FCC / ISED Test Report

For:
June Life

Brand:
June Life Inc.

Model #:
JCH03

Product Description:
Smart Countertop Convection Oven

FCC ID: 2AJGA-CP20A
IC ID: 21848-CP20A

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 2 (DTSs) & RSS-Gen Issue 5

REPORT #: EMC_JUNEL_002_20001_FCC_15.247_ISED_Wi-Fi_DTS

DATE: 10/21/2020

A2LA Accredited

IC recognized #
3462B-1
3462B-2

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

According to section 5 of this report, the overall result is Pass.

Company	Description	Model #
June Life	Smart Countertop Convection Oven	JCH03

Responsible for Testing Laboratory:

Date	Section	Name	Signature
21/10/2020	Compliance	Li, Cindy (EMC Lab Manager)	Cindy Li Digitally signed by cindy.li@cetecom.com DN: CN=cindy.li@cetecom.com Reason: I have reviewed this document Location: Date: 2020-10-21 09:52:19

Responsible for the Report:

Date	Section	Name	Signature
21/10/2020	Compliance	Ghanma, Issa (EMC Engineer)	Digitally signed by: Issa W Ghanma DN: CN = Issa W Ghanma email = Issaghanma@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2020.10.21 08:08:57 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Li, Cindy
Responsible Project Leader:	Palacios, Cathy

2.2 Identification of the Client

Applicant's Name:	June Life
Street Address:	1620 Folsom St
City/Zip Code	San Francisco CA, 94103
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client /----------
Manufacturers Address:	----------
City/Zip Code	----------
Country	----------

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	JCH03
Marketing name:	June Oven
FCC-ID :	2AJGA-CP20A
IC-ID:	21848-CP20A
HW Version :	11-00012-00,ASSY,PENGUIN-04
SW Version :	1.22.0.33
HVIN:	JCH03
PMN:	June Oven
FVIN:	N/A
HMN	June Oven
Product Description:	Smart Countertop Convection Oven
Frequency Range / number of channels:	Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Type(s) of Modulation:	DSSS, OFDM
Modes of Operation:	802.11b/g/n HT20 & HT40 SISO, CDD, MIMO (2x2)
Maximum Measured Conducted Output Power:	+15.63 dBm
Power Supply/ Rated Operating Voltage Range:	Low 90 V, Nominal 110 V, High 130 V
Operating Temperature Range:	Low 0º C, Nominal 25º C, High +35º C

Antenna Information as declared:	❖ Flex Dual Band Wi-Fi (2.4GHz/5GHz) Antenna • Dipole Antenna • FPC High Efficiency Dual Band Wi-Fi Dipole Antenna • Designed for 2.4 GHz and 5GHz dual band Wi-Fi applications • Linear Polarization • Omni-Directional • IPEX Connector • Miniature and light weight • RoHS Compliance • 3M300LSE adhesive • Wi-Fi0: o Maximum Gain : 3.4 dBi o Cable length : 245mm • Wi-Fi1: o Maximum Gain : 3.2 dBi o Cable length : 315mm
Other Radios included in the device:	❖ Bluetooth 2.1+EDR ❖ Bluetooth 4.2 Low Energy ❖ Bluetooth 5.0 ❖ Wi-Fi 5 GHz a/n/ac
Sample Revision:	☐ Prototype Unit; ☐ Production Unit; ■ Pre-Production
Product dimensions [cm]:	50.4 x 49.0 x 32.5

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	00738490008293830005	11-00012-00,ASSY,PENGUIN-04	1.22.0.33	Conducted measurement
2	00738490008293830009	11-00012-00,ASSY,PENGUIN-04	1.22.0.33	Radiated measurement

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
N/A	-	-	-	-

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for the test set up	Comments
1	EUT#1	The measurement equipment was connected to the 50 ohm RF port of the EUT.
2	EUT#2	The internal antenna was connected.

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Wi-Fi 2.4 GHz 802.11b/g/n	❖ Putty terminal used to communicate with the device, and sending commands provided by client, that will not available to end-user, to configure the Wi-Fi radio: ▪ Power level ▪ Select TX paths: primary or secondary. ▪ Mode: b/g/n ▪ Transmit mode: Continuous TX ▪ Duty cycle: 100% ▪ Hopping: No ▪ Hopping Type: Single Frequency ▪ Channel: Low , Mid, High, Channel # 11 ▪ Data rate ❖ The measurement equipment was connected to the 50 ohm RF port of the EUT.
Op. 2	Wi-Fi 2.4 GHz 802.11b + BLE Co-TX	❖ Putty terminal used to communicate with the device, and sending commands provided by client, that will not be available to end-user, to configure the Wi-Fi radio: ▪ Power level ▪ Select TX paths: both primary and secondary. ▪ Mode: b ▪ Transmit mode: Continuous TX ▪ Duty cycle: 100% ▪ Hopping: No ▪ Hopping Type: Single Frequency ▪ Channel: Low , Mid, High, Channel # 11 ▪ Data rate

Note: Refer to "Theory of Operation-v3.pdf" for Wi-Fi RF Power setting table.

3.6 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle and output power.

For radiated measurements;

- All data in this report show the worst case of Wi-Fi radio in simultaneous transmission mode with BLE CH39, transmitting at the highest output power band representing worst case transmission mode.
- All data in this report show the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under:

- FCC ID: 2AJGA-CP20A
- IC ID: 21848-CP20A

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – "GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES" - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(a)	Emission Bandwidth	Nominal	802.11b/g/n	■	☐	☐	Complies
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	802.11b/g/n	■	☐	☐	Complies
§15.247(b)(1) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	802.11b/g/n	■	☐	☐	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	802.11b/g/n	■	☐	☐	Complies
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	802.11b/g/n	■	☐	☐	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	802.11b + BLE	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	802.11b + BLE	■	☐	☐	Complies

Note1: NA= Not Applicable; NP= Not Performed.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)
RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

8/3/2020 – 10/6/2020

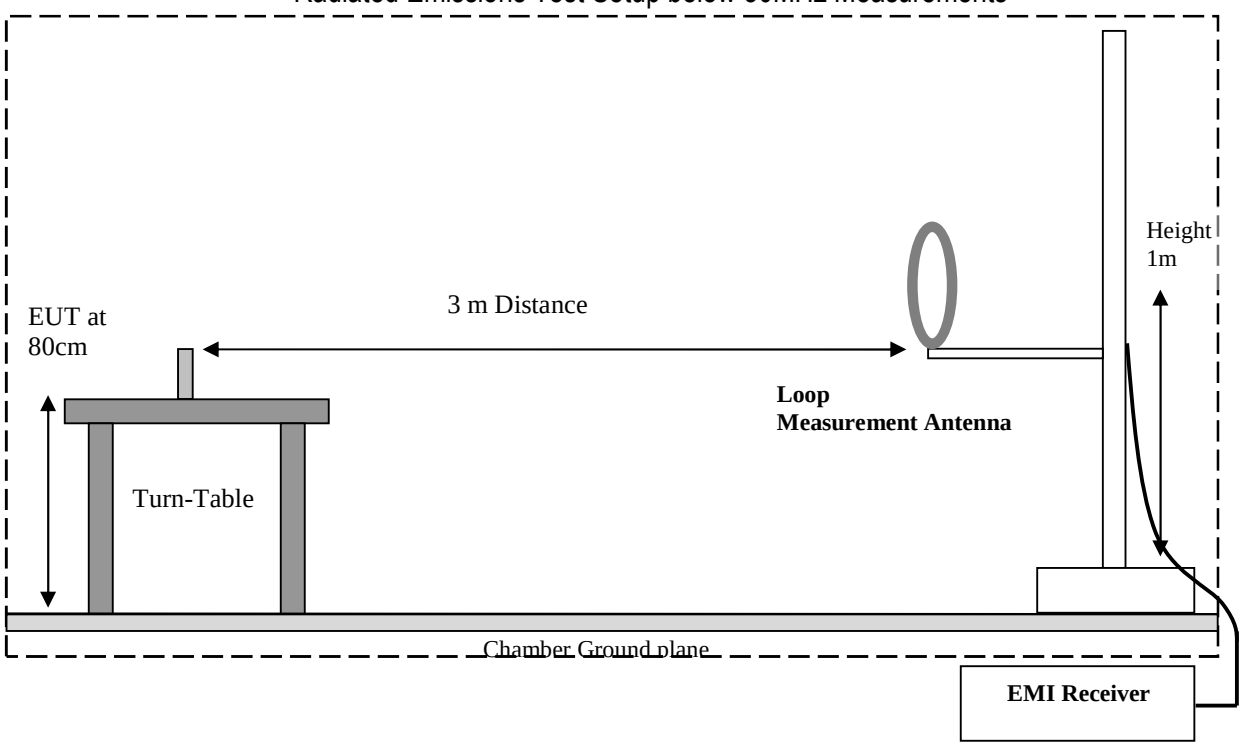
7 Measurement Procedures

7.1 Radiated Measurement

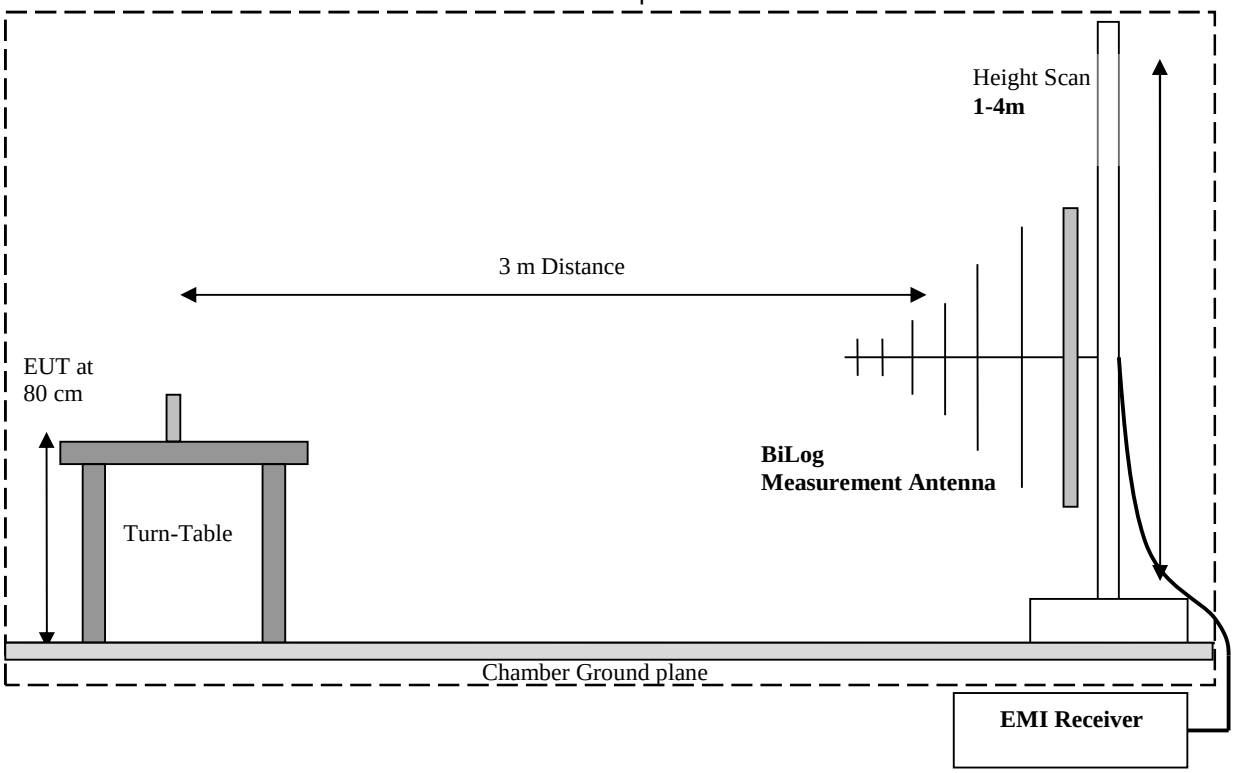
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 360º continuous measurement of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

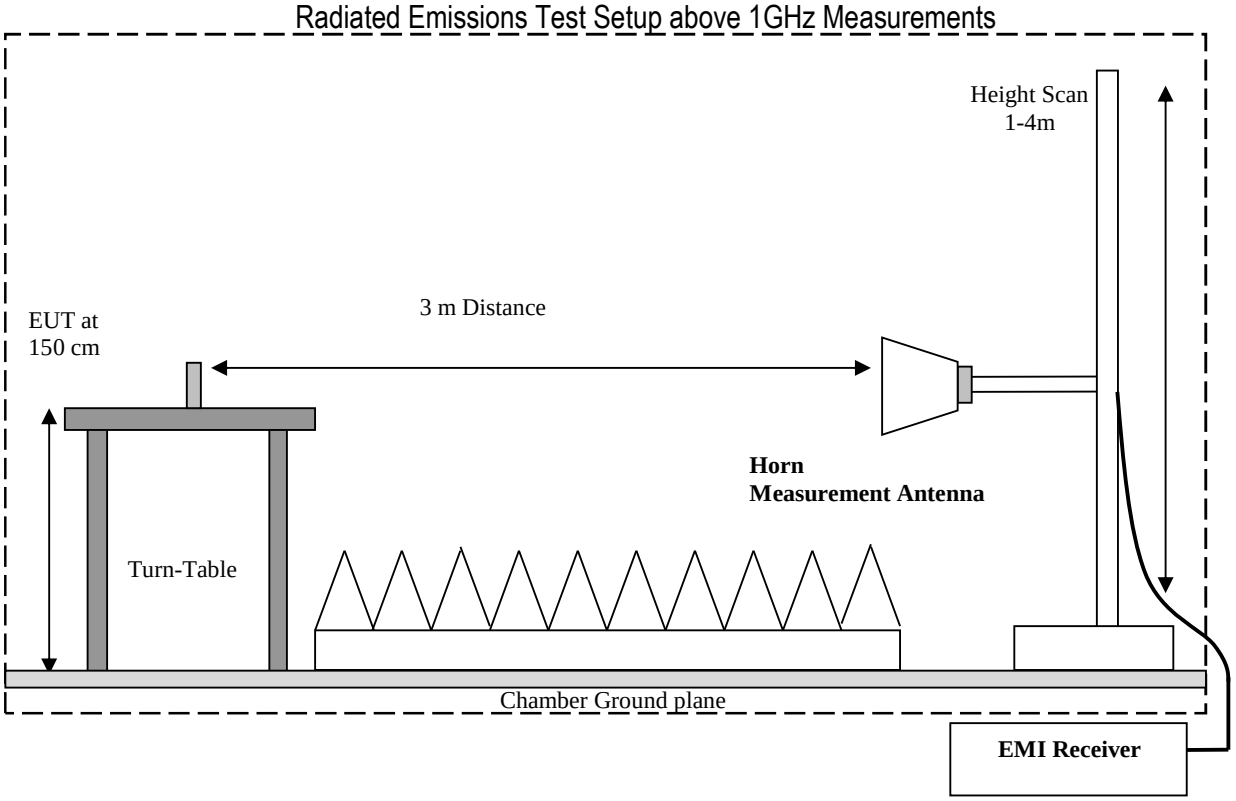
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)

Example:

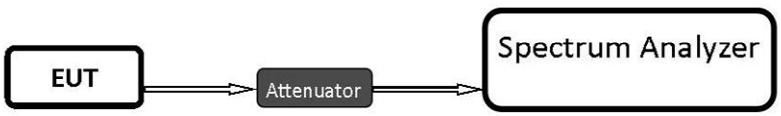
Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – "GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES" - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

8 Test Result Data

8.1 Duty Cycle

8.1.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02;

Section 6. DUTY CYCLE, TRANSMISSION FURATION AND MAXIMU POWER CONROL LEVEL

Measurements of duty cycle and transmission duration shall be performed using one of the following technique:

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on-and off-times of transmitted signal.

1. Set the center frequency of the instrument to the center frequency of the transmission.
2. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
3. Set detector = peak or average.
4. The zero-span measurement method shall not be used unless both RBW and VBW are >50/T and the number of sweep points across duration T exceeds 100.

(For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≥ 16.7 microseconds.)

8.1.2 Test conditions and setup:

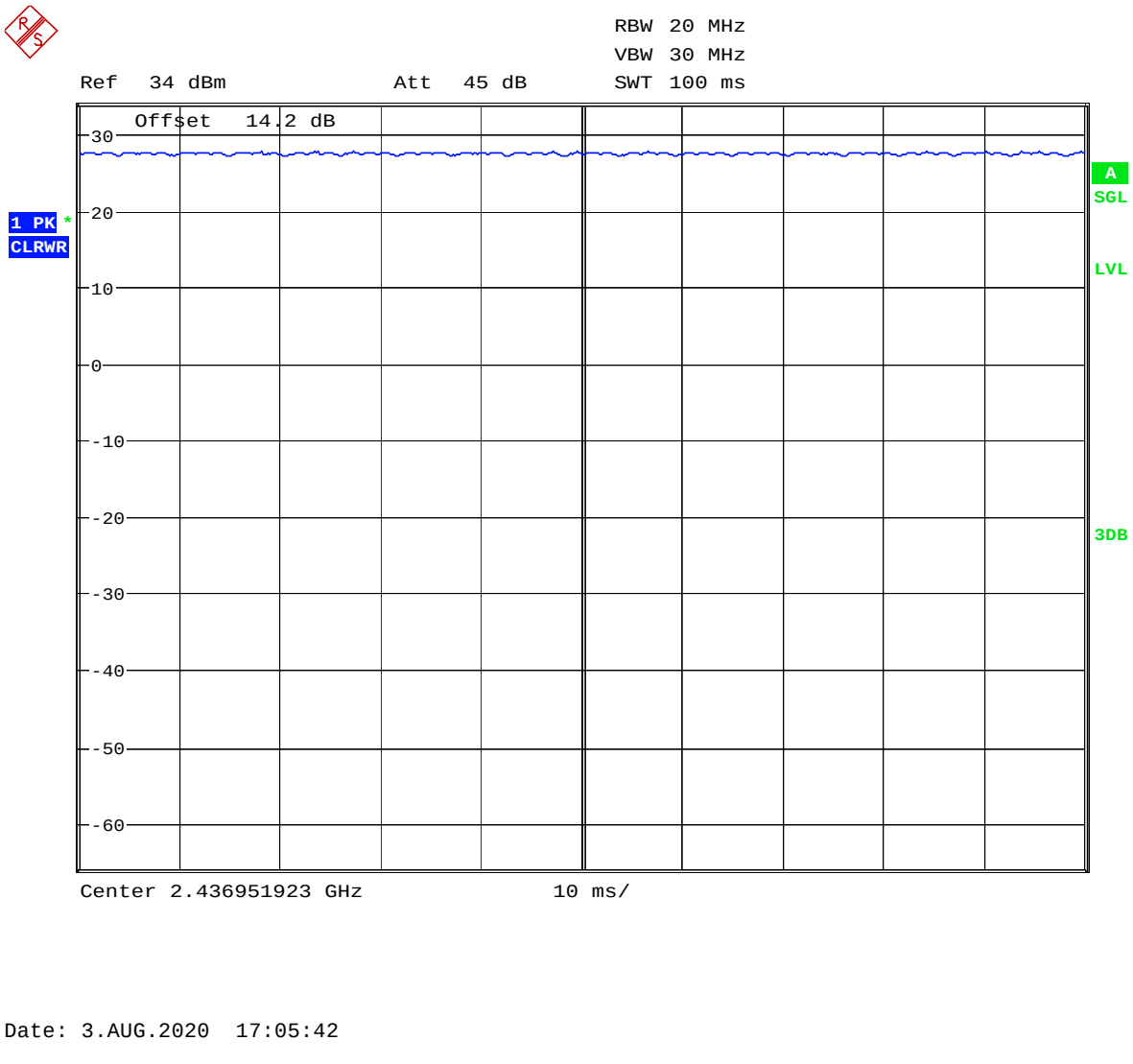
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.1.3 Measurement result:

Plot #	Mode	TX Frequency	Data Rate	Duty cycle
1	802.11b	2437 MHz	1 Mb/s	≥ 98.0 %
2	802.11g	2437 MHz	6 Mb/s	≥ 98.0 %
3	802.11n_HT20	2437 MHz	MCS0 6.5 Mb/s	≥ 98.0 %
4	802.11n_HT40	2422 MHz	MCS0 13.5 Mb/s	≥ 98.0 %

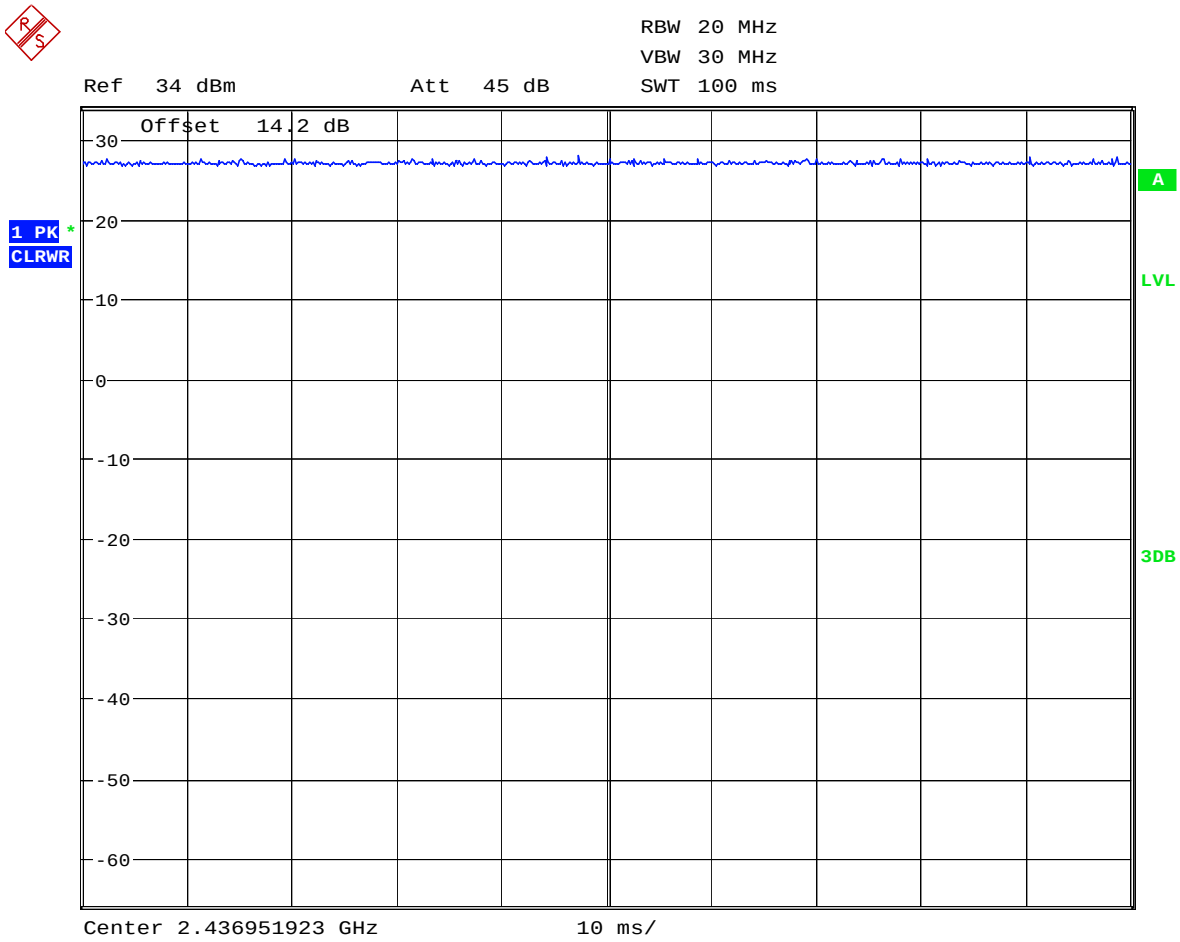
8.1.4 Measurement plots:

Plot # 1	
Tx Frequency: 2437 MHz	Mode: 802.11b



Plot # 2

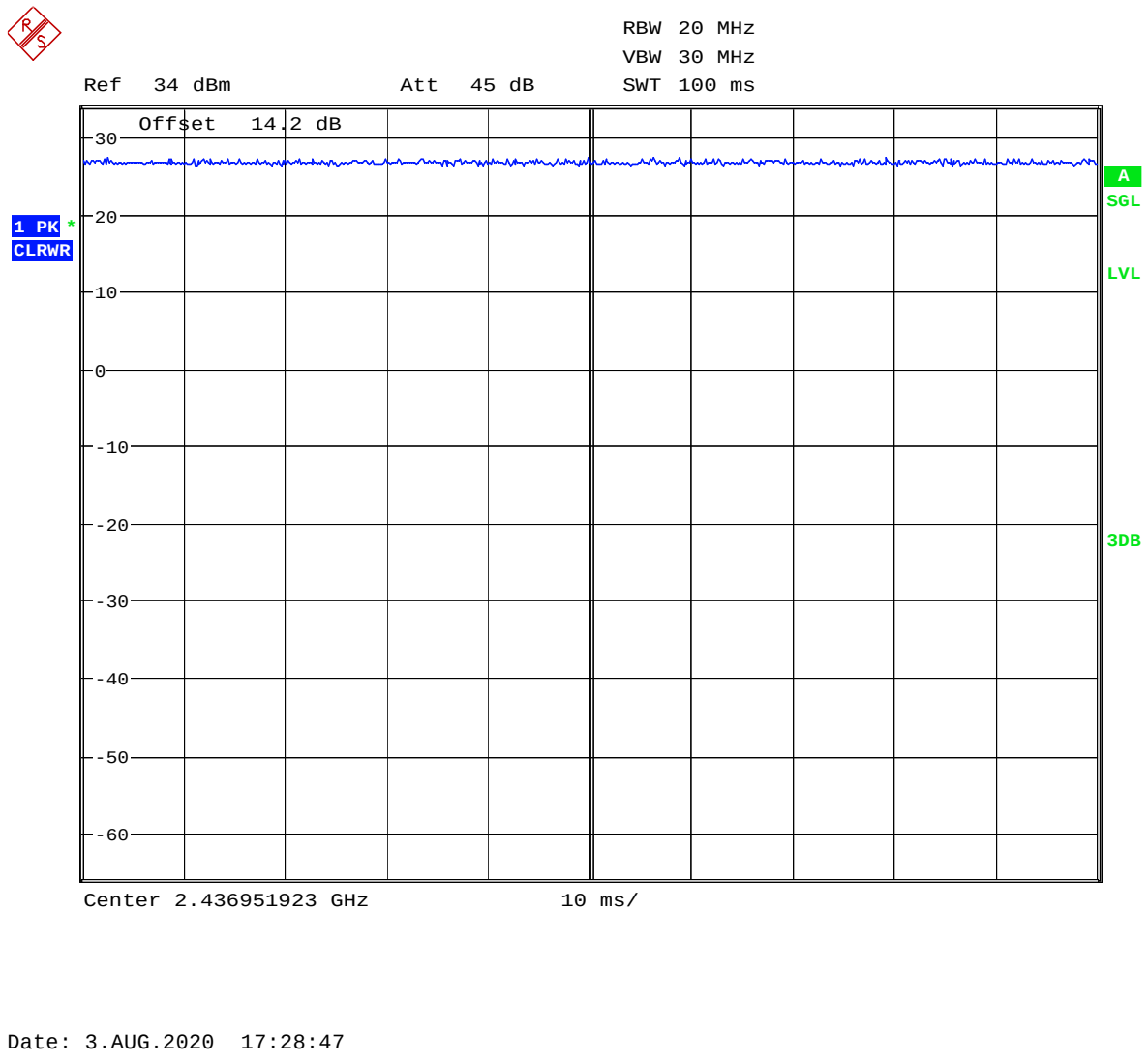
Tx Frequency: 2437 MHz	Mode: 802.11g



Date: 3.AUG.2020 17:27:06

Plot # 3

Tx Frequency: 2437 MHz	Mode: 802.11n_HT20



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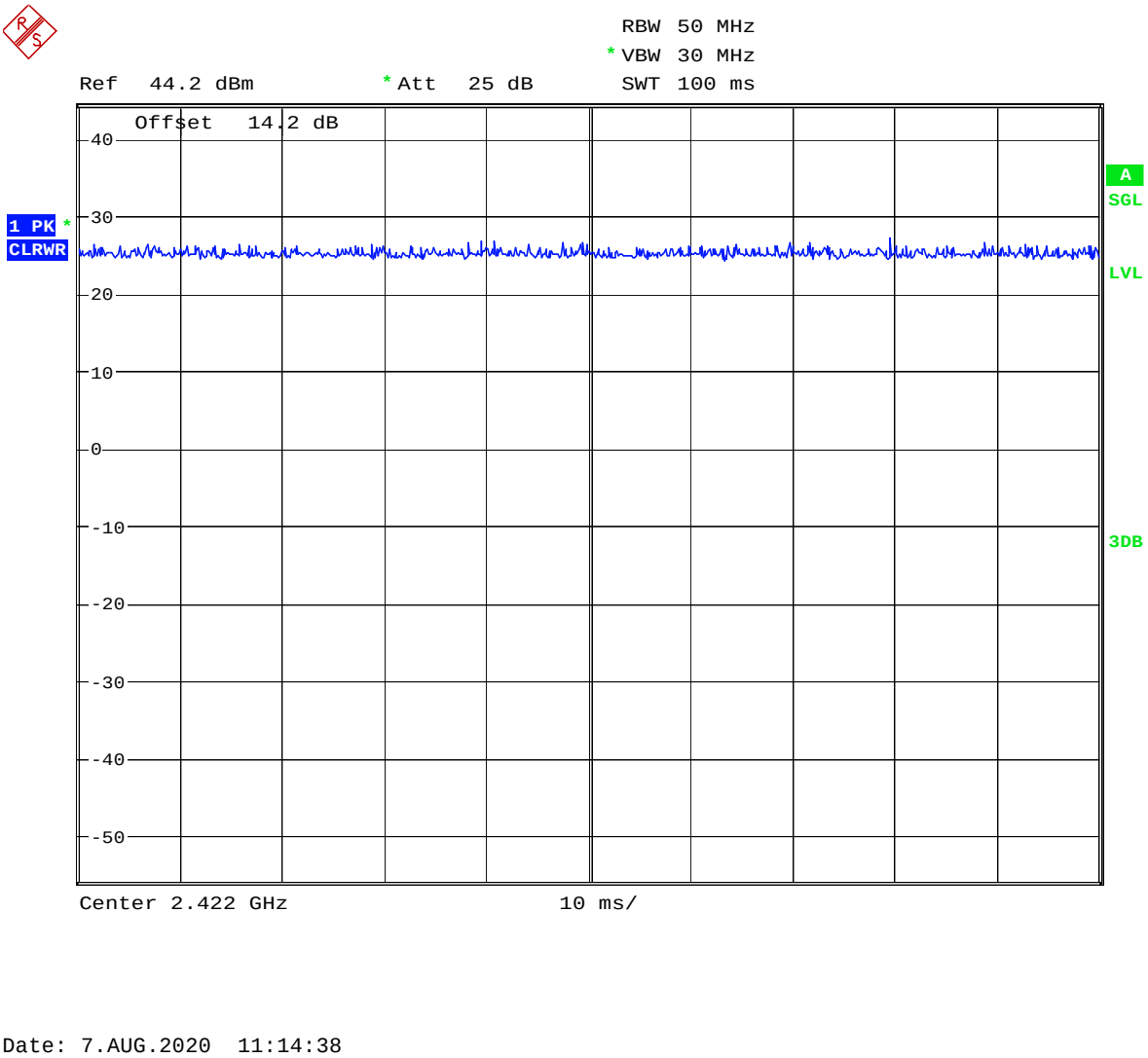
Plot # 4

Tx Frequency: 2422 MHz	Mode: 802.11n_HT40



Date: 7.AUG.2020 11:14:38

8.2 Emission Bandwidth 6dB and 99% Occupied Bandwidth

8.2.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

Spectrum Analyzer settings:

6dB (DTS) Bandwidth:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW) ≥ 3 x RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- 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.

99% Occupied Bandwidth:

- Set frequency = nominal EUT channel center frequency
- Set Span = 1.5 x to 5.0 x OBW
- Set RBW = 1% to 5% of OBW
- Set the video bandwidth (VBW) ≈ 3 x RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth
- If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

8.2.2 Limits:

FCC §15.247(a)(1) and RSS-247 5.2(1)

- Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.2.4 Measurement result:

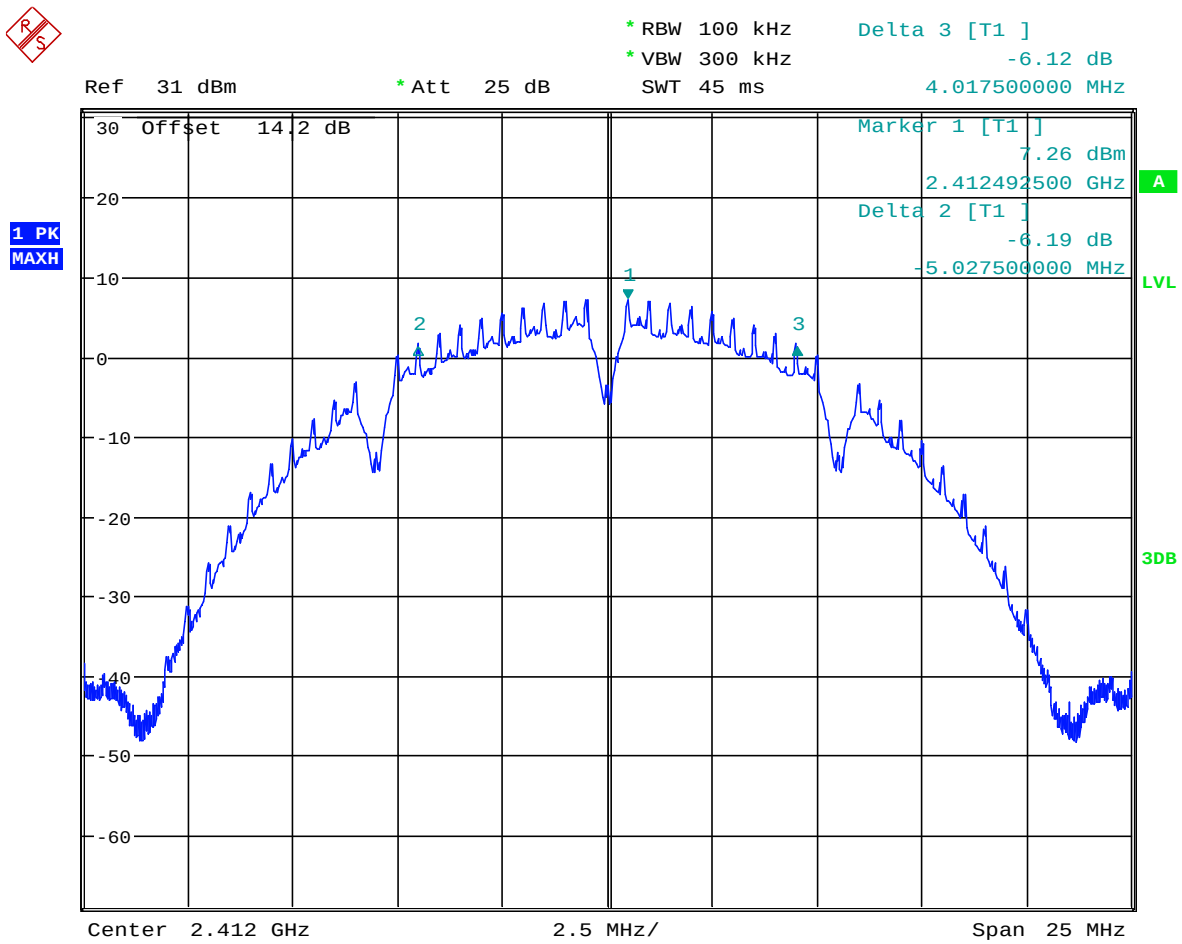
Plot #	Frequency (MHz)	EUT Operating Mode	6dB Emission Bandwidth (MHz)	Limit (MHz)	Result
5	2412	802.11b	9.05	> 0.5	Pass
6	2437	802.11b	9.04	> 0.5	Pass
7	2462	802.11b	9.04	> 0.5	Pass
8	2412	802.11g	16.43	> 0.5	Pass
9	2442	802.11g	16.32	> 0.5	Pass
10	2462	802.11g	16.34	> 0.5	Pass
11	2412	802.11n_HT20	17.56	> 0.5	Pass
12	2442	802.11n_HT20	17.57	> 0.5	Pass
13	2462	802.11n_HT20	17.51	> 0.5	Pass
14	2422	802.11n_HT40	36.33	> 0.5	Pass
15	2452	802.11n_HT40	36.29	> 0.5	Pass

Plot #	Frequency (MHz)	EUT Operating Mode	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
16	2412	802.11b	13.47	> 0.5	Pass
17	2442	802.11b	13.46	> 0.5	Pass
18	2462	802.11b	13.48	> 0.5	Pass
19	2412	802.11g	16.43	> 0.5	Pass
20	2442	802.11g	16.36	> 0.5	Pass
21	2462	802.11g	16.38	> 0.5	Pass
22	2412	802.11n_HT20	17.54	> 0.5	Pass
23	2442	802.11n_HT20	17.54	> 0.5	Pass
24	2462	802.11n_HT20	17.58	> 0.5	Pass
25	2422	802.11n_HT40	35.94	> 0.5	Pass
26	2452	802.11n_HT40	36.0	> 0.5	Pass

8.2.5 Measurement Plots:

6 dB Emission Bandwidth

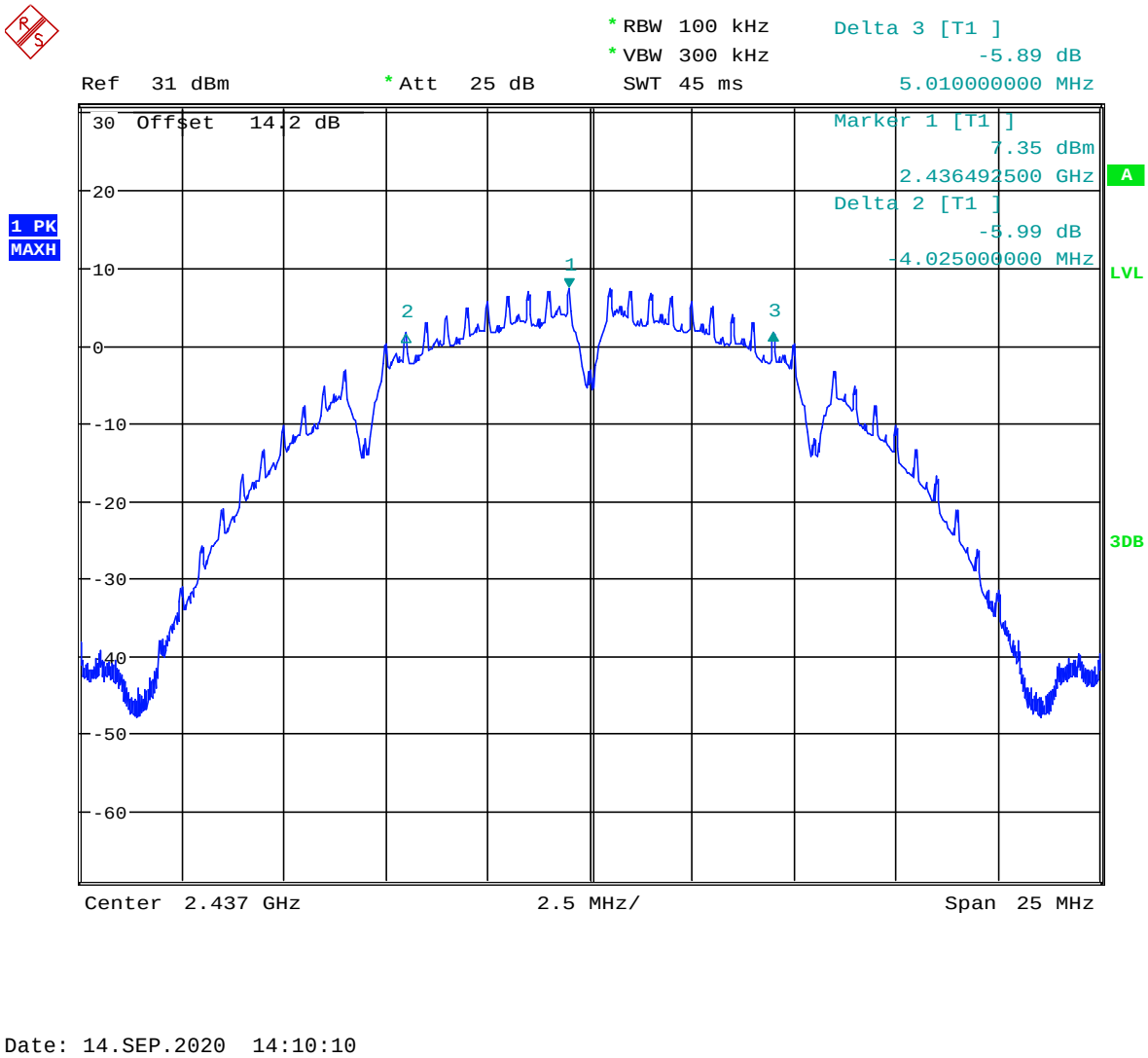
Plot # 5	
Tx Frequency: 2412 MHz	**Mode: 802.11b**



Date: 14.SEP.2020 13:56:32

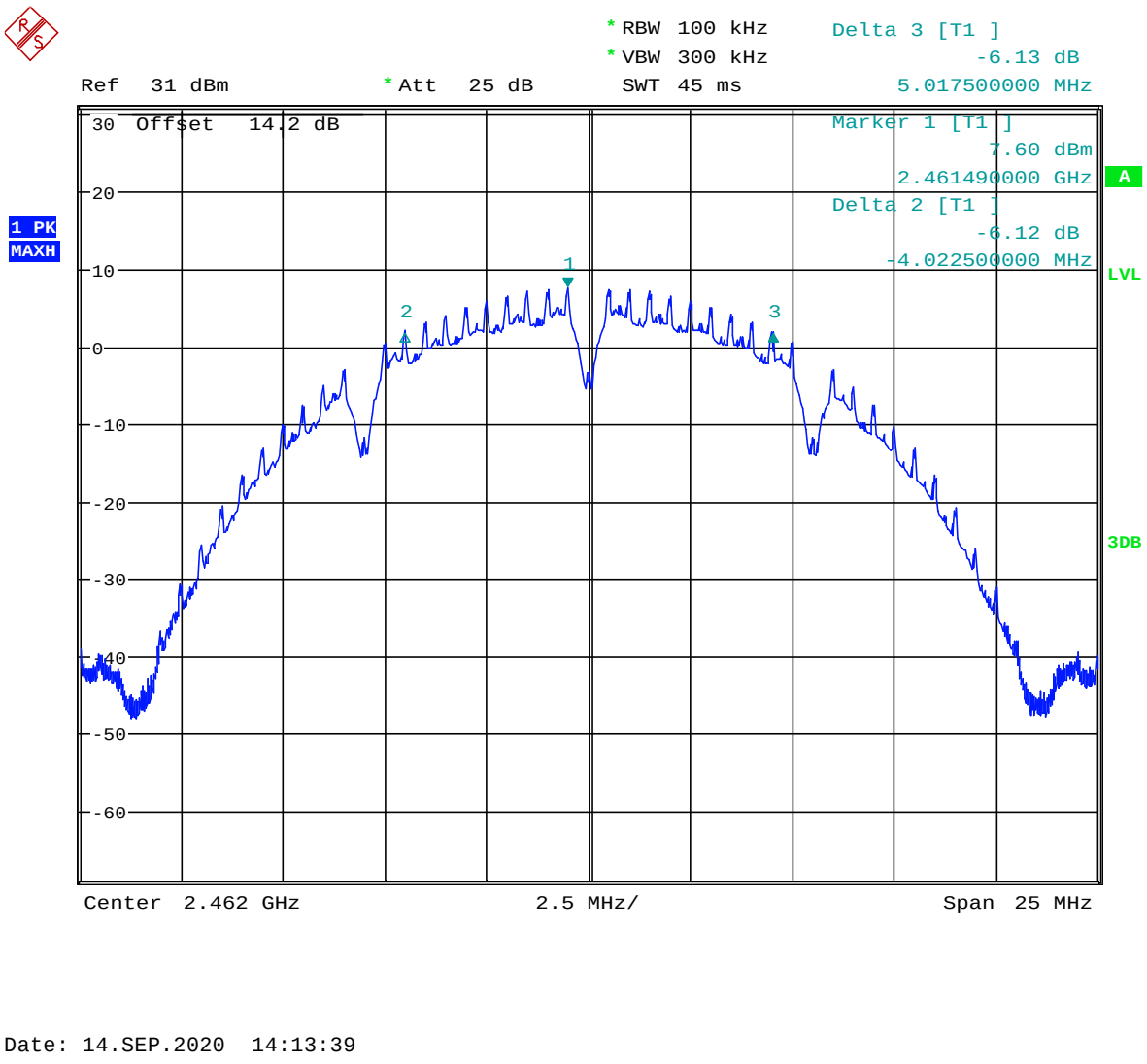
Plot # 6

Tx Frequency: 2437 MHz	Mode: 802.11b



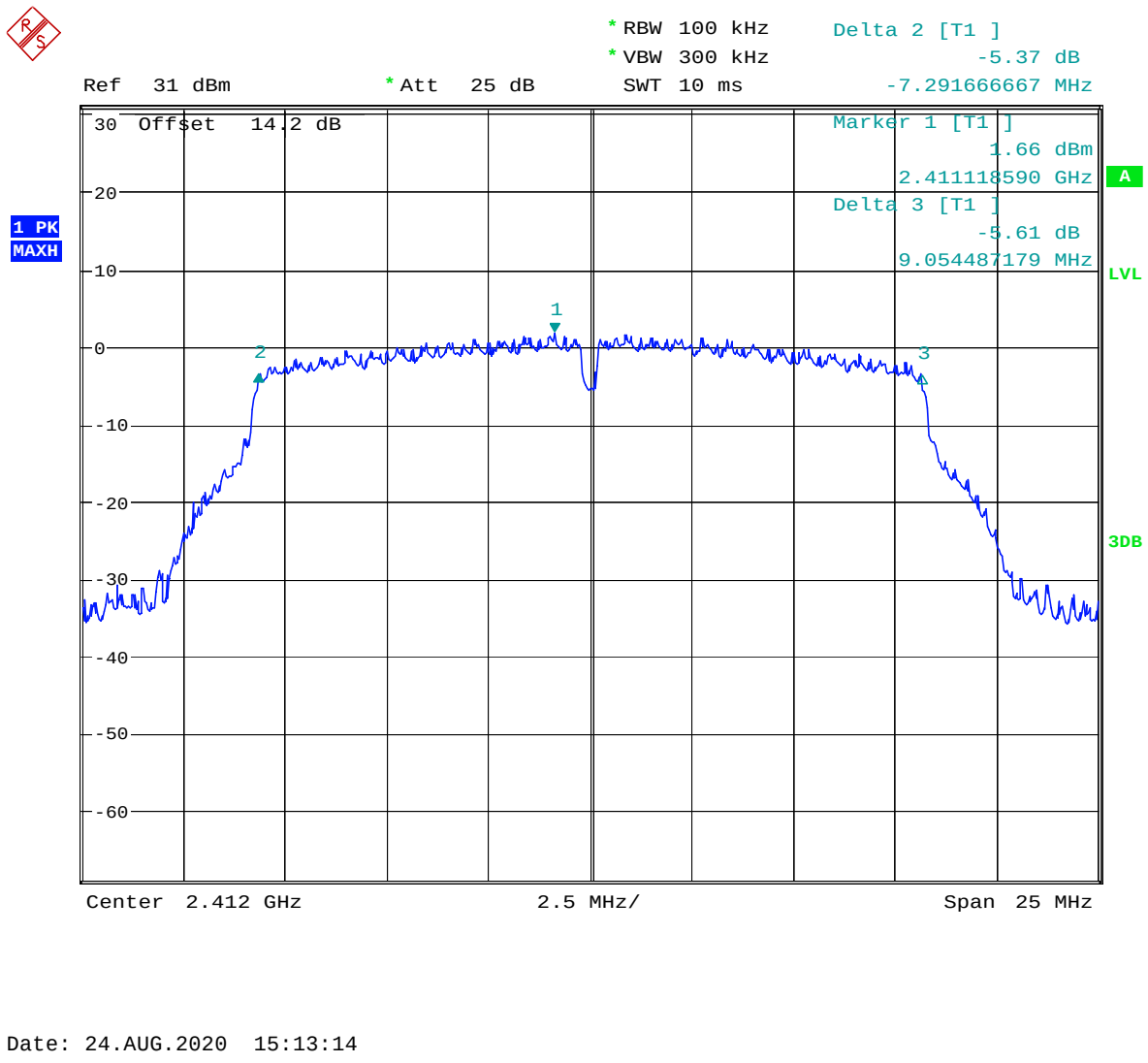
Plot # 7

Tx Frequency: 2462 MHz	Mode: 802.11b



Plot # 8

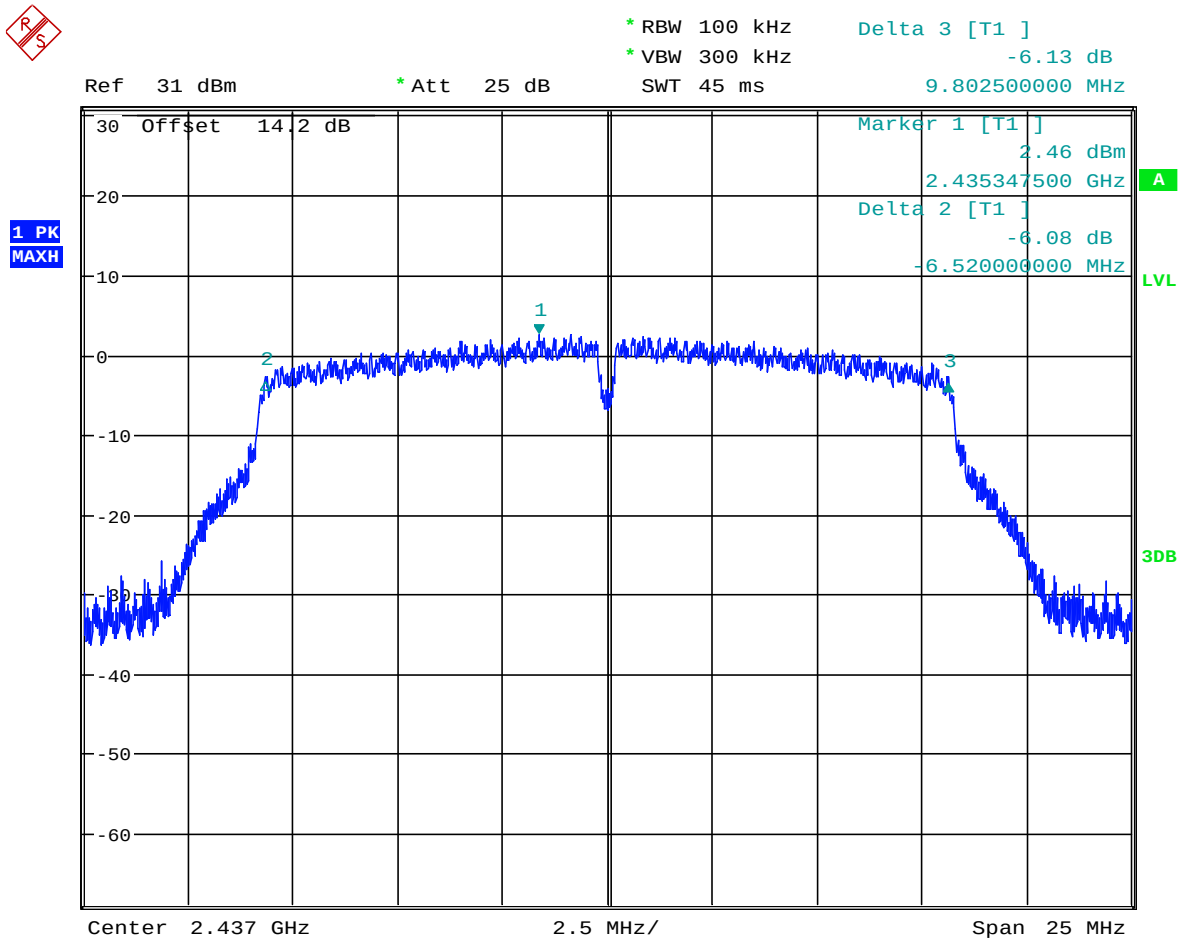
Tx Frequency: 2412 MHz	Mode: 802.11g



Date: 24.AUG.2020 15:13:14

Plot # 9

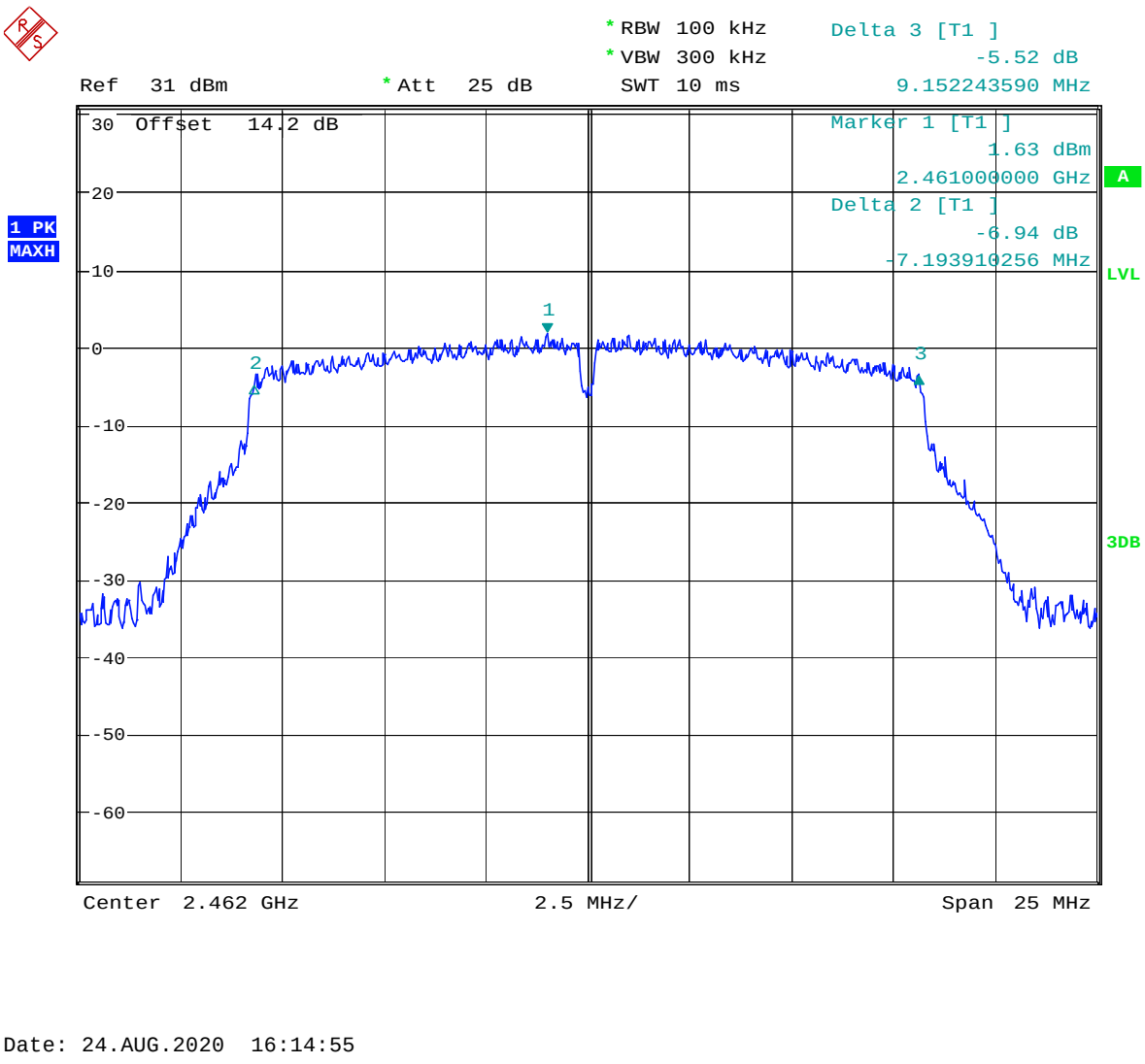
Tx Frequency: 2437 MHz	Mode: 802.11g



Date: 14.SEP.2020 14:28:14

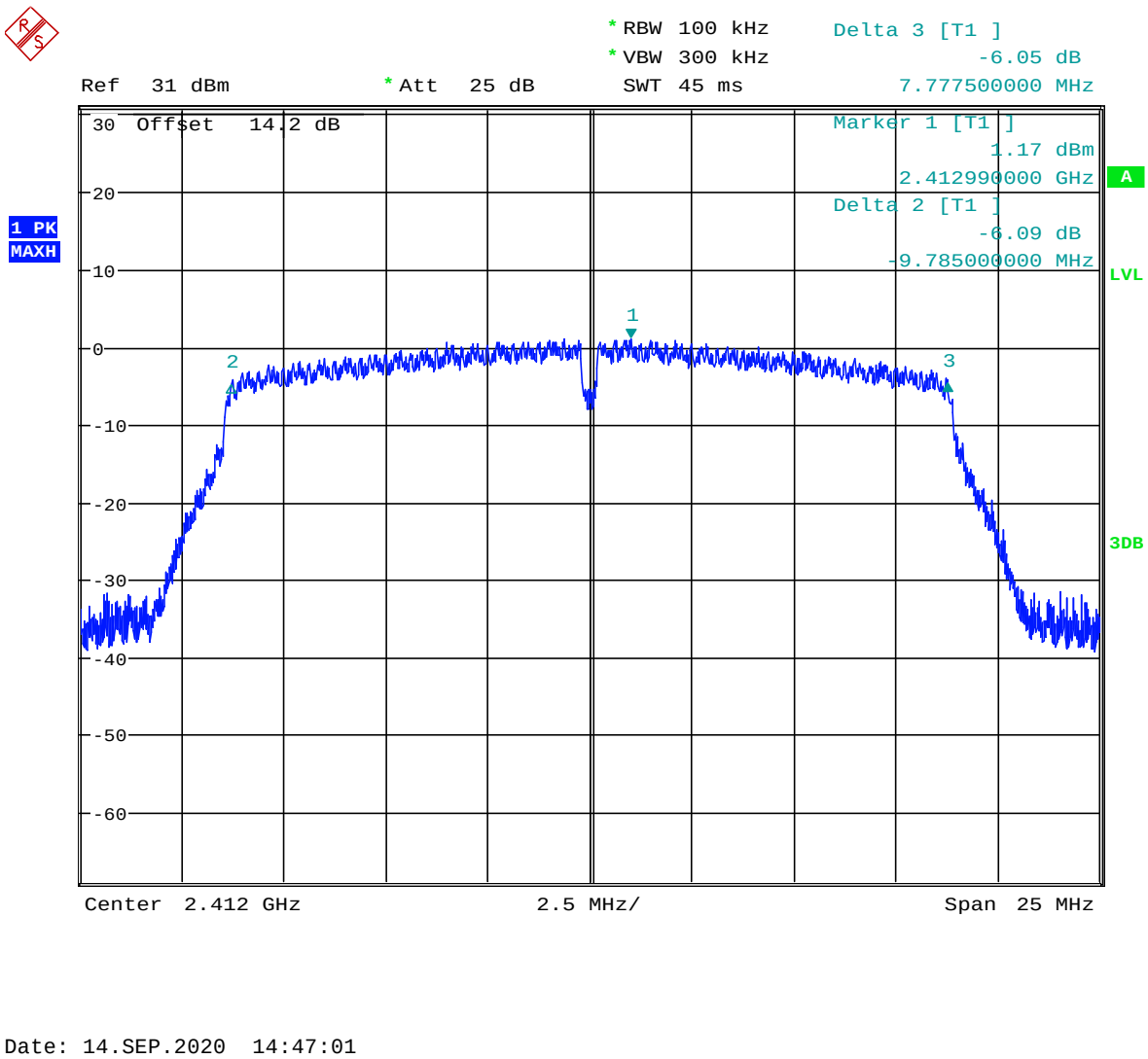
Plot # 10

Tx Frequency: 2462 MHz	Mode: 802.11g



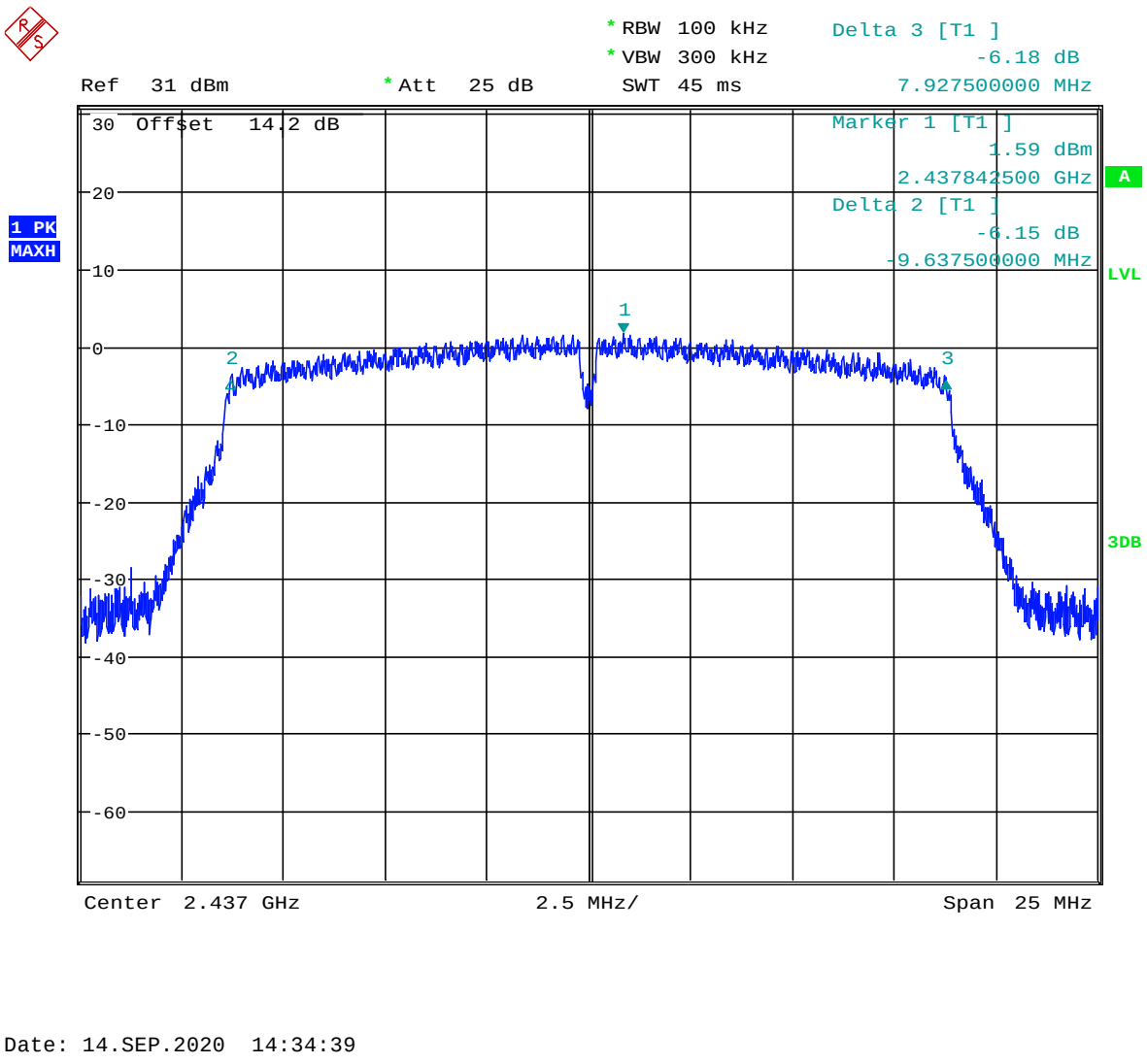
Plot # 11

Tx Frequency: 2412 MHz	Mode: 802.11n_HT20



Plot # 12

Tx Frequency: 2437 MHz	Mode: 802.11n_HT20



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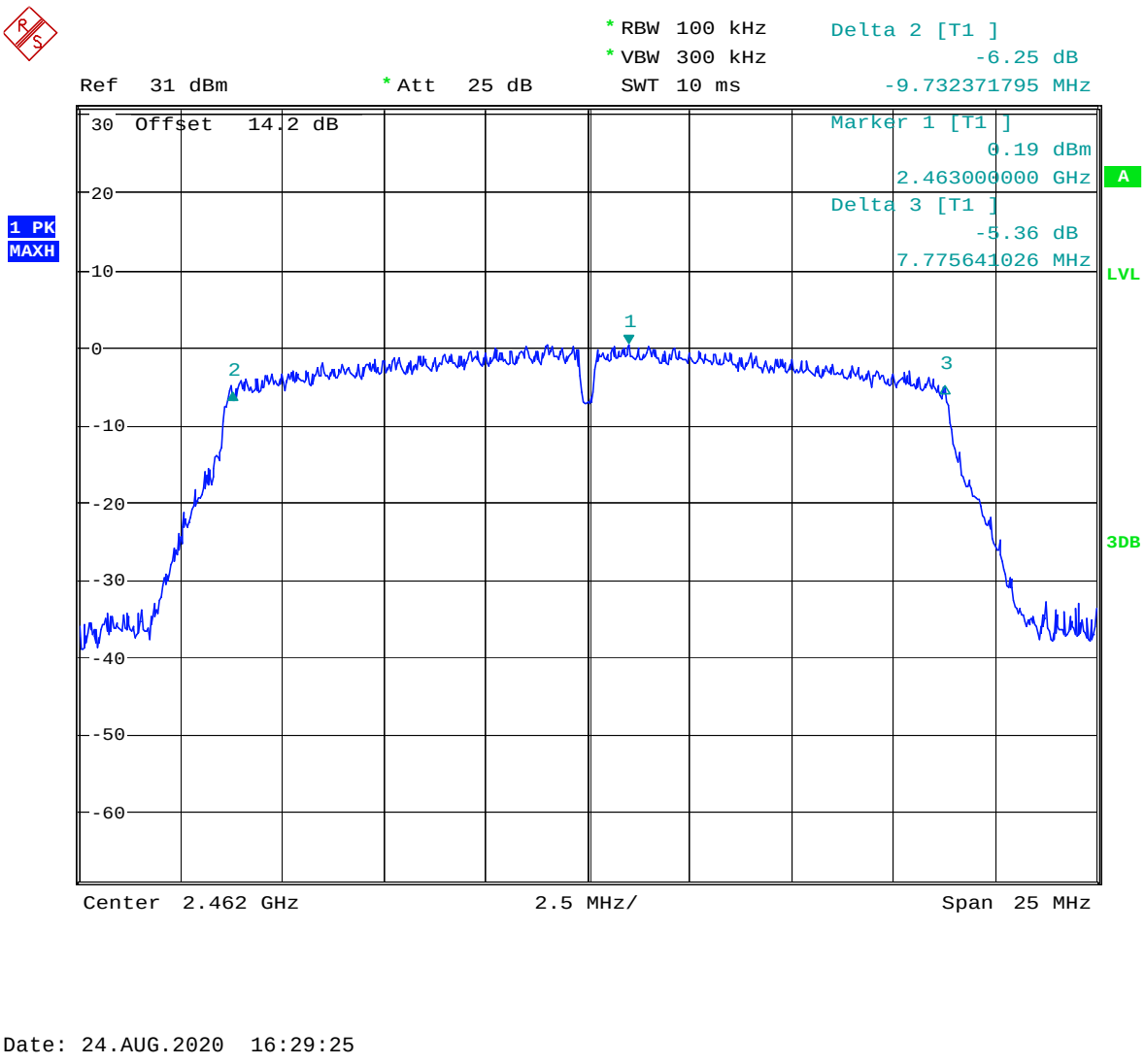
Plot # 13

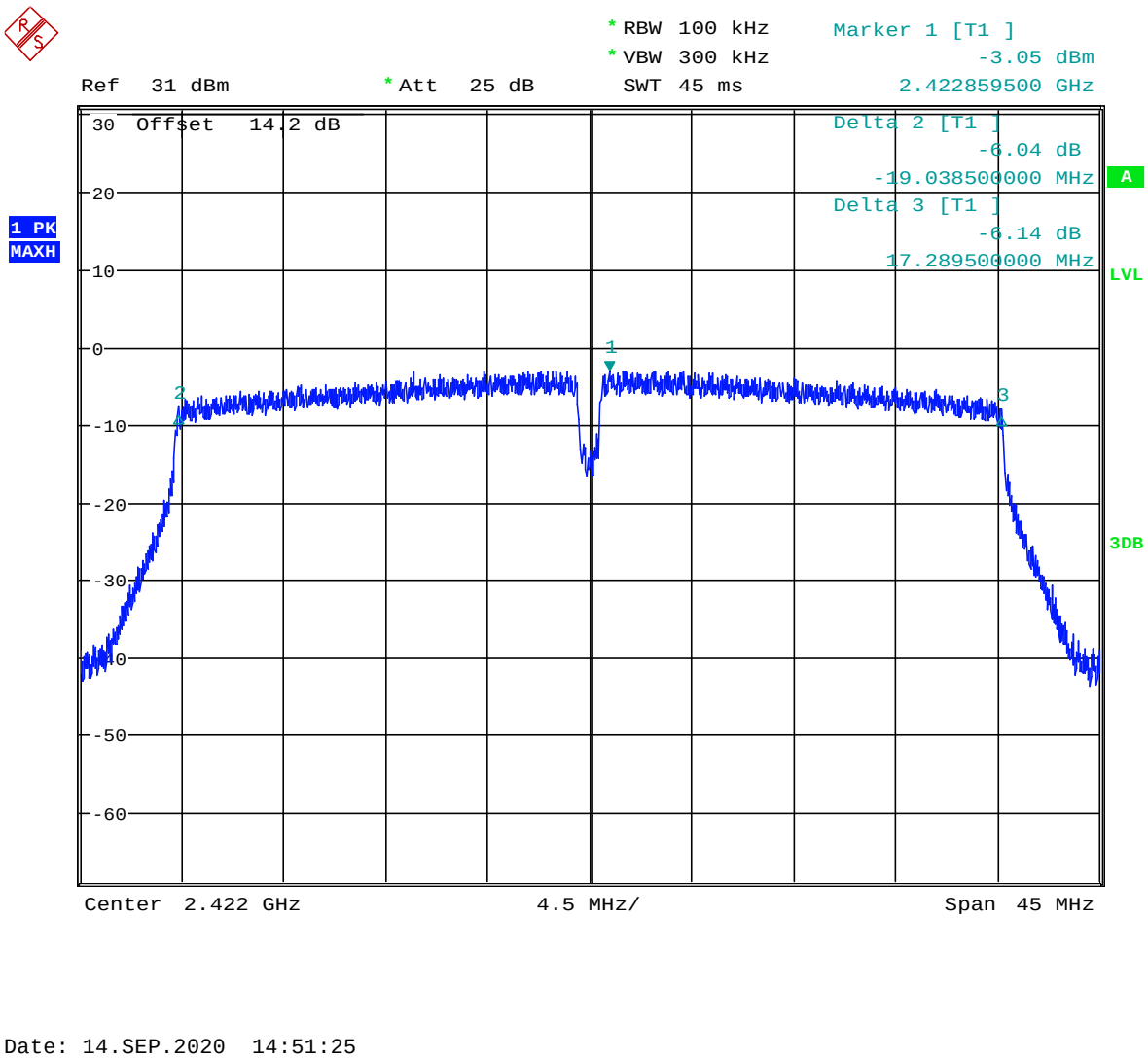
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20



Date: 24.AUG.2020 16:29:25

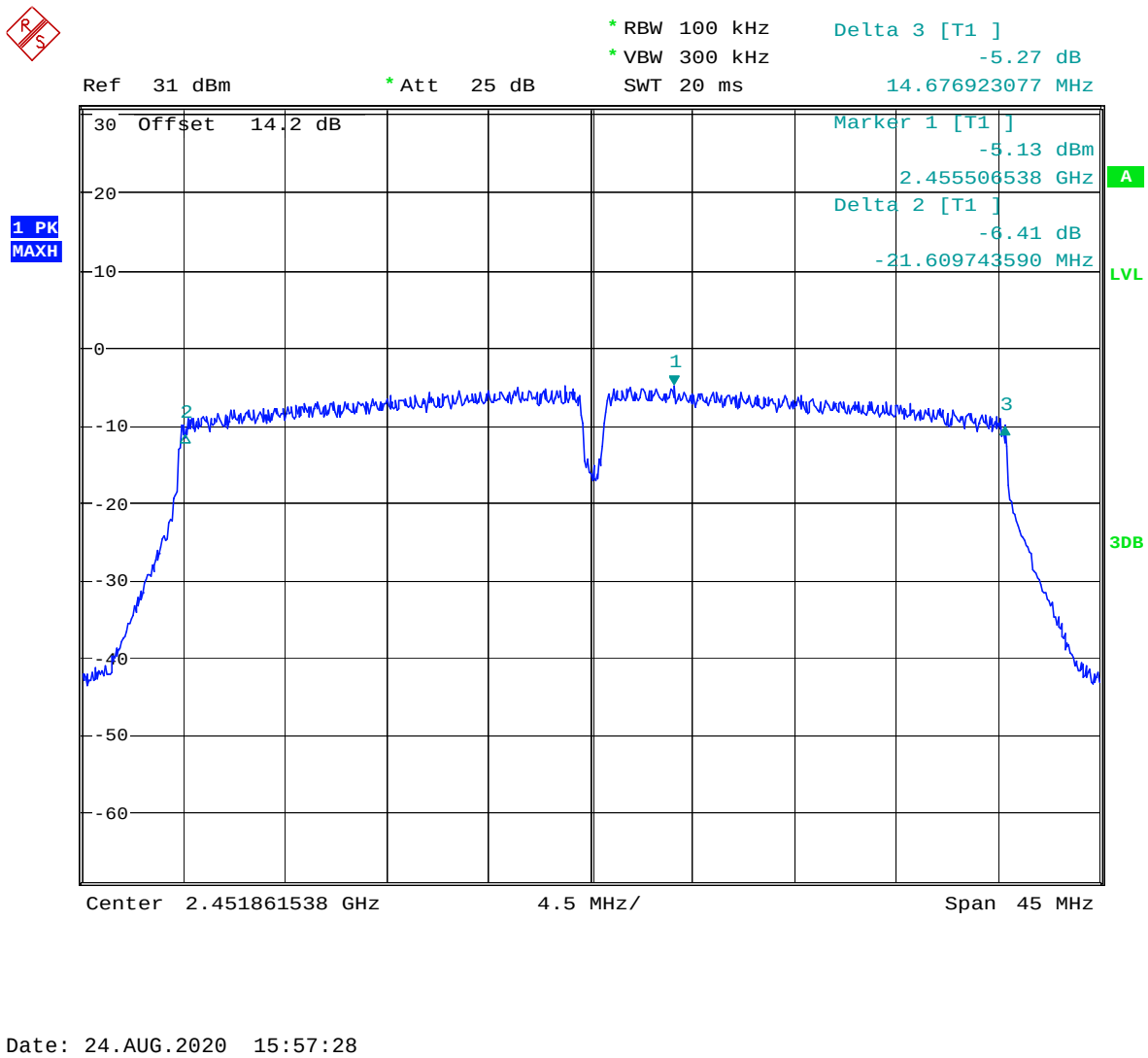
Plot # 14

Tx Frequency: 2422 MHz	Mode: 802.11n_HT40



Plot # 15

Tx Frequency: 2452 MHz	Mode: 802.11n_HT40

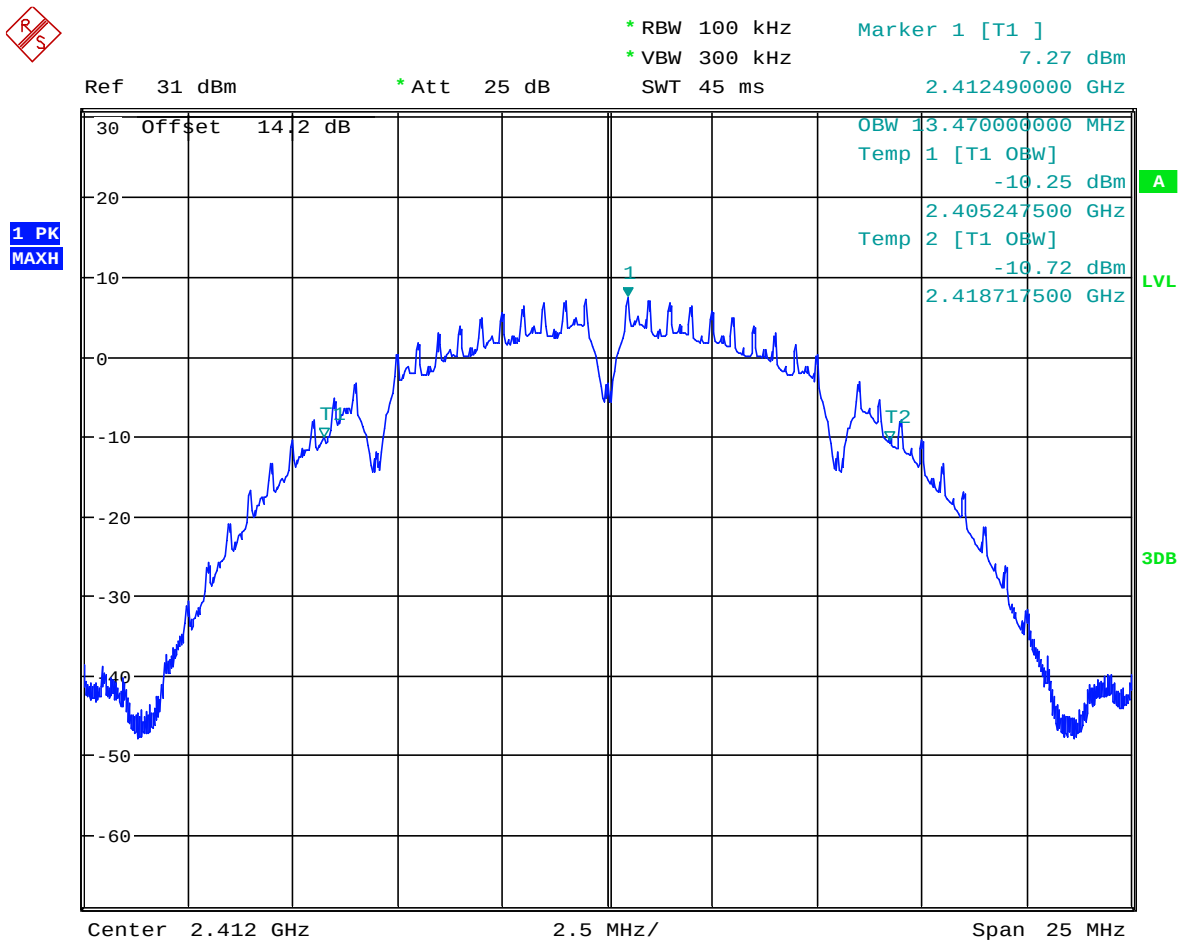


Date: 24.AUG.2020 15:57:28

99% Occupied Bandwidth

Plot # 16

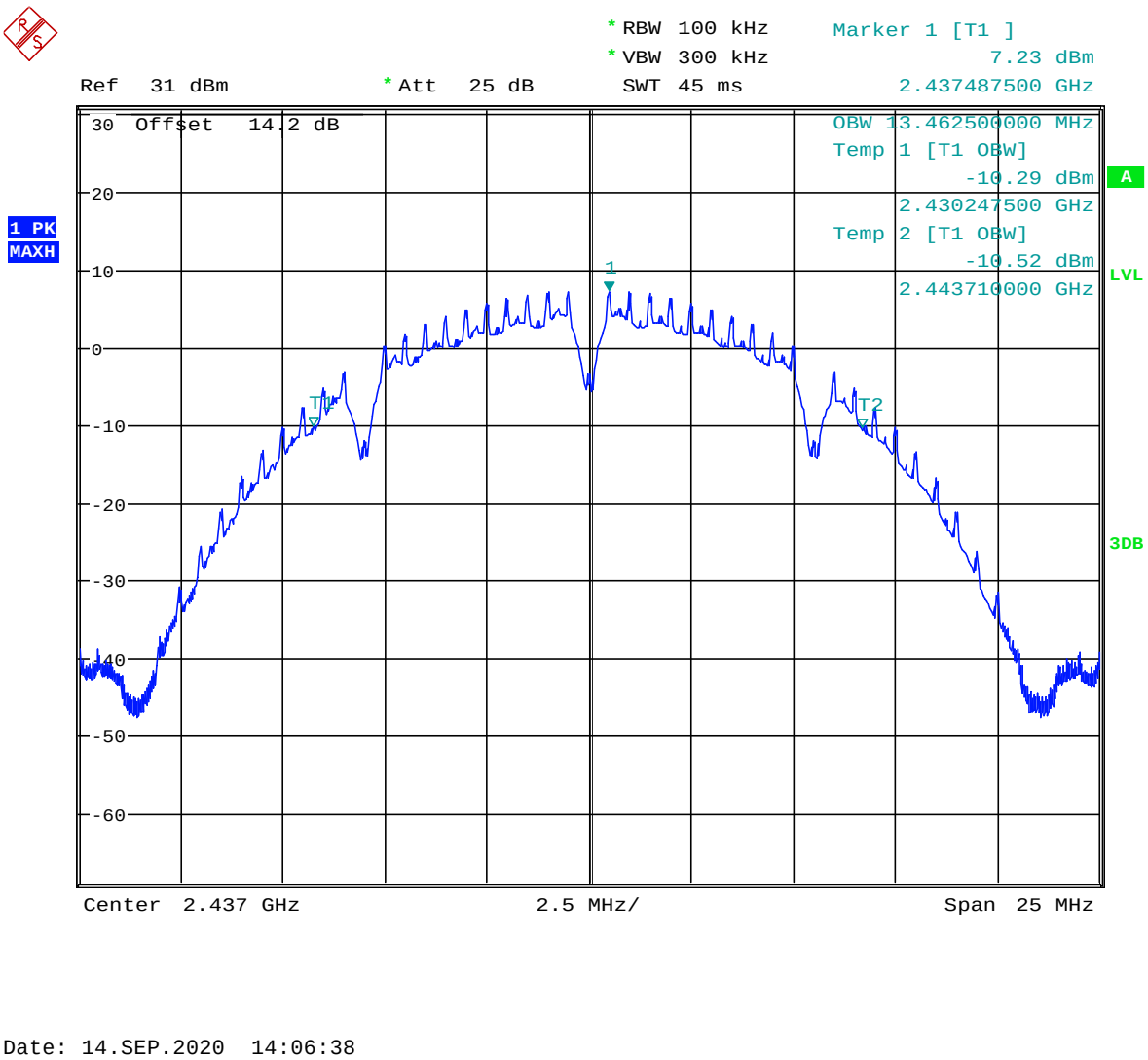
Tx Frequency: 2412 MHz	Mode: 802.11b



Date: 14.SEP.2020 14:01:30

Plot # 17

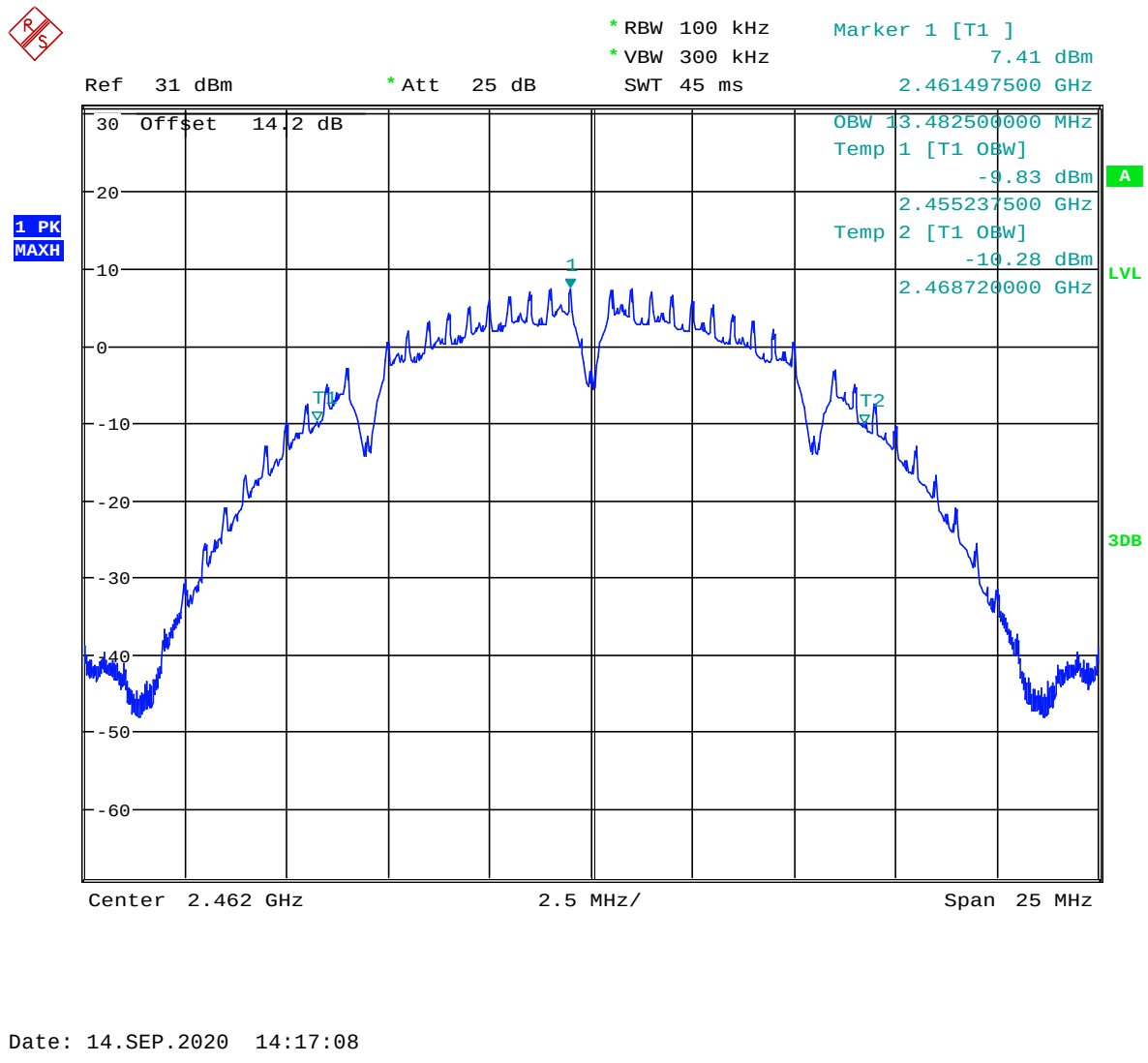
Tx Frequency: 2437 MHz	Mode: 802.11b



Date: 14.SEP.2020 14:06:38

Plot # 18

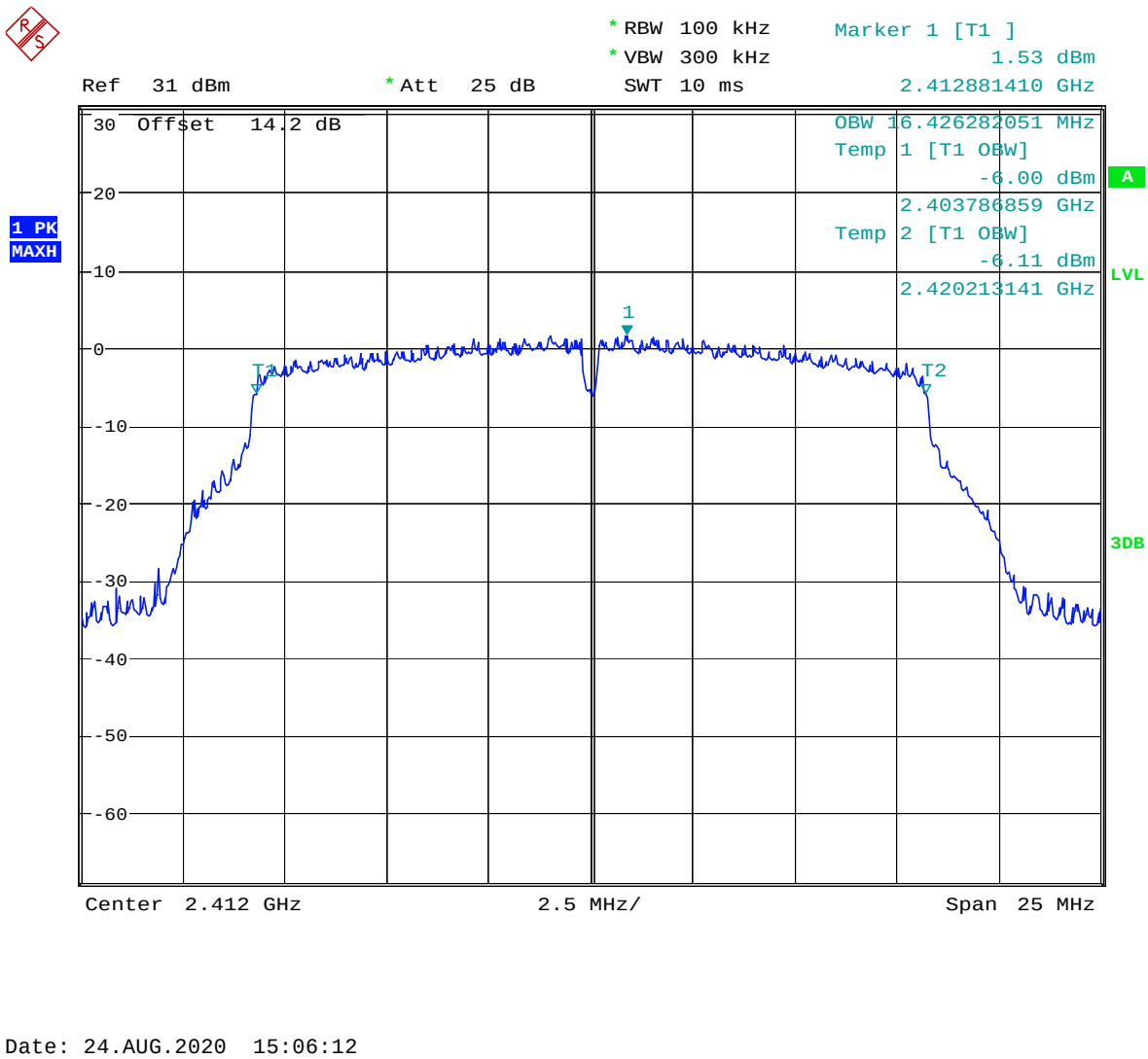
Tx Frequency: 2462 MHz	Mode: 802.11b



Date: 14.SEP.2020 14:17:08

Plot # 19

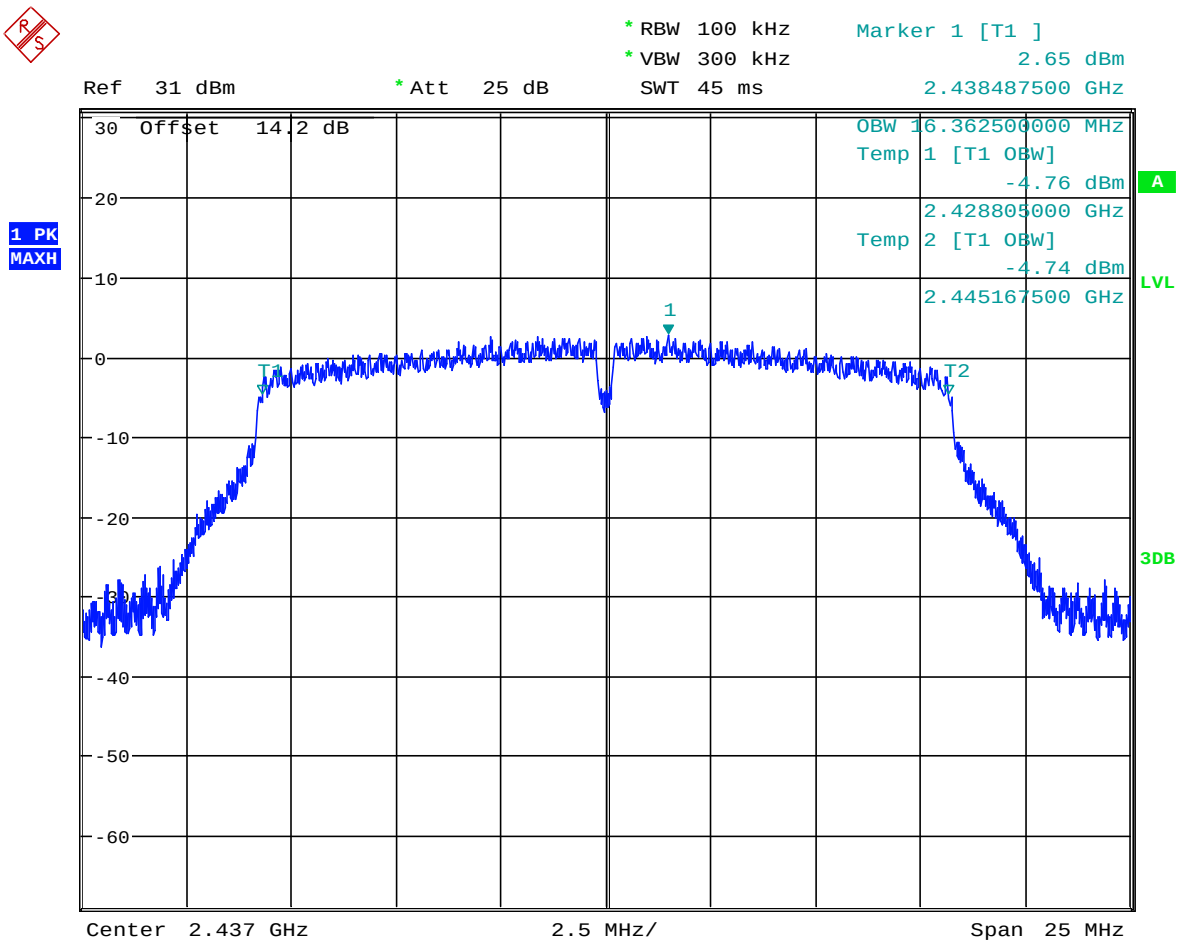
Tx Frequency: 2412 MHz	Mode: 802.11g



Date: 24.AUG.2020 15:06:12

Plot # 20

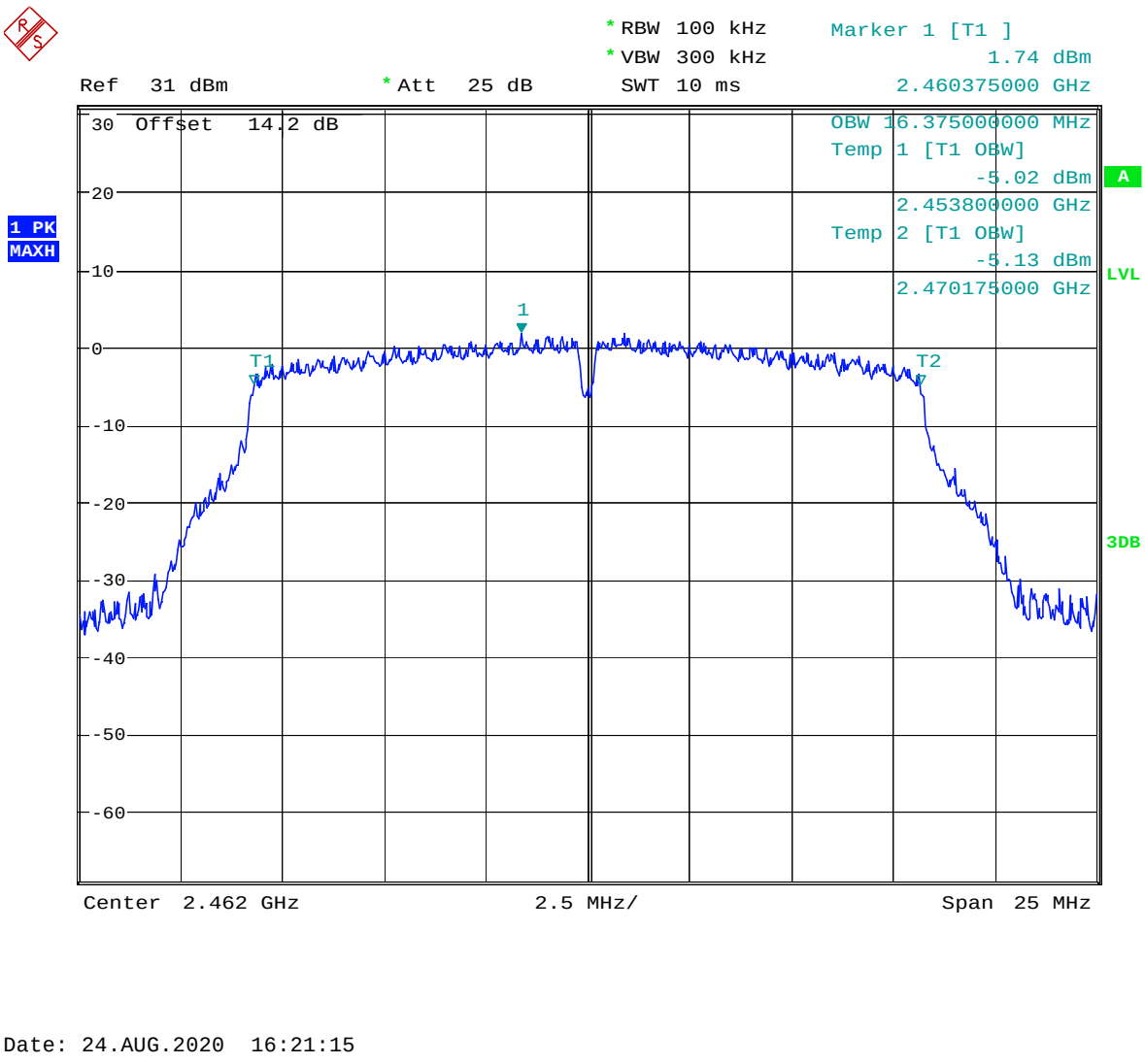
Tx Frequency: 2437 MHz	Mode: 802.11g



Date: 14.SEP.2020 14:24:08

Plot # 21

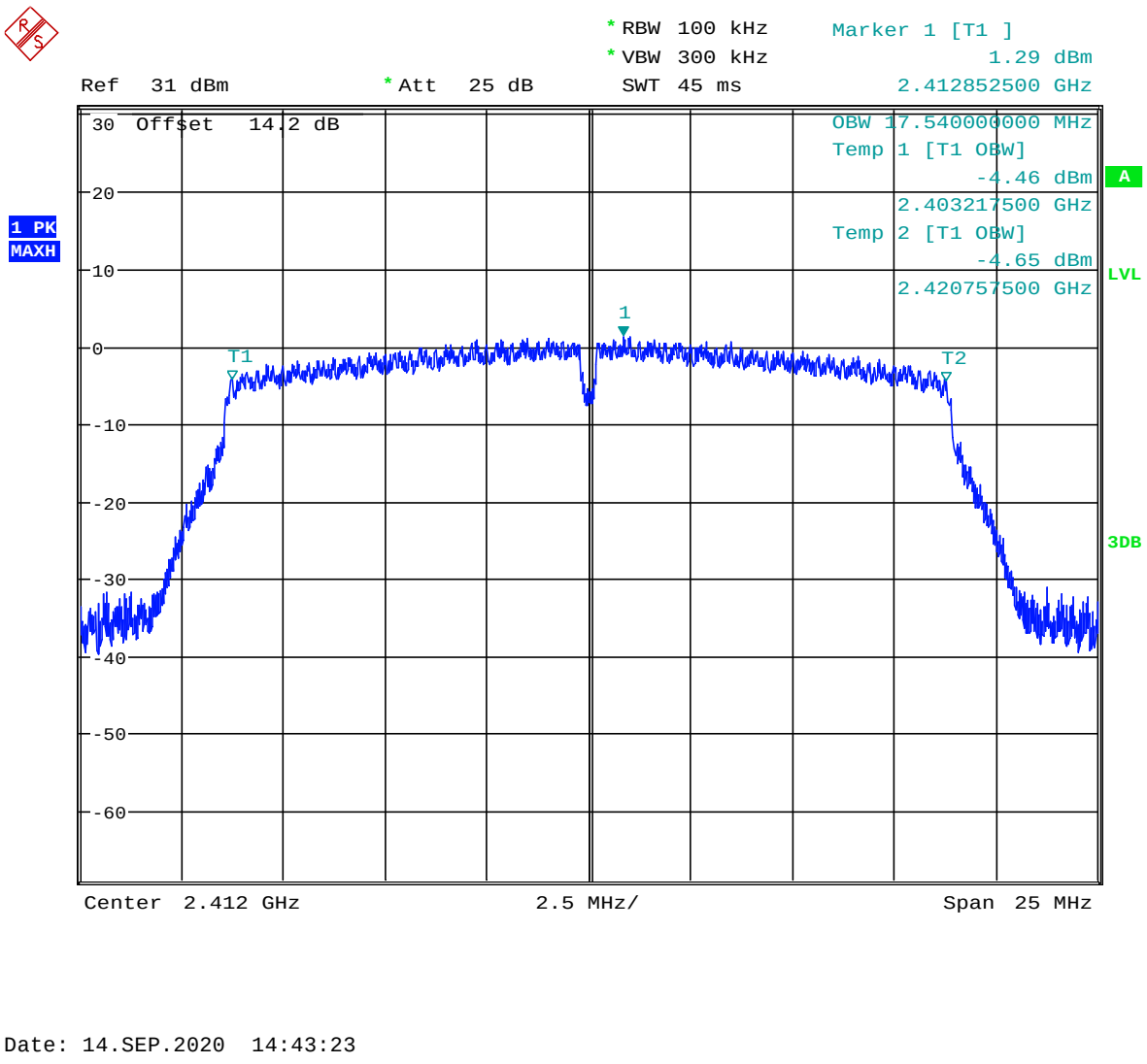
Tx Frequency: 2462 MHz	Mode: 802.11g



Date: 24.AUG.2020 16:21:15

Plot # 22

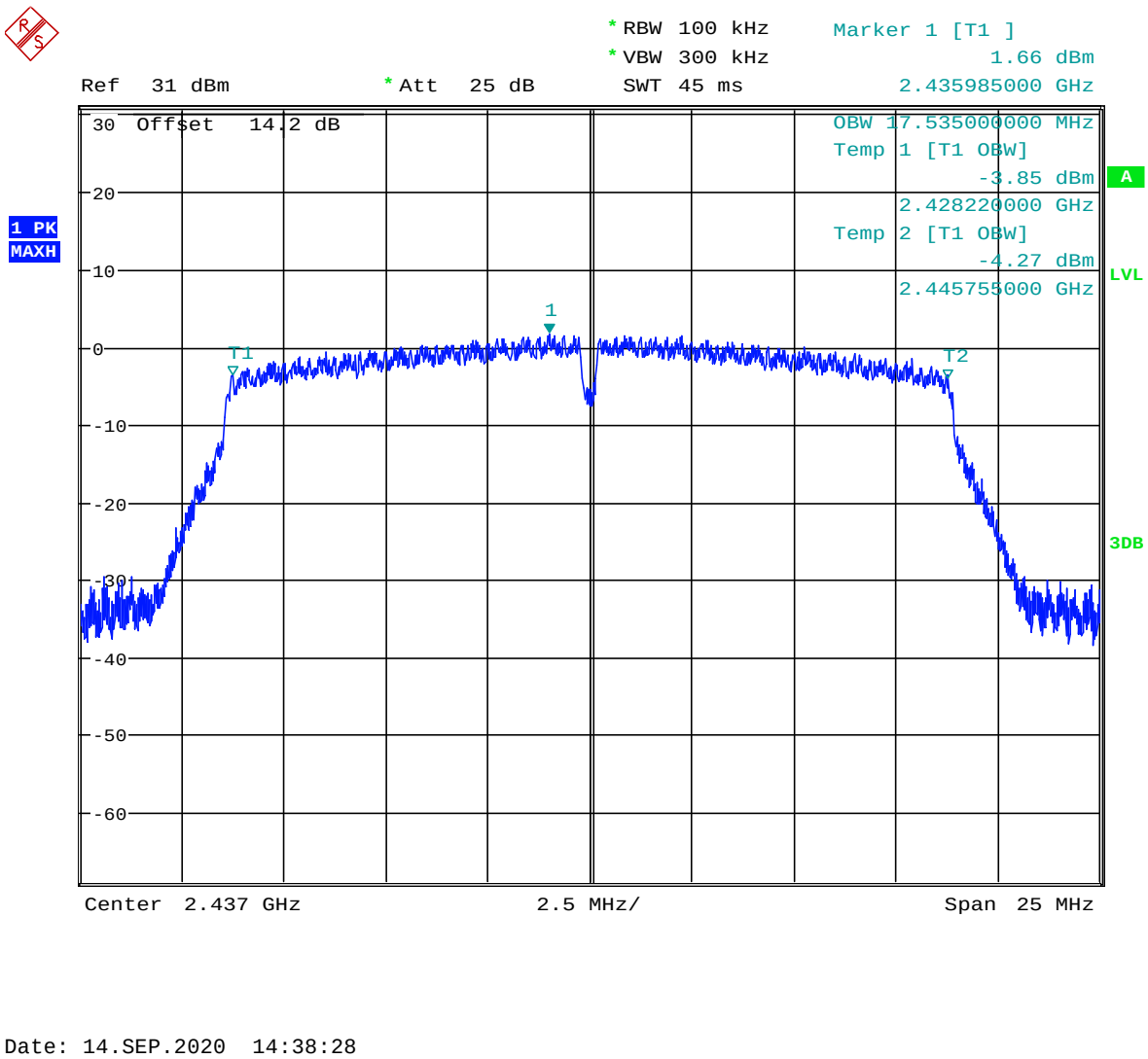
Tx Frequency: 2412 MHz	Mode: 802.11n_HT20



Date: 14.SEP.2020 14:43:23

Plot # 23

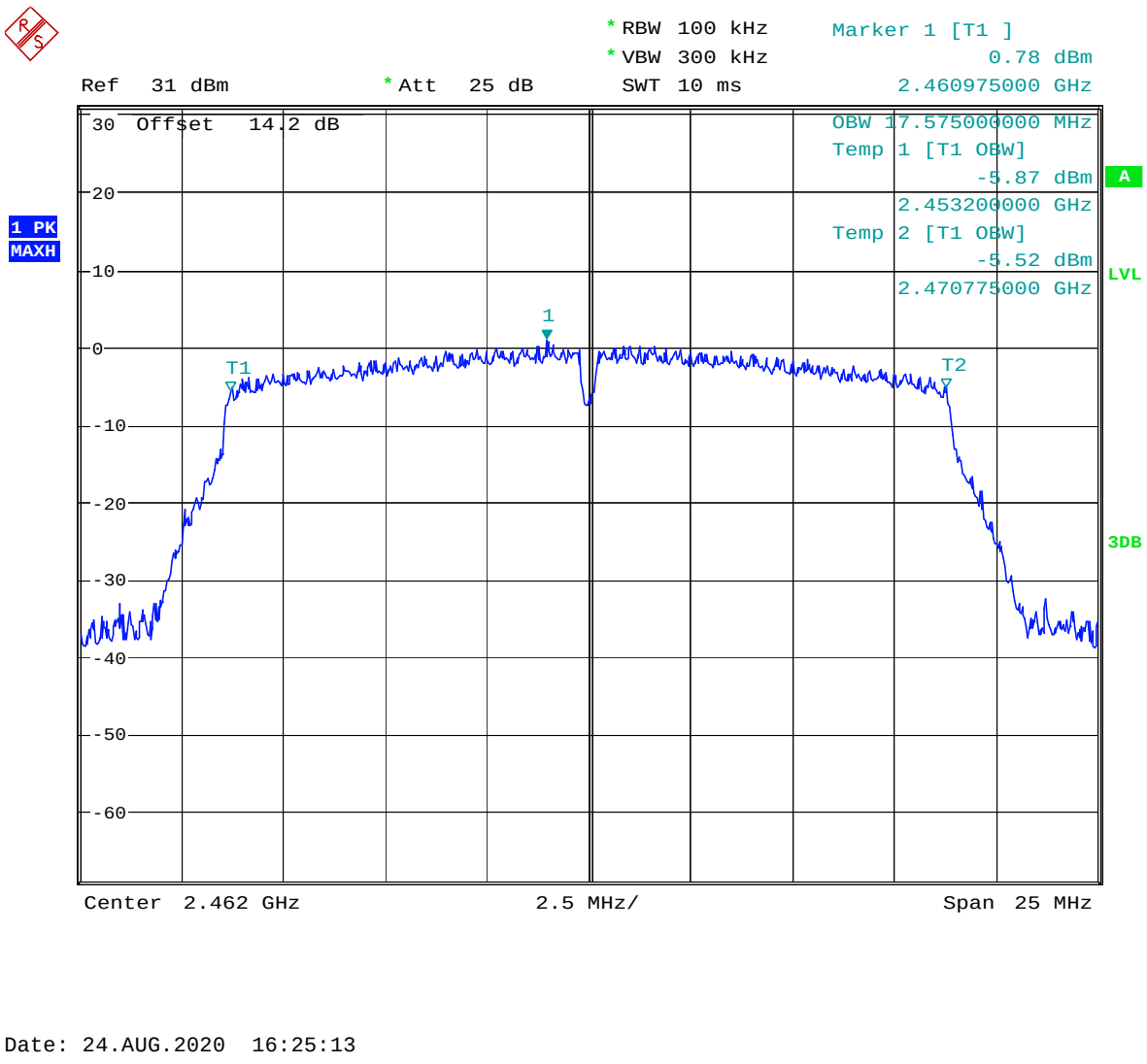
Tx Frequency: 2437 MHz	Mode: 802.11n_HT20



Date: 14.SEP.2020 14:38:28

Plot # 24

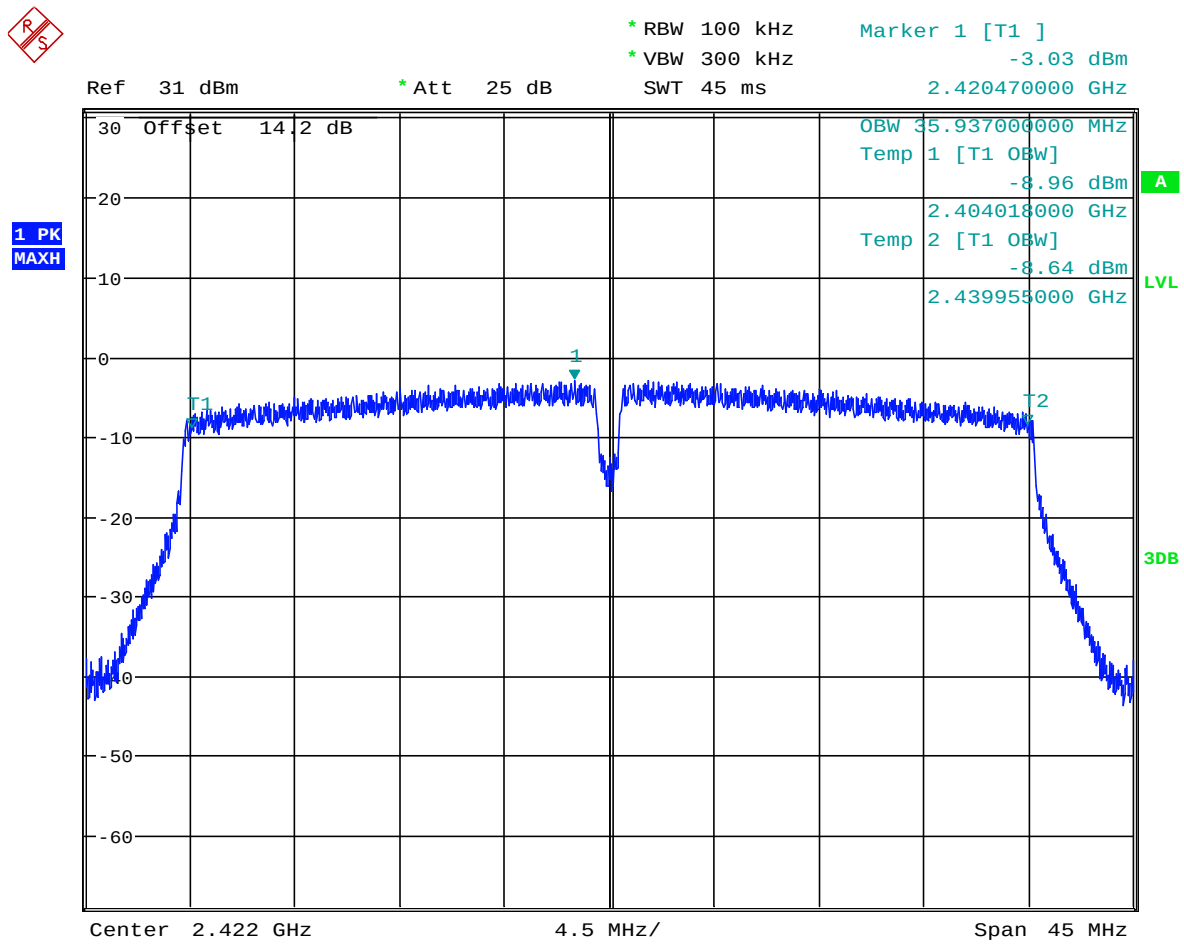
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20



Date: 24.AUG.2020 16:25:13

Plot # 25

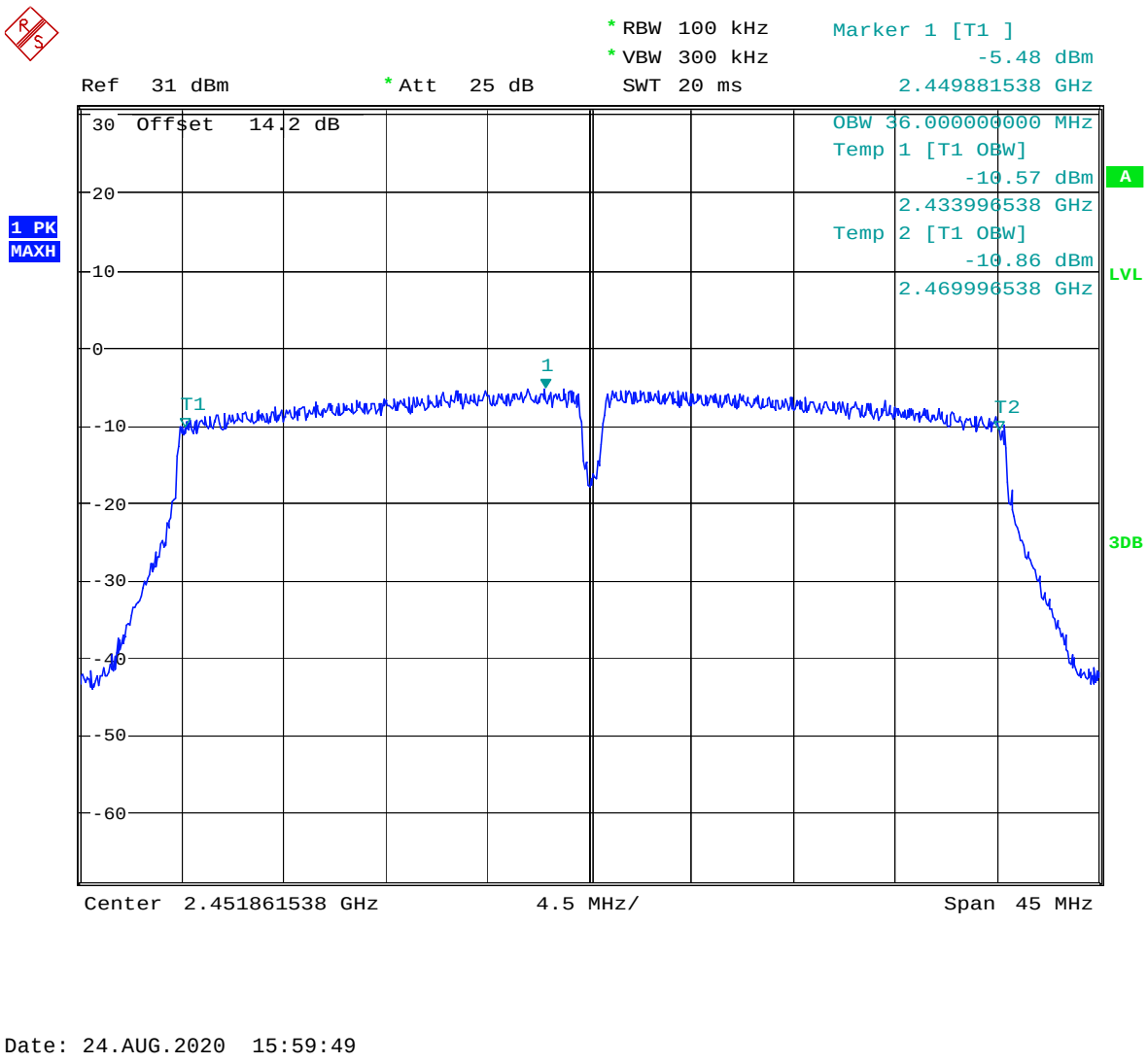
Tx Frequency: 2422 MHz	Mode: 802.11n_HT40



Date: 14.SEP.2020 14:56:00

Plot # 26

Tx Frequency: 2452 MHz	Mode: 802.11n_HT40



Date: 24.AUG.2020 15:59:49

8.3 Maximum peak conducted output power

8.3.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

ANSI_C63.10-2013 Subclause 11.9.2.2.2 Method AVGSA-1

Method AVGSA-1 uses trace averaging with the EUT transmitting at full power throughout each sweep. The procedure for this method is as follows:

a) Set span to at least 1.5 times the OBW.

b) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.

c) Set VBW ~ [3 x RBW].

d) 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.)

e) Sweep time = auto.

f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

g) If transmit duty cycle < 98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or at duty cycle ~ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."

h) Trace average at least 100 traces in power averaging (rms) mode.
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 of the spectrum

8.3.2 Limits:

Maximum Output Power:

- FCC §15.247 (b)(1): 1 W
- IC RSS-247: 1 W

8.3.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	Op.1	110 V AC	Primary: 3.4 dBi Secondary: 3.2 dBi

8.3.4 Measurement result:

8.3.4.1 Primary TX path (WIFI0):

Plot #	Frequency (MHz)	EUT Operating Mode	Measured conducted Output Power (dBm)	Output power corrected by antenna gain (3.4 dBi)	Limit (dBm)	Result
27	2412	802.11b	15.36	18.76	30 (Pk) / 36 (EIRP)	Pass
28	2437	802.11b	15.61	19.01	30 (Pk) / 36 (EIRP)	Pass
29	2462	802.11b	15.63	19.03	30 (Pk) / 36 (EIRP)	Pass
30	2412	802.11g	13.87	17.27	30 (Pk) / 36 (EIRP)	Pass
31	2437	802.11g	15.12	18.52	30 (Pk) / 36 (EIRP)	Pass
32	2462	802.11g	13.99	17.39	30 (Pk) / 36 (EIRP)	Pass
33	2412	802.11n_HT20	14.00	17.40	30 (Pk) / 36 (EIRP)	Pass
34	2437	802.11n_HT20	14.25	17.65	30 (Pk) / 36 (EIRP)	Pass
35	2462	802.11n_HT20	12.81	16.21	30 (Pk) / 36 (EIRP)	Pass
36	2422	802.11n_HT40	13.07	16.47	30 (Pk) / 36 (EIRP)	Pass
37	2452	802.11n_HT40	10.42	13.82	30 (Pk) / 36 (EIRP)	Pass

8.3.4.2 Secondary TX path (WIFI1):

Plot #	Frequency (MHz)	EUT Operating Mode	Measured conducted output Power (dBm)	Output power corrected by antenna gain (3.2 dBi)	Limit (dBm)	Result
38	2412	802.11b	14.19	17.39	30 (Pk) / 36 (EIRP)	Pass
39	2437	802.11b	14.30	17.50	30 (Pk) / 36 (EIRP)	Pass
40	2462	802.11b	14.24	17.44	30 (Pk) / 36 (EIRP)	Pass
41	2412	802.11g	12.59	15.79	30 (Pk) / 36 (EIRP)	Pass
42	2437	802.11g	13.35	16.55	30 (Pk) / 36 (EIRP)	Pass
43	2462	802.11g	12.82	16.02	30 (Pk) / 36 (EIRP)	Pass
44	2412	802.11n_HT20	12.54	15.74	30 (Pk) / 36 (EIRP)	Pass
45	2437	802.11n_HT20	13.01	16.21	30 (Pk) / 36 (EIRP)	Pass
46	2462	802.11n_HT20	11.5	14.70	30 (Pk) / 36 (EIRP)	Pass
47	2422	802.11n_HT40	11.73	14.93	30 (Pk) / 36 (EIRP)	Pass
48	2452	802.11n_HT40	9.0	12.20	30 (Pk) / 36 (EIRP)	Pass

8.3.4.3 Combining emissions and computing directional and array gain from devices with multiple outputs

According KDB 662911;

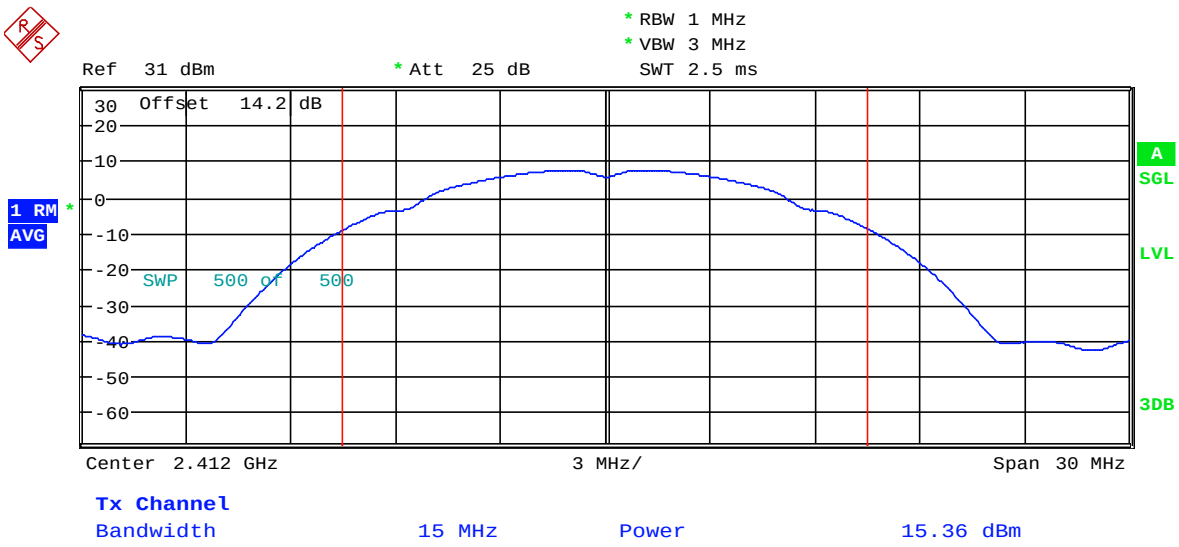
- E) 1) In-Band Power Measurements
  - The measure-and-sum technique shell be used for measuring in-band transmit power of a device. Total power is the sum of the conducted power levels measured at the various output ports.
- F) 2) Directional Gain Calculation for In-Band Measurements
  - d) Unequal antenna gains, with equal transmit power. For antenna gains given by G1, G2, …,$G_{N\ dBi}$
    - (i) If transmit signals are correlated then
      Directional gain = 10 log [(10^G_1 /20 + 10^G_2 /20 + … + 10^G_N /20)2 /N_{ANT}] dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

Frequency (MHz)	EUT Operating Mode	Conducted Output Power Primary \ Secondary (dBm)	Sum of output power (dBm)	EIRP Accounting for array gain (dBm)	Limit corrected for gain > 6 dBi (dBm)	Result
2412	802.11g	13.87 \ 12.59	16.29	22.60	35.40 (EIRP)	Pass
2437	802.11g	15.12 \ 13.35	17.33	23.65	35.40 (EIRP)	Pass
2462	802.11g	13.99 \ 12.82	16.45	22.77	35.40 (EIRP)	Pass
2412	802.11n_HT20	14.00 \ 12.54	16.34	22.65	35.40 (EIRP)	Pass
2437	802.11n_HT20	14.25 \ 13.01	16.68	23.00	35.40 (EIRP)	Pass
2462	802.11n_HT20	12.81 \ 11.5	15.21	21.53	35.40 (EIRP)	Pass
2422	802.11n_HT40	13.07 \ 11.73	15.46	21.77	35.40 (EIRP)	Pass
2452	802.11n_HT40	10.42 \ 9.0	12.78	19.09	35.40 (EIRP)	Pass

- Directional gain = 10*Log_{10}[(10^(3.4 /20) + 10^(3.2 /20)^2 /2] → 6.31 dBi
- Limit corrected for gain > 6 dBi = 36-[(3.4+3.2)-6] → 35.40 dBm

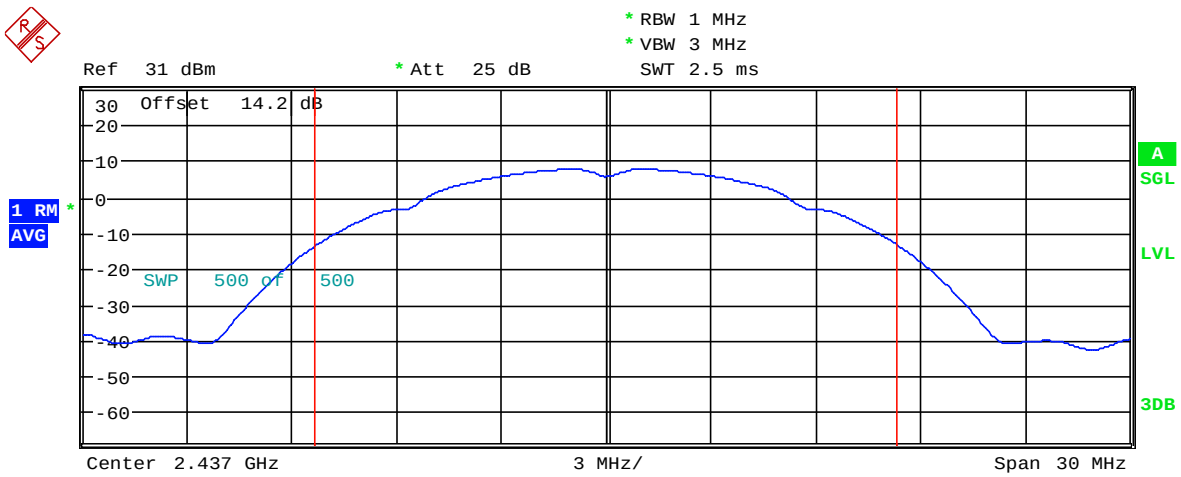
8.3.5 Measurement Plots:

Plot # 27		
Tx Frequency: 2412 MHz	**Mode: 802.11b**	**Primary**



Tx Channel
Bandwidth 15 MHz Power 15.36 dBm

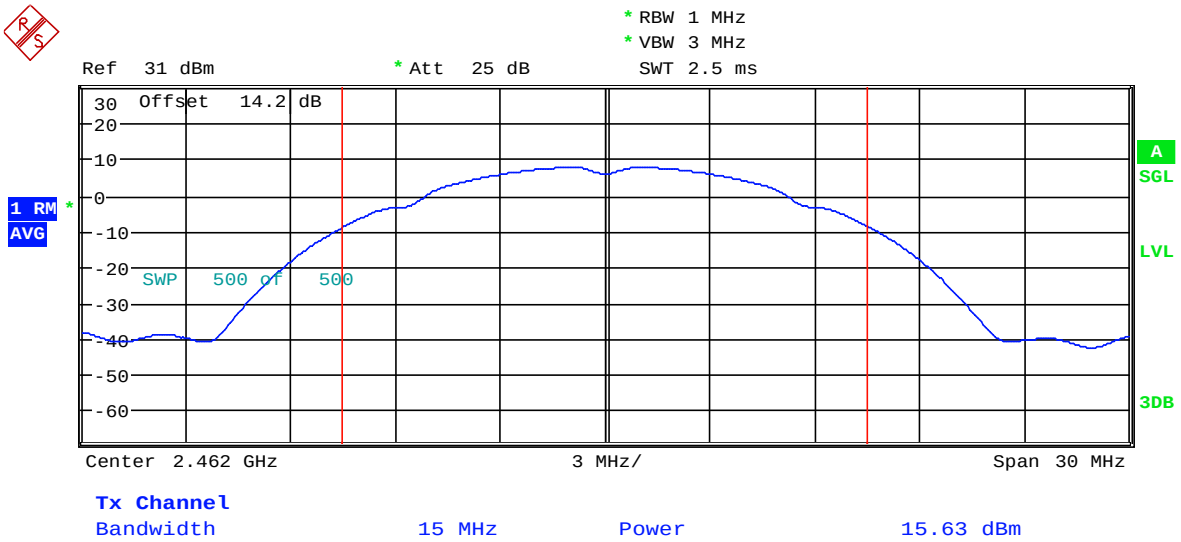
Plot # 28		
Tx Frequency: 2437 MHz	**Mode: 802.11b**	**Primary**



Tx Channel
Bandwidth 16.7 MHz Power 15.61 dBm

Plot # 29

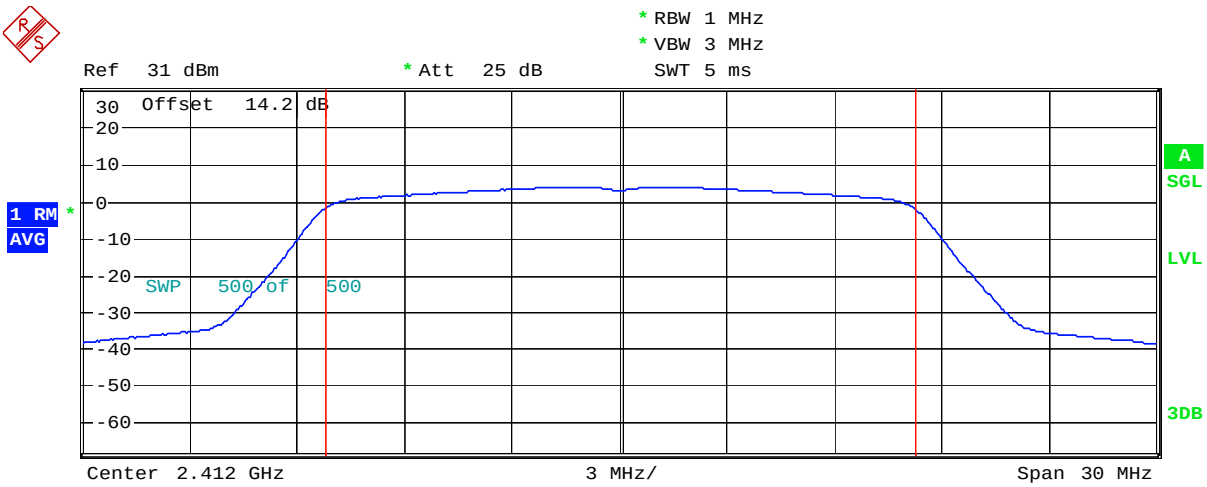
Tx Frequency: 2462 MHz	Mode: 802.11b	Primary



Tx Channel
Bandwidth 15 MHz Power 15.63 dBm

Plot # 30

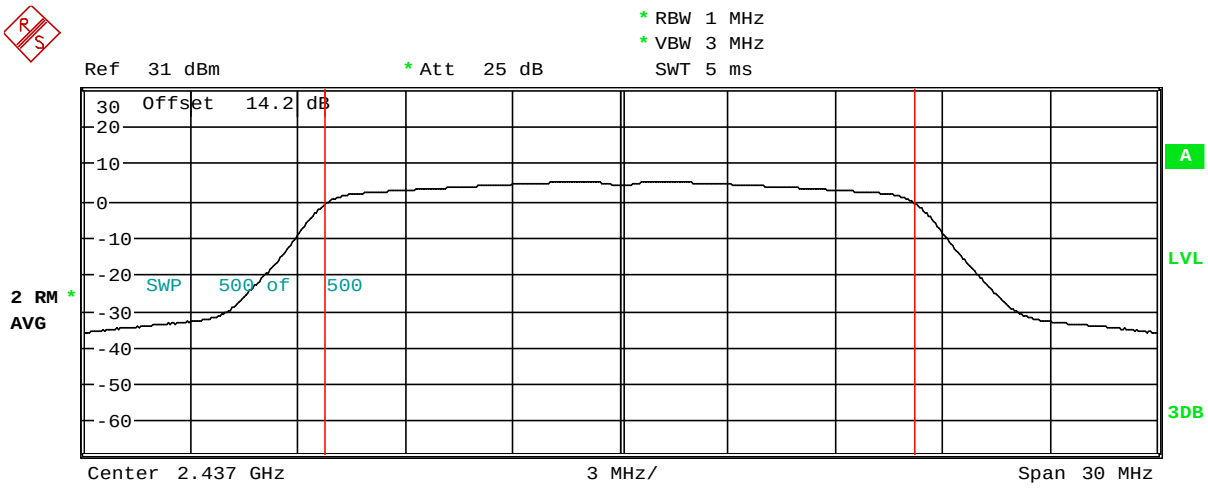
Tx Frequency: 2412 MHz	Mode: 802.11g	Primary



Tx Channel
Bandwidth 16.5 MHz Power 13.87 dBm

Plot # 31

Tx Frequency: 2437 MHz	Mode: 802.11g	Primary

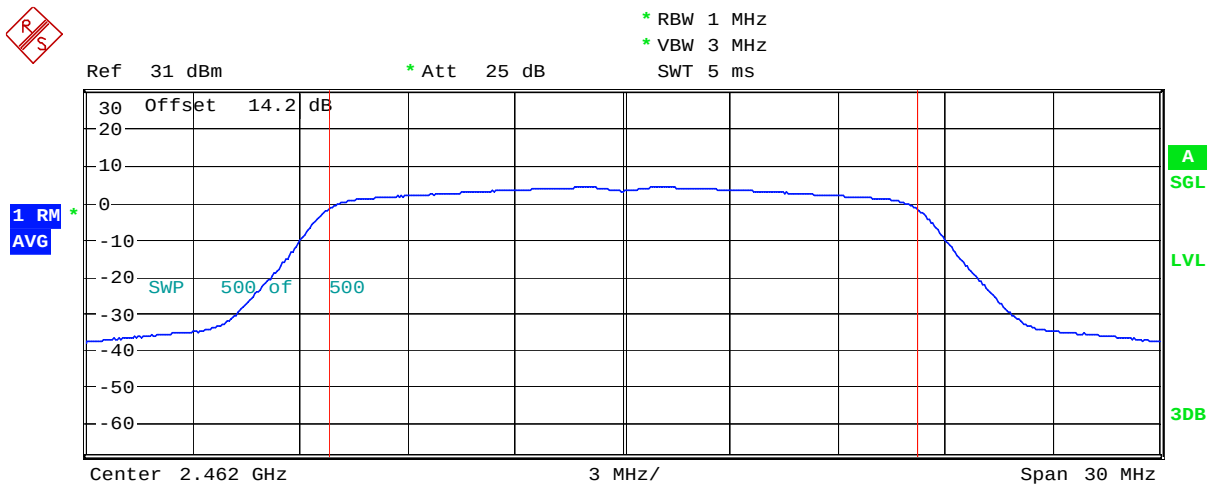


Tx Channel

Bandwidth	16.4 MHz	Power	15.12 dBm

Plot # 32

Tx Frequency: 2462 MHz	Mode: 802.11g	Primary

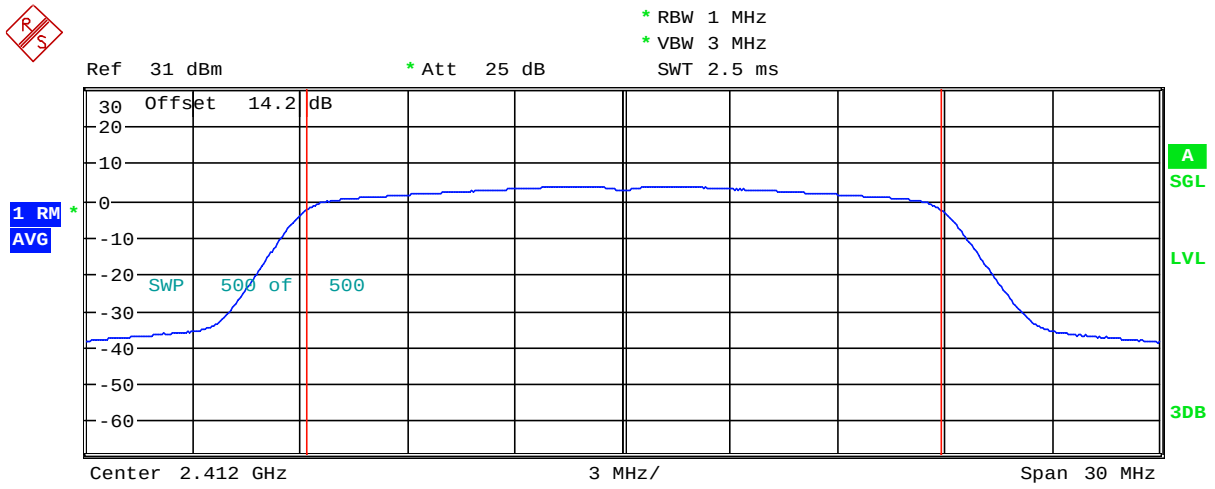


Tx Channel

Bandwidth	16.4 MHz	Power	13.99 dBm

Plot # 33

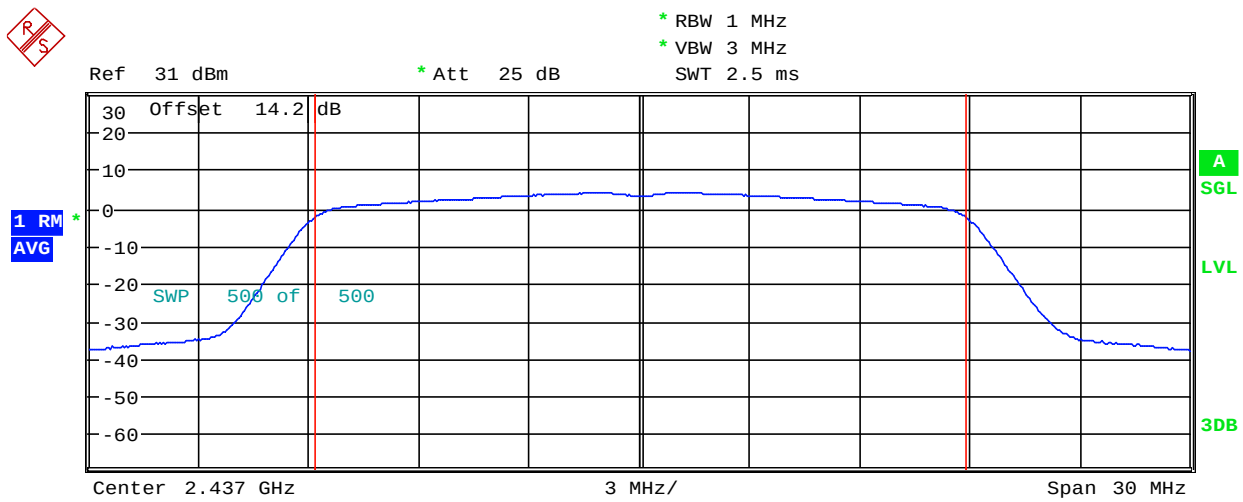
Tx Frequency: 2412 MHz	Mode: 802.11n_HT20	Primary



Tx Channel
Bandwidth 17.7 MHz Power 14.00 dBm

Plot # 34

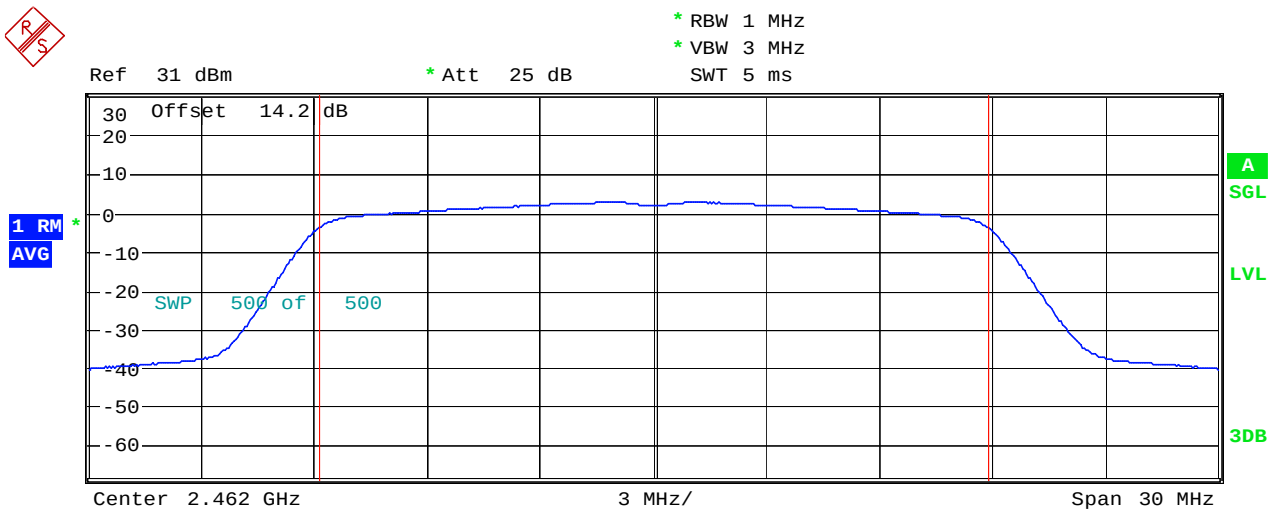
Tx Frequency: 2437 MHz	Mode: 802.11n_HT20	Primary



Tx Channel
Bandwidth 17.7 MHz Power 14.25 dBm

Plot # 35

Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Primary

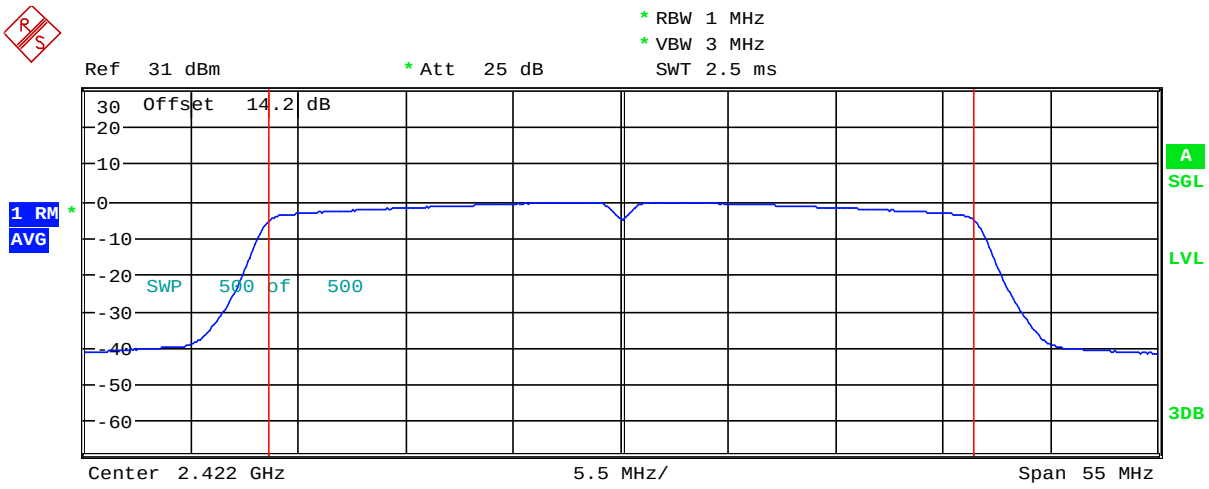


Tx Channel

Bandwidth	17.8 MHz	Power	12.81 dBm

Plot # 36

Tx Frequency: 2422 MHz	Mode: 802.11n_HT40	Primary

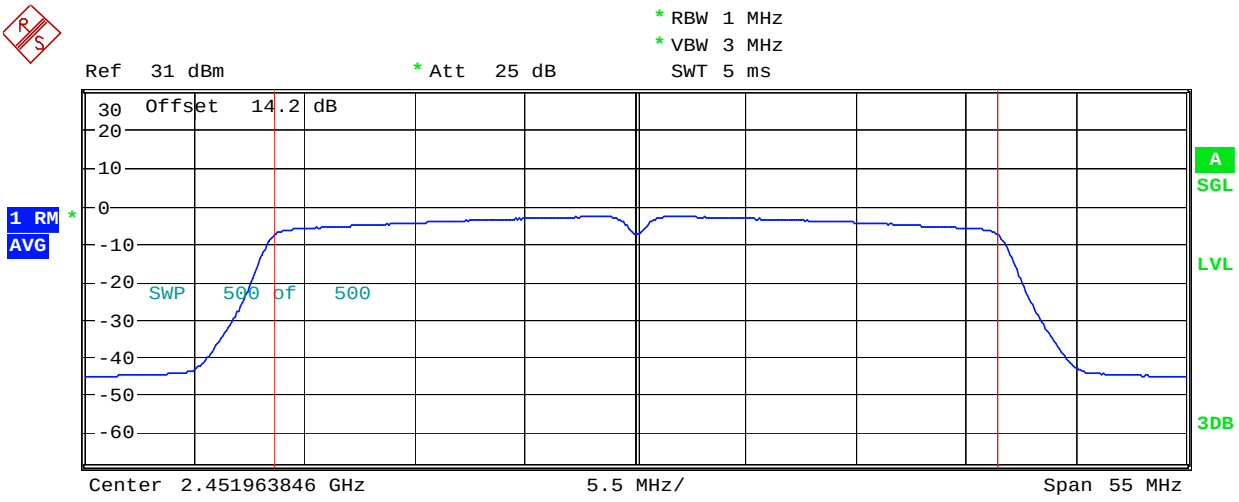


Tx Channel

Bandwidth	36 MHz	Power	13.07 dBm

Plot # 37

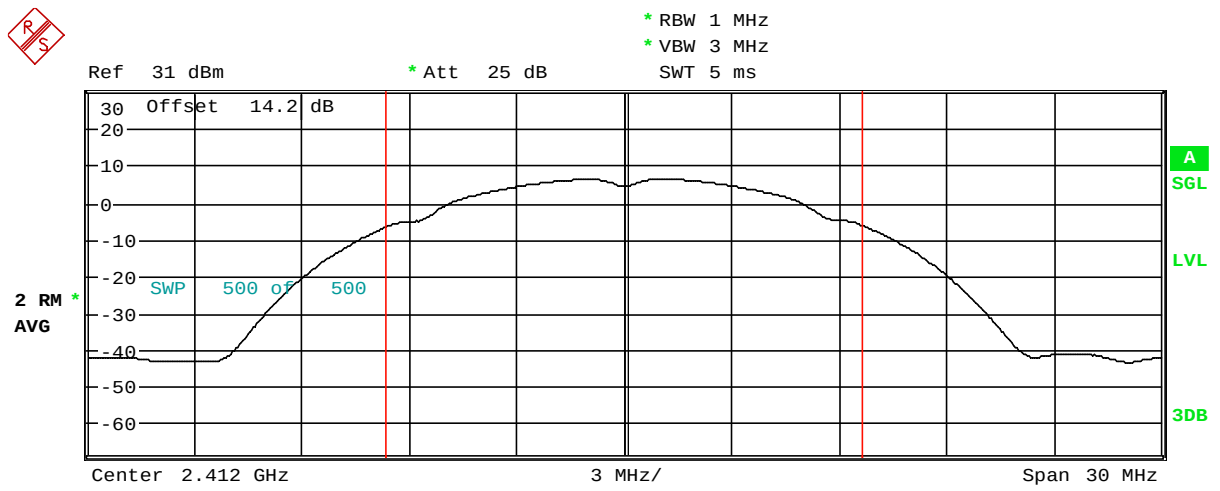
Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Primary



Tx Channel
Bandwidth 36 MHz Power 10.42 dBm

Plot # 38

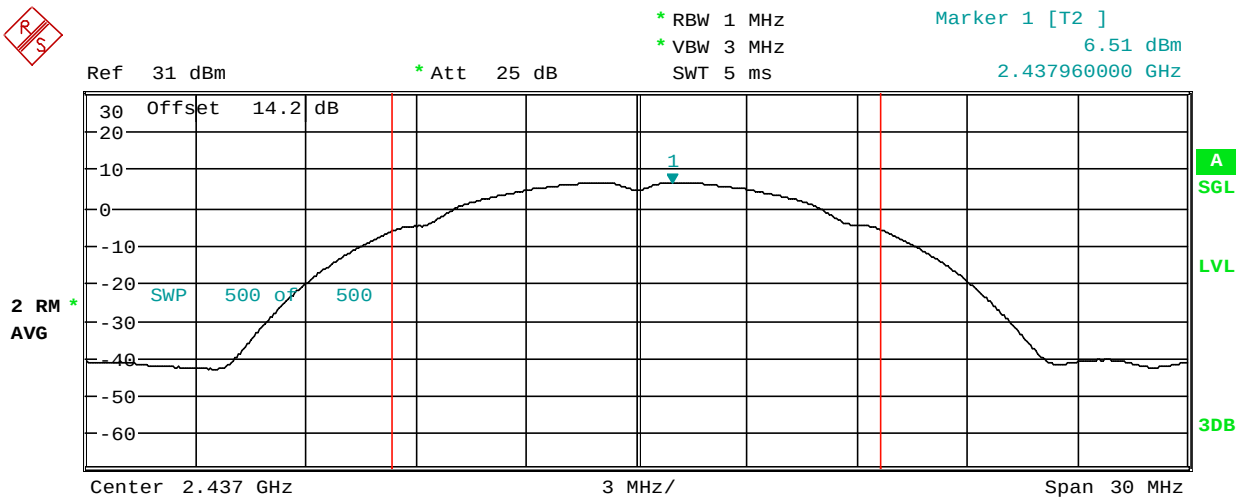
Tx Frequency: 2412 MHz	Mode: 802.11b	Secondary



Tx Channel
Bandwidth 13.34 MHz Power 14.19 dBm

Plot # 39

Tx Frequency: 2437 MHz	Mode: 802.11b	Secondary

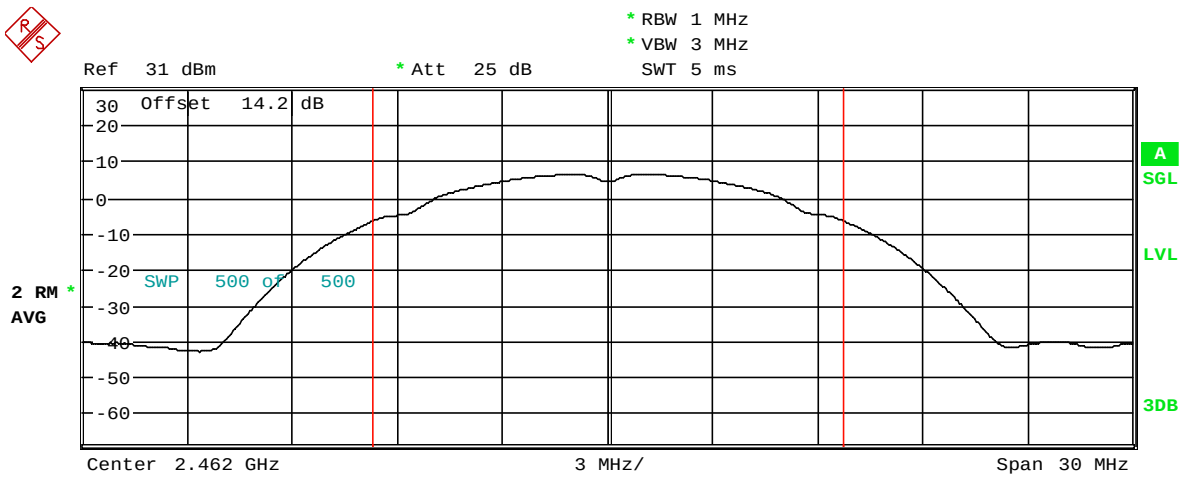


Tx Channel

Bandwidth	13.34 MHz	Power	14.30 dBm

Plot # 40

Tx Frequency: 2462 MHz	Mode: 802.11b	Secondary

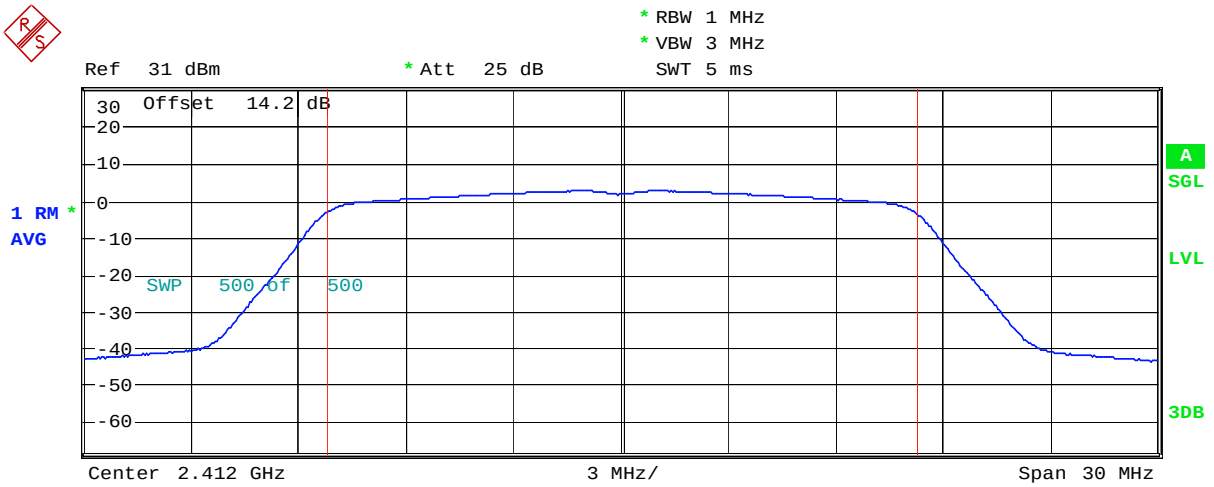


Tx Channel

Bandwidth	13.4 MHz	Power	14.24 dBm

Plot # 41

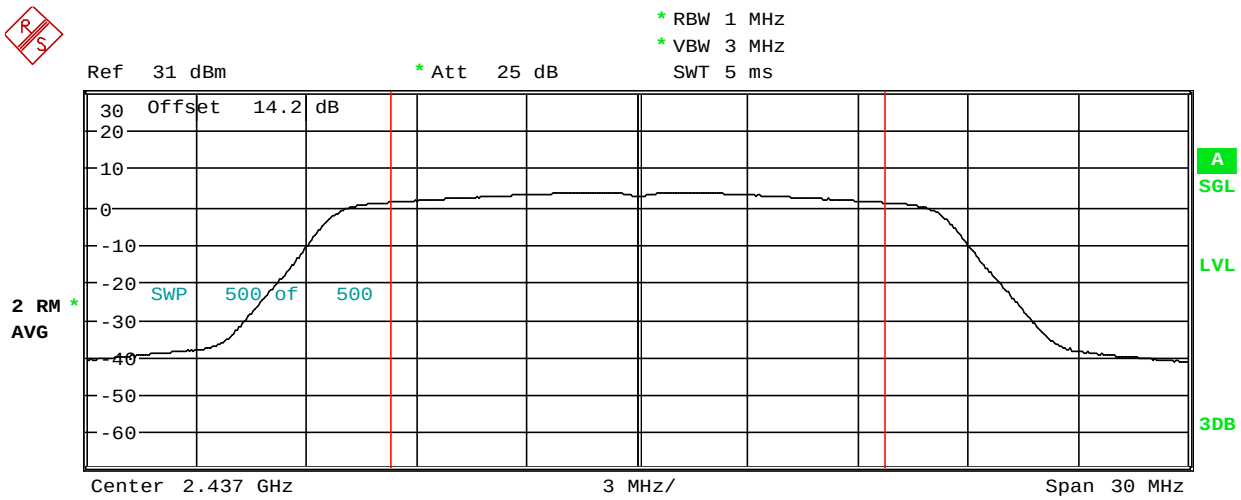
Tx Frequency: 2412 MHz	Mode: 802.11g	Secondary



Tx Channel
Bandwidth 16.5 MHz Power 12.59 dBm

Plot # 42

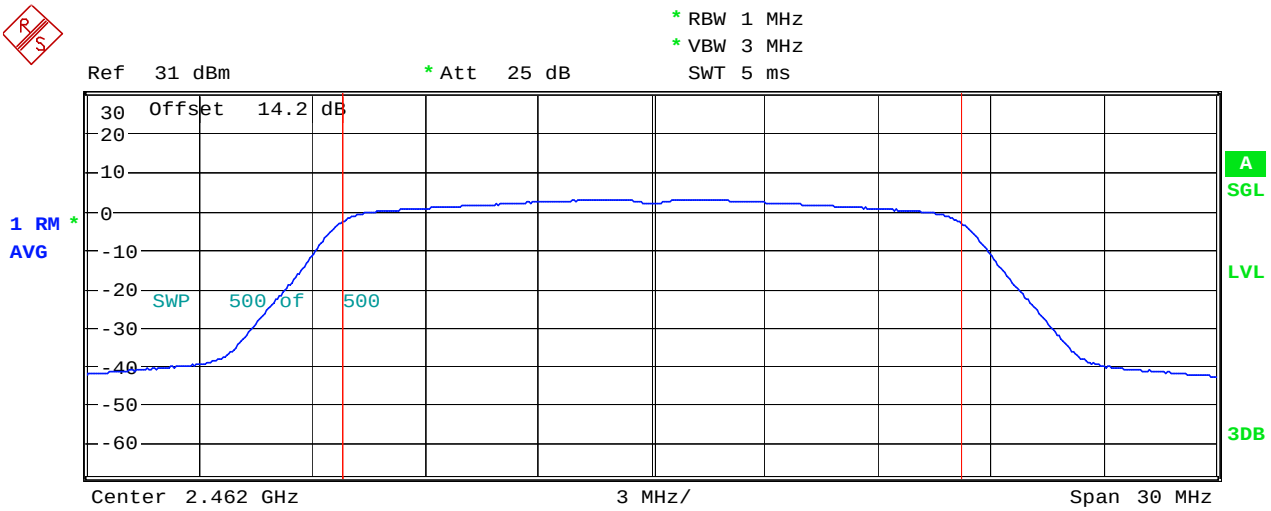
Tx Frequency: 2437 MHz	Mode: 802.11g	Secondary



Tx Channel
Bandwidth 13.4 MHz Power 13.35 dBm

Plot # 43

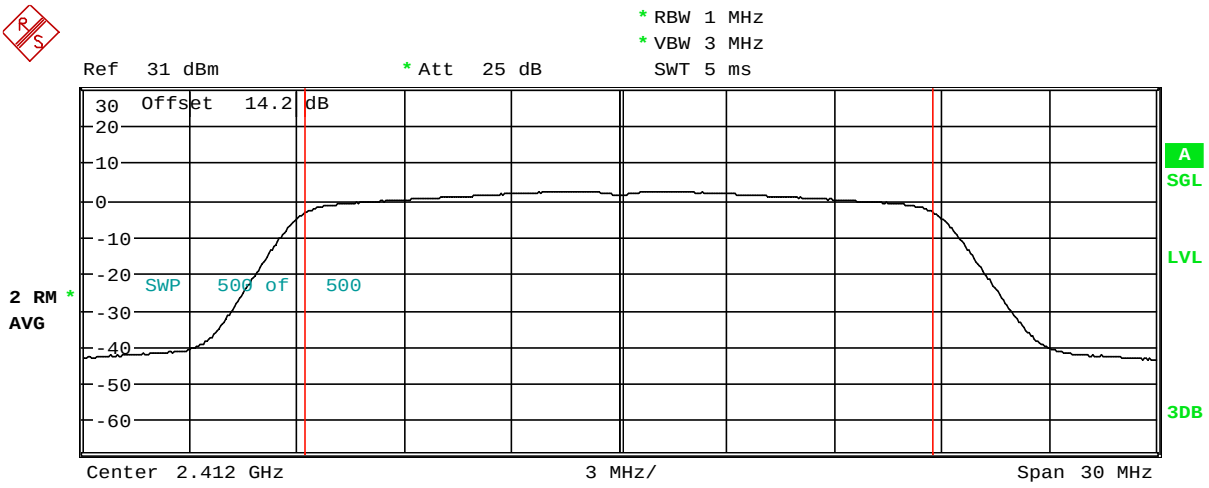
Tx Frequency: 2462 MHz	Mode: 802.11g	Secondary



Tx Channel
Bandwidth 16.4 MHz Power 12.82 dBm

Plot # 44

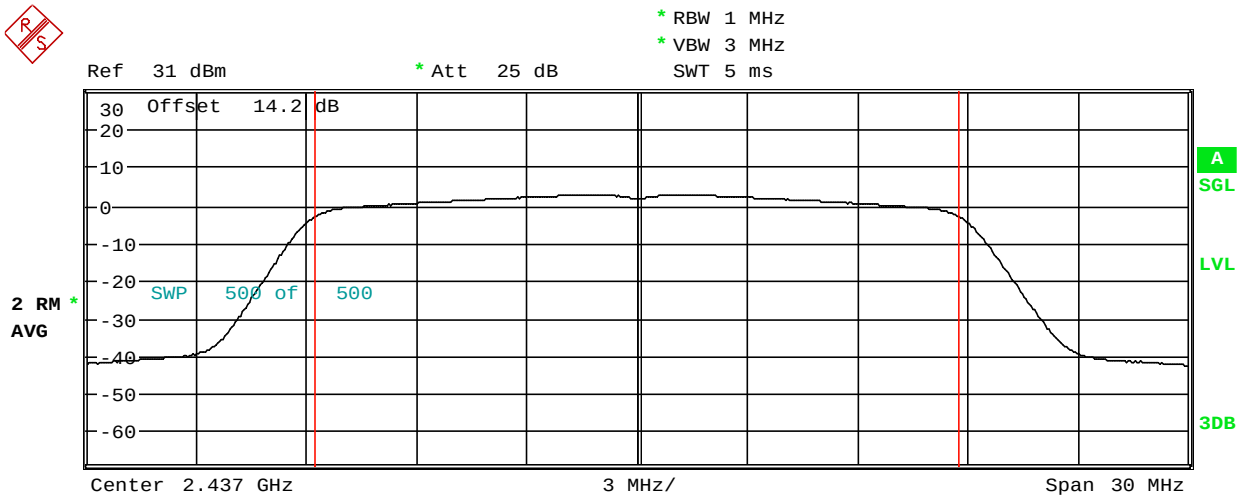
Tx Frequency: 2412 MHz	Mode: 802.11n_HT20	Secondary



Tx Channel
Bandwidth 17.535 MHz Power 12.54 dBm

Plot # 45

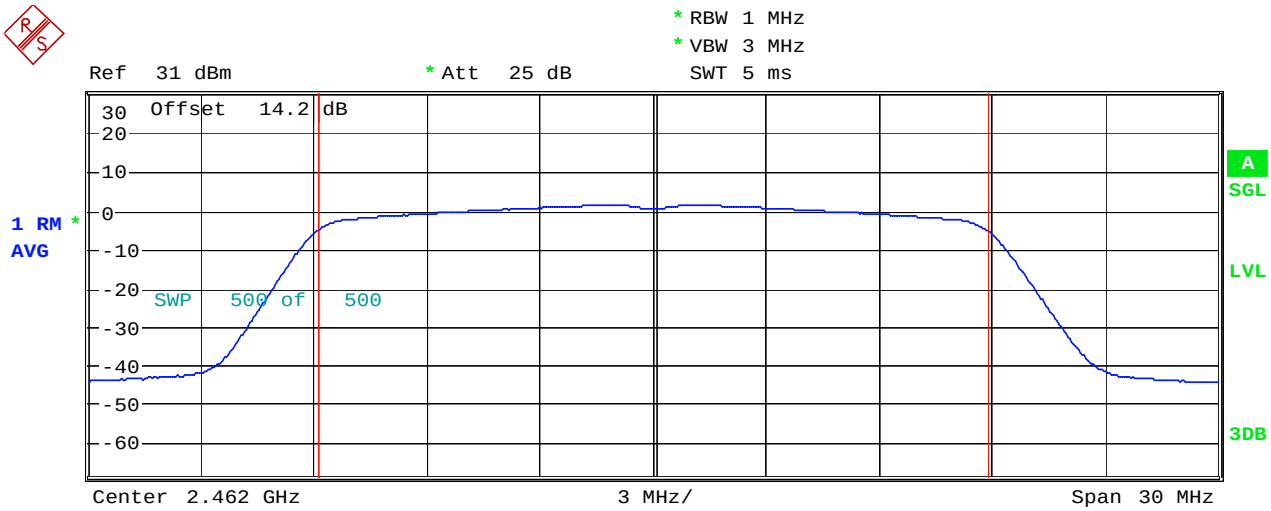
Tx Frequency: 2437 MHz	Mode: 802.11n_HT20	Secondary



Tx Channel
Bandwidth 17.535 MHz Power 13.01 dBm

Plot # 46

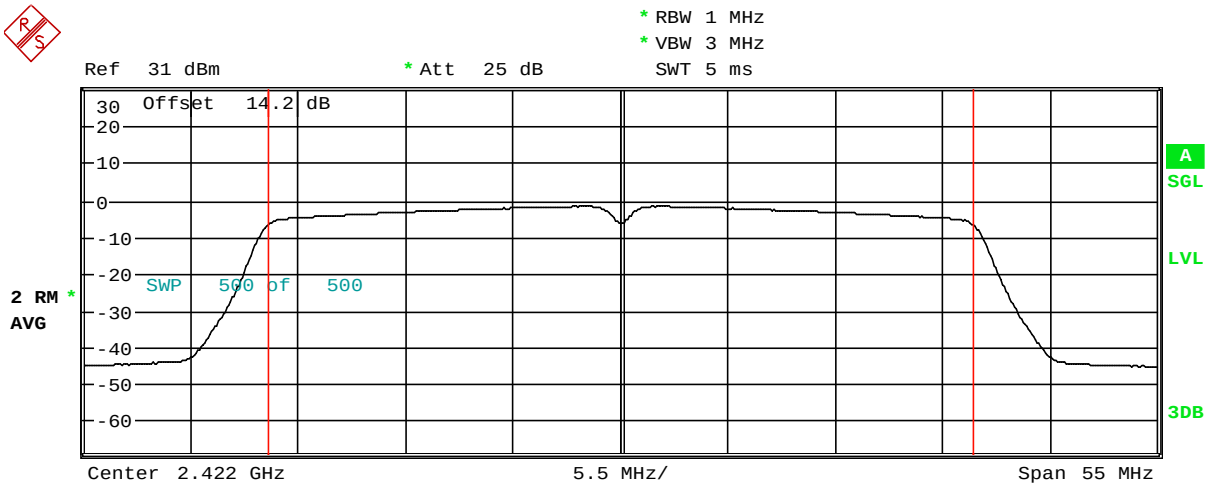
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Secondary



Tx Channel
Bandwidth 17.8 MHz Power 11.50 dBm

Plot # 47

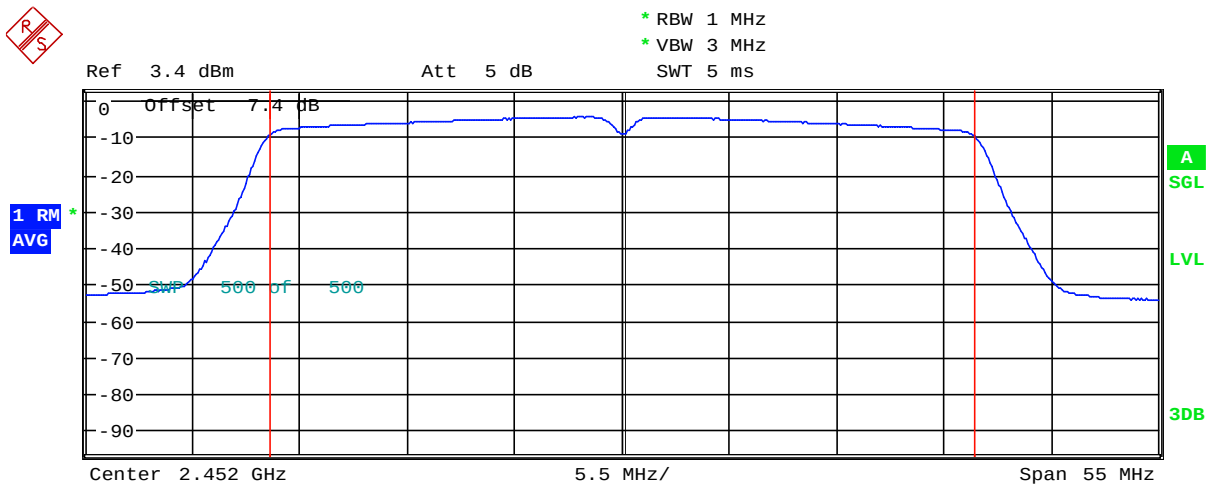
Tx Frequency: 2422 MHz	Mode: 802.11n_HT40	Secondary



Tx Channel
Bandwidth 36 MHz Power 11.73 dBm

Plot # 48

Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Secondary



Tx Channel
Bandwidth 36 MHz Power 9.00 dBm

8.4 Power Spectral Density

8.4.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10 Subclause 11.10.3 Method AVGPSD-1

Method AVGPSD-1 uses trace averaging with EUT transmitting at full power throughout each sweep.

The following procedure may be used when the maximum (average) conducted output power was used to determine compliance to the fundamental output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has a power averaging (rms) detector, then it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously (D ~ 98%), or else sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter OFF time to be considered):

a) Set instrument center frequency to DTS channel center frequency.

b) Set span to at least 1.5 times the OBW.

c) Set RBW to: 3 kHz < RBW < 100 kHz.

d) Set VBW ~ [3 □ RBW].

e) Detector = power averaging (rms) or sample detector (when rms not available).

f) Ensure that the number of measurement points in the sweep ~ [2 □ span / RBW].

g) Sweep time = auto couple.

h) Employ trace averaging (rms) mode over a minimum of 100 traces.

i) Use the peak marker function to determine the maximum amplitude level.

j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

8.4.2 Limits:

FCC§15.247(e) & RSS-247 5.2(2)

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

8.4.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	Op.1	110 V AC	Primary: 3.4 dBi Secondary: 3.2 dBi

8.4.4 Measurement result:

8.4.4.1 Primary TX path (WIFI0):

Plot #	Frequency (MHz)	EUT Operating Mode	Measured power spectral density (dBm/3 KHz)	Limit (dBm / 3 kHz)	Result
49	2412	802.11b	-9.82	8	Pass
50	2437	802.11b	-8.54	8	Pass
51	2462	802.11b	-10.09	8	Pass
52	2412	802.11g	-19.69	8	Pass
53	2437	802.11g	-12.98	8	Pass
54	2462	802.11g	-19.38	8	Pass
55	2412	802.11n_HT20	-19.06	8	Pass
56	2437	802.11n_HT20	-14.63	8	Pass
57	2462	802.11n_HT20	-20.90	8	Pass
58	2422	802.11n_HT40	-22.43	8	Pass
59	2452	802.11n_HT40	-26.58	8	Pass

8.4.4.2 Secondary TX path (WIFI1):

Plot #	Frequency (MHz)	EUT Operating Mode	Measured power spectral density (dBm/3 KHz)	Limit (dBm / 3 kHz)	Result
60	2412	802.11b	-10.75	8	Pass
61	2437	802.11b	-8.28	8	Pass
62	2462	802.11b	-11.49	8	Pass
63	2412	802.11g	-21.08	8	Pass
64	2437	802.11g	-13.67	8	Pass
65	2462	802.11g	-20.91	8	Pass
66	2412	802.11n_HT20	-20.23	8	Pass
67	2437	802.11n_HT20	-16.04	8	Pass
68	2462	802.11n_HT20	-22.68	8	Pass
69	2422	802.11n_HT40	-23.66	8	Pass
70	2452	802.11n_HT40	-28.01	8	Pass

8.4.4.3 Combining emissions and computing directional and array gain from devices with multiple outputs

According KDB 662911;

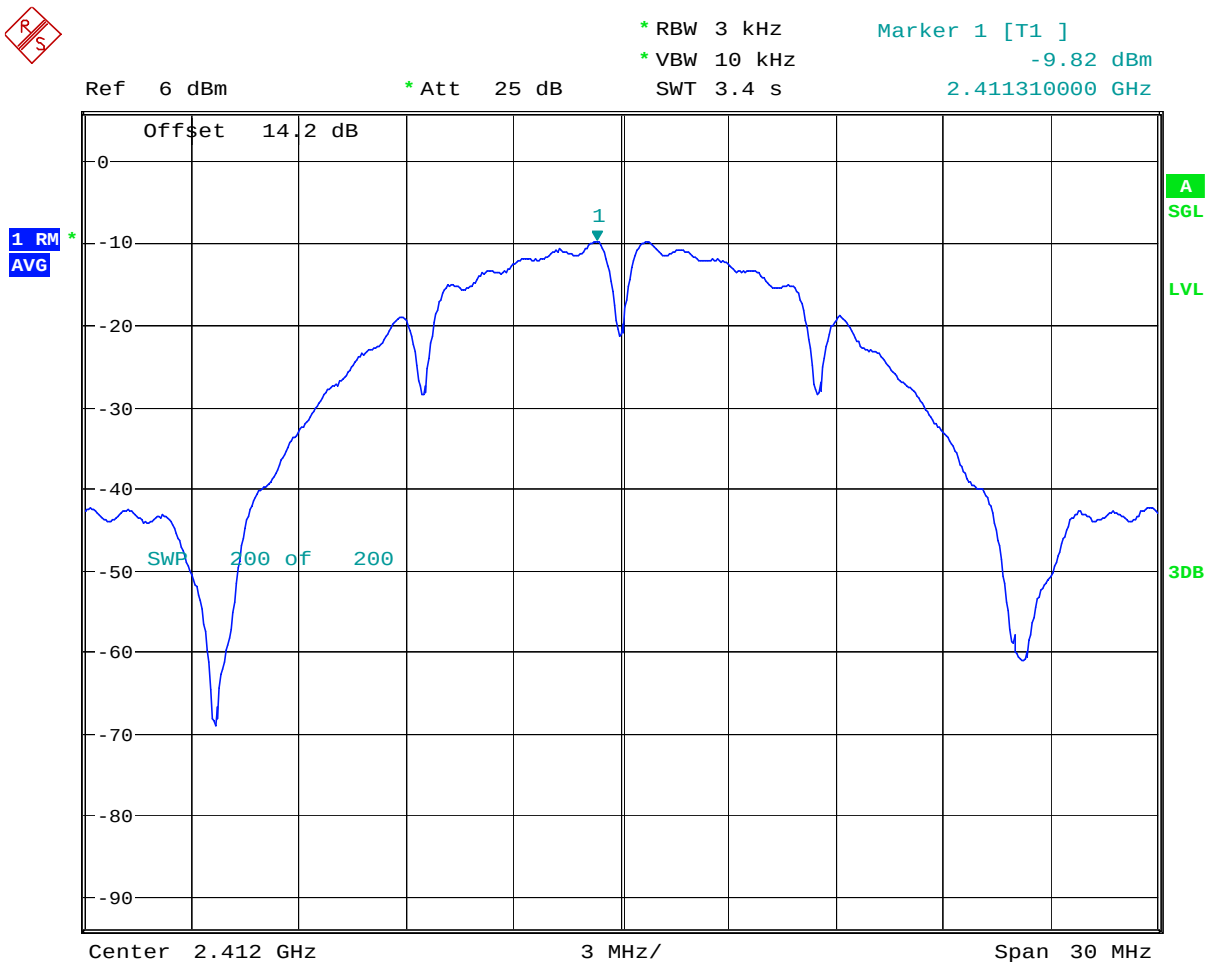
- E) 2) In-Band Power Spectral Density (PSD) Measurements
  - a) Measure and sum the spectra across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The individual spectra are then summed mathematically in linear power units. Unlike in-band power measurements, in which the sum involves a single measured value (output power) from each output, measurements for compliance with PSD limits involve summing entire spectra across corresponding frequency bins on the various outputs [i.e., for a device with NANT transmitter outputs, if the spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value (in watts or milliwatts) in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NANTth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way).] This will likely require transferring the measured spectra to a computer, where the bin-by-bin summing can be performed.
- F) 2) Directional Gain Calculation for In-Band Measurements
  - d) Unequal antenna gains, with equal transmit power. For antenna gains given by G1, G2, …,$G_{N\ dBi}$
    - (i) If transmit signals are correlated then
      Directional gain = 10 log [(10^G1 /20 + 10^G2 /20 + … + 10^GN /20)2 /NANT] dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

Frequency (MHz)	EUT Operating Mode	Power spectral density Primary \ Secondary (dBm)	Sum of power spectral density (dBm)	EIRP Accounting for array gain (dBm)	Limit (dBm / 3 kHz)	Result
2412	802.11g	-19.69 \ -21.08	-17.32	-11.02	7.40	Pass
2437	802.11g	-12.98 \ -13.67	-10.30	-3.99	7.40	Pass
2462	802.11g	-19.38 \ -20.91	-17.07	-10.78	7.40	Pass
2412	802.11n_HT20	-19.06 \ -20.23	-16.59	-10.30	7.40	Pass
2437	802.11n_HT20	-14.63 \ -16.04	-12.27	-5.96	7.40	Pass
2462	802.11n_HT20	-20.90 \ -22.68	-18.69	-12.38	7.40	Pass
2422	802.11n_HT40	-22.43 \ -23.66	-19.99	-13.72	7.40	Pass
2452	802.11n_HT40	-26.58 \ -28.01	-24.23	-17.98	7.40	Pass

- Directional gain = $10*Log_{10}[(10^{(3.4 /20)} + 10^{(3.2 /20)^2 /2}]$ → 6.31 dBi
- Limit corrected for gain > 6 dBi = 8-[(3.4+3.2)-6] → 7.40 dBm

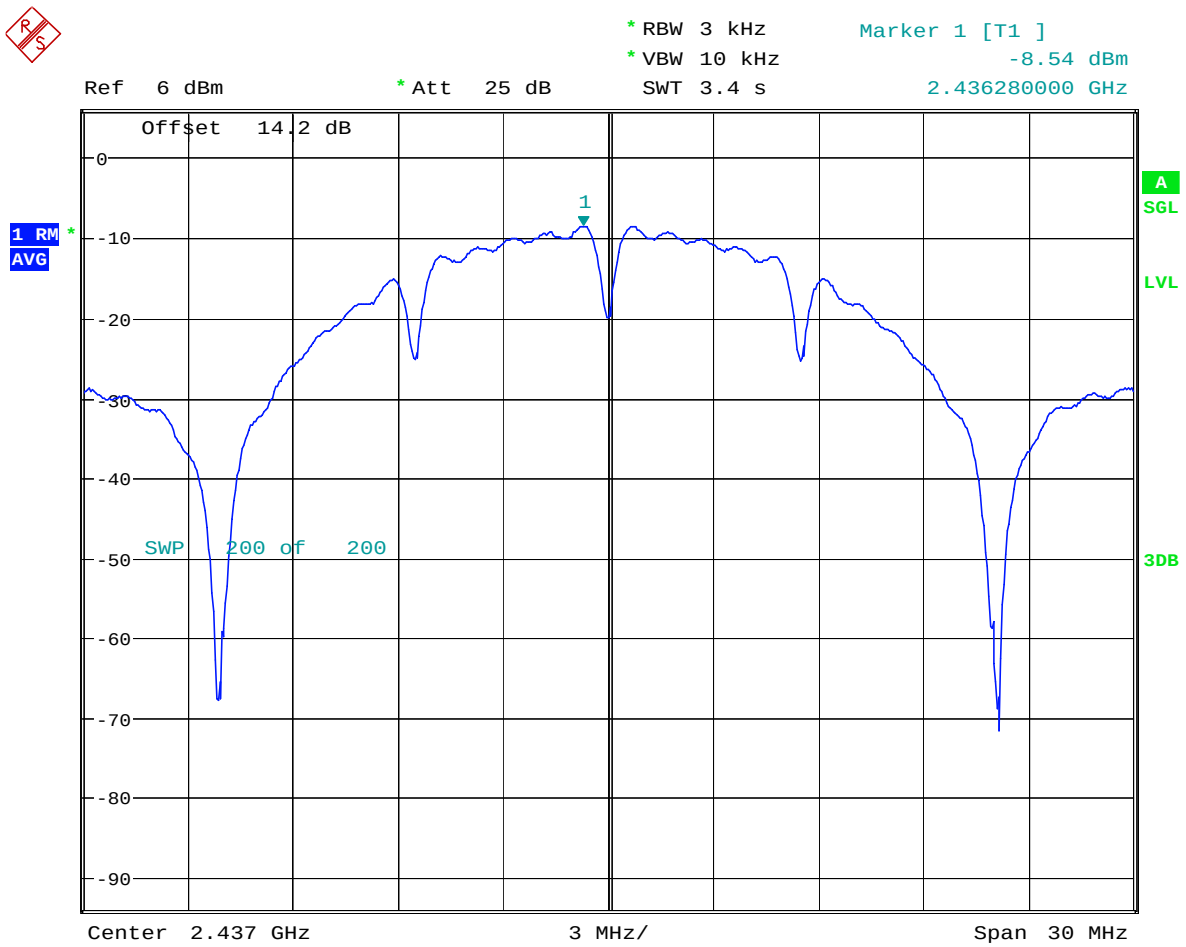
8.4.5 Measurement Plots:

Plot # 49		
Tx Frequency: 2412 MHz	Mode: 802.11b	Primary



Date: 25.AUG.2020 14:32:54

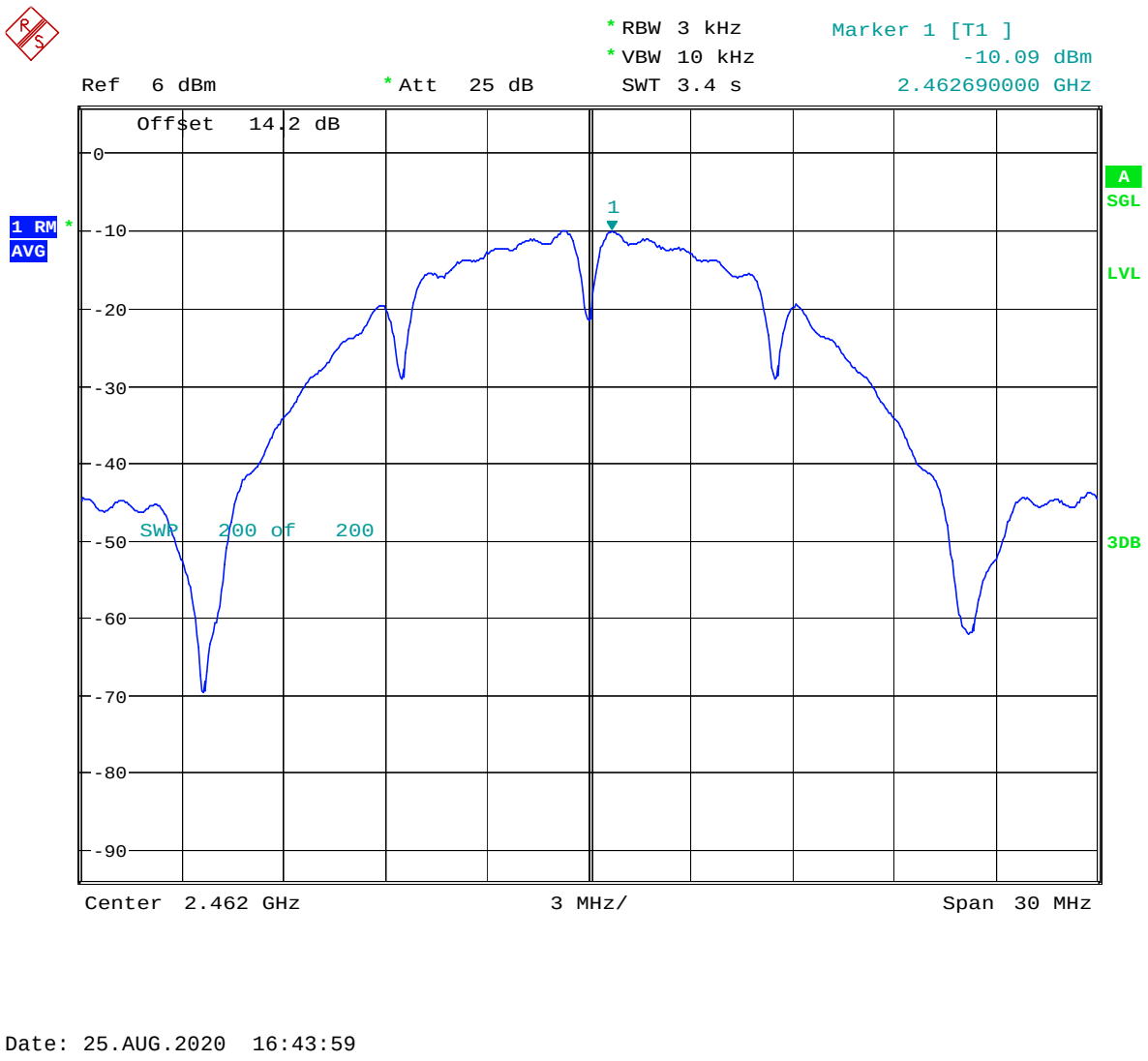
Plot # 50		
Tx Frequency: 2437 MHz	**Mode: 802.11b**	**Primary**



Date: 25.AUG.2020 16:27:44

Plot # 51

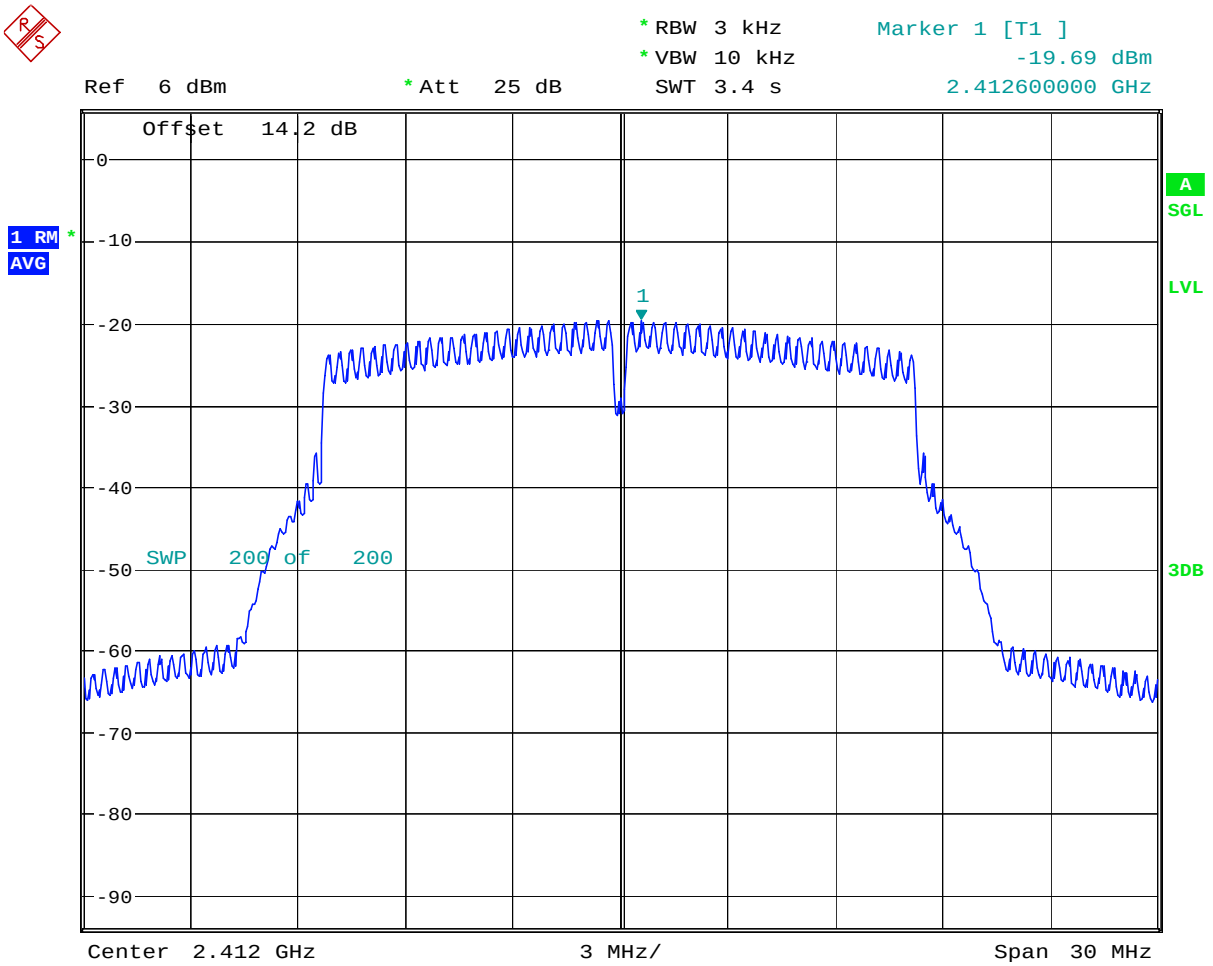
Tx Frequency: 2462 MHz	Mode: 802.11b	Primary



Date: 25.AUG.2020 16:43:59

Plot # 52

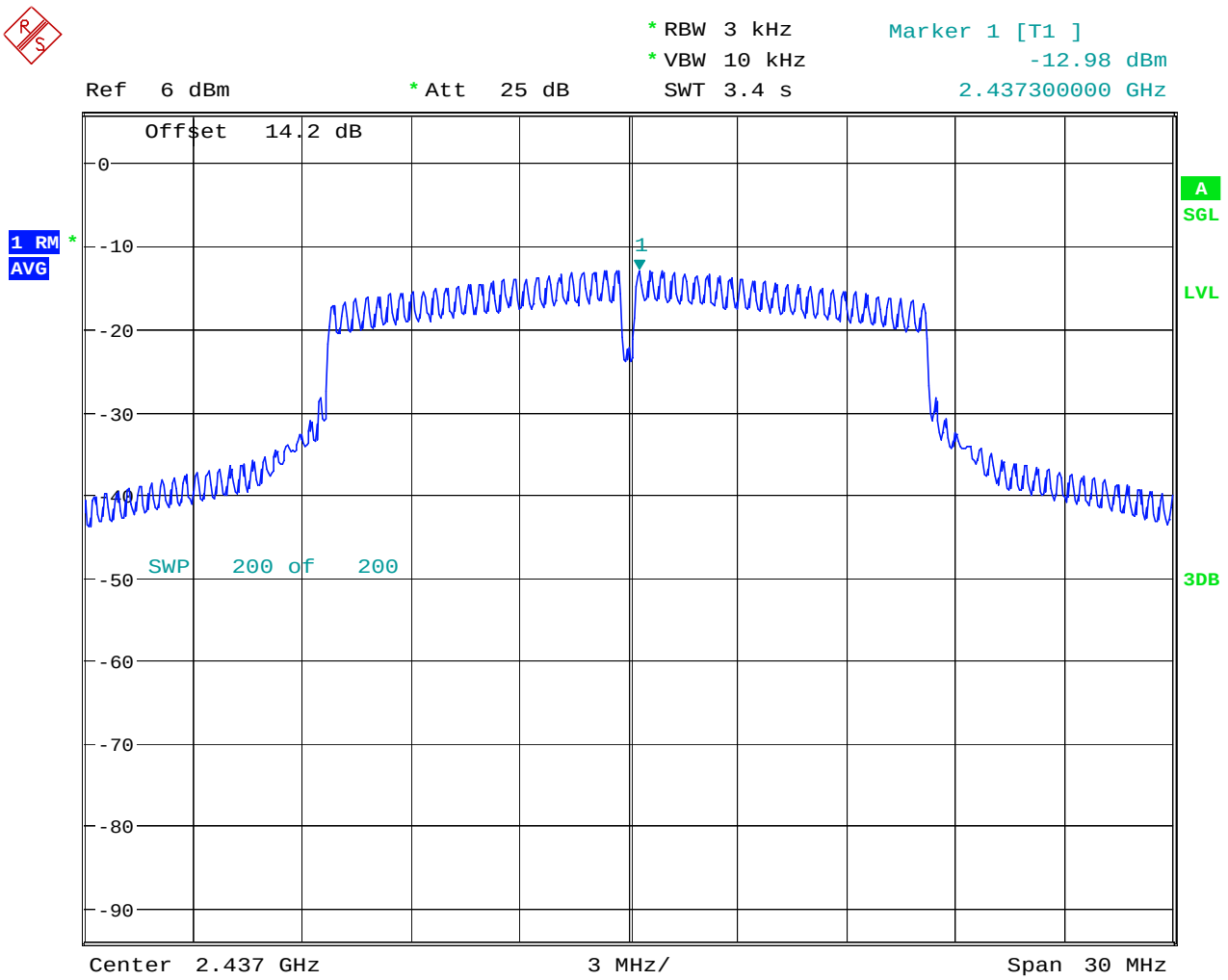
Tx Frequency: 2412 MHz	Mode: 802.11g	Primary



Date: 25.AUG.2020 15:26:09

Plot # 53

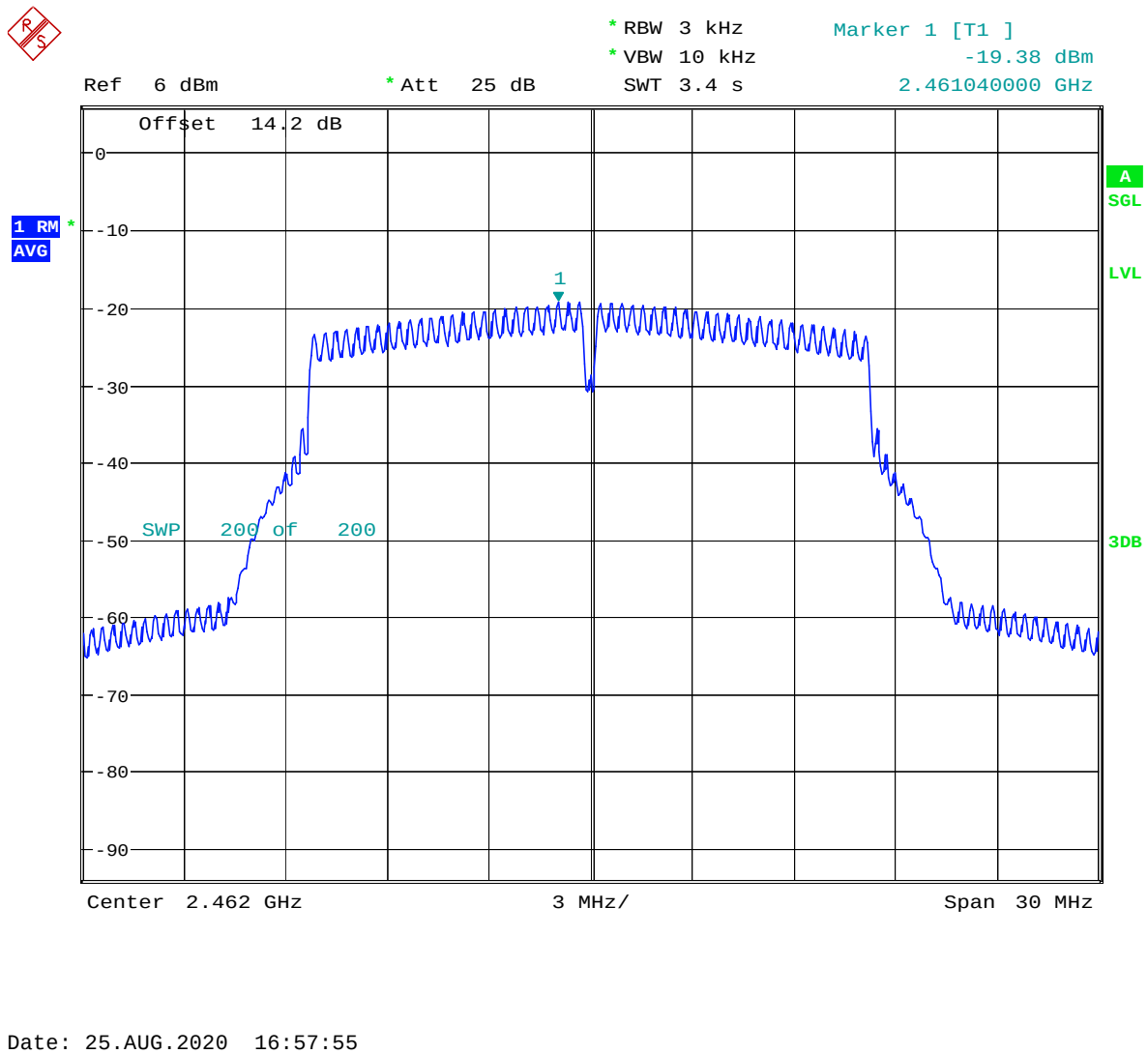
Tx Frequency: 2437 MHz	Mode: 802.11g	Primary



Date: 25.AUG.2020 16:06:53

Plot # 54

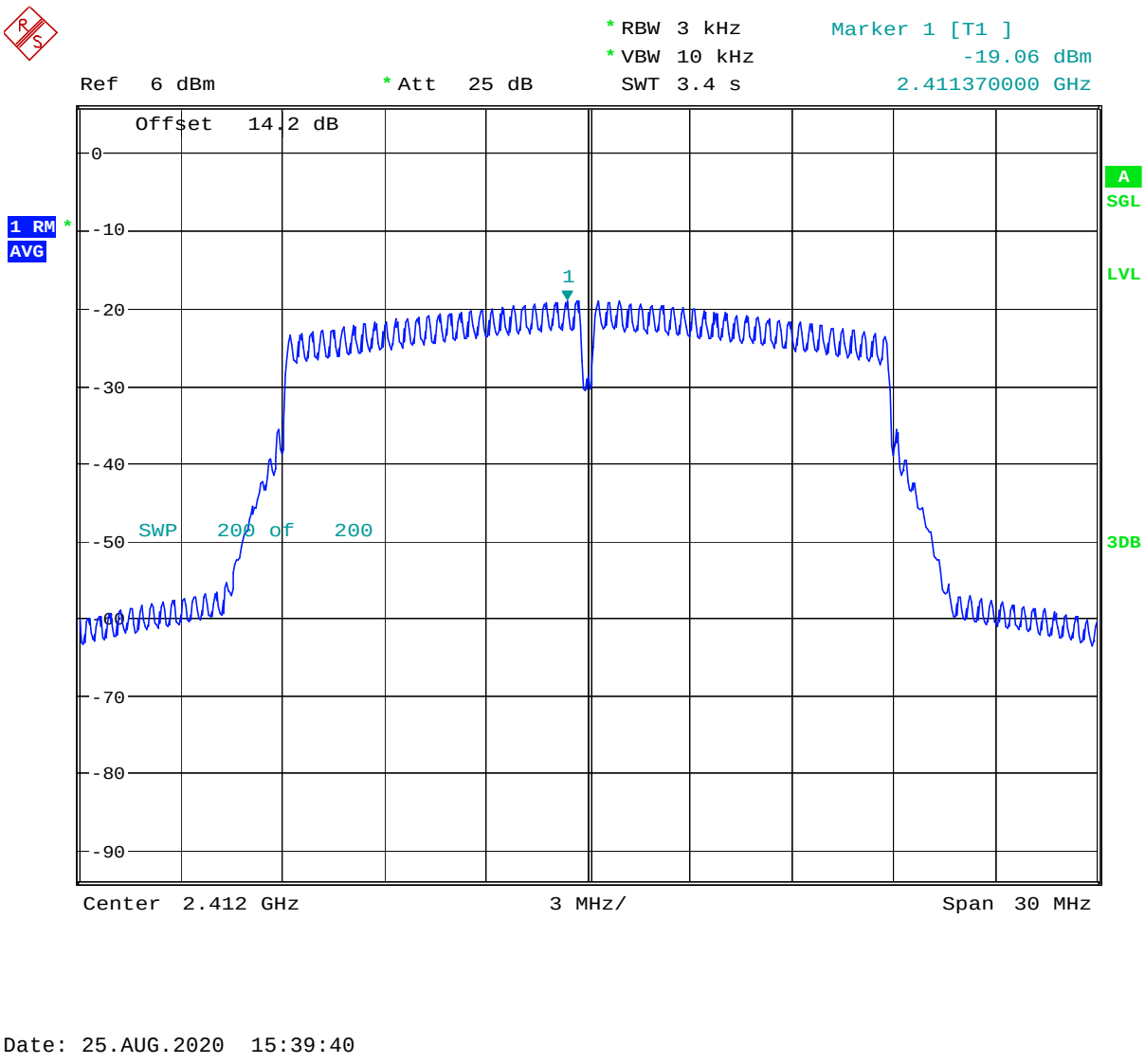
Tx Frequency: 2462 MHz	Mode: 802.11g	Primary



Date: 25.AUG.2020 16:57:55

Plot # 55

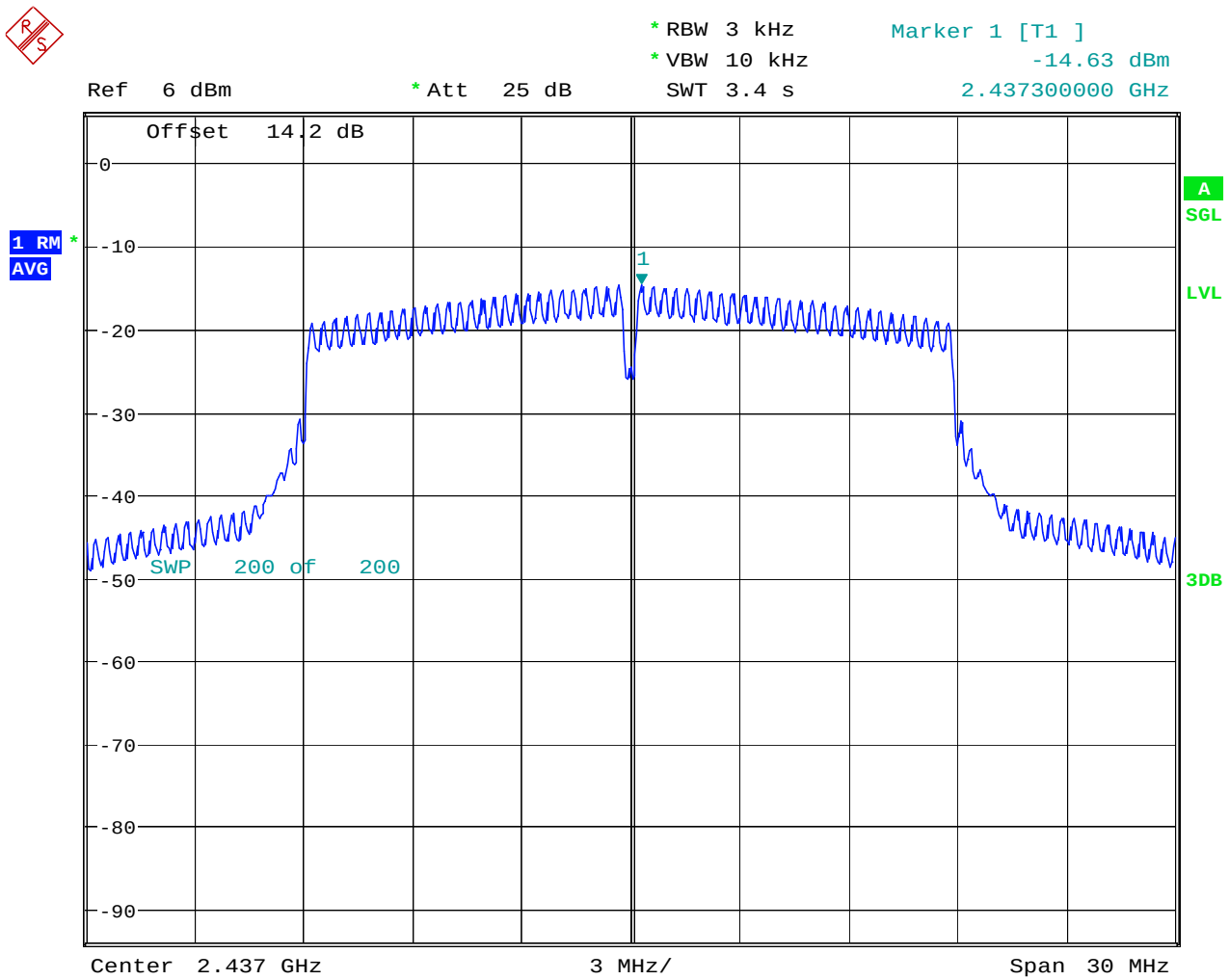
Tx Frequency: 2412 MHz	Mode: 802.11n_HT20	Primary



Date: 25.AUG.2020 15:39:40

Plot # 56

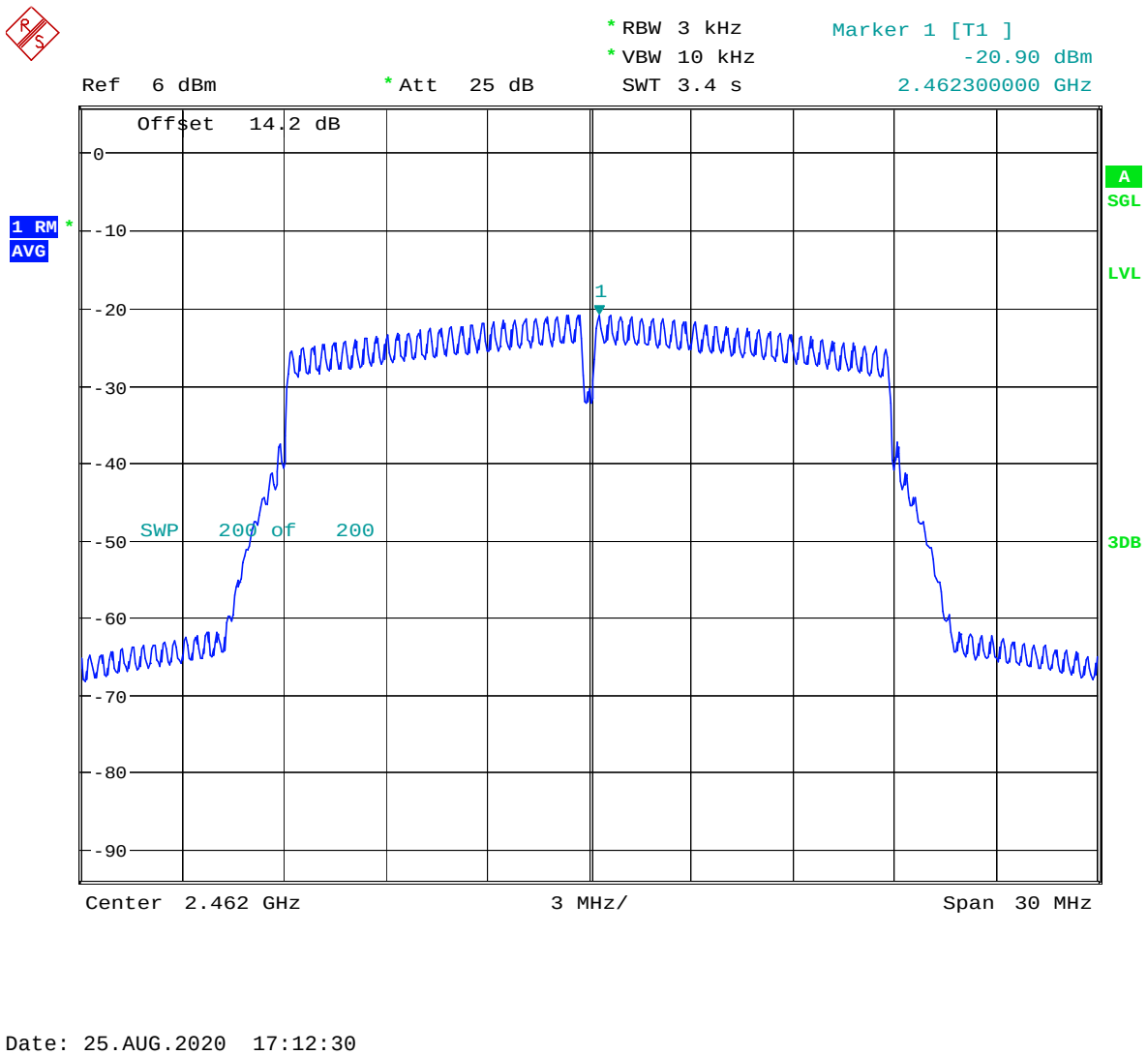
Tx Frequency: 2437 MHz	Mode: 802.11n_HT20	Primary



Date: 25.AUG.2020 15:53:31

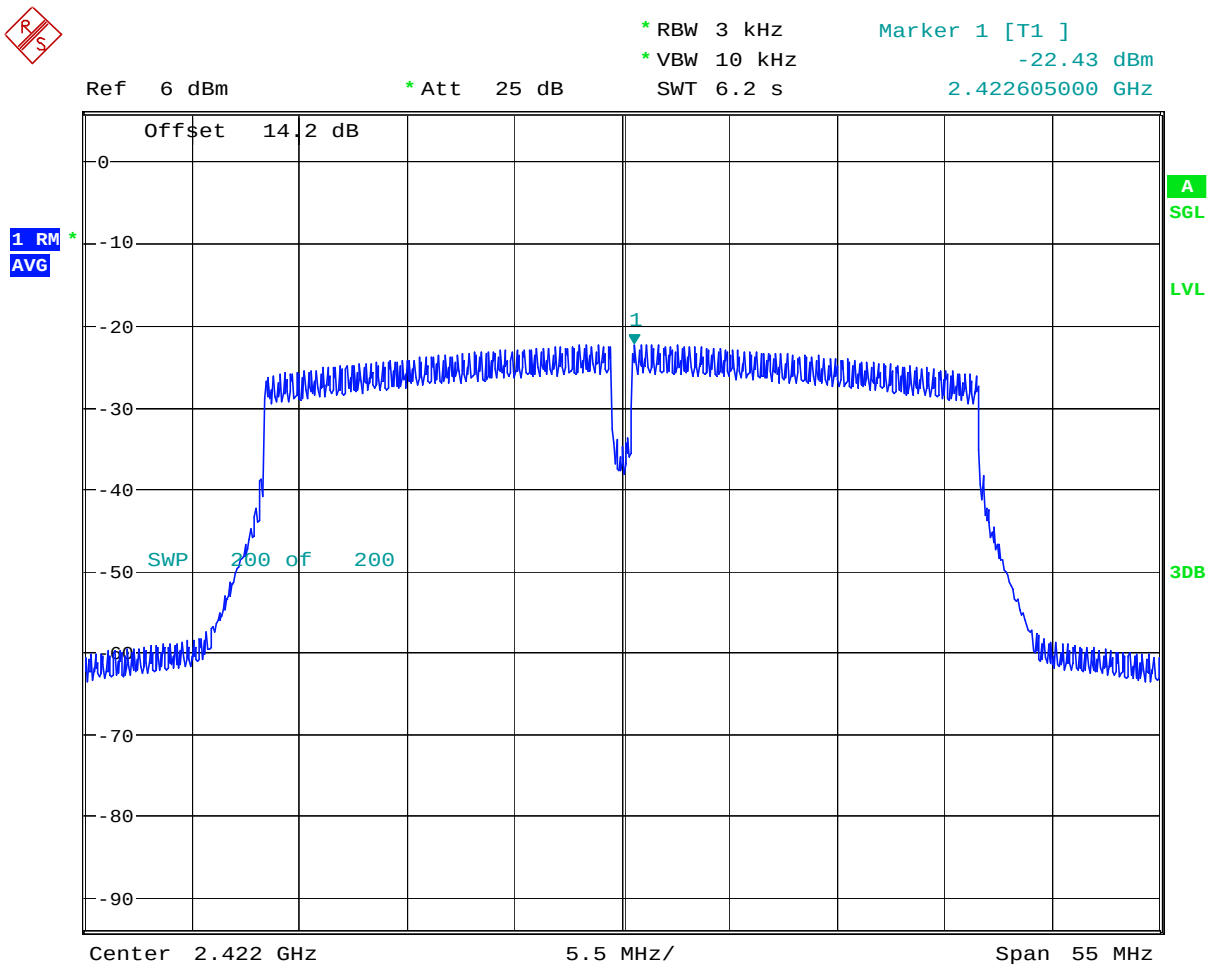
Plot # 57

Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Primary



Plot # 58

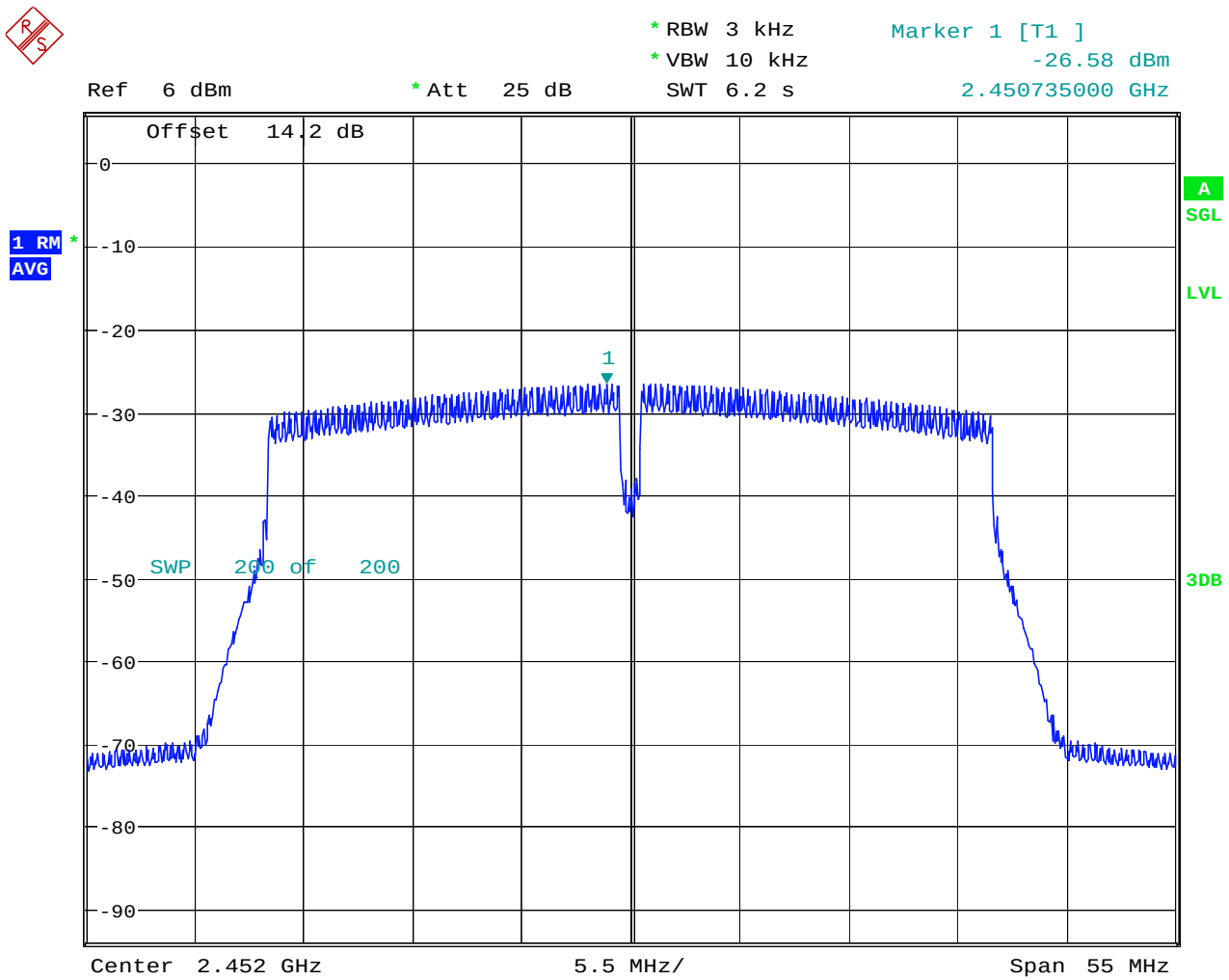
Tx Frequency: 2422 MHz	Mode: 802.11n_HT40	Primary



Date: 25.AUG.2020 14:14:54

Plot # 59

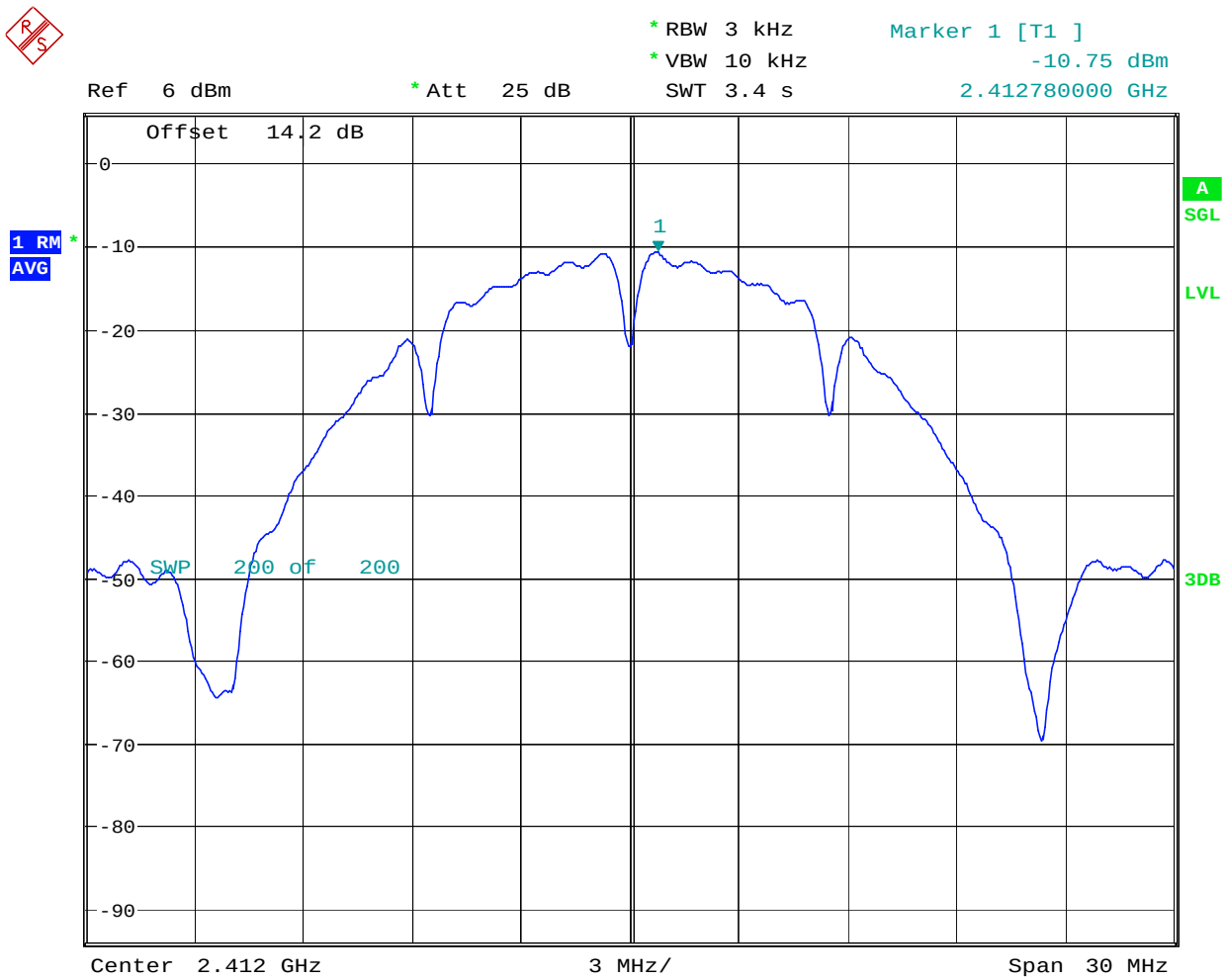
Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Primary



Date: 25.AUG.2020 13:51:53

Plot # 60

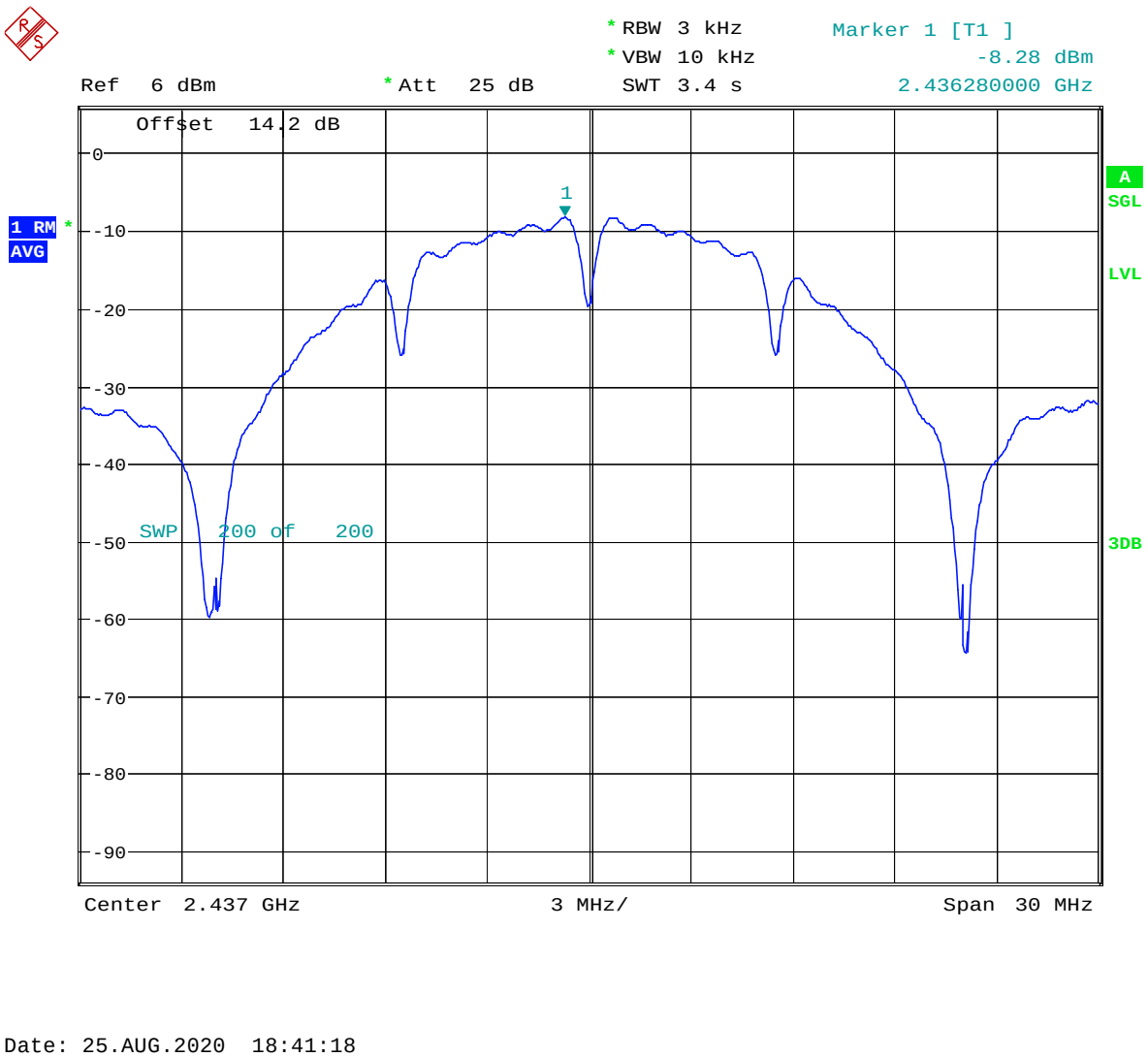
Tx Frequency: 2412 MHz	Mode: 802.11b	Secondary



Date: 25.AUG.2020 19:49:56

Plot # 61

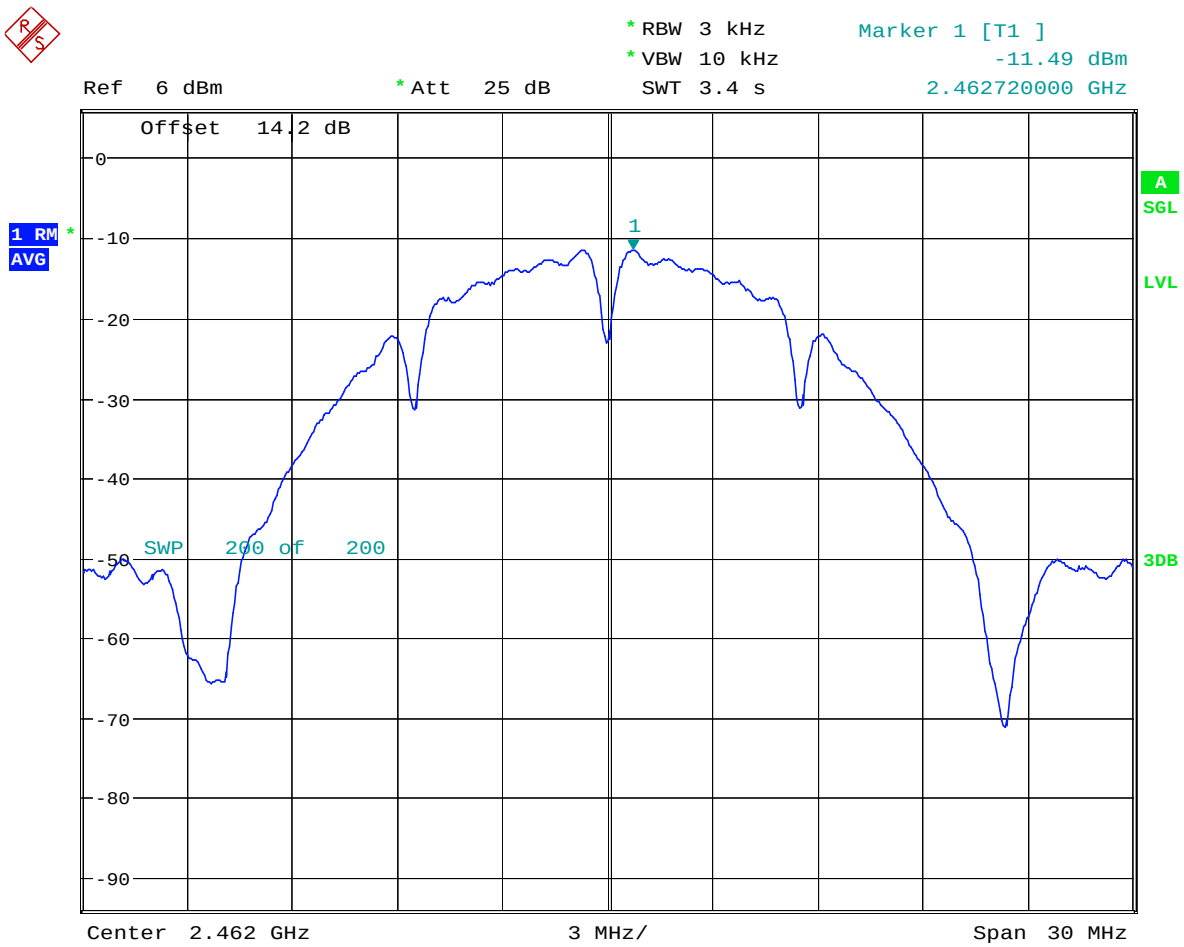
Tx Frequency: 2437 MHz	Mode: 802.11b	Secondary



Date: 25.AUG.2020 18:41:18

Plot # 62

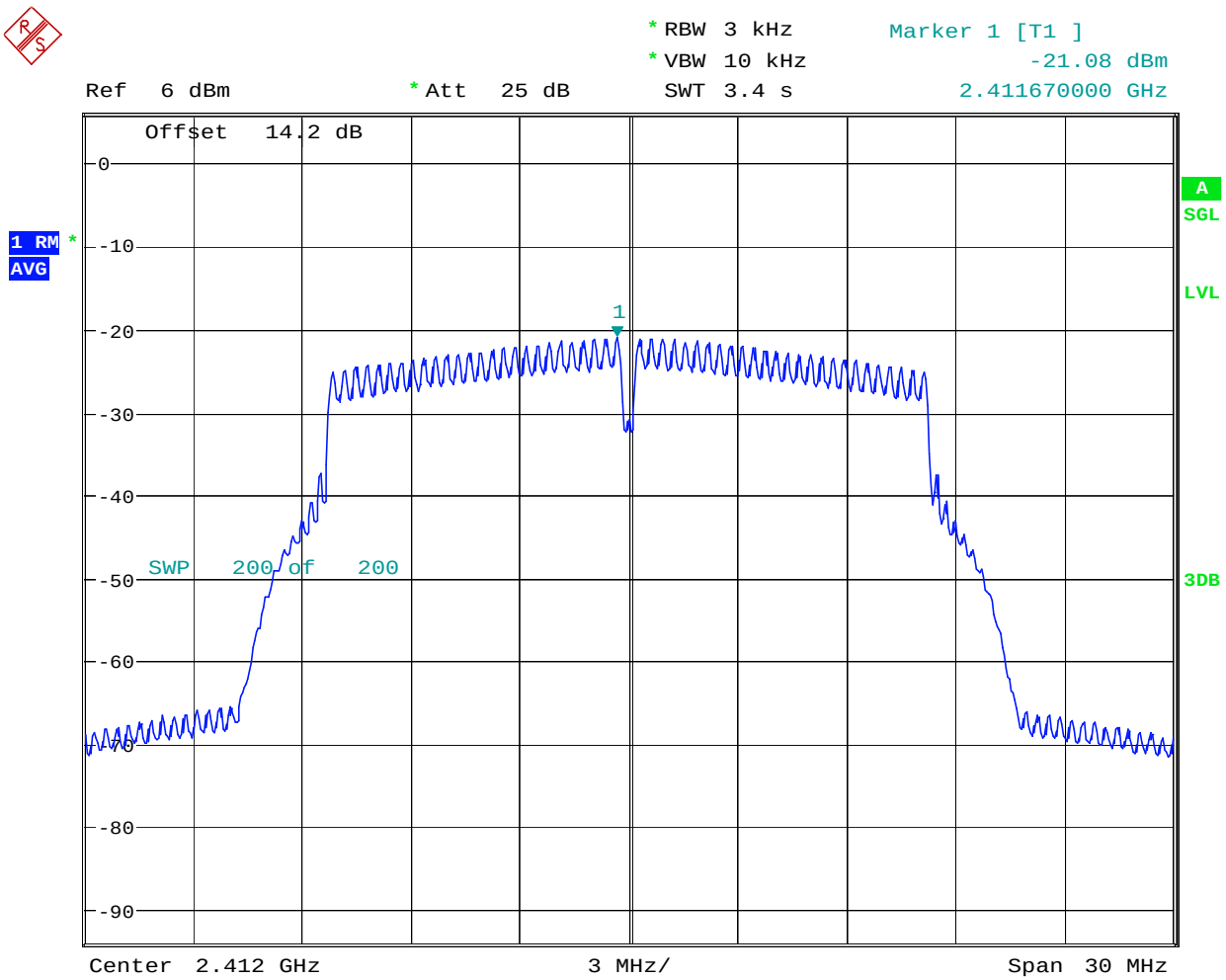
Tx Frequency: 2462 MHz	Mode: 802.11b	Secondary



Date: 25.AUG.2020 18:28:35

Plot # 63

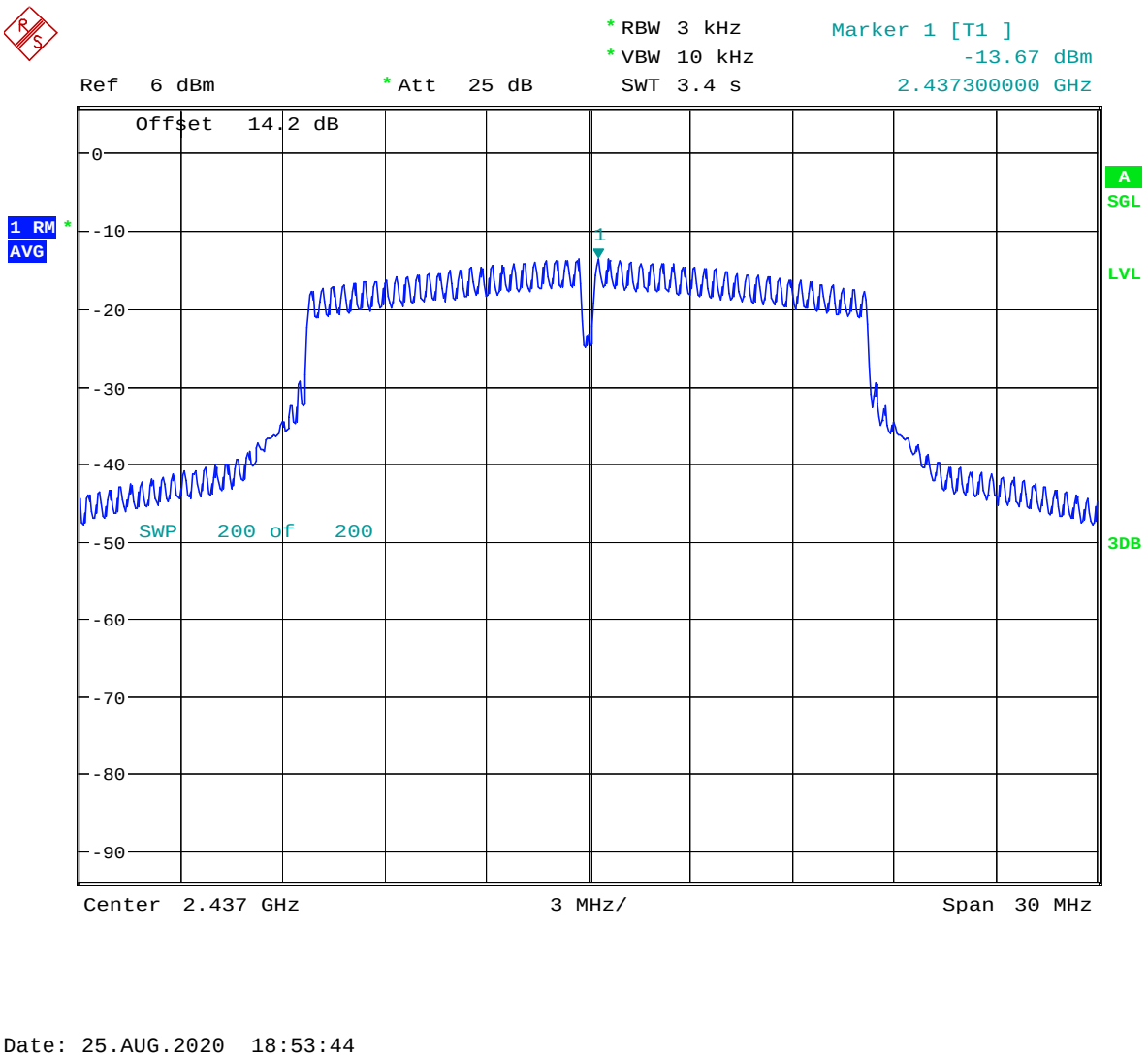
Tx Frequency: 2412 MHz	Mode: 802.11g	Secondary



Date: 25.AUG.2020 19:36:56

Plot # 64

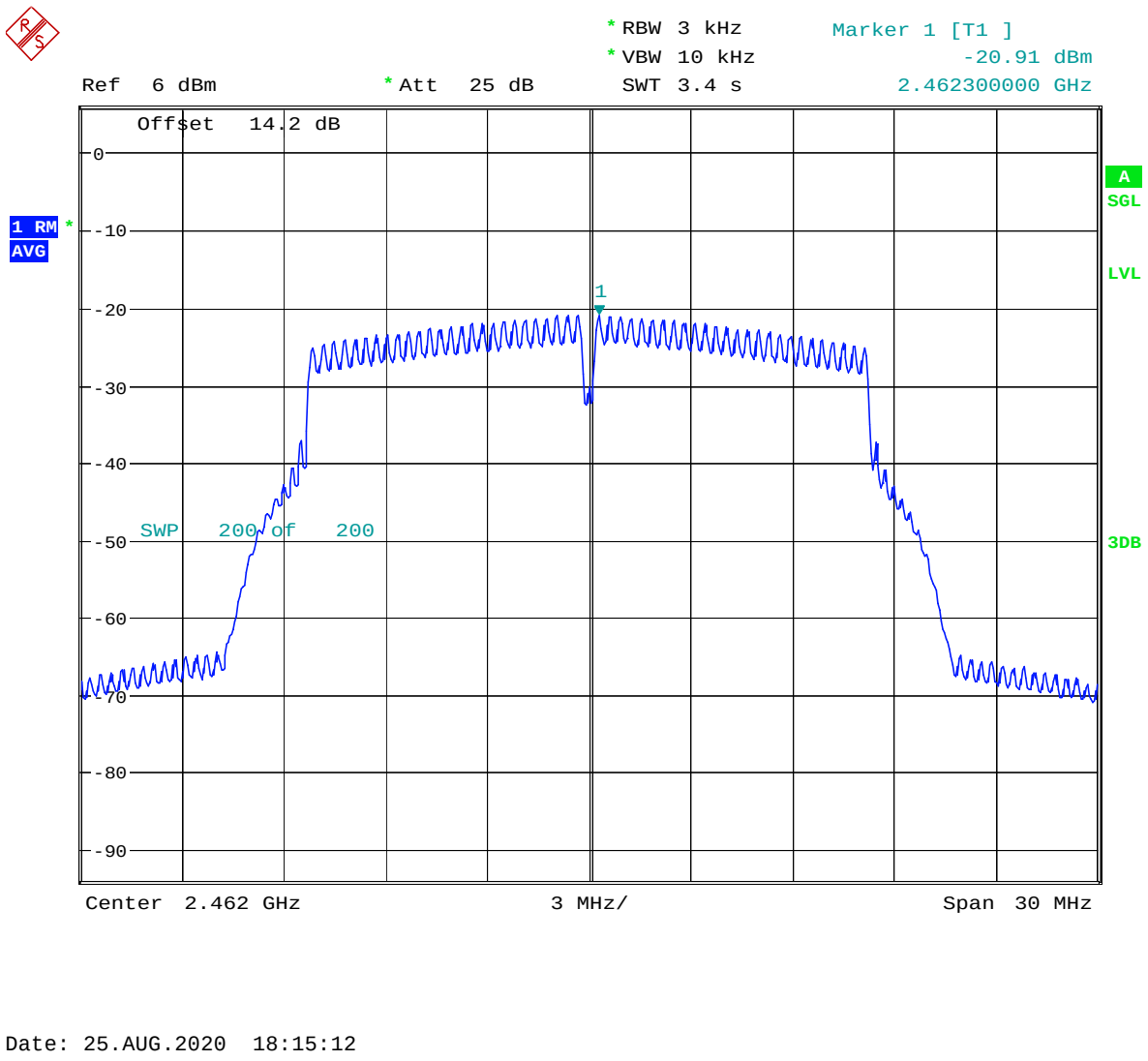
Tx Frequency: 2437 MHz	Mode: 802.11g	Secondary



Date: 25.AUG.2020 18:53:44

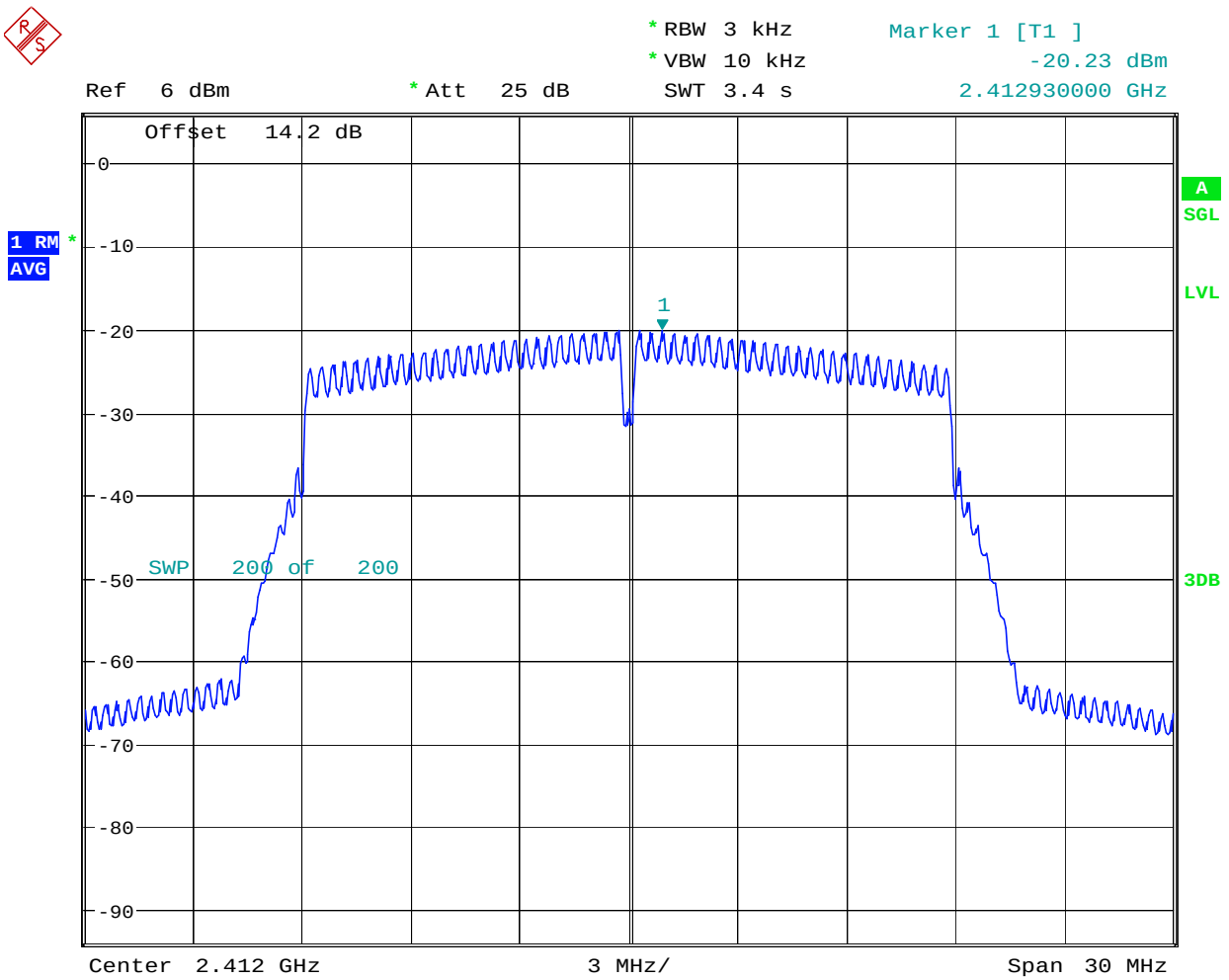
Plot # 65

Tx Frequency: 2462 MHz	Mode: 802.11g	Secondary



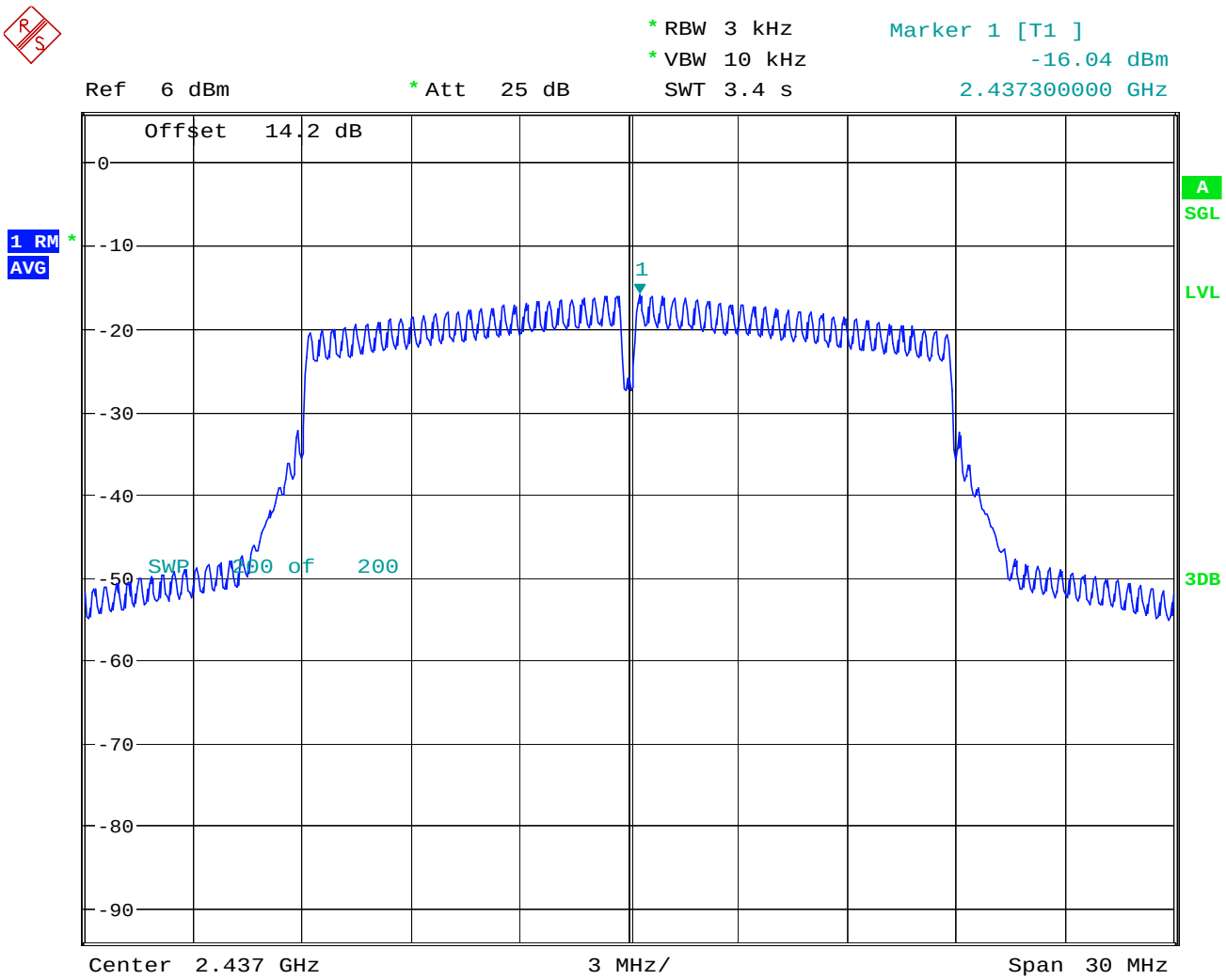
Plot # 66

Tx Frequency: 2412 MHz	Mode: 802.11n_HT20	Secondary



Plot # 67

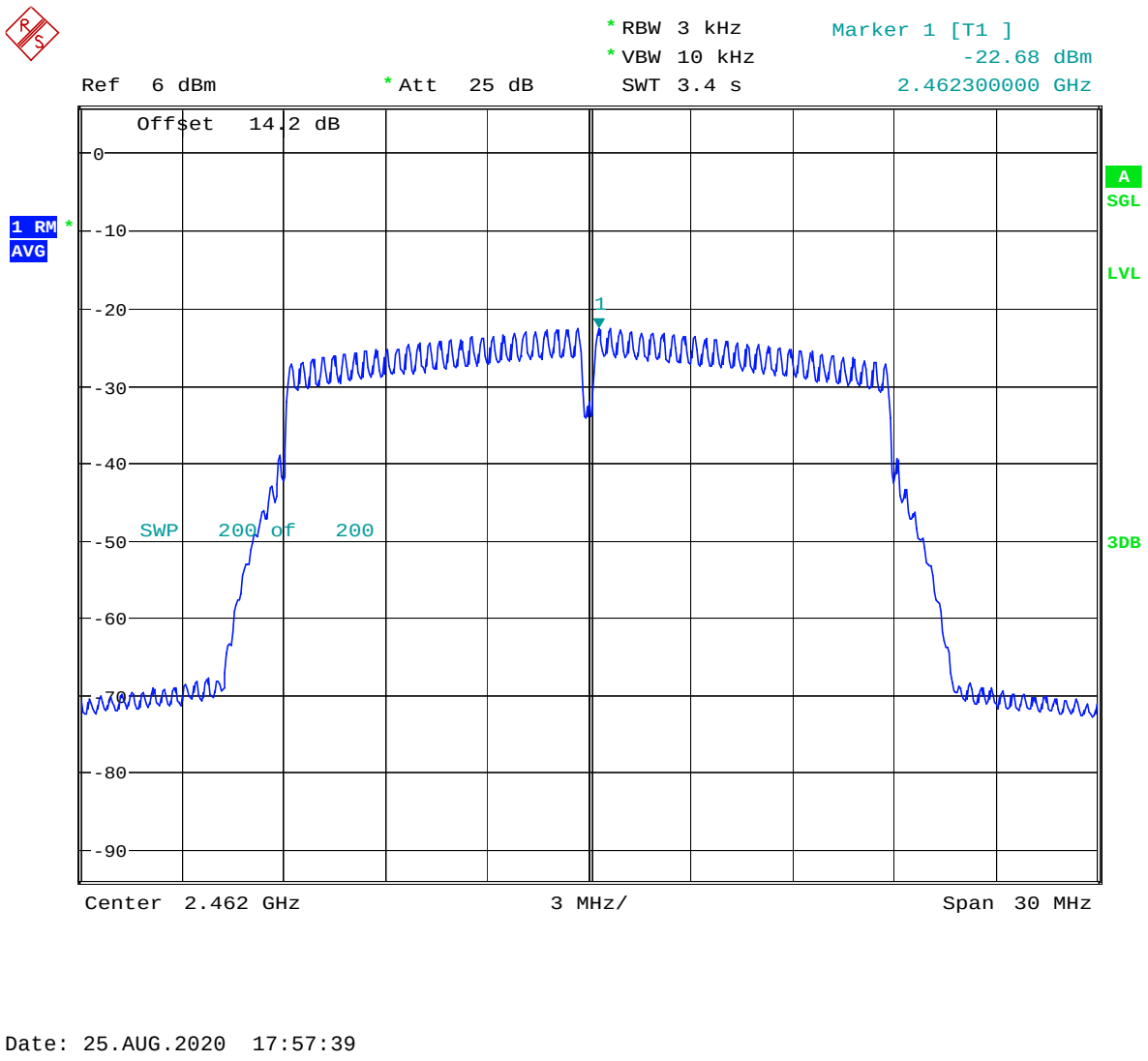
Tx Frequency: 2437 MHz	Mode: 802.11n_HT20	Secondary



Date: 25.AUG.2020 19:10:31

Plot # 68

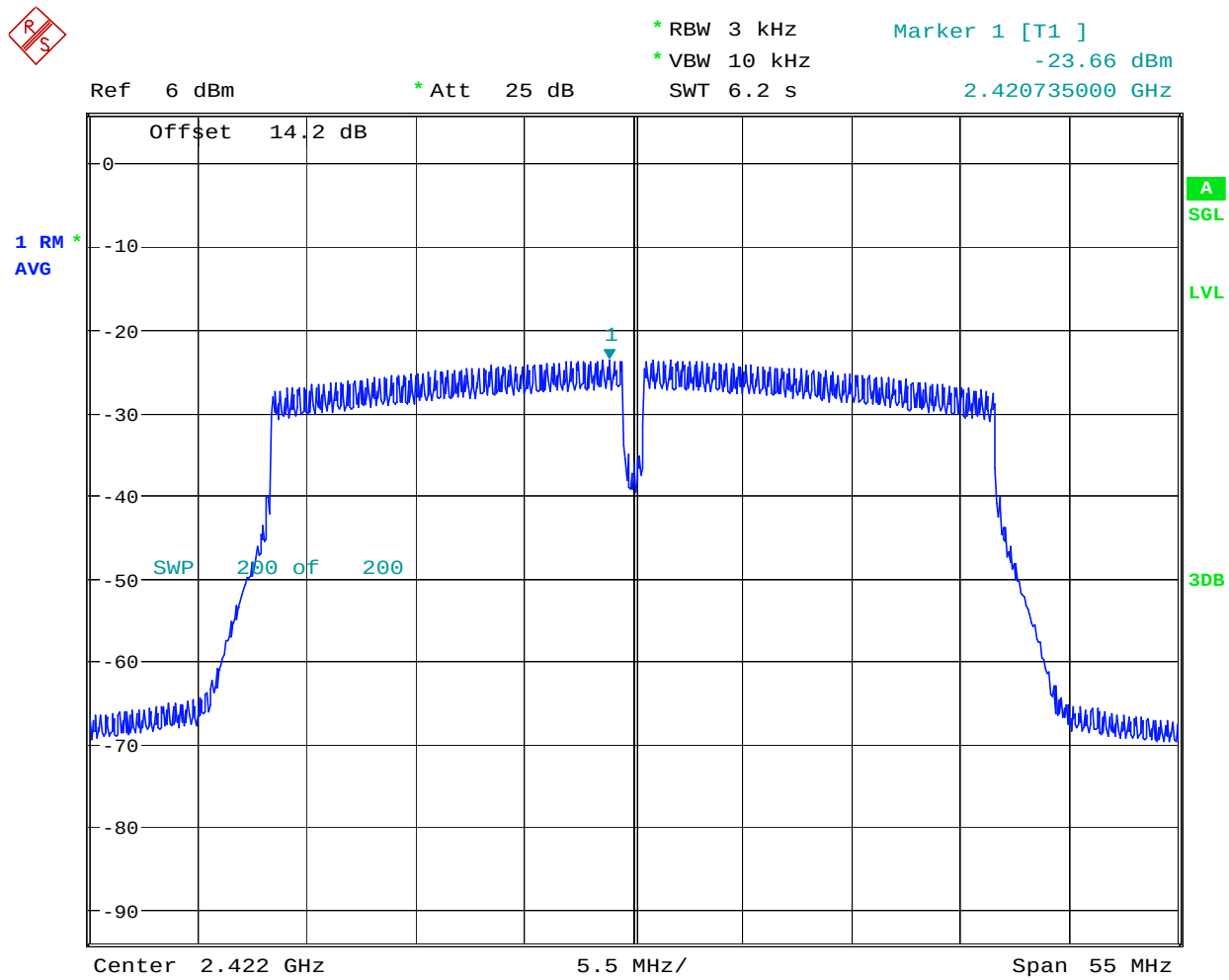
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Secondary



Date: 25.AUG.2020 17:57:39

Plot # 69

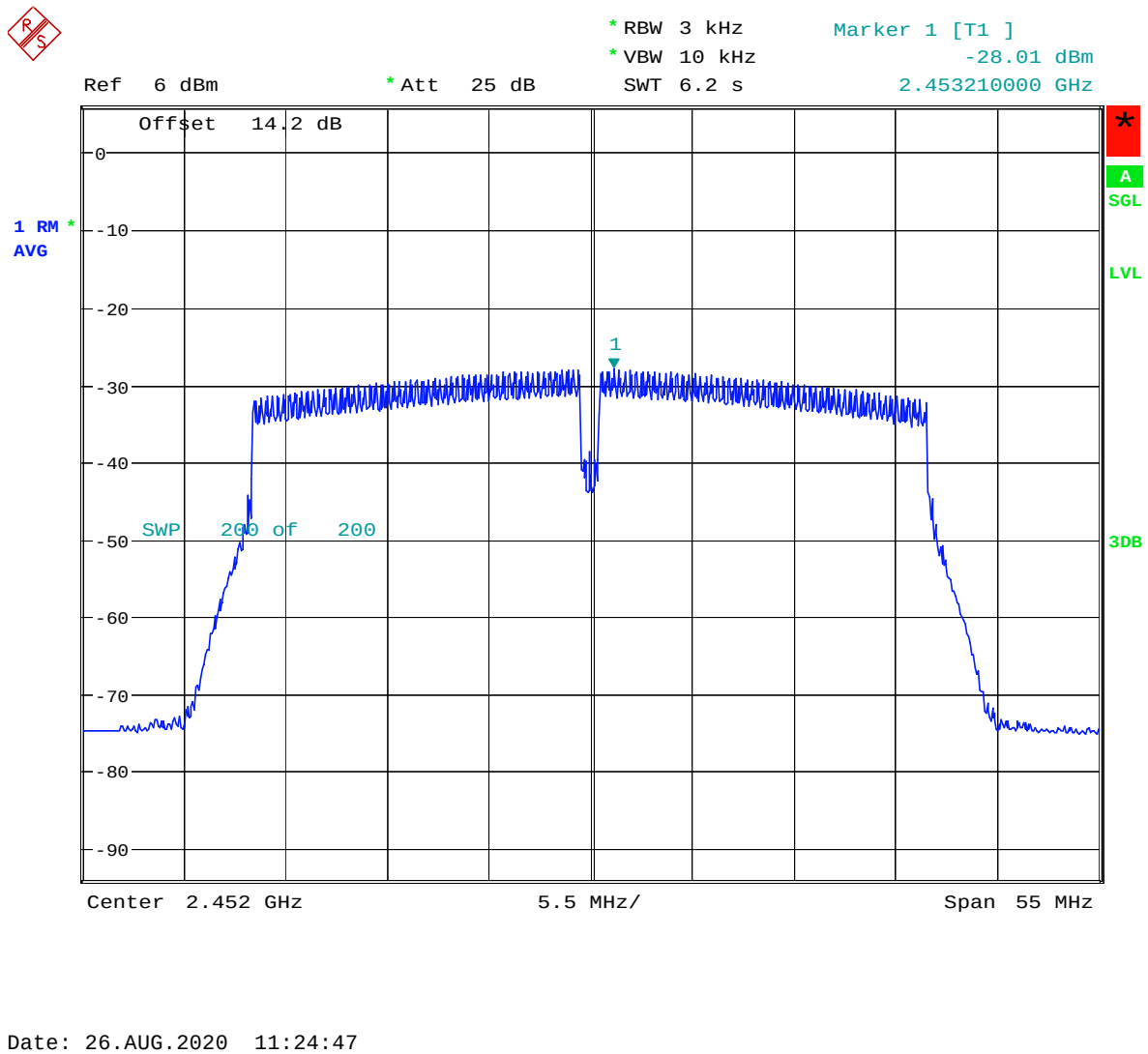
Tx Frequency: 2422 MHz	Mode: 802.11n_HT40	Secondary



Date: 26.AUG.2020 11:49:23

Plot # 70

Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Secondary



8.5 Band Edge Compliance

8.5.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

Spectrum Analyzer settings for band edge:

- Set the center frequency and span to encompass frequency range to be measured
- RBW = 100 kHz
- VBW ≥ 3 x RBW
- Sweep Time: Auto couple
- Detector = Peak
- Trace = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level
- Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge

8.5.2 Limits non restricted band:

FCC§15.247 (d)

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB.

Spectrum Analyzer settings for restricted band:

- Peak measurements are made using a peak detector and RBW=1 MHz

8.5.3 Limits restricted band §15.247/15.209/15.205 and RSS-Gen 8.9/8.10

- *PEAK LIMIT= 74 dBµV/m @3m =-21.23 dBm
- *AVG. LIMIT= 54 dBµV/m @3m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205 & RSS-Gen 8.10
- Measurements with a peak detector were used to show compliance to average limits, thus showing compliance to both peak and average limits.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

8.5.4 Test conditions and setup:

Restricted and Non-Restricted Band:

Ambient Temperature	EUT #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	Op.1	110 V AC	Primary: 3.4 dBi Secondary: 3.2 dBi

8.5.5 Measurement result:

8.5.5.1 Primary TX path (WIFI0):

Plot #	EUT operating mode	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
71	802.11b	Lower, Non-restricted	-32.47	< -30	Pass
72	802.11g	Lower, Non-restricted	-32.63	< -30	Pass
73	802.11n HT20	Lower, Non-restricted	-32.22	< -30	Pass
74	802.11n HT40	Lower, Non-restricted	-31.28	< -30	Pass

Plot #	EUT operating mode	Band Edge	Measured Peak/AVG Value (dBm)	Corrected by Antenna Gain (dBm)	Limit (dBm)	Result
75	802.11b	Upper Restricted	Peak: -39.57	Peak: - 36.17	Peak: -21.23	Pass
76			AVG: -49.17	AVG: -45.77	AVG: -41.23	
77	802.11g	Upper Restricted	Peak: -30.13	Peak: -26.73	Peak: -21.23	Pass
78			AVG: -49.23	AVG: -46.23	AVG: -41.23	
79	802.11n HT20	Upper Restricted	Peak: -30.64	Peak: -27.24	Peak: -21.23	Pass
80			AVG: -50.17	AVG: -46.77	AVG: -41.23	
81	802.11n HT40	Upper Restricted	Peak: -32.78	Peak: -29.38	Peak: -21.23	Pass
82			AVG: -50.27	AVG: -46.87	AVG: -41.23	

8.5.5.2 Secondary TX path (WIFI1):

Plot #	EUT operating mode	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
83	802.11b	Lower, Non-restricted	-48.54	< -30	Pass
84	802.11g	Lower, Non-restricted	-41.37	< -30	Pass
85	802.11n HT20	Lower, Non-restricted	-38.98	< -30	Pass
86	802.11n HT40	Lower, Non-restricted	-36.50	< -30	Pass

Plot #	EUT operating mode	Band Edge	Measured Peak/AVG Value (dBm)	Corrected by Antenna Gain (dBm)	Limit (dBm)	Result
87	802.11b	Upper Restricted	Peak: -38.30	Peak: - 35.10	Peak: -21.23	Pass
88			AVG: -47.59	AVG: -44.39	AVG: -41.23	
89	802.11g	Upper Restricted	Peak: -37.32	Peak: -34.12	Peak: -21.23	Pass
90			AVG: -52.74	AVG: -49.54	AVG: -41.23	
91	802.11n HT20	Upper Restricted	Peak: -37.99	Peak: -34.79	Peak: -21.23	Pass
92			AVG: -52.85	AVG: -49.65	AVG: -41.23	
93	802.11n HT40	Upper Restricted	Peak: -38.17	Peak: -34.97	Peak: -21.23	Pass
94			AVG: -55.03	AVG: -51.83	AVG: -41.23	

8.5.5.3 Combining emissions and computing directional and array gain from devices with multiple outputs

According KDB 662911;

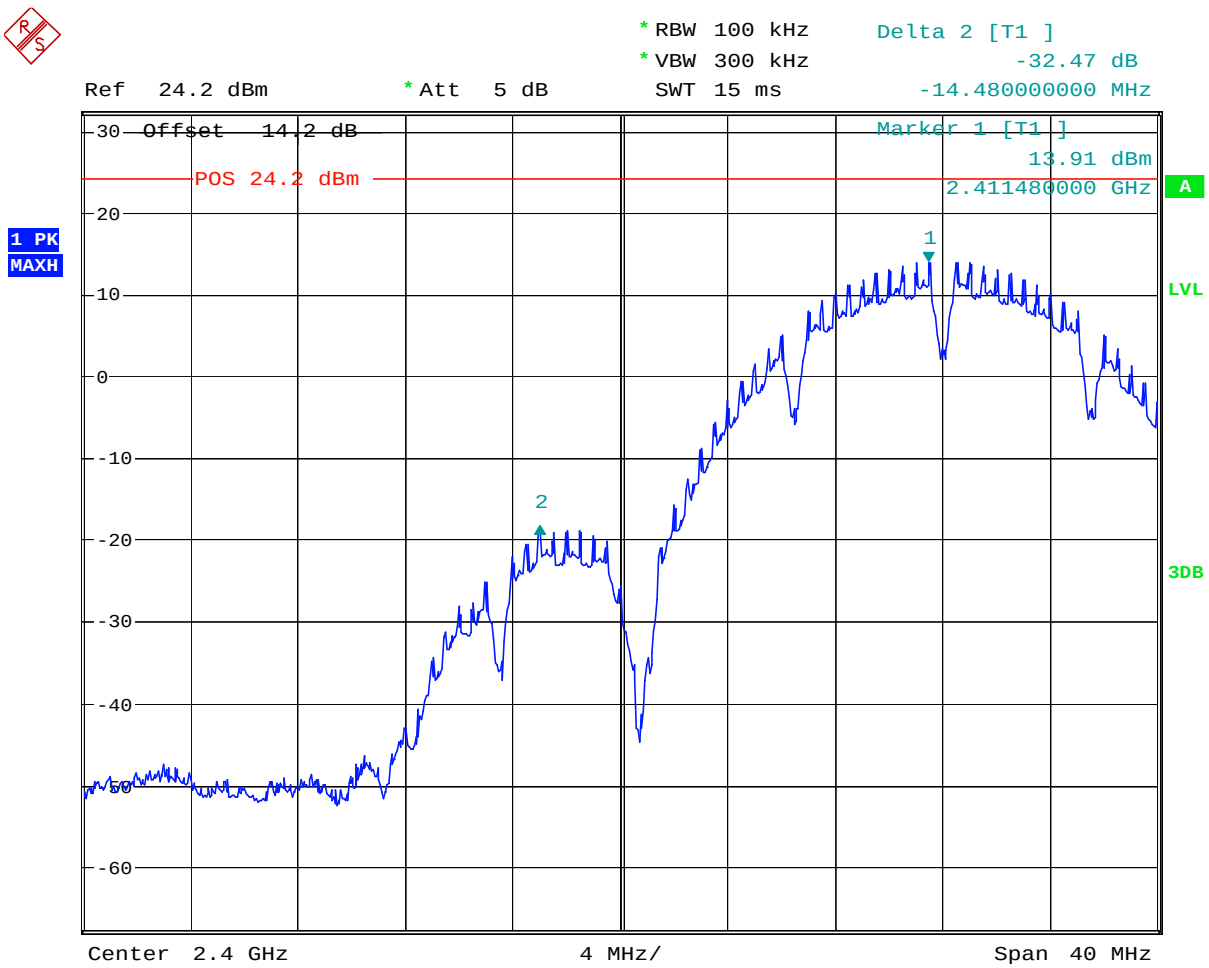
- E) 3) Out-of-Band and Spurious Emission Measurements
  - a) Absolute Emission Limits
    When performing measurements outside of the band of operation of a transmitter (i.e., out-of-band and spurious emissions), any of the three techniques below may be used to combine the emission measurements from multiple outputs prior to comparing to the emission limit. The first is the most accurate method. The second and third techniques are offered as simpler alternatives, but they may lead to overestimates of the total emission level when emission levels differ between outputs; consequently, if measurements performed using methods (ii) or (iii) exceed the emission limit, the test lab may wish to retest using method (i) before declaring that the device fails the emission test. With any of the methods, existing rules and guidance shall be applied in performing the measurements on the individual outputs and in determining the maximum permitted emission level for the device.
    - (ii) Measure and sum spectral maxima across the outputs as described in sectionE)2)b). Note that the summation must be performed in linear power units, or the equivalent. For example, if measurement units are microvolts or microvolts/meter, the values shall be squared before summing, and then a square root shall be applied to the sum in order to achieve the equivalent of summing in power units.
  - F) 3) Directional Gain Calculation for Conducted Out-of-Band and Spurious Measurements
    - c) Directional gain for out-of-band and spurious emissions shall be computed in the same way as for in-band signals.

EUT operating mode	Band Edge	Measured Peak/AVG Value (dBm)		Sum of output power (dBm)	EIRP Accounting for array gain (dBm)	Limit (dBm)	Result
		Primary	Secondary				
802.11g	Upper Restricted	Peak: -30.13	Peak: -37.32	-29.37	-23.06	Peak: -21.23	Pass
		AVG: -49.23	AVG: -52.74	-47.90	-41.59	AVG: -41.23	
802.11n HT20	Upper Restricted	Peak: -30.64	Peak: -37.99	-29.91	-23.60	Peak: -21.23	Pass
		AVG: -50.17	AVG: -52.85	-48.30	-41.99	AVG: -41.23	
802.11n HT40	Upper Restricted	Peak: -32.78	Peak: -38.17	-34.68	-25.37	Peak: -21.23	Pass
		AVG: -50.27	AVG: -55.03	-49.02	-42.71	AVG: -41.23	

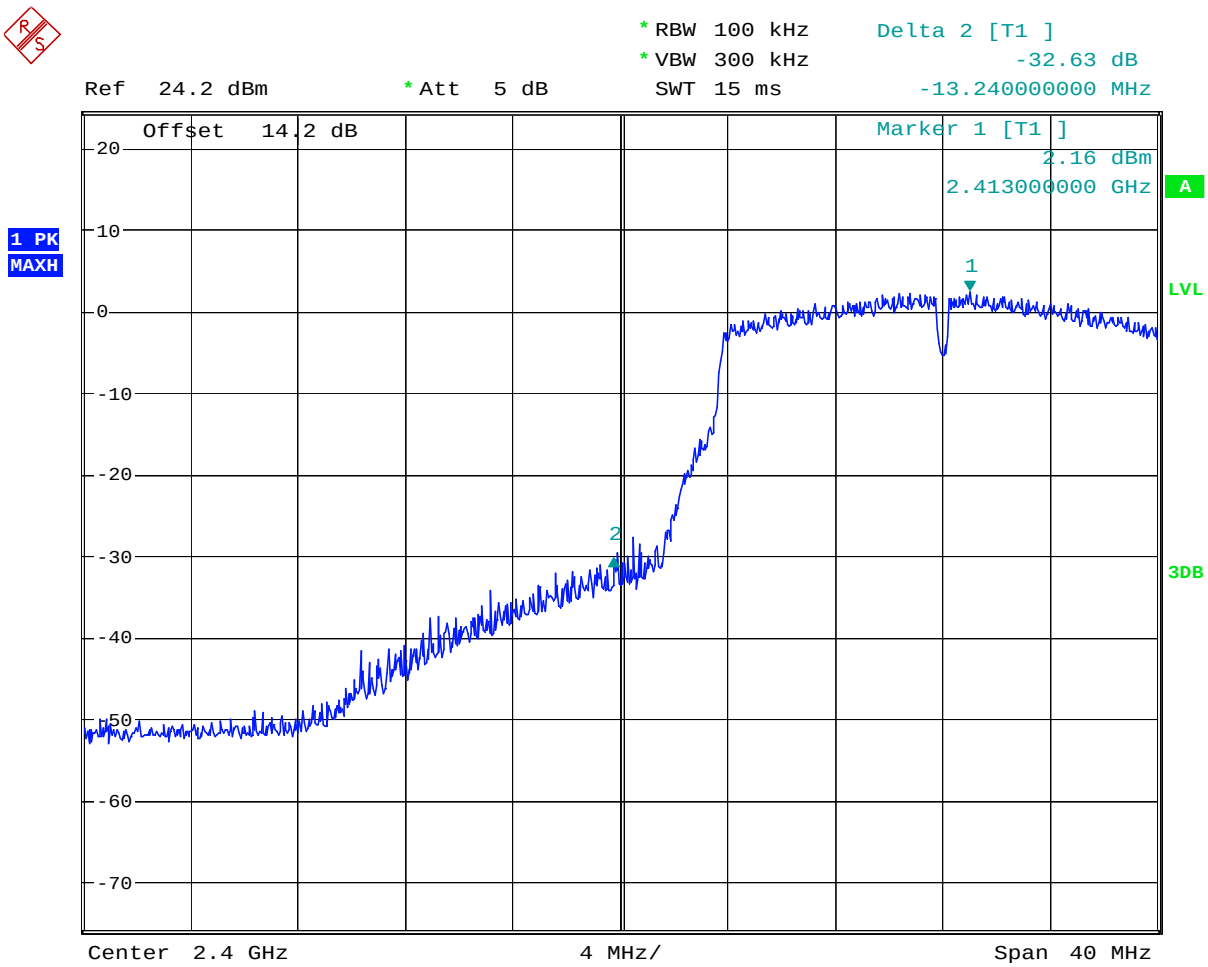
- Directional gain = $10*\text{Log}_{10}[(10^{(3.4/20)} + 10^{(3.2/20)^2/2}]$ → 6.31 dBi

8.5.6 Measurement Plots:

Plot # 71		
Tx Frequency: 2412 MHz	Mode: 802.11b	Primary



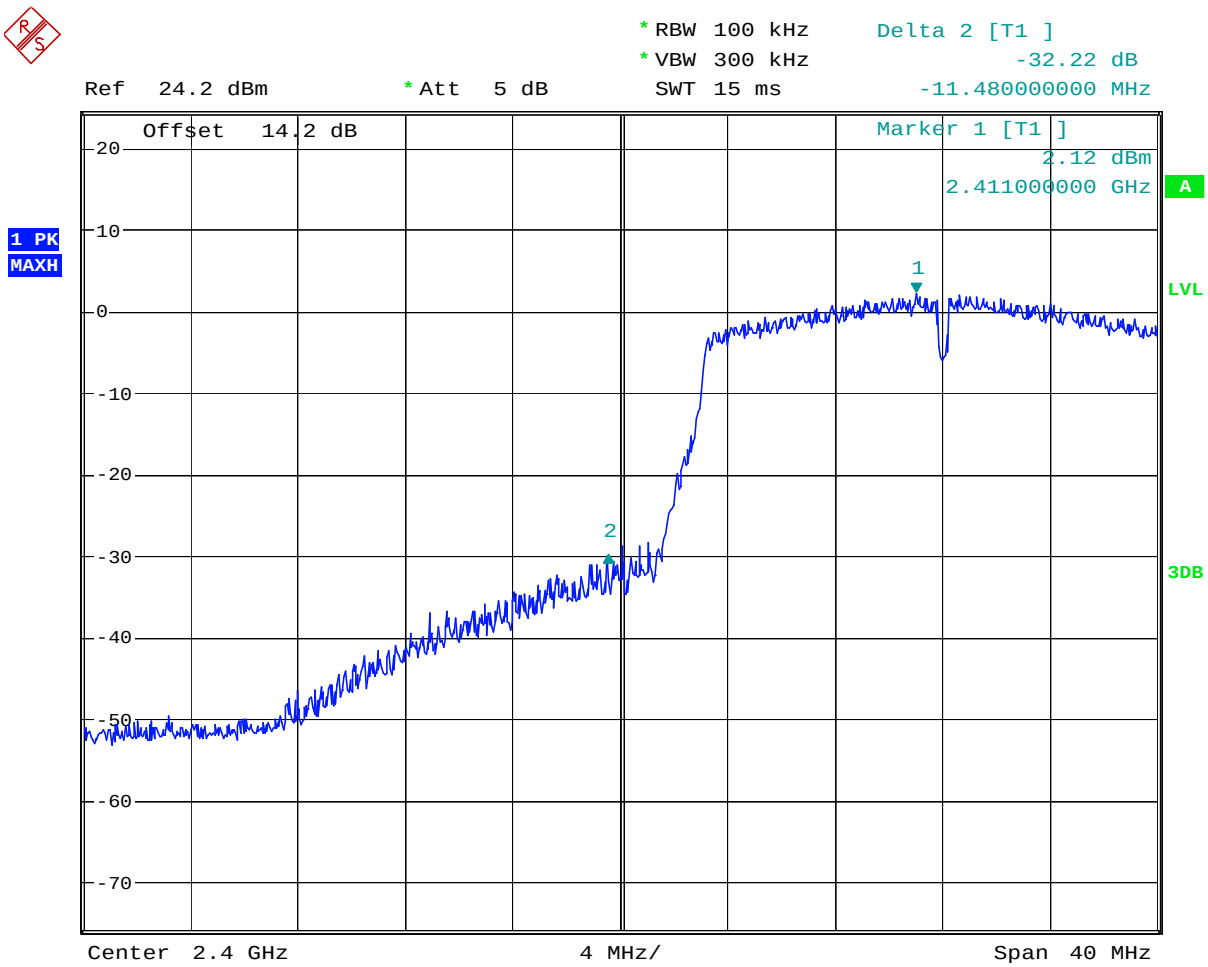
Plot # 72		
Tx Frequency: 2412 MHz	**Mode: 802.11g**	**Primary**



Date: 19.AUG.2020 13:55:02

Plot # 73

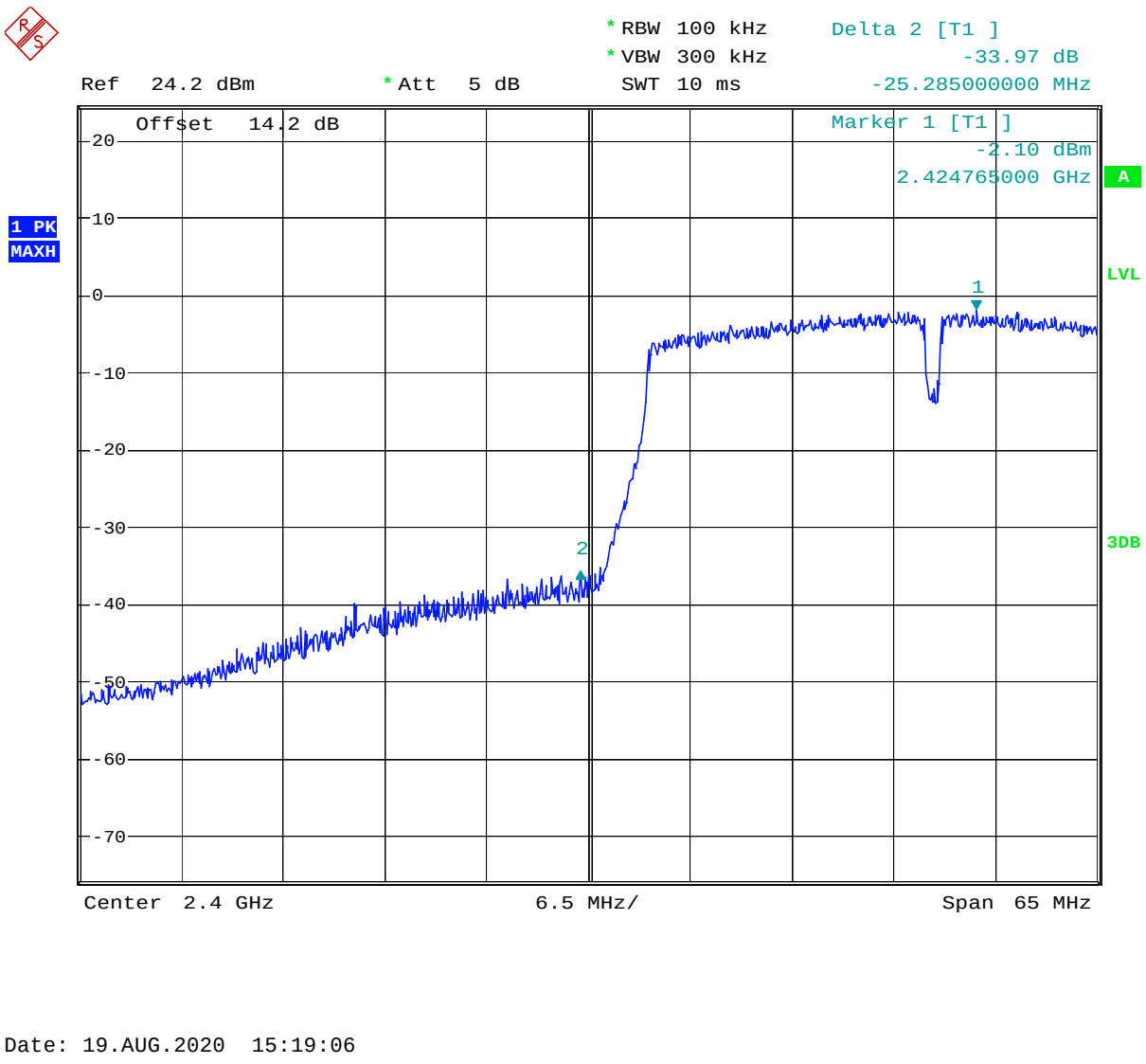
Tx Frequency: 2412 MHz	Mode: 802.11n_HT20	Primary



Date: 19.AUG.2020 14:15:18

Plot # 74

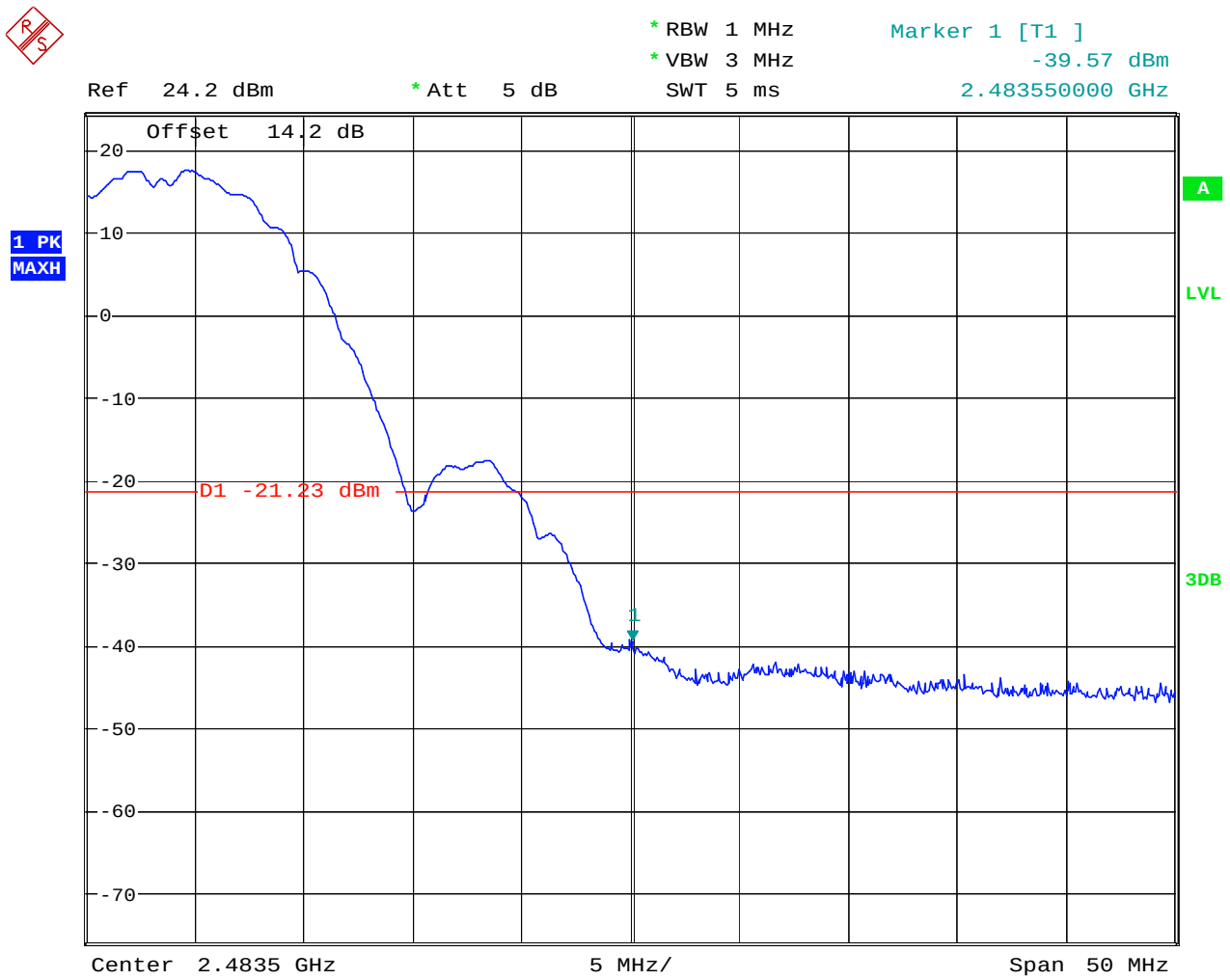
Tx Frequency: 2422 MHz	Mode: 802.11n_HT40	Primary



Date: 19.AUG.2020 15:19:06

Plot # 75

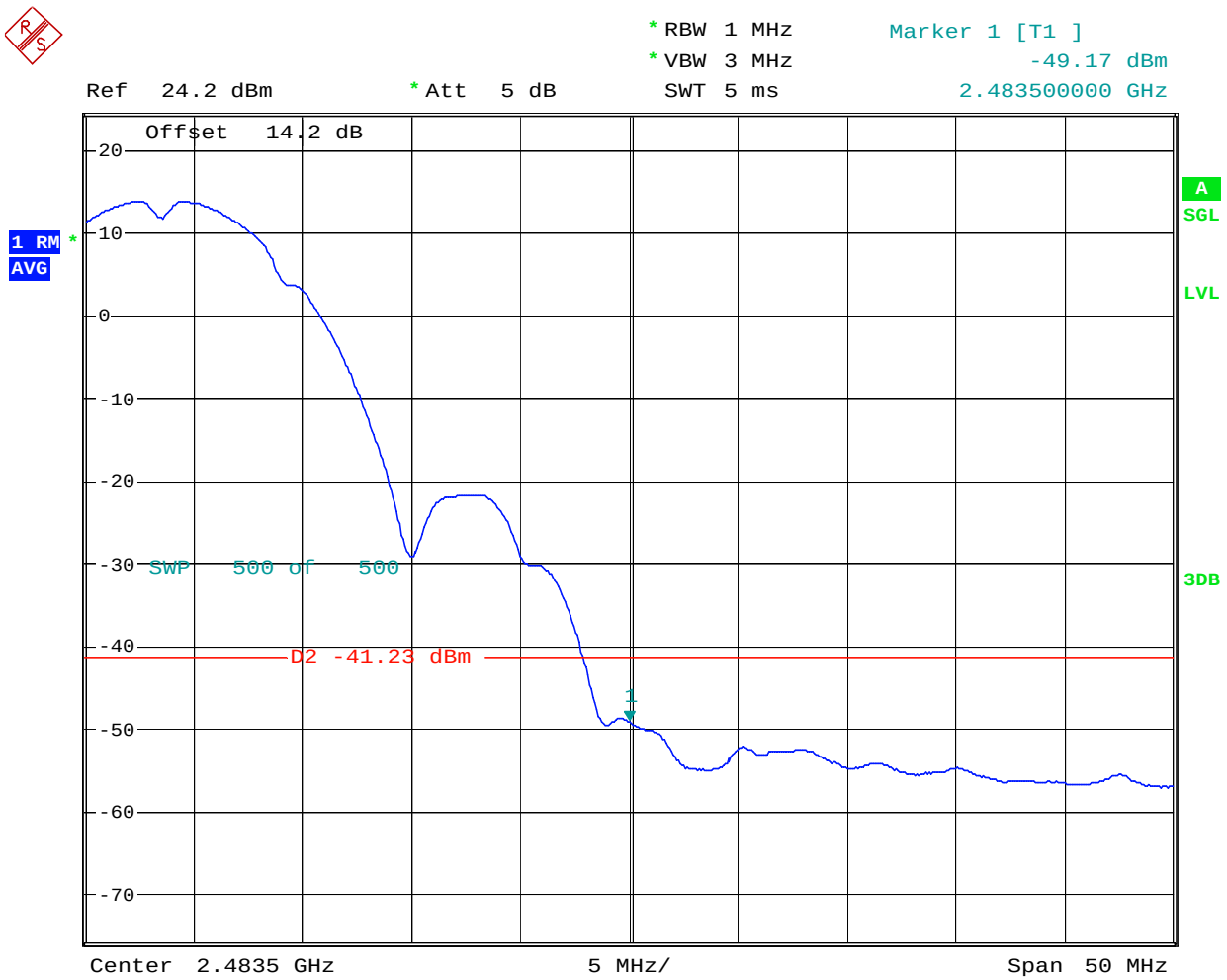
Tx Frequency: 2462 MHz	Mode: 802.11b	Primary



Date: 7.AUG.2020 18:24:22

Plot # 76

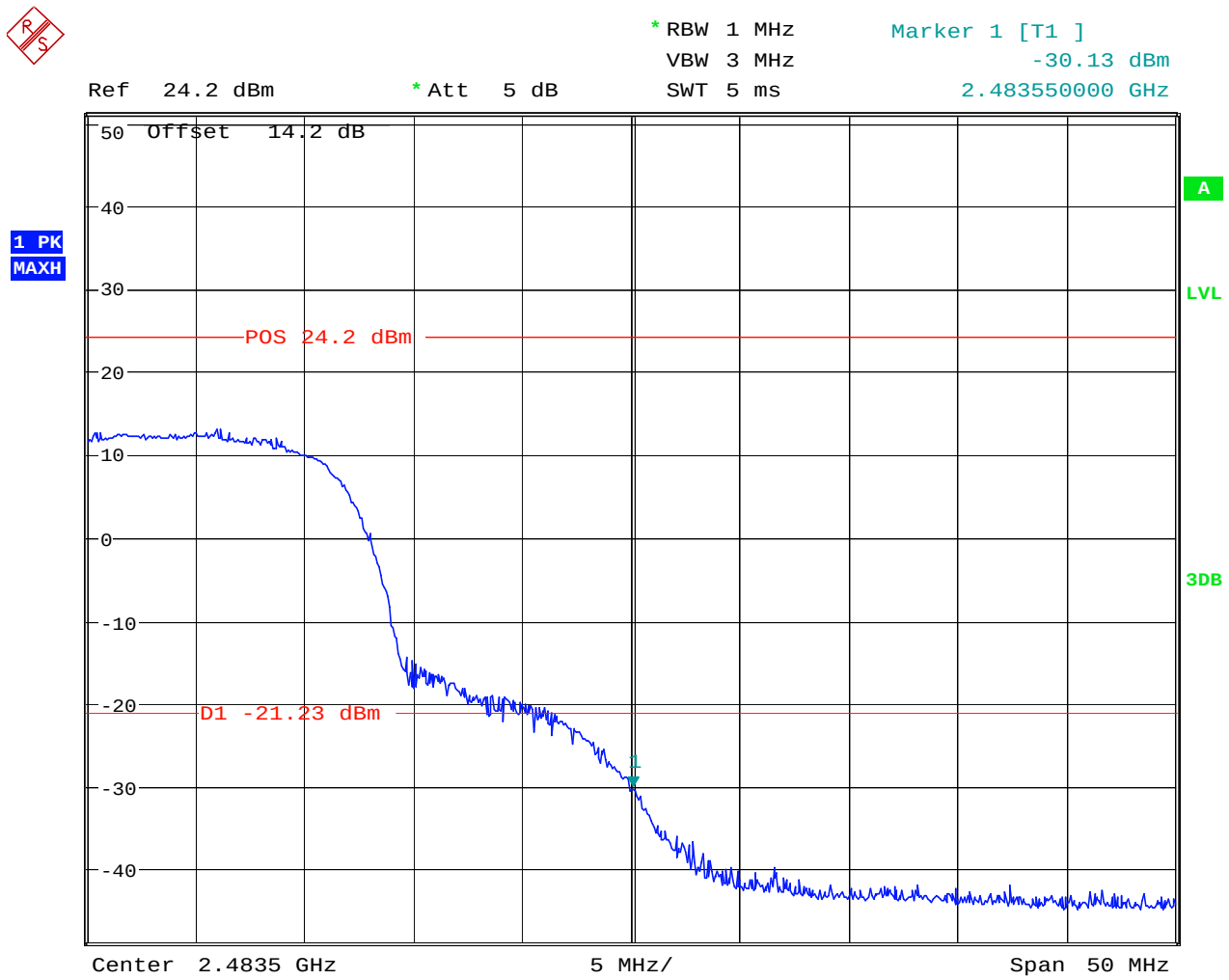
Tx Frequency: 2462 MHz	Mode: 802.11b	Primary



Date: 7.AUG.2020 18:18:59

Plot # 77

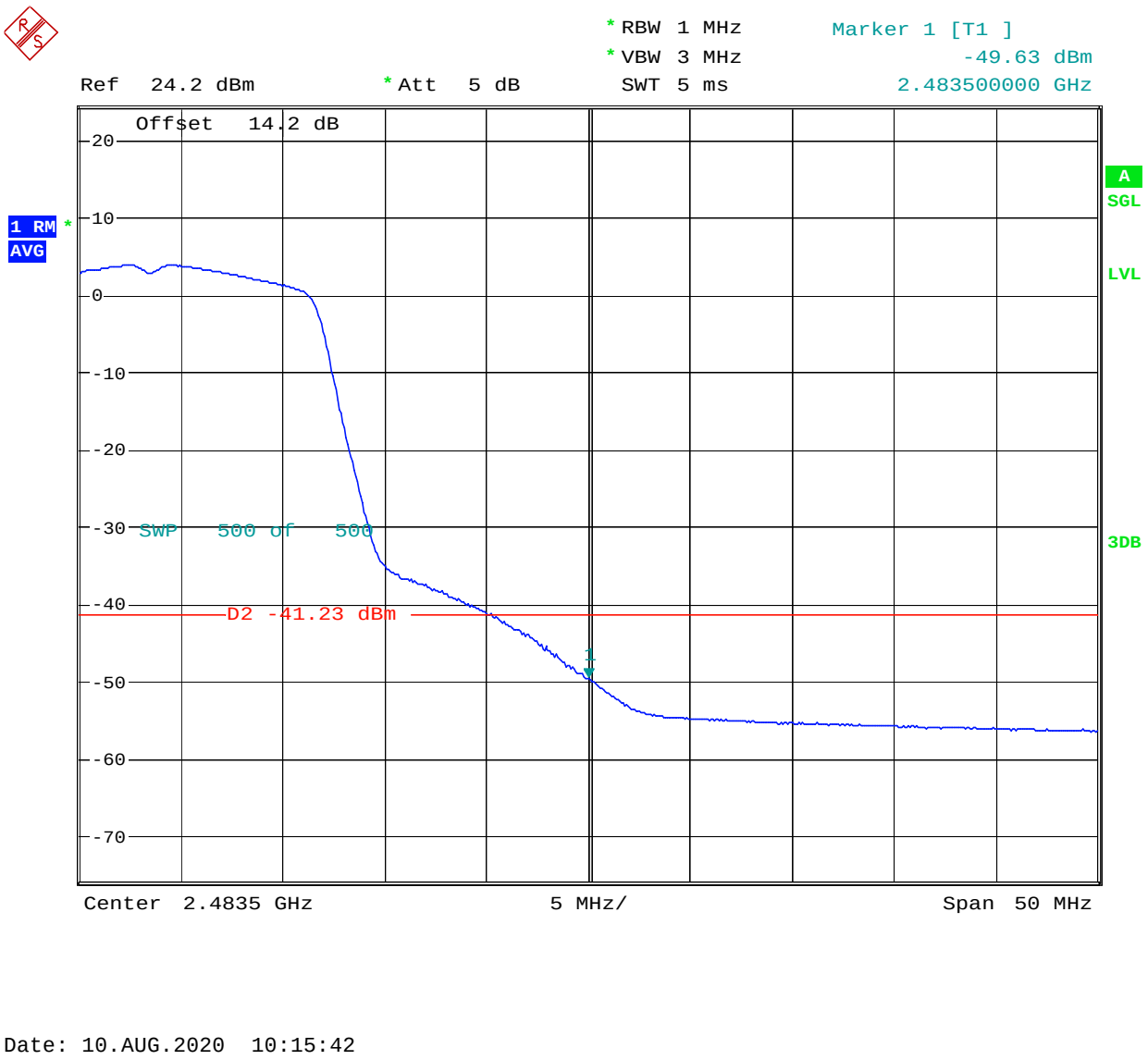
Tx Frequency: 2462 MHz	Mode: 802.11g	Primary



Date: 7.AUG.2020 18:00:25

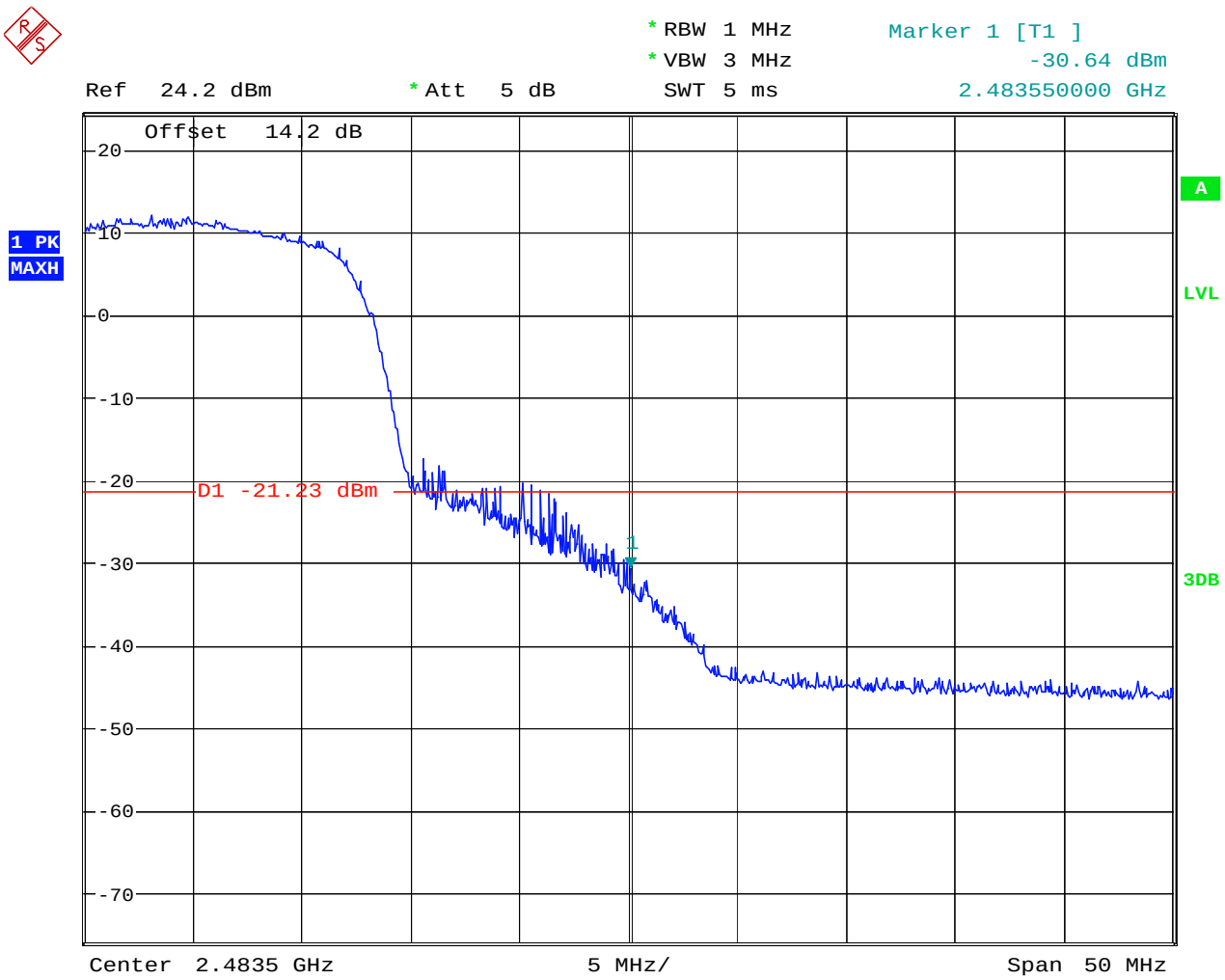
Plot # 78

Tx Frequency: 2462 MHz	Mode: 802.11g	Primary



Plot # 79

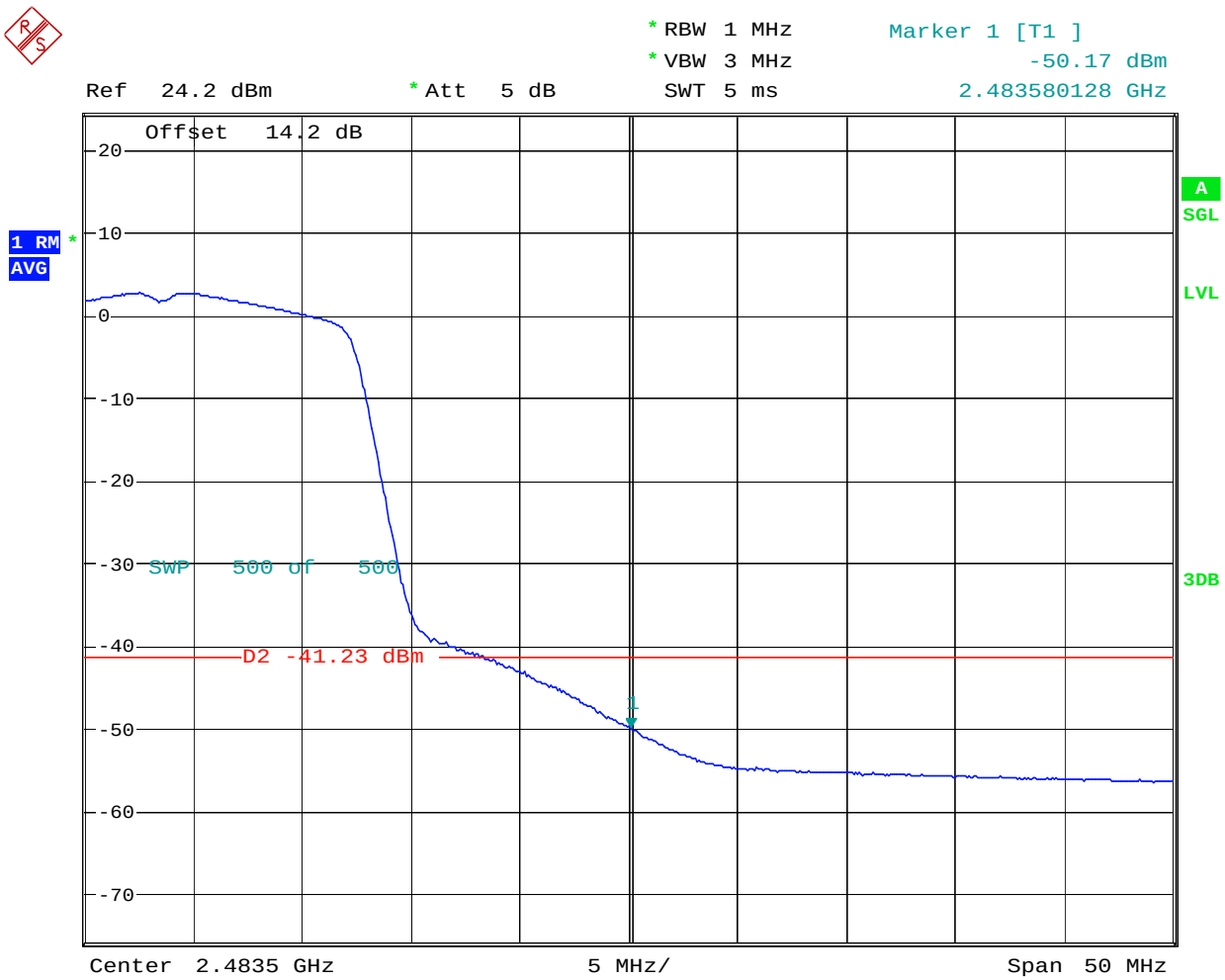
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Primary



Date: 7.AUG.2020 18:37:58

Plot # 80

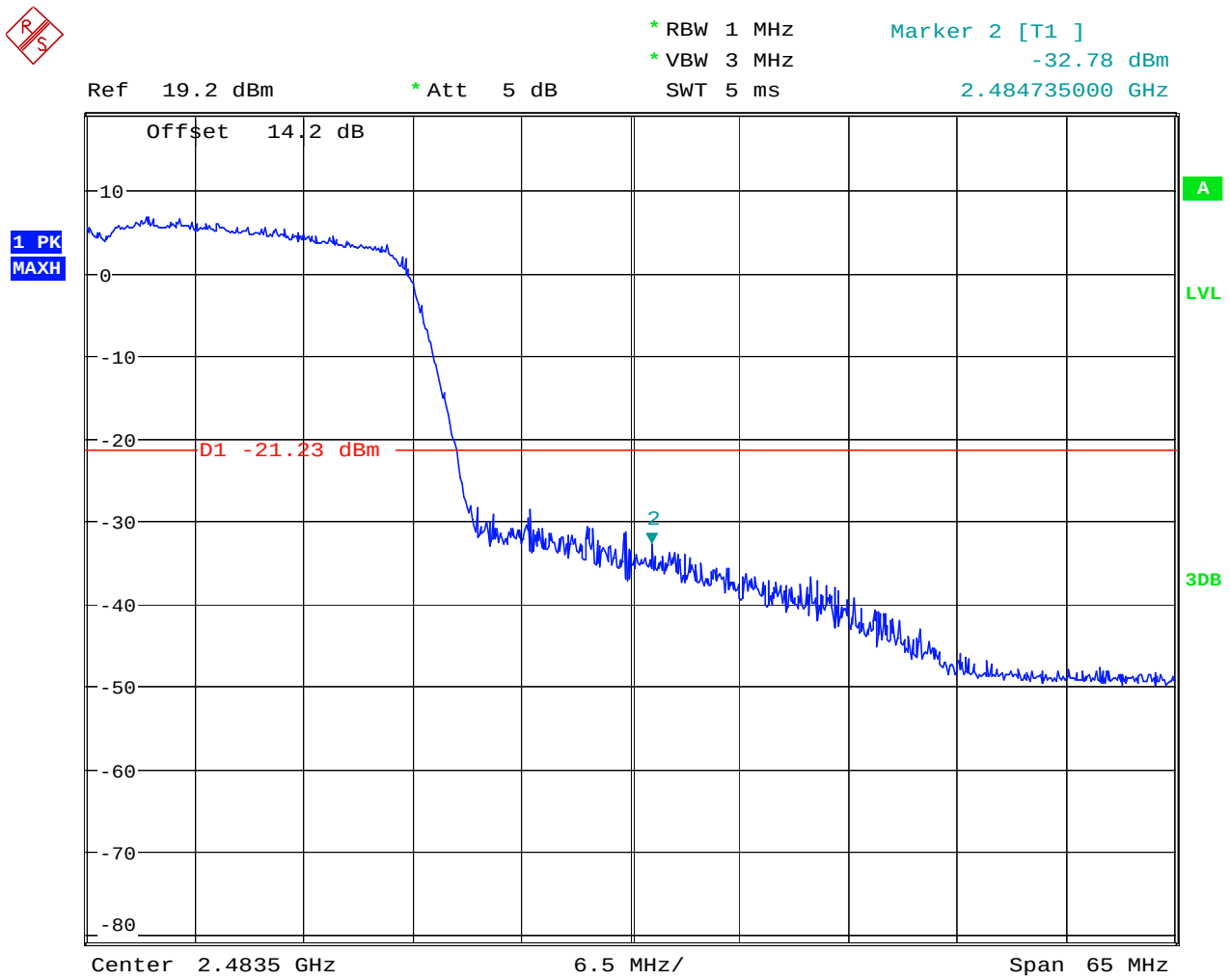
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Primary



Date: 7.AUG.2020 18:34:10

Plot # 81

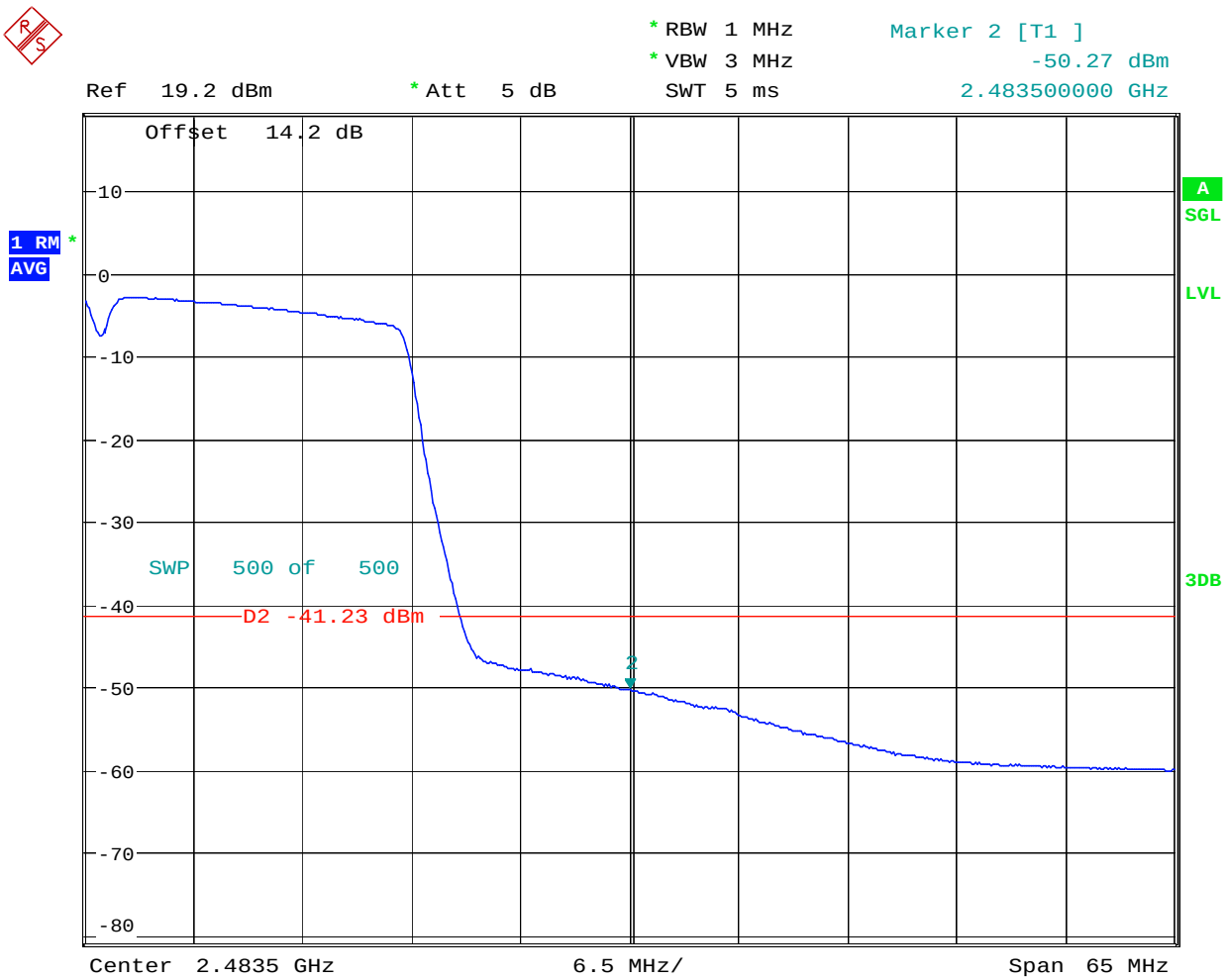
Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Primary



Date: 19.AUG.2020 14:58:24

Plot # 82

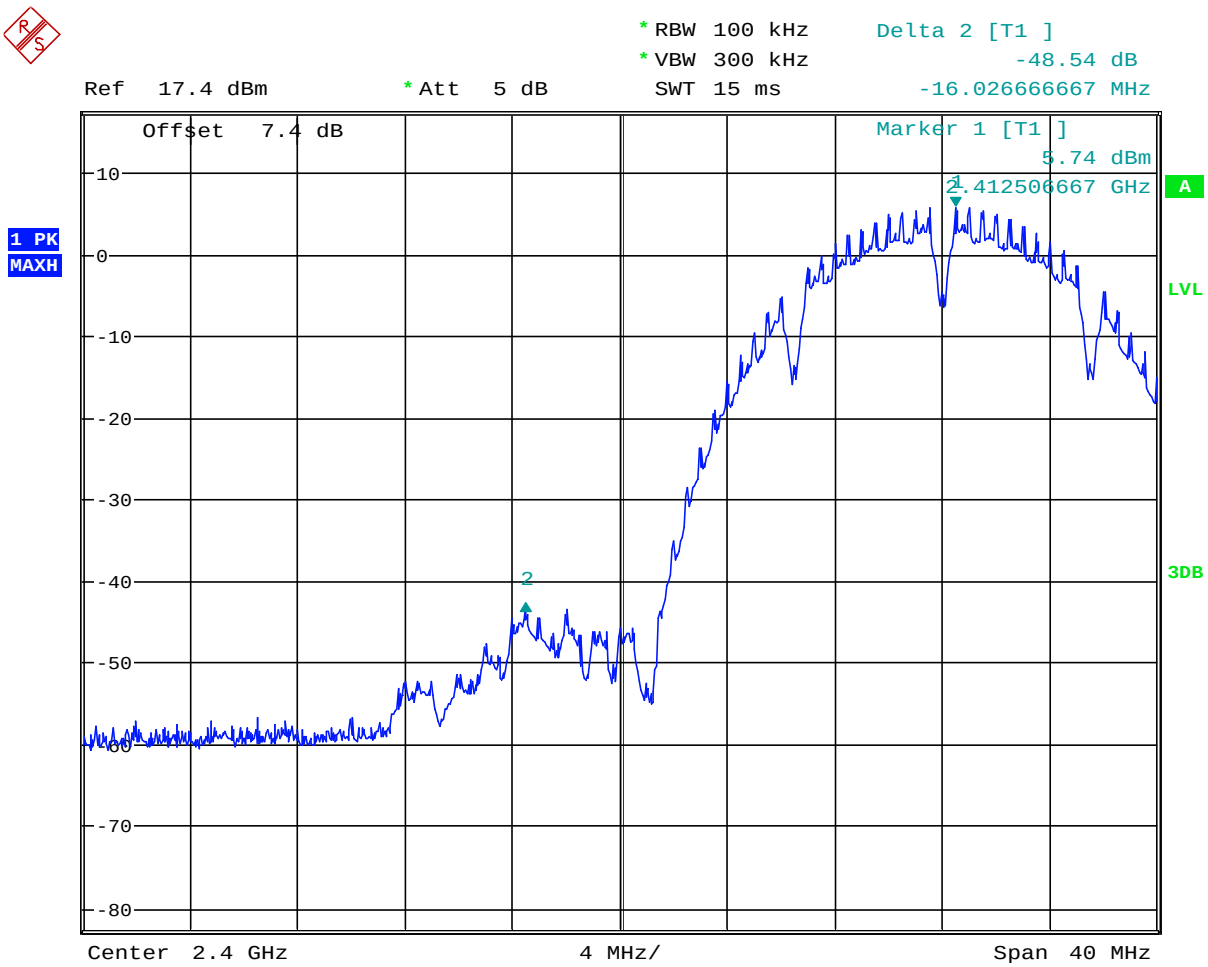
Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Primary



Date: 19.AUG.2020 14:48:45

Plot # 83

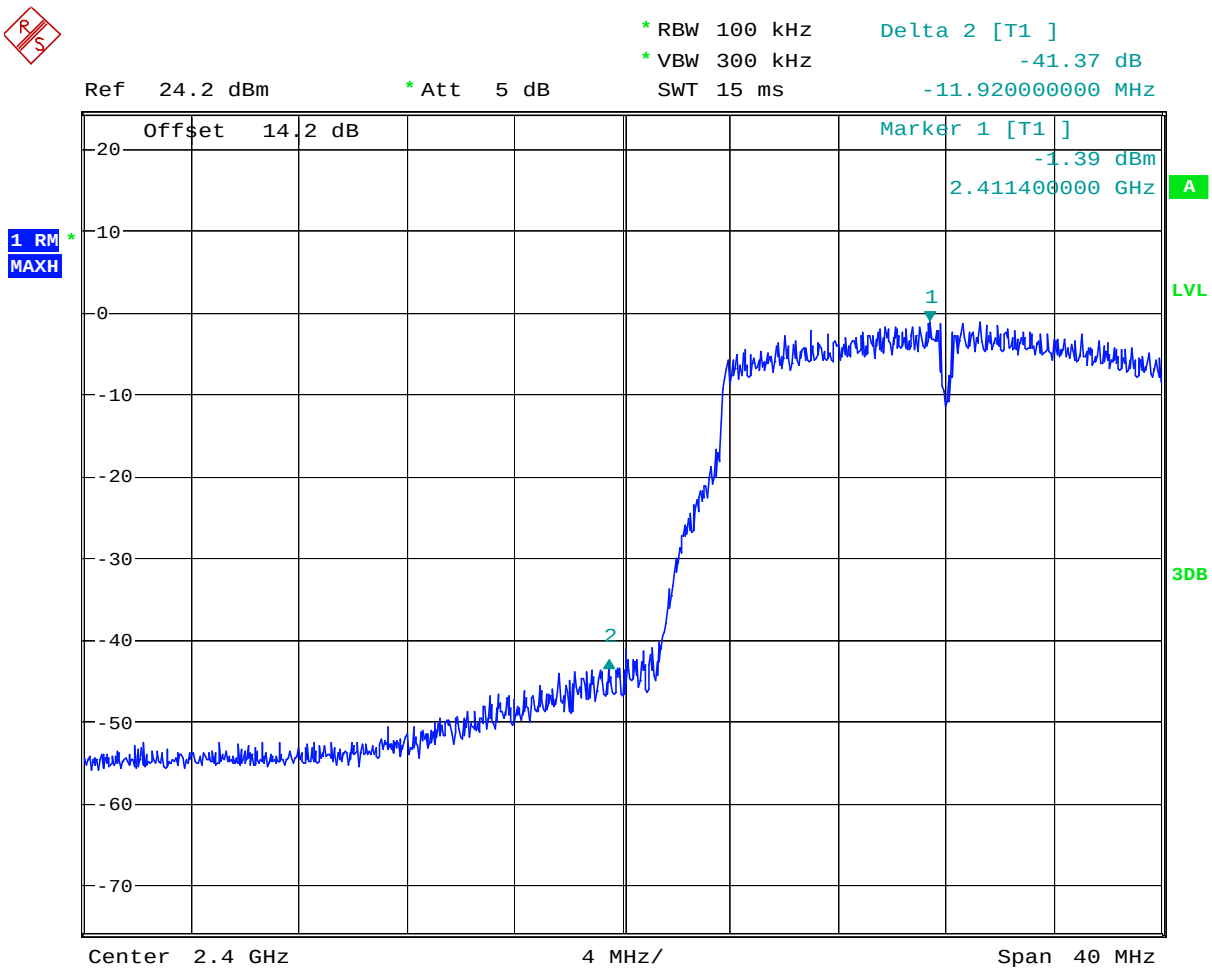
Tx Frequency: 2412 MHz	Mode: 802.11b	Secondary



Date: 14.OCT.2020 18:34:57

Plot # 84

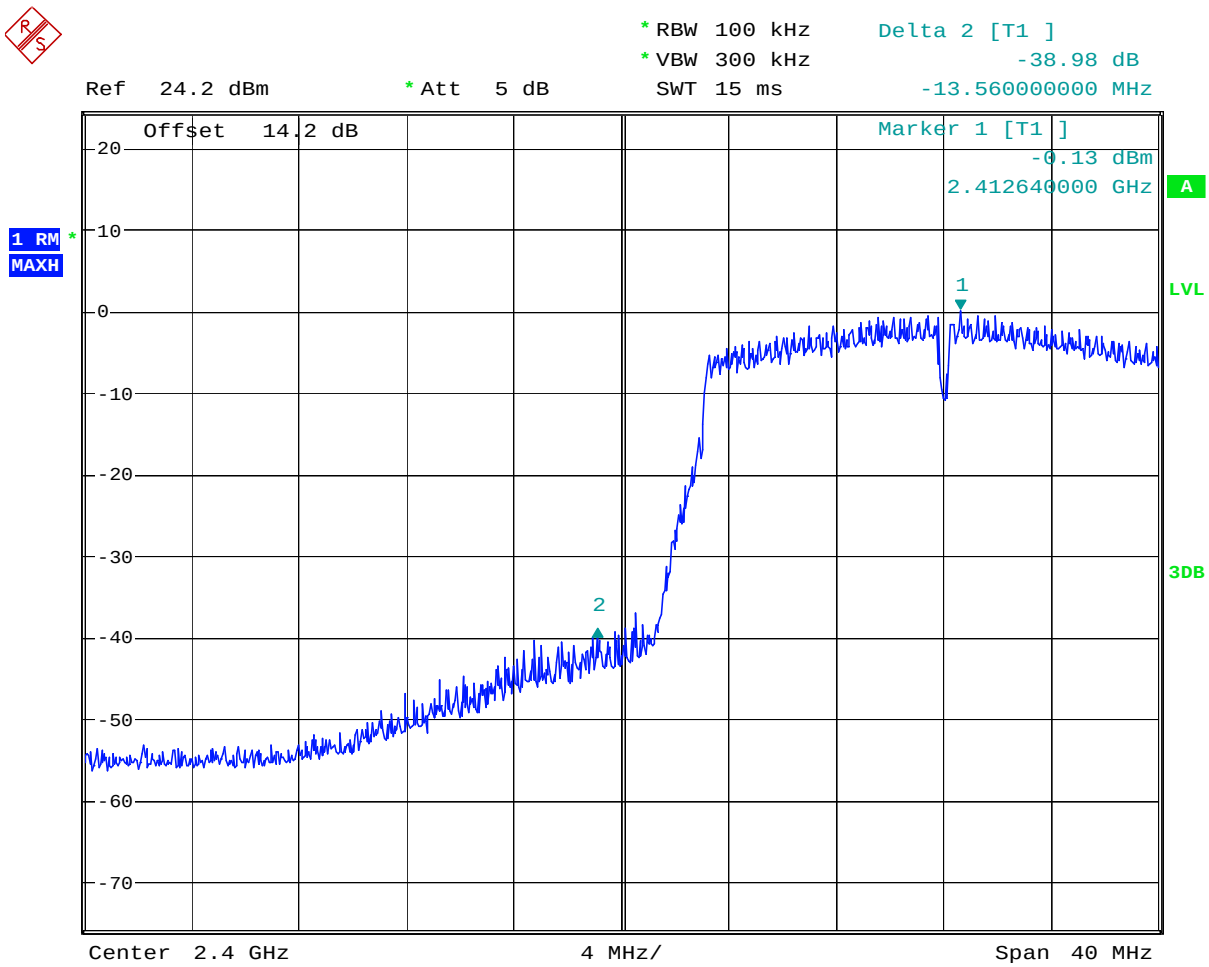
Tx Frequency: 2412 MHz	Mode: 802.11g	Secondary



Date: 27.AUG.2020 15:22:02

Plot # 85

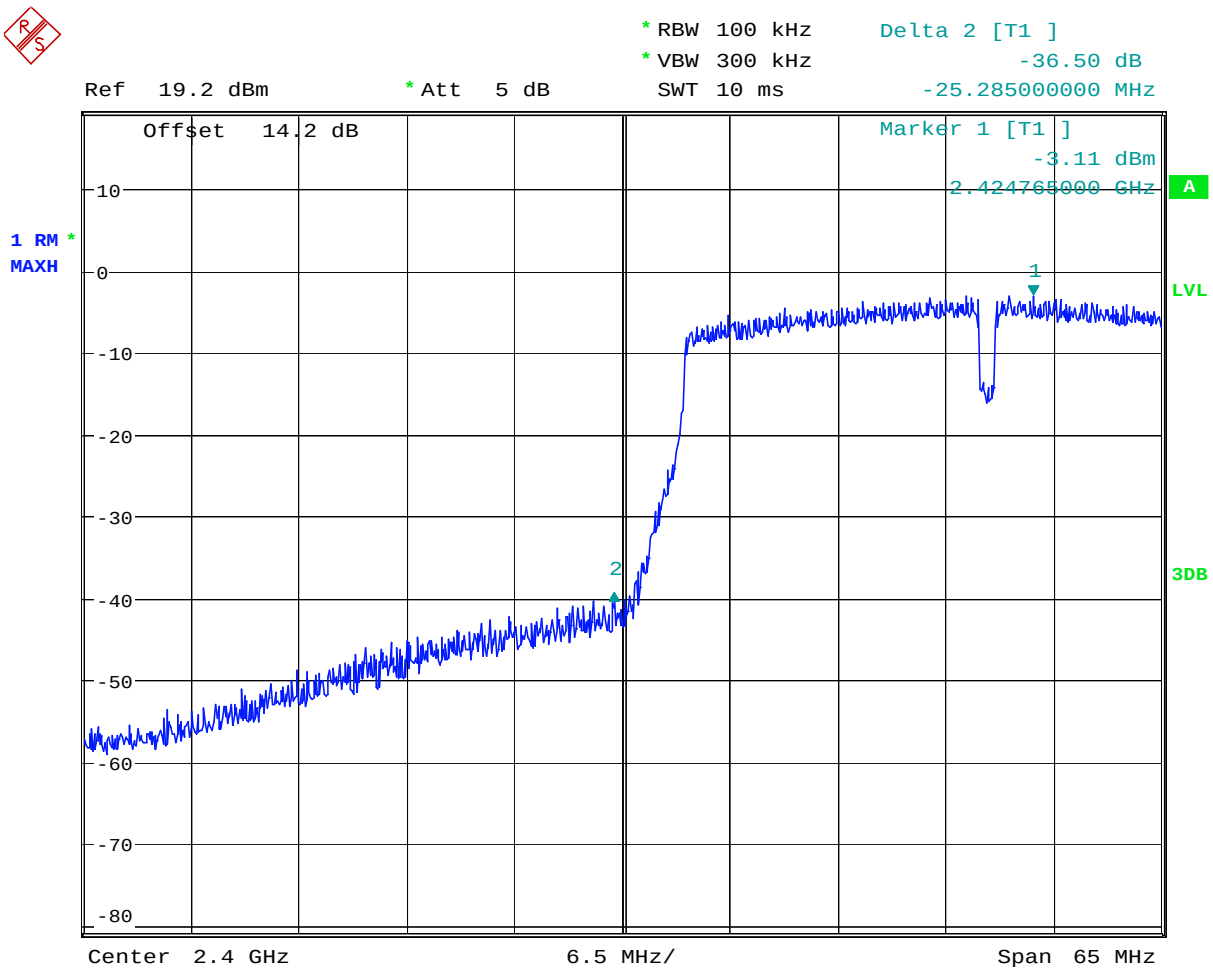
Tx Frequency: 2412 MHz	Mode: 802.11n_HT20	Secondary



Date: 27.AUG.2020 15:17:56

Plot # 86

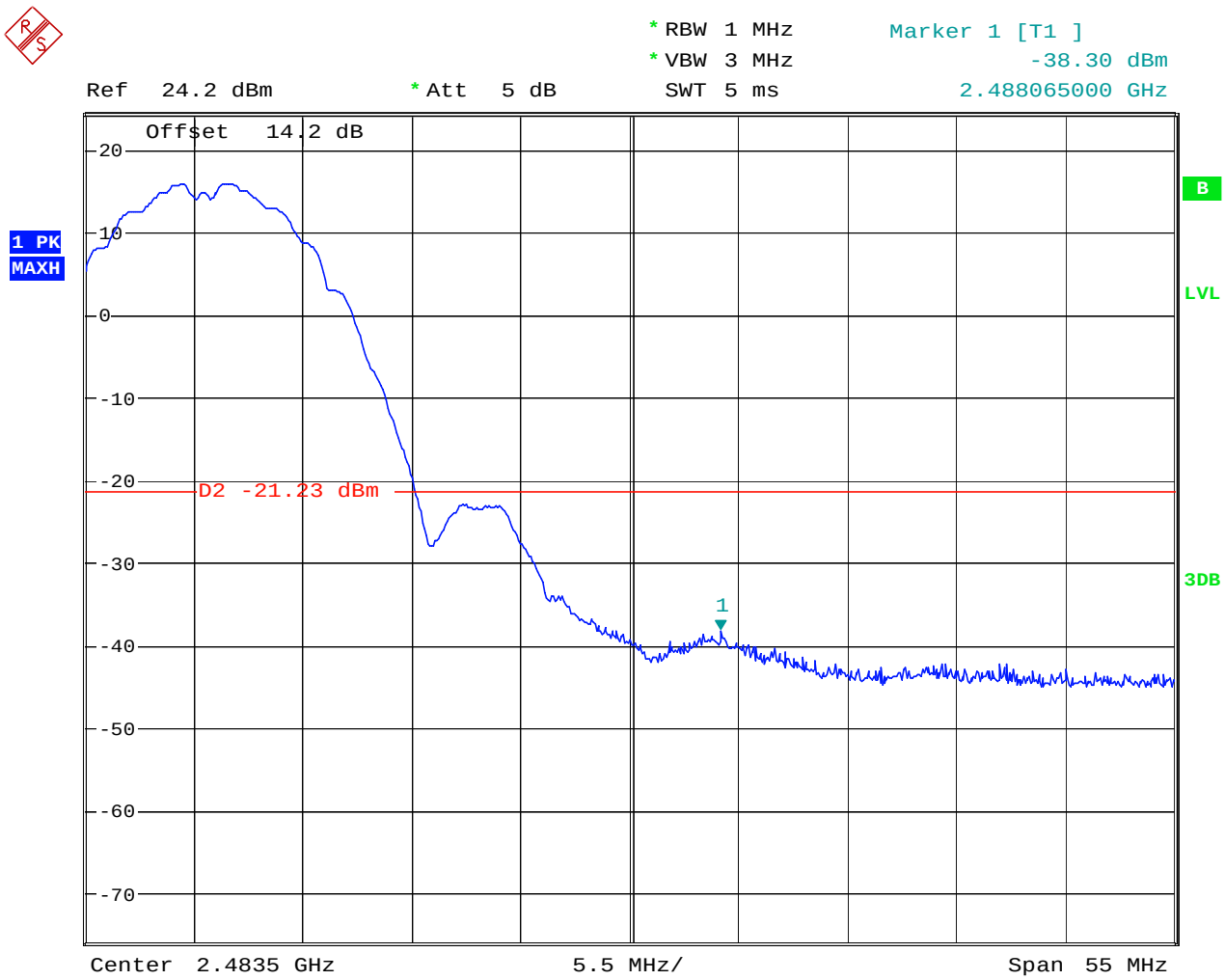
Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Secondary



Date: 27.AUG.2020 15:14:59

Plot # 87

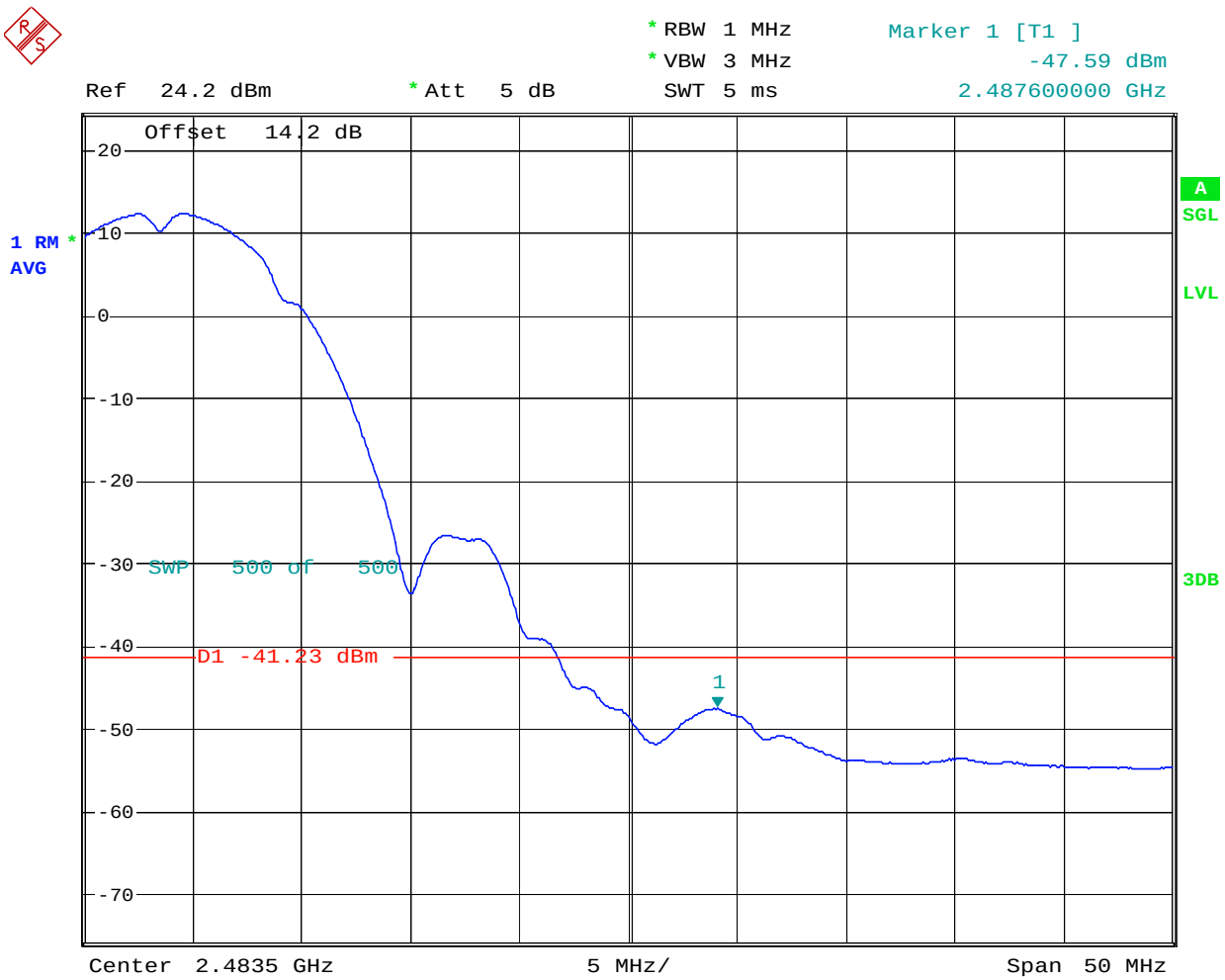
Tx Frequency: 2462 MHz	Mode: 802.11b	Secondary



Date: 27.AUG.2020 14:43:50

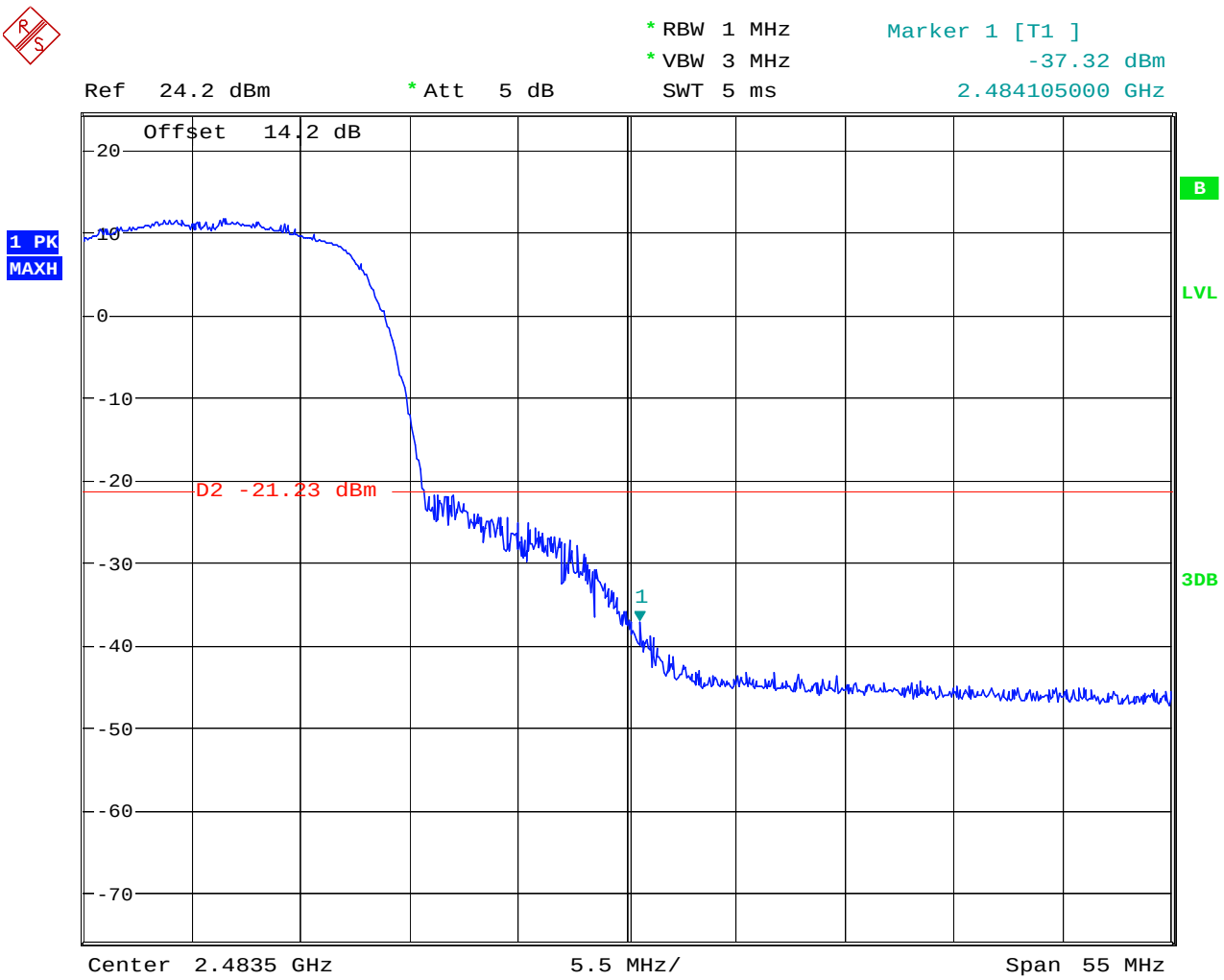
Plot # 88

Tx Frequency: 2462 MHz	Mode: 802.11b	Secondary



Plot # 89

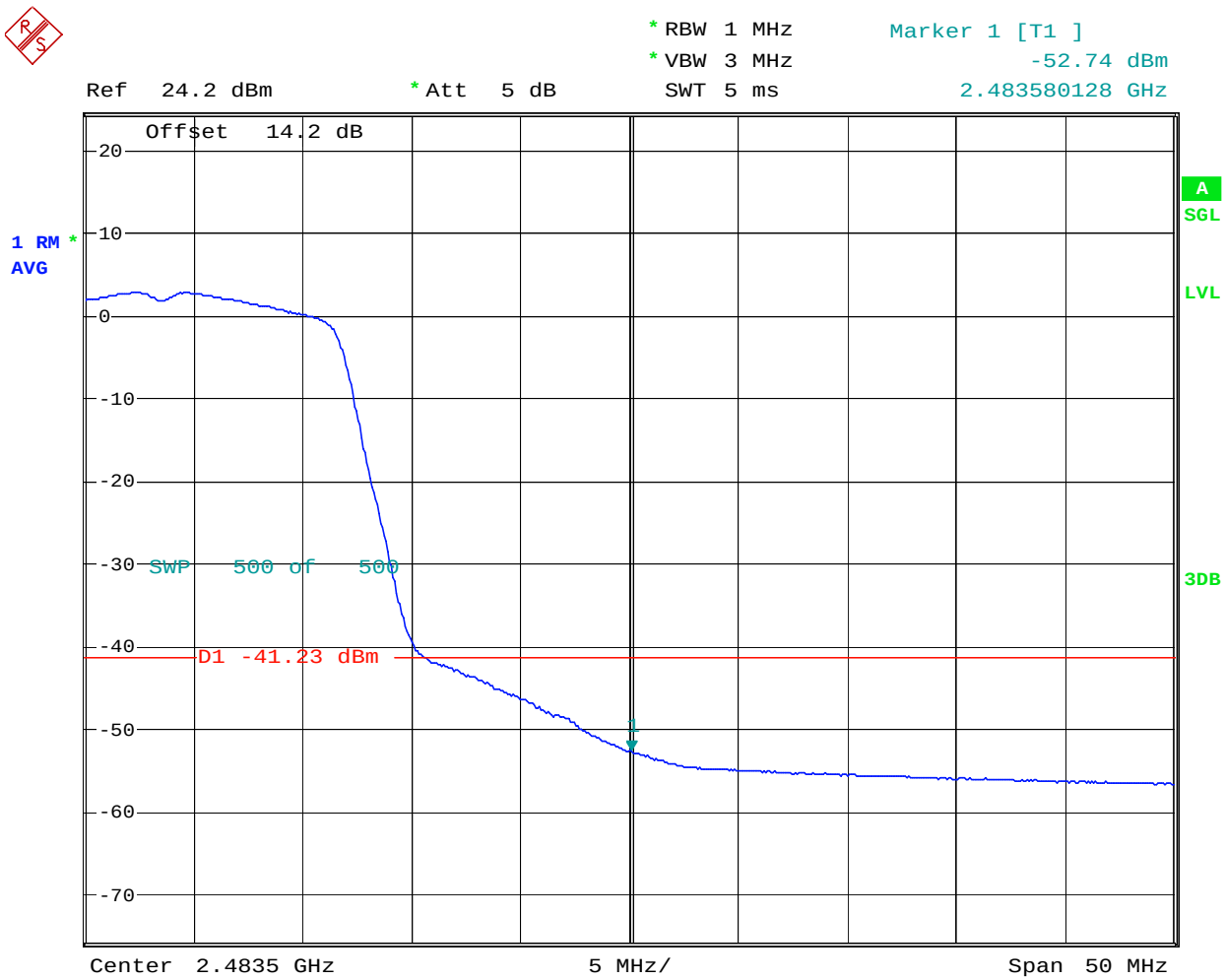
Tx Frequency: 2462 MHz	Mode: 802.11g	Secondary



Date: 27.AUG.2020 14:48:13

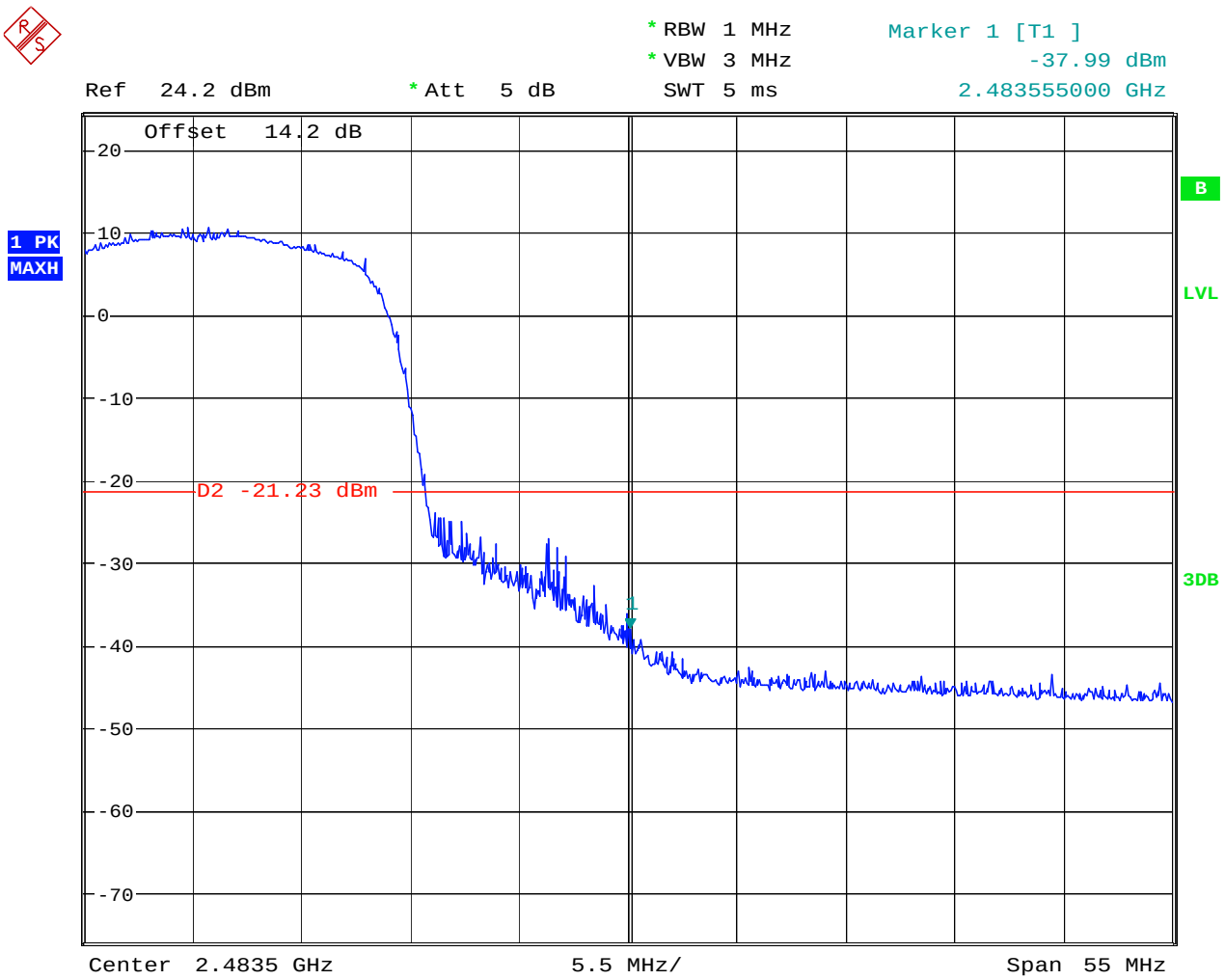
Plot # 90

Tx Frequency: 2462 MHz	Mode: 802.11g	Secondary



Plot # 91

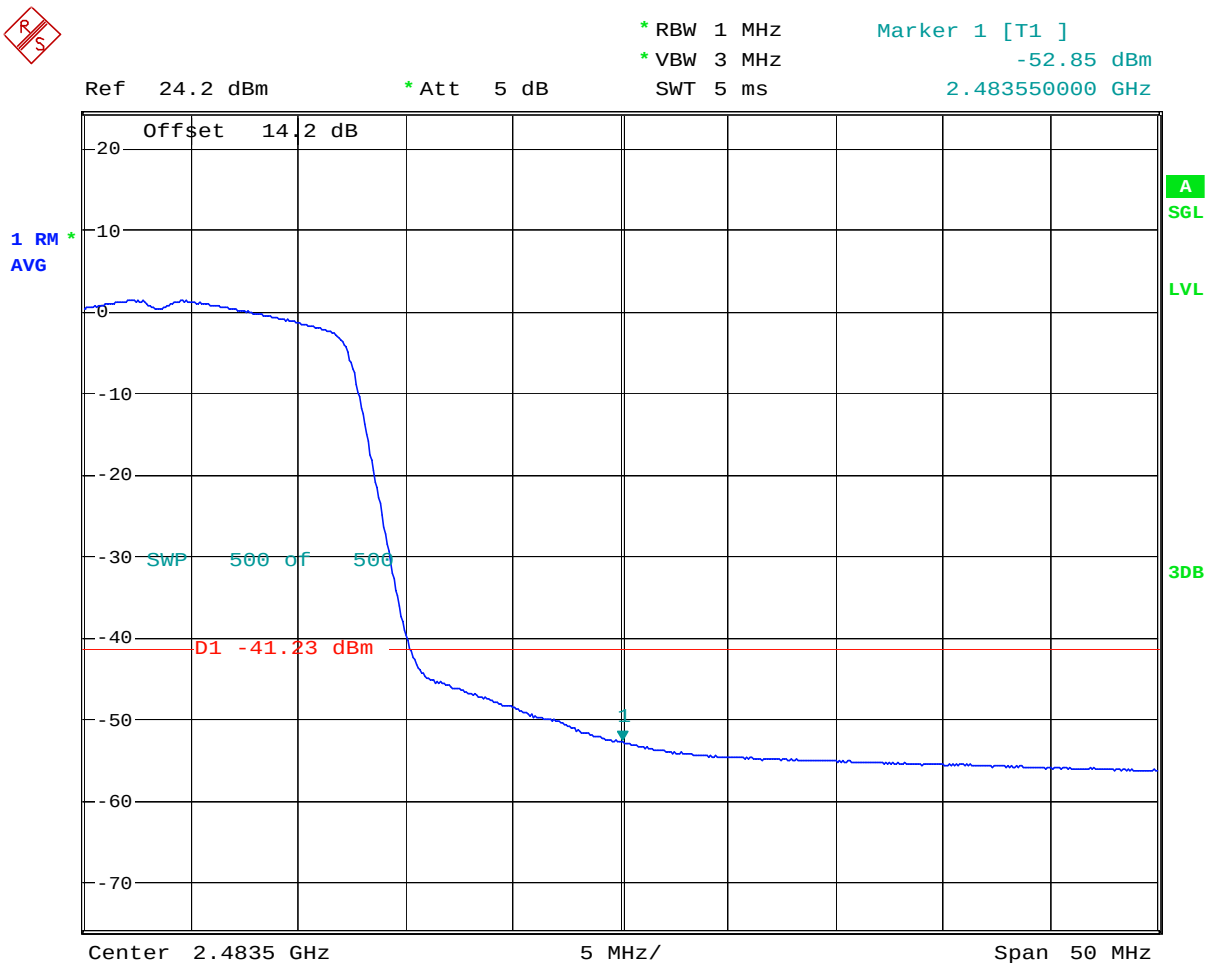
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Secondary



Date: 27.AUG.2020 14:59:15

Plot # 92

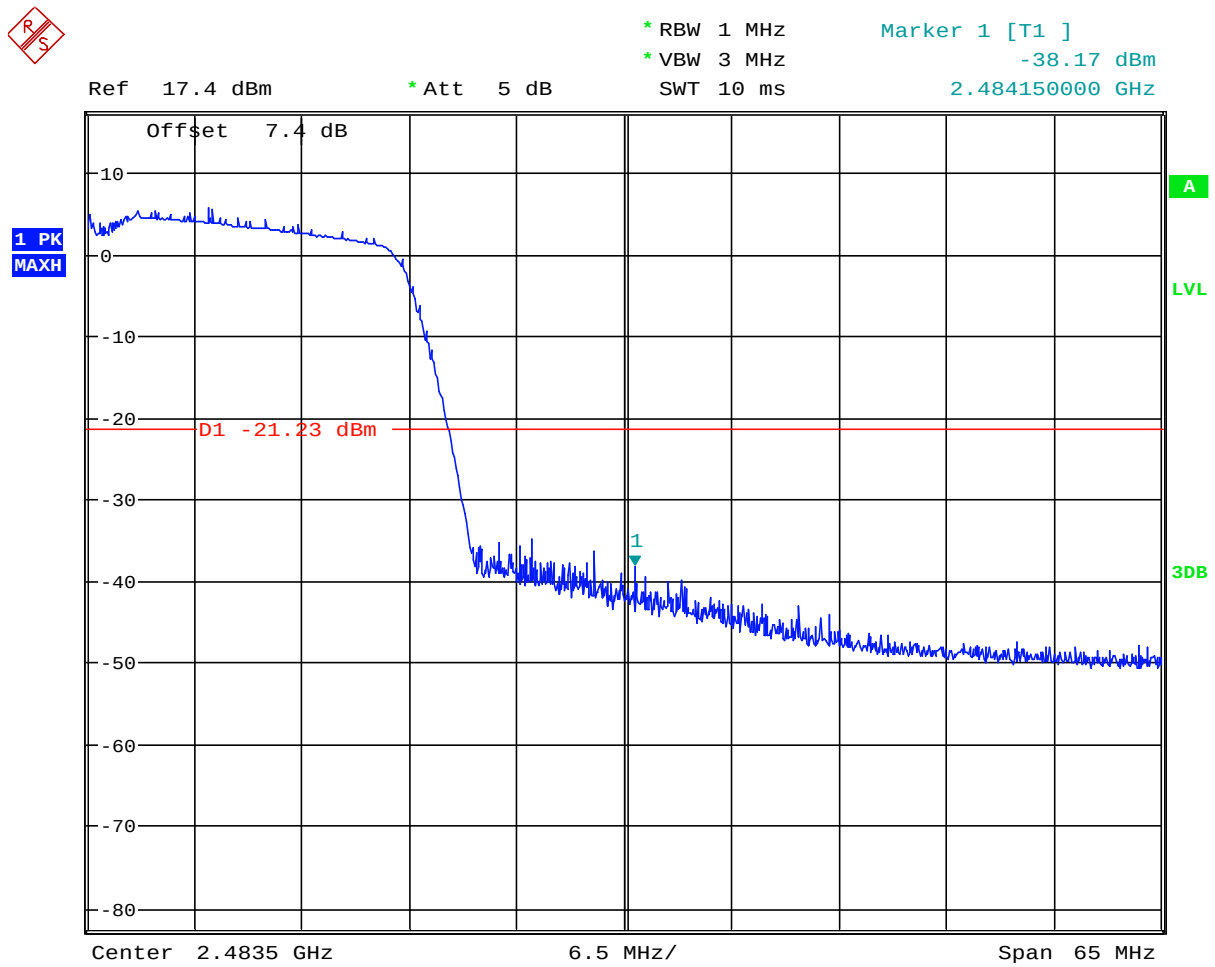
Tx Frequency: 2462 MHz	Mode: 802.11n_HT20	Secondary



Date: 27.AUG.2020 14:55:31

Plot # 93

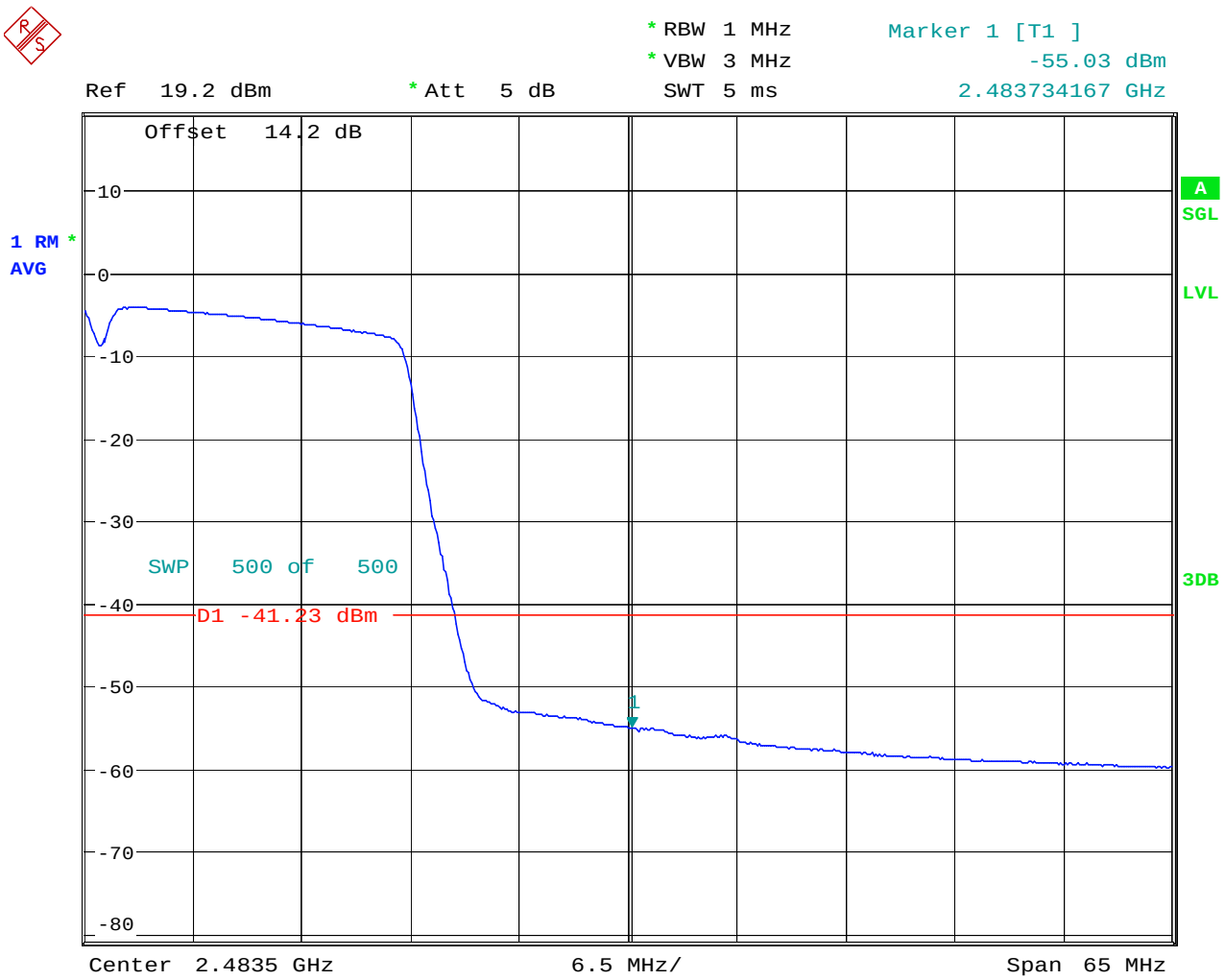
Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Secondary



Date: 14.OCT.2020 18:14:40

Plot # 94

Tx Frequency: 2452 MHz	Mode: 802.11n_HT40	Secondary



Date: 27.AUG.2020 15:04:26

8.6 Radiated Transmitter Spurious Emissions and Restricted Bands

8.6.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

8.6.2 Limits:

FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / ---------	300	-
0.490–1.705	24000/F(kHz) / --------	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
  *PEAK LIMIT= 74 dBµV/m
  *AVG. LIMIT= 54 dBµV/m

8.6.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23.8°C	2	Op. 2	110 V AC

8.6.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
95 – 97	Low	30 MHz – 18 GHz	See section 8.6.2	Pass
98 – 102	Mid	9 kHz – 40 GHz	See section 8.6.2	Pass
103 – 105	High	30 MHz – 18 GHz	See section 8.6.2	Pass

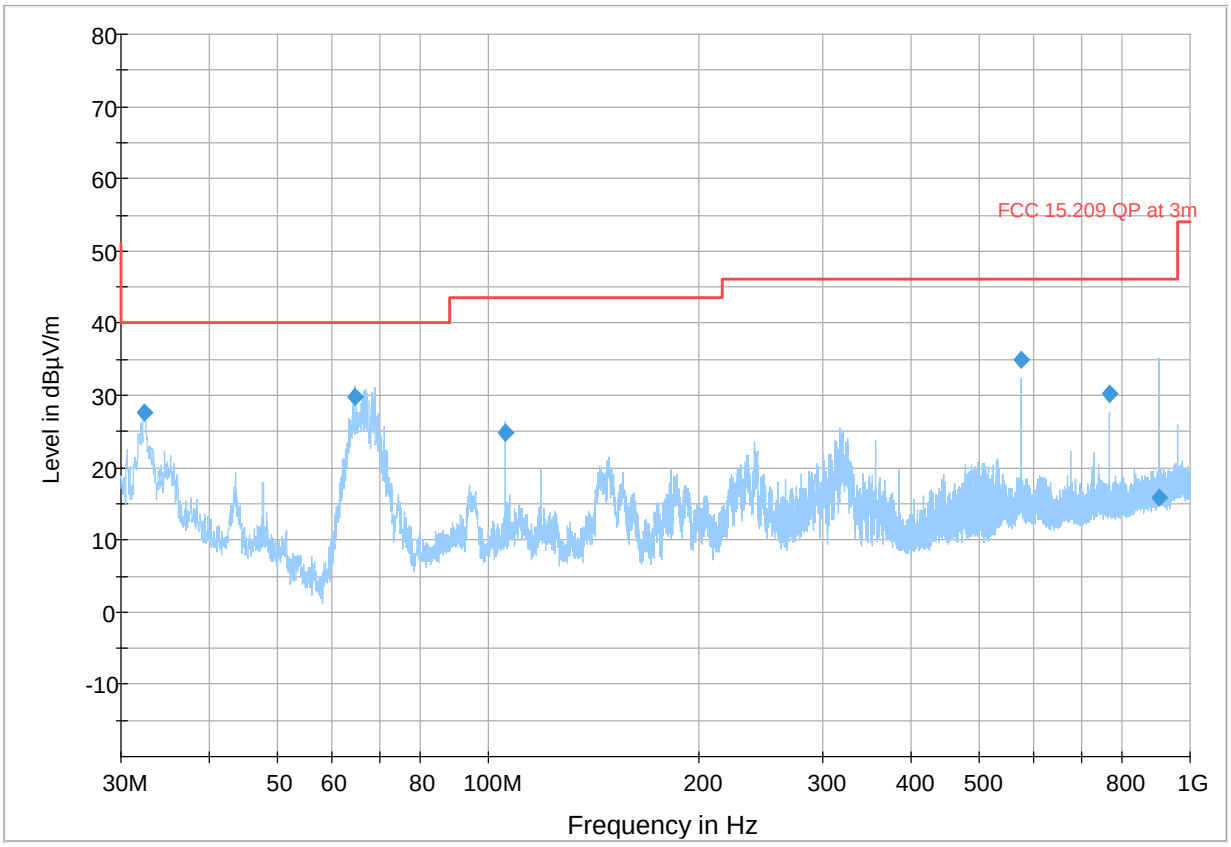
8.6.5 Measurement Plots:

Plot # 95 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2412 MHz	Mode: 802.11b

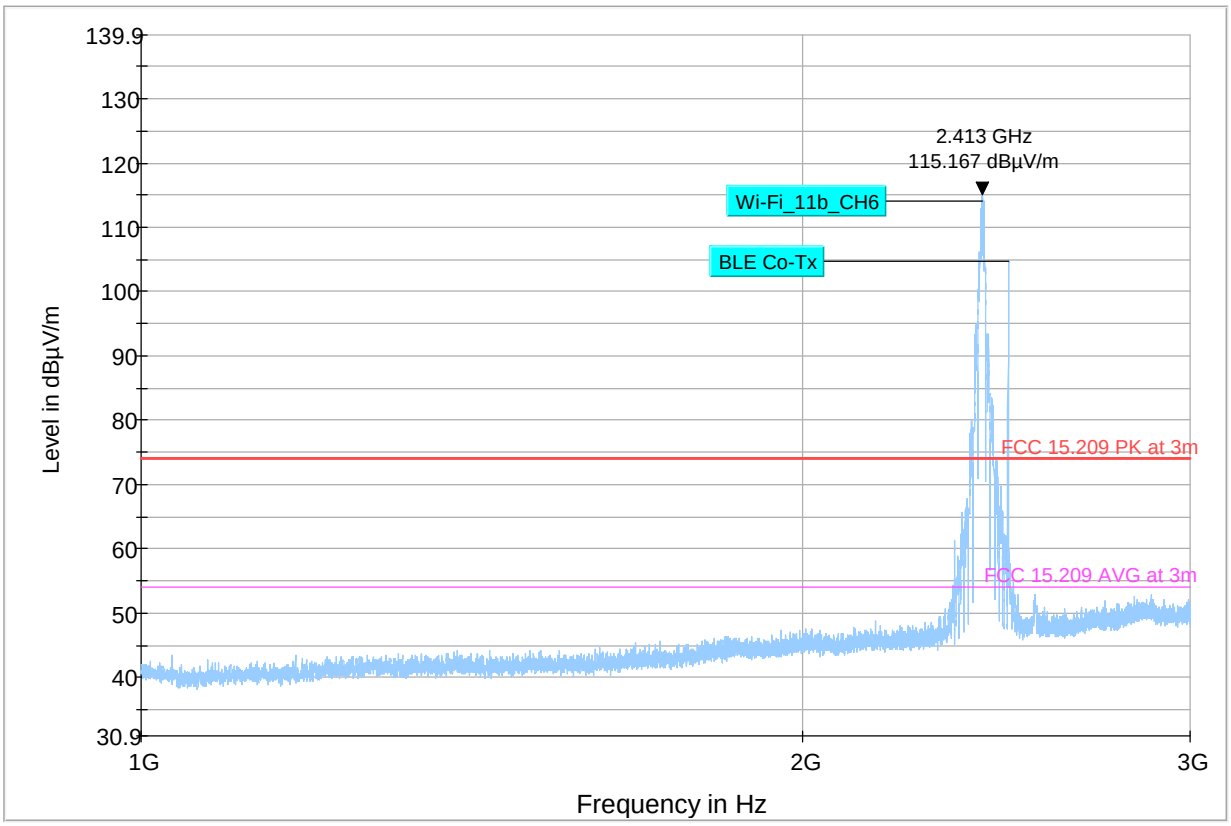
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.296	27.71	40.00	12.29	500.0	120.000	100.0	V	329.0	-13.9
64.758	29.73	40.00	10.27	500.0	120.000	100.0	V	-44.0	-27.0
105.660	24.90	43.50	18.60	500.0	120.000	100.0	V	-31.0	-23.5
575.948	34.94	46.02	11.08	500.0	120.000	155.0	V	65.0	-13.3
767.944	30.22	46.02	15.80	500.0	120.000	123.0	H	13.0	-10.4
904.843	15.92	46.02	30.11	500.0	120.000	175.0	V	272.0	-9.2



Plot # 96 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2412 MHz	Mode: 802.11b

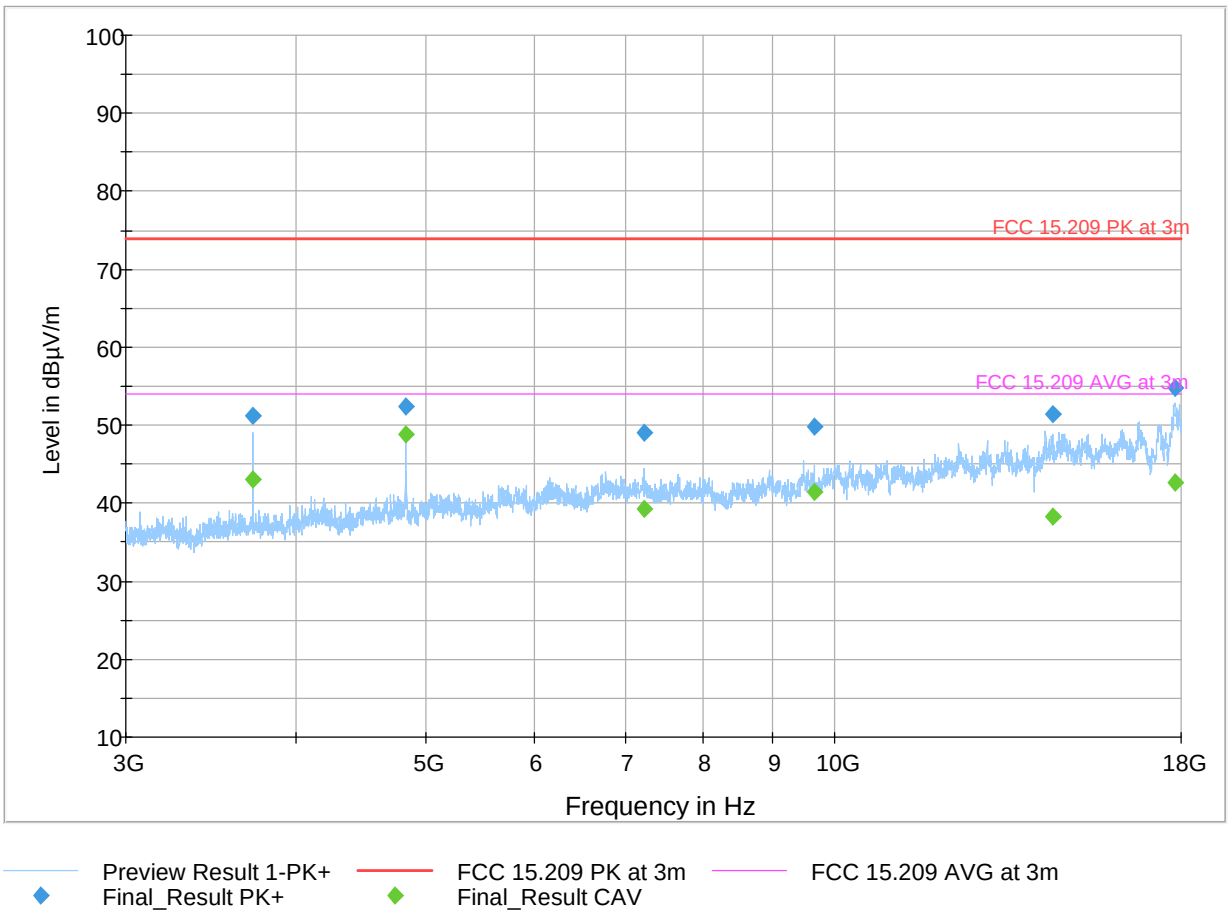


Plot # 97 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2412 MHz | **Mode: 802.11b**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3719.750	51.30	---	73.98	22.68	500.0	1000.000	141.0	H	66.0	-6.9
3719.750	---	42.98	53.98	11.00	500.0	1000.000	141.0	H	66.0	-6.9
4823.750	52.45	---	73.98	21.53	500.0	1000.000	188.0	V	169.0	-4.5
4823.750	---	48.90	53.98	5.08	500.0	1000.000	188.0	V	169.0	-4.5
7237.500	49.04	---	73.98	24.94	500.0	1000.000	193.0	H	147.0	-1.8
7237.500	---	39.28	53.98	14.70	500.0	1000.000	193.0	H	147.0	-1.8
9648.000	---	41.43	53.98	12.55	500.0	1000.000	279.0	H	102.0	0.1
9648.000	49.80	---	73.98	24.18	500.0	1000.000	279.0	H	102.0	0.1
14465.750	---	38.26	53.98	15.72	500.0	1000.000	202.0	H	86.0	7.6
14465.750	51.33	---	73.98	22.65	500.0	1000.000	202.0	H	86.0	7.6
17798.750	---	42.59	53.98	11.39	500.0	1000.000	278.0	V	51.0	17.4
17798.750	54.71	---	73.98	19.27	500.0	1000.000	278.0	V	51.0	17.4

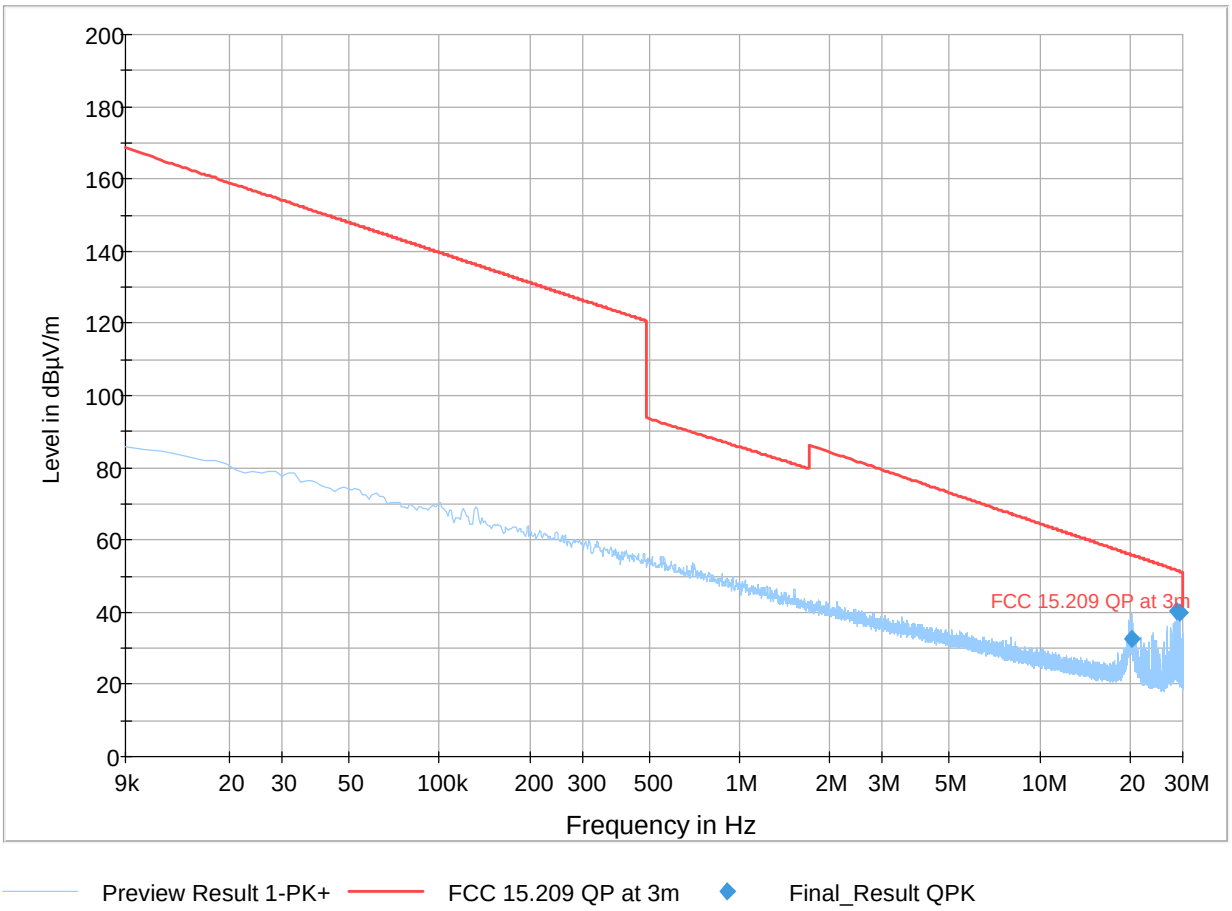


Plot # 98 Radiated Emissions: 9 KHz – 30 MHz

Tx Frequency: 2437 MHz | **Mode: 802.11b**

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20.259	32.44	55.87	23.43	500.0	9.000	100.0	H	80.0	16.8
28.686	40.40	51.59	11.19	500.0	9.000	100.0	H	104.0	16.2
29.237	39.93	51.36	11.43	500.0	9.000	107.0	H	316.0	16.2

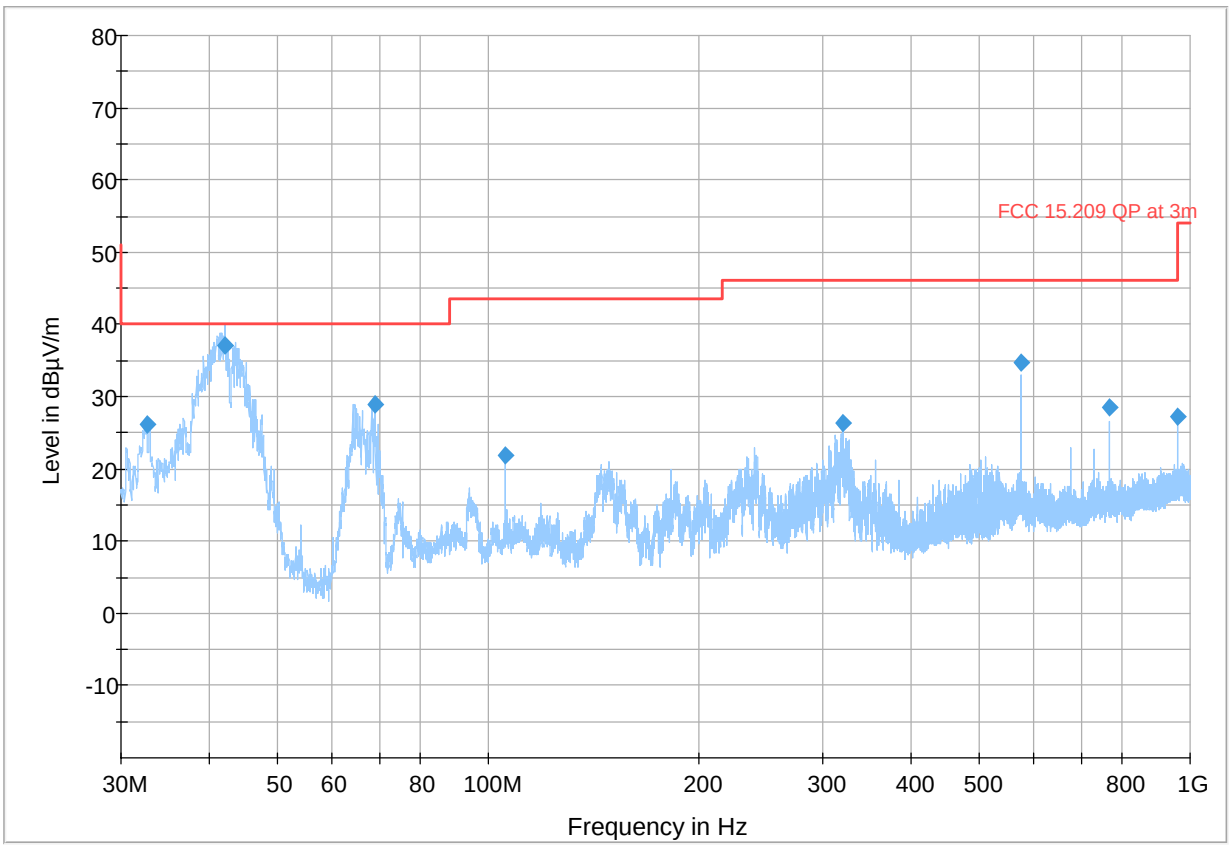


Plot # 99 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2437 MHz	Mode: 802.11b

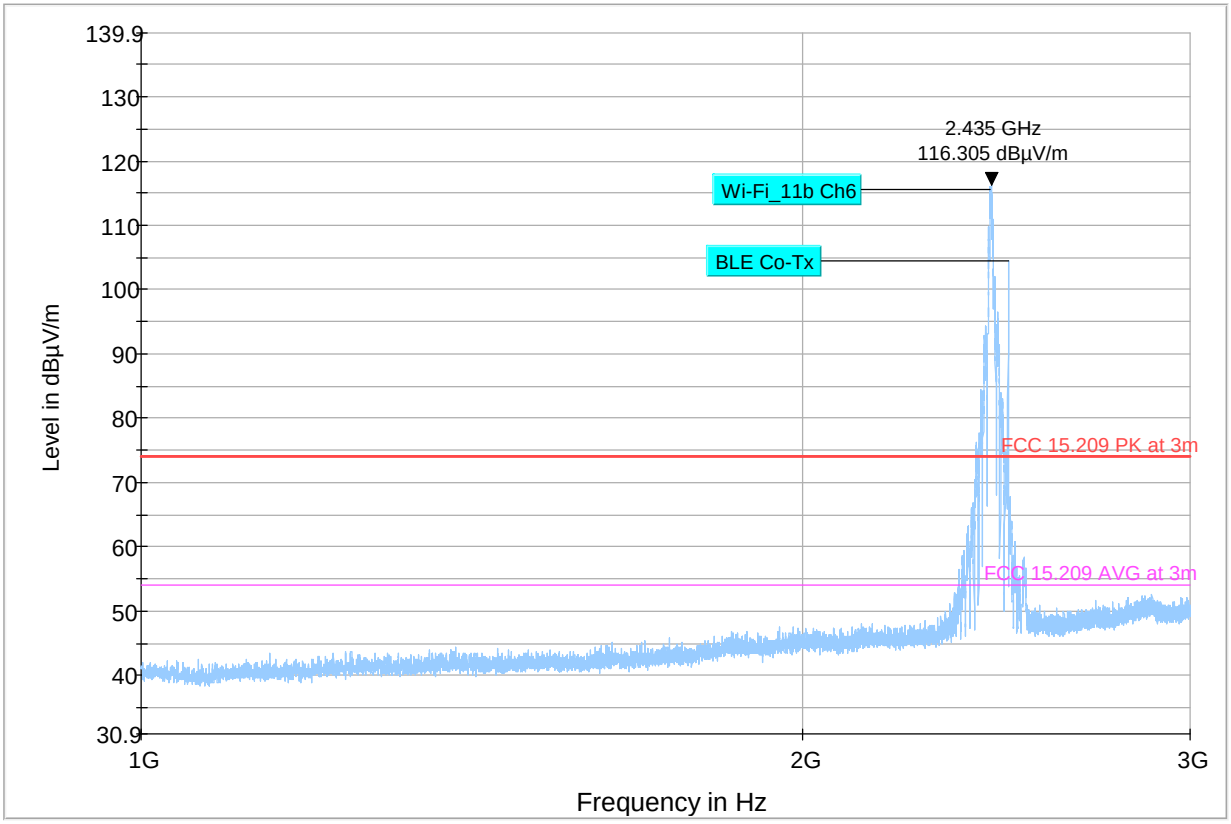
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.651	26.21	40.00	13.79	500.0	120.000	100.0	V	2.0	-14.0
42.157	37.08	40.00	2.92	500.0	120.000	100.0	V	51.0	-18.0
69.091	28.98	40.00	11.02	500.0	120.000	100.0	V	110.0	-27.8
105.660	21.87	43.50	21.63	500.0	120.000	107.0	H	243.0	-24.0
320.192	26.40	46.02	19.62	500.0	120.000	100.0	H	288.0	-19.6
575.948	34.79	46.02	11.23	500.0	120.000	155.0	V	73.0	-13.3
767.944	28.44	46.02	17.58	500.0	120.000	107.0	H	16.0	-10.4
959.939	27.17	46.02	18.85	500.0	120.000	100.0	H	72.0	-7.6



Plot # 100 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2437 MHz	Mode: 802.11b

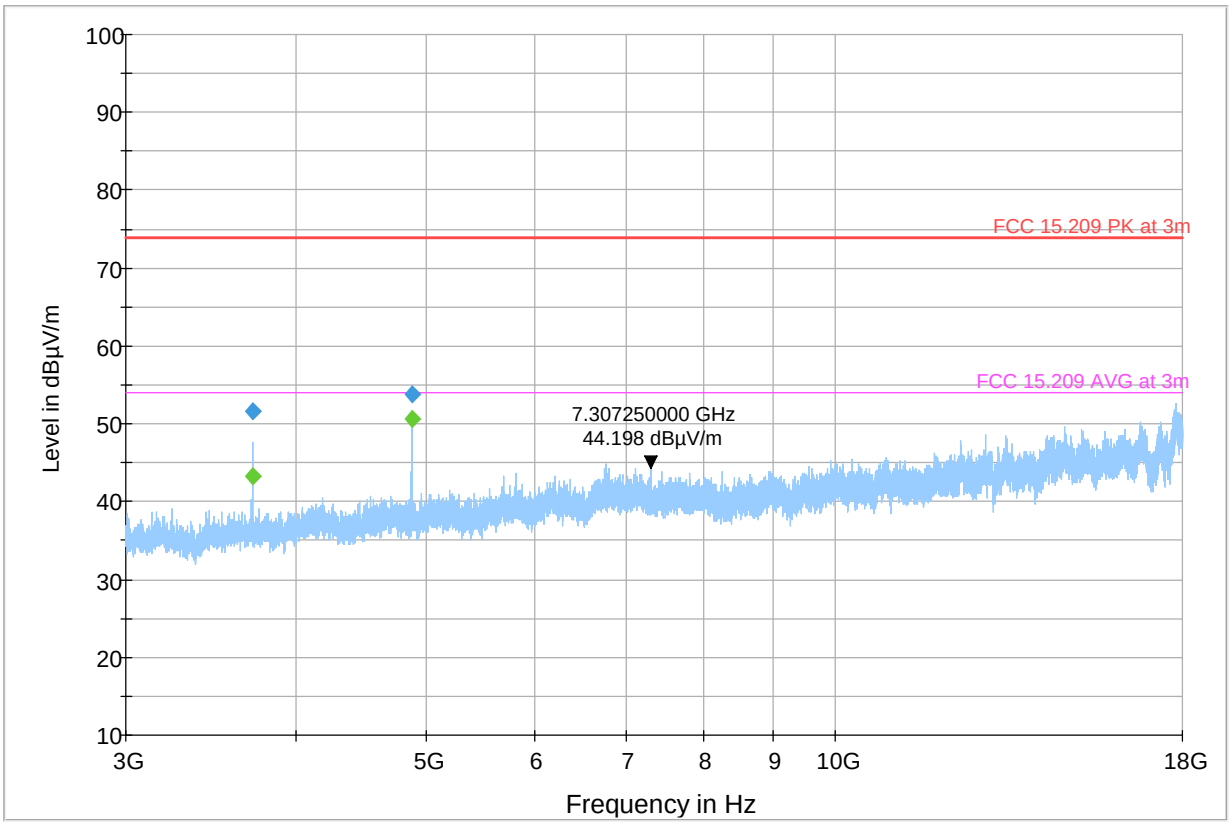


Plot # 101 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2437 MHz | **Mode: 802.11b**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3719.750	---	43.32	53.98	10.66	500.0	1000.000	116.0	H	54.0	-6.9
3719.750	51.55	---	73.98	22.43	500.0	1000.000	116.0	H	54.0	-6.9
4873.750	---	50.68	53.98	3.29	500.0	1000.000	189.0	V	169.0	-4.5
4873.750	53.74	---	73.98	20.24	500.0	1000.000	189.0	V	169.0	-4.5

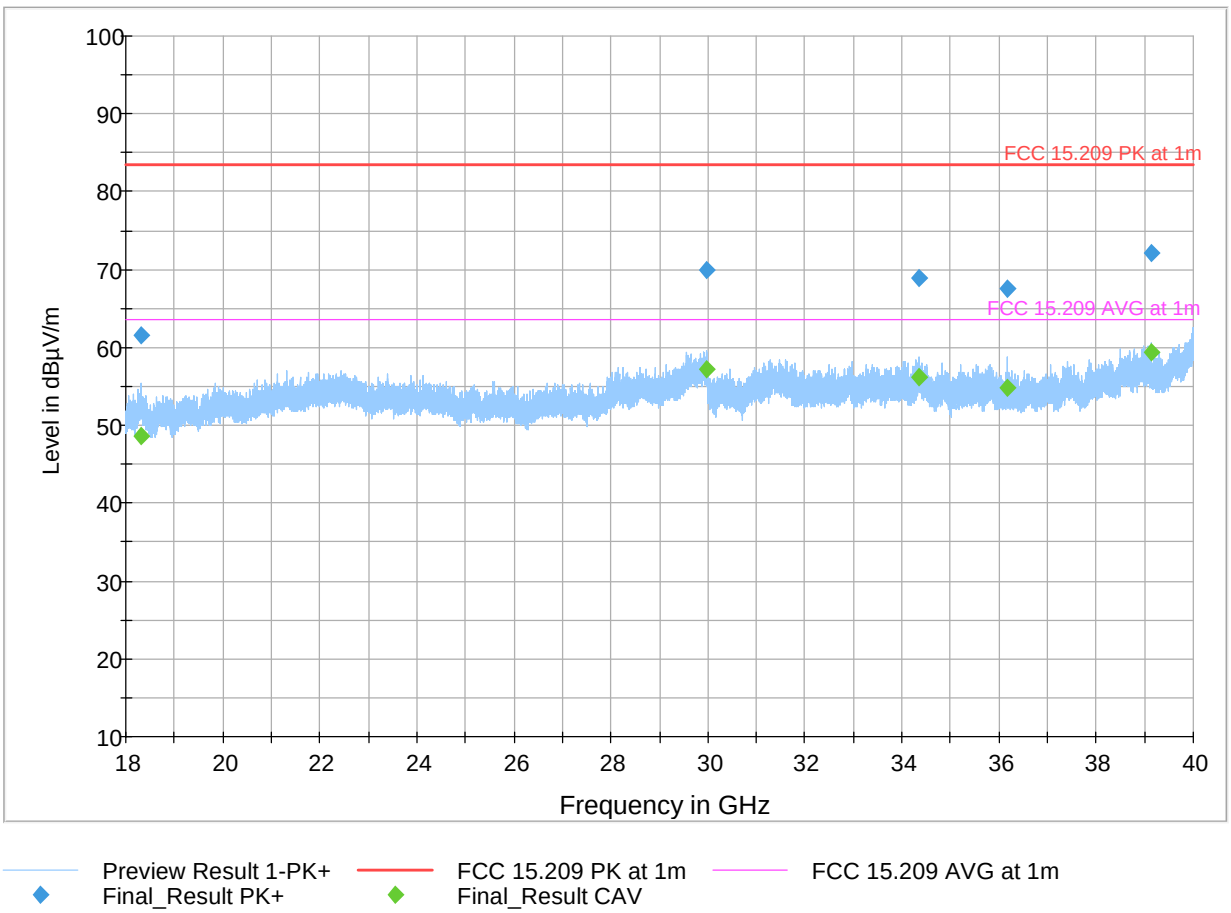


Plot # 102 Radiated Emissions: 18 – 40 GHz

Tx Frequency: 2437 MHz | **Mode: 802.11b**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m
18306.750	61.62	---	83.50	21.88	500.0	1000.000	100.0	V	116.0	12.2
18306.750	---	48.72	63.50	14.78	500.0	1000.000	100.0	V	116.0	12.2
29960.625	70.03	---	83.50	13.47	500.0	1000.000	157.0	V	89.0	23.1
29960.625	---	57.26	63.50	6.24	500.0	1000.000	157.0	V	89.0	23.1
34347.500	---	56.19	63.50	7.31	500.0	1000.000	100.0	V	272.0	21.8
34347.500	68.96	---	83.50	14.54	500.0	1000.000	100.0	V	272.0	21.8
36155.938	---	54.80	63.50	8.70	500.0	1000.000	100.0	H	341.0	20.6
36155.938	67.64	---	83.50	15.86	500.0	1000.000	100.0	H	341.0	20.6
39139.688	---	59.32	63.50	4.18	500.0	1000.000	208.0	H	182.0	22.7
39139.688	72.03	---	83.50	11.47	500.0	1000.000	208.0	H	182.0	22.7

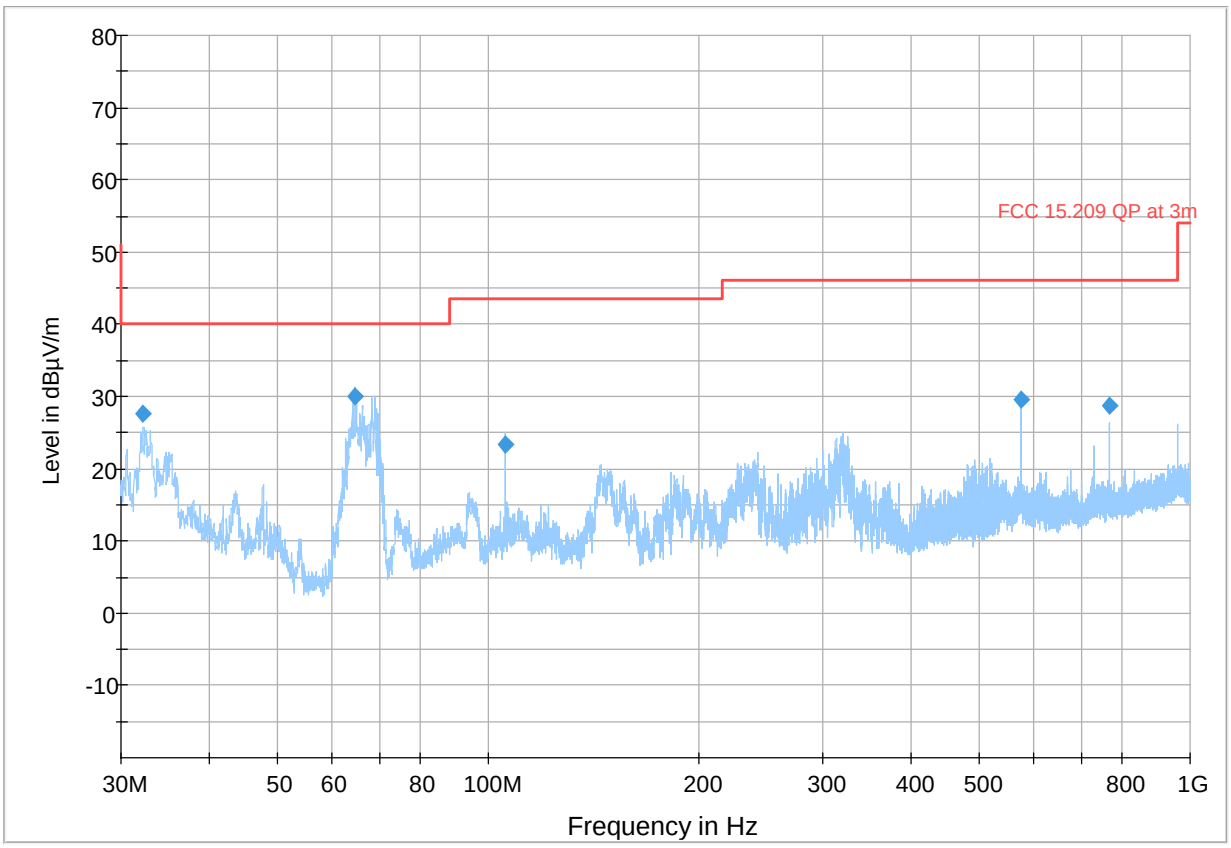


Plot # 103 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2462 MHz	Mode: 802.11b

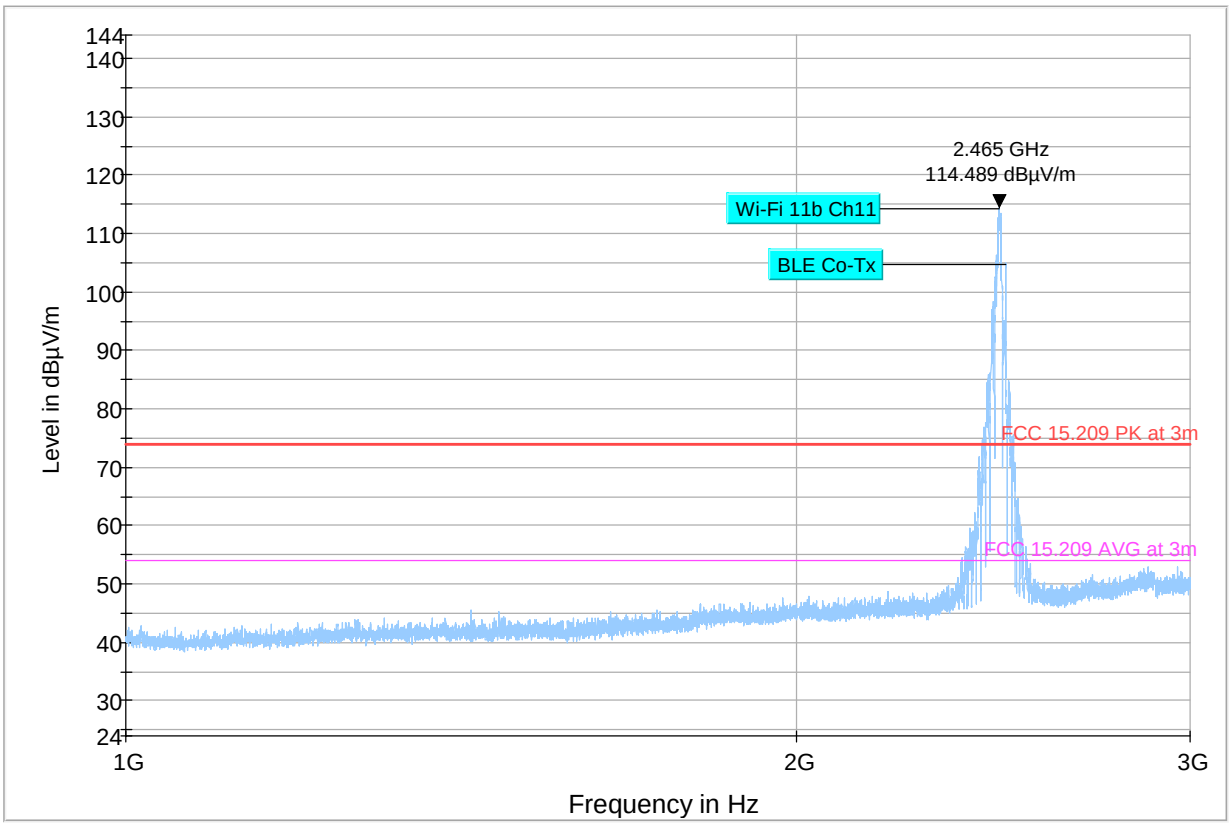
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.263	27.56	40.00	12.44	500.0	120.000	100.0	V	335.0	-13.8
64.758	29.95	40.00	10.05	500.0	120.000	107.0	V	133.0	-27.0
105.692	23.45	43.50	20.05	500.0	120.000	100.0	V	339.0	-23.5
575.948	29.56	46.02	16.46	500.0	120.000	100.0	H	4.0	-13.2
767.944	28.71	46.02	17.31	500.0	120.000	107.0	H	16.0	-10.4



Plot # 104 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2462 MHz	Mode: 802.11b

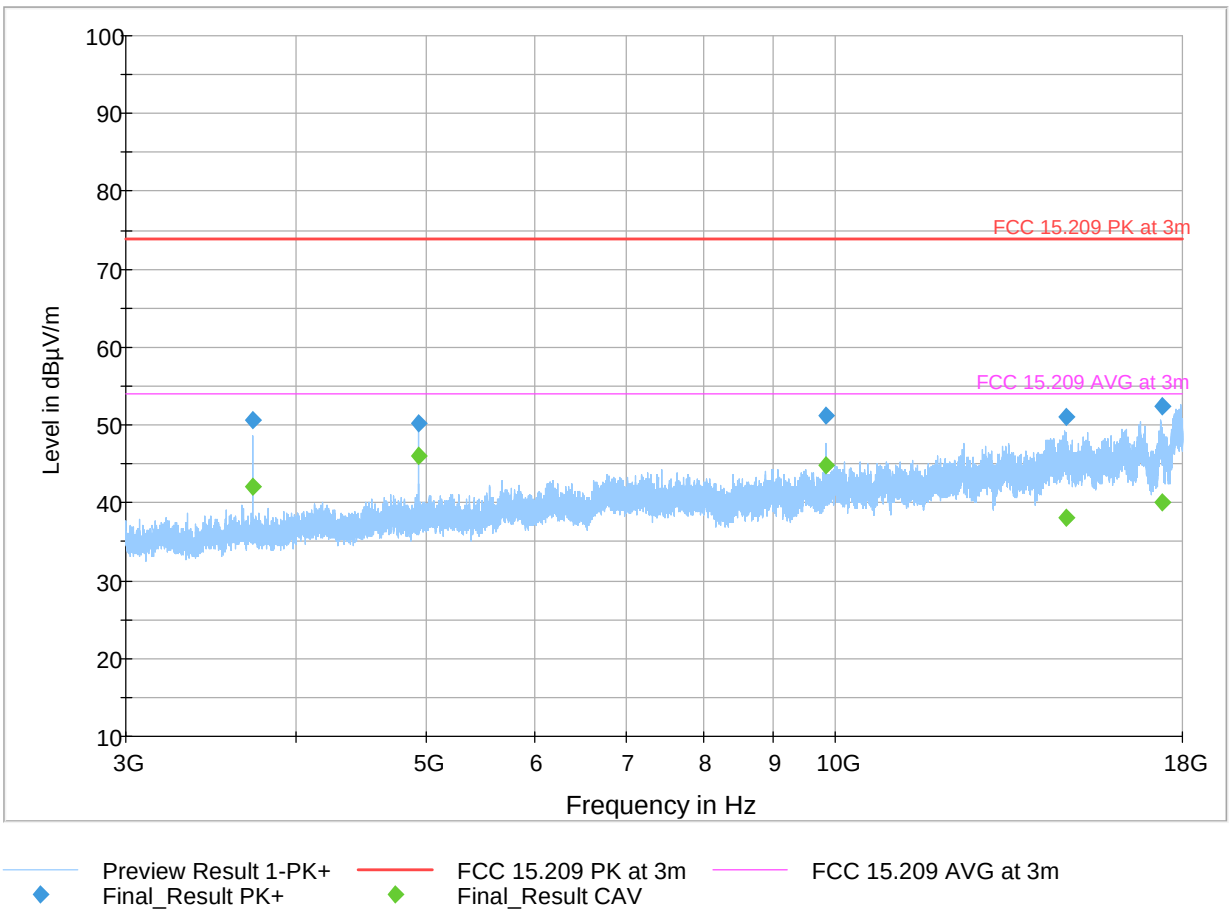


Plot # 105 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2462 MHz | **Mode: 802.11b**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3719.750	---	42.13	53.98	11.84	500.0	1000.000	136.0	H	36.0	-6.9
3719.750	50.70	---	73.98	23.28	500.0	1000.000	136.0	H	36.0	-6.9
4923.750	50.19	---	73.98	23.79	500.0	1000.000	142.0	V	168.0	-4.3
4923.750	---	46.10	53.98	7.88	500.0	1000.000	142.0	V	168.0	-4.3
9848.000	51.16	---	73.98	22.81	500.0	1000.000	185.0	H	103.0	0.7
9848.000	---	44.92	53.98	9.06	500.0	1000.000	185.0	H	103.0	0.7
14771.500	50.96	---	73.98	23.02	500.0	1000.000	228.0	H	232.0	8.3
14771.500	---	38.17	53.98	15.81	500.0	1000.000	228.0	H	232.0	8.3
17383.750	---	39.99	53.98	13.99	500.0	1000.000	125.0	V	169.0	15.0
17383.750	52.42	---	73.98	21.56	500.0	1000.000	125.0	V	169.0	15.0



8.7 AC Power Line Conducted Emissions

8.7.1 Measurement according to ANSI C63.4

Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

8.7.2 Limits: §15.207 & RSS-Gen 8.8

FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

8.7.3 Test conditions and setup:

Ambient Temperature ©	Power line (L1, L2, L3, N)	Power Input
22° C	Line & Neutral	110V / 60Hz

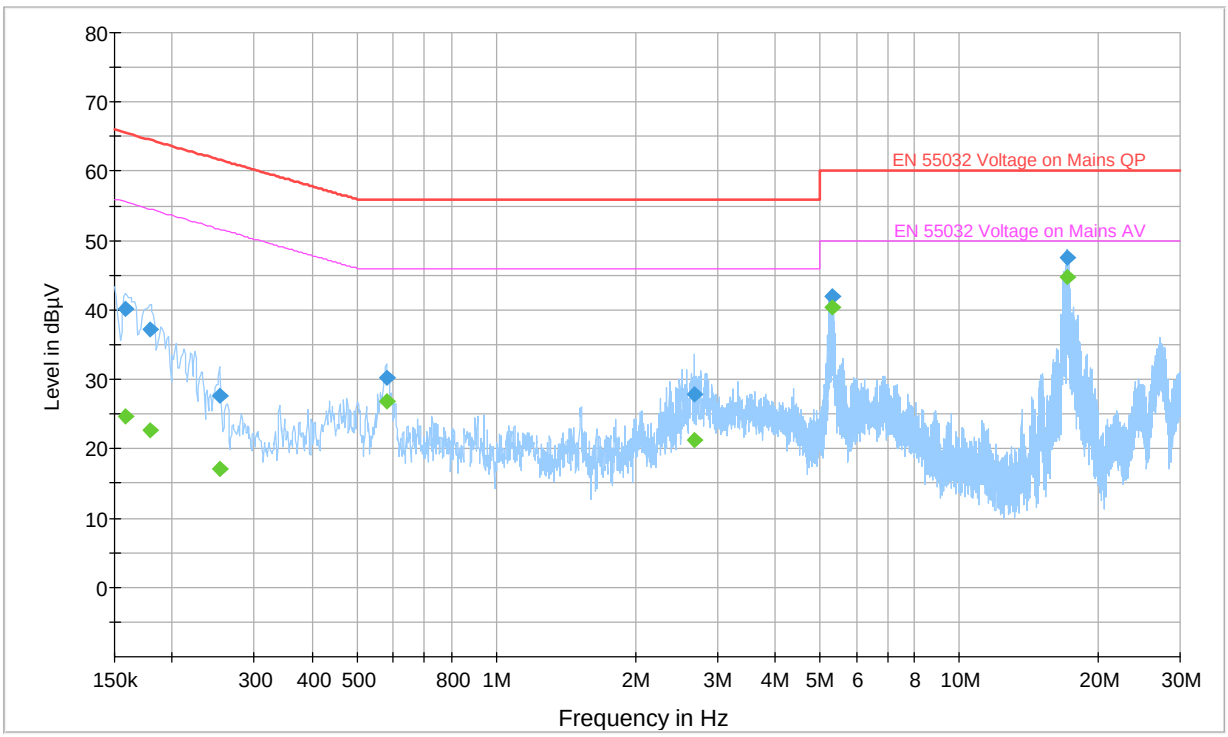
8.7.4 Measurement Result:

Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	2	Op.1	150 kHz – 30 MHz	See section 8.7.2	Pass

8.7.5 Measurement Plots:

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.159	---	24.67	55.54	30.87	500.0	9.000	N	GND	10.4
0.159	40.15	---	65.54	25.39	500.0	9.000	N	GND	10.4
0.179	---	22.66	54.54	31.88	500.0	9.000	N	GND	10.3
0.179	37.24	---	64.54	27.30	500.0	9.000	N	GND	10.3
0.252	27.57	---	61.68	34.11	500.0	9.000	N	GND	10.2
0.252	---	17.12	51.68	34.56	500.0	9.000	N	GND	10.2
0.580	30.18	---	56.00	25.82	500.0	9.000	N	GND	10.0
0.580	---	26.92	46.00	19.08	500.0	9.000	N	GND	10.0
2.685	27.85	---	56.00	28.15	500.0	9.000	N	GND	10.1
2.685	---	21.19	46.00	24.81	500.0	9.000	N	GND	10.1
5.320	---	40.28	50.00	9.72	500.0	9.000	L1	GND	10.1
5.320	41.93	---	60.00	18.07	500.0	9.000	L1	GND	10.1
17.079	47.50	---	60.00	12.50	500.0	9.000	L1	GND	10.2
17.079	---	44.81	50.00	5.19	500.0	9.000	L1	GND	10.2



9 Test setup photos

Setup photos are included in supporting file name: "EMC_JUNEL_002_20001_FCC_ISED_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
ACTIVE LOOP ANTENNA	ETS LINDGREN	6507	00161344	3 YEARS	10/26/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	EMCO	3115	00035111	3 YEARS	04/17/2019
HORN ANTENNA	ETS LINDGREN	3117	00215984	3 YEARS	1/26/2018
HORN ANTENNA	ETS LINDGREN	3116C	00169535	3 YEARS	9/23/2020
ESW.EMI TEST RECEIVER	R&S	ESW44	101715	3 YEARS	1/6/2020
Spectrum Analyzer	R&S	FSU26	200065	3 YEARS	07/16/2019
THERMOMETER HUMIDITY MONITOR	CONTROL COMPANY	36934-164	181230565	2 YEARS	01/10/2019

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Report prepared by
10/21/2020	EMC_JUNEL_002_20001_FCC_15.247_ISED_WIFI_DTS	Initial Version	Issa Ghanma

<<< The End >>>