ENGINEERING TEST REPORT

Border router/Bridge
Model(s): BRD10
FCC ID: XFF-BRD10

Applicant:

MMB Research Inc.
25 Adelaide Street East, Suite 400
Toronto, ON M5C 3A1
Canada

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Digital Modulation Systems (DTS) Operating in 2400 – 2483.5 MHz Band

UltraTech's File No.: 19MMBN014_FCC15C247W

This Test report is Issued under the Authority of Tri M. Luu Vice President of Engineering UltraTech Group of Labs Date: July 12, 2019	
Report Prepared by: Dan Huynh Issued Date: July 12, 2019	Tested by: Hung Trinh Test Dates: May 21 - 31, 2019 June 3 - 19, 2019

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Equipment Certification for Digital Modulation Systems (DTS) Operating Under §15.247
Test Procedures:	▪ ANSI C63.4 ▪ ANSI C63.10 ▪ FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05
Environmental Classification:	[x] Commercial, industrial or business environment [x] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2018	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC, KDB Publication No. 558074 D01 15.247 Meas Guidance v05r01	2019	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

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	MMB Research Inc.
Address:	25 Adelaide Street East, Suite 400 Toronto, ON M5C 3A1 Canada
Contact Person:	Hussein Nagji Phone #: 416-636-3145 x237 Fax #: n/a Email Address: hussein.nagji@mmbnetworks.com

Manufacturer	
Name:	MMB Research Inc.
Address:	25 Adelaide Street East, Suite 400 Toronto, ON M5C 3A1 Canada
Contact Person:	Hussein Nagji Phone #: 416-636-3145 x237 Fax #: n/a Email Address: hussein.nagji@mmbnetworks.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	MMB Research Inc.
Product Name:	Border router/Bridge
Model(s):	BRD10
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	5V, 1A via USB Hub
Primary User Functions of EUT:	Home automation/ IoT device

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Mobile Base station (fixed use)
Intended Operating Environment:	Residential environment Commercial, industrial or business environment
Power Supply Requirement:	5V, 1A
RF Output Power Rating:	802.11b: 19.06 dBm Peak 802.11g: 23.92 dBm Peak 802.11n HT20: 23.98 dBm Peak 802.11n HT40: 23.55 dBm Peak
Operating Frequency Range:	802.11b: 2412 - 2462 MHz 802.11g: 2412 - 2462 MHz 802.11n HT20: 2412 - 2462 MHz 802.11n HT20: 2432 - 2442 MHz
RF Output Impedance:	50 Ω
Duty Cycle:	Continuous
Modulation Type:	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g/n: OFDM (BPSK / QPSK / 16-QAM / 64-QAM)
Antenna Connector Types:	Integral

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Antenna Type	Manufacturer	Model	Maximum Gain (dBi)
[1]PCB trace antenna	MMB Networks	PCB trace antenna	-0.68
[2]Dual band (2.4&5G) PCB trace antenna	MMB Networks	PCB trace antenna	0.86

[1] For BLE and Zigbee modes
[2] For WiFi Mode

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Micro USB	1	Micro USB	Shielded
2	802.15.4/BLE RF port for Mfg. test & calibration	1	SWG connector	Shielded
3	2.4GHz/5GHz RF port for Mfg. test & calibration	1	SWG connector	Shielded
4	GPIO ports	3	24 position connector plug, SMT	N/A

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Laptop
Brand name:	Lenovo
Model Name or Number:	ThinkPad Edge 0578
Serial Number:	IS057882 ULRBXKBG
Connected to EUT's Port:	Connected to USB Hub

Ancillary Equipment # 2	
Description:	USB Hub
Brand name:	Insignia
Model Name or Number:	NS-PCH5421-C
Serial Number:	--
Connected to EUT's Port:	Micro USB

Ancillary Equipment # 3	
Description:	AC/DC Adapter
Brand name:	Shenzhen Luda Electrical Co. Ltd
Model Name or Number:	HL-050/2000-FBOS-EE
Serial Number:	--
Connected to EUT's Port:	Connected to USB Hub DC Jack

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	5V via USB Hub

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Test software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	802.11b/g, 802.11n HT20: 2412 - 2462 MHz 802.11n HT40: 2432 - 2442 MHz
Frequency(ies) Tested:	802.11b/g, 802.11n HT20: 2412 MHz, 2437 MHz, 2457 MHz, 2462 MHz 802.11n HT40: 2432 MHz, 2437 MHz, 2442 MHz
RF Power Output: (measured maximum output power at antenna terminals) **Normal Test Modulation:** **Modulating Signal Source:**	802.11b: 19.06 dBm Peak 802.11g: 23.92 dBm Peak 802.11n HT20: 23.98 dBm Peak 802.11n HT40: 23.55 dBm Peak DSSS / OFDM Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes*
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	Yes
15.247(b)(3)	Peak Conducted Output Power	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	Yes
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	Yes

* The EUT complies with the requirement; it employs a unique (non-standard) antenna connector or integral antenna.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

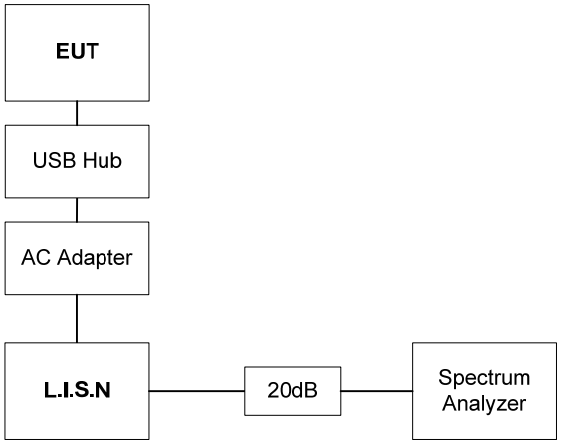
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ..……..	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

ANSI C63.4

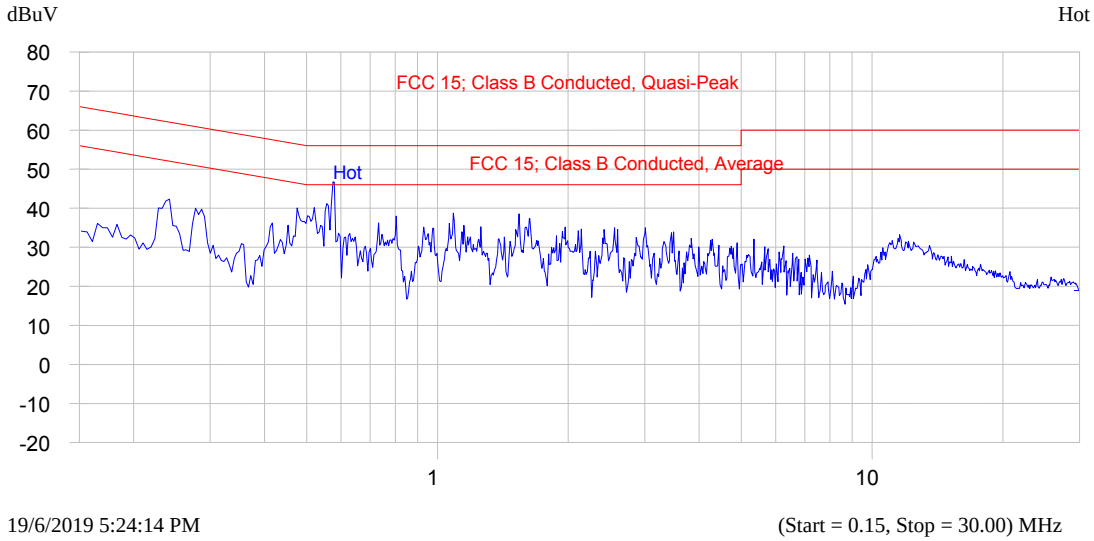
5.1.3. Test Arrangement



5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 120 VAC; Line Tested: Hot

Current Graph

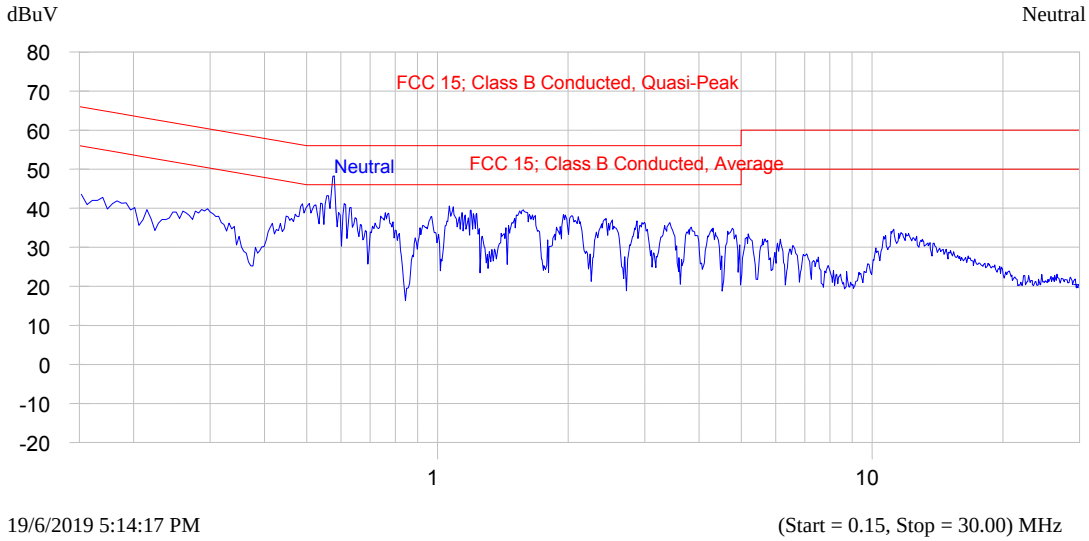


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.234	42.5	37.4	-24.9	23.6	-28.7	Hot
0.575	47.2	44.0	-12.0	37.8	-8.2	Hot
1.078	41.1	35.0	-21.0	25.8	-20.2	Hot
1.532	38.6	32.3	-23.7	23.0	-23.0	Hot
11.481	32.2	27.8	-32.2	21.0	-29.0	Hot

Plot 5.1.4.2. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 120 VAC Line Tested: Neutral

Current Graph

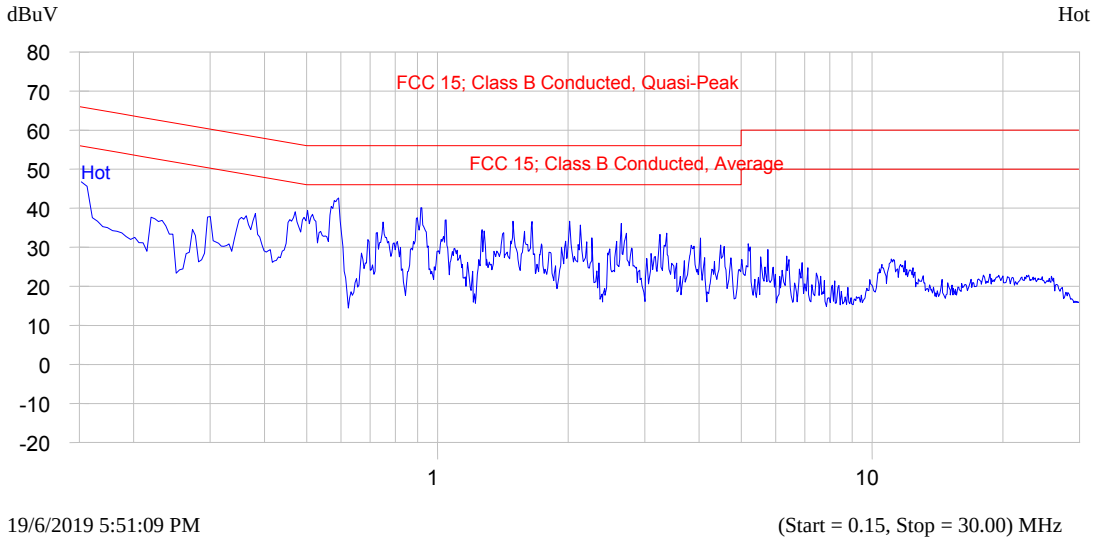


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.157	50.8	46.5	-19.1	35.2	-20.4	Neutral
0.574	50.3	49.1	-6.9	43.2	-2.8	Neutral
1.061	41.8	38.7	-17.3	30.6	-15.4	Neutral
1.576	39.9	36.0	-20.0	26.0	-20.0	Neutral
11.062	35.1	30.9	-29.1	23.4	-26.6	Neutral

Plot 5.1.4.3. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 120 VAC; Line Tested: Hot

Current Graph

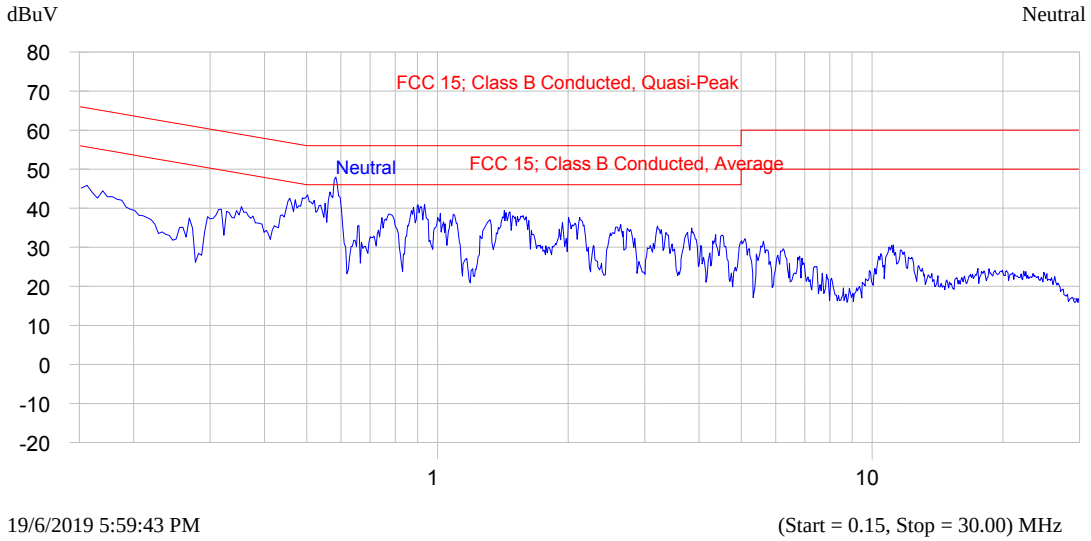


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.156	47.3	44.2	-21.5	29.4	-26.3	Hot
0.583	46.5	41.4	-14.6	32.4	-13.6	Hot
0.914	42.7	36.8	-19.2	27.6	-18.4	Hot
2.645	35.4	28.8	-27.2	19.8	-26.2	Hot

Plot 5.1.4.4. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 120 VAC; Line Tested: Neutral

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.153	47.6	45.0	-20.8	35.6	-20.2	Neutral
0.502	44.4	42.0	-14.0	35.0	-11.0	Neutral
0.583	48.9	46.8	-9.2	38.3	-7.7	Neutral
0.924	43.0	39.1	-16.9	29.9	-16.1	Neutral
1.432	40.5	37.2	-18.8	27.6	-18.4	Neutral

5.2. OCCUPIED BANDWIDTH [§ 15.247(a)(2)]

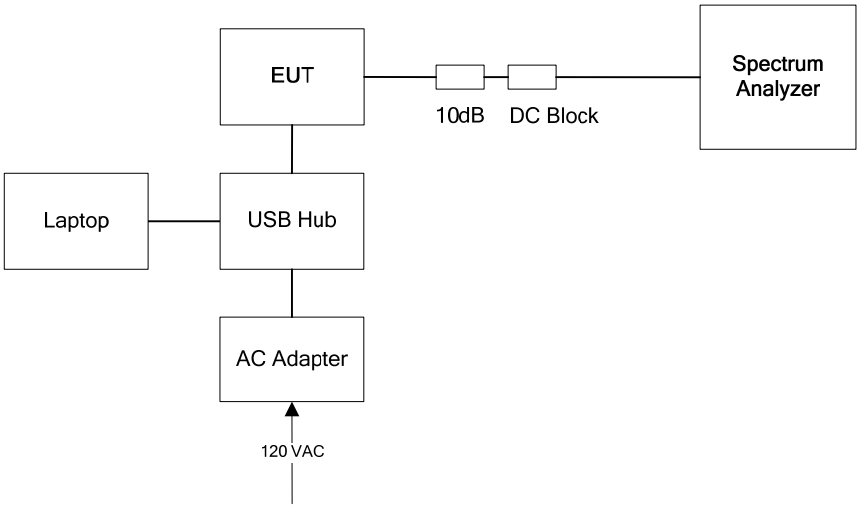
5.2.1. Limit(s)

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

5.2.2. Method of Measurements

KDB 558074 D01 15.247 Meas Guidance v05r01, Section 8.2 DTS Bandwidth (11.8.1 Option 2 ANSI C63.10-2013)

5.2.3. Test Arrangement



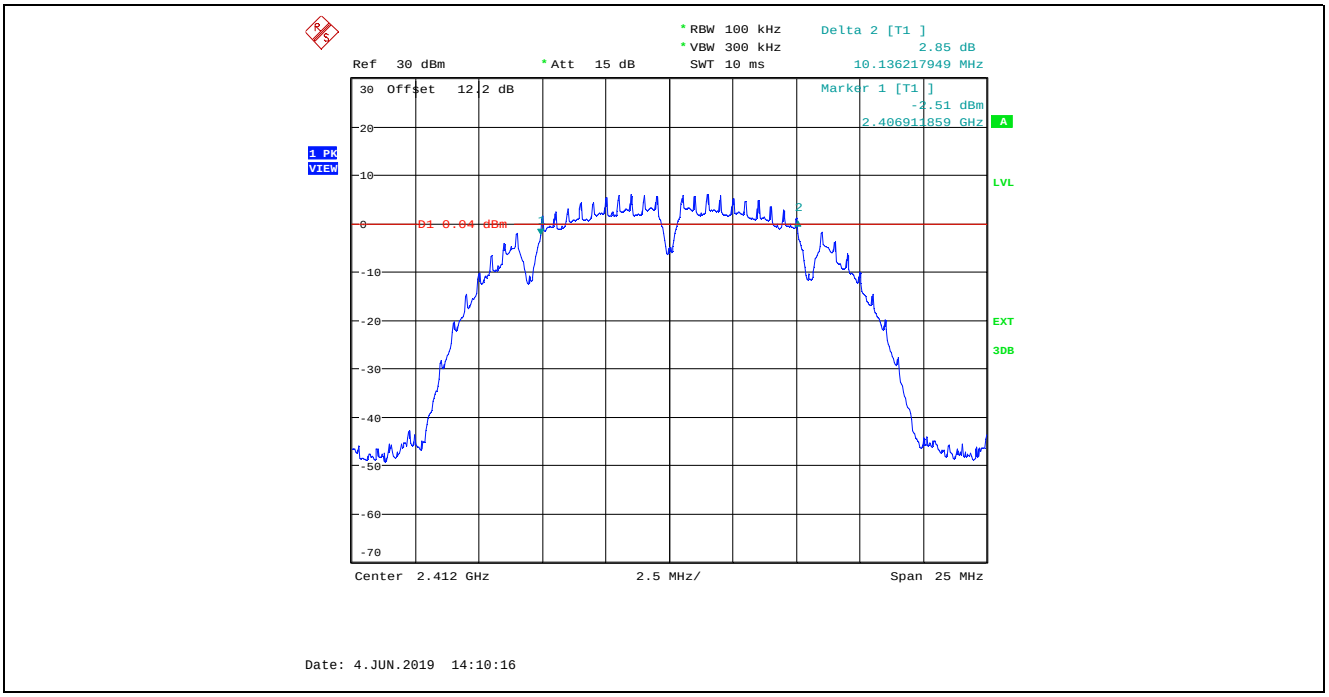
5.2.4. Test Data

Operating Mode		Power Setting	Frequency (MHz)	6dB Bandwidth (MHz)	Min. Limit (kHz)
802.11b	DBPSK 1 Mbps	17	2412	10.136	500
		17	2437	10.136	500
		17	2462	10.136	500
	DQPSK 2 Mbps	17	2412	10.136	500
		17	2437	10.136	500
		17	2462	10.136	500
	CCK 11 Mbps	17	2412	10.457	500
		17	2437	10.497	500
		17	2462	10.136	500

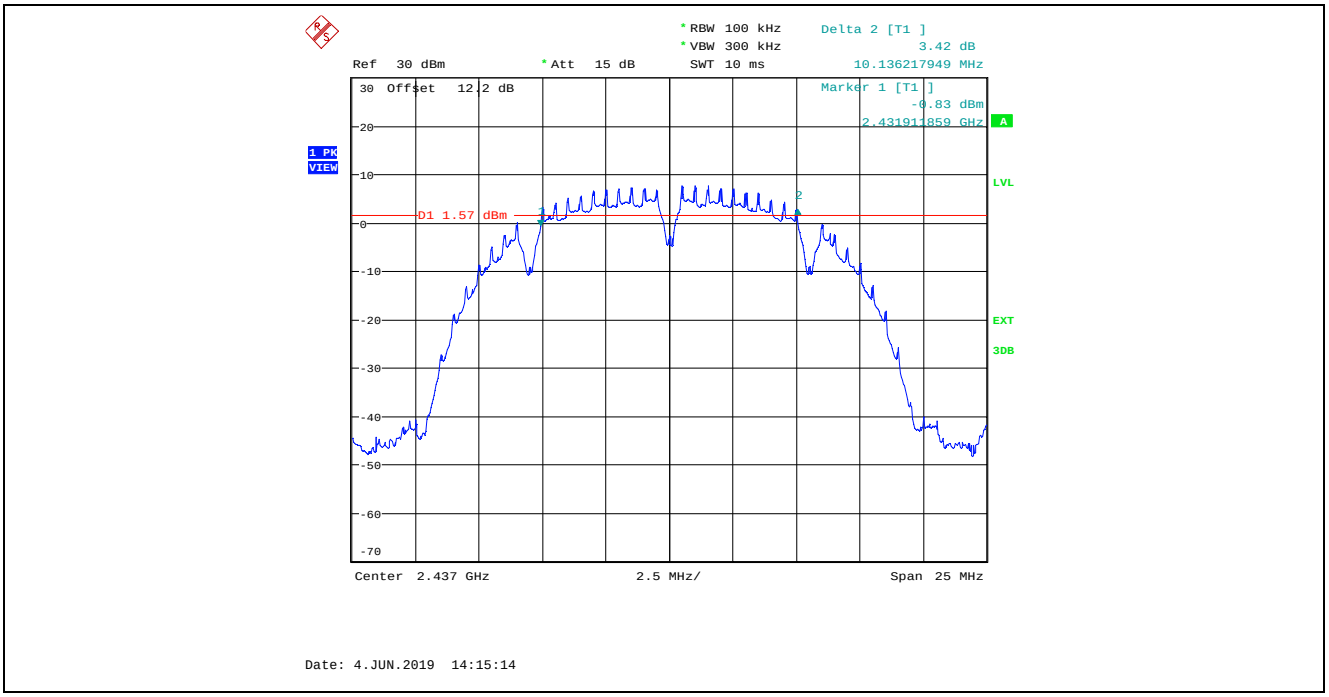
Operating Mode		Power Setting	Frequency (MHz)	6dB Bandwidth (MHz)	Min. Limit (kHz)
802.11g	BPSK 9 Mbps	17	2412	16.595	500
		17	2437	16.611	500
		15	2462	16.627	500
	QPSK 18 Mbps	17	2412	16.595	500
		17	2437	16.611	500
		15	2462	16.627	500
	16-QAM 36 Mbps	17	2412	16.595	500
		17	2437	16.611	500
		15	2462	16.627	500
	64-QAM 54 Mbps	17	2412	16.595	500
		17	2437	16.611	500
		15	2462	16.627	500
802.11n HT20	MCS 0	17	2412	17.780	500
		17	2437	17.853	500
		15	2462	17.756	500
	MCS 2	17	2412	17.837	500
		17	2437	17.853	500
		15	2462	17.813	500
	MCS 4	17	2412	17.837	500
		17	2437	17.853	500
		15	2462	17.813	500
	MCS 7	17	2412	17.837	500
		17	2437	17.853	500
		15	2462	17.813	500

Operating Mode		Power Setting	Frequency (MHz)	6dB Bandwidth (MHz)	Min. Limit (kHz)
802.11n HT40	MCS 0	16	2432	36.563	500
		16	2437	36.466	500
		14	2442	36.274	500
	MCS 2	16	2432	36.563	500
		16	2437	36.587	500
		14	2442	36.394	500
	MCS 4	16	2432	36.659	500
		16	2437	36.707	500
		14	2442	36.635	500
	MCS 7	16	2432	36.659	500
		16	2437	36.707	500
		14	2442	36.635	500

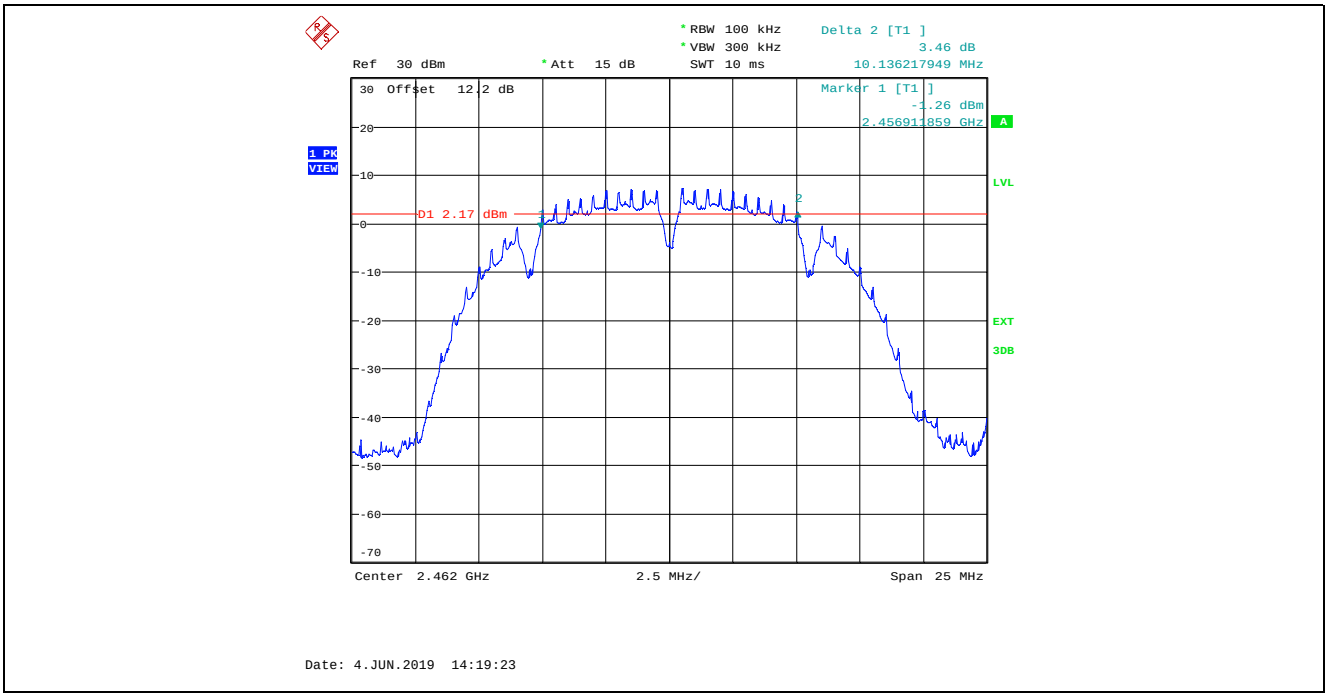
Plot 5.2.4.1. 6 dB Bandwidth
802.11b, DBPSK 1 Mbps, Power Setting 17, Channel 1, 2412 MHz



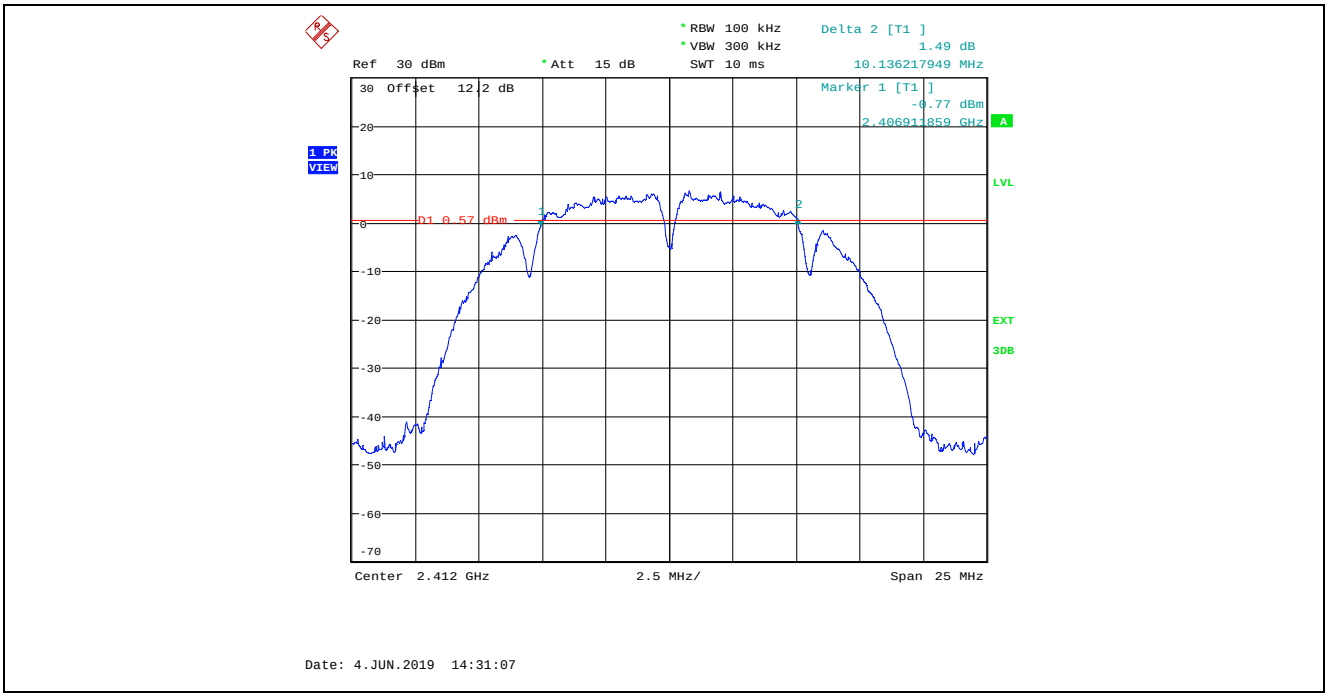
Plot 5.2.4.2. 6 dB Bandwidth
802.11b, DBPSK 1 Mbps, Power Setting 17, Channel 6, 2437 MHz



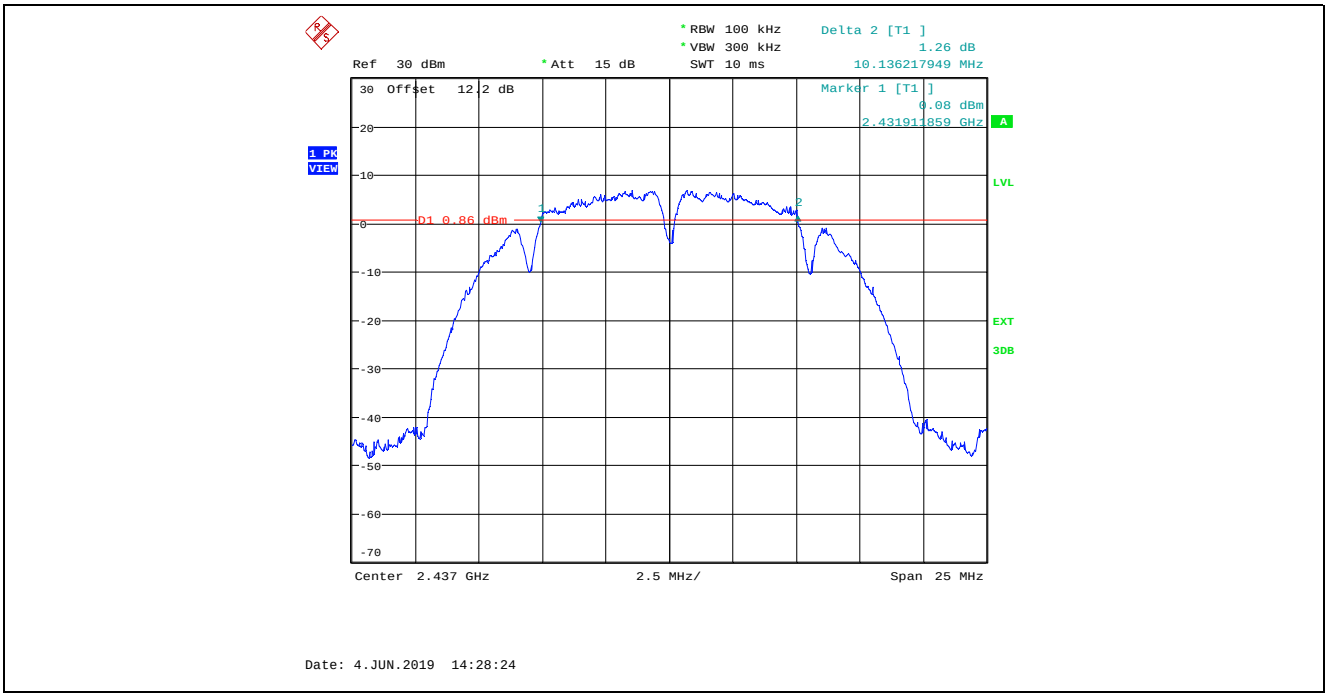
Plot 5.2.4.3. 6 dB Bandwidth
802.11b, DBPSK 1 Mbps, Power Setting 17, Channel 11, 2462 MHz



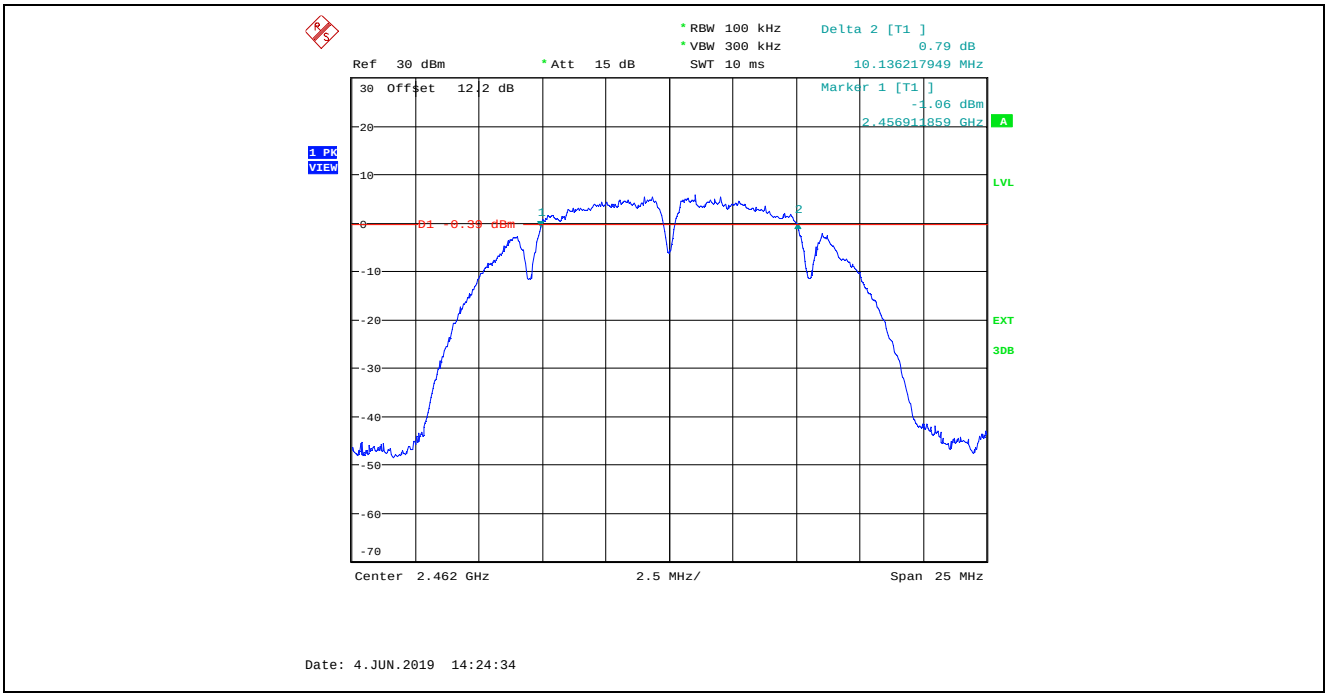
Plot 5.2.4.4. 6 dB Bandwidth
802.11b, DQPSK 2 Mbps, Power Setting 17, Channel 1, 2412 MHz,



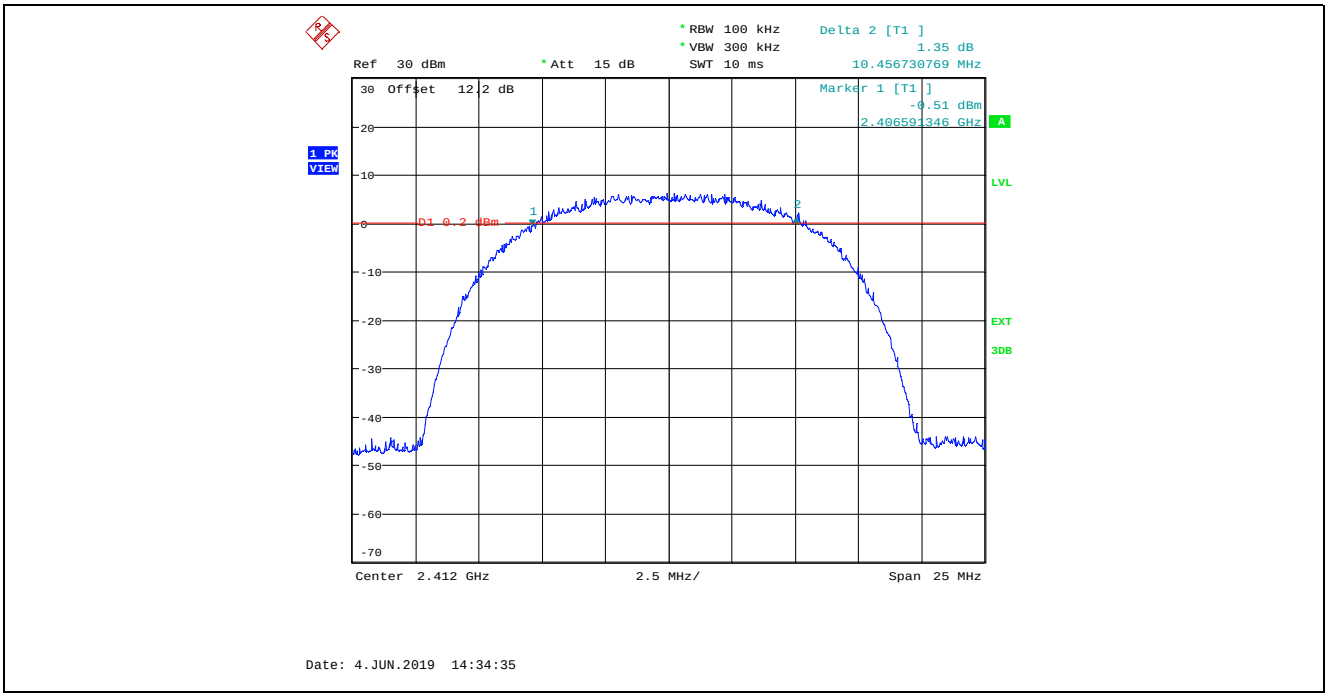
Plot 5.2.4.5. 6 dB Bandwidth
802.11b, DQPSK 2 Mbps, Power Setting 17, Channel 6, 2437 MHz,



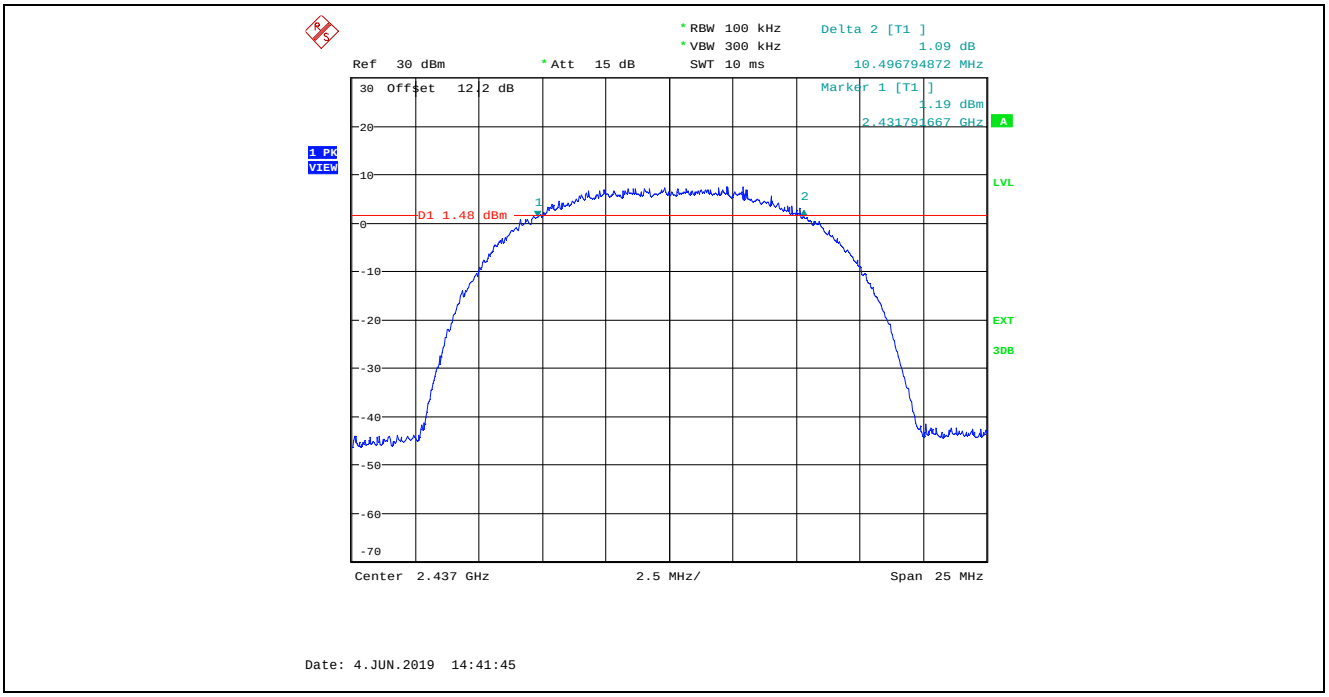
Plot 5.2.4.6. 6 dB Bandwidth
802.11b, DQPSK 2 Mbps, Power Setting 17, Channel 11, 2462 MHz,



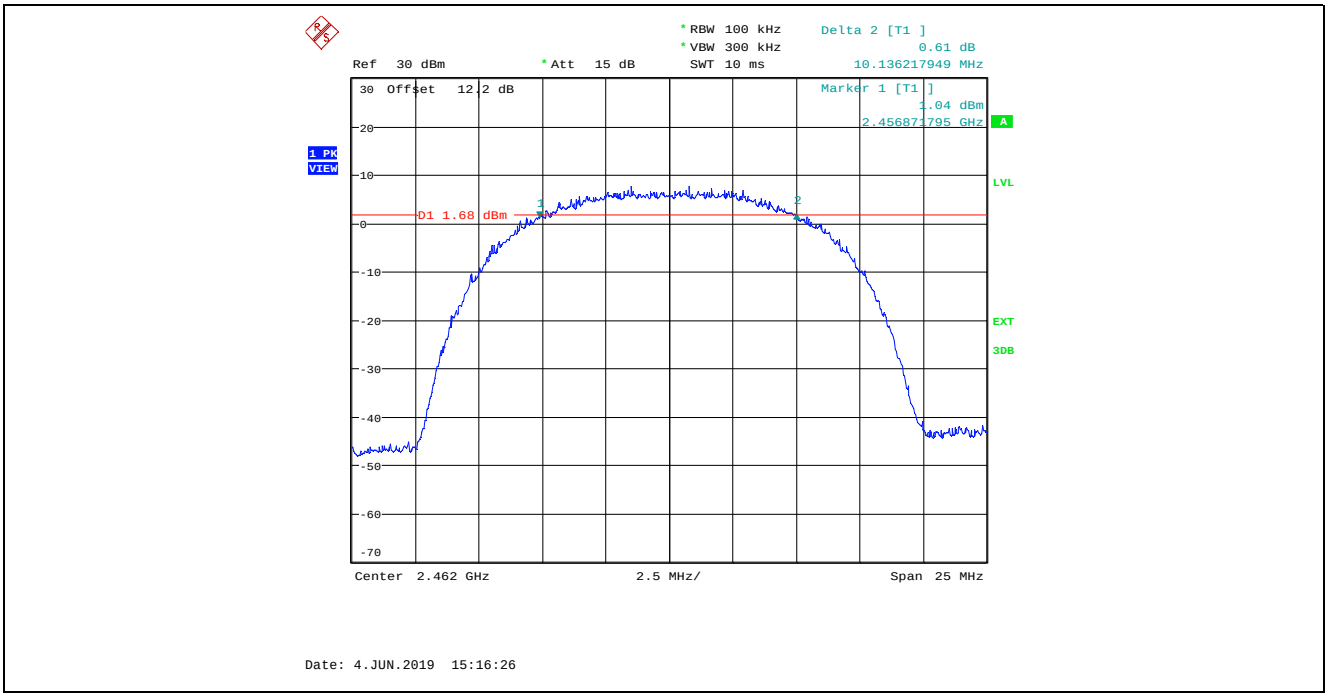
Plot 5.2.4.7. 6 dB Bandwidth
802.11b, CCK 11 Mbps, Power Setting 17, Channel 1, 2412 MHz



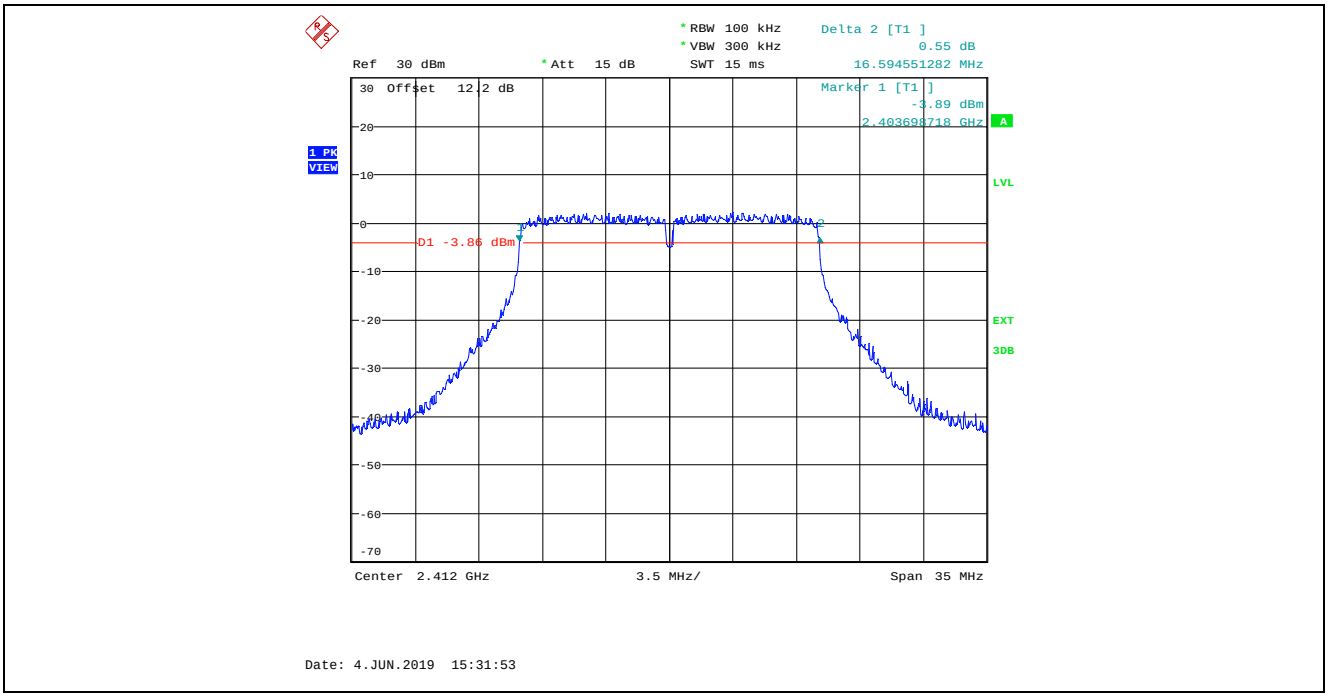
Plot 5.2.4.8. 6 dB Bandwidth
802.11b, CCK 11 Mbps, Power Setting 17, Channel 6, 2437 MHz



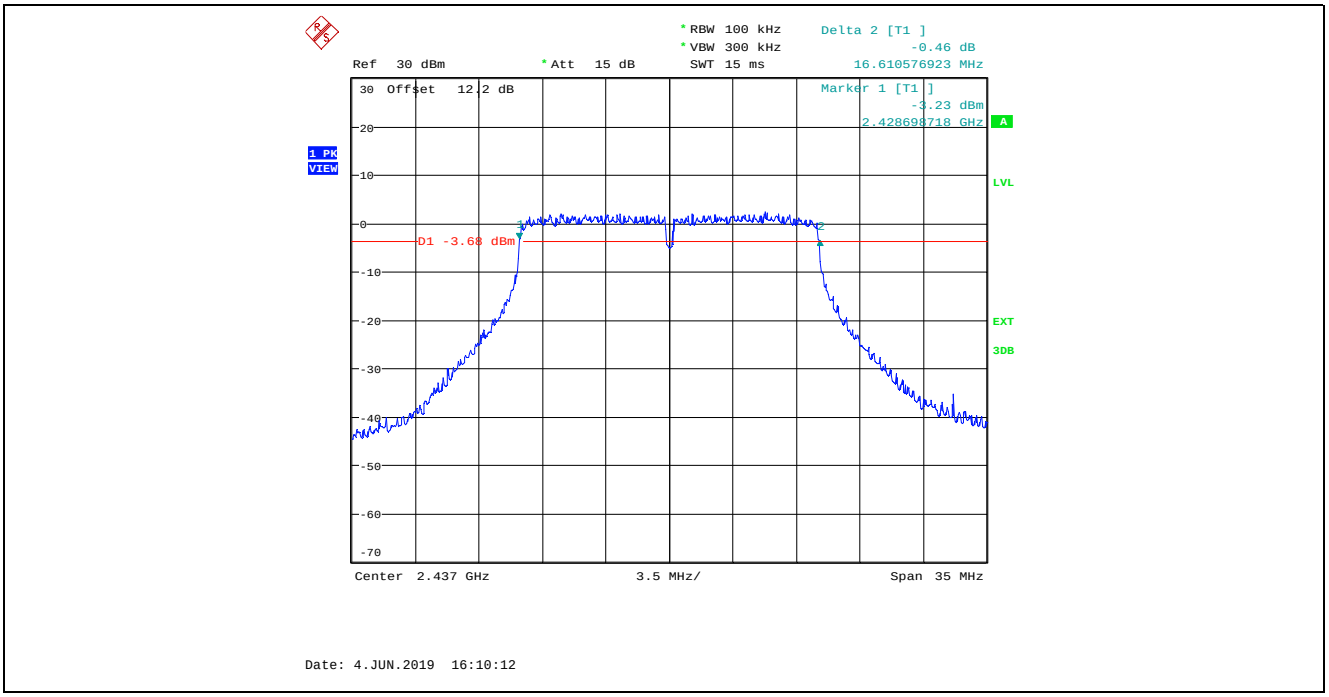
Plot 5.2.4.9. 6 dB Bandwidth
802.11b, CCK 11 Mbps, Power Setting 17, Channel 11, 2462 MHz



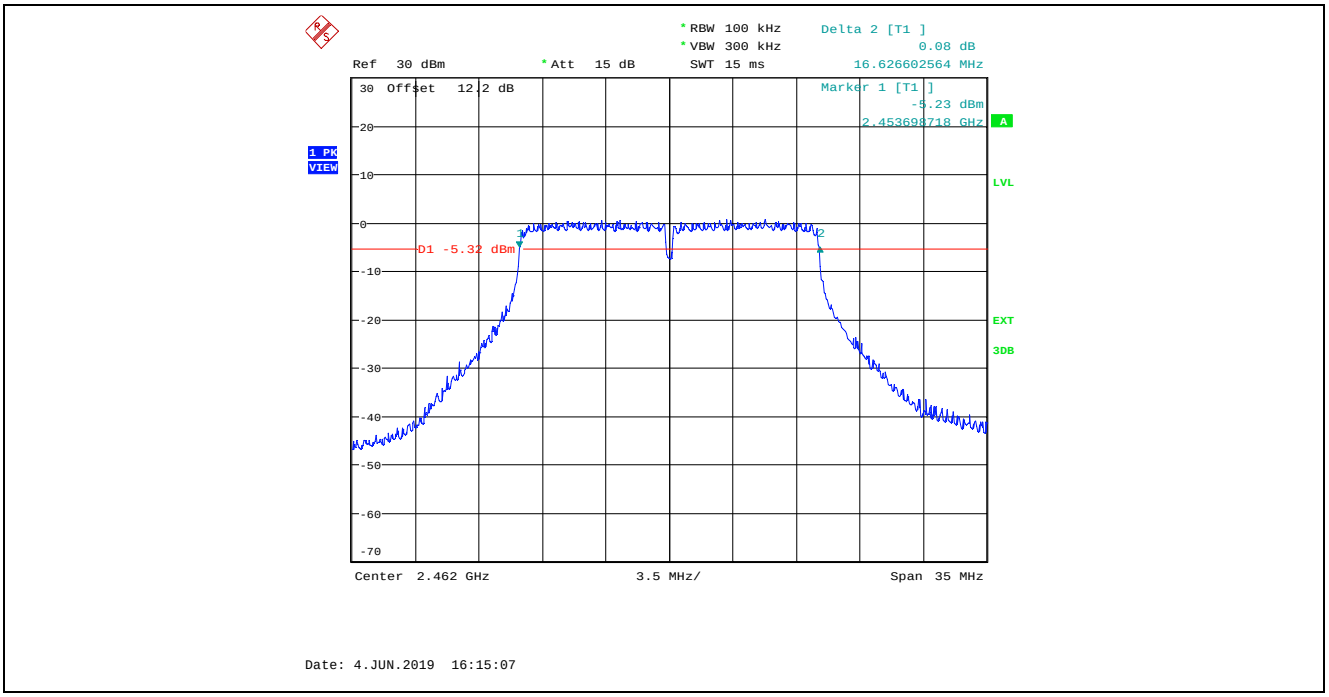
Plot 5.2.4.10. 6 dB Bandwidth
802.11g, BPSK 9 Mbps, Power Setting 17, Channel 1, 2412 MHz



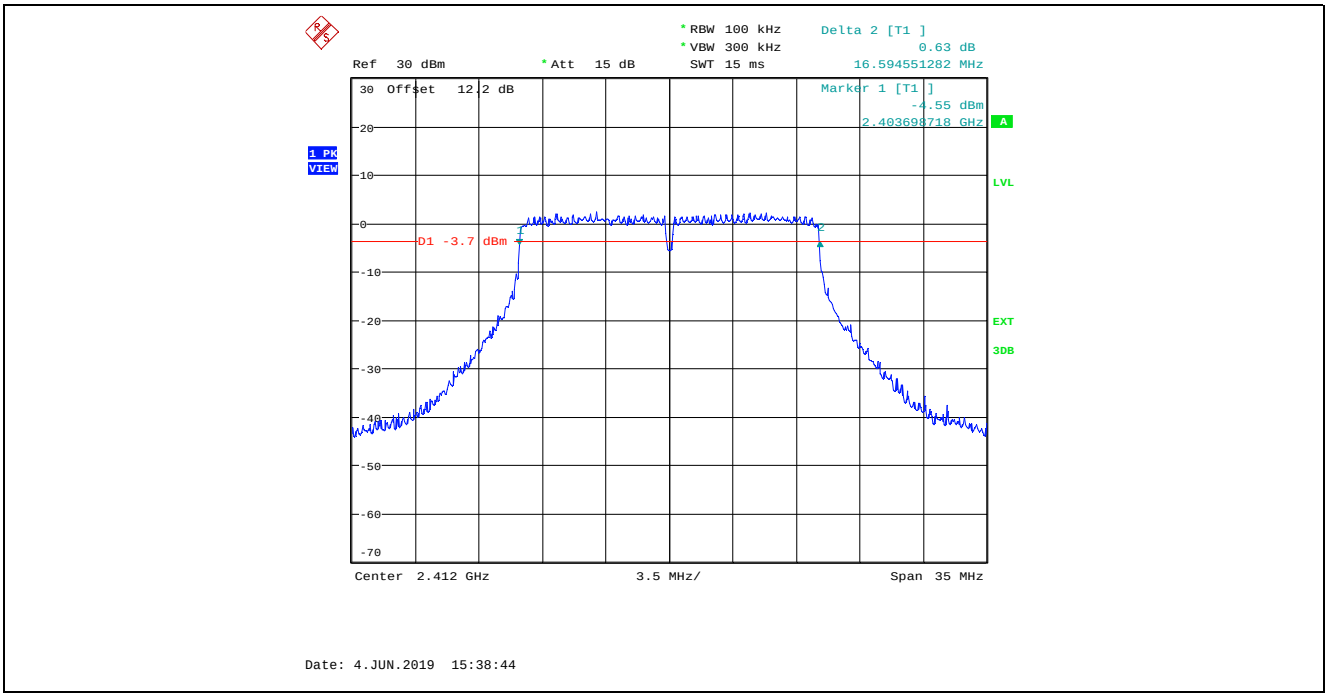
Plot 5.2.4.11. 6 dB Bandwidth
802.11g, BPSK 9 Mbps, Power Setting 17, Channel 6, 2437 MHz



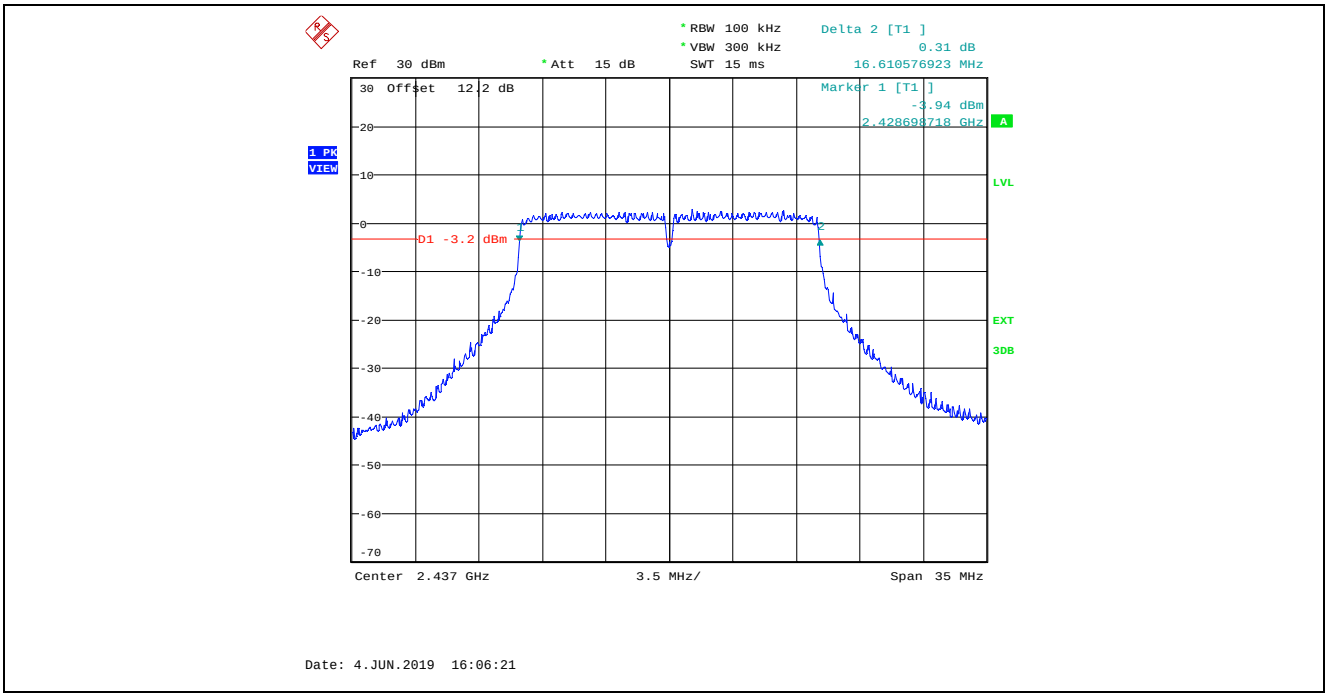
Plot 5.2.4.12. 6 dB Bandwidth
802.11g, BPSK 9 Mbps, Power Setting 15, Channel 11, 2462 MHz



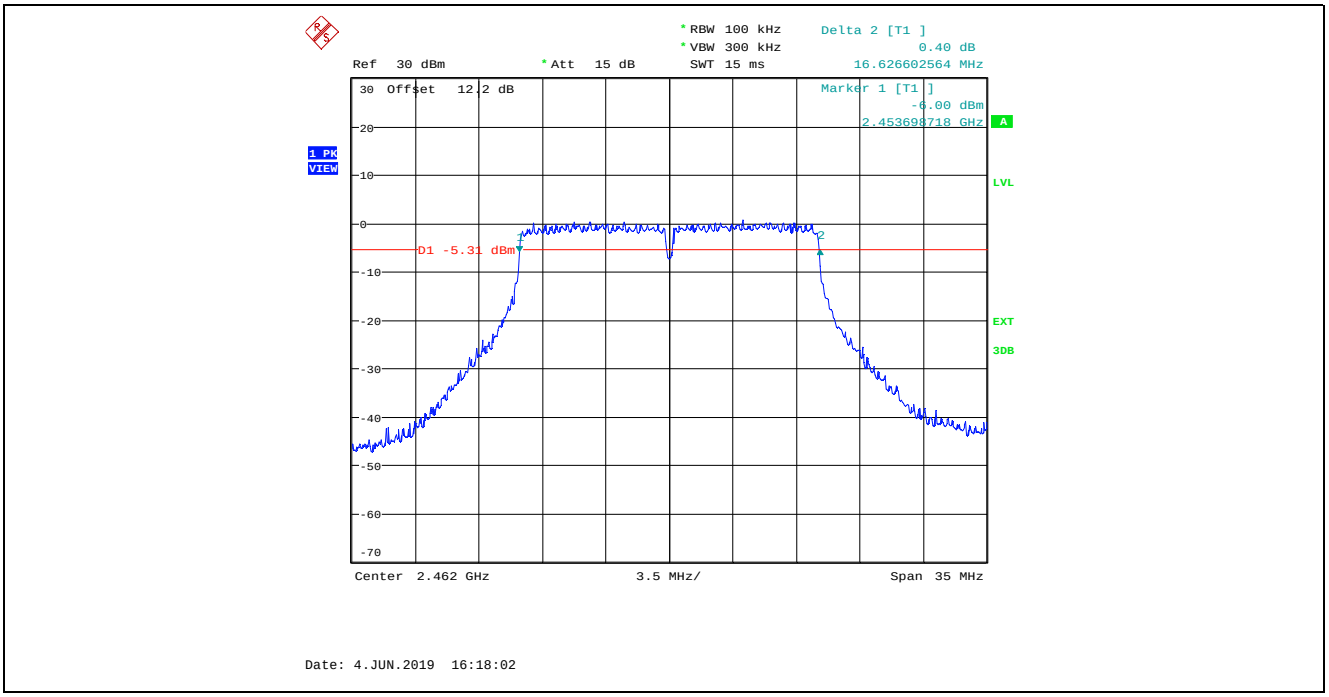
Plot 5.2.4.13. 6 dB Bandwidth
802.11g, QPSK 18 Mbps, Power Setting 17, Channel 1, 2412 MHz



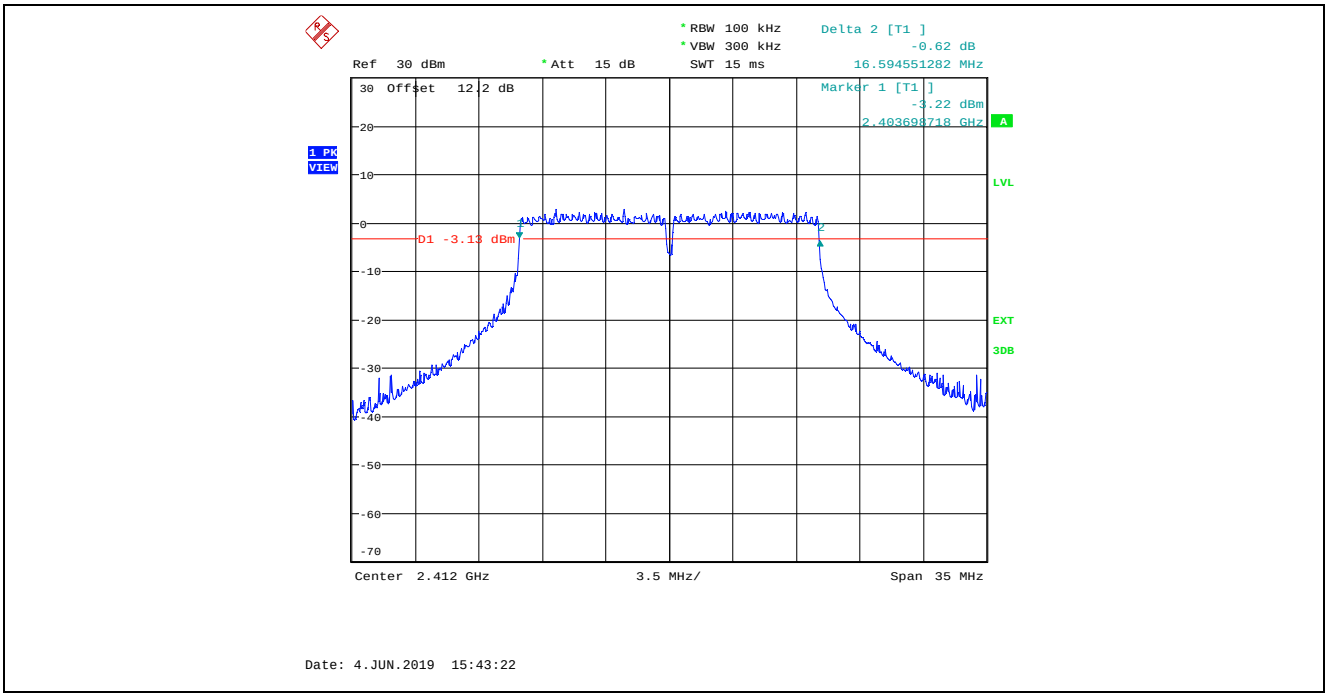
Plot 5.2.4.14. 6 dB Bandwidth
802.11g, QPSK 18 Mbps, Power Setting 17, Channel 6, 2437 MHz



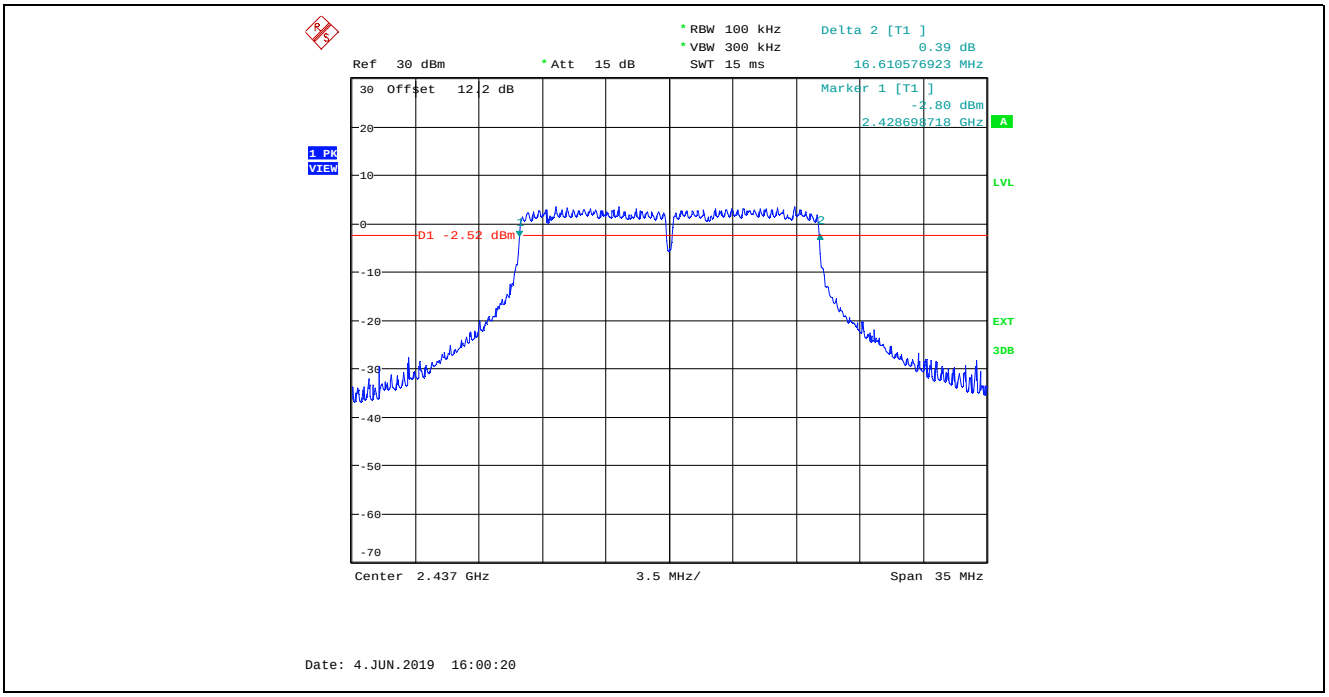
Plot 5.2.4.15. 6 dB Bandwidth
802.11g, QPSK 18 Mbps, Power Setting 15, Channel 11, 2462 MHz



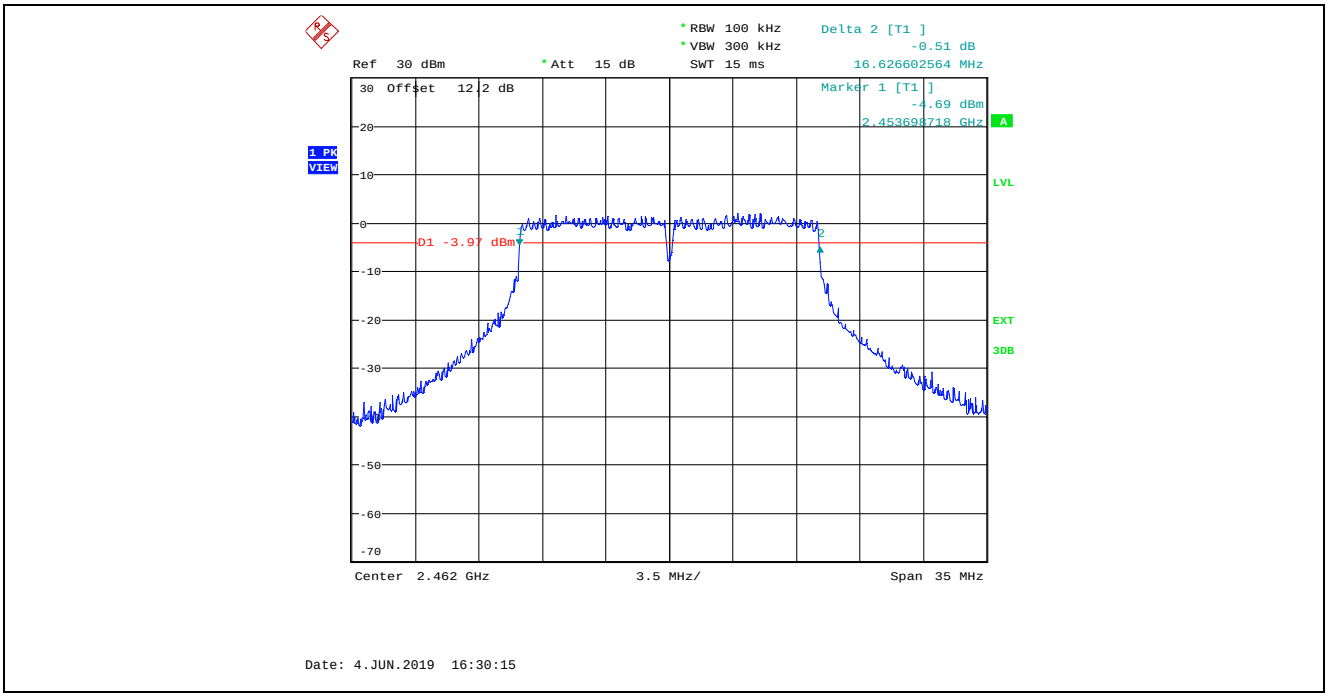
Plot 5.2.4.16. 6 dB Bandwidth
802.11g, 16-QAM 36 Mbps, Power Setting 17, Channel 1, 2412 MHz



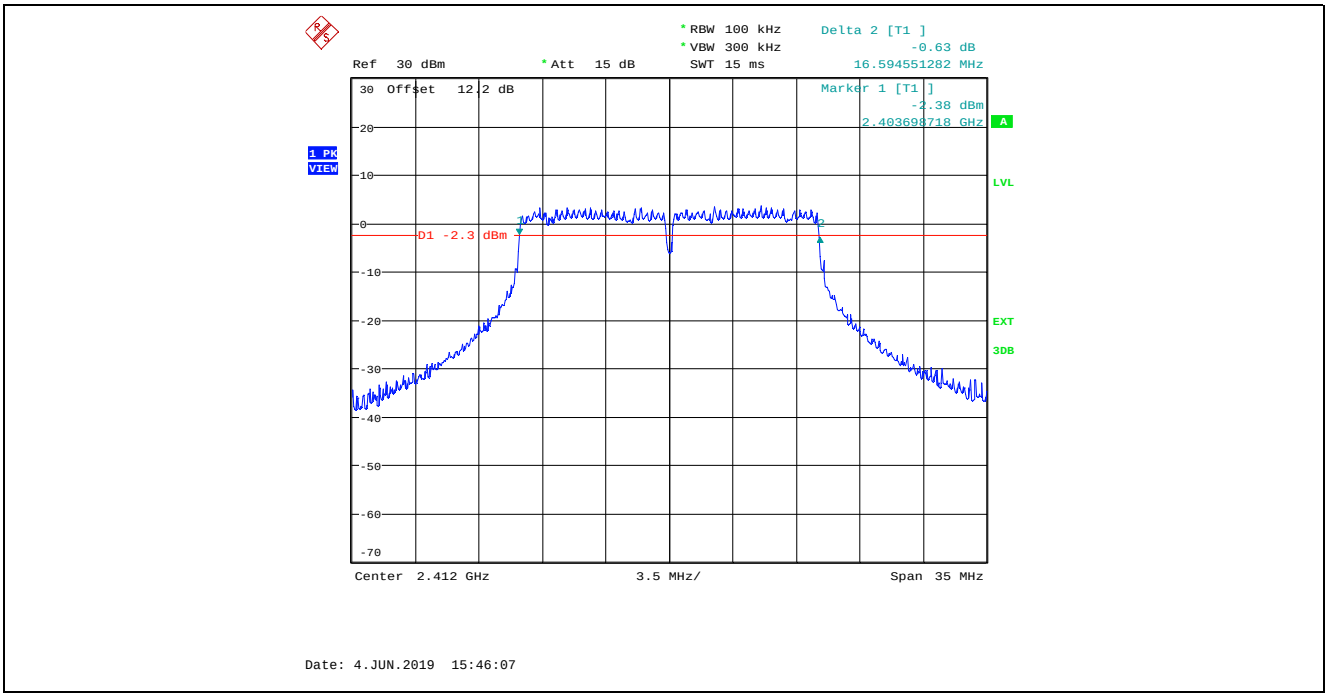
Plot 5.2.4.17. 6 dB Bandwidth
802.11g, 16-QAM 36 Mbps, Power Setting 17, Channel 6, 2437 MHz



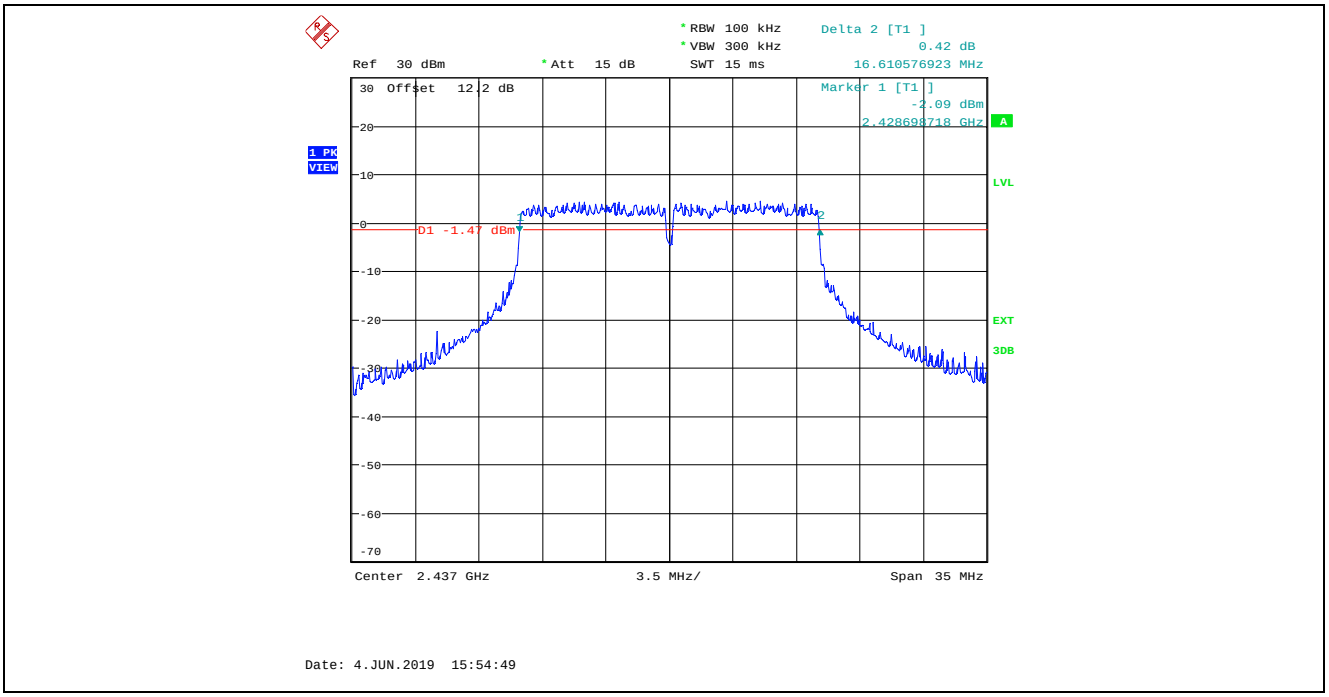
Plot 5.2.4.18. 6 dB Bandwidth
802.11g, 16-QAM 36 Mbps, Power Setting 15, Channel 11, 2462 MHz



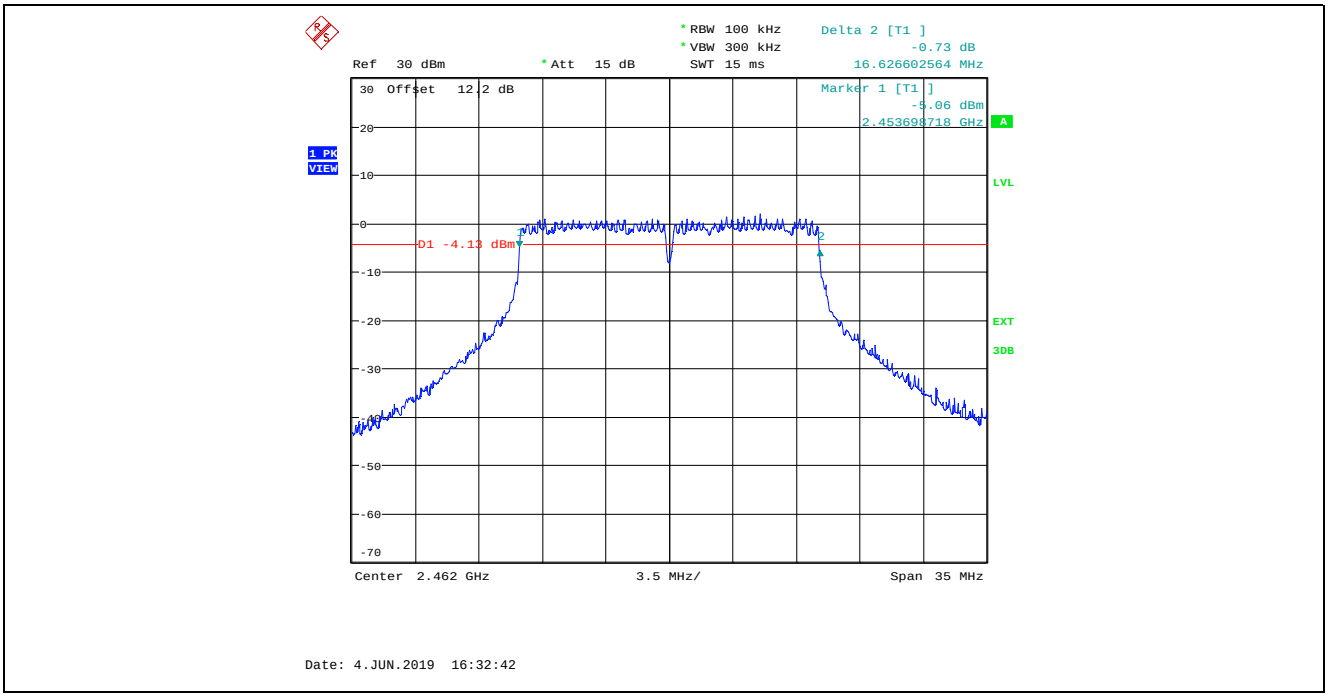
Plot 5.2.4.19. 6 dB Bandwidth
802.11g, 64-QAM 54 Mbps, Power Setting 17, Channel 1, 2412 MHz



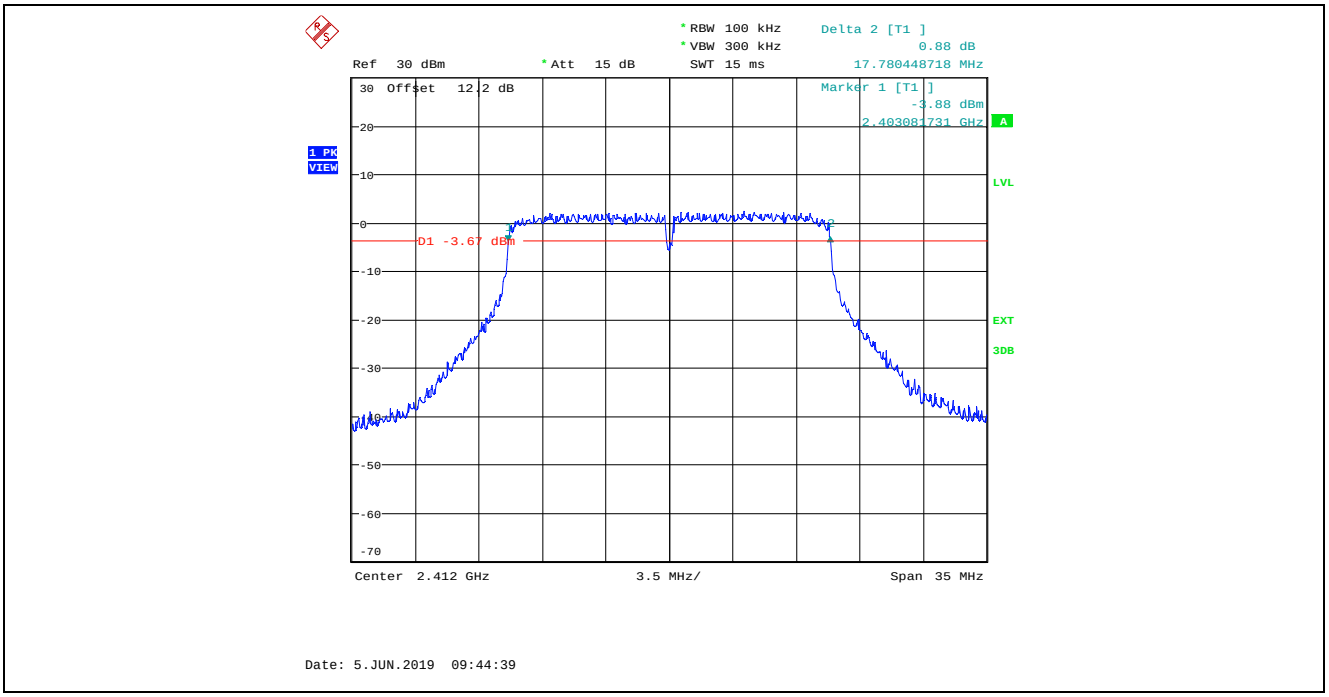
Plot 5.2.4.20. 6 dB Bandwidth
802.11g, 64-QAM 54 Mbps, Power Setting 17, Channel 6, 2437 MHz



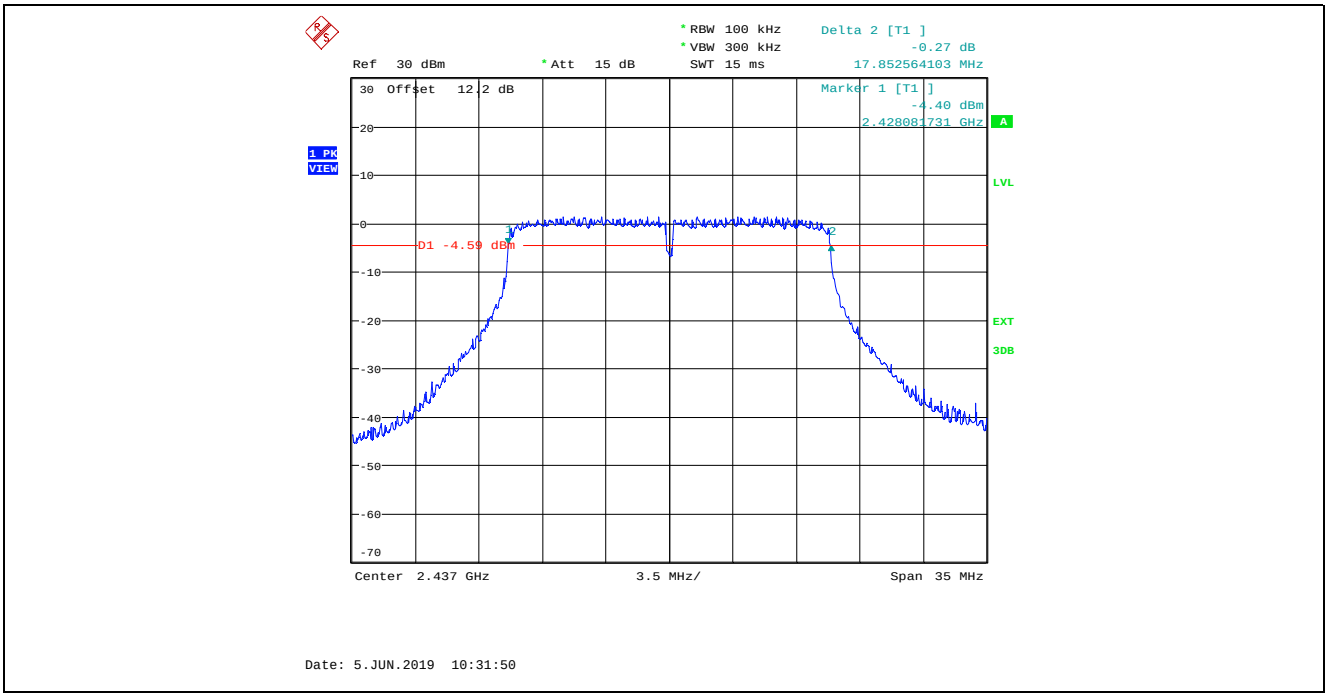
Plot 5.2.4.21. 6 dB Bandwidth
802.11g, 64-QAM 54 Mbps, Power Setting 15, Channel 11, 2462 MHz



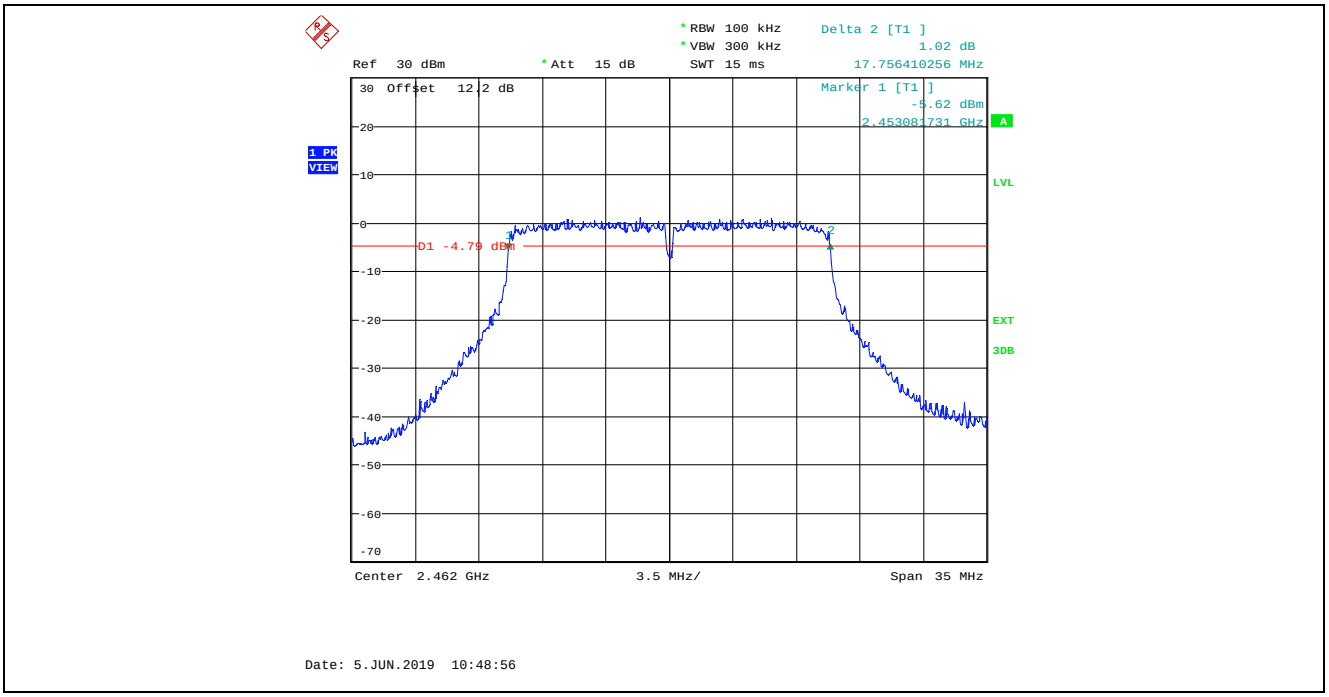
Plot 5.2.4.22. 6 dB Bandwidth
802.11n HT20, MCS 0, BPSK ½ 6.5 Mbps, Power Setting 17, Channel 1, 2412 MHz



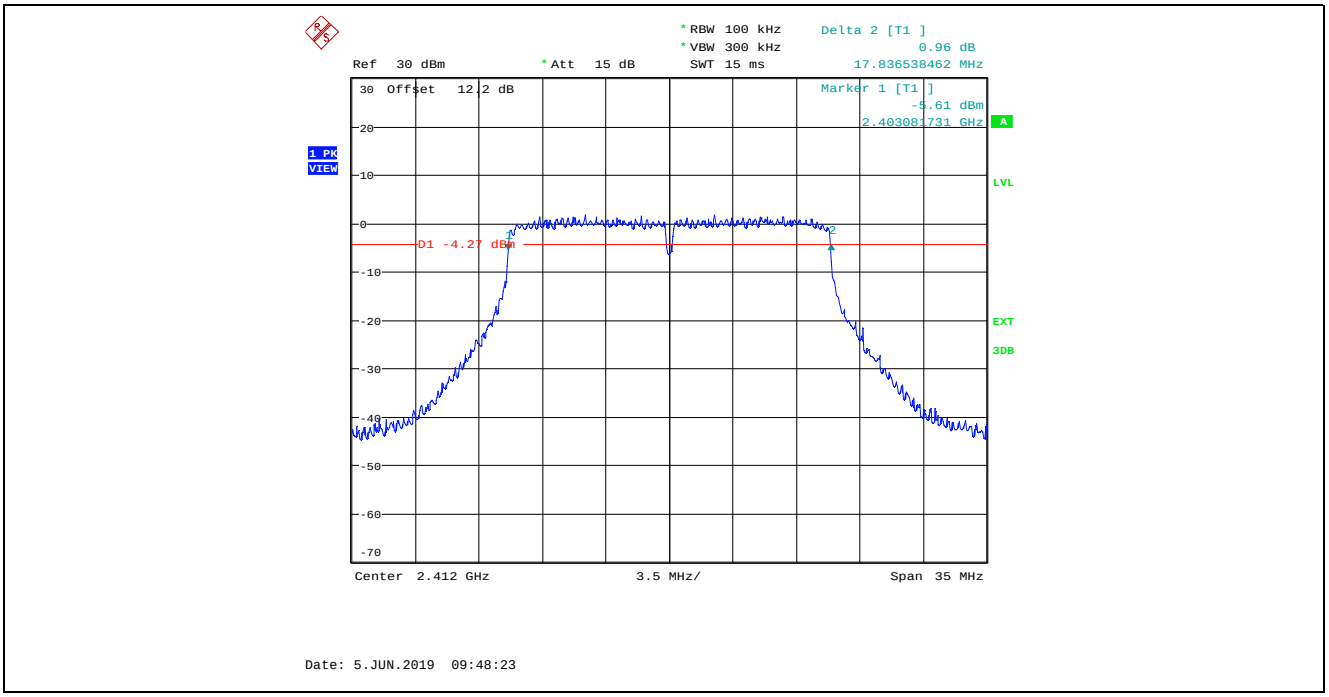
Plot 5.2.4.23. 6 dB Bandwidth
802.11n HT20, MCS 0, BPSK ½ 6.5 Mbps, Power Setting 17, Channel 6, 2437 MHz



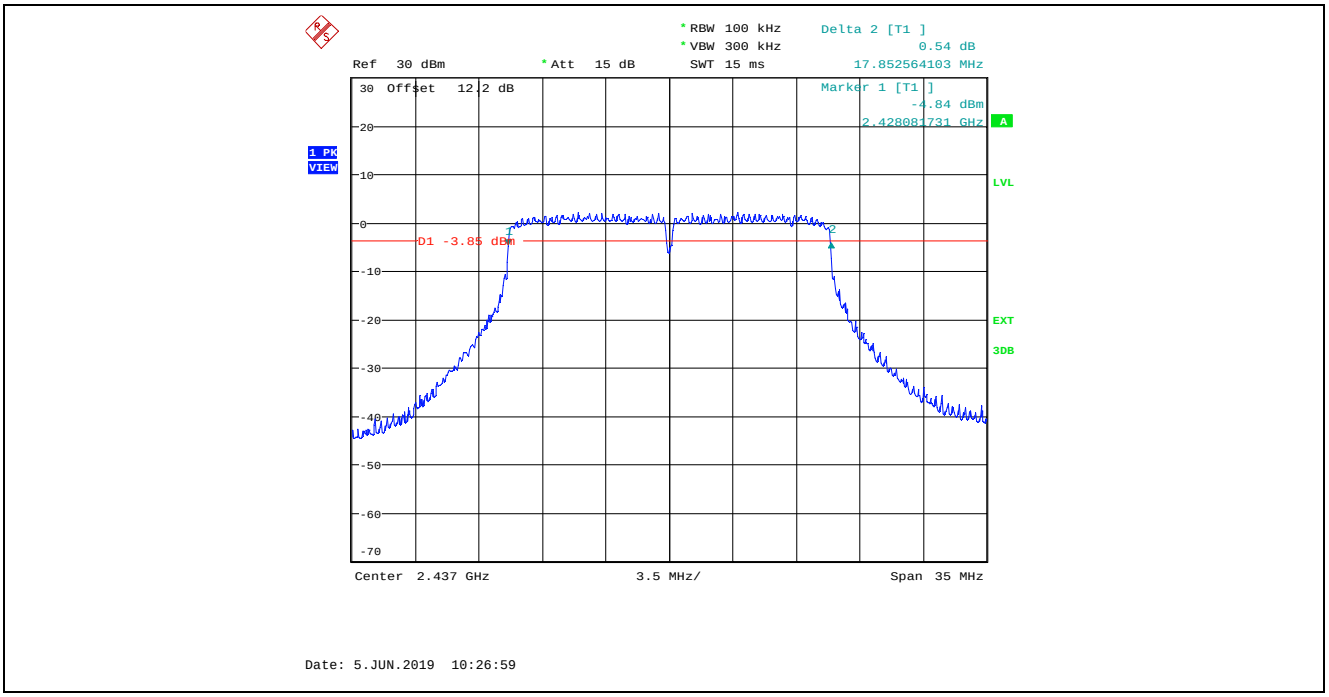
Plot 5.2.4.24. 6 dB Bandwidth
802.11n HT20, MCS 0, BPSK ½ 6.5 Mbps, Power Setting 15, Channel 11, 2462 MHz



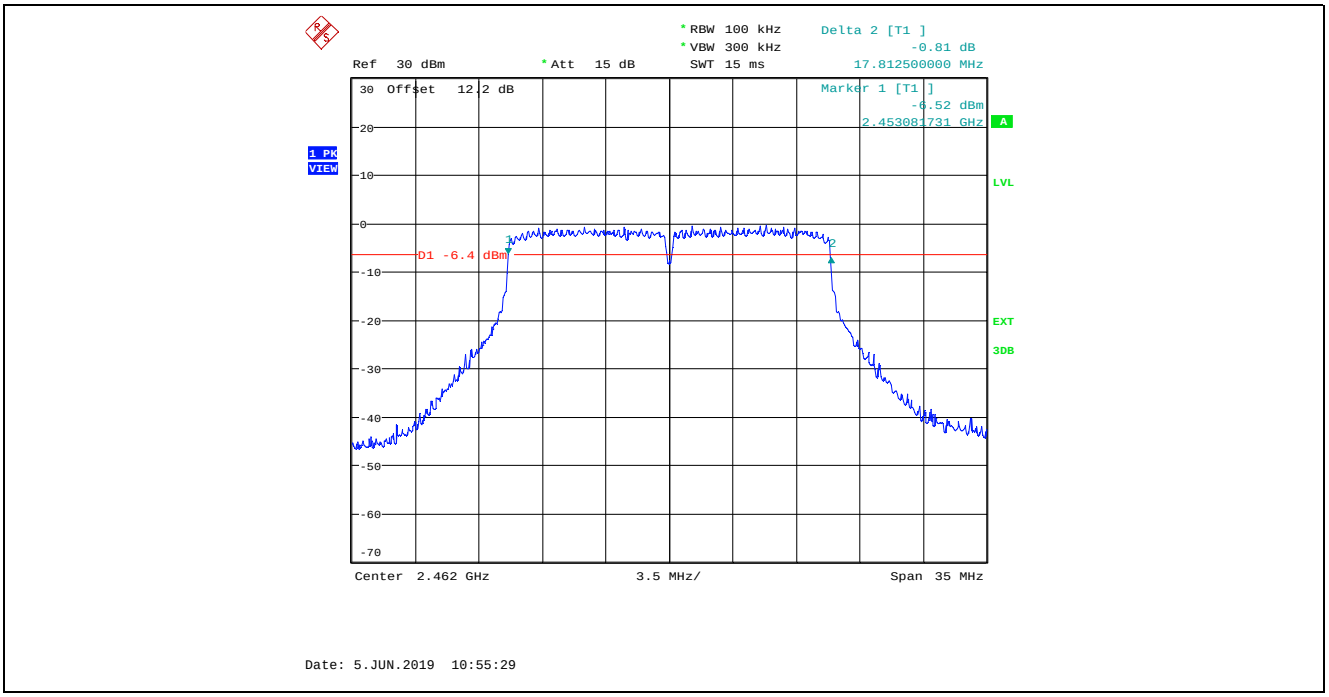
Plot 5.2.4.25. 6 dB Bandwidth
802.11n HT20, MCS 2, QPSK ¾ 19.5 Mbps, Power Setting 17, Channel 1, 2412 MHz



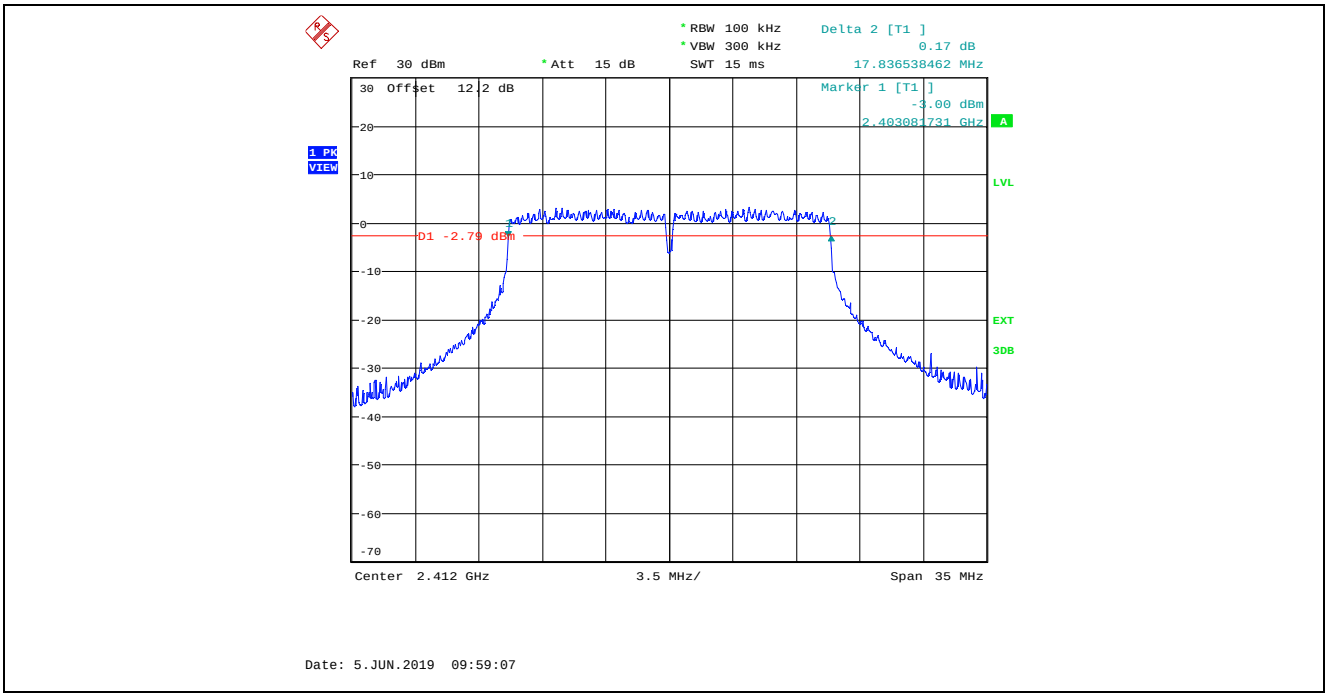
Plot 5.2.4.26. 6 dB Bandwidth
802.11n HT20, MCS 2, QPSK ¾ 19.5 Mbps, Power Setting 17, Channel 6, 2437 MHz



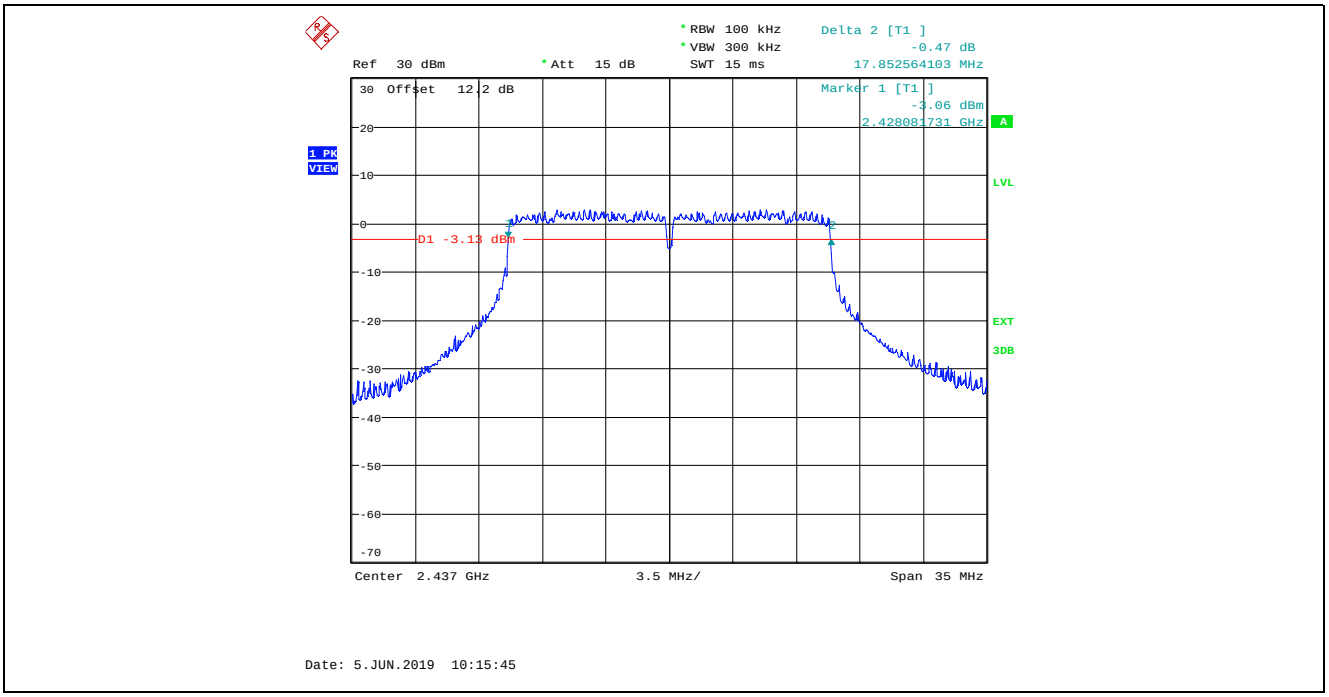
Plot 5.2.4.27. 6 dB Bandwidth
802.11n HT20, MCS 2, QPSK ¾ 19.5 Mbps, Power Setting 15, Channel 11, 2462 MHz



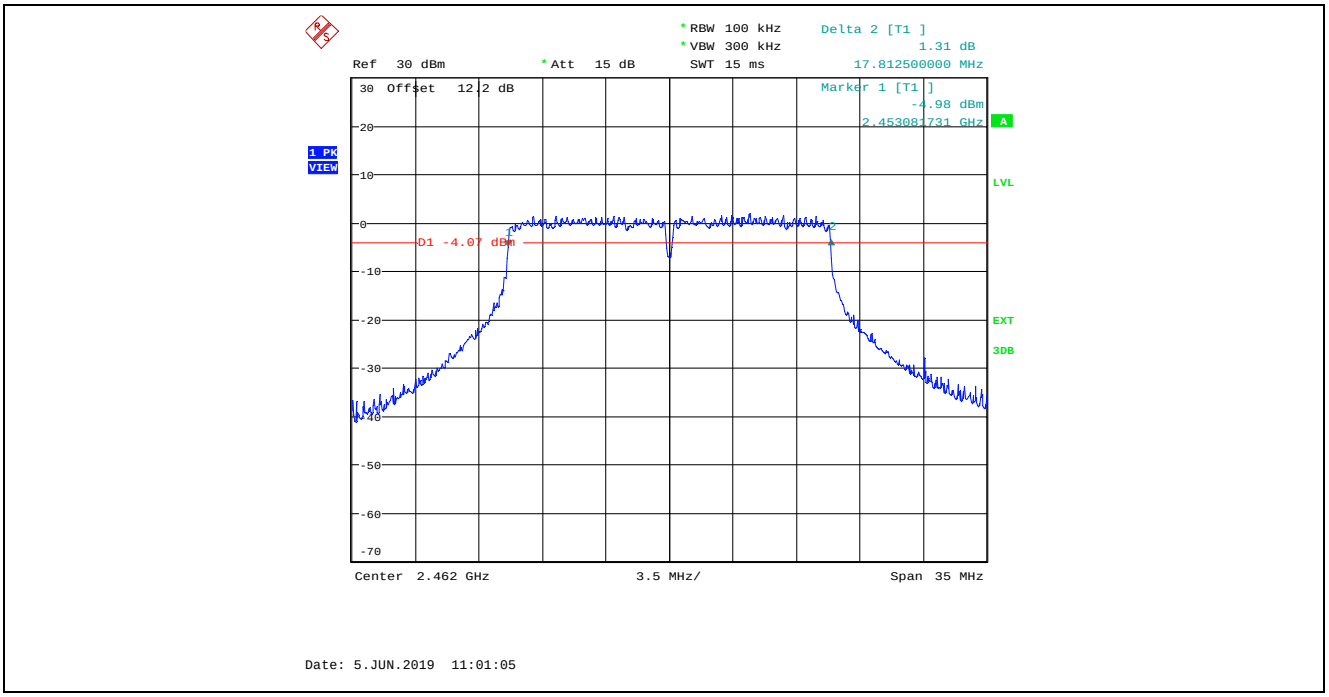
Plot 5.2.4.28. 6 dB Bandwidth
802.11n HT20, MCS 4, 16-QAM ¾ 39 Mbps, Power Setting 17, Channel 1, 2412 MHz



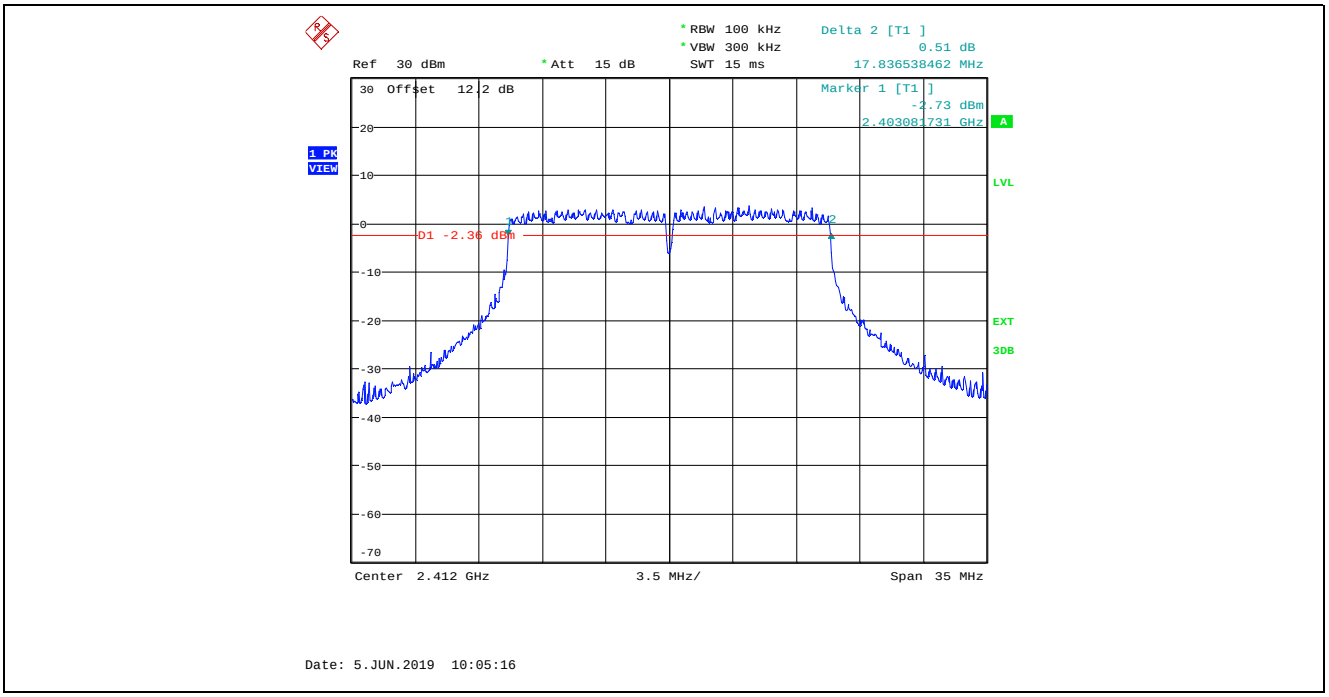
Plot 5.2.4.29. 6 dB Bandwidth
802.11n HT20, MCS 4, 16-QAM ¾ 39 Mbps, Power Setting 17, Channel 6, 2437 MHz



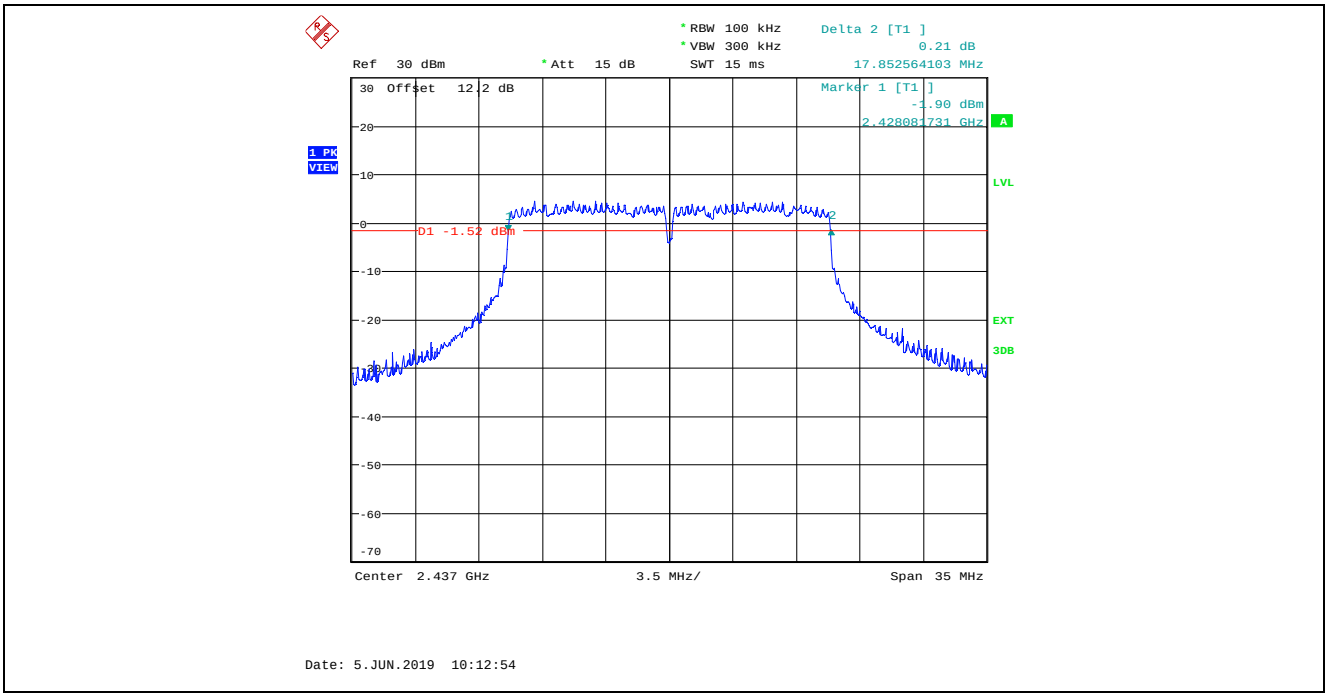
Plot 5.2.4.30. 6 dB Bandwidth
802.11n HT20, MCS 4, 16-QAM ¾ 39 Mbps, Power Setting 15, Channel 11, 2462 MHz



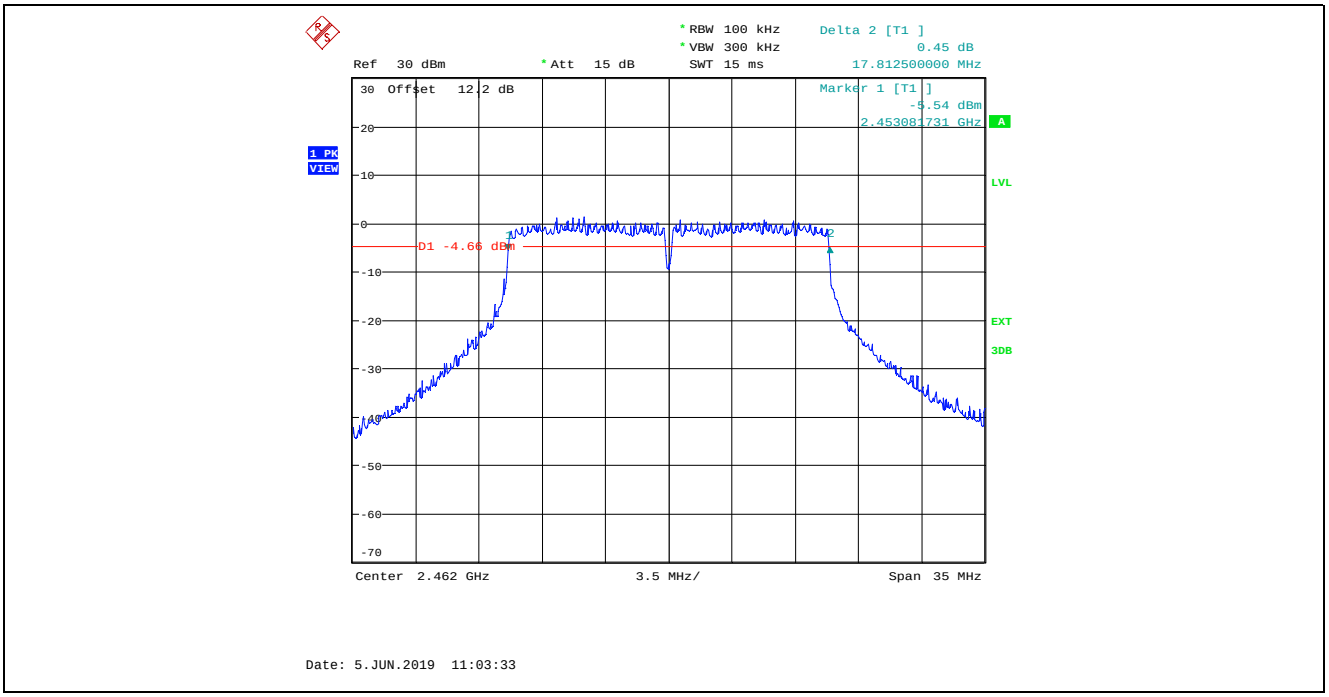
Plot 5.2.4.31. 6 dB Bandwidth
802.11n HT20, MCS 7, 64-QAM 5/6 65 Mbps, Power Setting 17, Channel 1, 2412 MHz



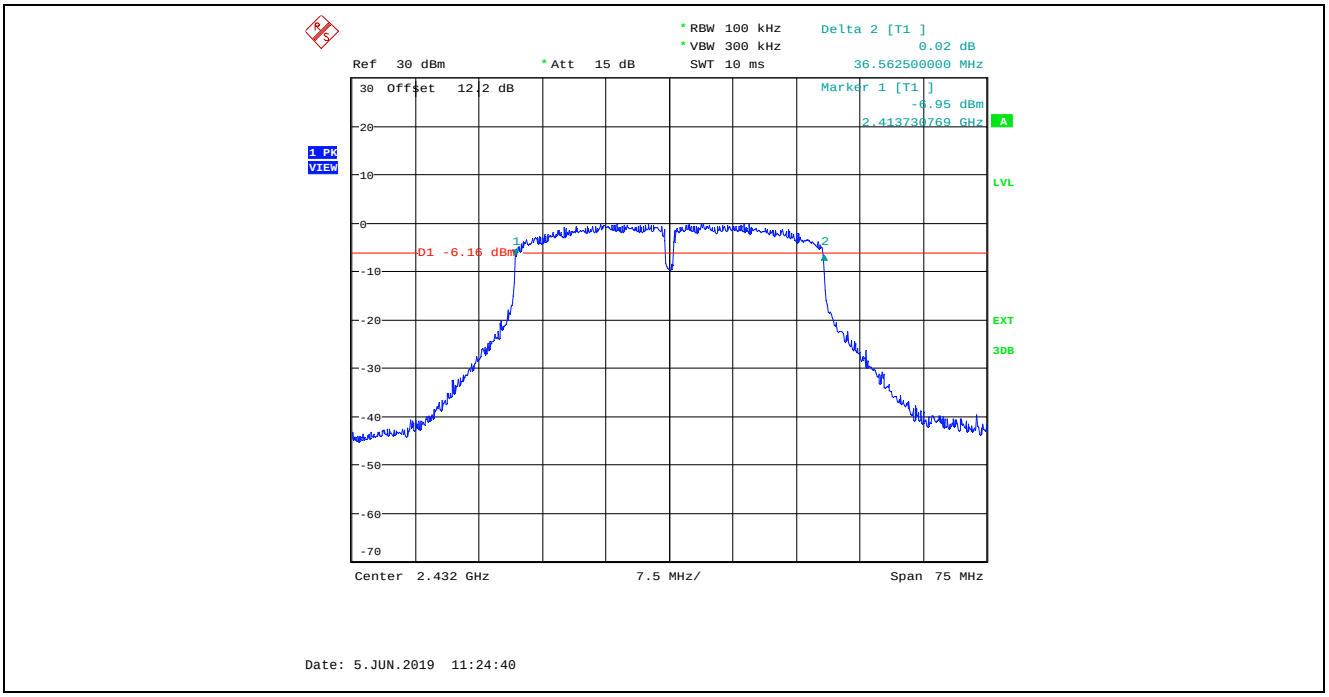
Plot 5.2.4.32. 6 dB Bandwidth
802.11n HT20, MCS 7, 64-QAM 5/6 65 Mbps, Power Setting 17, Channel 6, 2437 MHz



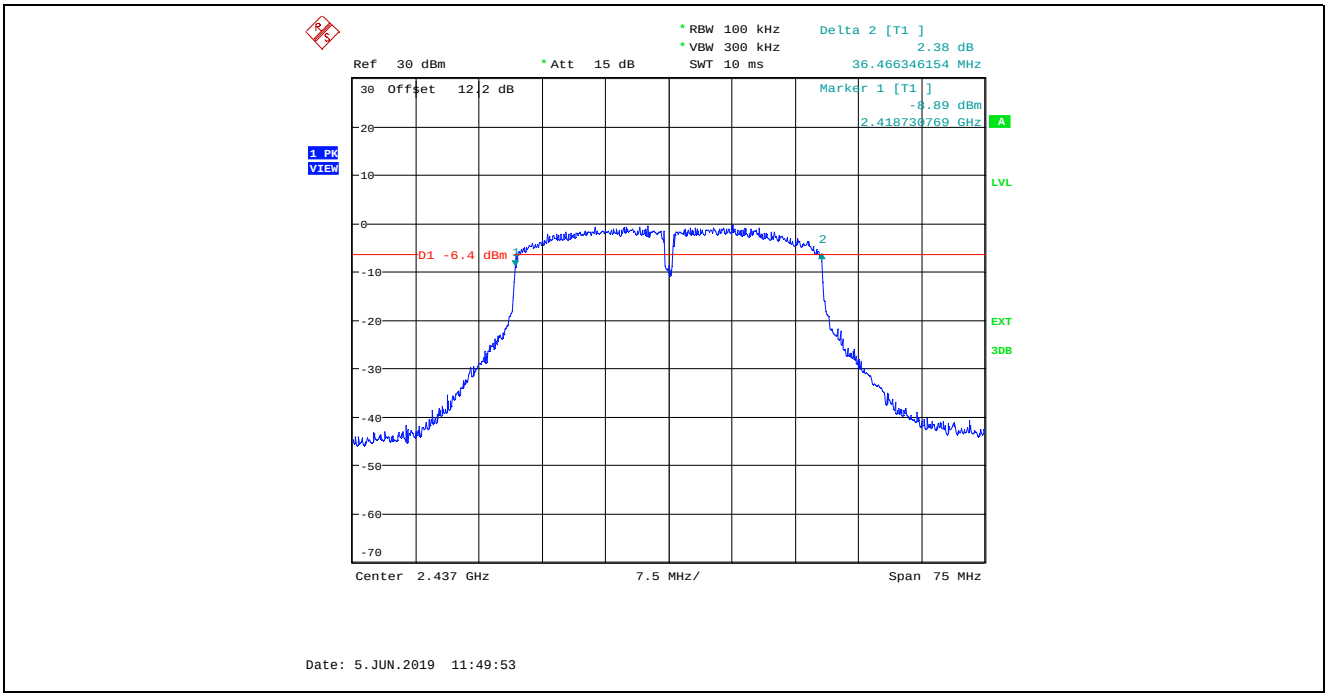
Plot 5.2.4.33. 6 dB Bandwidth
802.11n HT20, MCS 7, 64-QAM 5/6 65 Mbps, Power Setting 15, Channel 11, 2462 MHz



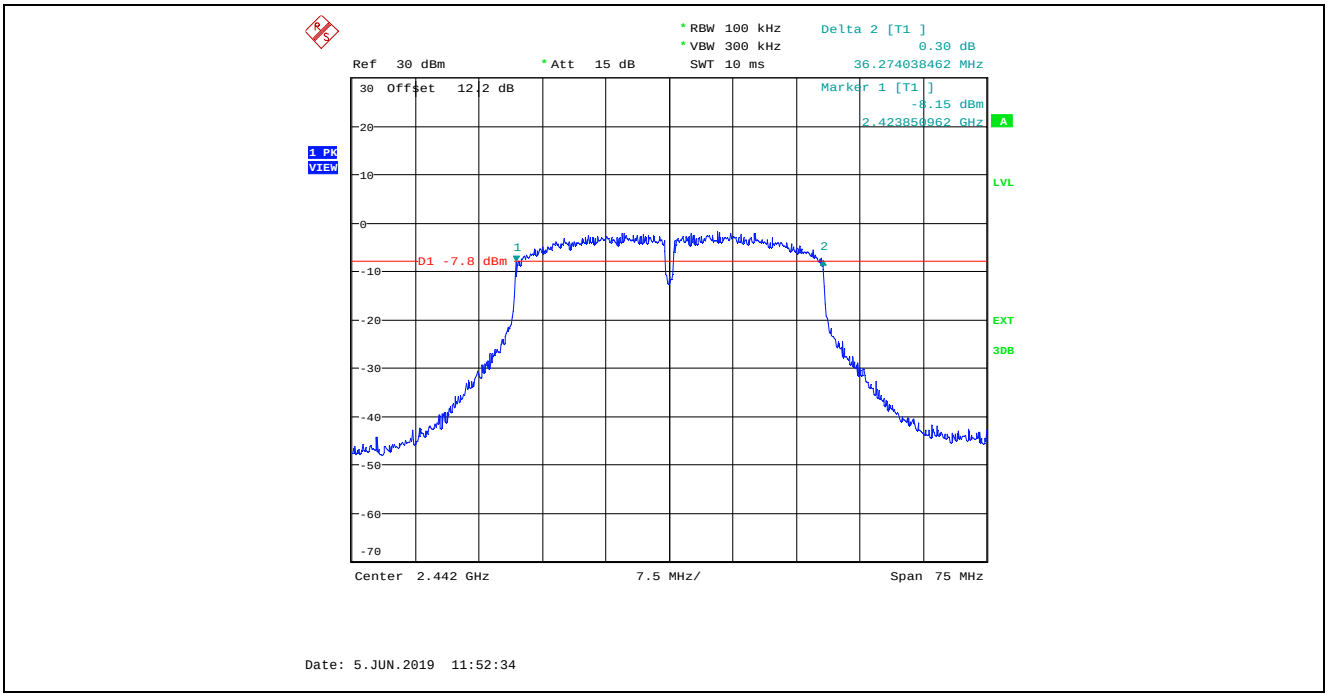
Plot 5.2.4.34. 6 dB Bandwidth
802.11n HT40, MCS 0, BPSK ½ 13.5 Mbps, Power Setting 16, Channel 5, 2432 MHz



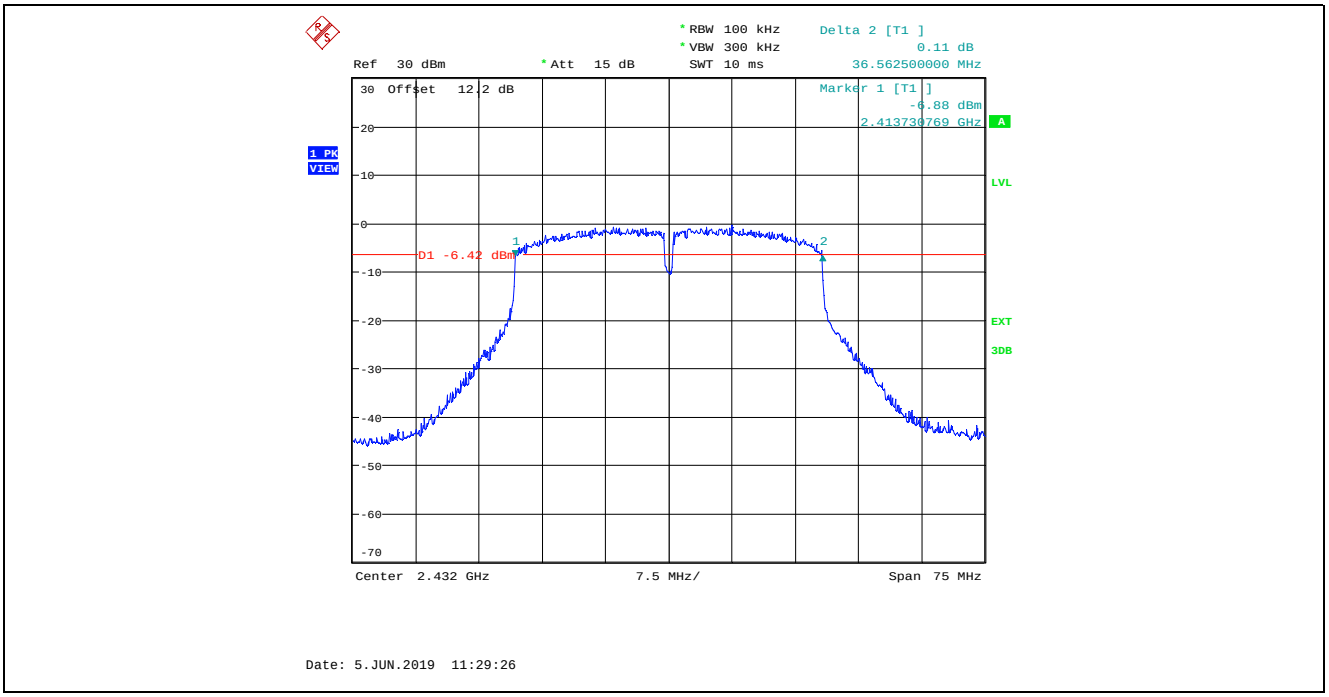
Plot 5.2.4.35. 6 dB Bandwidth
802.11n HT40, MCS 0, BPSK ½ 13.5 Mbps, Power Setting 16, Channel 6, 2437 MHz



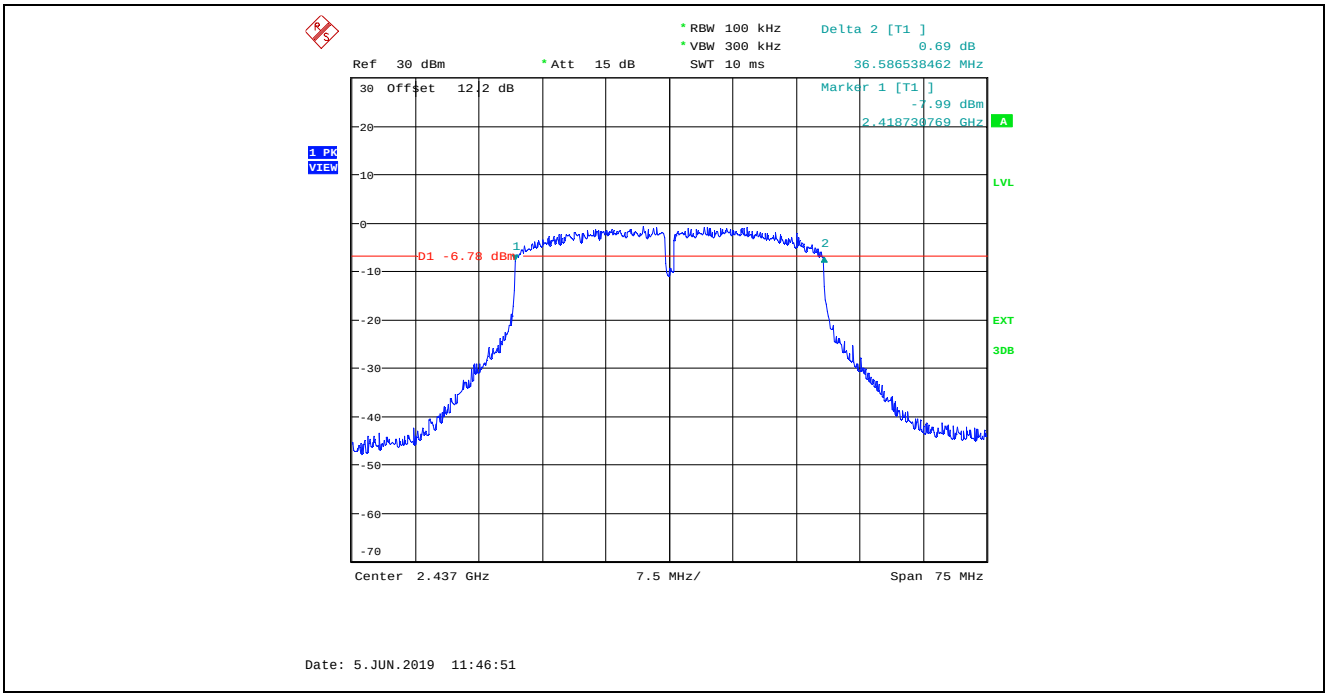
Plot 5.2.4.36. 6 dB Bandwidth
802.11n HT40, MCS 0, BPSK ½ 13.5 Mbps, Power Setting 14, Channel 7, 2442 MHz



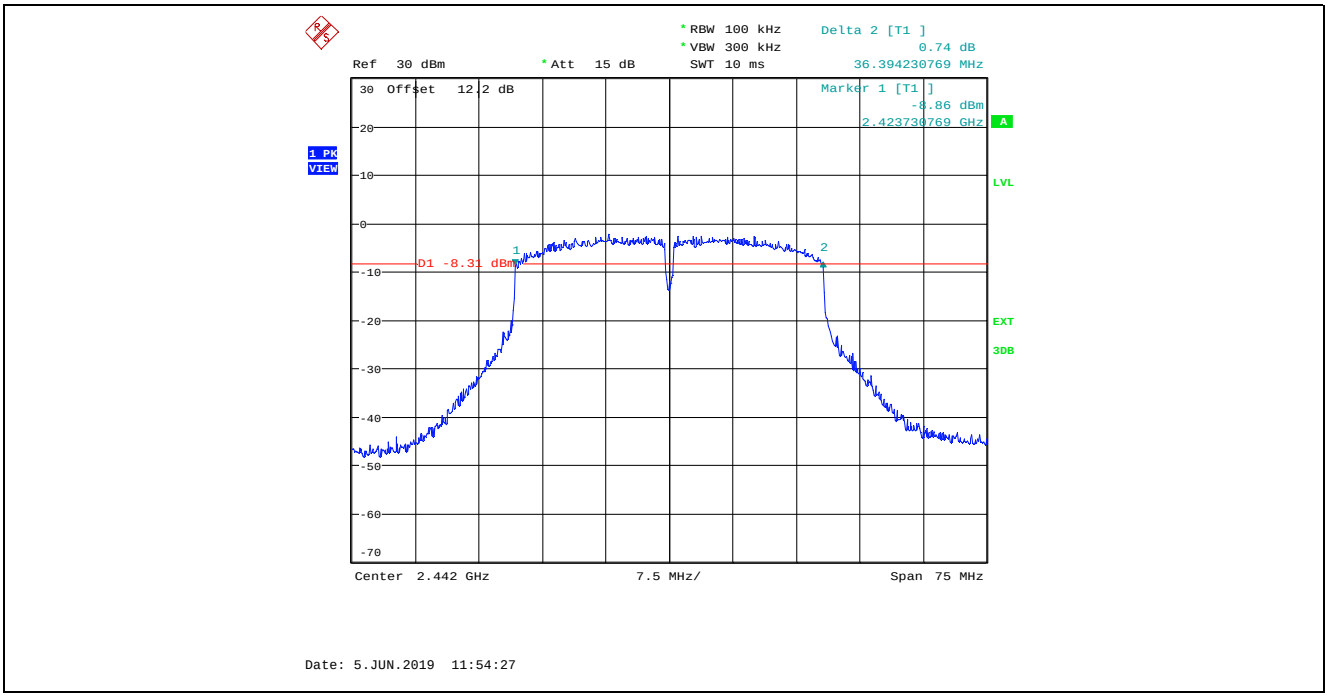
Plot 5.2.4.37. 6 dB Bandwidth
802.11n HT40, MCS 2, QPSK ¾ 40.5 Mbps, Power Setting 16, Channel 5, 2432 MHz



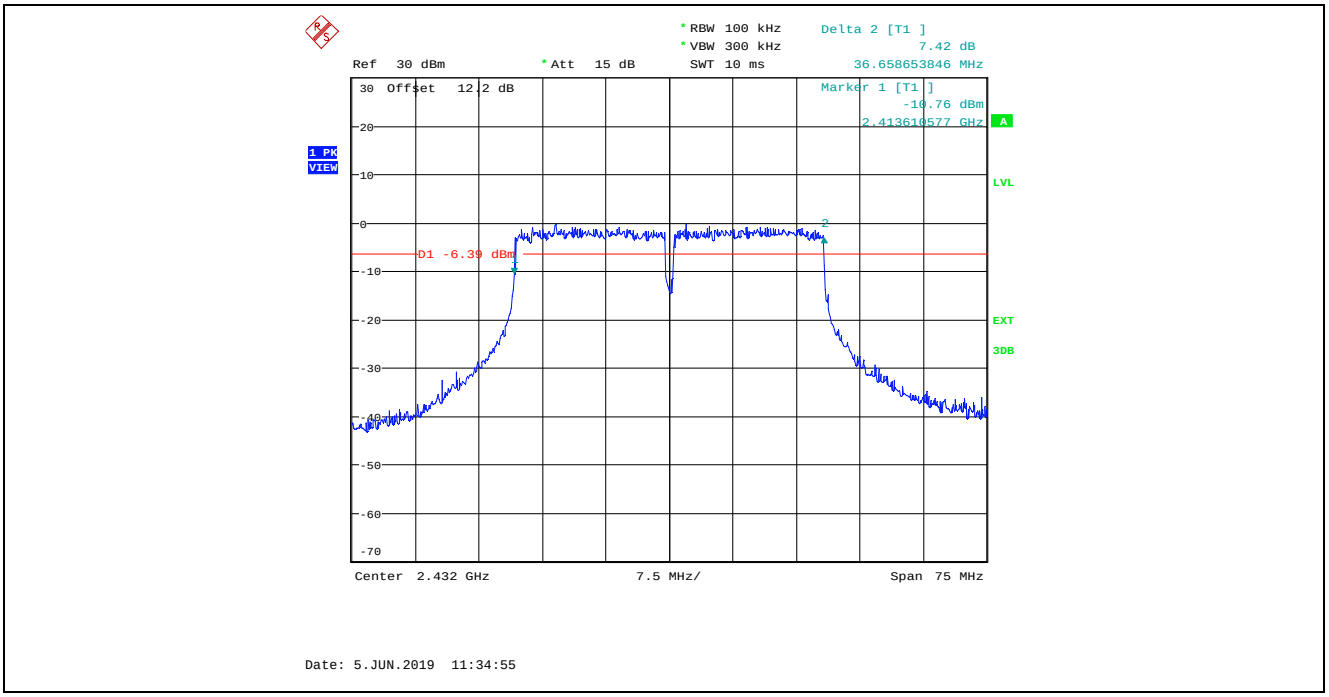
Plot 5.2.4.38. 6 dB Bandwidth
802.11n HT40, MCS 2, QPSK ¾ 40.5 Mbps, Power Setting 16, Channel 6, 2437 MHz



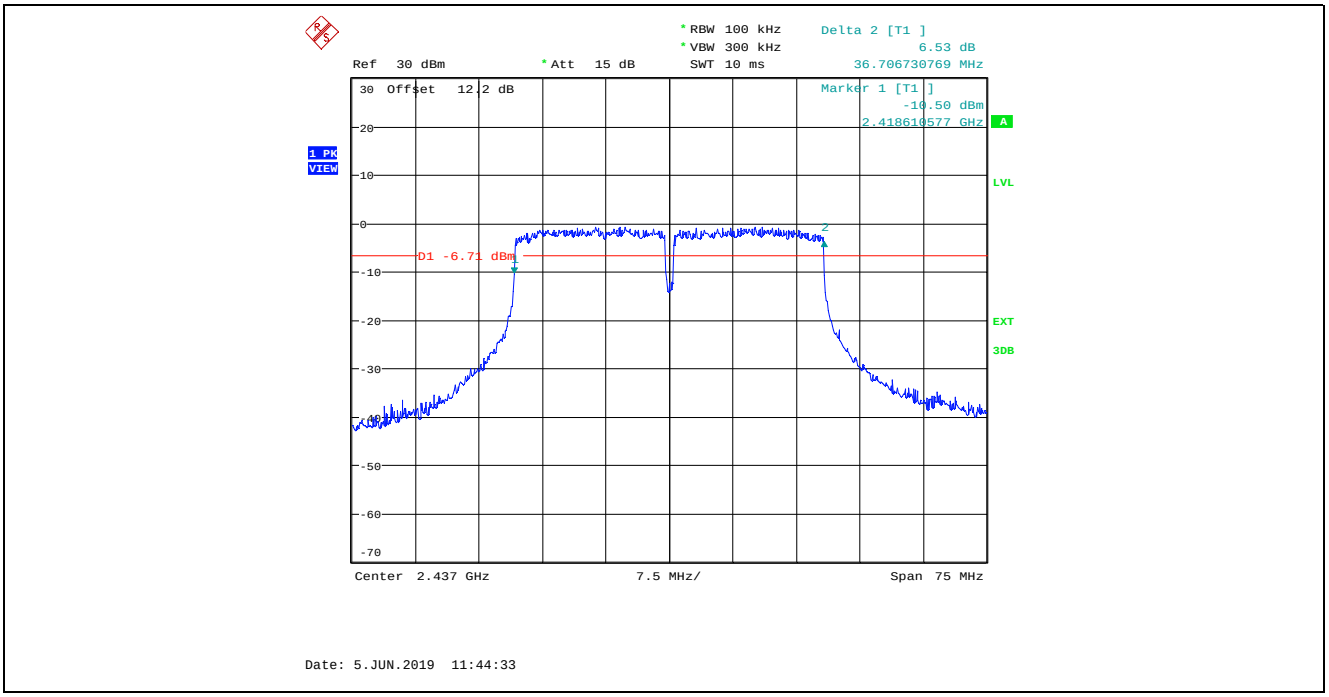
Plot 5.2.4.39. 6 dB Bandwidth
802.11n HT40, MCS 2, QPSK ¾ 40.5 Mbps, Power Setting 14, Channel 7, 2442 MHz



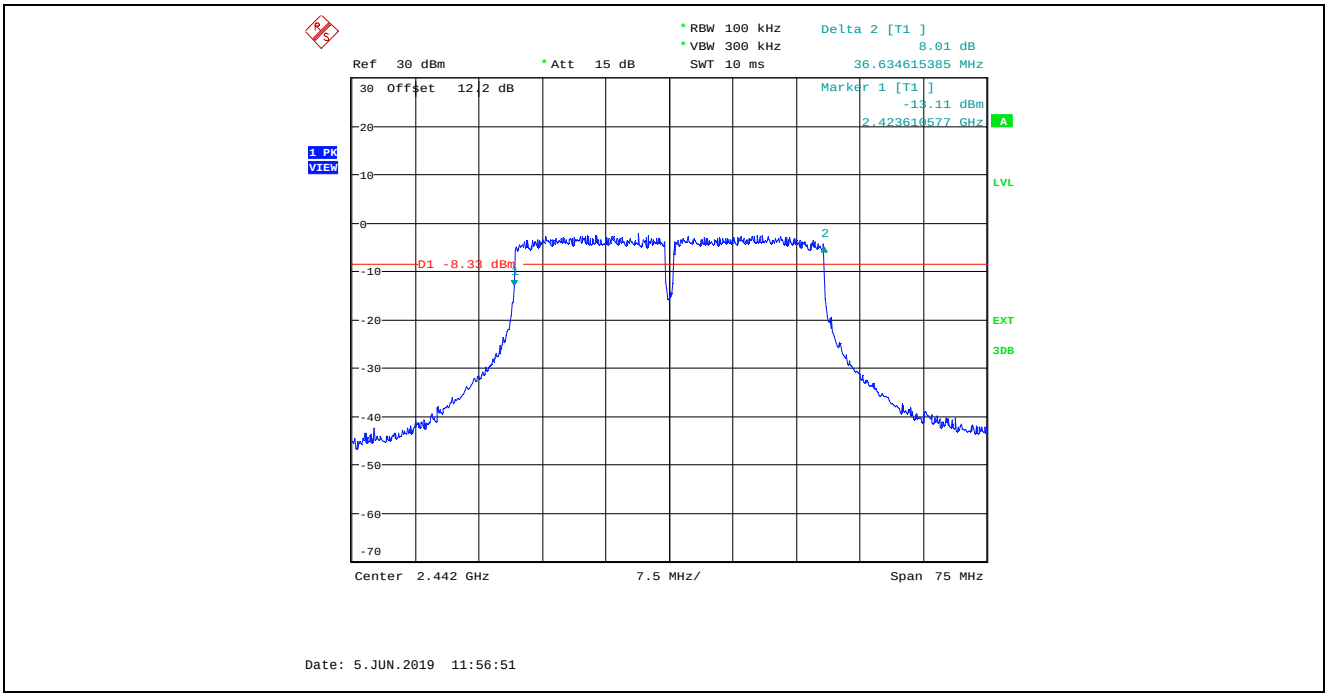
Plot 5.2.4.40. 6 dB Bandwidth
802.11n HT40, MCS 4, 16-QAM 3/4 81 Mbps, Power Setting 16, Channel 5, 2432 MHz



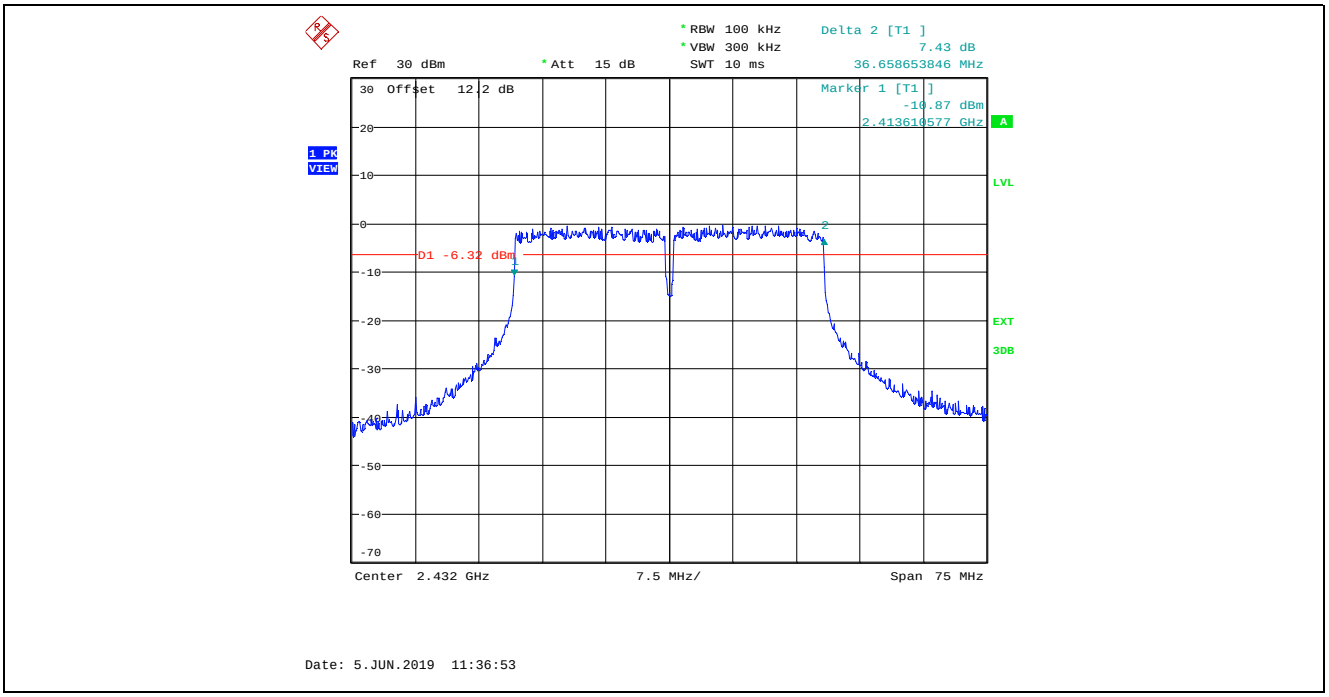
Plot 5.2.4.41. 6 dB Bandwidth
802.11n HT40, MCS 4, 16-QAM 3/4 81 Mbps, Power Setting 16, Channel 6, 2437 MHz



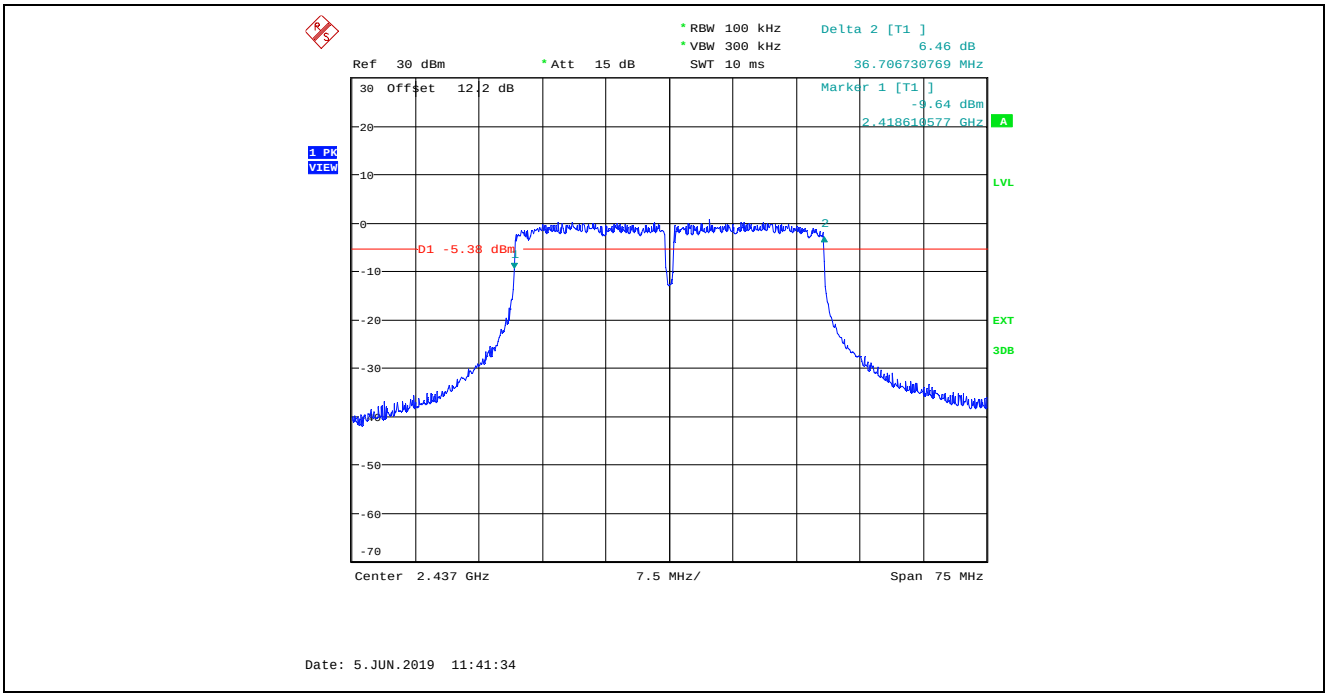
Plot 5.2.4.42. 6 dB Bandwidth
802.11n HT40, MCS 4, 16-QAM 3/4 81 Mbps, Power Setting 14, Channel 7, 2442 MHz



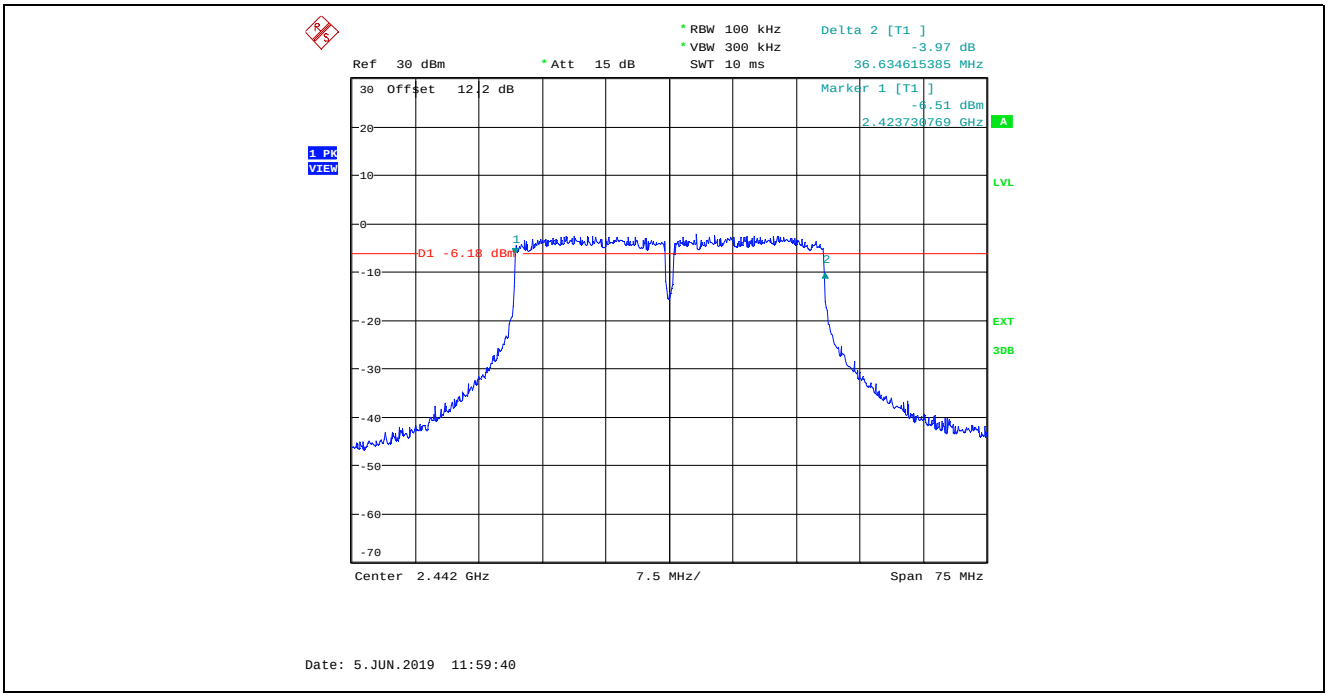
Plot 5.2.4.43. 6 dB Bandwidth
802.11n HT40, MCS 7, 64-QAM 5/6 135 Mbps, Power Setting 16, Channel 5, 2432 MHz



Plot 5.2.4.44. 6 dB Bandwidth
802.11n HT40, MCS 7, 64-QAM 5/6 135 Mbps, Power Setting 16, Channel 6, 2437 MHz



Plot 5.2.4.45. 6 dB Bandwidth
802.11n HT40, MCS 7, 64-QAM 5/6 135 Mbps, Power Setting 14, Channel 7, 2442 MHz



5.3. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

5.3.1. Limit(s)

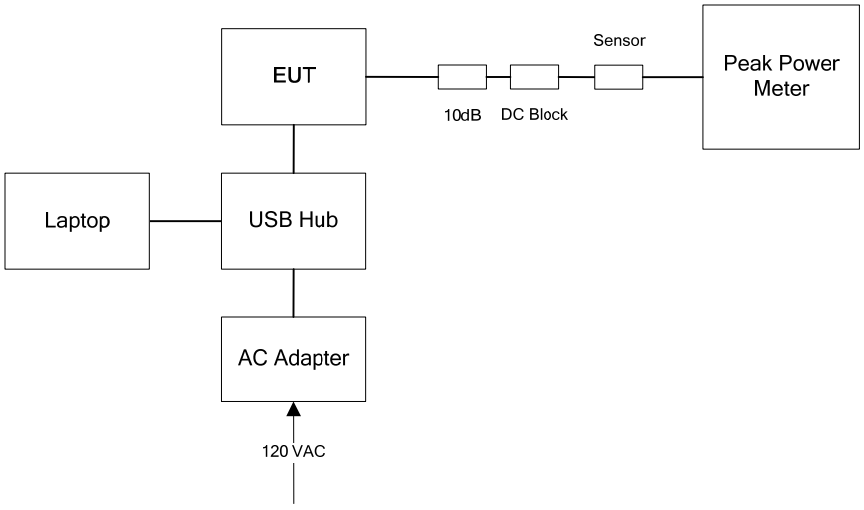
§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2. Method of Measurements & Test Arrangement

FCC KDB 558074 D01 15.247 Meas Guidance v05r01, Section 8.3.1.1 RBW ≥ DTS bandwidth / Subclause 11.9.1.1 of ANSI C63.10

5.3.3. Test Arrangement



5.3.4. Test Data

Peak Power and Power Setting for EUT with 0.86 dBi PCB Trace Antenna							
Operating Mode		**Power Setting**	**Channel**	**Frequency (MHz)**	**Peak Power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**
802.11b	DBPSK 1 Mbps	17	1	2412	18.79	0.86	19.65
		17	6	2437	18.87	0.86	19.73
		17	11	2462	19.06	0.86	19.92
	DQPSK 2 Mbps	17	1	2412	18.26	0.86	19.12
		17	6	2437	18.38	0.86	19.24
		17	11	2462	18.65	0.86	19.51
	CCK 11 Mbps	17	1	2412	18.32	0.86	19.18
		17	6	2437	18.89	0.86	19.75
		17	11	2462	18.52	0.86	19.38
802.11g	BPSK 9 Mbps	17	1	2412	22.23	0.86	23.09
		17	6	2437	22.24	0.86	23.10
		17	10	2457	22.33	0.86	23.19
		15	11	2462	20.68	0.86	21.54
	QPSK 18 Mbps	17	1	2412	22.03	0.86	22.89
		17	6	2437	22.96	0.86	23.82
		17	10	2457	21.73	0.86	22.59
		15	11	2462	20.54	0.86	21.40
	16-QAM 36 Mbps	17	1	2412	23.92	0.86	24.78
		17	6	2437	23.79	0.86	24.65
		17	10	2457	23.85	0.86	24.71
		15	11	2462	22.54	0.86	23.40
	64-QAM 54 Mbps	17	1	2412	23.61	0.86	24.47
		17	6	2437	23.91	0.86	24.77
		17	10	2457	23.86	0.86	24.72
		15	11	2462	22.53	0.86	23.39

Peak Power and Power Setting for EUT with 0.86 dBi PCB Trace Antenna							
Operating Mode		Power Setting	Channel	Frequency (MHz)	Peak Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)
802.11n HT20	MCS 0 BPSK ½ 6.5 Mbps	17	1	2412	22.21	0.86	23.07
		17	6	2437	22.25	0.86	23.11
		17	10	2457	22.08	0.86	22.94
		15	11	2462	20.54	0.86	21.40
	MCS 2 QPSK ¾ 19.5 Mbps	17	1	2412	21.62	0.86	22.48
		17	6	2437	21.92	0.86	22.78
		17	10	2457	21.47	0.86	22.33
		15	11	2462	19.50	0.86	20.36
	MCS 4 16-QAM ¾ 39 Mbps	17	1	2412	23.98	0.86	24.84
		17	6	2437	23.84	0.86	24.70
		17	10	2457	23.97	0.86	24.83
		15	11	2462	21.94	0.86	22.80
	MCS 7 64-QAM 5/6 65 Mbps	17	1	2412	23.85	0.86	24.71
		17	6	2437	23.72	0.86	24.58
		17	10	2457	23.25	0.86	24.11
		15	11	2462	21.93	0.86	22.79
802.11n HT40	MCS 0 BPSK ½ 13.5 Mbps	16	5	2432	20.51	0.86	21.37
		16	6	2437	20.51	0.86	21.37
		14	7	2442	19.36	0.86	20.22
	MCS 2 QPSK ¾ 40.5 Mbps	16	5	2432	20.35	0.86	21.21
		16	6	2437	20.65	0.86	21.51
		14	7	2442	20.29	0.86	21.15
	MCS 4 16-QAM ¾ 81 Mbps	16	5	2432	23.55	0.86	24.41
		16	6	2437	22.72	0.86	23.58
		14	7	2442	21.19	0.86	22.05
	MCS 7 64-QAM 5/6 135 Mbps	16	5	2432	23.20	0.86	24.06
		16	6	2437	23.37	0.86	24.23
		14	7	2442	21.74	0.86	22.60

5.4. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.4.1. Limit(s)

§ 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

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	2655–2900	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	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

Section 15.209(a) - Field Strength Limits within Restricted Frequency Bands

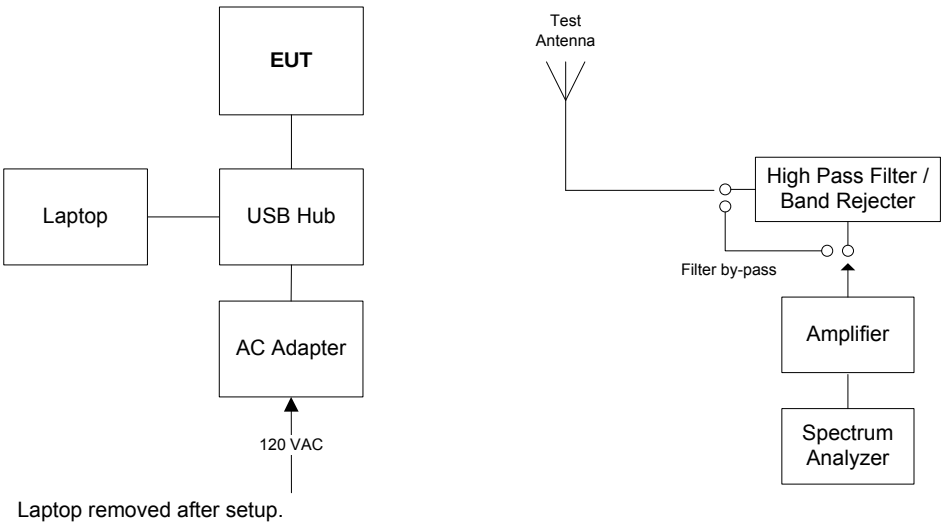
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.4.2. Method of Measurements

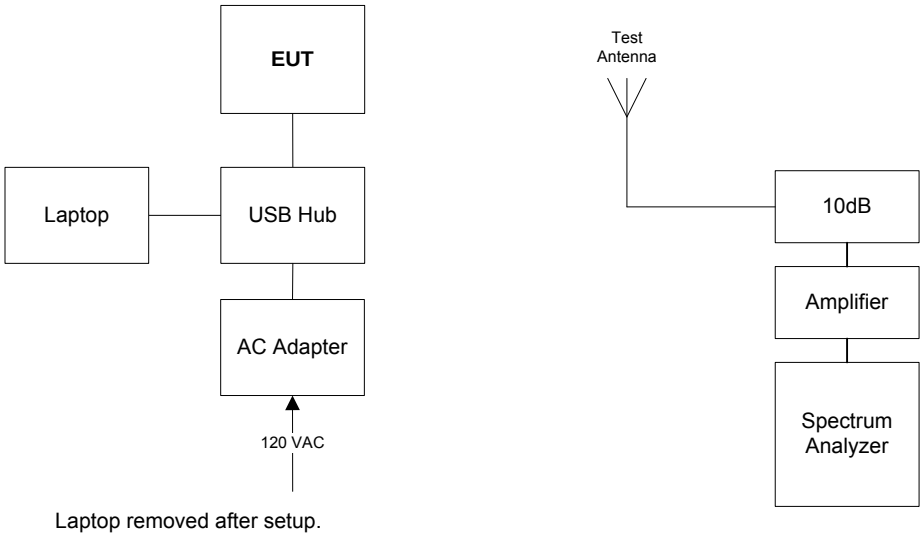
KDB 558074 D01 15.247 Meas Guidance v05r01, Sections 8.5, 8.6 and 8.7 / Subclauses 11.11, 11.12 and 11.13.of ANSI C63.10.

5.4.3. Test Arrangement

Radiated Emissions



Band-Edge Radiated Emissions



5.4.4. Test Data

5.4.4.1. Spurious Radiated Emissions

5.4.4.1.1. 802.11b, DBPSK 1 Mbps

Operating Mode:	802.11b, DBPSK 1 Mbps, Power Setting 17
Fundamental Frequency:	2412 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2412	110.31	--	V	--	--	--	--
2412	110.14	--	H	--	--	--	--
4824	49.52	38.58	V	54.0	90.3	-15.4	Pass*
4824	50.61	41.53	H	54.0	90.3	-12.5	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Operating Mode:	802.11b, DBPSK 1 Mbps, Power Setting 17
Fundamental Frequency:	2437 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2437	110.39	--	V	--	--	--	--
2437	111.48	--	H	--	--	--	--
4874	50.36	39.13	V	54.0	91.5	-14.9	Pass*
4874	50.83	41.31	H	54.0	91.5	-12.7	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Operating Mode:	802.11b, DBPSK 1 Mbps, Power Setting 17
Fundamental Frequency:	2462 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2462	110.45	--	V	--	--	--	--
2462	112.06	--	H	--	--	--	--
4924	49.69	36.92	V	54.0	92.1	-17.1	Pass*
4924	51.01	41.50	H	54.0	92.1	-12.5	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.4.4.1.2. 802.11g, BPSK 9 Mbps

Operating Mode:	802.11g, BPSK 9 Mbps, Power Setting 17
Fundamental Frequency:	2412 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2412	110.64	--	V	--	--	--	--
2412	108.81	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

Operating Mode:	802.11g, BPSK 9 Mbps, Power Setting 17
Fundamental Frequency:	2437 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2437	110.33	--	V	--	--	--	--
2437	108.67	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

Operating Mode:	802.11g, BPSK 9 Mbps, Power Settings 15 (for fundamental) and 17 (for spurious emissions)
Fundamental Frequency:	2462 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2462	108.46	--	V	--	--	--	--
2462	108.84	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

5.4.4.1.3. 802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps

Operating Mode:	802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps, Power Setting 17						
Fundamental Frequency:	2412 MHz						
Frequency Test Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2412	106.68	--	V	--	--	--	--
2412	106.05	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

Operating Mode:	802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps, Power Setting 17						
Fundamental Frequency:	2437 MHz						
Frequency Test Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2437	106.52	--	V	--	--	--	--
2437	106.15	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

Operating Mode:	802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps, Power Settings 15 (for fundamental) and 17 (for spurious emissions)						
Fundamental Frequency:	2462 MHz						
Frequency Test Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2462	106.05	--	V	--	--	--	--
2462	105.19	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

5.4.4.1.4. 802.11n HT40, MCS 0 BPSK ½ 13.5 Mbps

Operating Mode:	802.11n HT40, MCS 0 BPSK ½ 13.5 Mbps, Power Setting 16
Fundamental Frequency:	2432 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2432	106.33	--	V	--	--	--	--
2432	108.25	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

Operating Mode:	802.11n HT40, MCS 0 BPSK ½ 13.5 Mbps, Power Setting 16
Fundamental Frequency:	2437 MHz
Frequency Test Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2437	106.55	--	V	--	--	--	--
2437	108.73	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

Operating Mode:	802.11n HT40, MCS 0 BPSK ½ 13.5 Mbps, Power Setting 14
Fundamental Frequency:	2442 MHz
Frequency Test Range:	30 MHz – 25 GHz

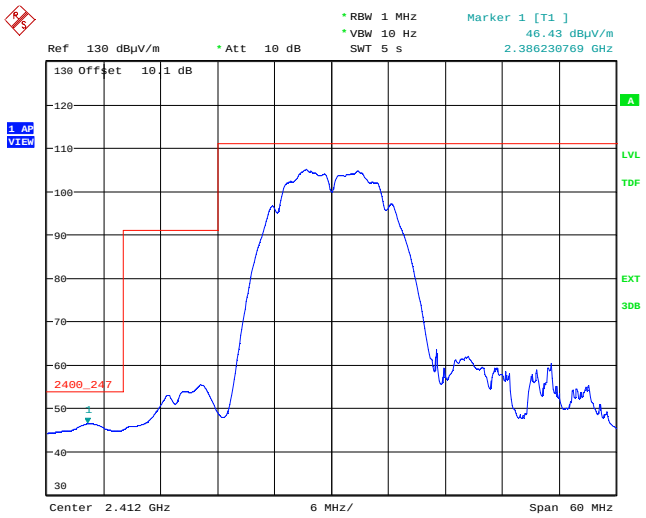
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2442	105.47	--	V	--	--	--	--
2442	106.46	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	*	*	Pass

* No spurious component detected.

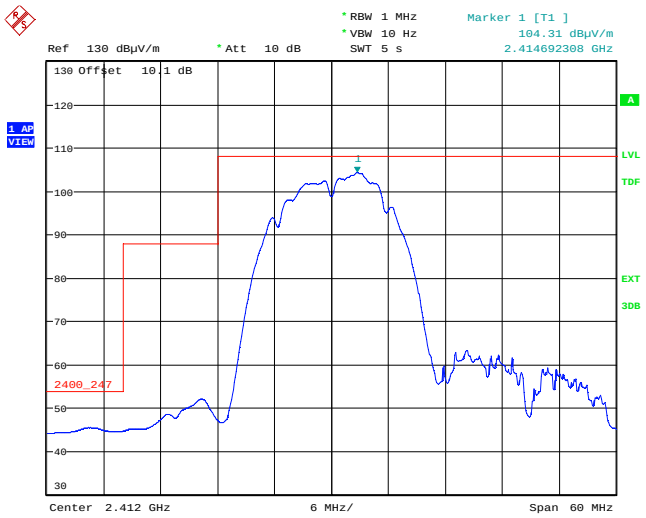
5.4.4.2. Band–Edge RF Radiated Emissions

5.4.4.2.1. Band–Edge RF Radiated Emissions for 802.11b

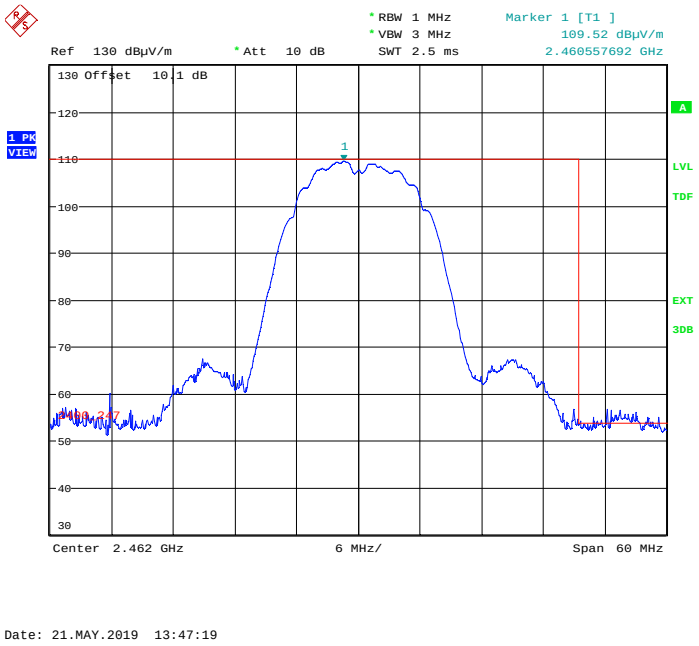
Plot 5.4.4.2.1.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
DBPSK 1Mbps, Power Setting 17, Channel 1, 2412 MHz



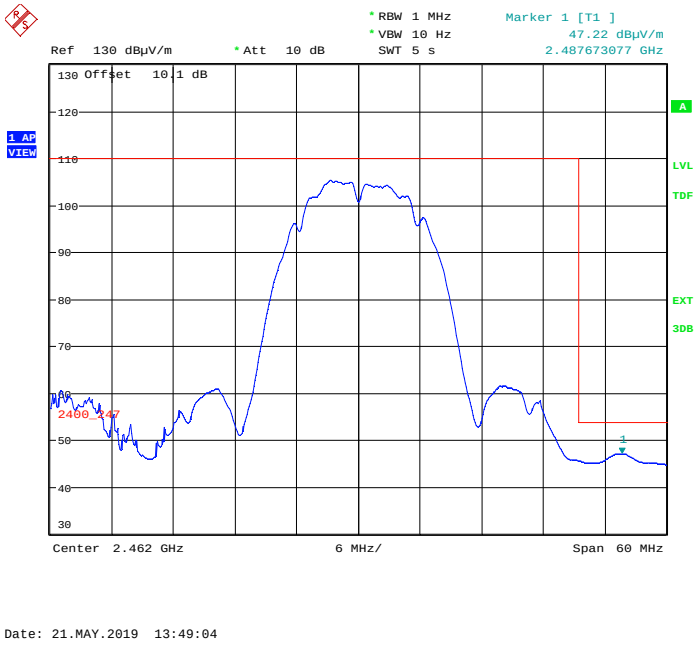
Plot 5.4.4.2.1.2. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
DBPSK 1Mbps, Power Setting 17, Channel 1, 2412 MHz



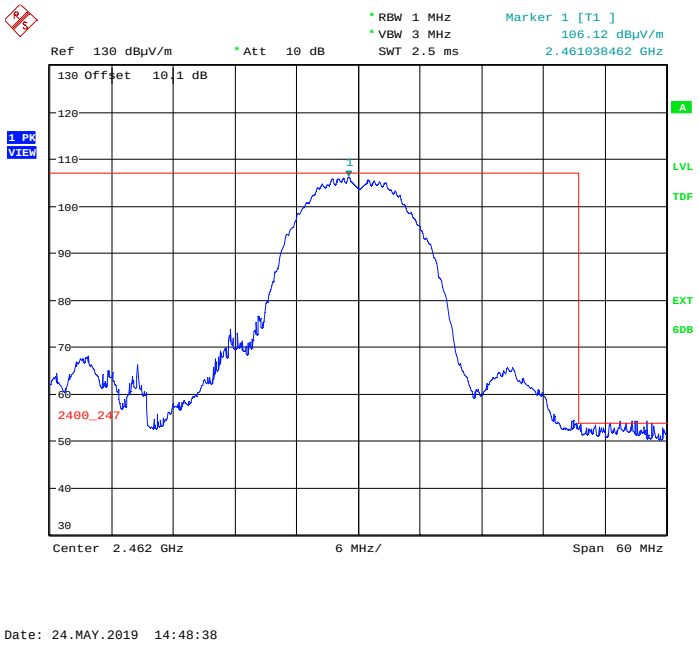
Plot 5.4.4.2.1.3. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
DBPSK 1Mbps, Power Setting 17, Channel 11, 2462 MHz



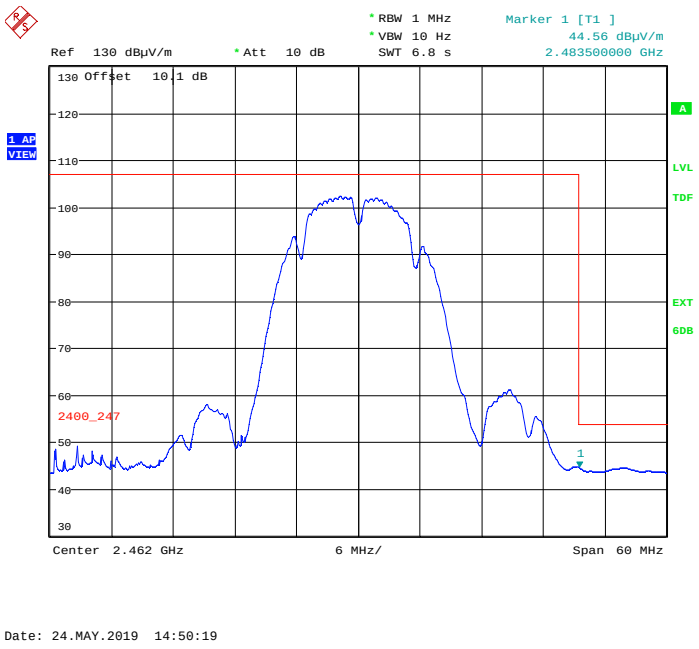
Plot 5.4.4.2.1.4. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
DBPSK 1Mbps, Power Setting 17, Channel 11, 2462 MHz



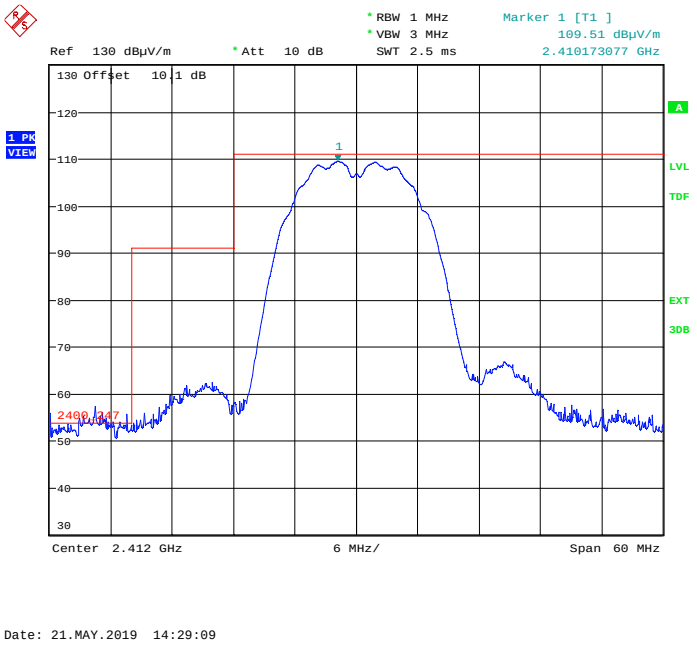
Plot 5.4.4.2.1.5. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
DBPSK 1Mbps, Power Setting 17, Channel 11, 2462 MHz



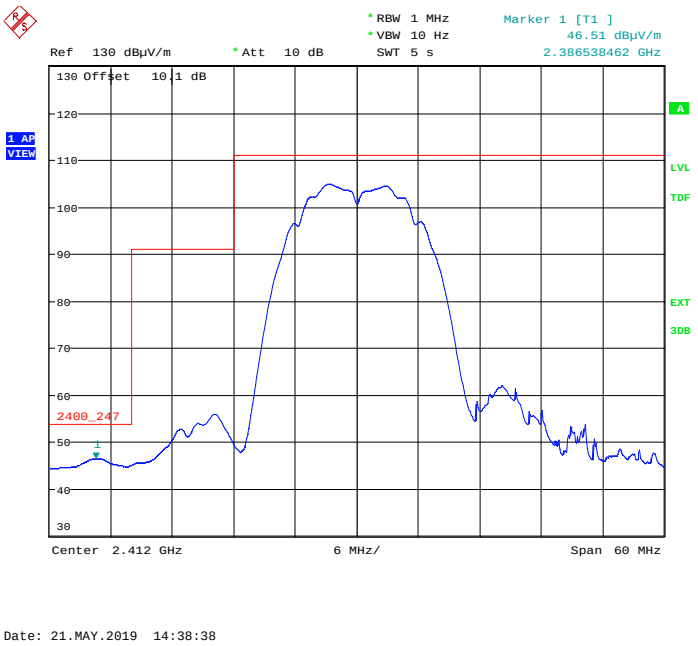
Plot 5.4.4.2.1.6. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
DBPSK 1Mbps, Power Setting 17, Channel 11, 2462 MHz



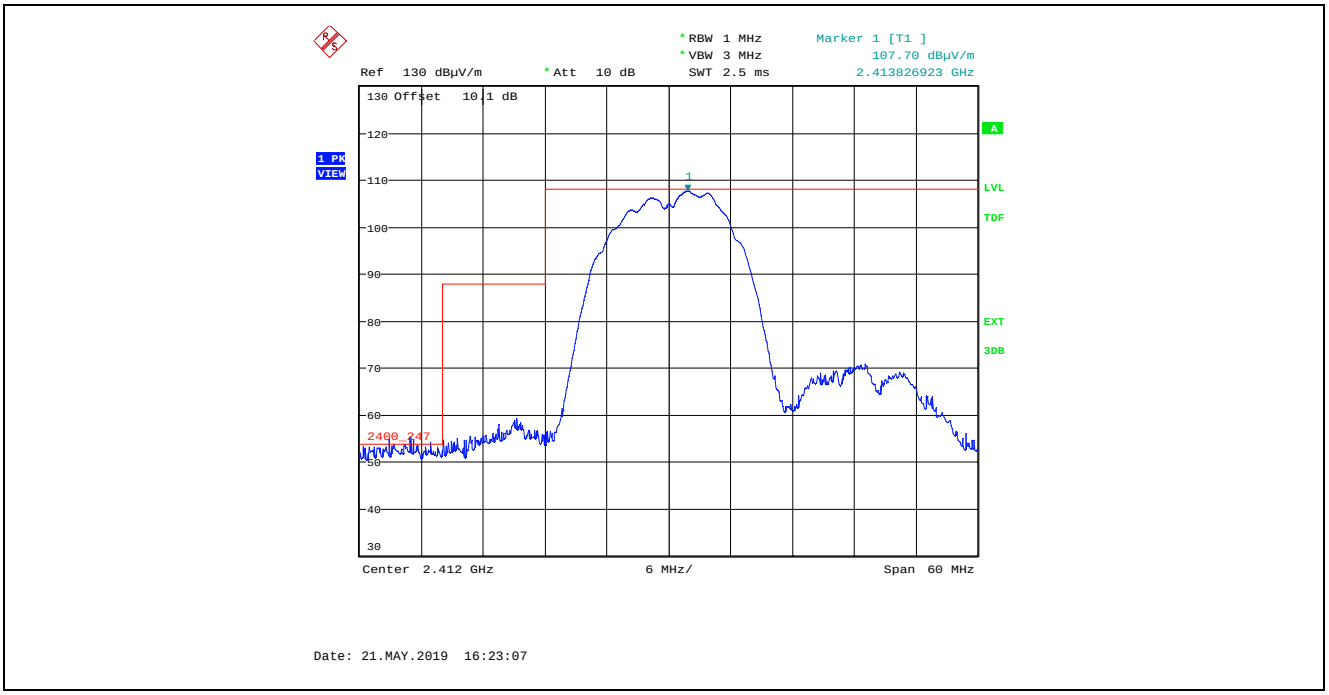
Plot 5.4.4.2.1.7. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
DQPSK 2Mbps, Power Setting 17, Channel 1, 2412 MHz



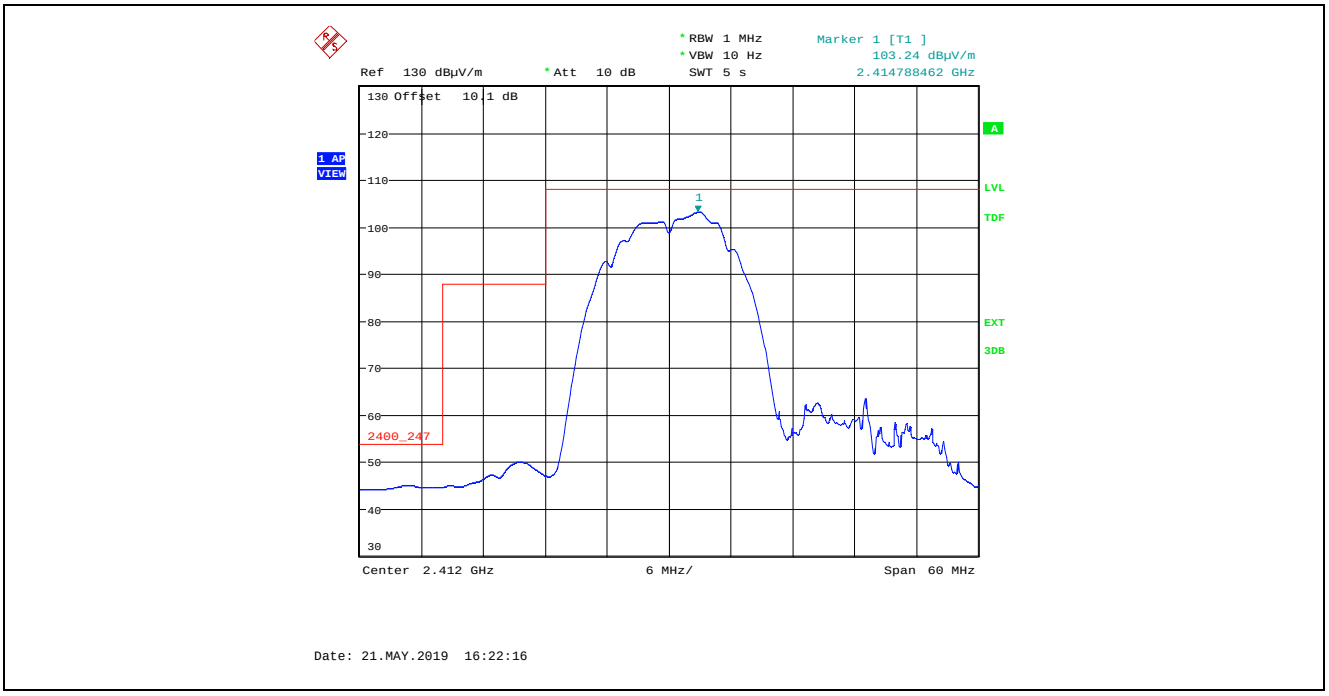
Plot 5.4.4.2.1.8. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
DQPSK 2Mbps, Power Setting 17, Channel 1, 2412 MHz



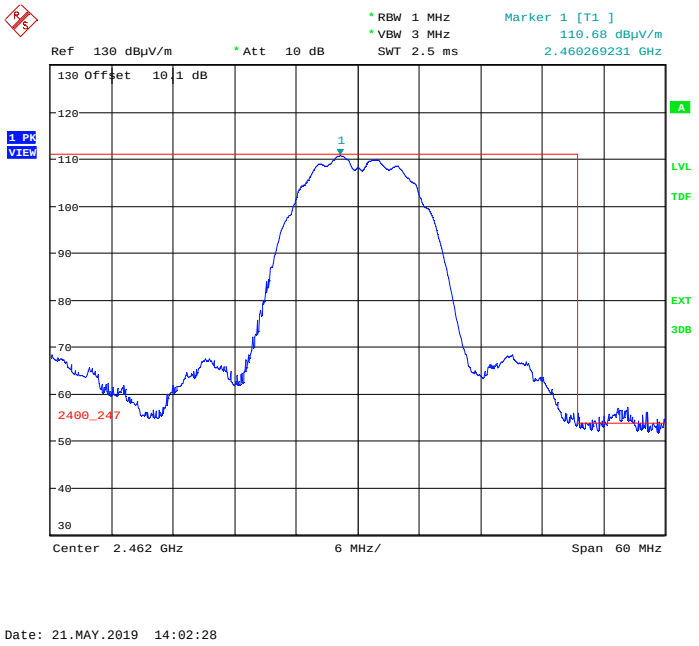
Plot 5.4.4.2.1.9. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
DQPSK 2Mbps, Power Setting 17, Channel 1, 2412 MHz



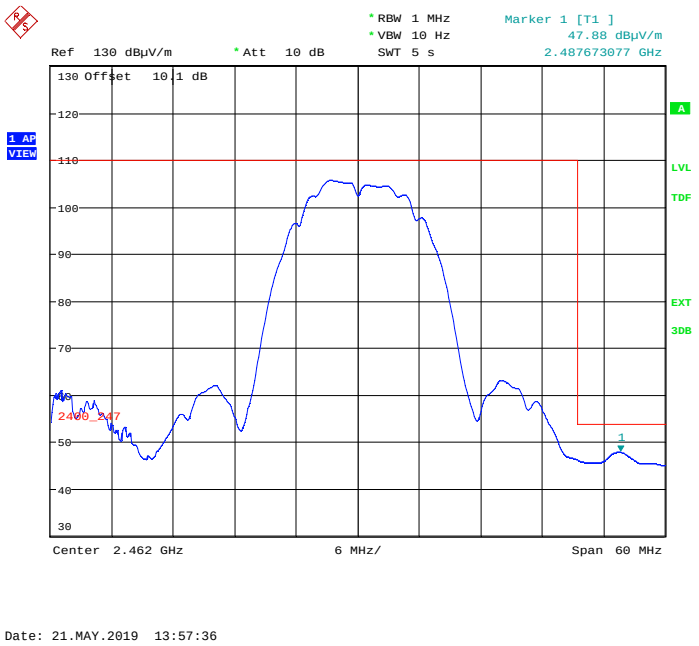
Plot 5.4.4.2.1.10. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
DQPSK 2Mbps, Power Setting 17, Channel 1, 2412 MHz



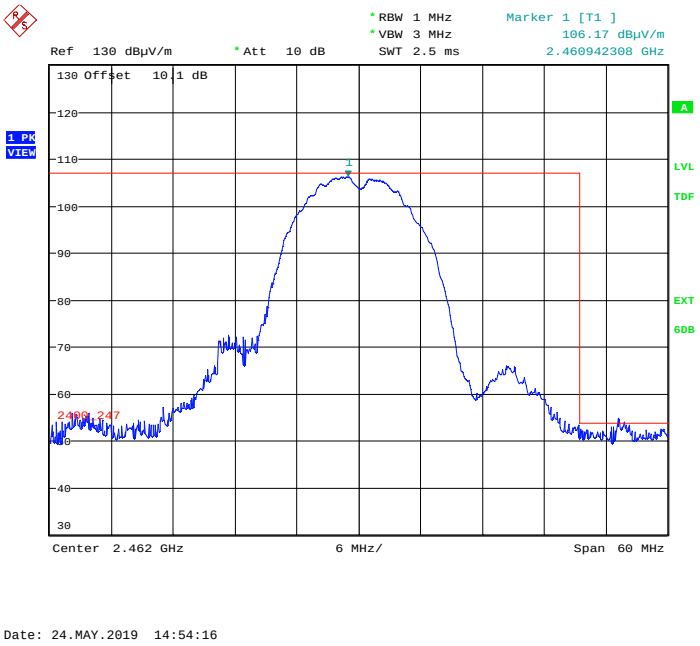
Plot 5.4.4.2.1.11. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
DQPSK 2Mbps, Power Setting 17, Channel 11, 2462 MHz



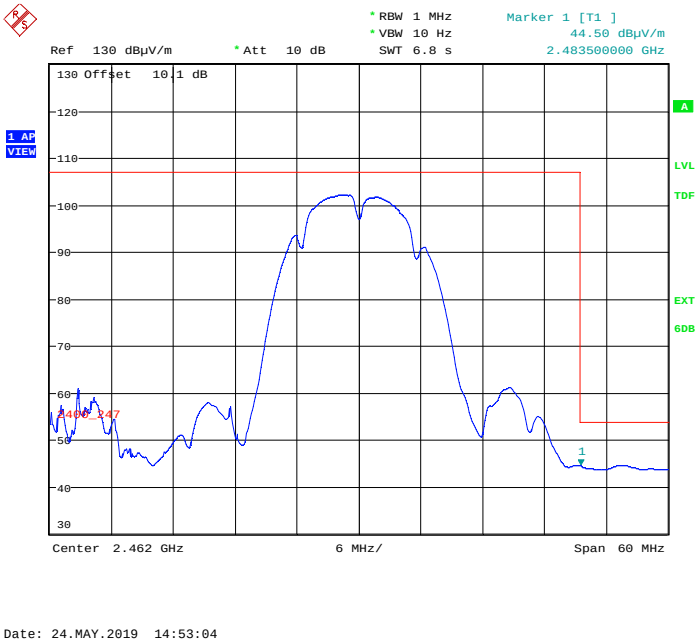
Plot 5.4.4.2.1.12. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
DQPSK 2Mbps, Power Setting 17, Channel 11, 2462 MHz



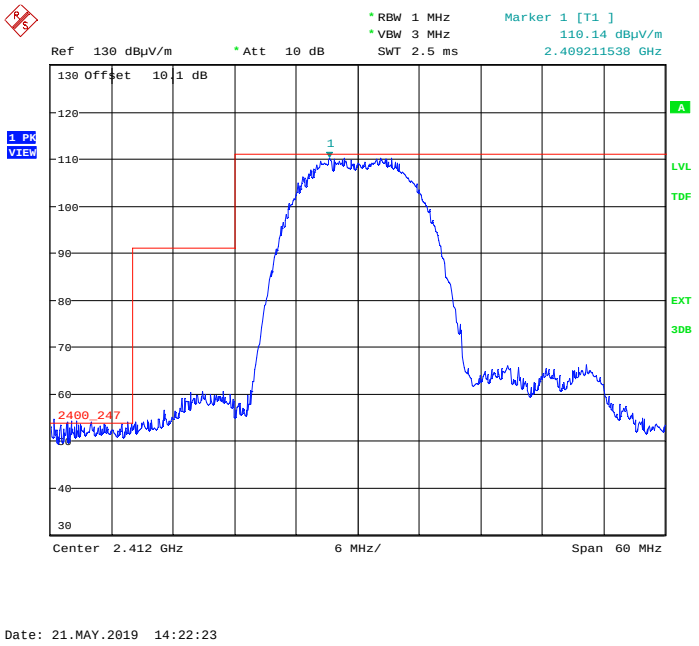
Plot 5.4.4.2.1.13. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
DQPSK 2Mbps, Power Setting 17, Channel 11, 2462 MHz



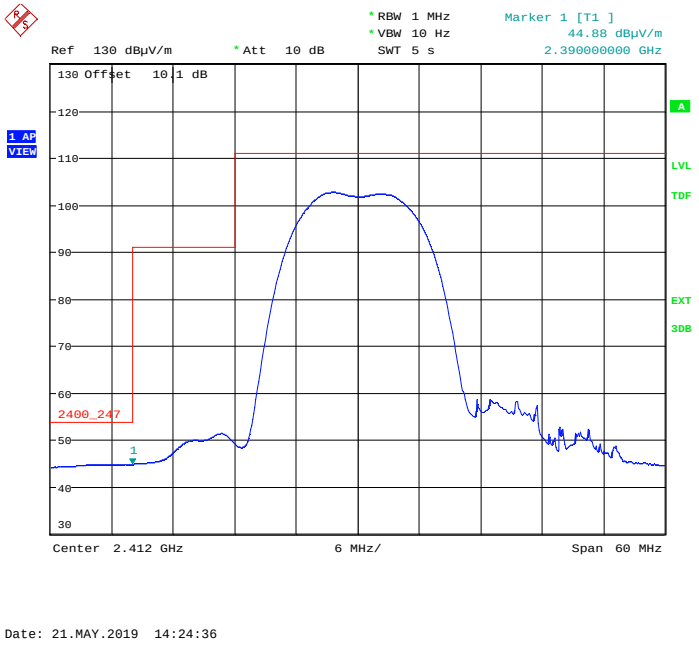
Plot 5.4.4.2.1.14. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
DQPSK 2Mbps, Power Setting 17, Channel 11, 2462 MHz



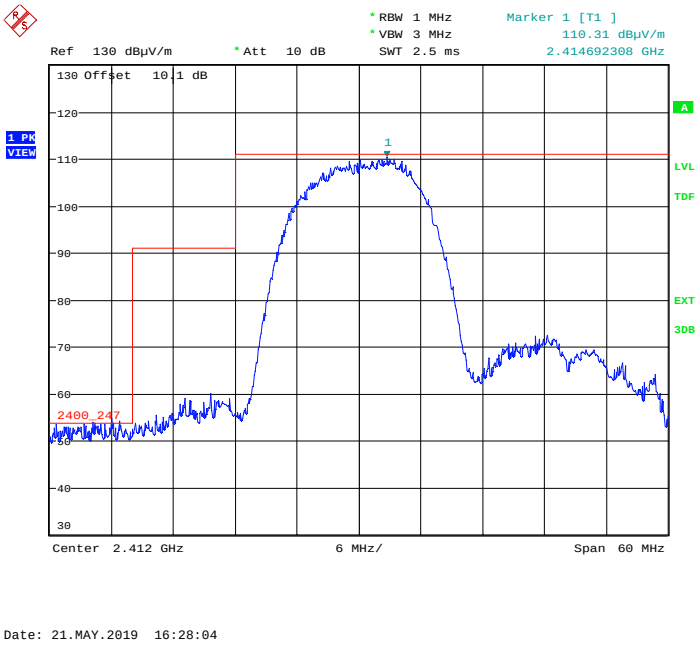
Plot 5.4.4.2.1.15. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
CCK 11Mbps, Power Setting 17, Channel 1, 2412 MHz



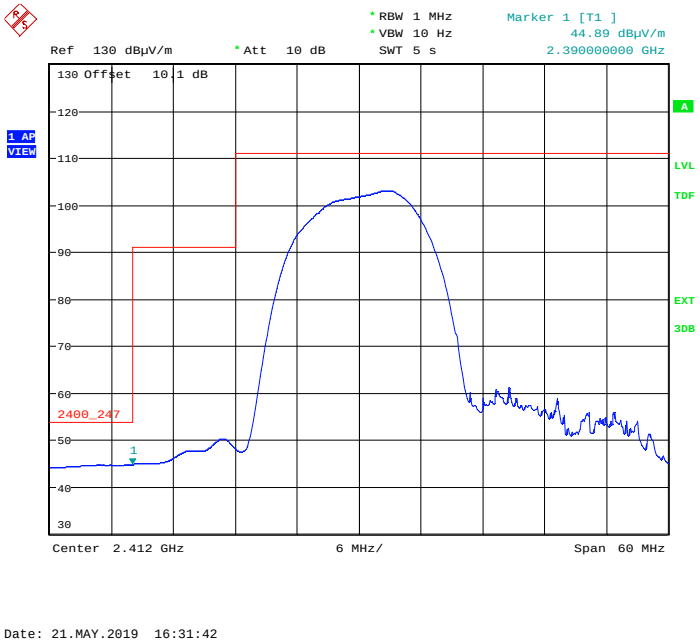
Plot 5.4.4.2.1.16. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
CCK 11Mbps, Power Setting 17, Channel 1, 2412 MHz



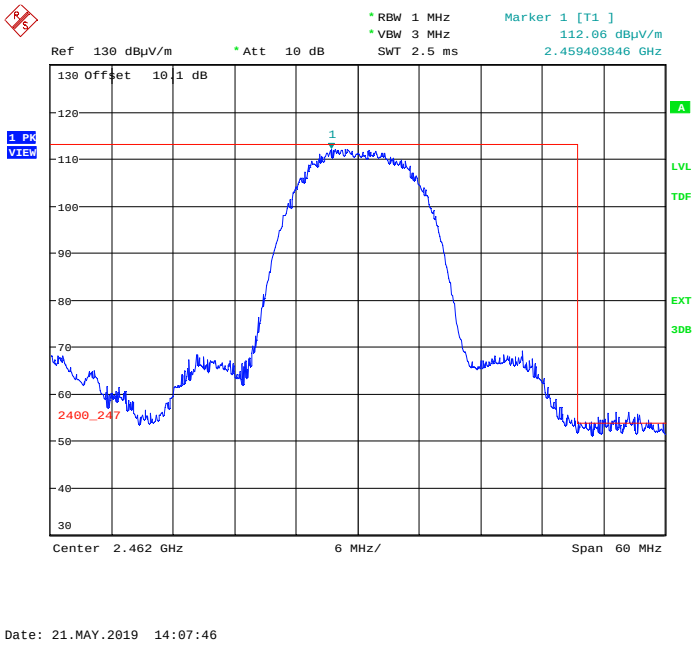
Plot 5.4.4.2.1.17. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
CCK 11Mbps, Power Setting 17, Channel 1, 2412 MHz



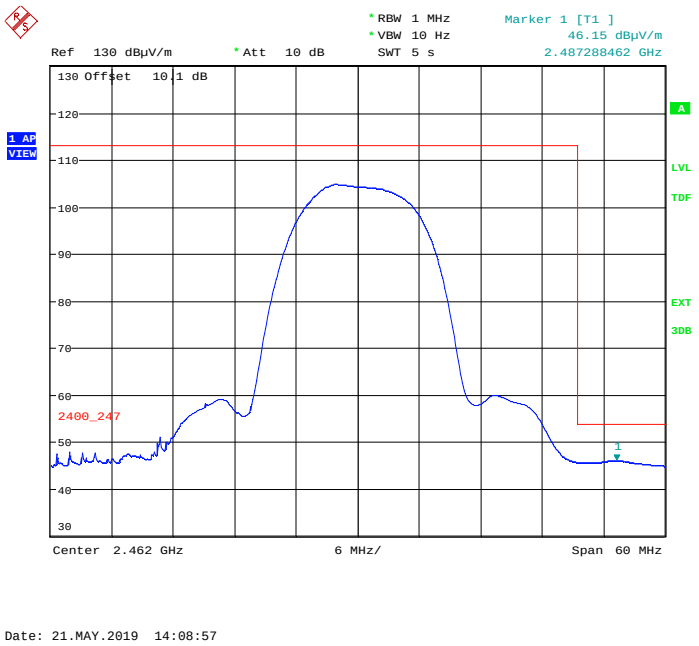
Plot 5.4.4.2.1.18. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
CCK 11Mbps, Power Setting 17, Channel 1, 2412 MHz



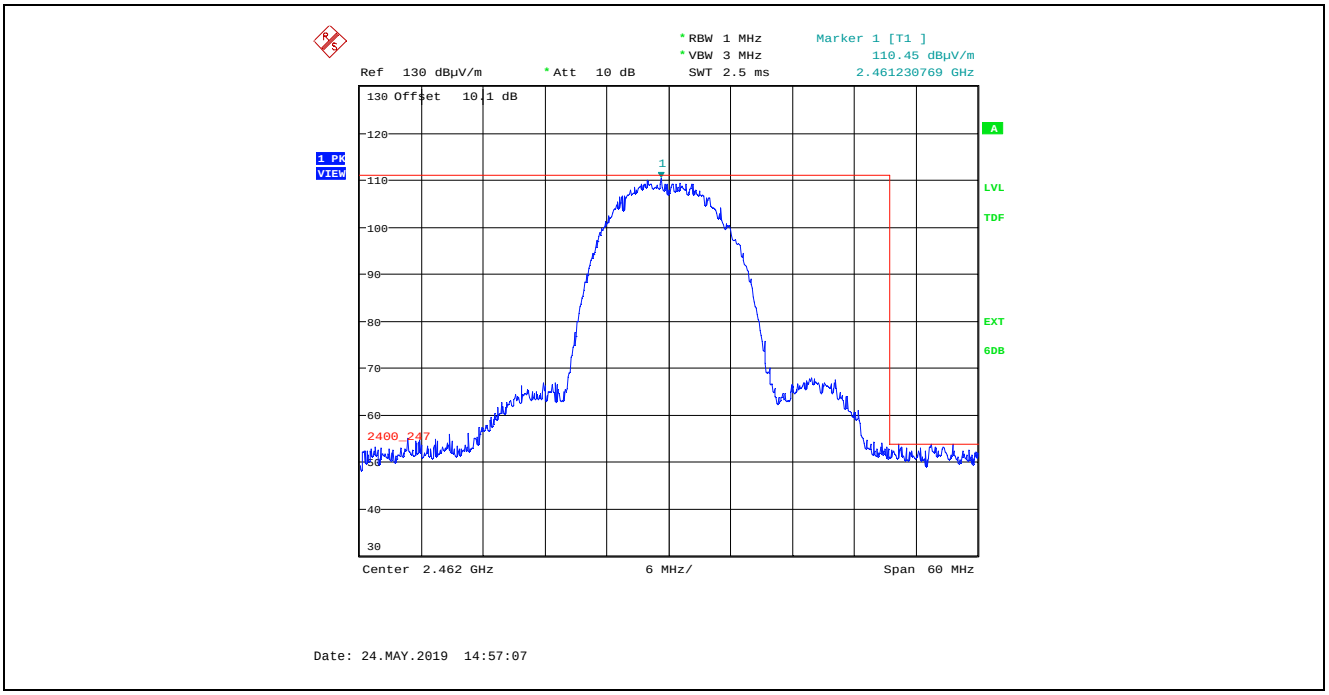
Plot 5.4.4.2.1.19. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
CCK 11Mbps, Power Setting 17, Channel 11, 2462 MHz



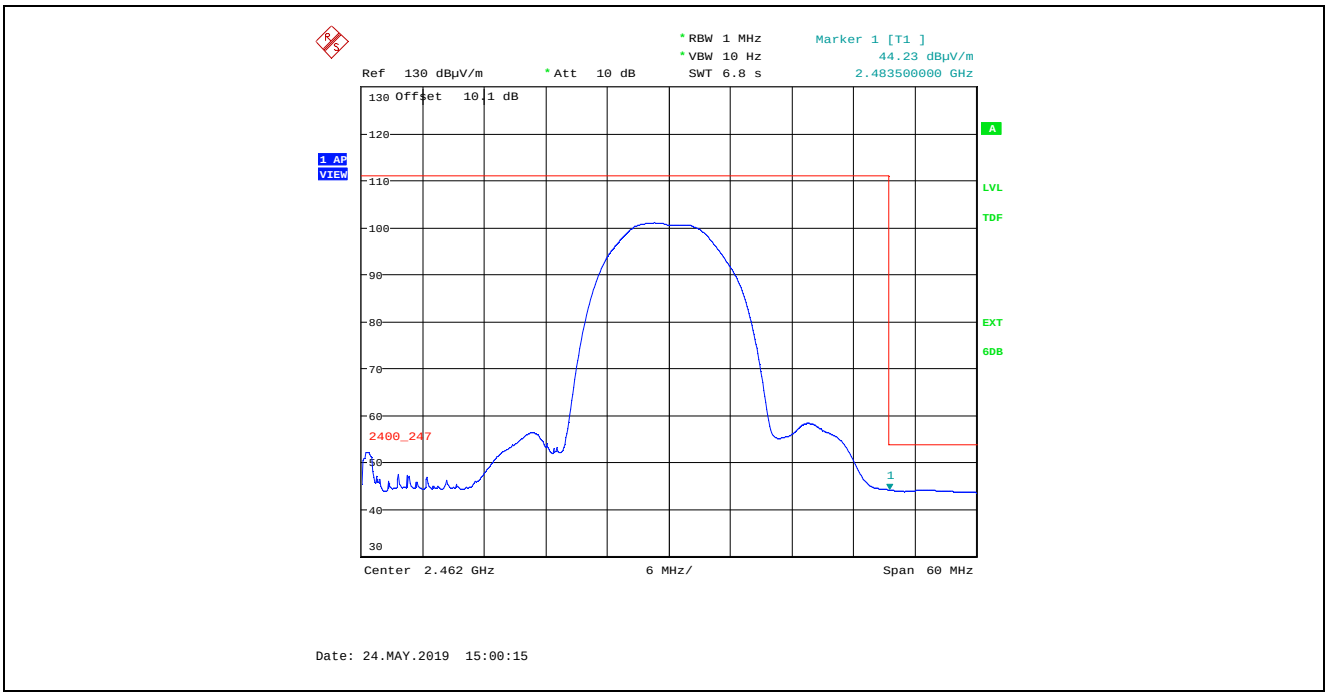
Plot 5.4.4.2.1.20. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
CCK 11Mbps, Power Setting 17, Channel 11, 2462 MHz



Plot 5.4.4.2.1.21. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
CCK 11Mbps, Power Setting 17, Channel 11, 2462 MHz

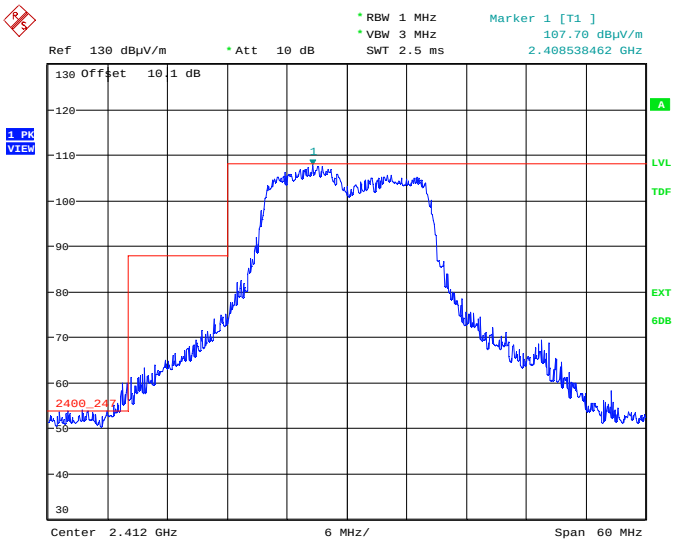


Plot 5.4.4.2.1.22. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
CCK 11Mbps, Power Setting 17, Channel 11, 2462 MHz

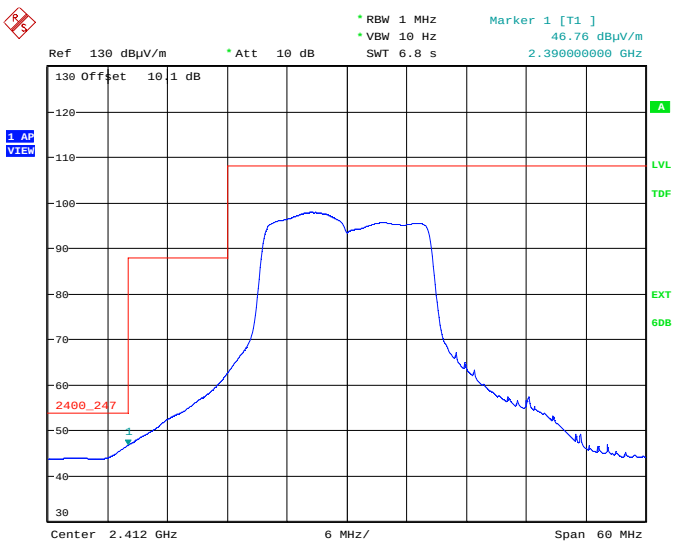


5.4.4.2.2. Band–Edge RF Radiated Emissions for 802.11g

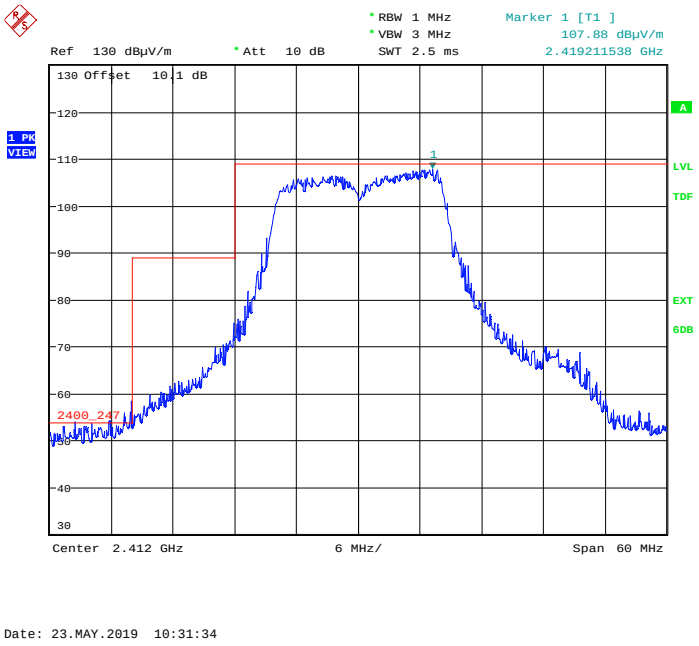
Plot 5.4.4.2.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
BPSK 9Mbps, Power Setting 17, Channel 1, 2412 MHz



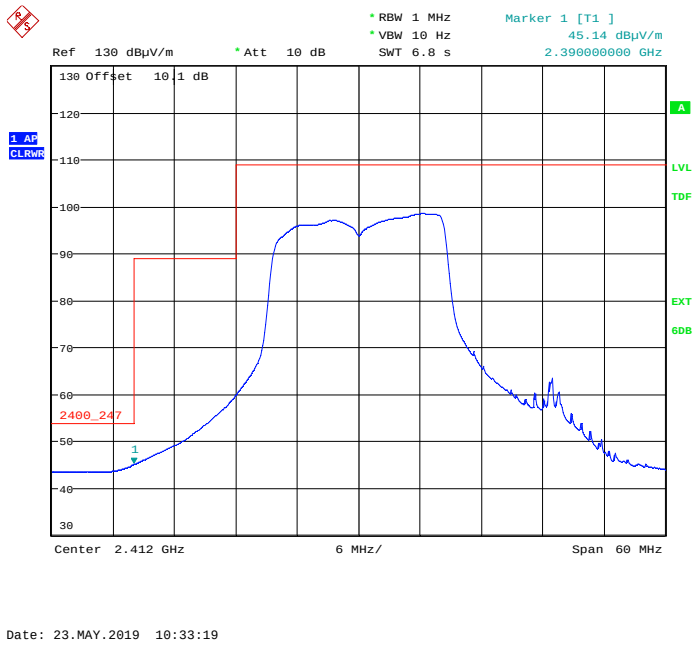
Plot 5.4.4.2.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
BPSK 9Mbps, Power Setting 17, Channel 1, 2412 MHz



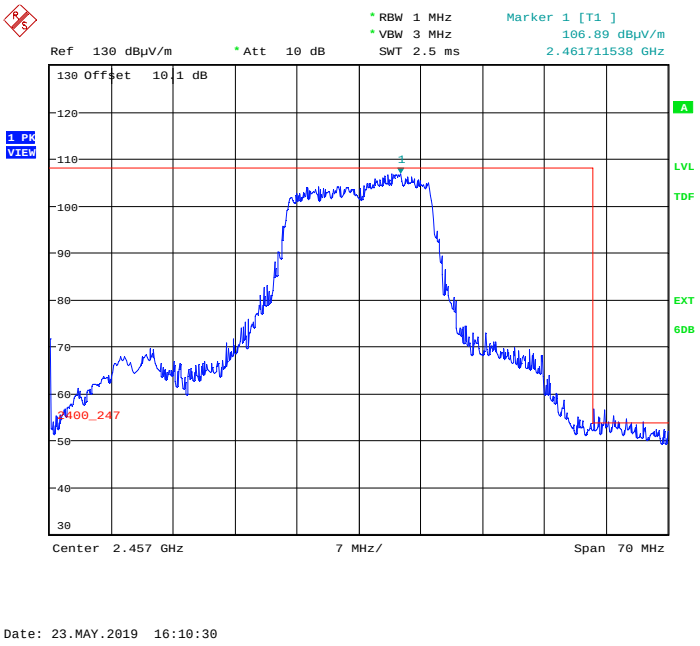
Plot 5.4.4.2.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
BPSK 9Mbps, Power Setting 17, Channel 1, 2412 MHz



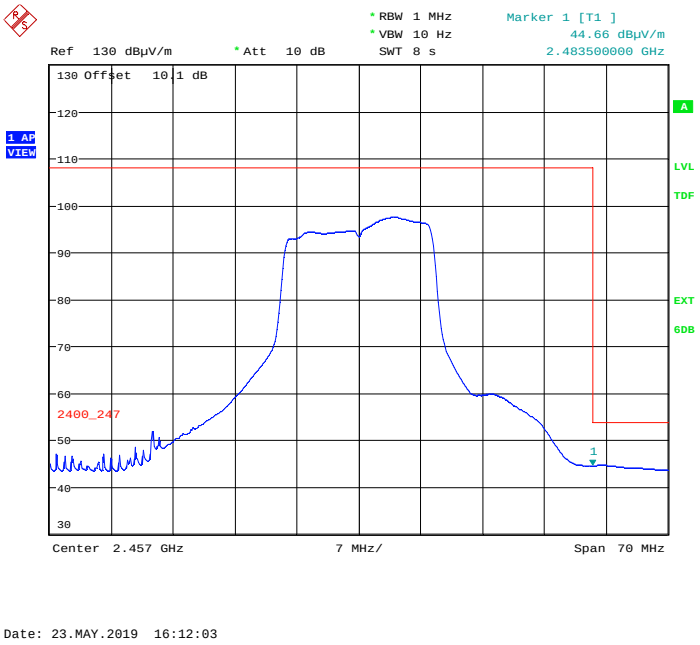
Plot 5.4.4.2.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
BPSK 9Mbps, Power Setting 17, Channel 1, 2412 MHz



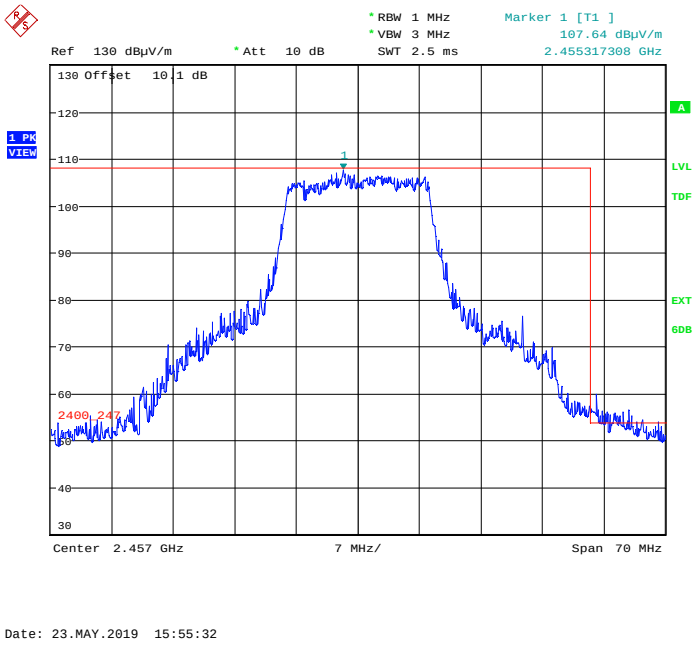
Plot 5.4.4.2.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
BPSK 9Mbps, Power Setting 17, Channel 10, 2457 MHz



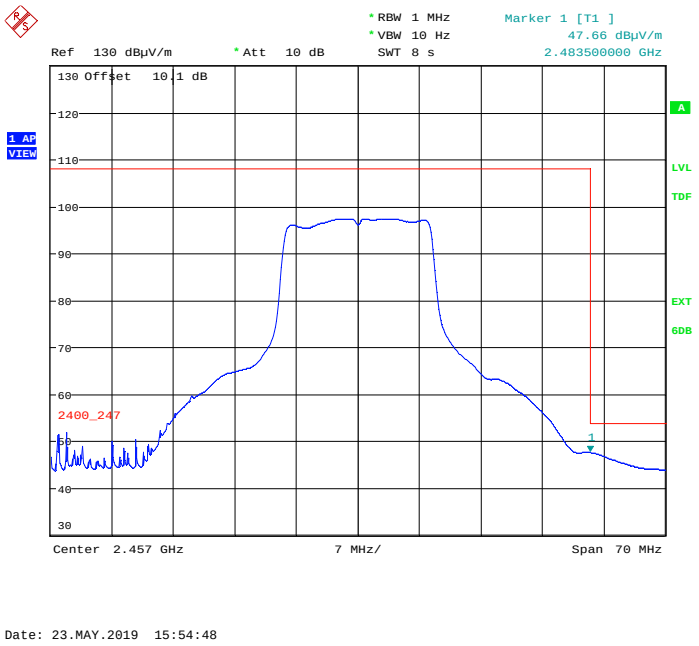
Plot 5.4.4.2.2.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
BPSK 9Mbps, Power Setting 17, Channel 10, 2457 MHz



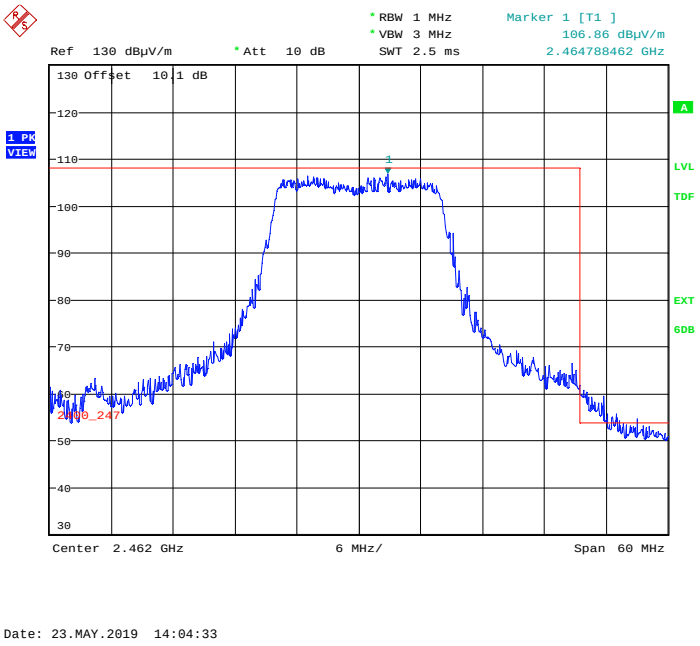
Plot 5.4.4.2.2.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
BPSK 9Mbps, Power Setting 17, Channel 10, 2457 MHz



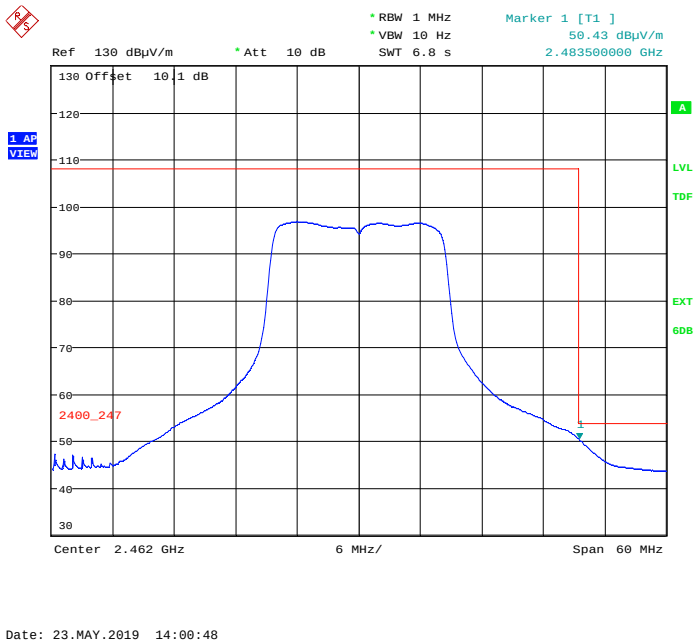
Plot 5.4.4.2.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
BPSK 9Mbps, Power Setting 17, Channel 10, 2457 MHz



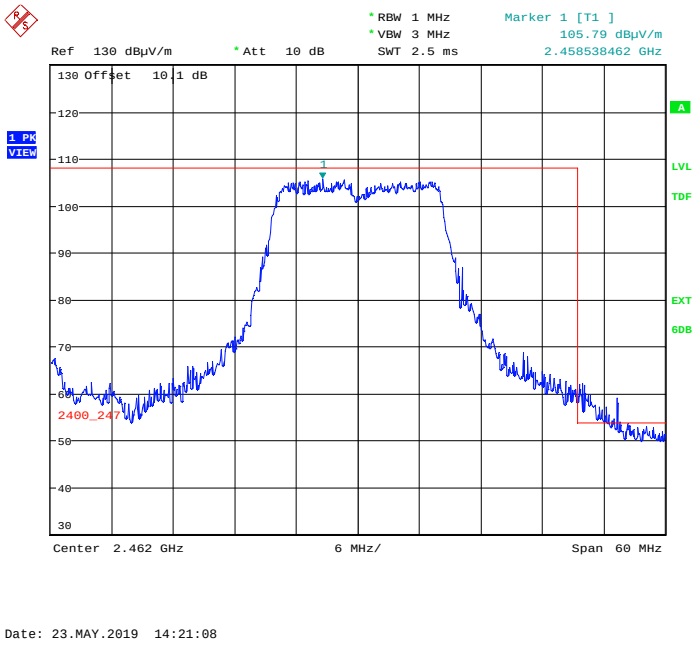
Plot 5.4.4.2.2.9. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
BPSK 9Mbps, Power Setting 15, Channel 11, 2462 MHz



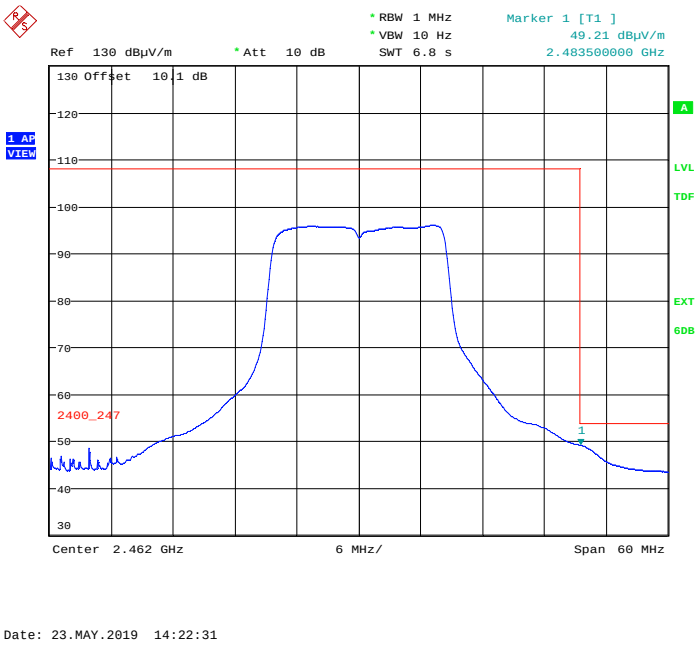
Plot 5.4.4.2.2.10. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
BPSK 9Mbps, Power Setting 15, Channel 11, 2462 MHz



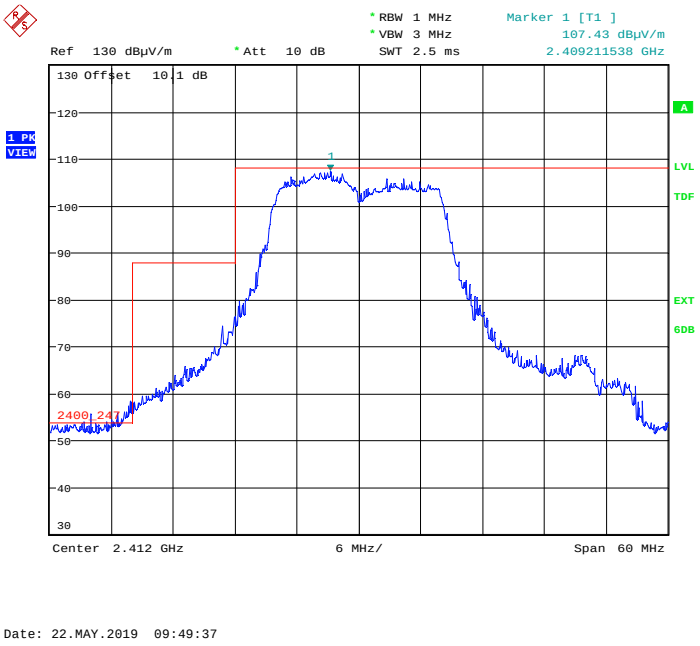
Plot 5.4.4.2.2.11. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
BPSK 9Mbps, Power Setting 15, Channel 11, 2462 MHz



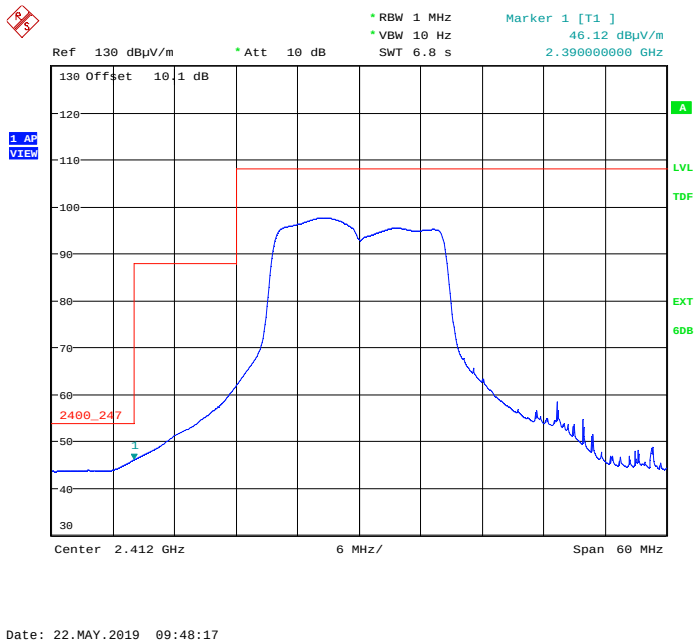
Plot 5.4.4.2.2.12. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
BPSK 9Mbps, Power Setting 15, Channel 11, 2462 MHz



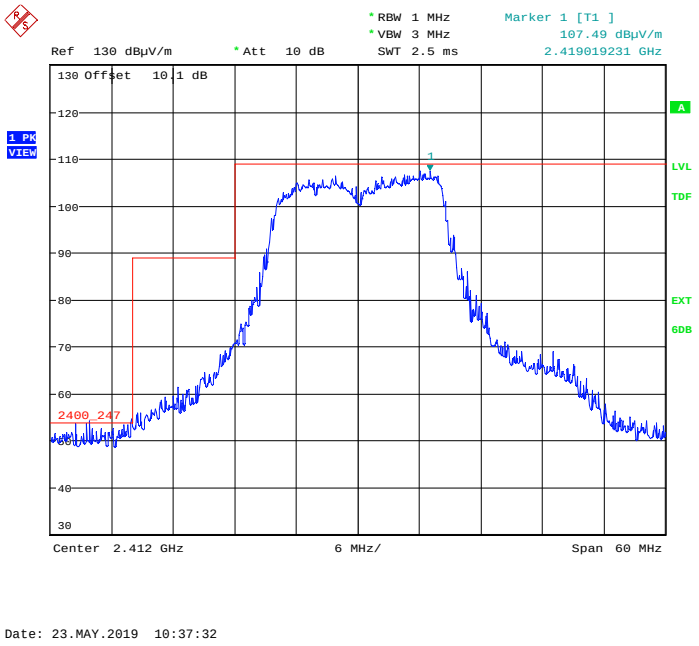
Plot 5.4.4.2.2.13. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
QPSK 18Mbps, Power Setting 17, Channel 1, 2412 MHz



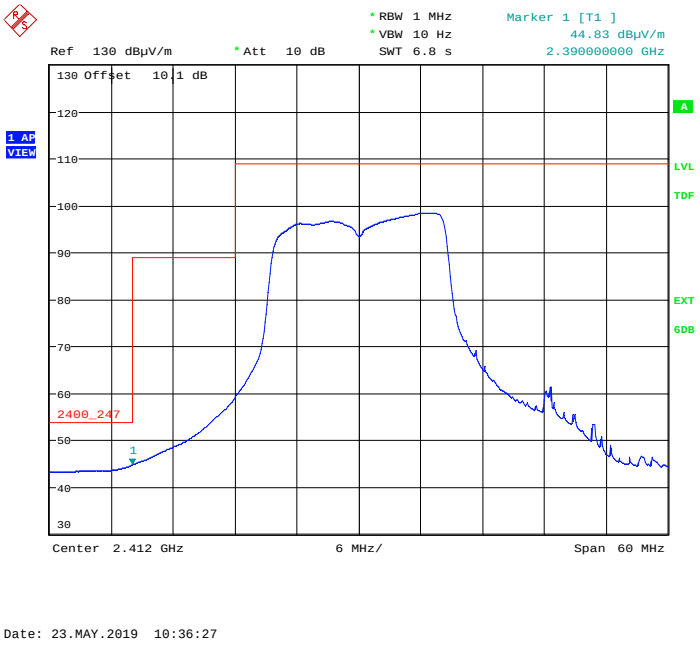
Plot 5.4.4.2.2.14. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
QPSK 18Mbps, Power Setting 17, Channel 1, 2412 MHz



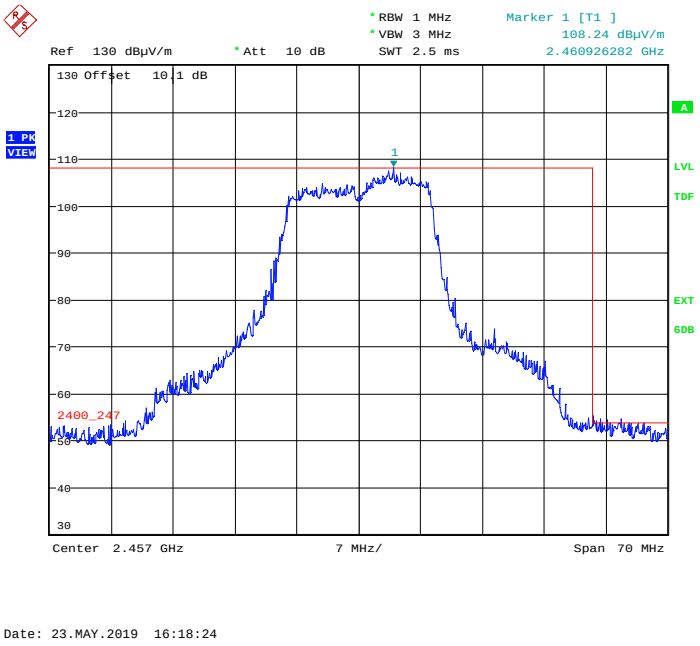
Plot 5.4.4.2.2.15. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
QPSK 18Mbps, Power Setting 17, Channel 1, 2412 MHz



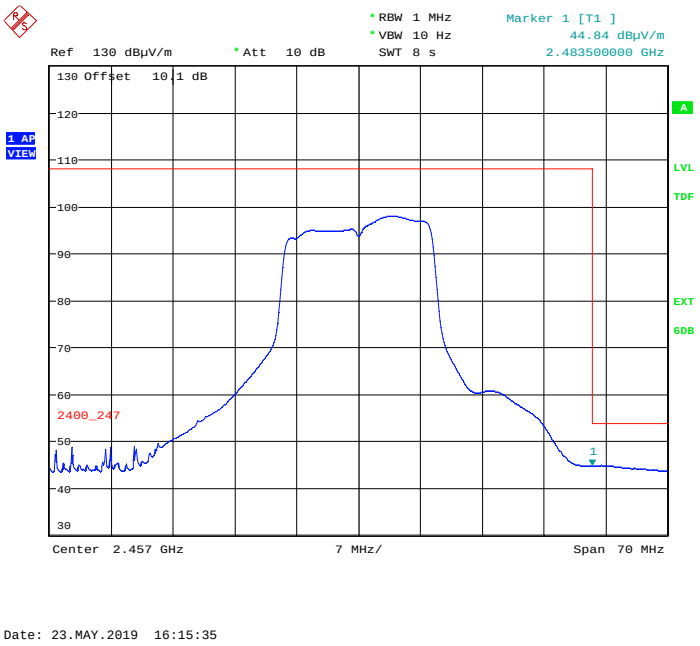
Plot 5.4.4.2.2.16. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
QPSK 18Mbps, Power Setting 17, Channel 1, 2412 MHz



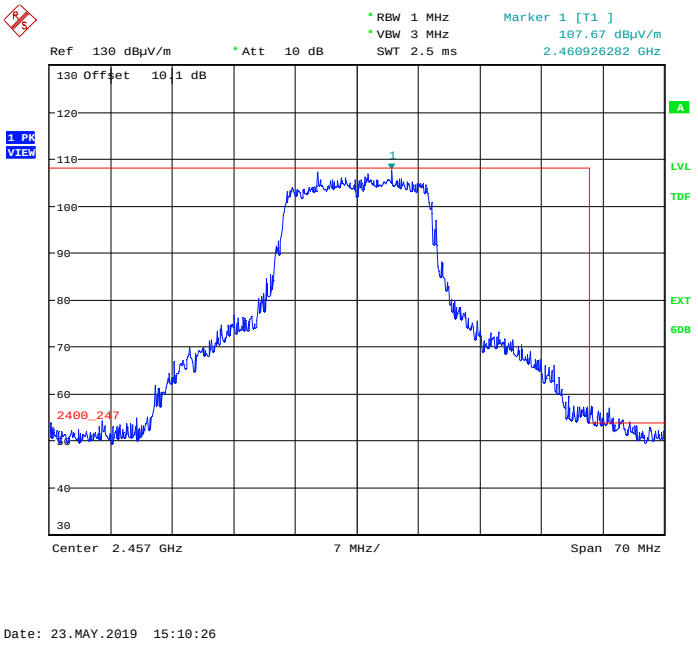
Plot 5.4.4.2.2.17. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
QPSK 18Mbps, Power Setting 17, Channel 10, 2457 MHz



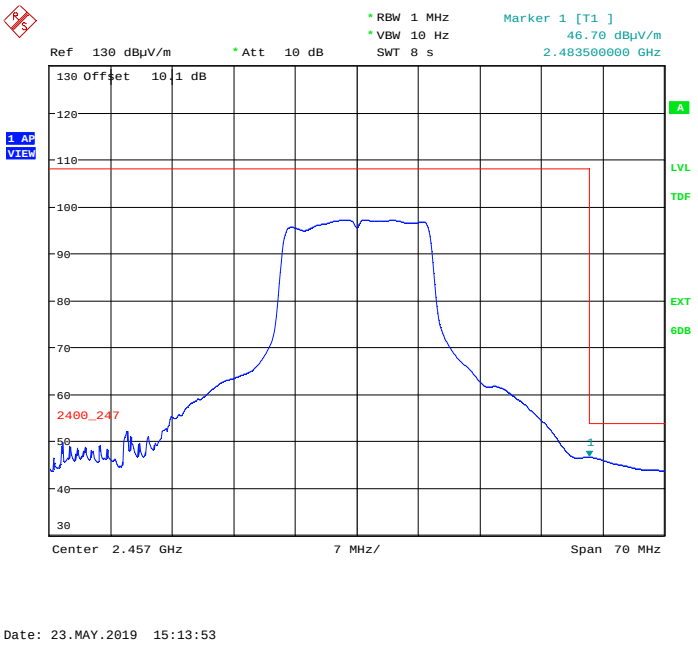
Plot 5.4.4.2.2.18. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
QPSK 18Mbps, Power Setting 17, Channel 10, 2457 MHz



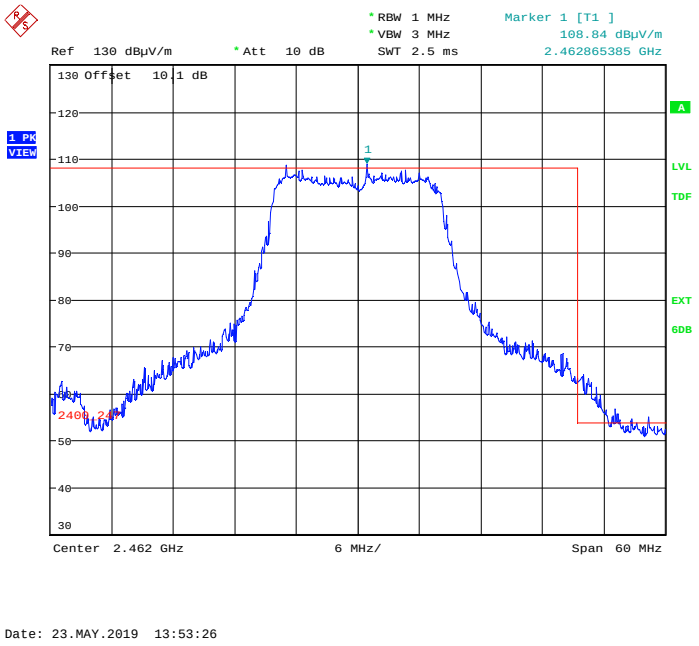
Plot 5.4.4.2.2.19. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
QPSK 18Mbps, Power Setting 17, Channel 10, 2457 MHz



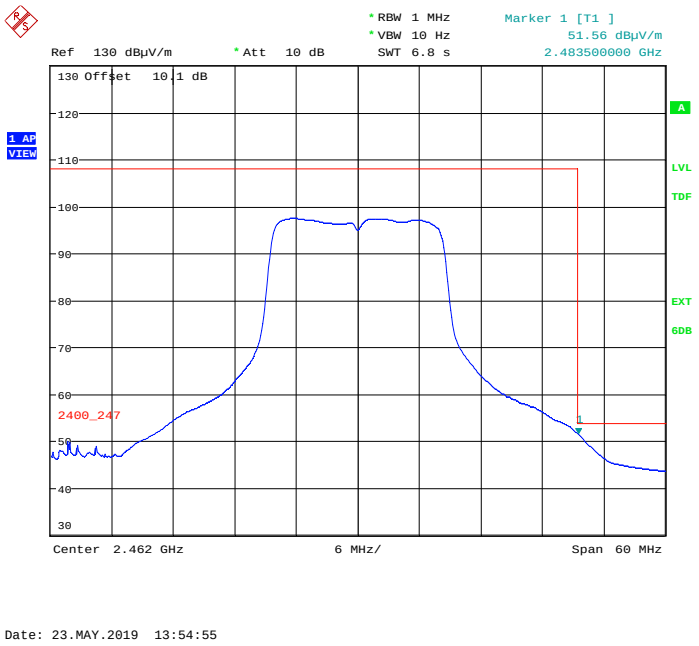
Plot 5.4.4.2.2.20. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
QPSK 18Mbps, Power Setting 17, Channel 10, 2457 MHz



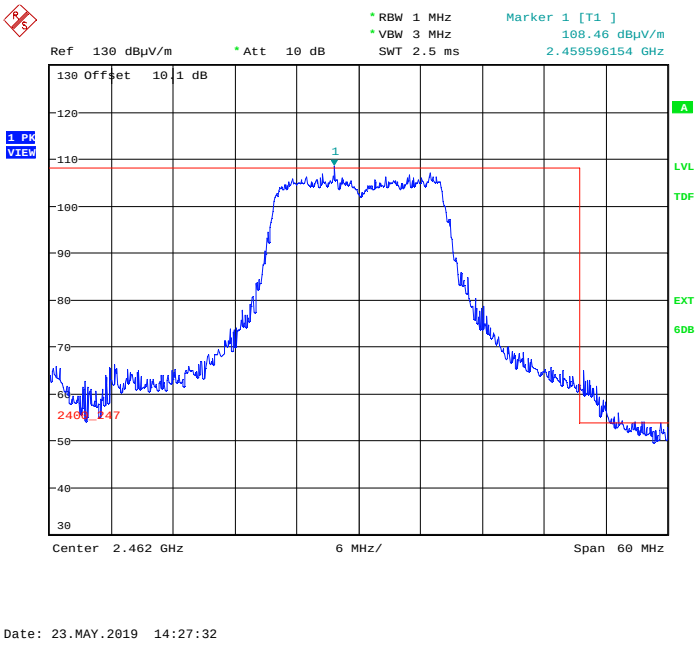
Plot 5.4.4.2.2.21. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
QPSK 18Mbps, Power Setting 15, Channel 11, 2462 MHz



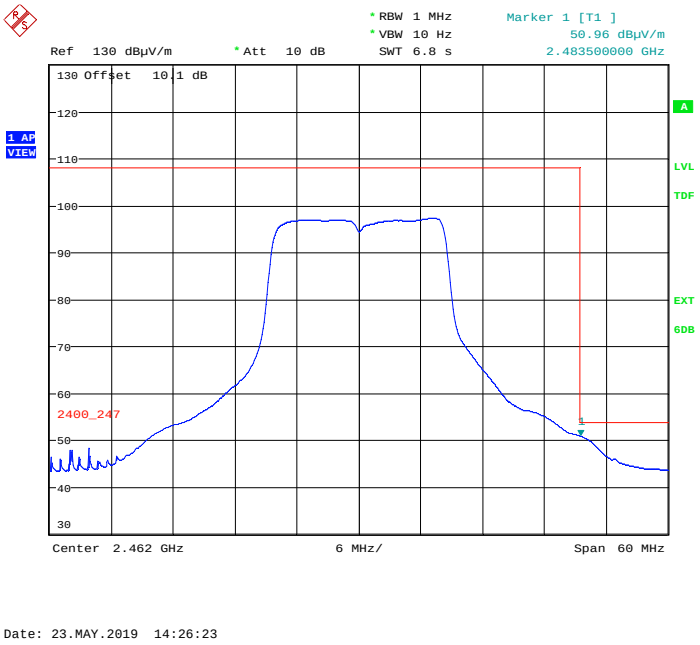
Plot 5.4.4.2.2.22. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
QPSK 18Mbps, Power Setting 15, Channel 11, 2462 MHz



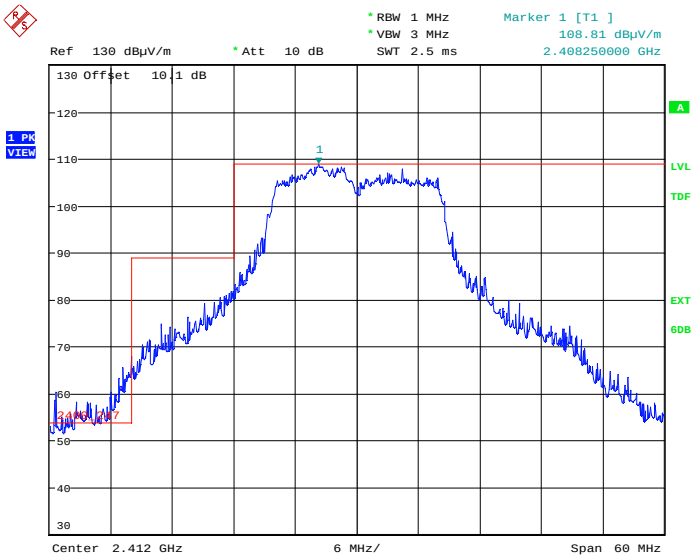
Plot 5.4.4.2.2.23. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
QPSK 18Mbps, Power Setting 15, Channel 11, 2462 MHz



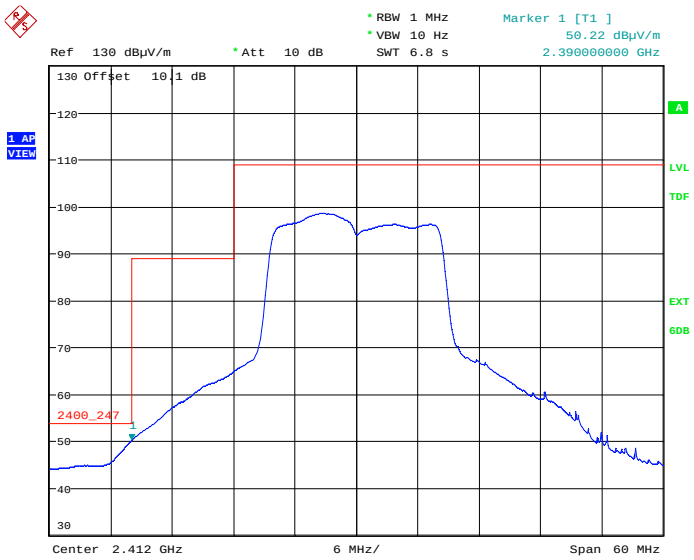
Plot 5.4.4.2.2.24. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
QPSK 18Mbps, Power Setting 15, Channel 11, 2462 MHz



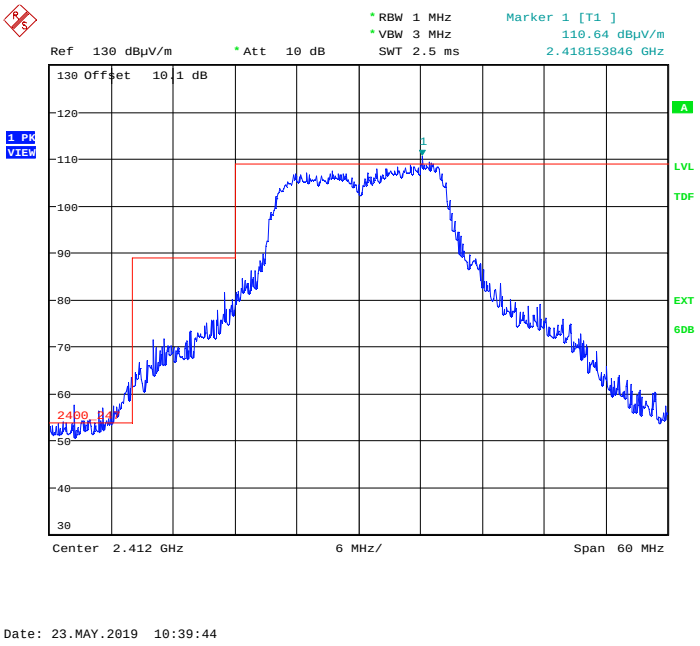
Plot 5.4.4.2.2.25. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
16-QAM 36Mbps, Power Setting 17, Channel 1, 2412 MHz



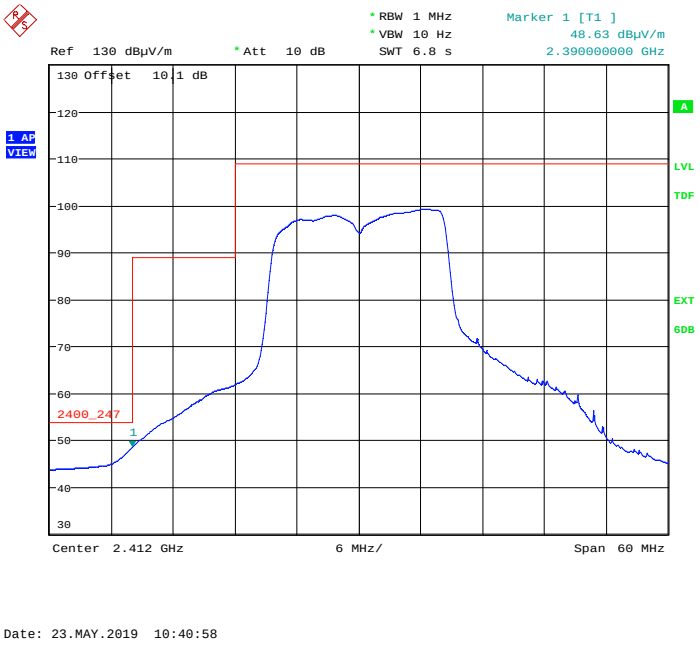
Plot 5.4.4.2.2.26. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
16-QAM 36Mbps, Power Setting 17, Channel 1, 2412 MHz



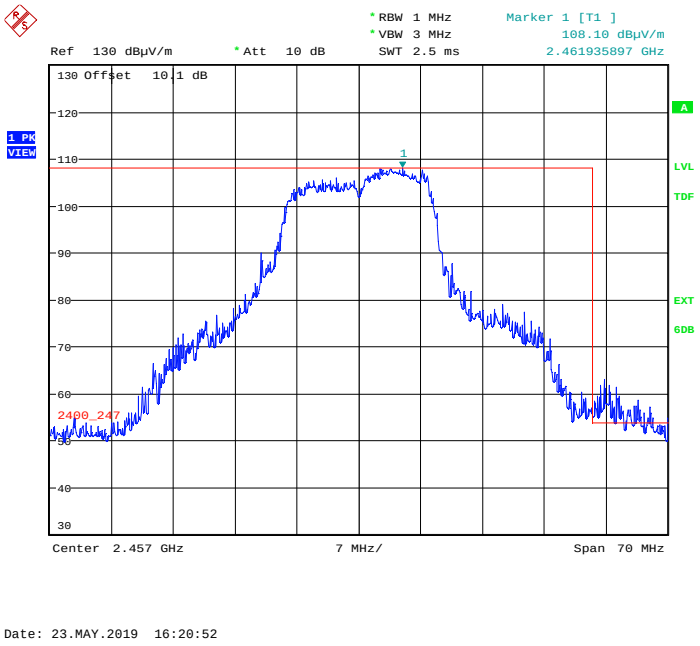
Plot 5.4.4.2.2.27. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
16-QAM 36Mbps, Power Setting 17, Channel 1, 2412 MHz



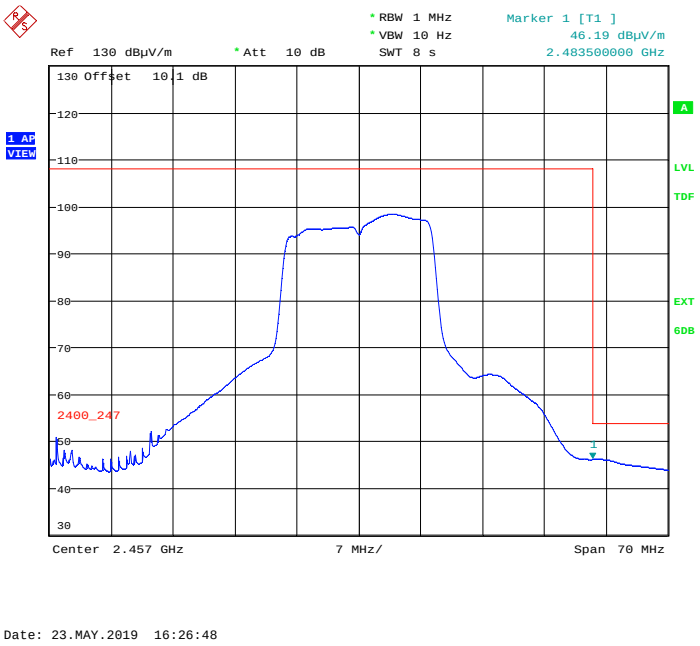
Plot 5.4.4.2.2.28. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
16-QAM 36Mbps, Power Setting 17, Channel 1, 2412 MHz



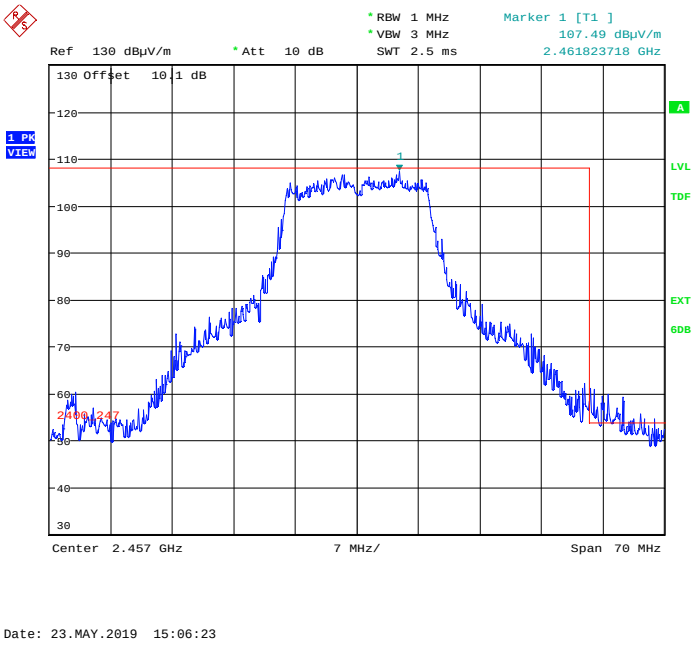
Plot 5.4.4.2.2.29. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
16-QAM 36Mbps, Power Setting 17, Channel 10, 2457 MHz



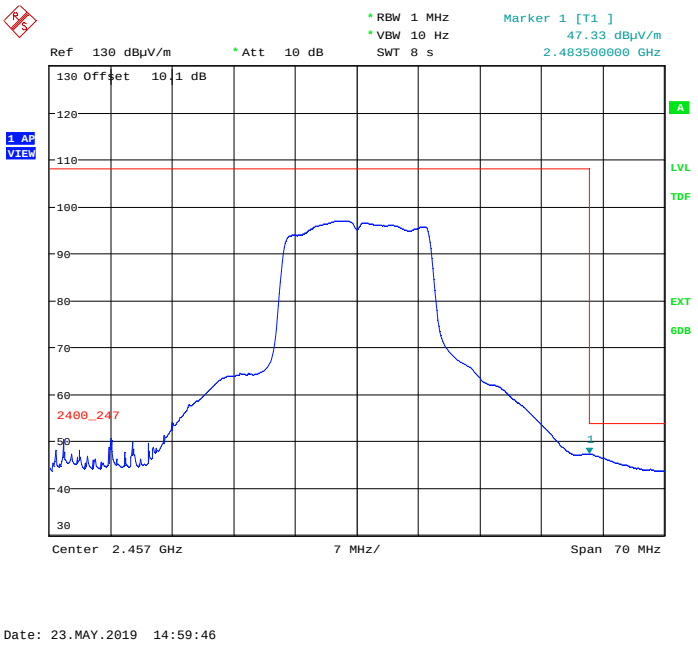
Plot 5.4.4.2.2.30. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
16-QAM 36Mbps, Power Setting 17, Channel 10, 2457 MHz



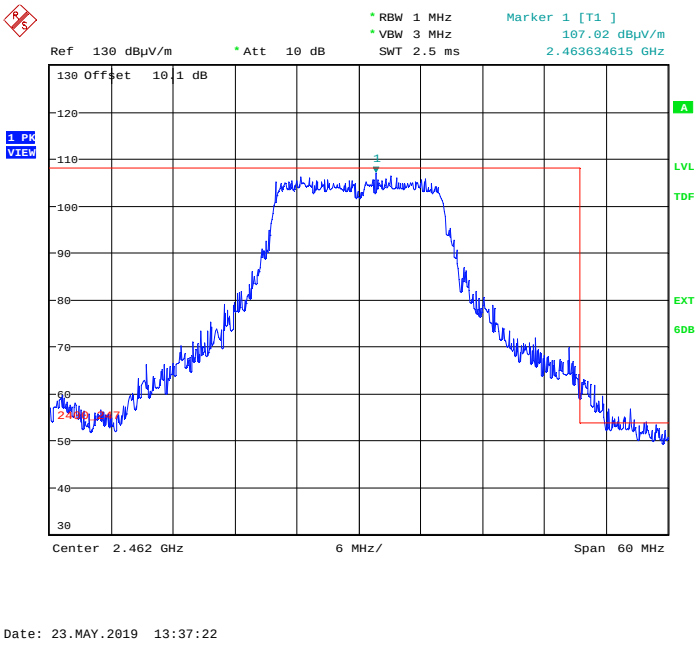
Plot 5.4.4.2.2.31. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
16-QAM 36Mbps, Power Setting 17, Channel 10, 2457 MHz



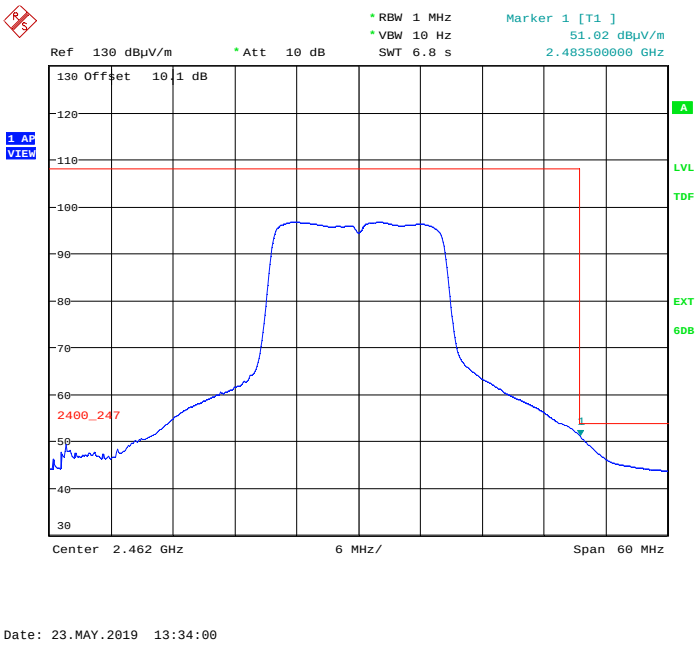
Plot 5.4.4.2.2.32. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
16-QAM 36Mbps, Power Setting 17, Channel 10, 2457 MHz



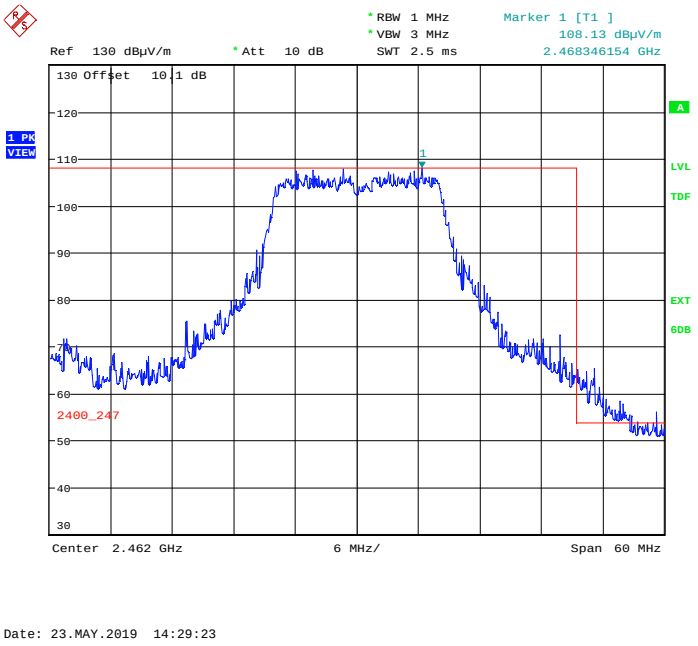
Plot 5.4.4.2.2.33. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
16-QAM 36Mbps, Power Setting 15, Channel 11, 2462 MHz



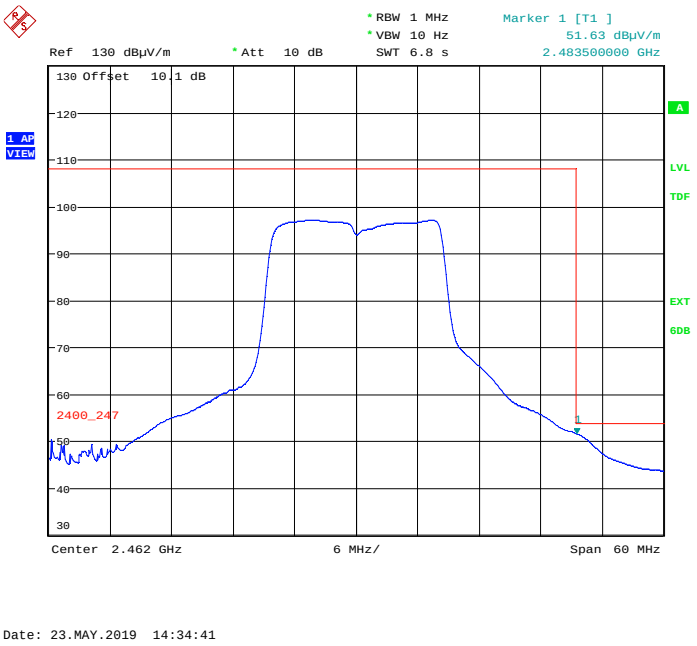
Plot 5.4.4.2.2.34. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
16-QAM 36Mbps, Power Setting 15, Channel 11, 2462 MHz



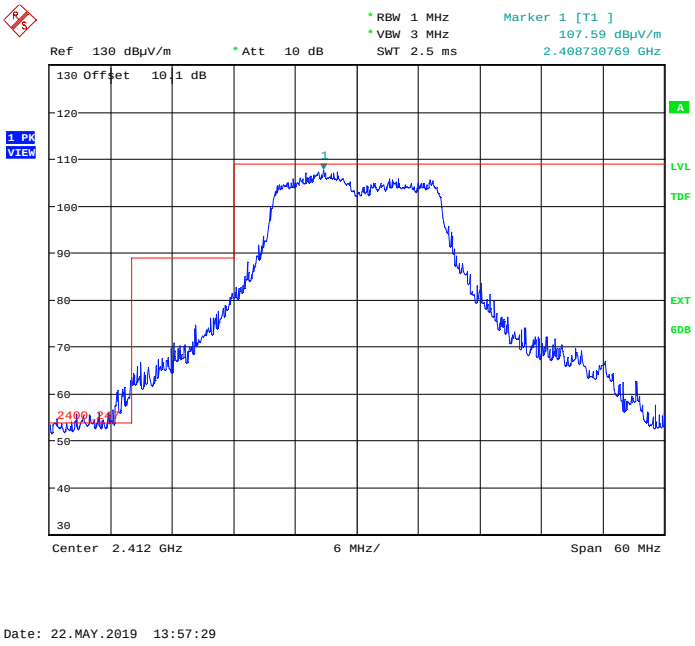
Plot 5.4.4.2.2.35. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
16-QAM 36Mbps, Power Setting 15, Channel 11, 2462 MHz



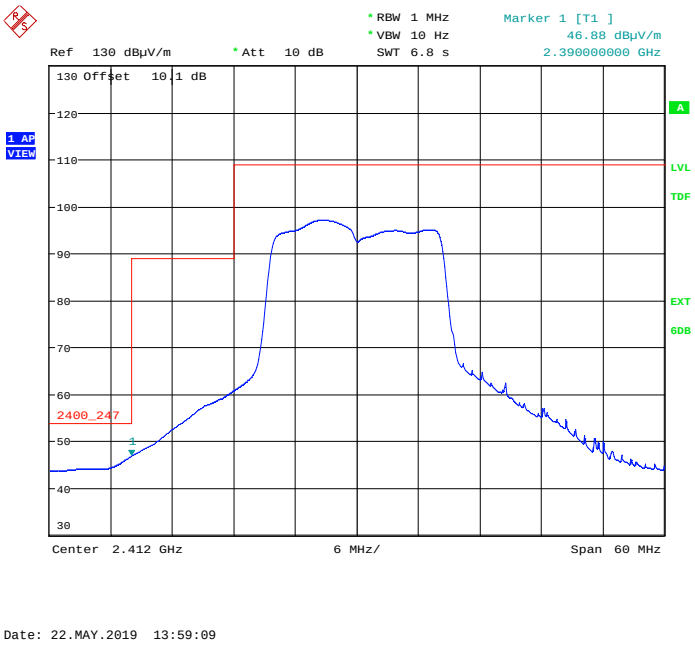
Plot 5.4.4.2.2.36. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
16-QAM 36Mbps, Power Setting 15, Channel 11, 2462 MHz



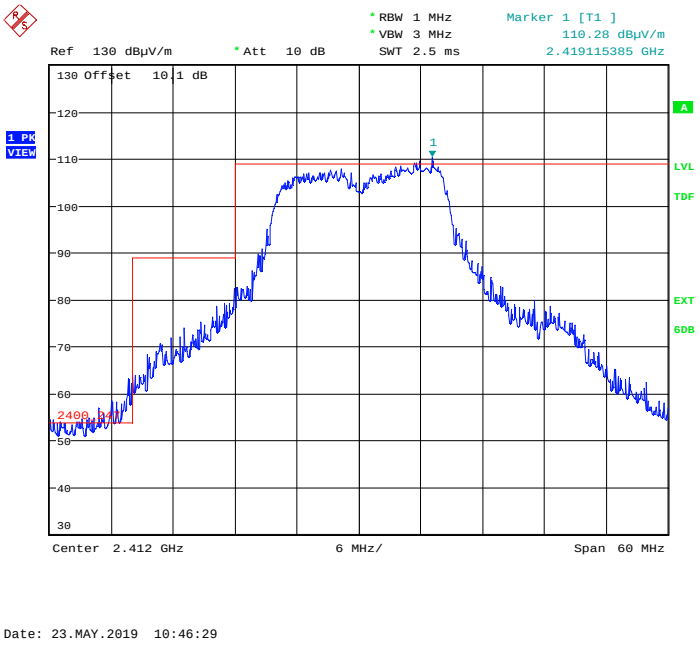
Plot 5.4.4.2.2.37. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
64-QAM 54Mbps, Power Setting 17, Channel 1, 2412 MHz



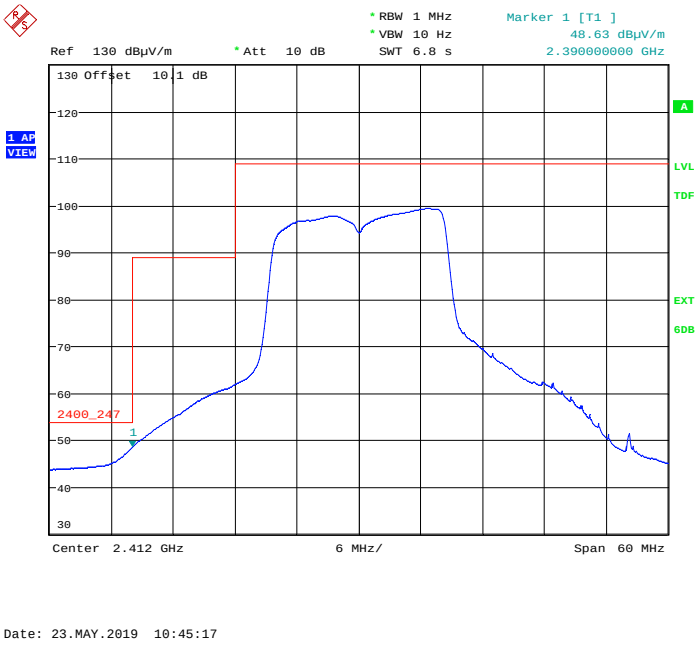
Plot 5.4.4.2.2.38. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
64-QAM 54Mbps, Power Setting 17, Channel 1, 2412 MHz



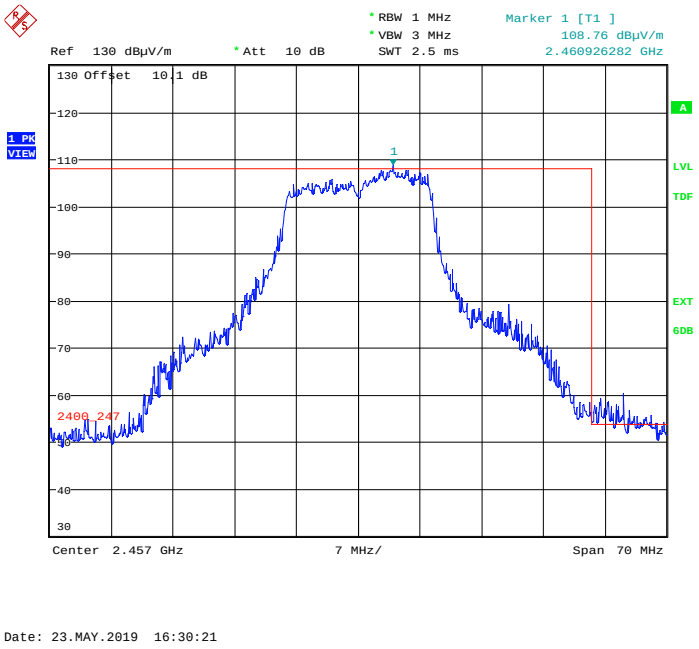
Plot 5.4.4.2.2.39. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
64-QAM 54Mbps, Power Setting 17, Channel 1, 2412 MHz



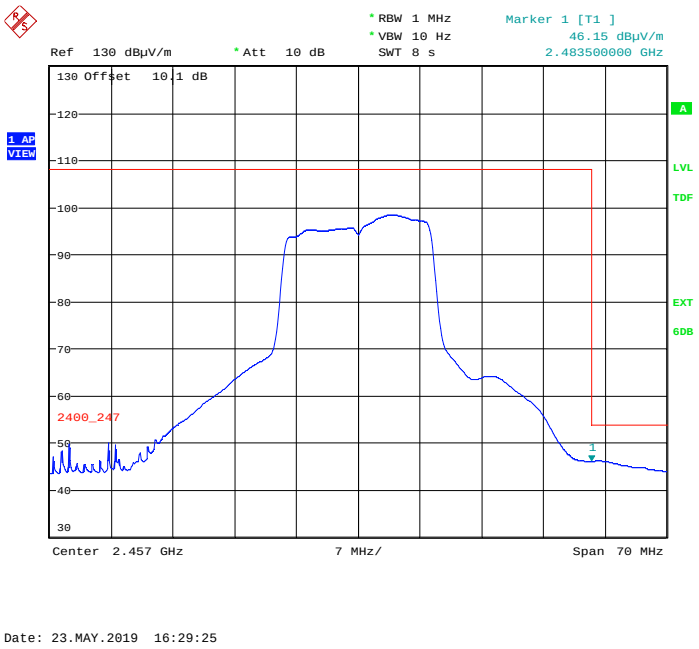
Plot 5.4.4.2.2.40. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
64-QAM 54Mbps, Power Setting 17, Channel 1, 2412 MHz



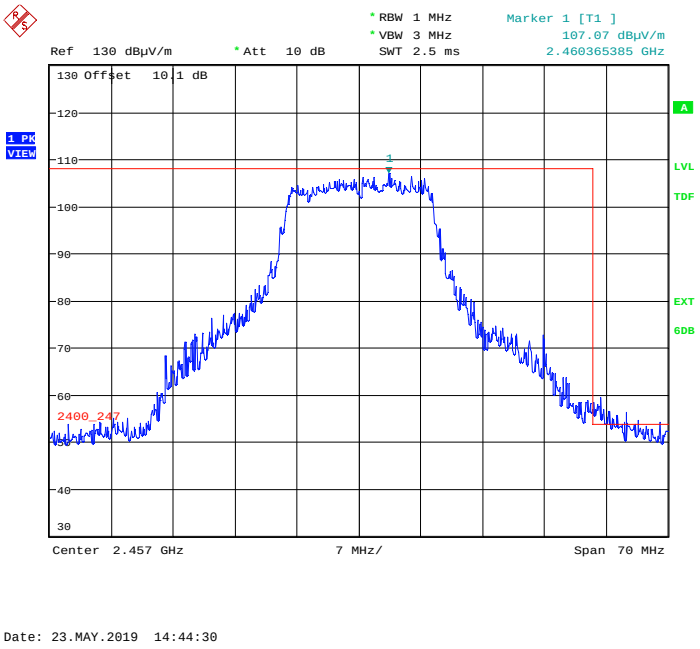
Plot 5.4.4.2.2.41. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
64-QAM 54Mbps, Power Setting 17, Channel 10, 2457 MHz



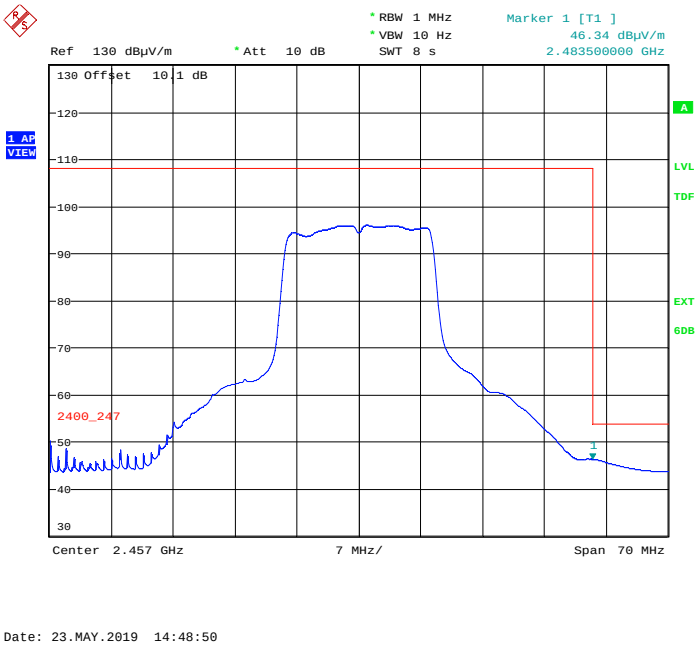
Plot 5.4.4.2.2.42. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
64-QAM 54Mbps, Power Setting 17, Channel 10, 2457 MHz



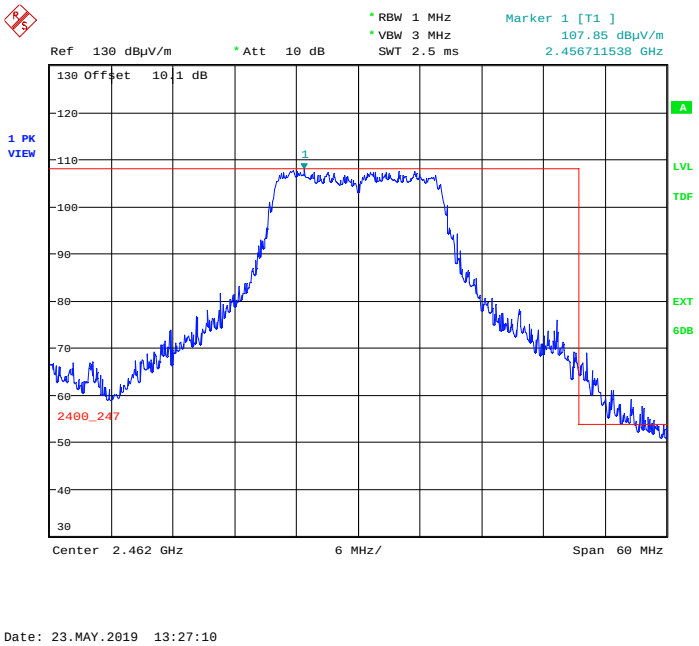
Plot 5.4.4.2.2.43. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
64-QAM 54Mbps, Power Setting 17, Channel 10, 2457 MHz



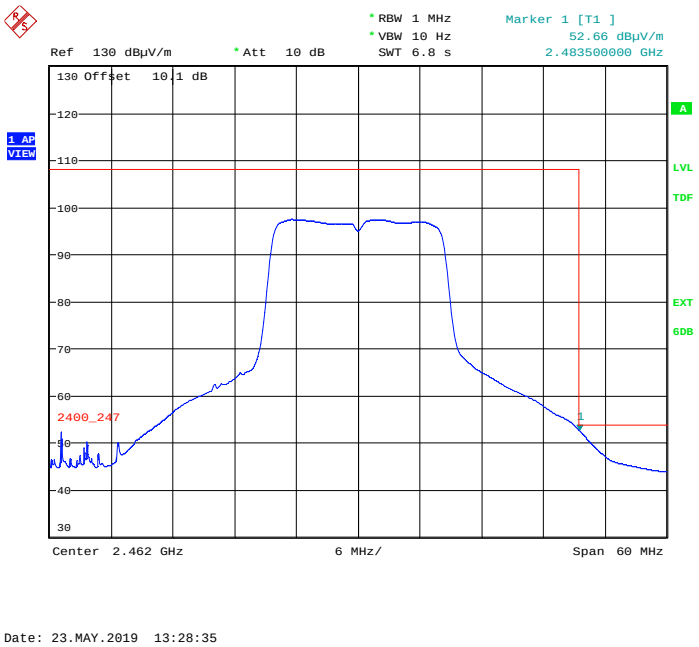
Plot 5.4.4.2.2.44. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
64-QAM 54Mbps, Power Setting 17, Channel 10, 2457 MHz



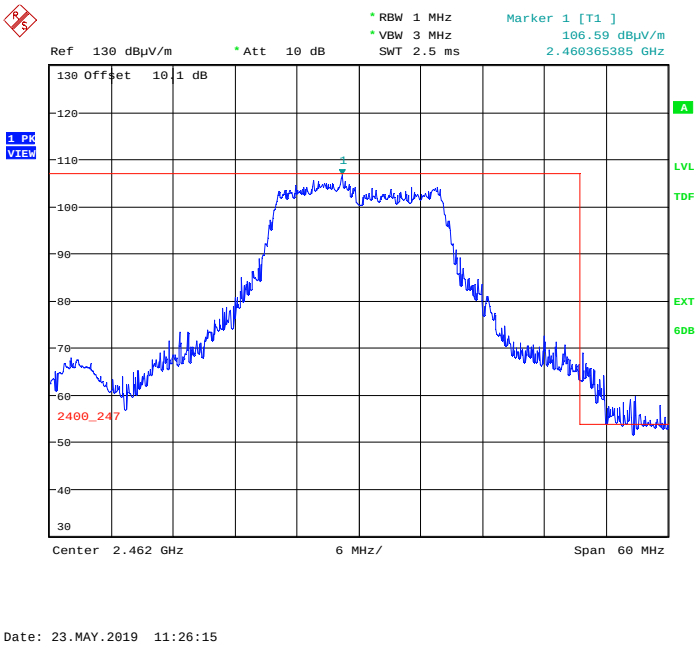
Plot 5.4.4.2.2.45. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
64-QAM 54Mbps, Power Setting 15, Channel 11, 2462 MHz



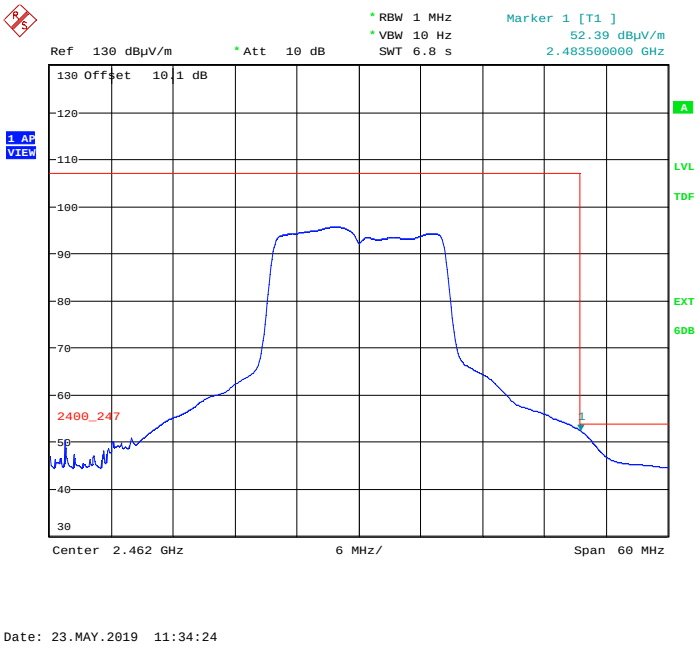
Plot 5.4.4.2.2.46. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
64-QAM 54Mbps, Power Setting 15, Channel 11, 2462 MHz



Plot 5.4.4.2.2.47. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
64-QAM 54Mbps, Power Setting 15, Channel 11, 2462 MHz

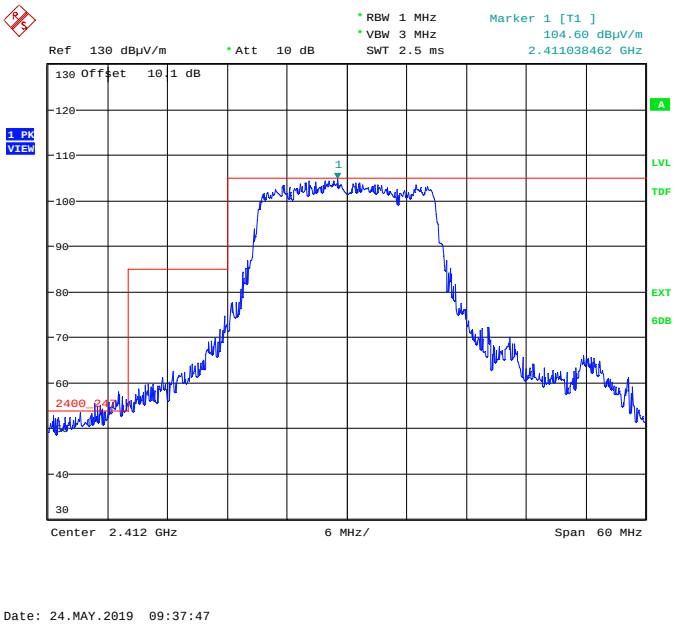


Plot 5.4.4.2.2.48. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
64-QAM 54Mbps, Power Setting 15, Channel 11, 2462 MHz

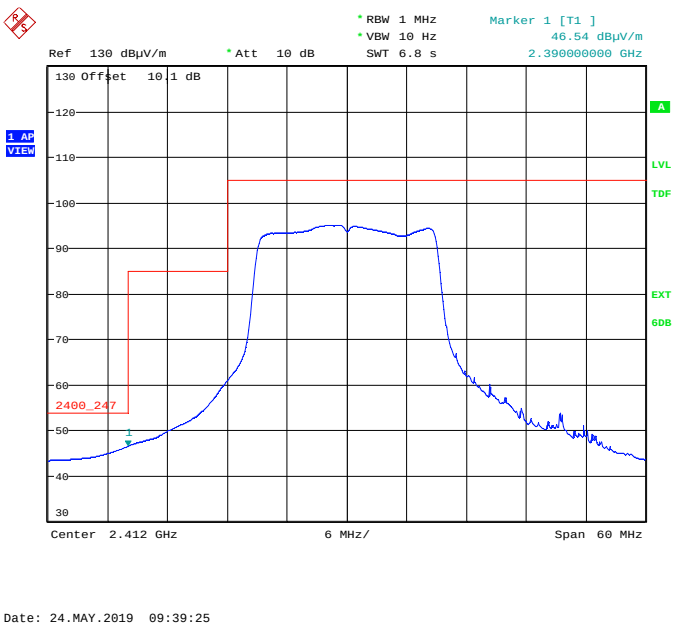


5.4.4.2.3. Band–Edge RF Radiated Emissions for 802.11n HT20

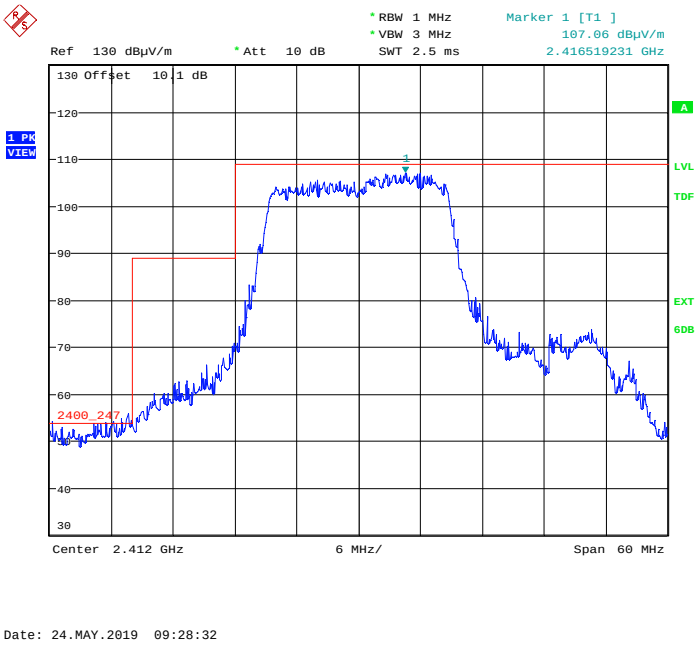
Plot 5.4.4.2.3.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 1, 2412 MHz



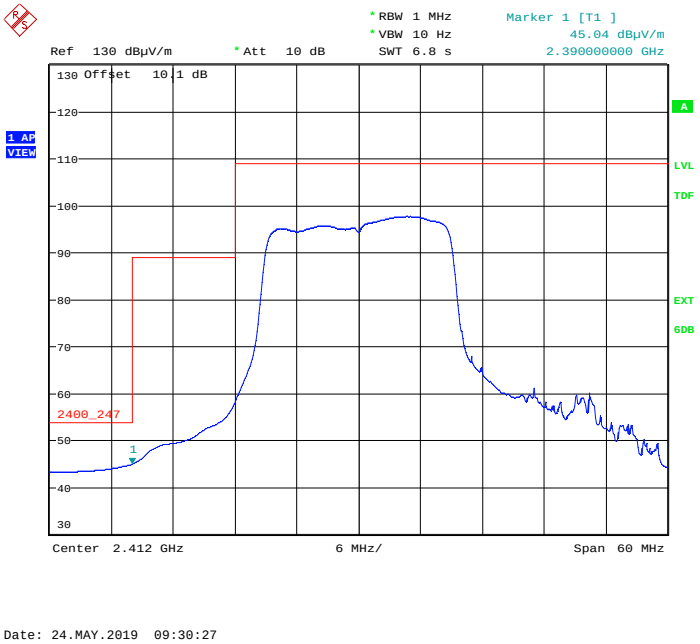
Plot 5.4.4.2.3.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 1, 2412 MHz



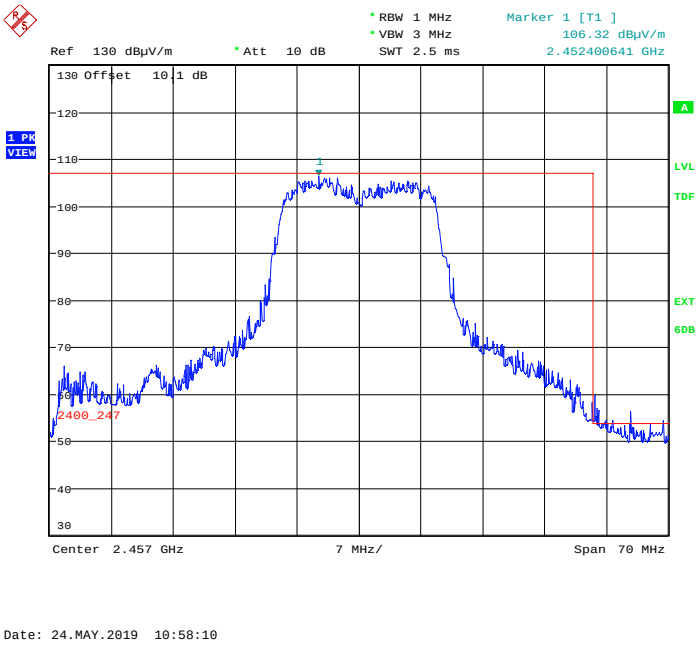
Plot 5.4.4.2.3.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 1, 2412 MHz



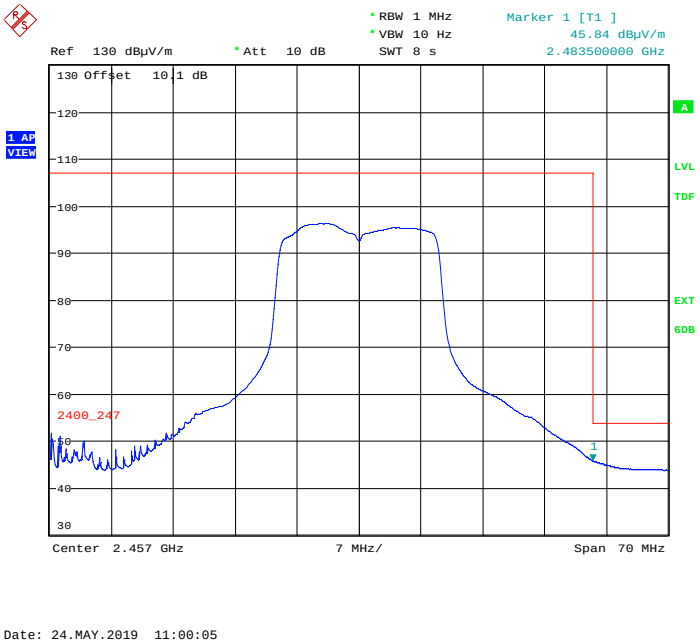
Plot 5.4.4.2.3.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 1, 2412 MHz



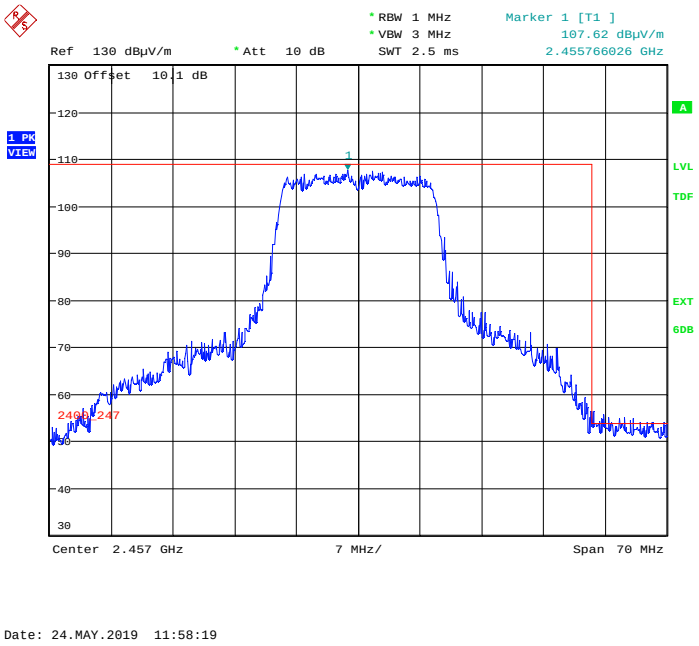
Plot 5.4.4.2.3.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 10, 2457 MHz



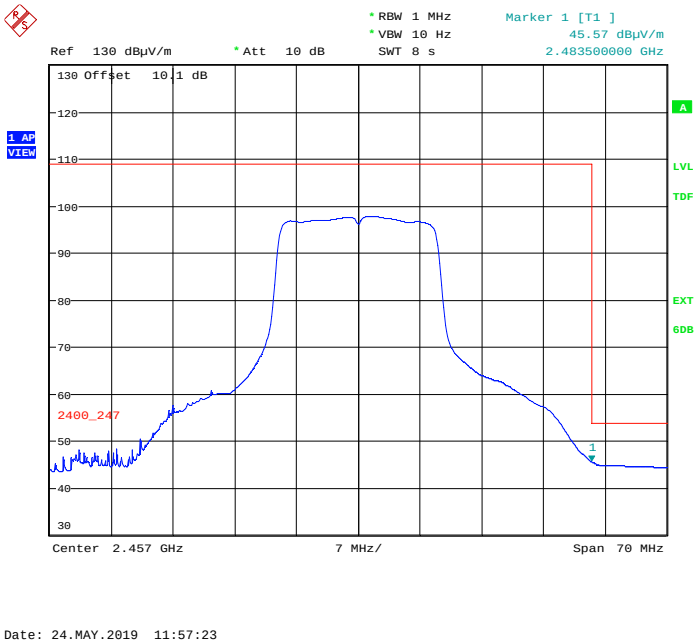
Plot 5.4.4.2.3.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 10, 2457 MHz



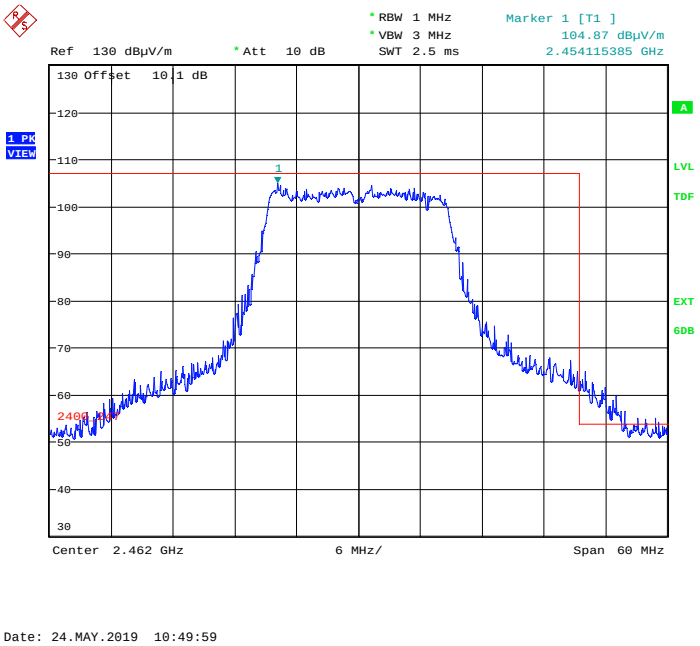
Plot 5.4.4.2.3.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 10, 2457 MHz



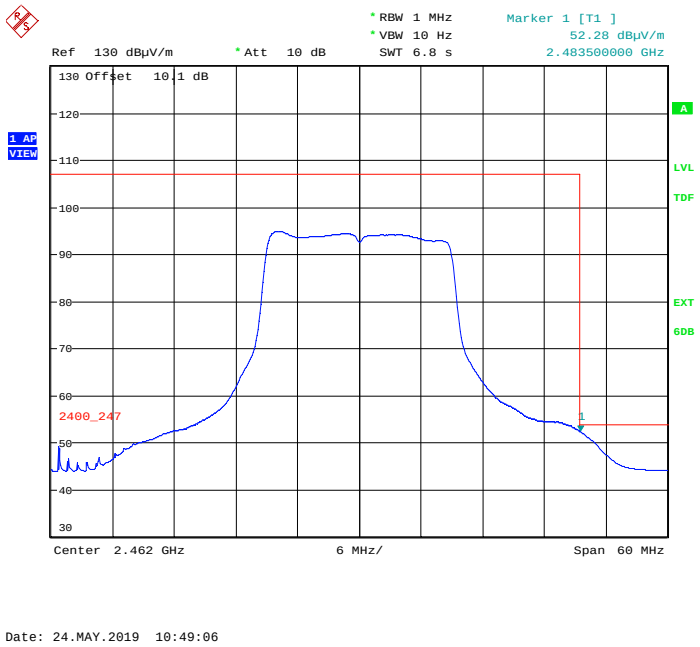
Plot 5.4.4.2.3.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 0 BPSK ½ 6.5Mbps, Power Setting 17, Channel 10, 2457 MHz



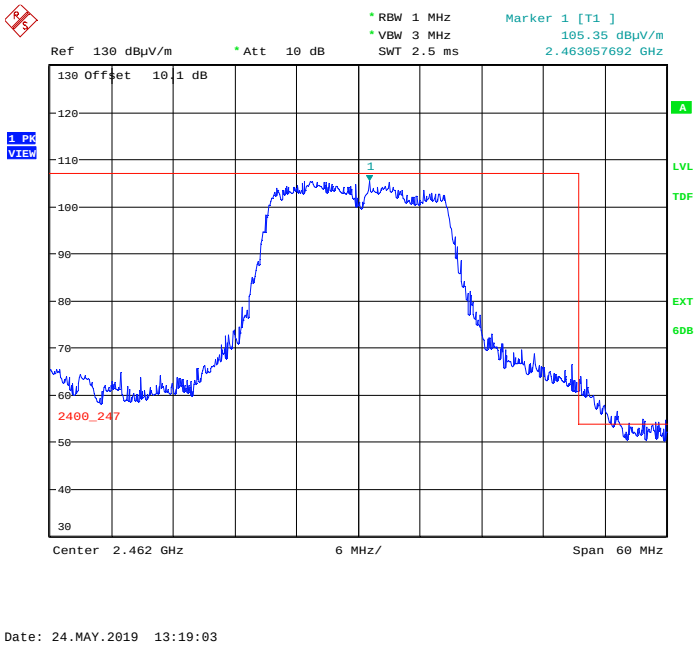
Plot 5.4.4.2.3.9. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 0 BPSK ½ 6.5Mbps, Power Setting 15, Channel 11, 2462 MHz



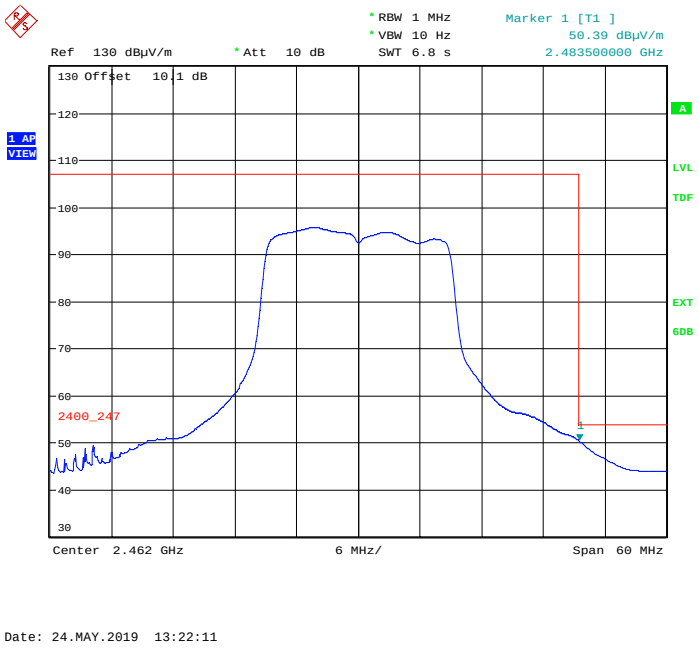
Plot 5.4.4.2.3.10. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 0 BPSK ½ 6.5Mbps, Power Setting 15, Channel 11, 2462 MHz



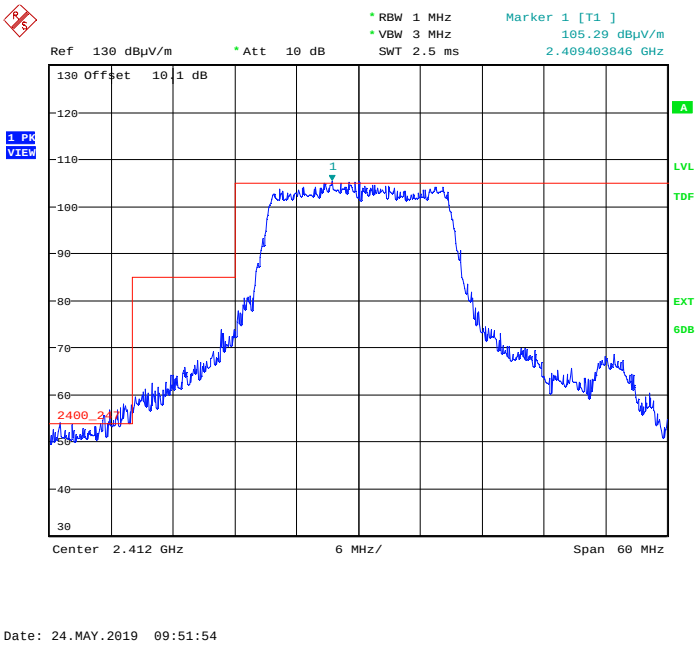
Plot 5.4.4.2.3.11. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 0 BPSK ½ 6.5Mbps, Power Setting 15, Channel 11, 2462 MHz



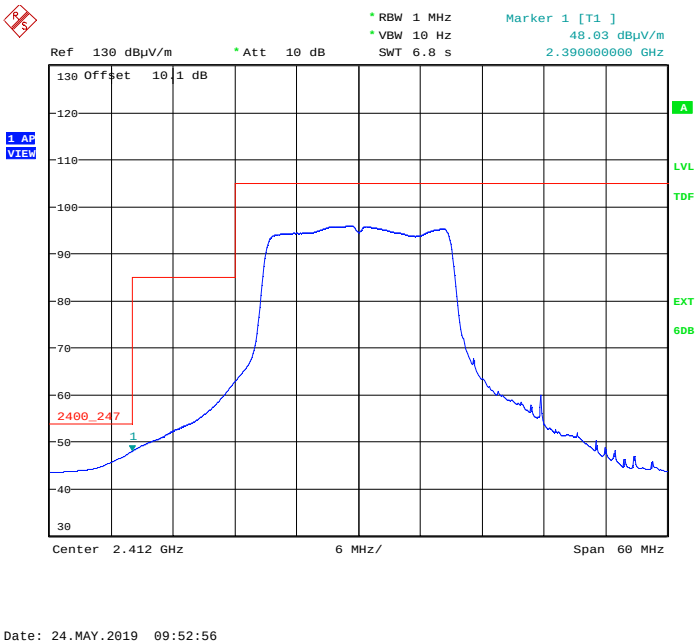
Plot 5.4.4.2.3.12. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 0 BPSK ½ 6.5Mbps, Power Setting 15, Channel 11, 2462 MHz



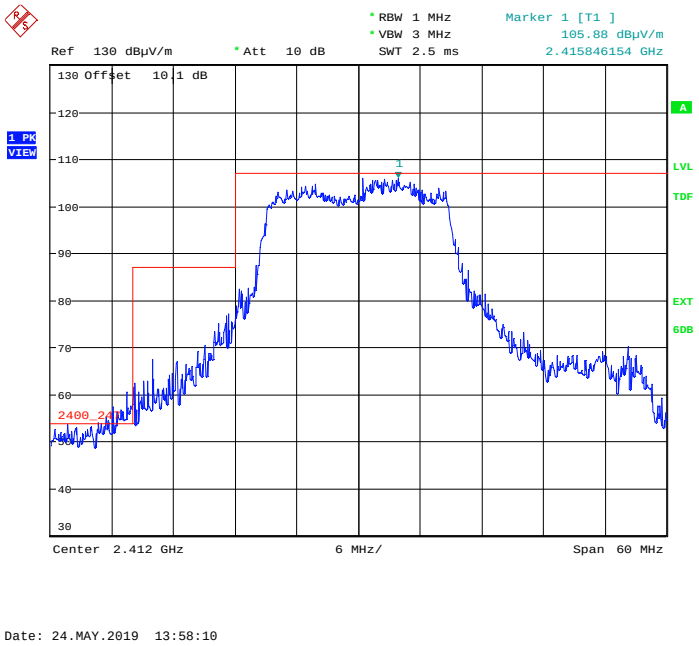
Plot 5.4.4.2.3.13. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 1, 2412 MHz



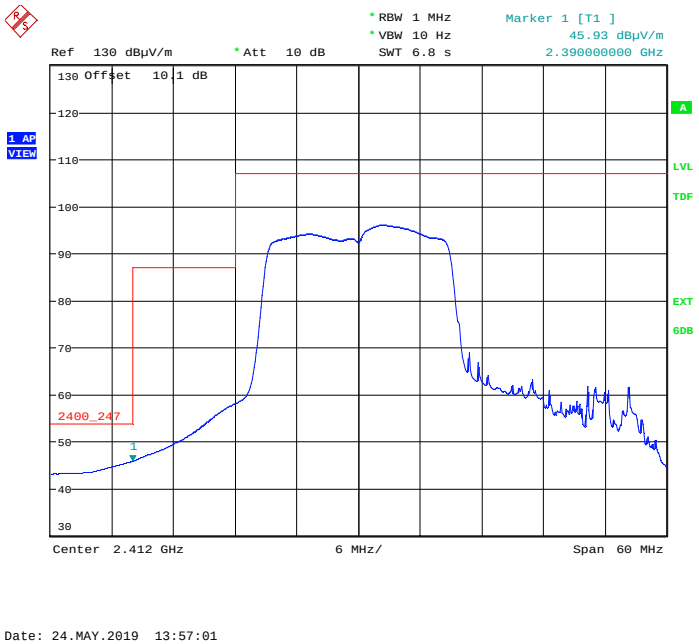
Plot 5.4.4.2.3.14. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 1, 2412 MHz



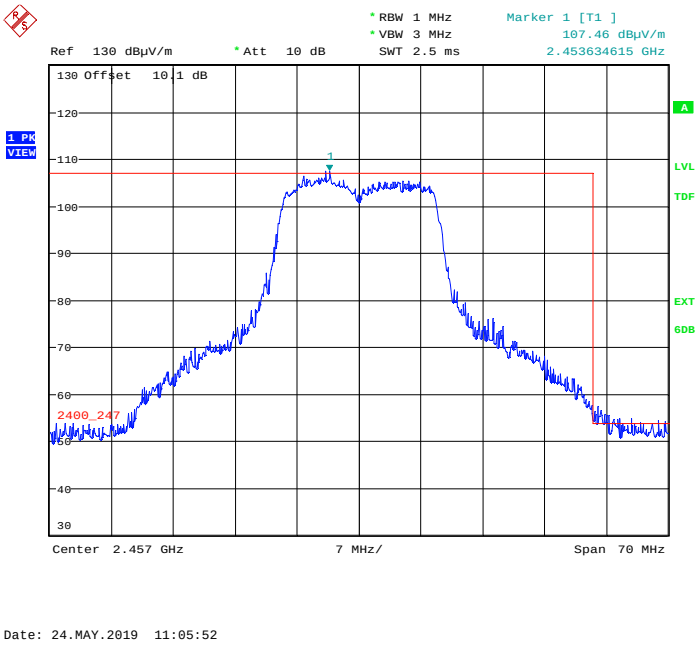
Plot 5.4.4.2.3.15. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 1, 2412 MHz



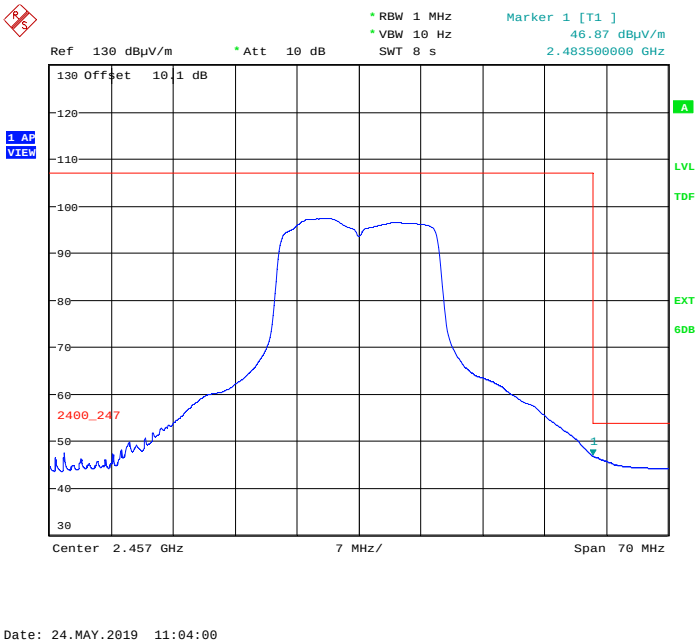
Plot 5.4.4.2.3.16. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 1, 2412 MHz



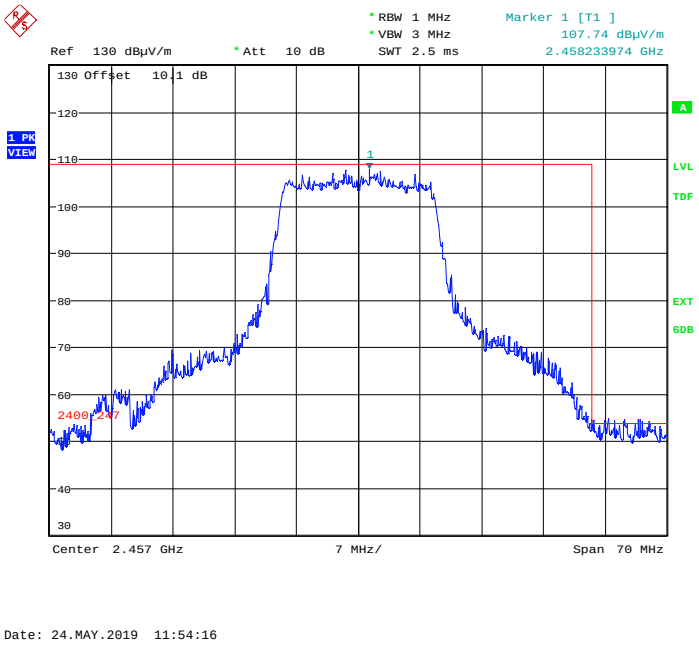
Plot 5.4.4.2.3.17. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 10, 2457 MHz



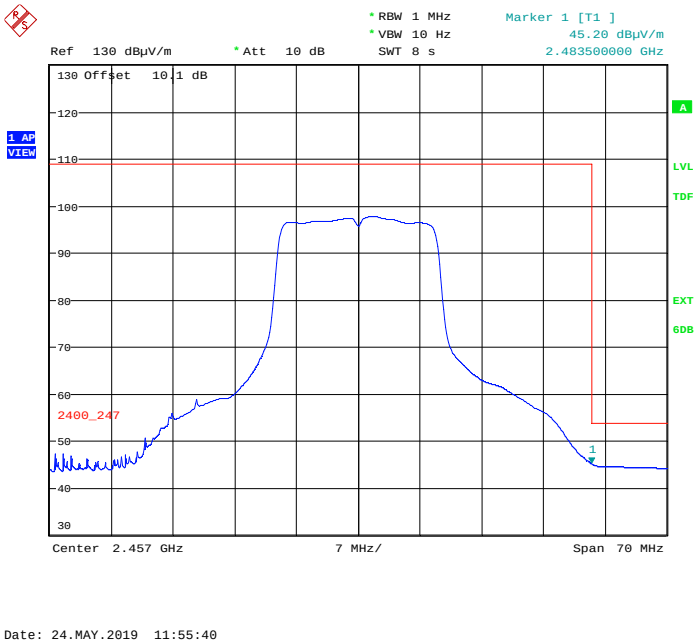
Plot 5.4.4.2.3.18. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 10, 2457 MHz



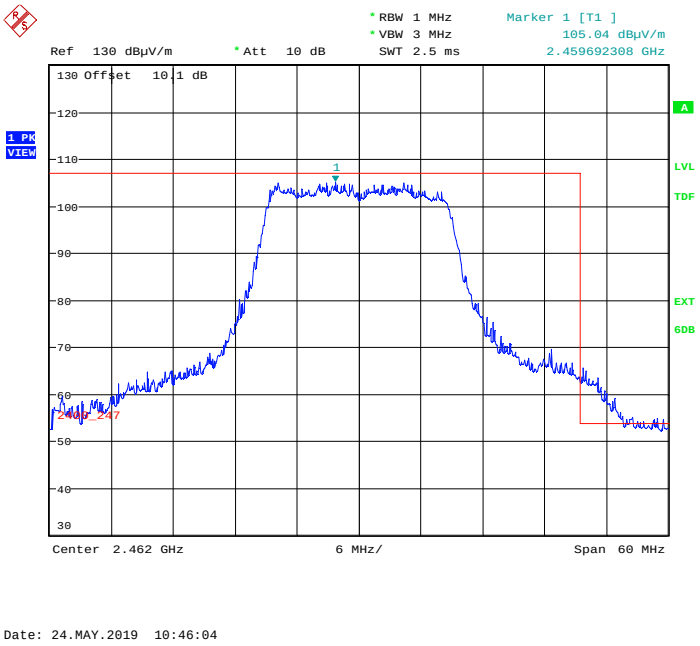
Plot 5.4.4.2.3.19. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 10, 2457 MHz



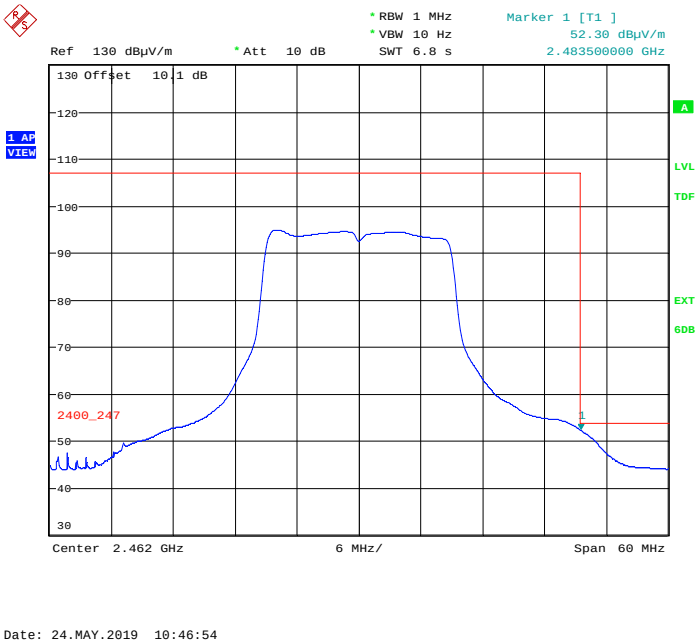
Plot 5.4.4.2.3.20. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 17, Channel 10, 2457 MHz



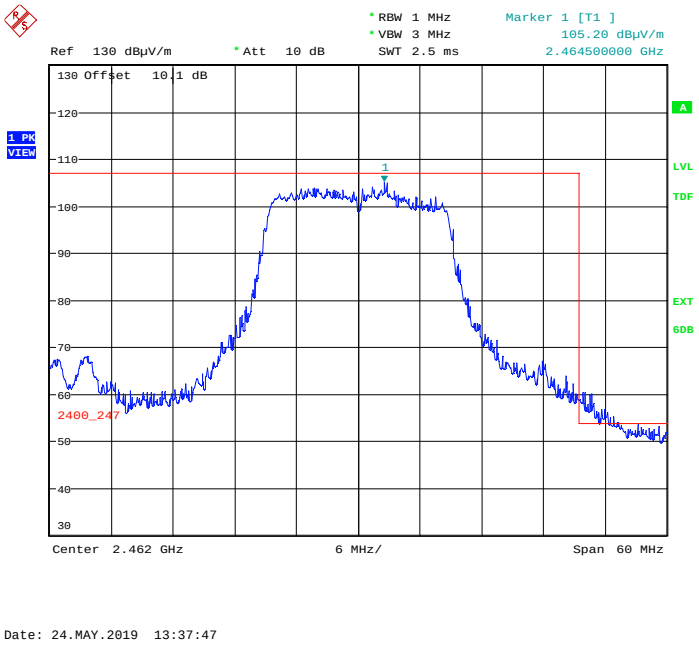
Plot 5.4.4.2.3.21. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 15, Channel 11, 2462 MHz



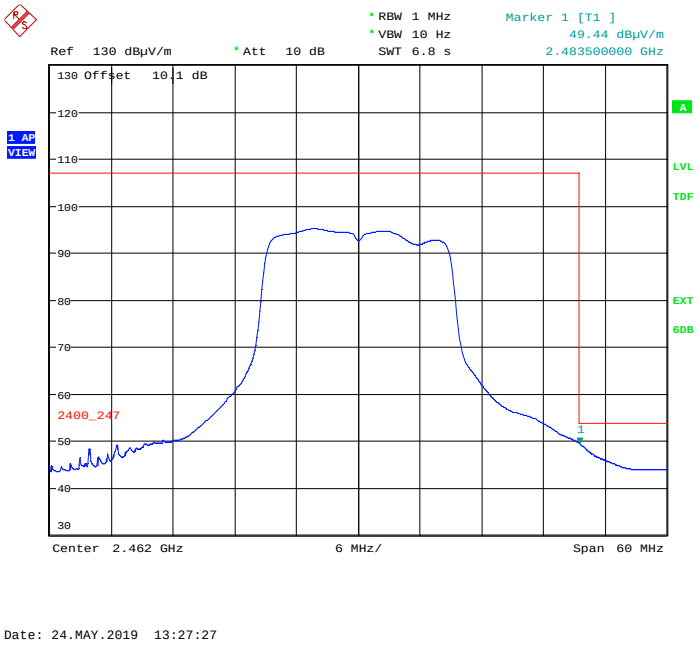
Plot 5.4.4.2.3.22. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 15, Channel 11, 2462 MHz



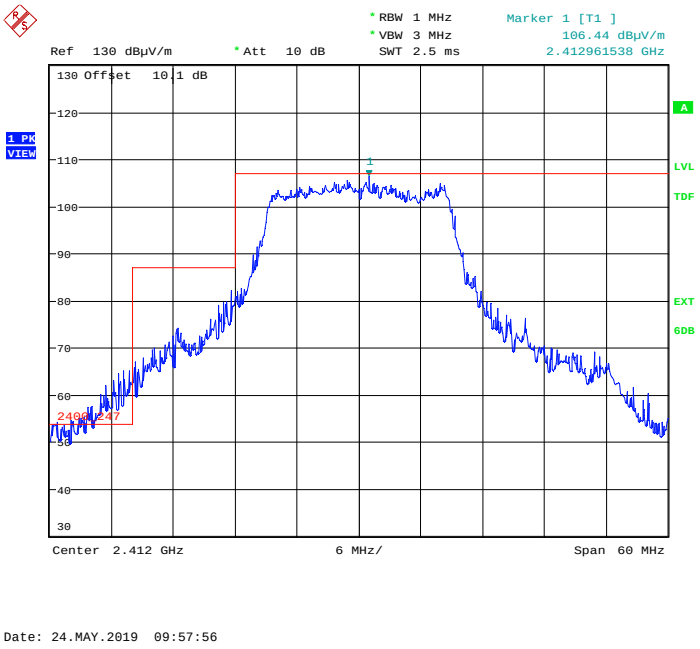
Plot 5.4.4.2.3.23. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 15, Channel 11, 2462 MHz



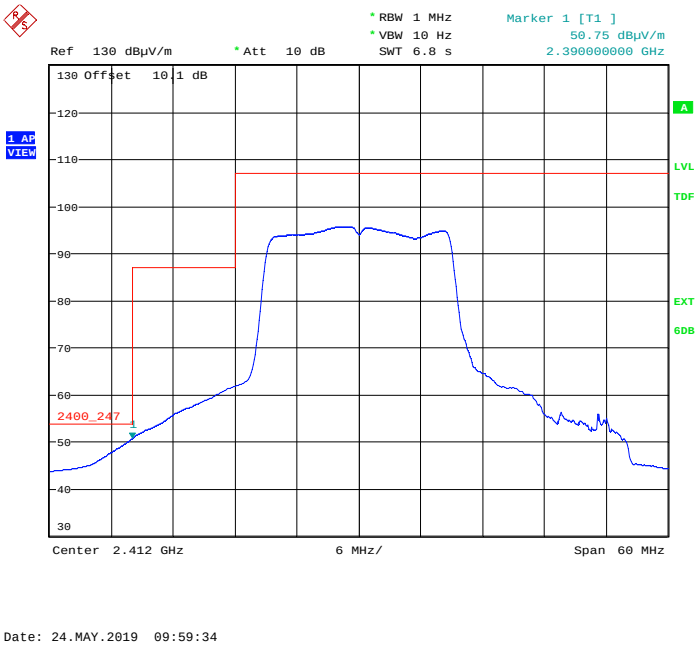
Plot 5.4.4.2.3.24. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 2 QPSK ¾ 19.5Mbps, Power Setting 15, Channel 11, 2462 MHz



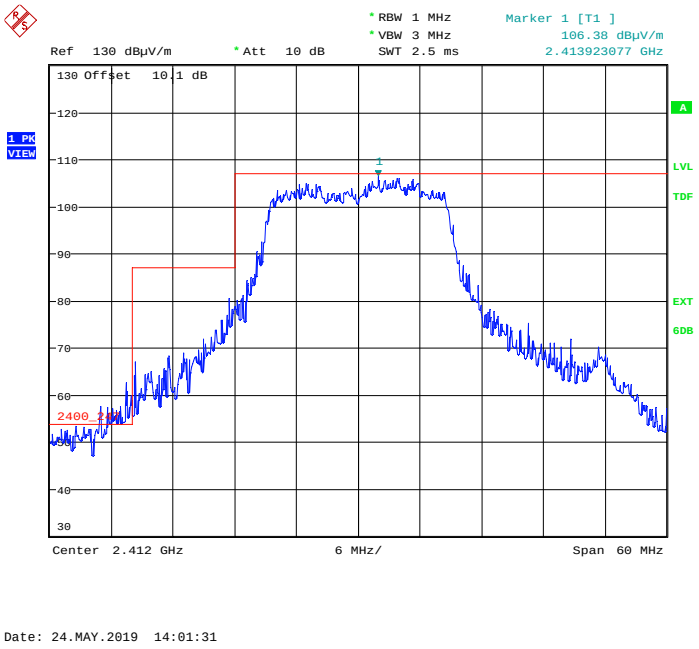
Plot 5.4.4.2.3.25. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 1, 2412 MHz



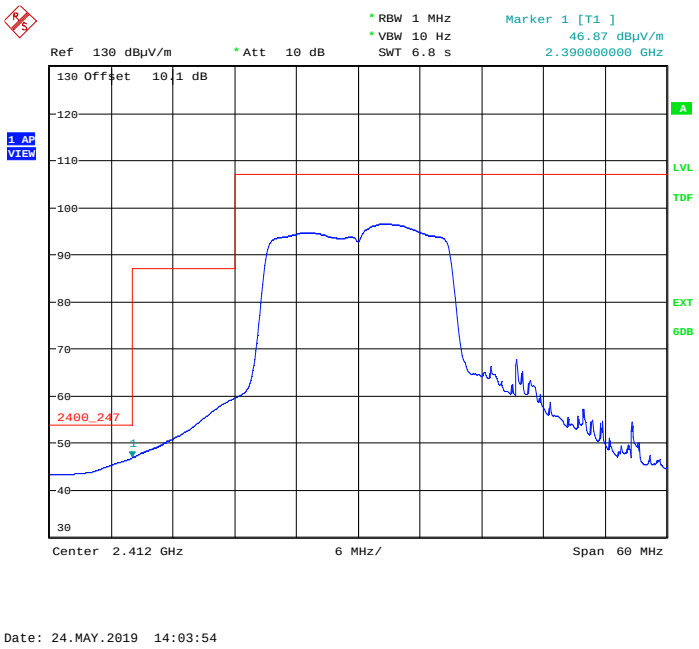
Plot 5.4.4.2.3.26. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 1, 2412 MHz



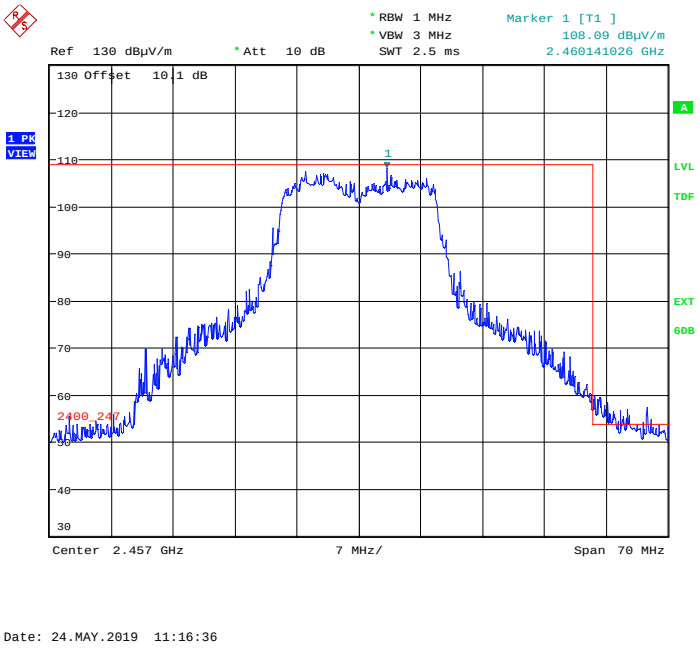
Plot 5.4.4.2.3.27. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 1, 2412 MHz



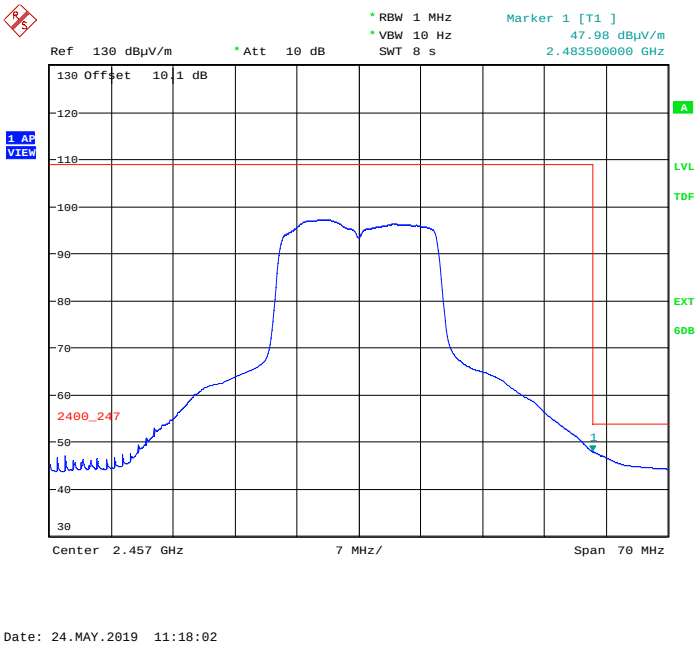
Plot 5.4.4.2.3.28. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 1, 2412 MHz



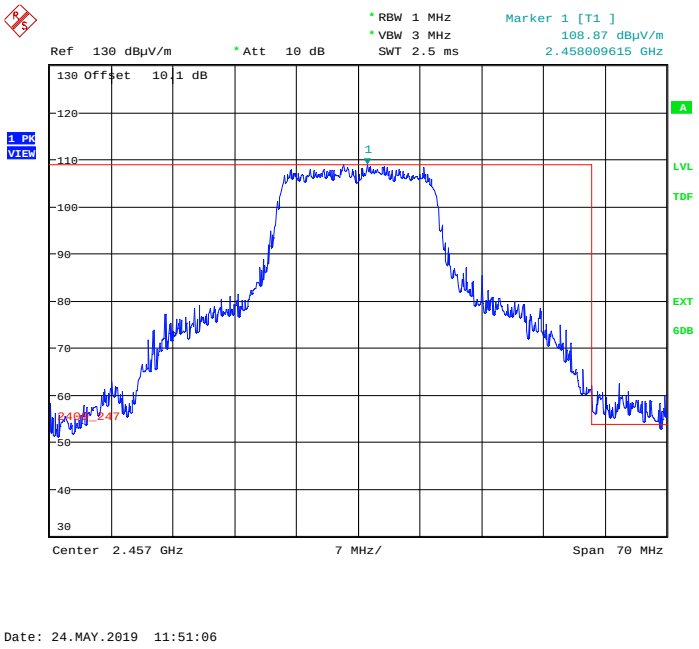
Plot 5.4.4.2.3.29. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 10, 2457 MHz



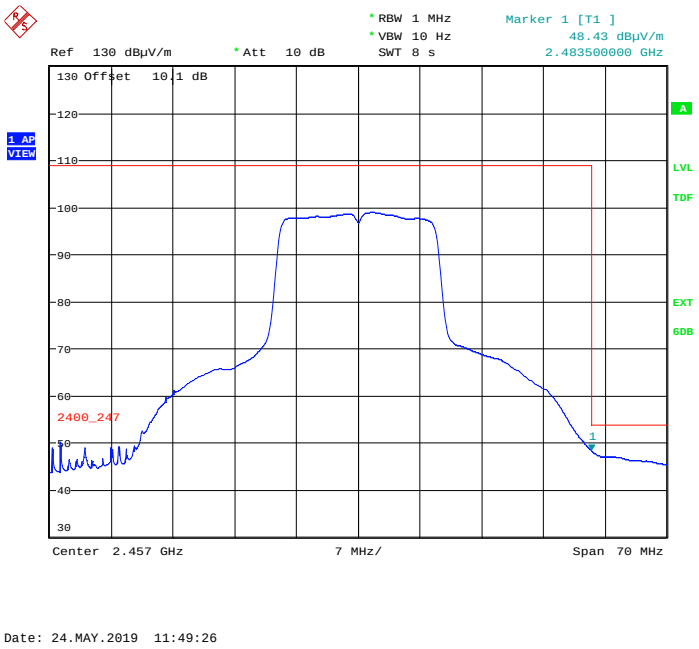
Plot 5.4.4.2.3.30. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 10, 2457 MHz



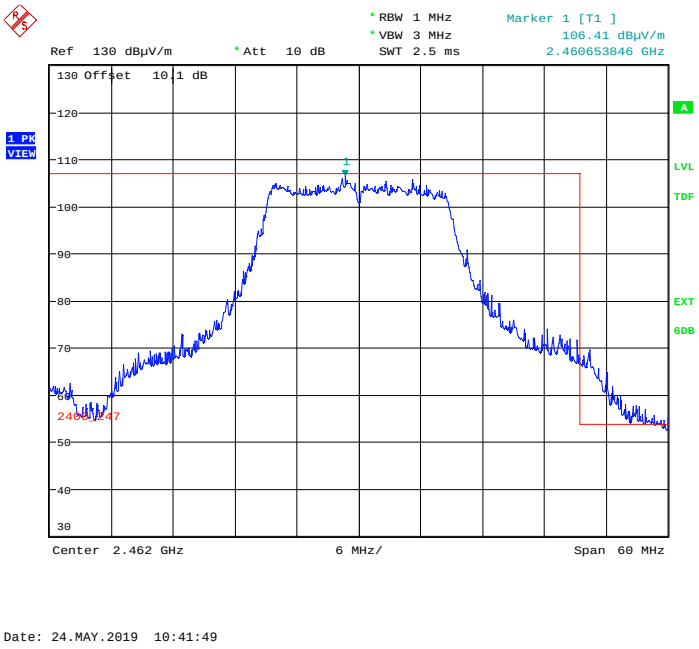
Plot 5.4.4.2.3.31. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 10, 2457 MHz



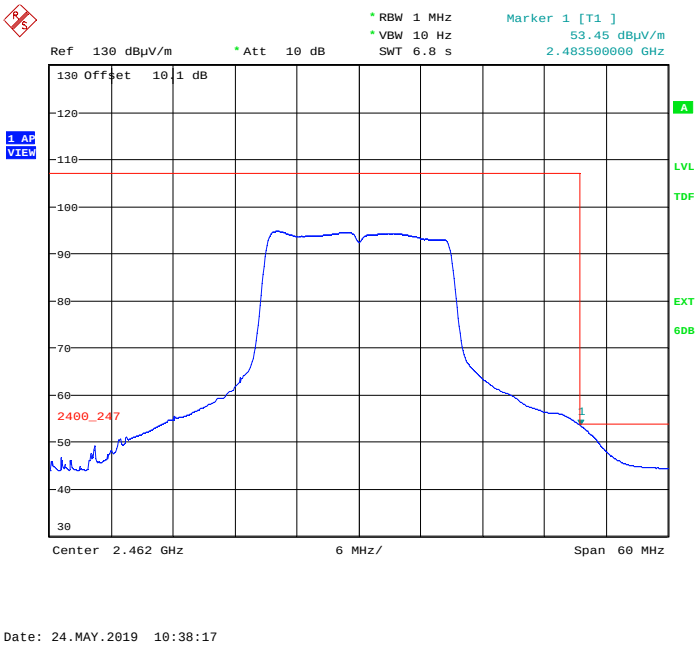
Plot 5.4.4.2.3.32. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 4 16-QAM ¾ 39Mbps, Power Setting 17, Channel 10, 2457 MHz



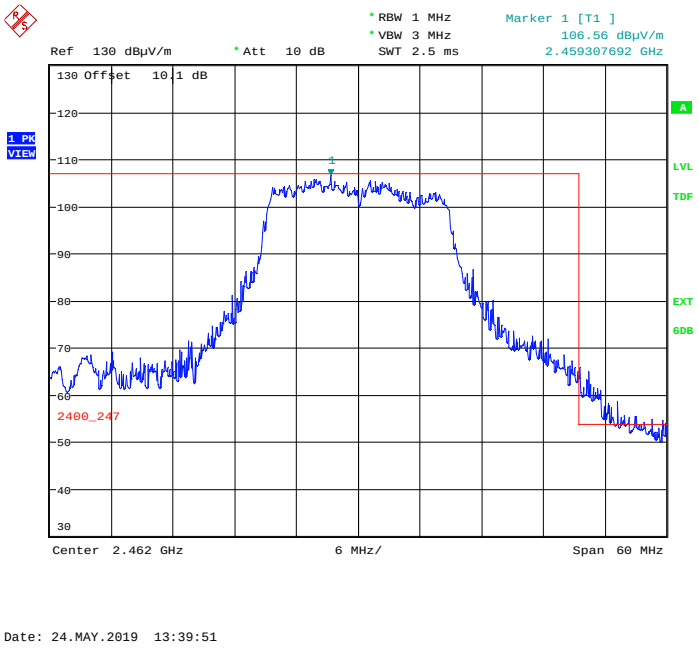
Plot 5.4.4.2.3.33. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 4 16-QAM ¾ 39Mbps, Power Setting 15, Channel 11, 2462 MHz



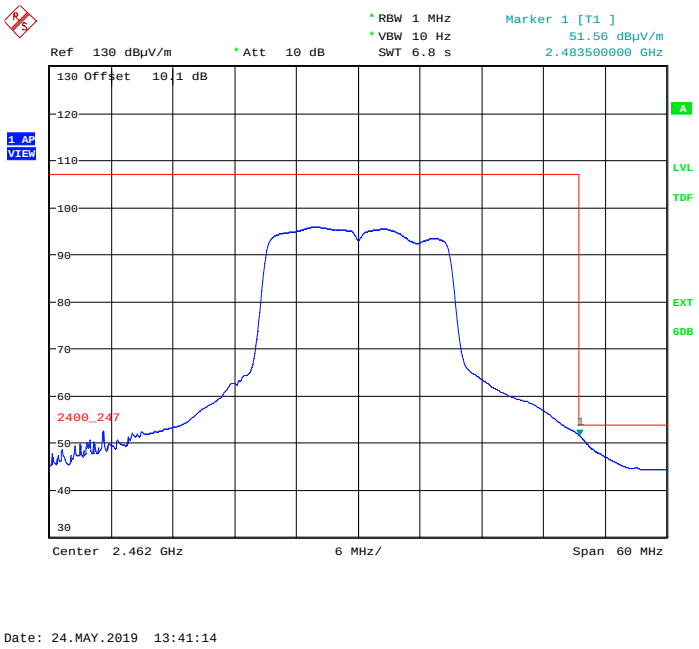
Plot 5.4.4.2.3.34. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 4 16-QAM ¾ 39Mbps, Power Setting 15, Channel 11, 2462 MHz



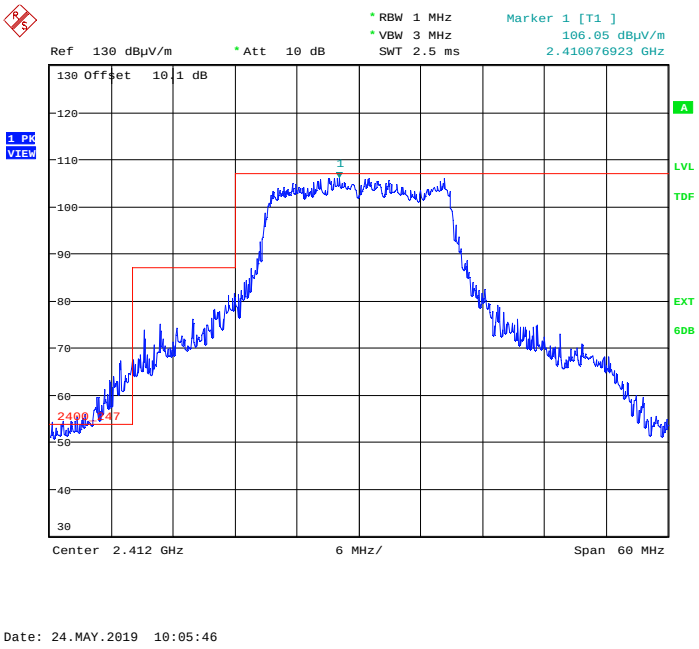
Plot 5.4.4.2.3.35. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 4 16-QAM ¾ 39Mbps, Power Setting 15, Channel 11, 2462 MHz



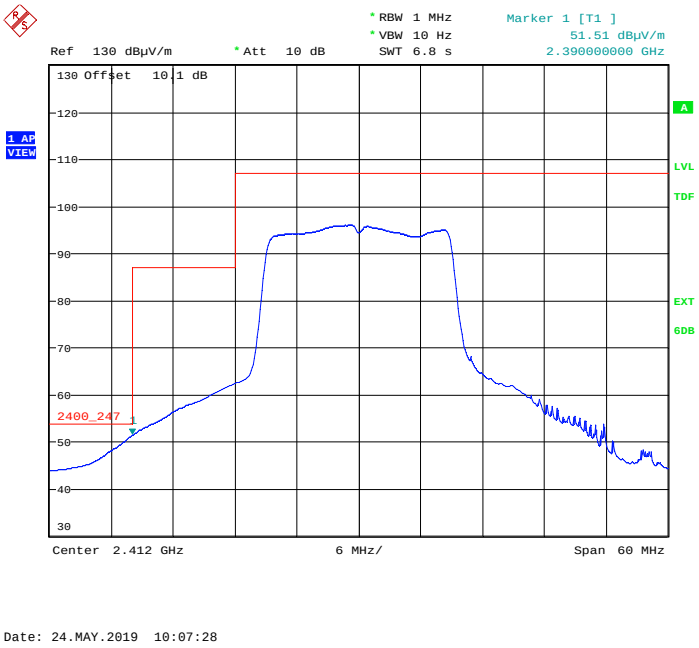
Plot 5.4.4.2.3.36. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 4 16-QAM ¾ 39Mbps, Power Setting 15, Channel 11, 2462 MHz



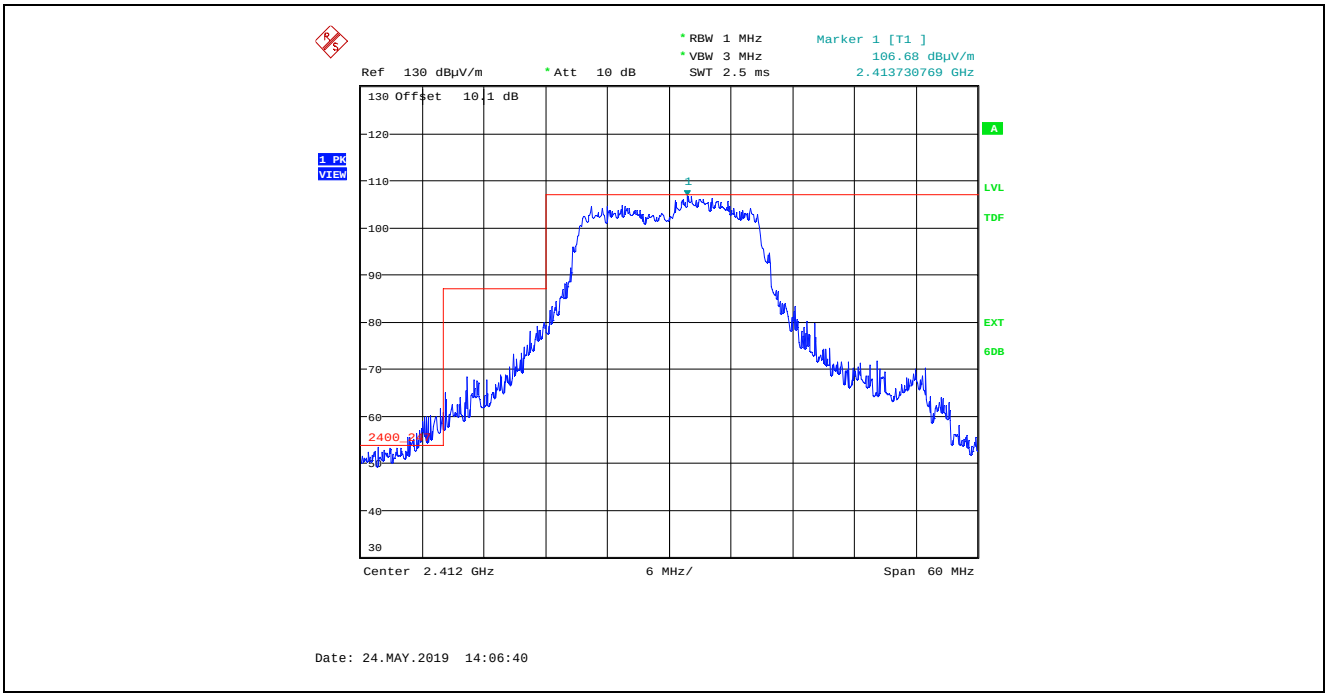
Plot 5.4.4.2.3.37. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 1, 2412 MHz



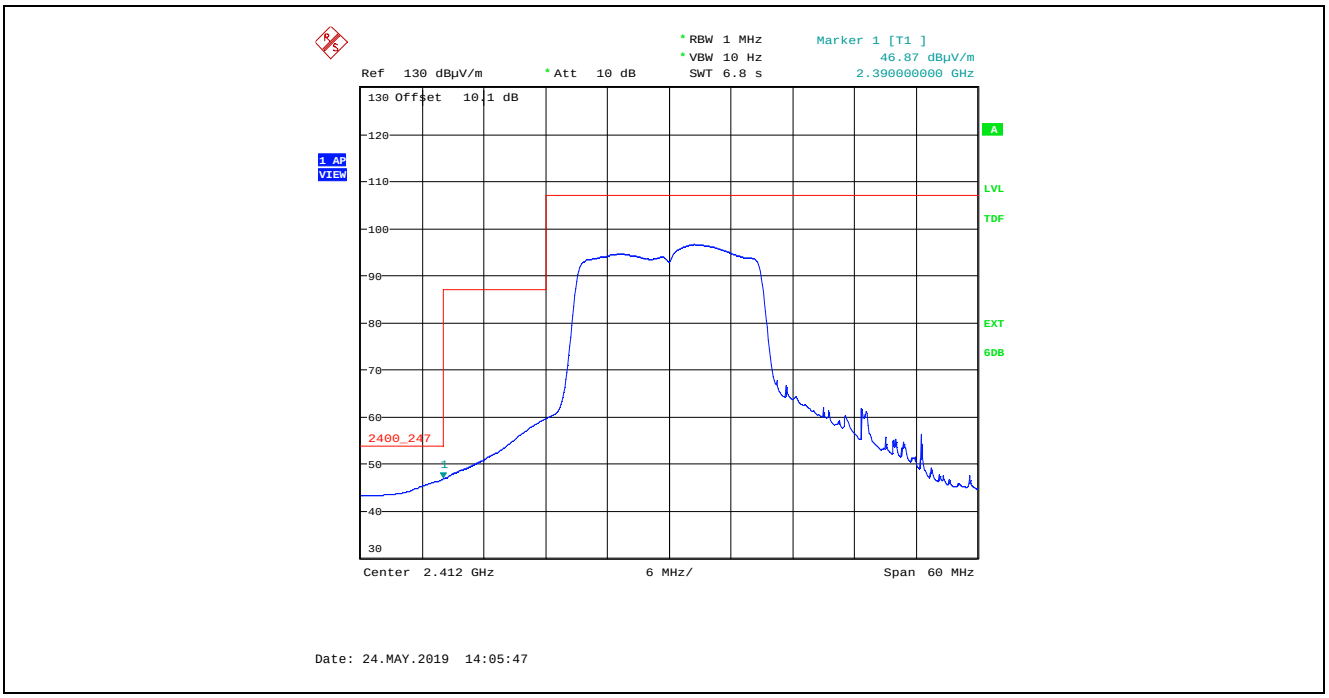
Plot 5.4.4.2.3.38. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 1, 2412 MHz



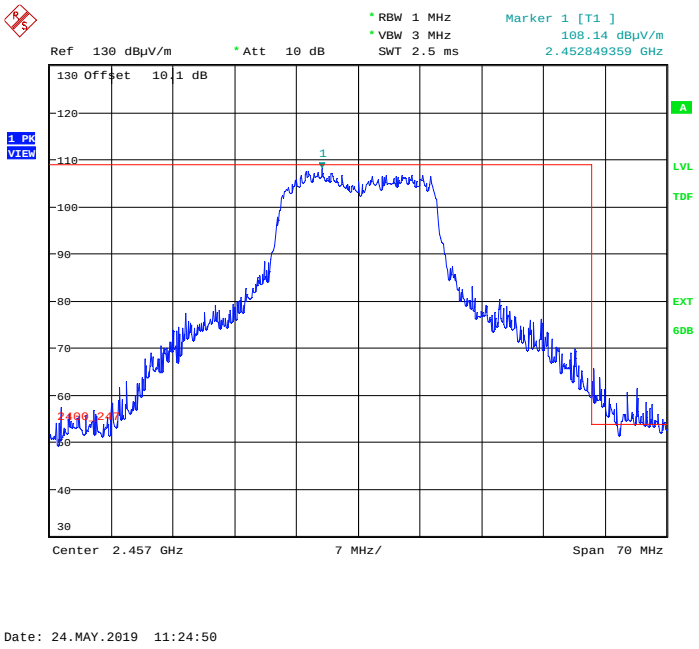
Plot 5.4.4.2.3.39. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 1, 2412 MHz



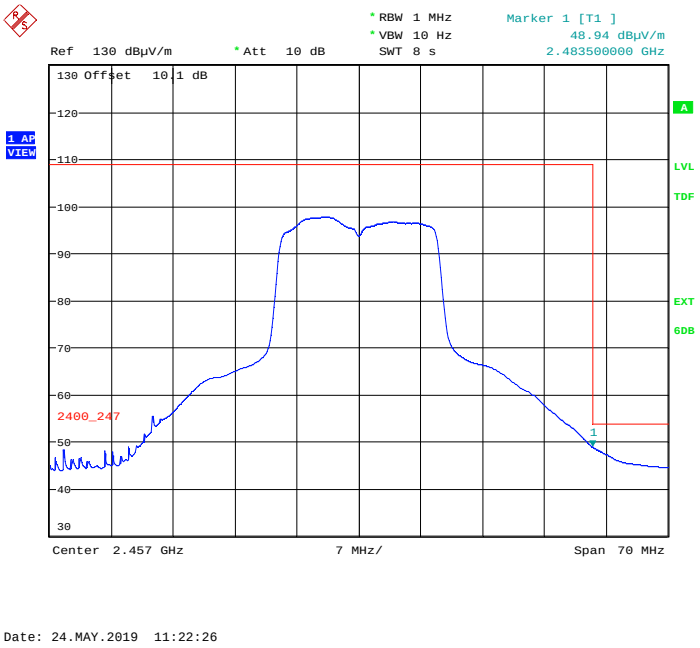
Plot 5.4.4.2.3.40. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 1, 2412 MHz



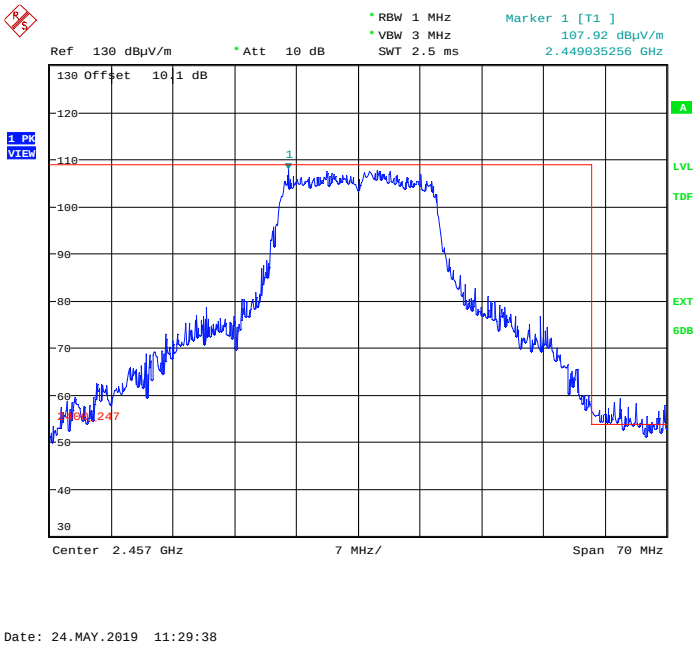
Plot 5.4.4.2.3.41. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 10, 2457 MHz



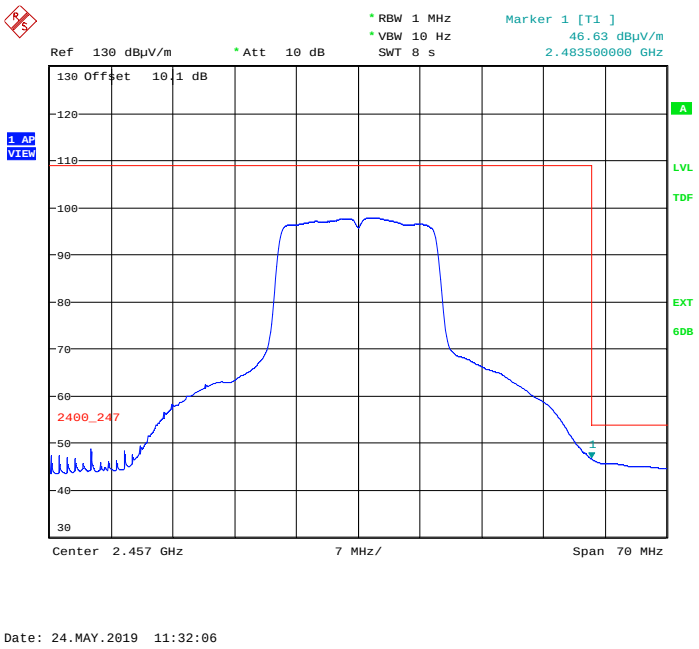
Plot 5.4.4.2.3.42. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 10, 2457 MHz



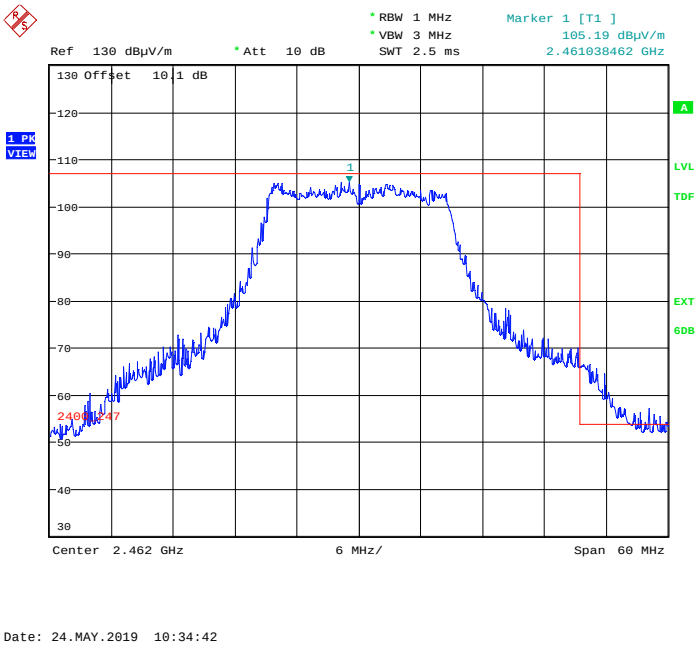
Plot 5.4.4.2.3.43. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 10, 2457 MHz



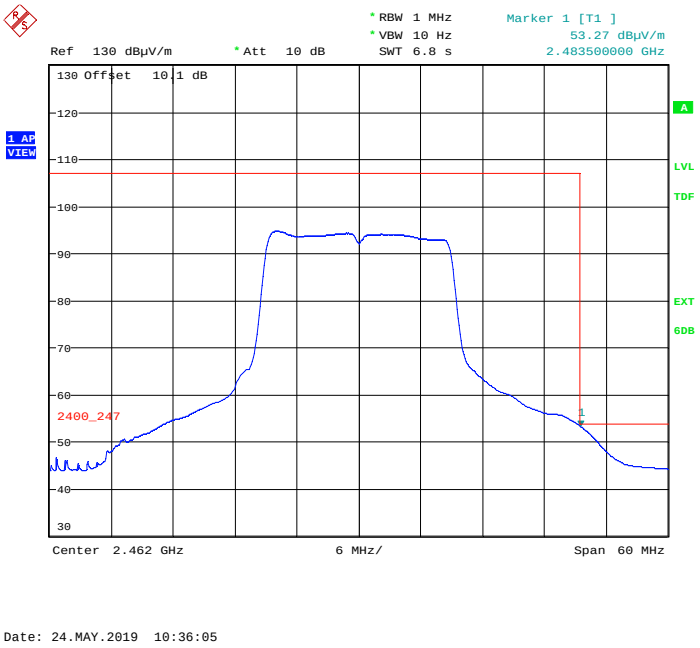
Plot 5.4.4.2.3.44. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 7 64-QAM 5/6 65Mbps, Power Setting 17, Channel 10, 2457 MHz



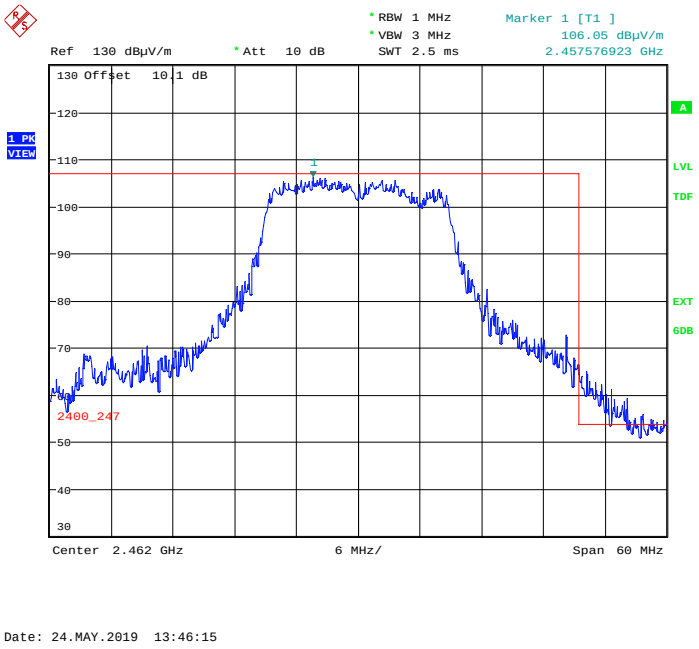
Plot 5.4.4.2.3.45. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 7 64-QAM 5/6 65Mbps, Power Setting 15, Channel 11, 2462 MHz



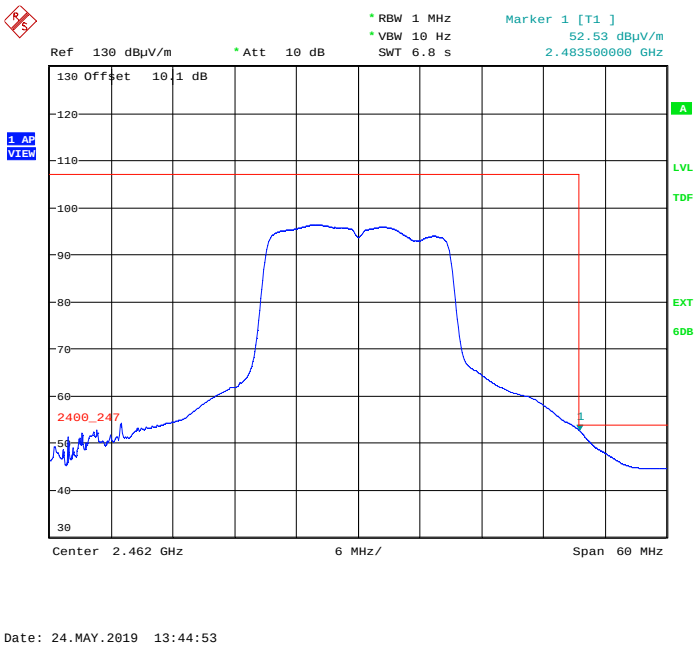
Plot 5.4.4.2.3.46. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 7 64-QAM 5/6 65Mbps, Power Setting 15, Channel 11, 2462 MHz



Plot 5.4.4.2.3.47. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 7 64-QAM 5/6 65Mbps, Power Setting 15, Channel 11, 2462 MHz

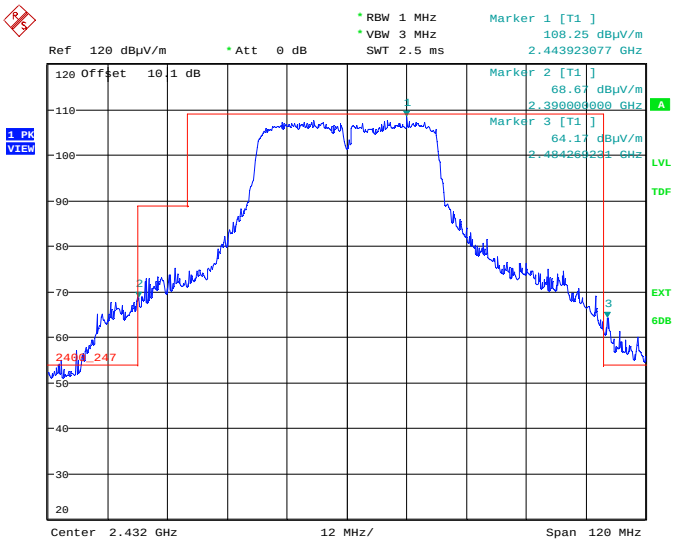


Plot 5.4.4.2.3.48. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 7 64-QAM 5/6 65Mbps, Power Setting 15, Channel 11, 2462 MHz

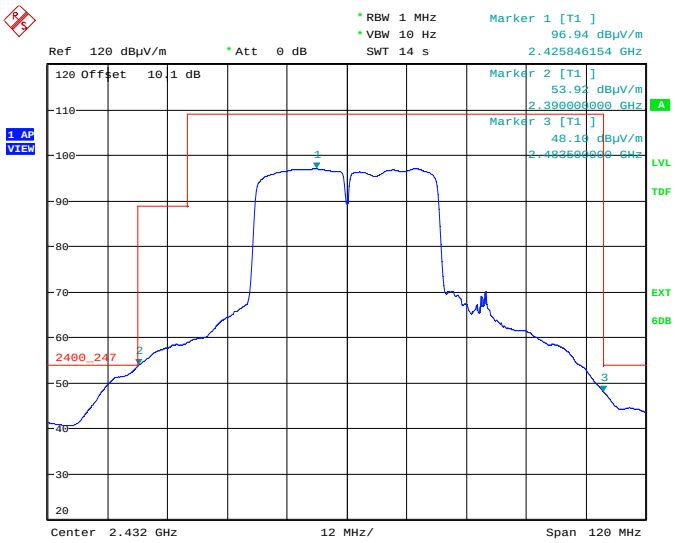


5.4.4.2.4. Band–Edge RF Radiated Emissions for 802.11n HT40

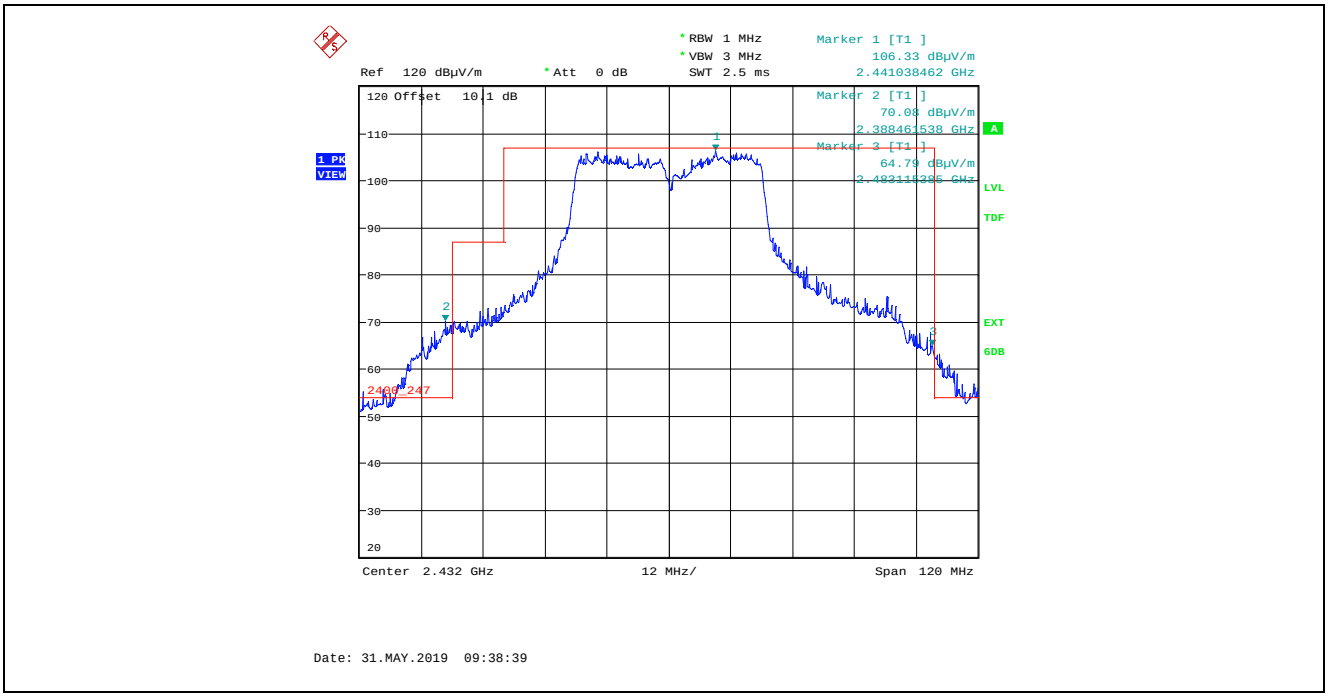
Plot 5.4.4.2.4.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 5, 2432 MHz



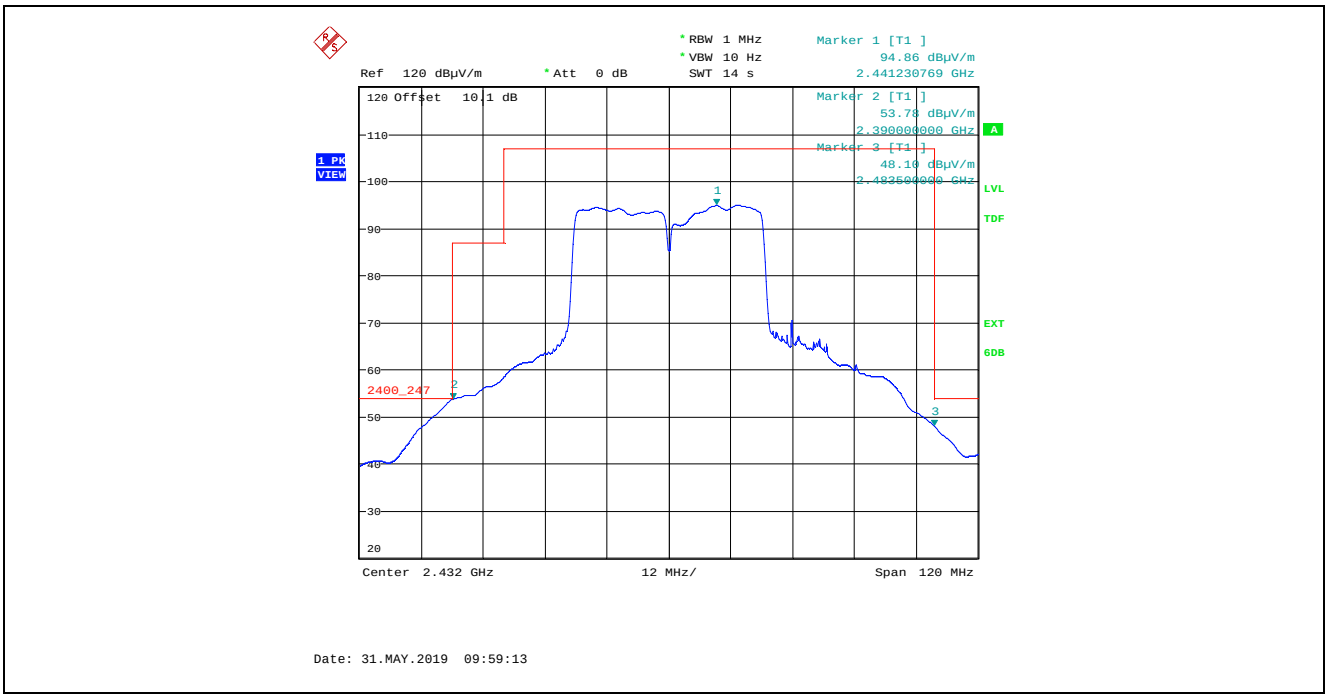
Plot 5.4.4.2.4.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 5, 2432 MHz



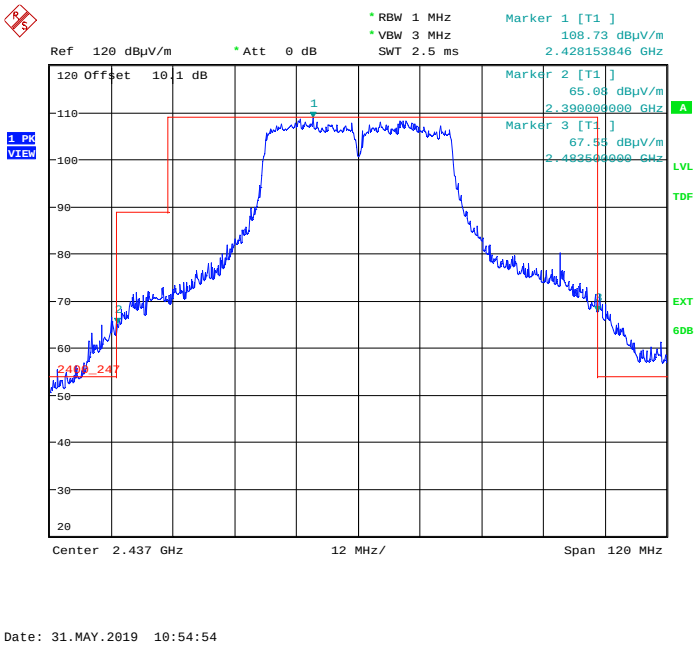
Plot 5.4.4.2.4.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 5, 2432 MHz



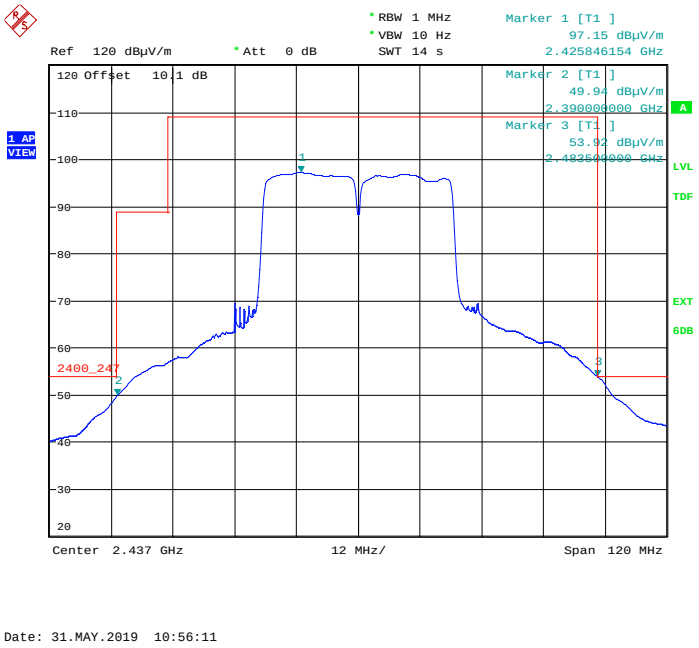
Plot 5.4.4.2.4.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 5, 2432 MHz



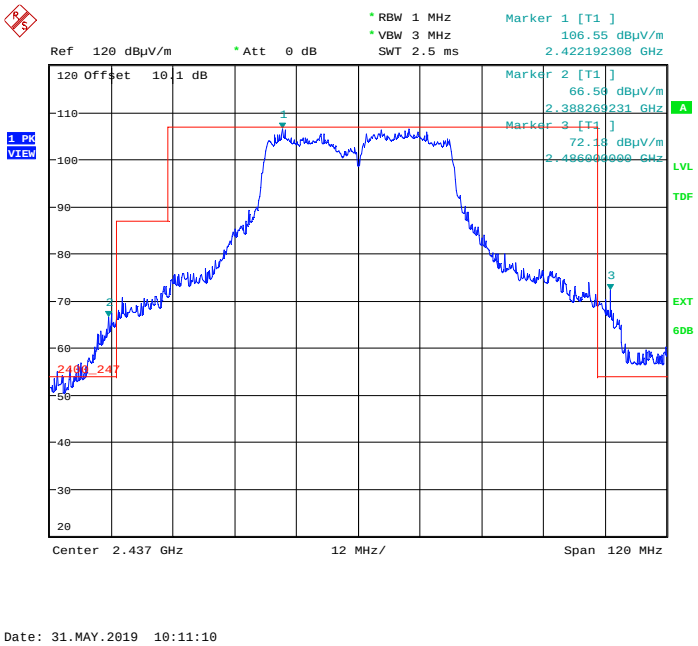
Plot 5.4.4.2.4.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 6, 2437 MHz



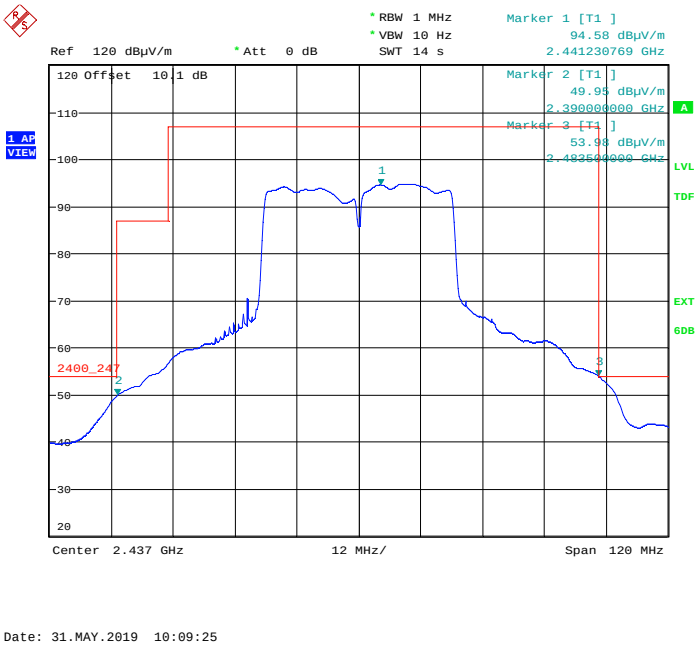
Plot 5.4.4.2.4.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 6, 2437 MHz



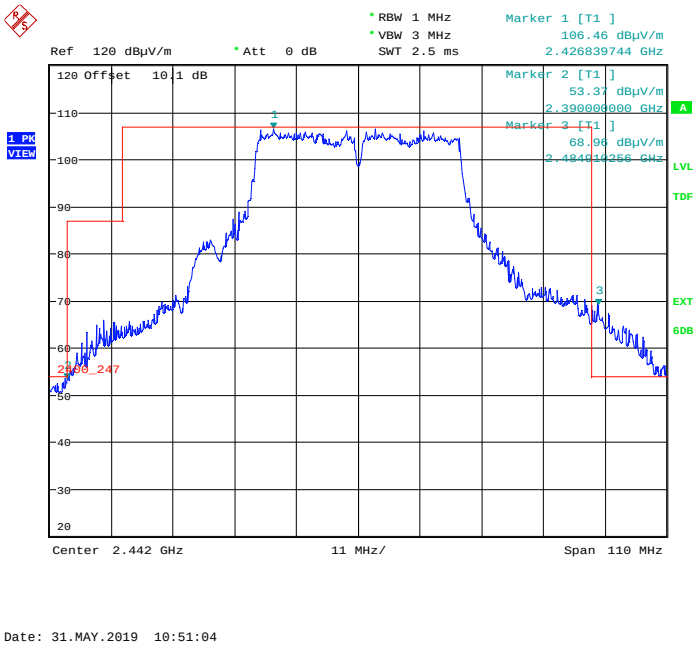
Plot 5.4.4.2.4.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 6, 2437 MHz



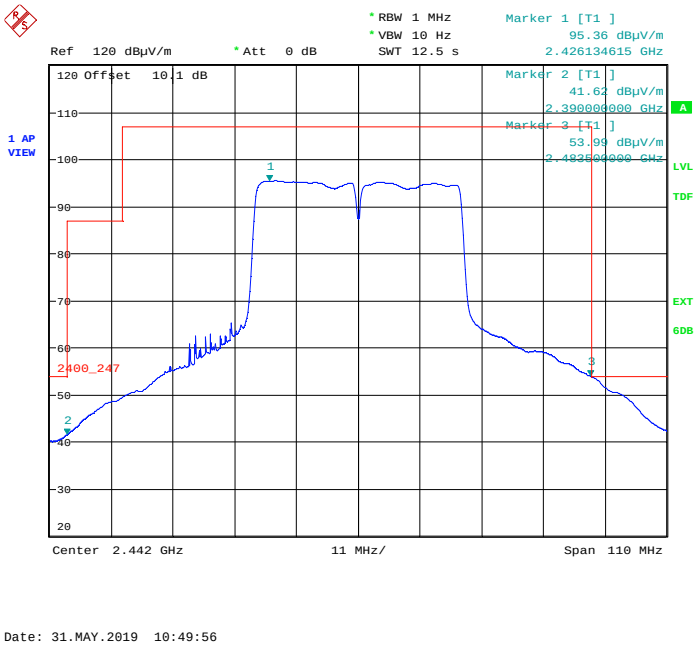
Plot 5.4.4.2.4.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 6, 2437 MHz



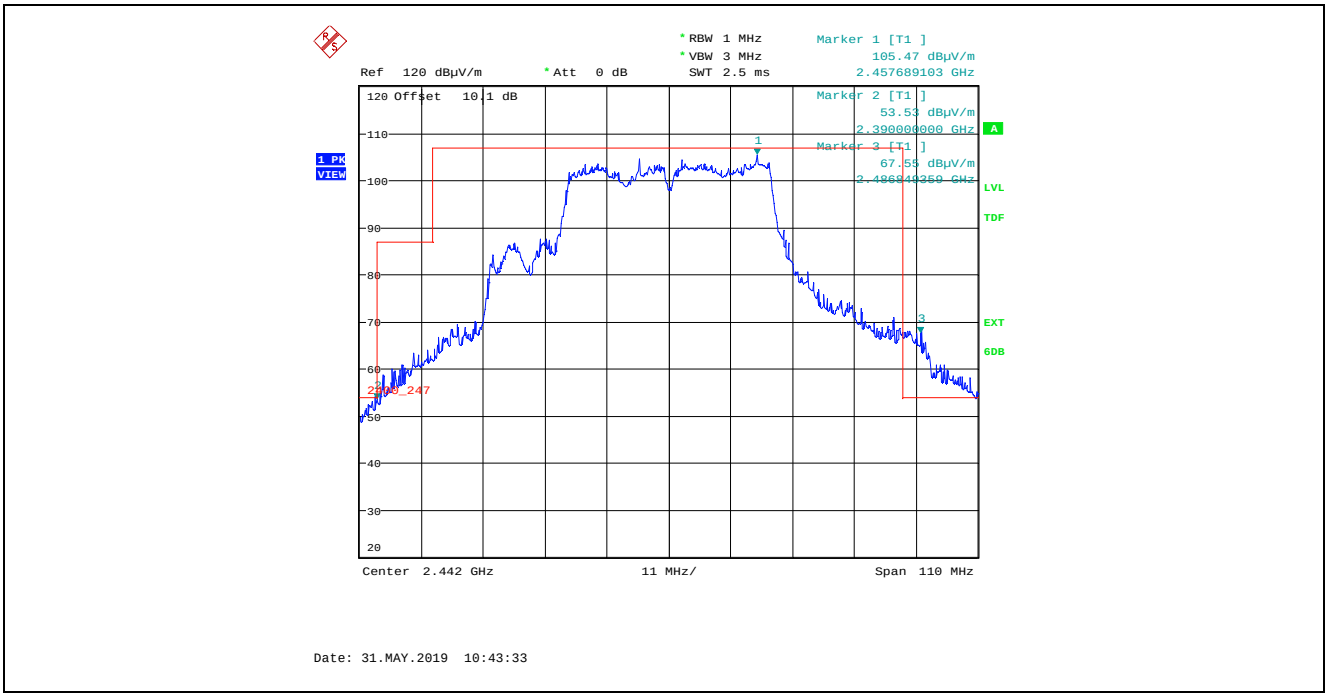
Plot 5.4.4.2.4.9. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Peak
MCS 7 64-QAM 5/6 135Mbps, Power Setting 14, Channel 7, 2442 MHz



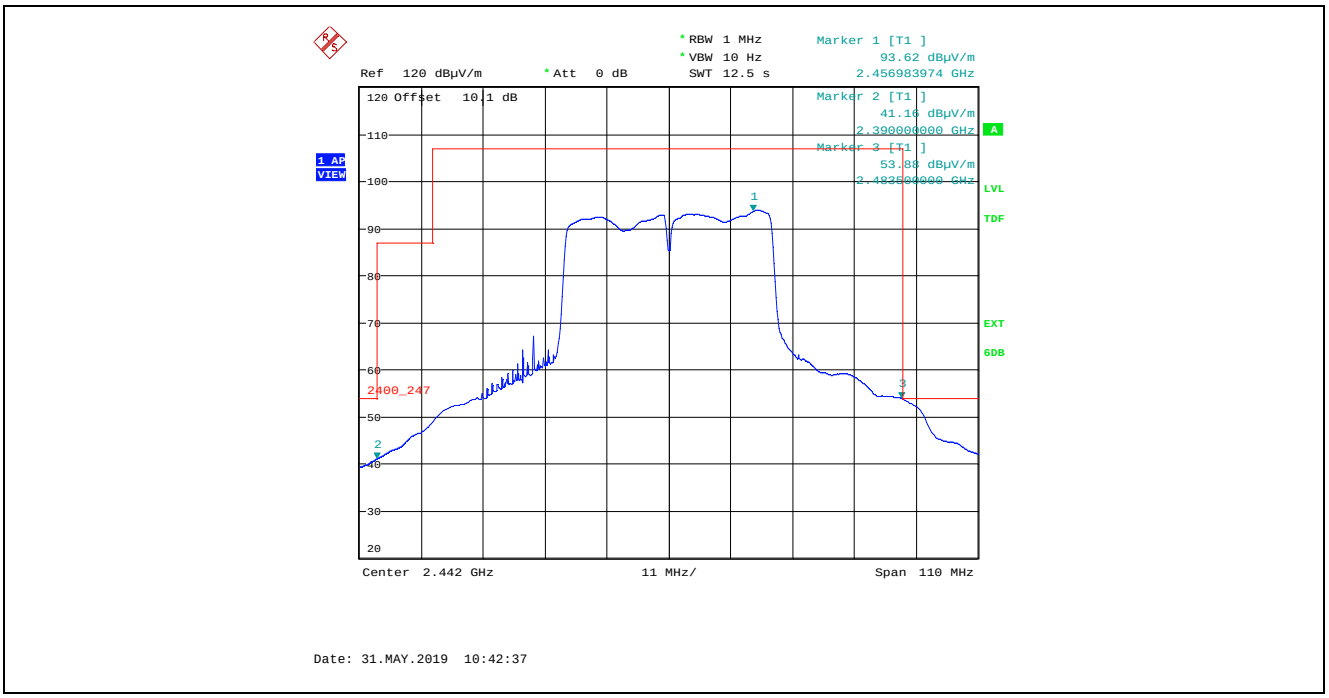
Plot 5.4.4.2.4.10. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization, Average
MCS 7 64-QAM 5/6 135Mbps, Power Setting 14, Channel 7, 2442 MHz



Plot 5.4.4.2.4.11. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Peak
MCS 7 64-QAM 5/6 135Mbps, Power Setting 14, Channel 7, 2442 MHz



Plot 5.4.4.2.4.12. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization, Average
MCS 7 64-QAM 5/6 135Mbps, Power Setting 14, Channel 7, 2442 MHz



5.5. POWER SPECTRAL DENSITY [§ 15.247(e)]

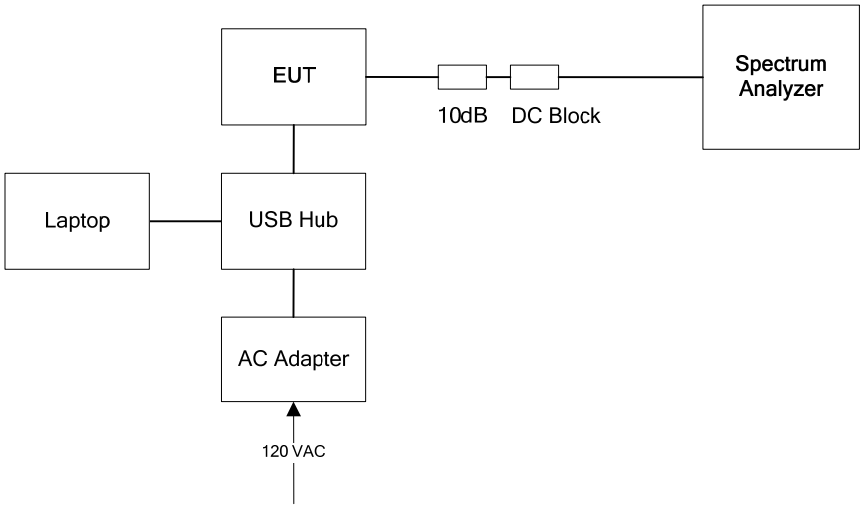
5.5.1. Limit(s)

For digitally modulated systems, the 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.

5.5.2. Method of Measurements

FCC KDB 558074 D01 15.247 Meas Guidance v05r01, Section 8.4 / ANSI C63.10 Subclause 11.10.2 Method PKPSD (peak PSD).

5.5.3. Test Arrangement



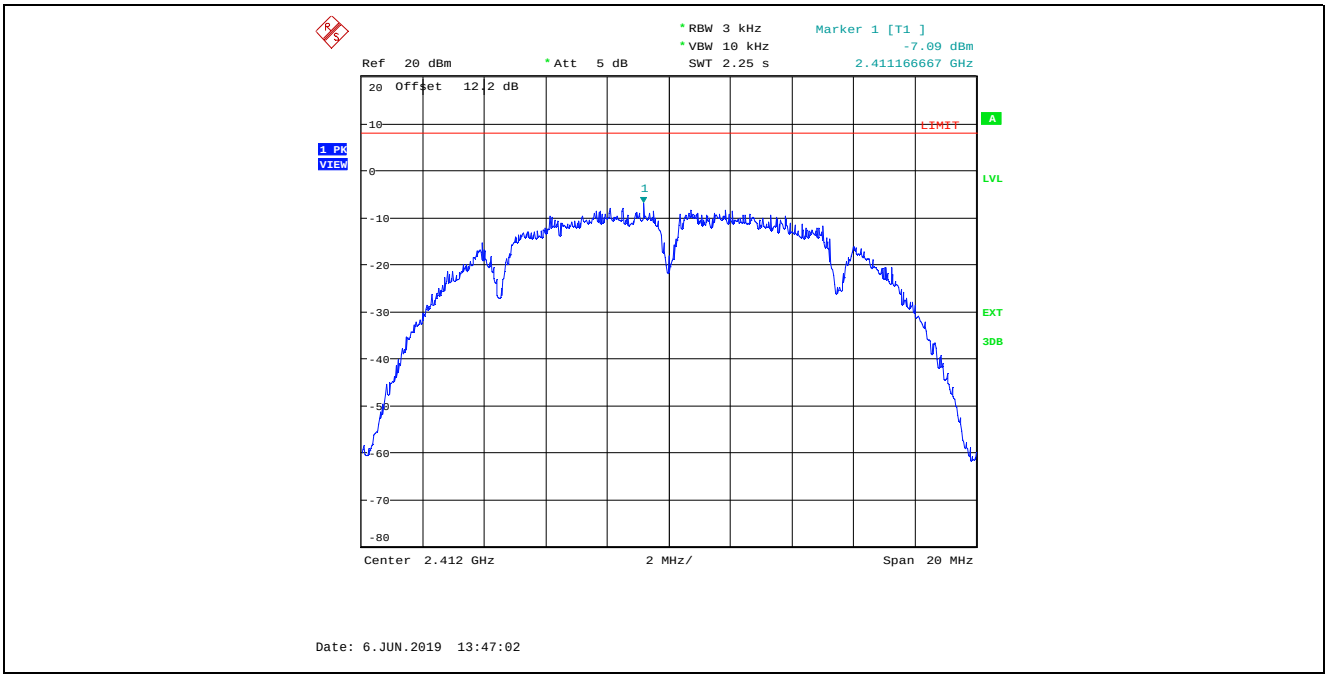
5.5.4. Test Data

Operating Mode		Power Setting	Channel	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
802.11b	DBPSK 1Mbps	17	1	2412	-7.09	8
		17	6	2437	-6.96	8
		17	11	2462	-6.64	8
	DQPSK 2Mbps	17	1	2412	-6.46	8
		17	6	2437	-5.65	8
		17	11	2462	-7.19	8
	CCK 11Mbps	17	1	2412	-6.32	8
		17	6	2437	-5.29	8
		17	11	2462	-7.89	8

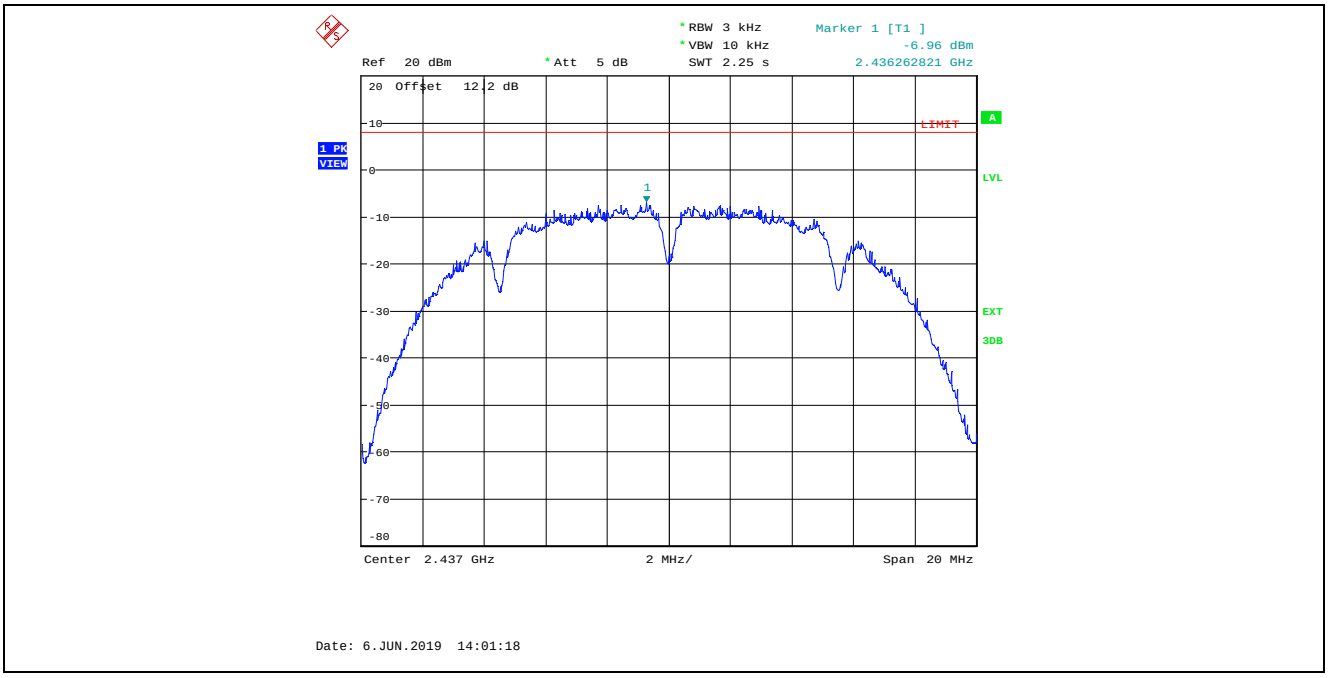
Operating Mode		Power Setting	Channel	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
802.11g	BPSK 9Mbps	17	1	2412	-9.23	8
		17	6	2437	-8.16	8
		15	11	2462	-11.31	8
	QPSK 18Mbps	17	1	2412	-9.59	8
		17	6	2437	-9.54	8
		15	11	2462	-11.89	8
	16-QAM 36Mbps	17	1	2412	-9.26	8
		17	6	2437	-9.44	8
		15	11	2462	-11.23	8
	64-QAM 54Mbps	17	1	2412	-9.28	8
		17	6	2437	-7.91	8
		15	11	2462	-12.24	8
02.11n HT20	MCS0 BPSK ½ 6.5 Mbps	17	1	2412	-9.79	8
		17	6	2437	-9.43	8
		15	11	2462	-11.10	8
	MCS2 QPSK ¾ 19.5 Mbps	17	1	2412	-9.58	8
		17	6	2437	-9.82	8
		15	11	2462	-12.19	8
	MCS4 16-QAM ¾ 39 Mbps	17	1	2412	-8.93	8
		17	6	2437	-9.33	8
		15	11	2462	-12.36	8
	MCS7 64-QAM 5/6 65 Mbps	17	1	2412	-9.29	8
		17	6	2437	-8.84	8
		15	11	2462	-11.19	8

Operating Mode		Power Setting	Channel	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
802.11n HT20 HT40	MCS 0 BPSK ½ 13.5 Mbps	16	5	2432	-10.98	8
		16	6	2437	-11.50	8
		14	7	2442	-15.24	8
	MCS 2 QPSK ¾ 40.5 Mbps	16	5	2432	-12.63	8
		16	6	2437	-12.41	8
		14	7	2442	-13.47	8
	MCS 4 16-QAM ¾ 81 Mbps	16	5	2432	-13.66	8
		16	6	2437	-14.72	8
		14	7	2442	-15.12	8
	MCS 7 64-QAM 5/6 135 Mbps	16	5	2432	-12.91	8
		16	6	2437	-13.64	8
		14	7	2442	-15.27	8

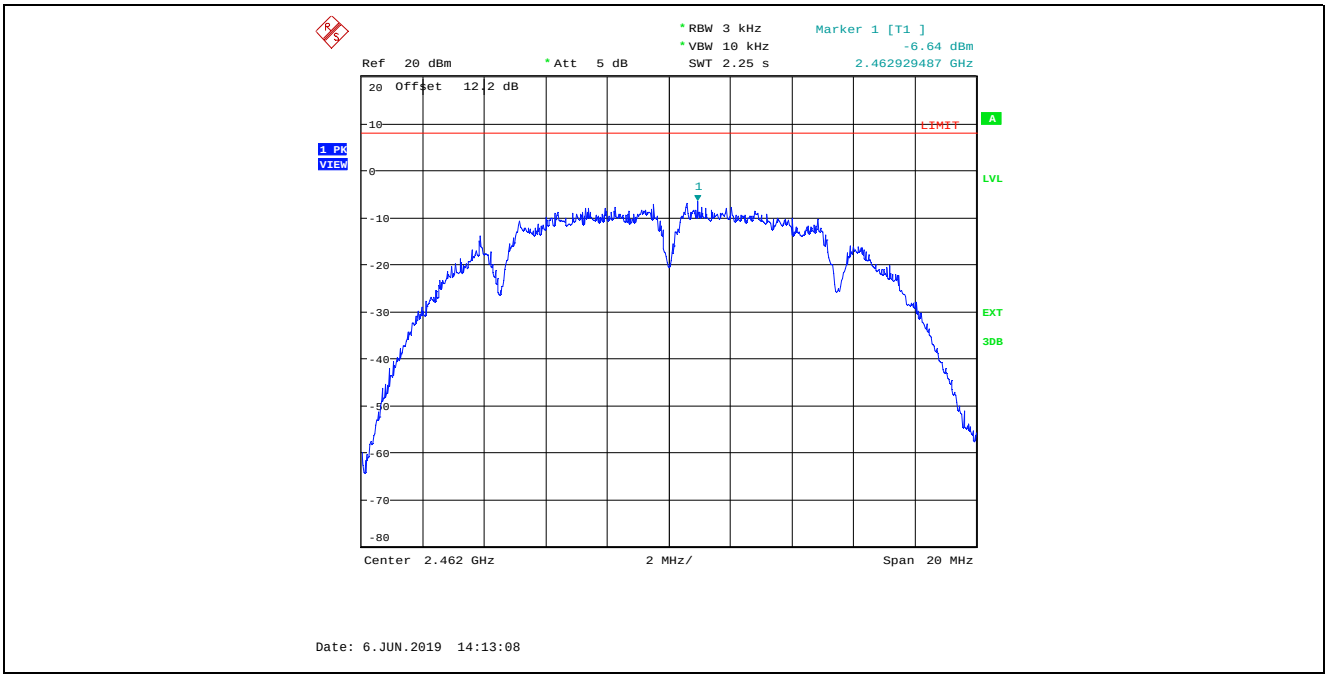
Plot 5.5.4.1. Power Spectral Density
802.11b, DBPSK 1Mbps, Power Setting 17, Channel 1, 2412 MHz



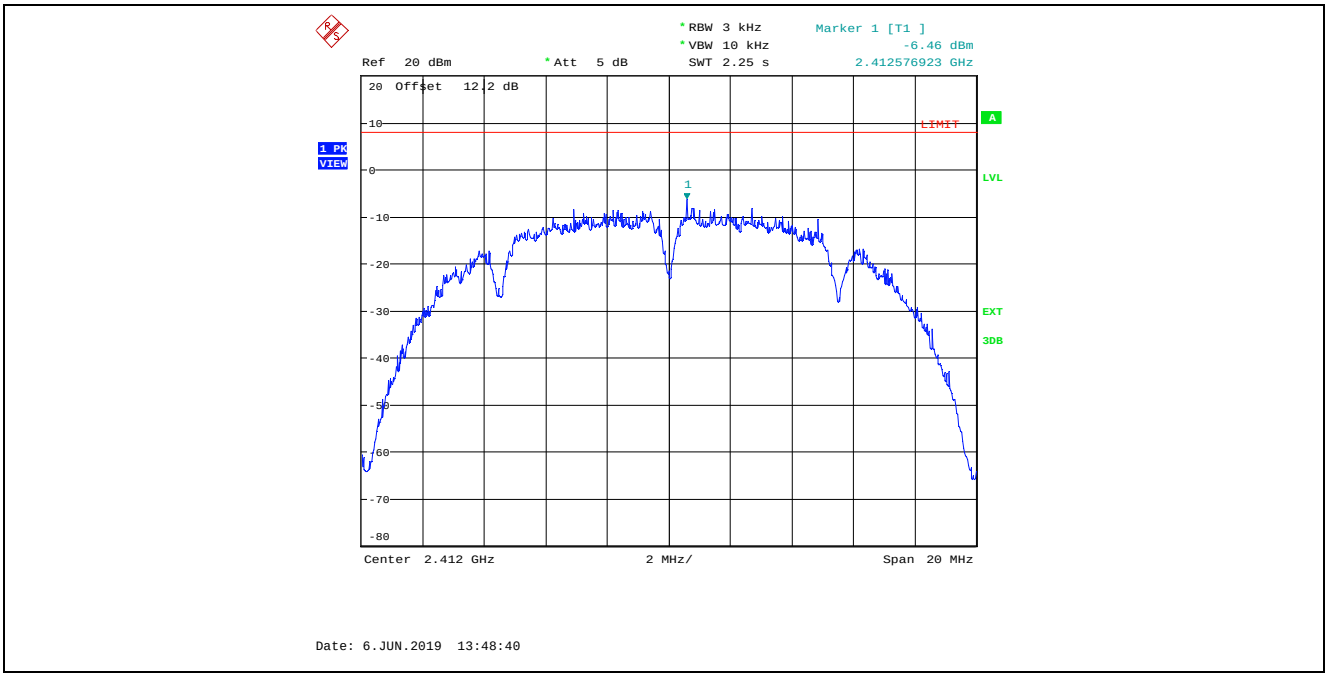
Plot 5.5.4.2. Power Spectral Density
802.11b, DBPSK 1Mbps, Power Setting 17, Channel 6, 2437 MHz



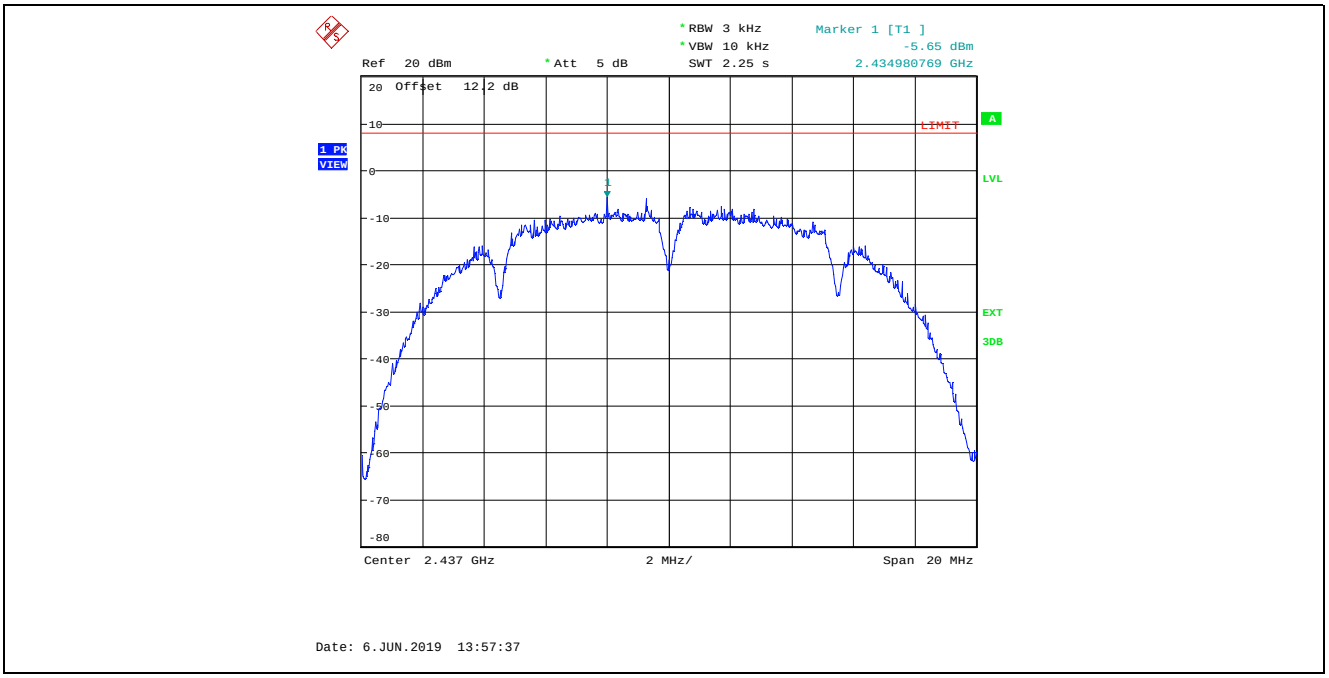
Plot 5.5.4.3. Power Spectral Density
802.11b, DBPSK 1Mbps, Power Setting 17, Channel 11, 2462 MHz



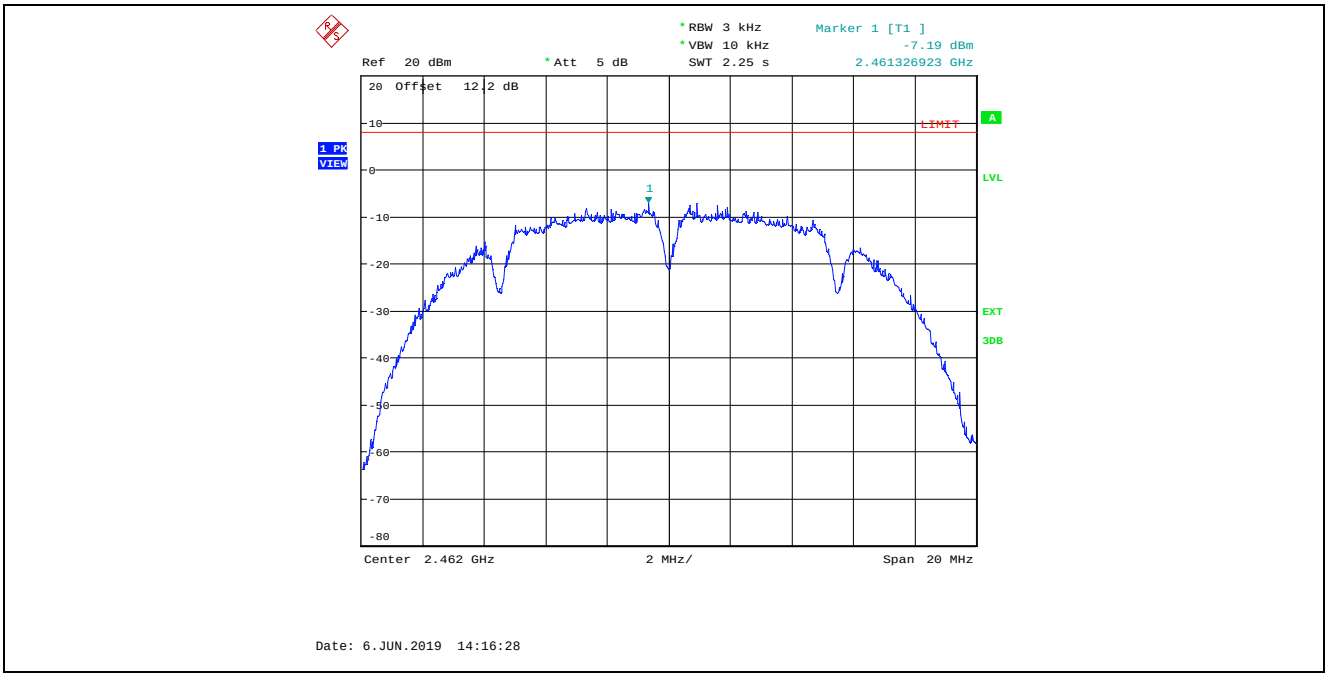
Plot 5.5.4.4. Power Spectral Density
802.11b, DQPSK 2Mbps, Power Setting 17, Channel 1, 2412 MHz,



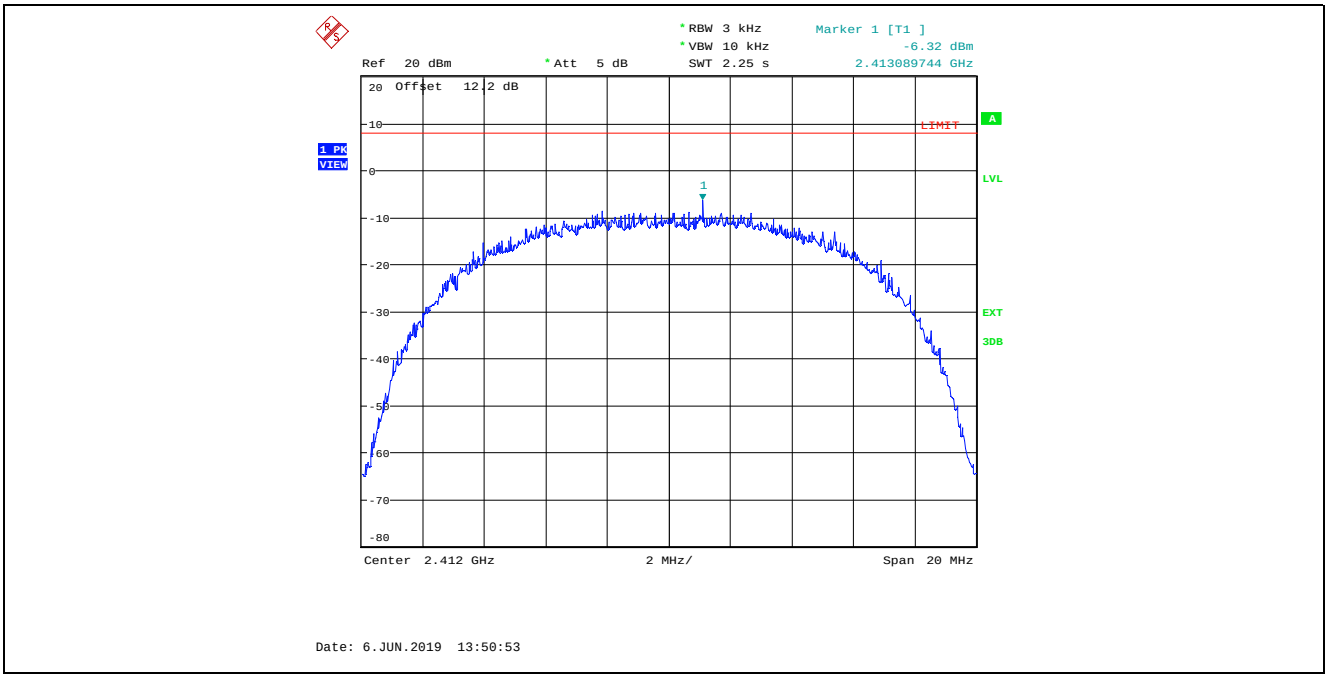
Plot 5.5.4.5. Power Spectral Density
802.11b, DQPSK 2Mbps, Power Setting 17, Channel 6, 2437 MHz,



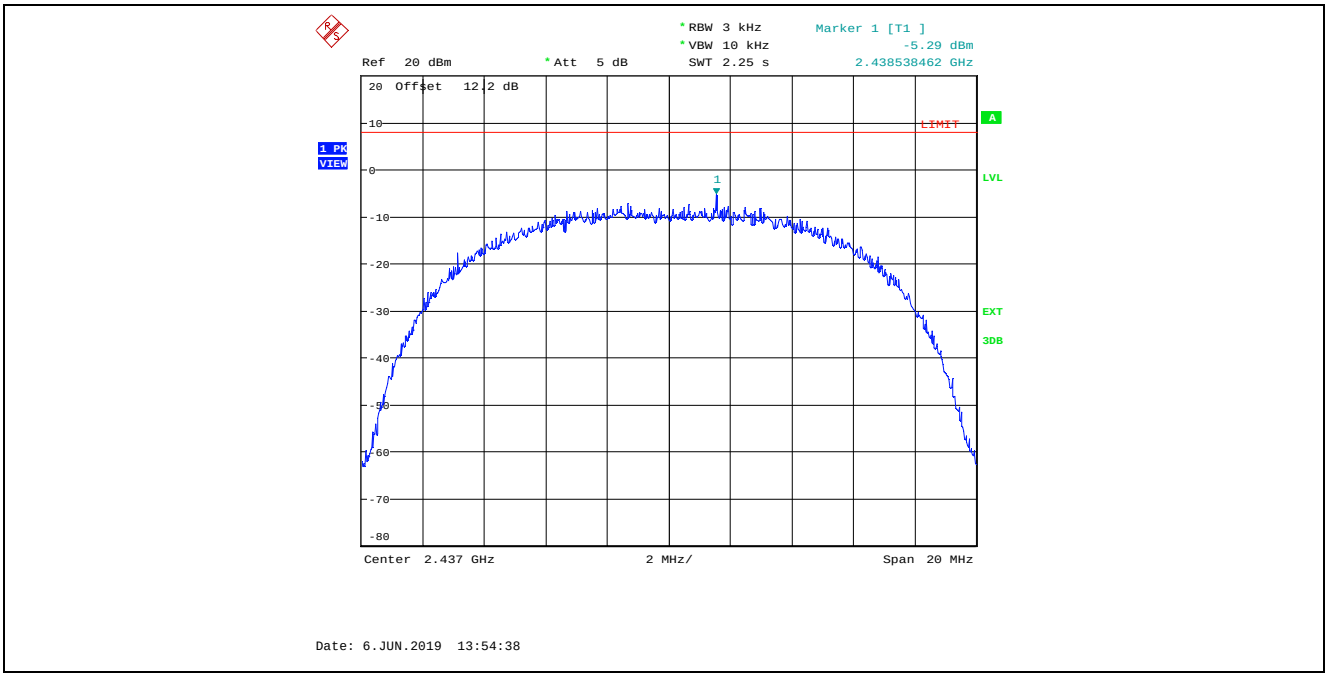
Plot 5.5.4.6. Power Spectral Density
802.11b, DQPSK 2Mbps, Power Setting 17, Channel 11, 2462 MHz,



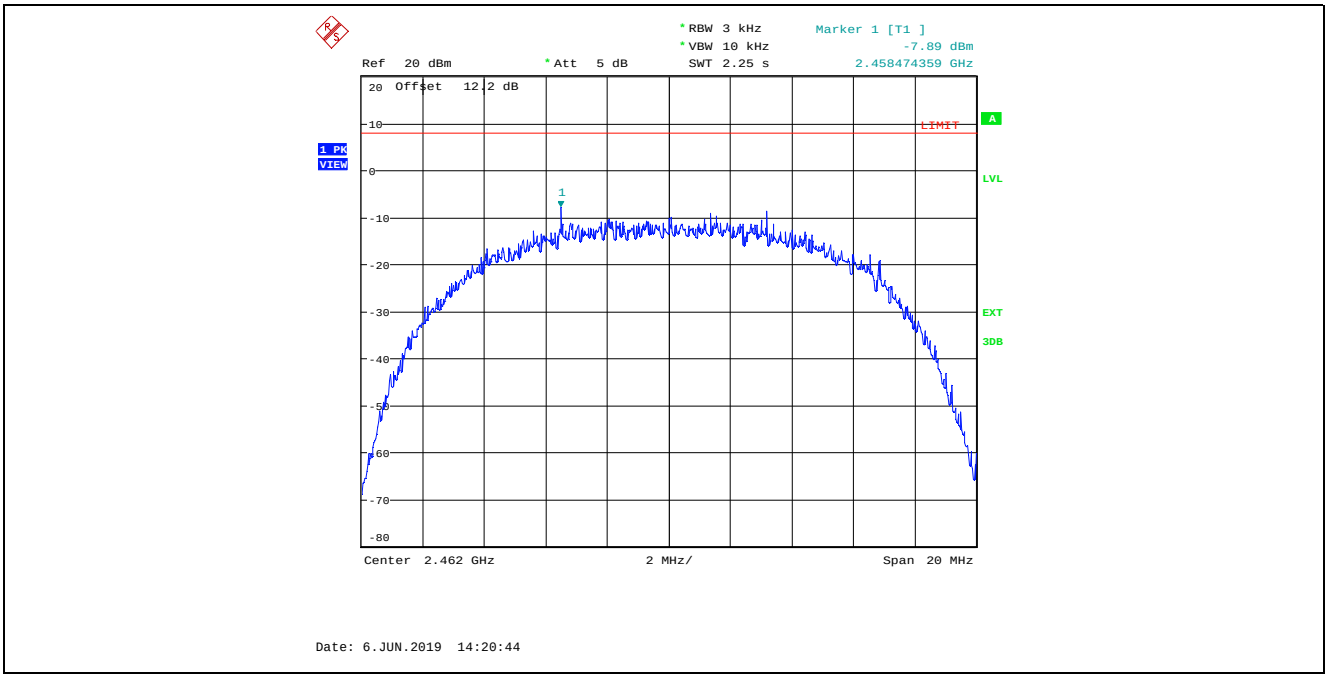
Plot 5.5.4.7. Power Spectral Density
802.11b, CCK 11Mbps, Power Setting 17, Channel 1, 2412 MHz



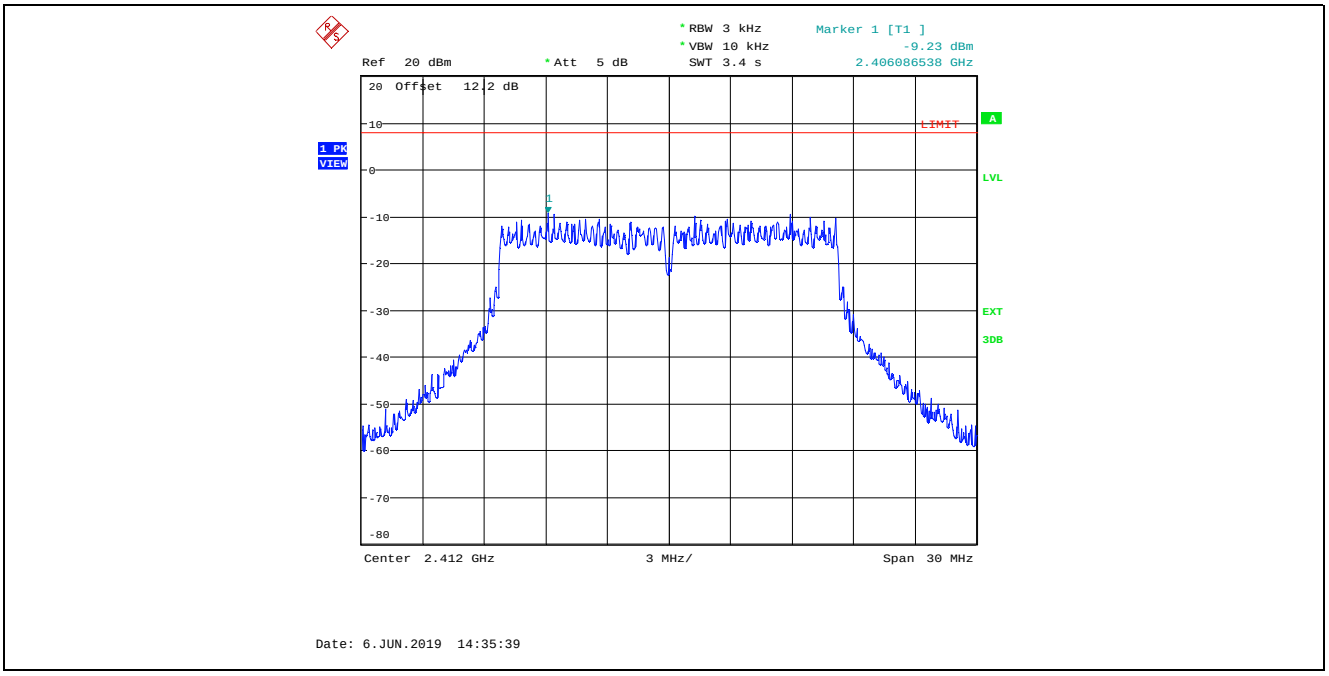
Plot 5.5.4.8. Power Spectral Density
802.11b, CCK 11Mbps, Power Setting 17, Channel 6, 2437 MHz



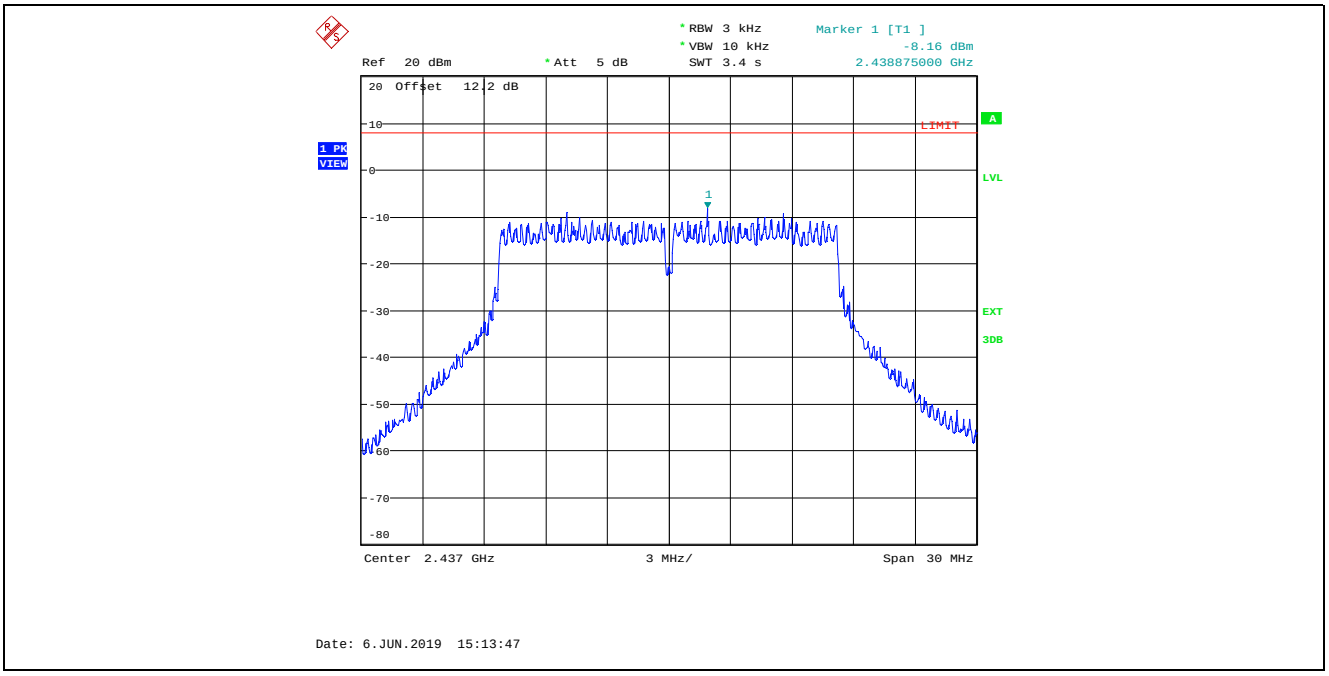
Plot 5.5.4.9. Power Spectral Density
802.11b, CCK 11Mbps, Power Setting 17, Channel 11, 2462 MHz



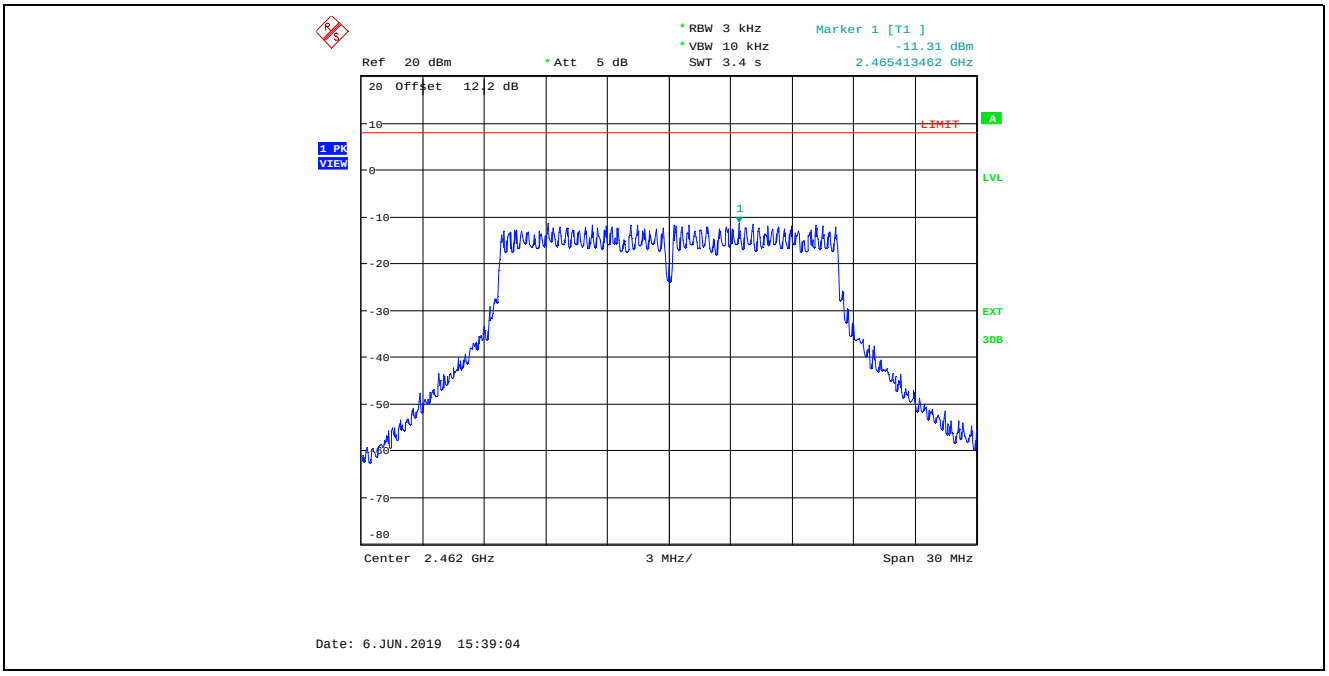
Plot 5.5.4.10. Power Spectral Density
802.11g, BPSK 9Mbps, Power Setting 17, Channel 1, 2412 MHz



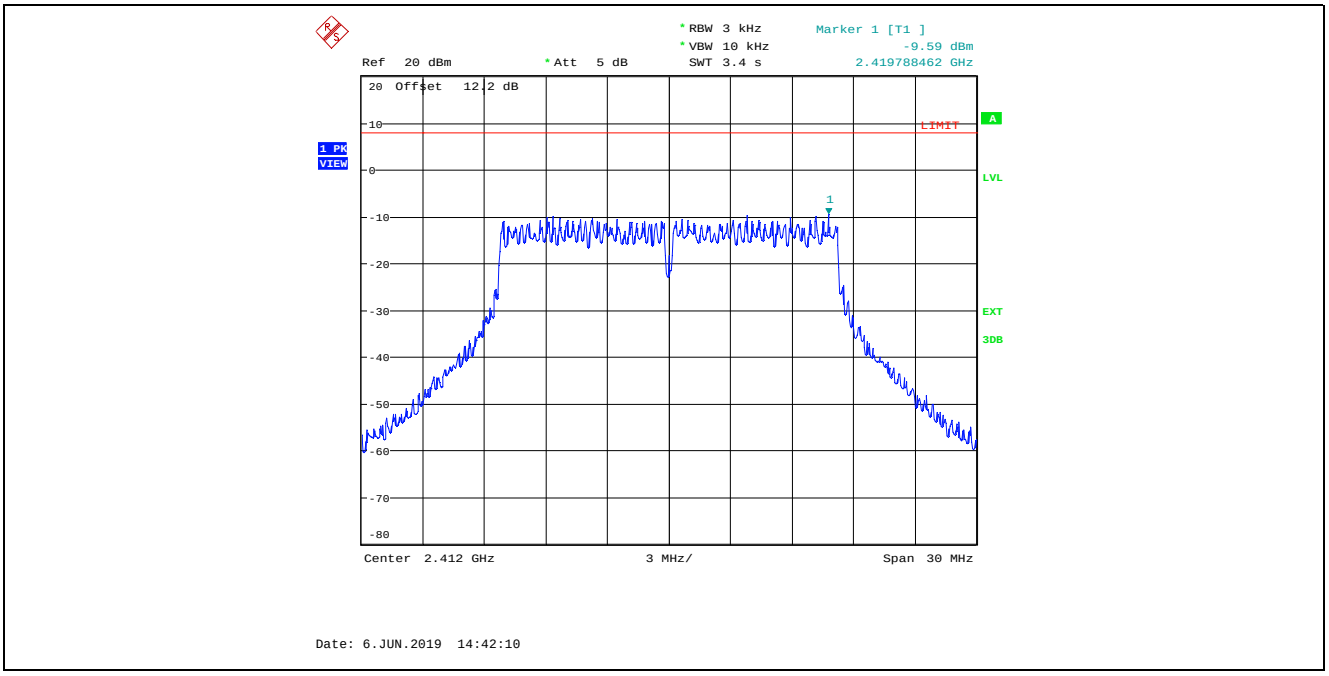
Plot 5.5.4.11. Power Spectral Density
802.11g, BPSK 9Mbps, Power Setting 17, Channel 6, 2437 MHz



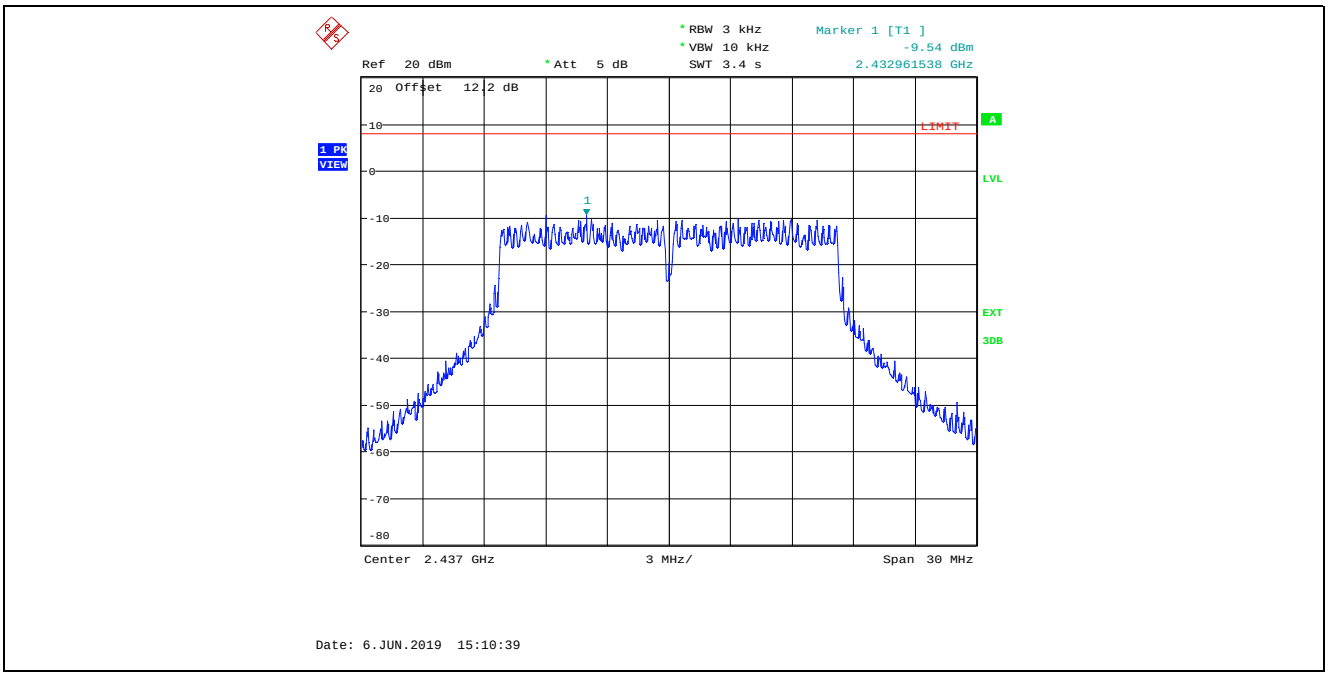
Plot 5.5.4.12. Power Spectral Density
802.11g, BPSK 9Mbps, Power Setting 15, Channel 11, 2462 MHz



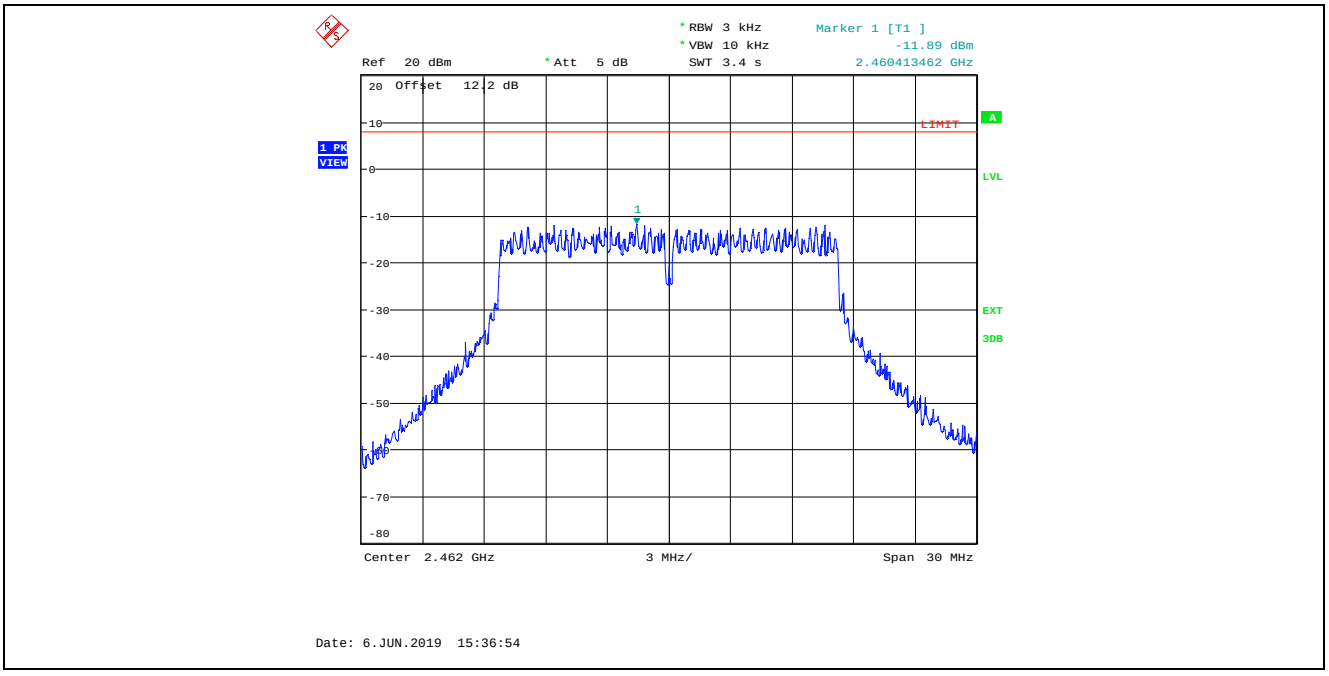
Plot 5.5.4.13. Power Spectral Density
802.11g, QPSK 18Mbps, Power Setting 17, Channel 1, 2412 MHz



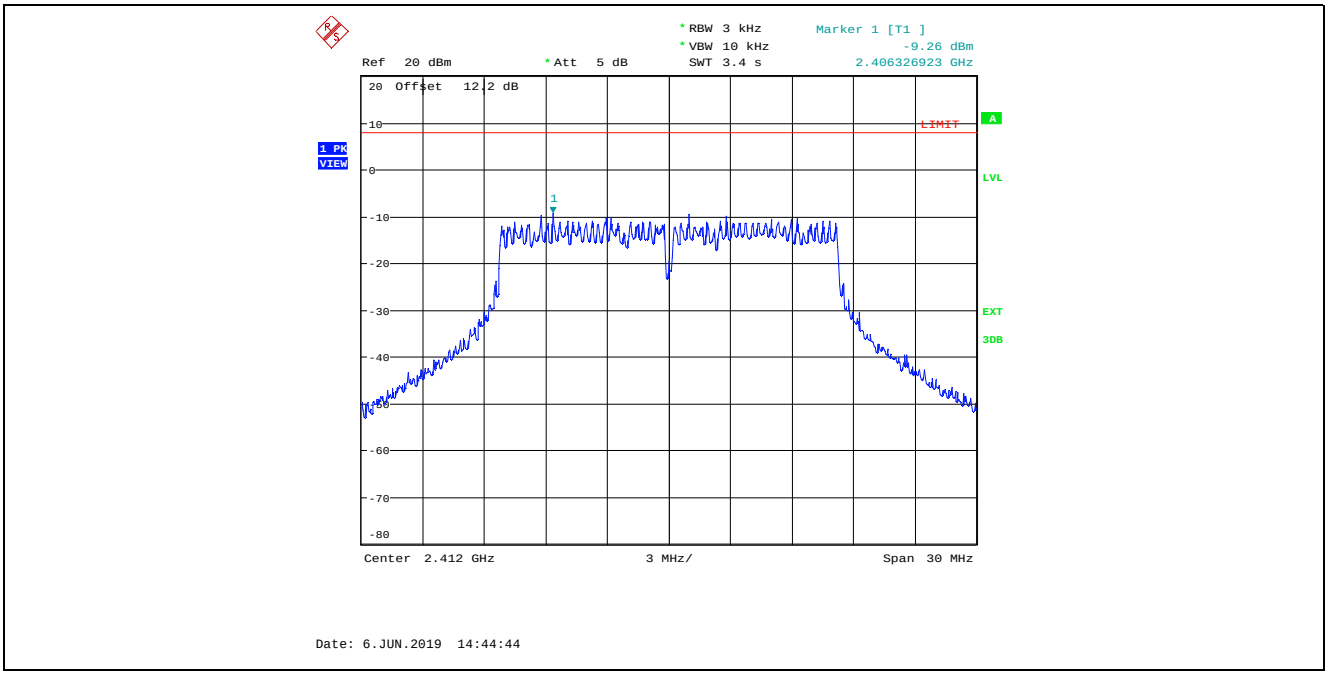
Plot 5.5.4.14. Power Spectral Density
802.11g, QPSK 18Mbps, Power Setting 17, Channel 6, 2437 MHz



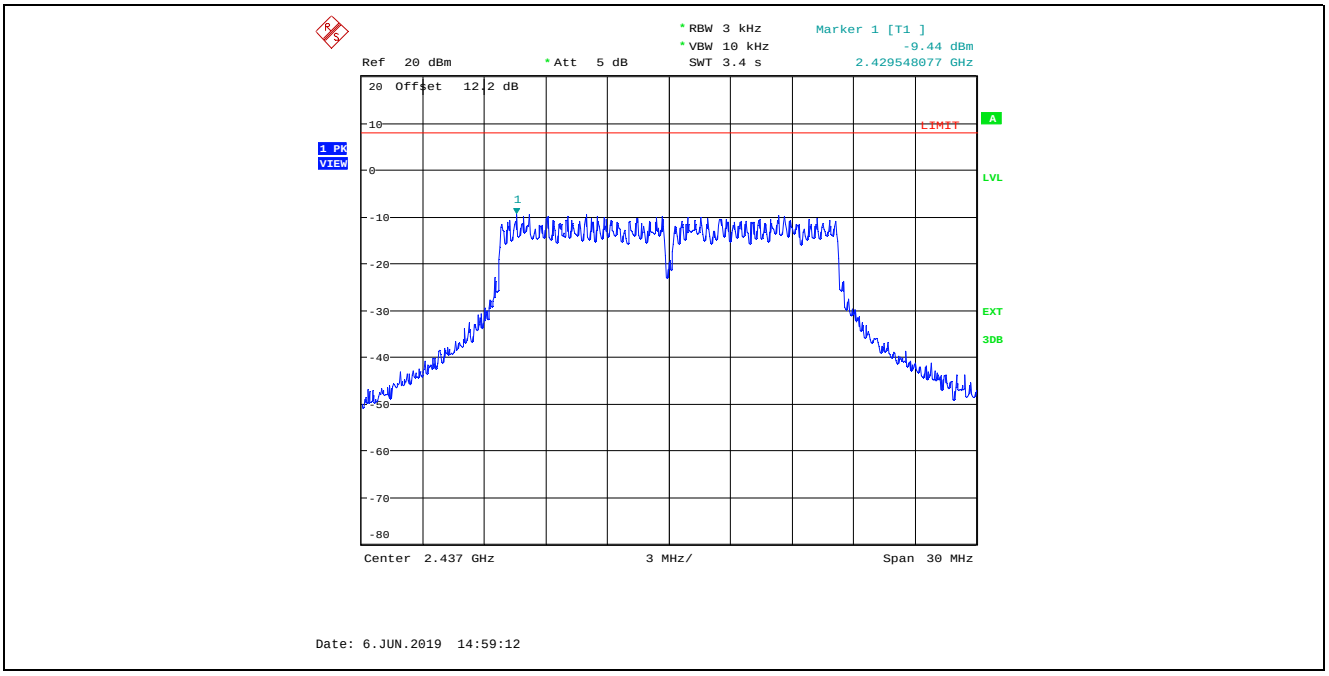
Plot 5.5.4.15. Power Spectral Density
802.11g, QPSK 18Mbps, Power Setting 15, Channel 11, 2462 MHz



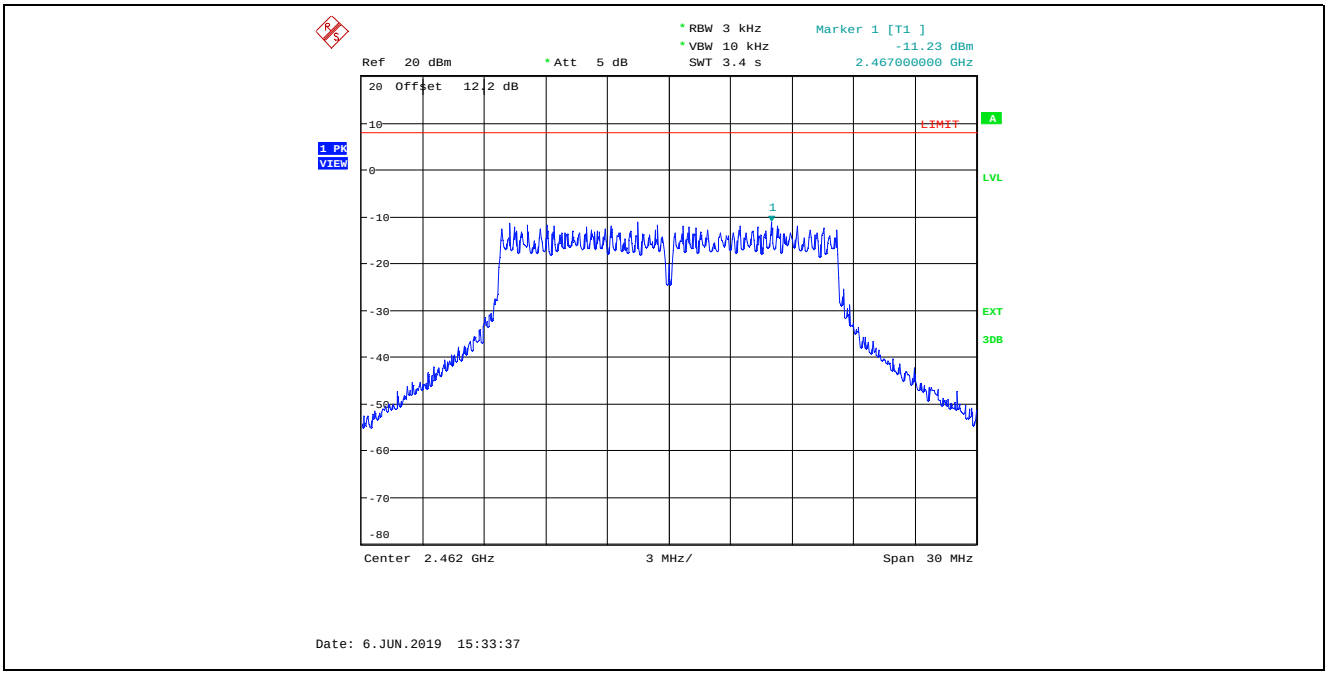
Plot 5.5.4.16. Power Spectral Density
802.11g, 16-QAM 36Mbps, Power Setting 17, Channel 1, 2412 MHz



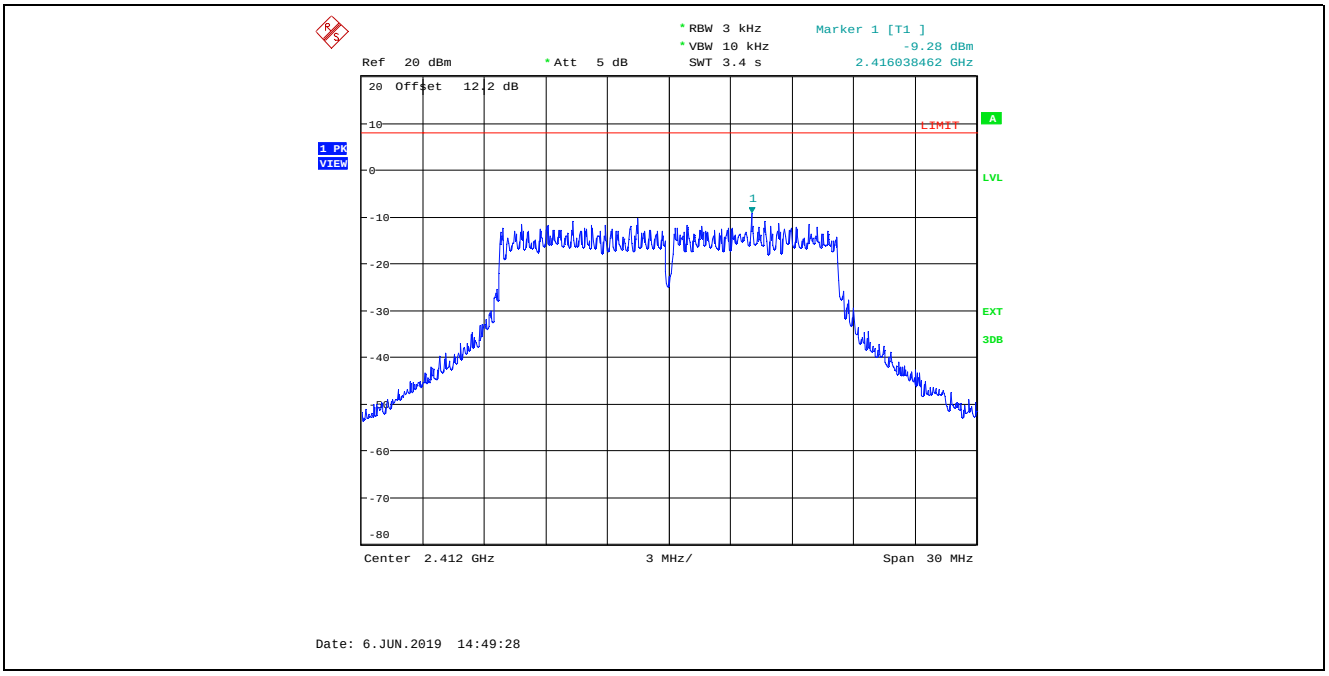
Plot 5.5.4.17. Power Spectral Density
802.11g, 16-QAM 36Mbps, Power Setting 17, Channel 6, 2437 MHz



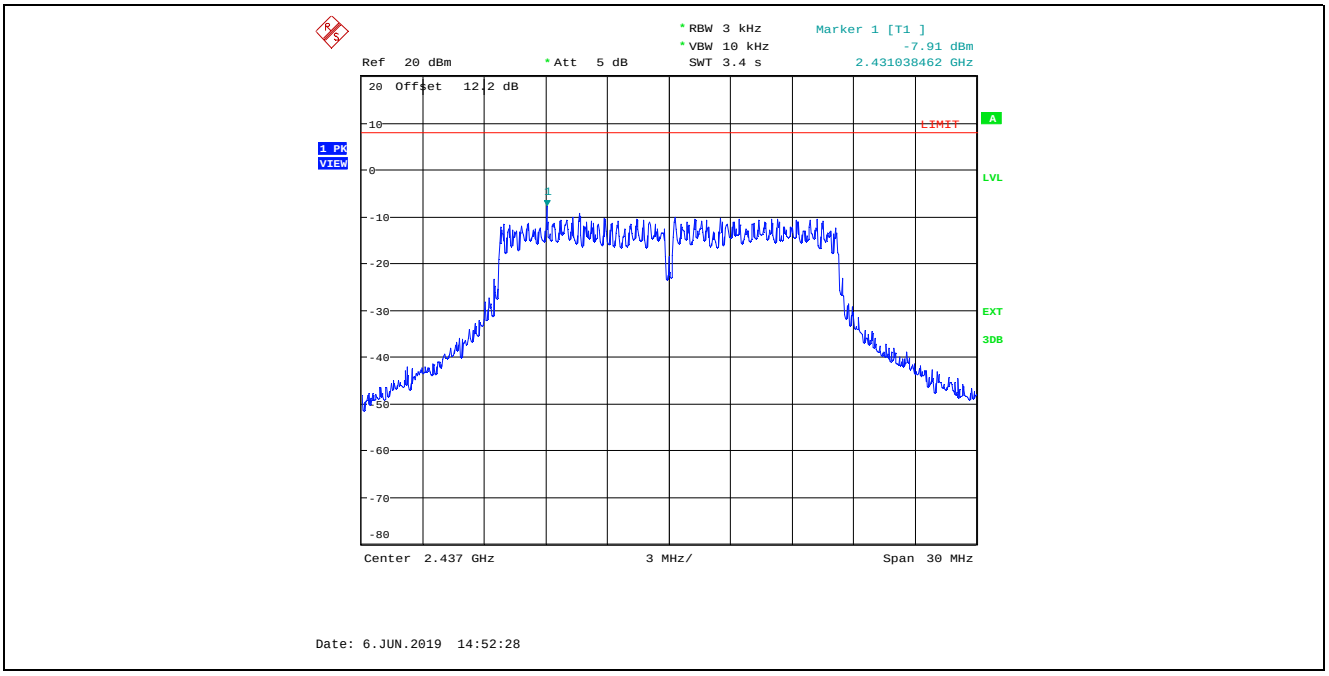
Plot 5.5.4.18. Power Spectral Density
802.11g, 16-QAM 36Mbps, Power Setting 15, Channel 11, 2462 MHz



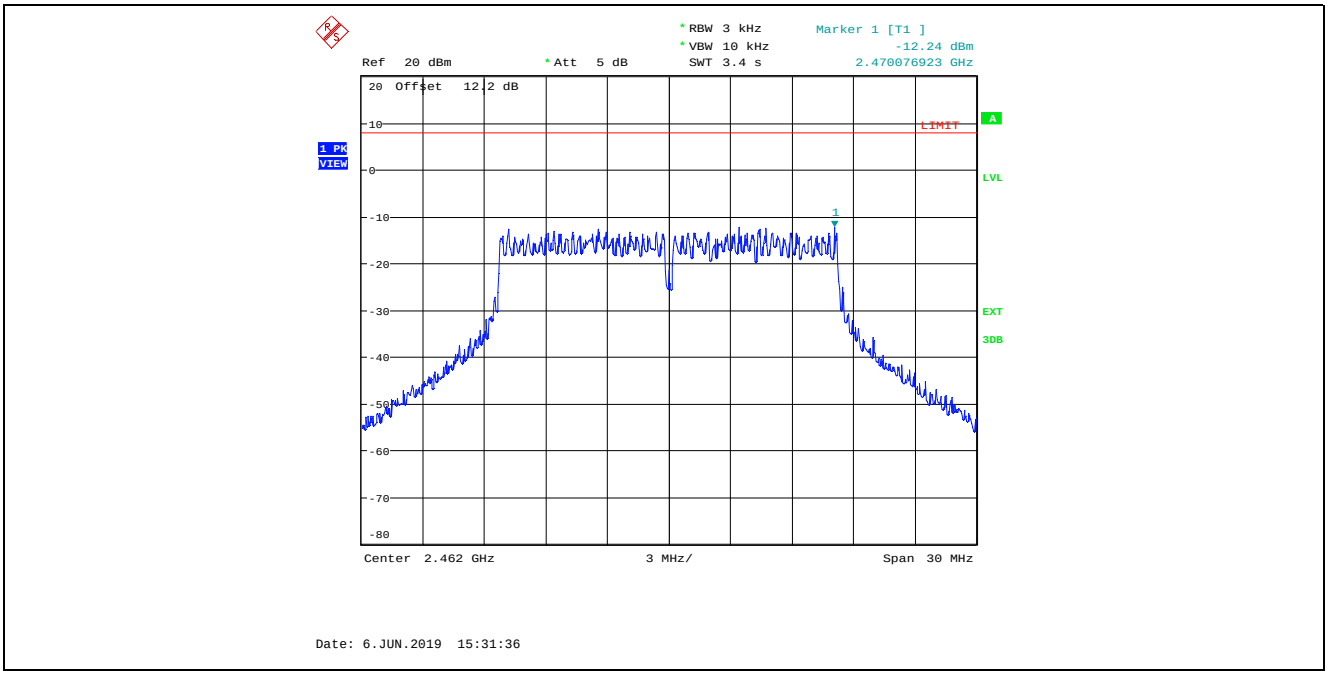
Plot 5.5.4.19. Power Spectral Density
802.11g, 64-QAM 54Mbps, Power Setting 17, Channel 1, 2412 MHz



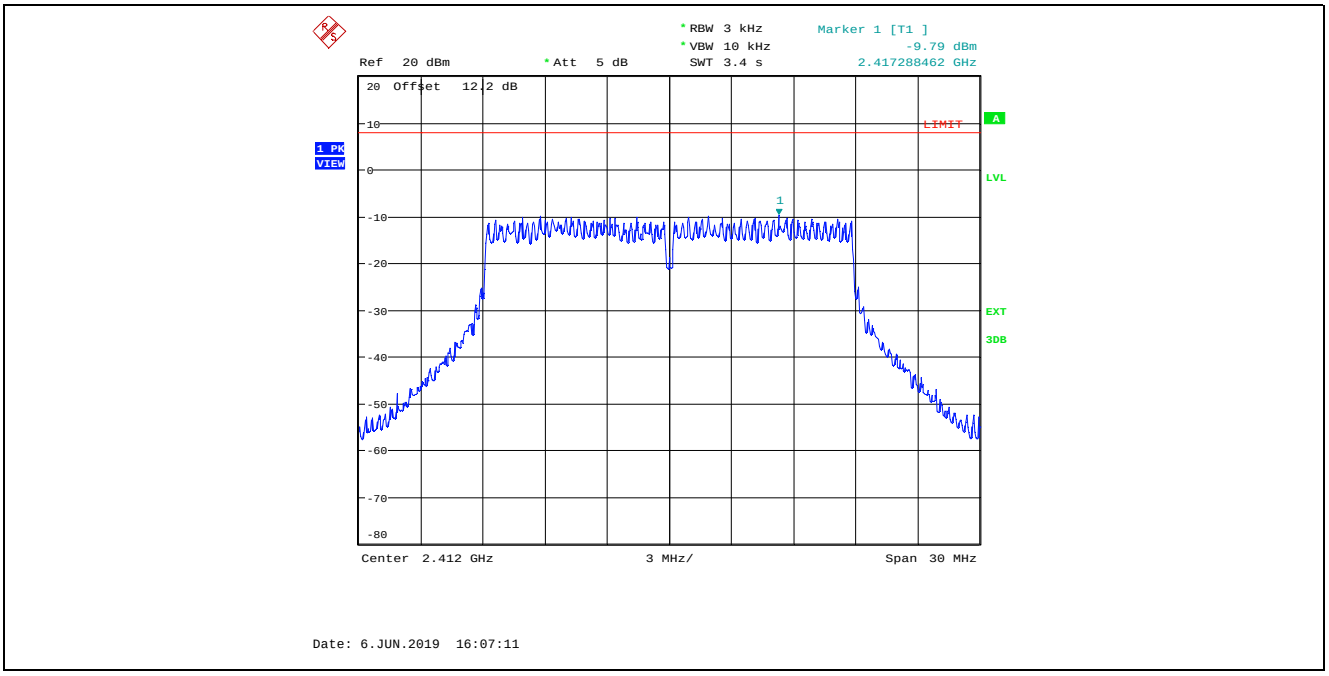
Plot 5.5.4.20. Power Spectral Density
802.11g, 64-QAM 54Mbps, Power Setting 17, Channel 6, 2437 MHz



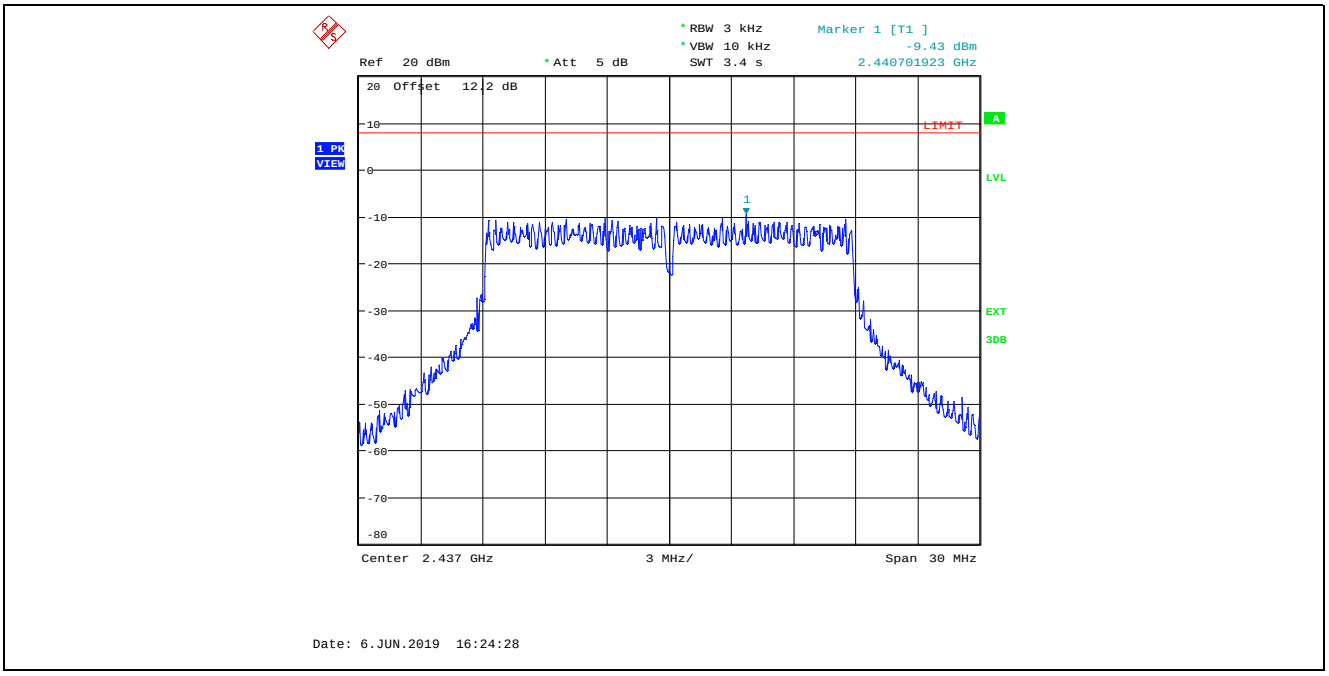
Plot 5.5.4.21. Power Spectral Density
802.11g, 64-QAM 54Mbps, Power Setting 15, Channel 11, 2462 MHz



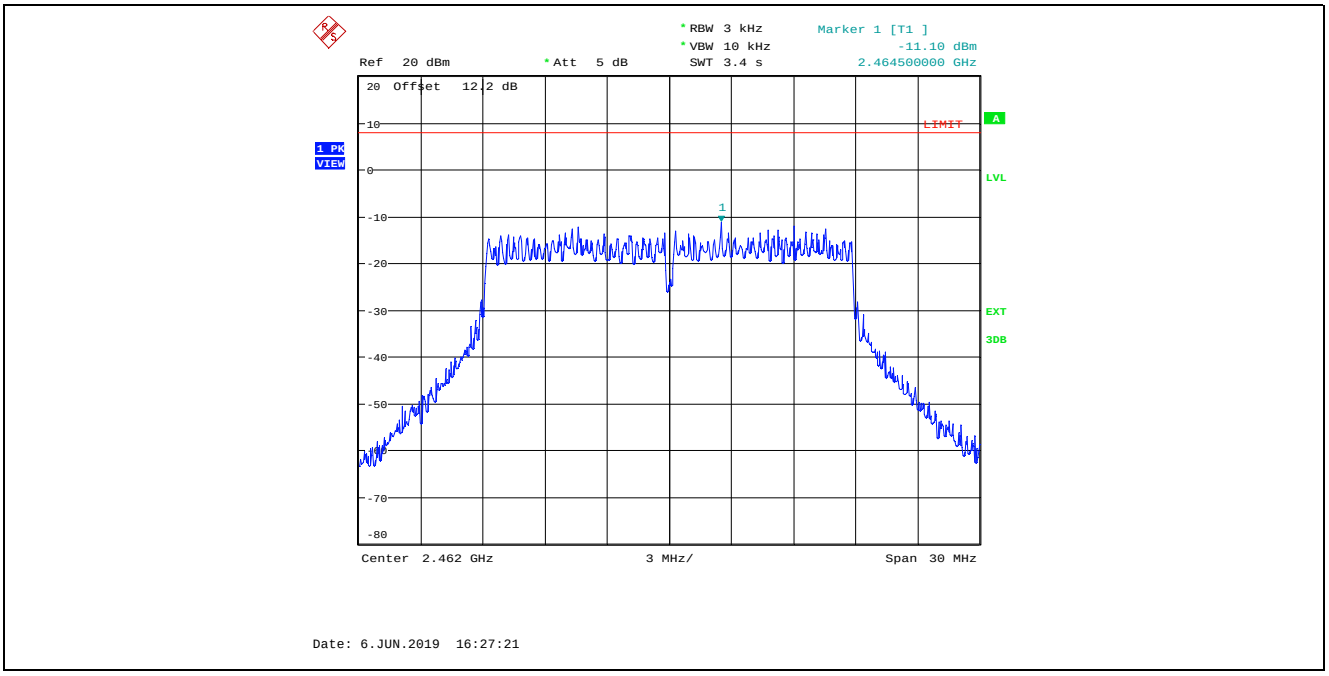
Plot 5.5.4.22. Power Spectral Density
802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps, Power Setting 17, Channel 1, 2412 MHz



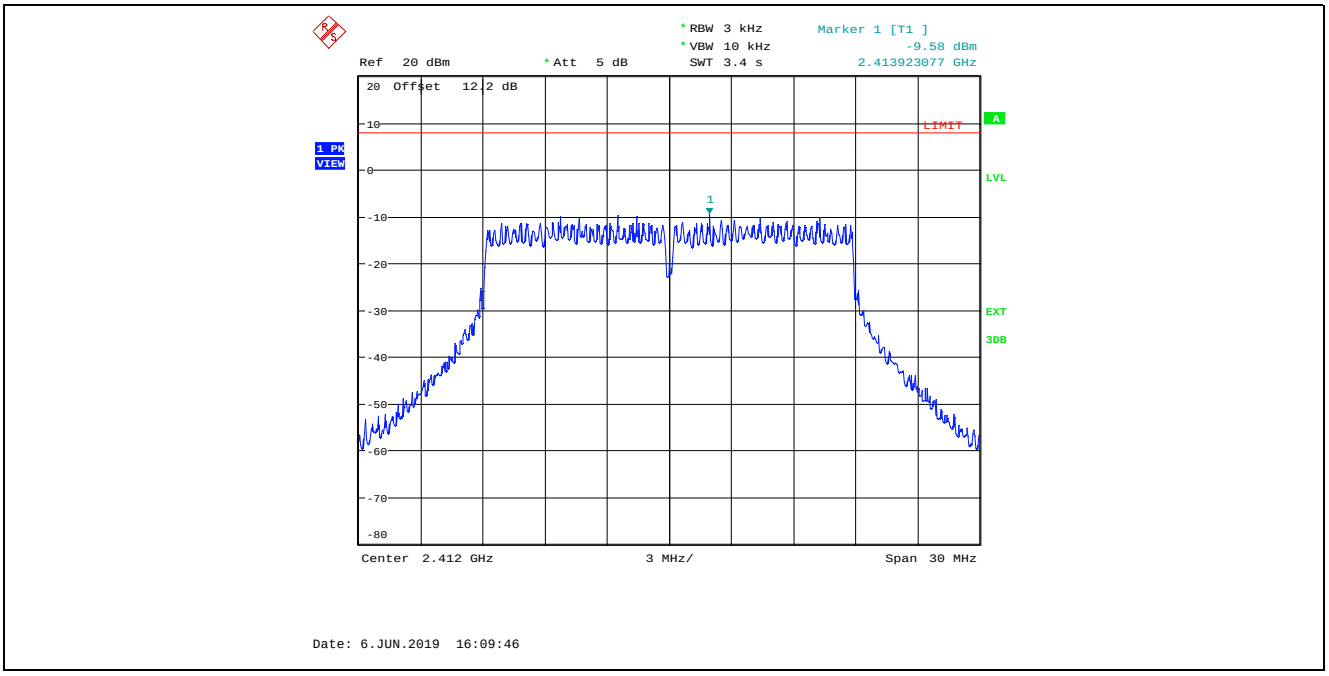
Plot 5.5.4.23. Power Spectral Density
802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps, Power Setting 17, Channel 6, 2437 MHz



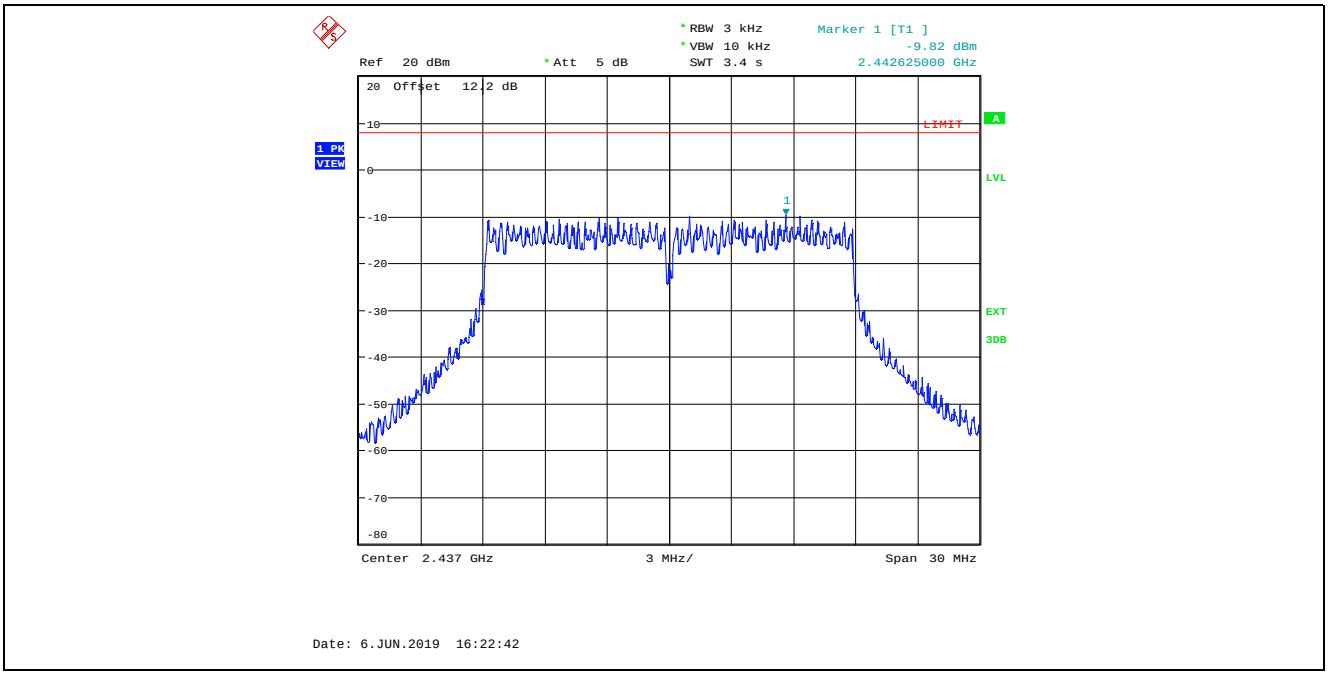
Plot 5.5.4.24. Power Spectral Density
802.11n HT20, MCS 0 BPSK ½ 6.5 Mbps, Power Setting 15, Channel 11, 2462 MHz



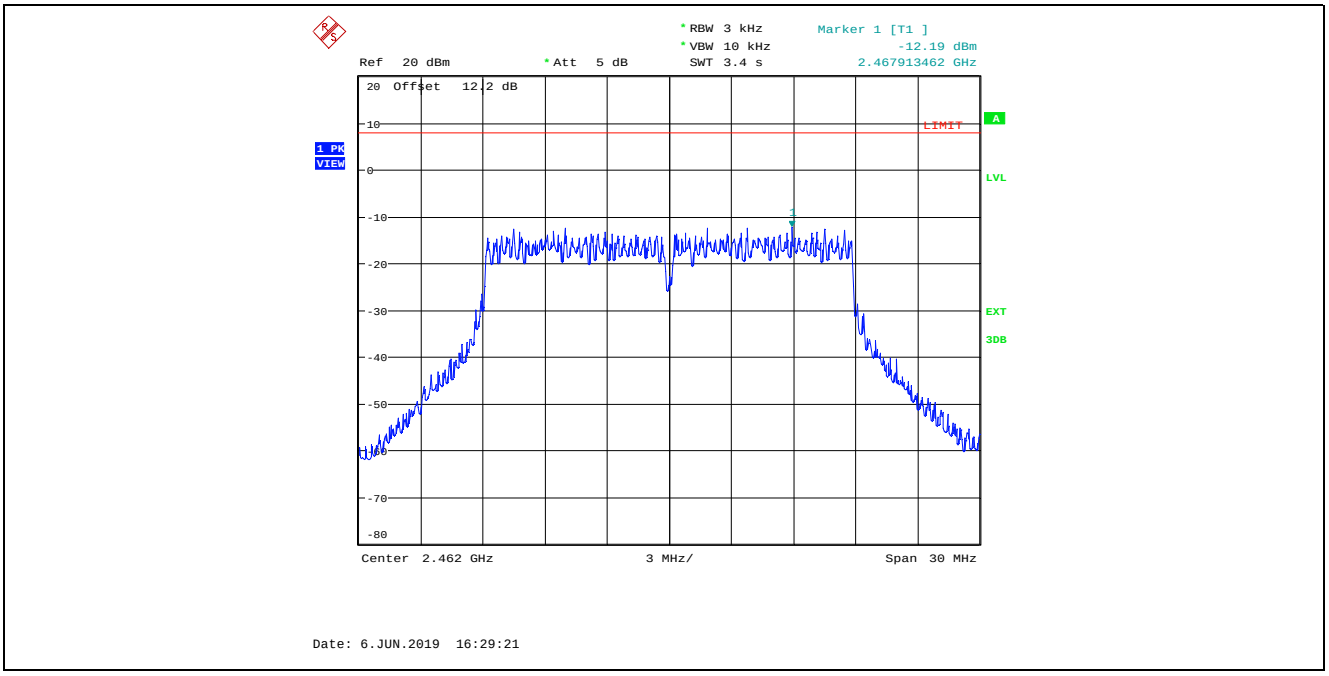
Plot 5.5.4.25. Power Spectral Density
802.11n HT20, MCS 2 QPSK ¾ 19.5 Mbps , Power Setting 17, Channel 1, 2412 MHz



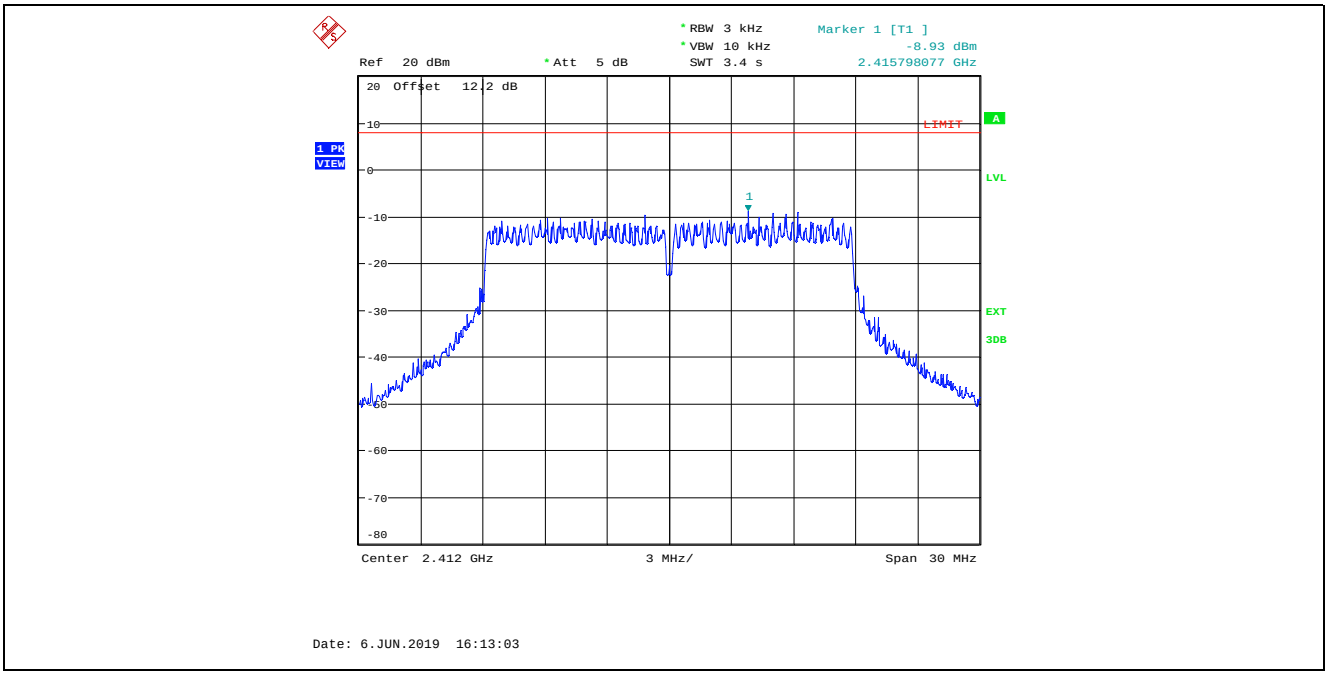
Plot 5.5.4.26. Power Spectral Density
802.11n HT20, MCS 2 QPSK ¾ 19.5 Mbps , Power Setting 17, Channel 6, 2437 MHz



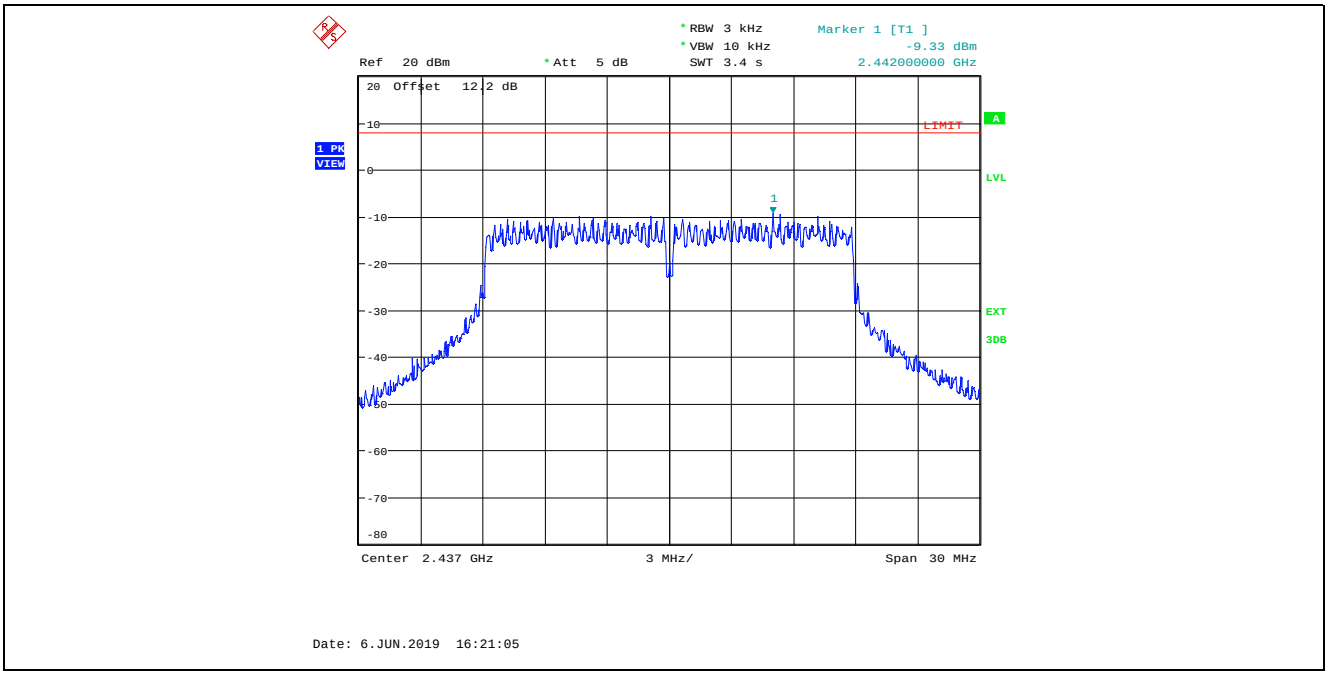
Plot 5.5.4.27. Power Spectral Density
802.11n HT20, MCS 2 QPSK ¾ 19.5 Mbps , Power Setting 15, Channel 11, 2462 MHz



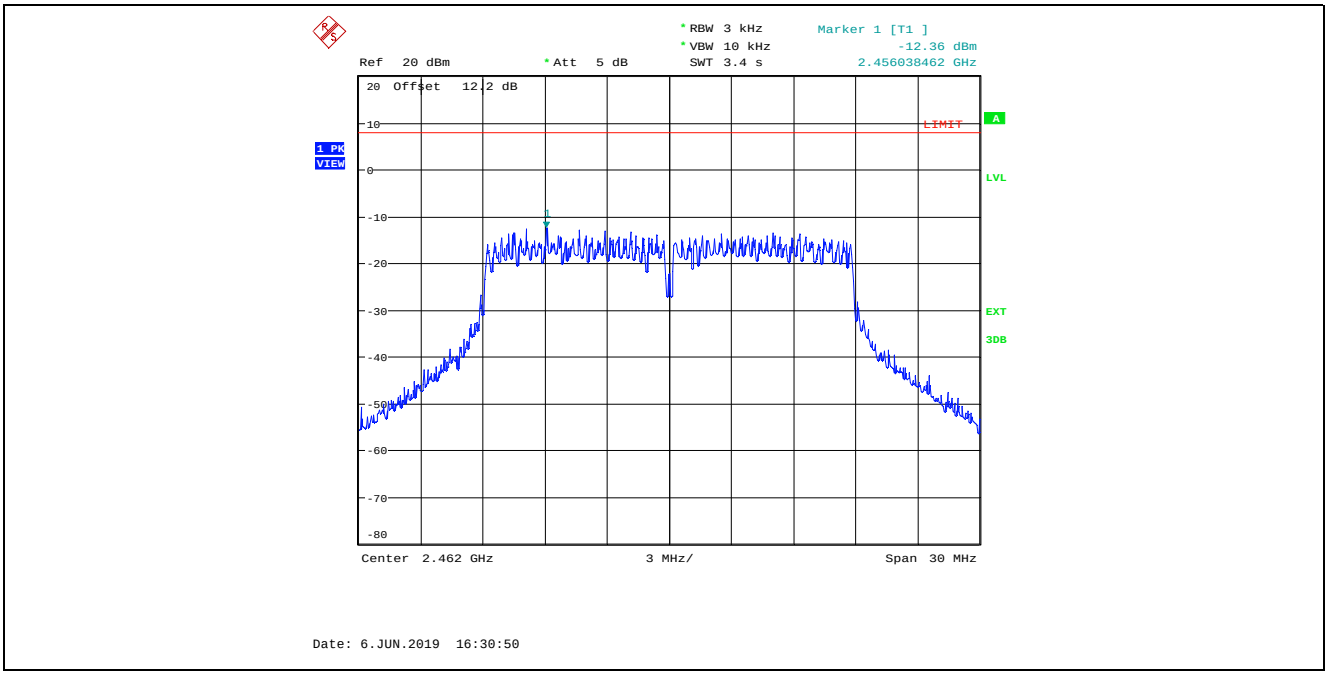
Plot 5.5.4.28. Power Spectral Density
802.11n HT20, MCS 4 16-QAM ¾ 39 Mbps , Power Setting 17, Channel 1, 2412 MHz



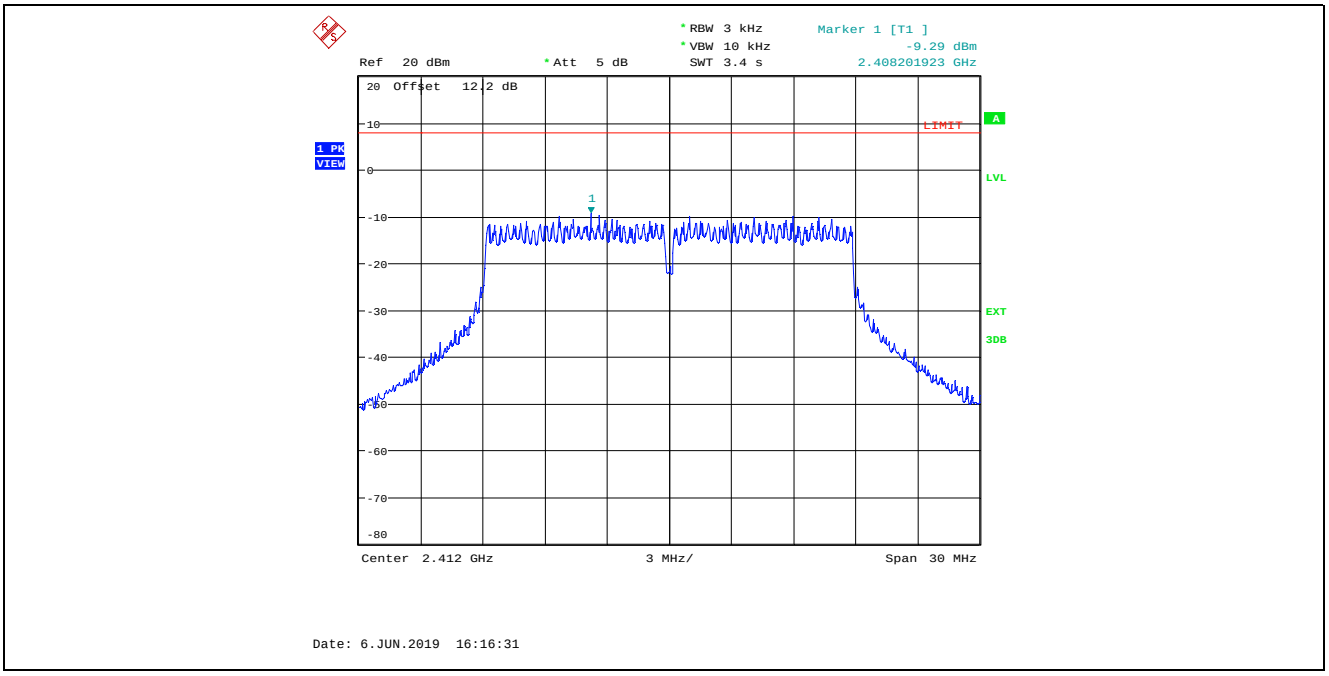
Plot 5.5.4.29. Power Spectral Density
802.11n HT20, MCS 4 16-QAM ¾ 39 Mbps , Power Setting 17, Channel 6, 2437 MHz



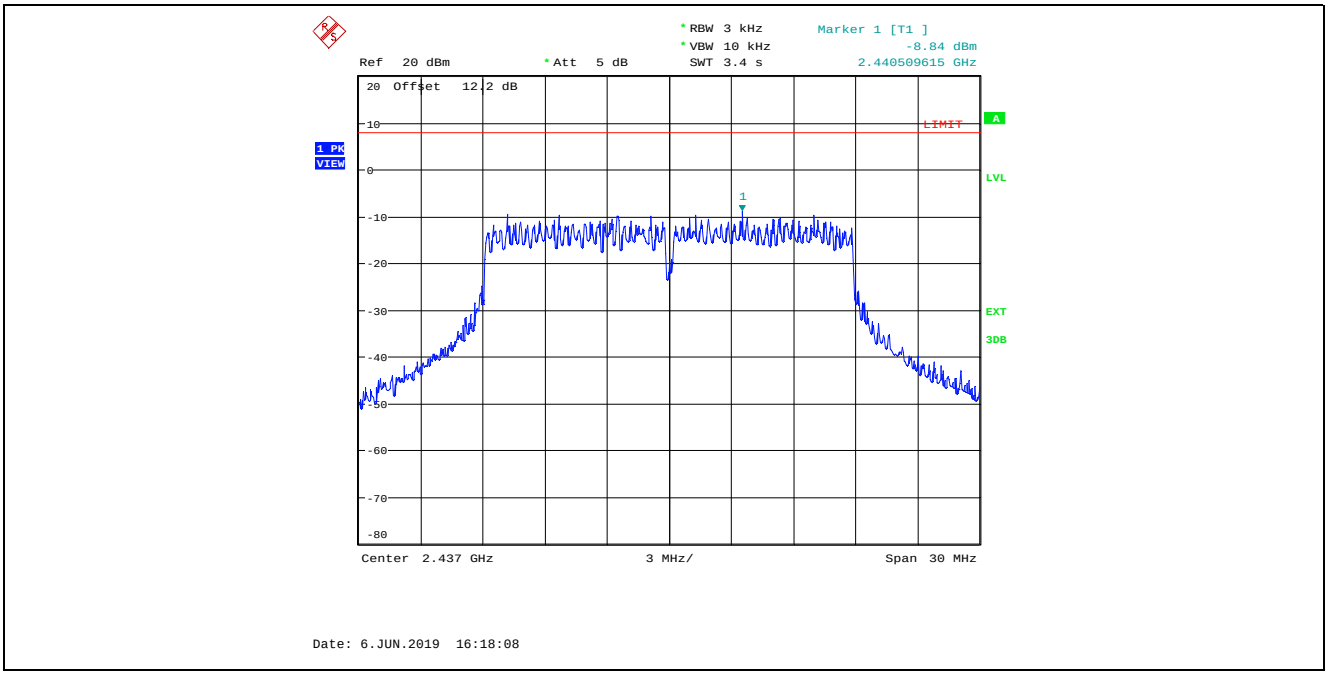
Plot 5.5.4.30. Power Spectral Density
802.11n HT20, MCS 4 16-QAM ¾ 39 Mbps , Power Setting 15, Channel 11, 2462 MHz



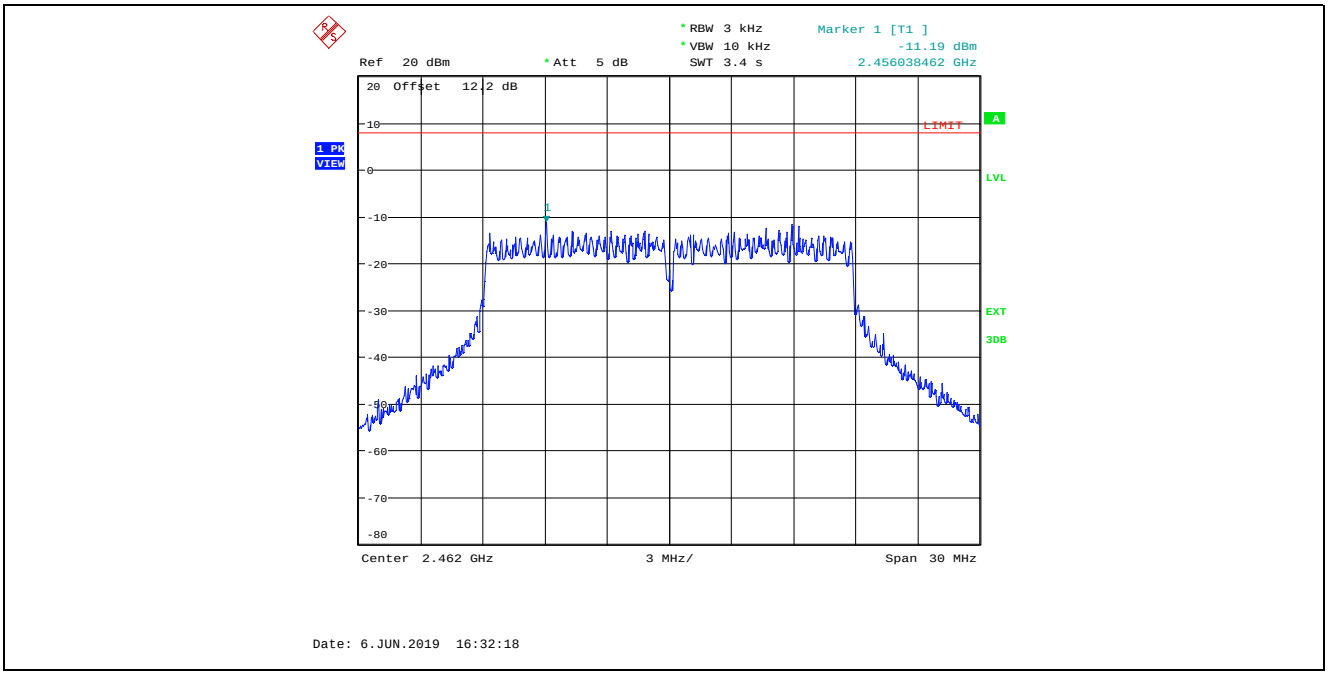
Plot 5.5.4.31. Power Spectral Density
802.11n HT20, MCS 7 64-QAM 5/6 65 Mbps, Power Setting 17, Channel 1, 2412 MHz



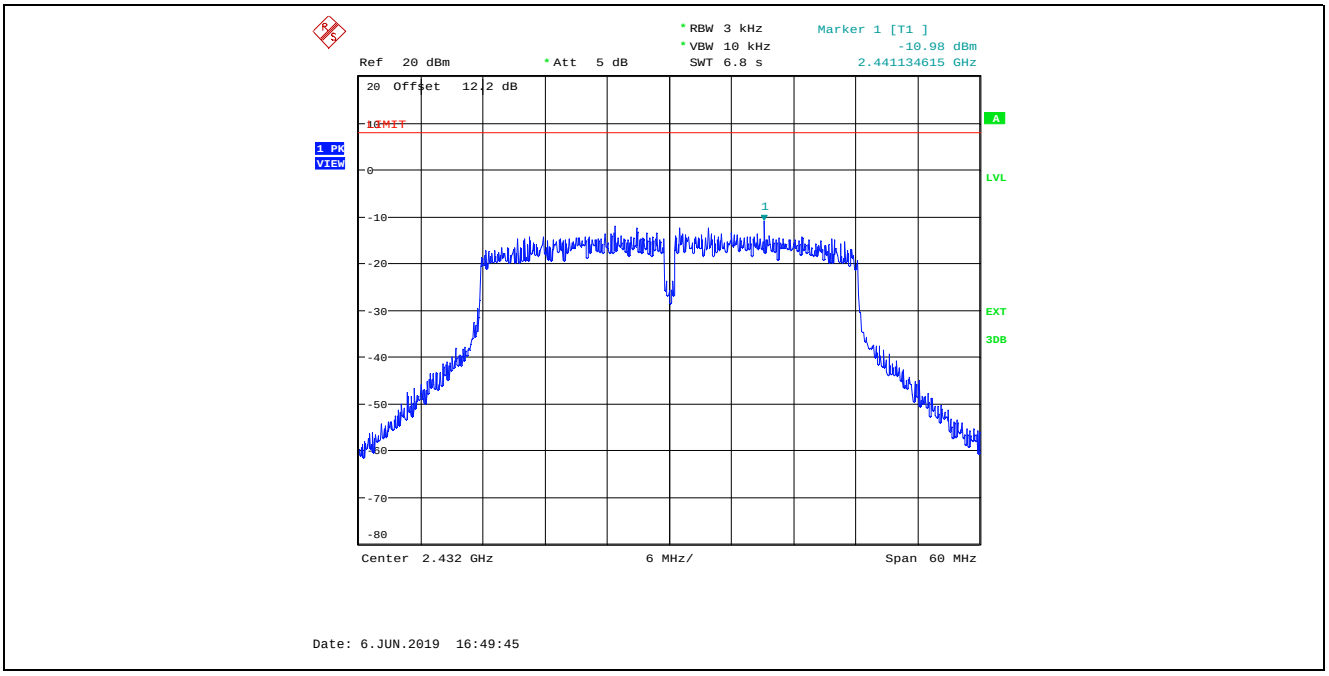
Plot 5.5.4.32. Power Spectral Density
802.11n HT20, MCS 7 64-QAM 5/6 65 Mbps, Power Setting 17, Channel 6, 2437 MHz



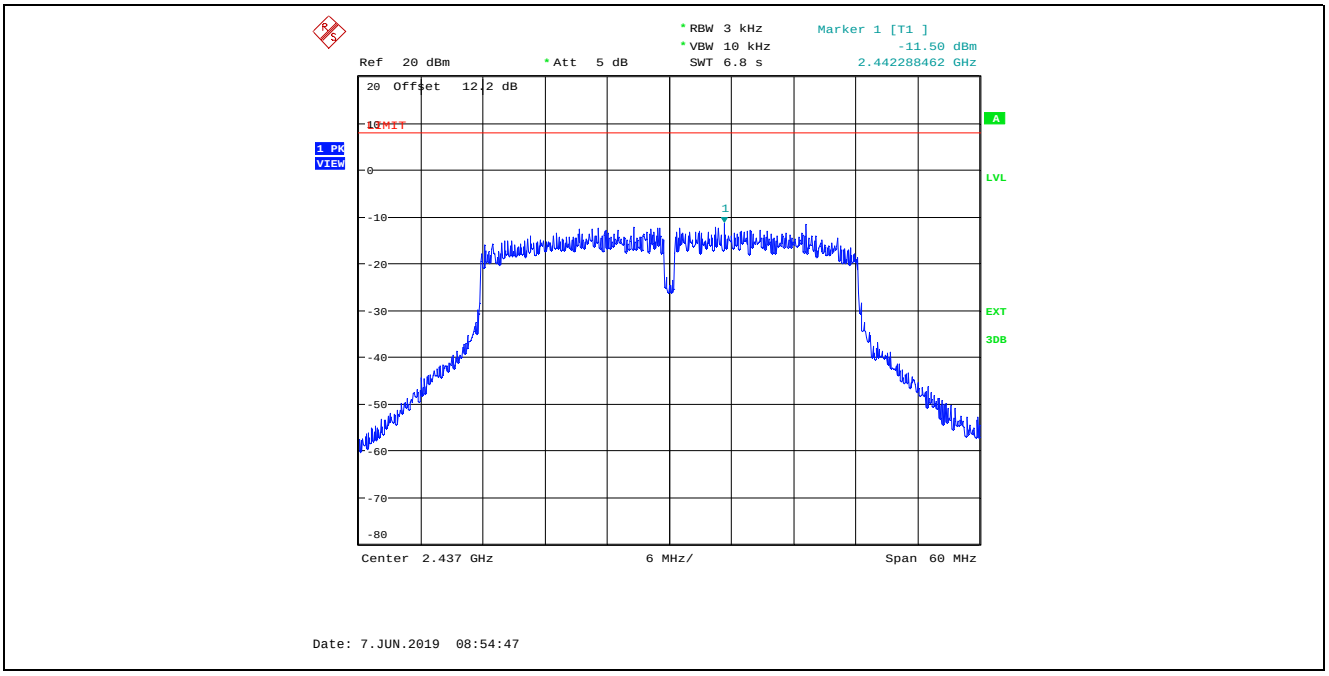
Plot 5.5.4.33. Power Spectral Density
802.11n HT20, MCS 7 64-QAM 5/6 65 Mbps, Power Setting 15, Channel 11, 2462 MHz



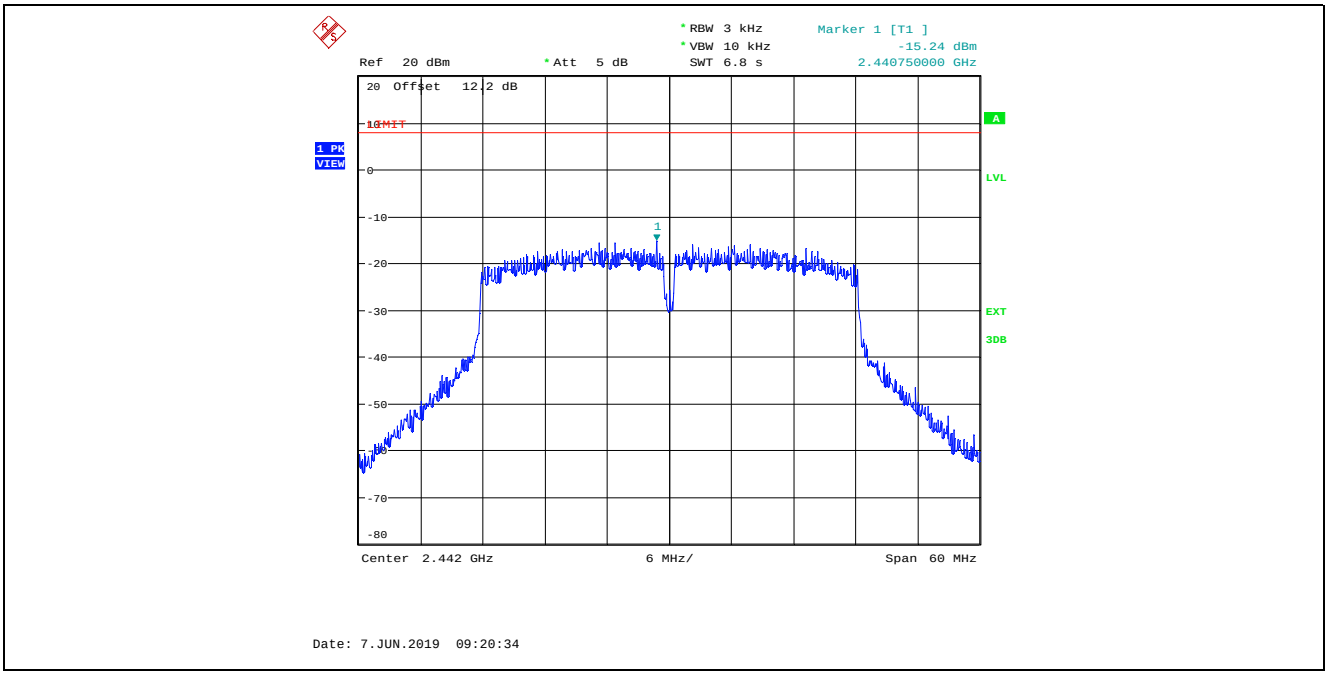
Plot 5.5.4.34. Power Spectral Density
802.11n HT40, MCS 0 BPSK ½ 13.5Mbps, Power Setting 16, Channel 5, 2432 MHz



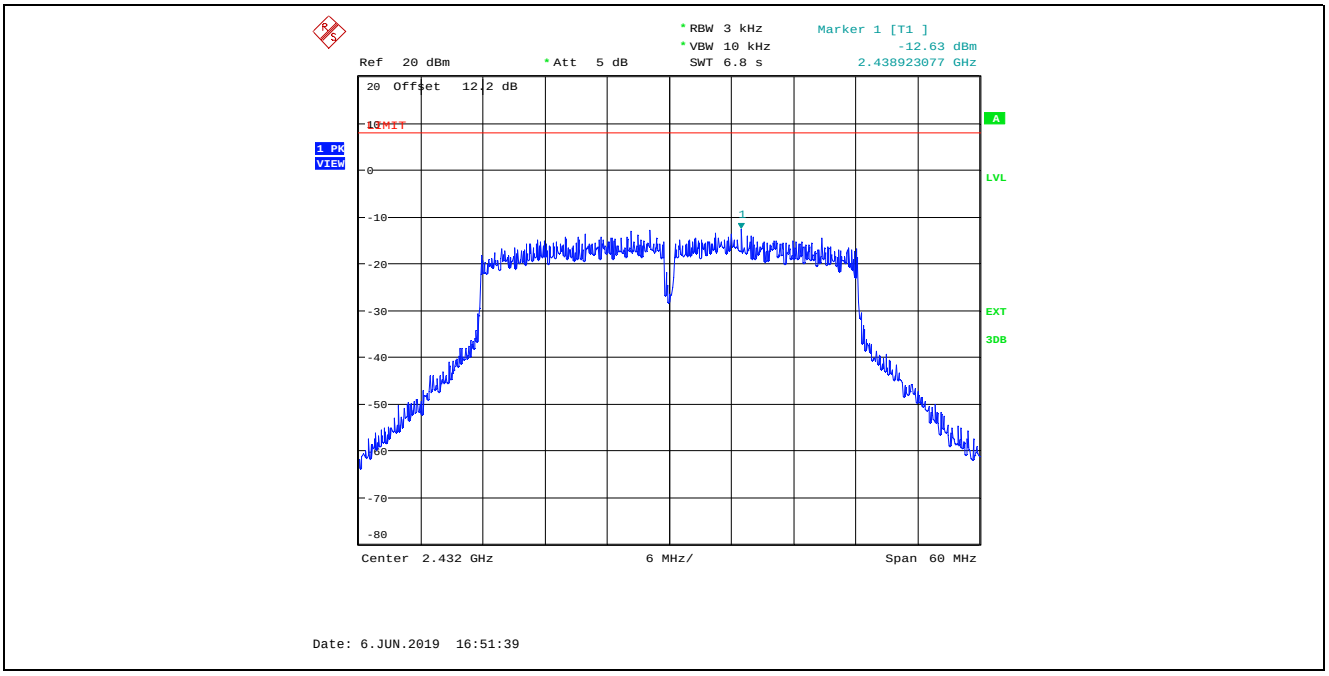
Plot 5.5.4.35. Power Spectral Density
802.11n HT40, MCS 0 BPSK ½ 13.5Mbps, Power Setting 16, Channel 6, 2437 MHz



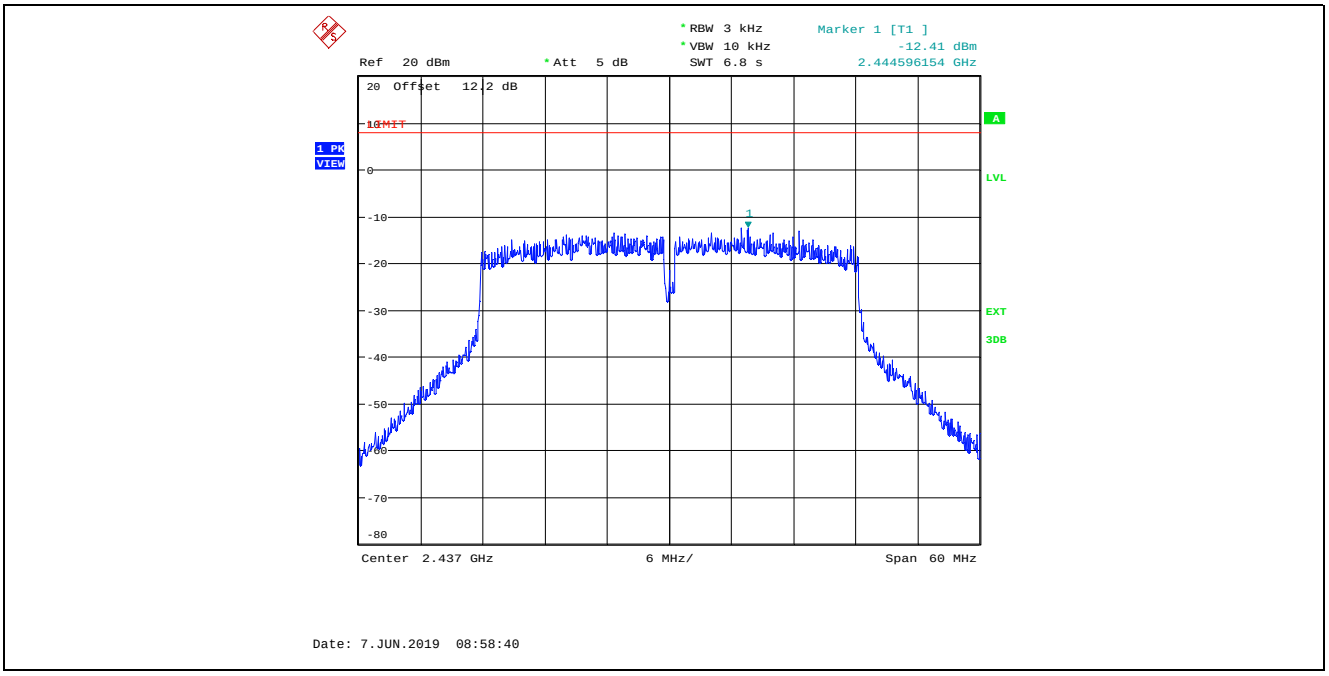
Plot 5.5.4.36. Power Spectral Density
802.11n HT40, MCS 0 BPSK ½ 13.5Mbps, Power Setting 14, Channel 7, 2442 MHz



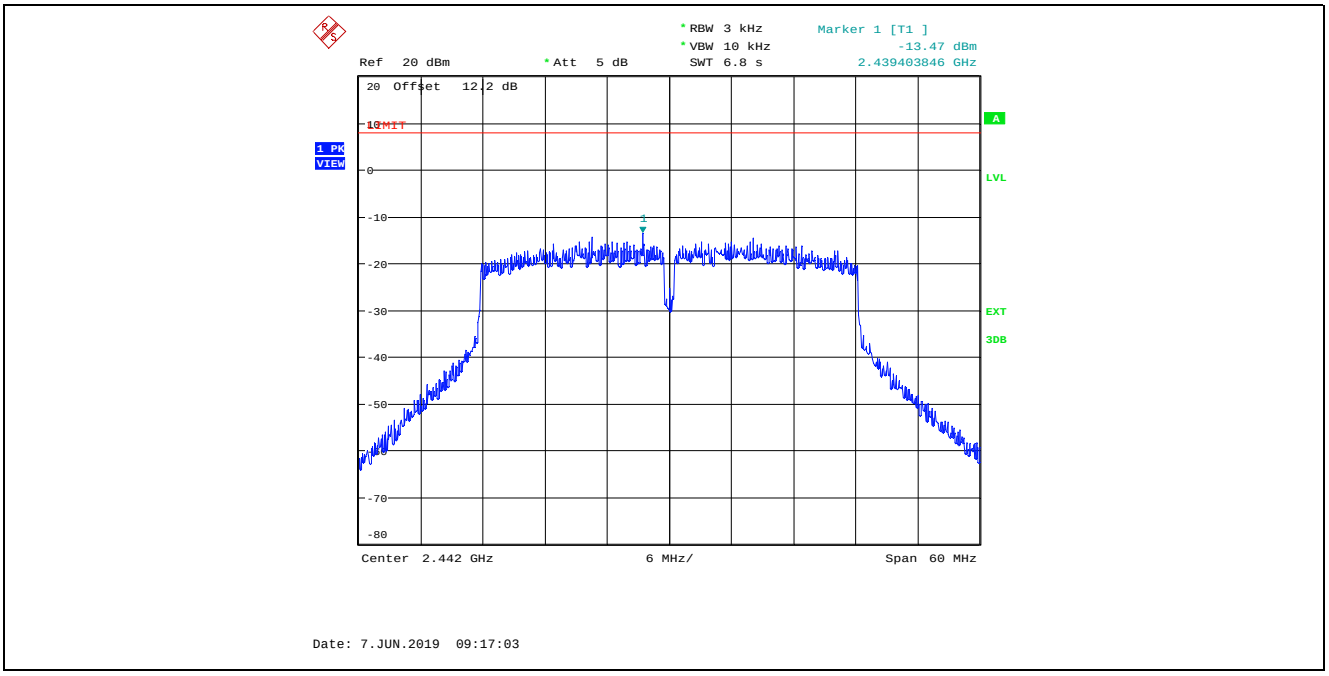
Plot 5.5.4.37. Power Spectral Density
802.11n HT40, MCS 2 QPSK ¾ 40.5Mbps , Power Setting 16, Channel 5, 2432 MHz



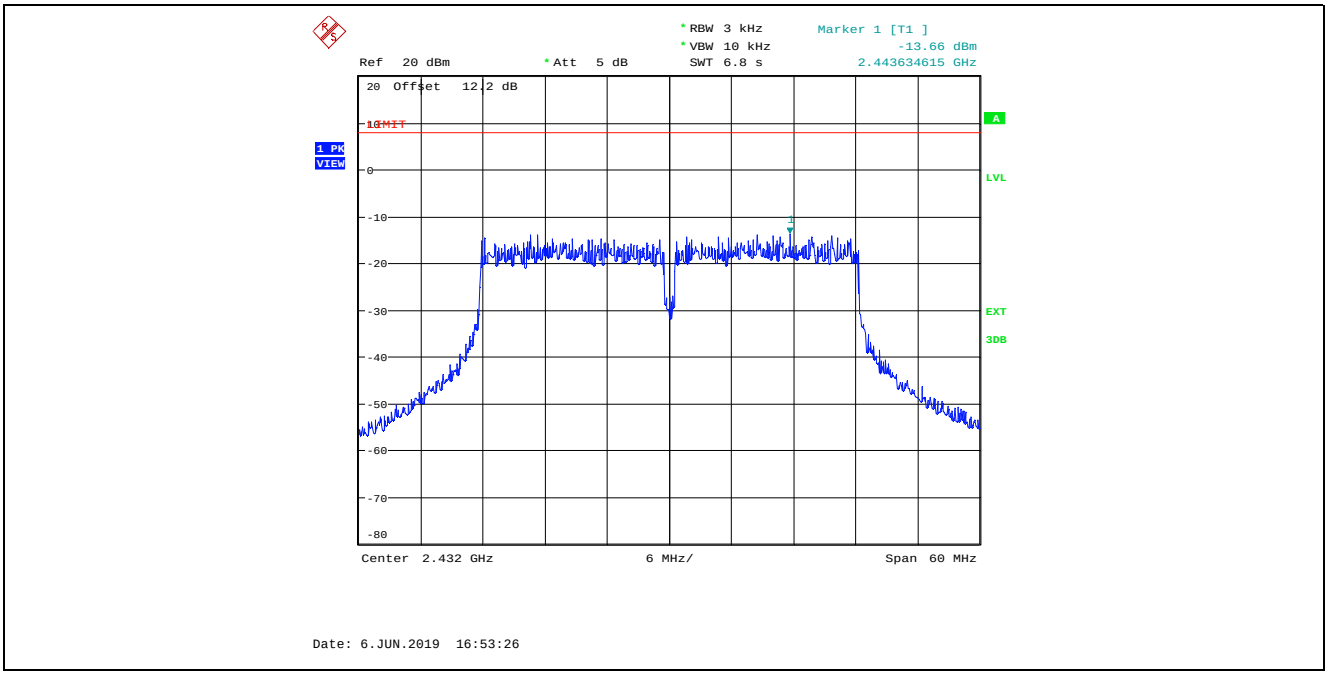
Plot 5.5.4.38. Power Spectral Density
802.11n HT40, MCS 2 QPSK ¾ 40.5Mbps , Power Setting 16, Channel 6, 2437 MHz



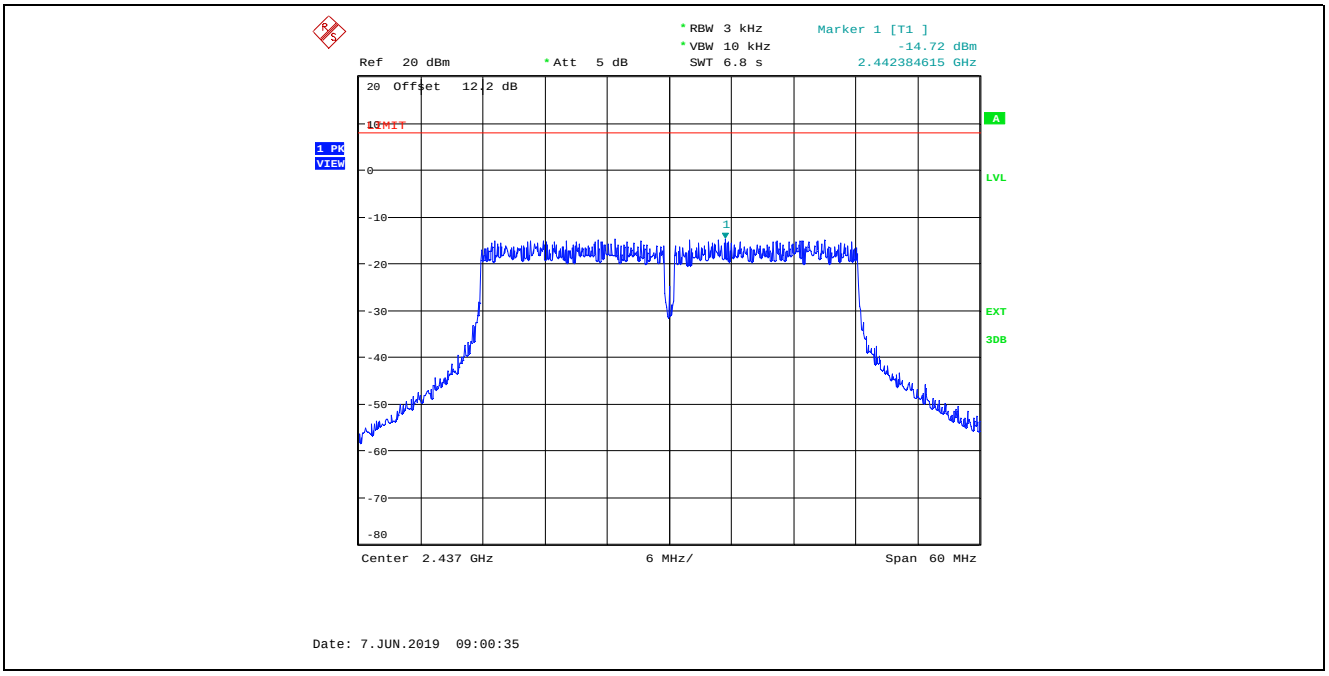
Plot 5.5.4.39. Power Spectral Density
802.11n HT40, MCS 2 QPSK ¾ 40.5Mbps , Power Setting 14, Channel 7, 2442 MHz



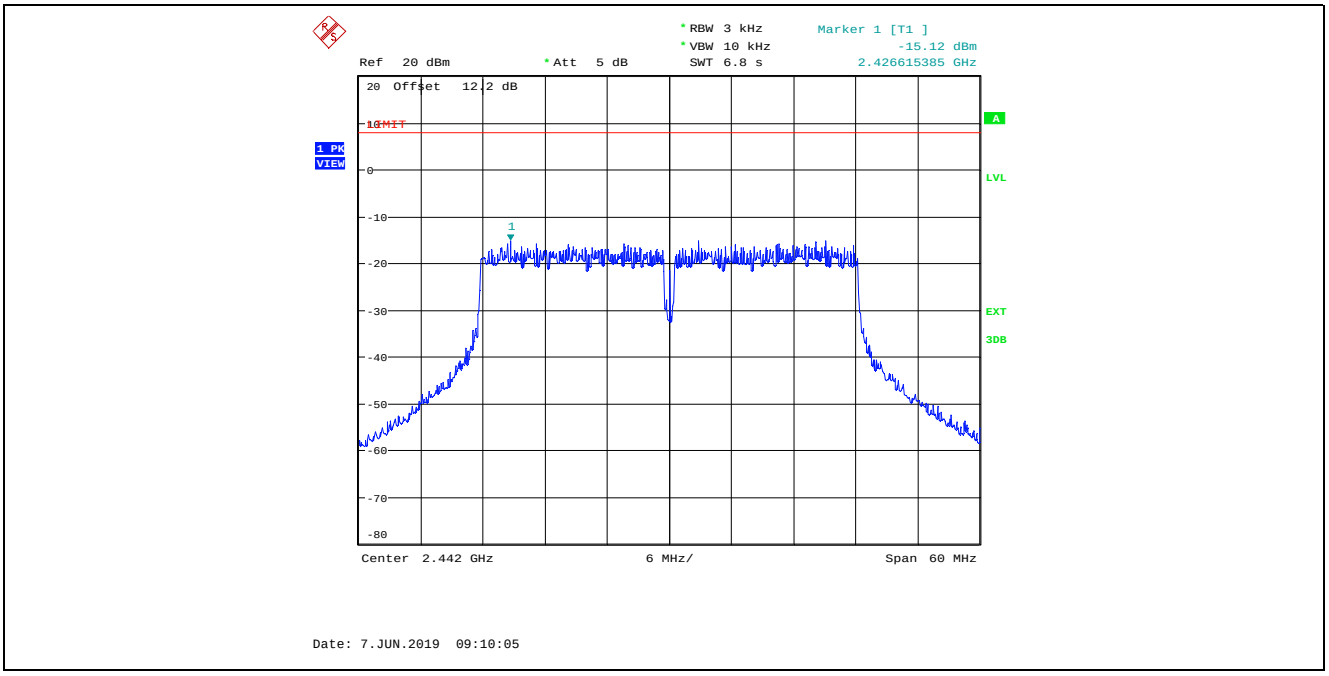
Plot 5.5.4.40. Power Spectral Density
802.11n HT40, MCS 4 16-QAM ¾ 81Mbps , Power Setting 16, Channel 5, 2432 MHz



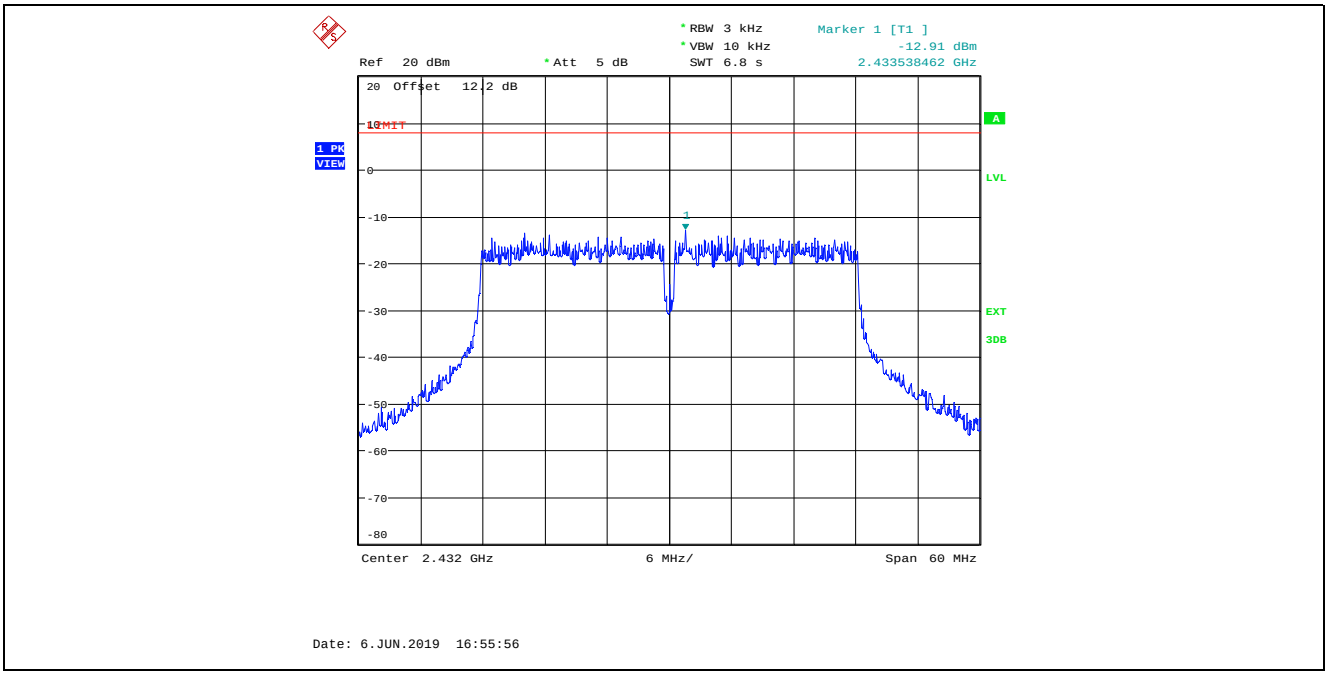
Plot 5.5.4.41. Power Spectral Density
802.11n HT40, MCS 4 16-QAM ¾ 81Mbps , Power Setting 16, Channel 6, 2437 MHz



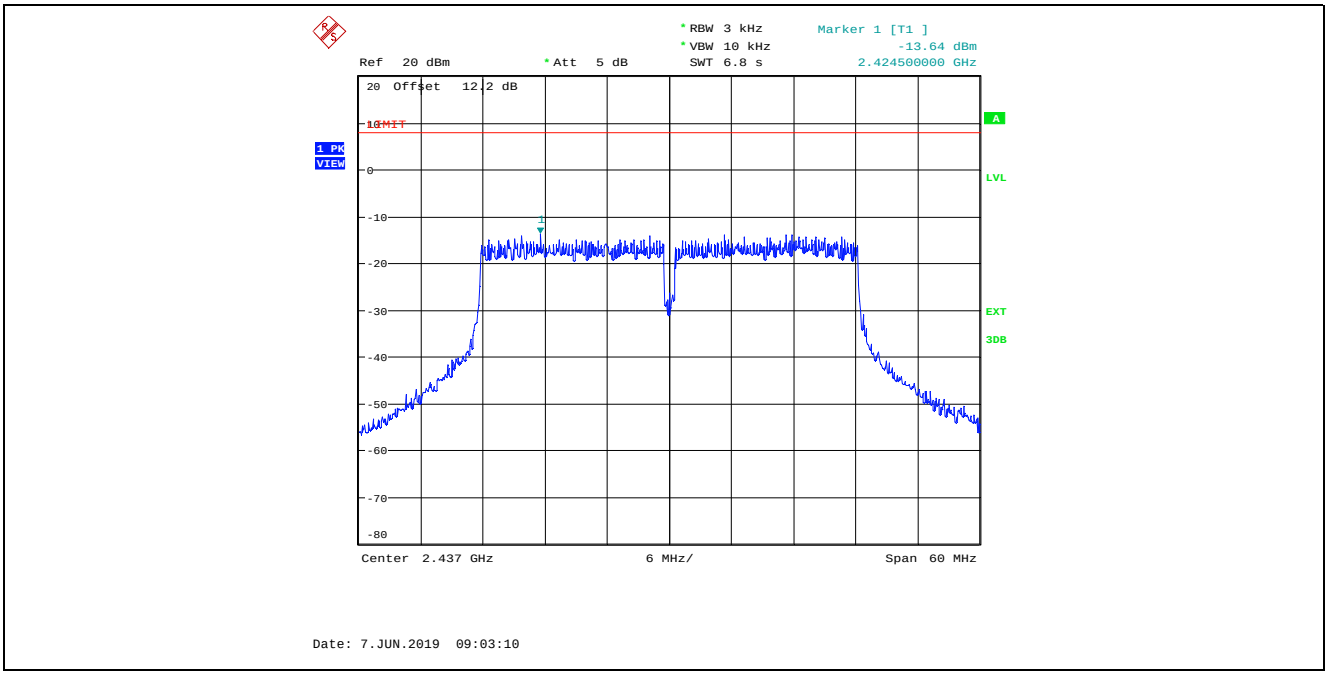
Plot 5.5.4.42. Power Spectral Density
802.11n HT40, MCS 4 16-QAM ¾ 81Mbps , Power Setting 14, Channel 7, 2442 MHz



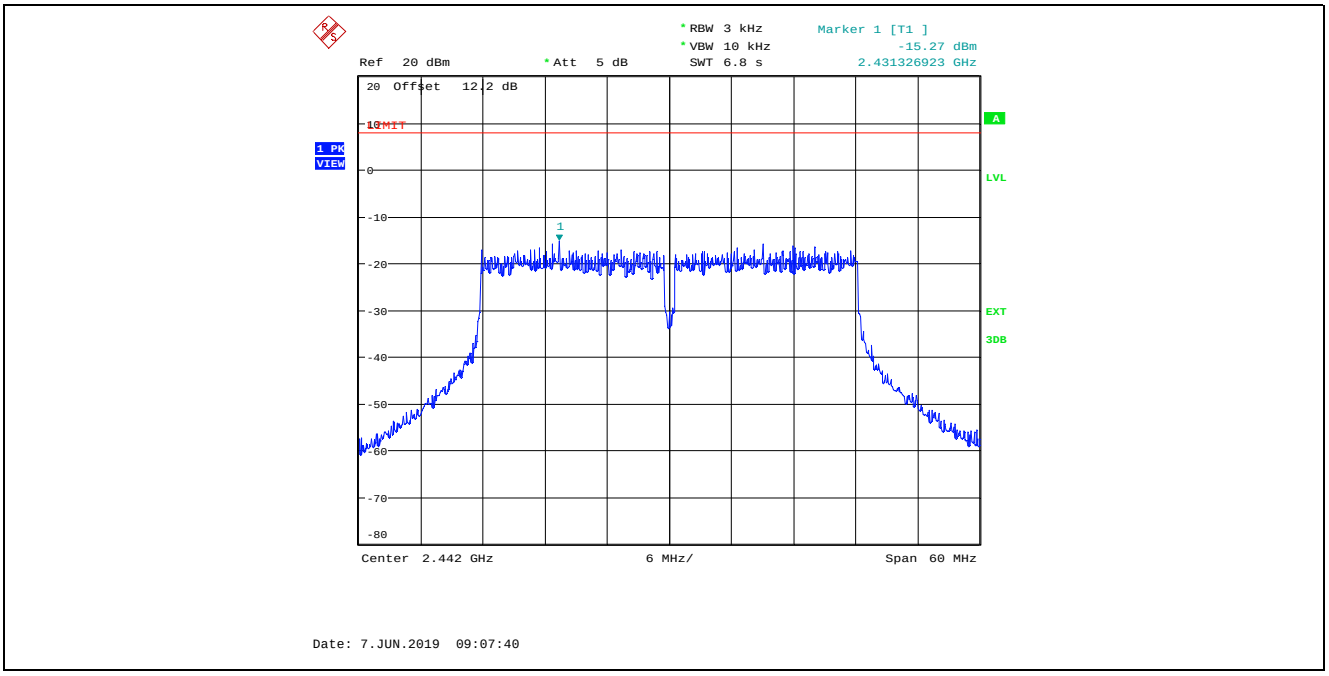
Plot 5.5.4.43. Power Spectral Density
802.11n HT40, MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 5, 2432 MHz



Plot 5.5.4.44. Power Spectral Density
802.11n HT40, MCS 7 64-QAM 5/6 135Mbps, Power Setting 16, Channel 6, 2437 MHz



Plot 5.5.4.45. Power Spectral Density
802.11n HT40, MCS 7 64-QAM 5/6 135Mbps, Power Setting 14, Channel 7, 2442 MHz



5.6. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091]

5.6.1. Limits

§ **1.1310:** The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.6.2. Method of Measurements

Calculation Method of Power Density/RF Safety Distance:

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where, P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.6.3. RF Evaluation

Remark(s):

The EUT contained ZigBee/ BLE and WiFi radio modules with the following operating conditions:

- BLE and WiFi may transmit at the same time
- Zigbee and WiFi may transmit at the same time
- BLE and Zigbee will NOT transmit at the same time

Pursuant to KDB 447498 D01 General RF Exposure Guidance v06, Section 7.2:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0, according to calculated/estimated, numerically modeled, or measured field strengths or power density.

The sum of the MPE ratios for all simultaneously transmitting antennas incorporated in the EUT is ≤ 1.0 as calculated in the following table.

EUT Co-located MPE for BLE/Zigbee with WiFi Radio								
Transmitter	**Frequency Band (MHz)**	**Frequency**	**Max. EIRP (dBm)**	**Max. EIRP (mW)**	**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**Power Density Limit (mW/cm^2)**	**Power Density MPE Ratio**
BLE	2402-2480	2402	1.99	1.581	20	0.0003	1.0	0.0003
Zigbee	2405-2480	2405	22.08	161.436	20	0.0321	1.0	**0.0321**
802.11b	2412-2462	2412	19.92	98.175	20	0.0195	1.0	0.0195
802.11g	2412-2462	2412	24.78	300.608	20	0.0598	1.0	0.0598
802.11n	2412-2462	2412	24.84	304.789	20	0.0606	1.0	**0.0606**
Worst Case Combination (Zigbee with WiFi 802.11n mode) :								**0.0928**

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Hewlett Packard	HP8593EM	3710A00223	9 kHz–22 GHz	13 May 2020
Attenuator	Rohde & Schwarz	EZ-25	1023.7796.03	150 kHz–30 MHz	07 Jun 2020
LISN Used	EMCO	3825/2R	1165	150 kHz–30 MHz	18 Oct 2019
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20Hz–26.5 GHz	25 Jul 2020
DC Block	Hewlett Packard	11742A	12460	0.045 – 26.5 GHz	See Note 1
Attenuator	Hewlett Packard	8493C	0465	DC - 26.5 GHz	See Note 1
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	15 Mar 2020
RF Amplifier	Com-Power	PAM-0118A	551052	0.5 – 18 GHz	26 Jul 2019
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	15 May 2020
Biconilog	EMCO	3142B	1575	26-2000 MHz	10 May 2020
Horn Antenna	EMCO	3155	6570	1 – 18 GHz	11 Oct 2020
Horn Antenna	ETS-Lindgren	3160-09	001183858	18 – 26.5 GHz	27 Oct 2020
High Pass Filter	K & L	11SH10-4000/T12000	4	Cut off 2.4 GHz	See Note 1
Band Reject Filter	Micro-Tronics	BRM50701	105	Cut off 2.4-2.483 GHz	See Note 1
Peak Power Meter	Hewlett Packard	8991A	3342A00657	0.5 - 40 GHz	18 Aug 2019
Peak Power Sensor	Hewlett Packard	84814A	3205A00175	0.5 - 40 GHz	18 Aug 2019
Note 1: Internal Verification/Calibration check					

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.44**	**± 1.8**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 2.89**	**± 3.6**

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.79**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.87**	**Under consideration**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	**Under consideration**