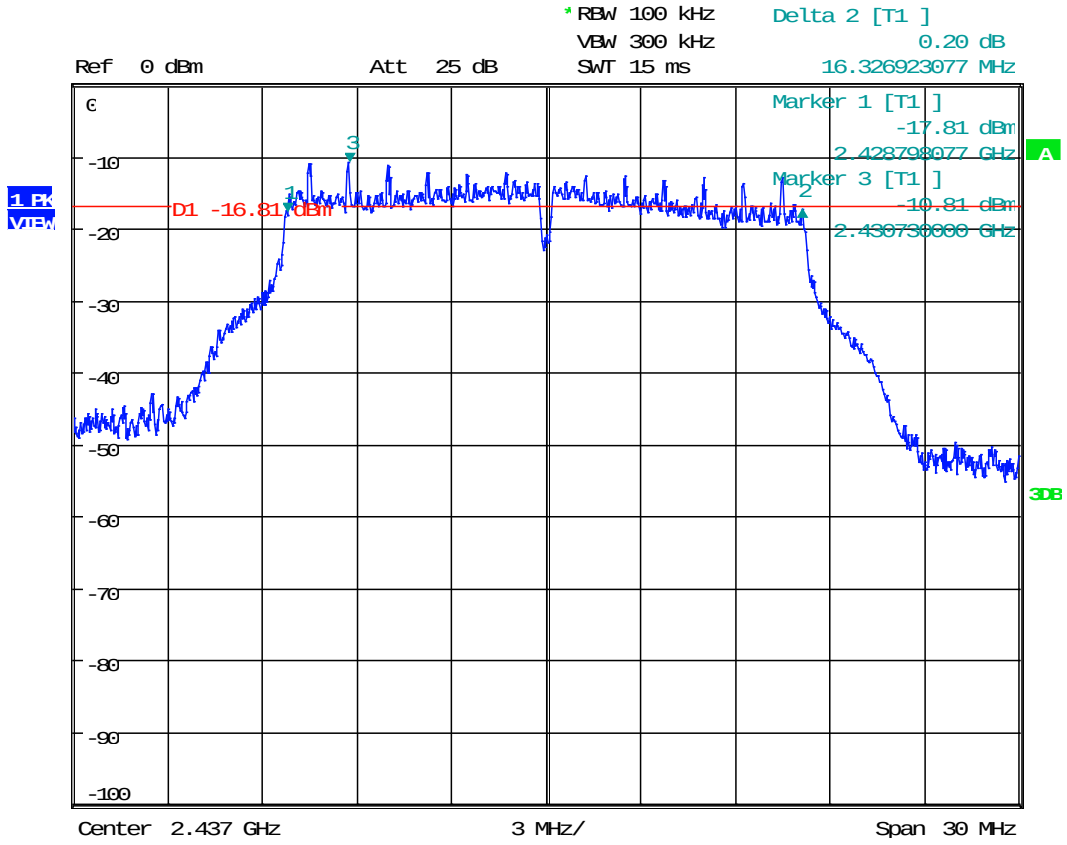
Date: 18.APR.2017 07:54:51

Plot 1.4 – 6dB Bandwidth (FCC)



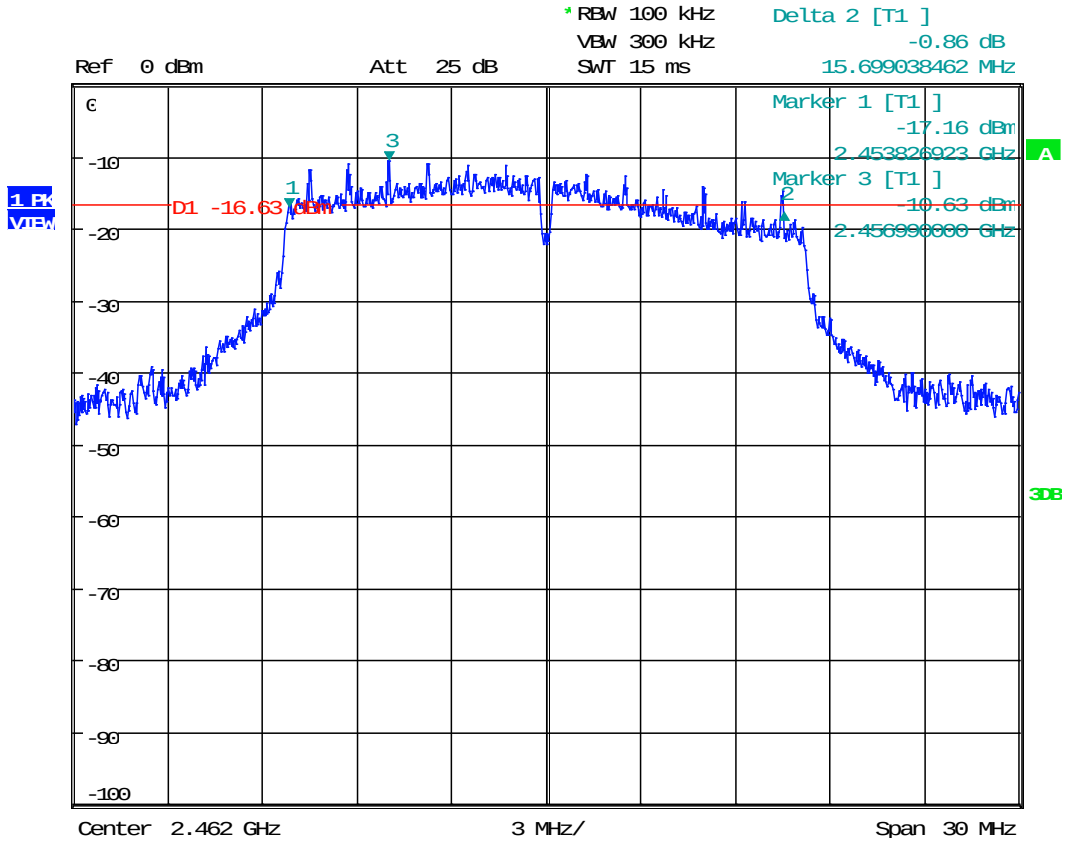
Date: 18.APR.2017 08:00:15

Plot 1.5 – 6dB Bandwidth (FCC)



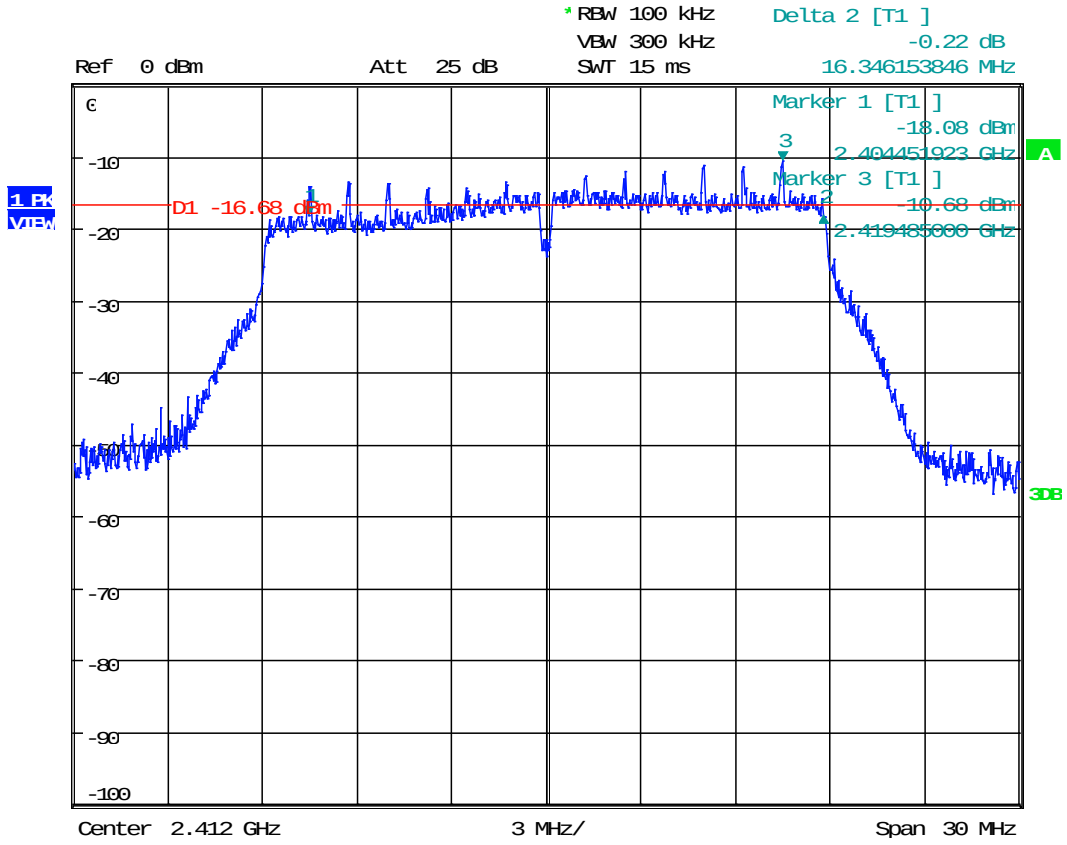
Date: 18.APR.2017 07:58:47

Plot 1.6 – 6dB Bandwidth (FCC)

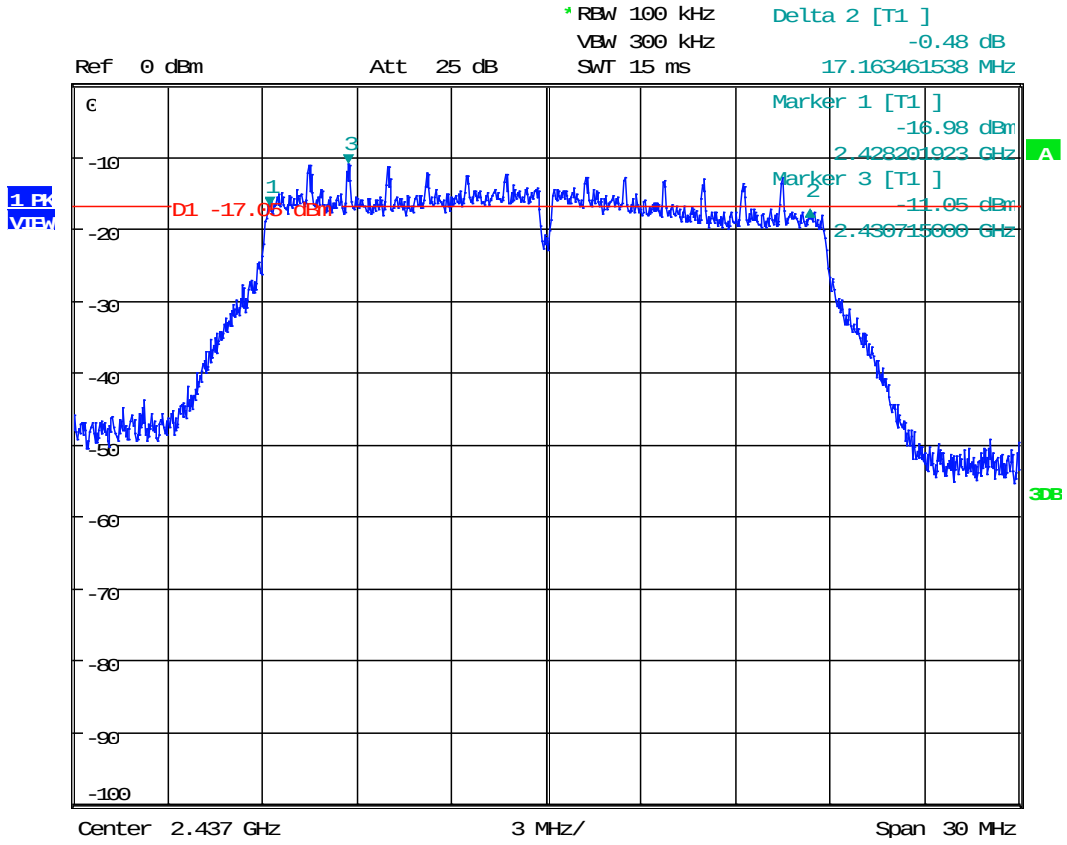


Date: 18.APR.2017 07:57:15

Plot 1.7 – 6dB Bandwidth (FCC)

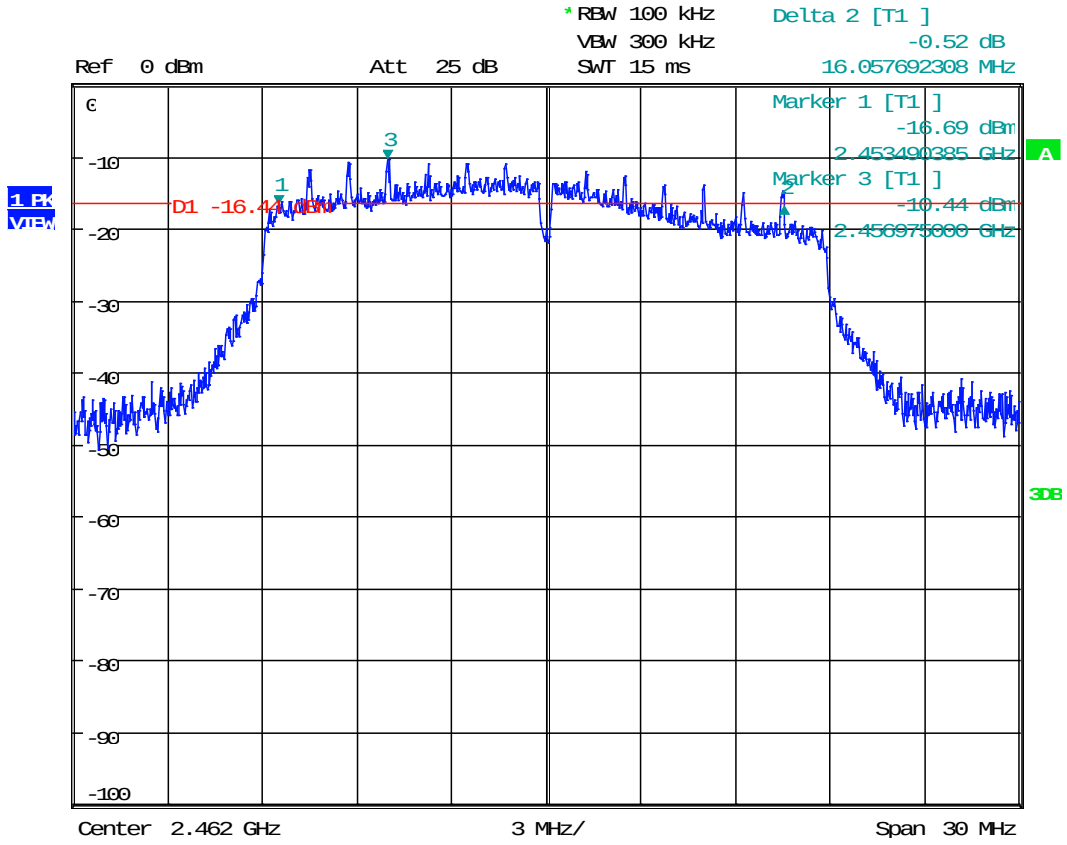


Plot 1.8 – 6dB Bandwidth (FCC)



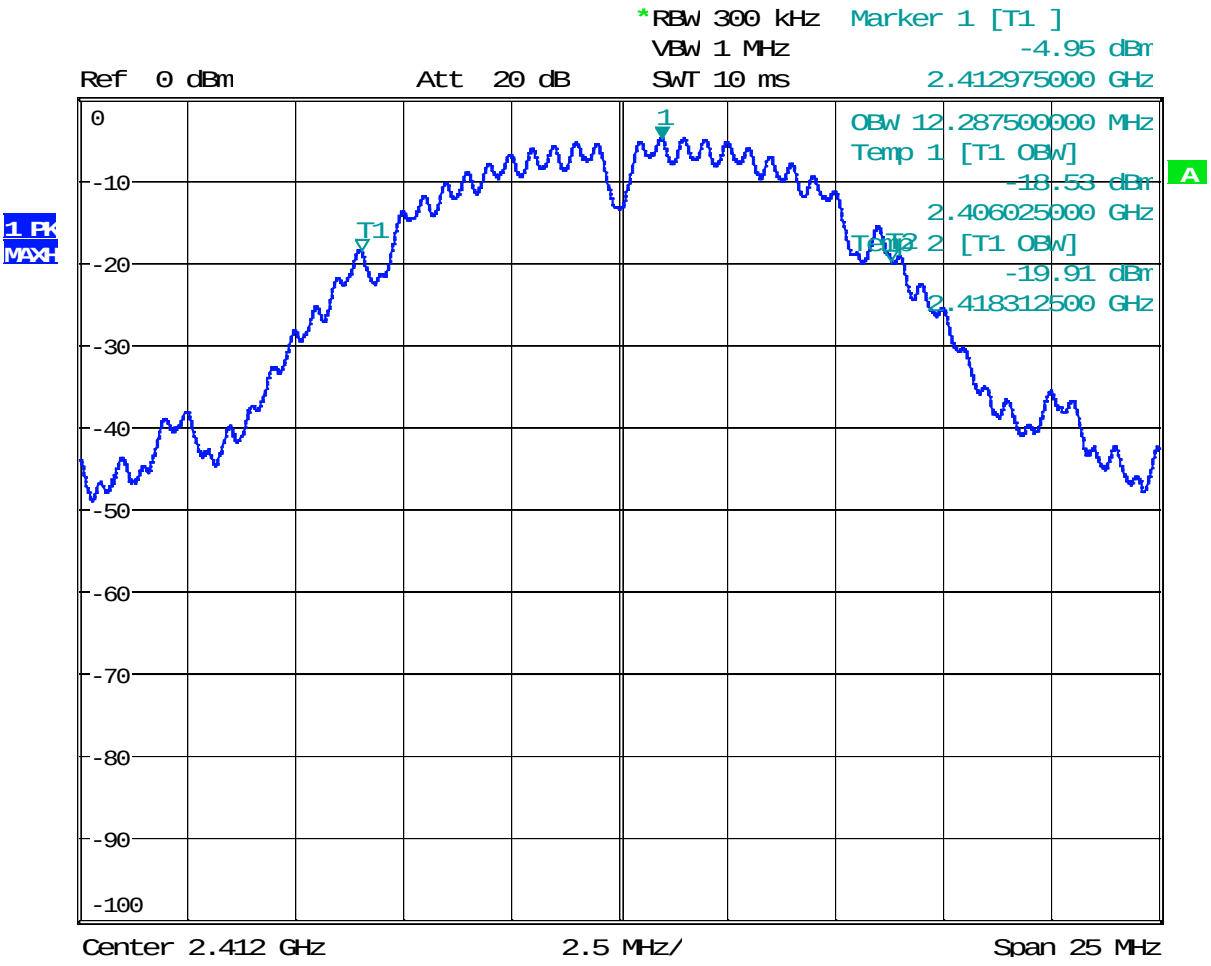
Date: 18.APR.2017 08:04:04

Plot 1.9 – 6dB Bandwidth (FCC)



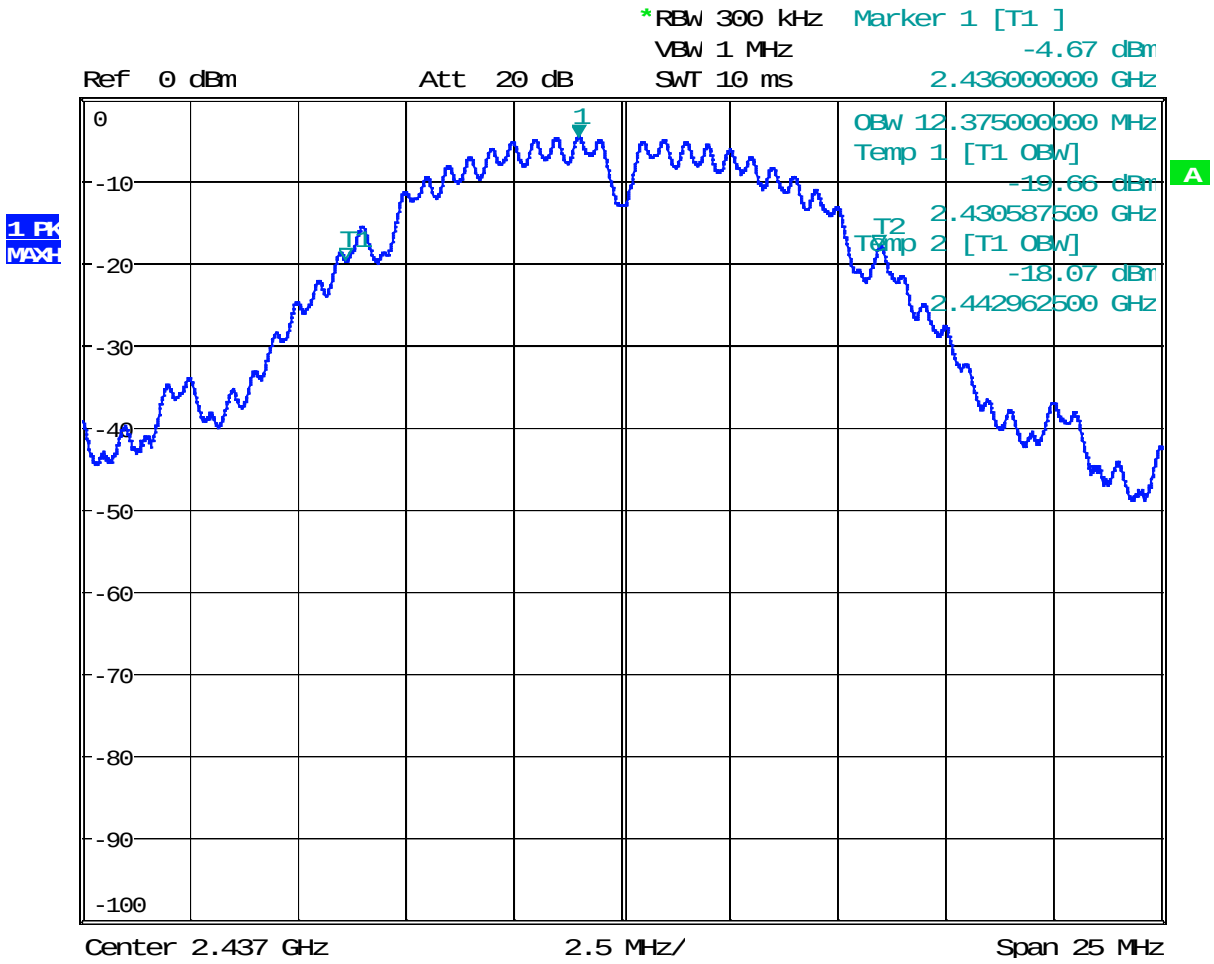
Date: 18.APR.2017 08:05:24

Plot 1.10 – 99% Bandwidth

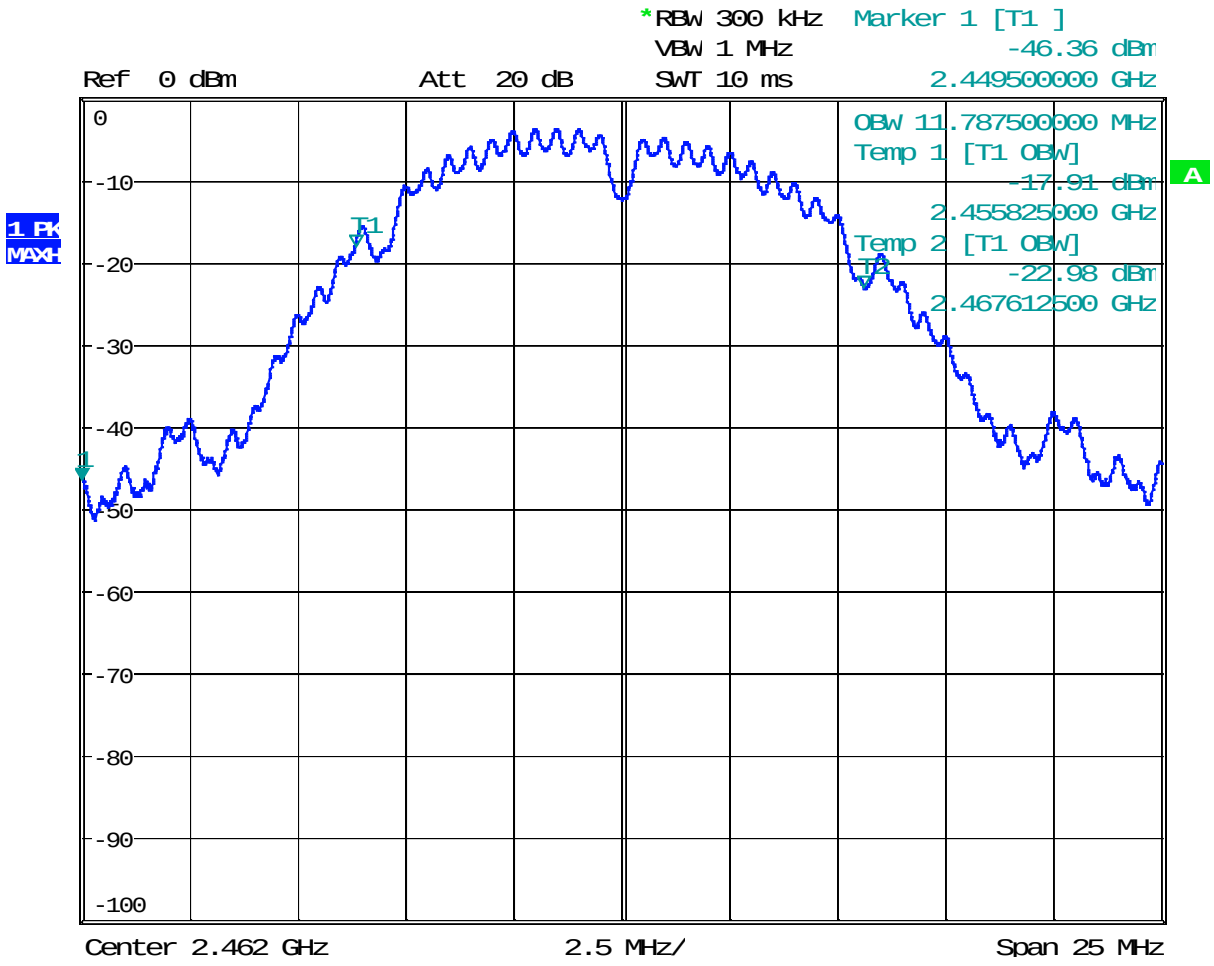


Date: 12.APR.2017 13:12:29

Plot 1.11 – 99% Bandwidth

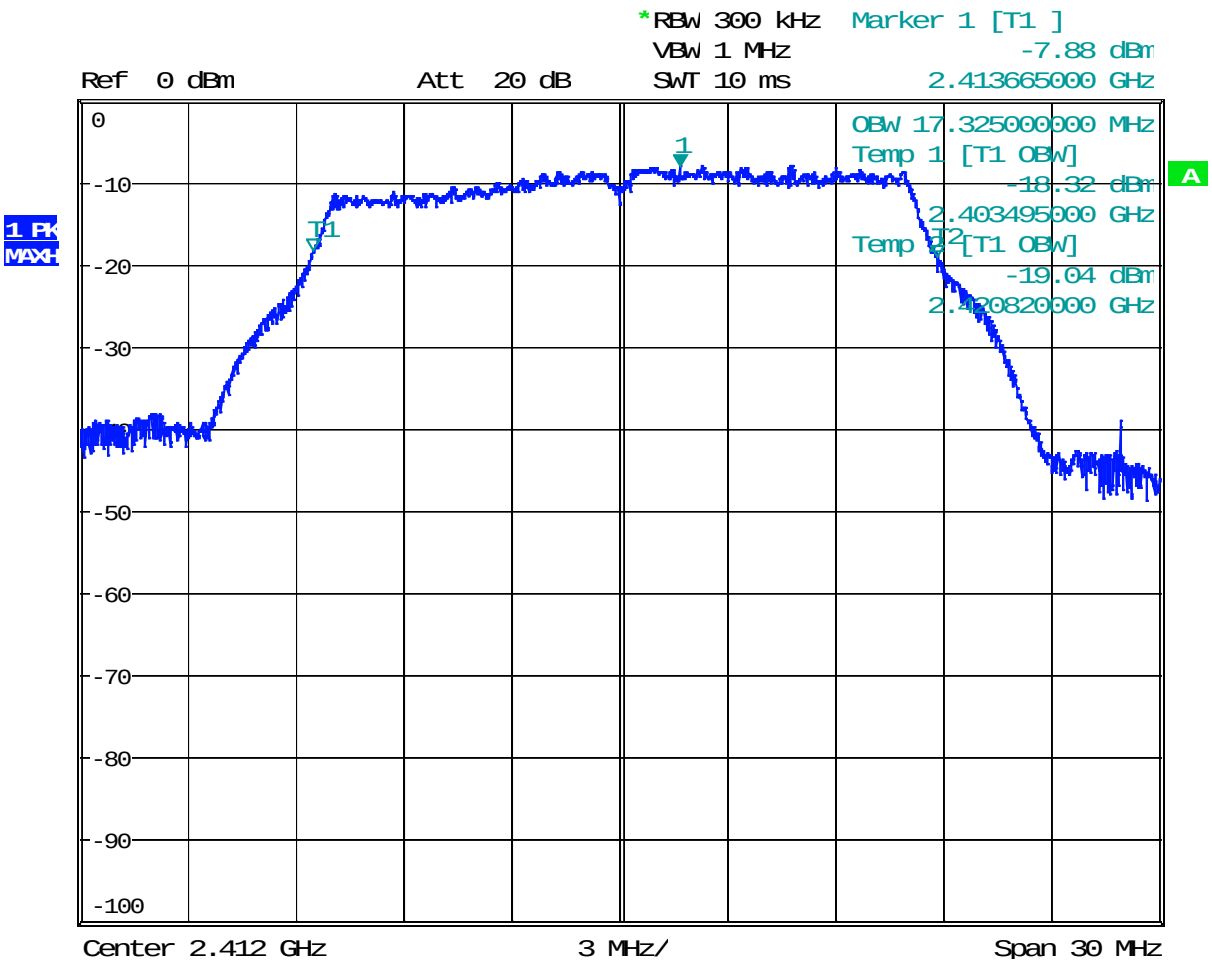


Plot 1.12 – 99% Bandwidth

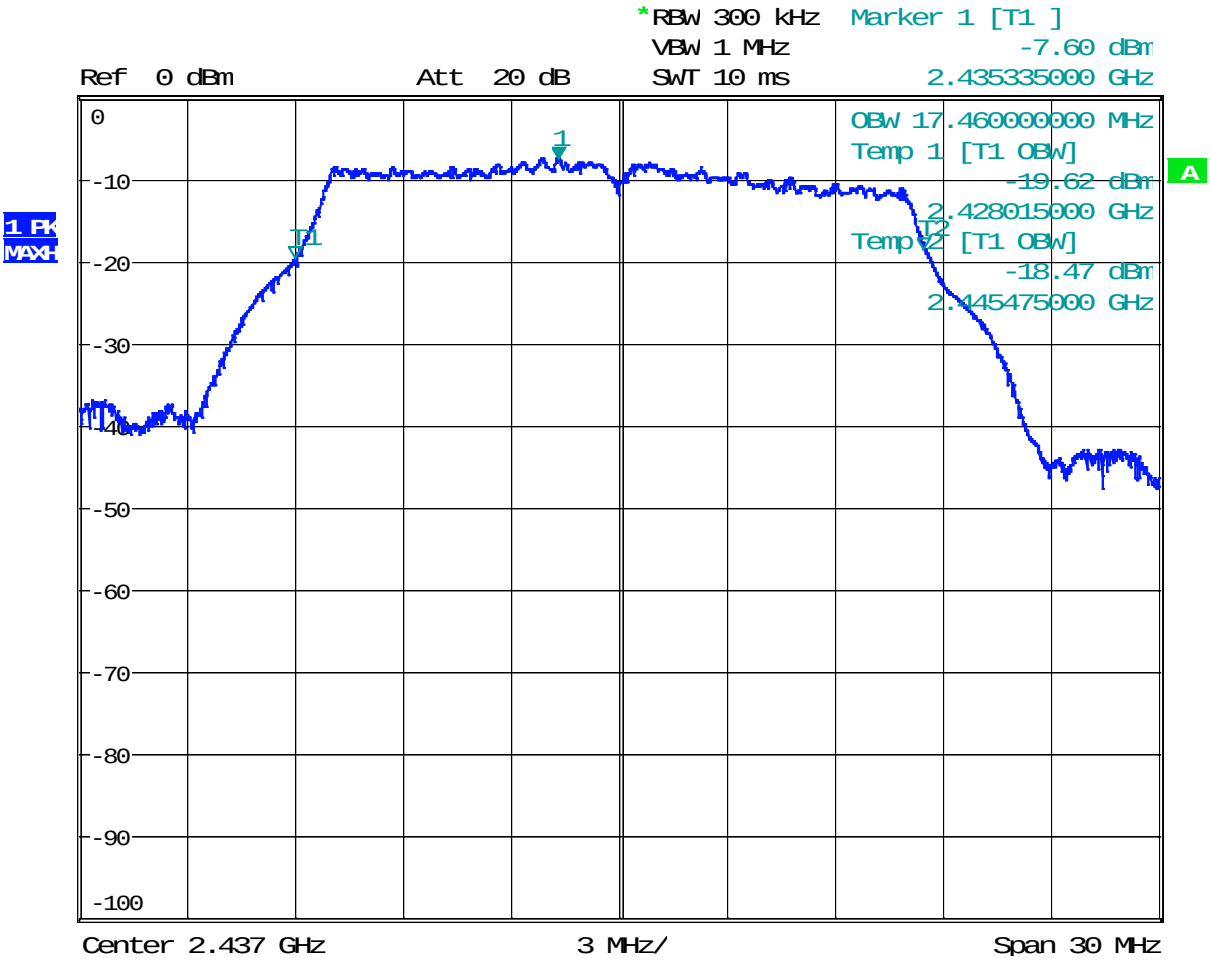


Date: 12.APR.2017 13:21:15

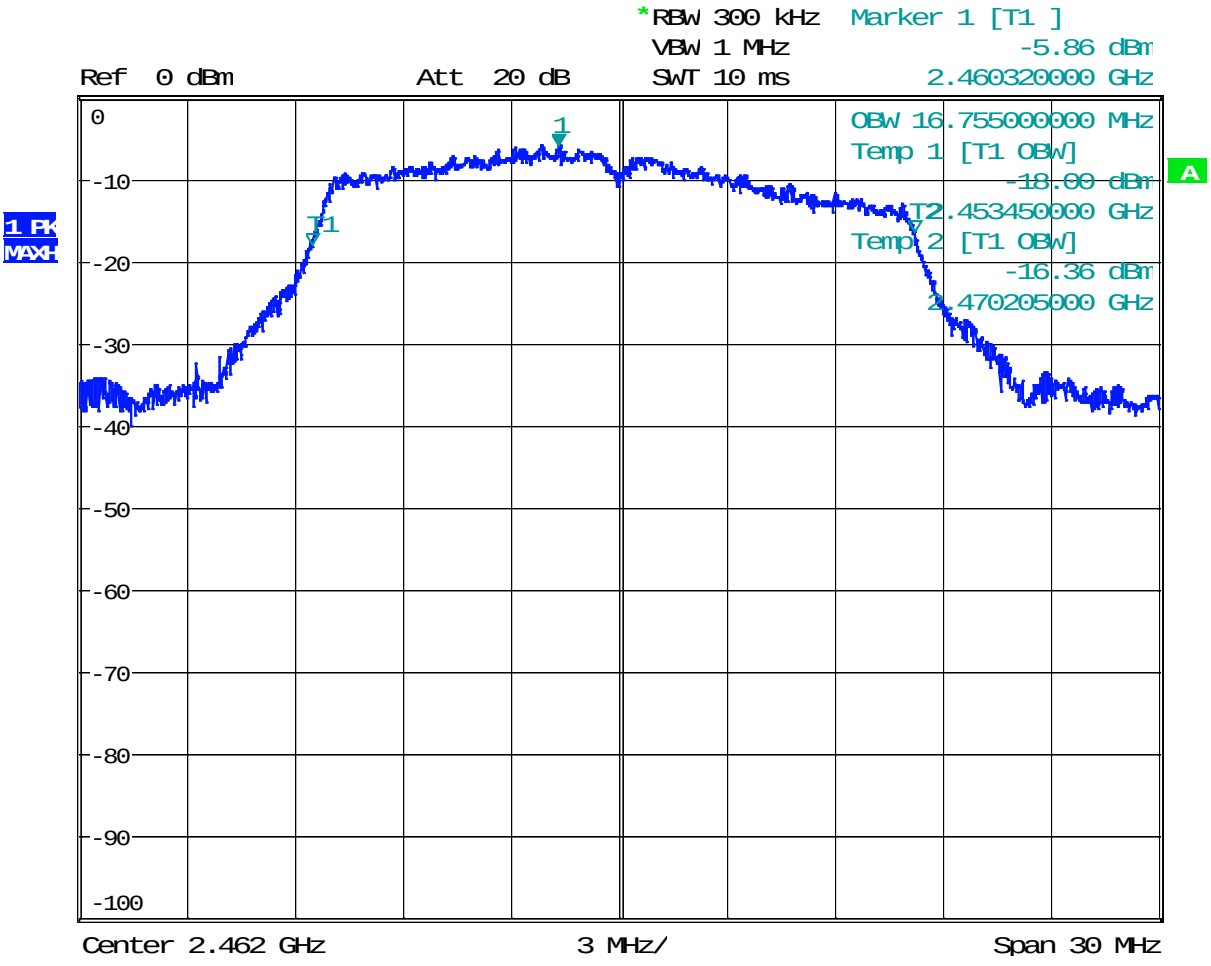
Plot 1.13 – 99% Bandwidth



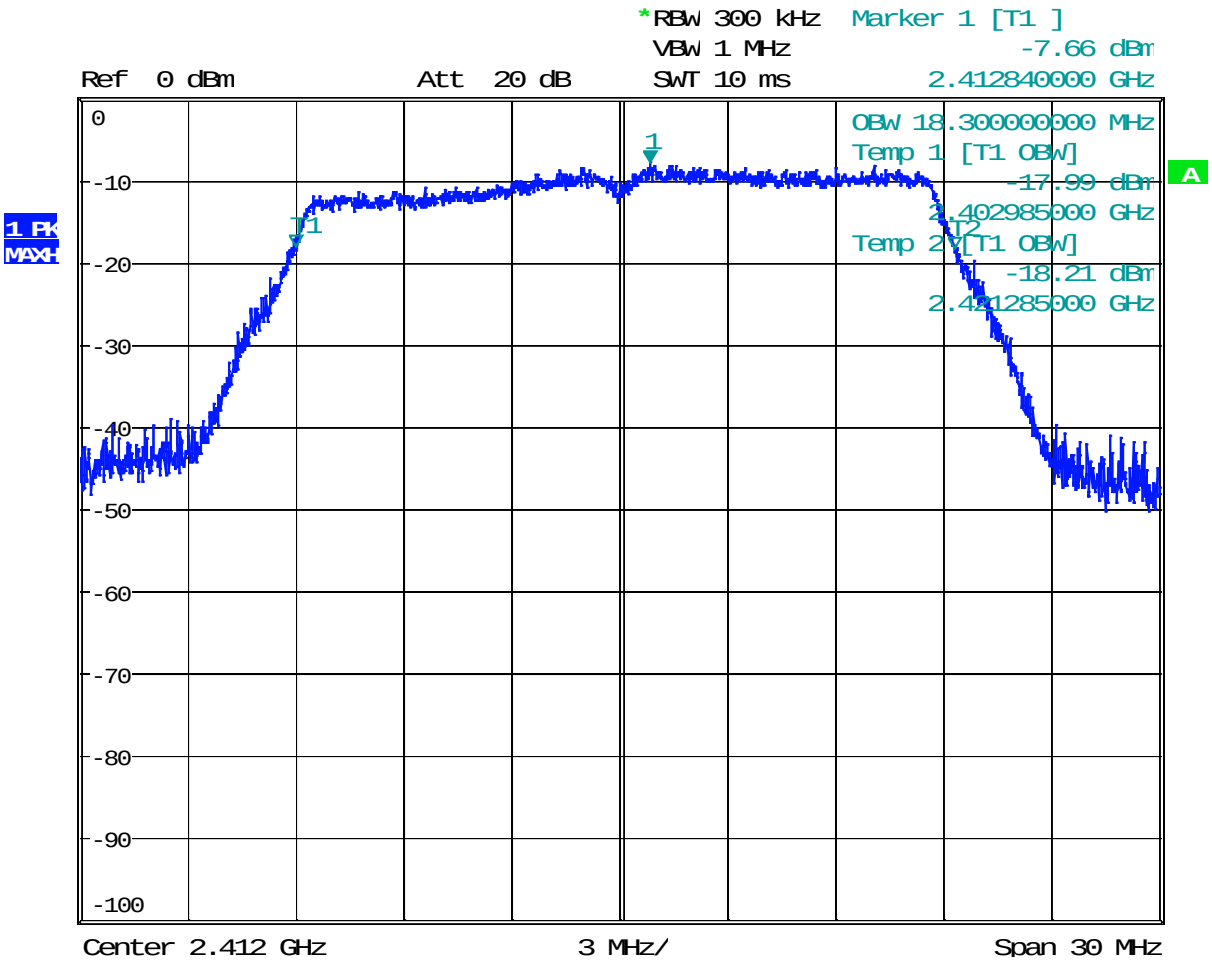
Plot 1.14 – 99% Bandwidth



Plot 1.15 – 99% Bandwidth

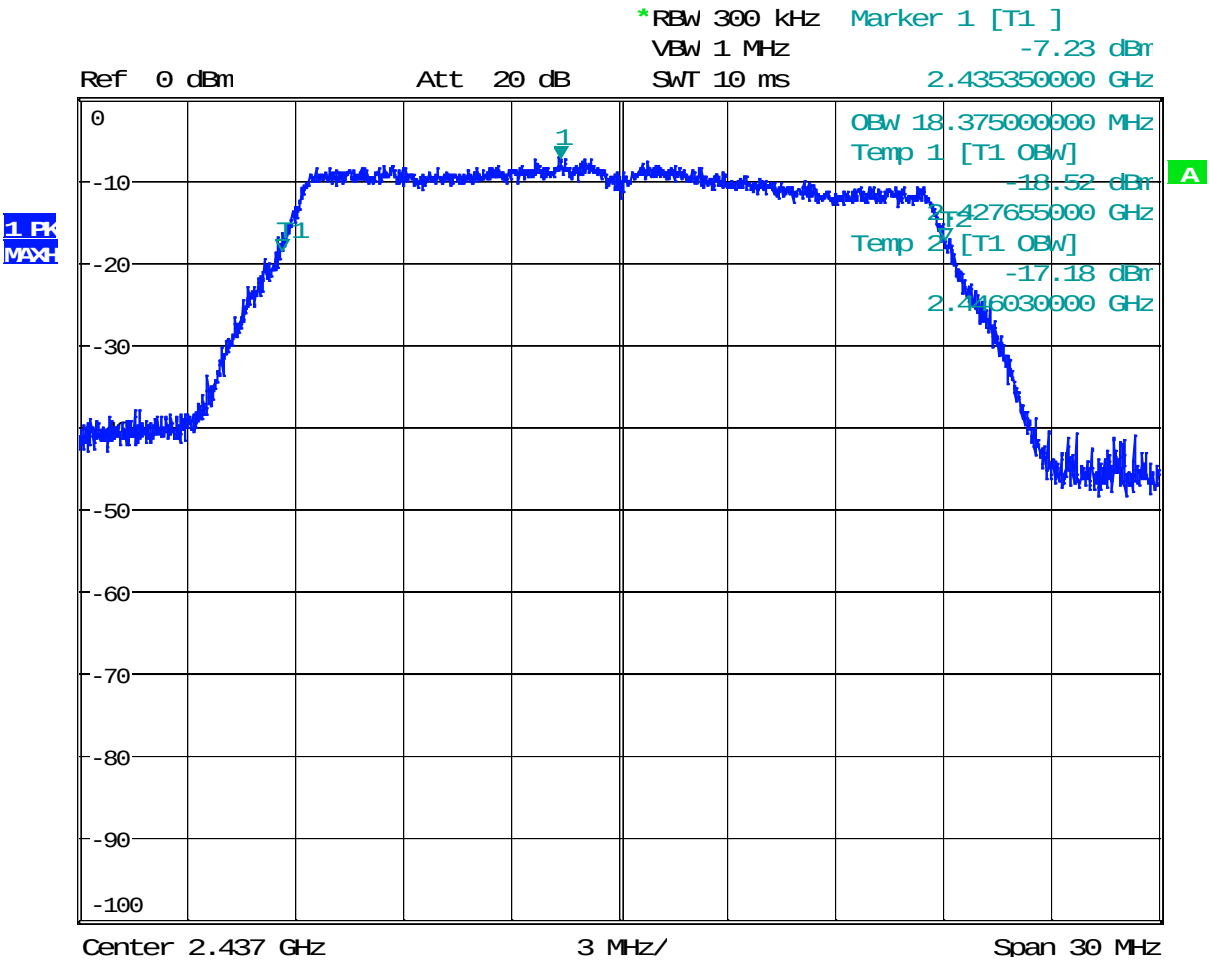


Plot 1.16 – 99% Bandwidth

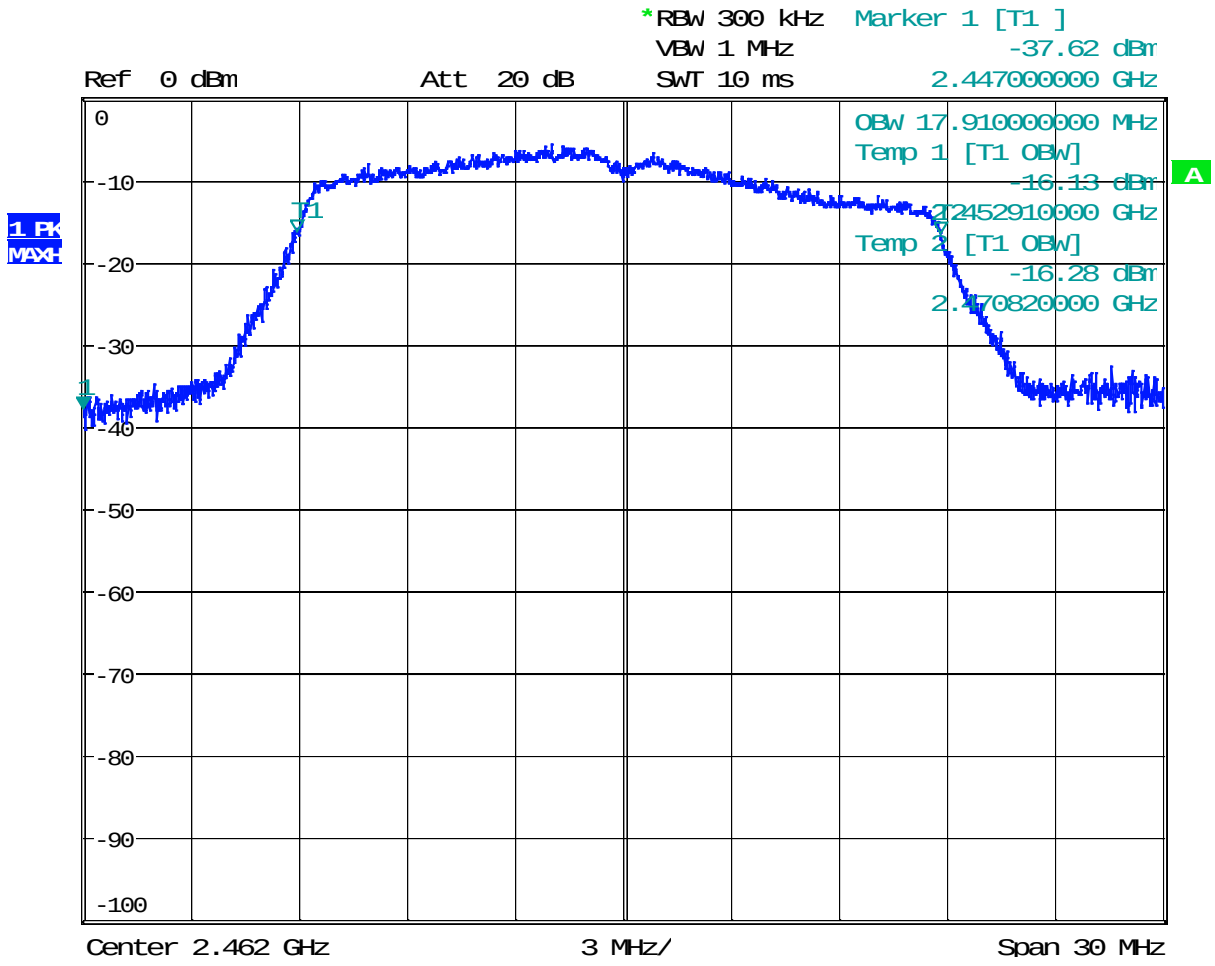


Date: 12.APR.2017 13:25:22

Plot 1.17 – 99% Bandwidth



Plot 1.18 – 99% Bandwidth



Date: 12.APR.2017 13:28:10

4.2 Maximum Conducted Output Power at Antenna Terminals
FCC Rule 15.247(b)(3)

4.2.1 Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).
For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Maximum Conducted Transmitter Output Power. The offset programmed on the analyzer is corrected to include cable loss, attenuator and duty cycle correction.

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance v04 was used. Specifically, section 9.2.2.5 Method AVGSA-2 Alternative (RMS detection with slow sweep with spectrum bin averaging across on- and off-times of the EUT transmissions, followed by duty cycle correction).

1. Measure the duty cycle, x, of the transmitter output signal.
2. Set span to at least 1.5 x OBW.
3. Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
4. Set VBW ≥ 3 x RBW.
5. Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
6. Manually set sweep time ≥ 10 x (number of points in sweep) x (total on/off period of the transmitted signal).
7. Set detector = RMS.
8. Perform a single sweep.
9. Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW.
10. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

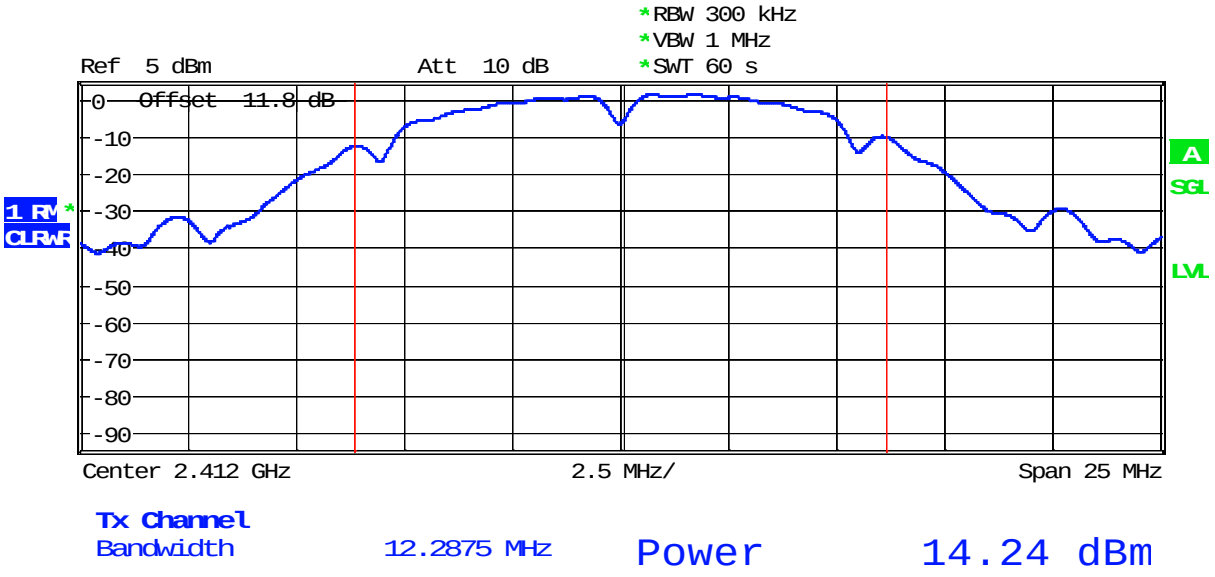
Test Date:	April 13, 2017

4.2.3 Test Result

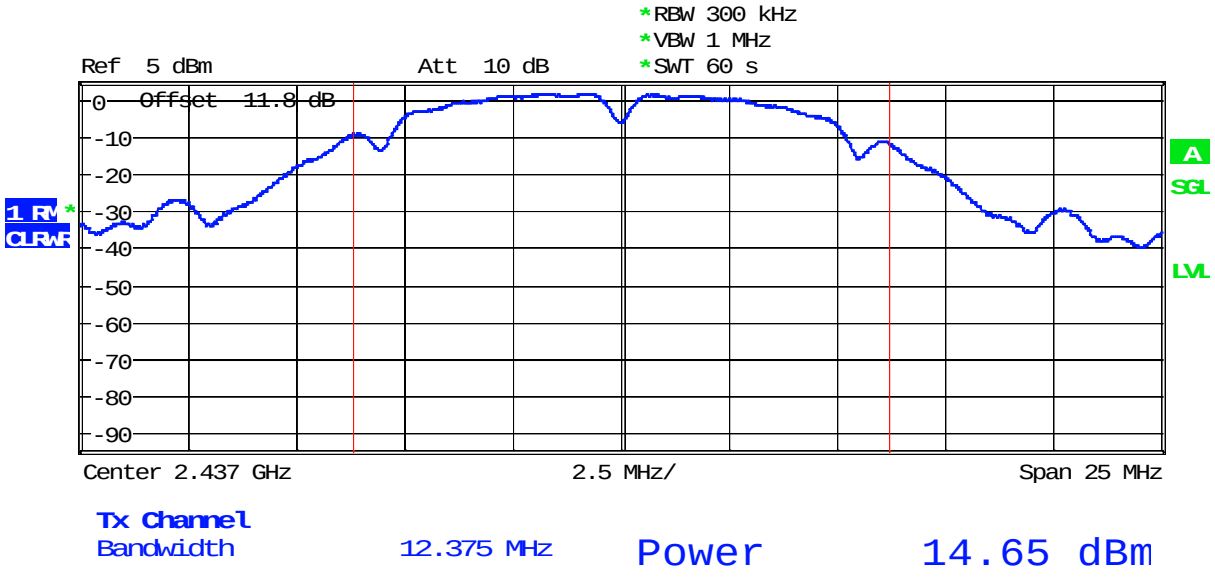
Refer to the following plots for the test result:

Standard	Data Rate	Channel	Frequency MHz	Conducted Average Power dBm	Conducted Average Power mW	Plot #
802.11b	1 Mbps	1	2412	14.24	26.546	2.1
		6	2437	14.65	29.174	2.2
		11	2462	15.22	33.266	2.3
802.11g	6 Mbps	1	2412	11.41	13.836	2.4
		6	2437	11.93	15.596	2.5
		11	2462	12.16	16.444	2.6
802.11n	0 MCS	1	2412	11.24	13.305	2.7
		6	2437	11.81	15.171	2.8
		11	2462	11.92	15.560	2.9

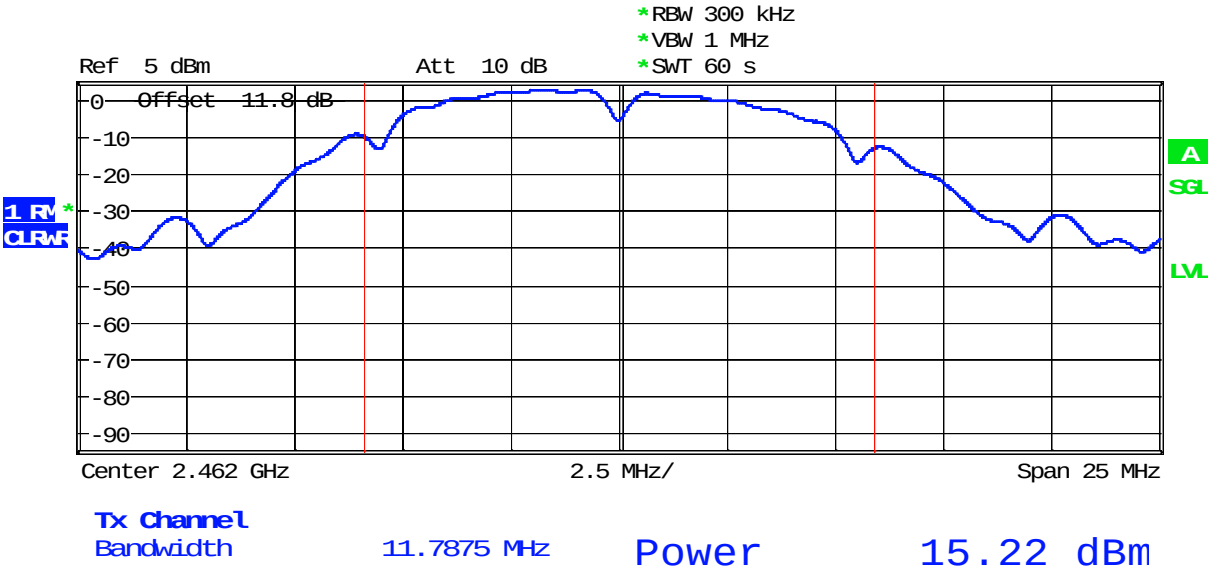
Plot 2. 1



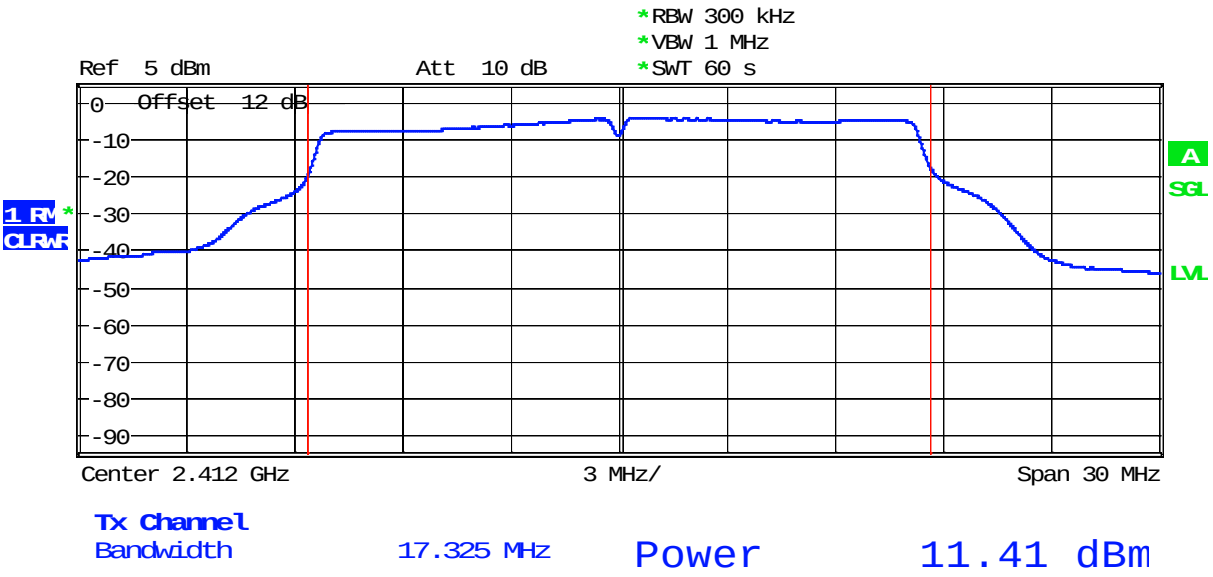
Plot 2. 2



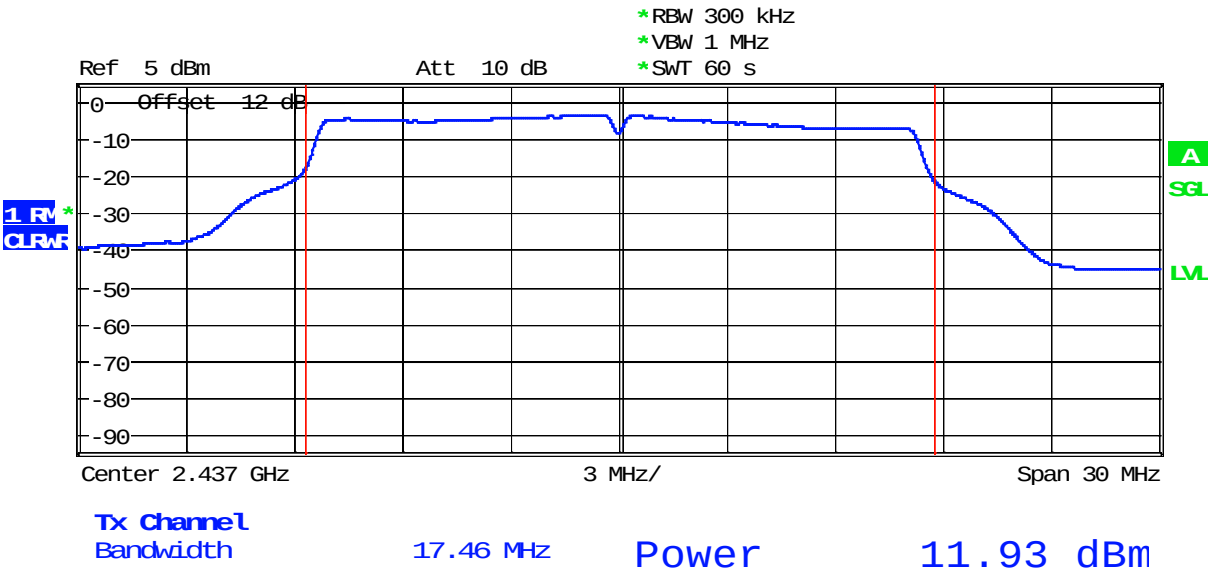
Plot 2. 3


*RBW 300 kHz
*VBW 1 MHz
*SWT 60 s
Ref 5 dBm
Att 10 dB
Offset 11.8 dB
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
A
SGL
LVL
Center 2.462 GHz
2.5 MHz/
Span 25 MHz
Tx Channel
Bandwidth
11.7875 MHz
Power
15.22 dBm

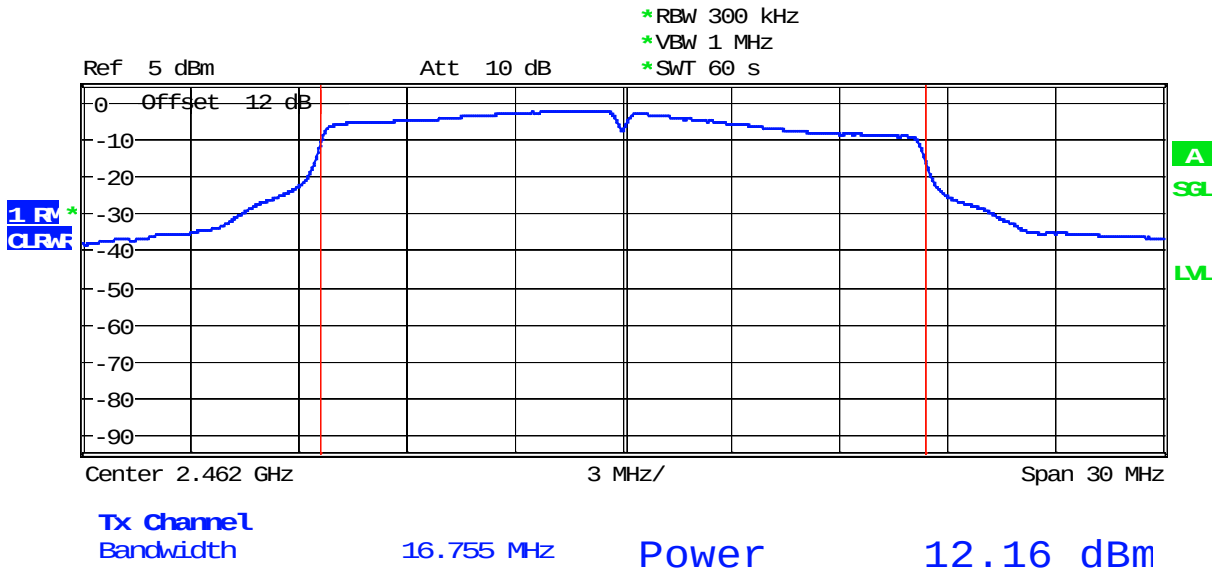
Plot 2. 4



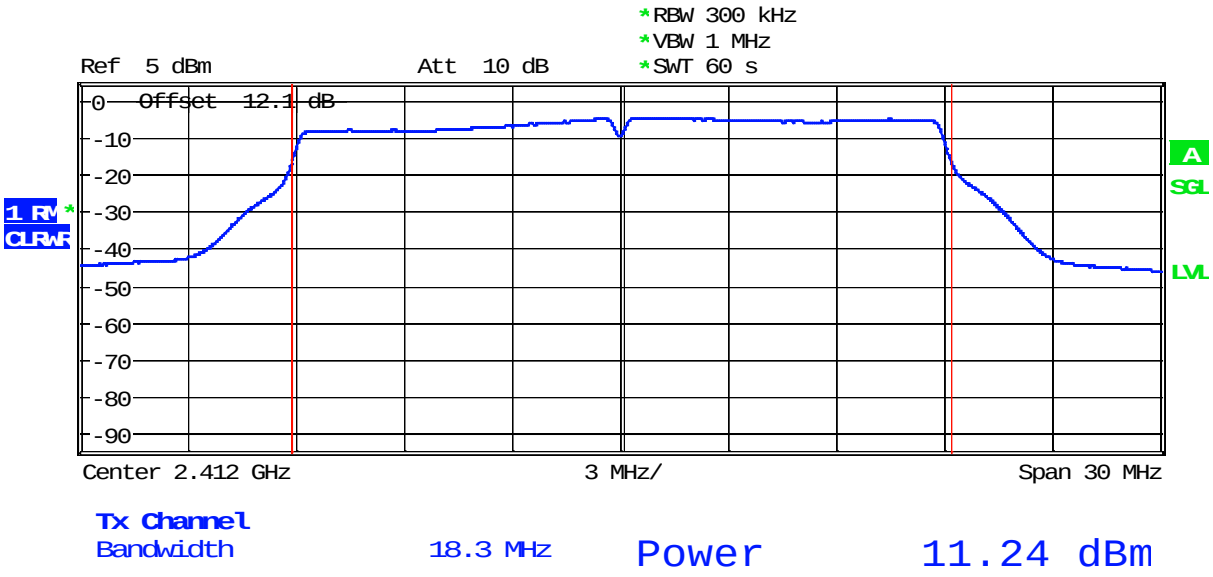
Plot 2. 5



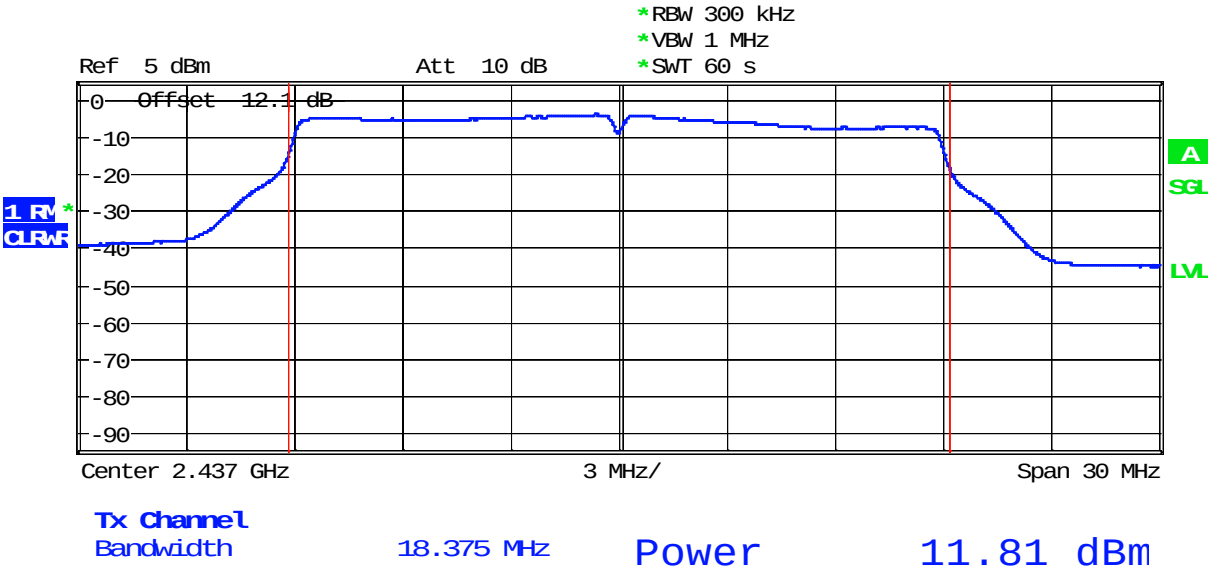
Plot 2. 6



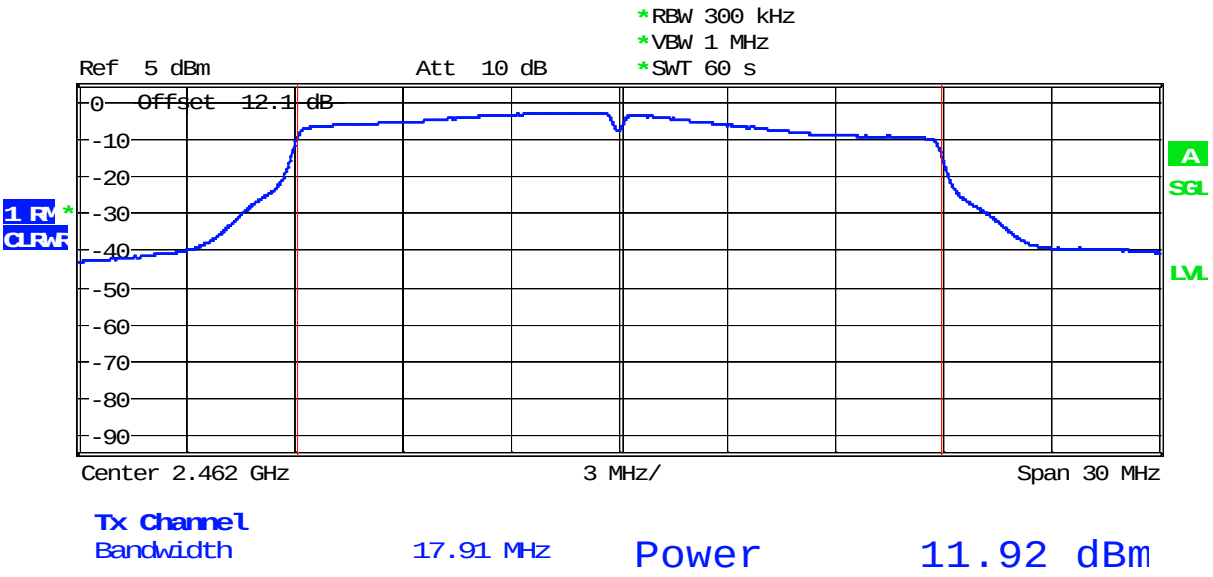
Plot 2. 7



Plot 2. 8



Plot 2. 9



4.3 Power Spectral Density
FCC 15.247 (e)

4.3.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna should not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Transmitter Power Density (PSD). The offset programmed on the analyzer is corrected to include cable loss, attenuator.

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance, specifically section 10.2 Method PKPSD (peak PSD).

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the *DTS bandwidth*.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

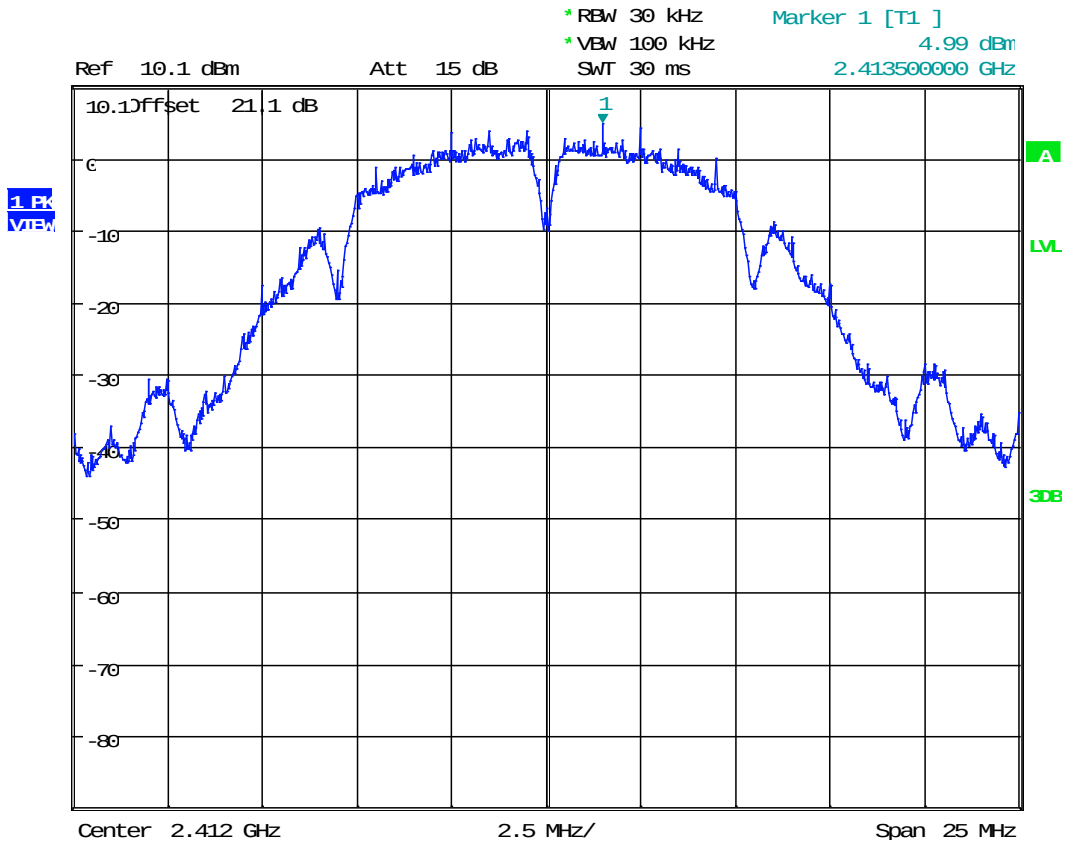
Test Date:	May 26, 2017

4.3.3 Test Result

Refer to the following plots for the test result:

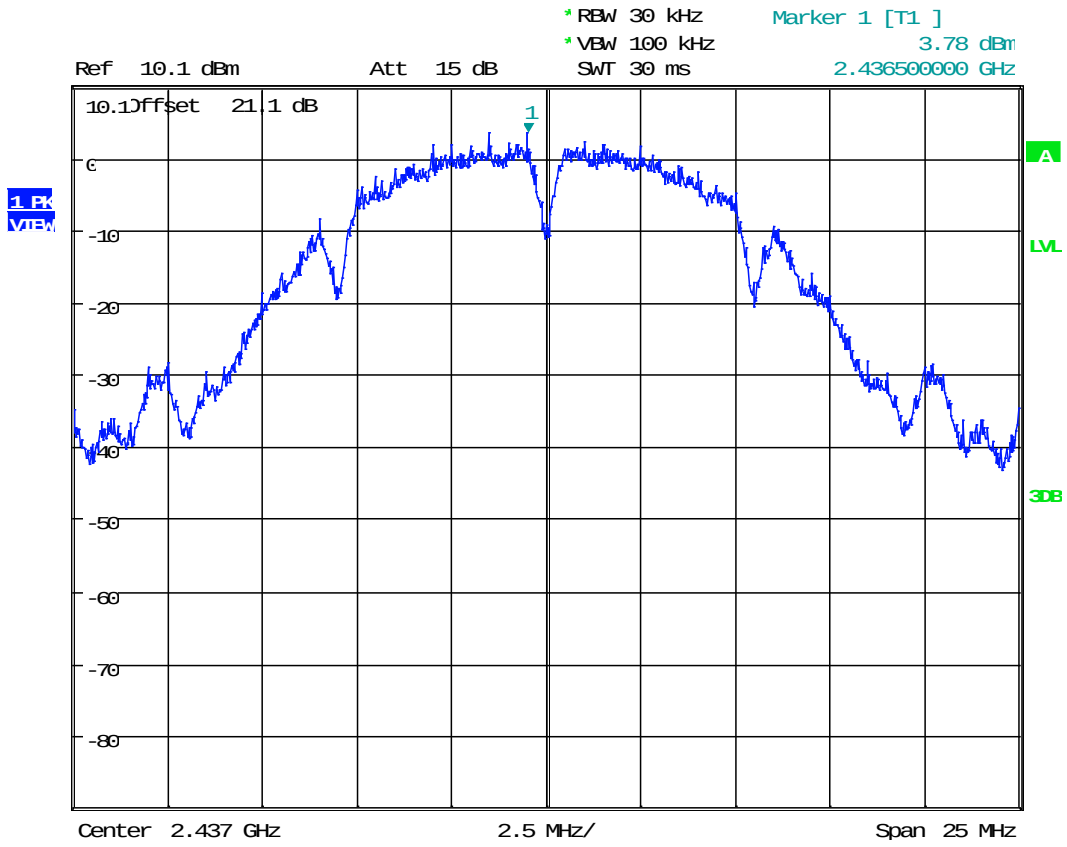
Standard	Channel	Frequency MHz	PSD (Peak) dBm	Margin to 8dBm Limit dB	Plot #
802.11b	1	2412	4.99	-3.01	3.1
	6	2437	3.78	-4.22	3.2
	11	2462	5.05	-2.95	3.3
802.11g	1	2412	-2.80	-10.80	3.4
	6	2437	-2.62	-10.62	3.5
	11	2462	-2.38	-10.38	3.6
802.11n	1	2412	-2.30	-10.30	3.7
	6	2437	-2.67	-10.67	3.8
	11	2462	-2.18	-10.18	3.9

Plot 3. 1



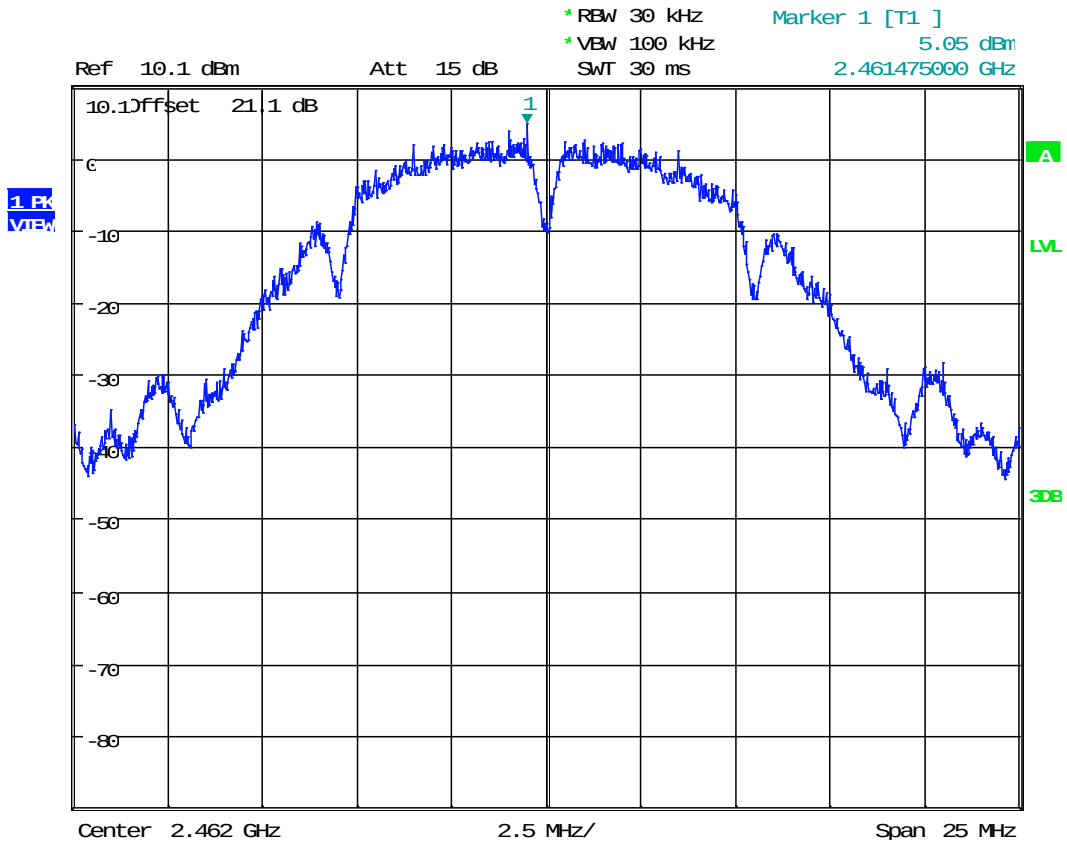
Date: 26.MAY.2017 07:28:18

Plot 3. 2



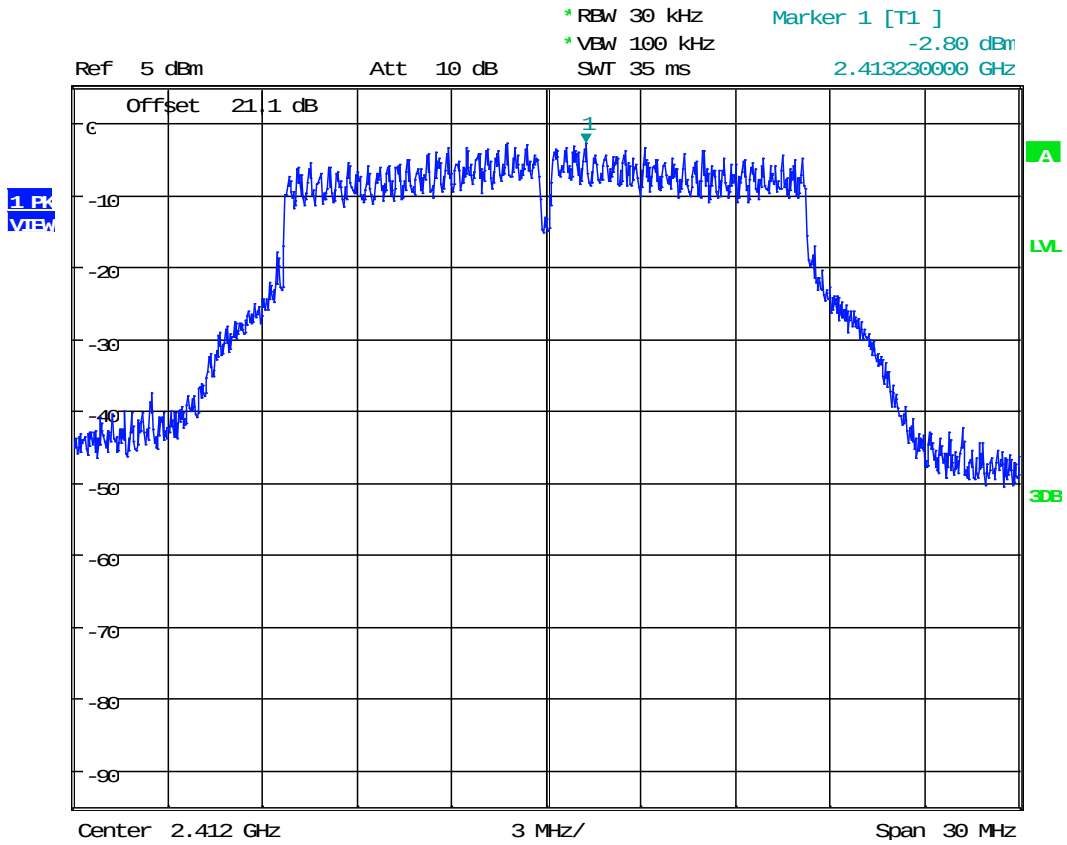
Date: 26.MAY.2017 07:30:55

Plot 3. 3



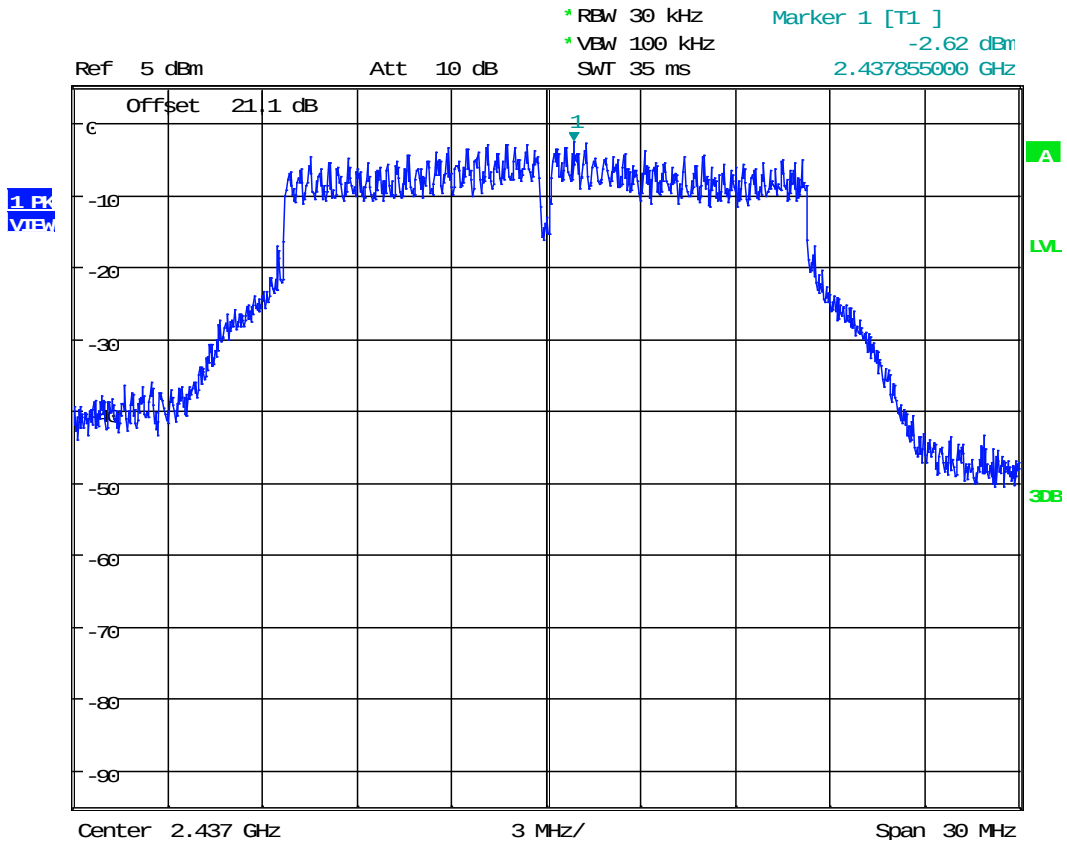
Date: 26.MAY.2017 07:31:45

Plot 3. 4



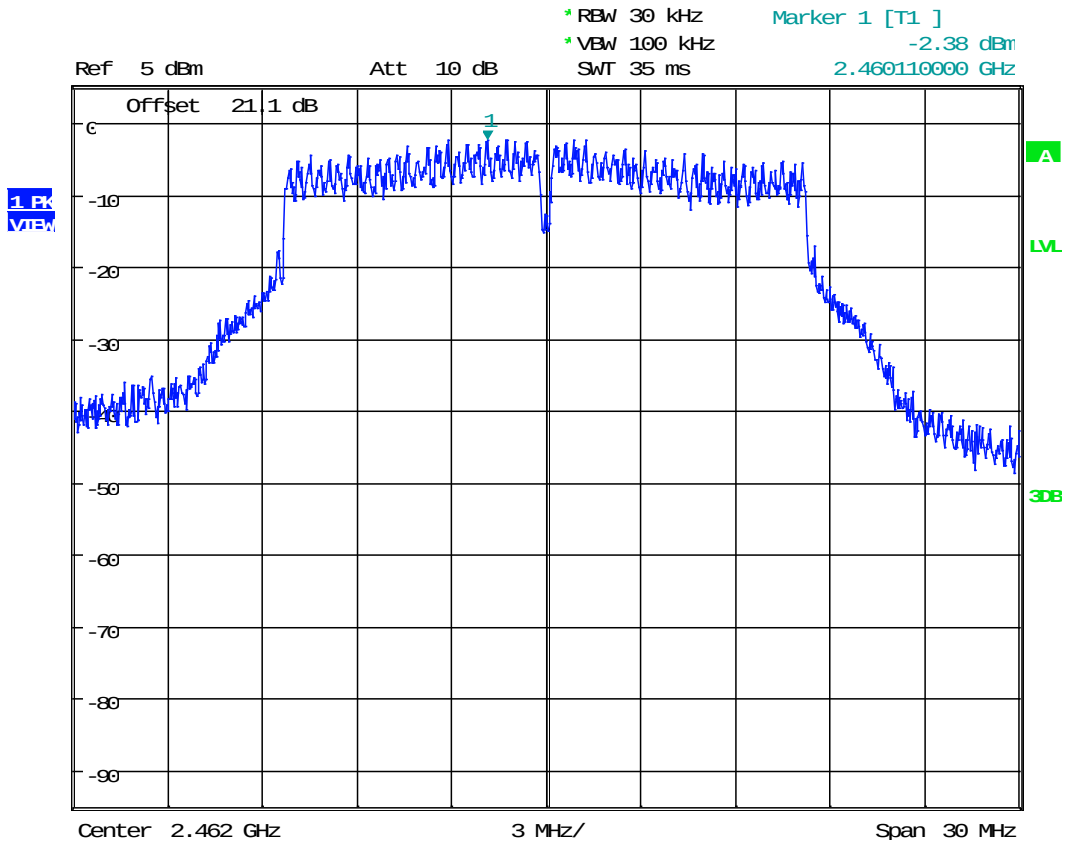
Date: 26.MAY.2017 07:34:09

Plot 3. 5

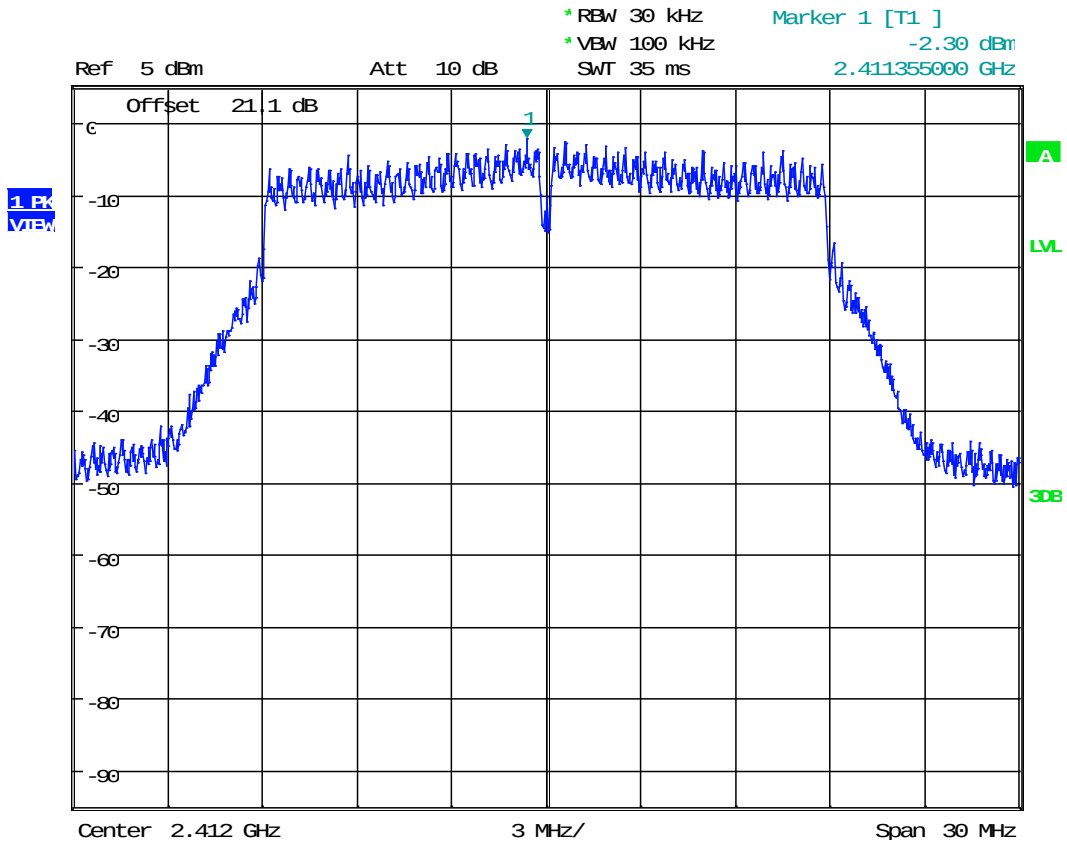


Date: 26.MAY.2017 07:33:13

Plot 3. 6

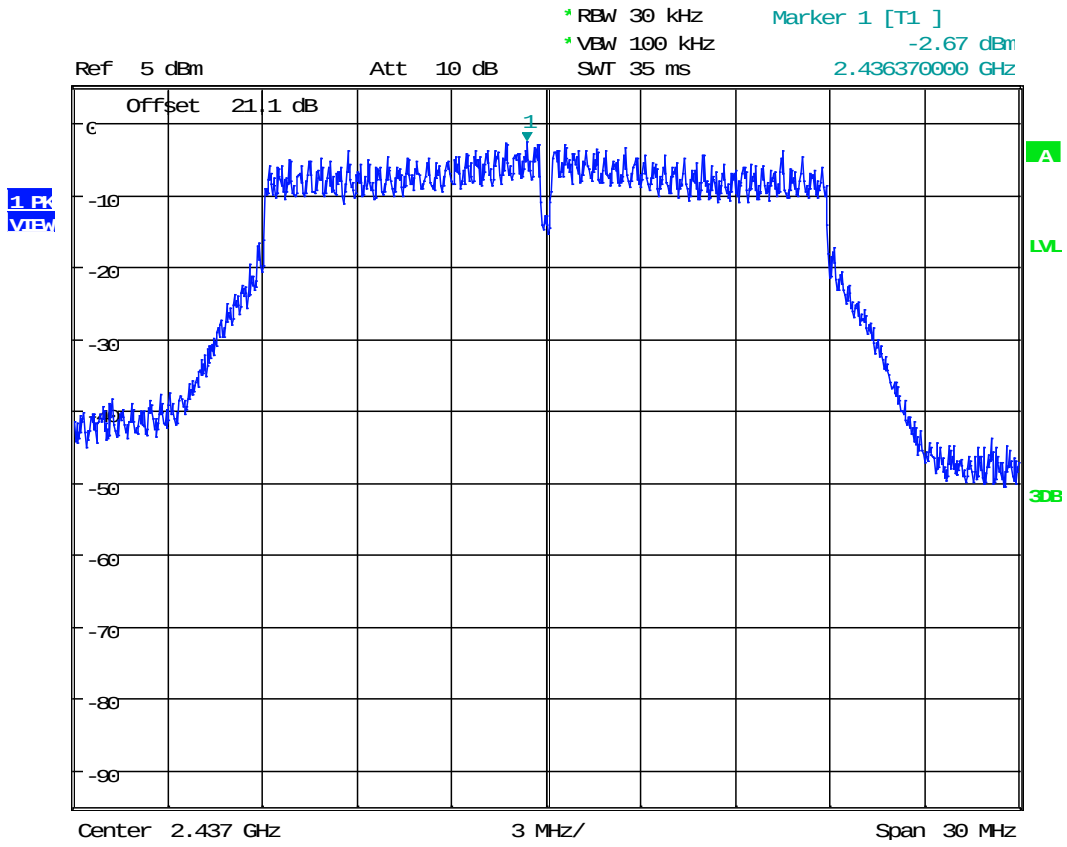

RBW 30 kHz
VBW 100 kHz
SWT 35 ms
Marker 1 [T1]
-2.38 dBm
2.460110000 GHz
Ref 5 dBm
Att 10 dB
Offset 21.1 dB
1
-10
-20
-30
-50
-60
-70
-80
-90
A
LVL
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 26.MAY.2017 07:32:38

Plot 3. 7



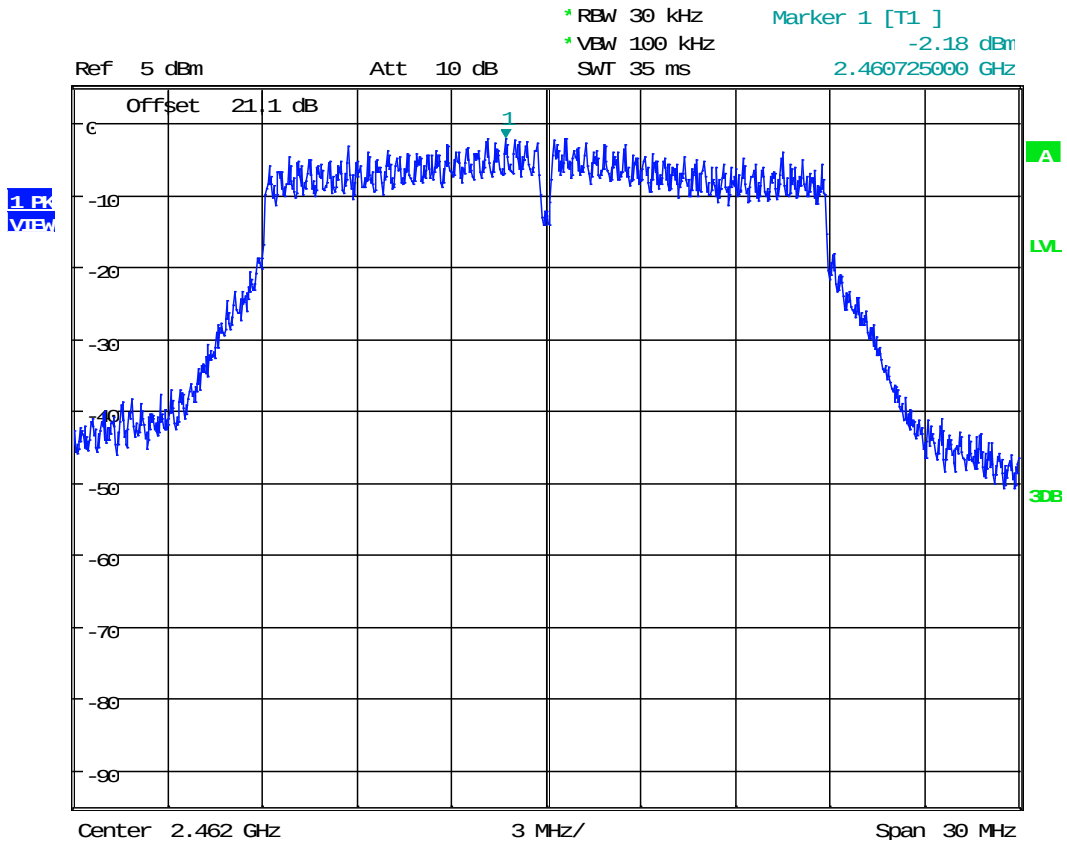
Date: 26.MAY.2017 07:35:22

Plot 3. 8



Date: 26.MAY.2017 07:37:08

Plot 3. 9



Date: 26.MAY.2017 07:38:09

4.4 Out-of-Band Conducted Emissions
FCC 15.247(d)

4.4.1 Requirement

In any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.4.2 Procedure

A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30 MHz to 25 GHz.

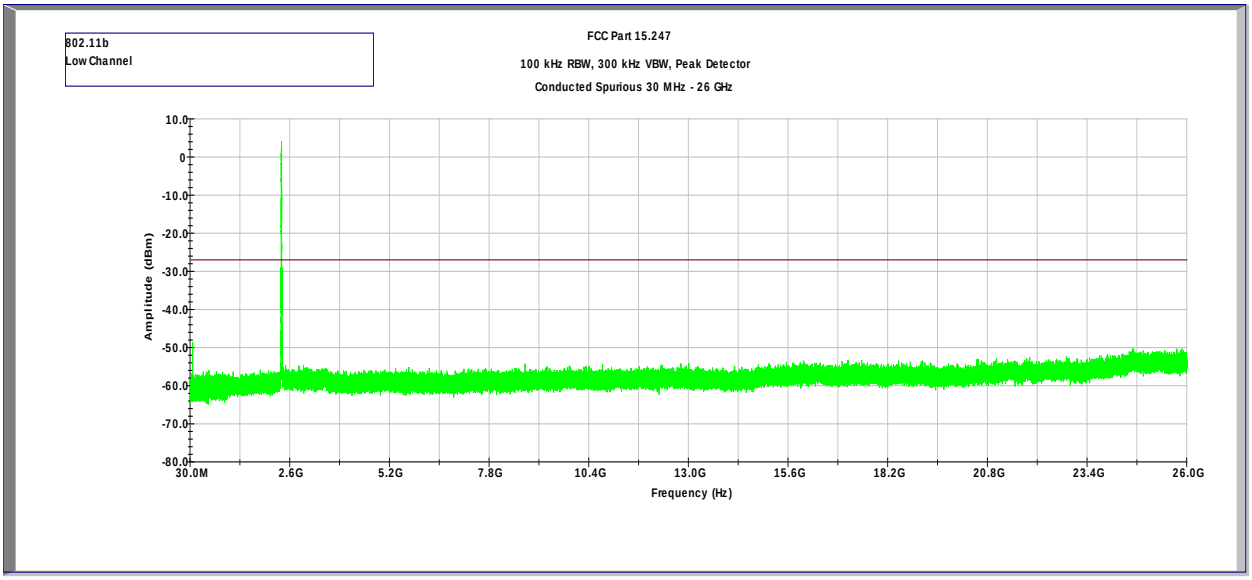
4.4.3 Test Result

Refer to the following plots 4.1 – 4.9 for unwanted conducted emissions. The plot shows -30dB attenuation limit line.

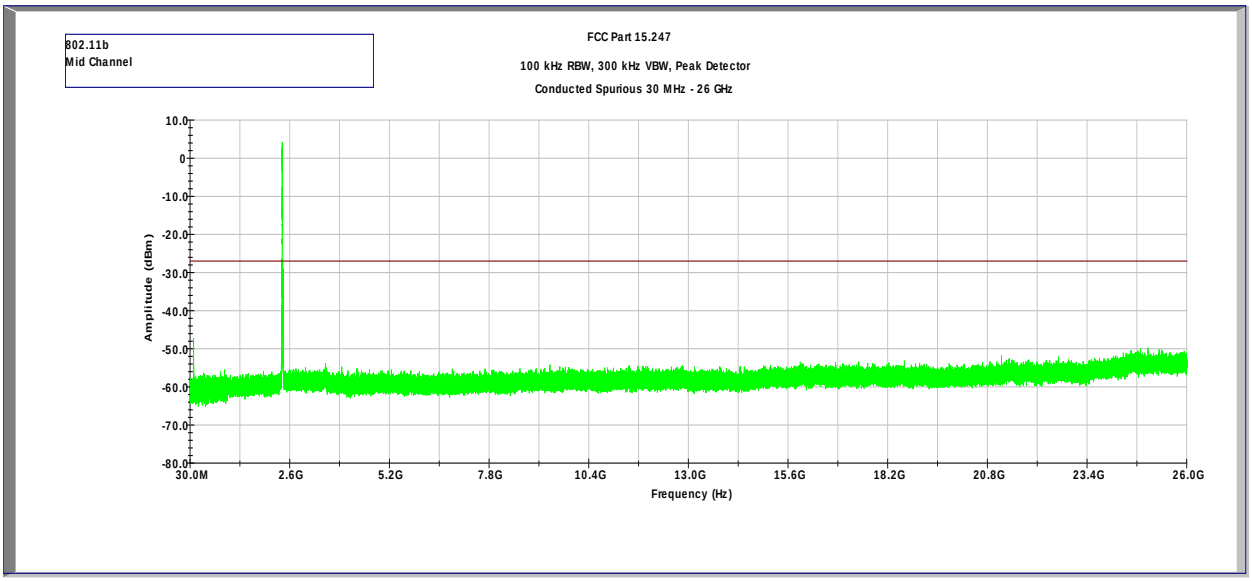
Results	**Complies**

Test Date:	April 13, 2017

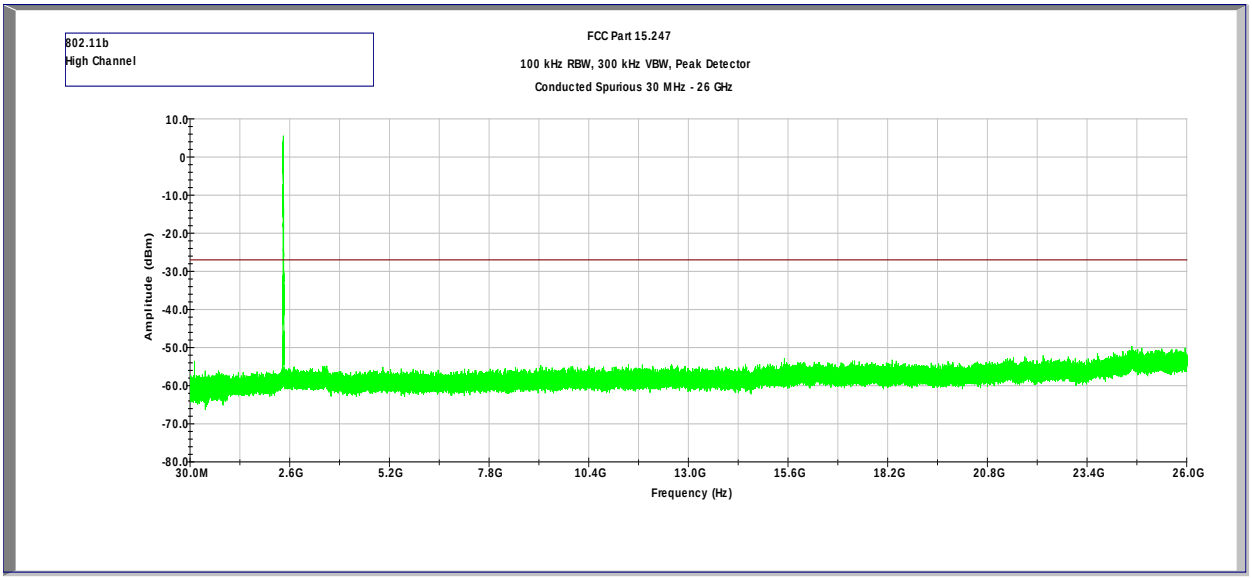
Plot 4.1
Tx @ 2412MHz 802.11b



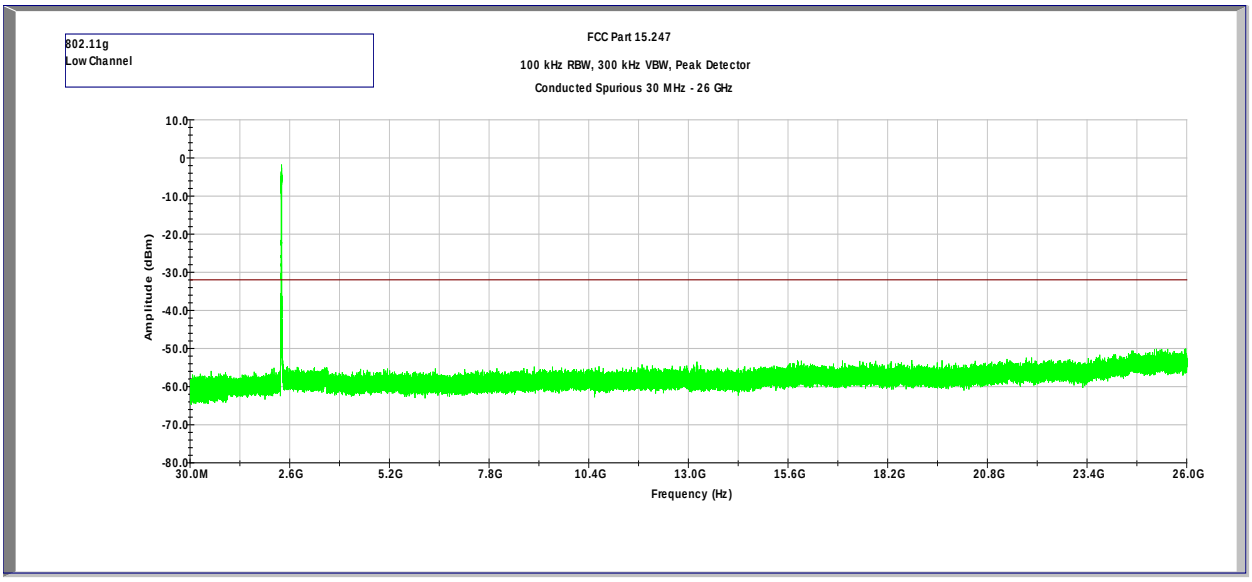
Plot 4.2
Tx @ 2437MHz 802.11b



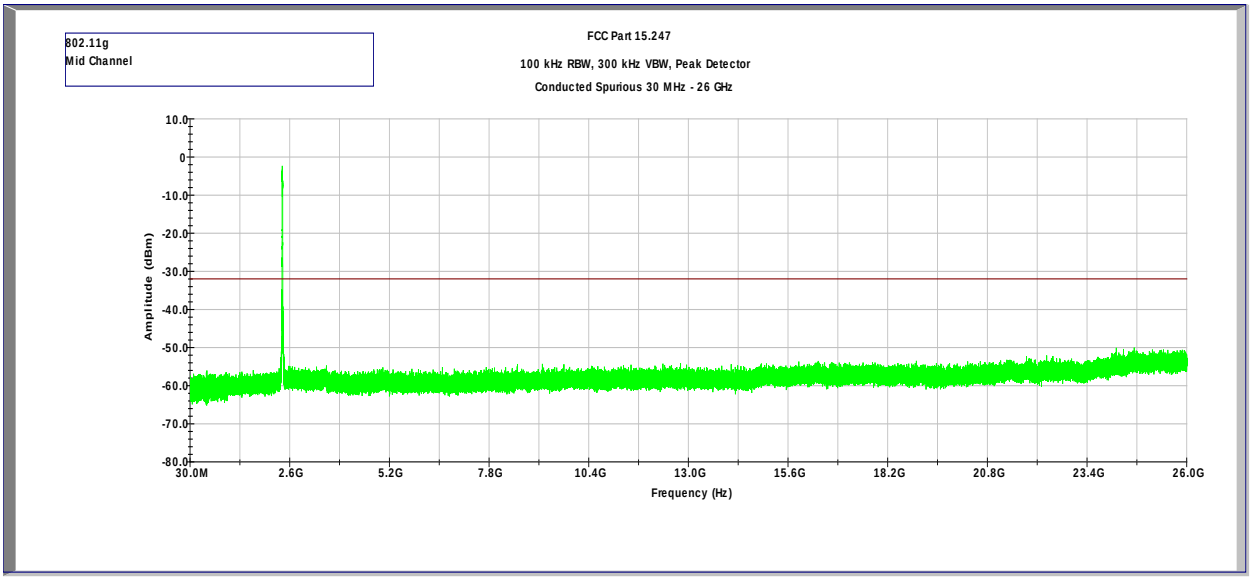
Plot 4.3
Tx @ 2462MHz 802.11b



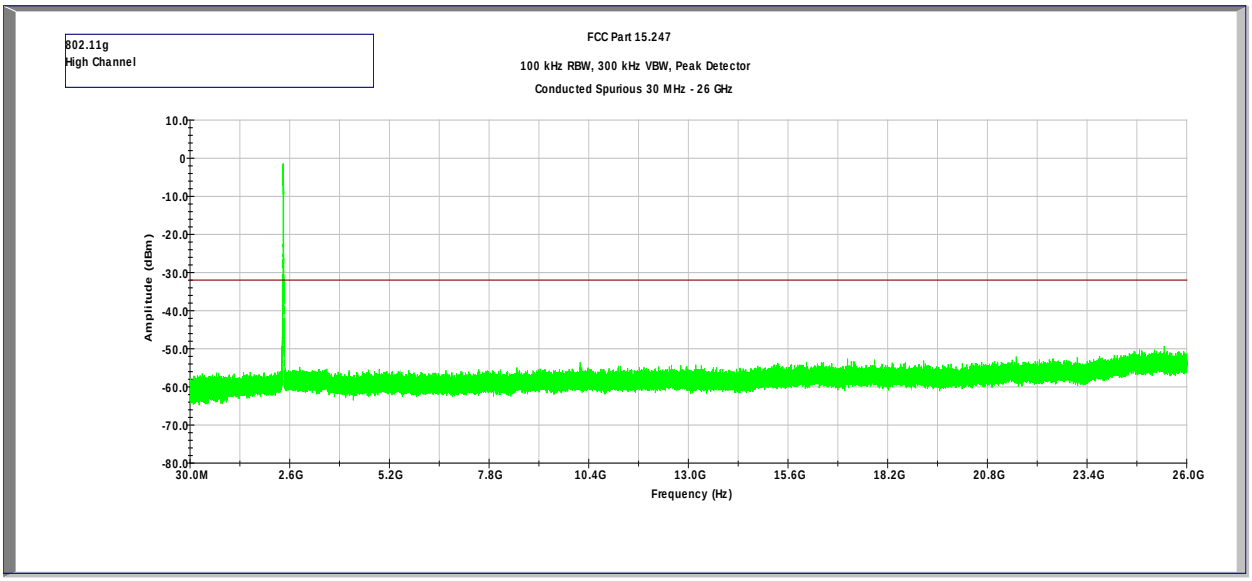
Plot 4.4
Tx @ 2412MHz 802.11g



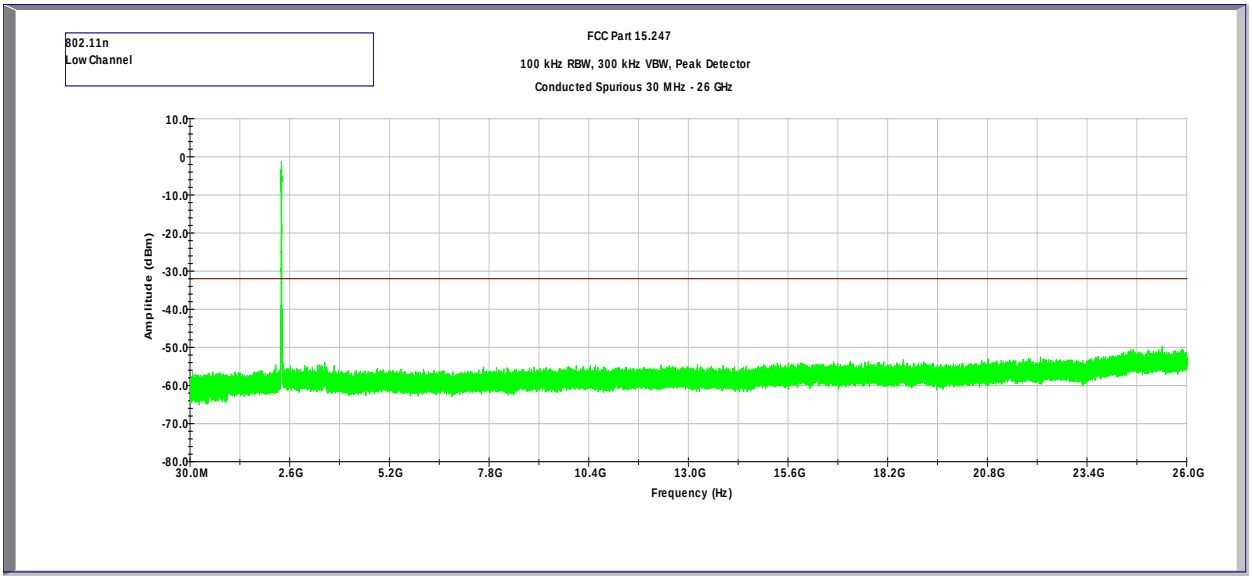
Plot 4.5
Tx @ 2437MHz 802.11g



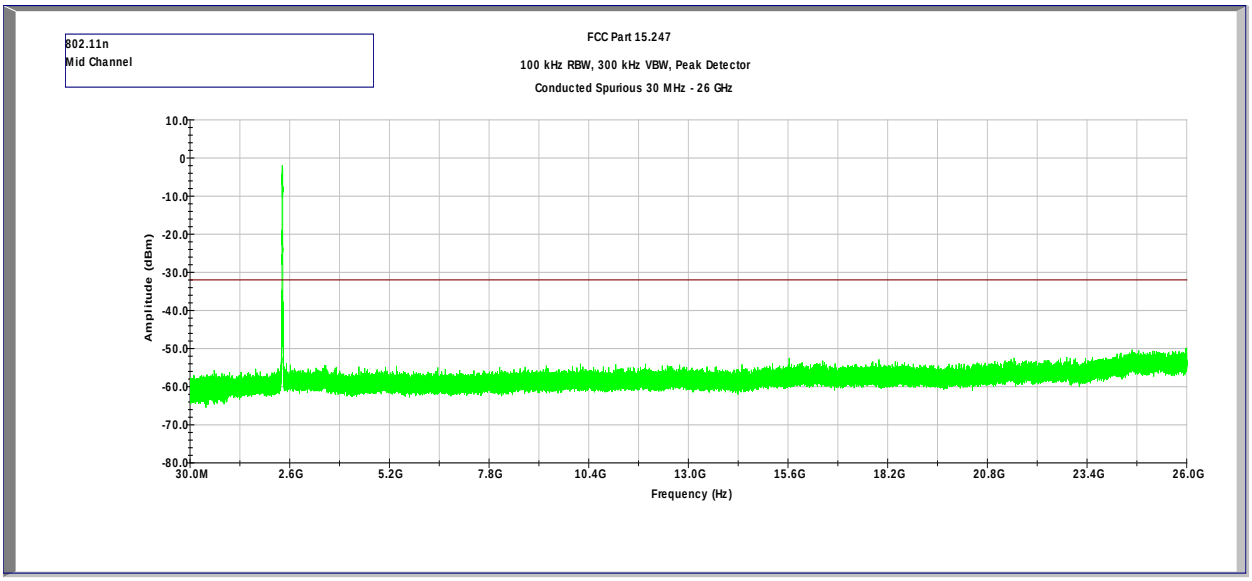
Plot 4.6
Tx @ 2462MHz 802.11g



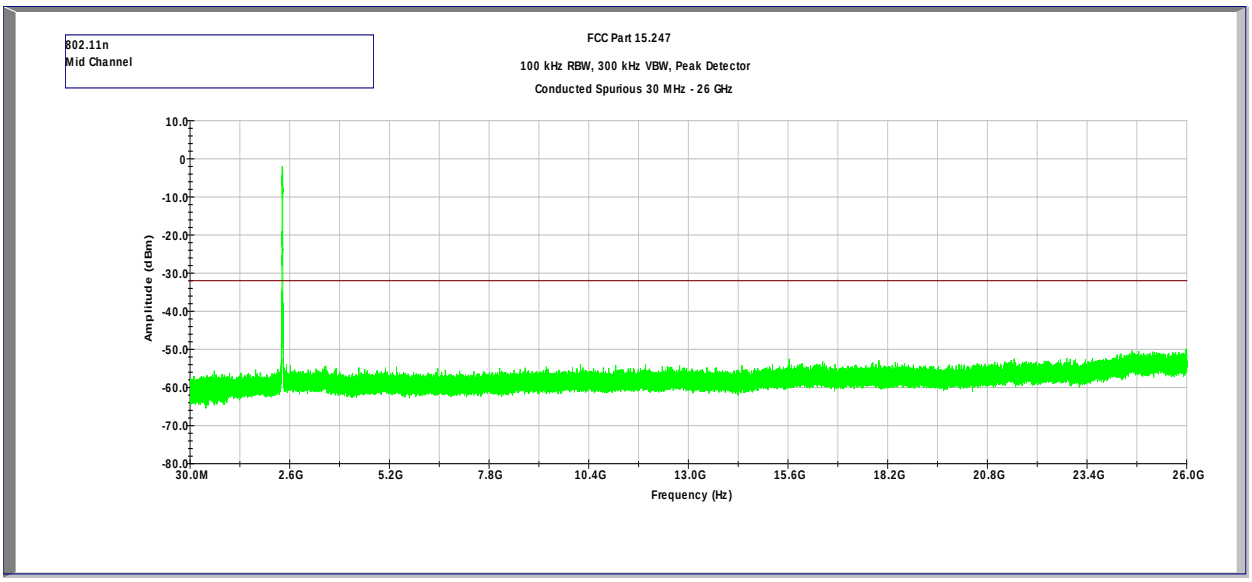
Plot 4.7
Tx @ 2412MHz 802.11n



Plot 4.8
Tx @ 2437MHz 802.11n

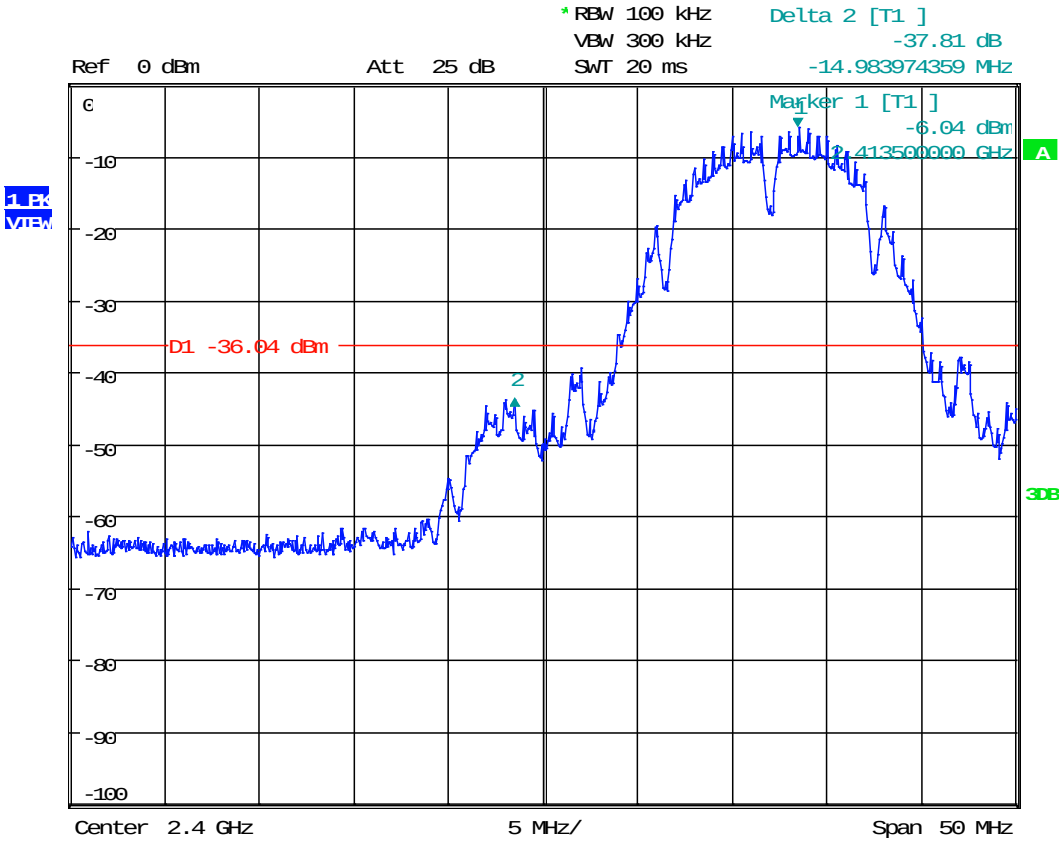


Plot 4.9
Tx @ 2462MHz 802.11n



Plot 4.10

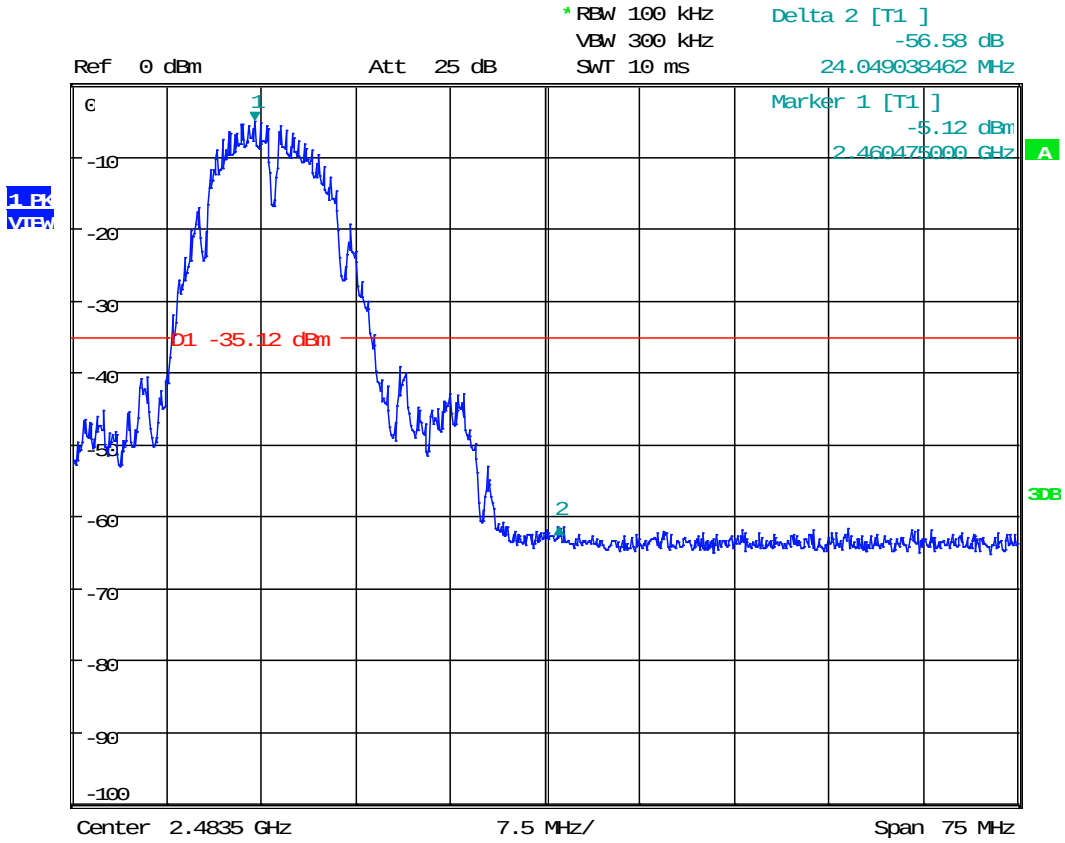
Conducted Band Edge, Tx @ 2412MHz 802.11b



Date: 24.APR.2017 12:18:19

Plot 4.11

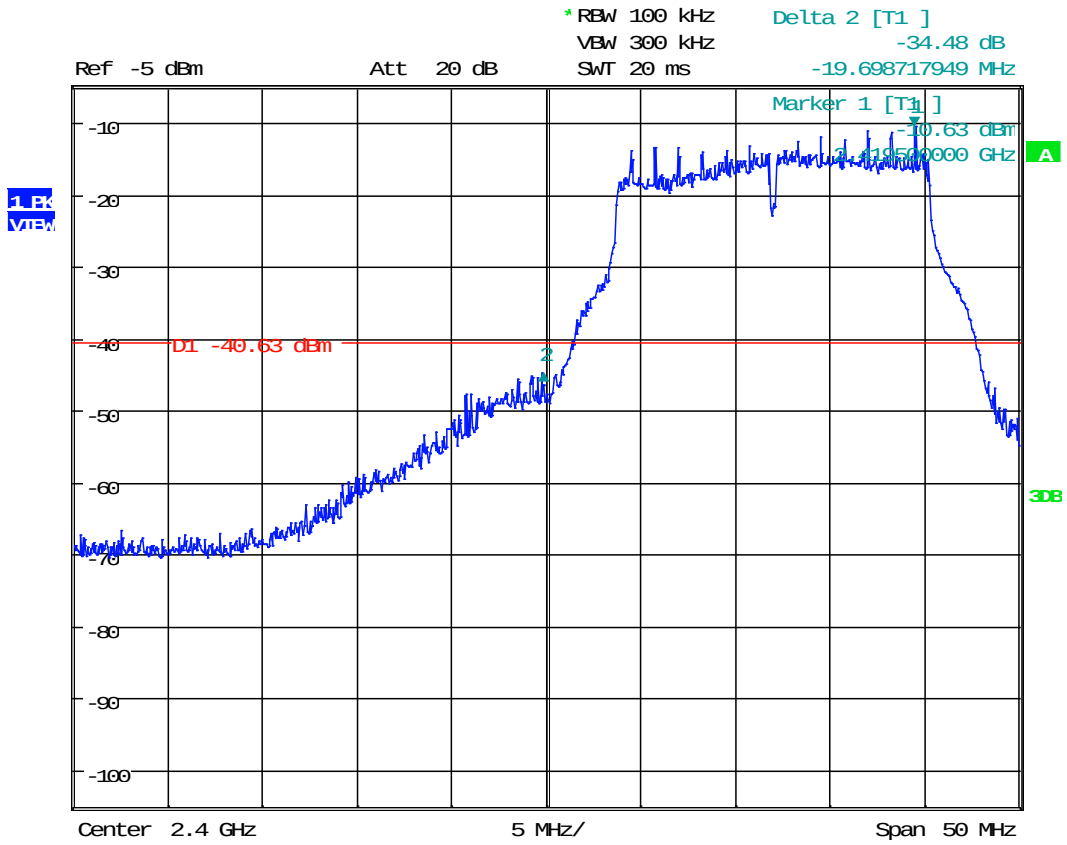
Conducted Band Edge, Tx @ 2462MHz 802.11b



Date: 24.APR.2017 12:17:15

Plot 4.12

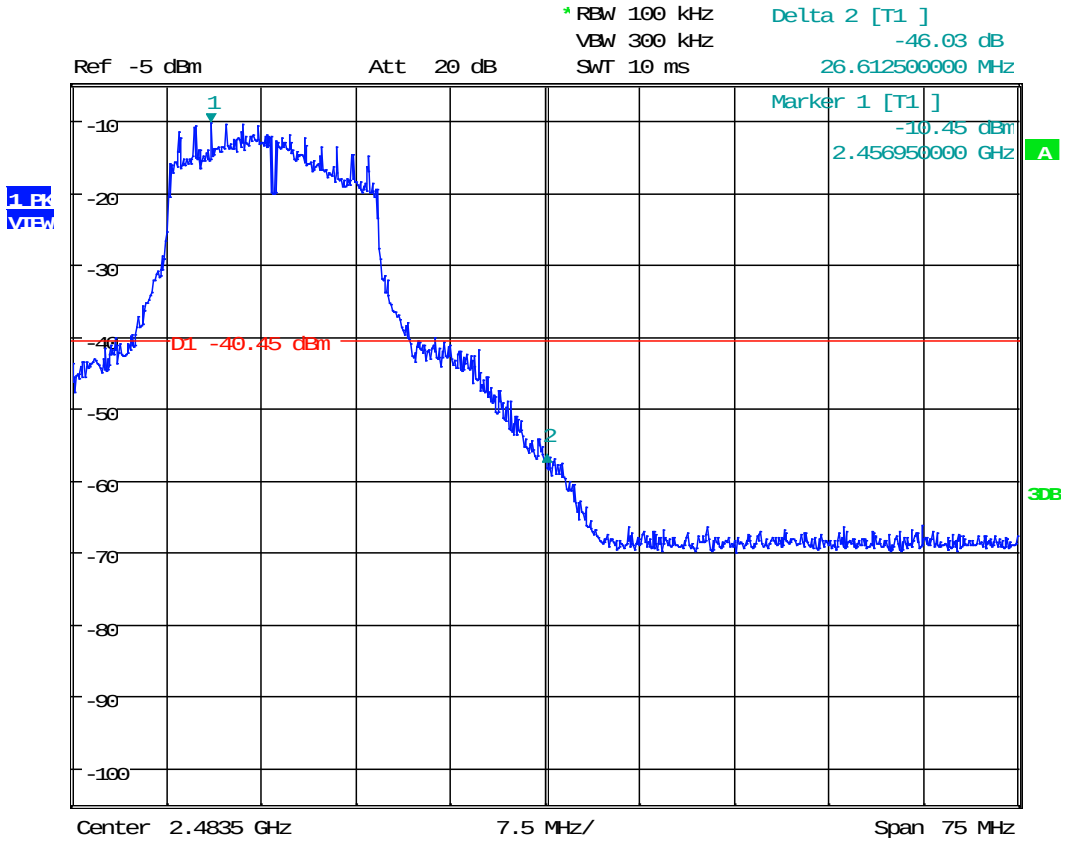
Conducted Band Edge, Tx @ 2412MHz 802.11g



Date: 24.APR.2017 12:12:23

Plot 4.13

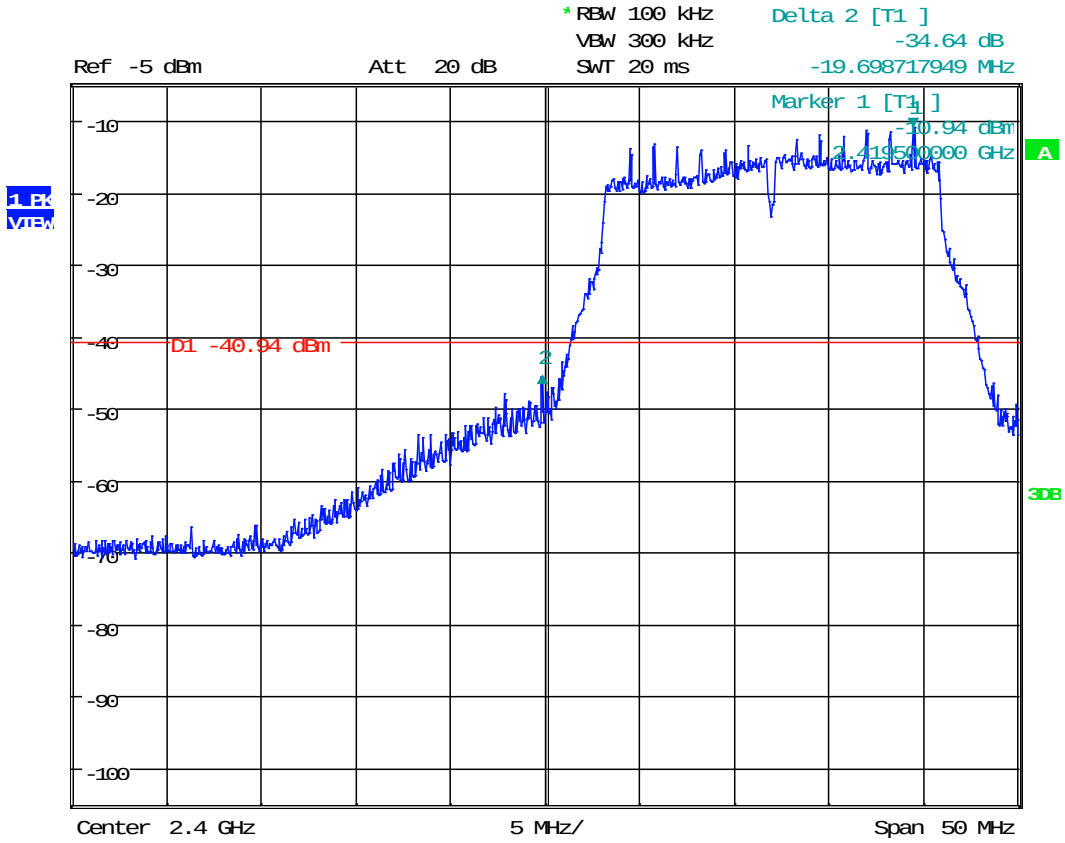
Conducted Band Edge, Tx @ 2462MHz 802.11g



Date: 24.APR.2017 12:15:51

Plot 4.14

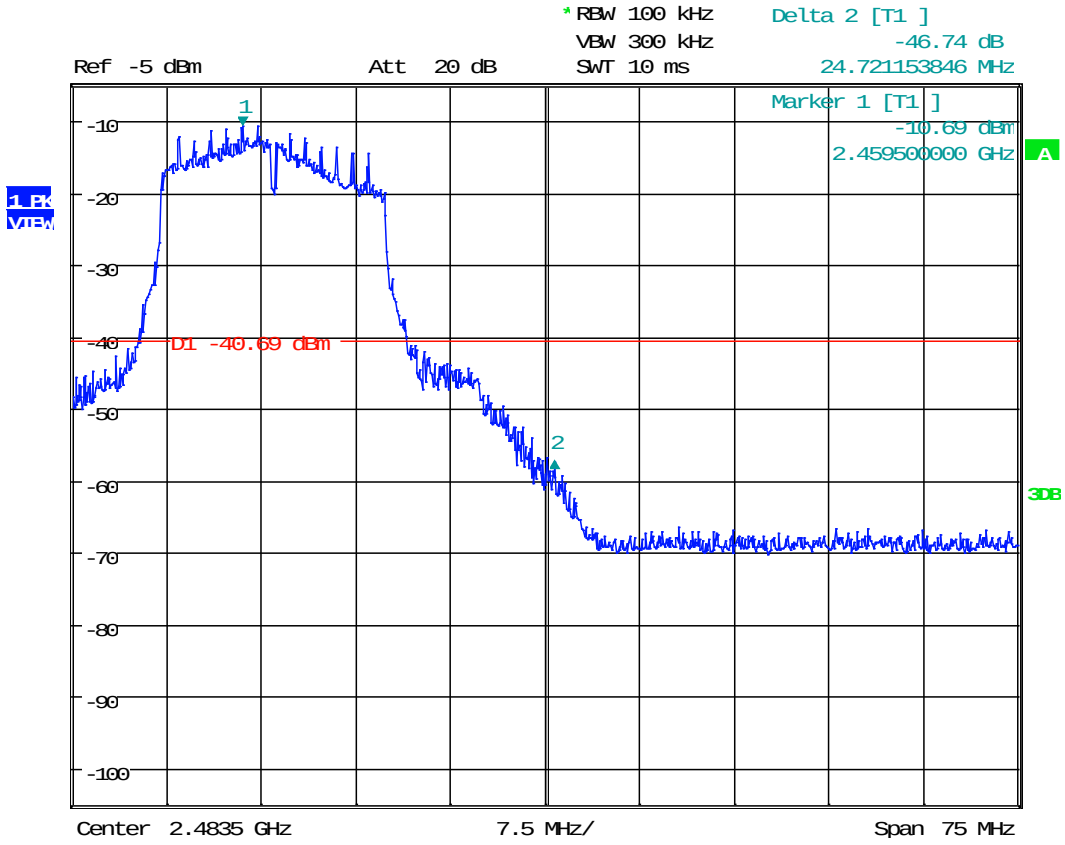
Conducted Band Edge, Tx @ 2412MHz 802.11n



Date: 24.APR.2017 12:13:22

Plot 4.15

Conducted Band Edge, Tx @ 2462MHz 802.11n



Date: 24.APR.2017 12:14:46