FCC / IC Test Report

FOR:

Garmin International

Model Name:

AA3111

Product Description:

Personal Navigation Device

FCC ID: IPH-A3111
IC ID: 1792A-A3111

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 1 (DTSs)
RSS-Gen Issue 4

REPORT #: EMC_GARMI-047-17001_15.247_Wi-Fi

DATE: 2017-10-26

A2LA Accredited

IC recognized # 3462B-2

***CETECOM* Inc.**
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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 IC standard RSS-247 Issue 1, and RSS-Gen Issue 4.

No deviations were ascertained.

Company	Description	Model #
Garmin International	Personal Navigation Device	AA3111

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2017-10-26	Compliance	Peter Nevermann (Director Radio Communications and EMC)	Peter Ne

Responsible for the Report:

Date	Section	Name	Signature
2017-10-26	Compliance	Elijah Garcia (EMC Engineer)	Elijah Garcia Digitally signed by Elijah Garcia DN: cn=Elijah Garcia, o=Cetecom Inc., ou=RC&E, email=elijah.garcia@cetecom.com, c=US Date: 2017.11.03 11:37:44 -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
Compliance Manager:	Franz Engert
Responsible Project Leader:	Kris Lazarov

2.2 Identification of the Client

Applicant's Name:	Garmin International
Street Address:	100 Regency Forest Drive, Suite 350
City/Zip Code	Cary, NC 27518
Country	USA
Contact Person:	Jay Everett
Phone No.	(919) 337-0163
e-mail:	jay.everett@garmin.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Garmin Corporation
Manufacturers Address:	No. 68, Jangshu 2nd Road
City/Zip Code	Xizhi Dist., New Taipei City 221
Country	Taiwan

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	AA3111
HW Version	0
SW Version	2.30
FCC-ID	IPH-A3111
IC-ID	1792A-A3111
HVIN	AA3111[1]
PMN	fleet™ 790 xy, fleet™ 780 xy, and fleet™ 770 xy
Product Description	Personal Navigation Device
Frequency Range / number of channels	Nominal band: 2412 MHz (Ch. 1) – 2472 (Ch.13), 13 channels
Type(s) of Modulation	802.11b: DSSS 802.11g/n: OFDM 802.11n: MCS (20 & 40 MHz)
Modes of Operation	802.11b/g/n (Client)
Antenna Information as declared	max gain 1.575 dBi
Max. Output Powers	Peak Conducted Power 16.19dBm
Power Supply/ Rated Operating Voltage Range	4.5 V dc (min) / 5 V dc (nom) / 5.5 V dc (max)
Operating Temperature Range	-10 ºC to 55 ºC
Other Radios included in the device	Bluetooth Basic / EDR: GFSK, π /4 DQPSK, 8DPSK Bluetooth Low Energy: GFSK
Sample Revision	☐Prototype Unit ■Production Unit ☐Pre-Production

[1] Fleet™ 790 xy was fully tested and a spot-check was performed on, fleet™ 780 xy, and fleet™ 770 xy, refer to section 3.6

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	39F003818	0	2.30	Radiated and AC Conducted Emissions
2	39F003830	0	2.30	Conducted RF

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adapter	PSAF10R-050Q	Phihong	P164604044A1

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#2 + AE#1	The radio of the EUT was configured to a fixed channel transmission with 100% duty cycle using software that is not available to the end user. The measurement equipment was connected to the 50 ohm RF port of the EUT.
2	EUT#1 + AE#1	The radio of the EUT was configured to a fixed channel transmission with 100% duty cycle using software that is not available to the end user. The internal antenna was connected.

3.5 Miscellaneous EUT Information

Only Fleet™ 790 xy was fully tested and based on the information that were provided by Garmin about the differences, the lab concluded that only a spot check is needed which was performed on, fleet™ 780 xy, and fleet™ 770 xy.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. and this test report is to support a request for new equipment authorization under the FCC ID: IPH-A3111 IC ID: 1792A-A3111.

According to the guidelines from FCC KDB 996369 for the product under evaluation, and the pre-certified module to be integrated (WL1831MOD) as described in Section 3, the output power has been verified to be within the specified production tolerances and measurement uncertainties, and where relevant test procedures did not change the conducted test results from module certification are re-used. Full Radiated Spurious Emissions test was conducted 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 Issue 1 of Industry Canada.

The module test data can be obtained under the FCC ID: IPH-A3111 IC ID: 1792A-A3111.

Testing procedures are based on 558074 D01 DTS Meas Guidance v03r05 – "GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER §15.247; April 8, 2016" 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	Fail	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(1)	Emission Bandwidth	Nominal	BTLE	■	☐	☐	☐	Complies
§15.247© RSS-247 5.2(2)	Power Spectral Density	Nominal	BTLE	■	☐	☐	☐	Complies
§15.247(b)(1) RSS-247 5.4(4)	Maximum Conducted Output Power and EIRP	Nominal	BTLE	■	☐	☐	☐	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	BTLE	■	☐	☐	☐	Complies
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	BTLE	■	☐	☐	☐	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	BTLE	■	☐	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	BTLE	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Radiated RF Output Power test intended for power verification on mid channel of applicable frequency band – see section 7.1.
Note 3: Leveraged from module certification.

6 Measurements

6.1 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 30MHz	±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

6.2 Environmental Conditions during Testing:

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

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

6.3 Dates of Testing:

08/02/2017 - 08/12/2017

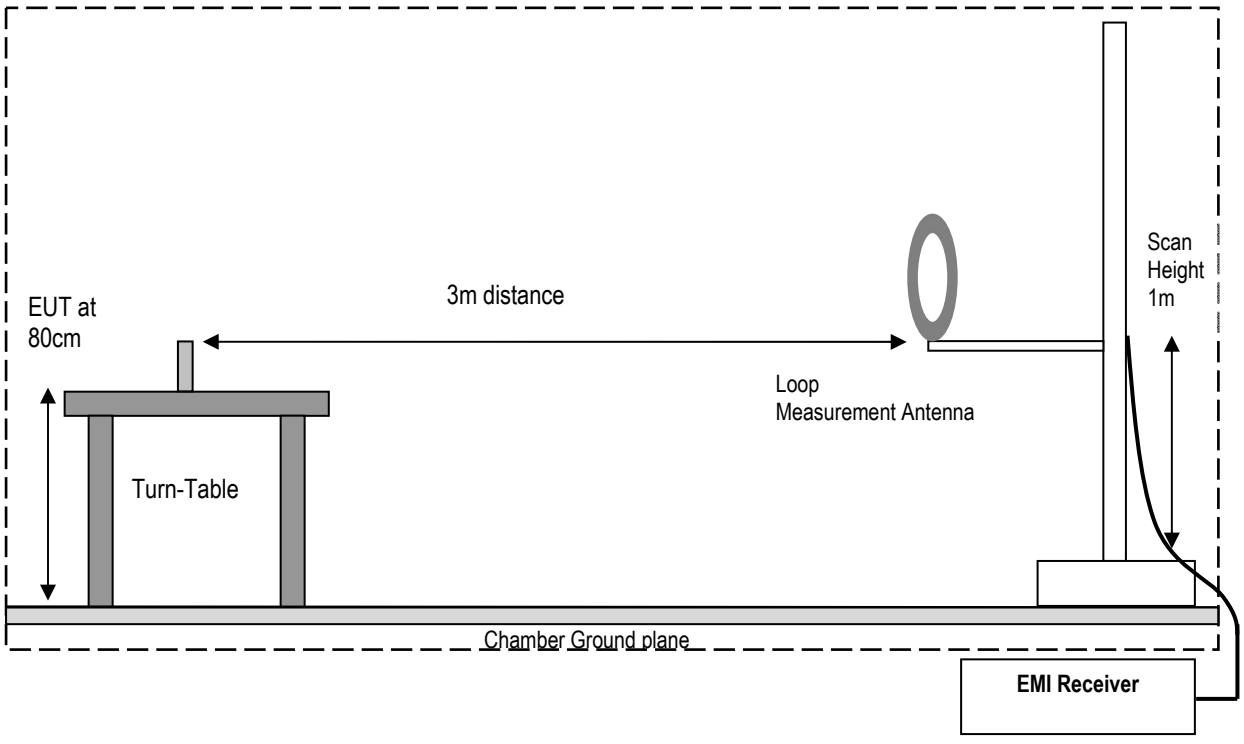
7 Measurement Procedures

7.1 Radiated Measurement

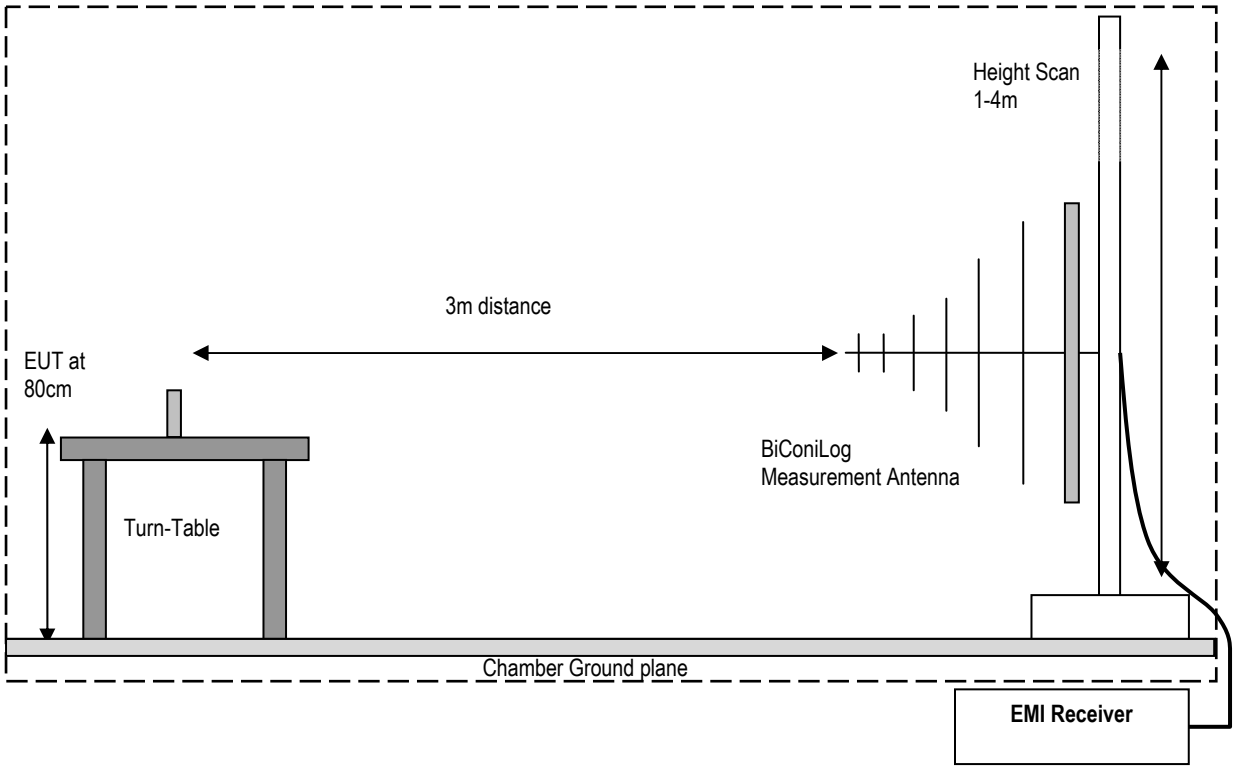
The radiated measurement is performed according to: ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions 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.

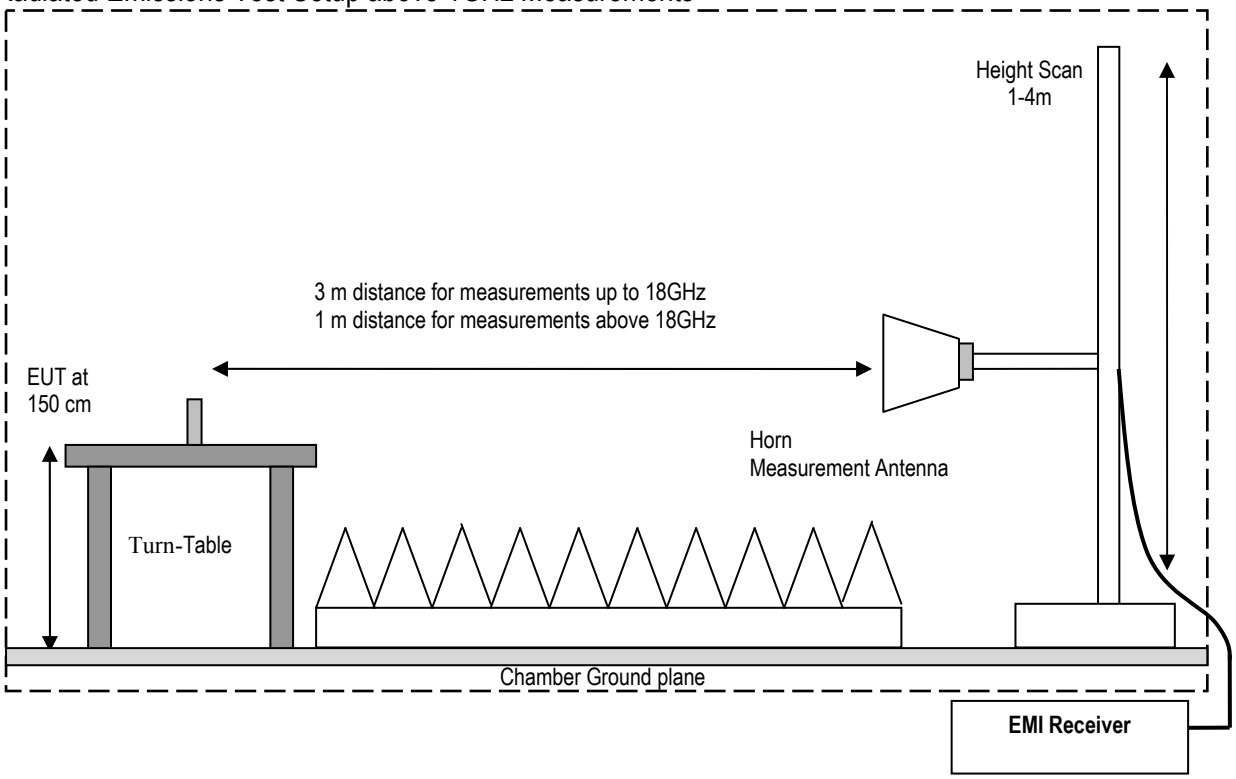
Radiated Emissions Test Setup below 30 MHz Measurements



Radiated Emissions Test Setup 30 MHz-1 GHz 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 Spectrum Analyzer 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 (2009)

8 Test Result Data

8.1 Maximum Peak Conducted Output Power

8.1.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

Spectrum Analyzer settings:

- RBW ≥ DTS bandwidth
- VBW ≥ 3 × RBW
- Span ≥ 3 x RBW
- Detector = Peak
- Trace = Max hold
- Sweep = auto couple
- Use the peak marker function to determine the peak amplitude level

8.1.2 Limits:

Maximum Peak Output Power:

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

8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain (dBi)
23° C	1	802.11b/g/n	5 VDC	1.575 dBi

8.1.4 Measurement result:

Plot #	Frequency (MHz)	Data Rate	Modulation or Bandwidth	Maximum Peak Conducted Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
1	2442	1 Mbps	DSSS	9.02	10.60	30 (Pk.) / 36 (EIRP)	Pass
2	2442	2 Mbps	DSSS	9.19	10.77	30 (Pk.) / 36 (EIRP)	Pass
3	2442	5.5 Mbps	DSSS	9.39	10.97	30 (Pk.) / 36 (EIRP)	Pass
4	2442	11 Mbps	DSSS	9.24	10.82	30 (Pk.) / 36 (EIRP)	Pass
5	2442	MCS 0	20 MHz	15.34	16.92	30 (Pk.) / 36 (EIRP)	Pass
6	2442	MCS 0	40 MHz	9.93	11.51	30 (Pk.) / 36 (EIRP)	Pass
7	2442	MCS 1	20 MHz	16.19	17.77	30 (Pk.) / 36 (EIRP)	Pass
8	2442	MCS 1	40 MHz	10.49	12.10	30 (Pk.) / 36 (EIRP)	Pass
9	2442	MCS 2	20 MHz	15.32	16.90	30 (Pk.) / 36 (EIRP)	Pass
10	2442	MCS 2	40 MHz	10.51	12.10	30 (Pk.) / 36 (EIRP)	Pass
11	2442	MCS 3	20 MHz	15.18	16.76	30 (Pk.) / 36 (EIRP)	Pass
12	2442	MCS 3	40 MHz	9.84	11.42	30 (Pk.) / 36 (EIRP)	Pass
13	2442	MCS 4	20 MHz	15.19	16.77	30 (Pk.) / 36 (EIRP)	Pass
14	2442	MCS 4	40 MHz	10.59	12.17	30 (Pk.) / 36 (EIRP)	Pass
15	2442	MCS 5	20 MHz	14.44	16.02	30 (Pk.) / 36 (EIRP)	Pass
16	2442	MCS 5	40 MHz	9.10	10.68	30 (Pk.) / 36 (EIRP)	Pass
17	2442	MCS 6	20 MHz	14.23	15.81	30 (Pk.) / 36 (EIRP)	Pass
18	2442	MCS 6	40 MHz	11.24	12.82	30 (Pk.) / 36 (EIRP)	Pass
19	2442	MCS 7	20 MHz	14.38	15.96	30 (Pk.) / 36 (EIRP)	Pass
20	2442	MCS 7	40 MHz	8.54	10.12	30 (Pk.) / 36 (EIRP)	Pass
21	2442	MCS 32	40 MHz	10.30	11.88	30 (Pk.) / 36 (EIRP)	Pass
22	2442	6 Mbps	OFDM	15.90	17.48	30 (Pk.) / 36 (EIRP)	Pass
23	2442	9 Mbps	OFDM	15.82	17.40	30 (Pk.) / 36 (EIRP)	Pass
24	2442	12 Mbps	OFDM	15.92	17.50	30 (Pk.) / 36 (EIRP)	Pass

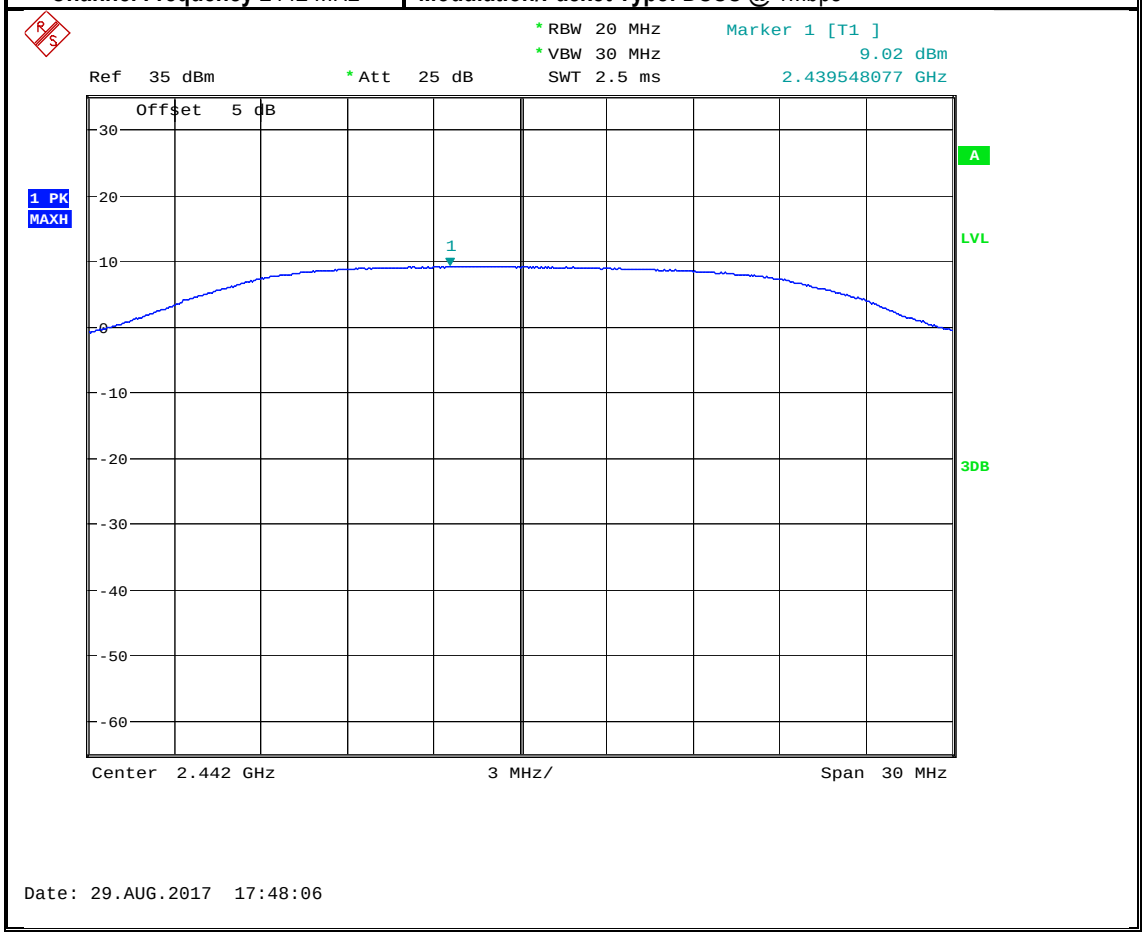
25	2442	18 Mbps	OFDM	15.97	17.55	30 (Pk.) / 36 (EIRP)	Pass
26	2442	24 Mbps	OFDM	15.10	16.68	30 (Pk.) / 36 (EIRP)	Pass
27	2442	36 Mbps	OFDM	15.88	17.46	30 (Pk.) / 36 (EIRP)	Pass
28	2442	48 Mbps	OFDM	15.43	17.01	30 (Pk.) / 36 (EIRP)	Pass
29	2442	54 Mbps	OFDM	14.67	16.25	30 (Pk.) / 36 (EIRP)	Pass

Note: Equivalent Conducted Output Power = EIRP - Antenna Gain

8.1.5 Measurement Plots:

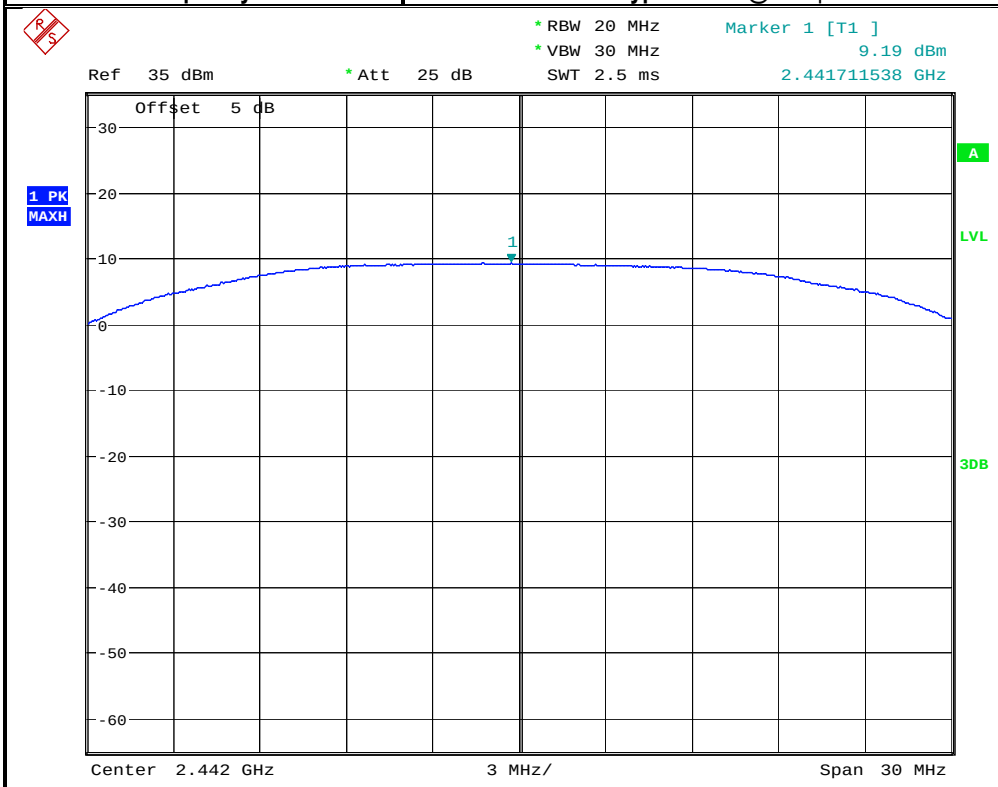
Plot #1

Channel Frequency 2442 MHz | **Modulation/Packet Type:** DSSS @ 1Mbps



Plot #2

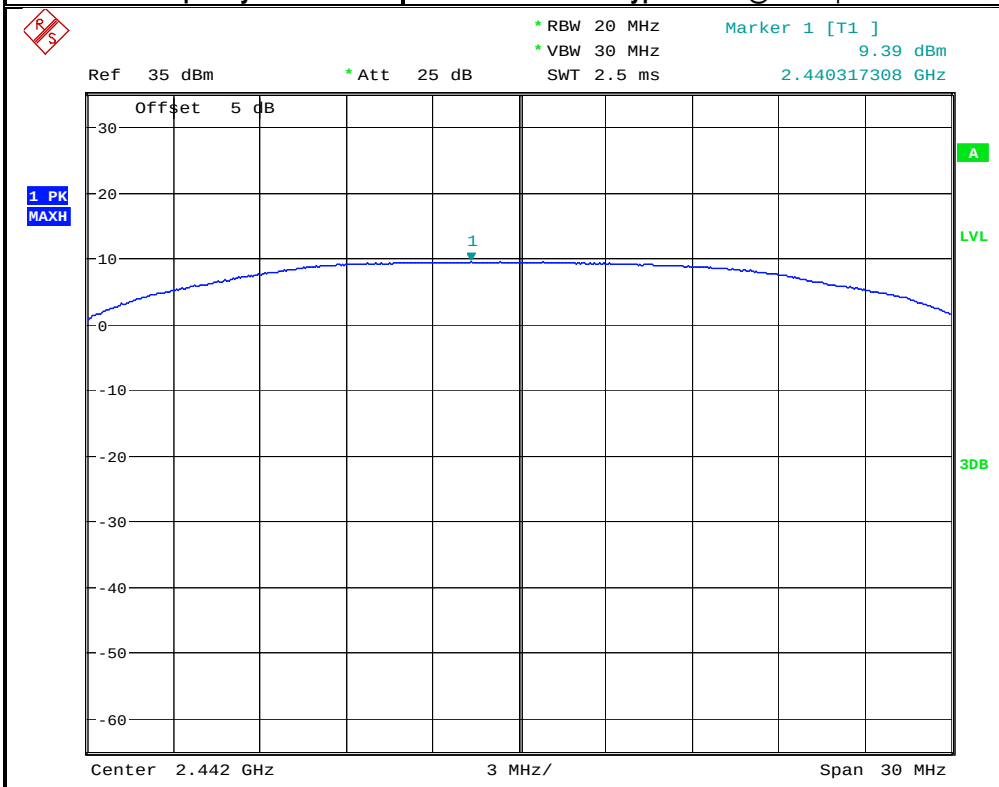
Channel Frequency 2442 MHz | **Modulation/Packet Type:** DSSS @ 2Mbps



Date: 29.AUG.2017 17:49:21

Plot #3

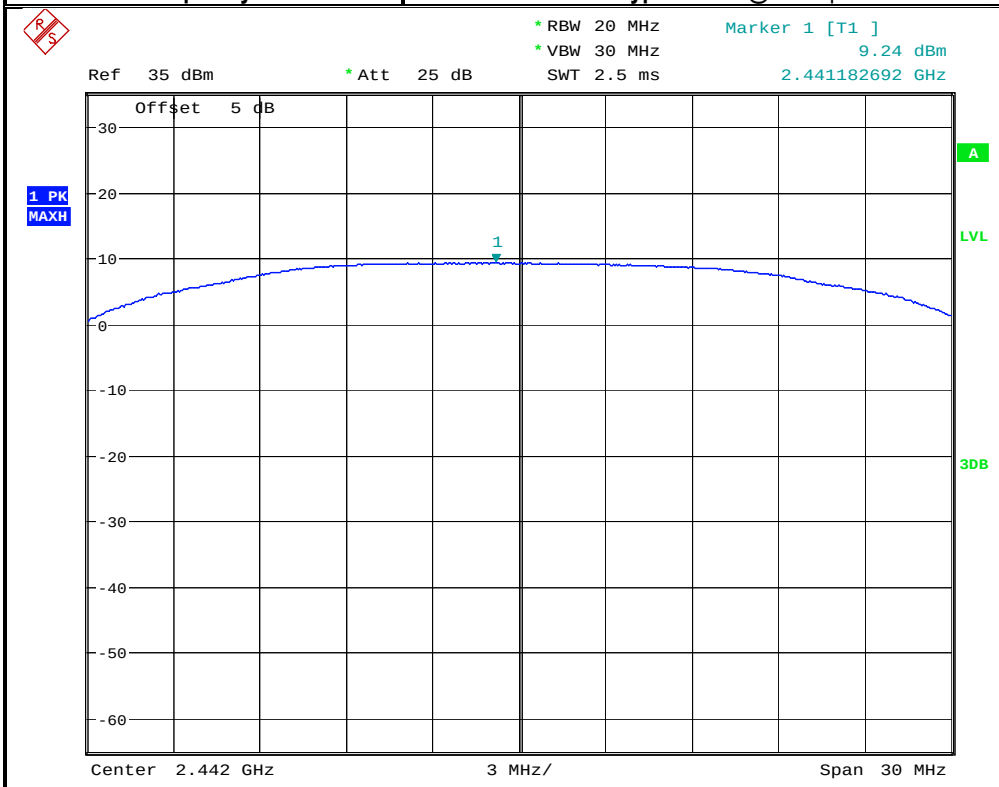
Channel Frequency 2442 MHz | **Modulation/Packet Type:** DSSS @ 5.5Mbps



Date: 29.AUG.2017 17:50:22

Plot #4

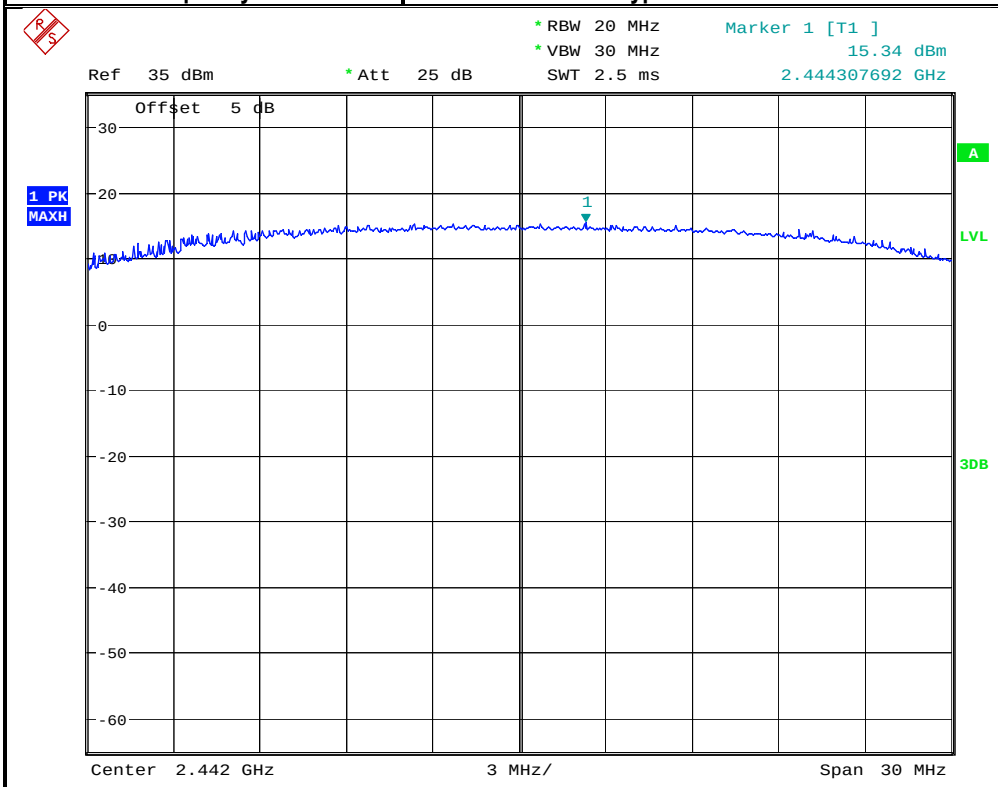
Channel Frequency 2442 MHz | **Modulation/Packet Type:** DSSS @ 11Mbps



Date: 29.AUG.2017 17:51:06

Plot #5

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 0 - 20 MHz



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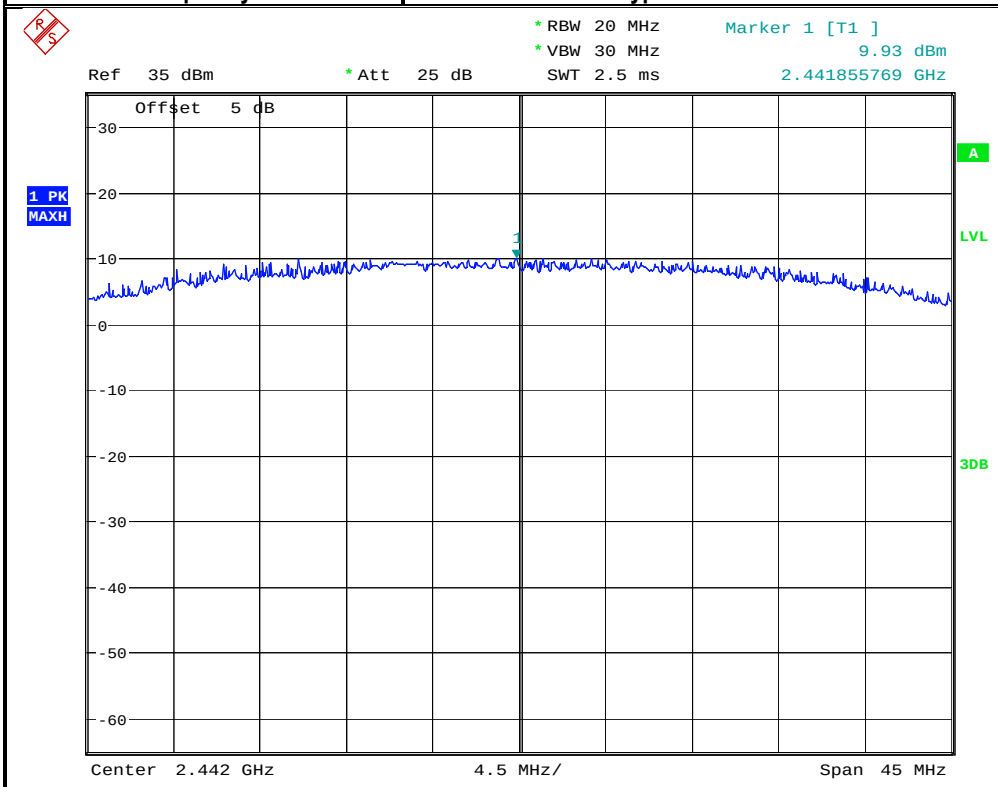
Plot #6

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 0 - 40 MHz



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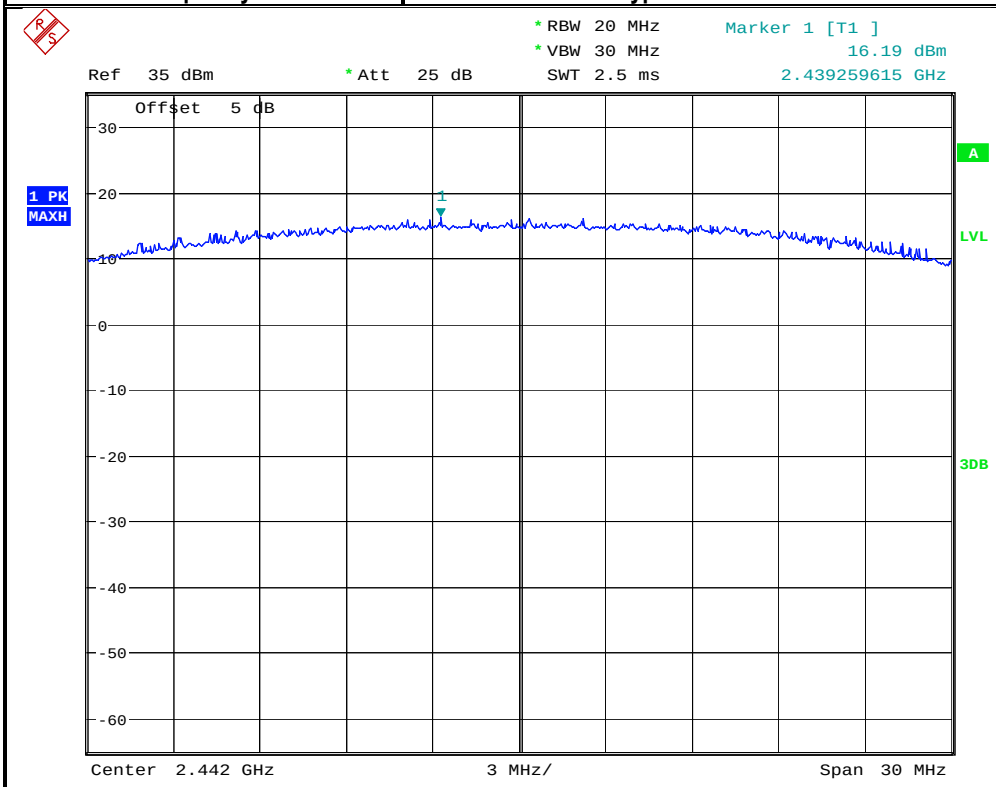
Plot #7

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 1 - 20 MHz



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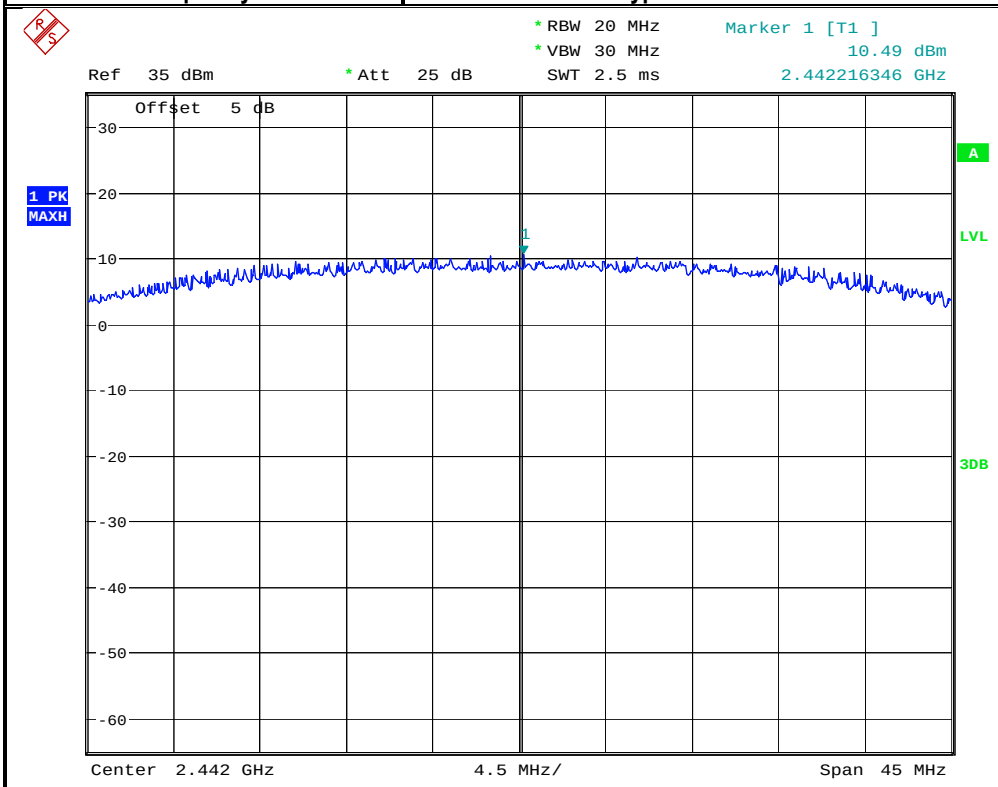
Plot #8

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 1 - 40 MHz



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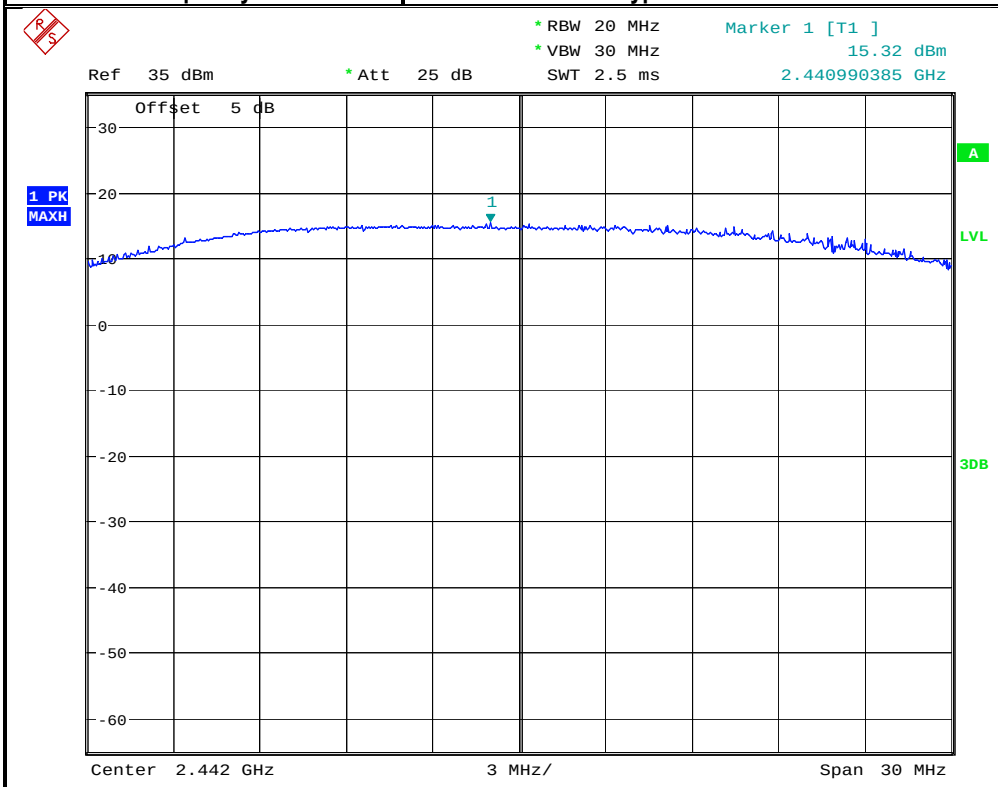
Plot #9

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 2 - 20 MHz



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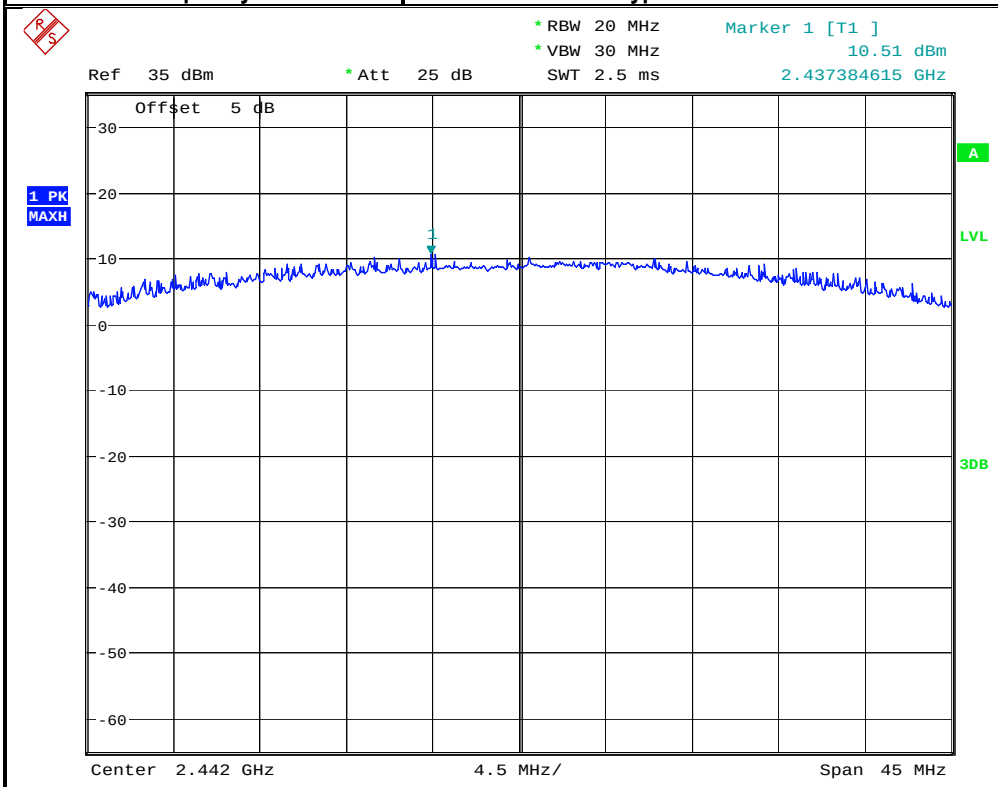
Plot #10

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 2 - 40 MHz



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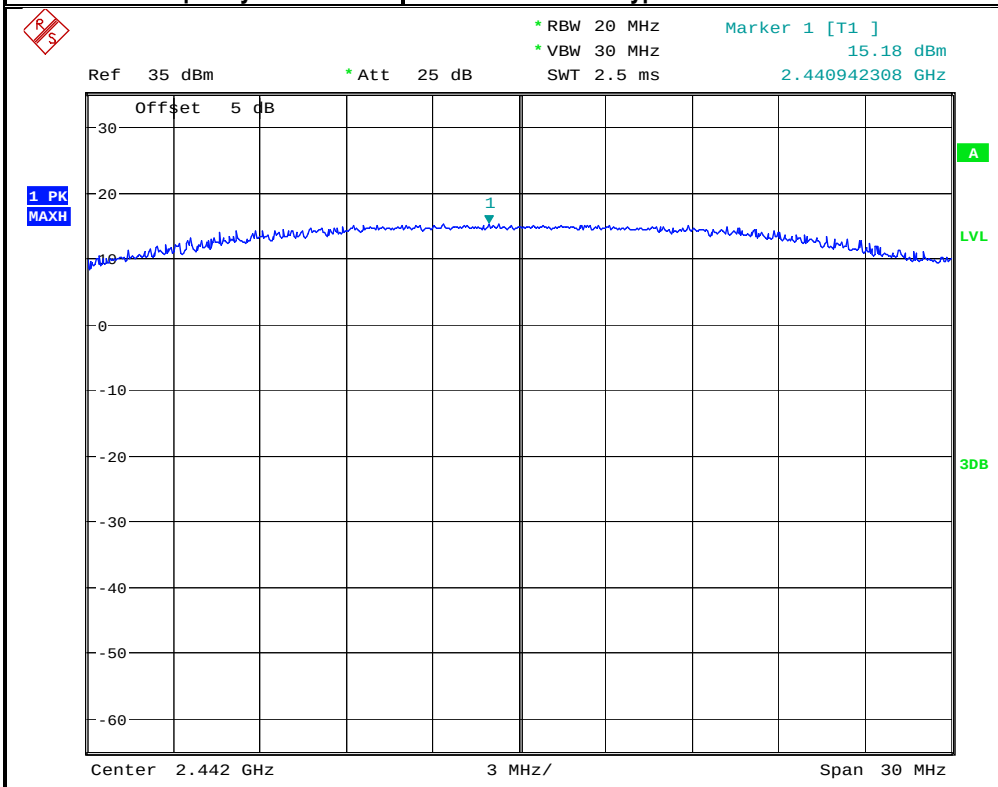
Plot #11

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 3 - 20 MHz



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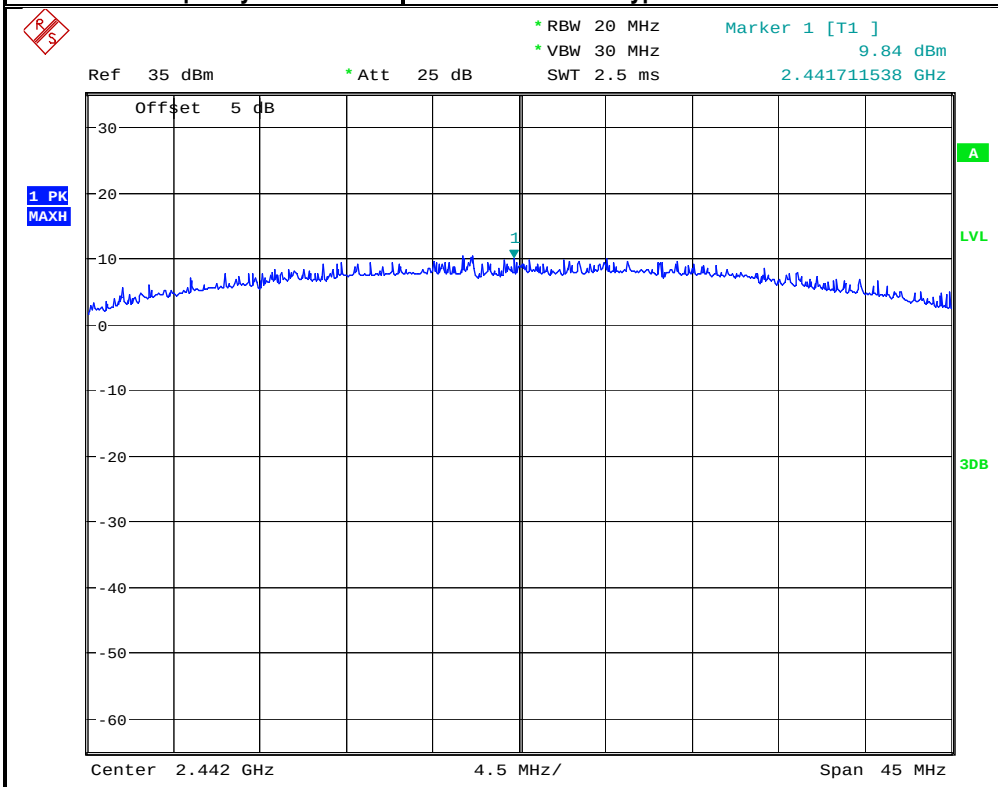
Plot #12

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 3 - 40 MHz



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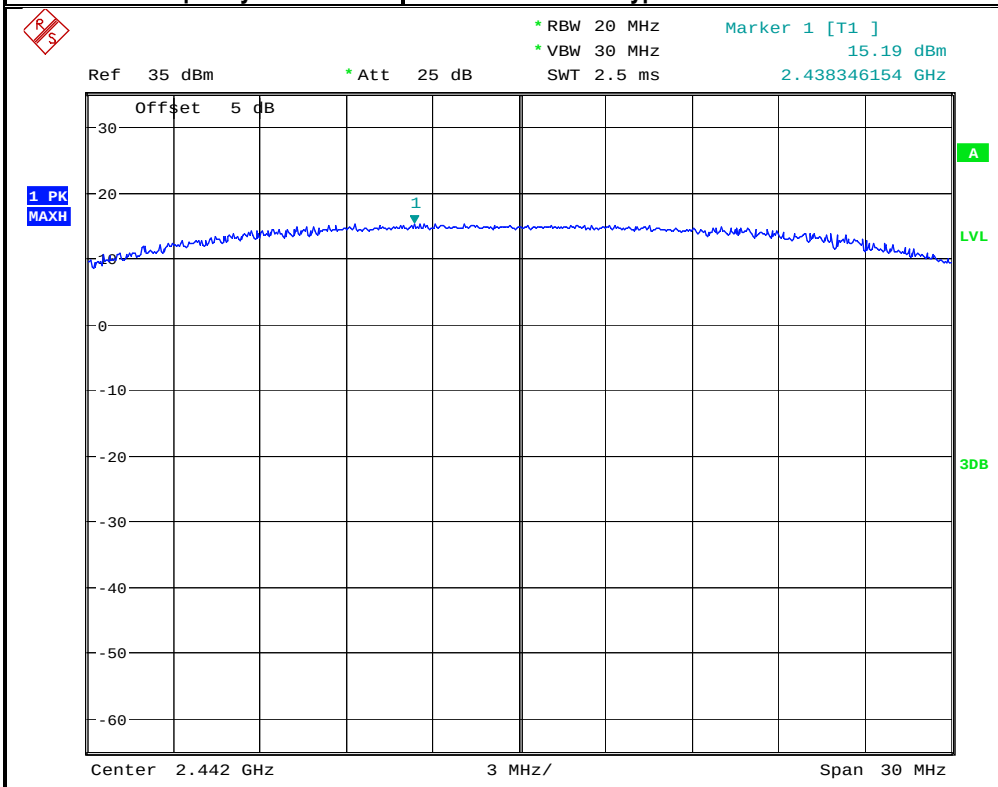
Plot #13

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 4 - 20 MHz



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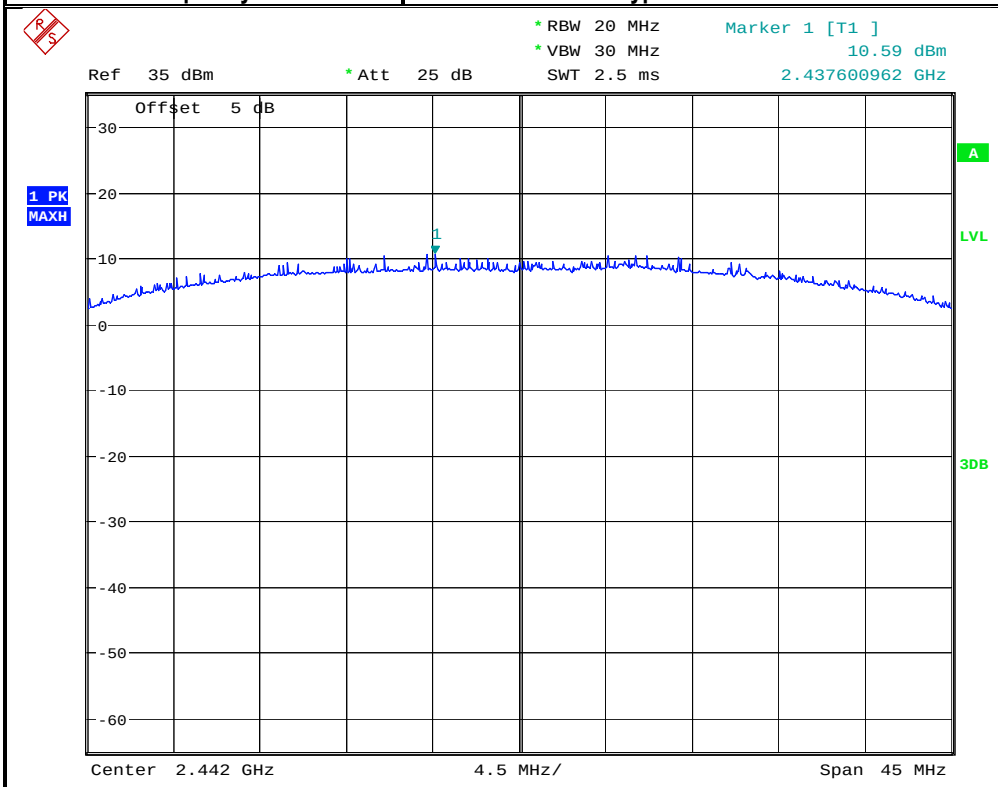
Plot #14

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 4 - 40 MHz



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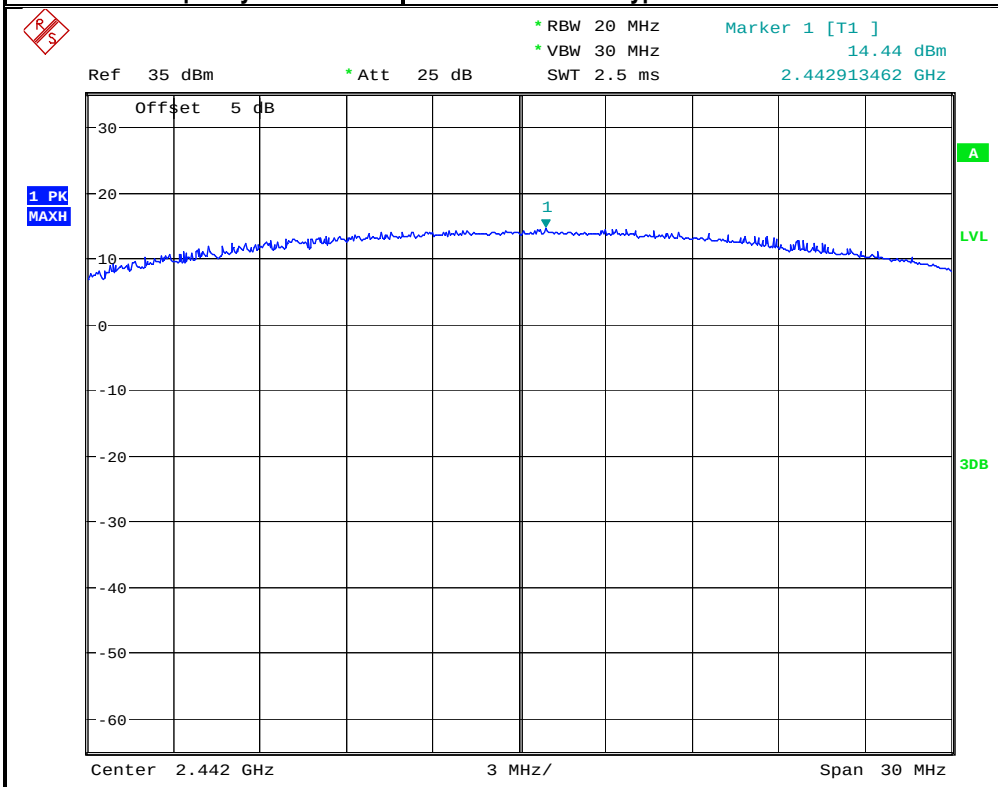
Plot #15

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 5 - 20 MHz



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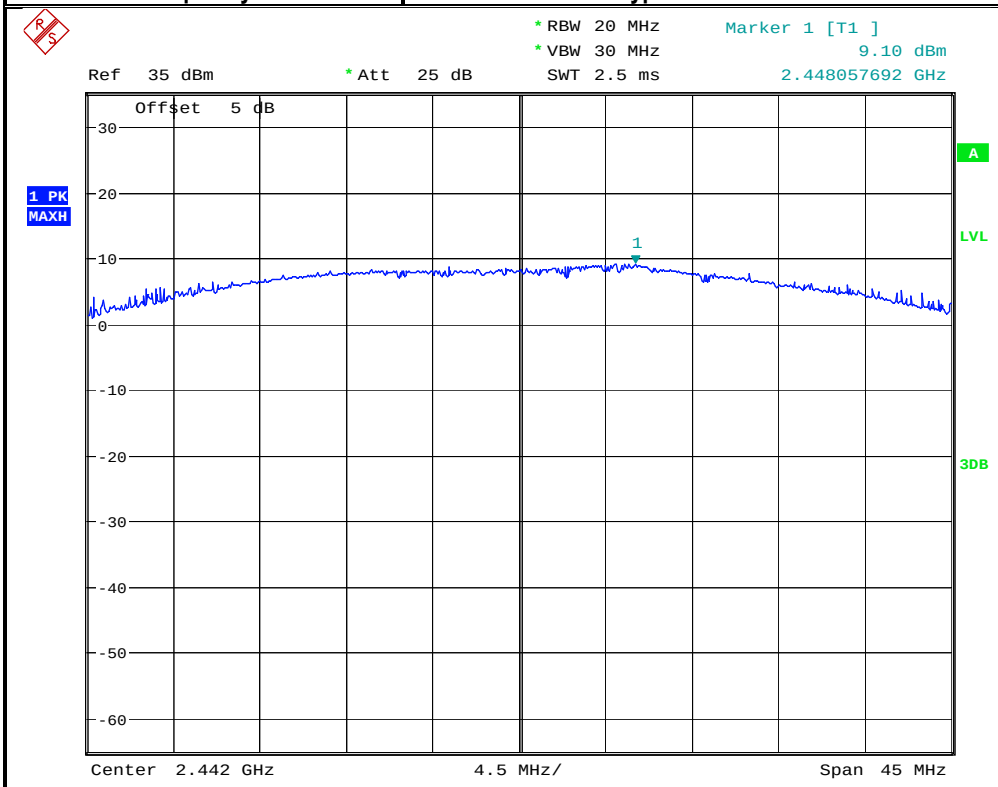
Plot #16

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 5 - 40 MHz



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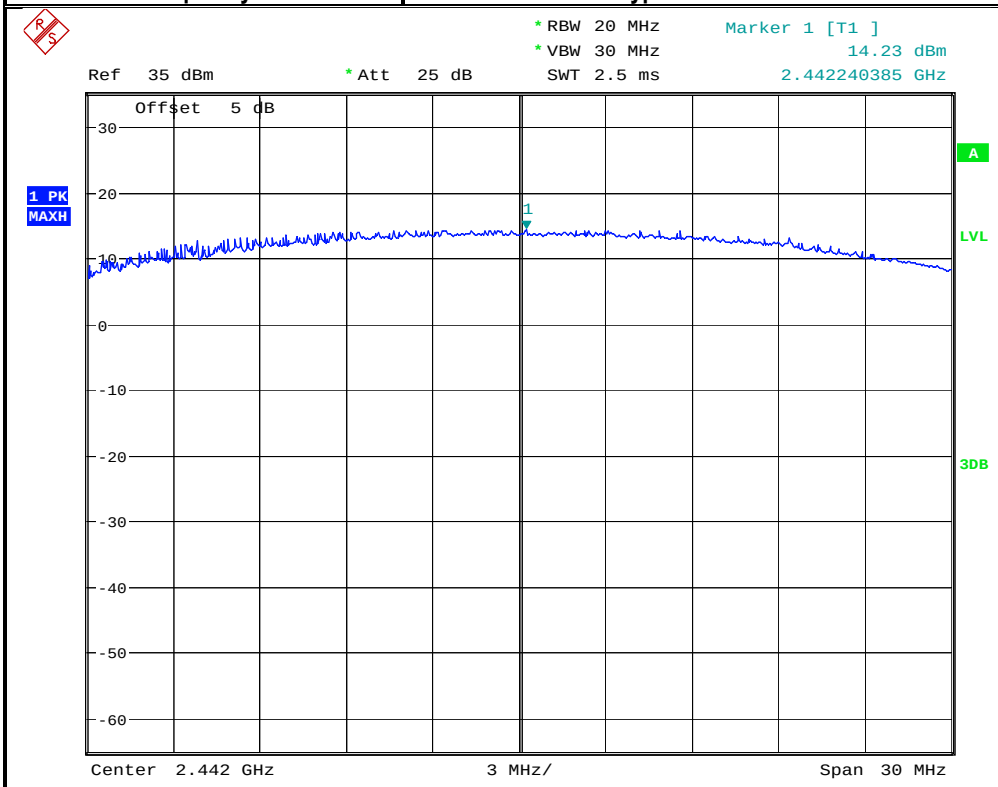
Plot #17

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 6 - 20 MHz



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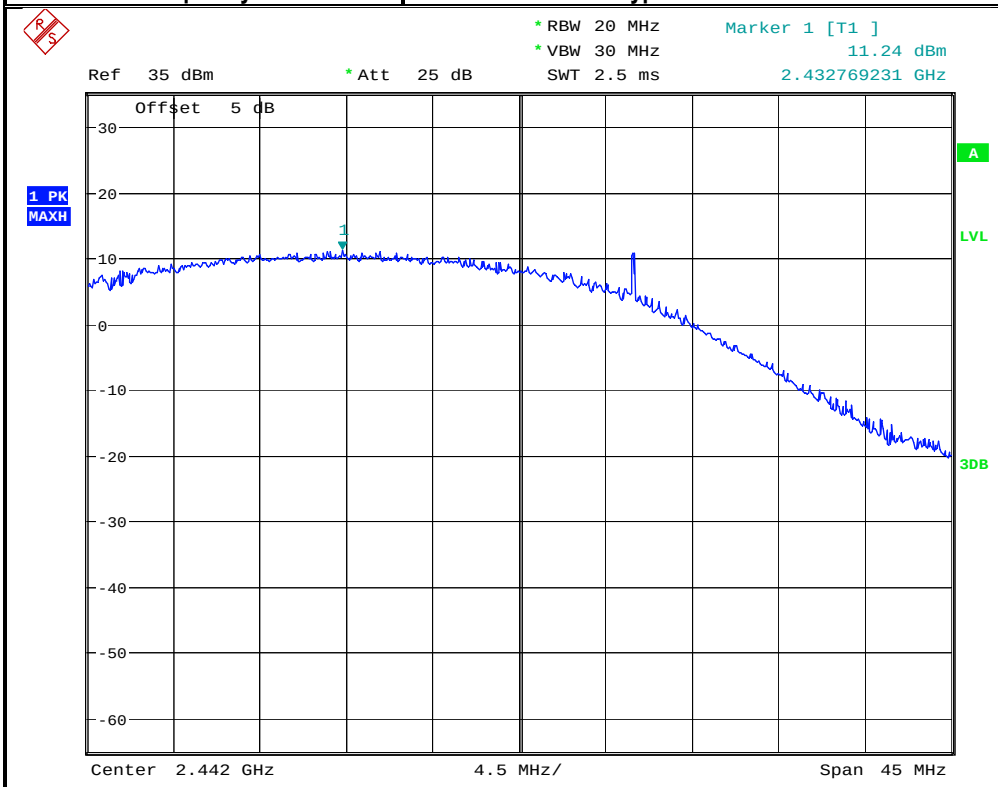
Plot #18

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 6 - 40 MHz



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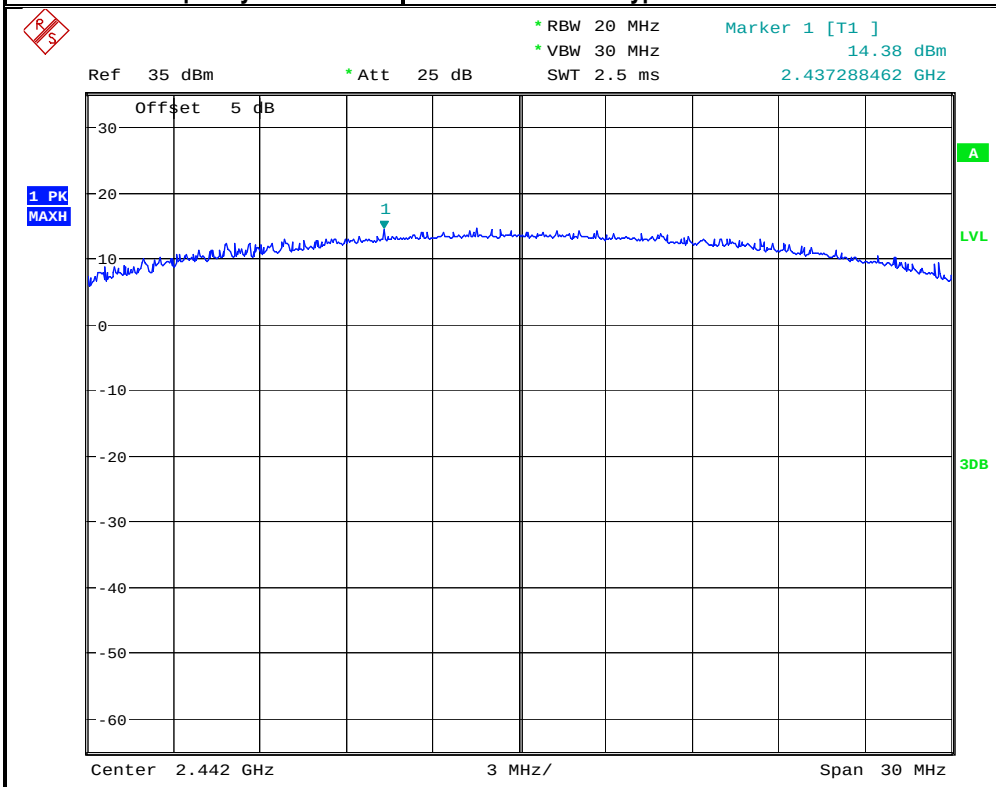
Plot #19

Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 7 - 20 MHz



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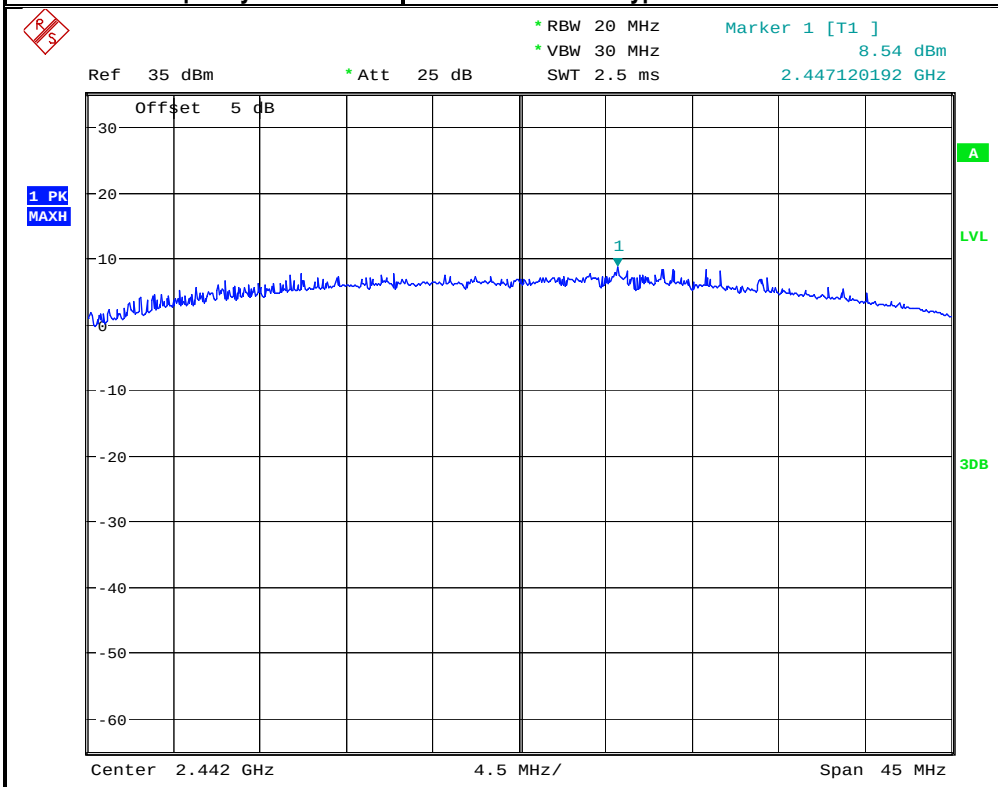
Plot #20

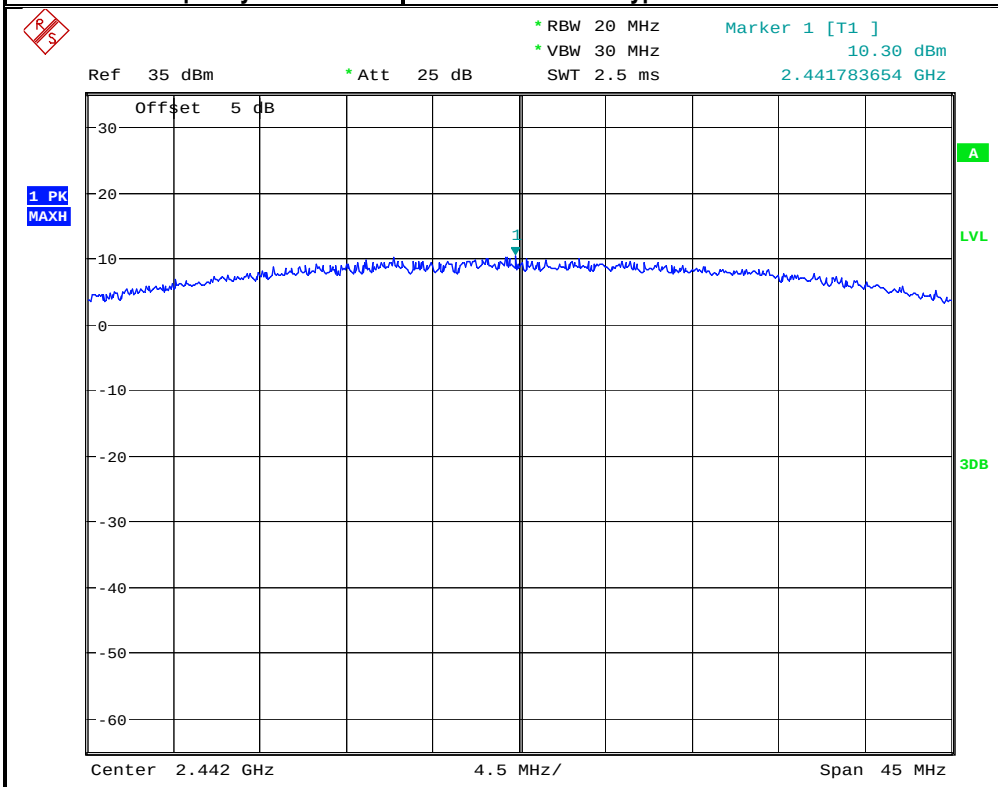
Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 7 - 40 MHz



Date: 29.AUG.2017 17:44:46

Plot #21

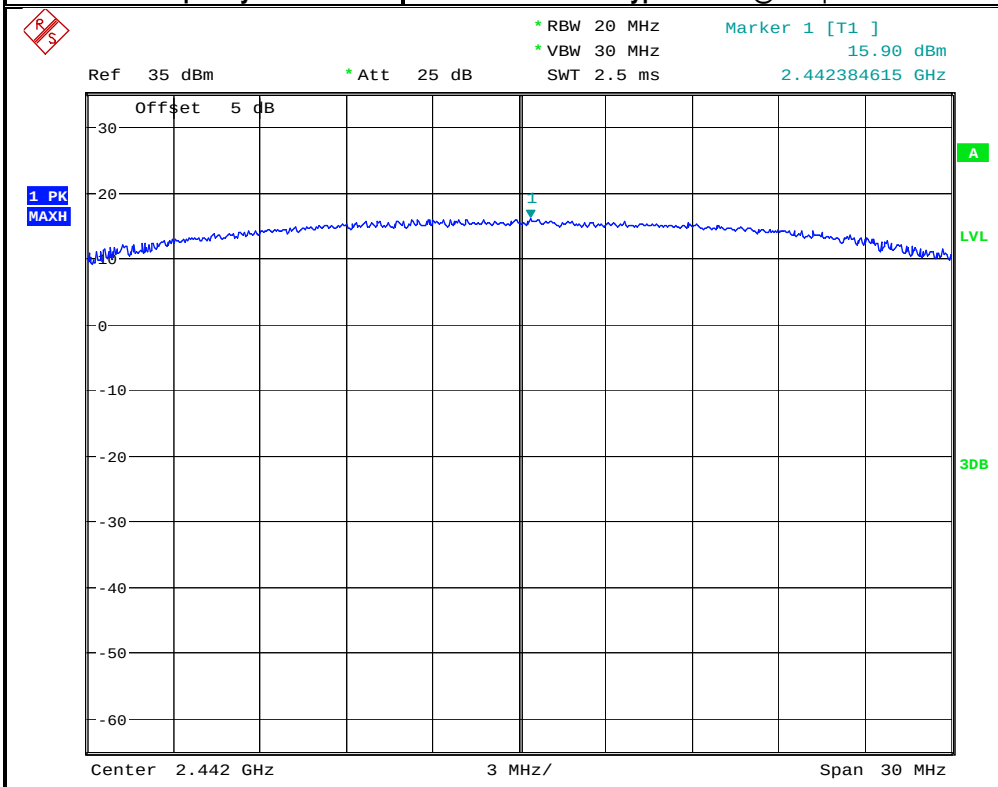
Channel Frequency 2442 MHz | **Modulation/Packet Type:** MCS 32 - 40 MHz



Date: 29.AUG.2017 17:45:55

Plot #22

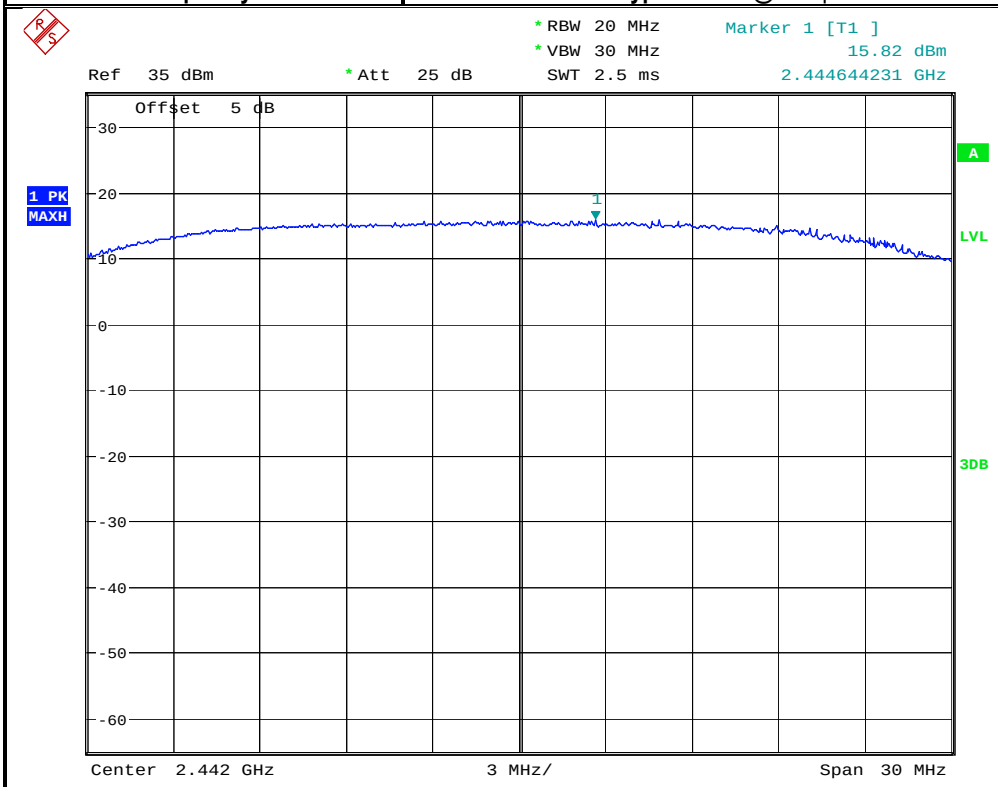
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 6Mbps



Date: 29.AUG.2017 17:51:57

Plot #23

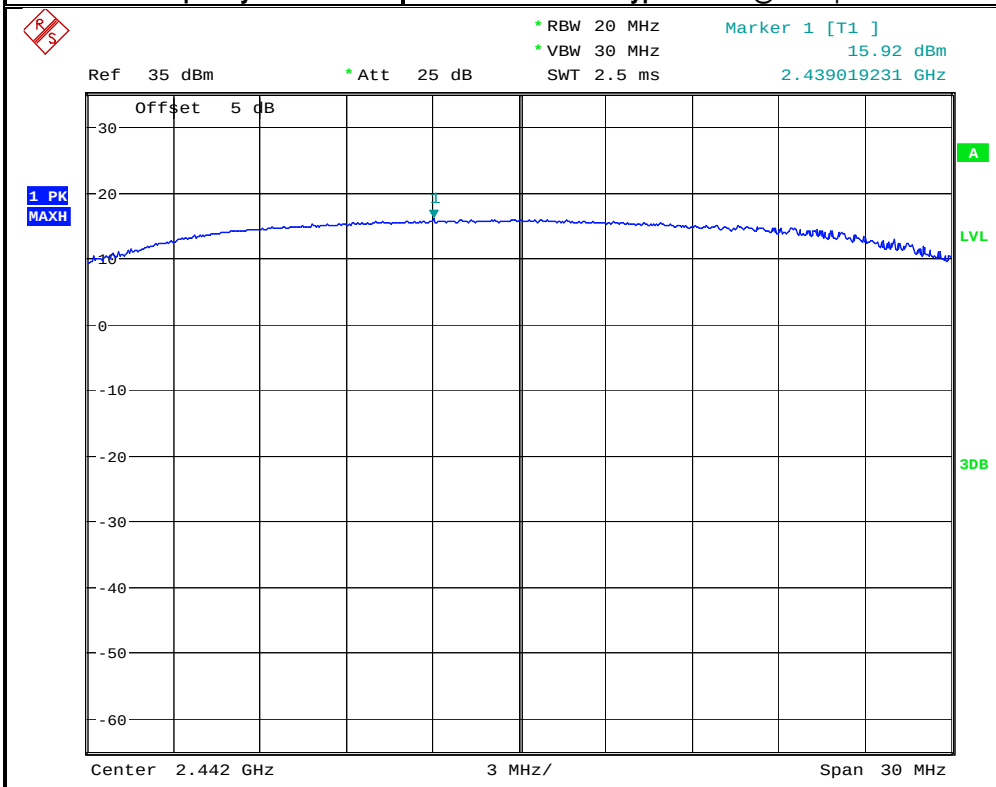
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 9Mbps



Date: 29.AUG.2017 17:53:21

Plot #24

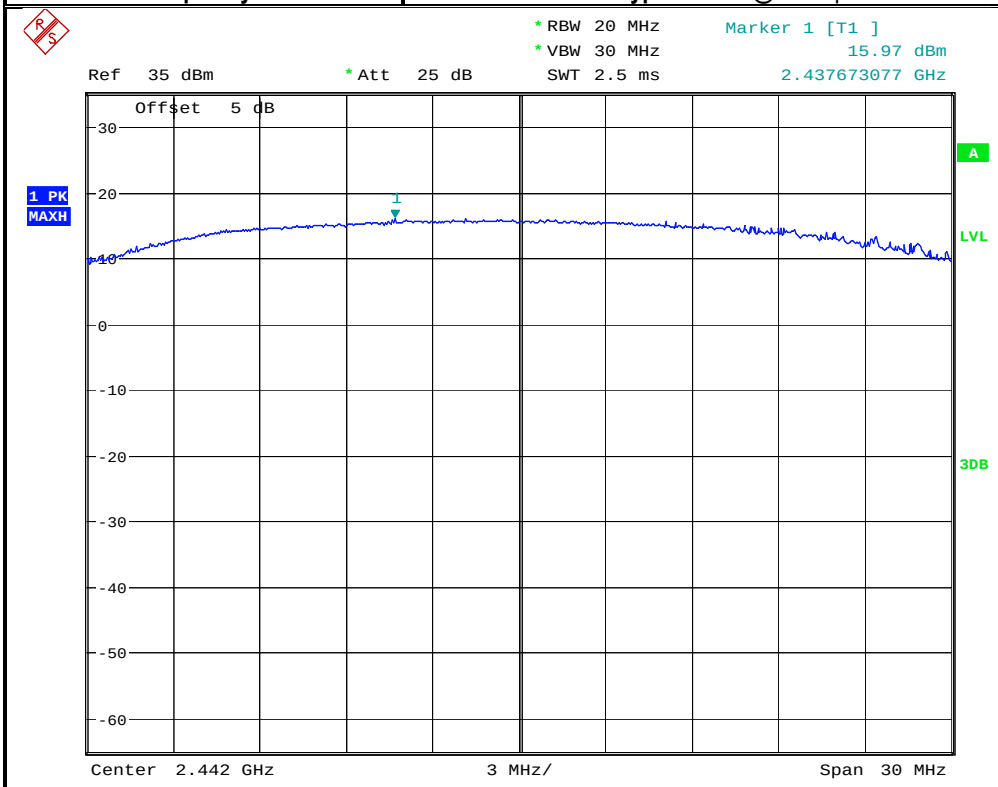
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 12Mbps



Date: 29.AUG.2017 17:54:23

Plot #25

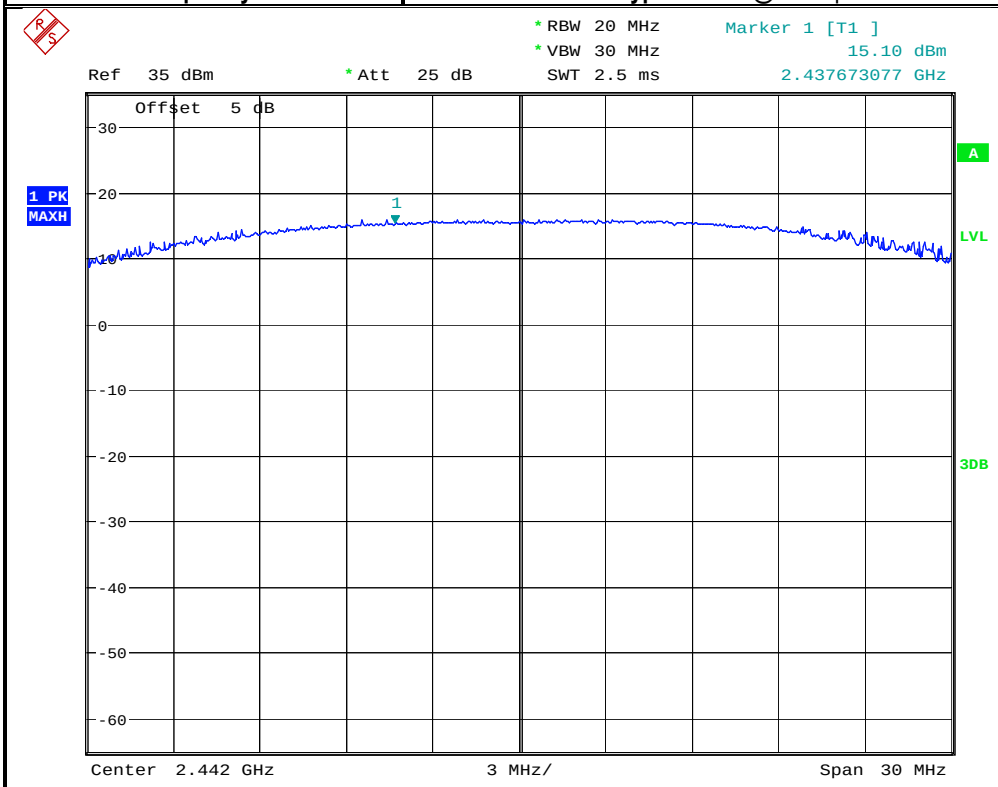
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 18Mbps



Date: 29.AUG.2017 17:55:06

Plot #25

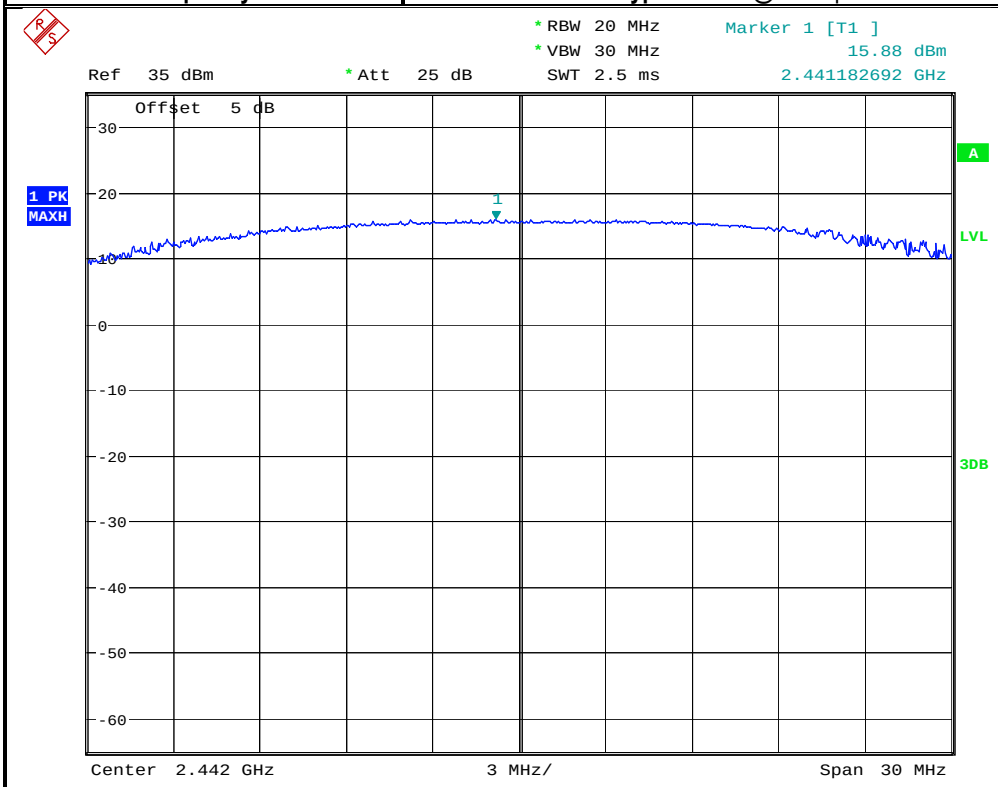
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 24Mbps



Date: 29.AUG.2017 17:55:53

Plot #26

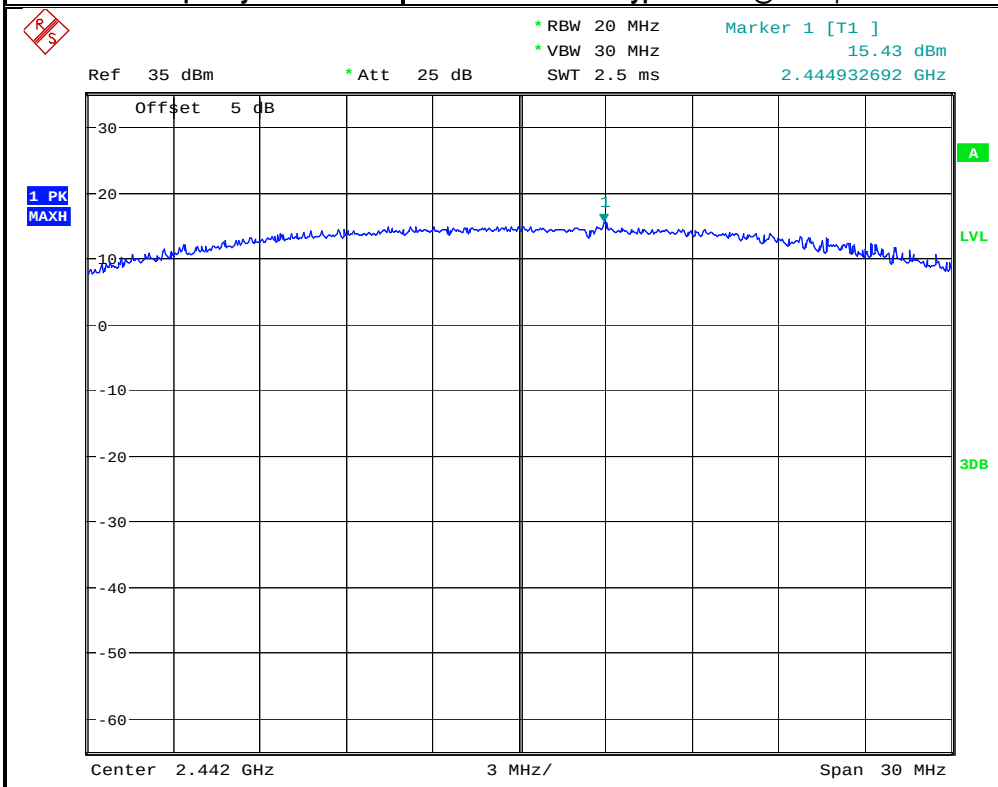
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 36Mbps



Date: 29.AUG.2017 17:56:51

Plot #27

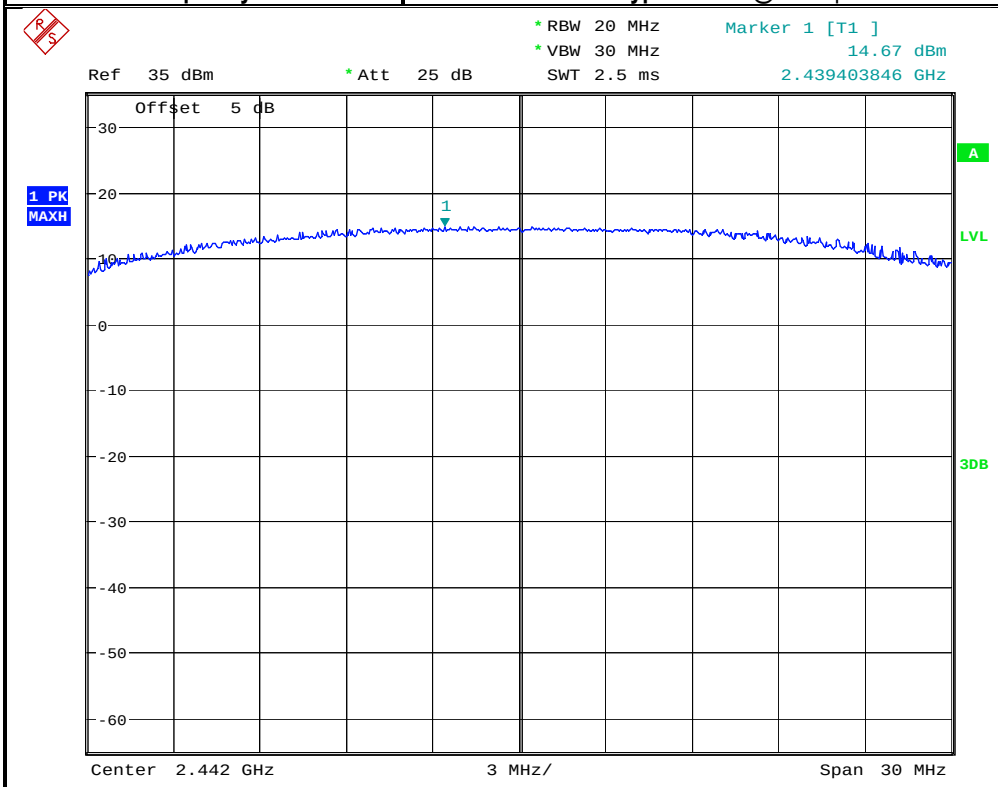
Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 48Mbps



Date: 29.AUG.2017 17:57:37

Plot #28

Channel Frequency 2442 MHz | **Modulation/Packet Type:** OFDM @ 54Mbps



Date: 29.AUG.2017 17:58:27

8.2 Power Spectral Density

8.2.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

Spectrum Analyzer settings for Peak PSD method:

- Set analyzer center frequency to DTS channel center frequency
- Set the span to 1.5 x DTS bandwidth
- Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz
- Set the VBW ≥ 3 x RBW
- Detector = Peak
- Sweep time = Auto couple
- Trace mode = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level within the RBW
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

8.2.2 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.

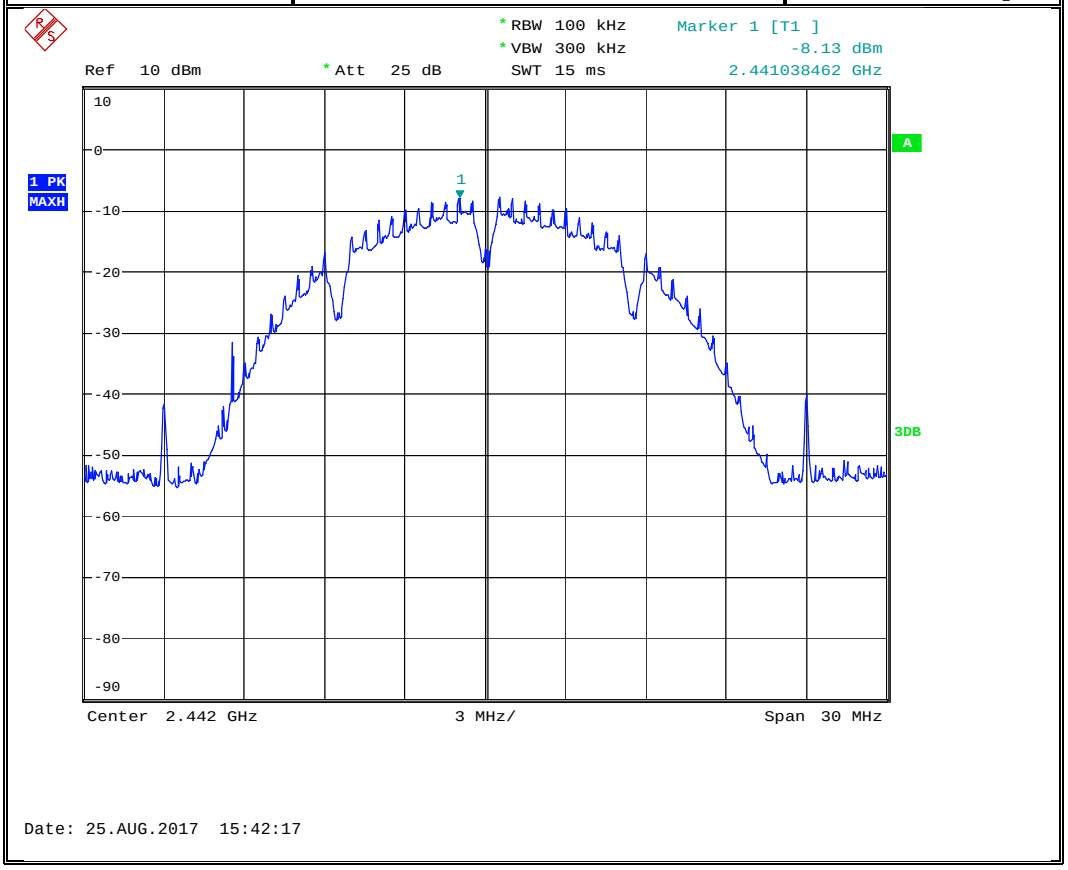
8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23° C	1	DSSS, MCS, OFDM	5 VDC	1.575 dBi

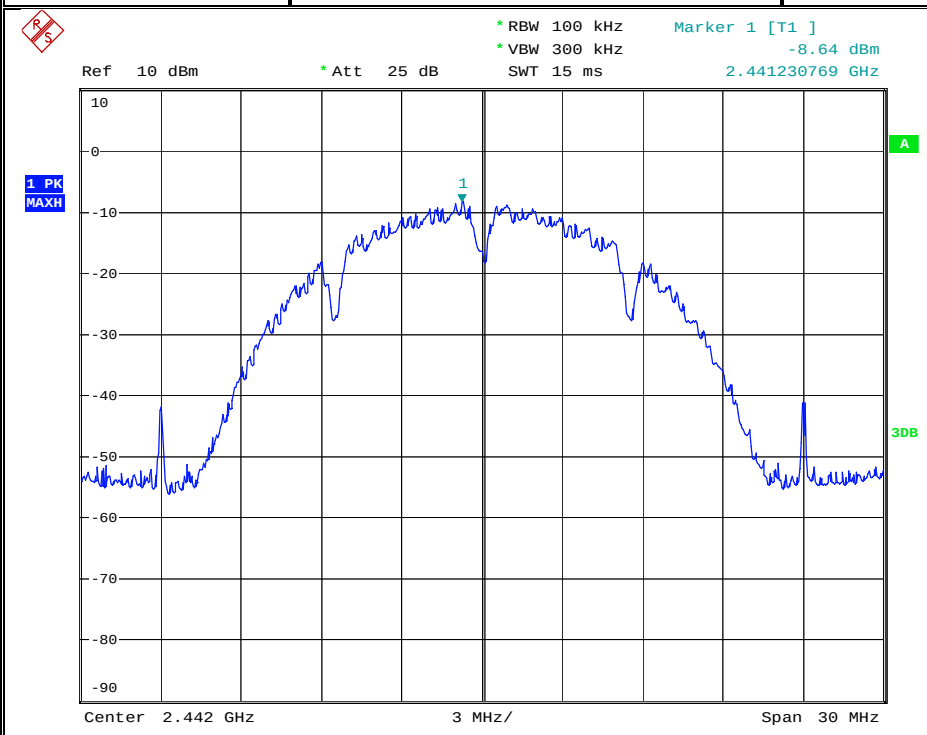
8.2.4 Measurement result:

Plot #	Frequency (MHz)	Maximum Power Spectral Density (dBm/3 kHz)	PSD Adjusted for Antenna Gain (dBm/3 kHz)	Limit (dBm / 3 kHz)	Result
1	2442	-8.13	-6.56	8	Pass
2	2442	-8.64	-7.07	8	Pass
3	2442	-8.62	-7.05	8	Pass
4	2442	-8.73	-7.16	8	Pass
5	2442	-8.87	-7.30	8	Pass
6	2442	-17.52	-15.95	8	Pass
7	2442	-8.77	-7.20	8	Pass
8	2442	-17.72	-16.15	8	Pass
9	2442	-8.48	-6.91	8	Pass
10	2442	-17.54	-15.97	8	Pass
11	2442	-8.89	-7.32	8	Pass
12	2442	-17.61	-16.04	8	Pass
13	2442	-8.77	-7.20	8	Pass
14	2442	-14.43	-12.86	8	Pass
15	2442	-10.08	-8.51	8	Pass
16	2442	-19.07	-17.50	8	Pass
17	2442	-10.05	-8.48	8	Pass
18	2442	-19.09	-17.52	8	Pass
19	2442	-19.10	-17.53	8	Pass
20	2442	-19.12	-17.55	8	Pass
21	2442	-19.08	-17.51	8	Pass
22	2442	-8.00	-6.43	8	Pass
23	2442	-8.43	-6.86	8	Pass
24	2442	-8.17	-6.60	8	Pass
25	2442	-8.04	-6.47	8	Pass
26	2442	-8.02	-6.45	8	Pass
27	2442	-8.01	-6.44	8	Pass
28	2442	-7.99	-6.42	8	Pass
29	2442	-9.33	-7.76	8	Pass

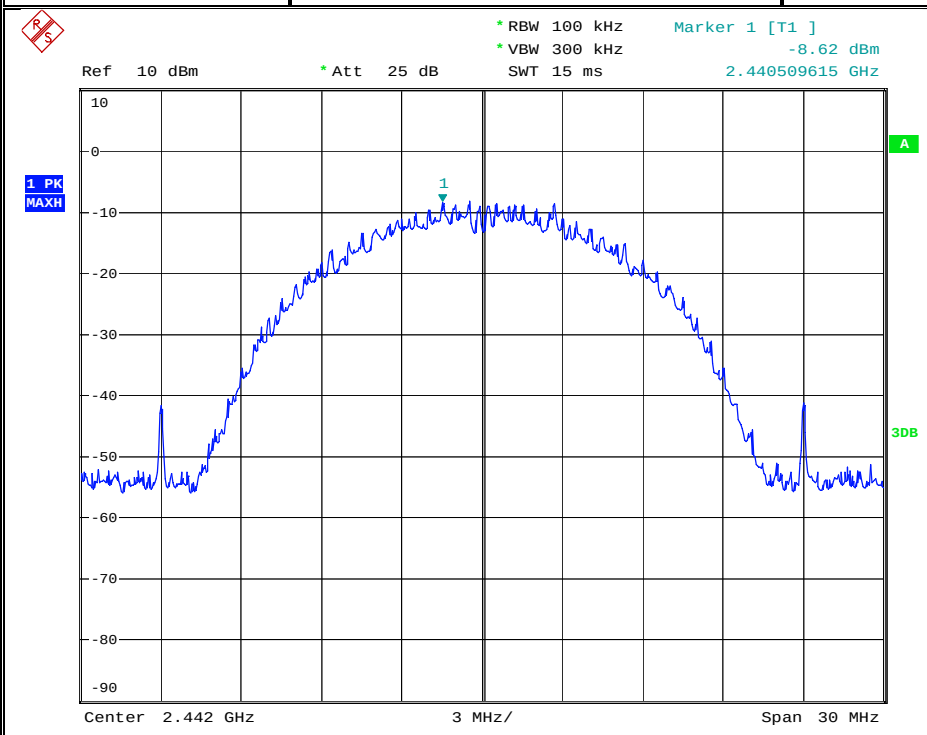
Power Spectral Density		
2442 MHz	Mode: DSSS	Data Rate: 1Mbps



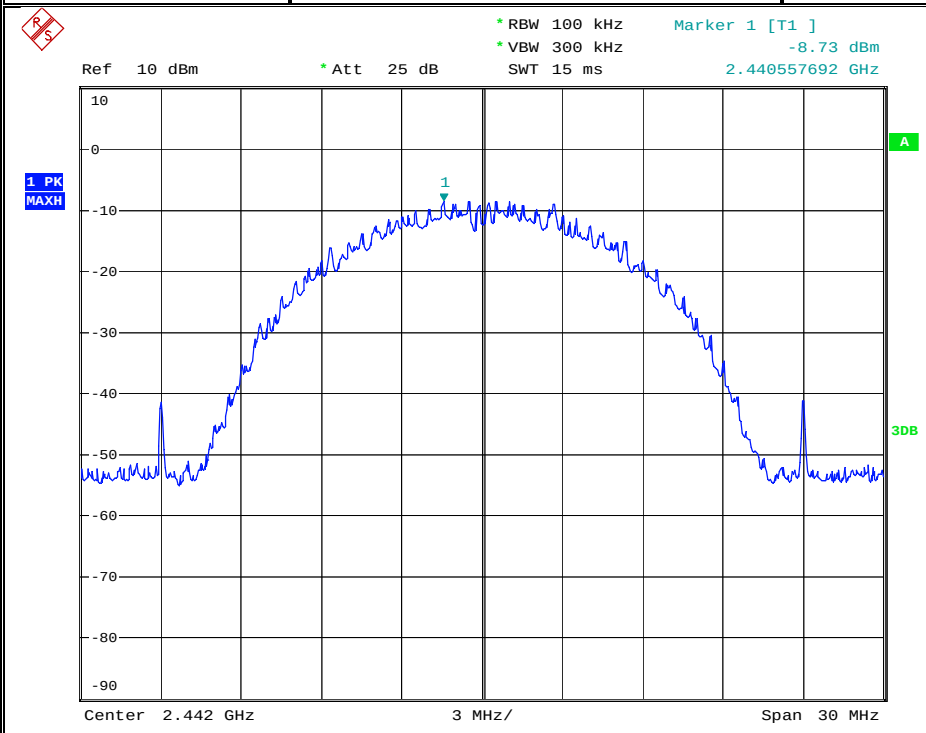
Power Spectral Density		
2442 MHz	Mode: DSSS	Data Rate: 2Mbps



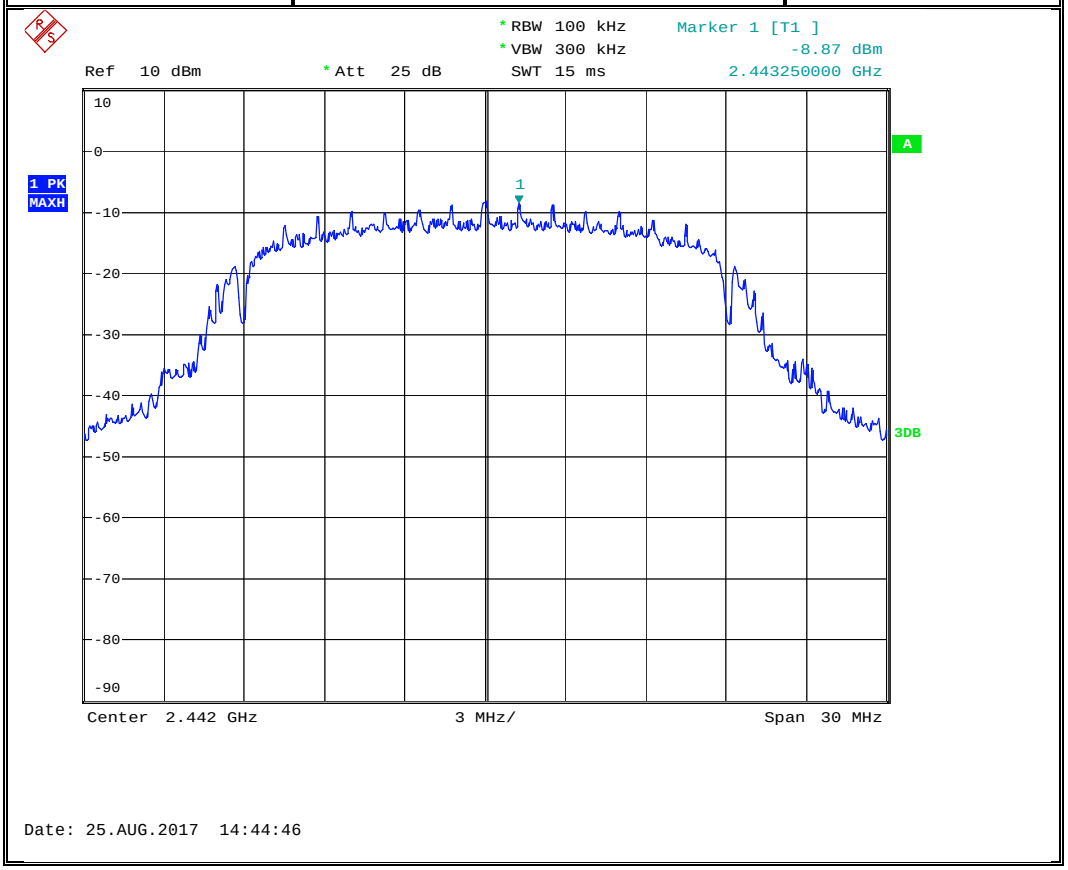
Power Spectral Density		
2442 MHz	Mode: DSSS	Data Rate: 5.5Mbps



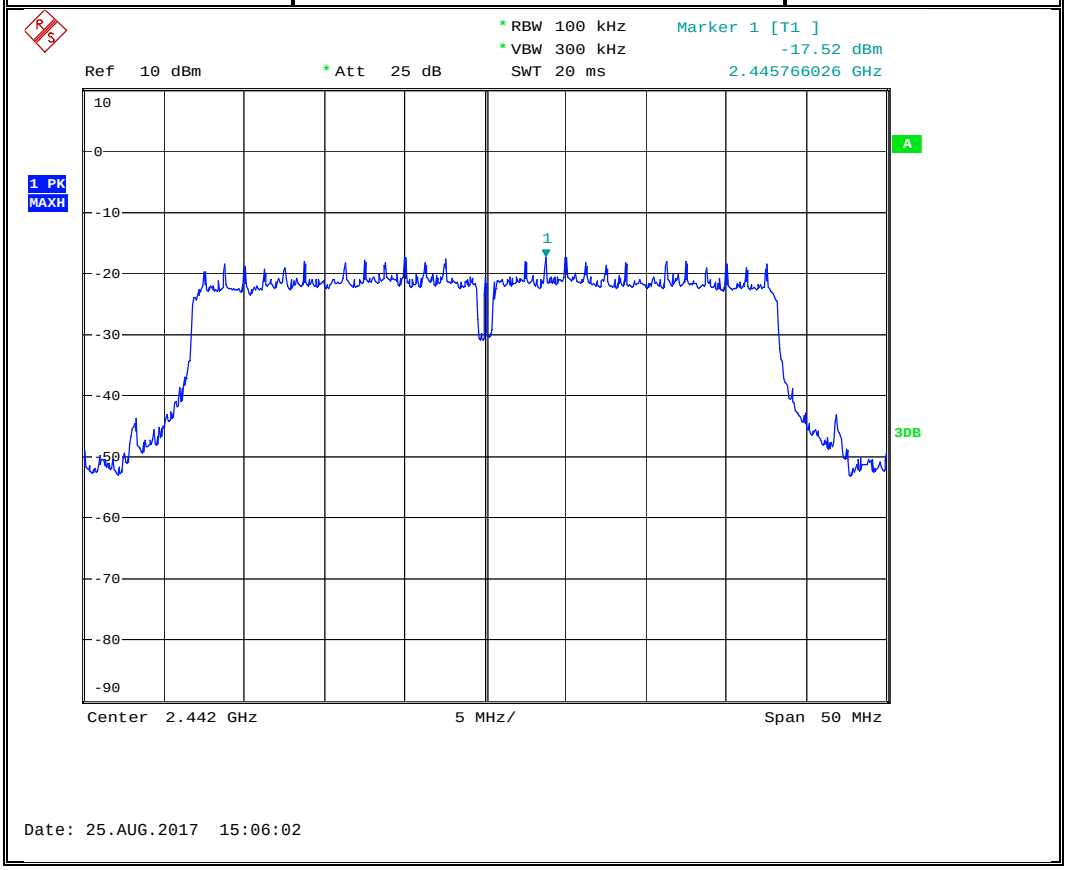
Power Spectral Density		
2442 MHz	Mode: DSSS	Data Rate: 11Mbps



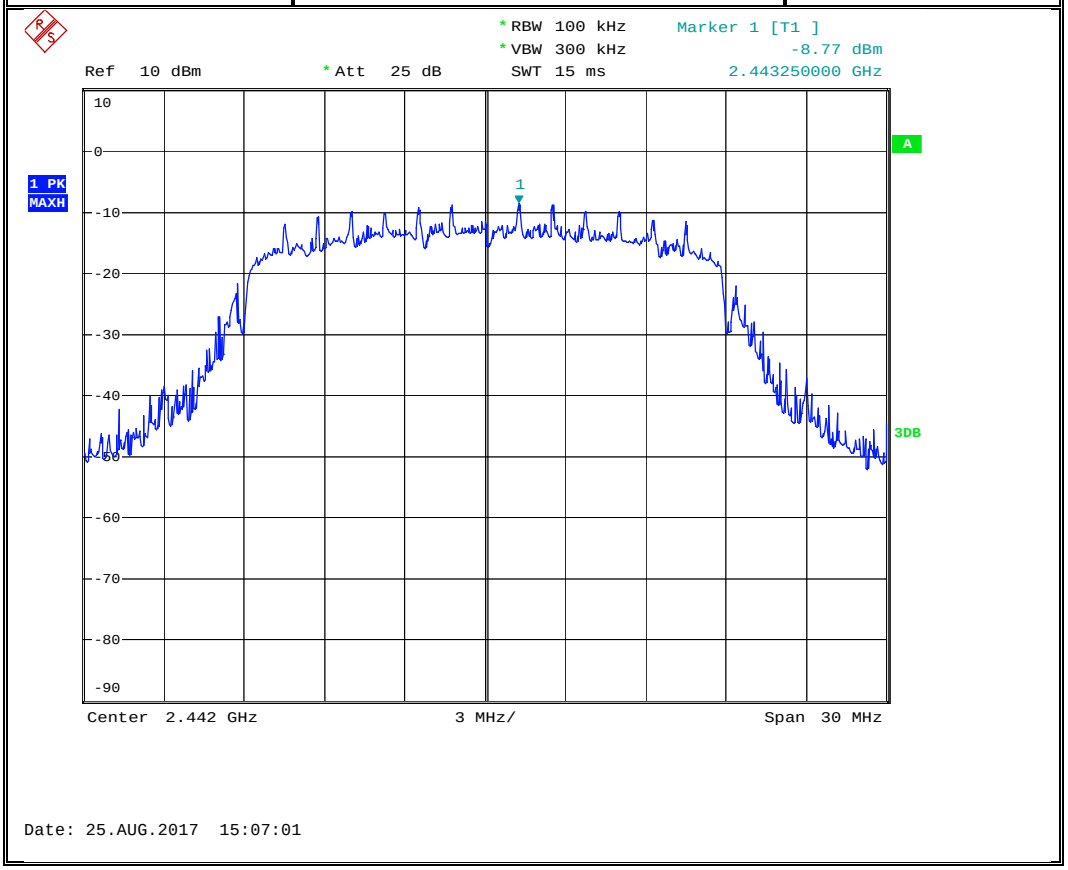
Power Spectral Density		
2442 MHz	Mode: MCS 0	Bandwidth:20 MHz



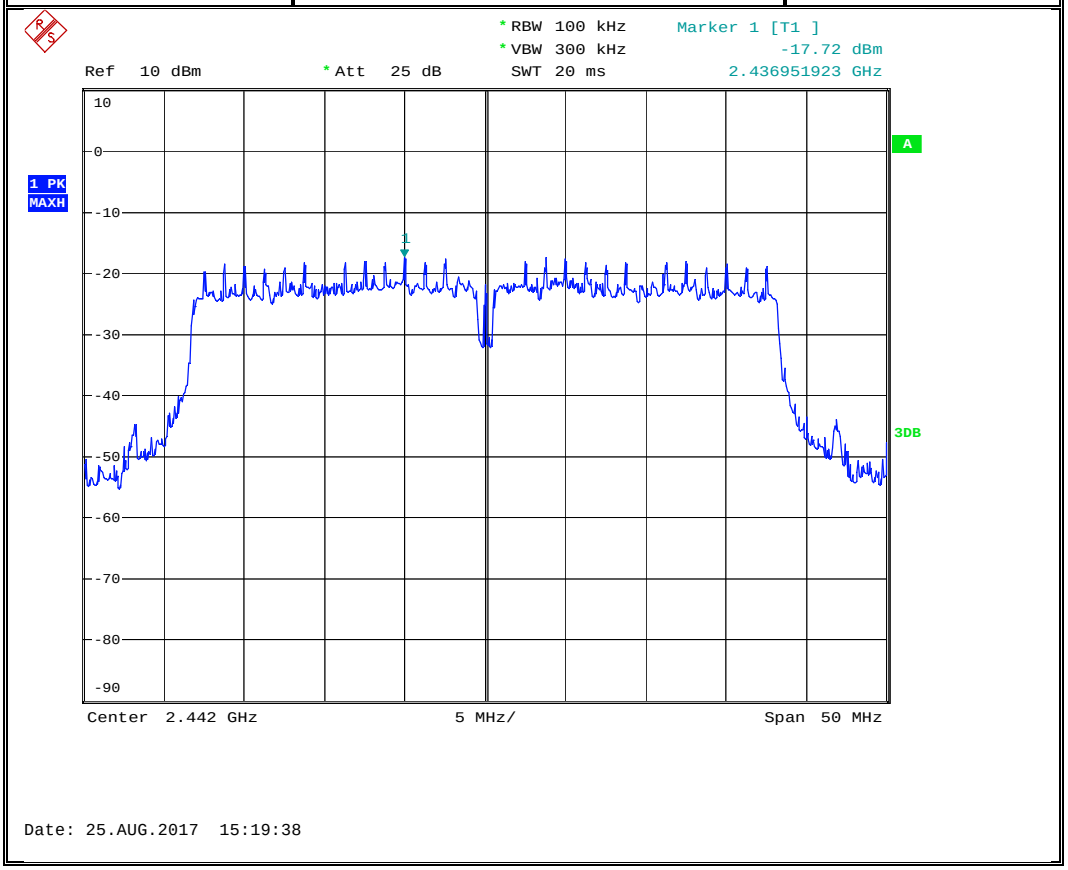
Power Spectral Density		
2442 MHz	Mode: MCS 0	Bandwidth:40 MHz



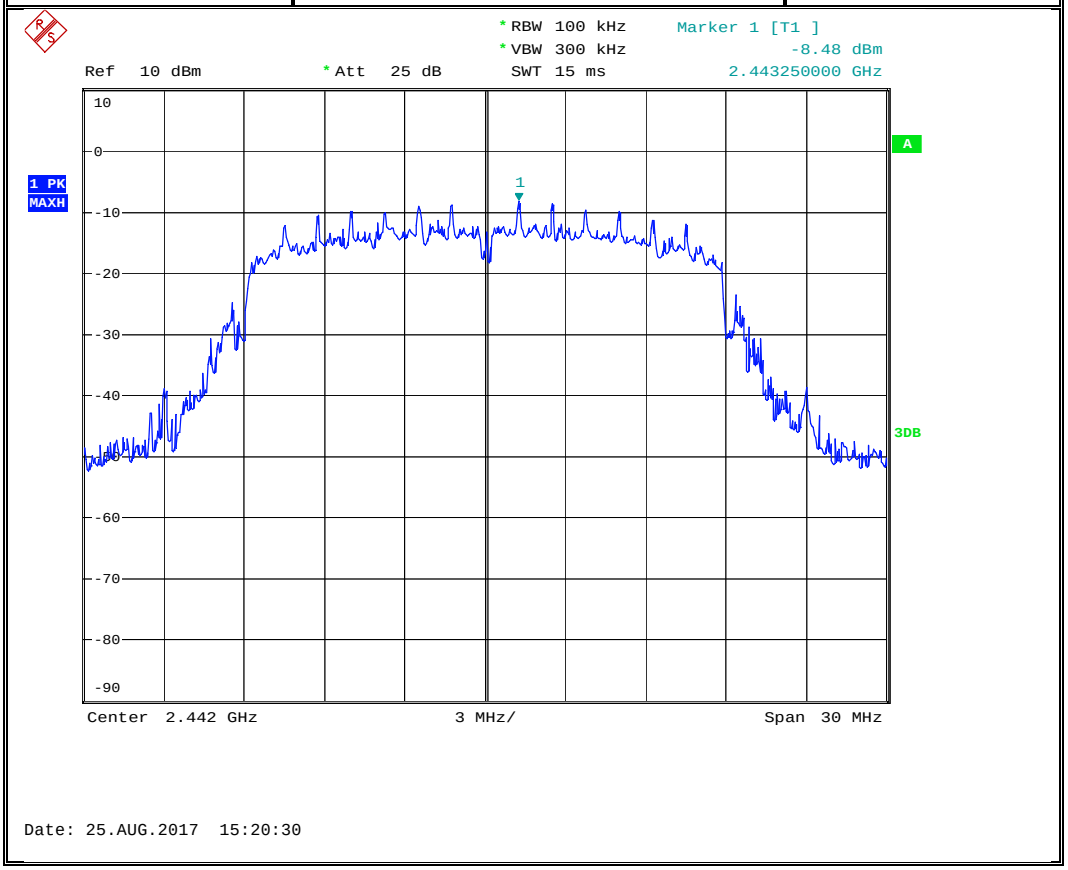
Power Spectral Density		
2442 MHz	Mode: MCS 1	Bandwidth:20 MHz



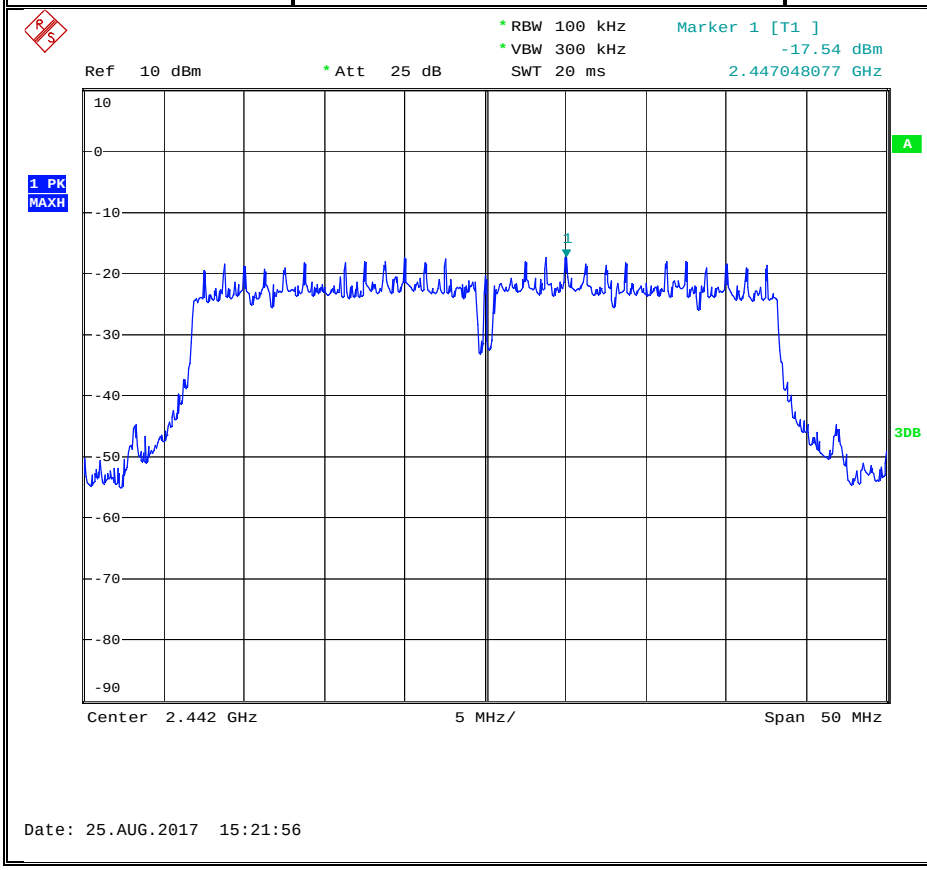
Power Spectral Density		
2442 MHz	Mode: MCS 1	Bandwidth:40 MHz



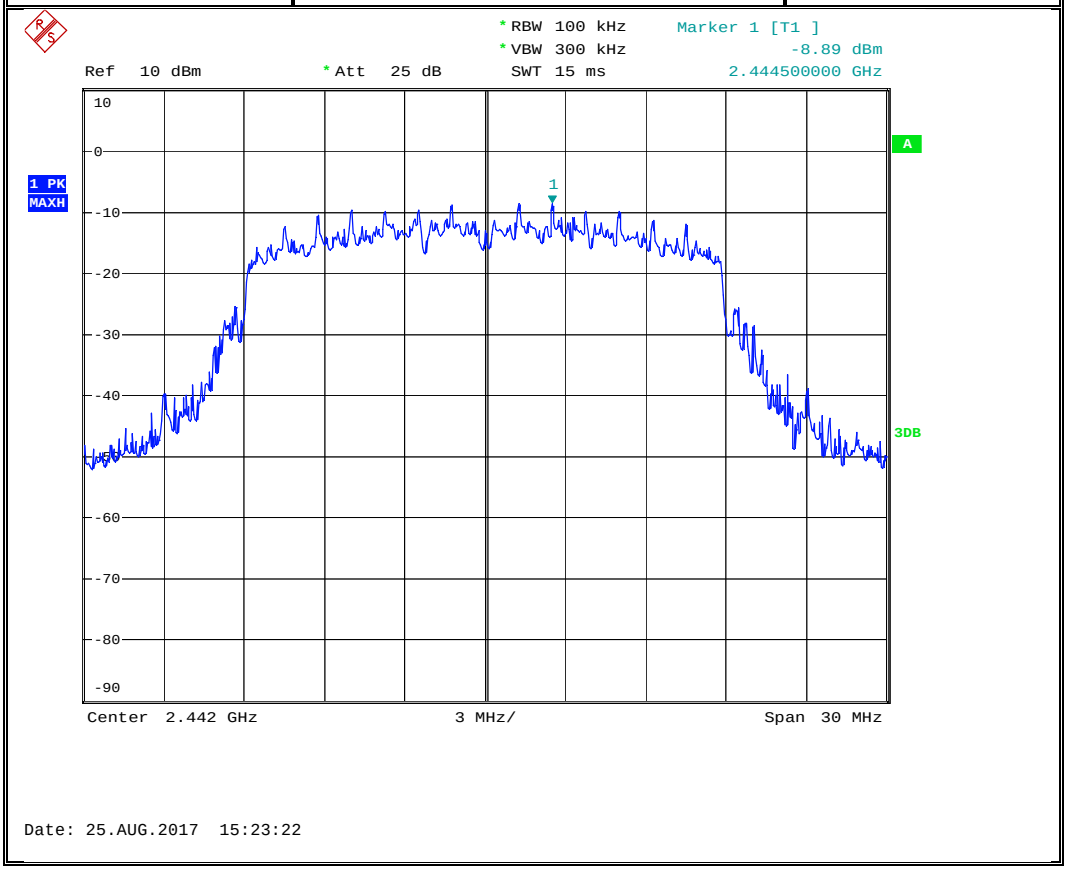
Power Spectral Density		
2442 MHz	Mode: MCS 2	Bandwidth:20 MHz



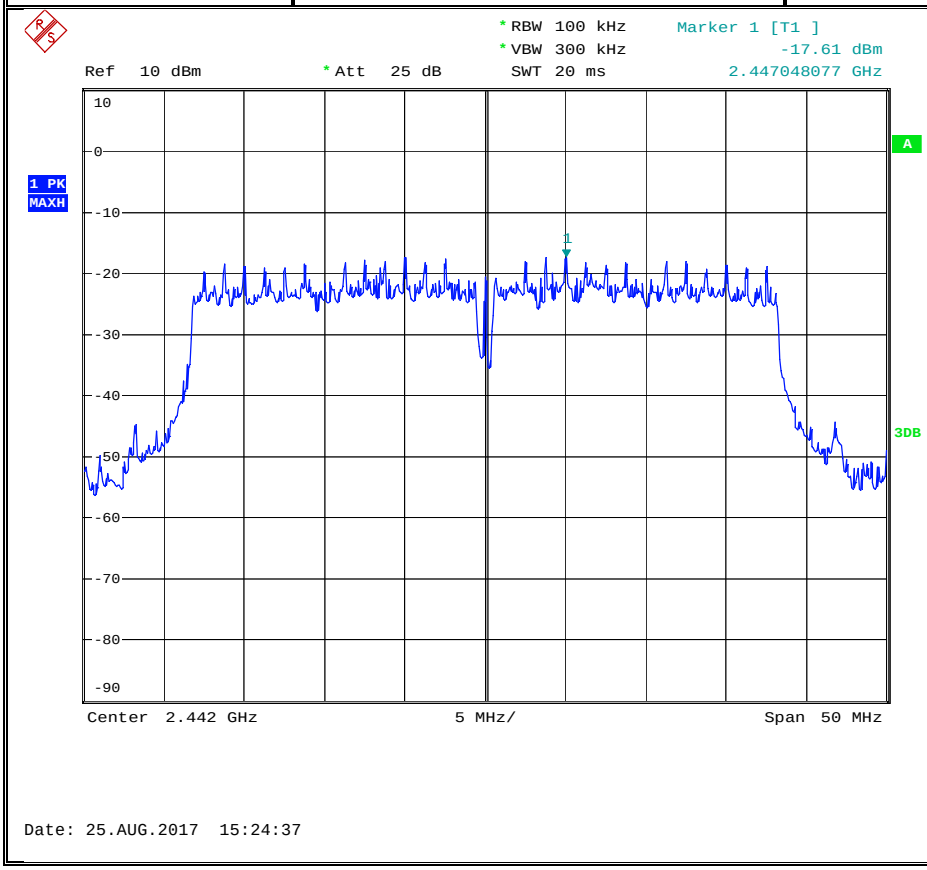
Power Spectral Density		
2442 MHz	Mode: MCS 2	Bandwidth:40 MHz



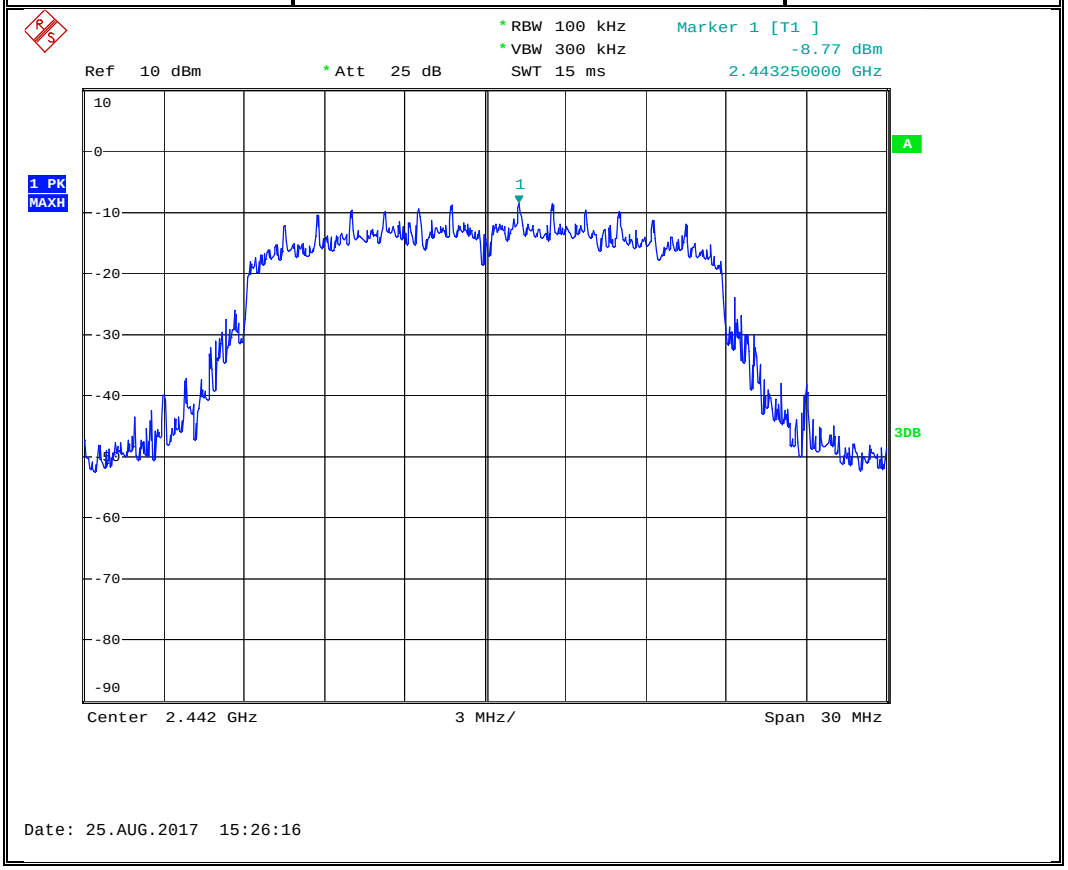
Power Spectral Density		
2442 MHz	Mode: MCS 3	Bandwidth:20 MHz



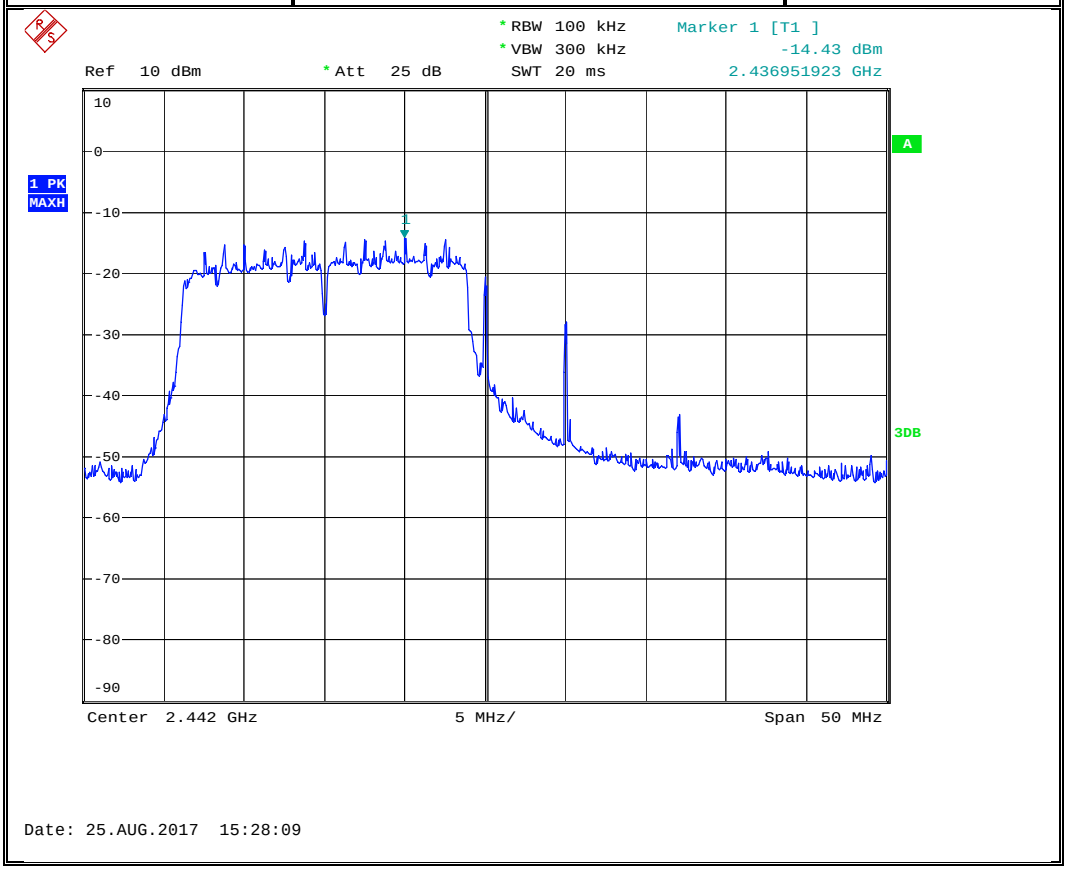
Power Spectral Density		
2442 MHz	Mode: MCS 3	Bandwidth:40 MHz



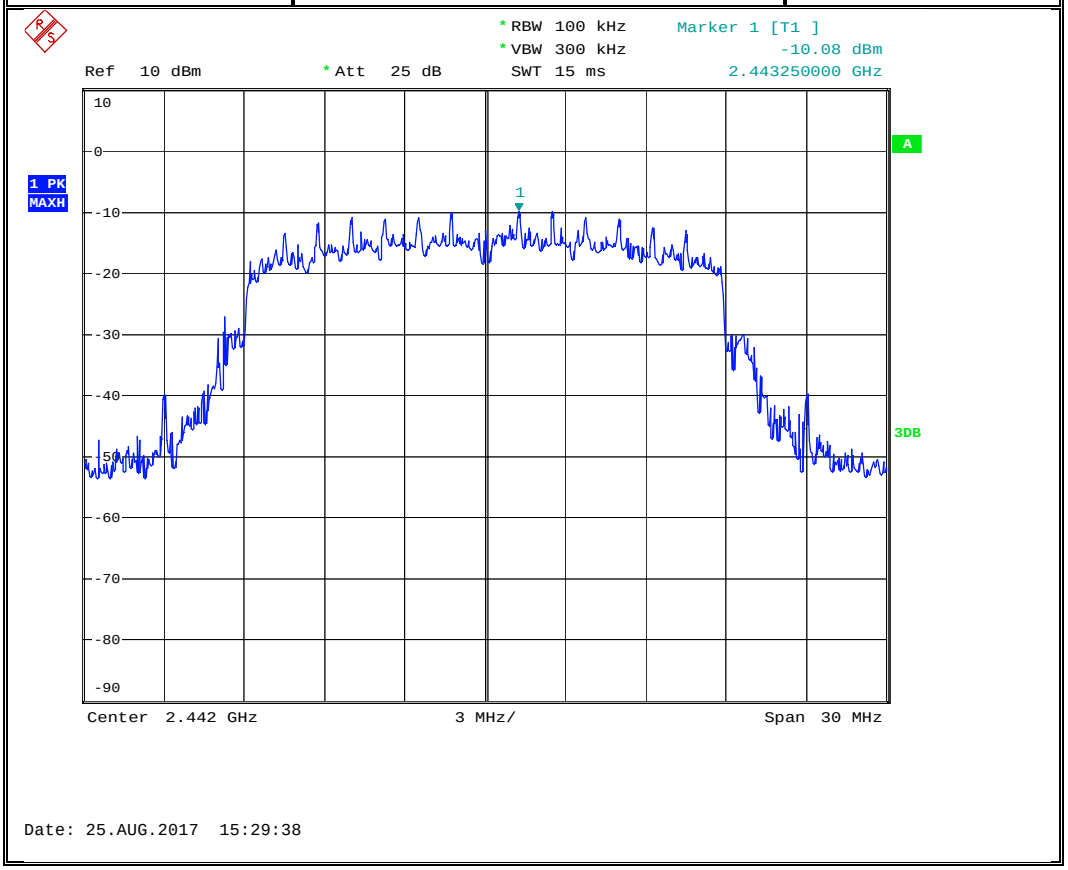
Power Spectral Density		
2442 MHz	Mode: MCS 4	Bandwidth:20 MHz



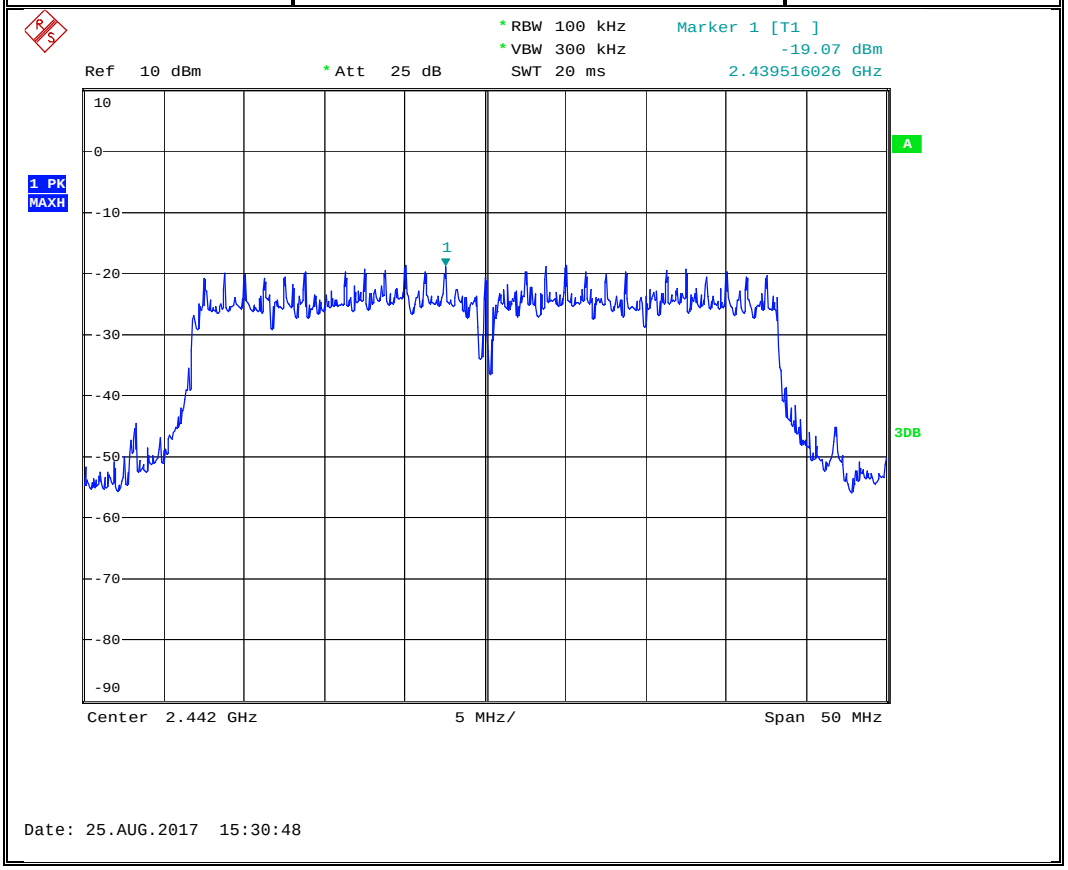
Power Spectral Density		
2442 MHz	Mode: MCS 4	Bandwidth:40 MHz



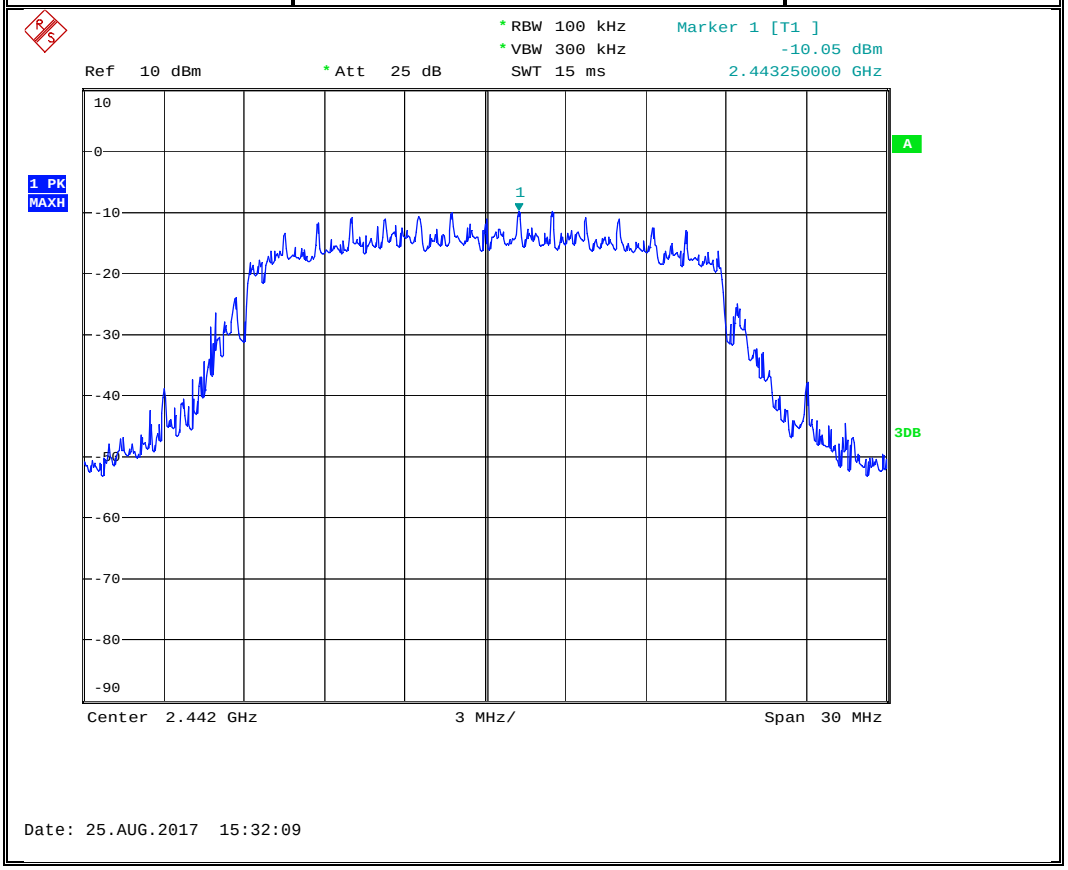
Power Spectral Density		
2442 MHz	Mode: MCS 5	Bandwidth:20 MHz



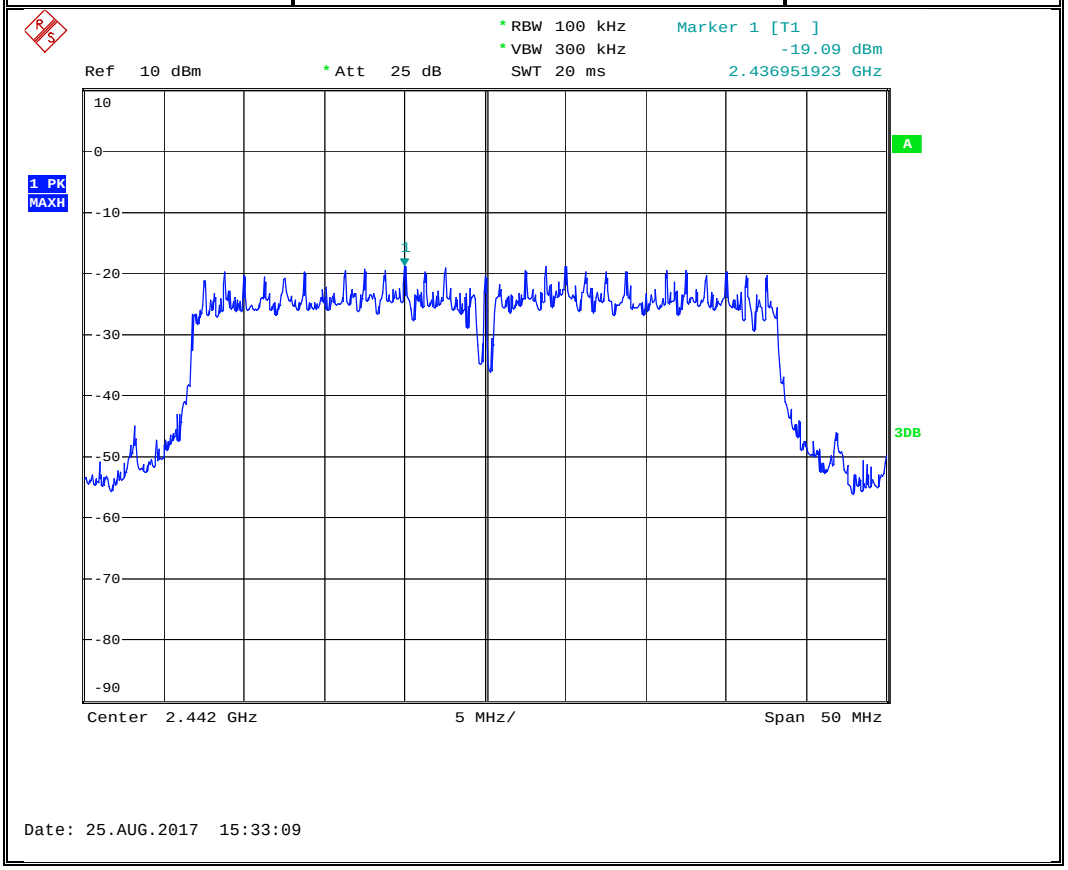
Power Spectral Density		
2442 MHz	Mode: MCS 5	Bandwidth:40 MHz



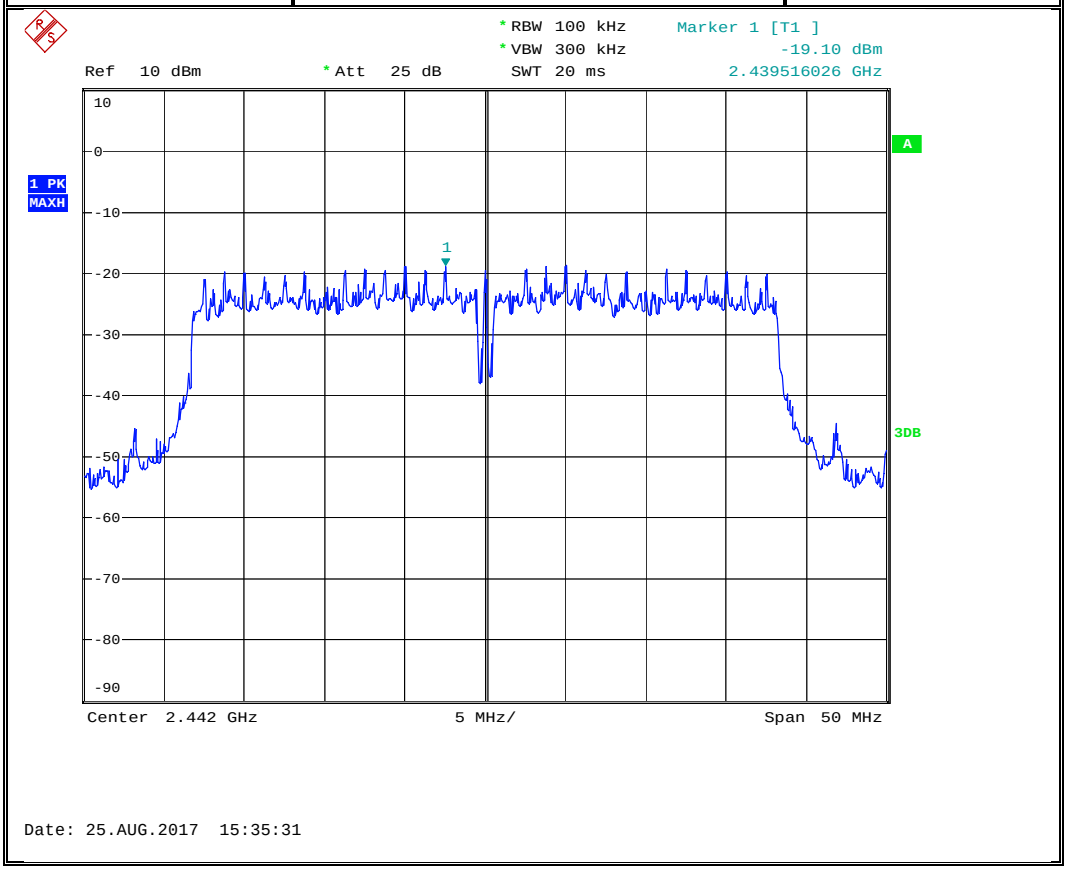
Power Spectral Density		
2442 MHz	Mode: MCS 6	Bandwidth:20 MHz



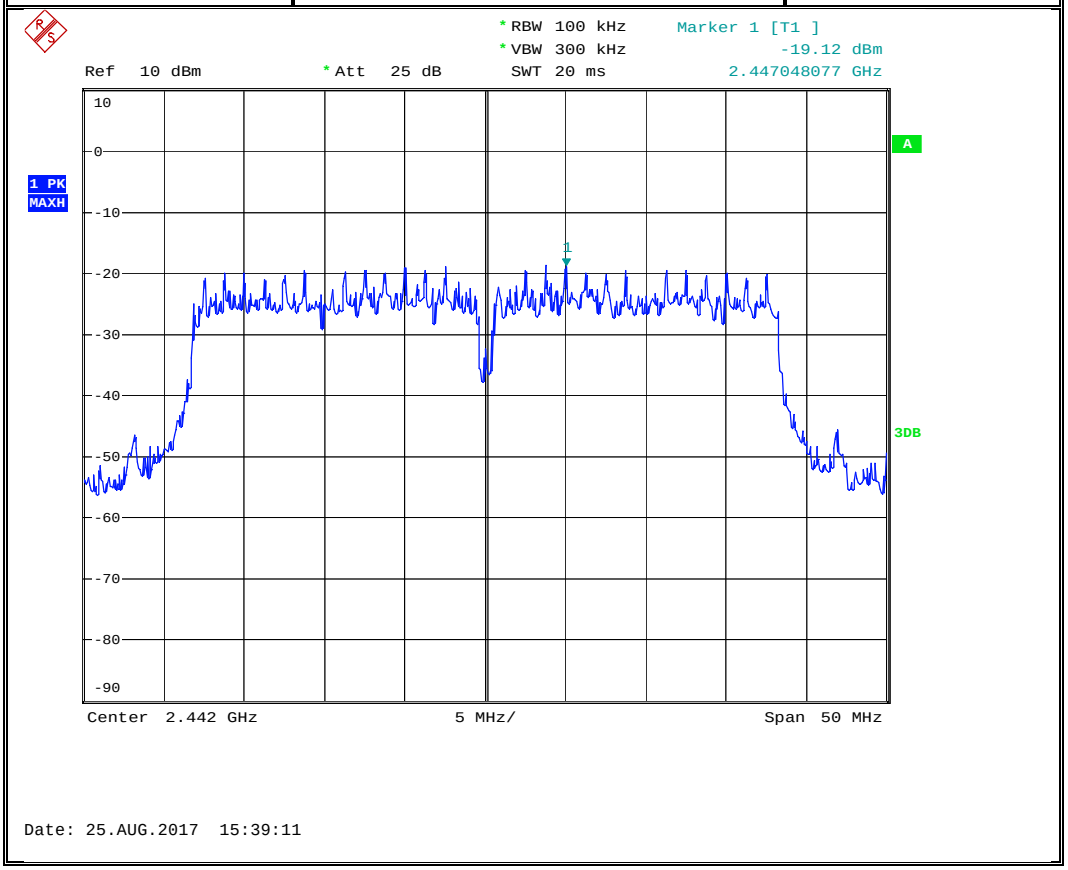
Power Spectral Density		
2442 MHz	Mode: MCS 6	Bandwidth:40 MHz



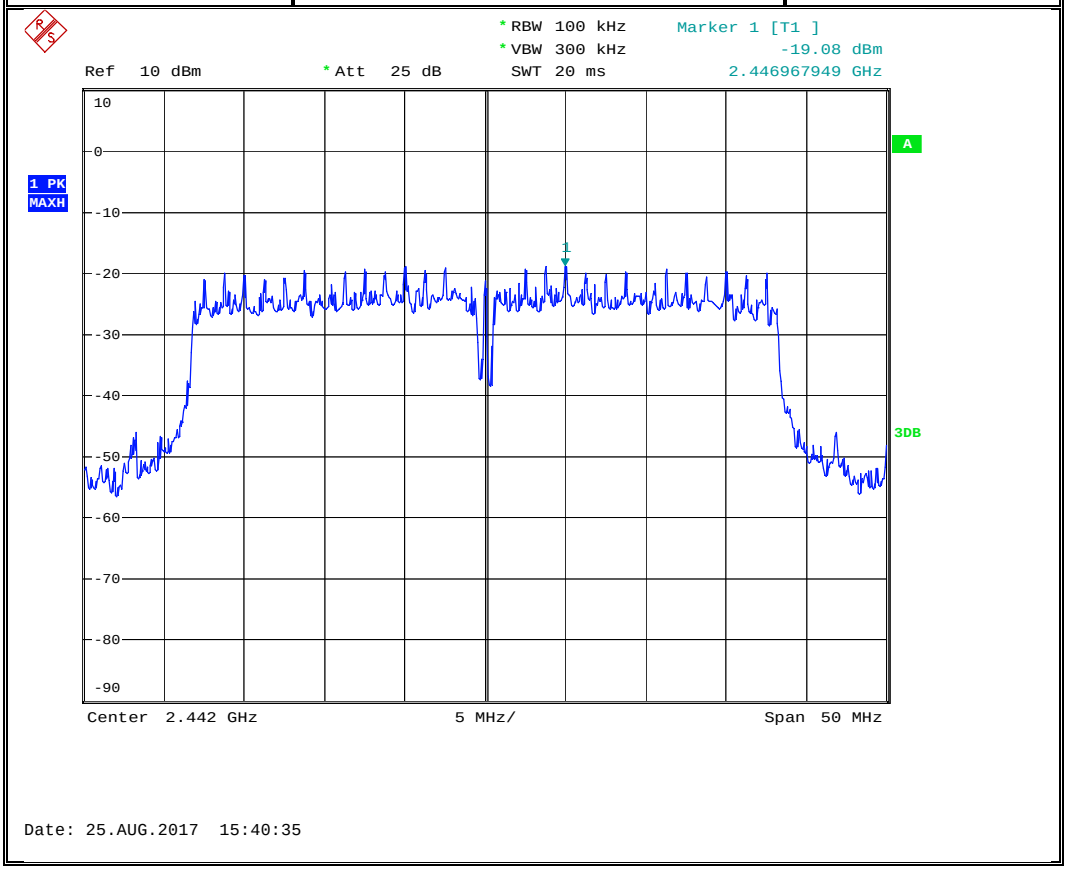
Power Spectral Density		
2442 MHz	Mode: MCS 7	Bandwidth:20 MHz



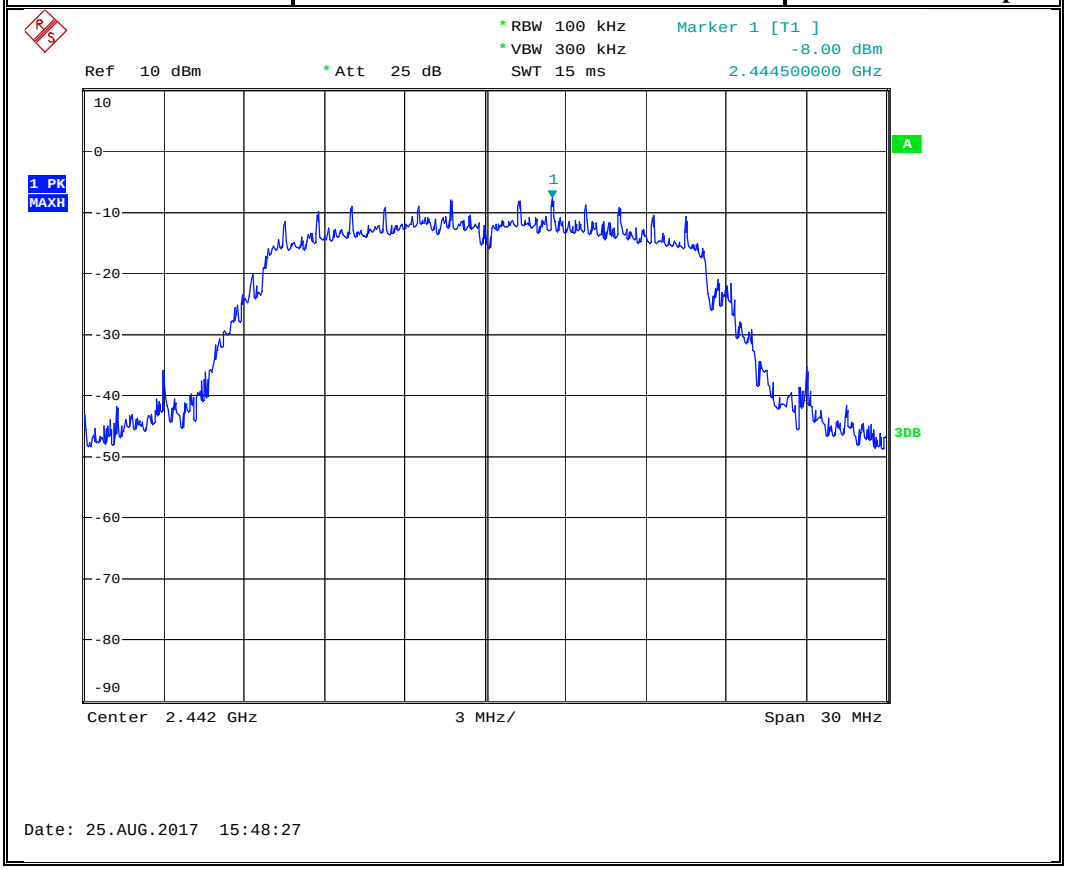
Power Spectral Density		
2442 MHz	Mode: MCS 7	Bandwidth:40 MHz



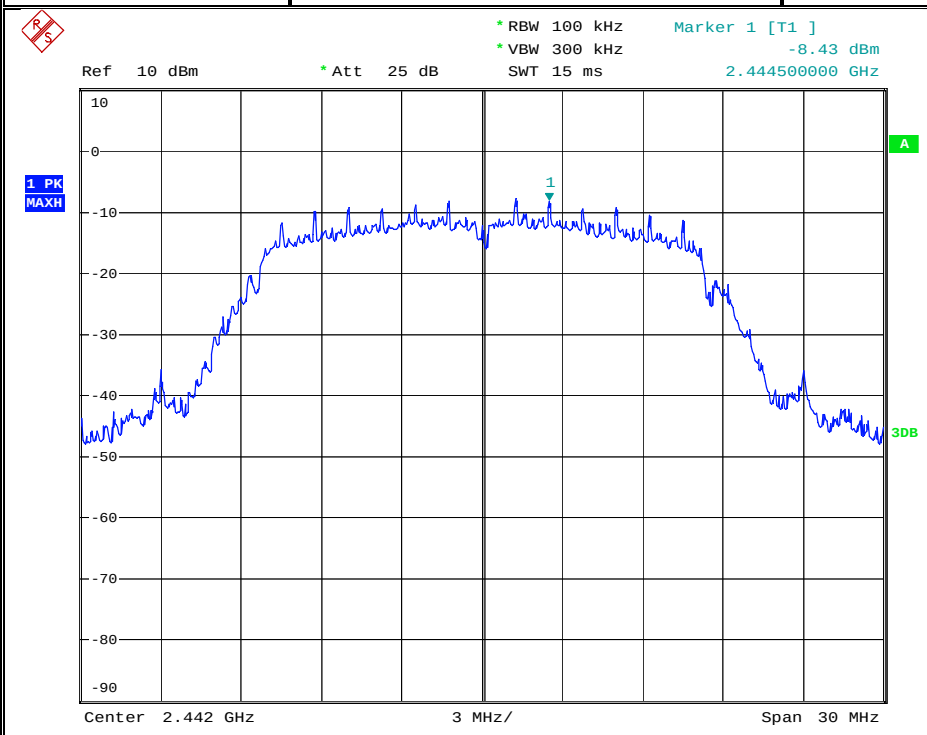
Power Spectral Density		
2442 MHz	Mode: MCS 32	Bandwidth:40 MHz



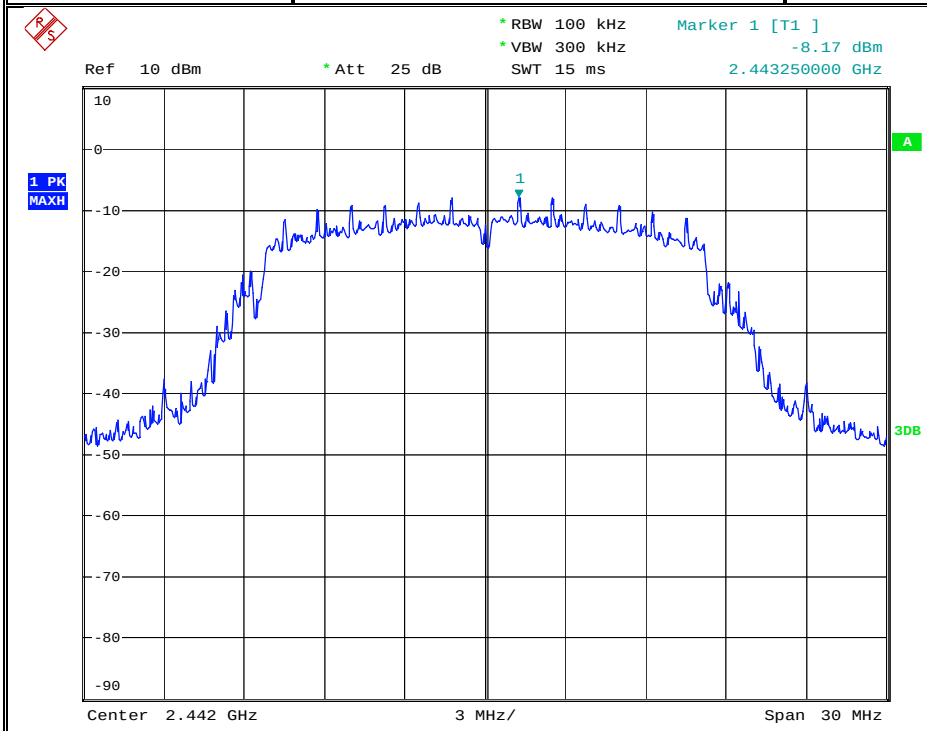
Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 6Mbps



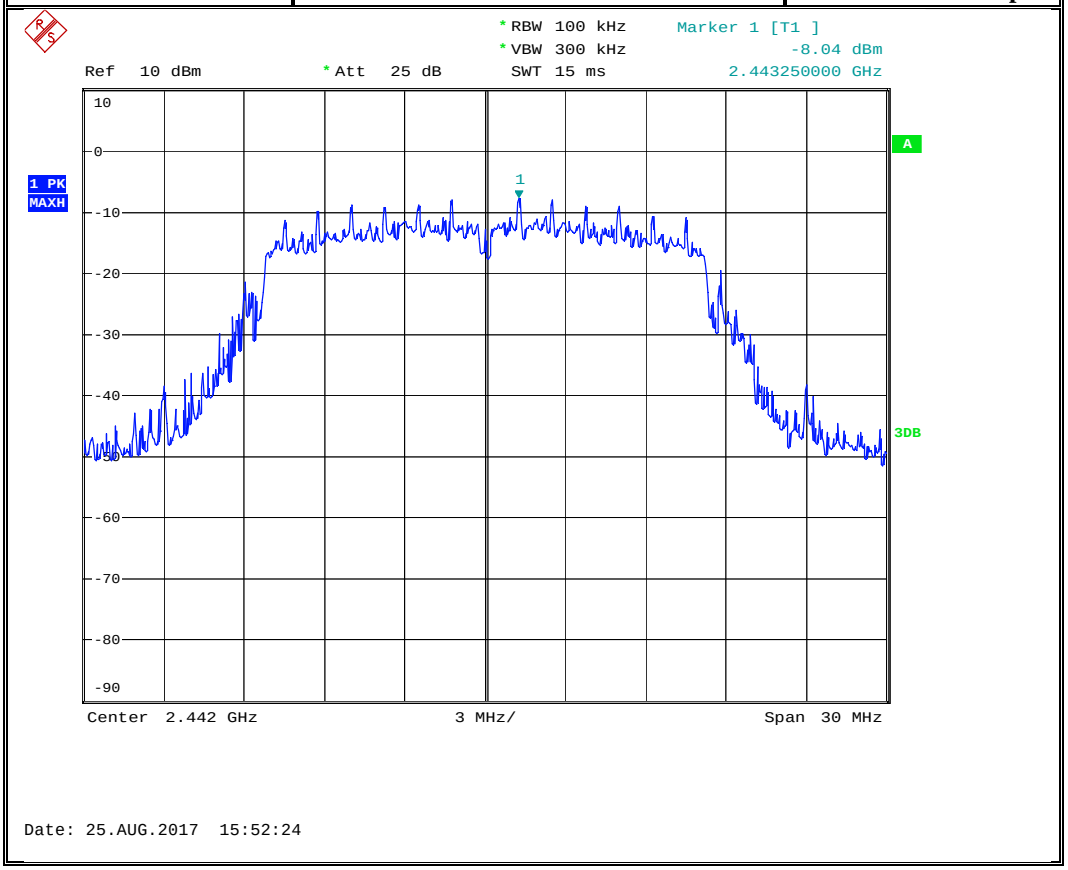
Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 9Mbps



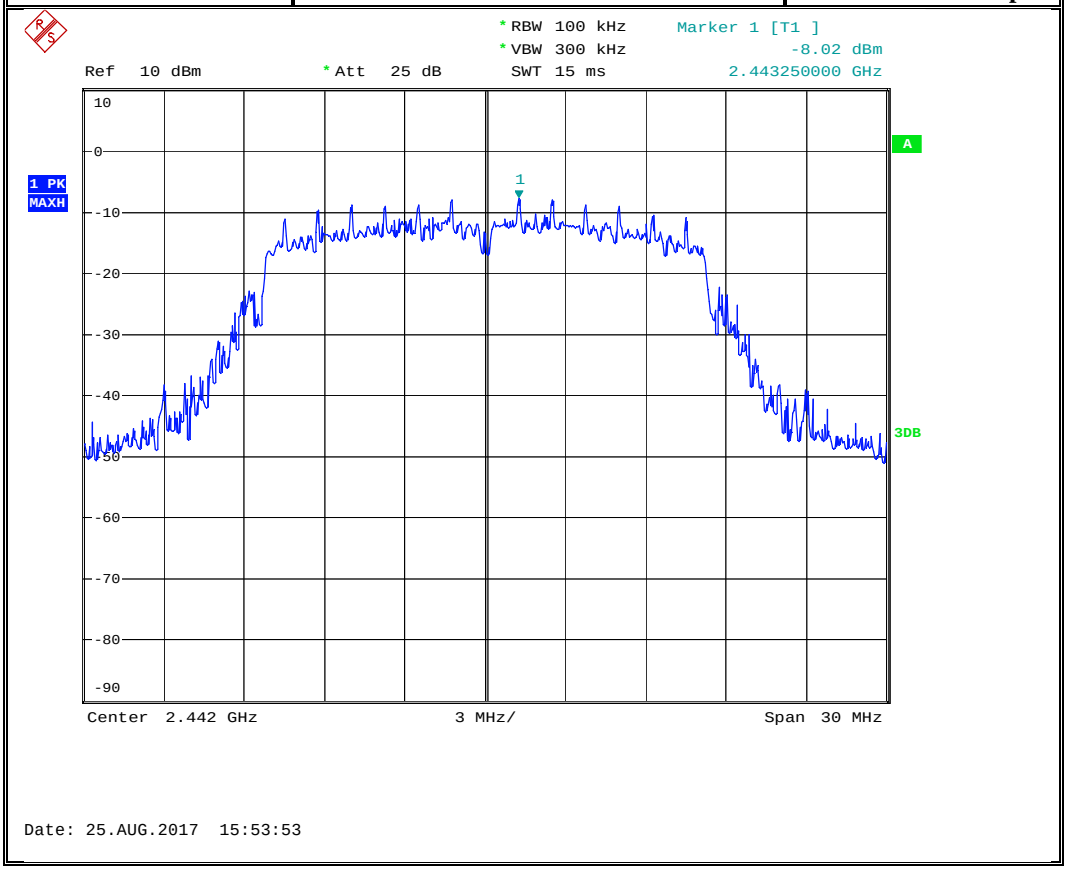
Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 12Mbps



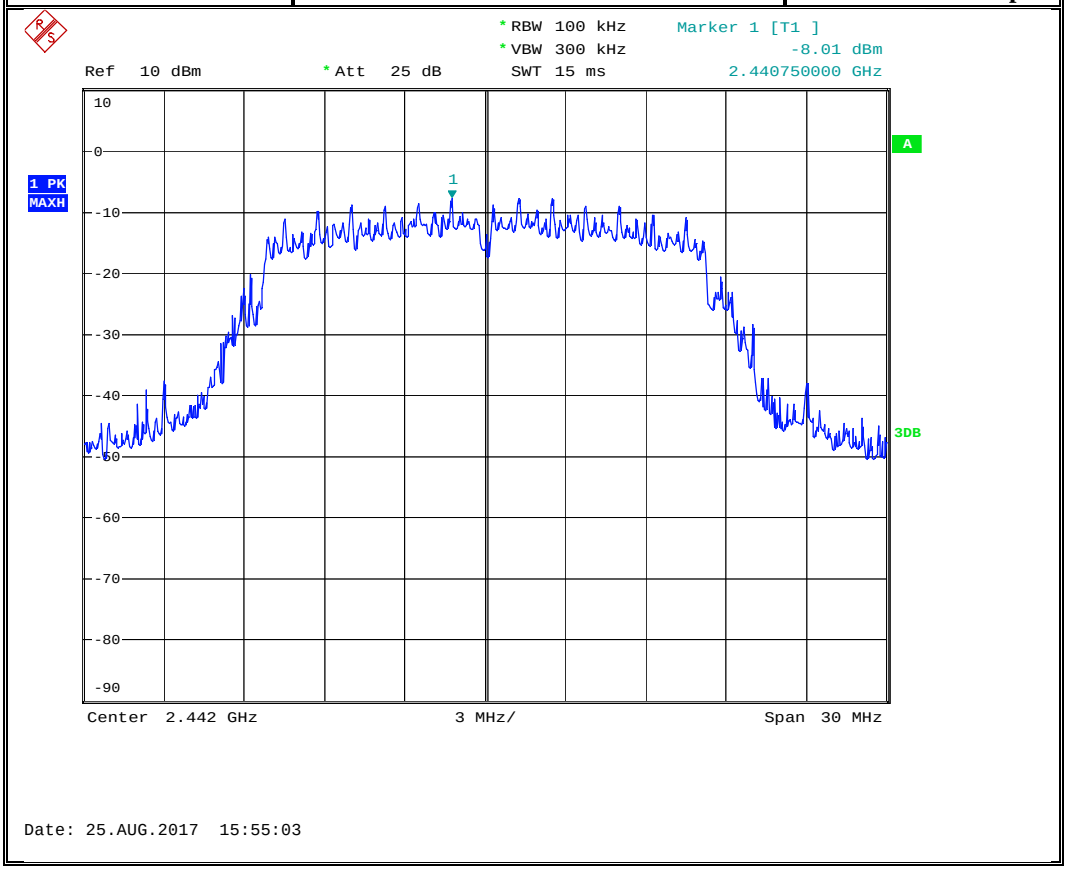
Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 18Mbps



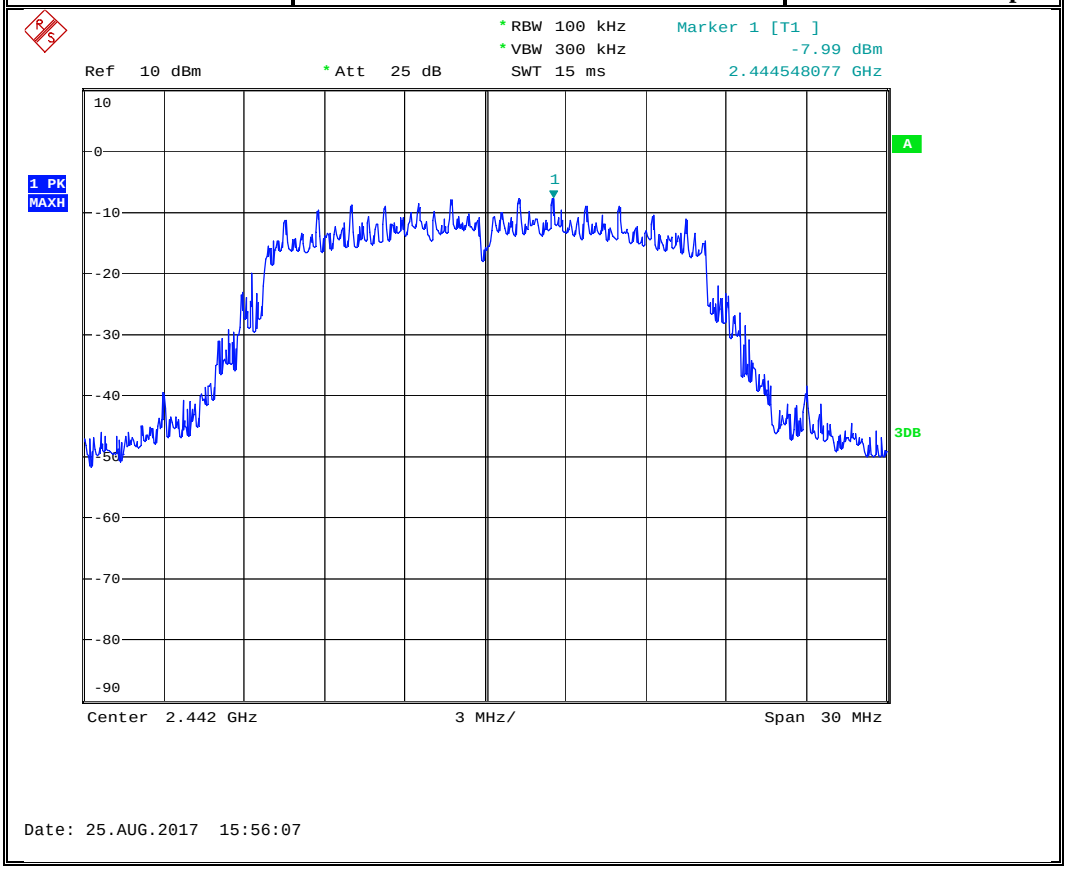
Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 24Mbps



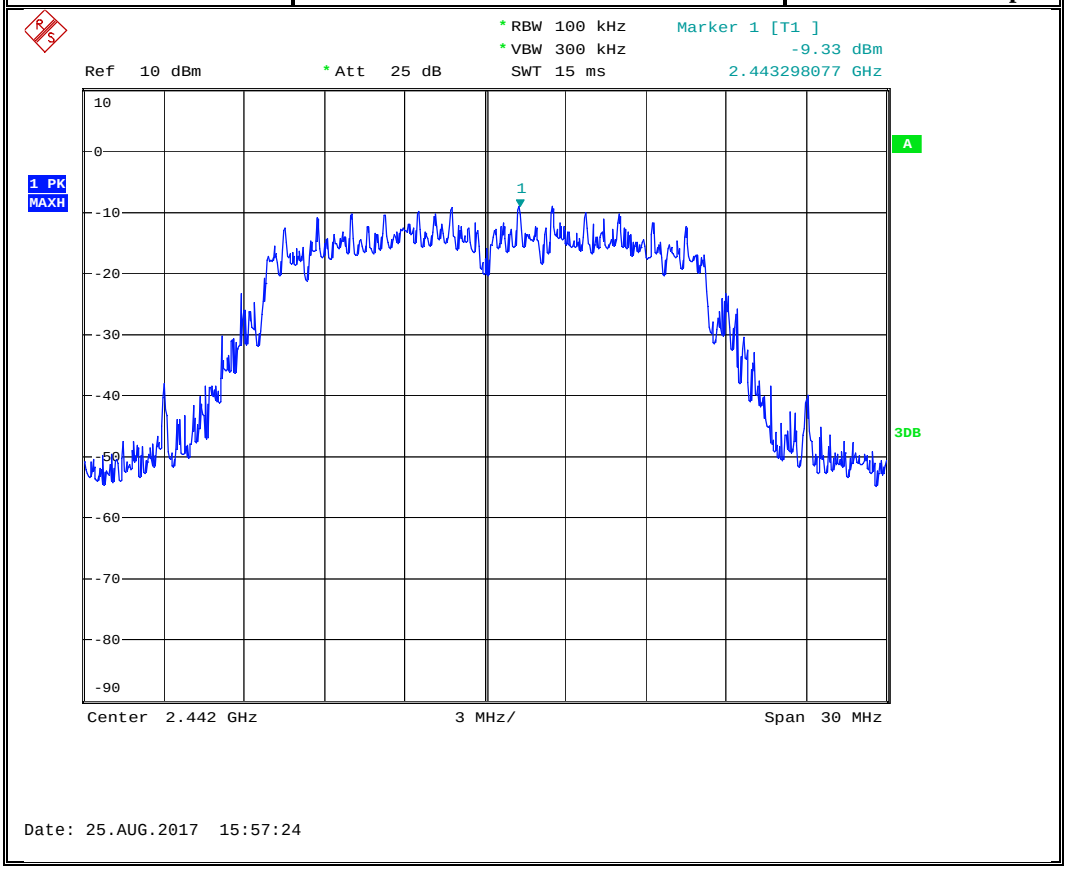
Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 36Mbps



Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 48Mbps



Power Spectral Density		
2442 MHz	Mode: OFDM	Data Rate: 54Mbps



8.3 Band Edge Compliance

8.3.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

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

8.3.2 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

8.3.3 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:

(b)

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			

8.3.4 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23° C	1	GFSK continuous fixed channel	5 VDC	1.575 dBi

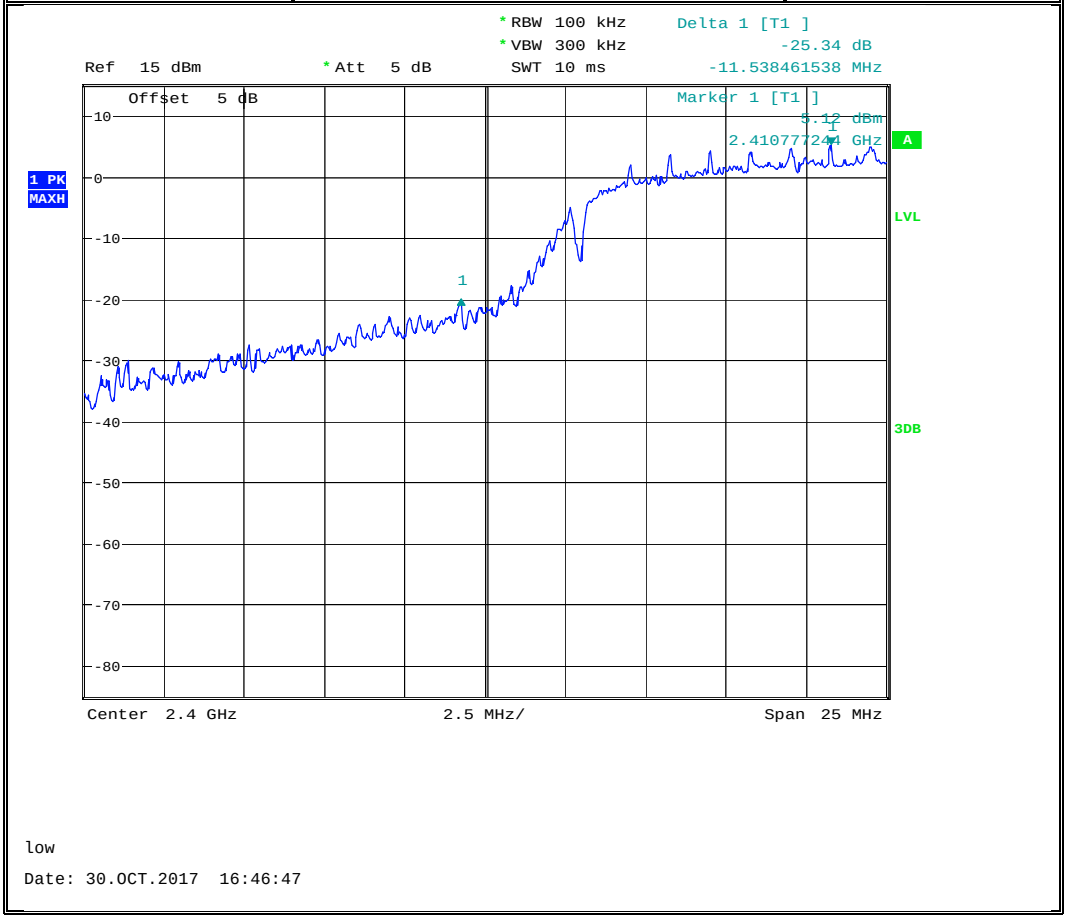
8.3.5 Measurement result:

Plot #	EUT operating mode	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
1	MCS 1 - 20 MHz	Lower, Non-restricted	-25.34	20	Pass

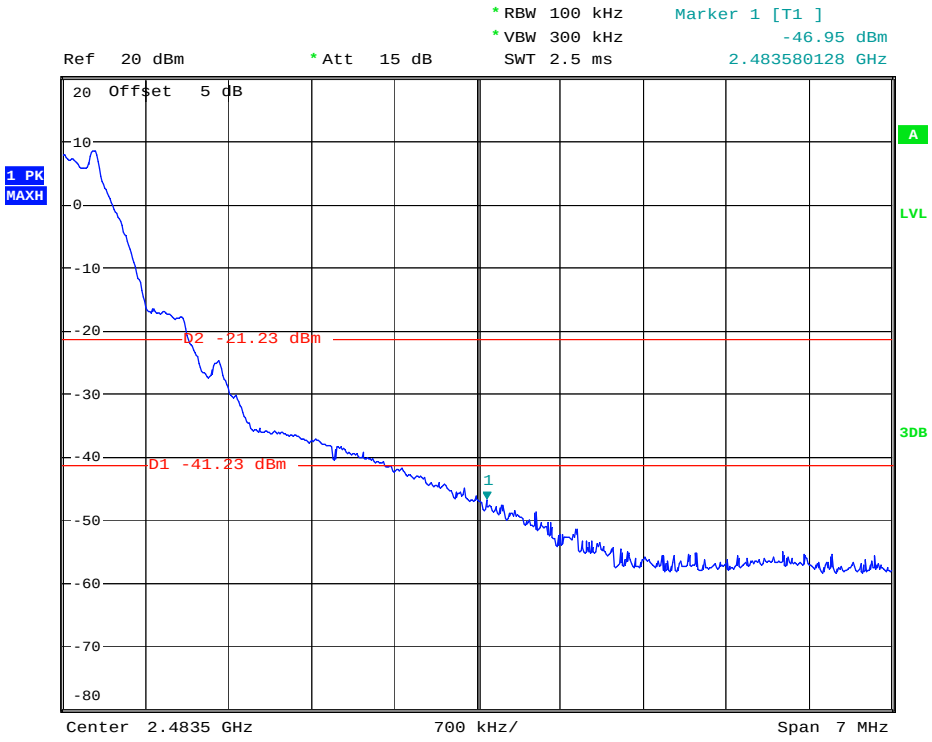
Plot #	EUT operating mode	Band Edge	Measured Peak Value (dBm)	Corrected by duty cycle	Corrected by Antenna Gain (dBm)	Limit (dBm)	Result
2	MCS 1 - 20 MHz	Upper Restricted peak	-46.95	NA due to peak detector, 100%DC and max hold	-45.38	-21.23 Peak -41.23 AVG	Pass

Note: The peak measurement passes both peak and average limits.

Lower Band Edge (non-restricted band)		
Ch.1 / 2412 MHz	**Mode: MCS 1**	**Bandwidth: 20 MHz**



Lower Band Edge (non-restricted band)		
Ch.1 / 2412 MHz	**Mode: MCS 1**	**Bandwidth: 20 MHz**



low

Date: 10.OCT.2017 16:32:16

8.4 Emission Bandwidth 6dB and 99% Occupied Bandwidth

8.4.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

Spectrum Analyzer settings:

- 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.

8.4.2 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.

8.4.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	DSSS, MCS, OFDM	5 VDC

8.4.4 Measurement result:

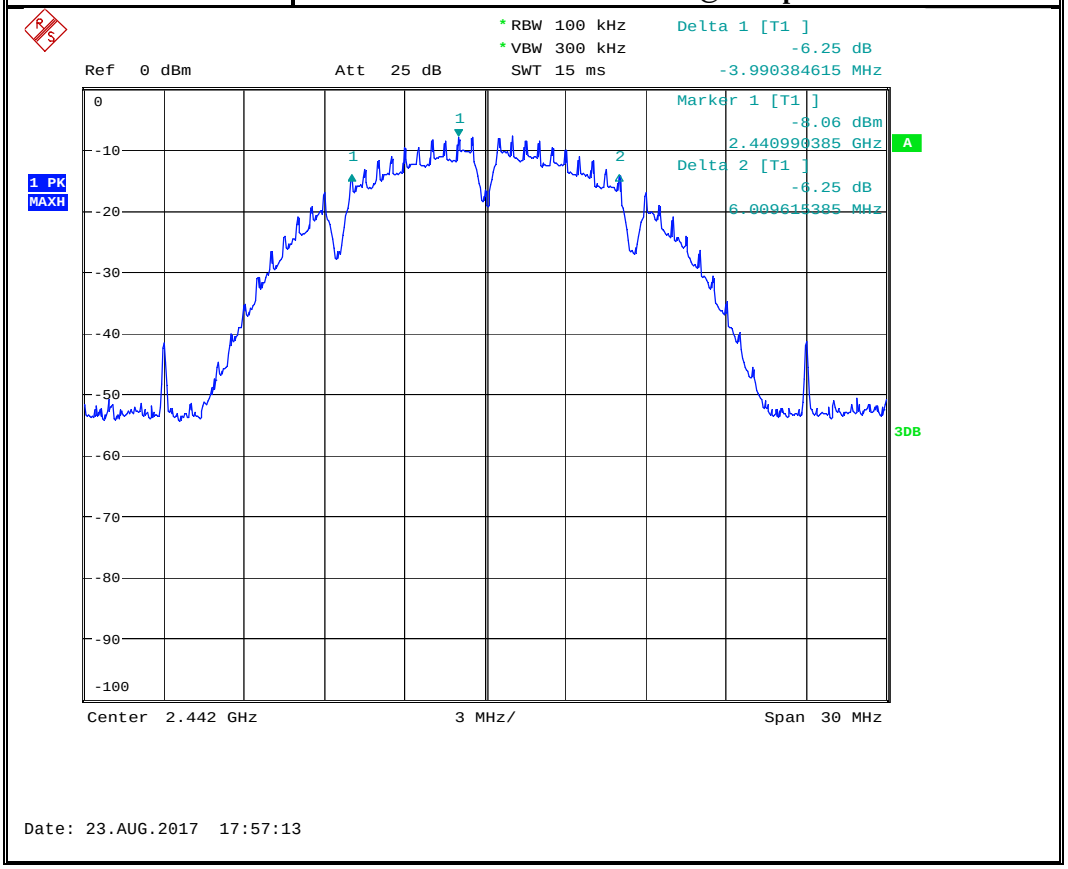
Plot #	Frequency (MHz)	6dB Emissions Bandwidth (MHz)	Limit (MHz)	Result
1	2442	2.01	> 0.5	Pass
2	2442	1.60	> 0.5	Pass
3	2442	1.76	> 0.5	Pass
4	2442	2.36	> 0.5	Pass
5	2442	2.36	> 0.5	Pass
6	2442	9.57	> 0.5	Pass
7	2442	2.60	> 0.5	Pass
8	2442	9.46	> 0.5	Pass
9	2442	7.54	> 0.5	Pass
10	2442	10.39	> 0.5	Pass
11	2442	2.50	> 0.5	Pass
12	2442	8.65	> 0.5	Pass
13	2442	1.73	> 0.5	Pass
14	2442	9.43	> 0.5	Pass
15	2442	15.38	> 0.5	Pass
16	2442	1.15	> 0.5	Pass
17	2442	1.97	> 0.5	Pass
18	2442	9.94	> 0.5	Pass
19	2442	2.84	> 0.5	Pass
20	2442	9.61	> 0.5	Pass
21	2442	7.41	> 0.5	Pass
22	2442	2.51	> 0.5	Pass
23	2442	2.78	> 0.5	Pass
24	2442	2.41	> 0.5	Pass
25	2442	2.50	> 0.5	Pass
26	2442	2.78	> 0.5	Pass
27	2442	2.17	> 0.5	Pass
28	2442	2.31	> 0.5	Pass
29	2442	2.31	> 0.5	Pass

Plot #	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
1	2442	14.09	> 0.5	Pass
2	2442	14.04	> 0.5	Pass
3	2442	14.00	> 0.5	Pass
4	2442	13.94		Pass
5	2442	18.89		Pass
6	2442	36.06		Pass
7	2442	17.79		Pass
8	2442	36.06		Pass
9	2442	17.64		Pass
10	2442	36.06		Pass
11	2442	36.06		Pass
12	2442	36.14		Pass
13	2442	17.55		Pass
14	2442	35.98		Pass
15	2442	17.55		Pass
16	2442	36.06		Pass
17	2442	17.65		Pass
18	2442	36.14		Pass
19	2442	17.65		Pass
20	2442	36.06		Pass
21	2442	36.14		Pass
22	2442	17.30		Pass
23	2442	16.88		Pass
24	2442	16.83		Pass
25	2442	16.54		Pass
26	2442	16.83		Pass
27	2442	16.54		Pass
28	2442	16.50		Pass
29	2442	16.68		Pass

6dB Emissions Bandwidth

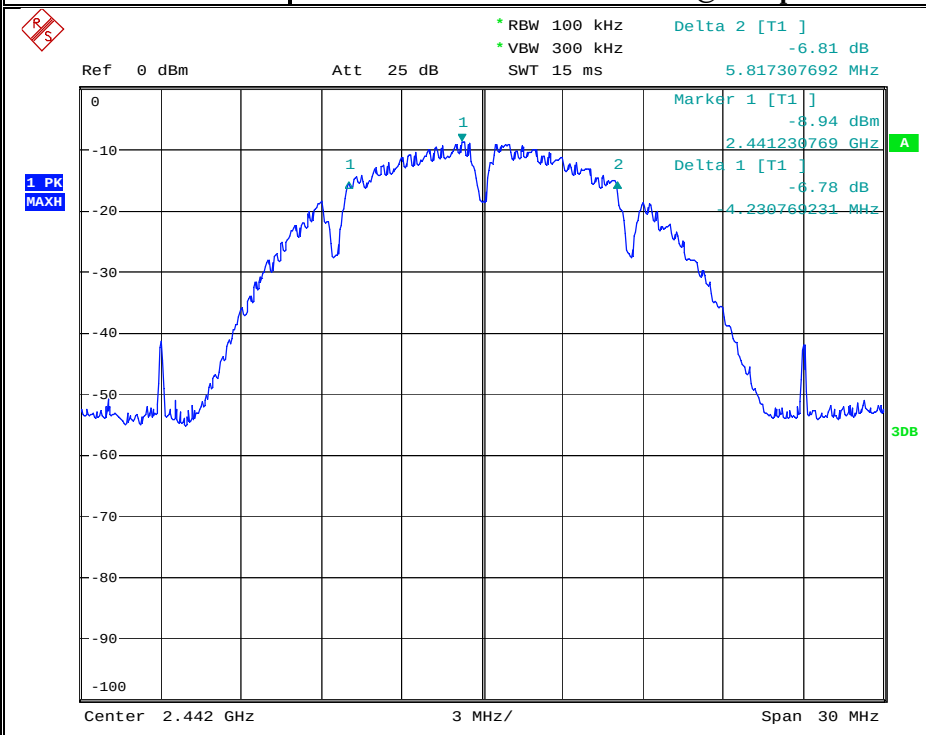
Plot #1

2442 MHz	Mode: DSSS @ 1Mbps



Plot #2

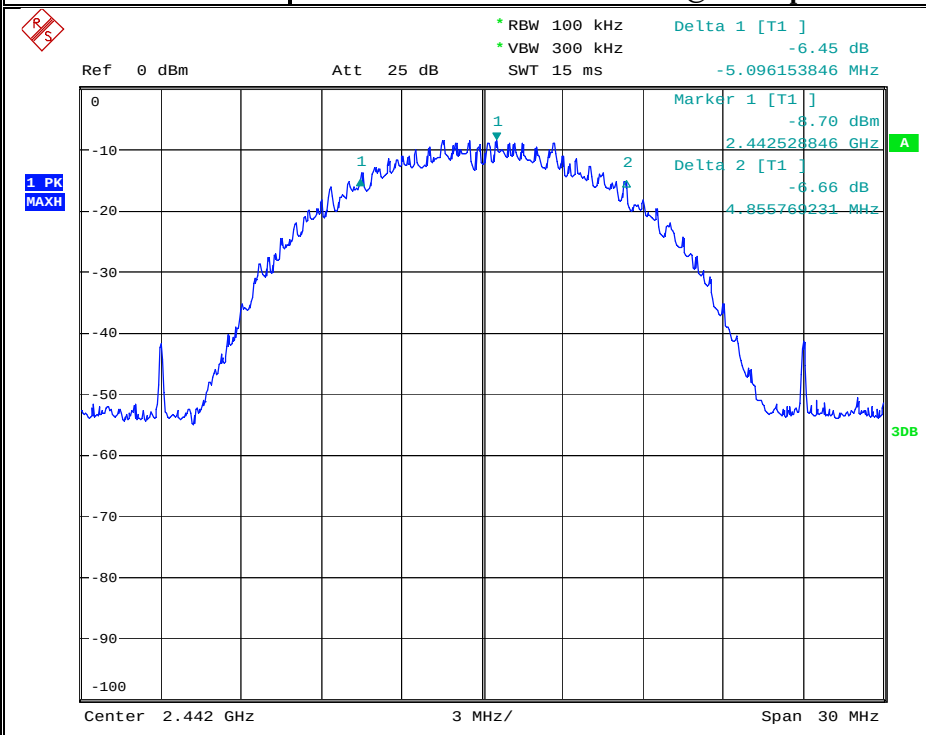
2442 MHz	Mode: DSSS @ 2Mbps



Date: 23.AUG.2017 17:59:16

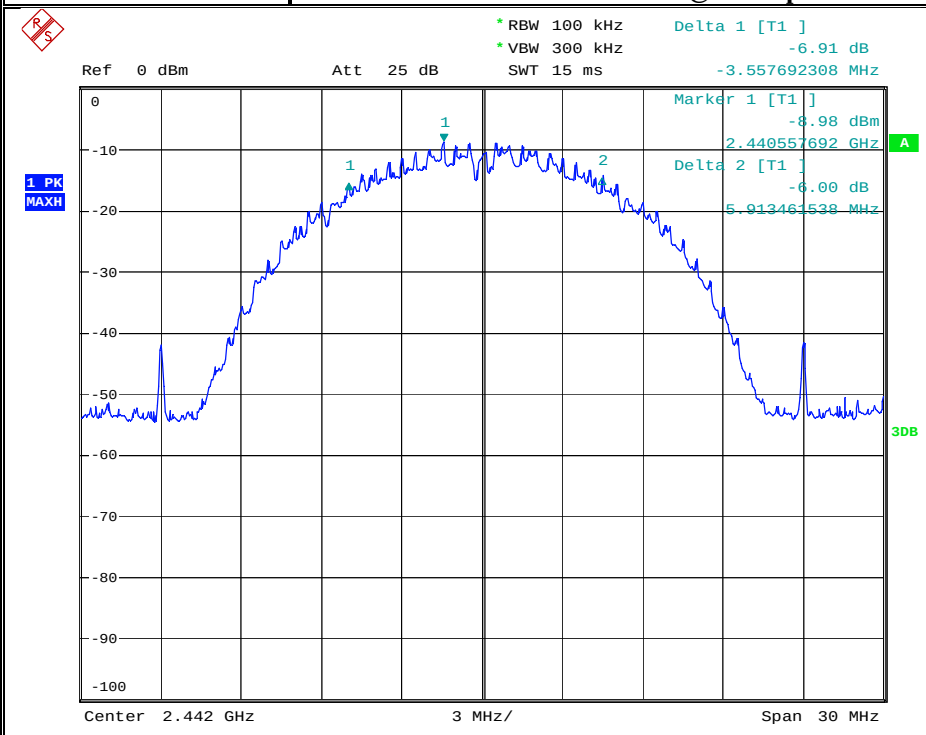
Plot #3

2442 MHz	Mode: DSSS @ 5.5Mbps



Plot #4

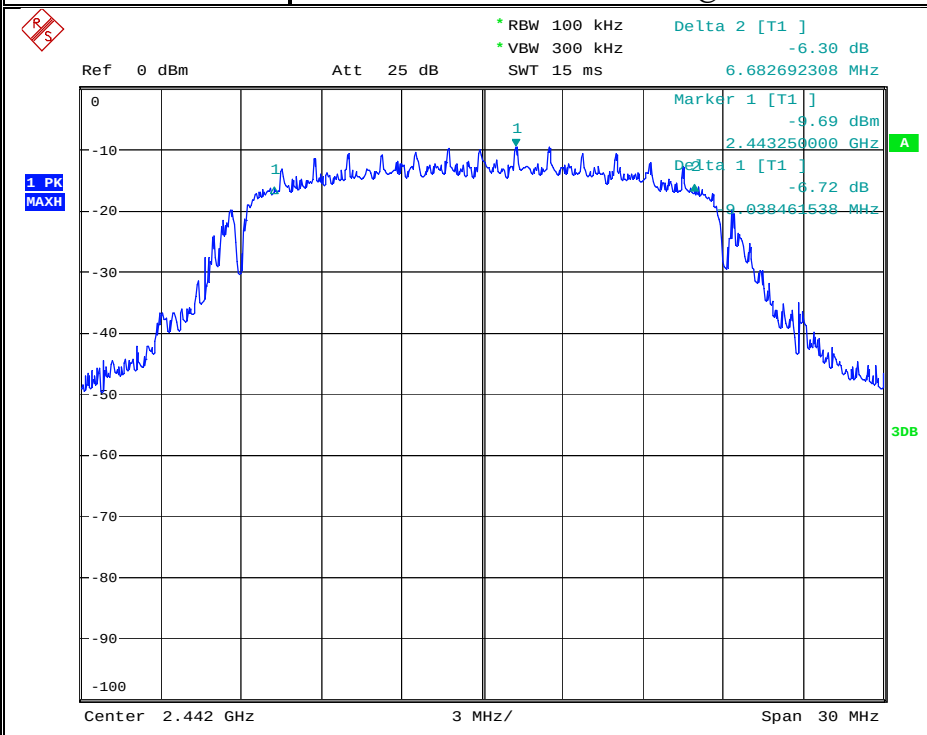
2442 MHz	Mode: DSSS @ 11Mbps



Date: 23.AUG.2017 18:04:01

Plot #5

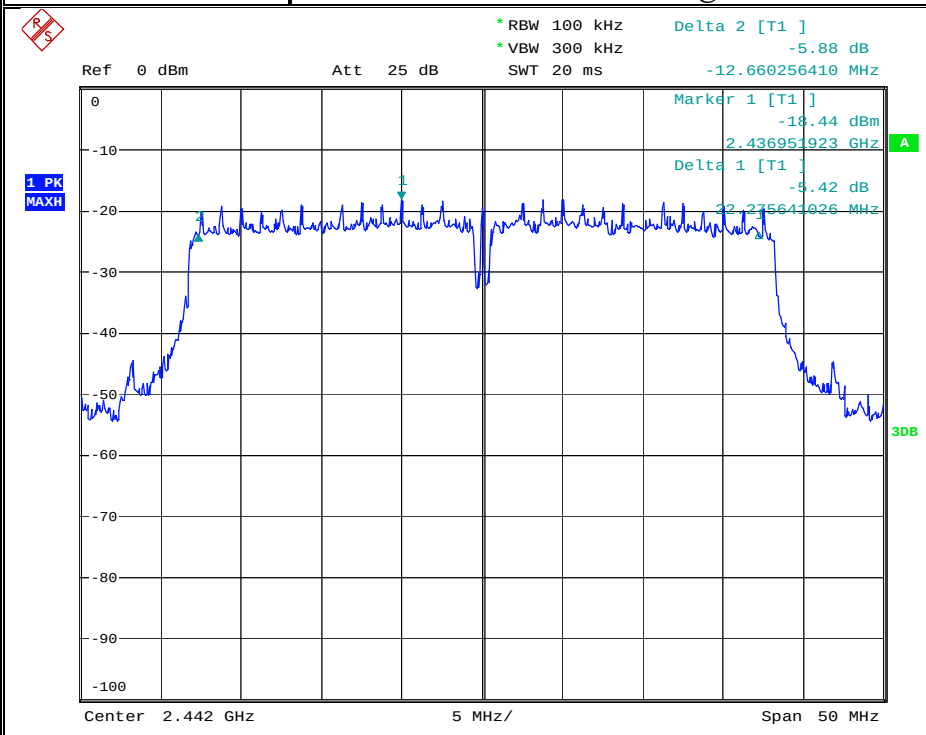
2442 MHz	Mode: MCS 0 @ 20 MHz



Date: 23.AUG.2017 18:17:48

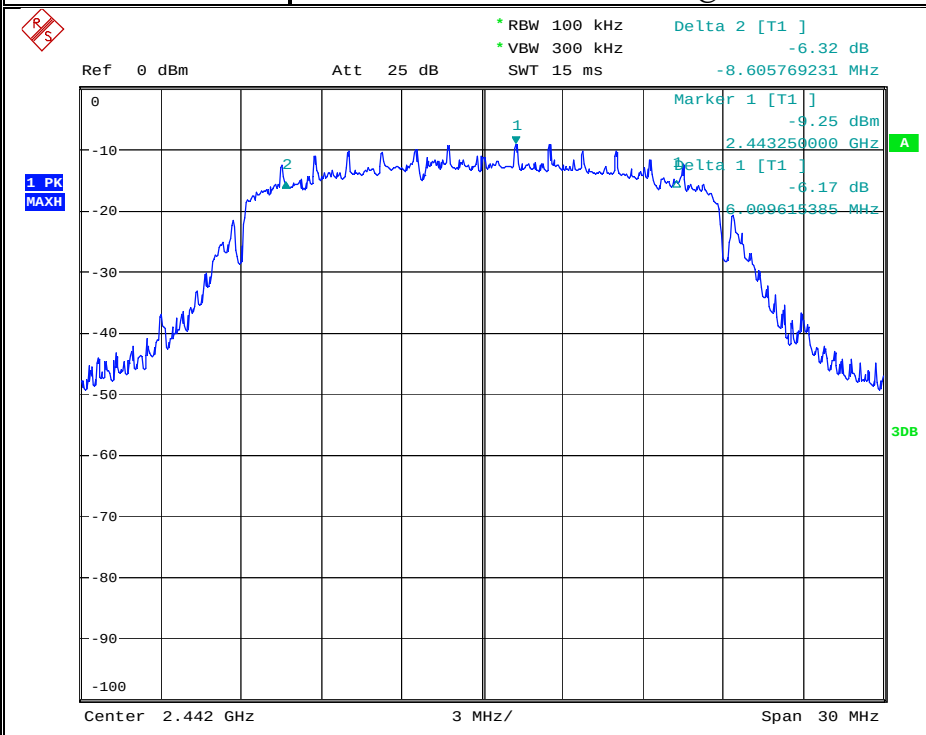
Plot #6

2442 MHz	Mode: MCS 0 @ 40 MHz



Plot #7

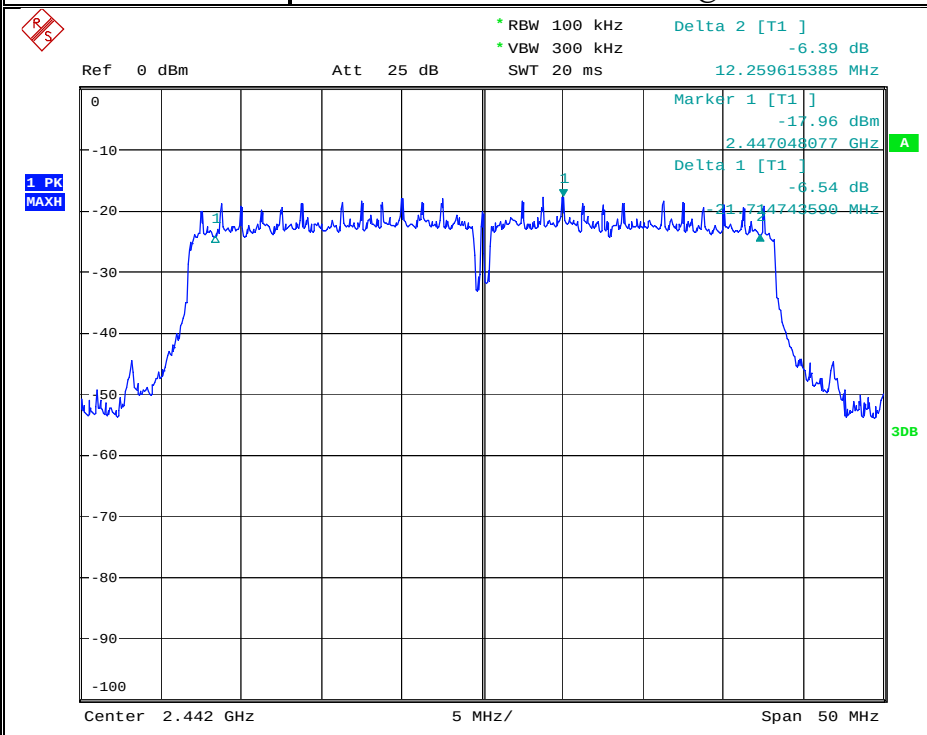
2442 MHz	Mode: MCS 1 @ 20 MHz



Date: 23.AUG.2017 16:33:16

Plot #8

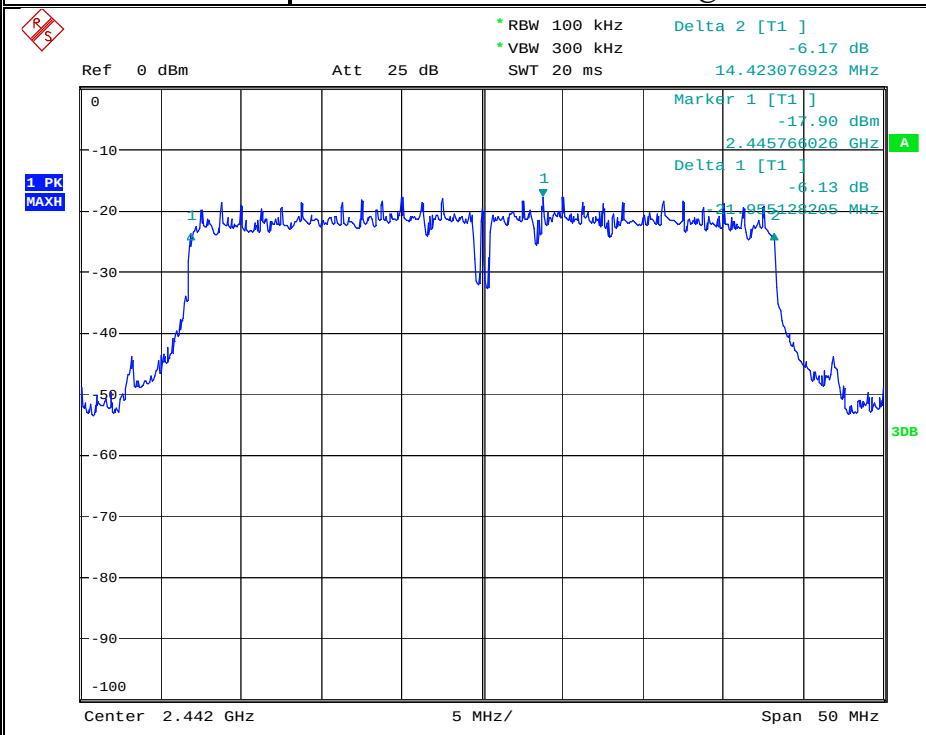
2442 MHz	Mode: MCS 1 @ 40 MHz



Date: 23.AUG.2017 16:34:52

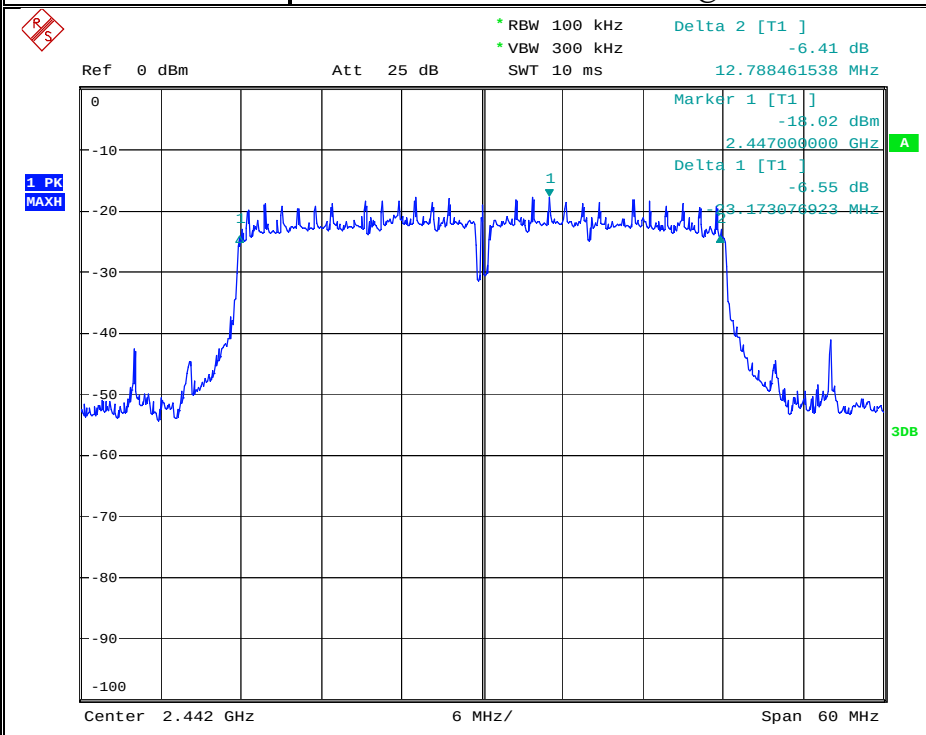
Plot #9

2442 MHz	Mode: MCS 2 @ 20 MHz



Plot #10

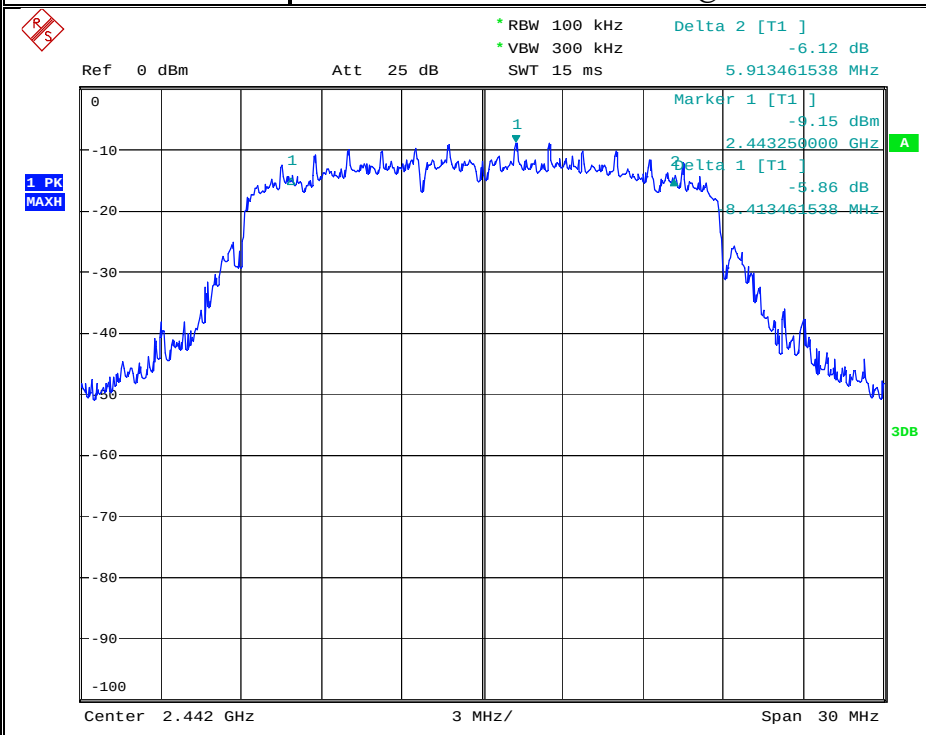
2442 MHz	Mode: MCS 2 @ 40 MHz



Date: 23.AUG.2017 16:30:08

Plot #11

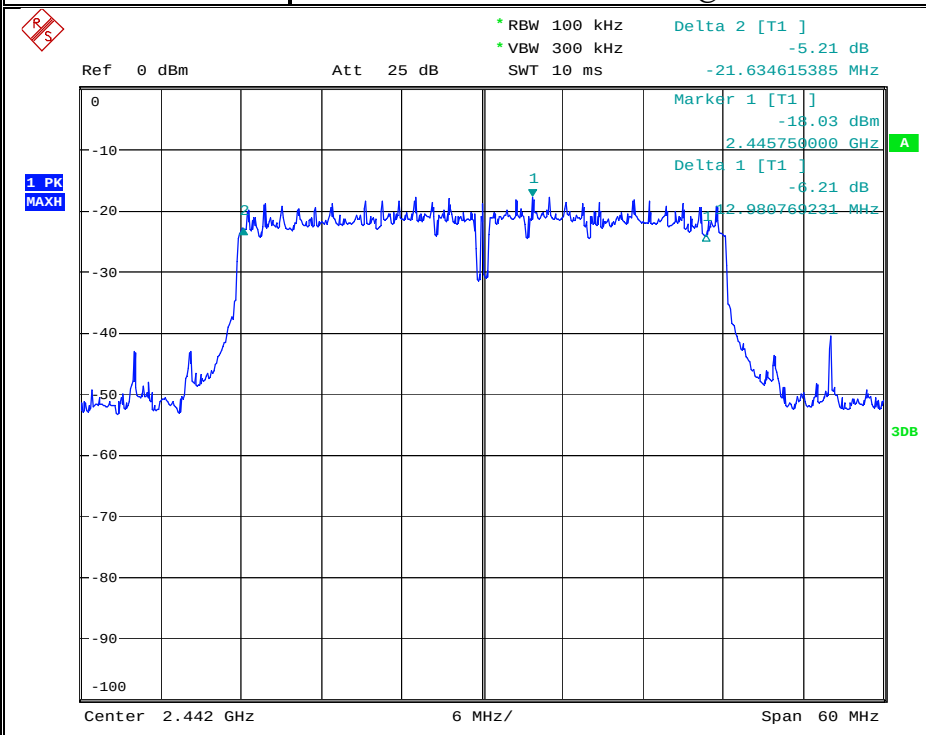
2442 MHz	Mode: MCS 3 @ 20 MHz



Date: 23.AUG.2017 16:16:57

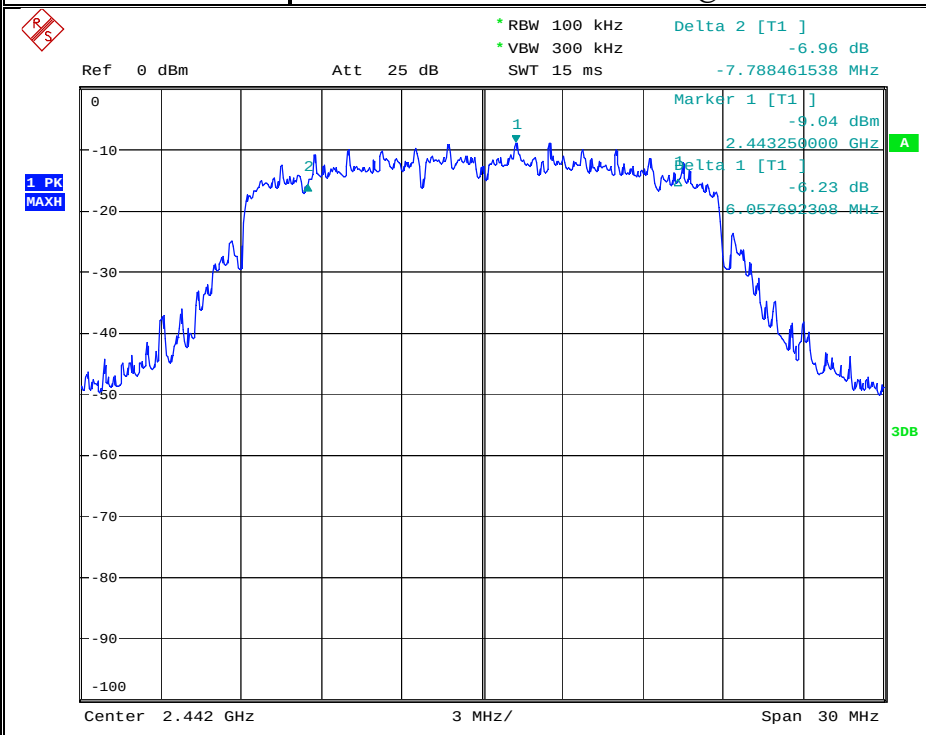
Plot #12

2442 MHz	Mode: MCS 3 @ 40 MHz



Plot #13

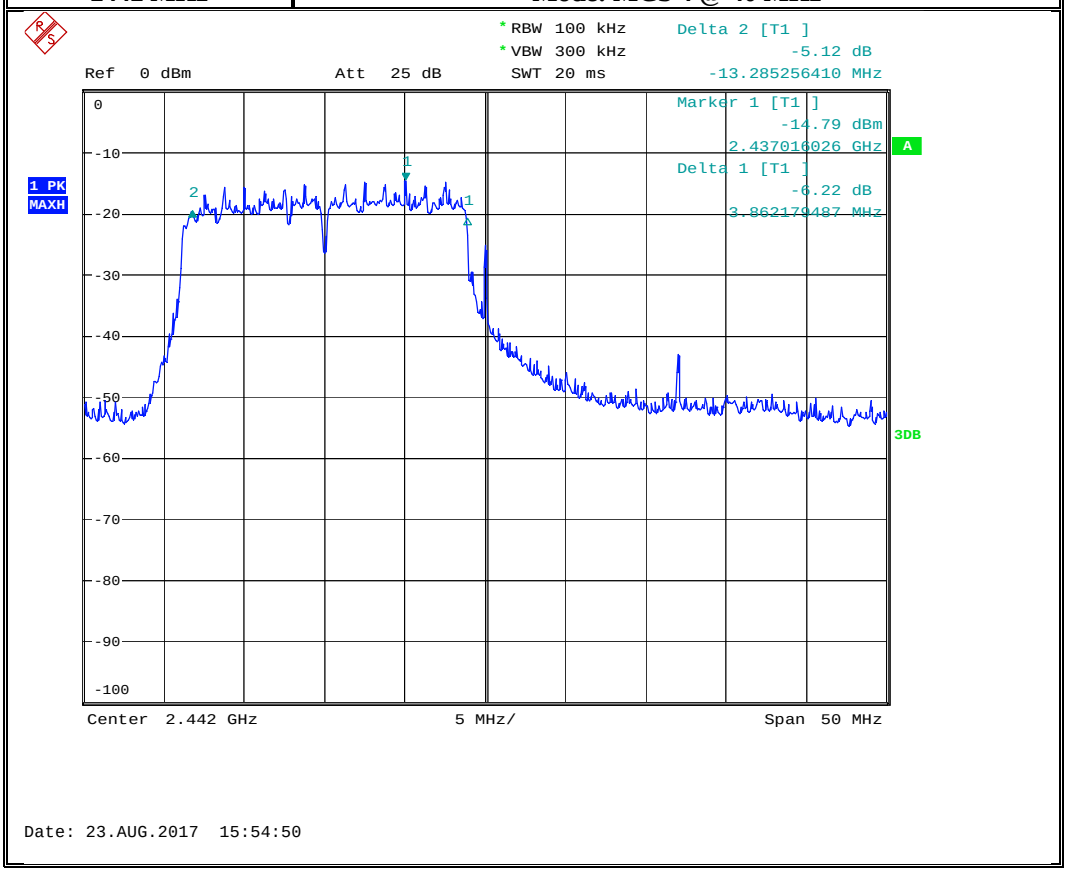
2442 MHz	Mode: MCS 4 @ 20 MHz



Date: 23.AUG.2017 15:49:09

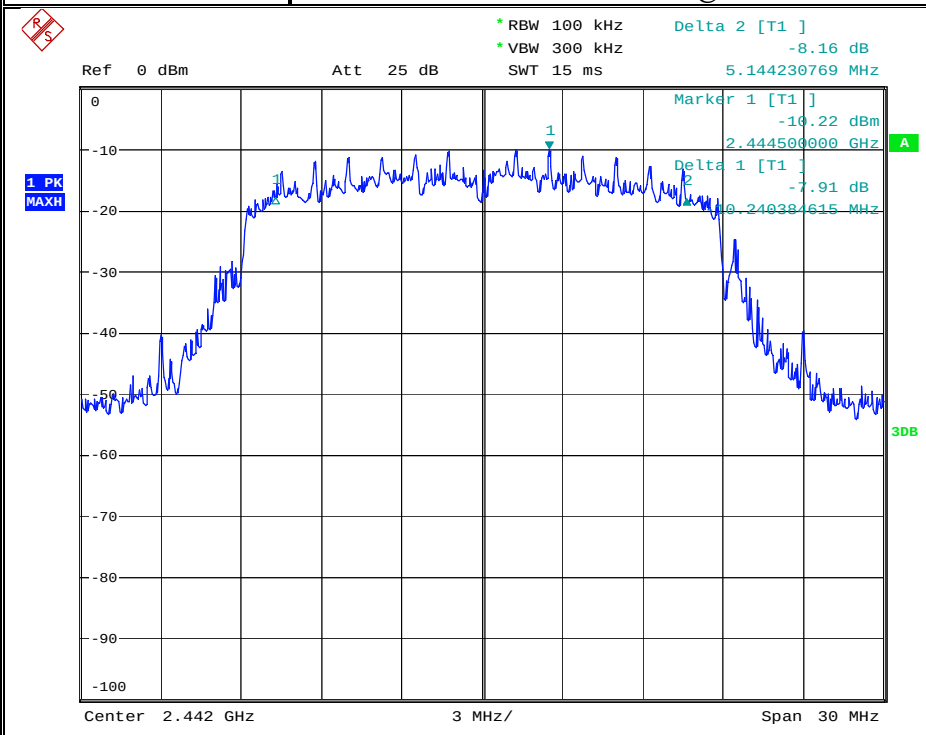
Plot #14

2442 MHz	Mode: MCS 4 @ 40 MHz



Plot #15

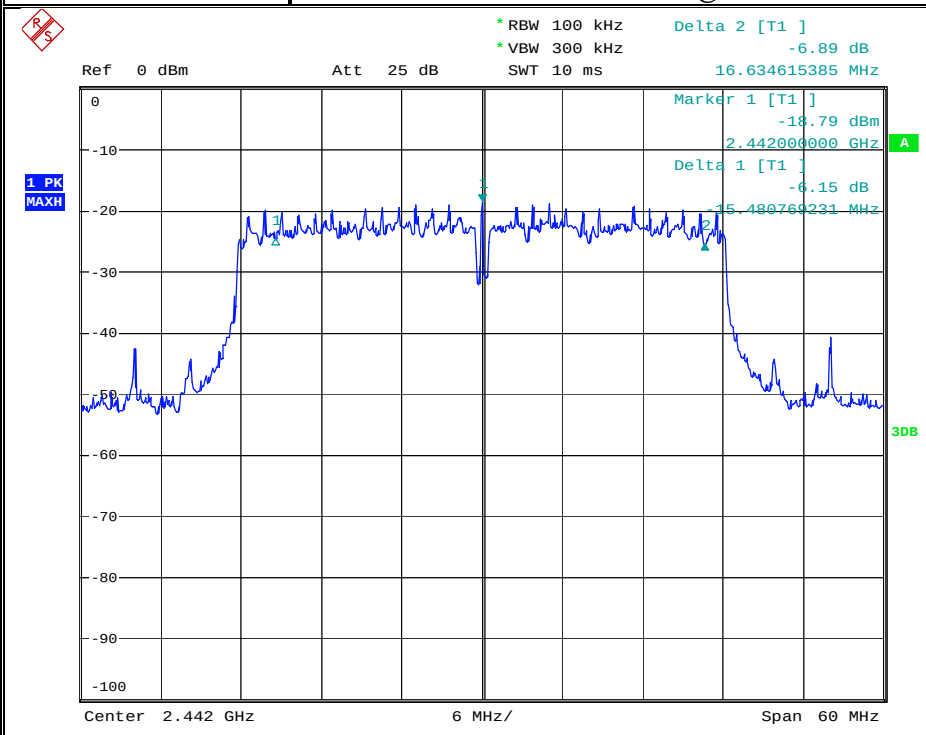
2442 MHz	Mode: MCS 5 @ 20 MHz



Date: 23.AUG.2017 15:19:15

Plot #16

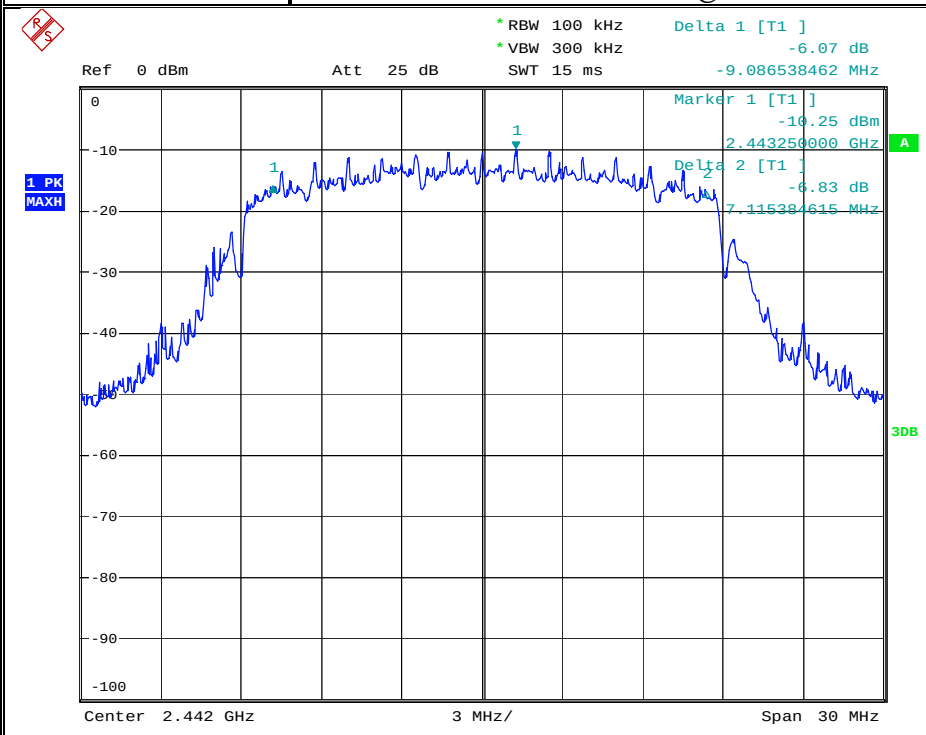
2442 MHz	Mode: MCS 5 @ 40 MHz



Date: 23.AUG.2017 15:34:05

Plot #17

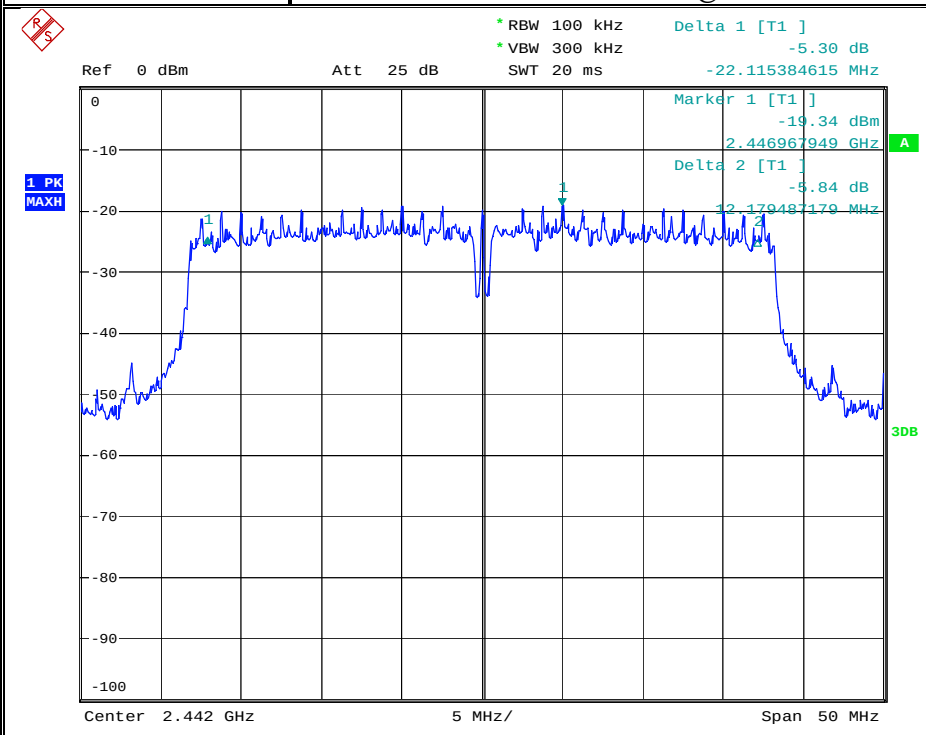
2442 MHz	Mode: MCS 6 @ 20 MHz



Date: 23.AUG.2017 17:42:42

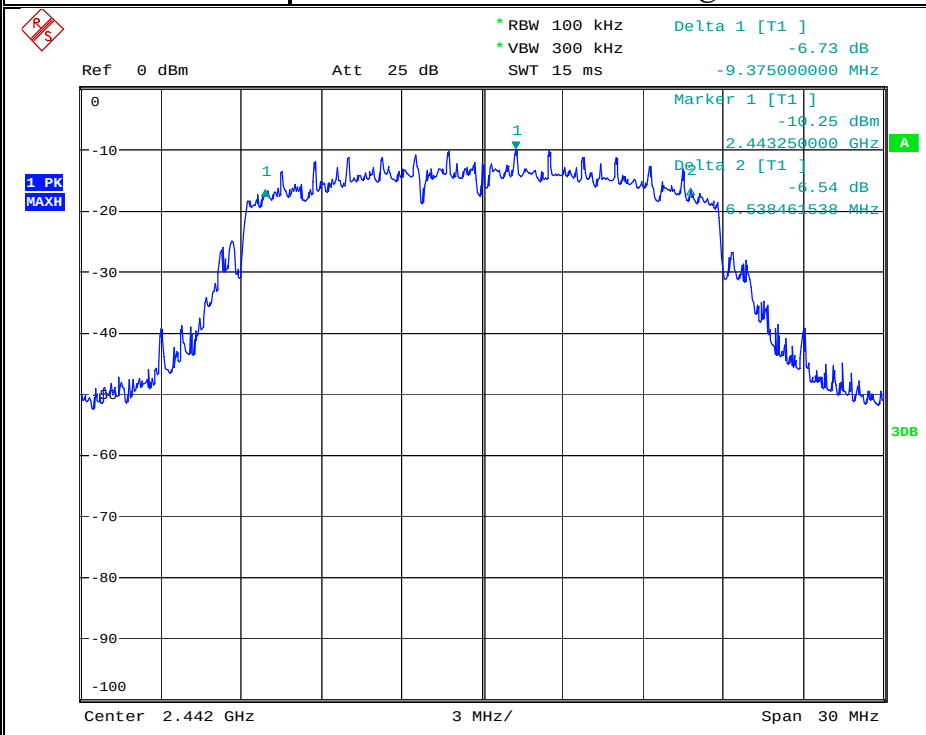
Plot #18

2442 MHz	Mode: MCS 6 @ 40 MHz



Plot #19

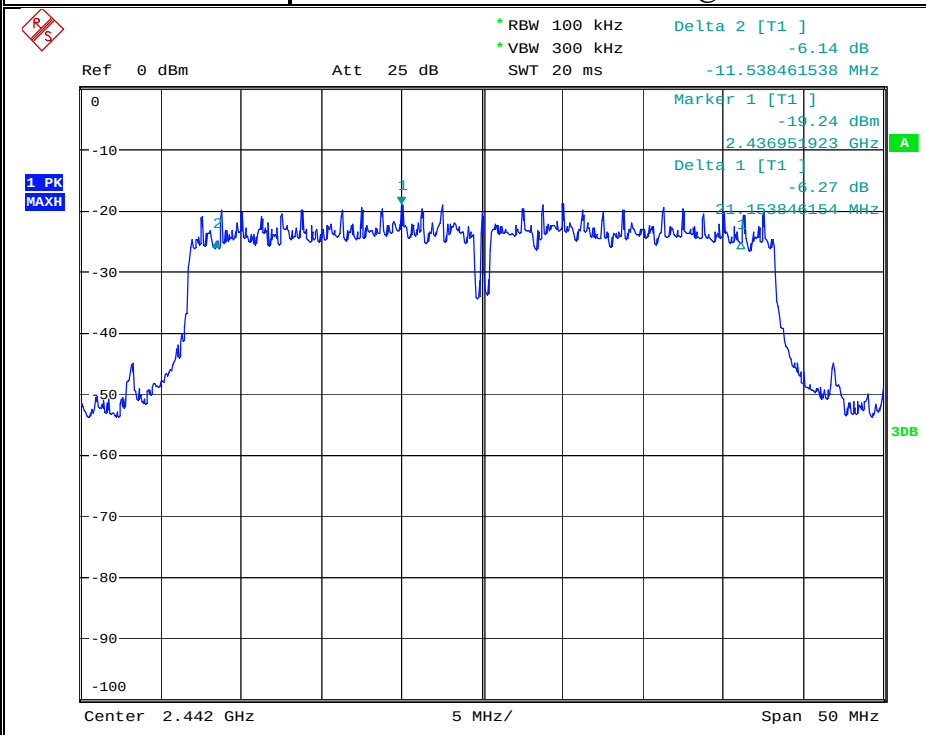
2442 MHz	Mode: MCS 7 @ 20 MHz



Date: 23.AUG.2017 17:49:37

Plot #20

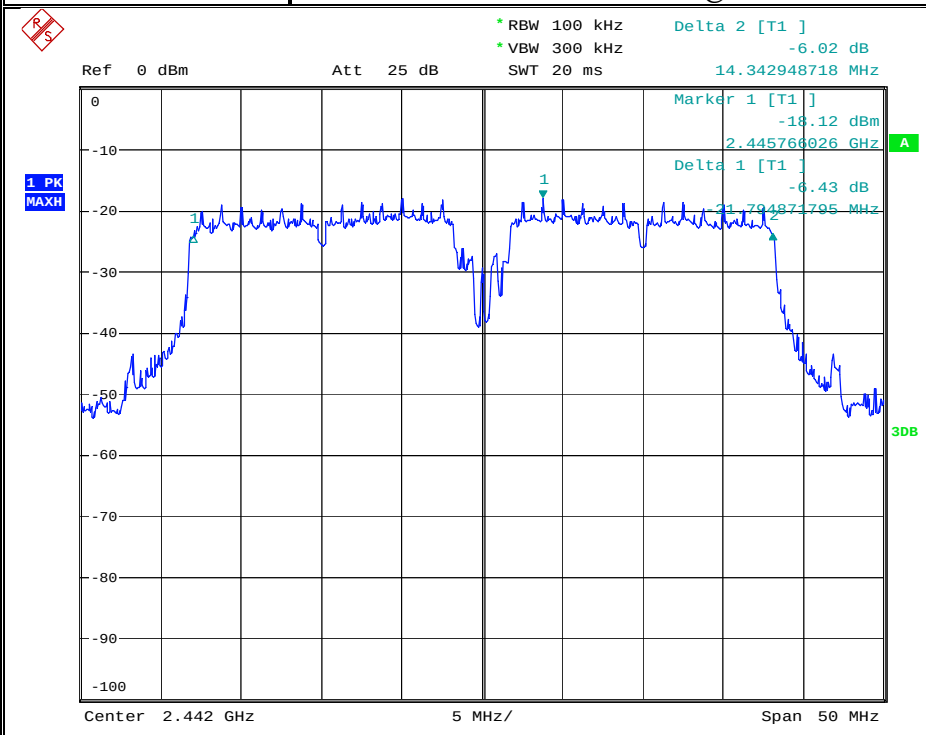
2442 MHz	Mode: MCS 7 @ 40 MHz



Date: 23.AUG.2017 17:52:23

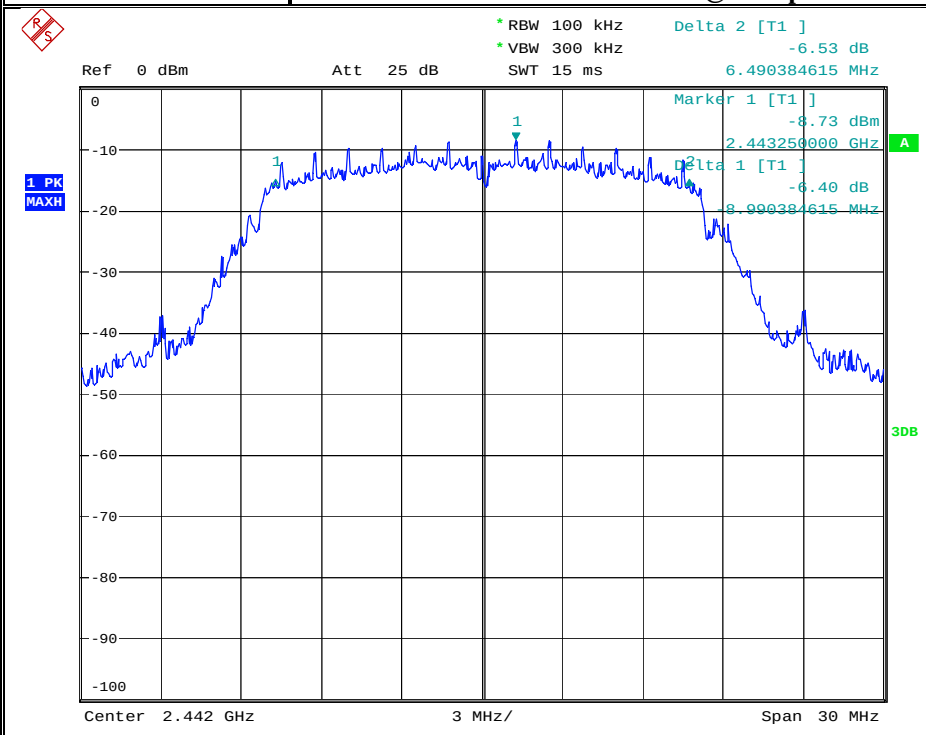
Plot #21

2442 MHz	Mode: MCS 32 @ 40 MHz



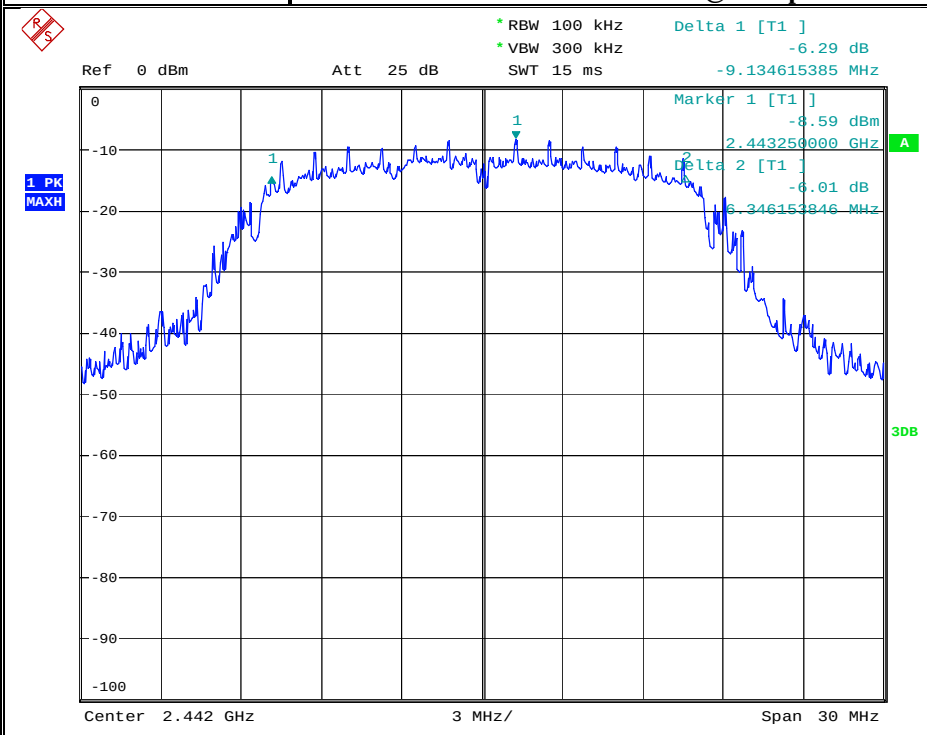
Plot #22

2442 MHz	Mode: OFDM @ 6Mbps



Plot #23

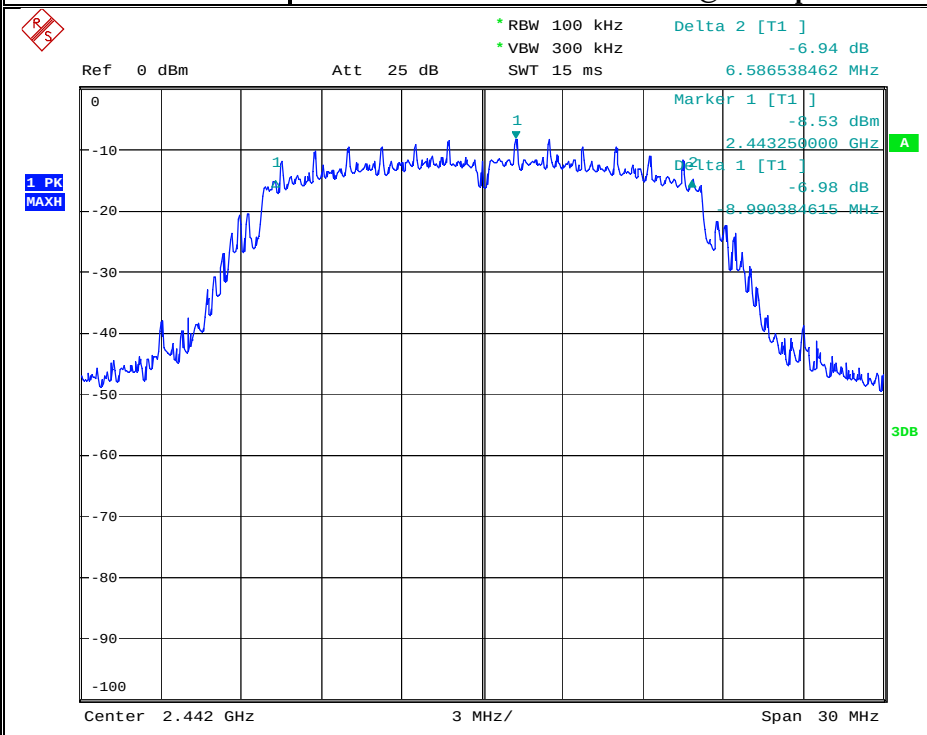
2442 MHz	Mode: OFDM @ 9Mbps



Date: 23.AUG.2017 18:07:53

Plot #24

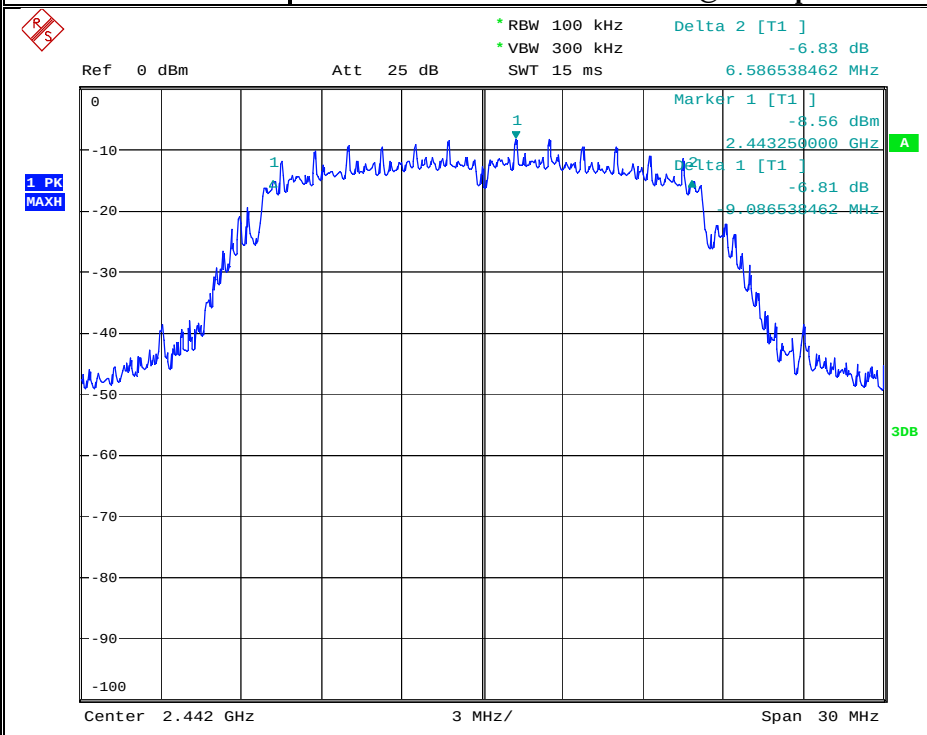
2442 MHz	Mode: OFDM @ 12Mbps



Date: 23.AUG.2017 18:09:26

Plot #25

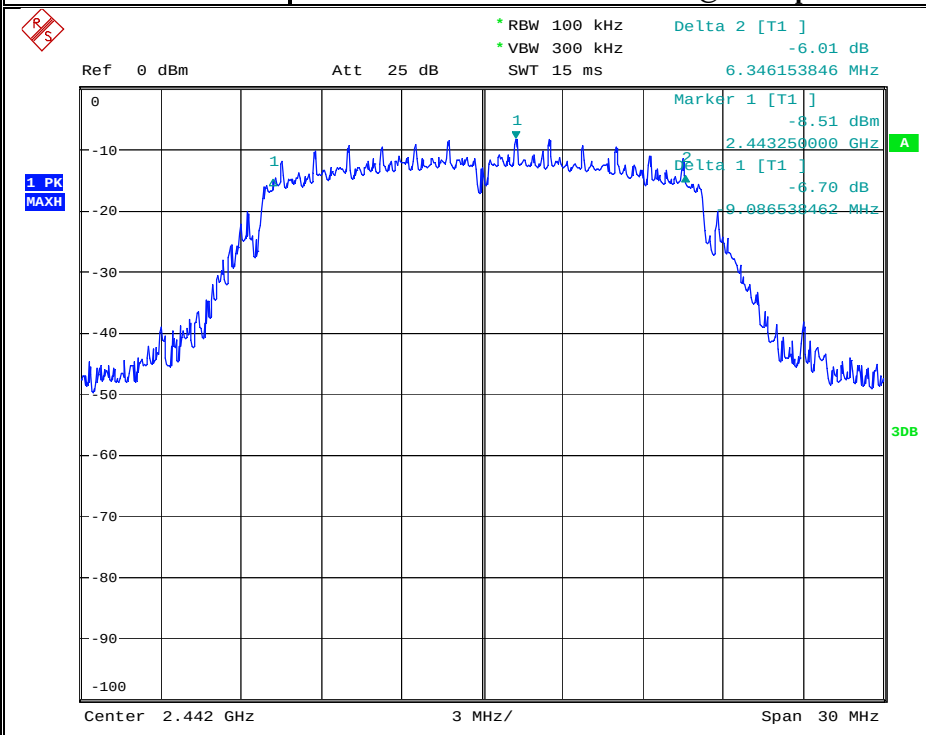
2442 MHz	Mode: OFDM @ 18Mbps



Date: 23.AUG.2017 18:10:51

Plot #26

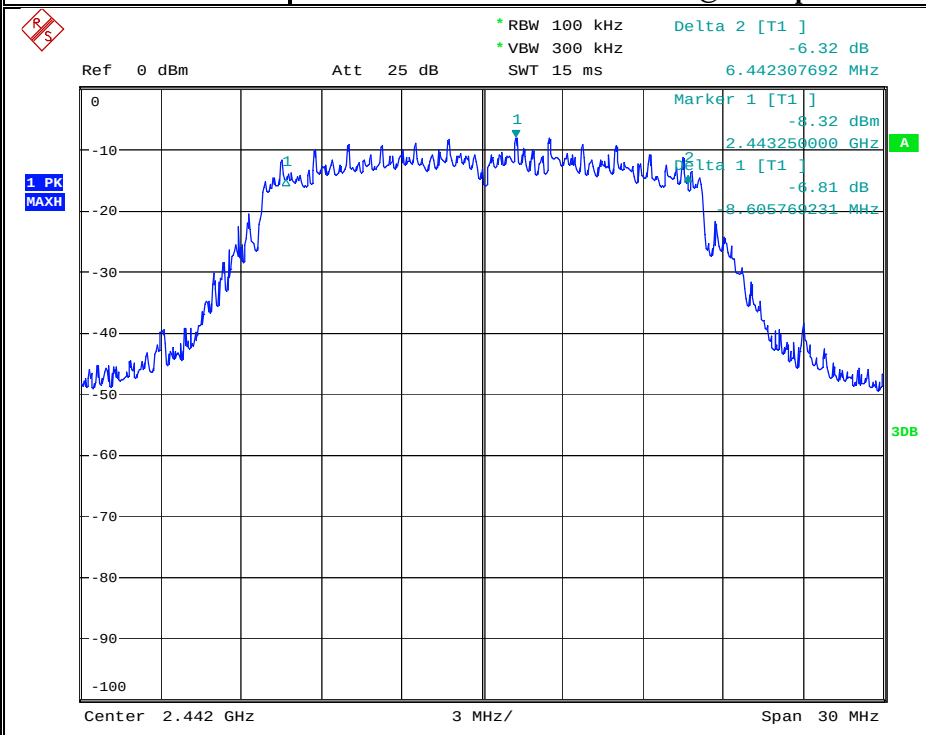
2442 MHz	Mode: OFDM @ 24Mbps



Date: 23.AUG.2017 18:12:23

Plot #27

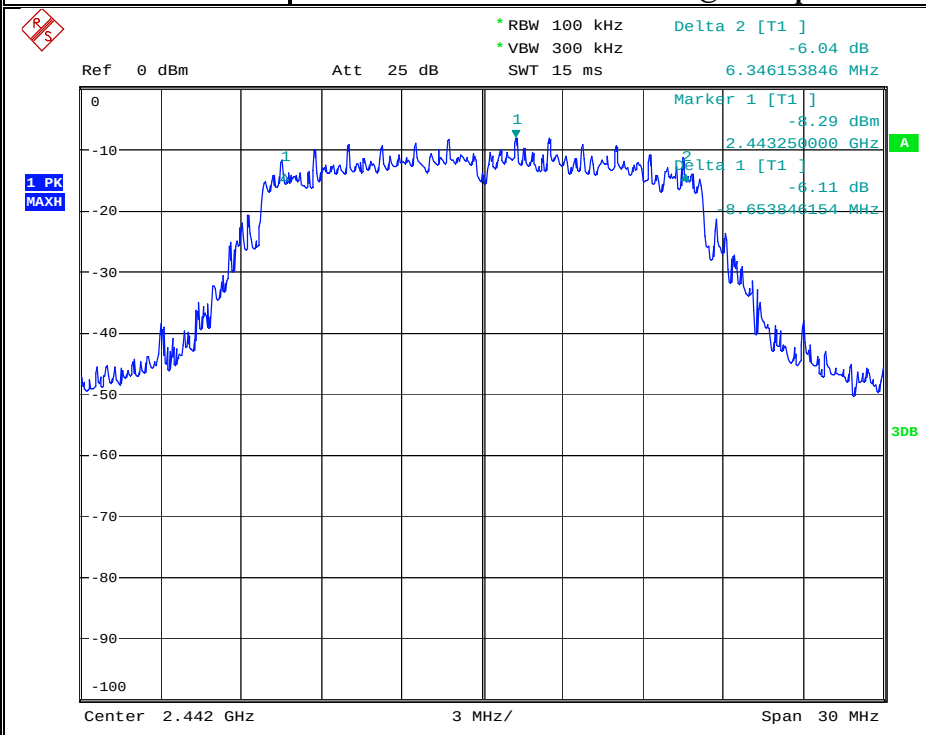
2442 MHz	Mode: OFDM @ 36Mbps



Date: 23.AUG.2017 18:13:54

Plot #28

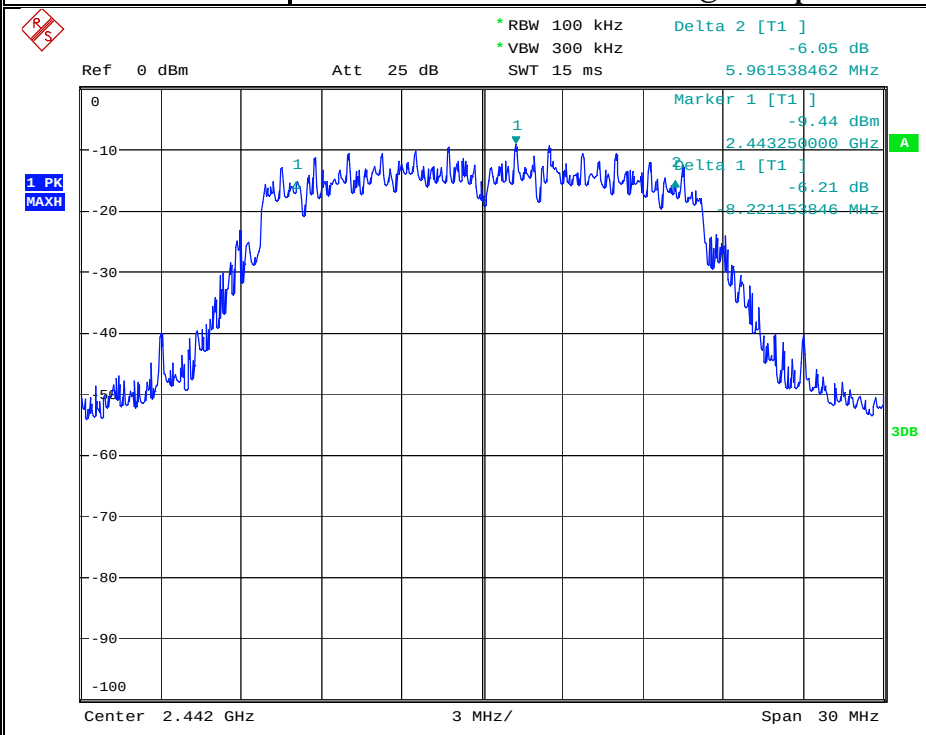
2442 MHz	Mode: OFDM @ 48Mbps



Date: 23.AUG.2017 18:15:12

Plot #29

2442 MHz	Mode: OFDM @ 54Mbps

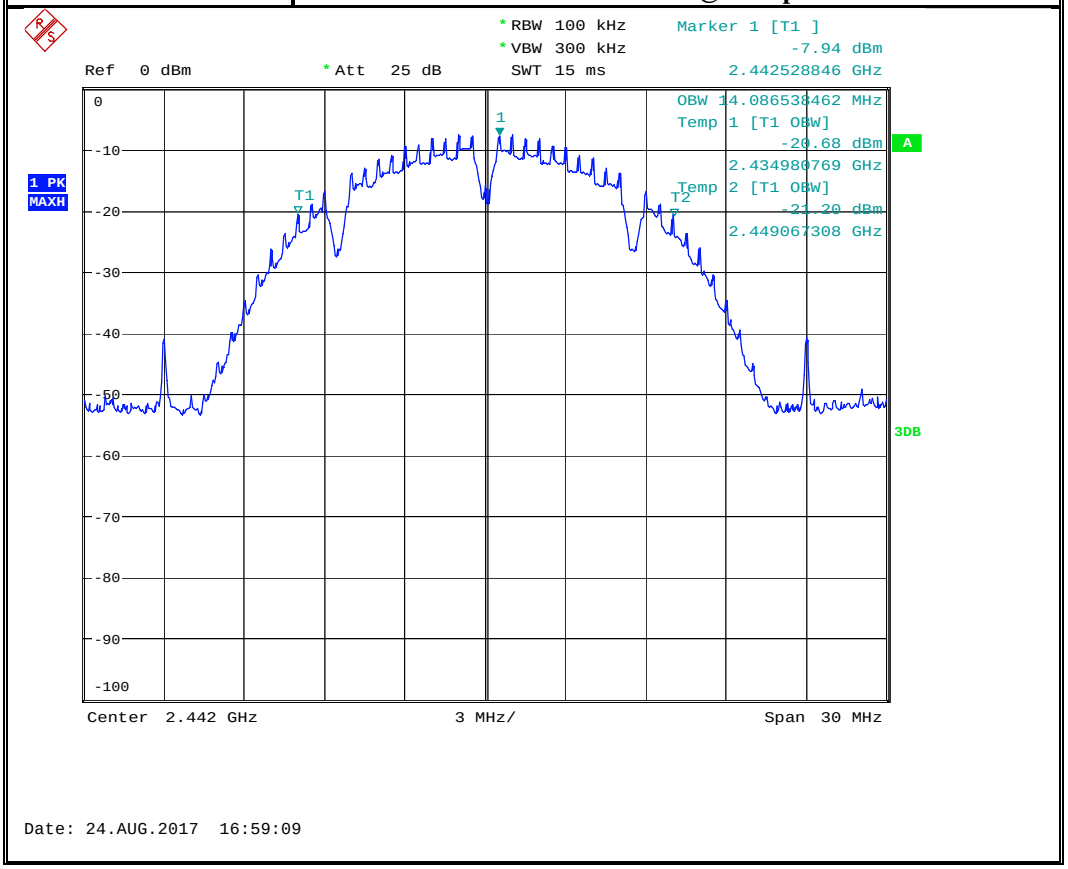


Date: 23.AUG.2017 18:16:22

99% Occupied Bandwidth

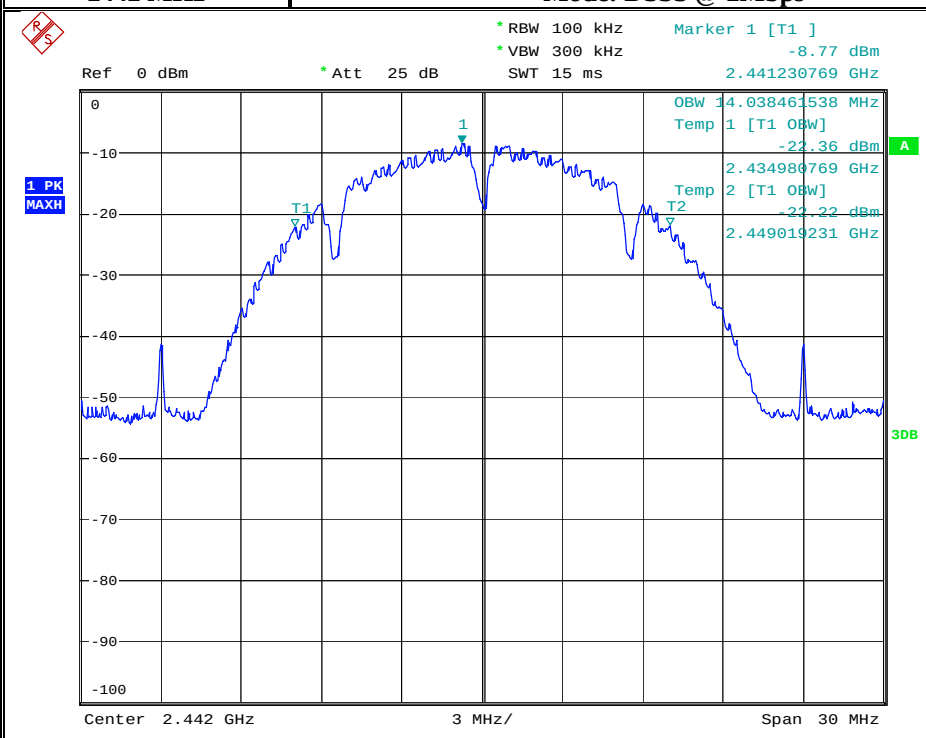
Plot #1

2442 MHz	Mode: DSSS @ 1Mbps



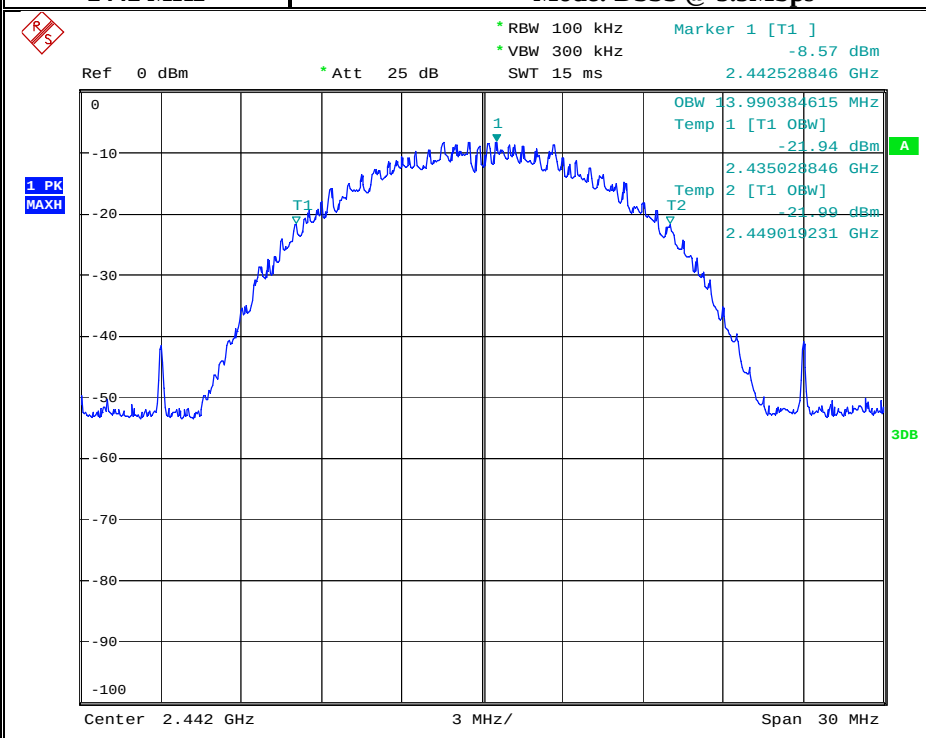
Plot #2

2442 MHz	Mode: DSSS @ 2Mbps



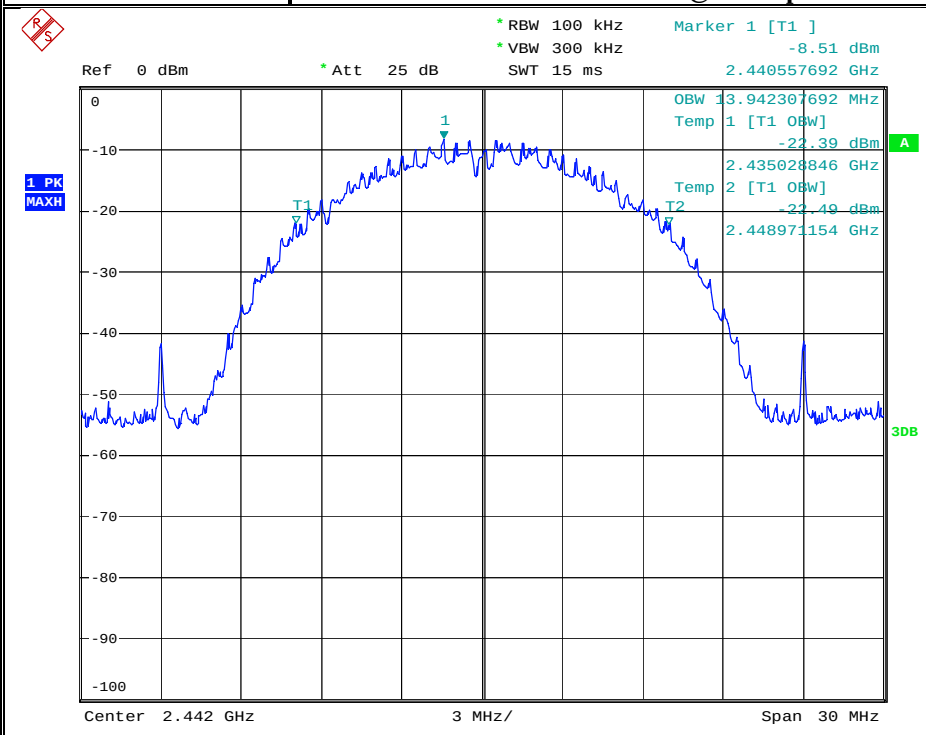
Plot #3

2442 MHz	Mode: DSSS @ 5.5Mbps



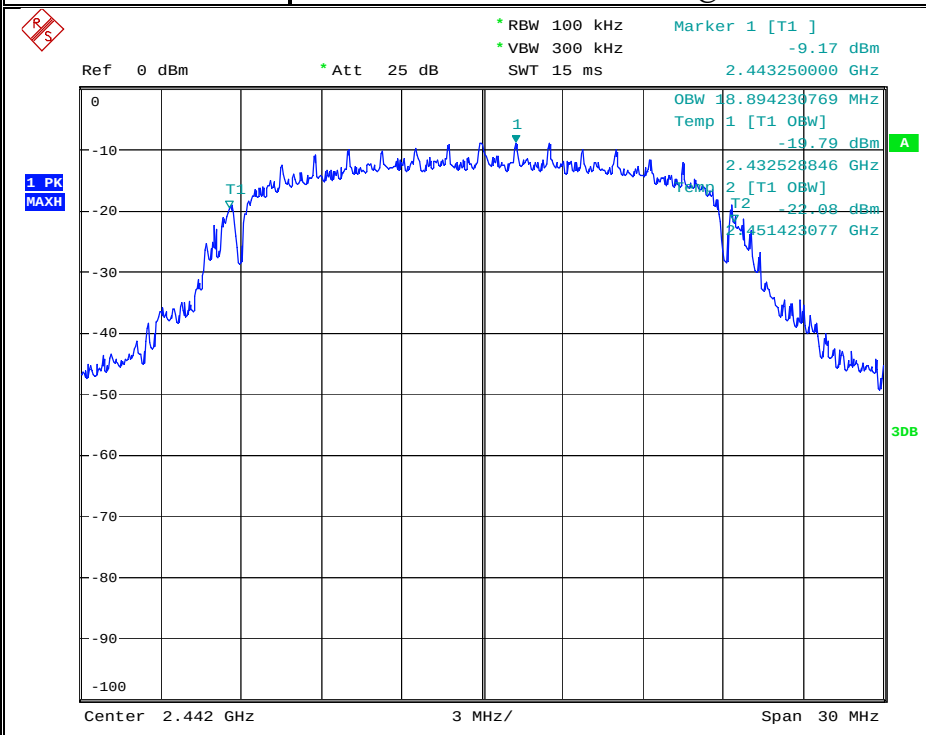
Plot #4

2442 MHz	Mode: DSSS @ 11Mbps



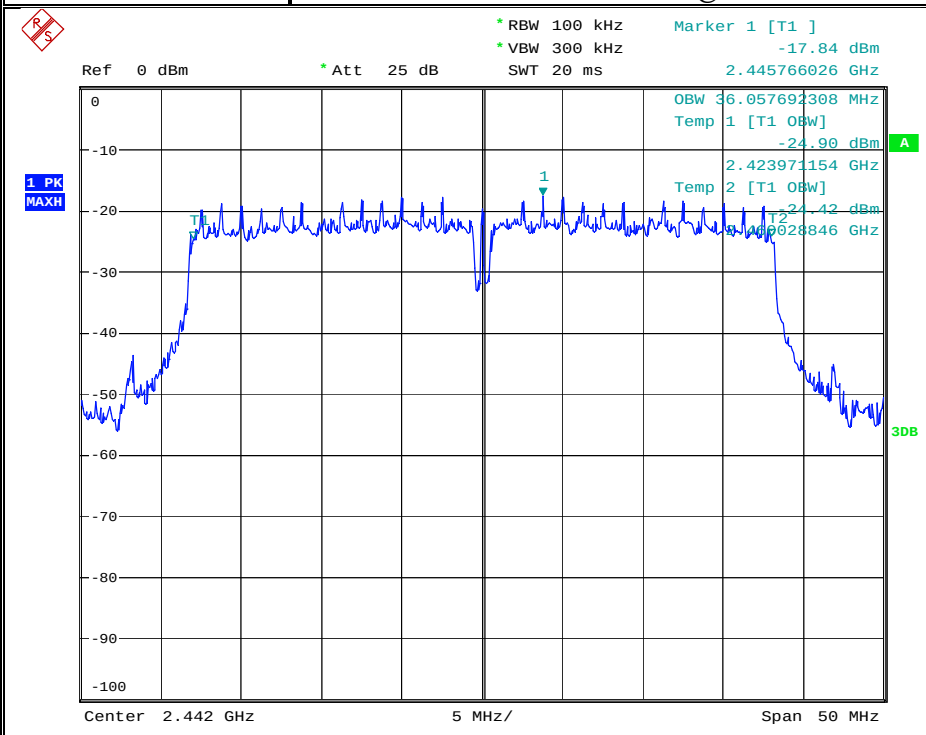
Plot #5

2442 MHz	Mode: MCS 0 @ 20 MHz



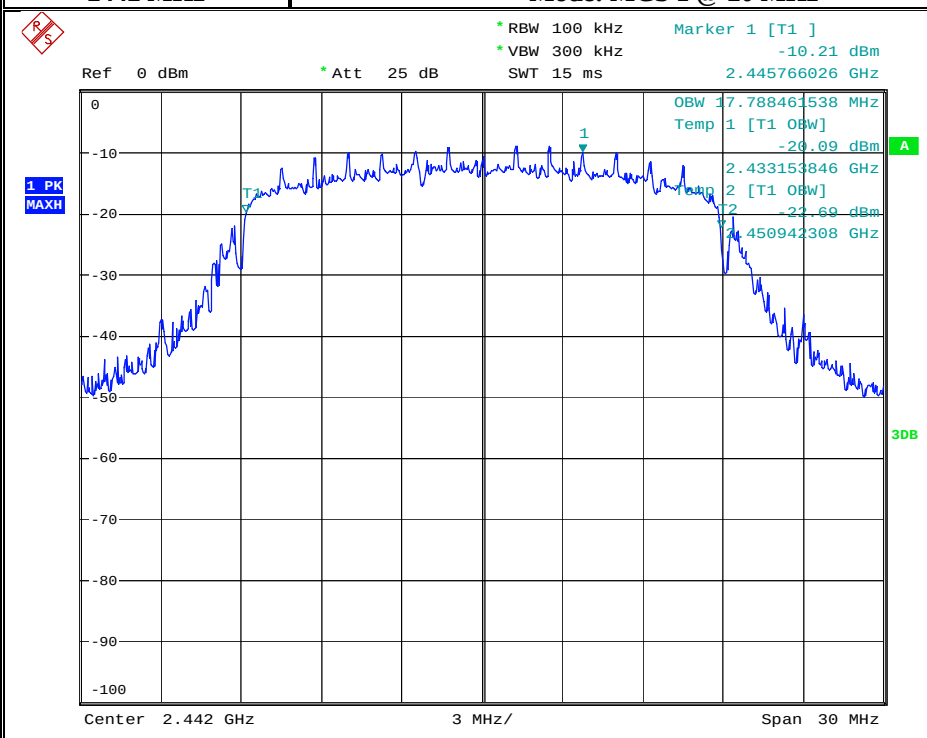
Plot #6

2442 MHz	Mode: MCS 0 @ 40 MHz



Plot #7

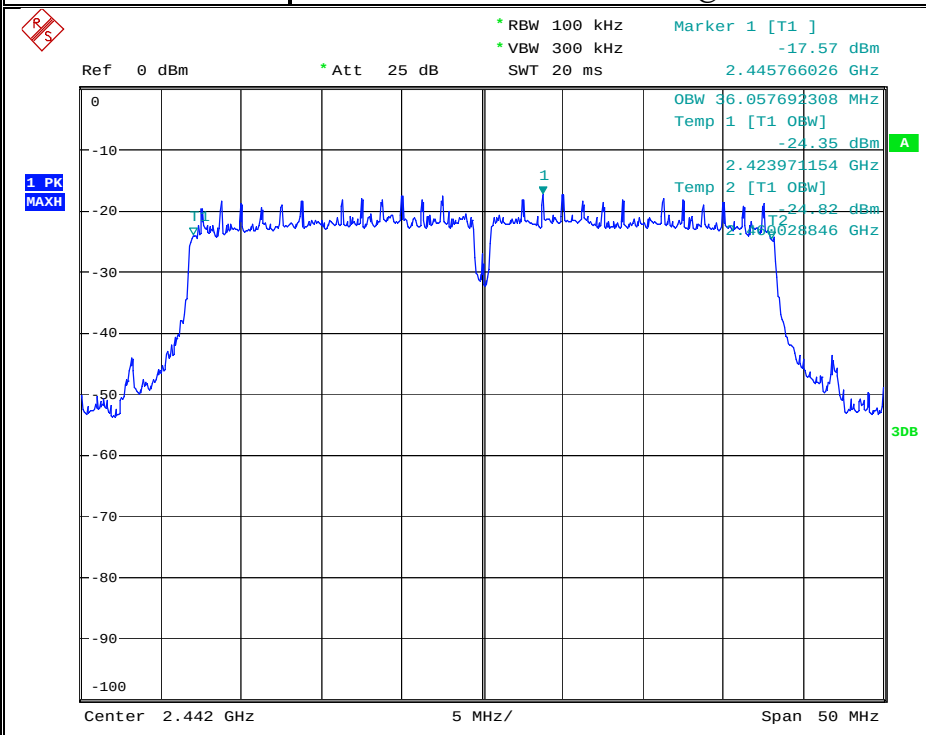
2442 MHz	Mode: MCS 1 @ 20 MHz



Date: 24.AUG.2017 15:04:05

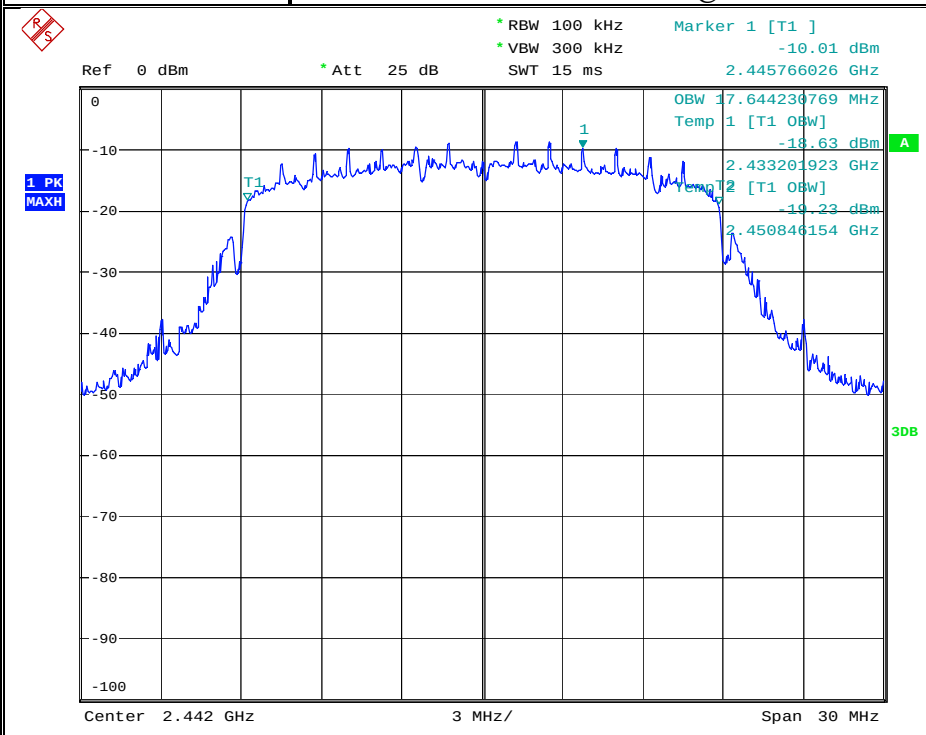
Plot #8

2442 MHz	Mode: MCS 1 @ 40 MHz



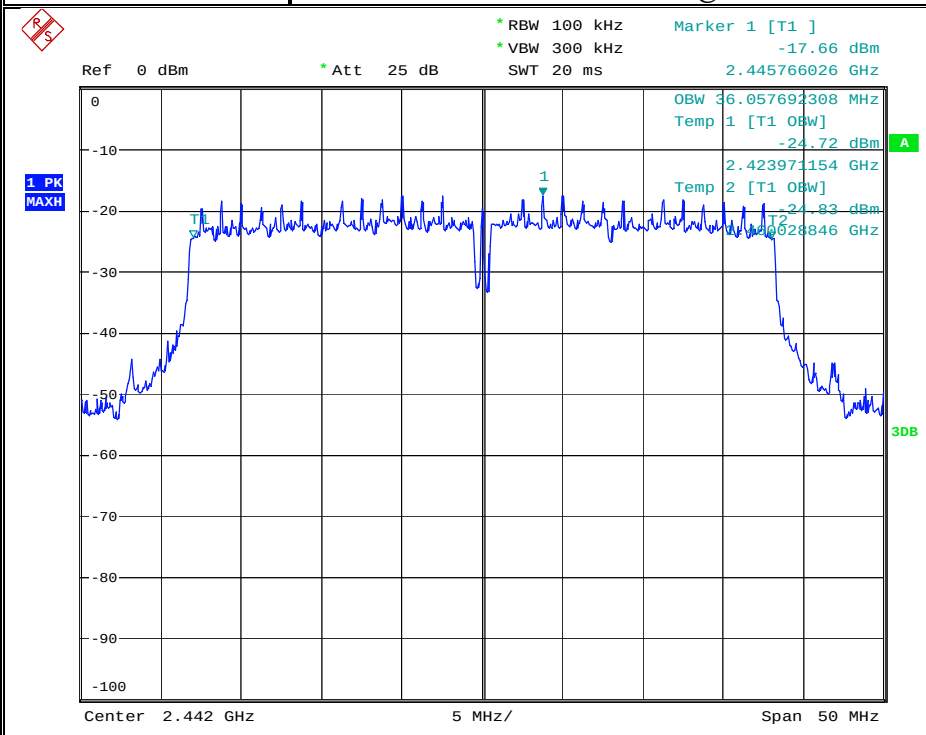
Plot #9

2442 MHz	Mode: MCS 2 @ 20 MHz



Plot #10

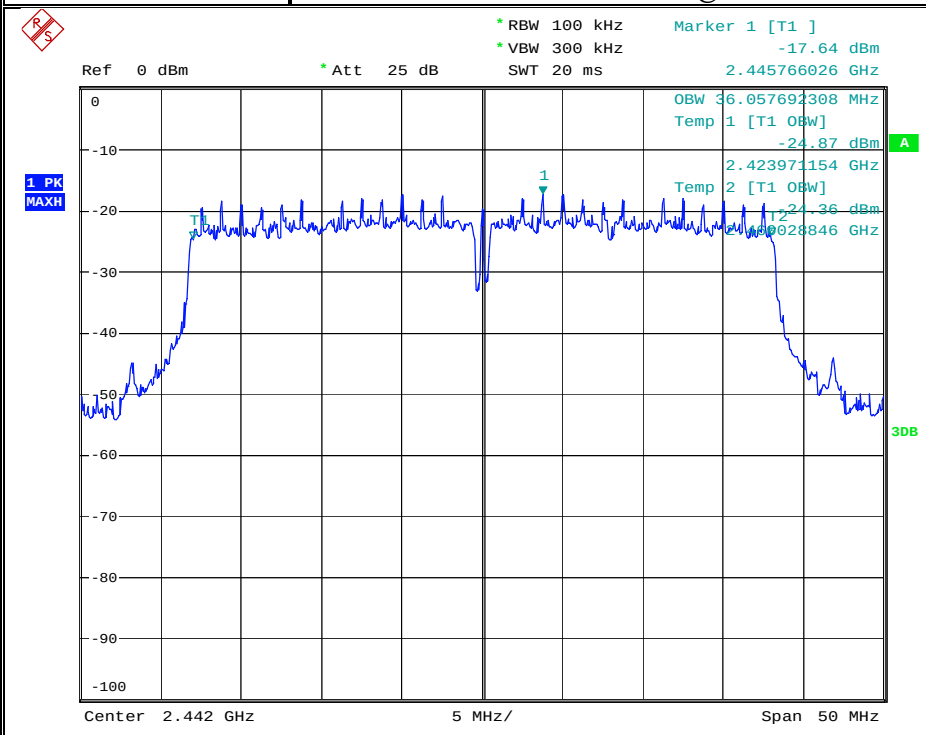
2442 MHz	Mode: MCS 2 @ 40 MHz



Date: 24.AUG.2017 16:07:01

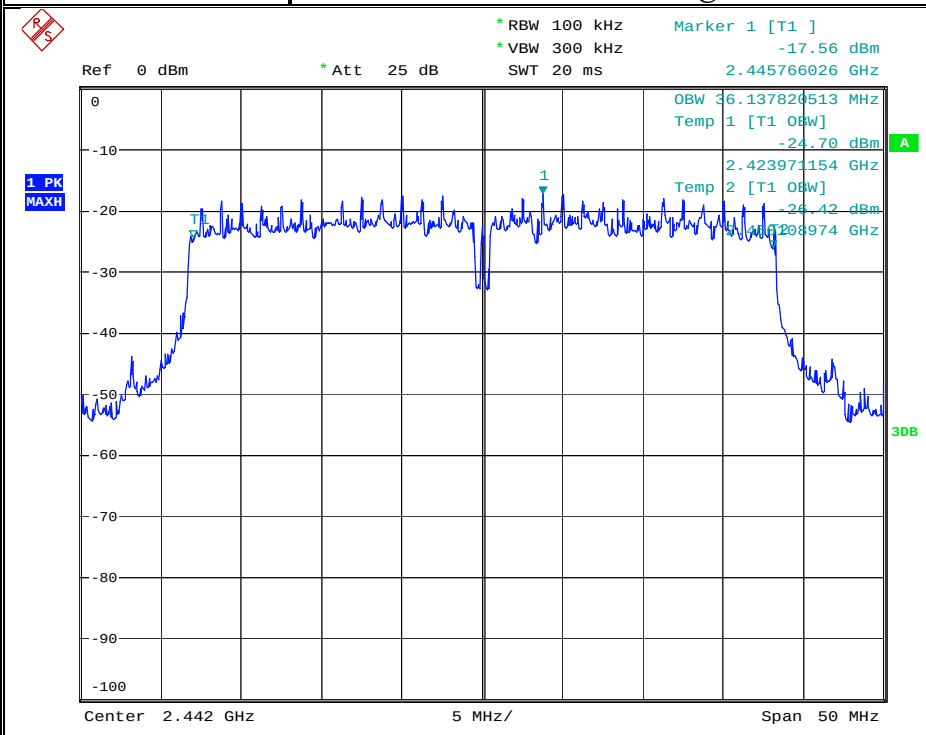
Plot #11

2442 MHz	Mode: MCS 3 @ 20 MHz



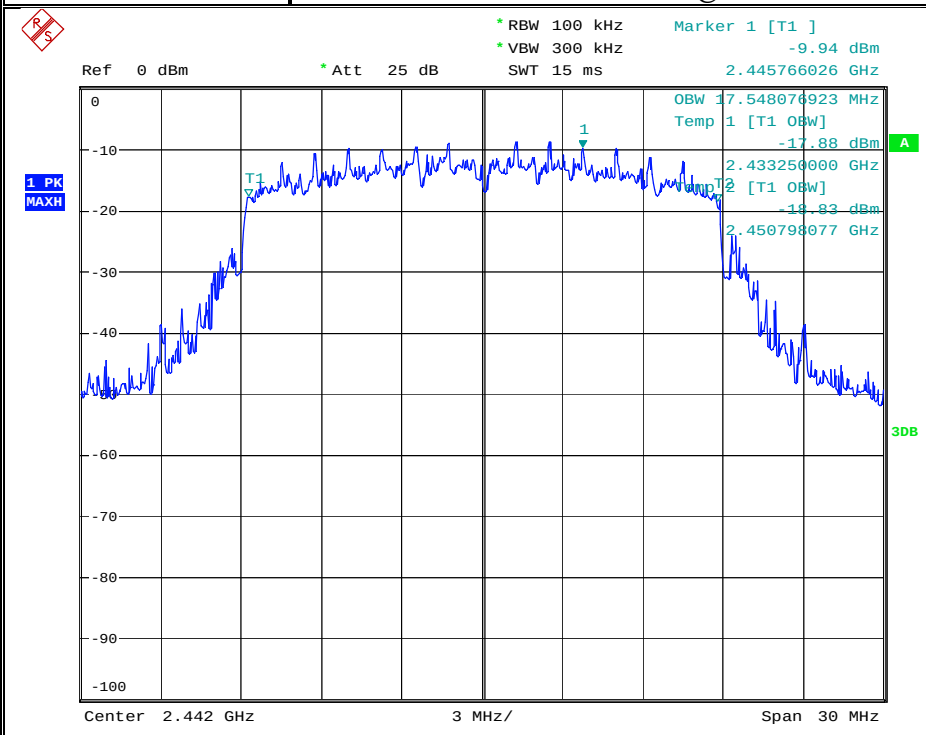
Plot #12

2442 MHz	Mode: MCS 3 @ 40 MHz



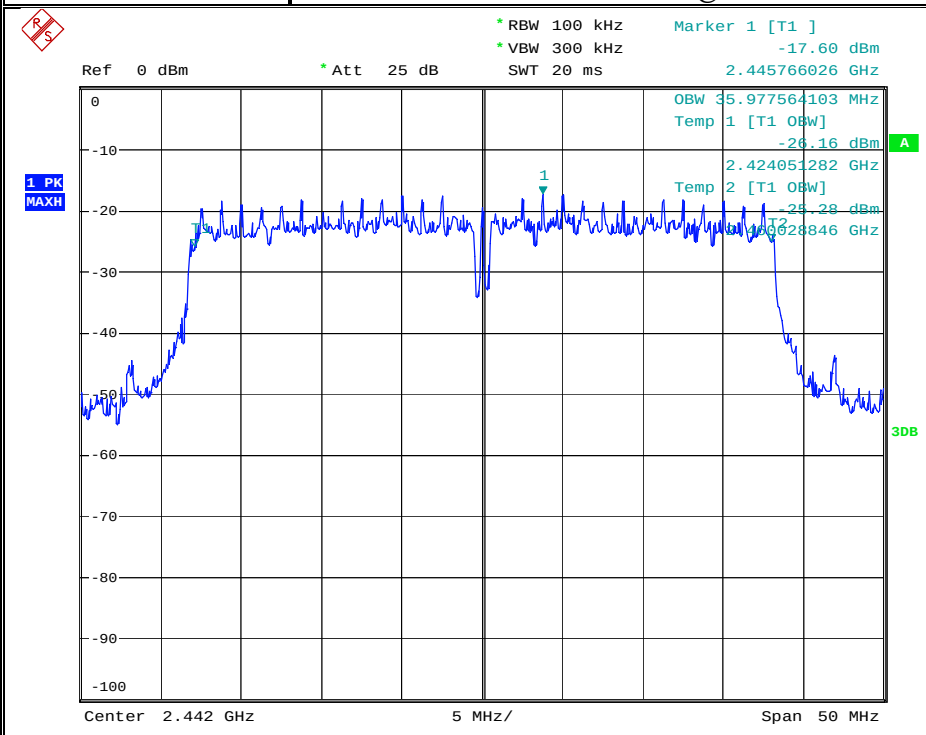
Plot #13

2442 MHz	Mode: MCS 4 @ 20 MHz



Plot #14

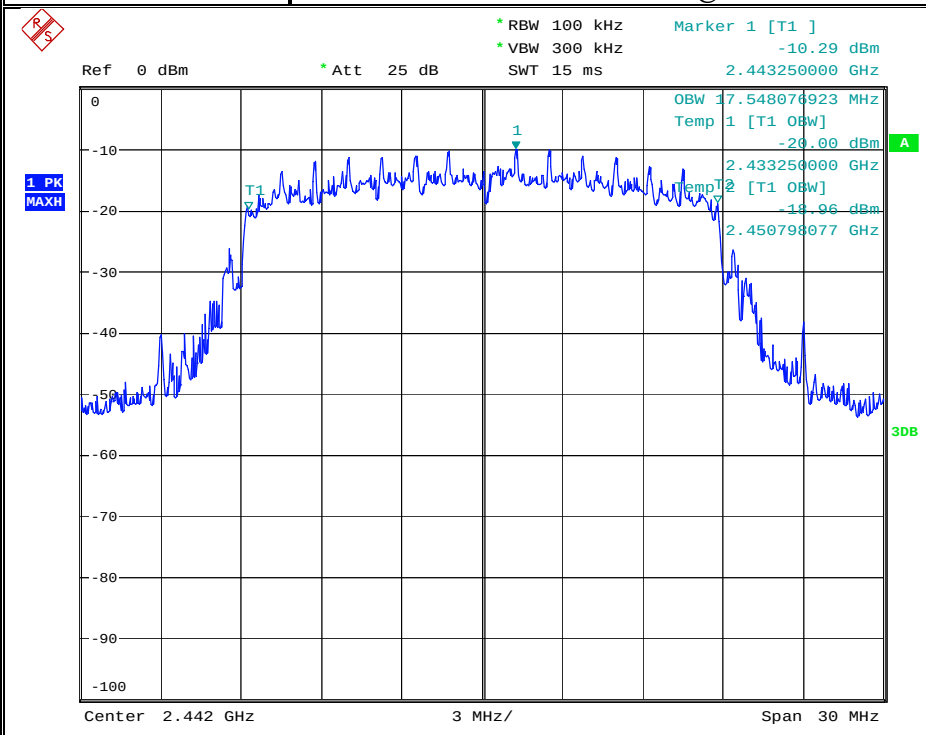
2442 MHz	Mode: MCS 4 @ 40 MHz



Date: 24.AUG.2017 16:33:49

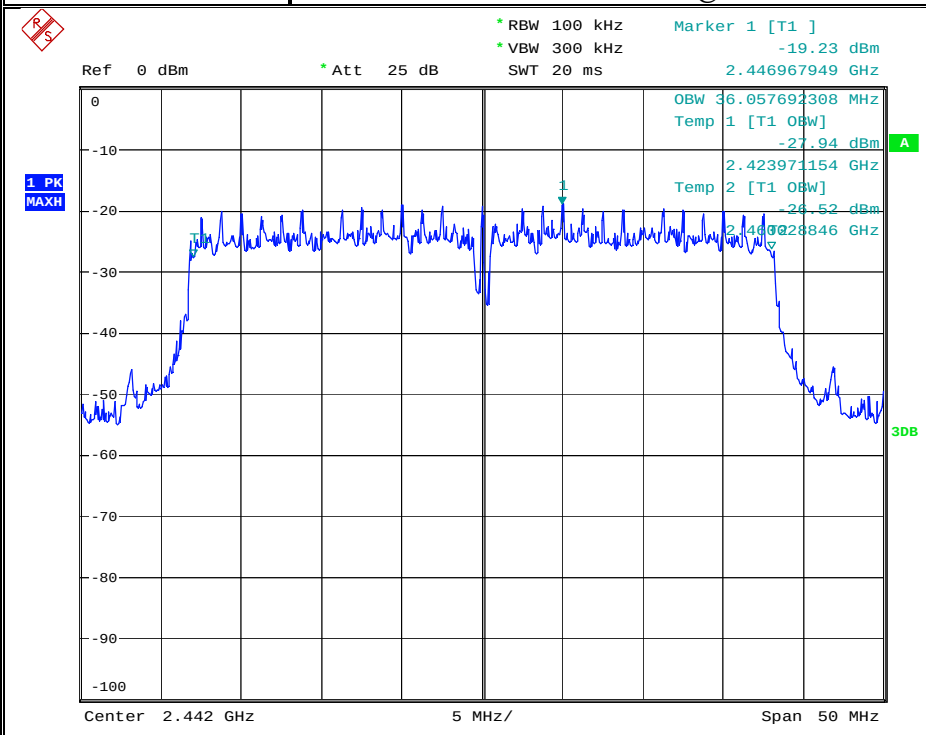
Plot #15

2442 MHz	Mode: MCS 5 @ 20 MHz



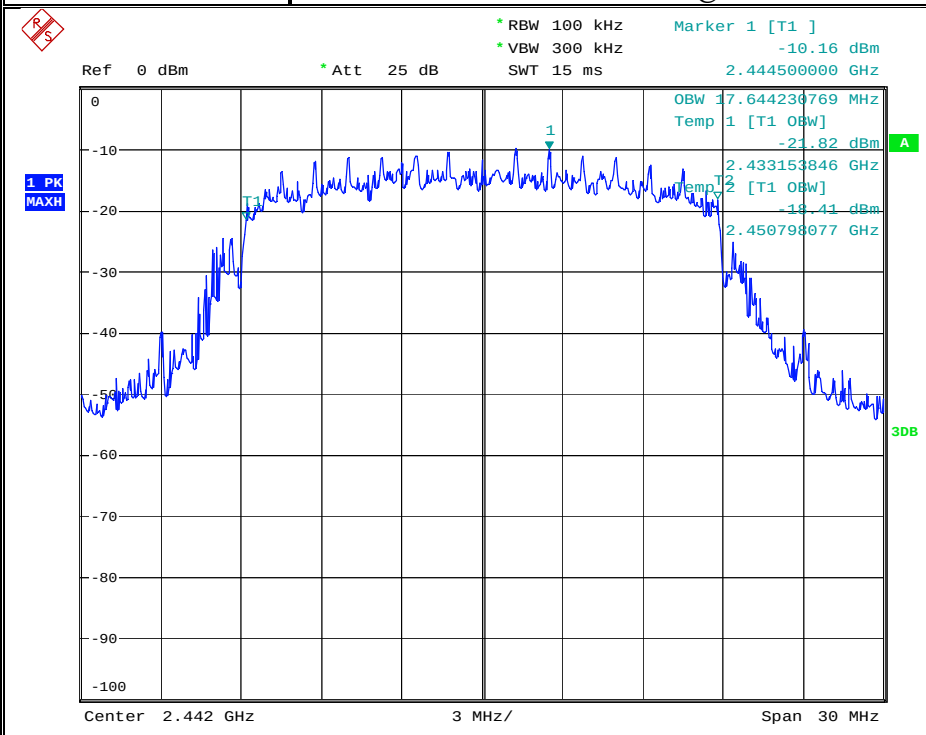
Plot #16

2442 MHz	Mode: MCS 5 @ 40 MHz



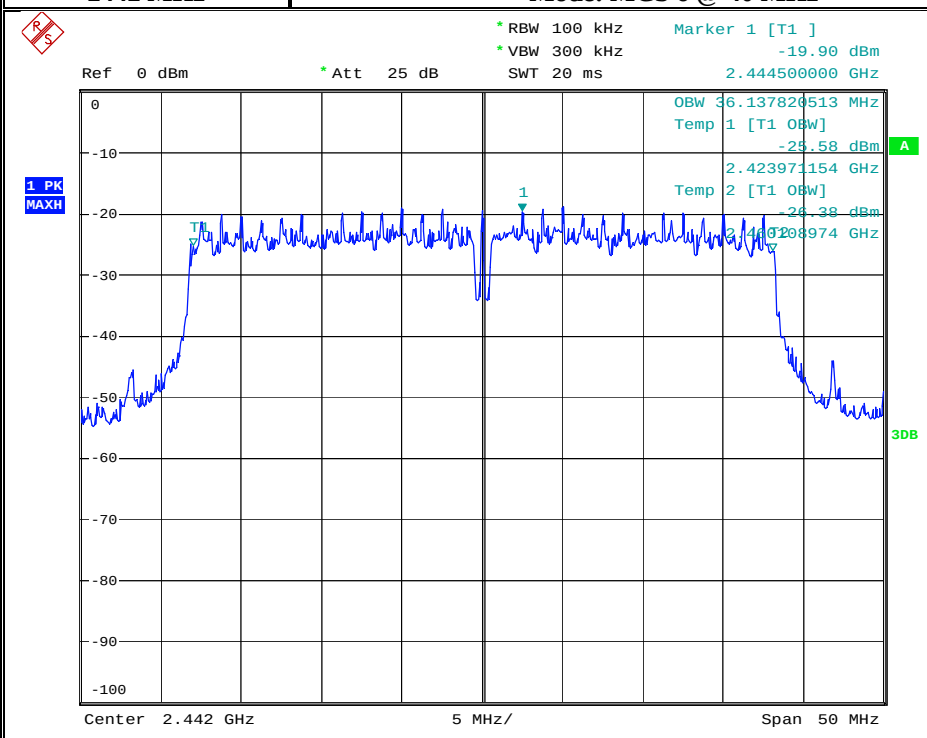
Plot #17

2442 MHz	Mode: MCS 6 @ 20 MHz



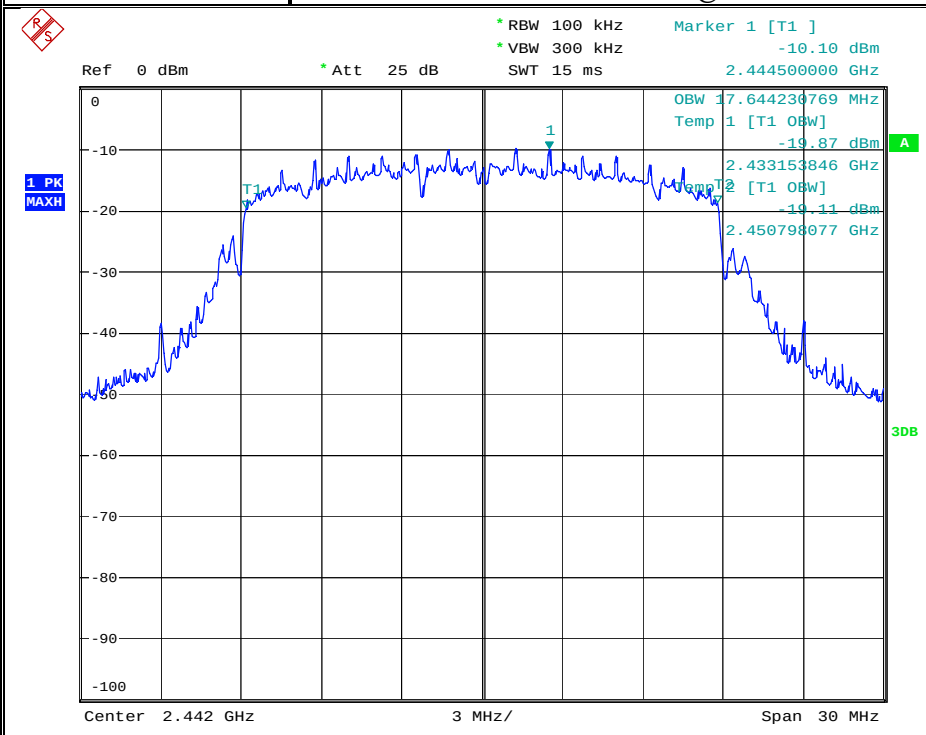
Plot #18

2442 MHz	Mode: MCS 6 @ 40 MHz



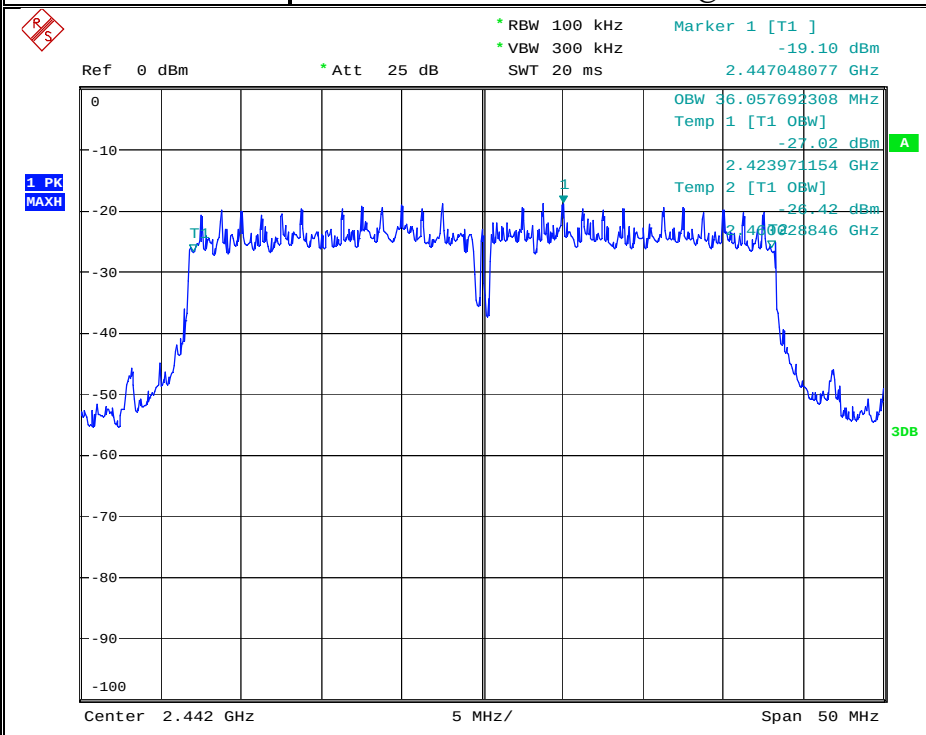
Plot #19

2442 MHz	Mode: MCS 7 @ 20 MHz



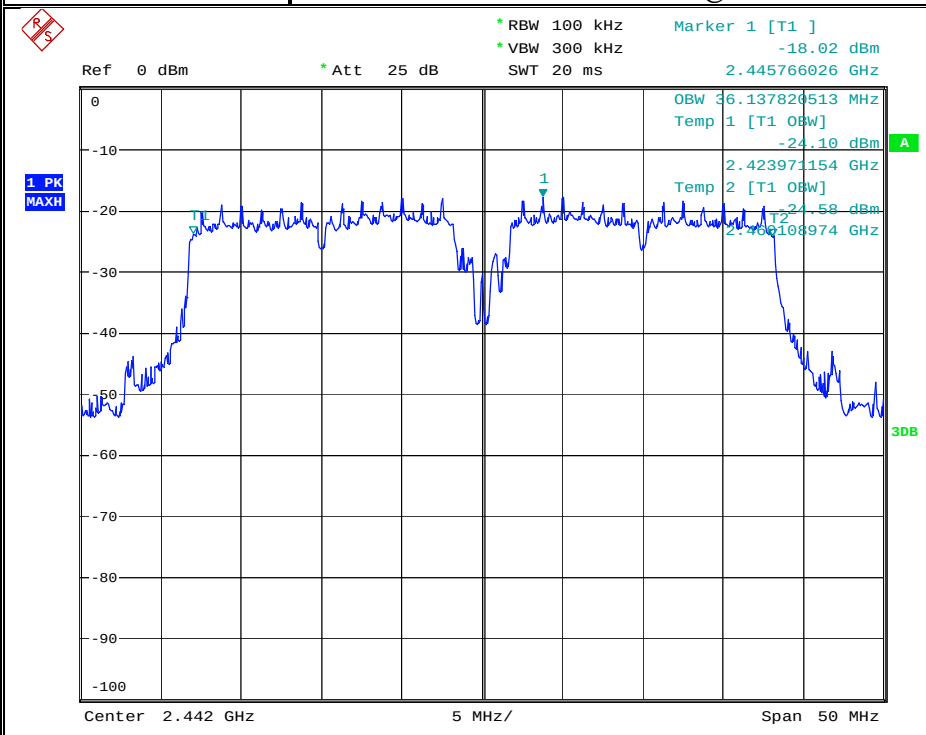
Plot #20

2442 MHz	Mode: MCS 7 @ 40 MHz



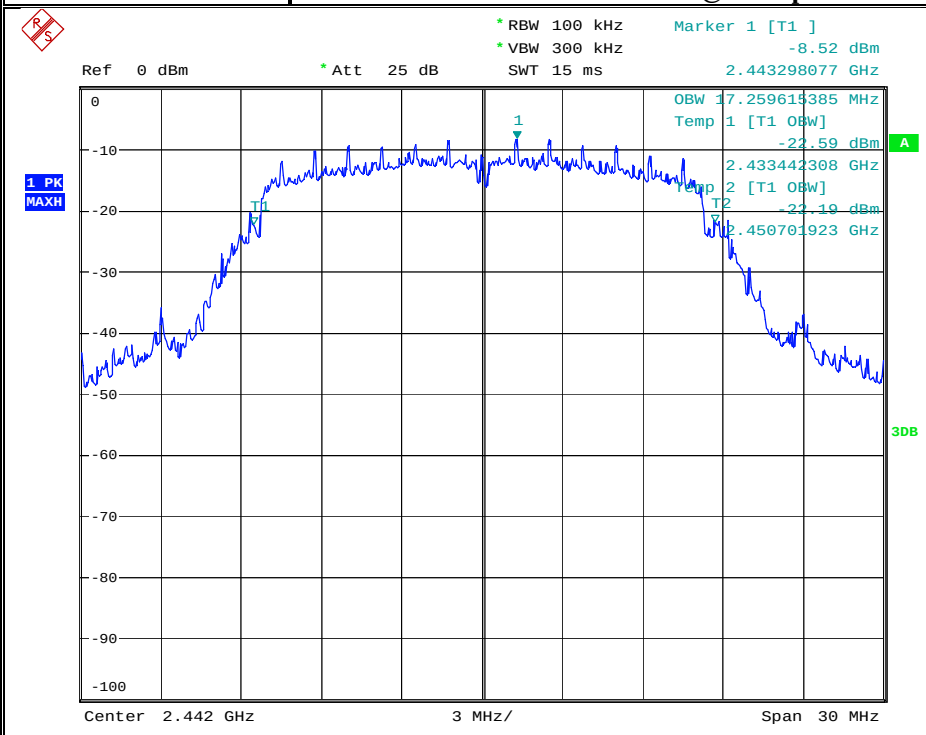
Plot #21

2442 MHz	Mode: MCS 32 @ 40 MHz



Plot #22

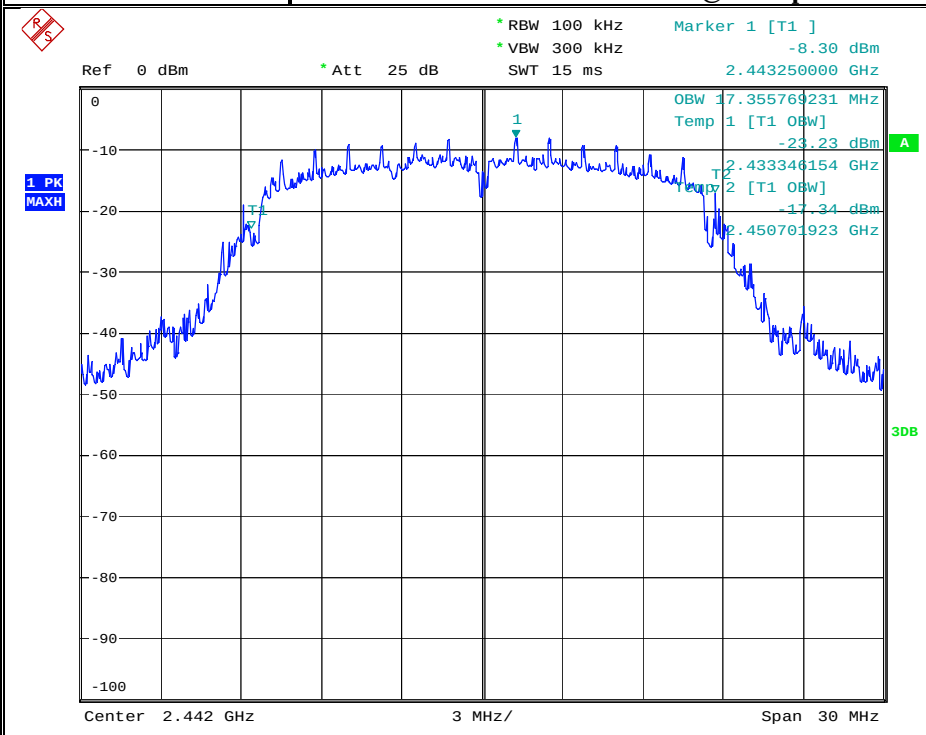
2442 MHz	Mode: OFDM @ 6 Mbps



Date: 24.AUG.2017 17:40:18

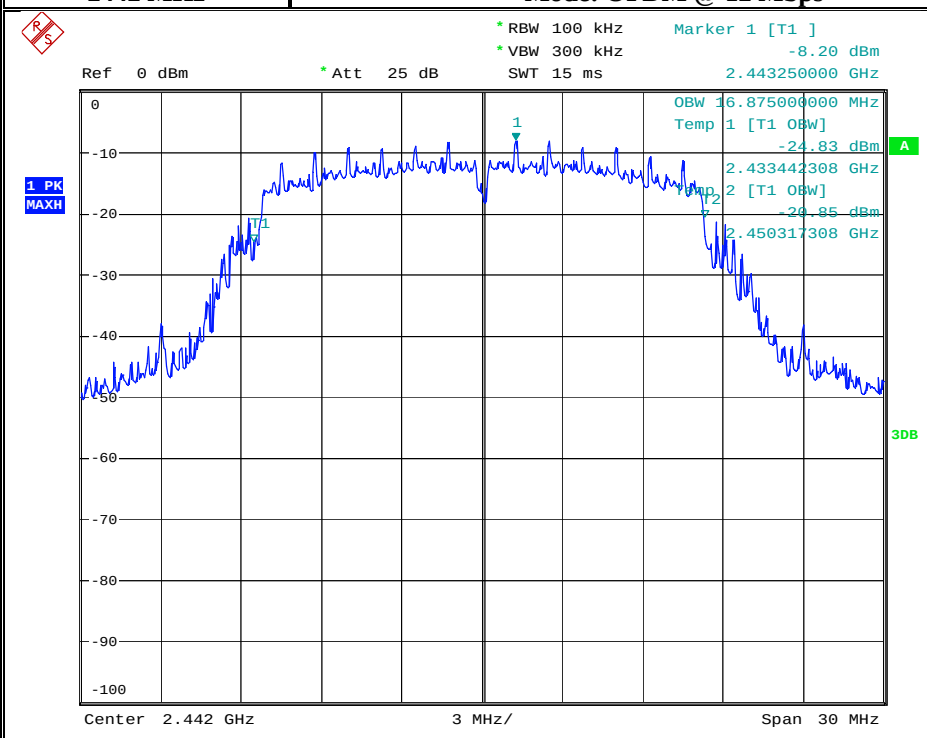
Plot #23

2442 MHz	Mode: OFDM @ 9 Mbps



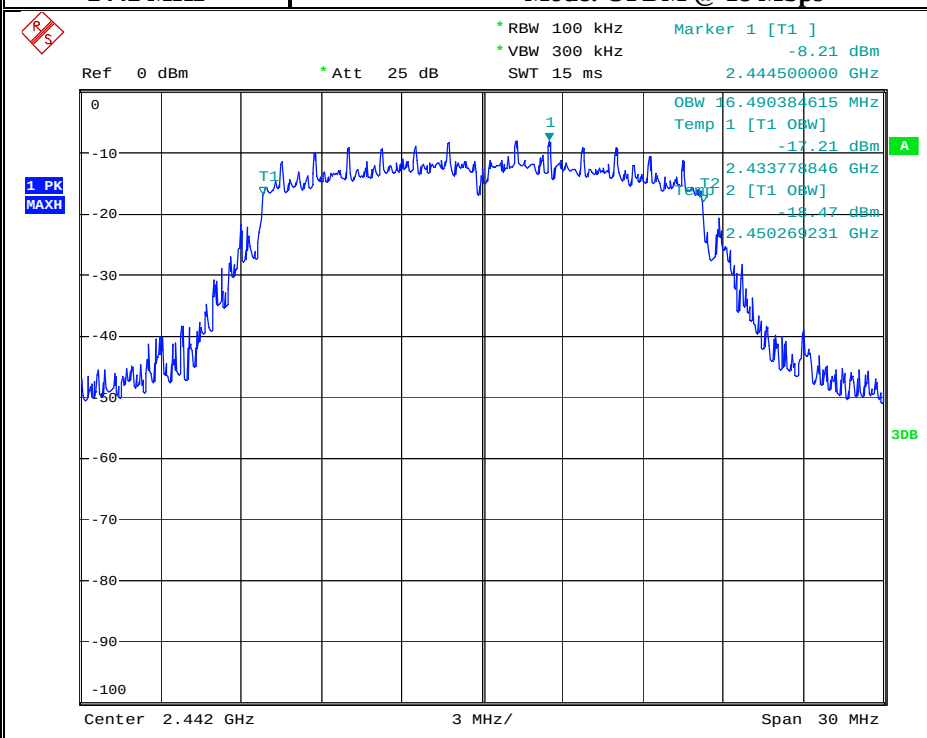
Plot #24

2442 MHz	Mode: OFDM @ 12 Mbps



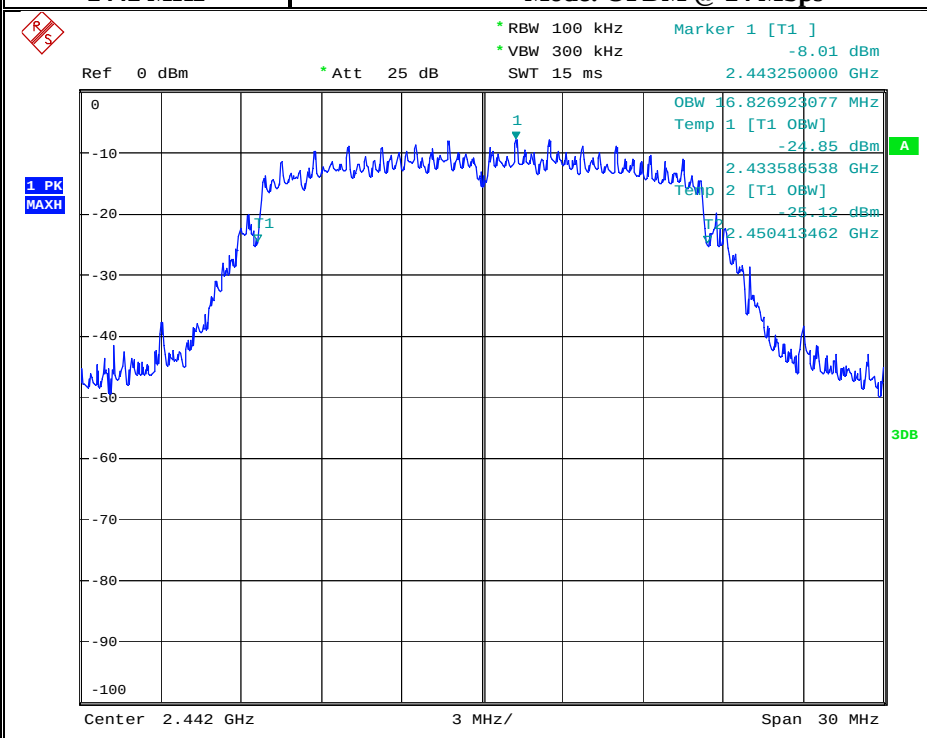
Plot #25

2442 MHz	Mode: OFDM @ 18 Mbps



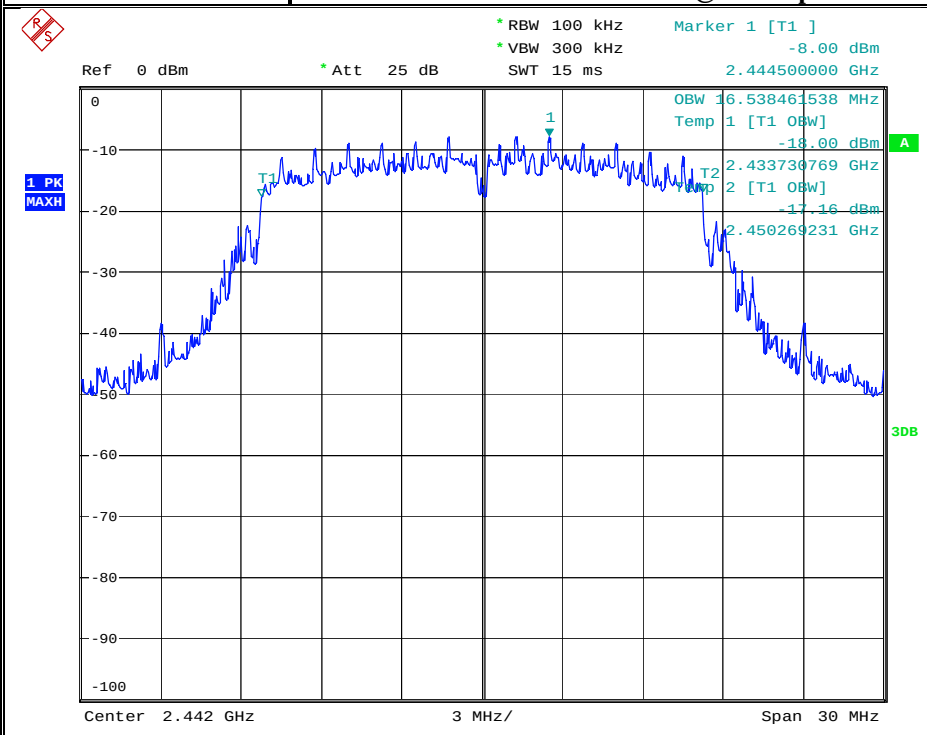
Plot #26

2442 MHz	Mode: OFDM @ 24 Mbps



Plot #27

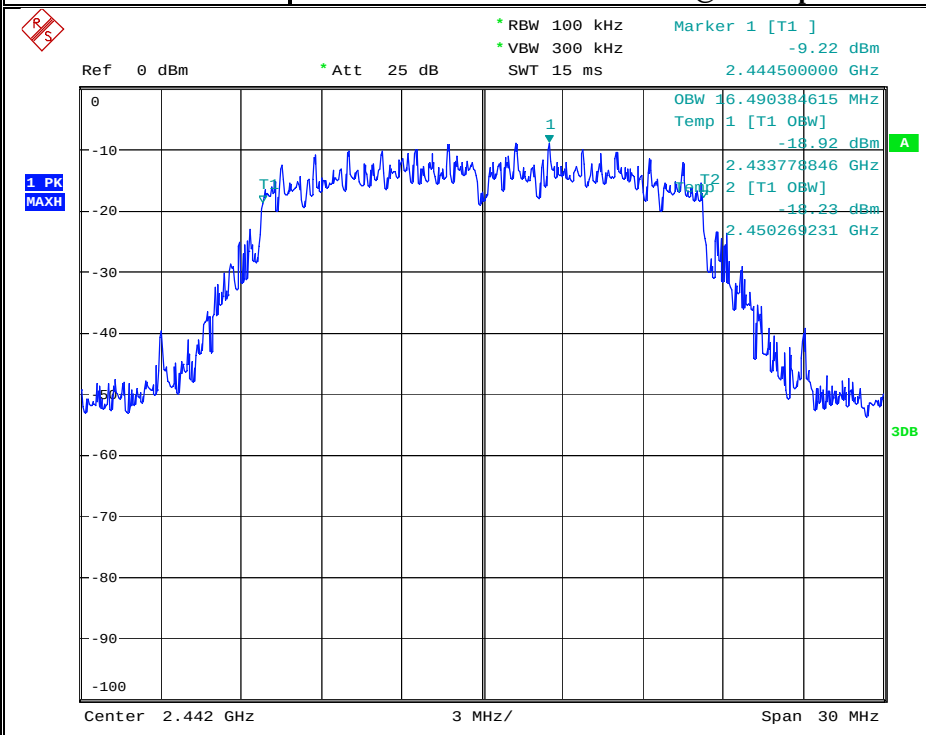
2442 MHz	Mode: OFDM @ 36 Mbps



Date: 24.AUG.2017 17:46:29

Plot #28

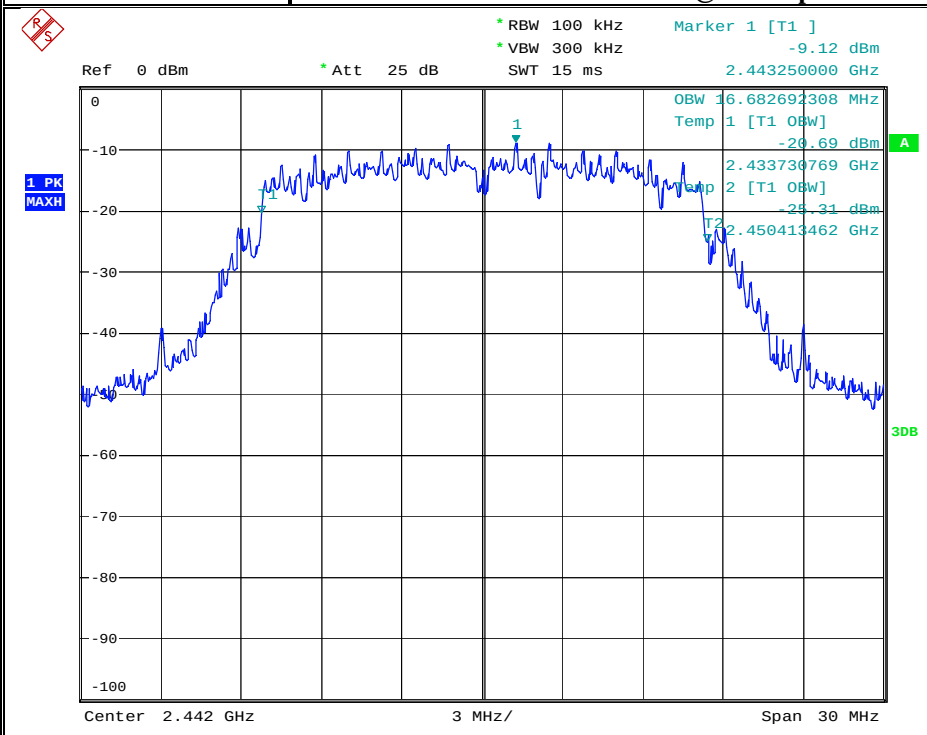
2442 MHz	Mode: OFDM @ 48 Mbps



Date: 24.AUG.2017 17:47:52

Plot #29

2442 MHz	Mode: OFDM @ 54 Mbps



8.5 Radiated Transmitter Spurious Emissions

8.5.1 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= 1MHz

- 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

8.5.2 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	40dBµV/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= 74dBµV/m
  *AVG. LIMIT= 54dBµV/m

8.5.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain (dBi)
23° C	1	MCS 1	5 Vdc	1.575

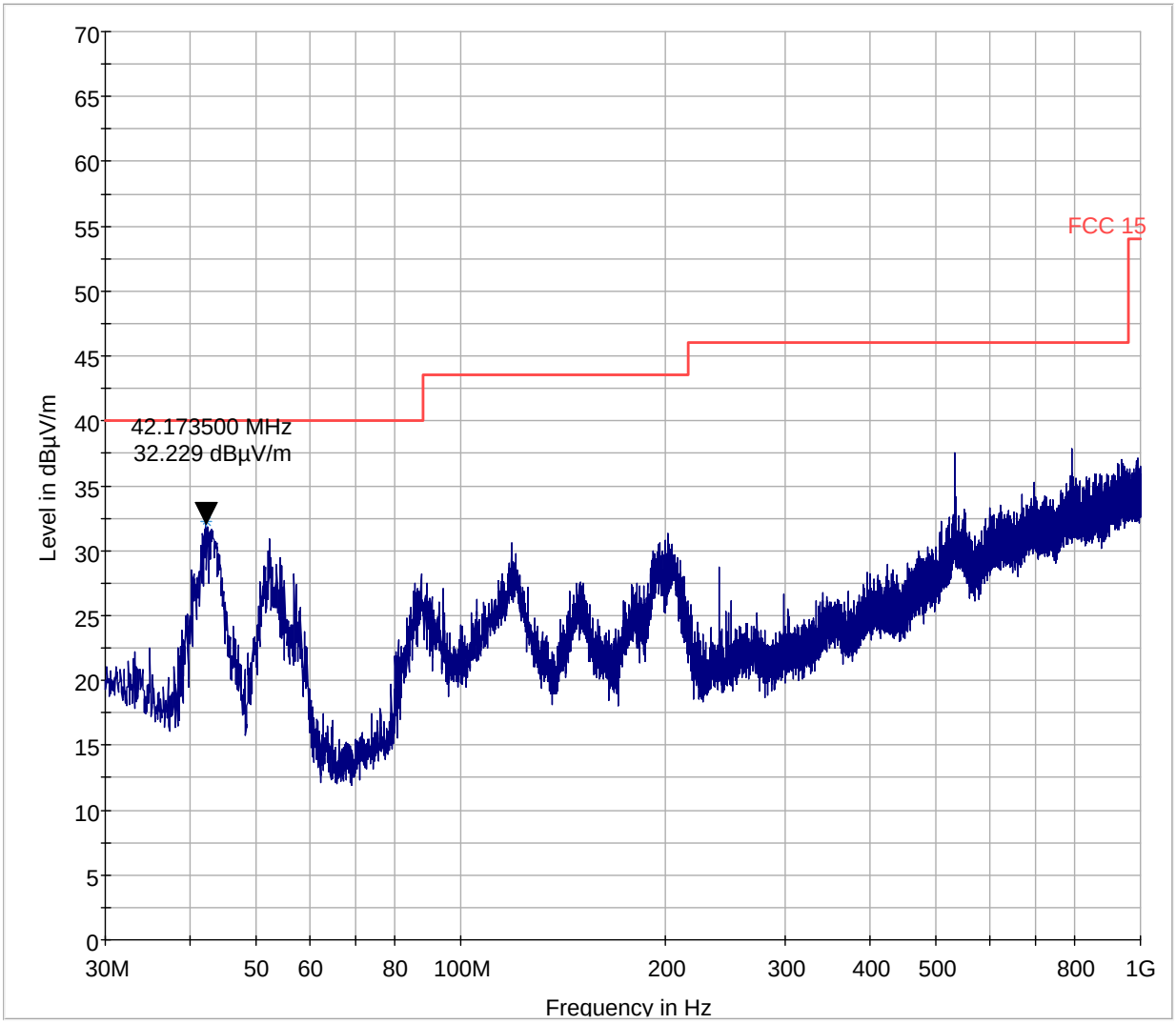
8.5.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Low	30 MHz – 18 GHz	See section 8.2.2	Pass
4-8	Mid	9 kHz – 26 GHz	See section 8.2.2	Pass
9-11	High	30 MHz – 18 GHz	See section 8.2.2	Pass

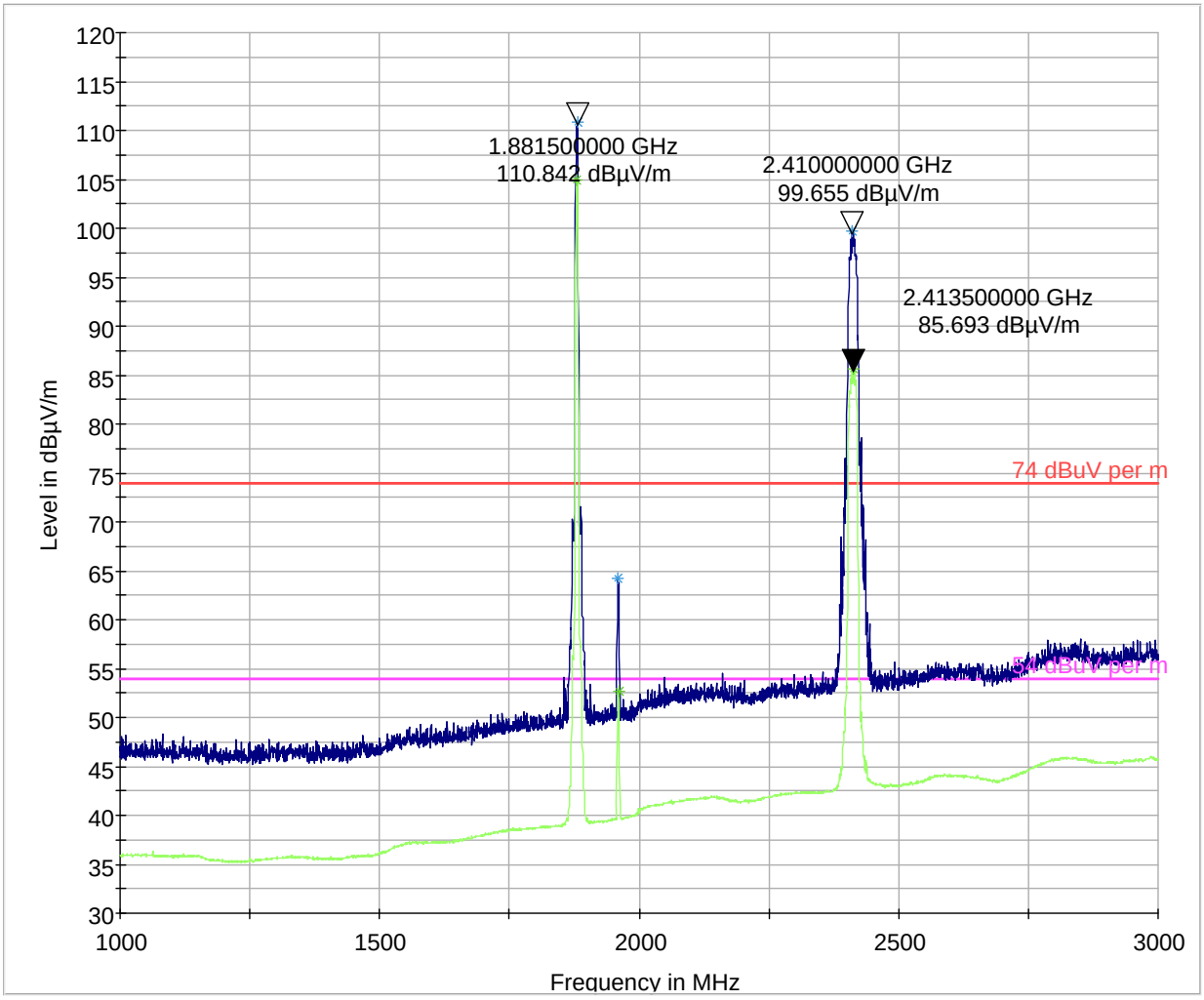
8.5.5 Measurement Plots:

Plots reported here represent the worst case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT. Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.

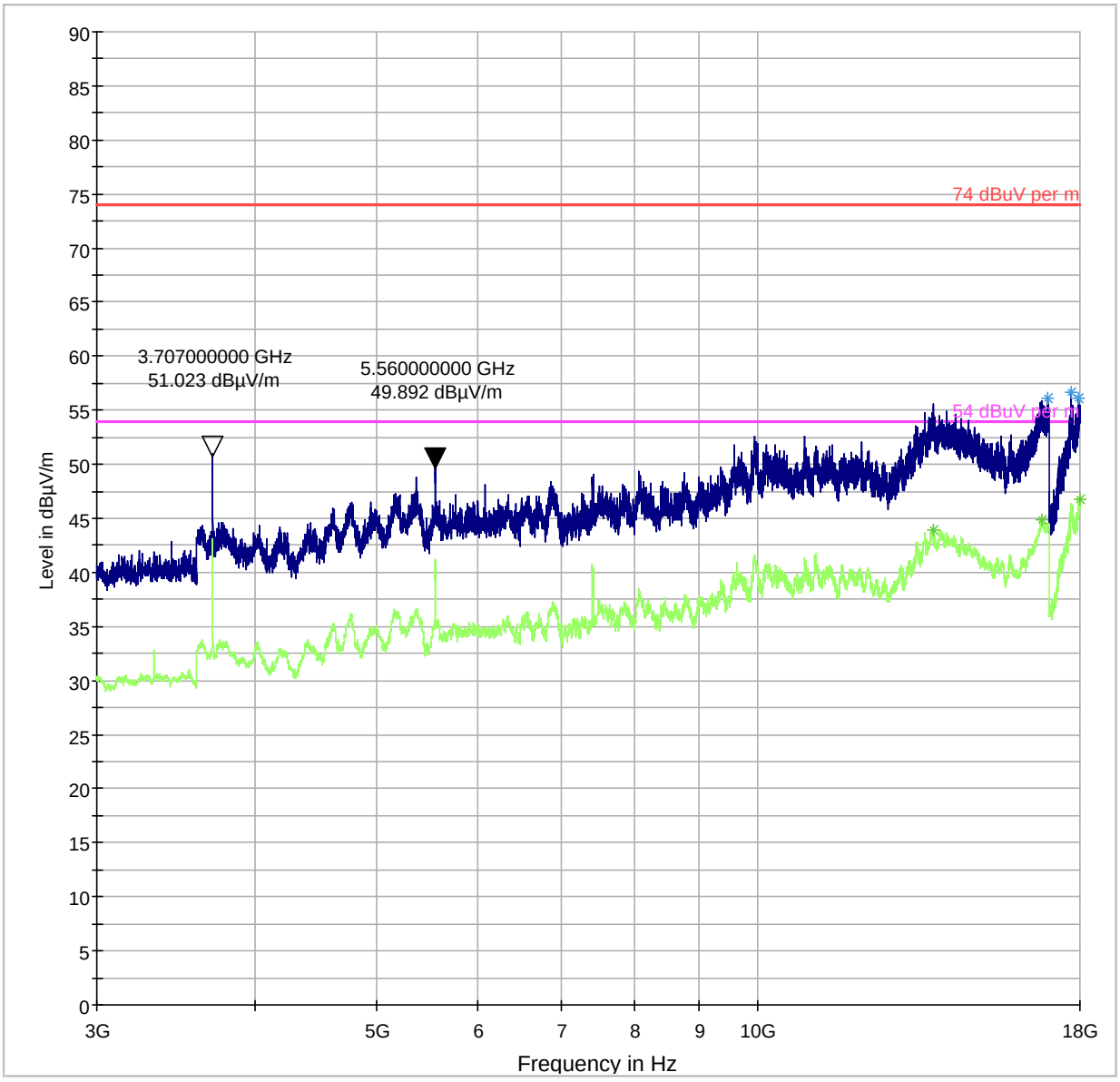
Plot #1 Radiated Emissions: 30 MHz – 1GHz	
Modulation: MCS 1	**Channel: Low**



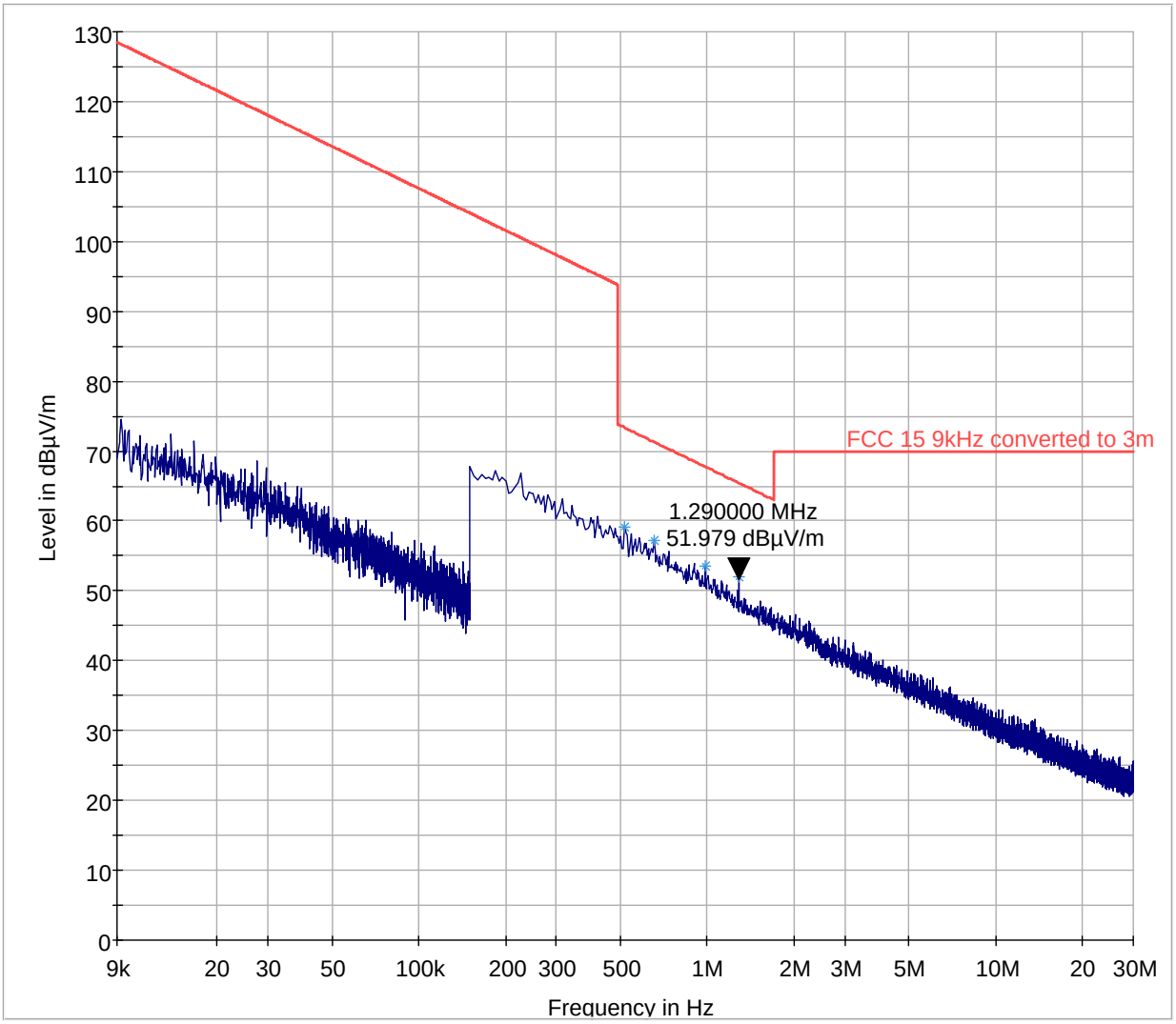
Plot # 2 Radiated Emissions: 1-3 GHz	
Modulation: MCS 1	**Channel: Low**



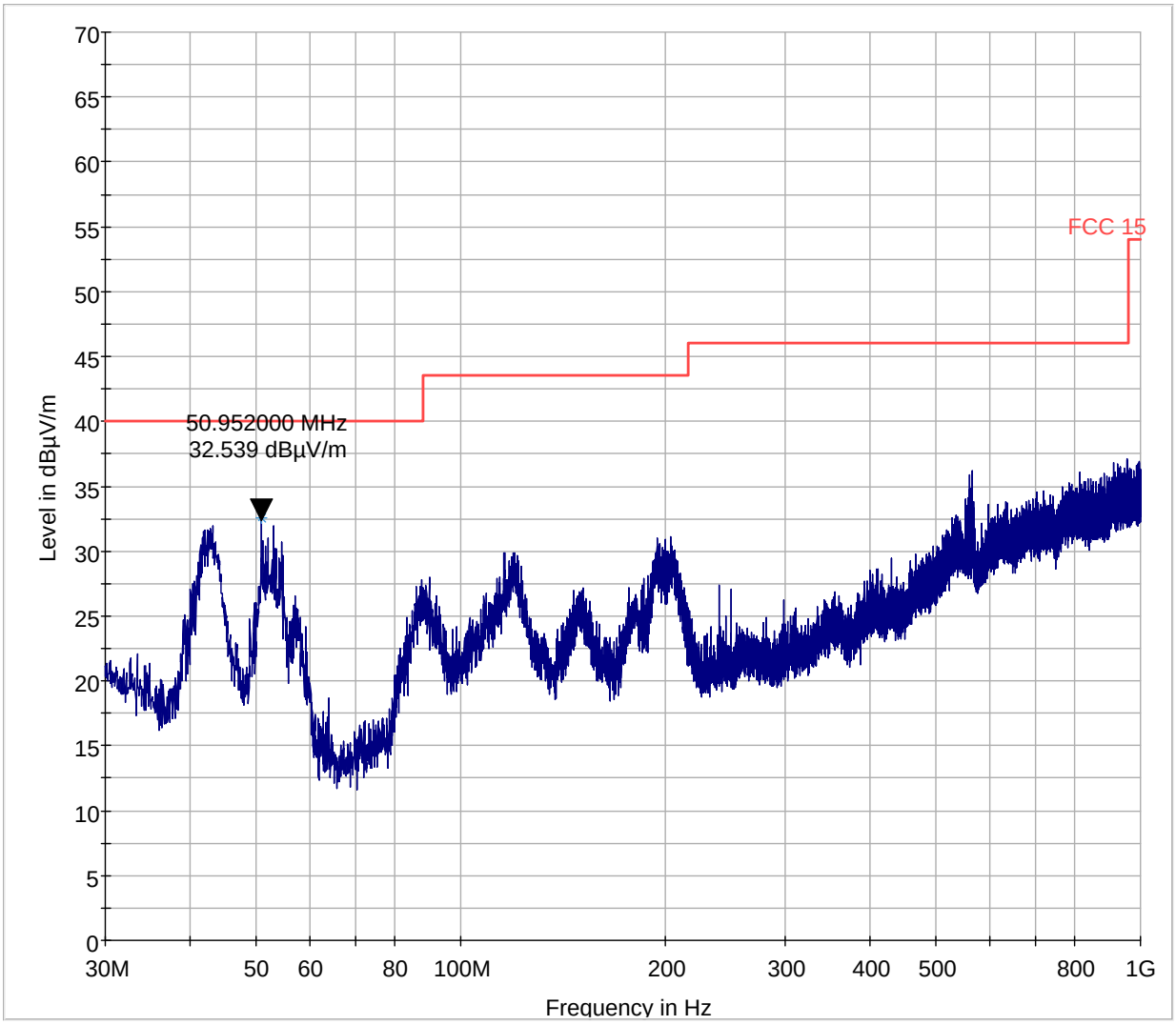
Plot # 3 Radiated Emissions: 3-18 GHz	
Modulation: MCS 1	**Channel: Low**



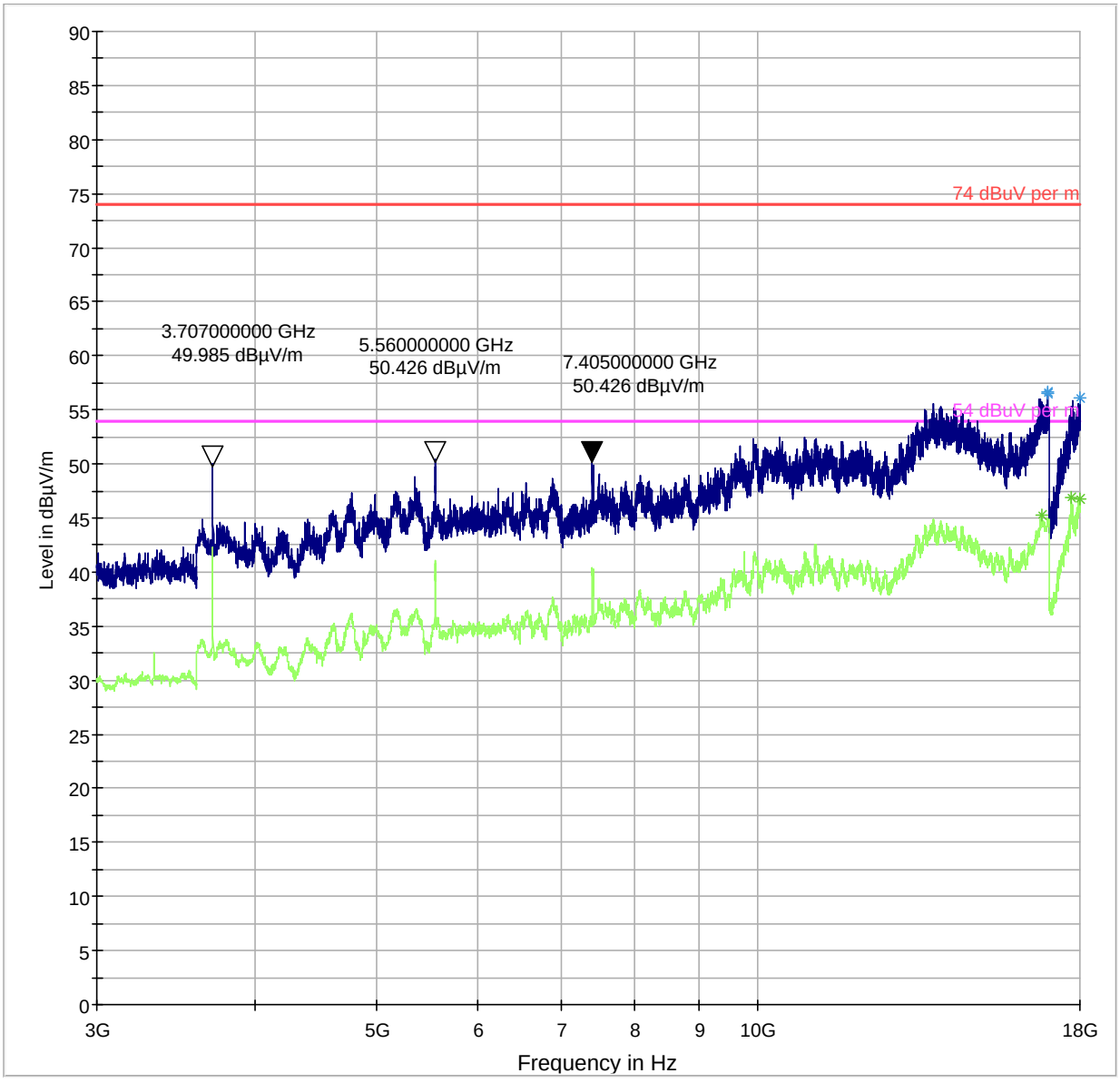
Plot # 4 Radiated Emissions: 9 kHz – 30 MHz	
Modulation: MCS 1	**Channel: Mid**



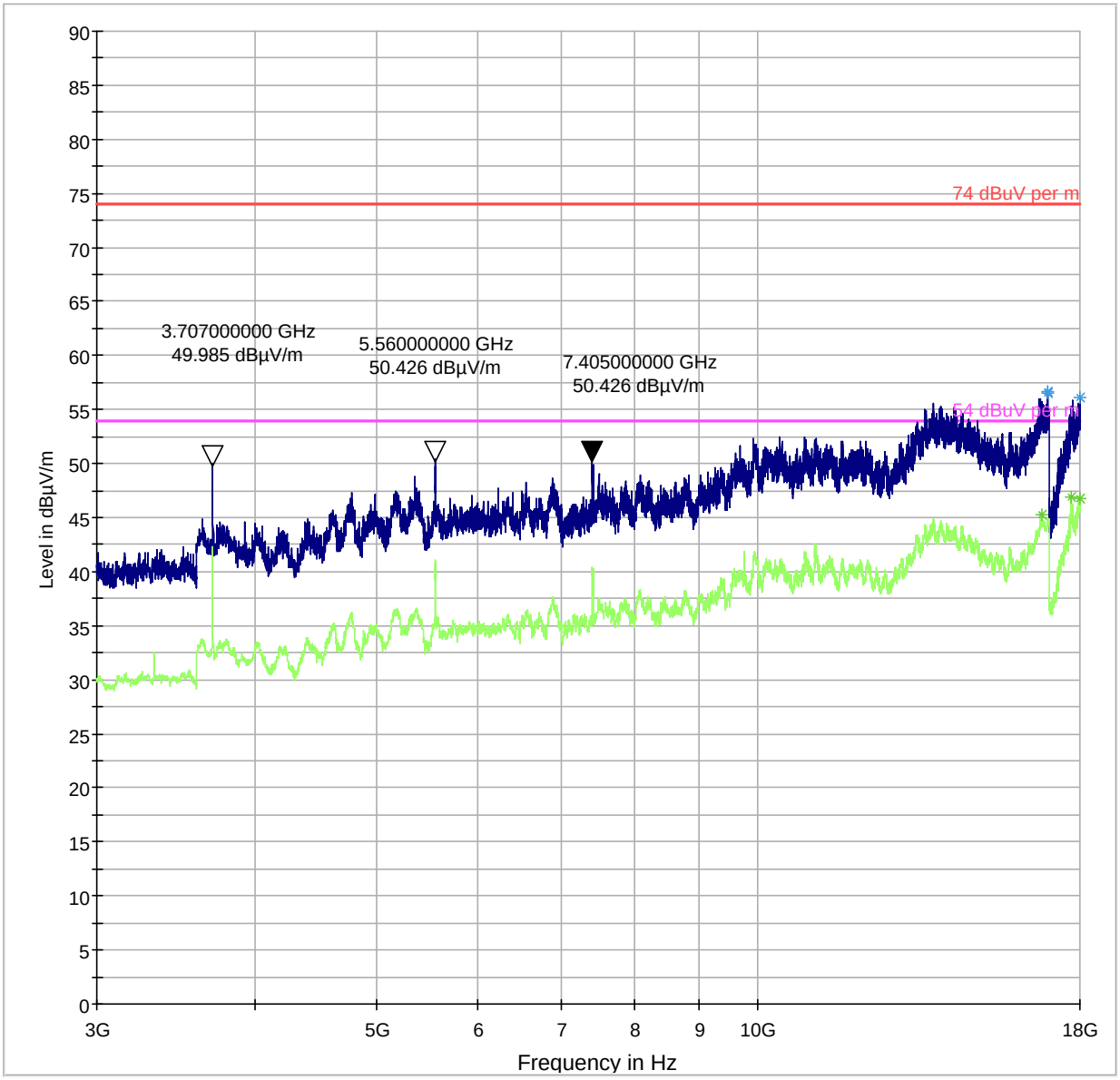
Plot #5 Radiated Emissions: 30 MHz – 1 GHz	
Modulation: MCS 1	**Channel: Mid**



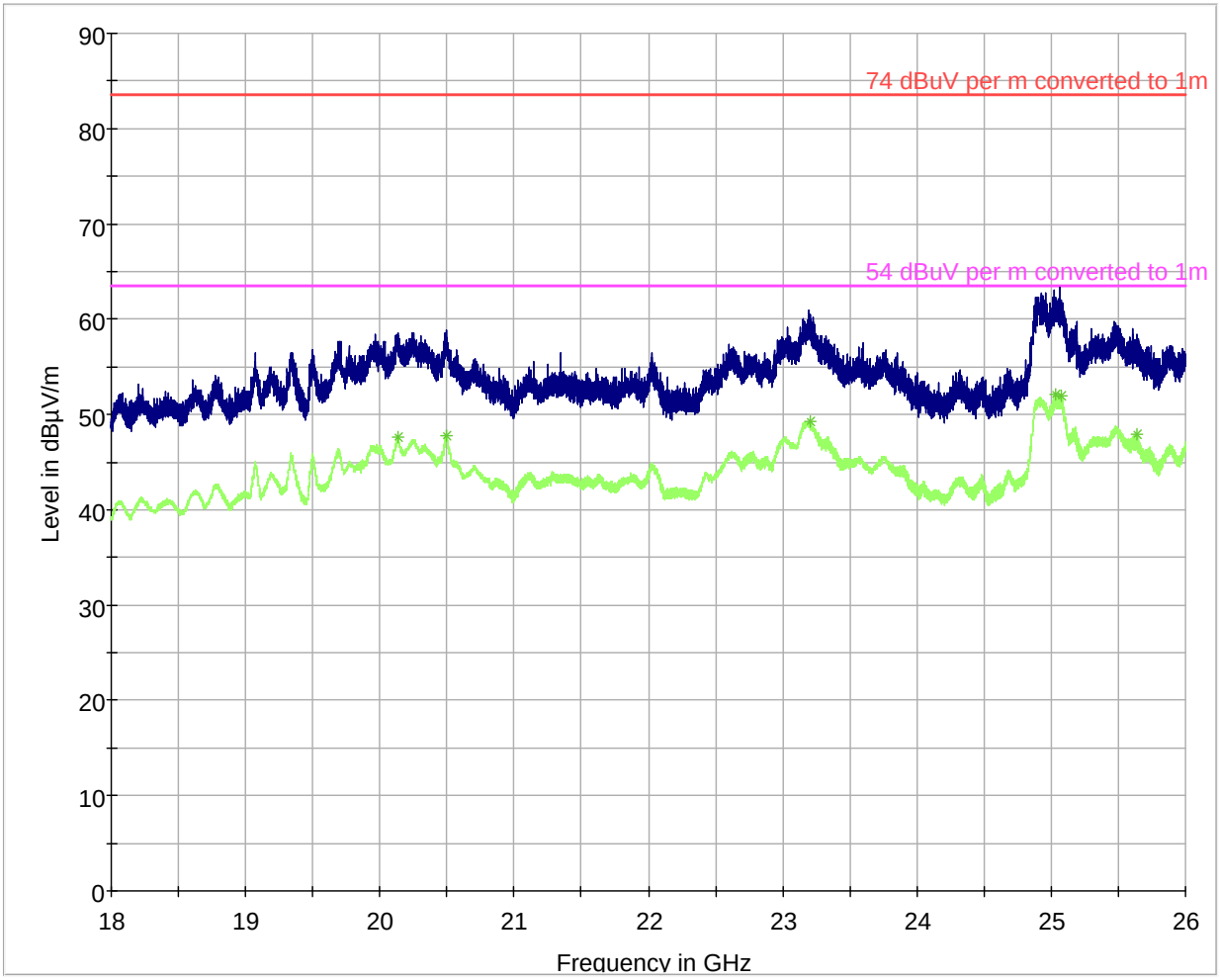
Plot #6 Radiated Emissions: 1-3 GHz	
Modulation: MCS 1	**Channel: Mid**



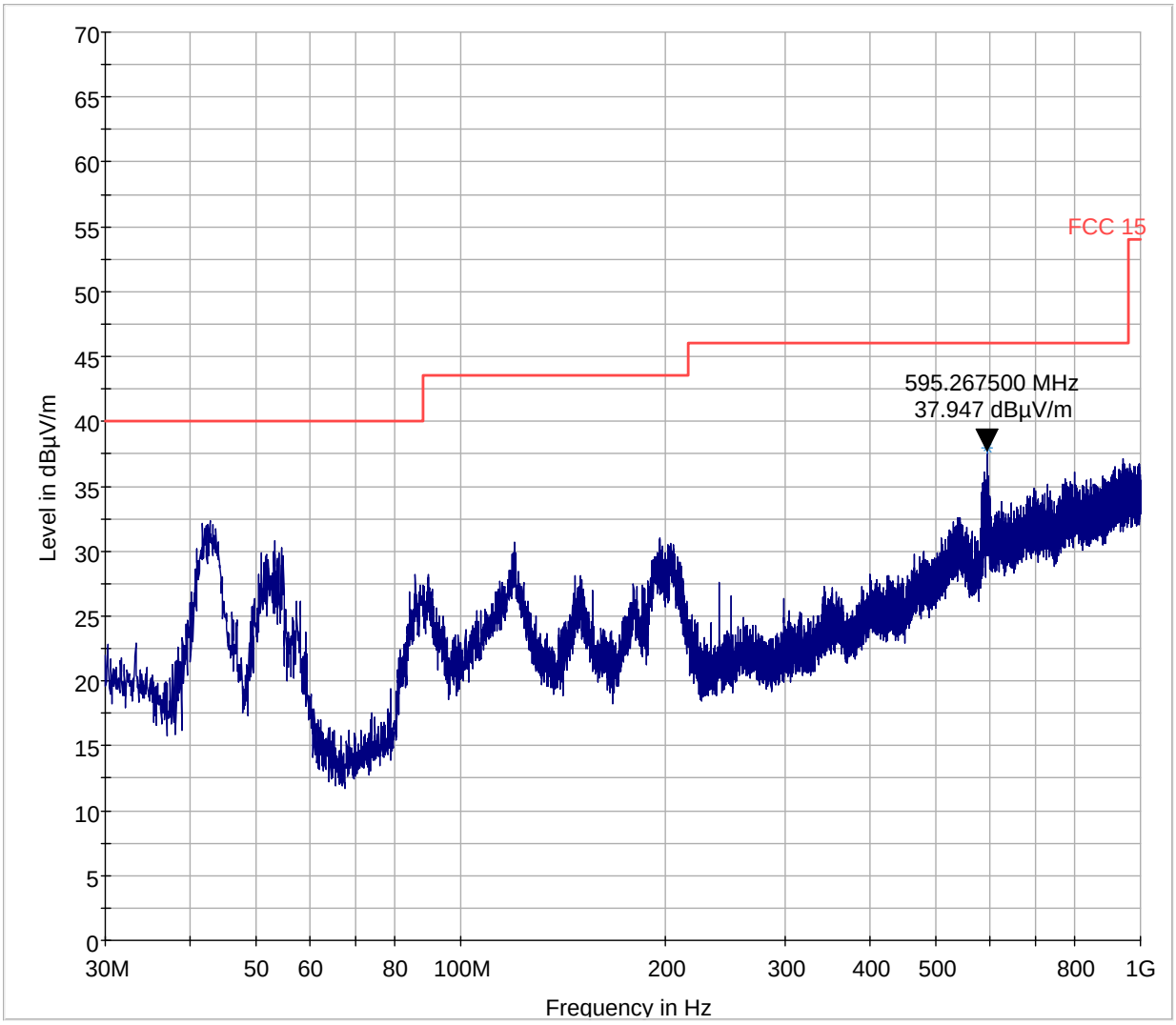
Plot #7 Radiated Emissions: 3-18 GHz	
Modulation: MCS 1	**Channel: Mid**



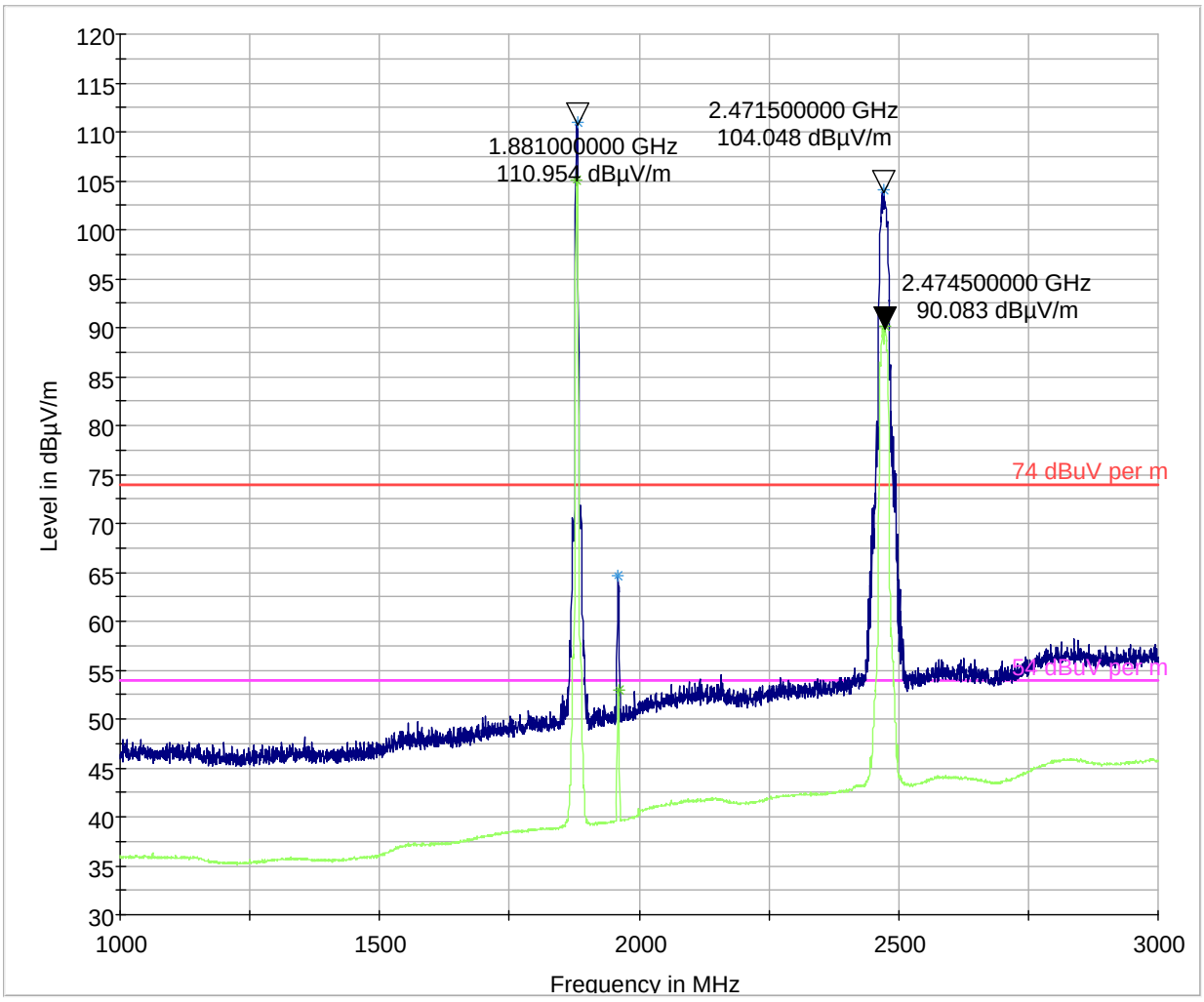
Plot #8 Radiated Emissions: 18-26 GHz	
Modulation: MCS 1	**Channel: Mid**



Plot #9 Radiated Emissions: 30 MHz – 1GHz	
Modulation: MCS 1	**Channel: High**

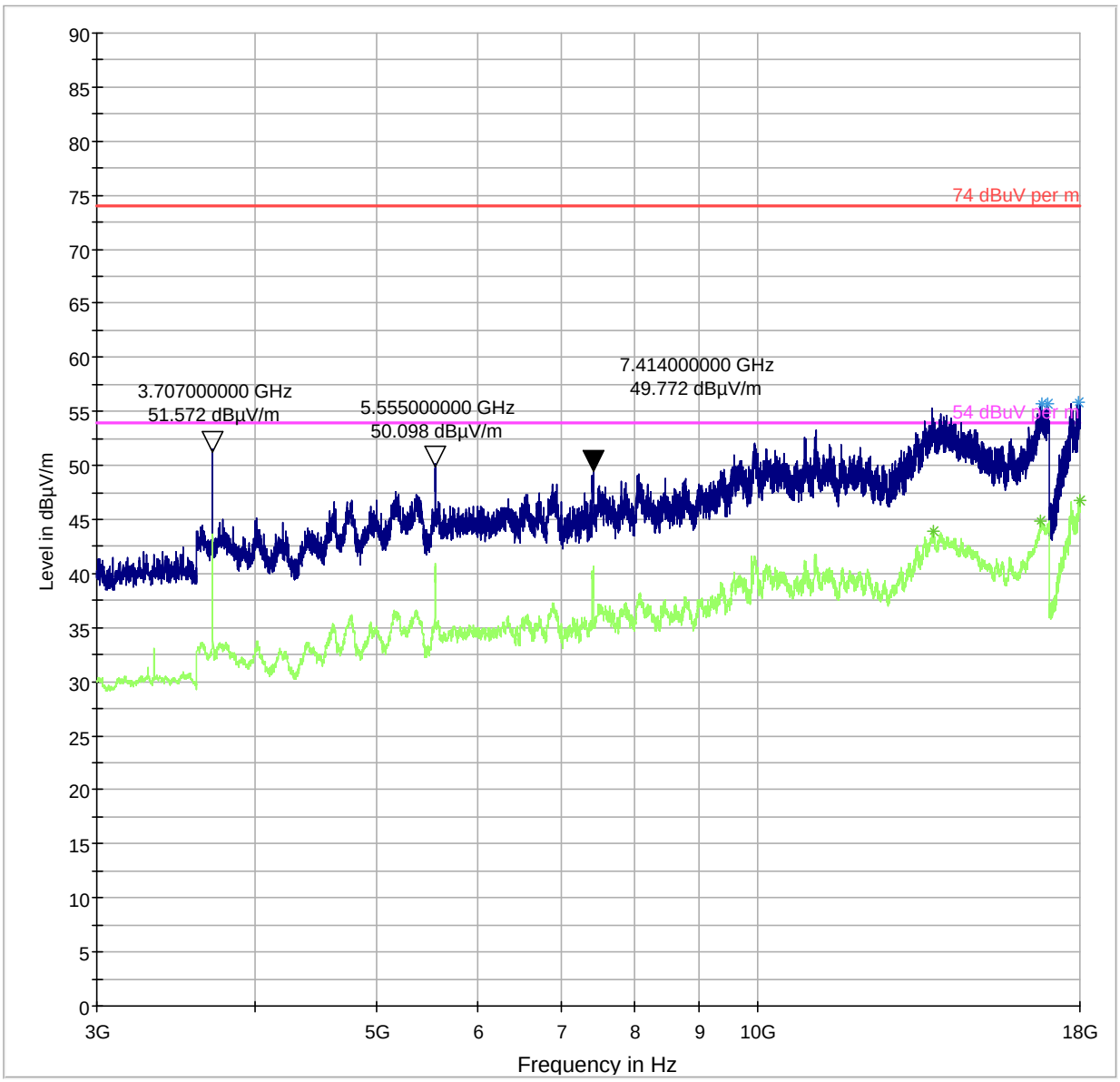


Plot # 10 Radiated Emissions: 1-3 GHz	
Modulation: MCS 1	**Channel: High**



74 dBuV per m
Preview Result 1-PK+
Data Reduction Result 1 [3]-PK+
54 dBuV per m
Preview Result 2-RMS
Data Reduction Result 2 [3]-RMS

Plot #11 Radiated Emissions: 3-18 GHz	
Modulation: MCS 1	**Channel: High**



8.6 AC Power Line Conducted Emissions

8.6.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

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

8.6.2 Limits:

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.

8.6.3 Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22	1	MCS 1	Line & Neutral	5 Vdc

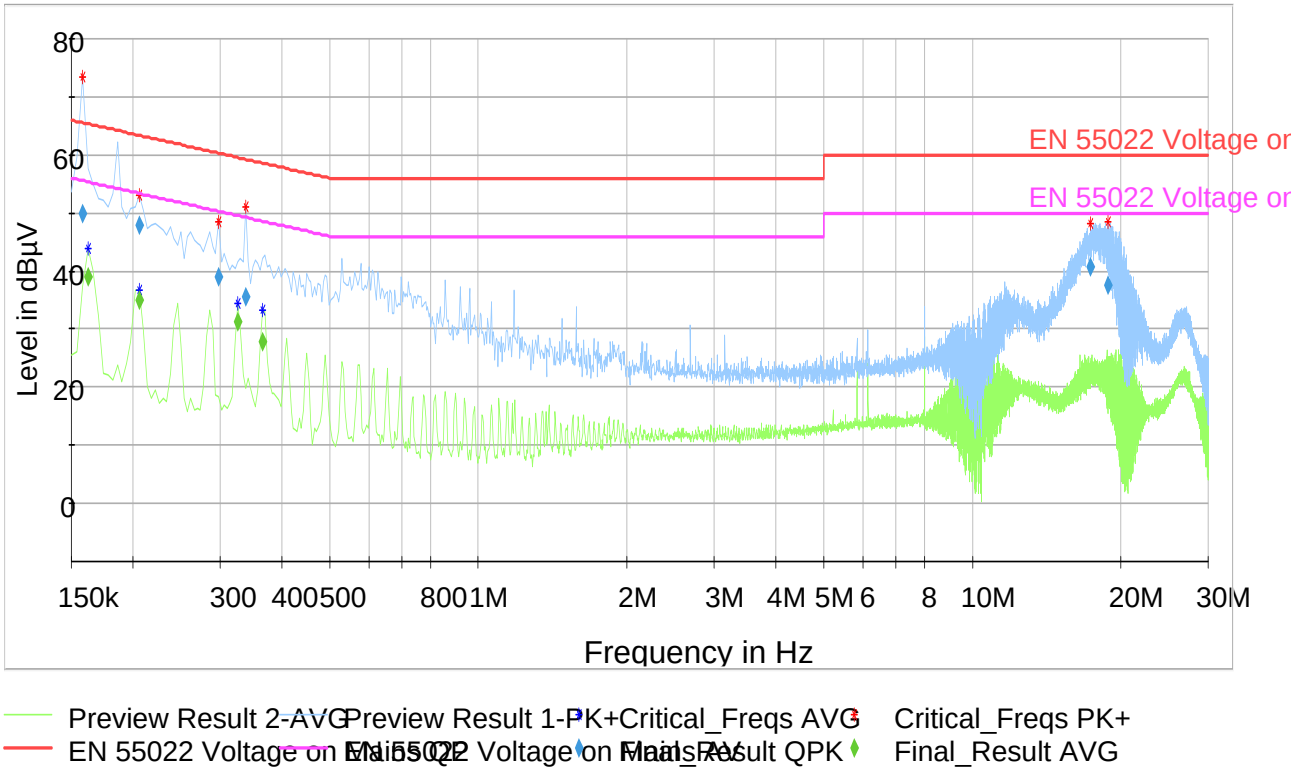
8.6.4 Measurement Result:

Plot #	Port	EUT Set-Up #	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	1	MCS 1	150 kHz – 30 MHz	See section 8.3.2	Pass

8.6.5 Measurement Plots:

Plot # 1

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Quasi-peak and Average Measurement Final Result

Frequency (MHz)	Quasi-Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.158000	49.84	---	65.57	15.73	500.0	9.000	N	GND	8.4
0.162000	---	39.12	55.36	16.24	500.0	9.000	L1	GND	8.2
0.206000	---	34.86	53.37	18.50	500.0	9.000	L1	GND	6.8
0.206000	47.87	---	63.37	15.49	500.0	9.000	L1	GND	6.8
0.298000	38.87	---	60.30	21.43	500.0	9.000	L1	GND	4.0
0.326000	---	31.30	49.55	18.25	500.0	9.000	L1	GND	3.7
0.338000	35.60	---	59.25	23.65	500.0	9.000	N	GND	3.6
0.366000	---	27.97	48.59	20.62	500.0	9.000	L1	GND	3.2
17.338000	40.71	---	60.00	19.29	500.0	9.000	N	GND	0.7
18.834000	37.56	---	60.00	22.44	500.0	9.000	N	GND	0.7

9 Test setup photos

Setup photos are included in supporting file name: “EMC_GARMI-001-17001_15.247 _Setup_Photos.pdf”

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	BiconiLog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6512	00049838	3 years	7/28/2017
Antenna Horn 3115	Horn Antenna	EMCO	3115	35111	3 years	7/24/2015
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	7/22/2015
Digital Barometer, Temperature, Humidity	Compact Digital Barometer	Control Company	35519-055	91119547	1 Years	06/08/2017
FSU26	Spectrum Analyzer	R&S	FSU26	200256	2 years	07/04/2017
LISN	Line Impedance Stabilization Network	FCC	FCC-LISN-50-25-2-08	8014	1 Year	11/10/2016

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 Revision History

Date	Report Name	Changes to report	Report prepared by
2017-10-10	EMC_GARMIN_047_17001_15.247_WIFI_DTS	Initial Report	Elijah Garcia