



Engineering Solutions & Electromagnetic Compatibility Services

Unlicensed National Information Infrastructure (U-NII) Transmitter Report

| | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------|
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| FCC ID/ IC | OWDTR-0146-E 3636B-0146 | Test Report Date: | August 10, 2017 |
| Platform | N/A | RTL Work Order # | 2017007 |
| Model | XL-200P C1D1 Non-Rebanded | RTL Quote # | QRTL17-007A |
| American National Standard Institute | ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices | | |
| FCC Classification | DTS – Part 15 Digital Transmission System | | |
| FCC Rule Part(s)/Guidance | FCC Rules Part 15.407 (Subpart E): Unlicensed National Information Infrastructure Devices (2016) | | |
| Industry Canada | RSS-247 Issue 2: Digital Transmission Systems (DTs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices | | |
| Frequency Range (MHz) | Output Power (W)* | Frequency Tolerance | Emission Designator |
| 5180-5250 | 0.015 | N/A | 44M2G7D |
| 5745-5825 | 0.008 | N/A | 48M7G7D |

* power is conducted

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, Industry Canada RSS-247, RSS-Gen, and ANSI C63.10.

Signature: 

Date: August 10, 2017

Typed/Printed Name: Desmond A. Fraser

Position: President

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These test(s) are accredited under Rhein Tech Laboratories, Inc. ISO/IEC 17025 accreditation issued by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

Applicable Standards:

- FCC Rules Part 15E: Unlicensed National Information Infrastructure Devices
- Industry Canada RSS-247 Issue 2: Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.2 Description of EUT

The EUT is a slave/client device with no ad-hoc capabilities.

| | |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Equipment Under Test | XL-200P C1D1 Non-Rebanded |
| Power Supply | 7.4 VDC LI-ion Battery |
| Modulation Type | DSSS |
| Transfer Rate | 1, 2, 5.5, 6, 6.5, 9, 11,12, 13, 13.5, 18, 19.5, 24, 26, 27, 36, 39, 40.5, 48, 52, 54, 58.5, 65, 81, 108, 121.5, 135 |
| Frequency Range | 5180 – 5250 MHz; 5745 - 5825 MHz |
| Antenna Connector Type | N/A |
| Antenna Type | Internal chip (-1 to 1 dBi gain) |

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

1.4 Related Submittal(s)/Grant(s)

This report supports a certification application for Harris Corporation Model XL-200P C1D1 Non-Rebanded, FCC ID: OWDTR-0146-E, IC: 3636B-0146.

1.5 Modifications

No modifications were required for compliance.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Channels Tested - 802.11a/n

| Channel | Frequency (MHz) |
|---------|-----------------|
| 36 | 5180 |
| 40 | 5200 |
| 44 | 5220 |
| 48 | 5240 |
| 149 | 5745 |
| 157 | 5785 |
| 165 | 5825 |

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart E (Section 15.407)

| Test | FCC Reference | IC Reference | Result |
|-----------------------------------------|-----------------------|---------------------------------|--------|
| Maximum Conducted Output Power | FCC 15.407(a/1/2/3) | RSS-247 6.2 RSS-Gen 6.12 | Pass |
| Peak Power Spectral Density Measurement | FCC 15.407(a/1/2/3) | RSS-247 6.2 | Pass |
| Frequency Stability Measurement | FCC 15.407(g) | RSS-Gen 6.11 | Pass |
| Compliance With the Band Edge | FCC 15.407(7), 15.205 | RSS-247 6.2 | Pass |
| Antenna Conducted Spurious Emissions | FCC 15.407(6) | RSS-247 6.2 | Pass |
| 26 dB and 6dB Bandwidth | FCC 15.407(a) and (e) | RSS-247 6.2 | Pass |
| Radiated Emissions | FCC 15.209 | RSS-247 6.2 RSS-Gen 6.13/7.1 | Pass |
| Conducted AC Emissions | FCC 15.207 | RSS-Gen 8.8 | N/A |

2.4 Test System Details

The test sample was received on December 16, 2014. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-3: Equipment Under Test

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|-------------------------------------|--------------------|---------------------------------|---------------|--------------|-------------------|--------------|
| Portable Transceiver | Harris Corporation | XL-200P C1D1 Non-Rebanded | 1Y1D-E00067 | OWDTR-0146-E | N/A | 21269 |
| Portable Transceiver with connector | Harris Corporation | XL-200P C1D1 Non-Rebanded | 0WXD-E00239 | OWDTR-0146-E | N/A | 21269 |

Table 2-4: Support Equipment

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|--------------------|--------------------|---------------|---------------|--------|-----------------------------------|--------------|
| Battery Eliminator | Harris Corporation | 14035-4300-01 | N/A | N/A | 1m unshielded | 21553 |
| Breakout Box | Harris Corporation | 12082-7980-01 | N/A | N/A | 2m USB, 1m serial radio interface | 20599 |

2.5 Configuration of Tested System

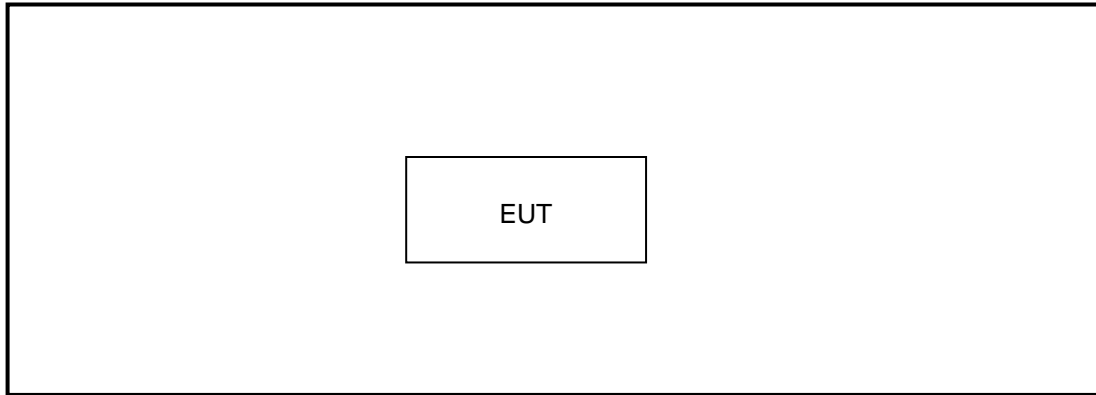


Figure 2-1: Configuration of System Under Test

3 Transmit Power Measurement – FCC 15.407(a/1/2/3); RSS-247 6.2

3.1 Power Output Test Procedure

Method SA-1 789033 D02 General UNII Test Procedures v01

Table 3-1: Power Output Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-------|-------------------|---------------|----------------------|
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |

3.2 Power Output Test Data


Table 3-2: Power Output Test Data

| Channel | Frequency (MHz) | Maximum Conducted Output Power (dBm) |
|---------|-----------------|--------------------------------------|
| 36 | 5180 | 11.8 |
| 40 | 5200 | 11.2 |
| 44 | 5220 | 11.2 |
| 48 | 5240 | 11.1 |
| 149 | 5745 | 9.1 |
| 157 | 5785 | 9.2 |
| 165 | 5825 | 9.2 |

3.3 Limits of Maximum Transmit Power Measurement

| Frequency Band | Limit |
|-----------------|------------------------------------------------|
| 5.15-5.25 GHz | 250 mW (24 dBm) |
| 5.25-5.35 GHz | The lesser of 250 mW (24 dBm) or 11 dBm+10logB |
| 5.725-5.825 GHz | 1 W (30 dBm) |

Test Personnel:

| | | |
|-------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------|
| Daniel W. Baltzell Test Engineer |  Signature | June 2, 2015 Date of Test |
|-------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------|

4 Peak Power Spectral Density Measurement – FCC 15.407(a) 1-5; RSS-247 6.2

4.1 Limits of Peak Power Spectral Density

| Frequency Band | Limit |
|-----------------------------|--------|
| 5.15-5.725 GHz (1 MHz BW) | 11 dBm |
| 5.725-5.85 GHz (500 kHz BW) | 30 dBm |

4.2 Peak Power Spectral Density Measurement Test Procedure

FCC 789033 D02 II.F. Maximum Power Spectral Density (PSD)

The transmitter output was connected to a spectrum analyzer; for 5150-5725 MHz the RBW was set to 1 MHz and the VBW was set to 5 MHz, and for 5725-5850 MHz the RBW was set to 500 kHz. Method SA-1: RMS detector, 100 traces in power averaging, video trigger set to trigger on full power pulses, and auto sweep time were used. The highest level PPSD was measured across the emission.

Table 4-1: Peak Power Spectral Density Measurement Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-------|-------------------|---------------|----------------------|
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |

4.3 Peak Power Spectral Density Test Data

Table 4-2: Peak Power Spectral Density Test Data - 802.11a 54 Mbps

| Channel | Frequency (MHz) | RF Power Level in 1 MHz BW (dBm) | Maximum Limit (dBm) | Pass/Fail |
|---------|-----------------|----------------------------------|---------------------|-----------|
| 36 | 5180 | 3.7 | 11 | Pass |
| 40 | 5200 | 3.8 | 11 | Pass |
| 44 | 5220 | 4.1 | 11 | Pass |
| 48 | 5240 | 3.7 | 11 | Pass |
| Channel | Frequency (MHz) | RF Power Level in 500 kHz (dBm) | Maximum Limit (dBm) | Pass/Fail |
| 149 | 5745 | -1.2 | 30 | Pass |
| 157 | 5785 | -1.4 | 30 | Pass |
| 165 | 5825 | -1.6 | 30 | Pass |

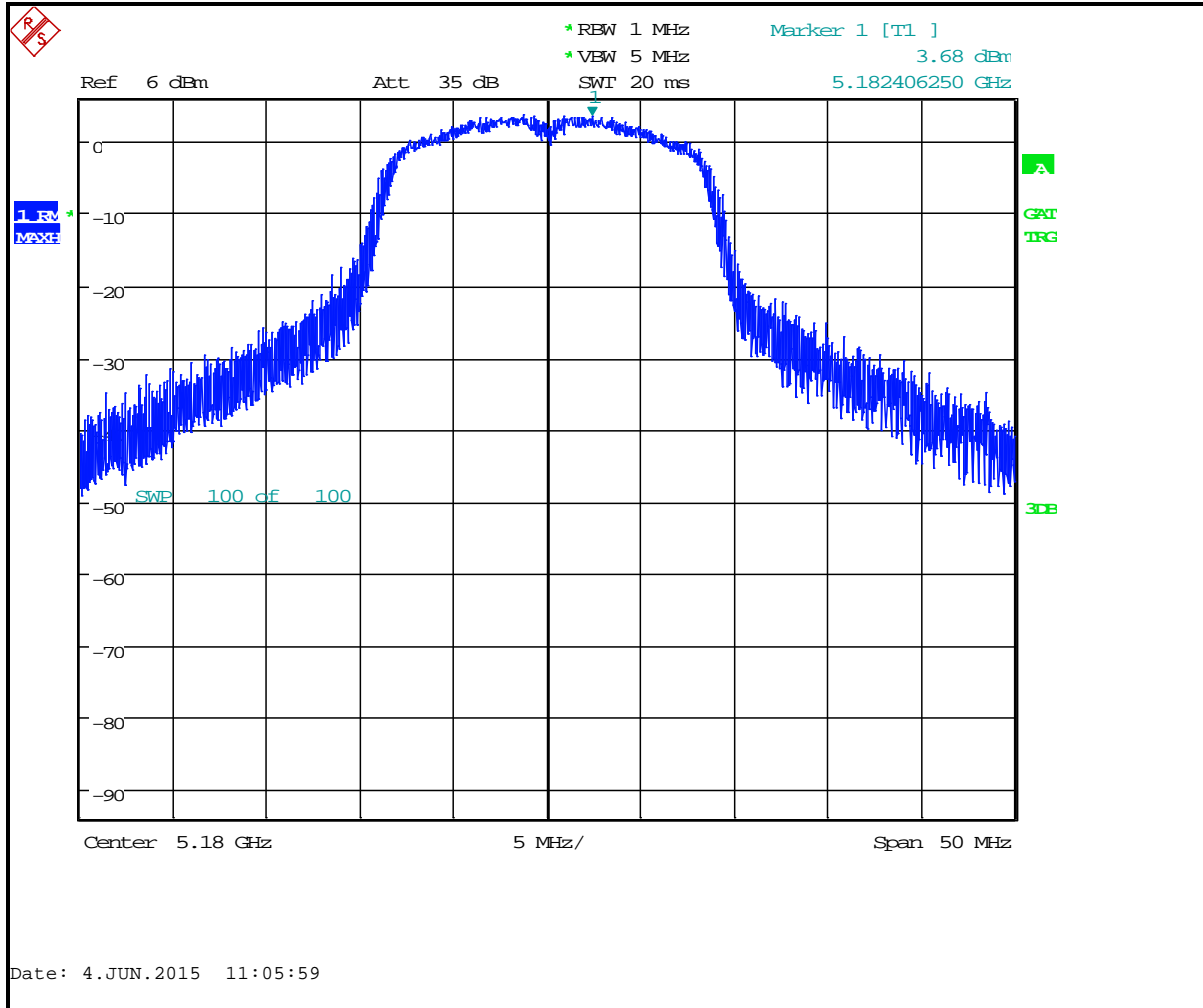
Table 4-3: Power Spectral Density Test Data – 802.11n (65 Mbps)

| Channel | Frequency (MHz) | RF Power Level in 1MHz BW (dBm) | Maximum Limit (dBm) | Pass/Fail |
|---------|-----------------|---------------------------------|---------------------|-----------|
| 36 | 5180 | 0.1 | 11 | Pass |
| 40 | 5200 | 1.5 | 11 | Pass |
| 44 | 5220 | 1.7 | 11 | Pass |
| 48 | 5240 | 1.3 | 11 | Pass |
| Channel | Frequency (MHz) | RF Power Level in 500 kHz (dBm) | Maximum Limit (dBm) | Pass/Fail |
| 149 | 5745 | -1.5 | 30 | Pass |
| 157 | 5785 | -2.4 | 30 | Pass |
| 165 | 5825 | -2.3 | 30 | Pass |

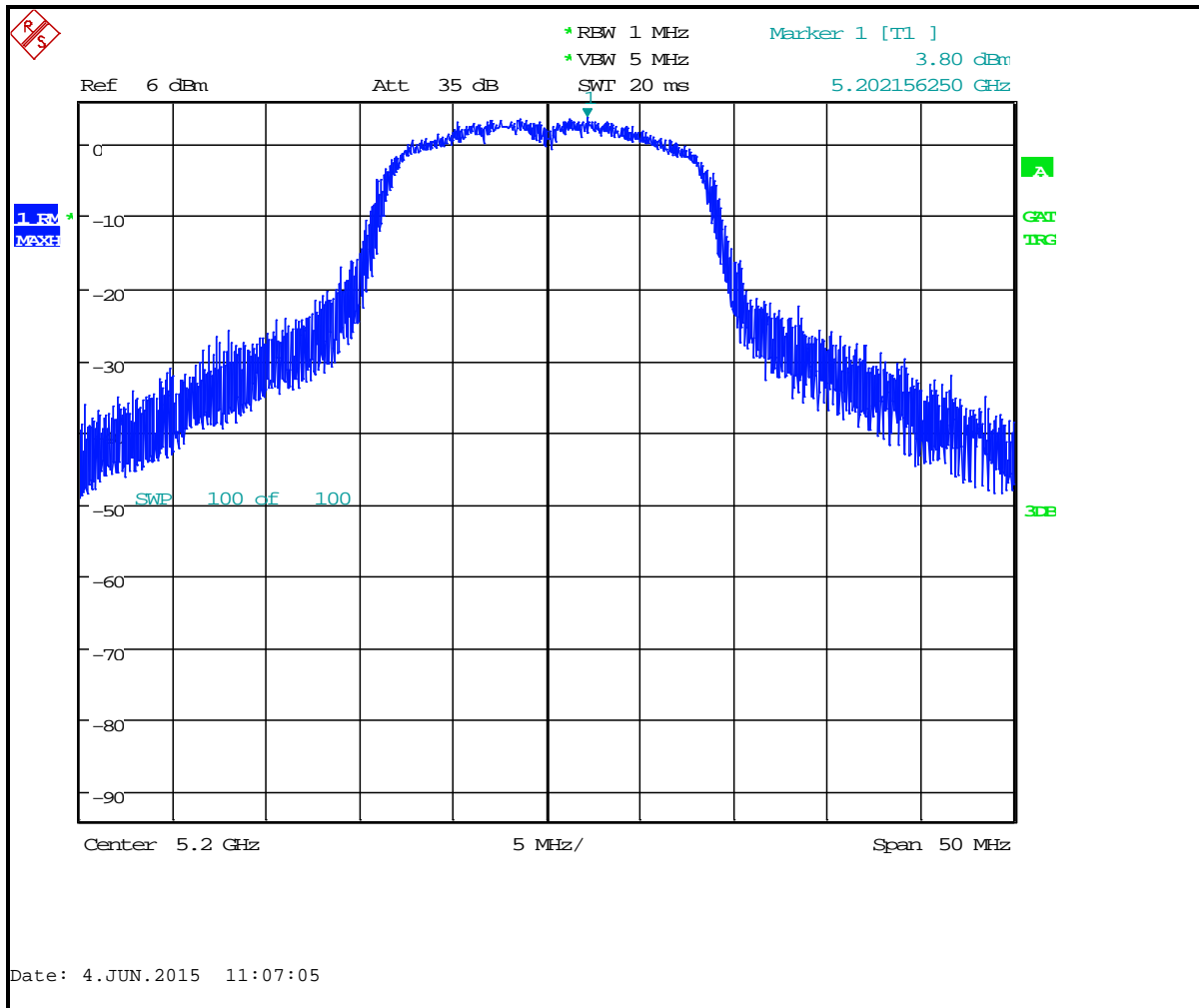
Table 4-4: Power Spectral Density Test Data – 802.11n (40 MHz BW)

| Channel | Frequency (MHz) | RF Power Level in 1 MHz BW (dBm) | Maximum Limit (dBm) | Pass/Fail |
|---------|-----------------|----------------------------------|---------------------|-----------|
| 36 | 5180 | 1.5 | 11 | Pass |
| 40 | 5200 | 1.2 | 11 | Pass |
| 44 | 5220 | 1.4 | 11 | Pass |
| 48 | 5240 | 1.0 | 11 | Pass |
| Channel | Frequency (MHz) | RF Power Level in 500 kHz (dBm) | Maximum Limit (dBm) | Pass/Fail |
| 149 | 5745 | -2.6 | 30 | Pass |
| 157 | 5785 | -2.1 | 30 | Pass |
| 165 | 5825 | -2.5 | 30 | Pass |

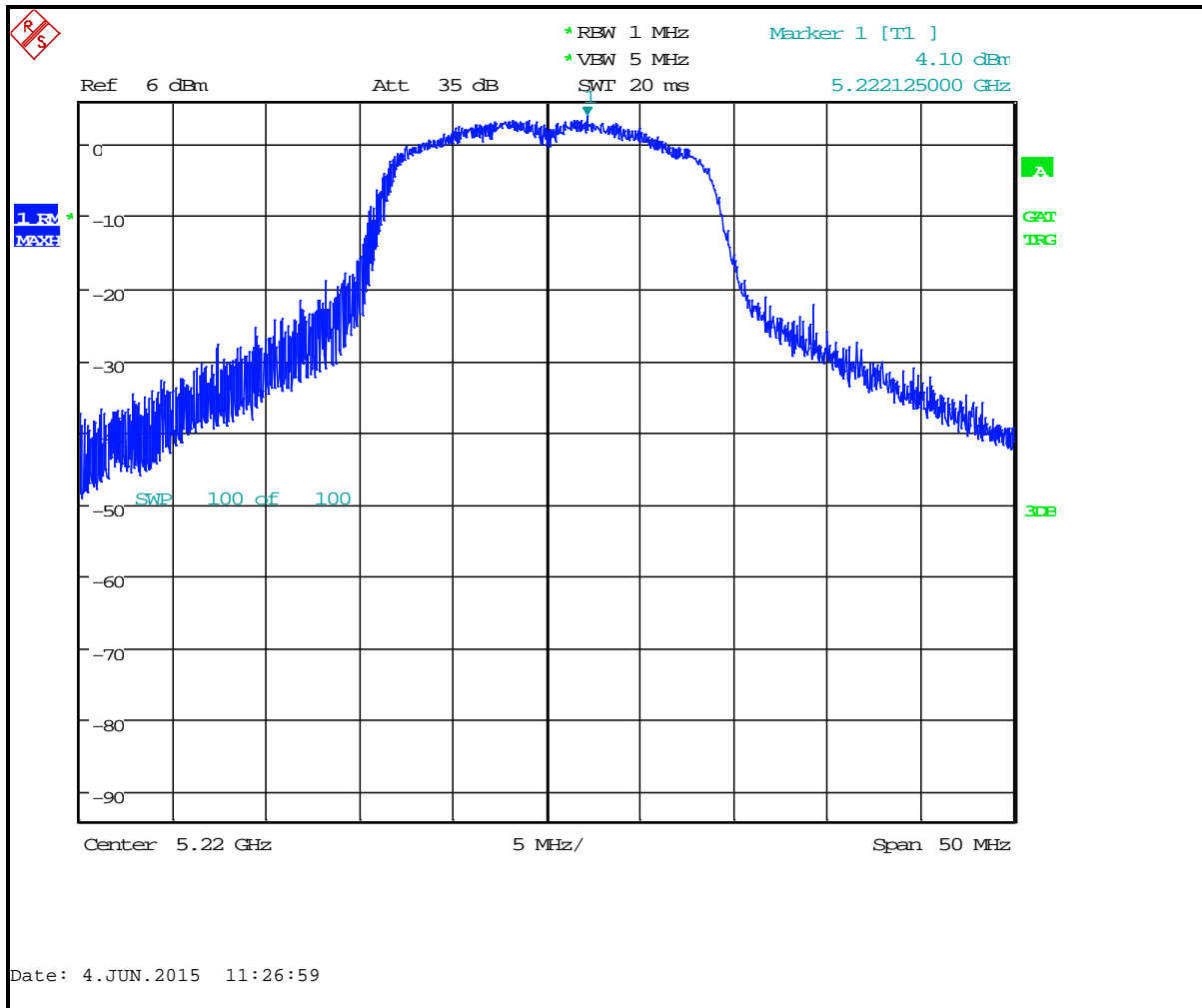
Plot 4-1: Peak Power Spectral Density: Channel 36 (5180 MHz) 802.11a 54 Mbps



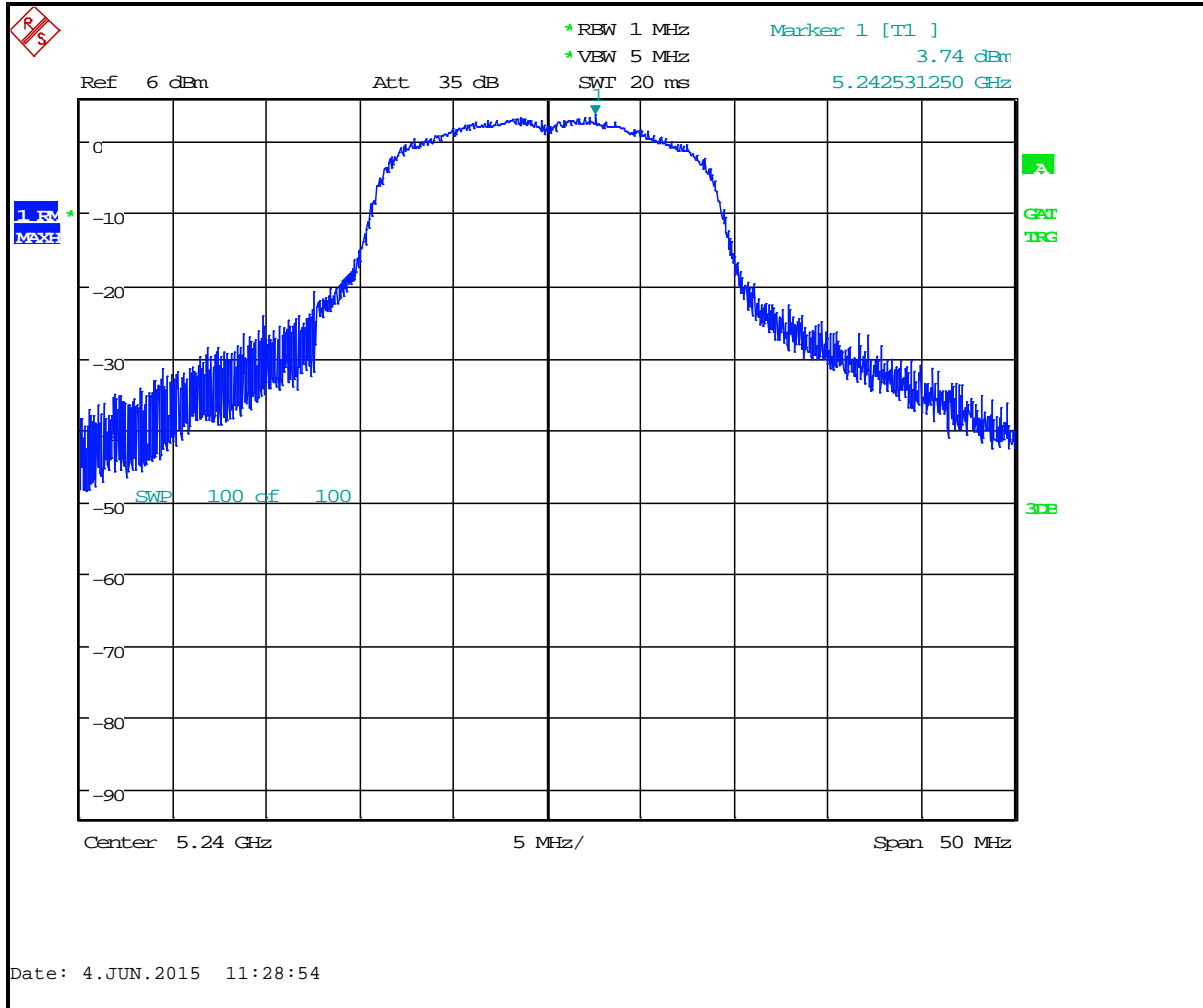
Plot 4-2: Peak Power Spectral Density: Channel 40 (5200 MHz) 802.11a 54 Mbps



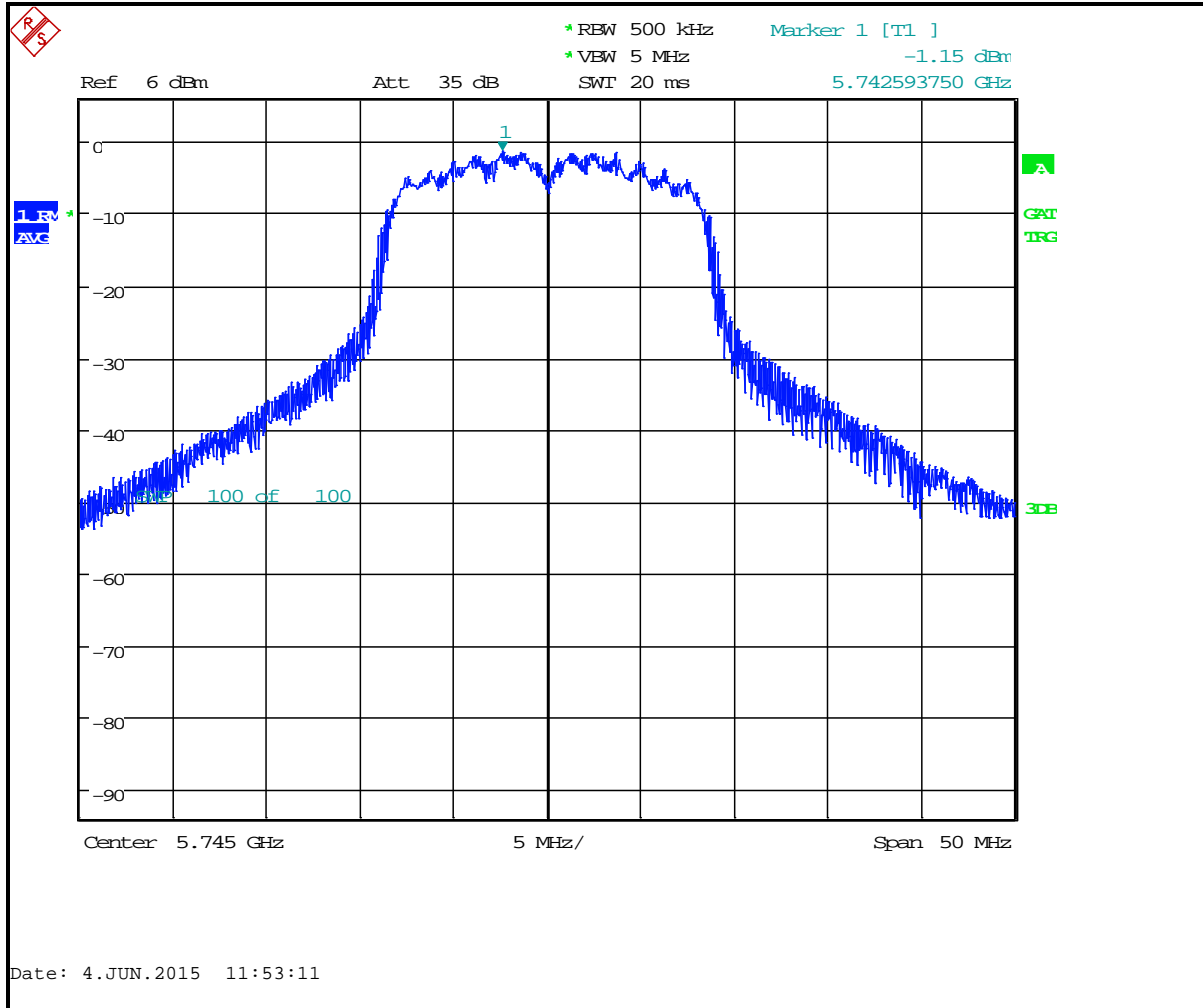
Plot 4-3: Peak Power Spectral Density: Channel 44 (5220 MHz) 802.11a 54 Mbps



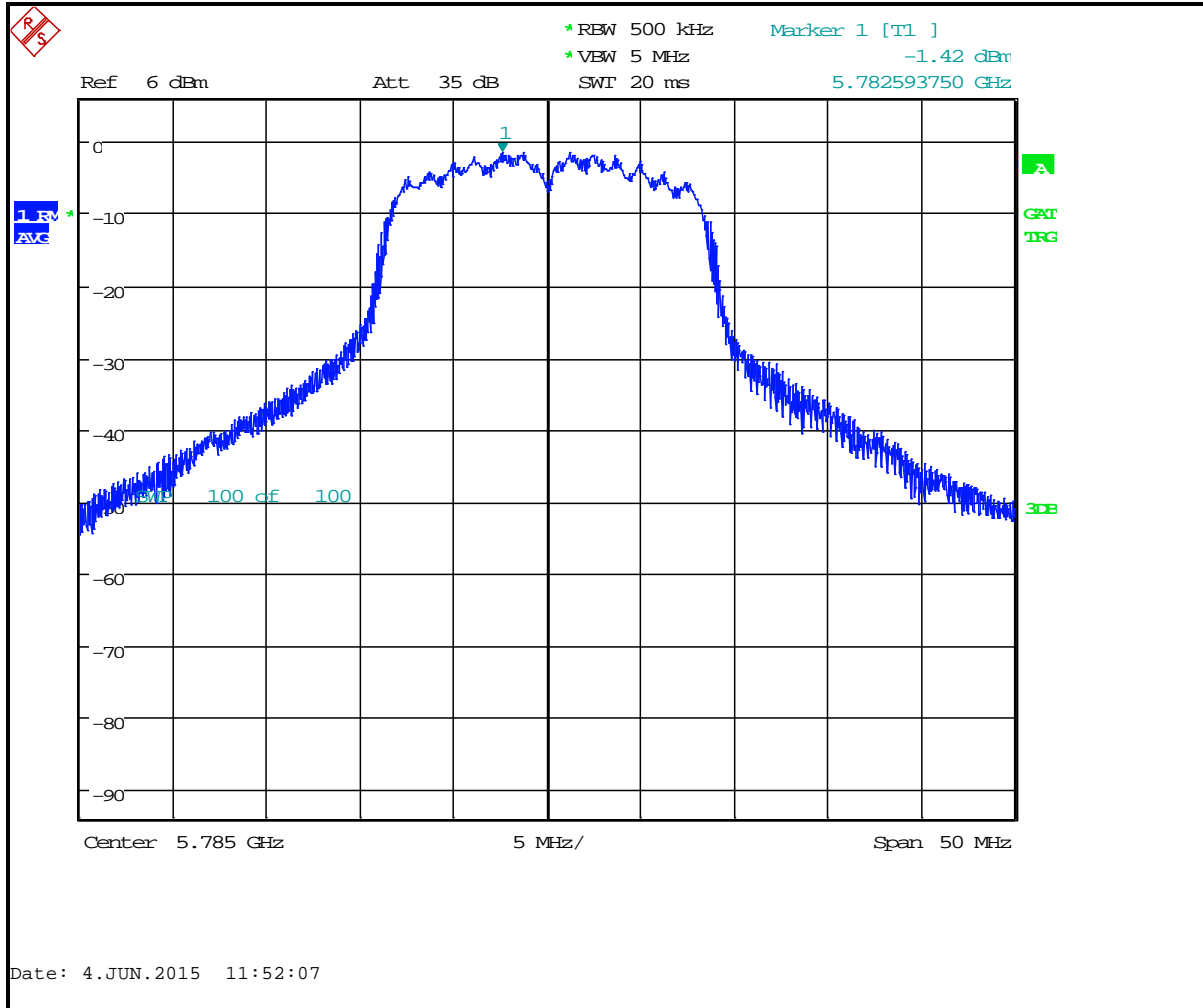
Plot 4-4: Peak Power Spectral Density: Channel 48 (5240 MHz) 802.11a 54 Mbps



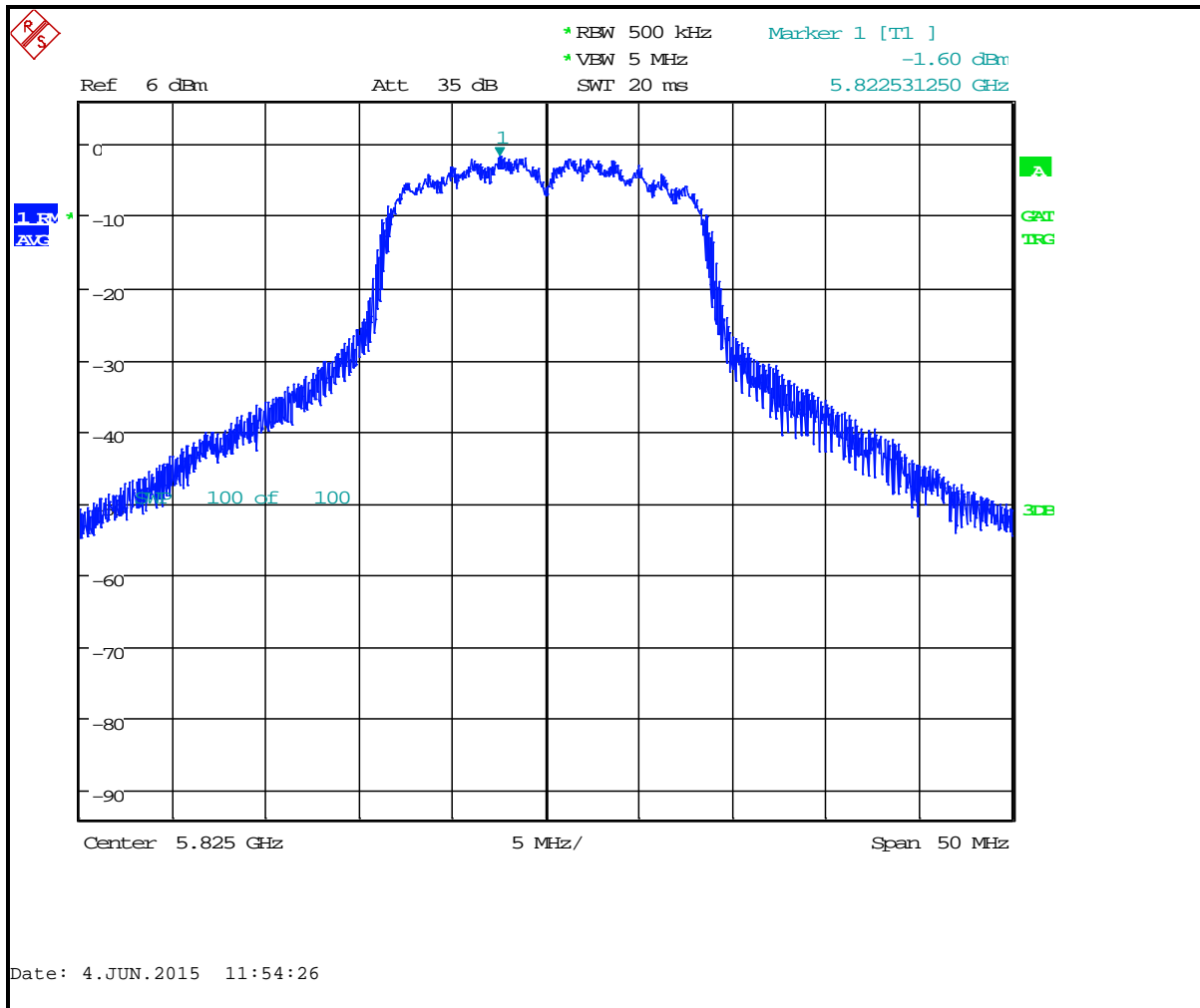
Plot 4-5: Power Spectral Density: Channel 149 (5745 MHz) 802.11a 54 Mbps



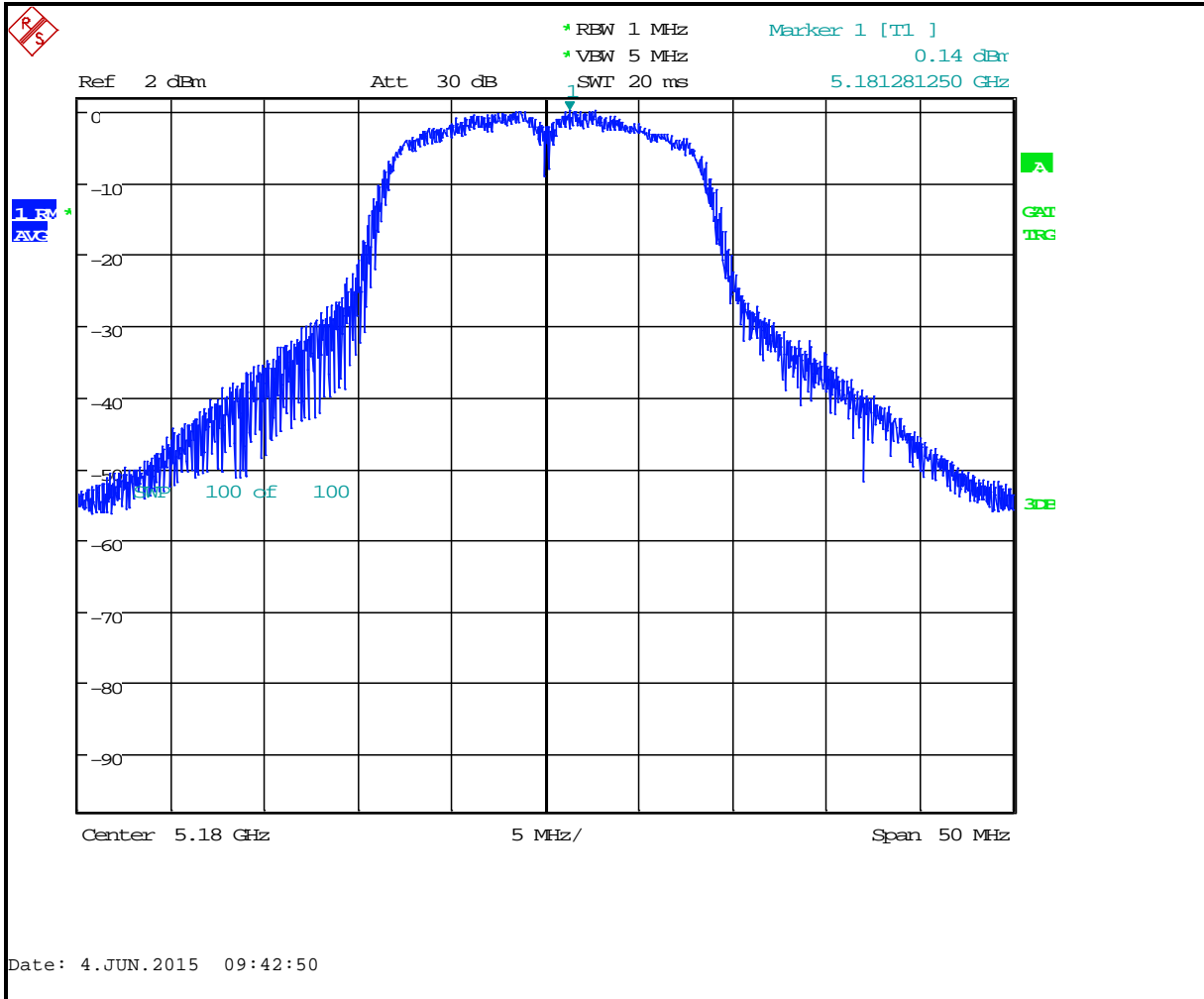
Plot 4-6: Power Spectral Density: Channel 157 (5785 MHz) 802.11a 54 Mbps



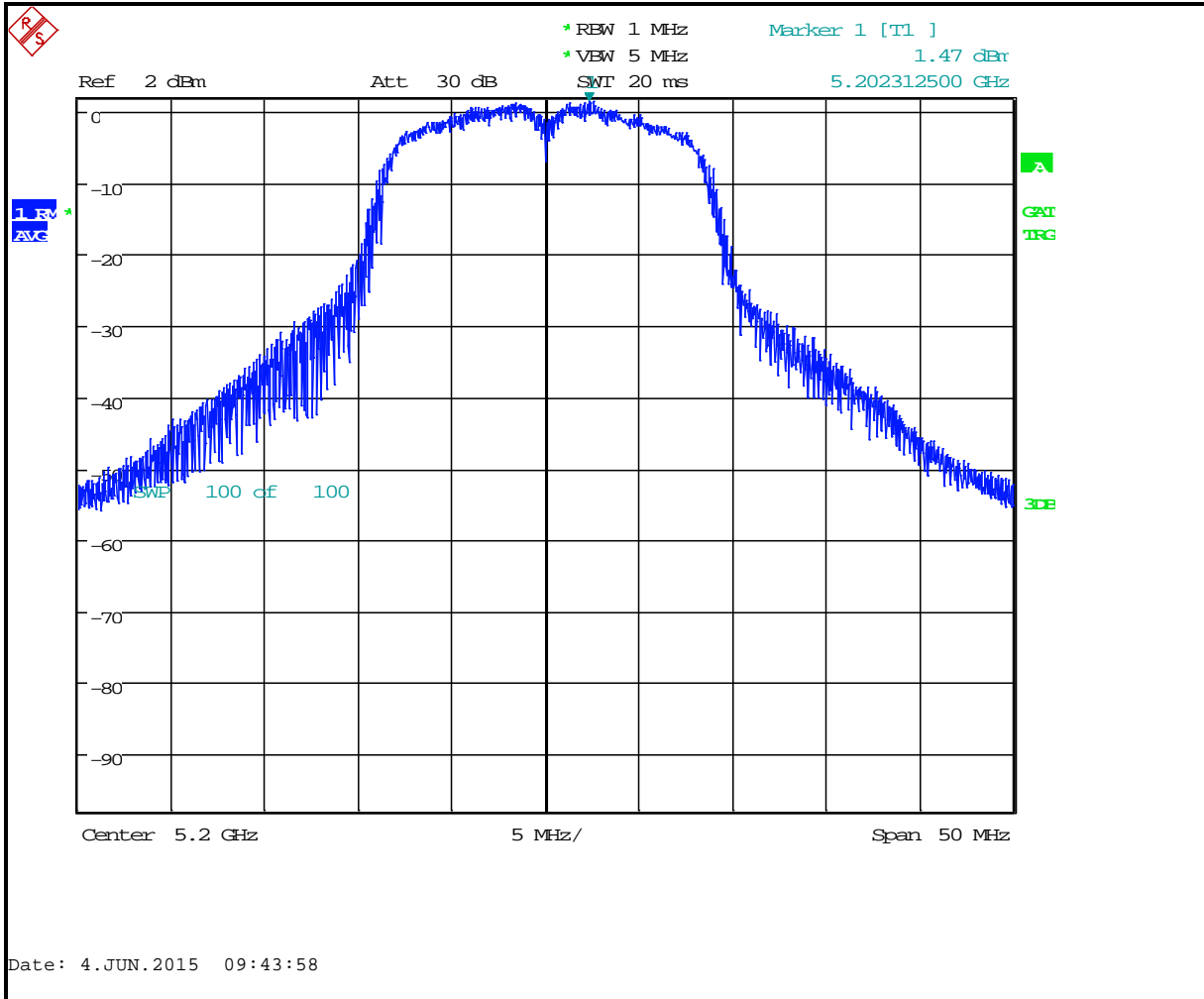
Plot 4-7: Power Spectral Density: Channel 165 (5825 MHz) 802.11a 54 Mbps



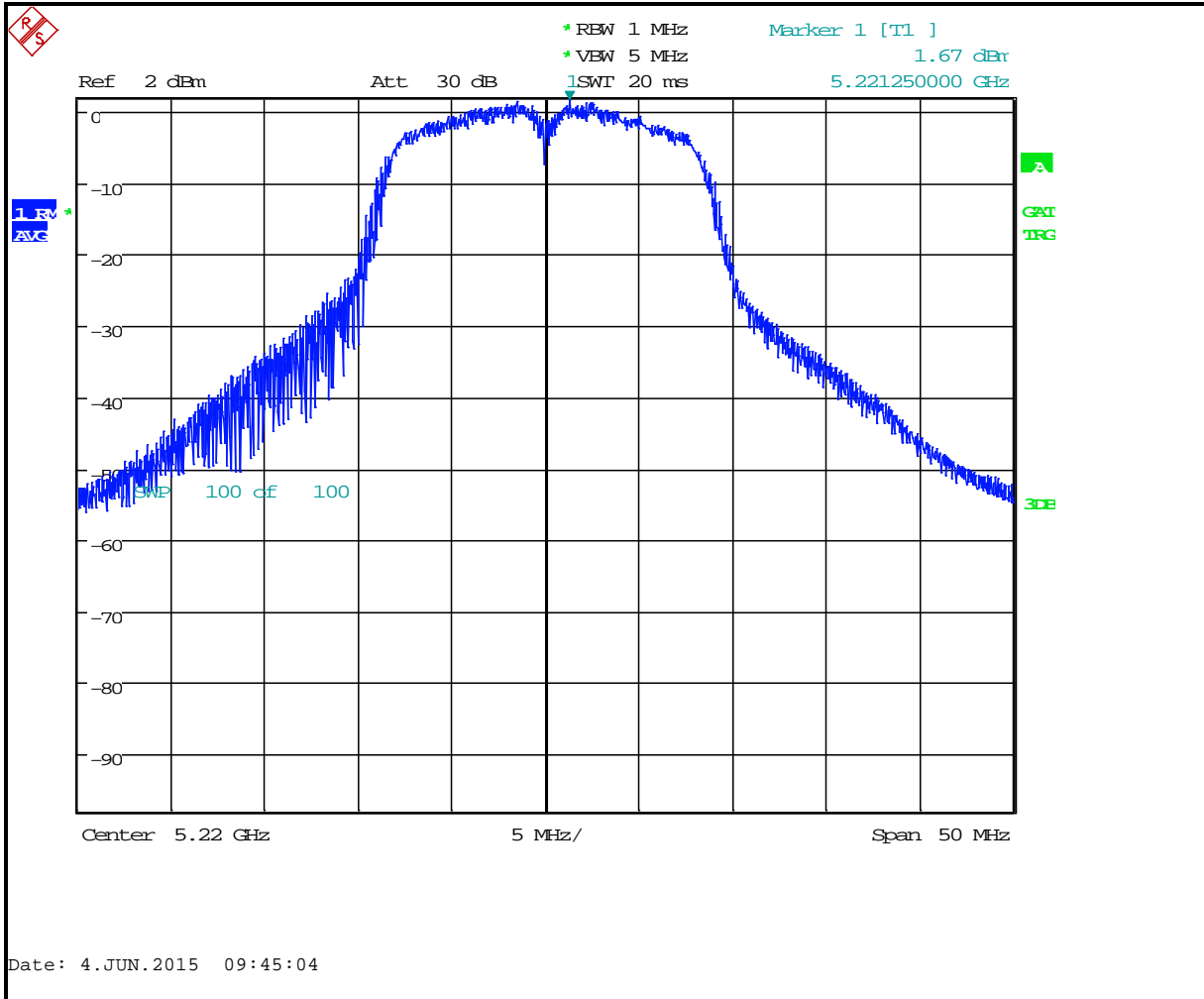
Plot 4-8: Peak Power Spectral Density: Channel 36 (5180 MHz) 802.11n 65 Mbps



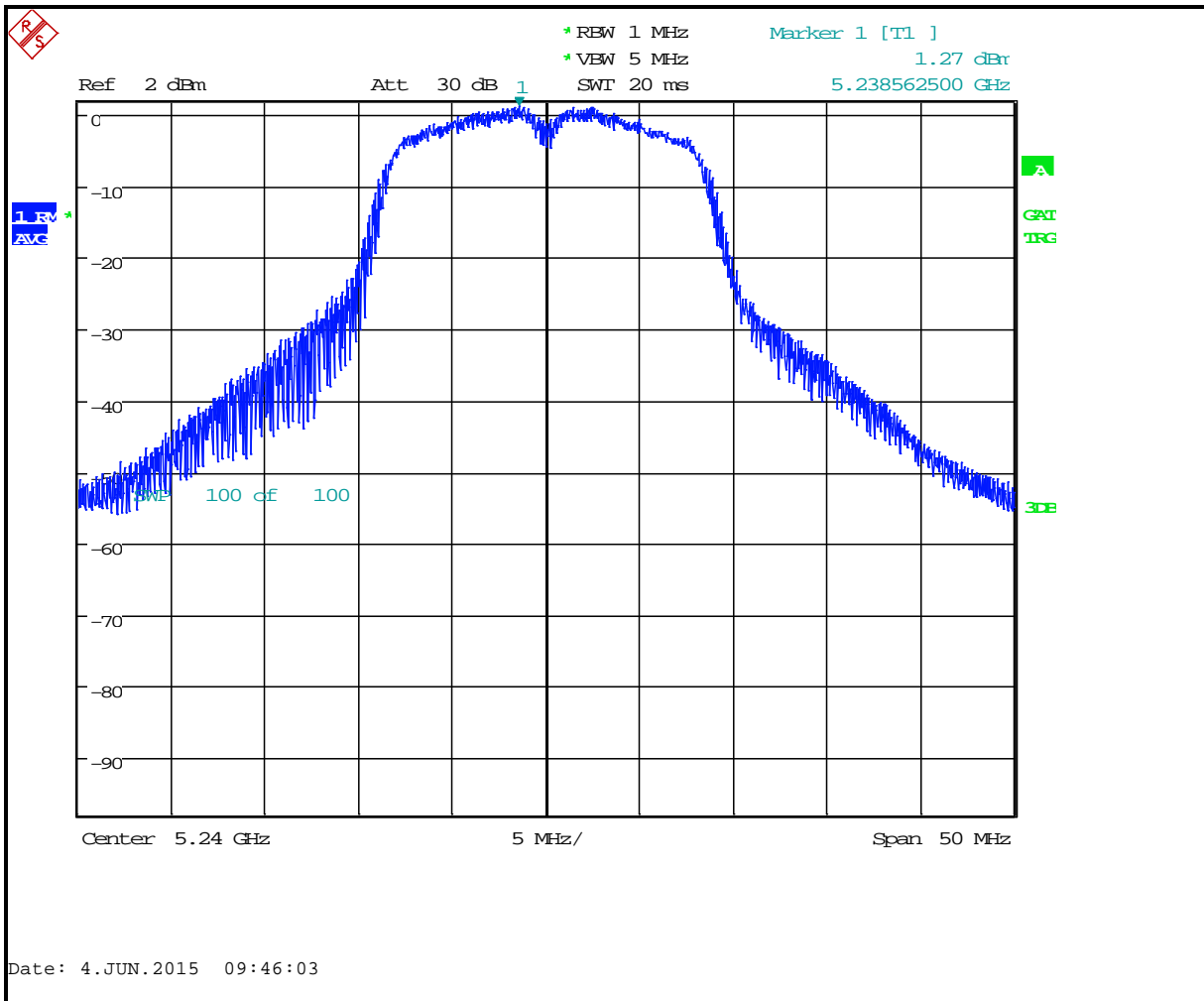
Plot 4-9: Peak Power Spectral Density: Channel 40 (5200 MHz) 802.11n 65 Mbps



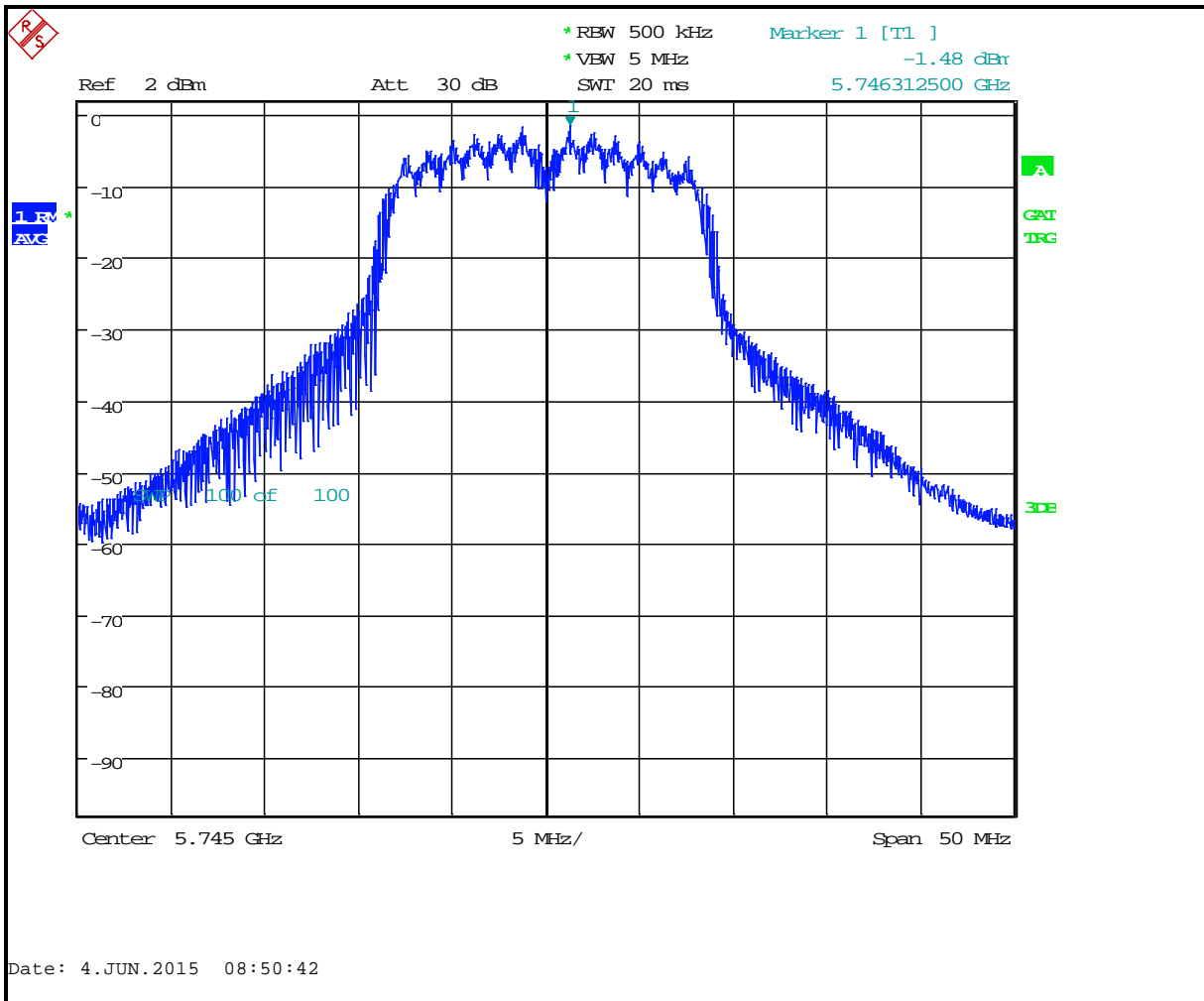
Plot 4-10: Peak Power Spectral Density: Channel 44 (5220 MHz) 802.11n 65 Mbps



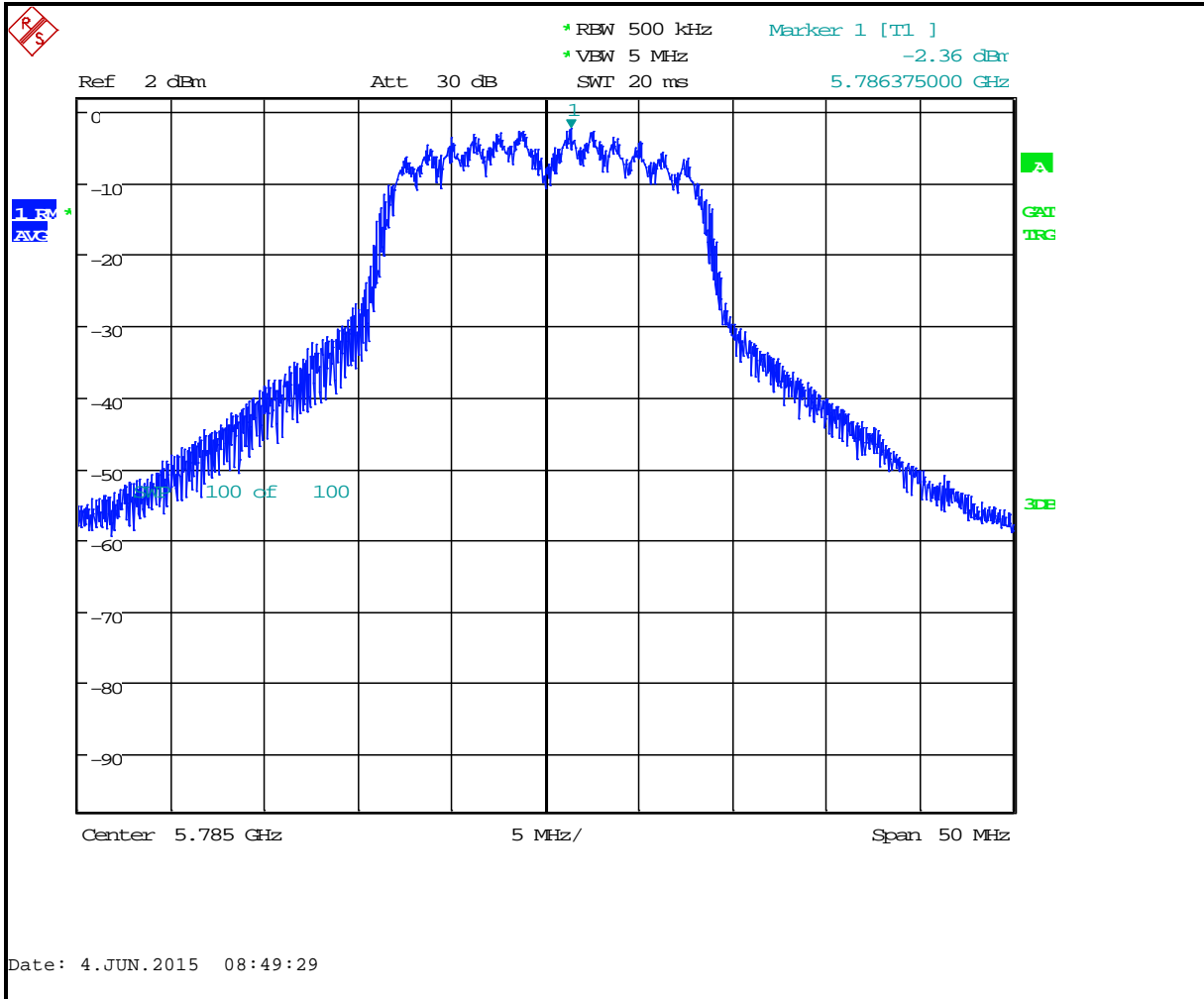
Plot 4-11: Peak Power Spectral Density: Channel 48 (5240 MHz) 802.11n 65 Mbps



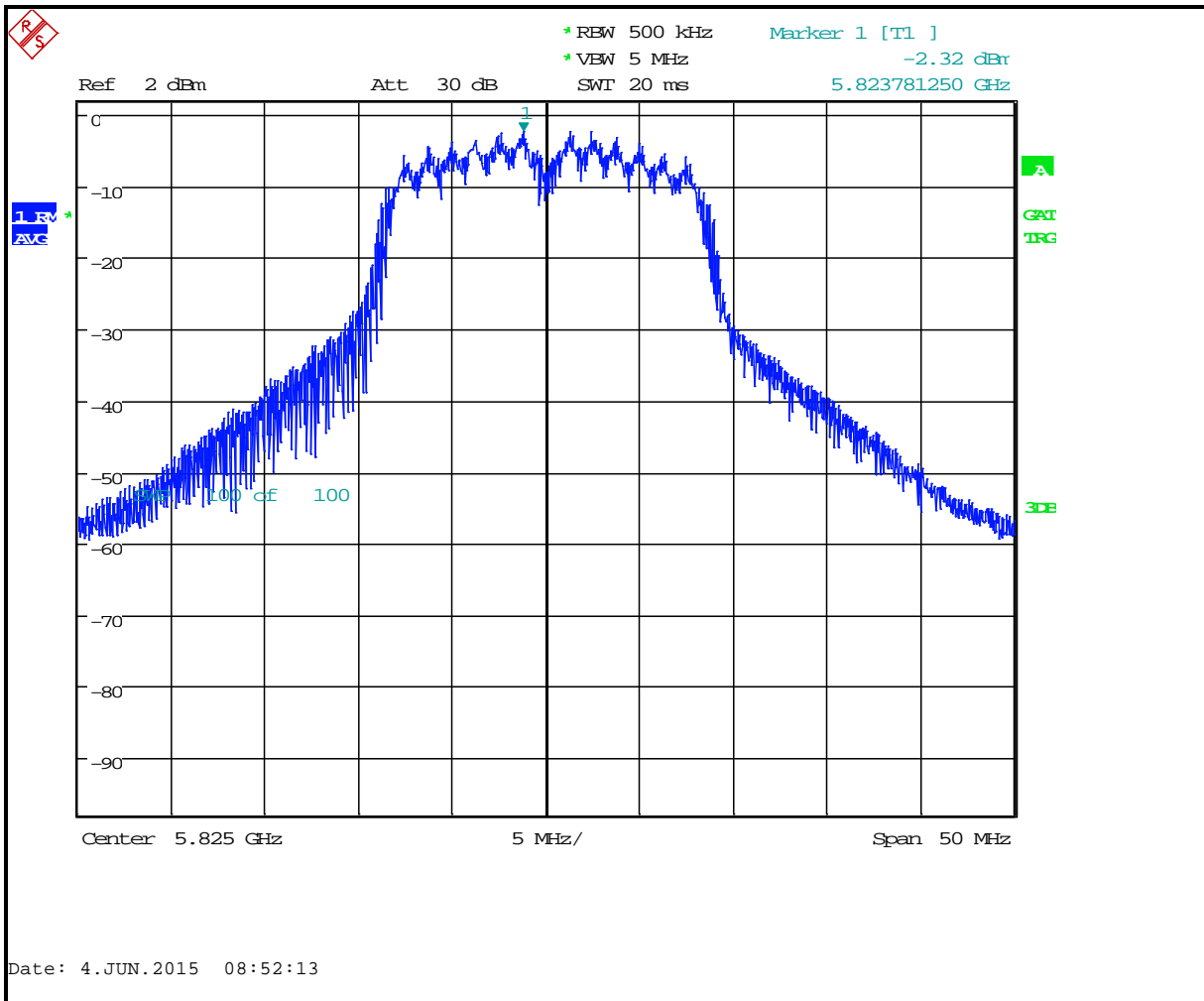
Plot 4-12: Power Spectral Density: Channel 149 (5745 MHz) 802.11n 65 Mbps



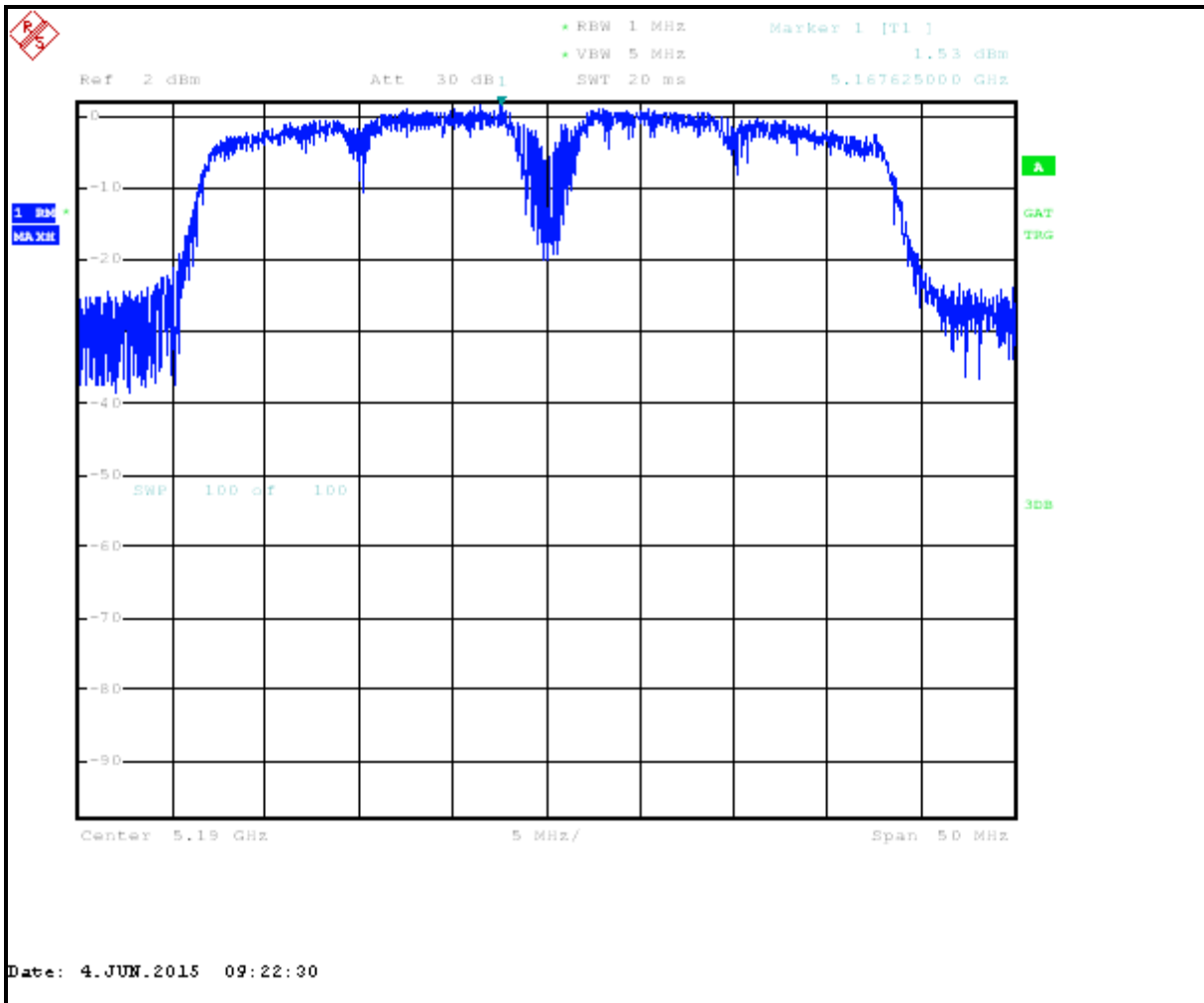
Plot 4-13: Power Spectral Density: Channel 157 (5785 MHz) 802.11n 65 Mbps



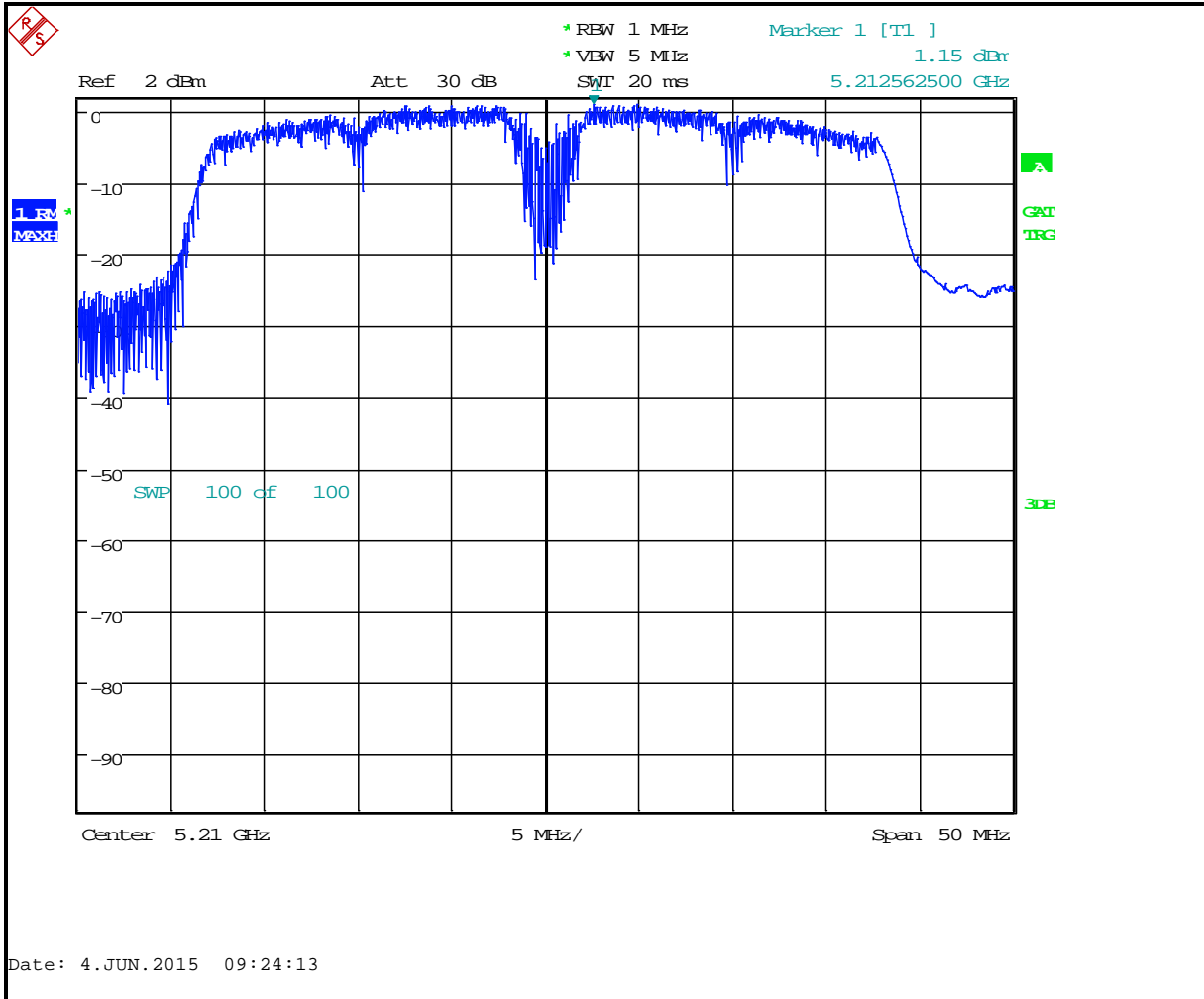
Plot 4-14: Power Spectral Density: Channel 165 (5825 MHz) 802.11n 65 Mbps



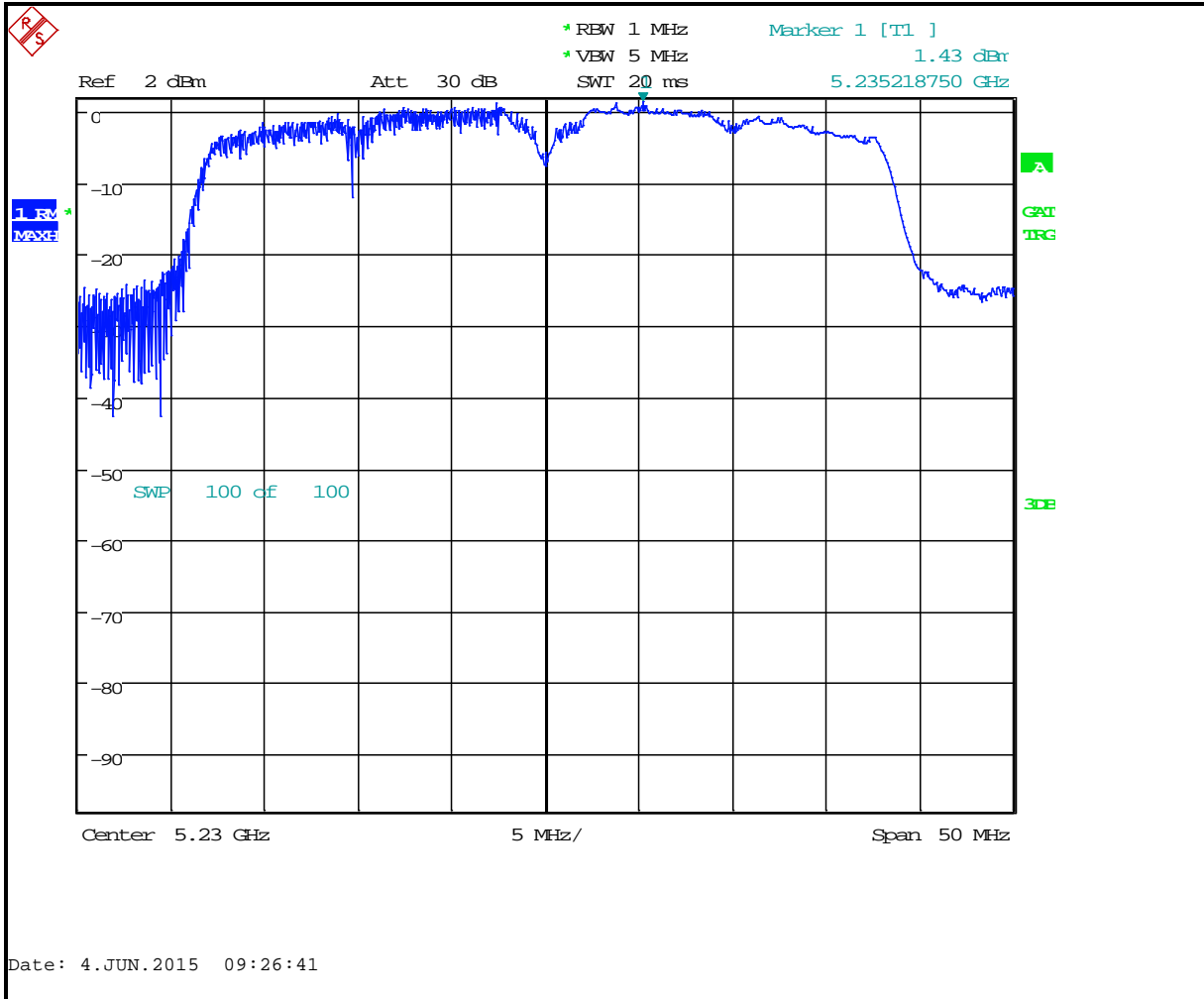
Plot 4-15: Peak Power Spectral Density: Channel 36 (5180 MHz, lower) 802.11n 40 MHz



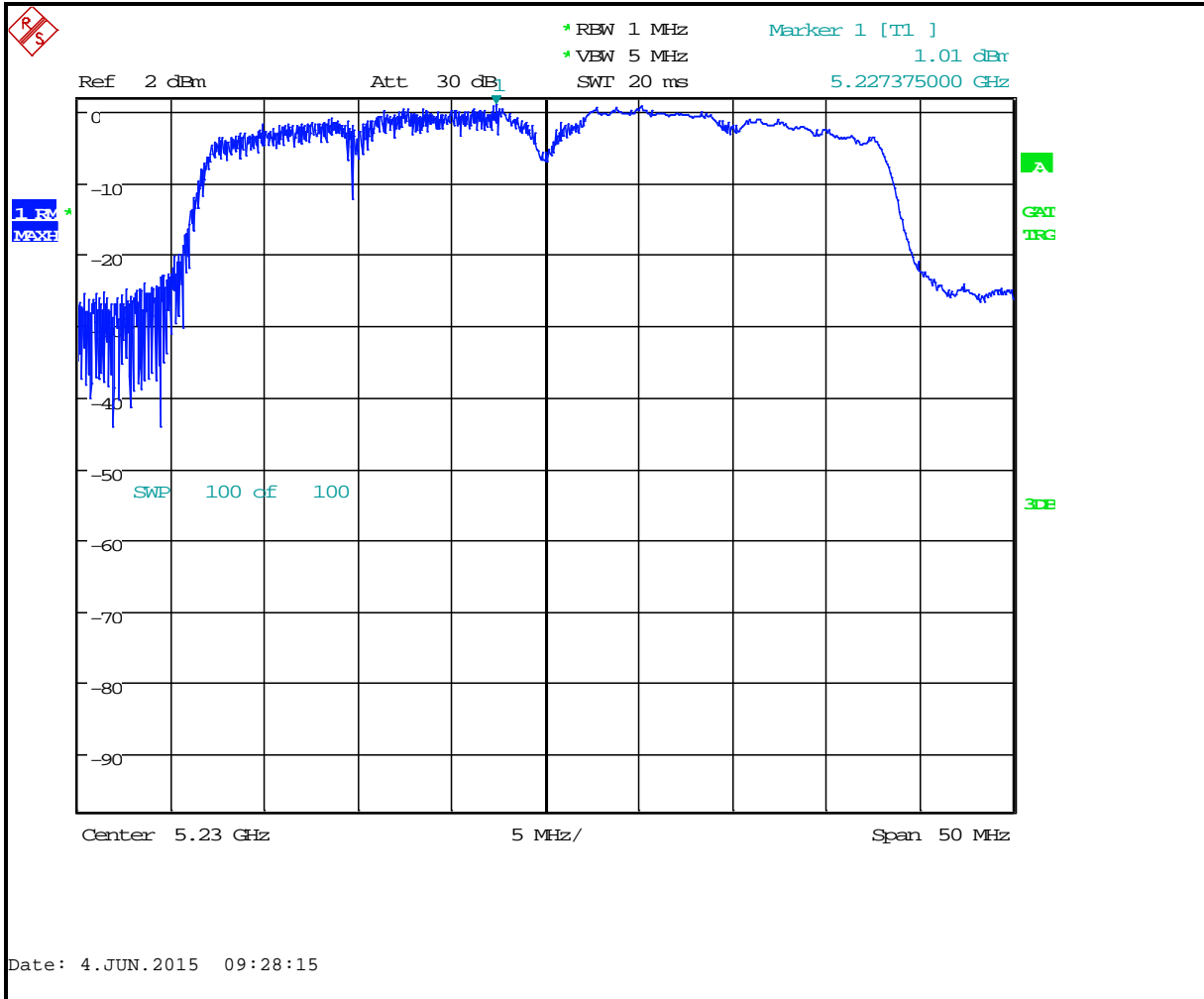
Plot 4-16: Peak Power Spectral Density: Channel 40 (5200 MHz, lower) 802.11n 40 MHz



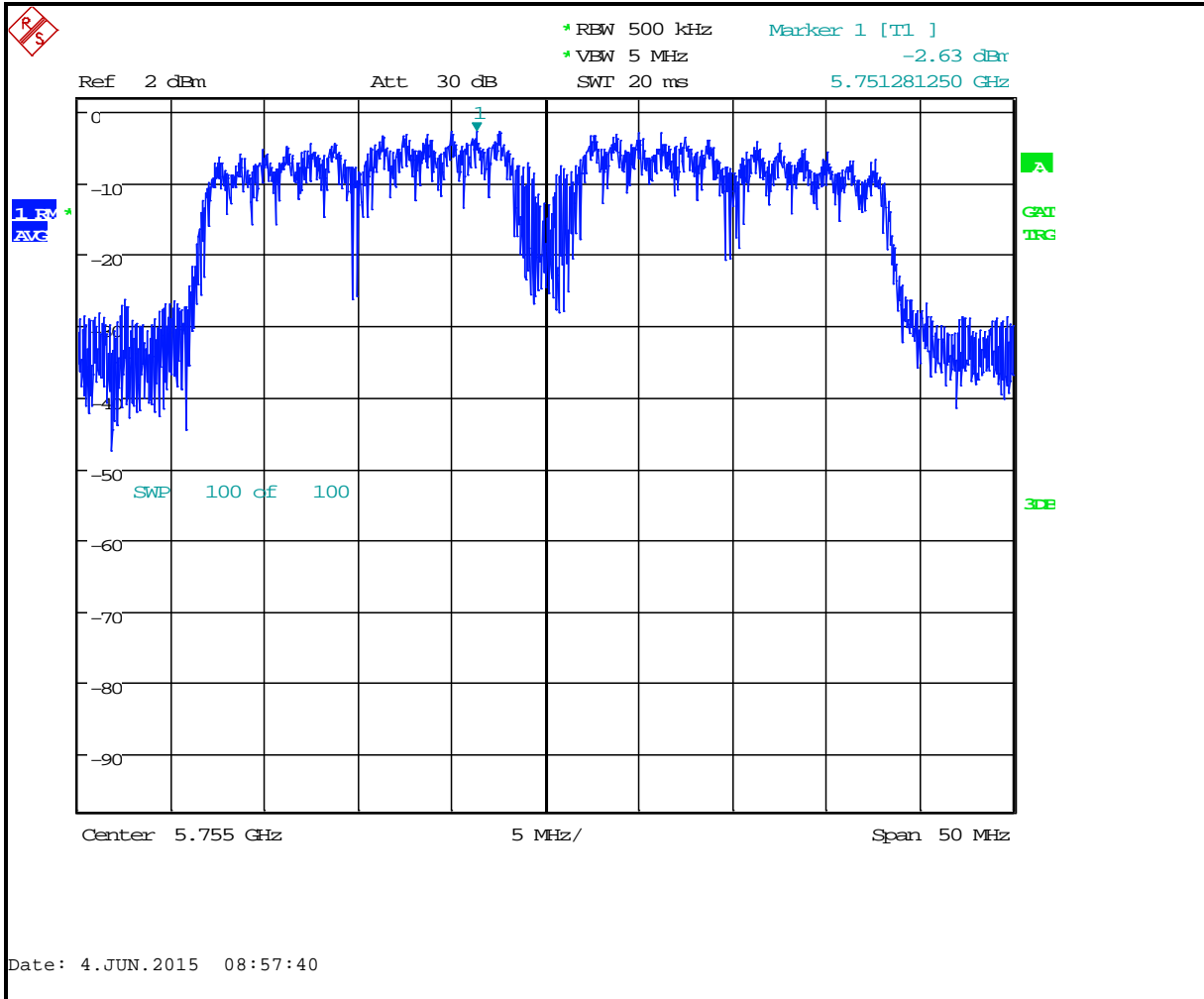
Plot 4-17: Peak Power Spectral Density: Channel 44 (5220 MHz, lower) 802.11n 40 MHz



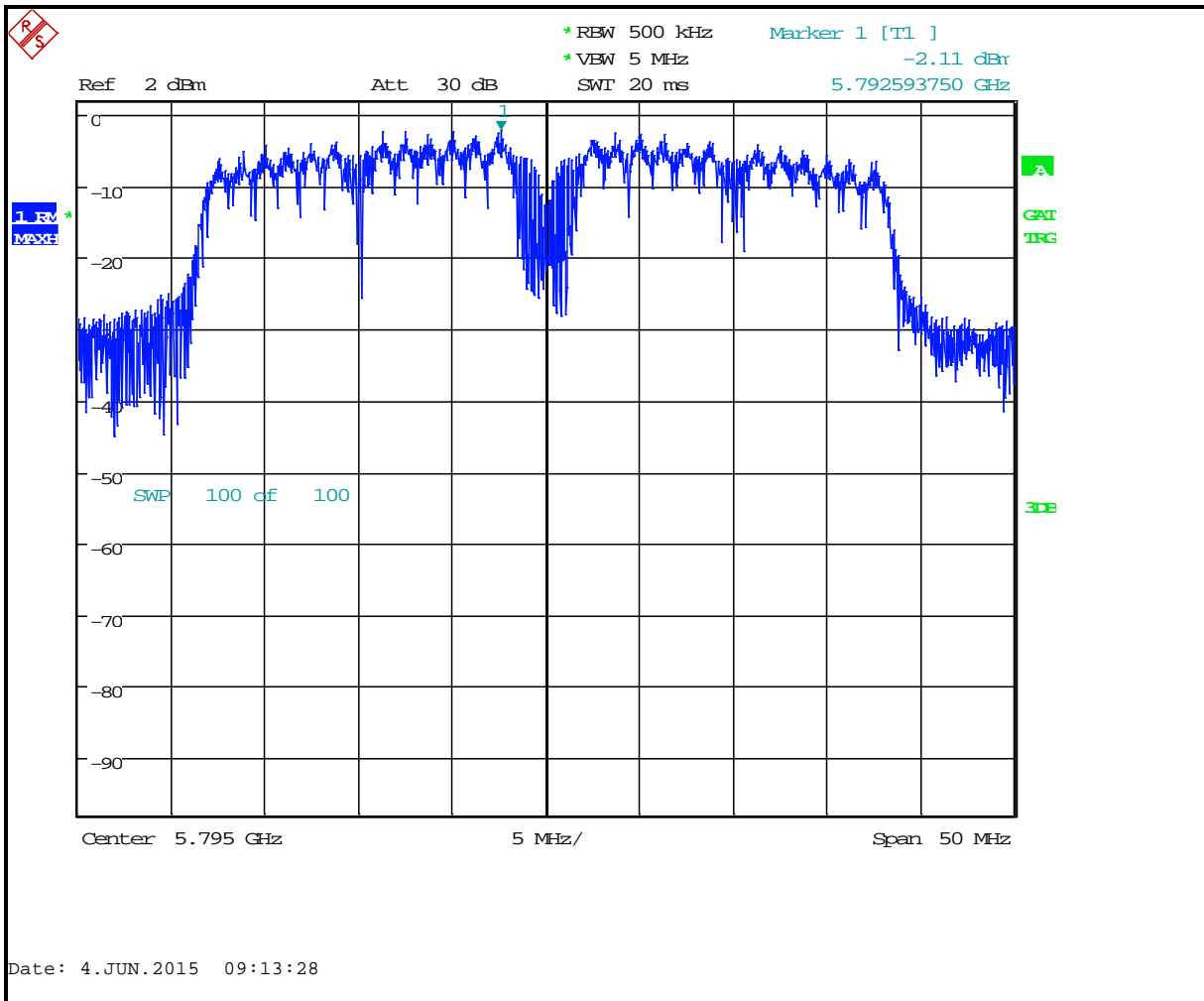
Plot 4-18: Peak Power Spectral Density: Channel 48 (5240 MHz, upper) 802.11n 40 MHz



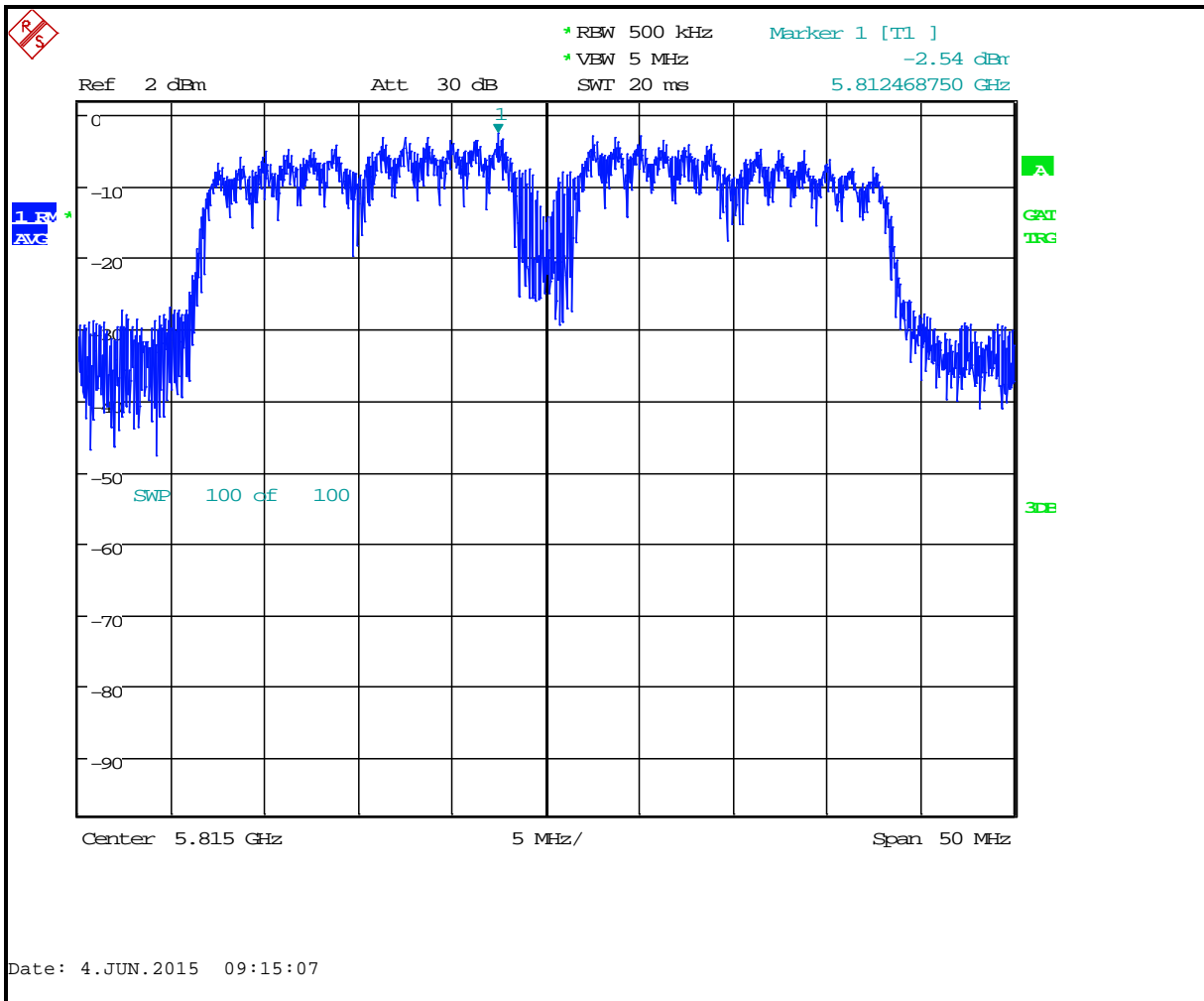
Plot 4-19: Power Spectral Density: Channel 149 (5745 MHz, lower) 802.11n 40 MHz



Plot 4-20: Power Spectral Density: Channel 157 (5785 MHz, lower) 802.11n 40 MHz



Plot 4-21: Power Spectral Density: Channel 165 (5825 MHz, upper) 802.11n 40 MHz



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Signature

June 4, 2013
 Date of Test

5 Frequency Stability Measurement – FCC 15.407(g)

5.1 Limits of Frequency Stability

The frequency tolerance shall be maintained within +/-0.02% of the operating frequency over a temperature variation of -30°C to 50°C at normal supply voltage, and for a variation in the primary supply voltage from 85%-115% of the rated supply voltage at a temperature of 20°C.

$$5280 \text{ MHz} \times 0.02\% = 1.056 \text{ MHz} = 200 \text{ ppm}$$

5.2 Frequency Stability Measurement Test Procedure

The EUT was placed inside the temperature chamber and supplied by nominal 7.4 VDC. The EUT was connected to an analyzer which was located outside of the chamber. The temperature was set to the lowest level and the EUT was allowed to stabilize with power off for a period of 1 hour. The EUT was then powered up and the frequency was measured. This was continued in 10 degree steps until the highest temperature level of 50°C was measured. The chamber was allowed to stabilize between measurements for approximately 30 minutes. At 20°C, the EUT supply voltage was adjusted to 85% and 115% of nominal voltage and the frequency was recorded.

Table 5-1: Frequency Stability Measurement Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|--------------------------|------------------|-----------------------------------|---------------|----------------------|
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |
| 901350 | Meterman | 33XR | Multimeter | 040402802 | 4/14/17 |
| 901594 | Insulated Wire Inc. | KPS-1503-360-KPR | SMK RF Cables 36" | NA | 9/3/15 |
| 900946 | Tenney Engineering, Inc. | TH65 | Temperature Chamber with Humidity | 11380 | 3/28/16 |
| 1724 | Hewlett Packard | 6024A | DC Power Supply | 1912A00331 | N/A |

5.3 Frequency Stability Test Data

Table 5-2: Frequency Stability/Temperature Variation; Channel 56 – 5280 MHz (36 Mbps)

| Temperature (°C) | Measured Frequency (MHz) | ppm |
|------------------|--------------------------|------|
| -30 | 5280.001747 | 0.33 |
| -20 | 5280.001939 | 0.37 |
| -10 | 5280.002083 | 0.39 |
| 0 | 5280.001507 | 0.29 |
| 10 | 5280.000914 | 0.17 |
| 20 | 5280.000000 | 0.00 |
| 30 | 5280.001939 | 0.37 |
| 40 | 5280.000521 | 0.10 |
| 50 | 5280.000521 | 0.10 |

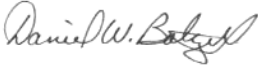
Table 5-3: Frequency Stability/Voltage Variation; Channel 56 – 5280 MHz (36 Mbps)

| Voltage (VDC) | Measured Frequency (MHz) | ppm |
|---------------|--------------------------|-------|
| 6.29 | 5279.999760 | -0.05 |
| 7.4 | 5280.000000 | 0.00 |
| 8.51 | 5279.999616 | -0.07 |

Highest deviation noted: 0.39 ppm

Pass limit of 200 ppm.

Test Personnel:

| | | |
|-------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------|
| Daniel W. Baltzell Test Engineer |  Signature | June 10, 2015 Date of Test |
|-------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------|

6 Compliance with the Band Edge – FCC 15.407(b); RSS-247 6.2

6.1 Limits of Band Edge Measurement

For transmitters operating in the 5.15 - 5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band:

The limits of FCC 15.407 have changed from the 10-01-15 version originally tested, from “All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz..”

To the 2016 version, section (a)(4) which states the difference “For transmitters operating in the 5.725–5.85 GHz band:”, in section (i): “All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.”

This 2016 version of the limit is less stringent than the -27 dBm/MHz or -17 dBm/MHz which is shown in the following plots, and which may be considered worst case.

6.2 Band Edge Test Procedure

789033 D02 General UNII Test Procedures New Rules v01 II.G.3.d)(ii)

Integration Method

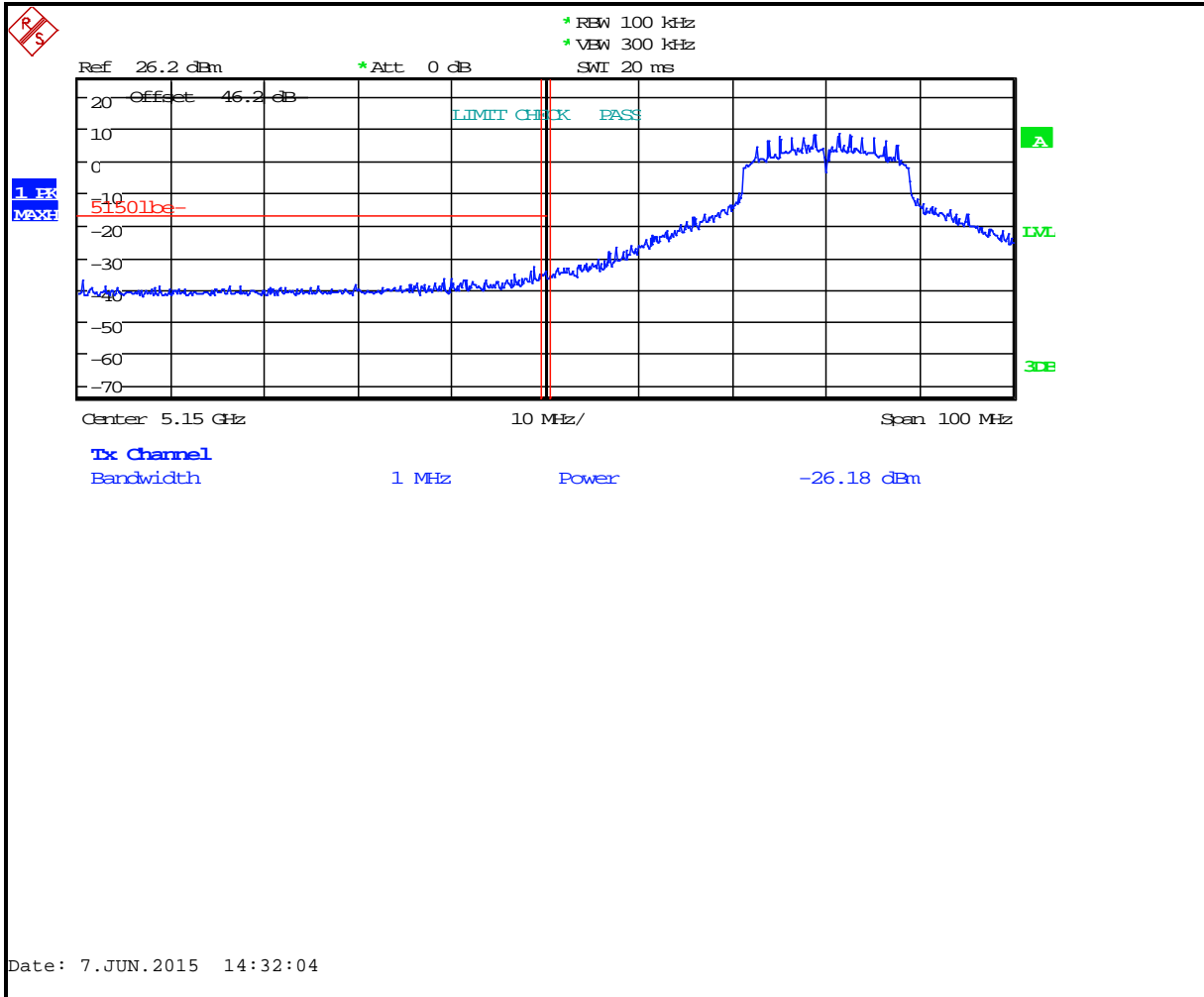
Table 6-1: Band Edge Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|---------------------|-------------------|------------------------------|---------------|----------------------|
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |
| 900321 | EMCO | 3161-03 | Horn Antenna (4.0 - 8.2 GHz) | 9508-1020 | 4/9/18 |
| 901592 | Insulated Wire Inc. | KPS-1503-3600-KPR | SMK RF Cables 20' | NA | 9/3/15 |

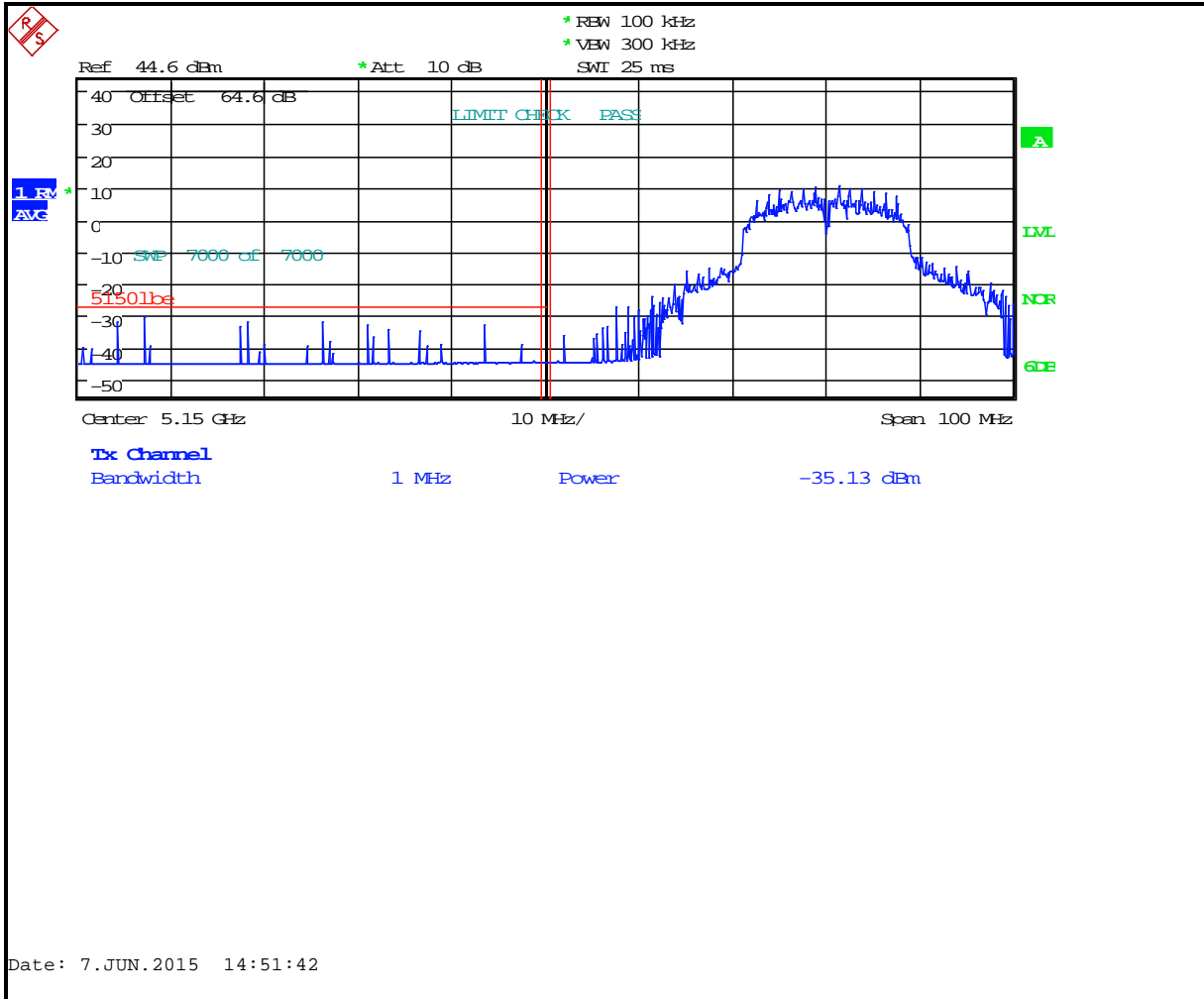
6.3 Band Edge Test Results

6.3.1 5150 – 5350 MHz Band Edges – 802.11a and 802.11n

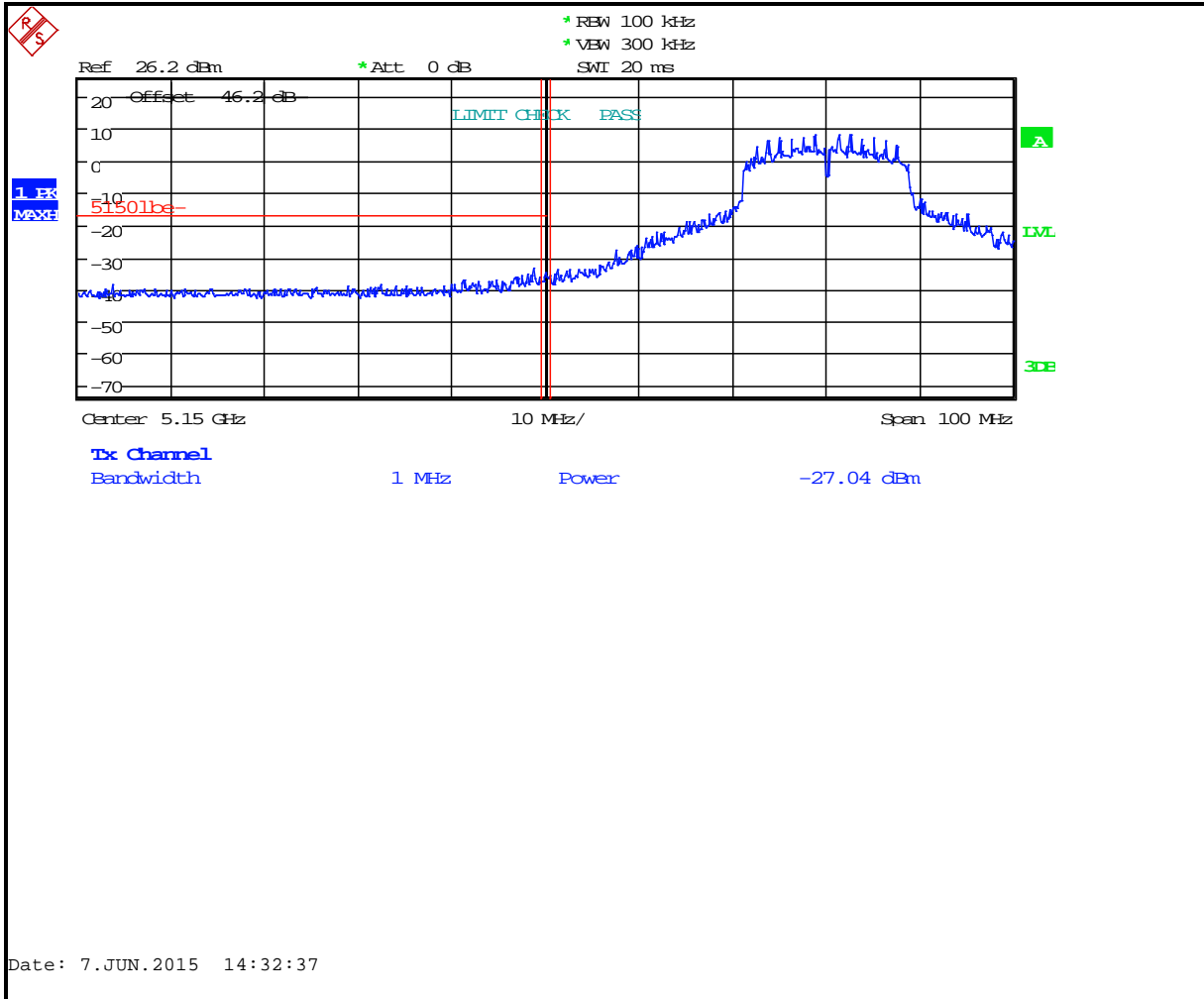
Plot 6-1: Lower Band Edge: Measurement Channel 36 (5180 MHz, 802.11a, Peak)



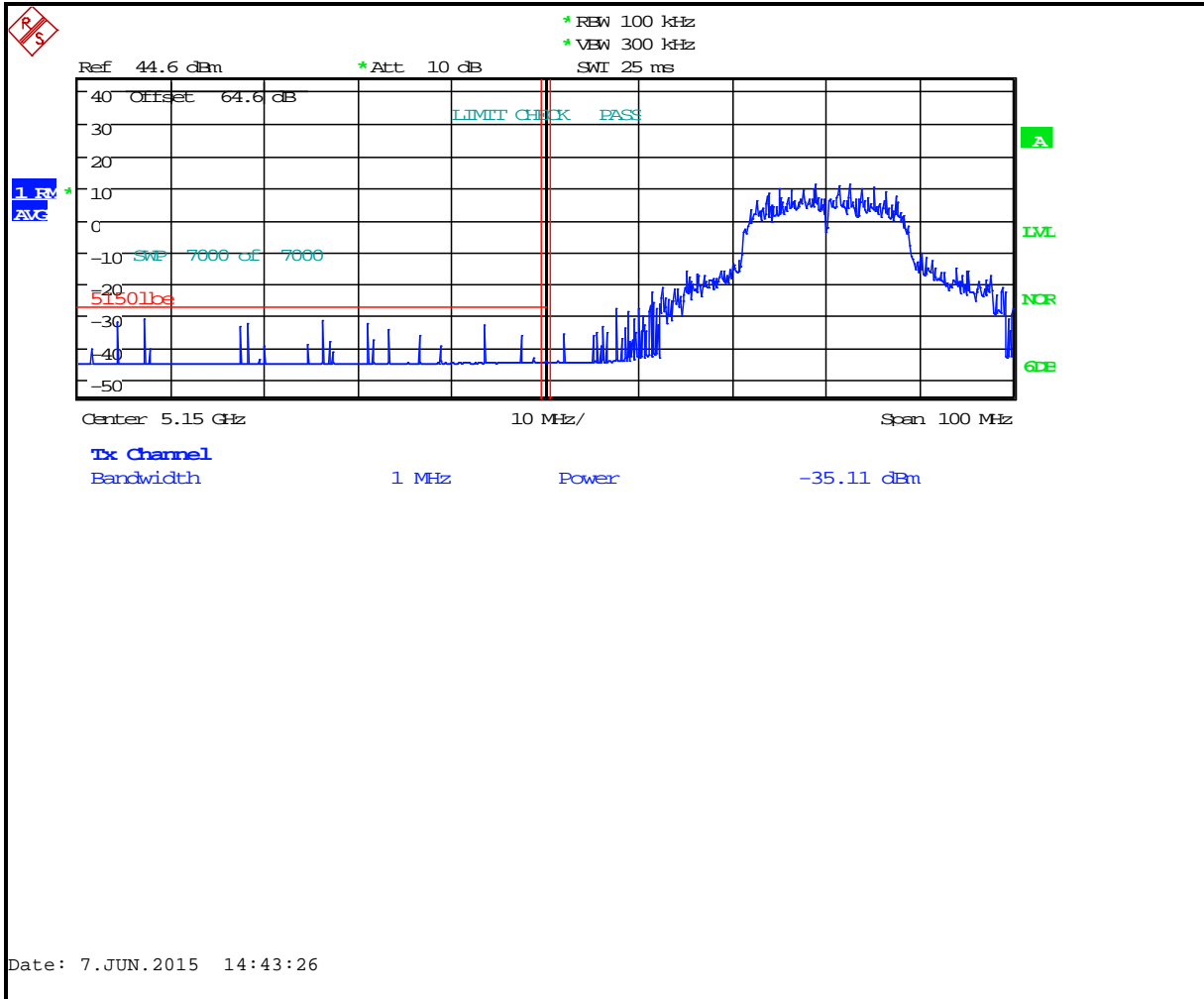
Plot 6-2: Lower Band Edge: Measurement Channel 36 (5180 MHz, 802.11a, Average)



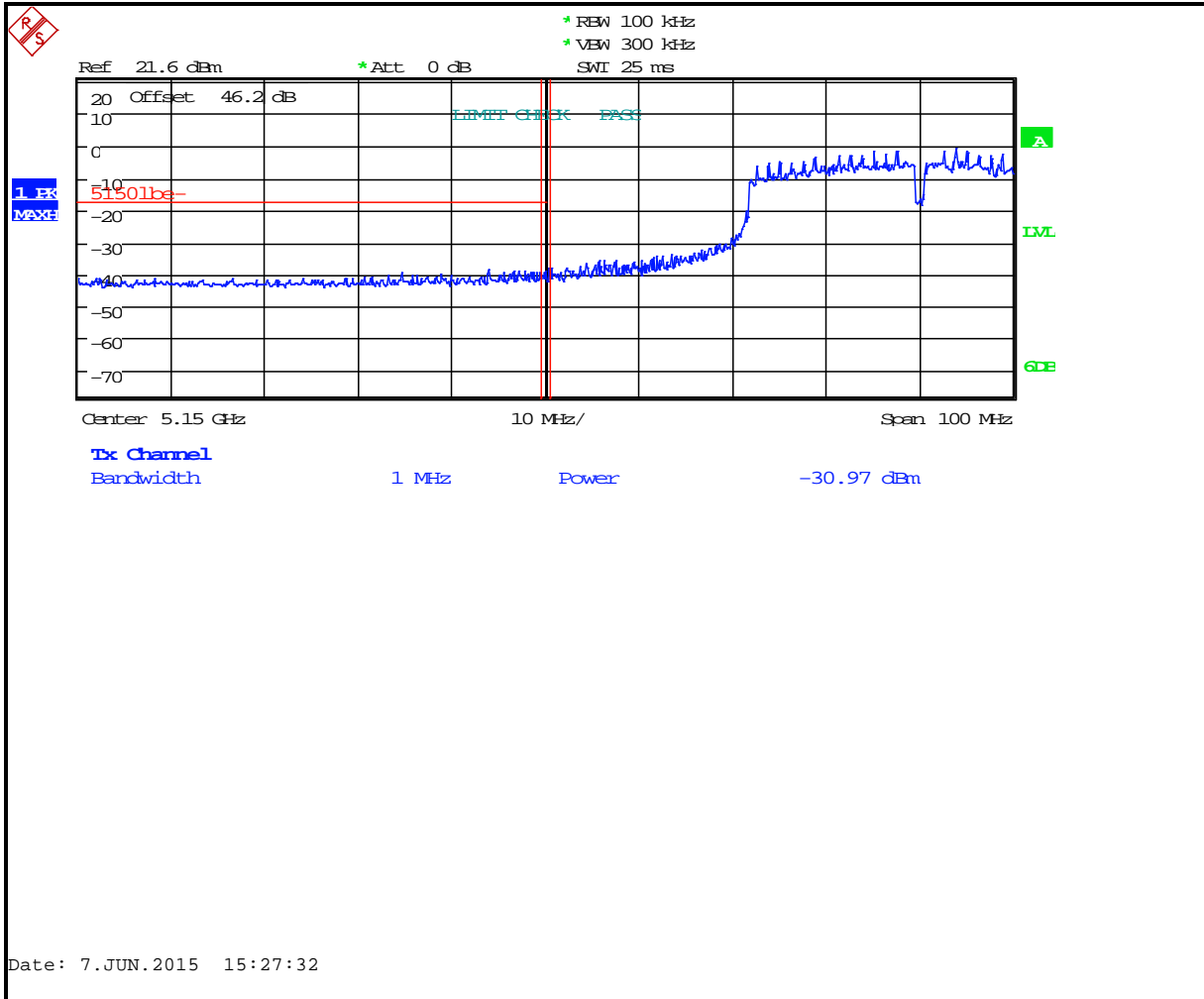
Plot 6-3: Lower Band Edge: Measurement Channel 36 (5180 MHz, 802.11n, Peak)



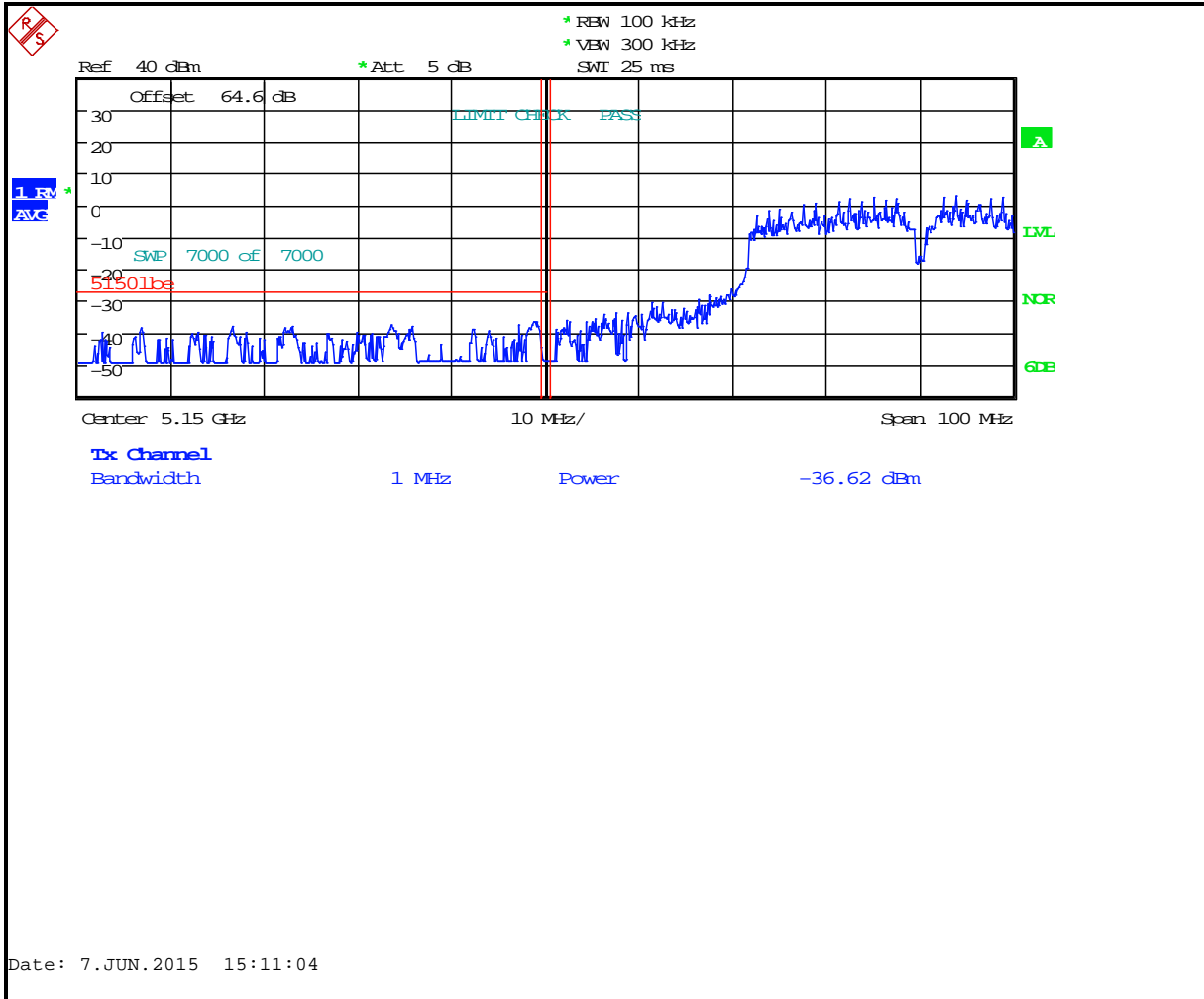
Plot 6-4: Lower Band Edge: Measurement Channel 36 (5180 MHz, 802.11n, Average)



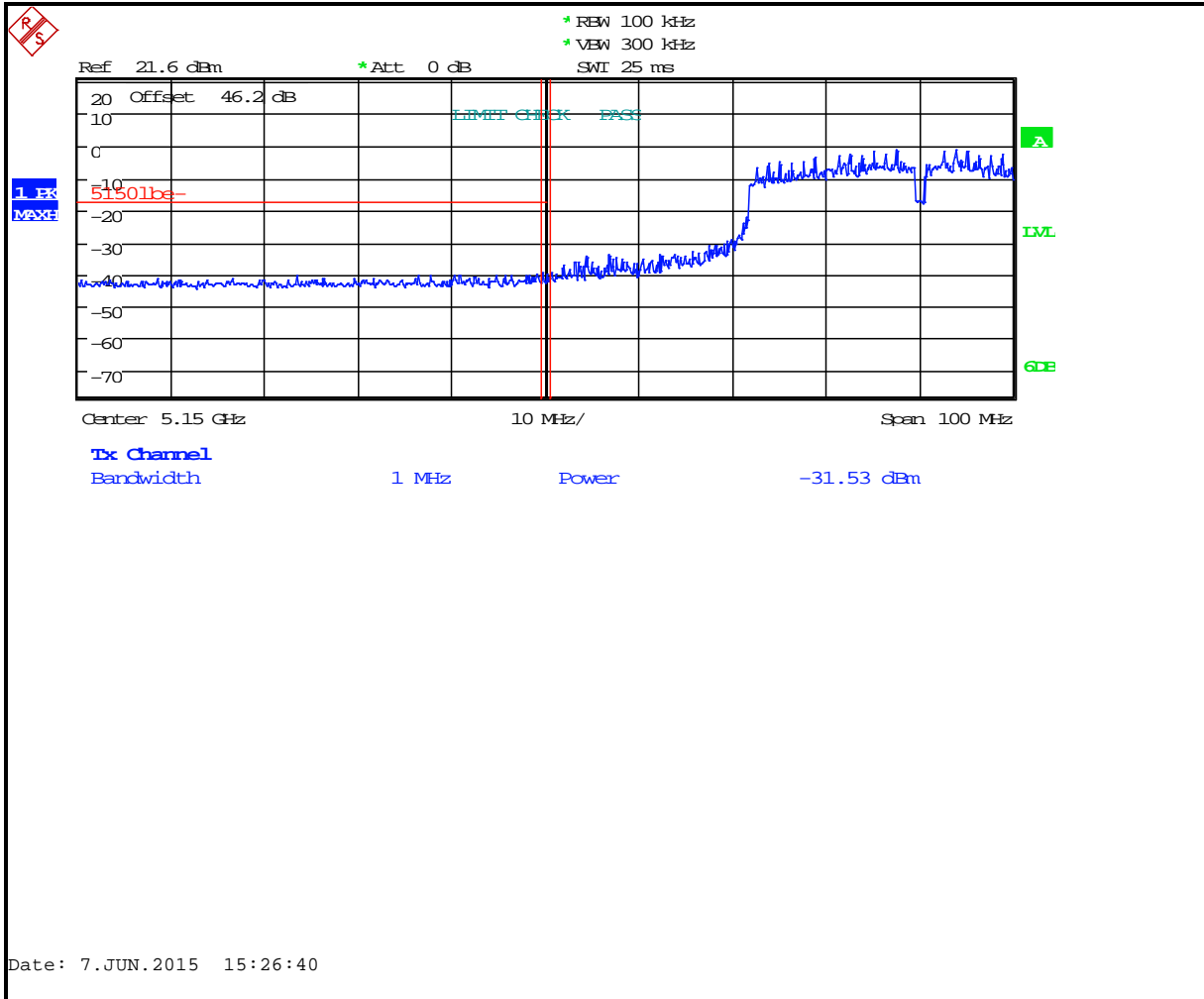
Plot 6-5: Lower Band Edge: Measurement Channel 36 (5180 MHz, 40 MHz BW, 802.11a, Peak)



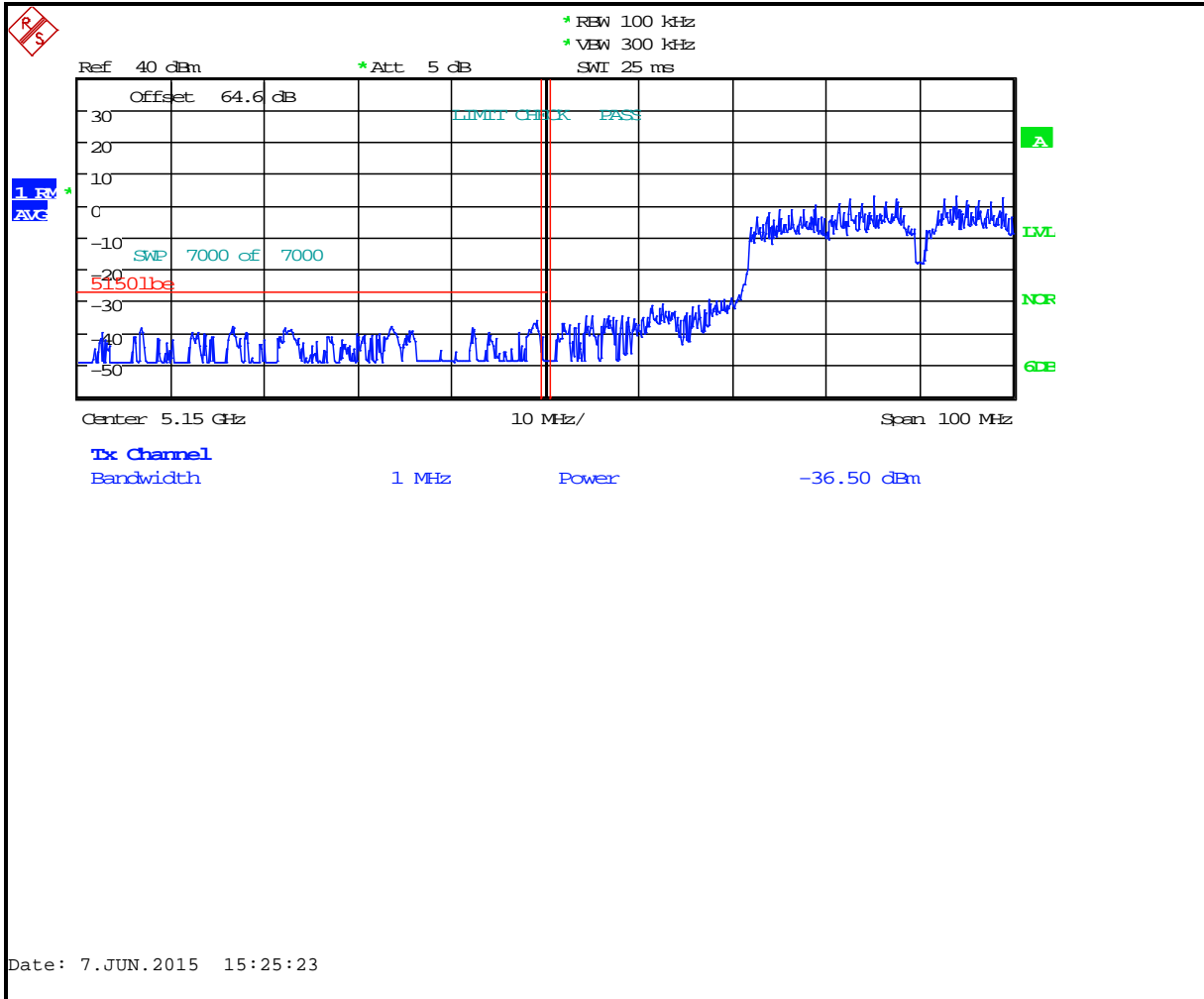
Plot 6-6: Lower Band Edge: Measurement Channel 36 (5180 MHz, 40 MHz BW, 802.11a, Average)



Plot 6-7: Lower Band Edge: Measurement Channel 36 (5180 MHz, 40 MHz BW, 802.11n, Peak)

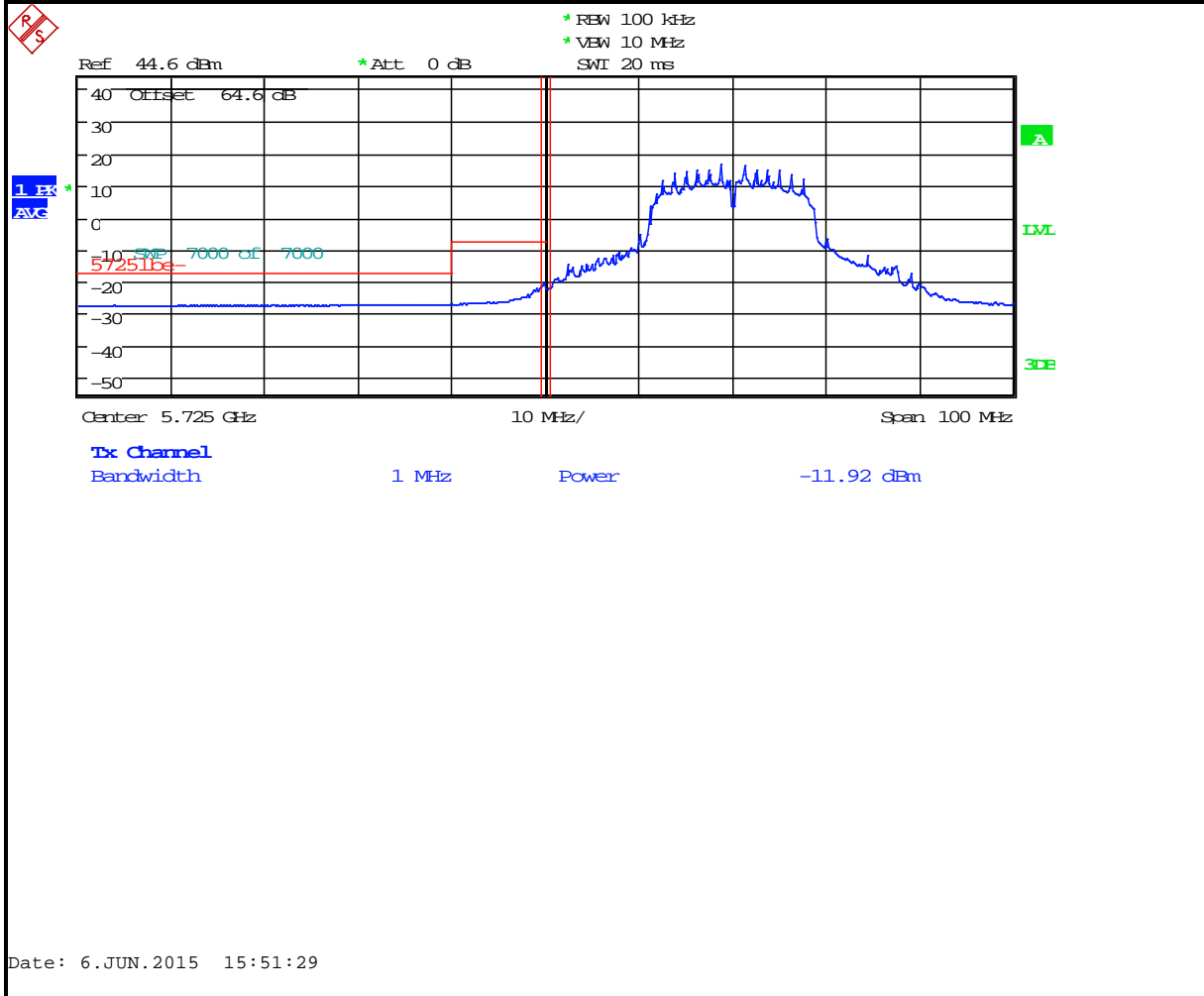


Plot 6-8: Lower Band Edge: Measurement Channel 36 (5180 MHz, 40 MHz BW, 802.11n, Average)

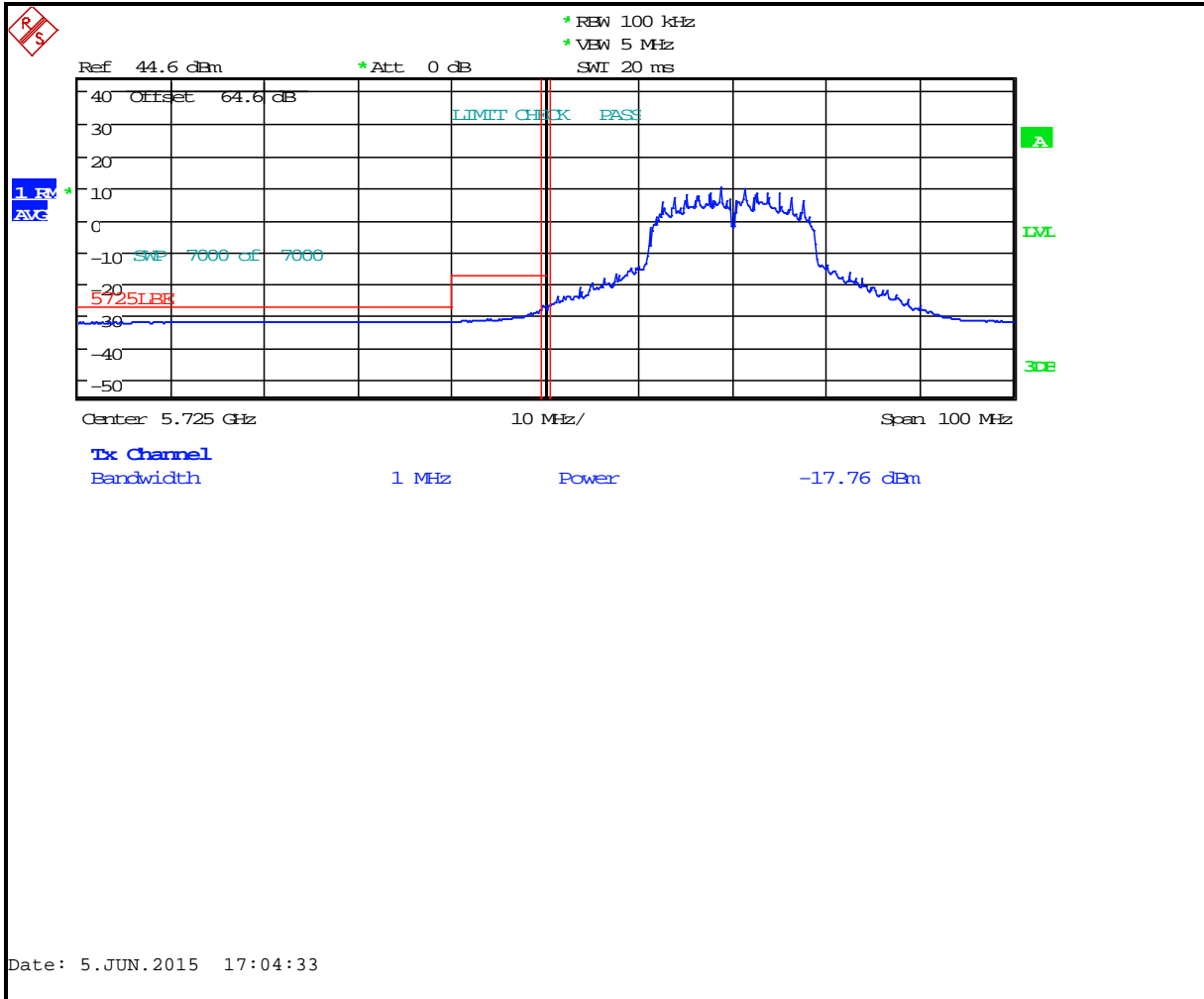


6.3.2 5725 – 5850 MHz Band Edges – 802.11a and 802.11n

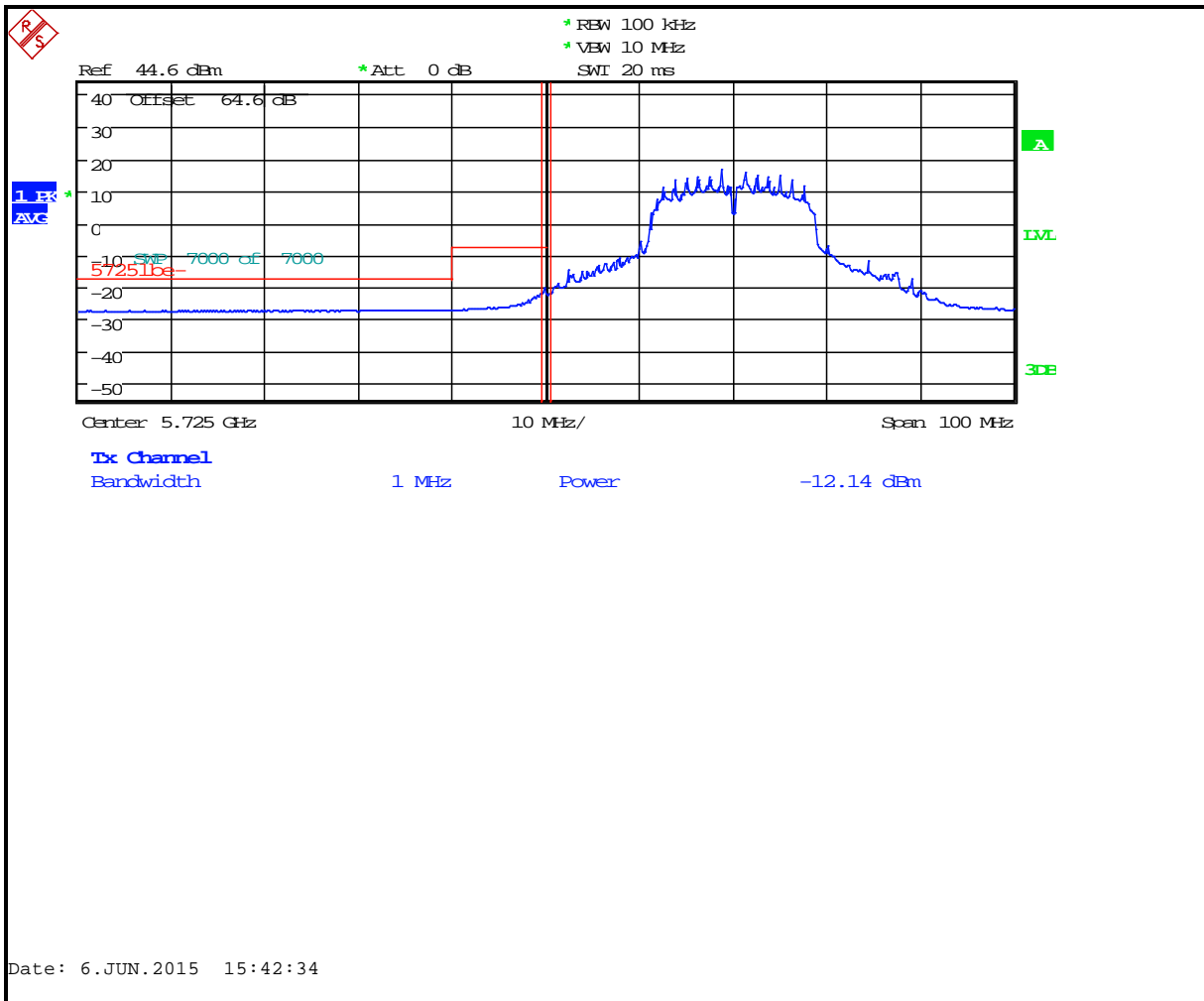
Plot 6-9: Lower Band Edge: Measurement Channel 149 (5745 MHz, 802.11a, Peak)



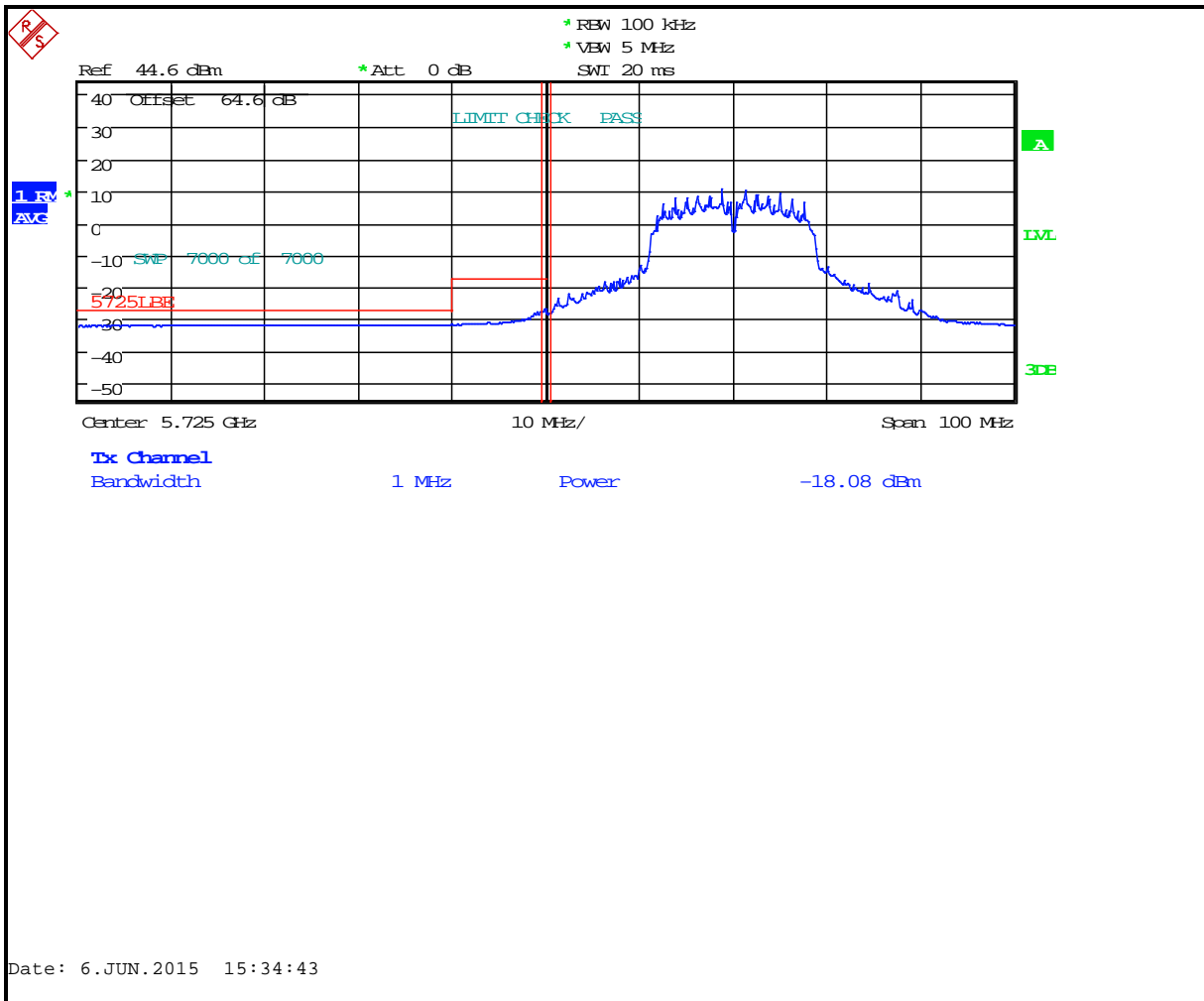
Plot 6-10: Lower Band Edge: Measurement Channel 149 (5745 MHz, 802.11a, Average)



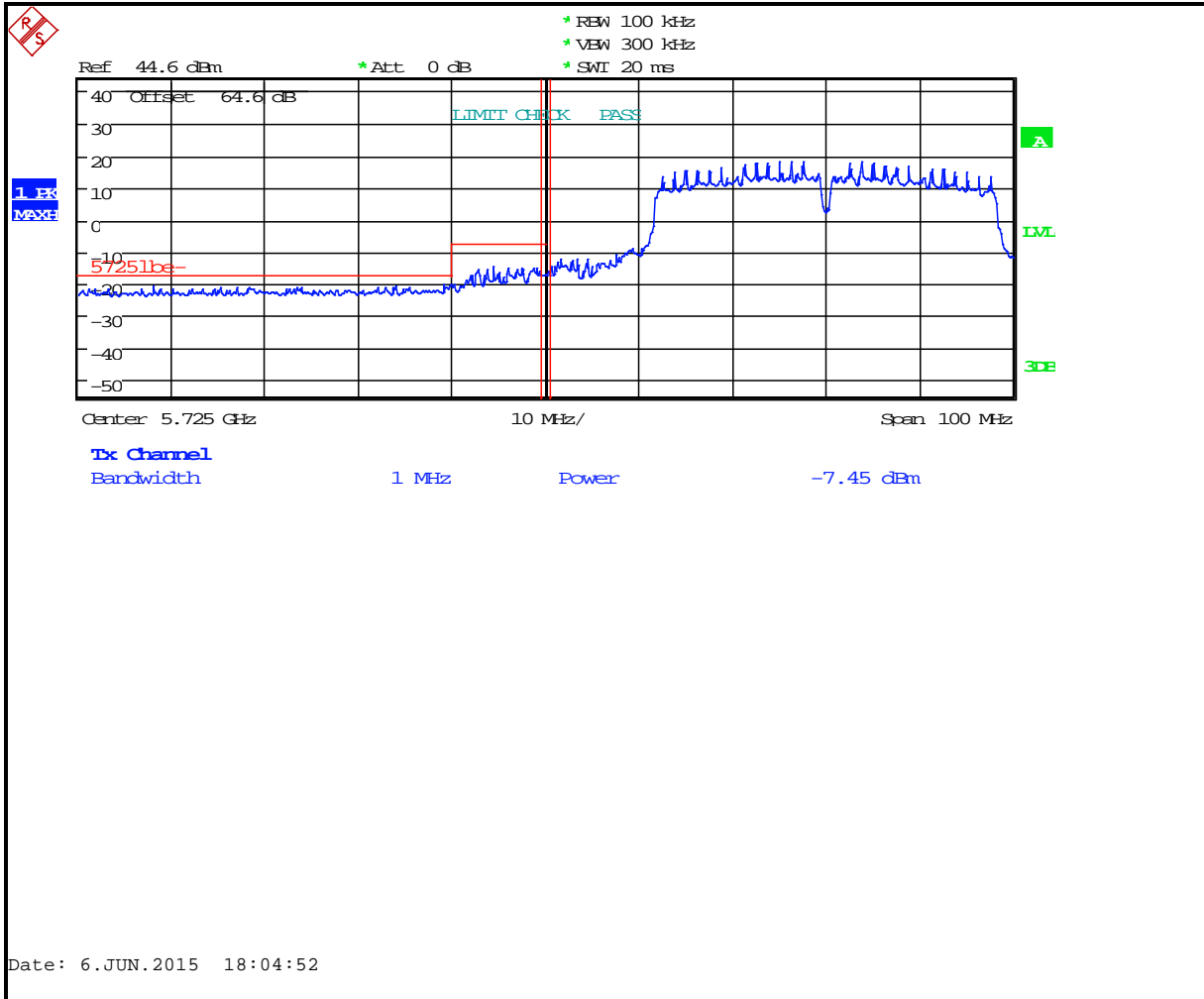
Plot 6-11: Lower Band Edge: Measurement Channel 149 (5745 MHz, 802.11n, Peak)



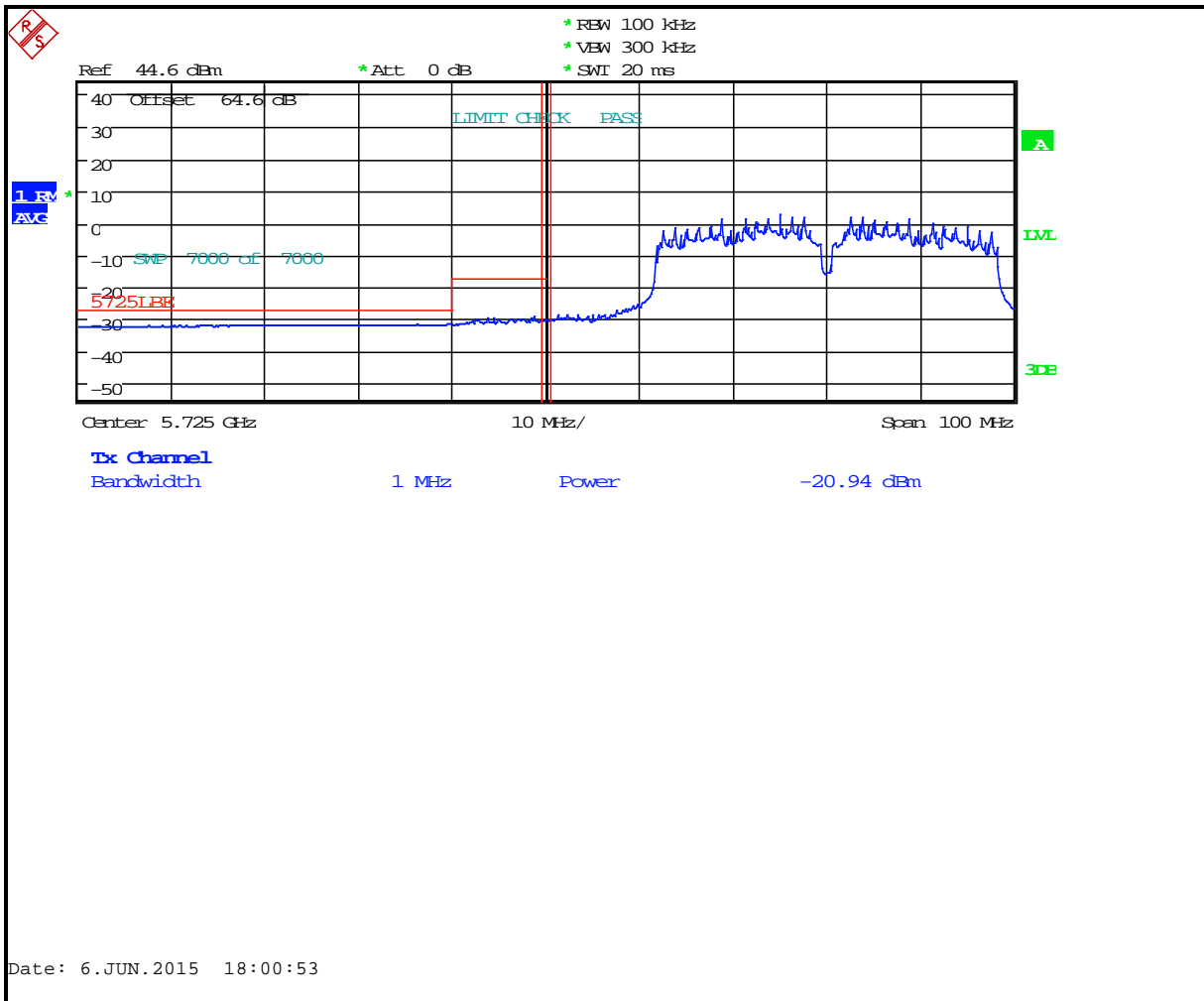
Plot 6-12: Lower Band Edge: Measurement Channel 149 (5745 MHz, 802.11n, Average)



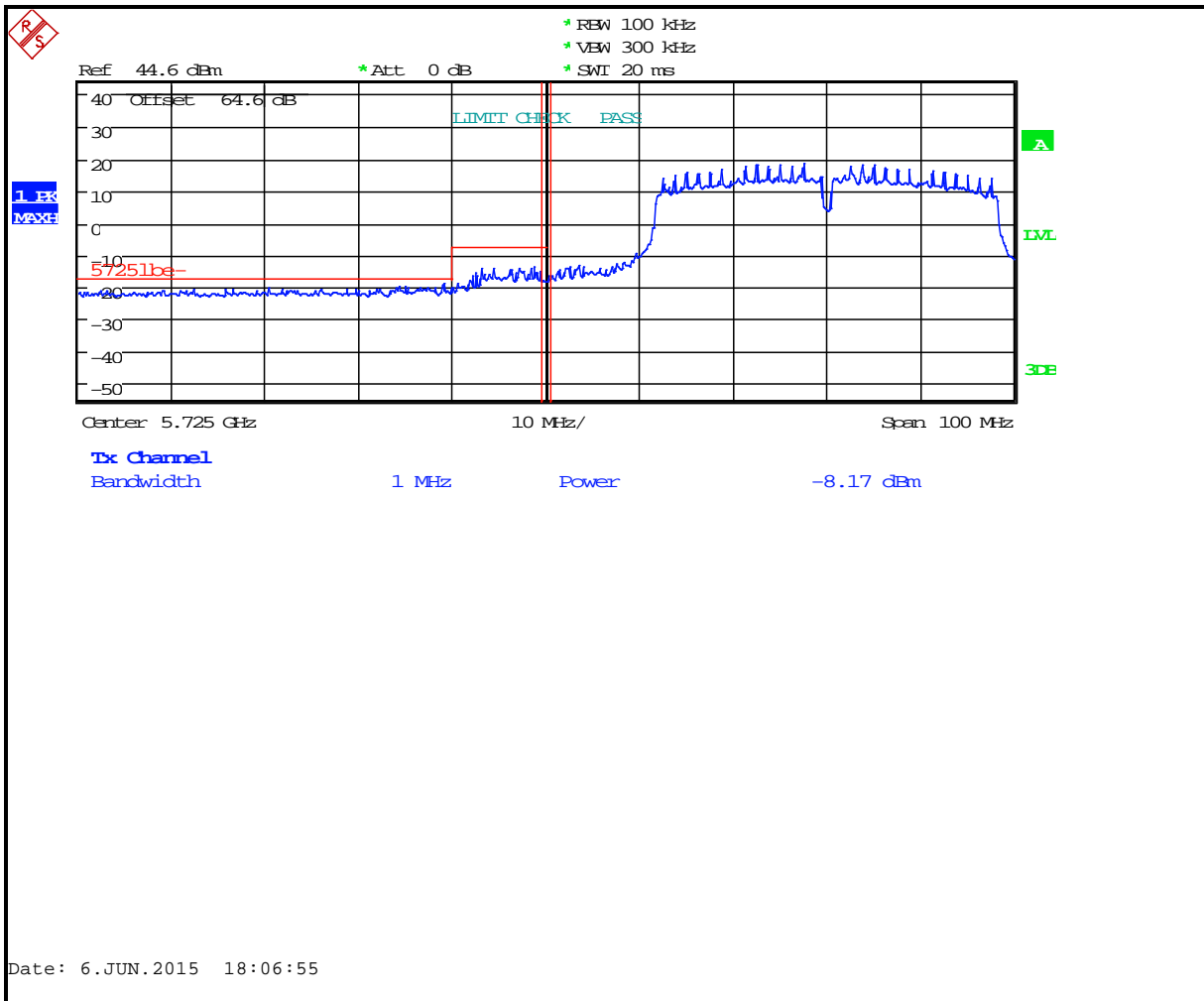
Plot 6-13: Lower Band Edge: Measurement Channel 149 (5745 MHz, 40 MHz BW, 802.11a, Peak)



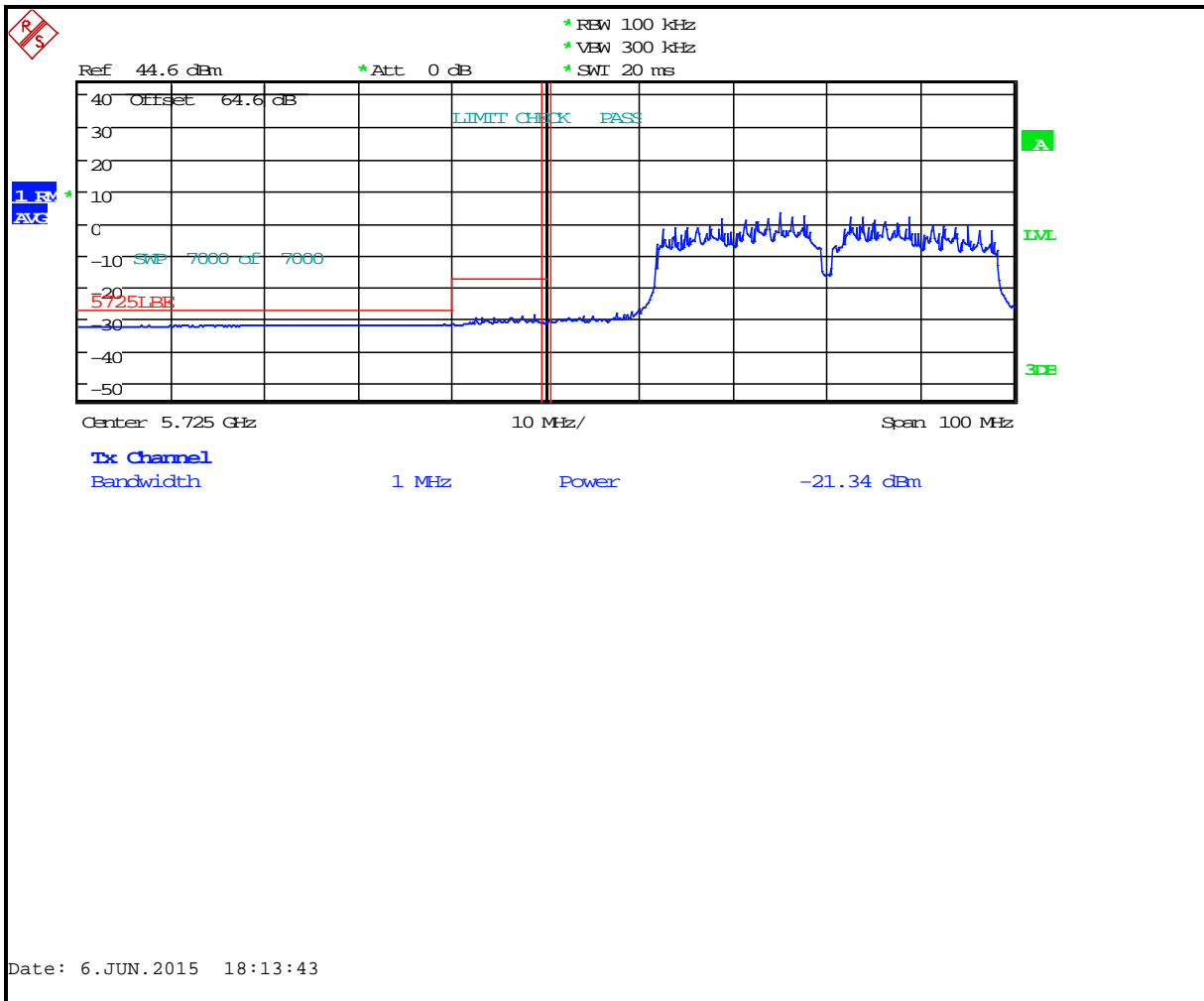
Plot 6-14: Lower Band Edge: Measurement Channel 149 (5745 MHz, 40 MHz BW, 802.11a, Average)



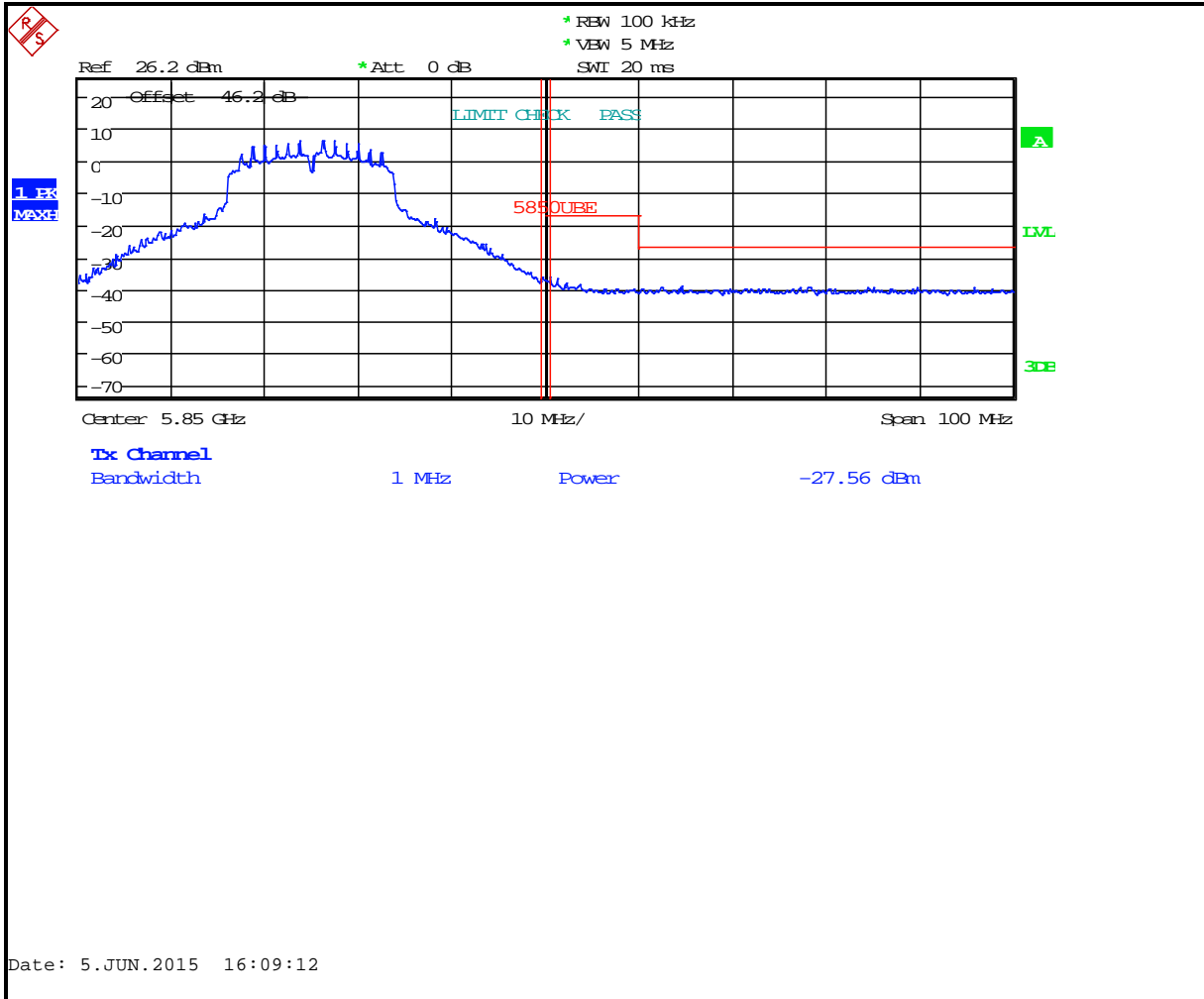
Plot 6-15: Lower Band Edge: Measurement Channel 149 (5745 MHz, 40 MHz BW, 802.11n, Peak)



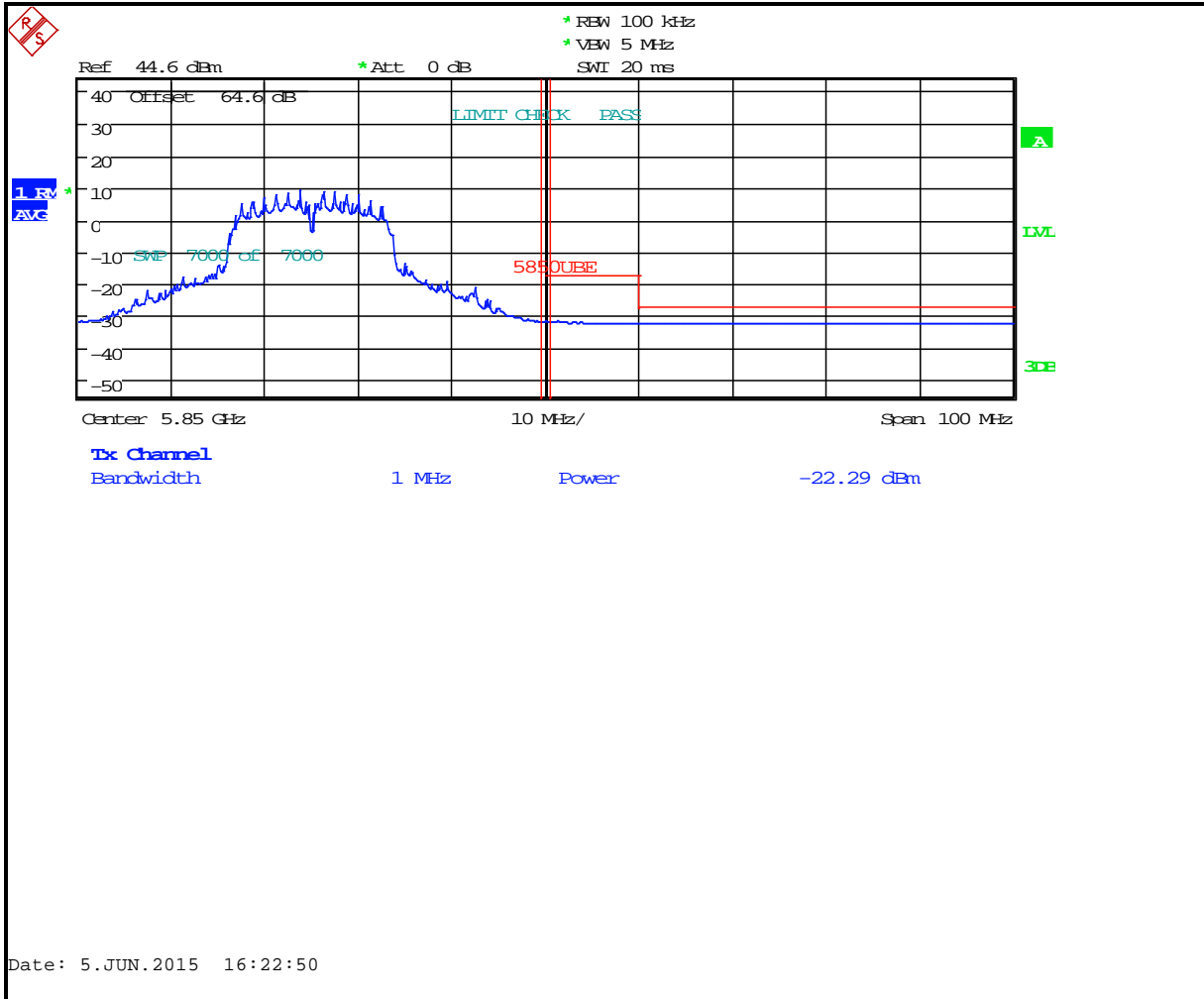
Plot 6-16: Lower Band Edge: Measurement Channel 149 (5745 MHz, 40 MHz BW, 802.11n, Average)



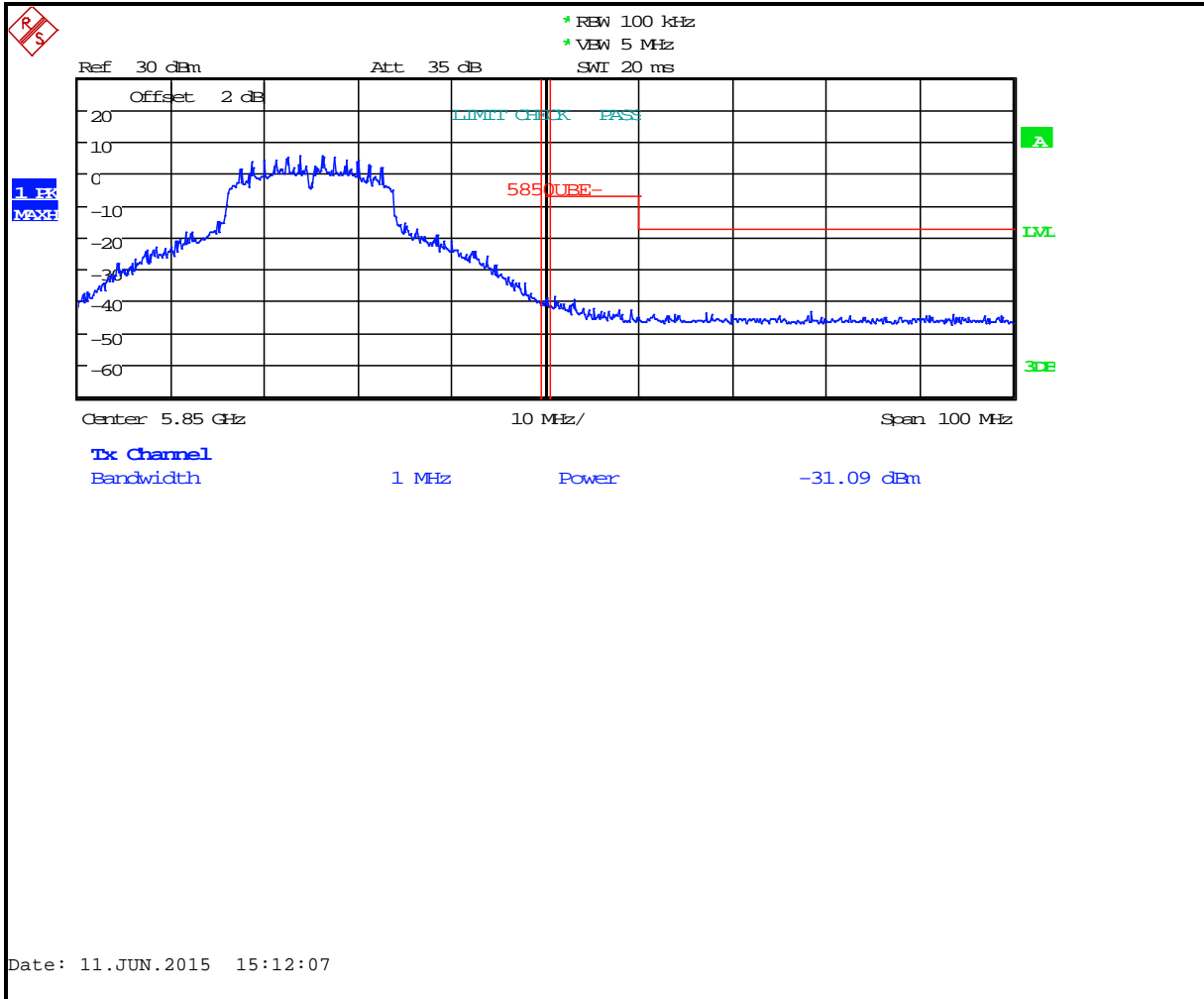
Plot 6-17: Upper Band Edge: Measurement Channel 165 (5825 MHz, 802.11a, Peak)



Plot 6-18: Upper Band Edge: Measurement Channel 165 (5825 MHz, 802.11a, Average)

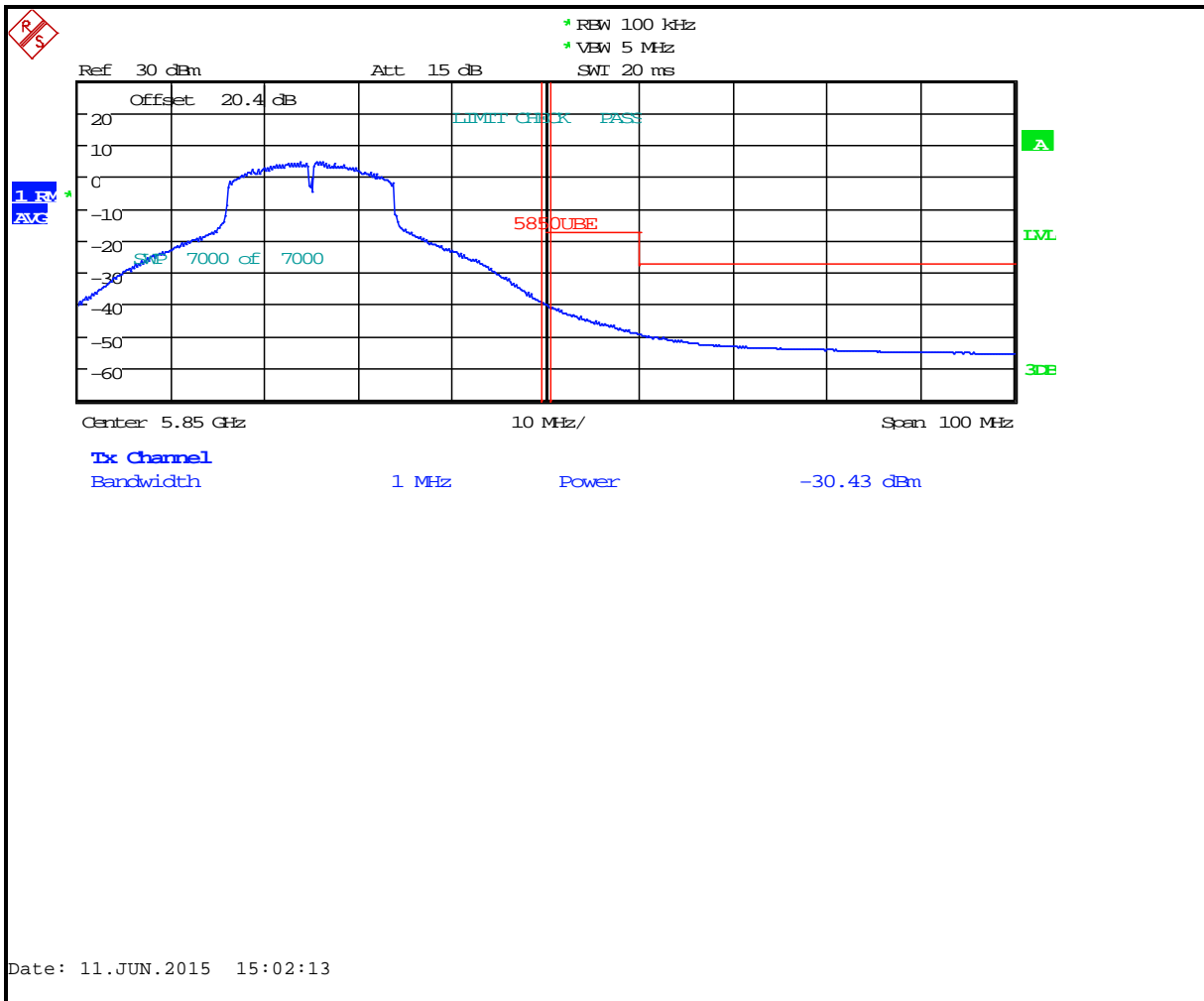


Plot 6-19: Upper Band Edge: Measurement Channel 165 (5825 MHz, 802.11n, Peak)



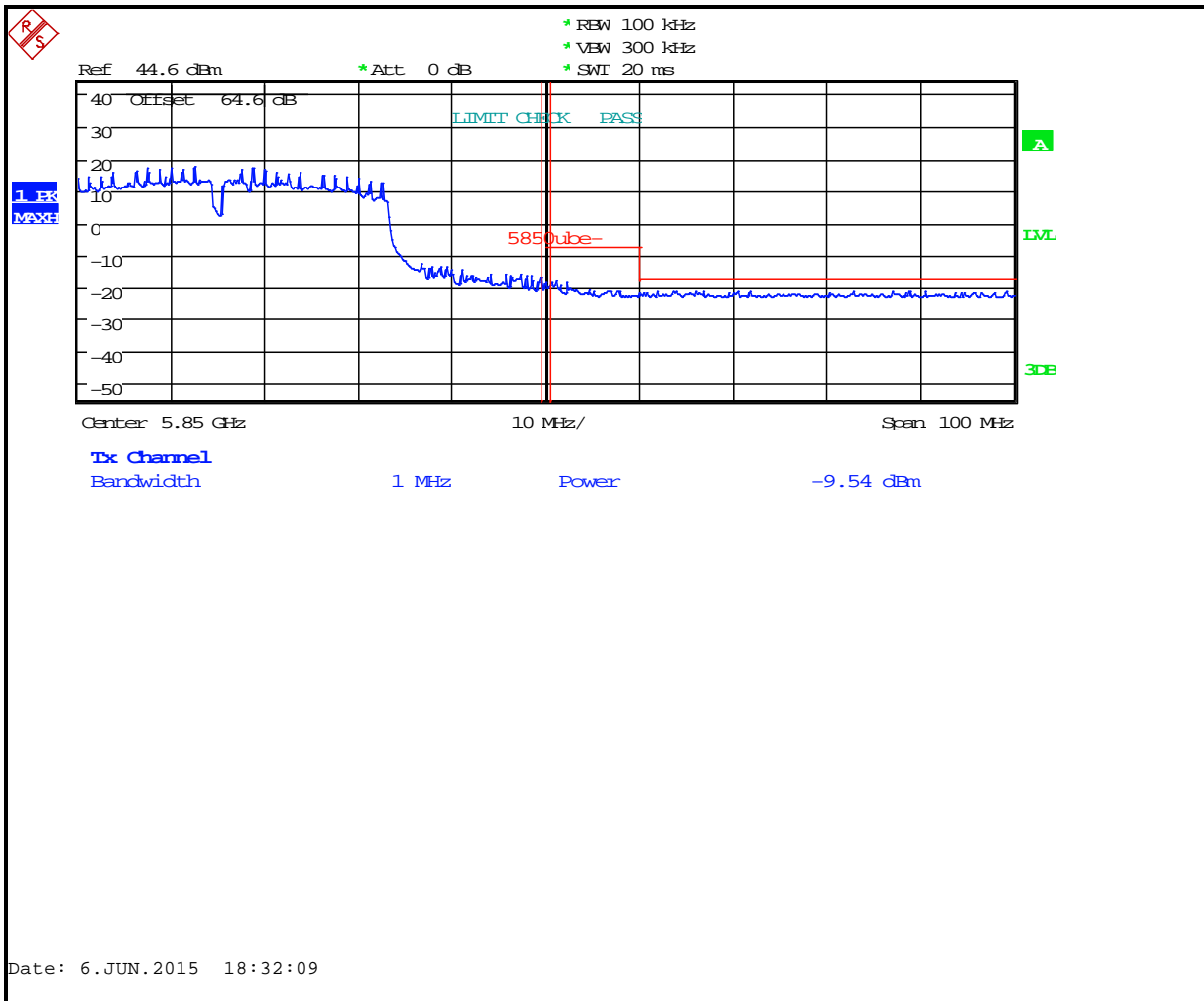
Note: Conducted antenna port measurement

Plot 6-20: Upper Band Edge: Measurement Channel 165 (5825 MHz, 802.11n, Average)

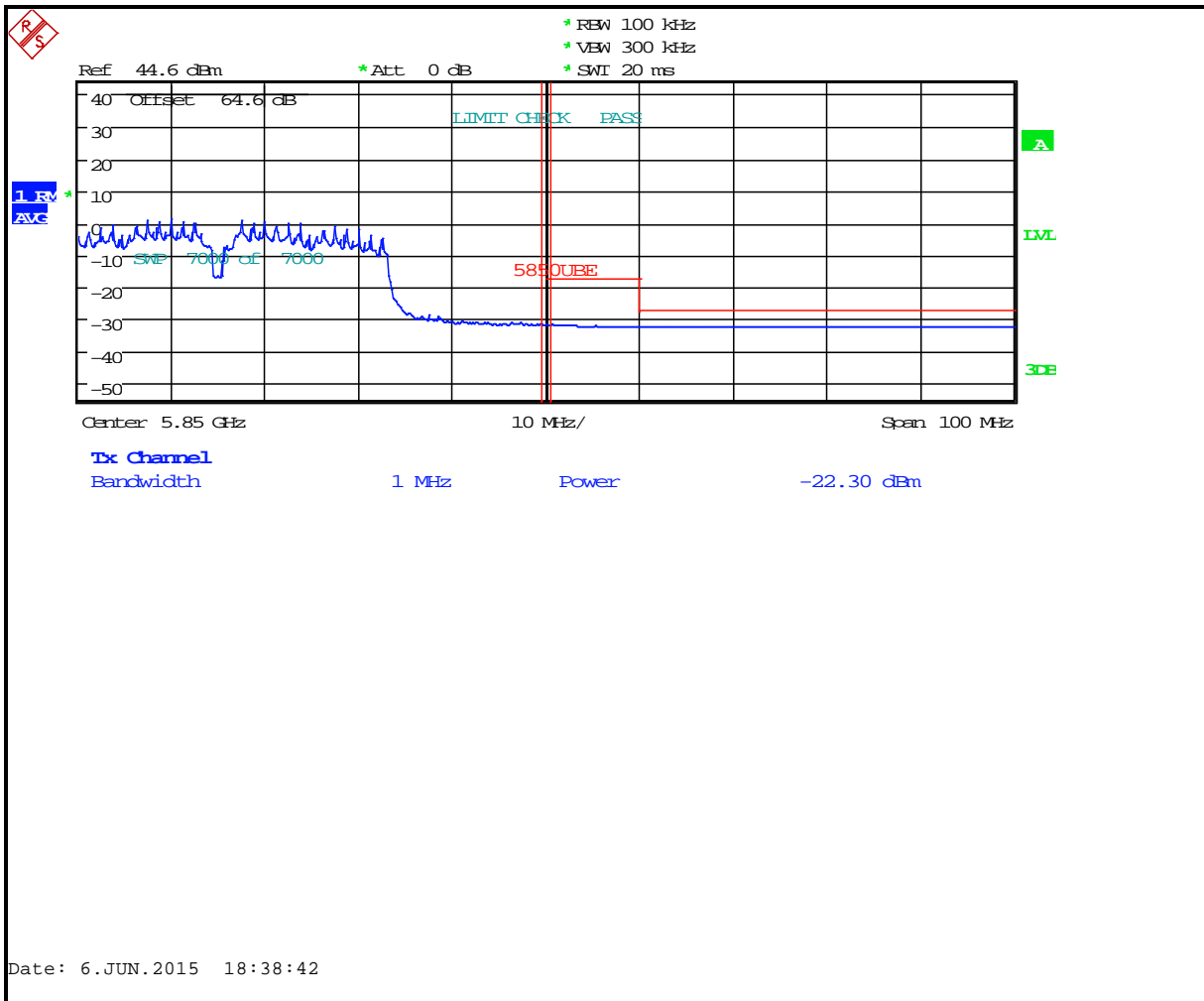


Note: Conducted antenna port measurement

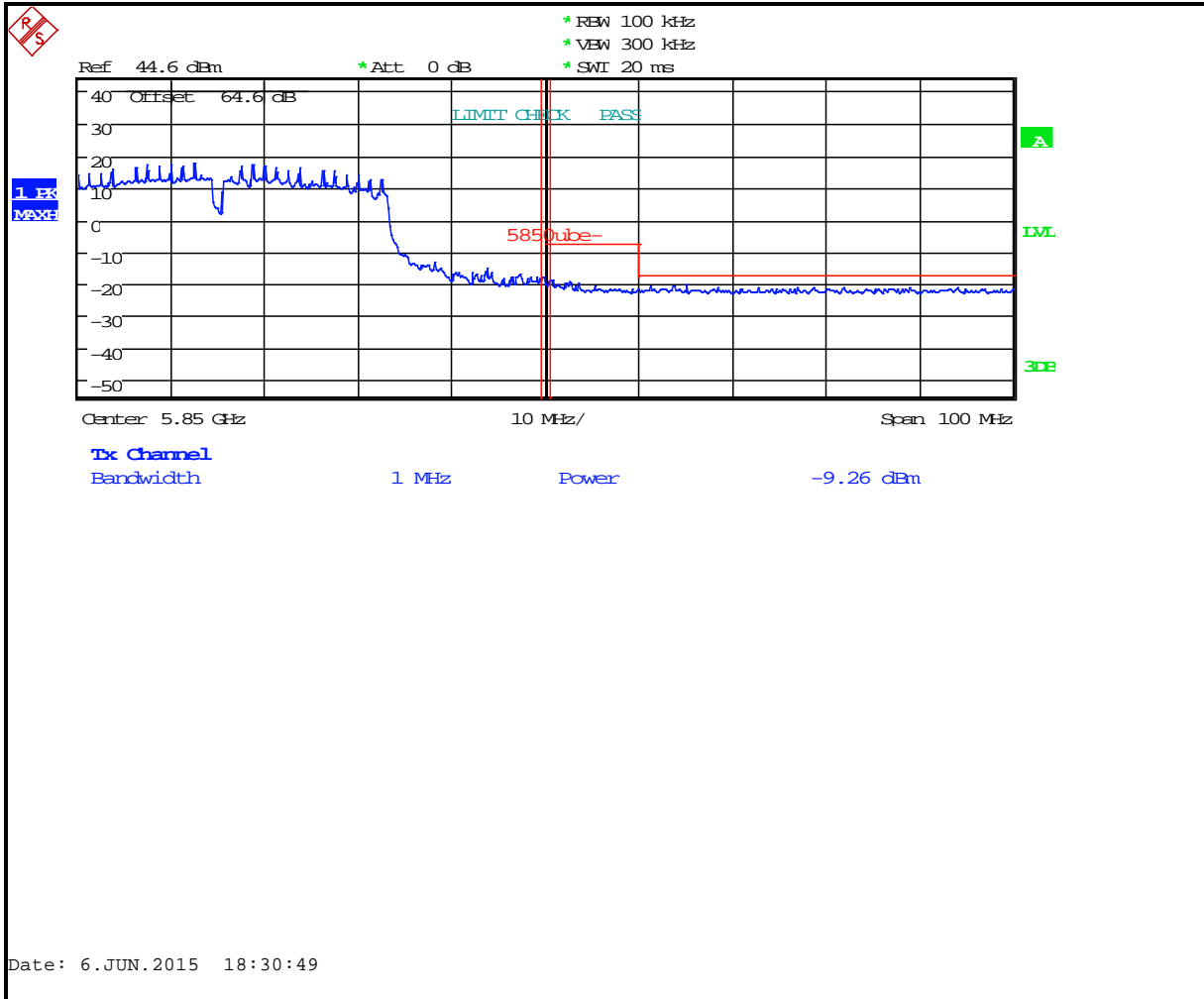
Plot 6-21: Upper Band Edge: Measurement Channel 165 (5825 MHz, 40 MHz BW, 802.11a, Peak)



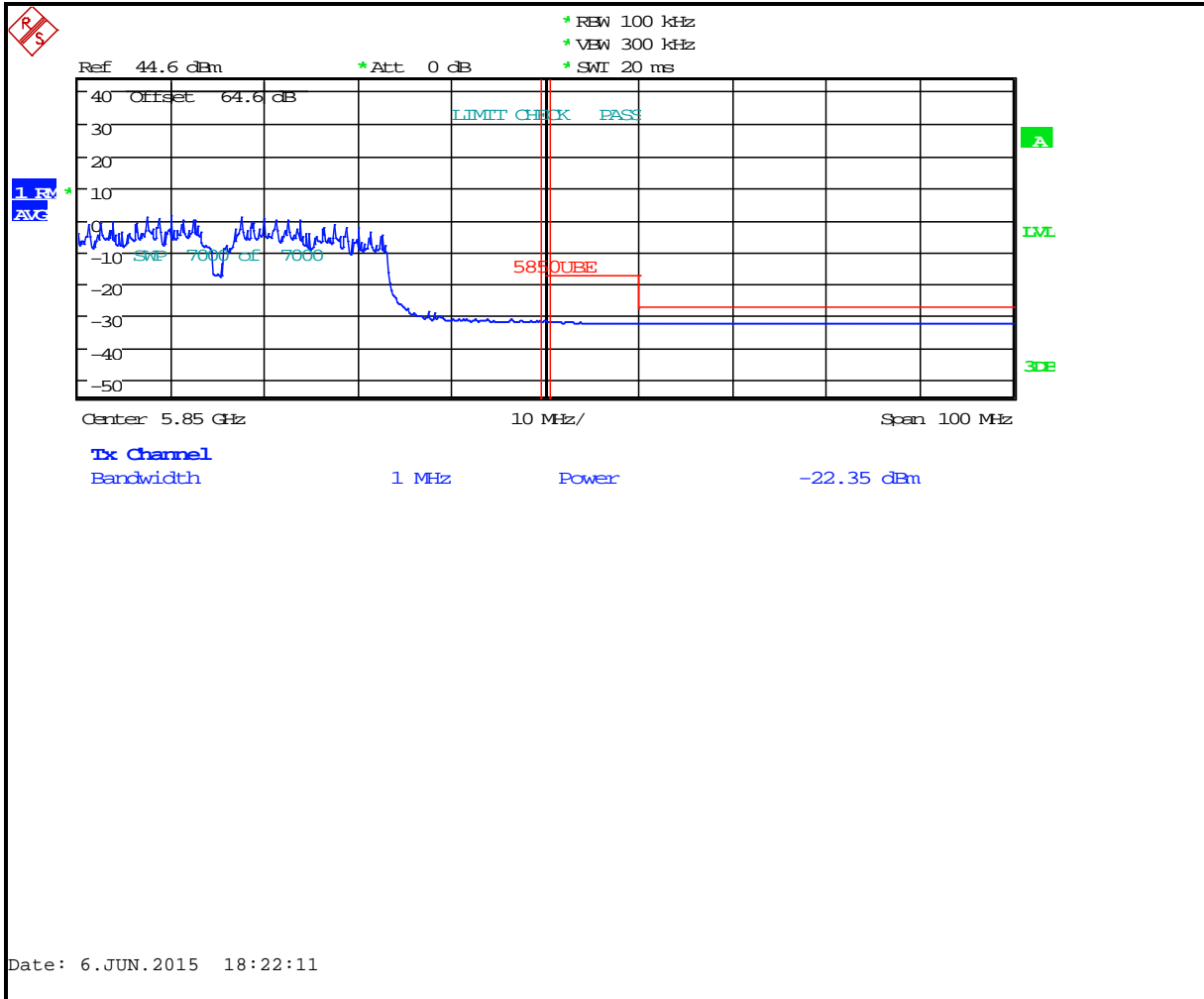
Plot 6-22: Upper Band Edge: Measurement Channel 165 (5825 MHz, 40 MHz BW, 802.11a, Average)



Plot 6-23: Upper Band Edge: Measurement Channel 165 (5825 MHz, 40 MHz BW, 802.11n, Peak)



Plot 6-24: Upper Band Edge: Measurement Channel 165 (5825 MHz, 40 MHz BW, 802.11n, Average)



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Signature

June 6-11, 2015
 Dates of Test

7 Undesirable Emissions - 15.407(b); RSS-247 6.2

7.1 Undesirable Emissions Test Procedures

Antenna spurious emissions were measured from the EUT antenna port using a 50-ohm spectrum analyzer.

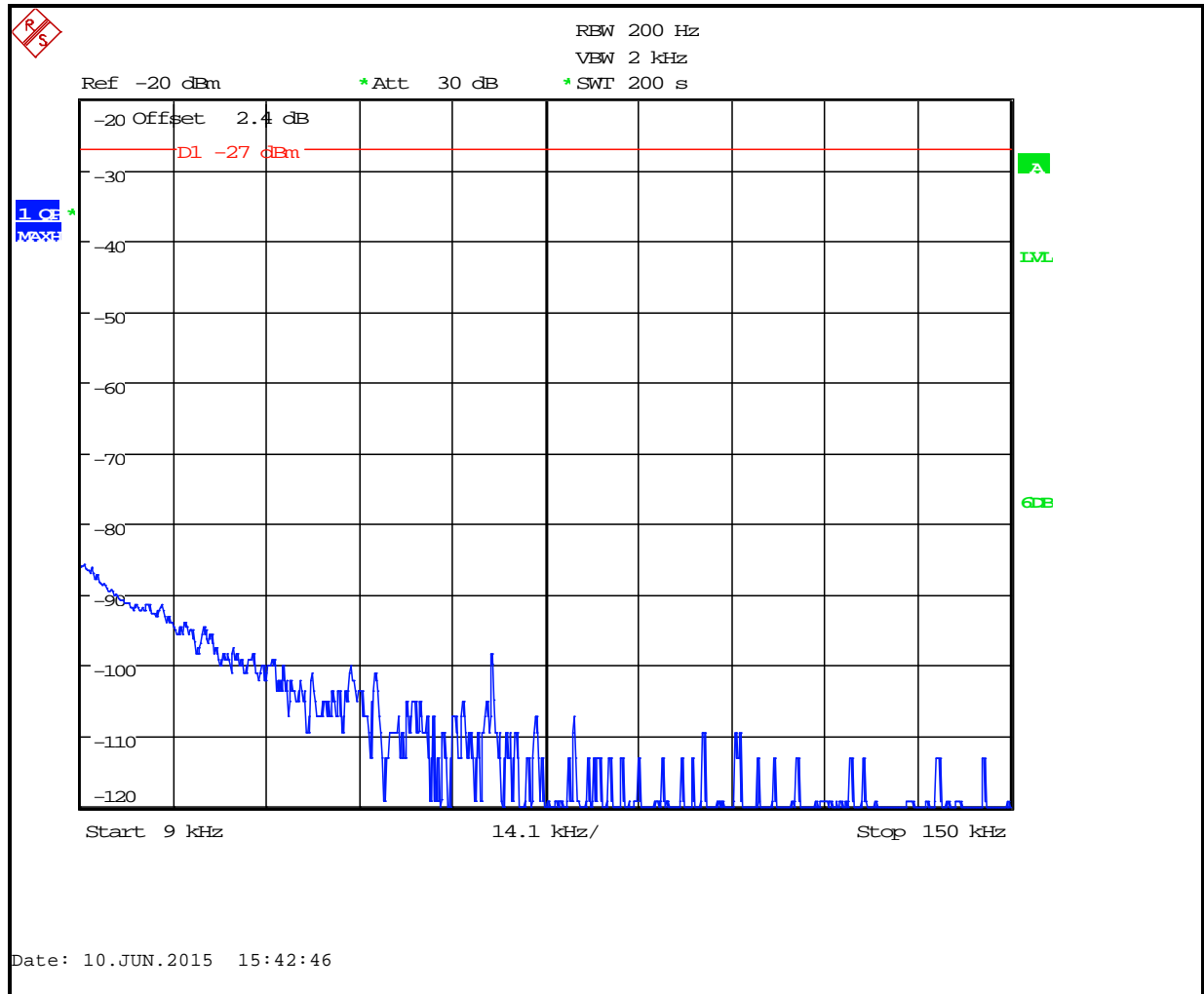
NOTE: Offset is 2 dB antenna gain added for EIRP comparison to limit since manufacturer's maximum gain is 1 dB, with duty cycle addition.

Table 7-1: Undesirable Emissions Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-------|-------------------|---------------|----------------------|
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |

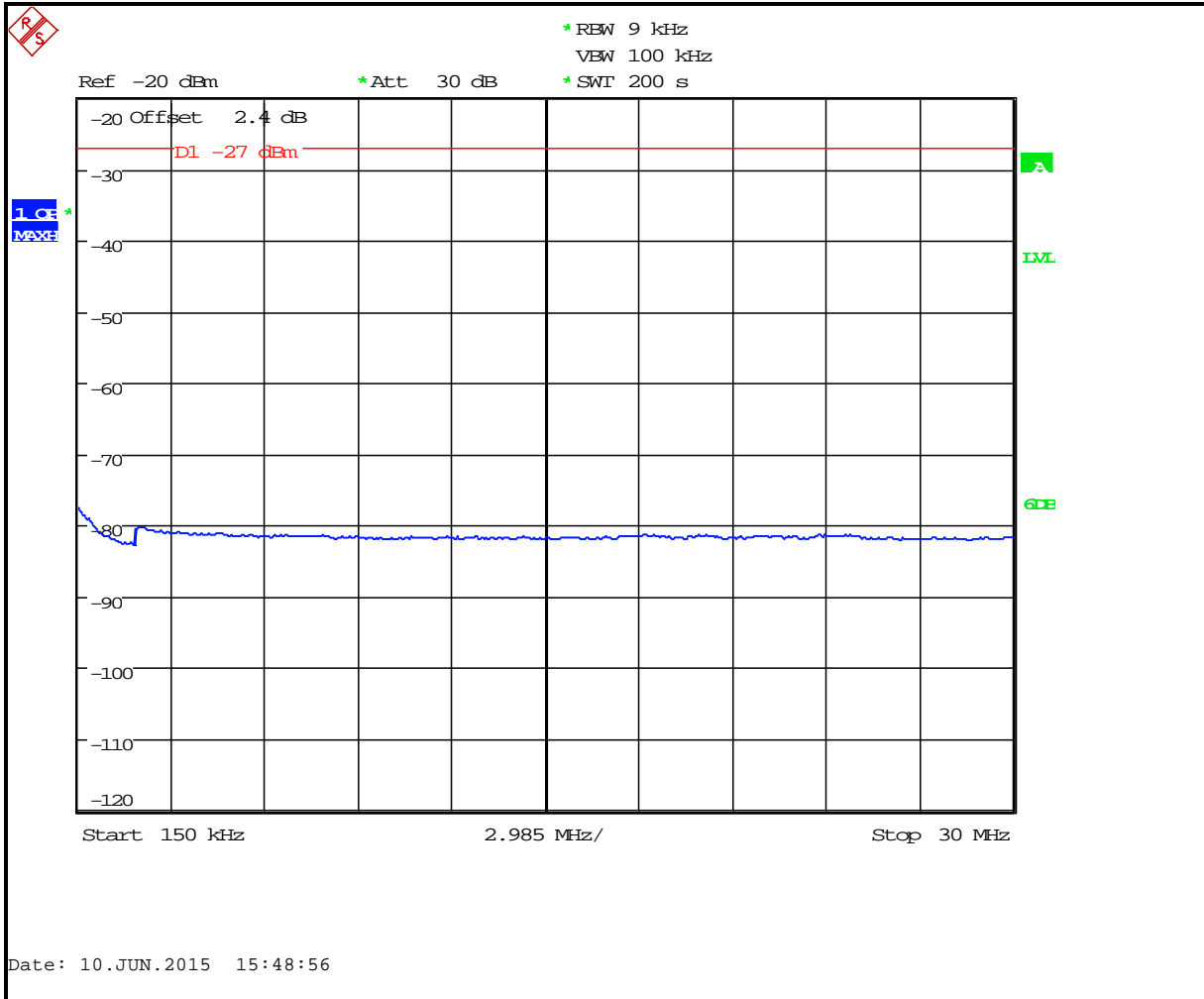
7.2 Undesirable Emissions Test Results

Plot 7-1: Undesirable Emissions Channel 36 (5180 MHz); 9 kHz – 150 kHz



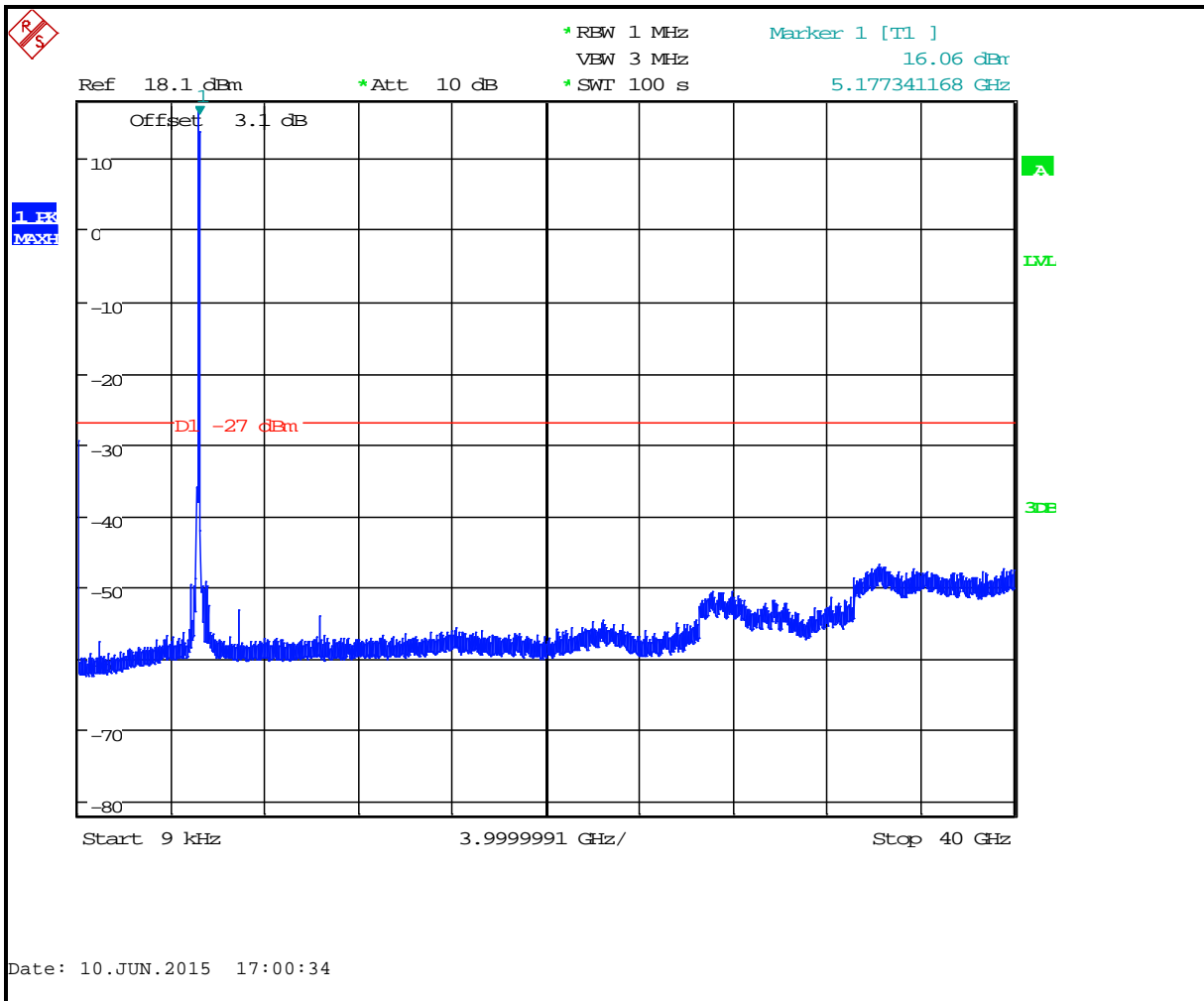
NOTE: Displayed as representative of all channels

Plot 7-2: Undesirable Emissions Channel 36 (5180 MHz); 150 kHz – 30 MHz

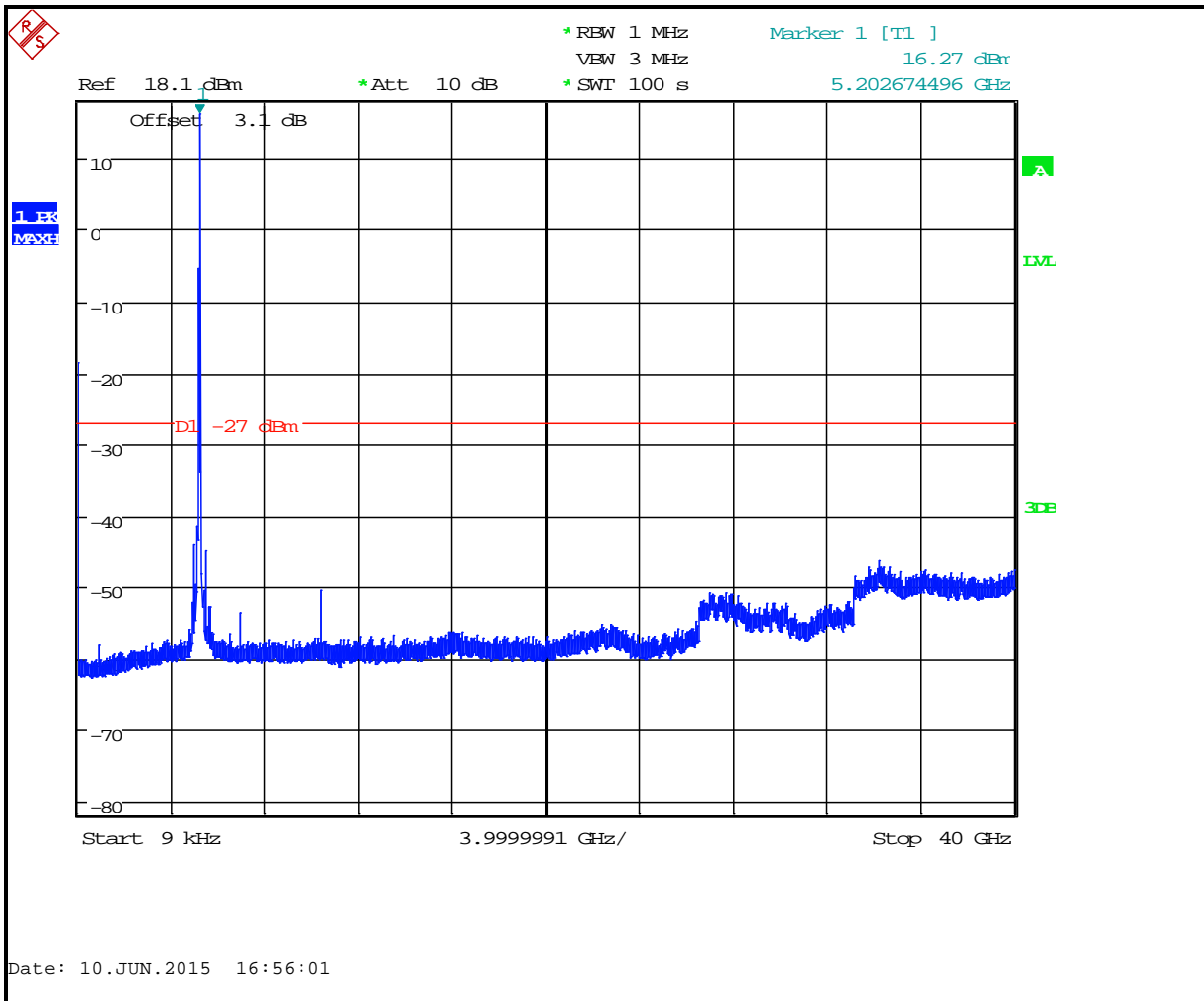


NOTE: Displayed as representative of all channels

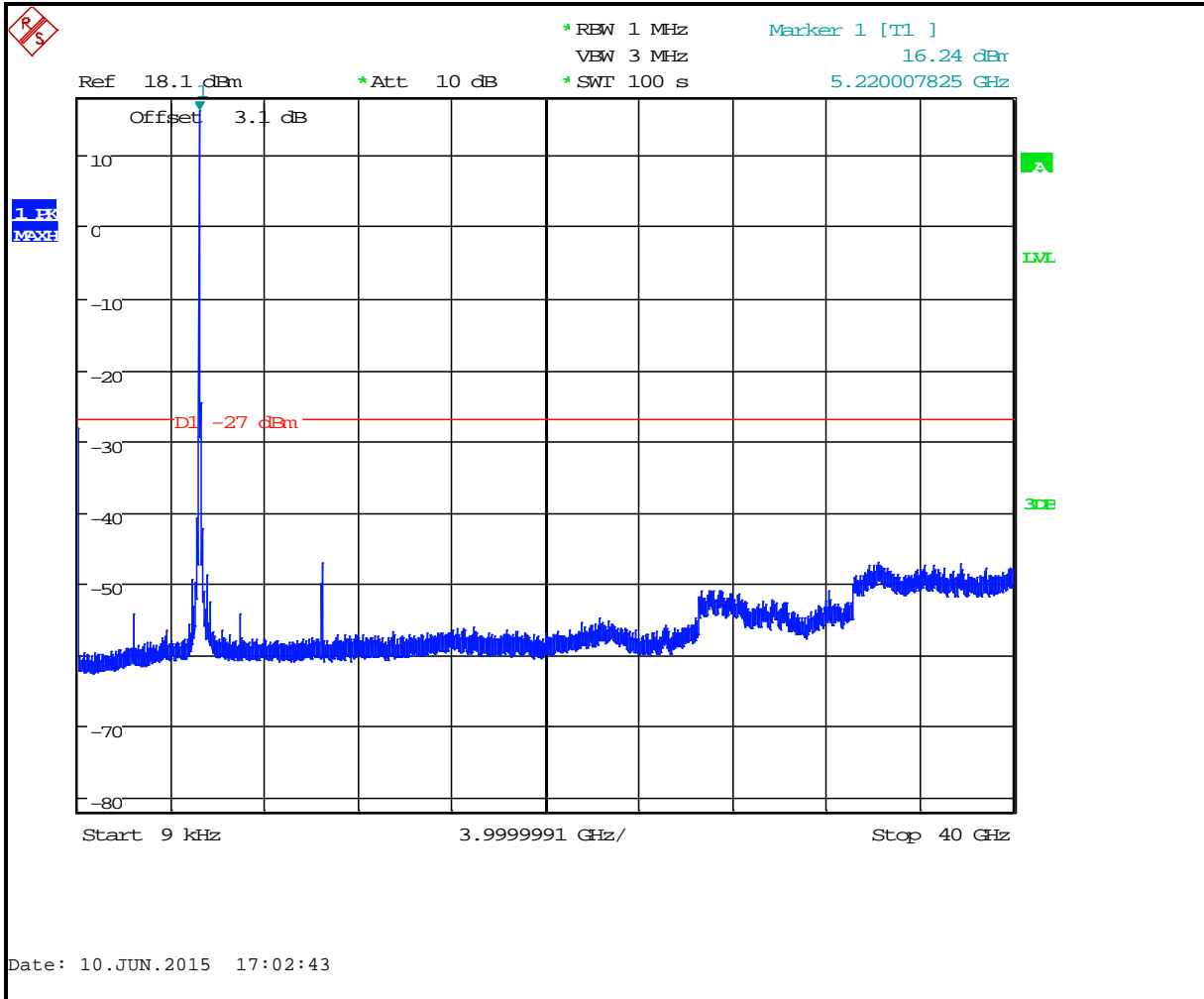
Plot 7-3: Undesirable Emissions Channel 36 (5180 MHz);



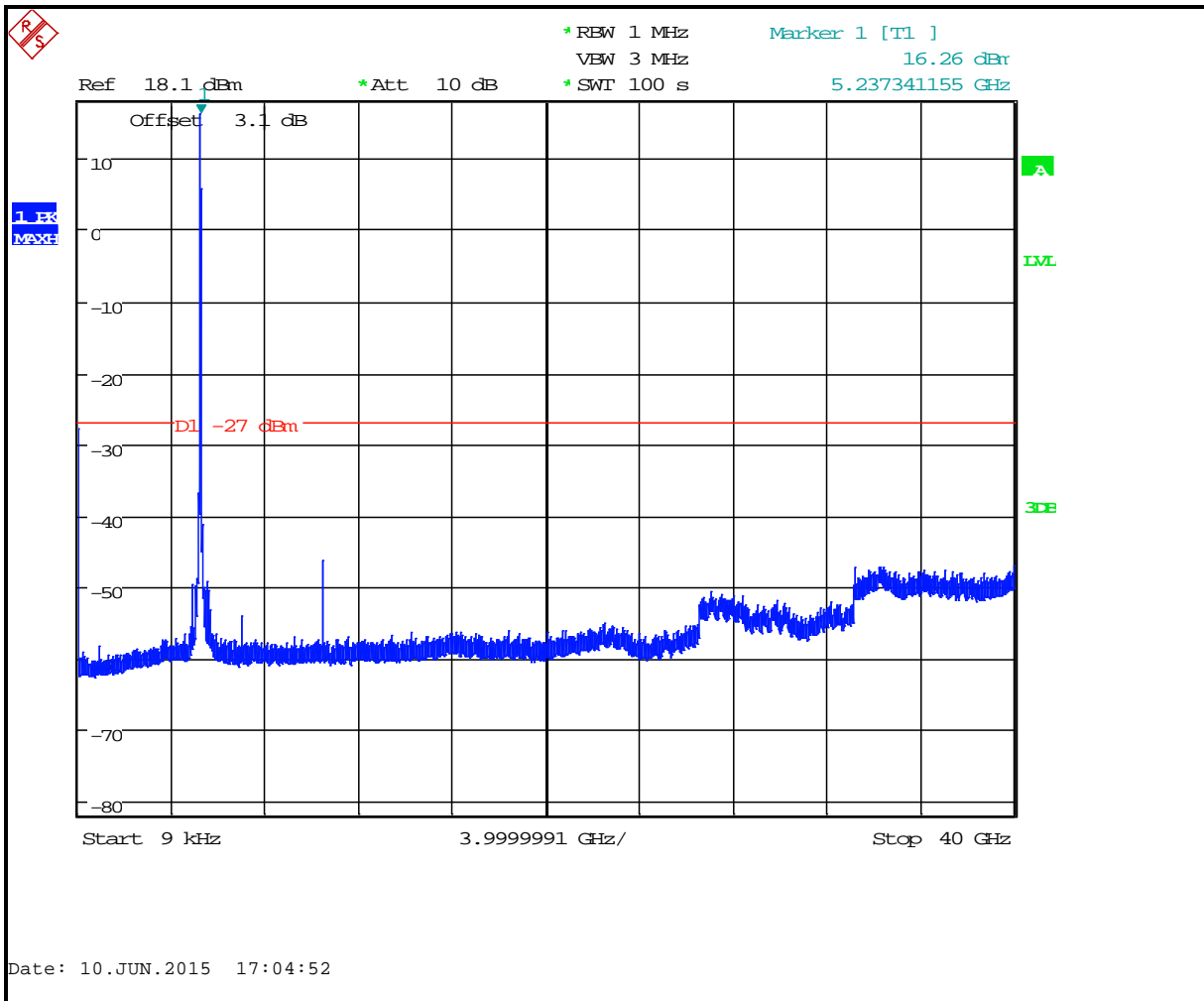
Plot 7-4: Undesirable Emissions Channel 40 (5200 MHz)



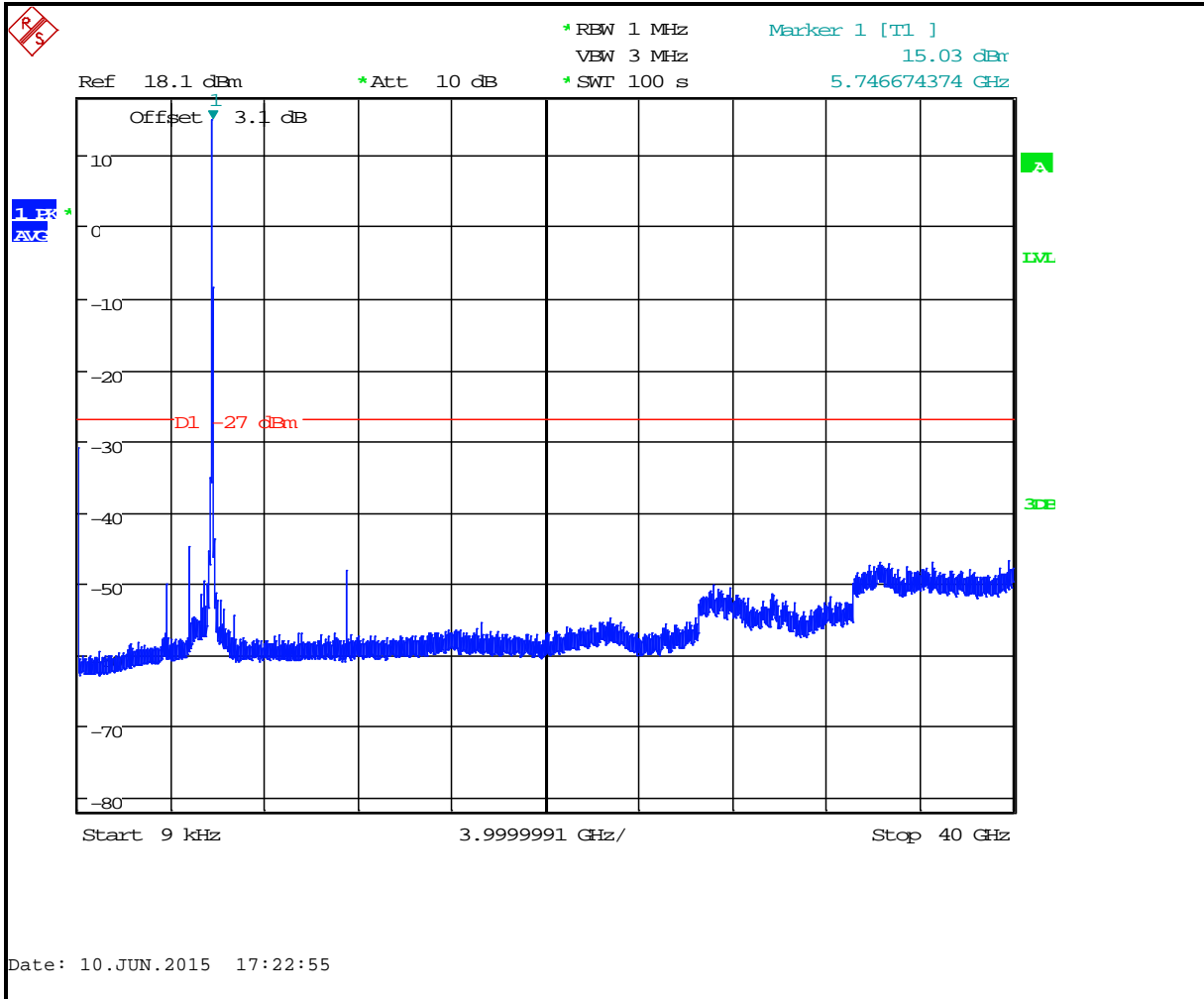
Plot 7-5: Undesirable Emissions Channel 44 (5220 MHz)



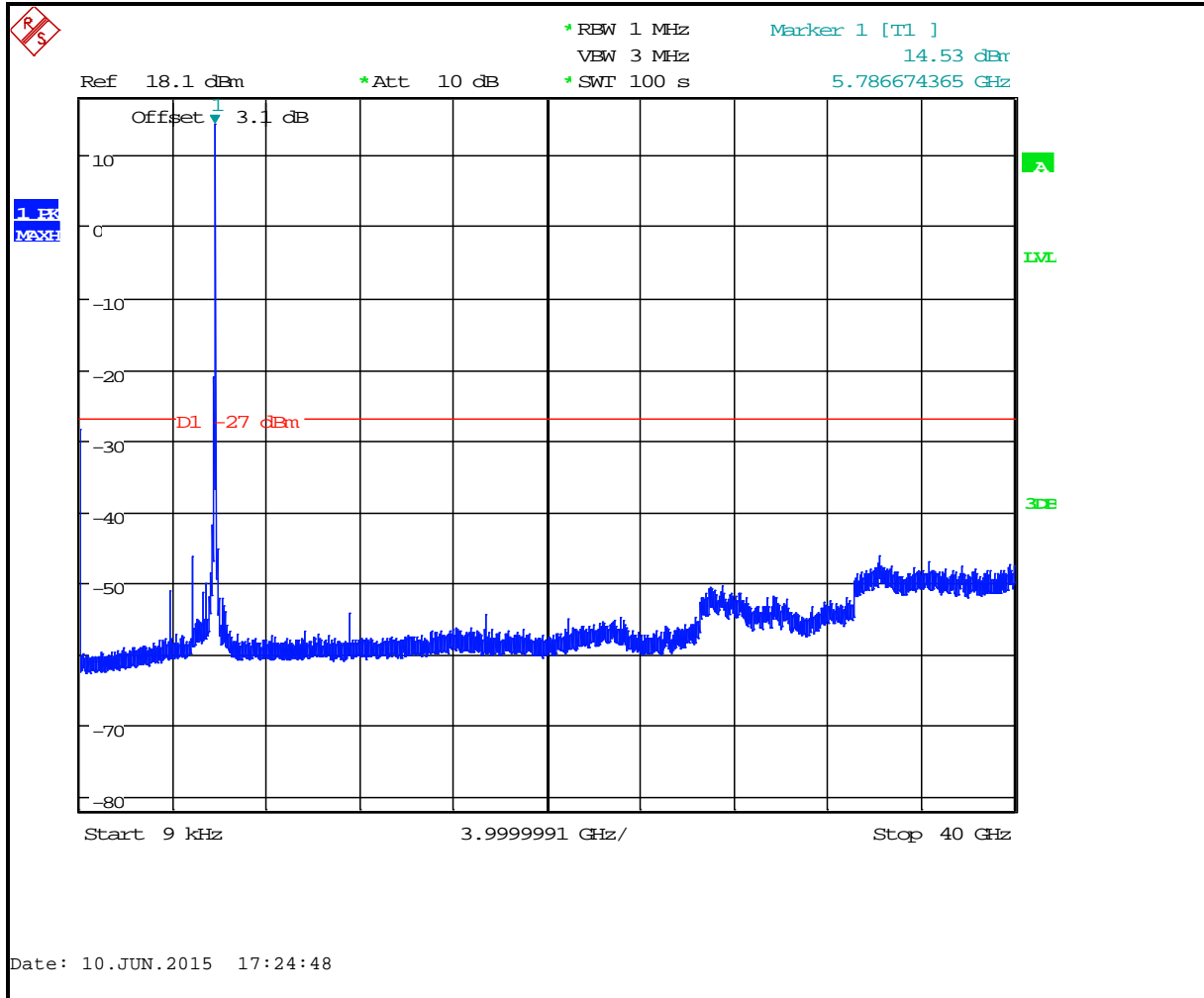
Plot 7-6: Undesirable Emissions Channel 48 (5240 MHz)



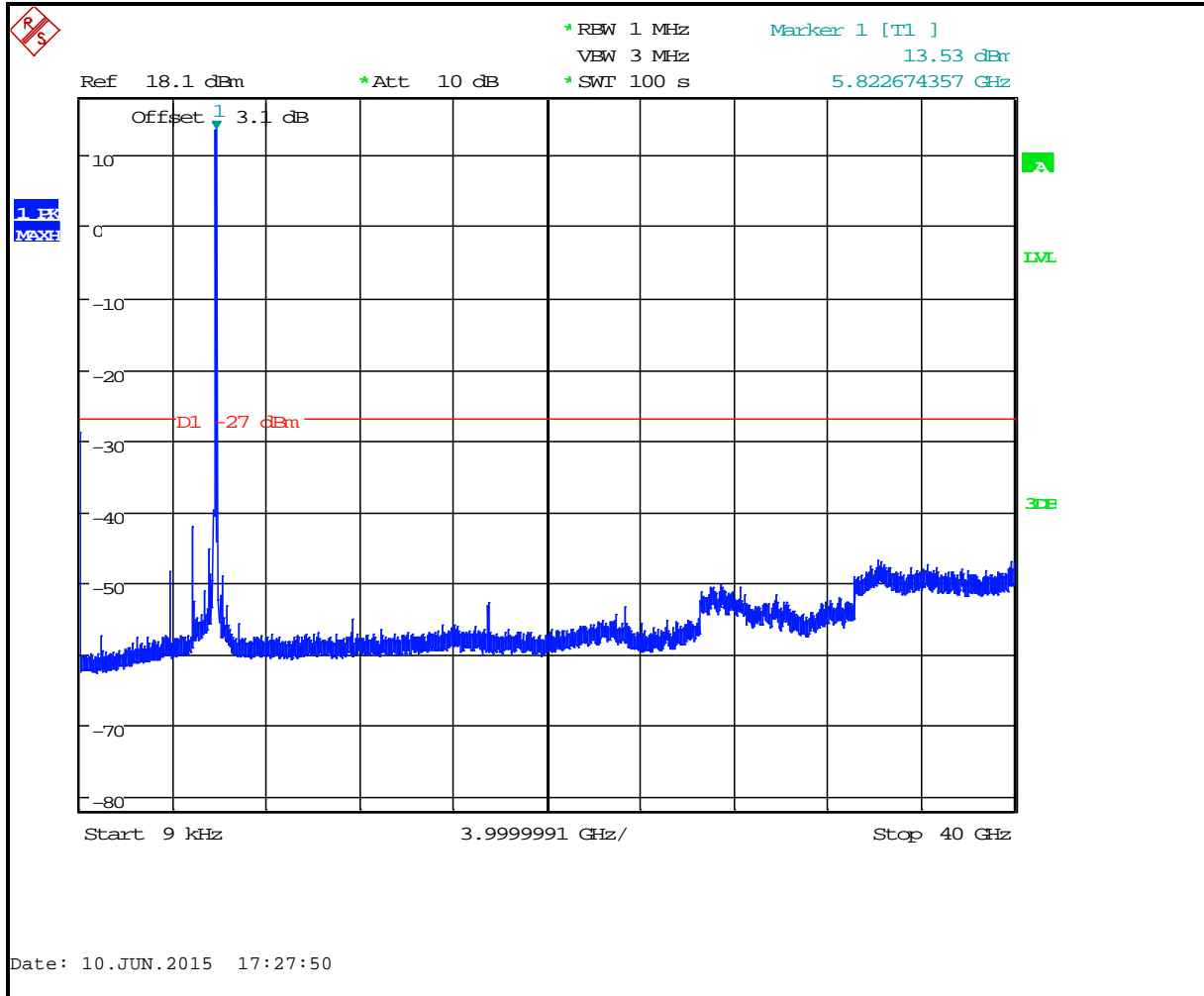
Plot 7-7: Undesirable Emissions Channel 149 (5745 MHz)



Plot 7-8: Undesirable Emissions Channel 157(5785 MHz)



Plot 7-9: Undesirable Emissions Channel 165 (5825 MHz)



7.3 Limits of Undesirable Emissions

(b) *Undesirable emission limits:* Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.
- (2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.
- (3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

Test Personnel:

| | | |
|--------------------|-----------------------------------------------------------------------------------|---------------|
| Daniel W. Baltzell |  | June 10, 2015 |
| Test Engineer | Signature | Date of Test |

8 Bandwidth – FCC 15.407(a) and (e); RSS-247 6.2

8.1 Bandwidth Test Procedure

The bandwidths were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 1% of the emission bandwidth. The device was modulated and the spectrum analyzer placed in max hold, peak detector, to capture the trace. The minimum 26 dB and 6 dB bandwidths are presented below.

Table 8-1: 26 dB Bandwidth Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-------|-------------------|---------------|----------------------|
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |

Table 8-2: 26 dB Bandwidth Test Data – 802.11a (36 Mbps)

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| 36 | 5180 | 19.5 |
| 40 | 5200 | 19.4 |
| 44 | 5220 | 19.5 |
| 48 | 5240 | 19.3 |
| 149 | 5745 | 19.6 |
| 157 | 5785 | 19.6 |
| 165 | 5825 | 19.4 |

Table 8-3: 26 dB Bandwidth Test Data – 802.11n (39 Mbps)

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| 36 | 5180 | 22.7 |
| 40 | 5200 | 22.7 |
| 44 | 5220 | 22.6 |
| 48 | 5240 | 22.6 |
| 149 | 5745 | 23.5 |
| 157 | 5785 | 25.8 |
| 165 | 5825 | 26.7 |

Table 8-4: 26 dB Bandwidth Test Data – 802.11a (40 MHz BW, 36 Mbps)

| Channel | Center Frequency (MHz) | 26 dB Bandwidth (MHz) |
|------------------|------------------------|-----------------------|
| 36 (lower half) | 5190 | 43.6 |
| 40 (lower half) | 5210 | 43.9 |
| 44 (lower half) | 5230 | 43.4 |
| 48 (lower half) | 5250 | 43.8 |
| 149 (lower half) | 5755 | 48.7 |
| 157 (lower) half | 5795 | 48.4 |
| 165 (upper half) | 5815 | 48.2 |

Table 8-5: 26 dB Bandwidth Test Data – 802.11n (40 MHz BW, 39 Mbps)

| Channel | Center Frequency (MHz) | 26 dB Bandwidth (MHz) |
|------------------|------------------------|-----------------------|
| 36 (lower half) | 5190 | 43.9 |
| 40 (lower half) | 5210 | 44.2 |
| 44 (lower half) | 5230 | 44.2 |
| 48 (lower half) | 5250 | 44.2 |
| 149 (lower half) | 5755 | 43.3 |
| 157 (lower) half | 5795 | 42.9 |
| 165 (upper half) | 5815 | 44.2 |

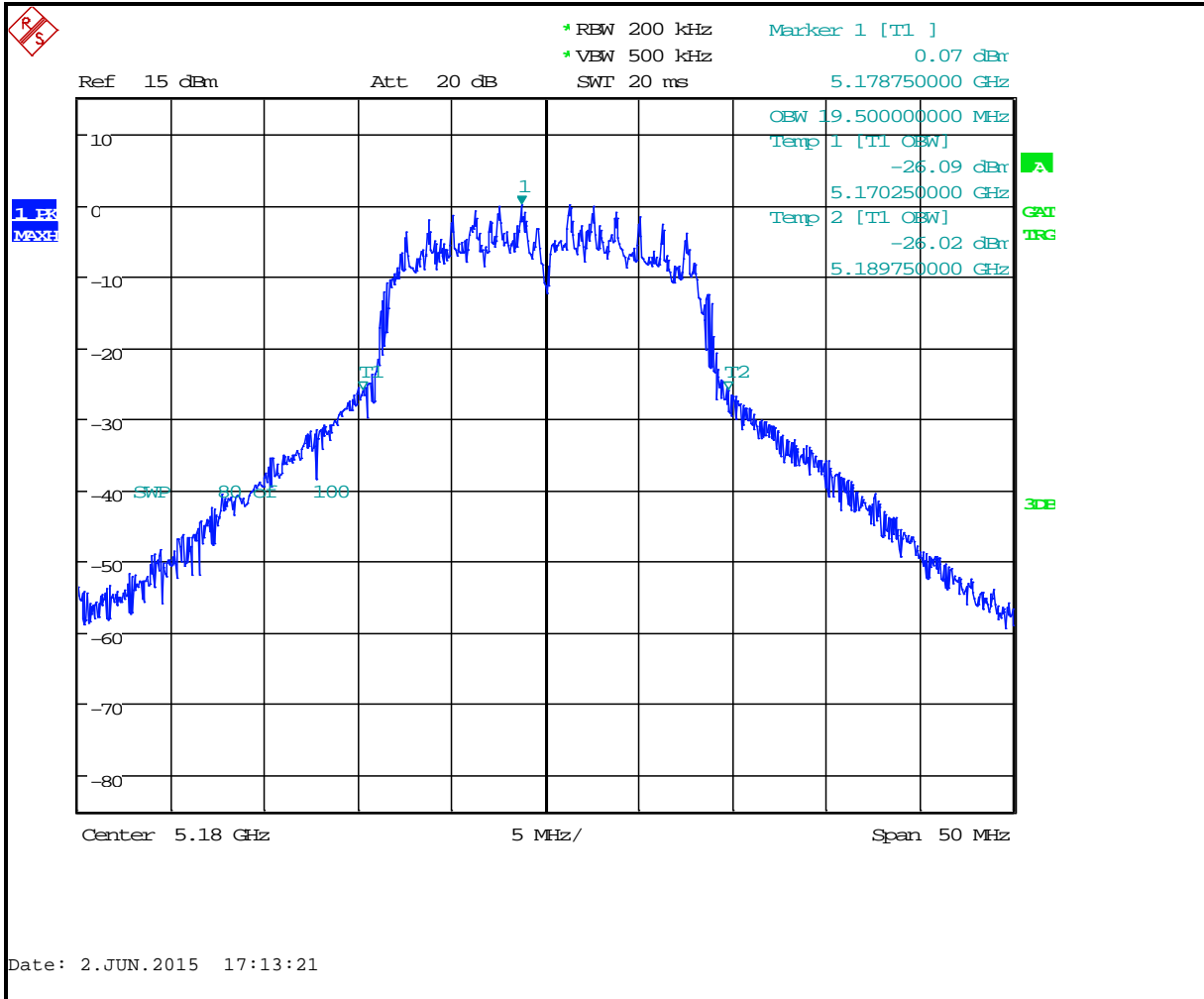
Table 8-6: 6 dB Bandwidth Test Data – 802.11a (36 Mbps)

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/Fail |
|---------|-----------------|----------------------|---------------------|-----------|
| 149 | 5745 | 16.0 | 0.5 | Pass |
| 157 | 5785 | 16.1 | 0.5 | Pass |
| 165 | 5825 | 15.9 | 0.5 | Pass |

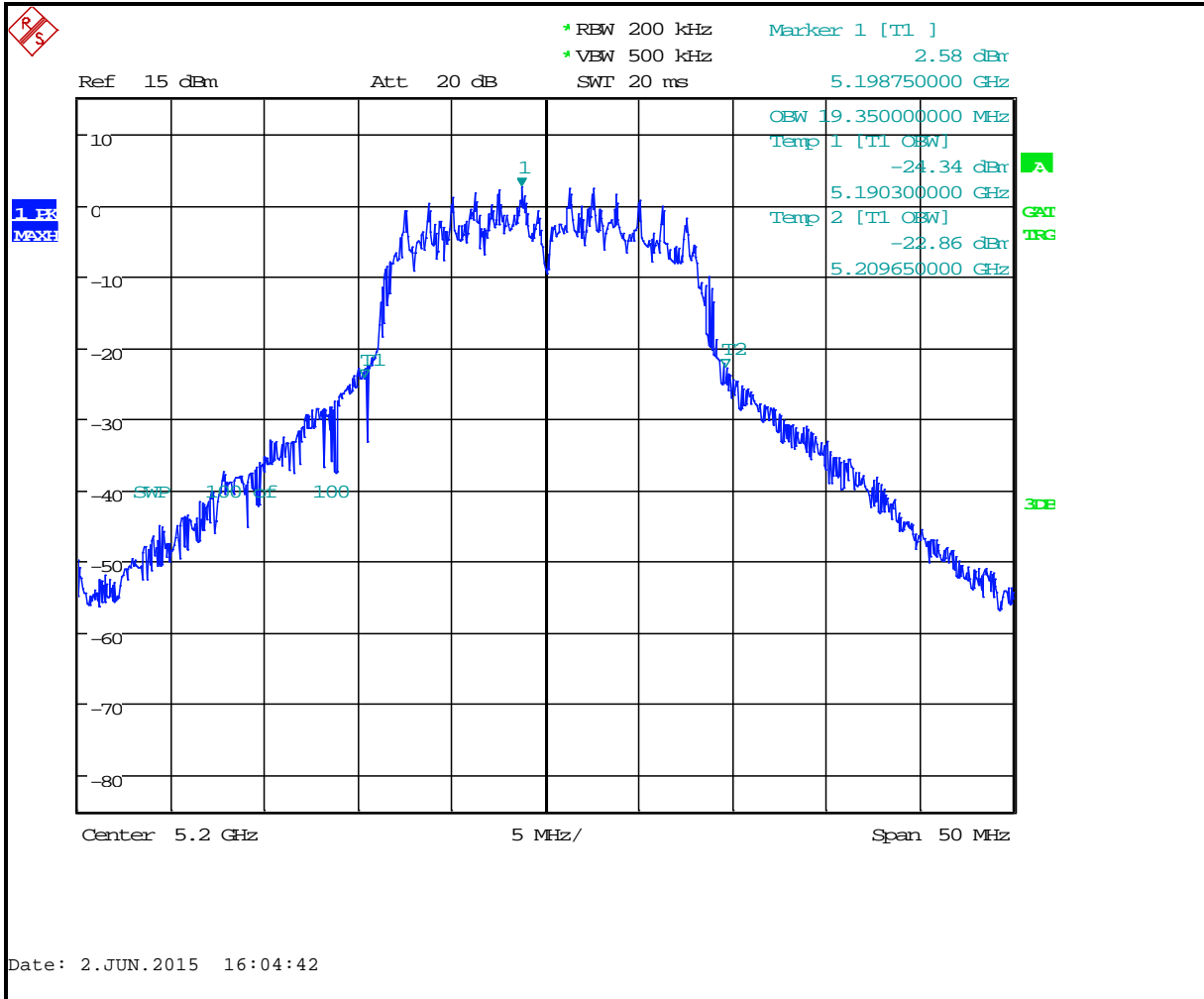
Table 8-7: 6 dB Bandwidth Test Data – 802.11n (39 Mbps)

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/Fail |
|---------|-----------------|----------------------|---------------------|-----------|
| 149 | 5745 | 15.8 | 0.5 | Pass |
| 157 | 5785 | 16.0 | 0.5 | Pass |
| 165 | 5825 | 16.0 | 0.5 | Pass |

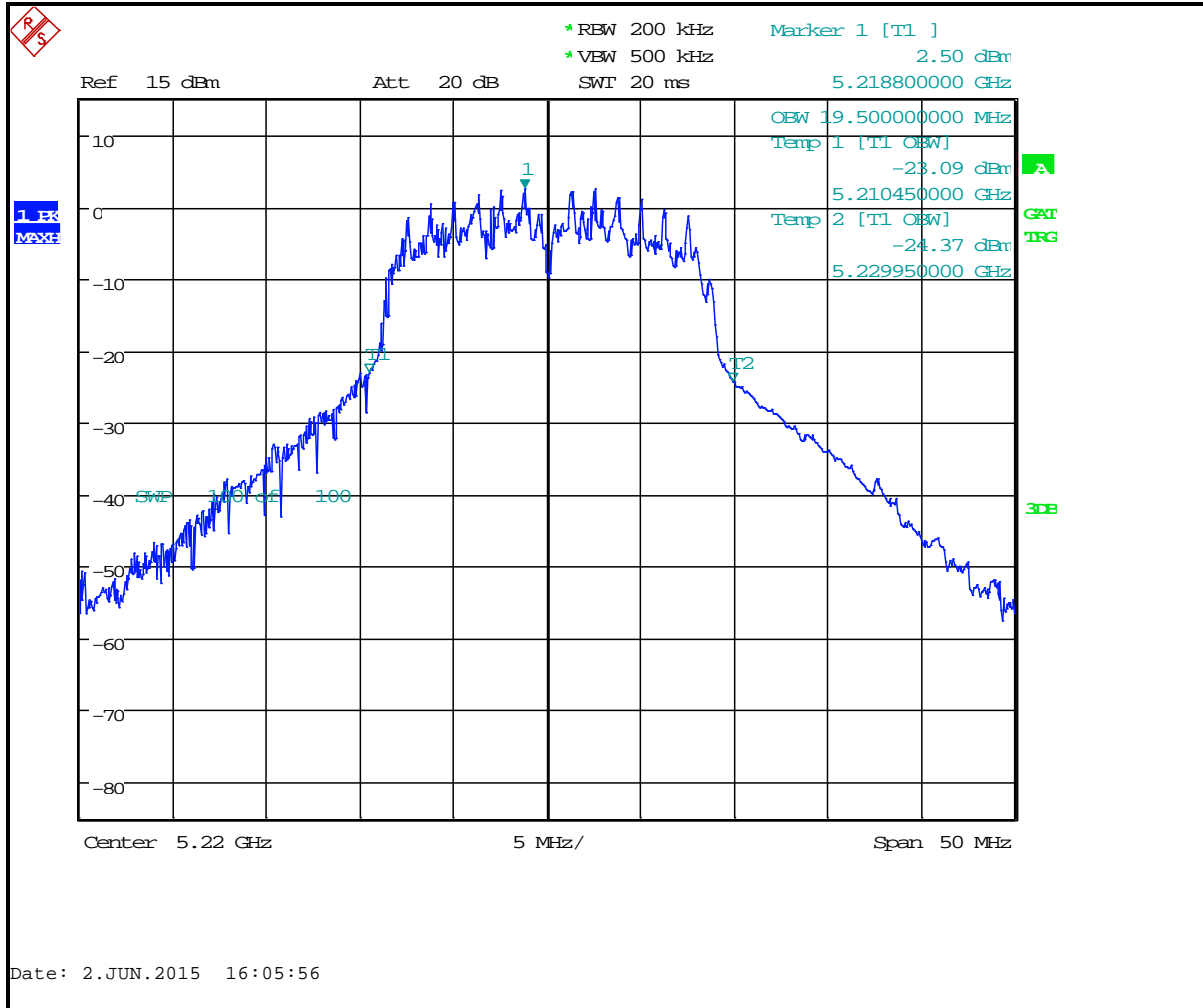
Plot 8-1: 26 dB Bandwidth Channel 36 (TX Frequency 5180 MHz) - 802.11a



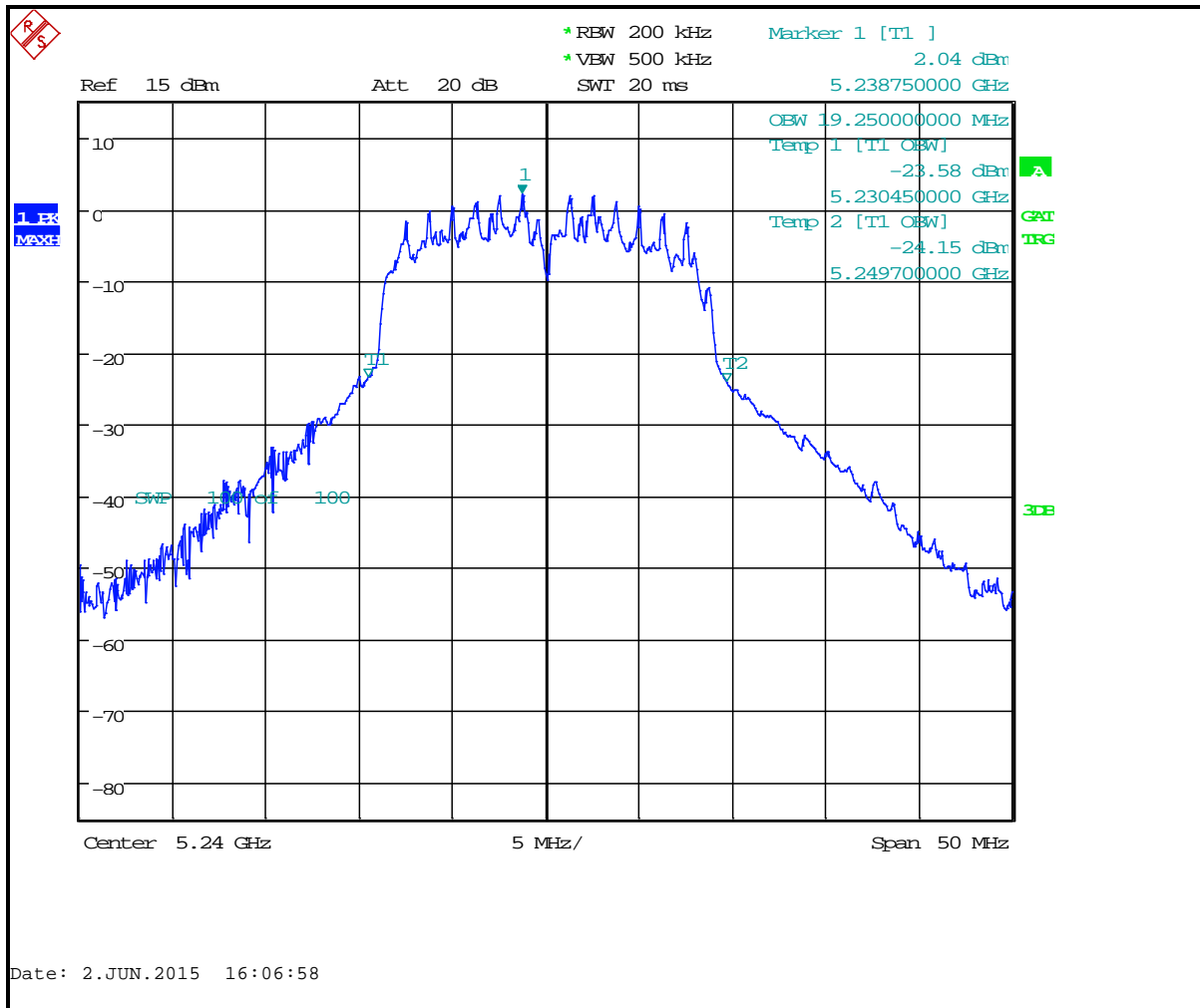
Plot 8-2: 26 dB Bandwidth Channel 40 (TX Frequency 5200 MHz) - 802.11a



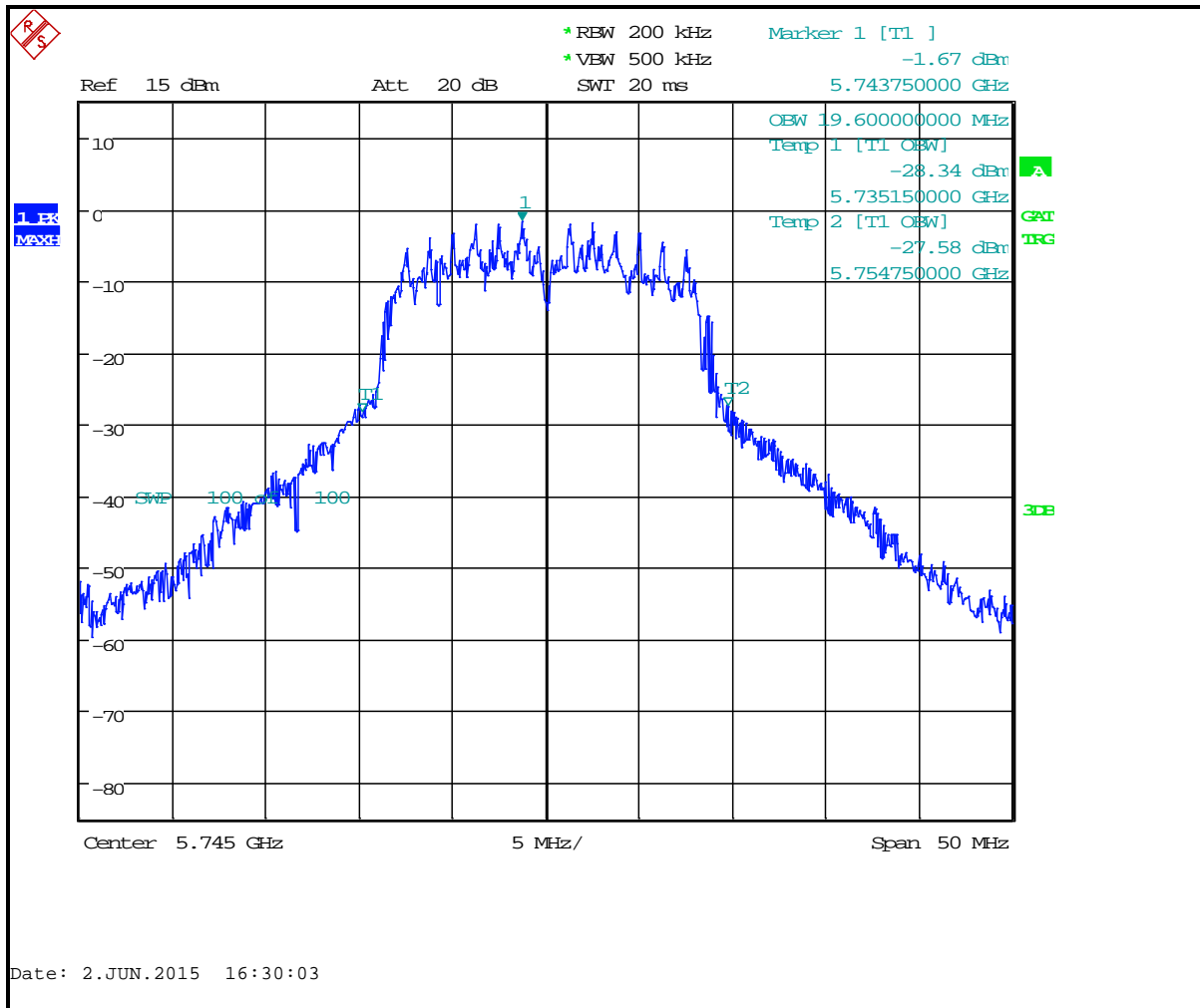
Plot 8-3: 26 dB Bandwidth Channel 44(TX Frequency 5220 MHz) - 802.11a



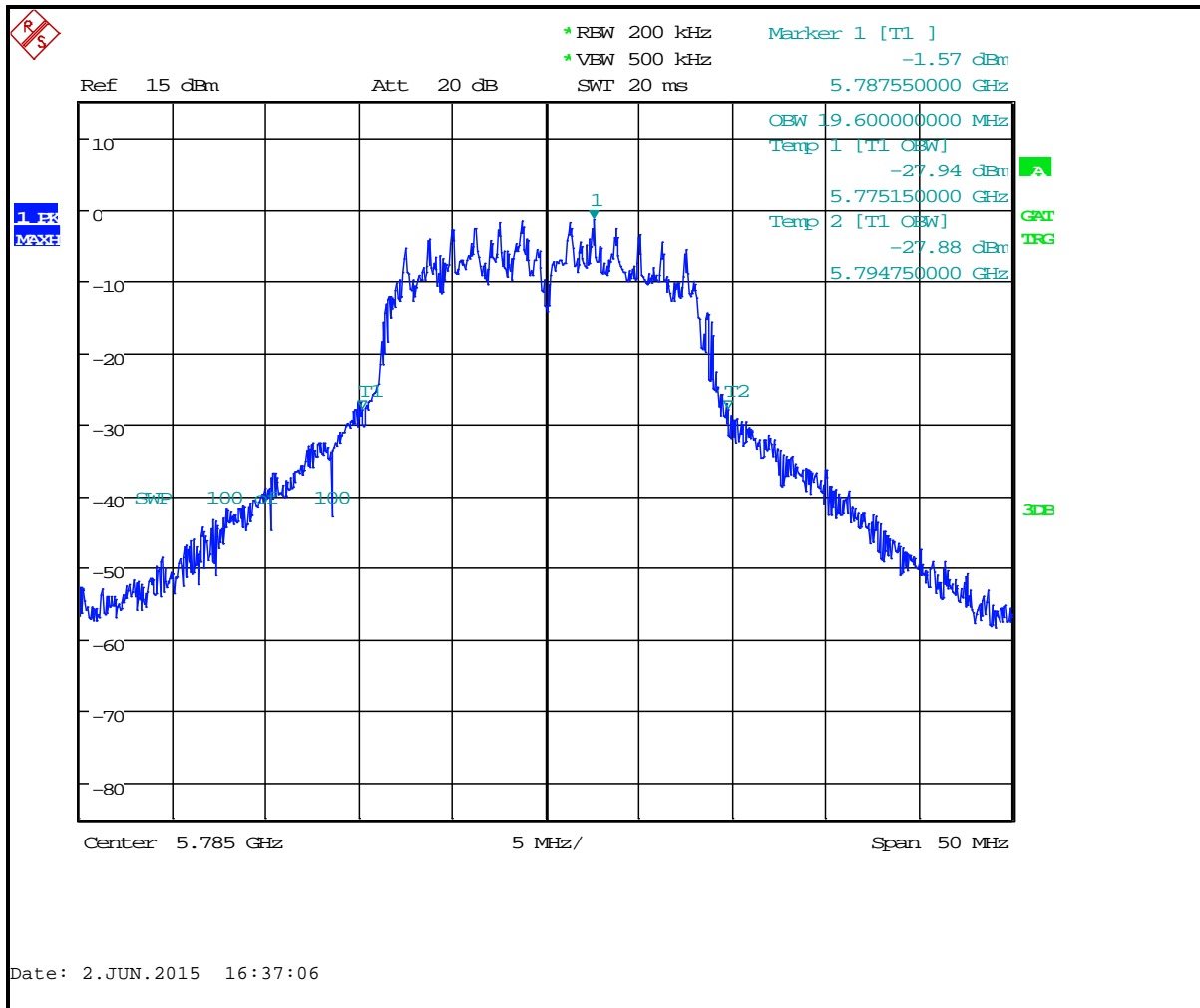
Plot 8-4: 26 dB Bandwidth Channel 48 (TX Frequency 5240 MHz) - 802.11a



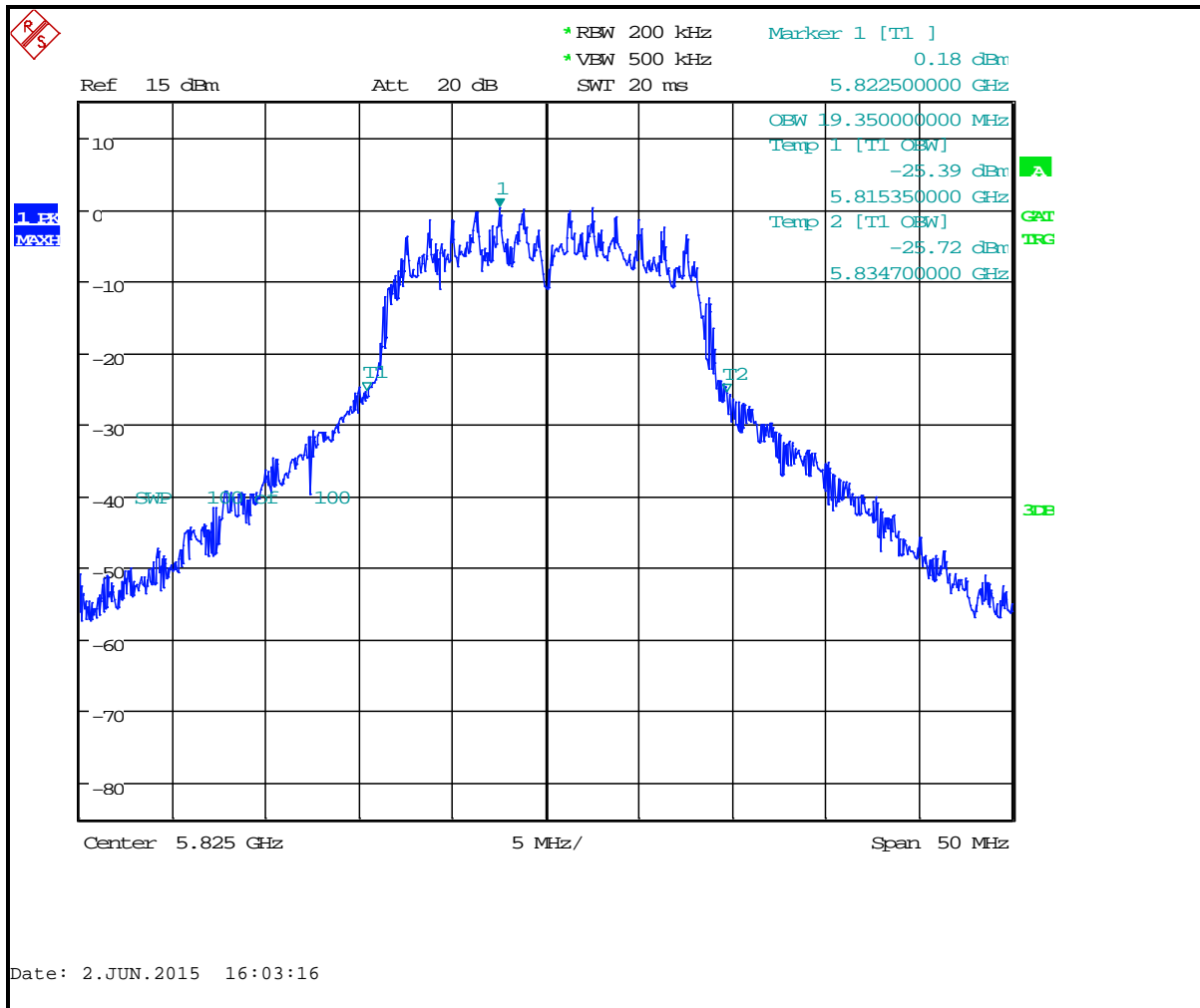
Plot 8-5: 26 dB Bandwidth Channel 149 (TX Frequency 5745 MHz) - 802.11a



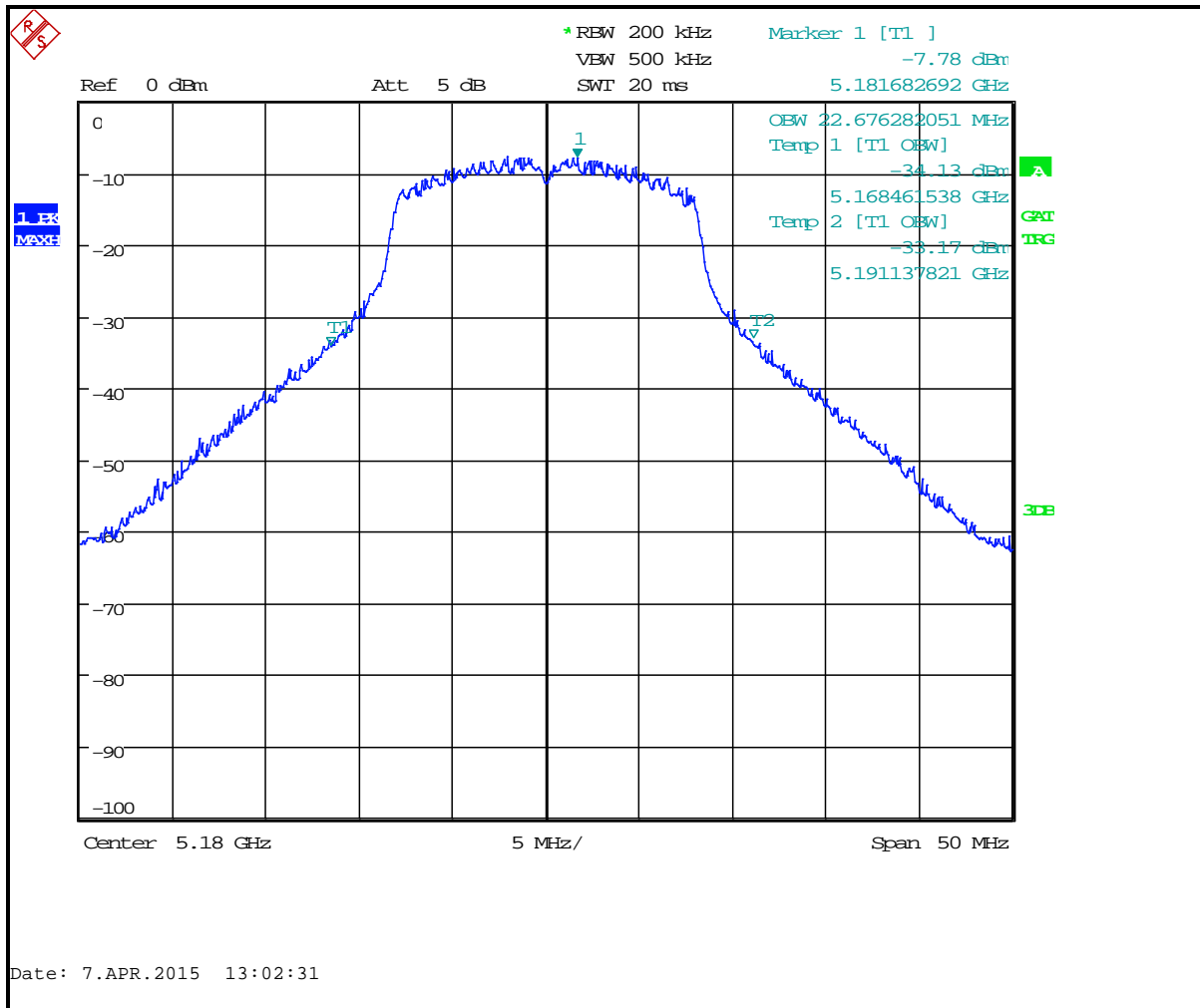
Plot 8-6: 26 dB Bandwidth Channel 157 (TX Frequency 5785 MHz) - 802.11a



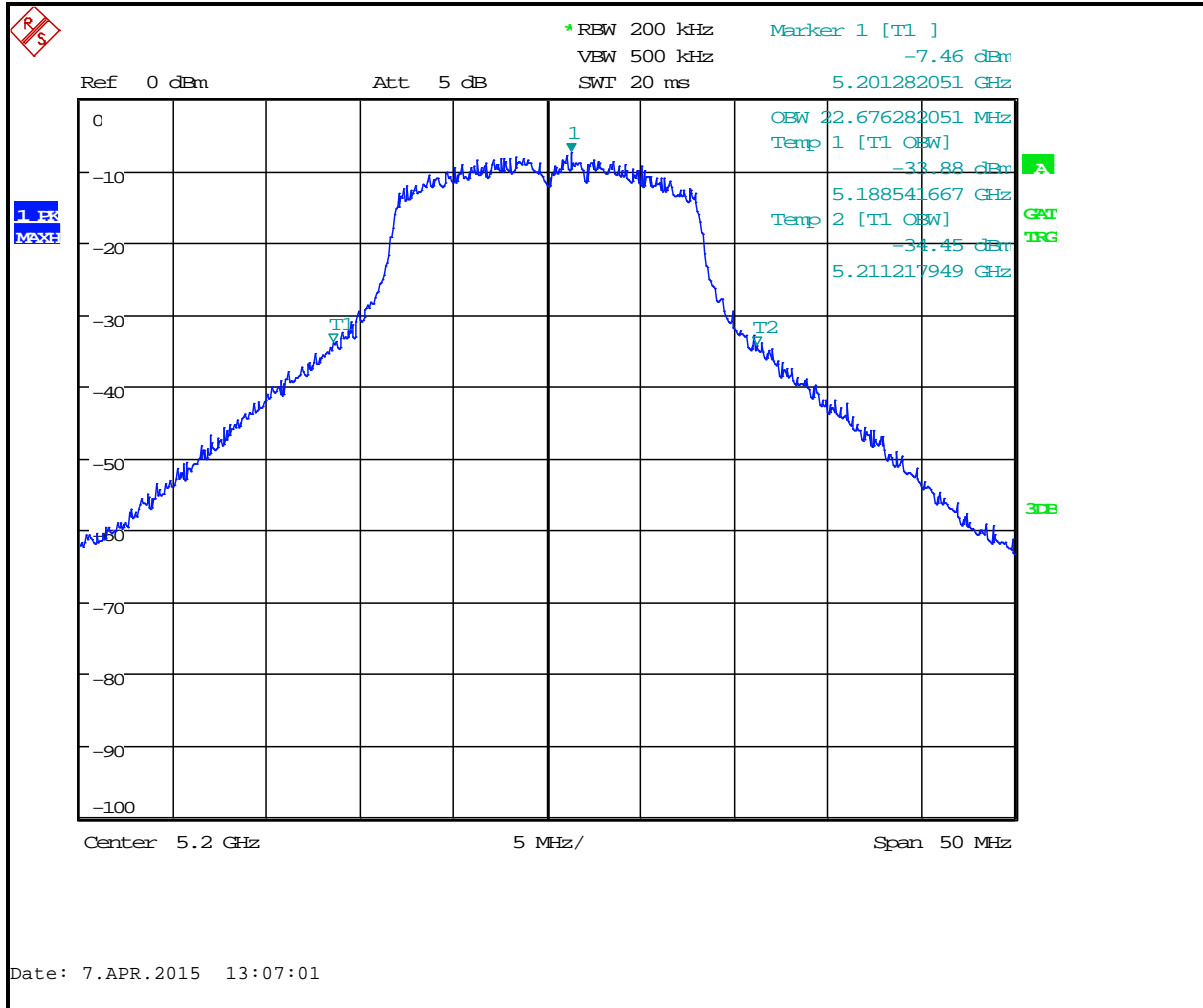
Plot 8-7: 26 dB Bandwidth Channel 165 (TX Frequency 5825 MHz) - 802.11a



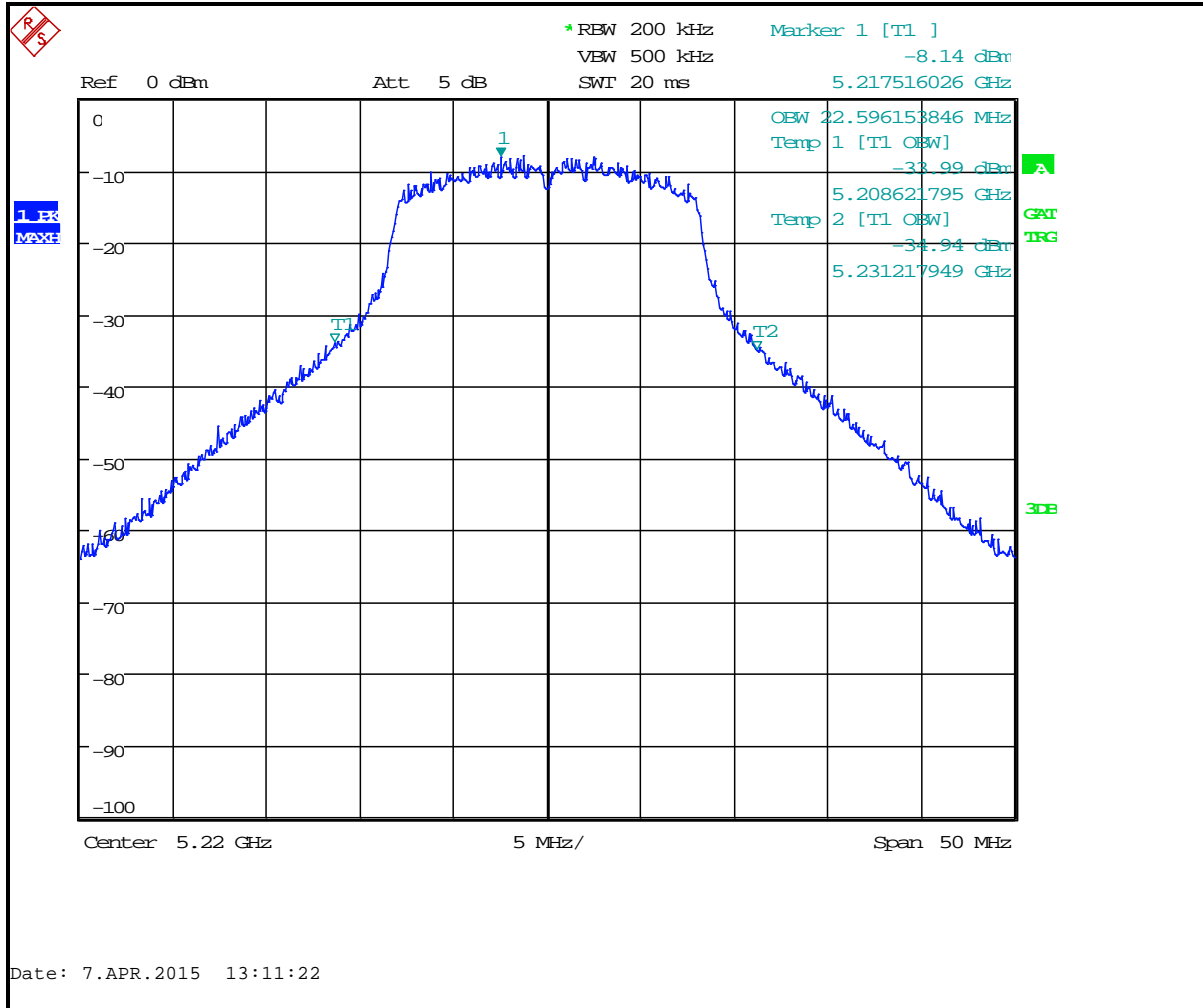
Plot 8-8: 26 dB Bandwidth Channel 36 (TX Frequency 5180 MHz) - 802.11n



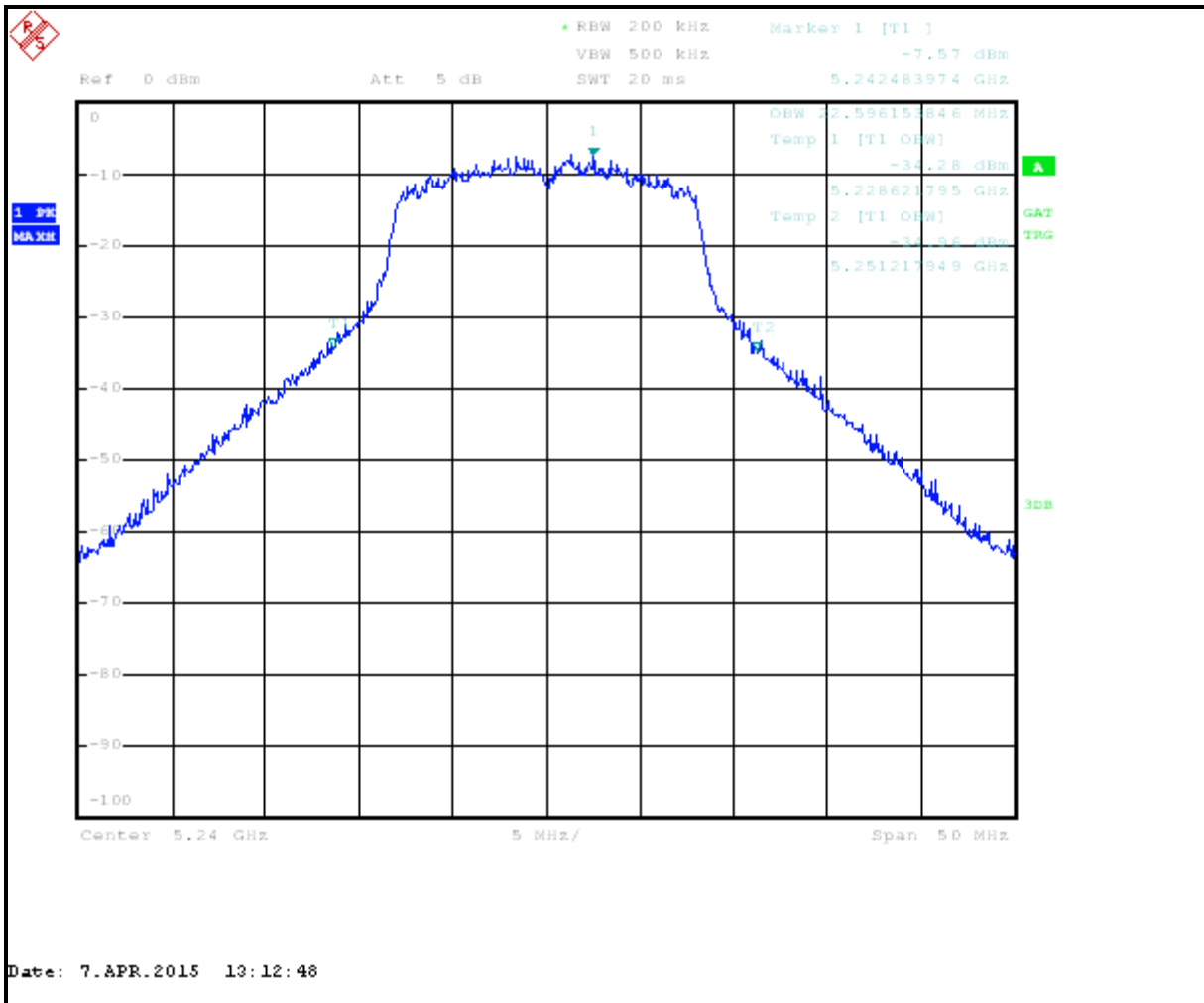
Plot 8-9: 26 dB Bandwidth Channel 40 (TX Frequency 5200 MHz) - 802.11n



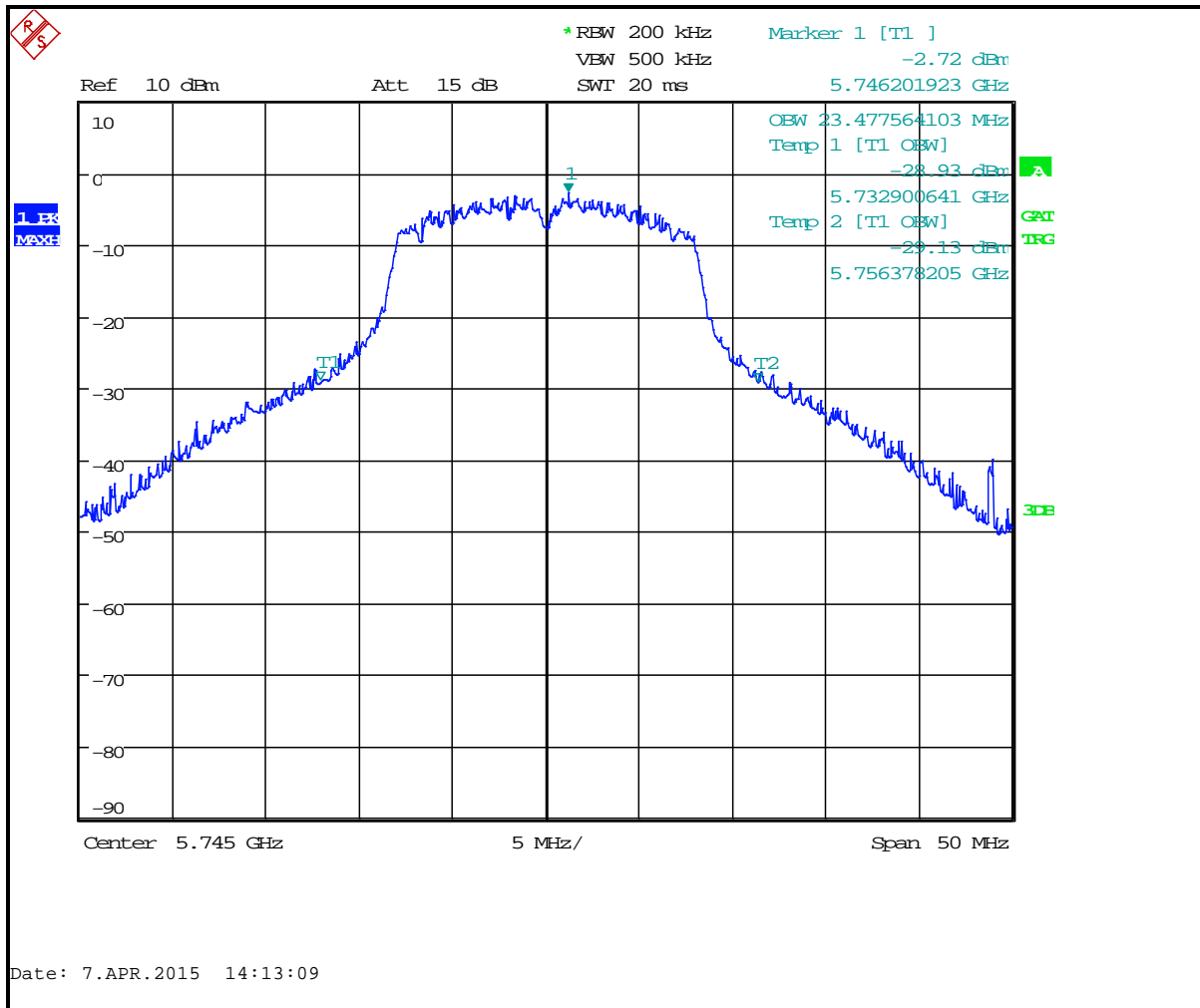
Plot 8-10: 26 dB Bandwidth Channel 44 (TX Frequency 5220 MHz) - 802.11n



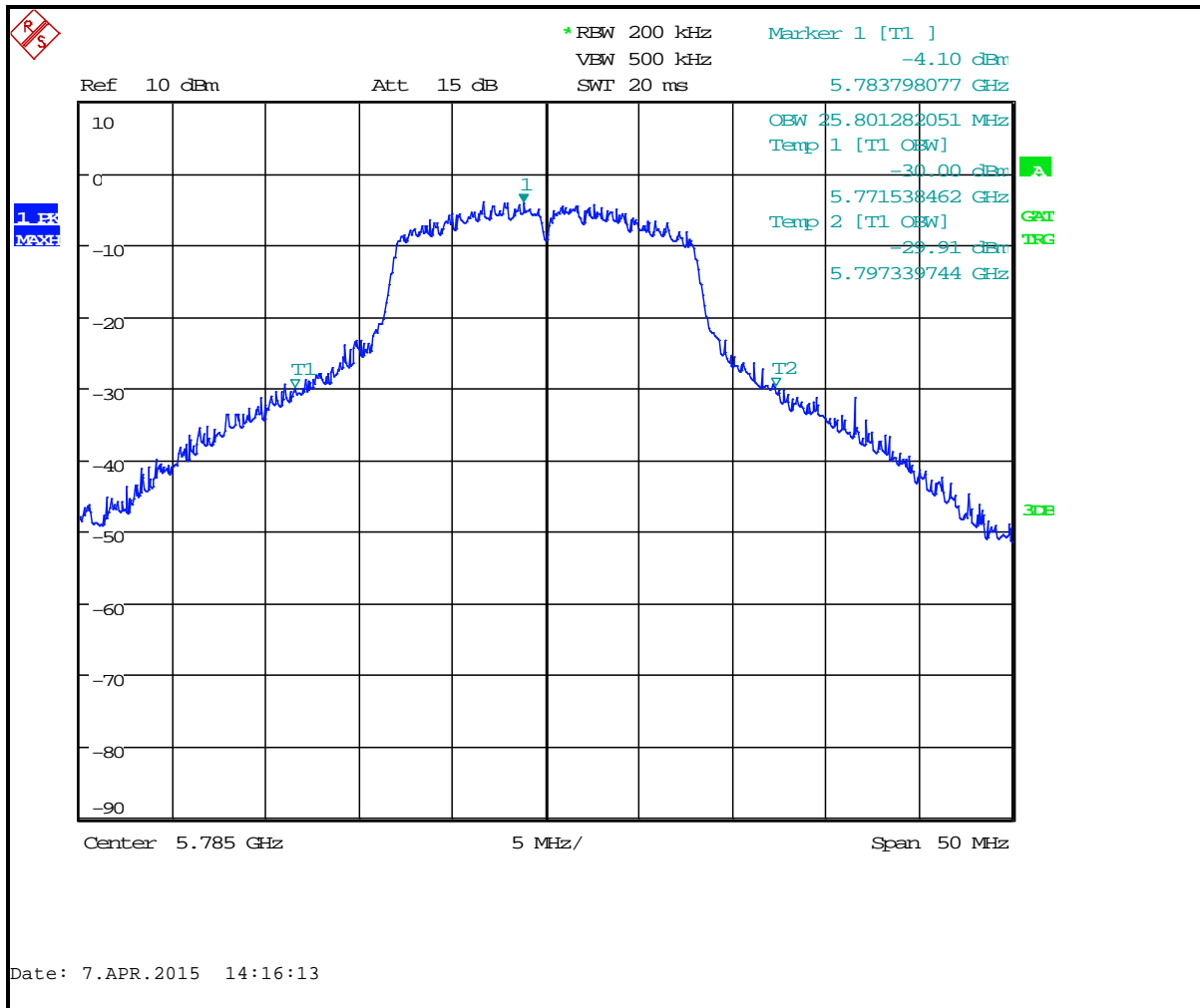
Plot 8-11: 26 dB Bandwidth Channel 48 (TX Frequency 5240 MHz) - 802.11n



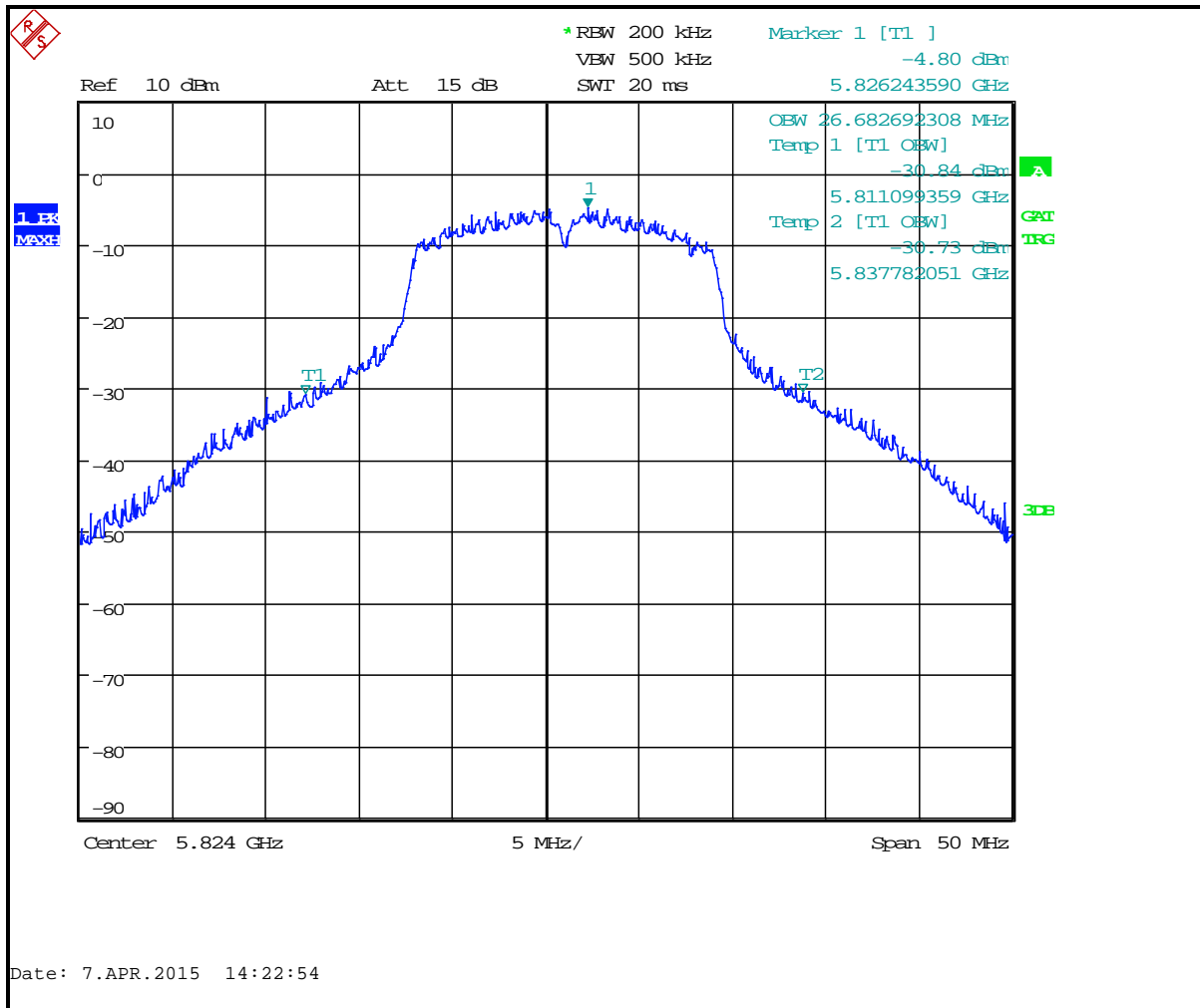
Plot 8-12: 26 dB Bandwidth Channel 149 (TX Frequency 5745 MHz) - 802.11n



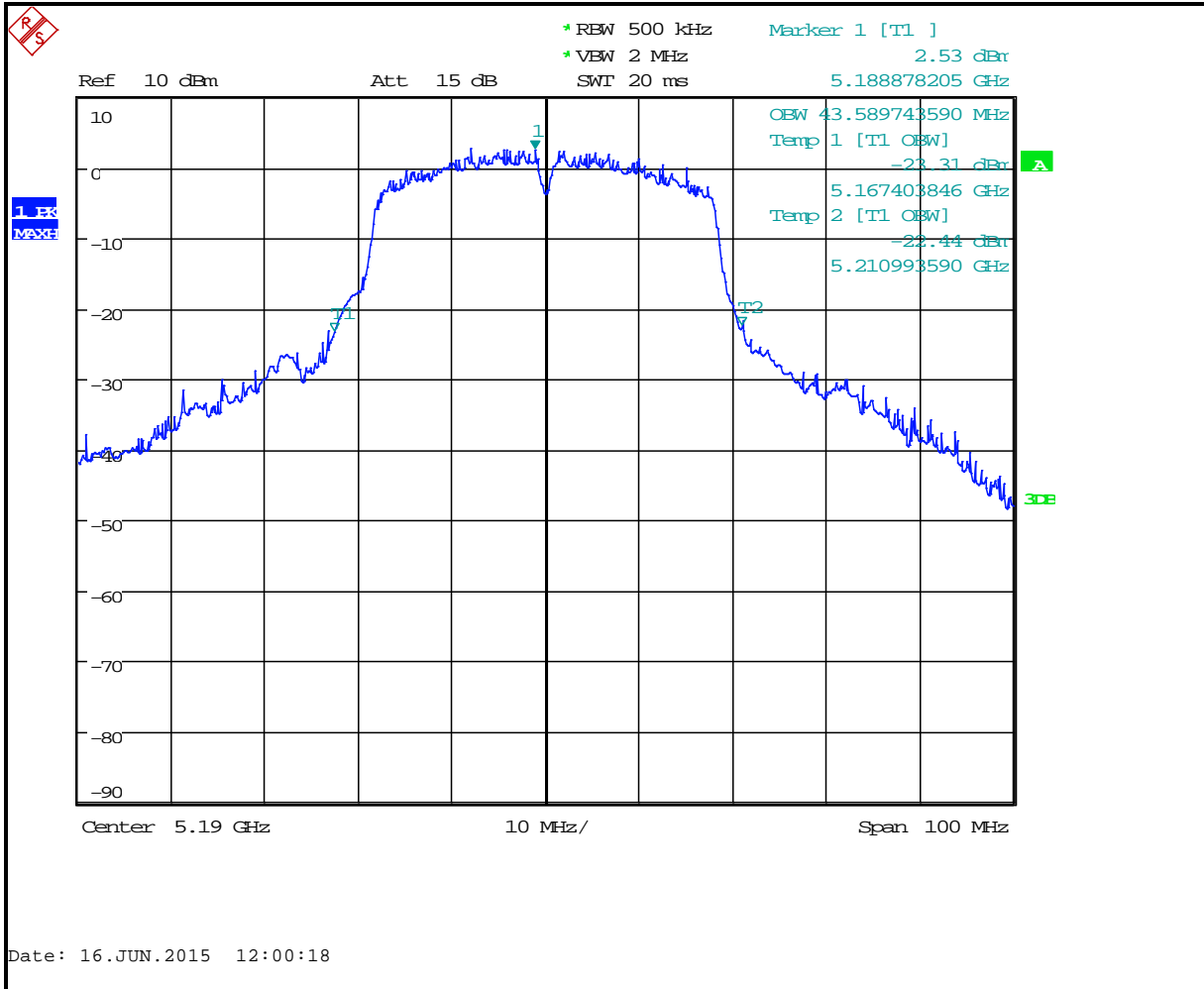
Plot 8-13: 26 dB Bandwidth Channel 157 (TX Frequency 5785 MHz) - 802.11n



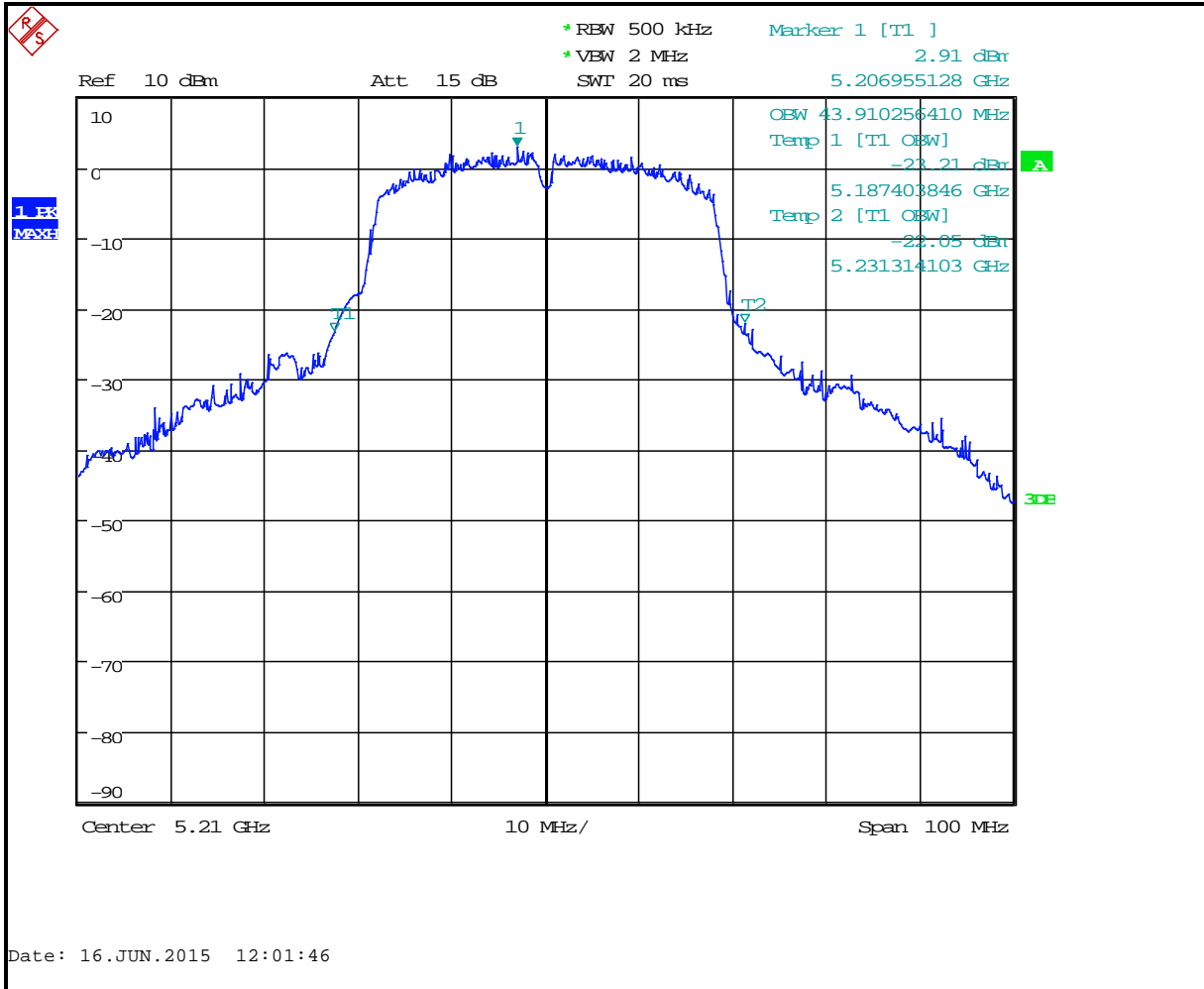
Plot 8-14: 26 dB Bandwidth Channel 165 (TX Frequency 5825 MHz) - 802.11n



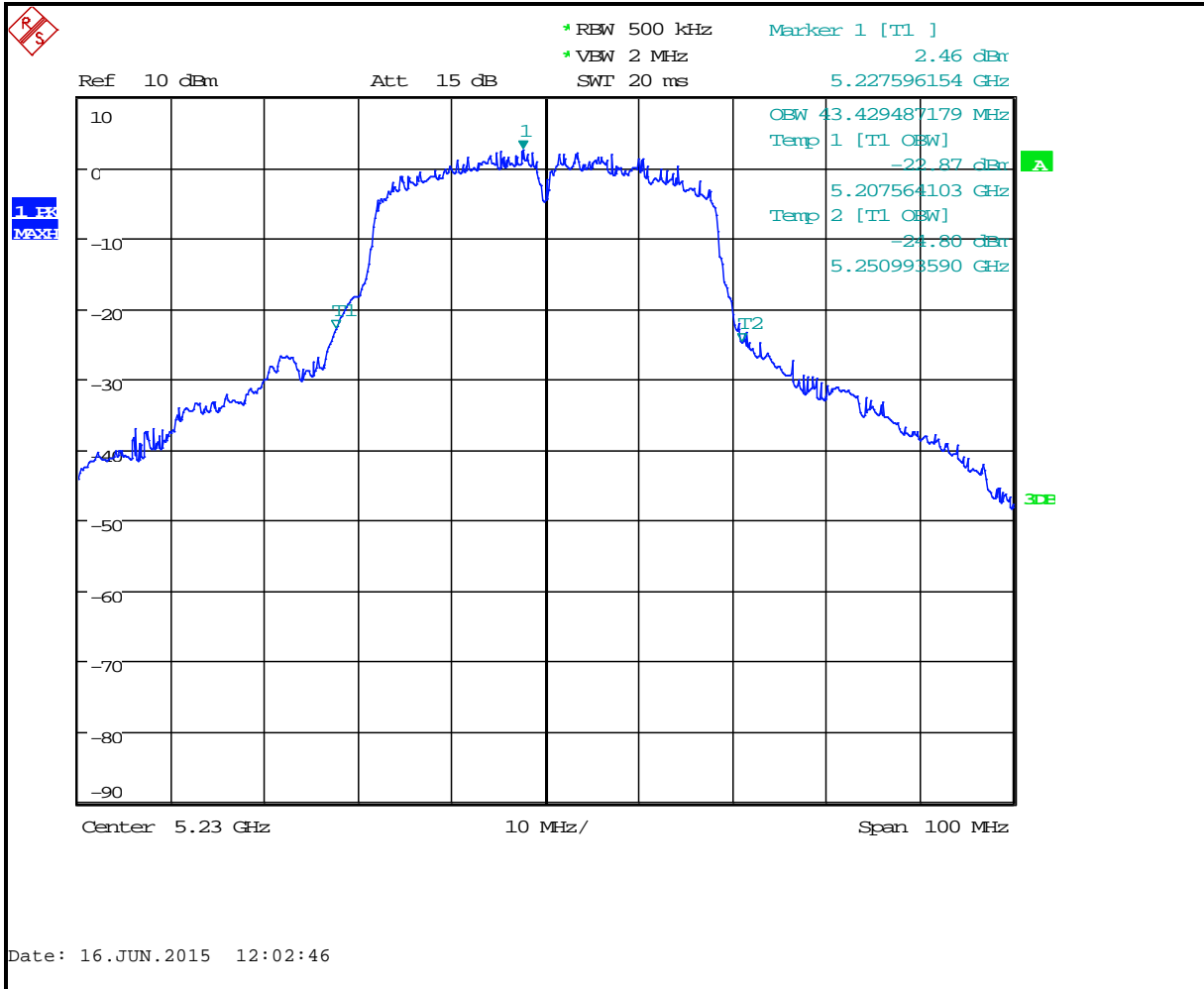
Plot 8-15: 26 dB Bandwidth (Frequency 5190 MHz) - 802.11a (40 MHz BW, 36 Mbps)



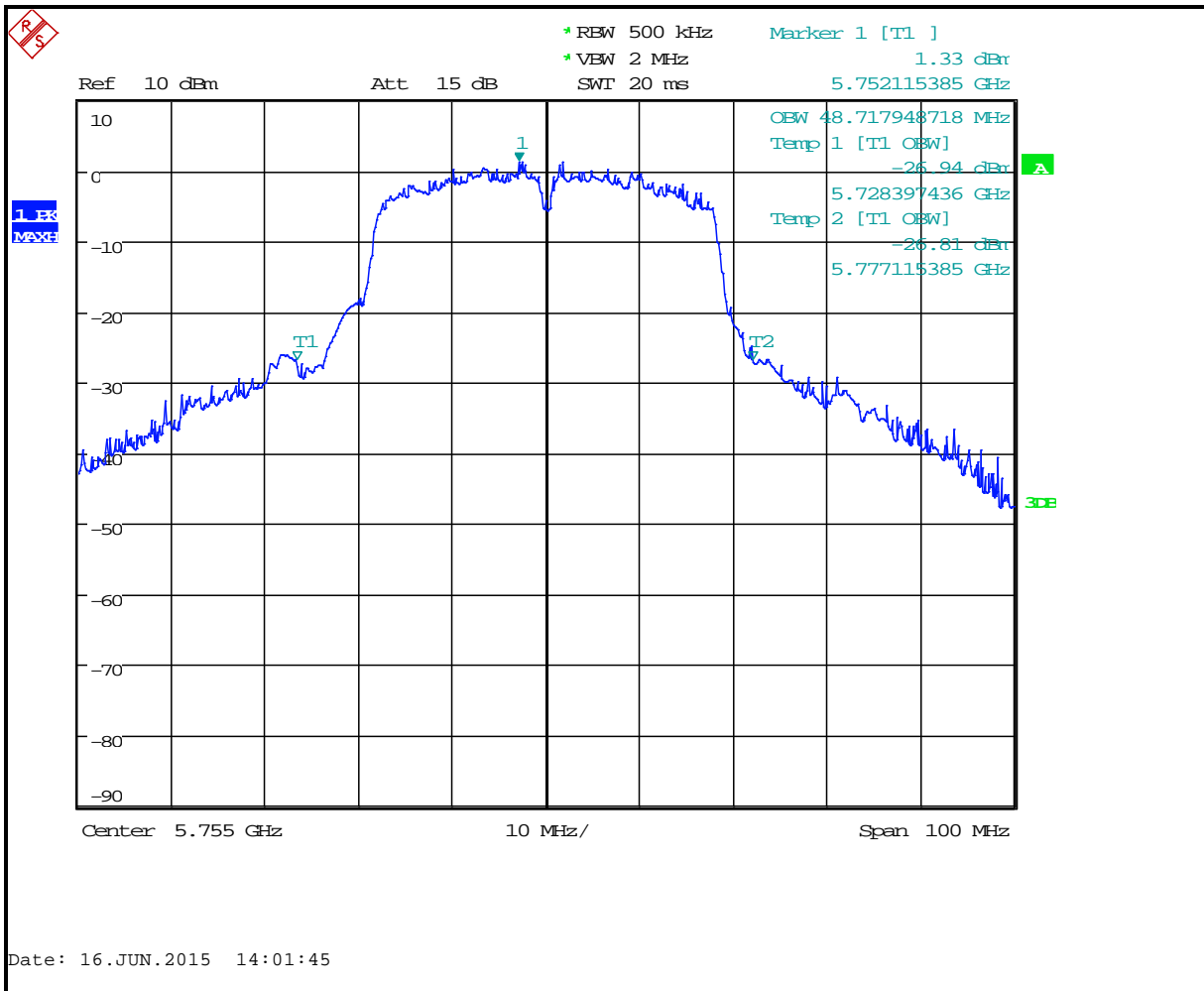
Plot 8-16: 26 dB Bandwidth (Frequency 5210 MHz) - 802.11a (40 MHz BW, 36 Mbps)



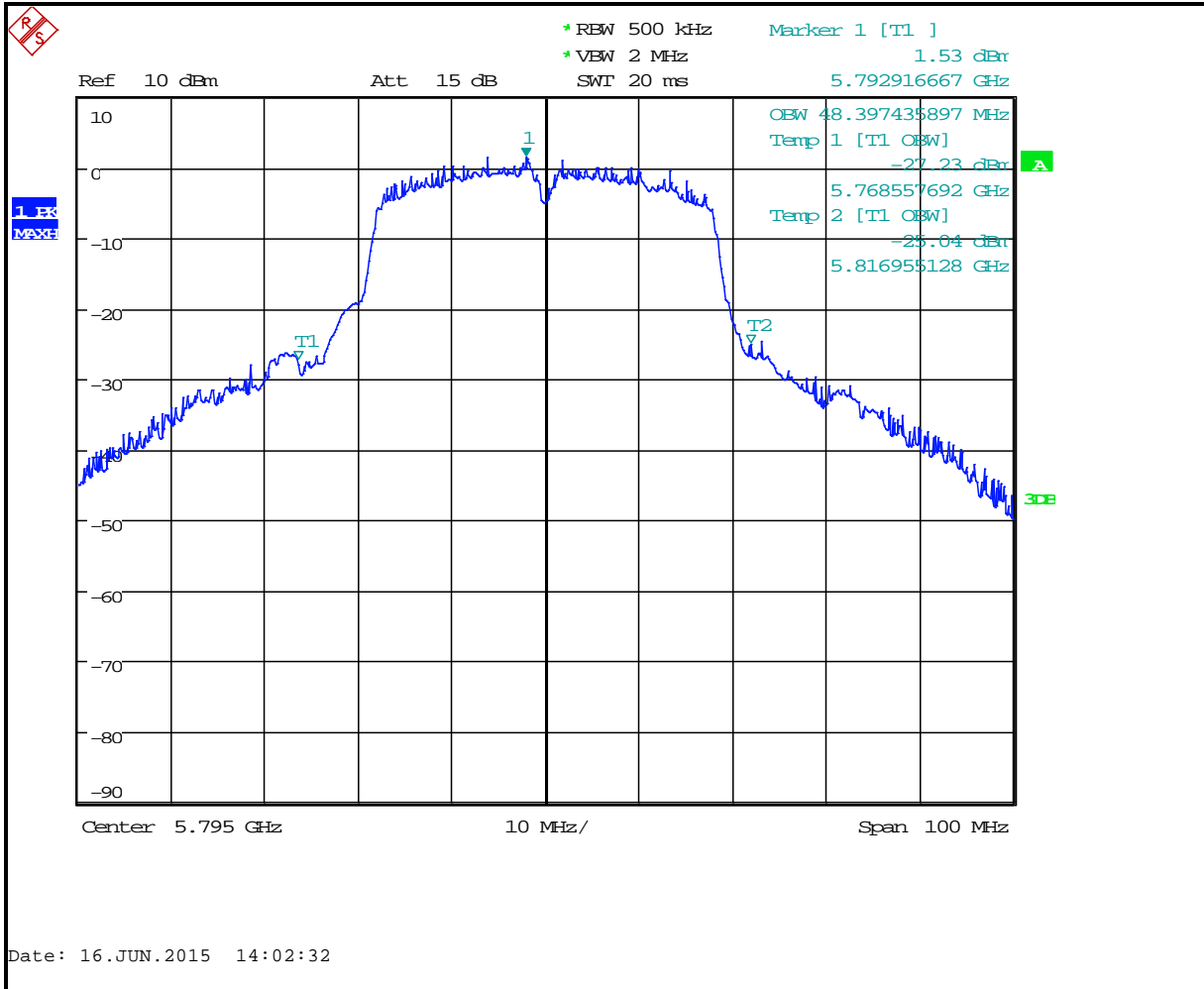
Plot 8-17: 26 dB Bandwidth (Frequency 5230 MHz) - 802.11a (40 MHz BW, 36 Mbps)



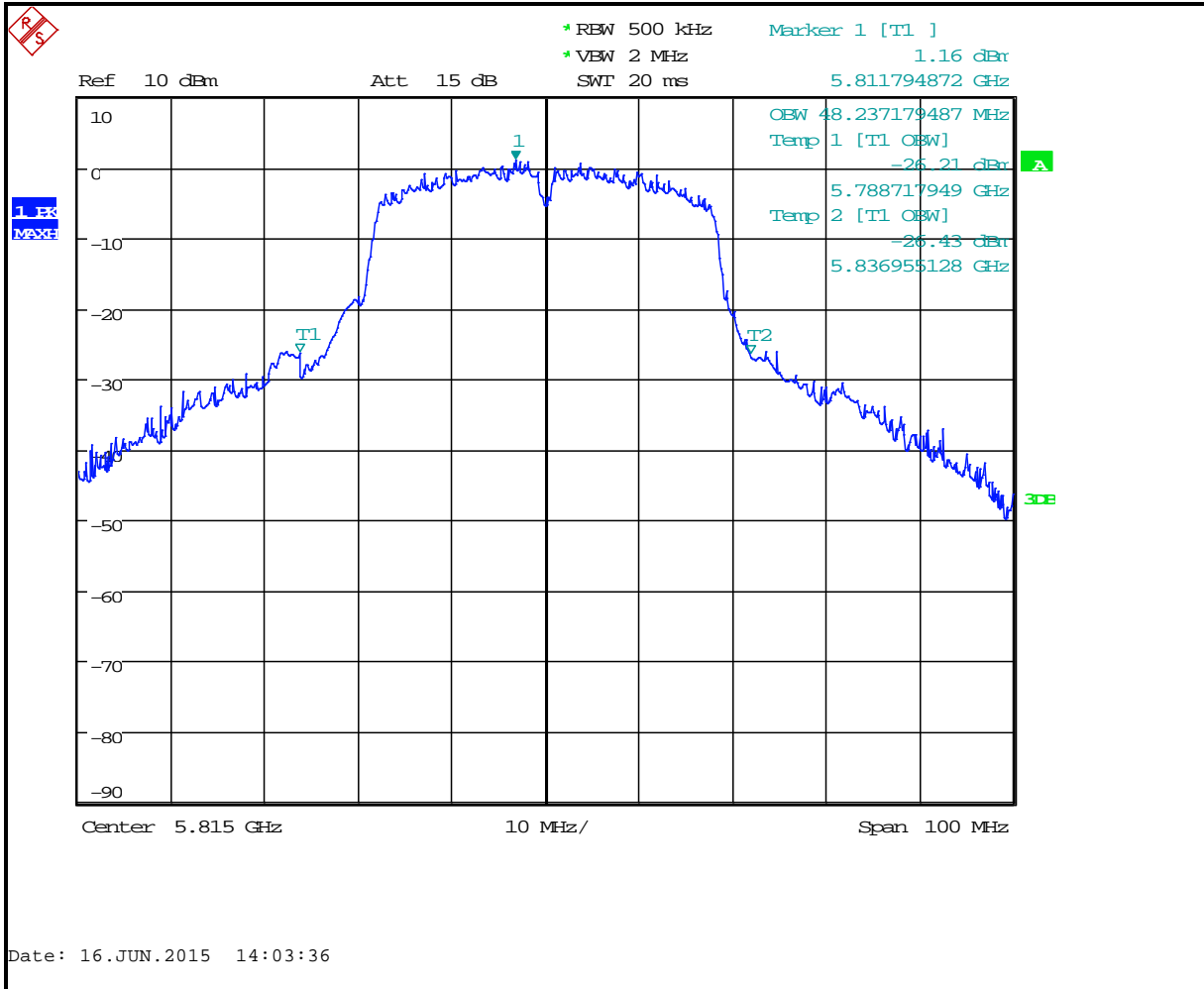
Plot 8-18: 26 dB Bandwidth (Frequency 5755 MHz) - 802.11a (40 MHz BW, 36 Mbps)



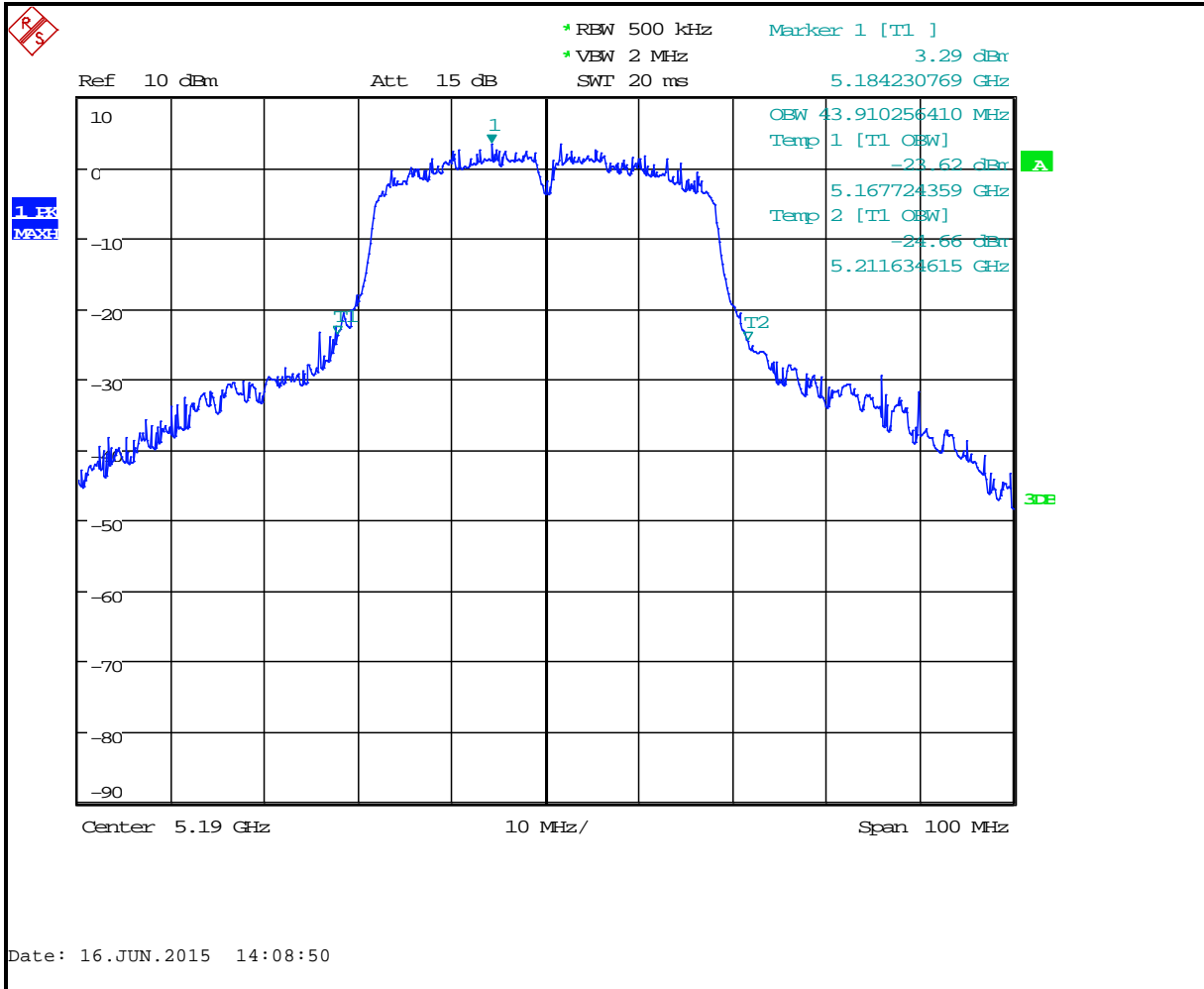
Plot 8-19: 26 dB Bandwidth (Frequency 5795 MHz) - 802.11a (40 MHz BW, 36 Mbps)



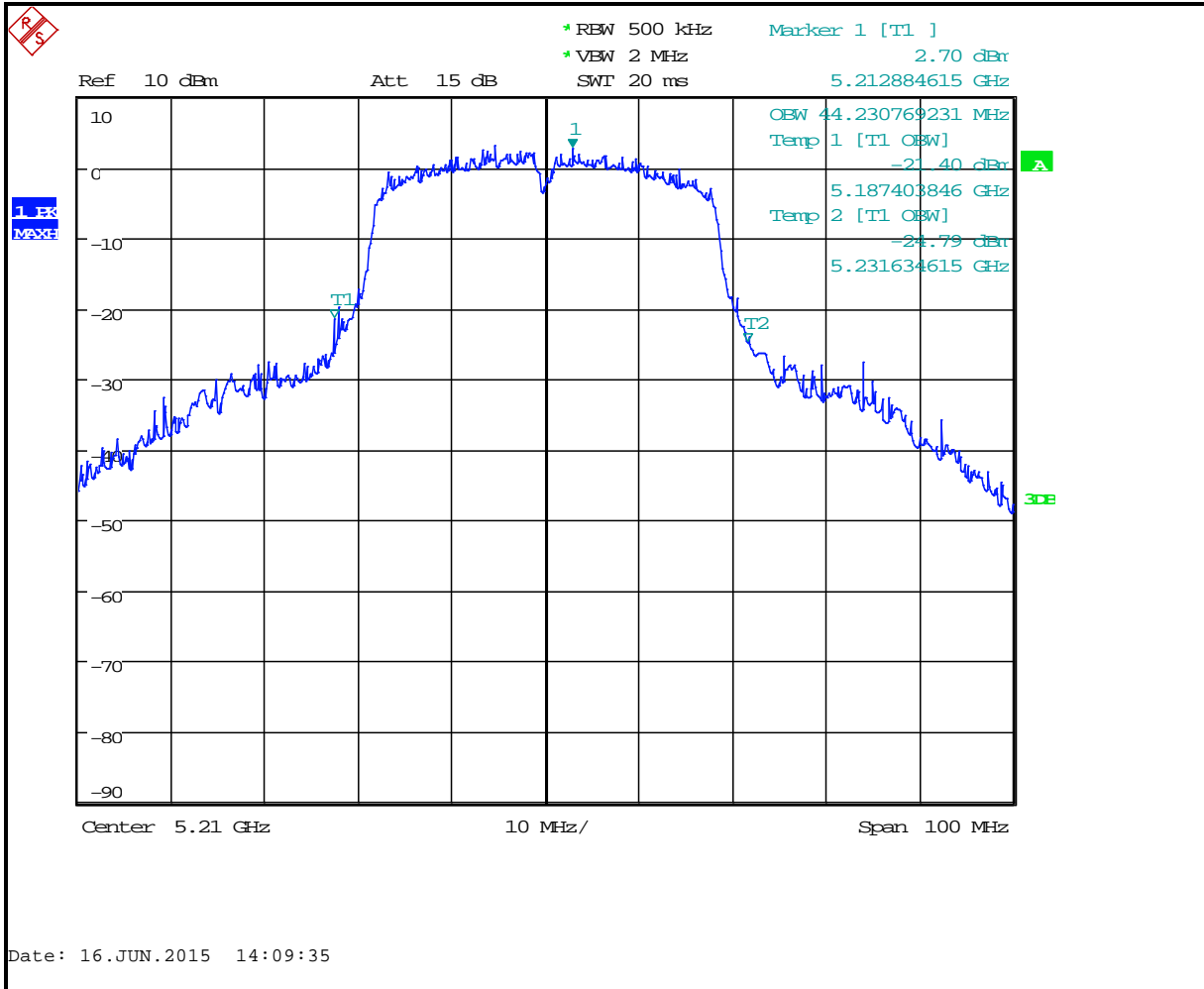
Plot 8-20: 26 dB Bandwidth (Frequency 5815 MHz) - 802.11a (40 MHz BW, 36 Mbps)



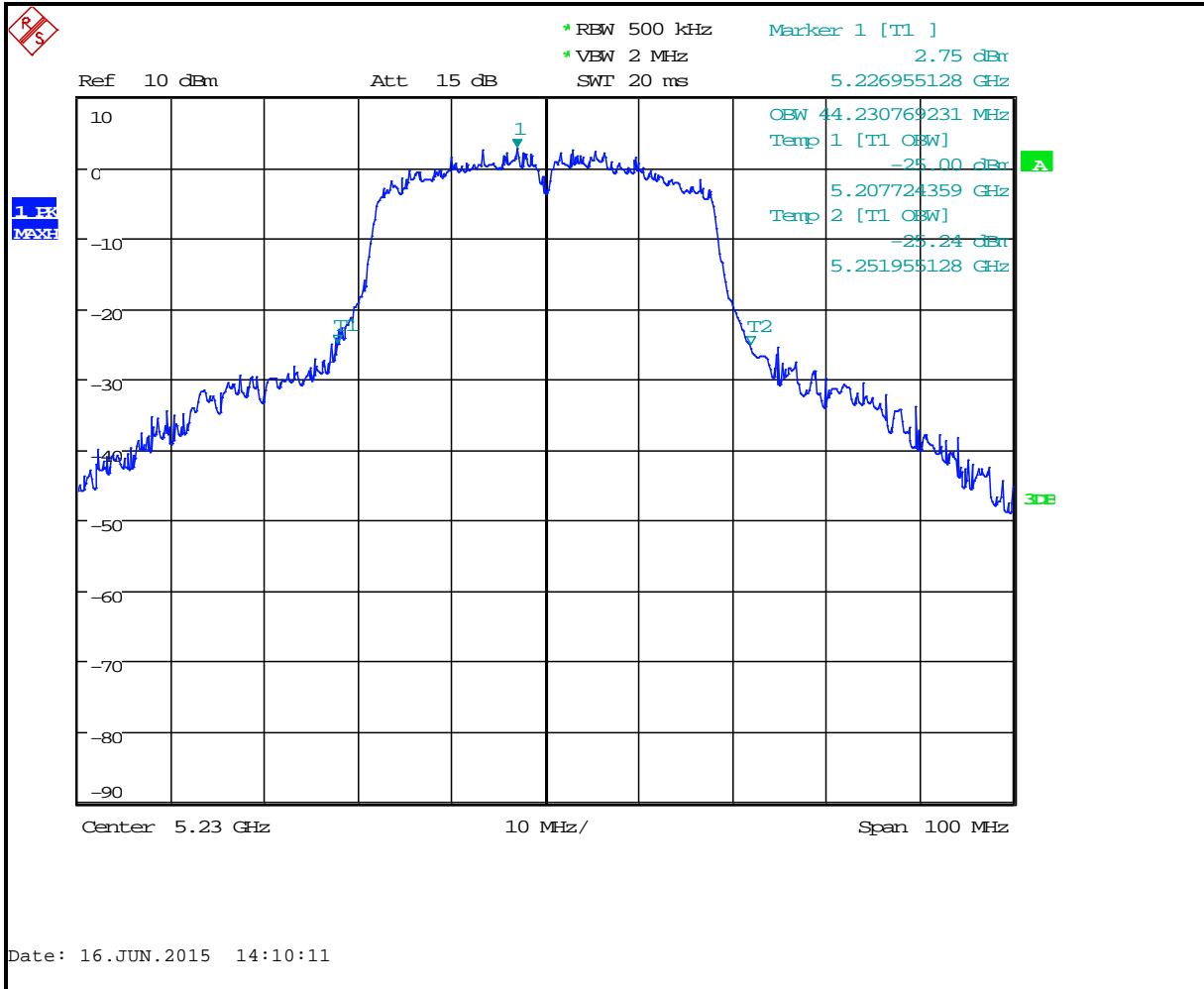
Plot 8-21: 26 dB Bandwidth (Frequency 5190 MHz) - 802.11n (40 MHz BW)



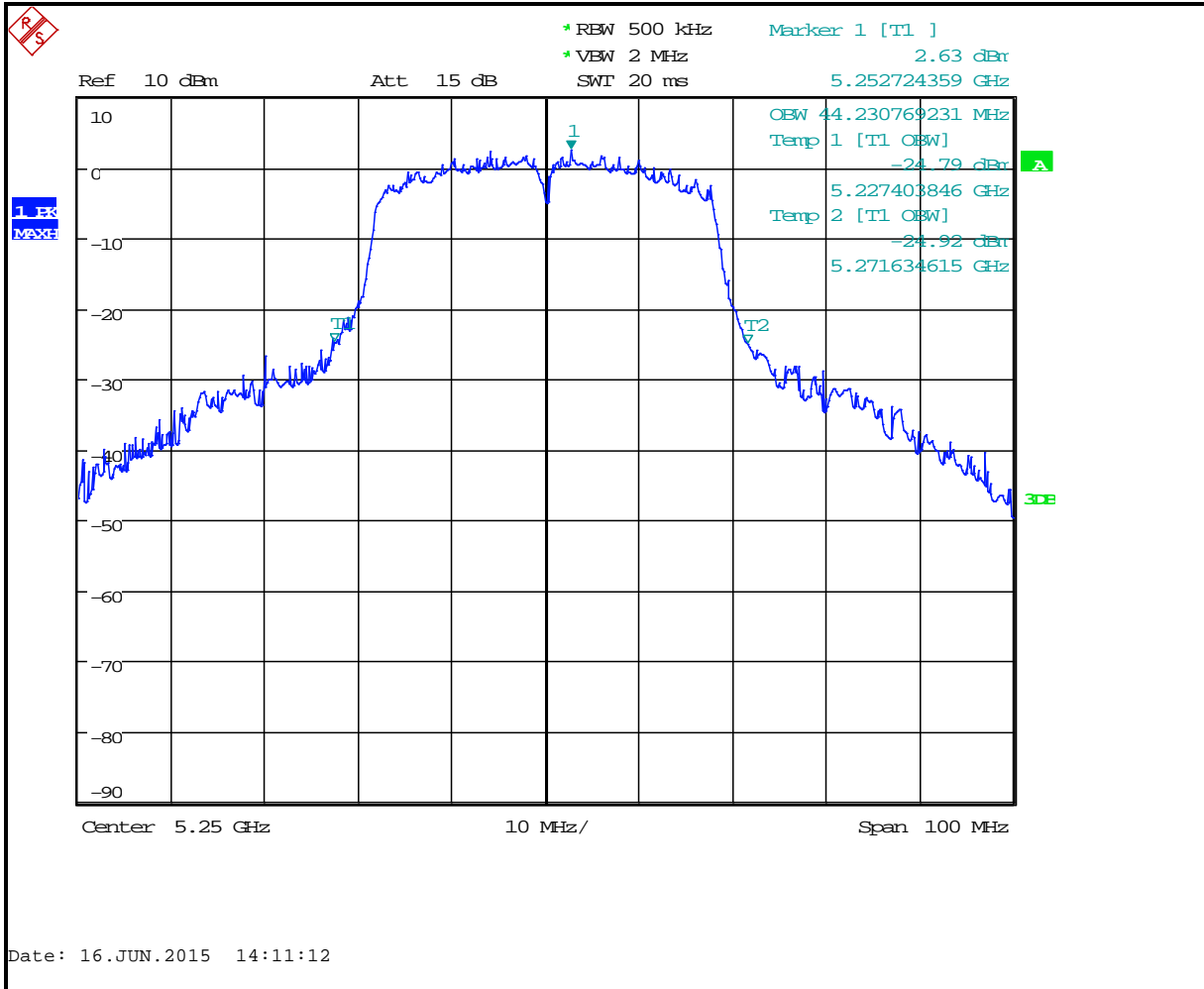
Plot 8-22: 26 dB Bandwidth (Frequency 5210 MHz) - 802.11n (40 MHz BW)



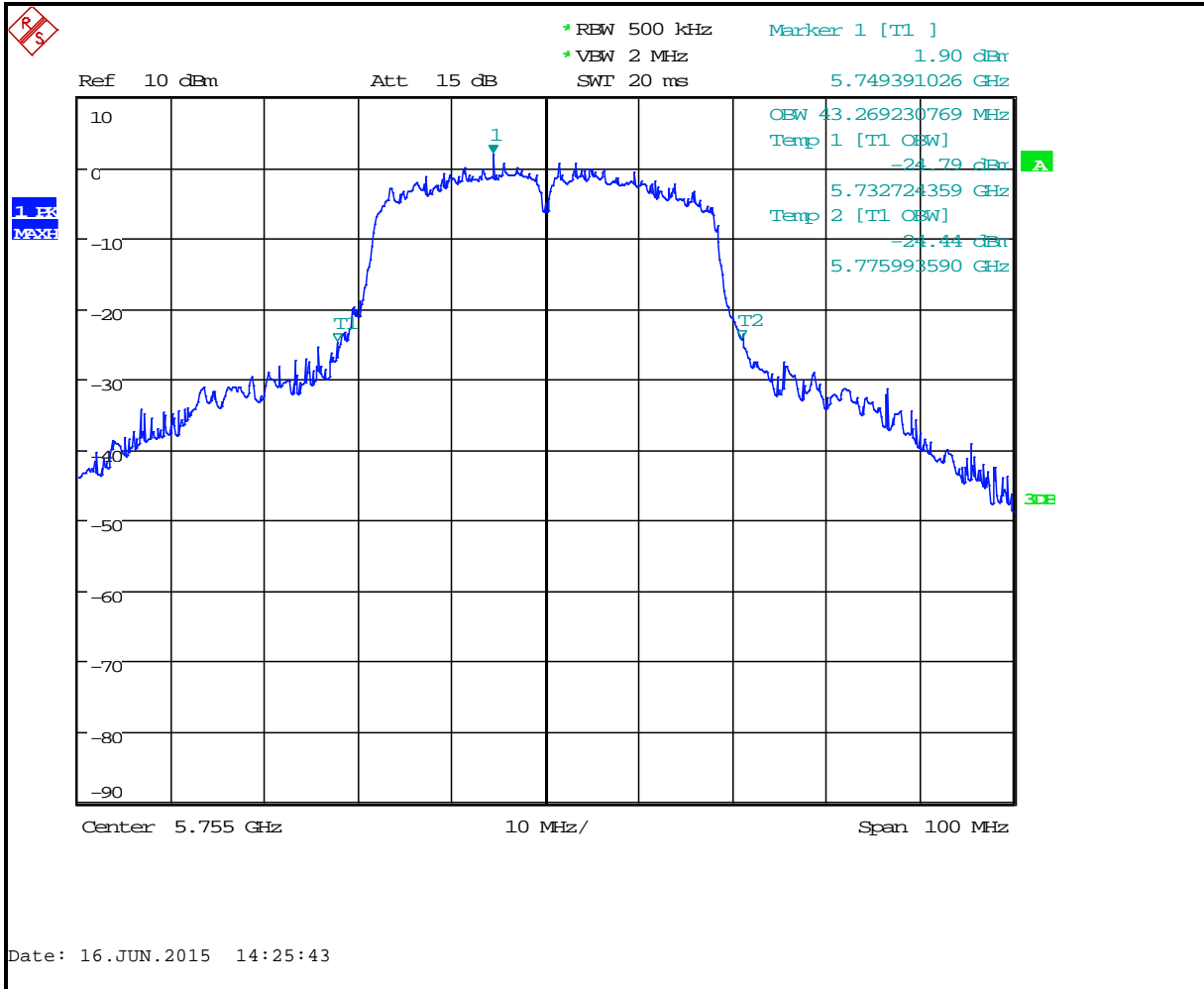
Plot 8-23: 26 dB Bandwidth (Frequency 5230 MHz) - 802.11n (40 MHz BW)



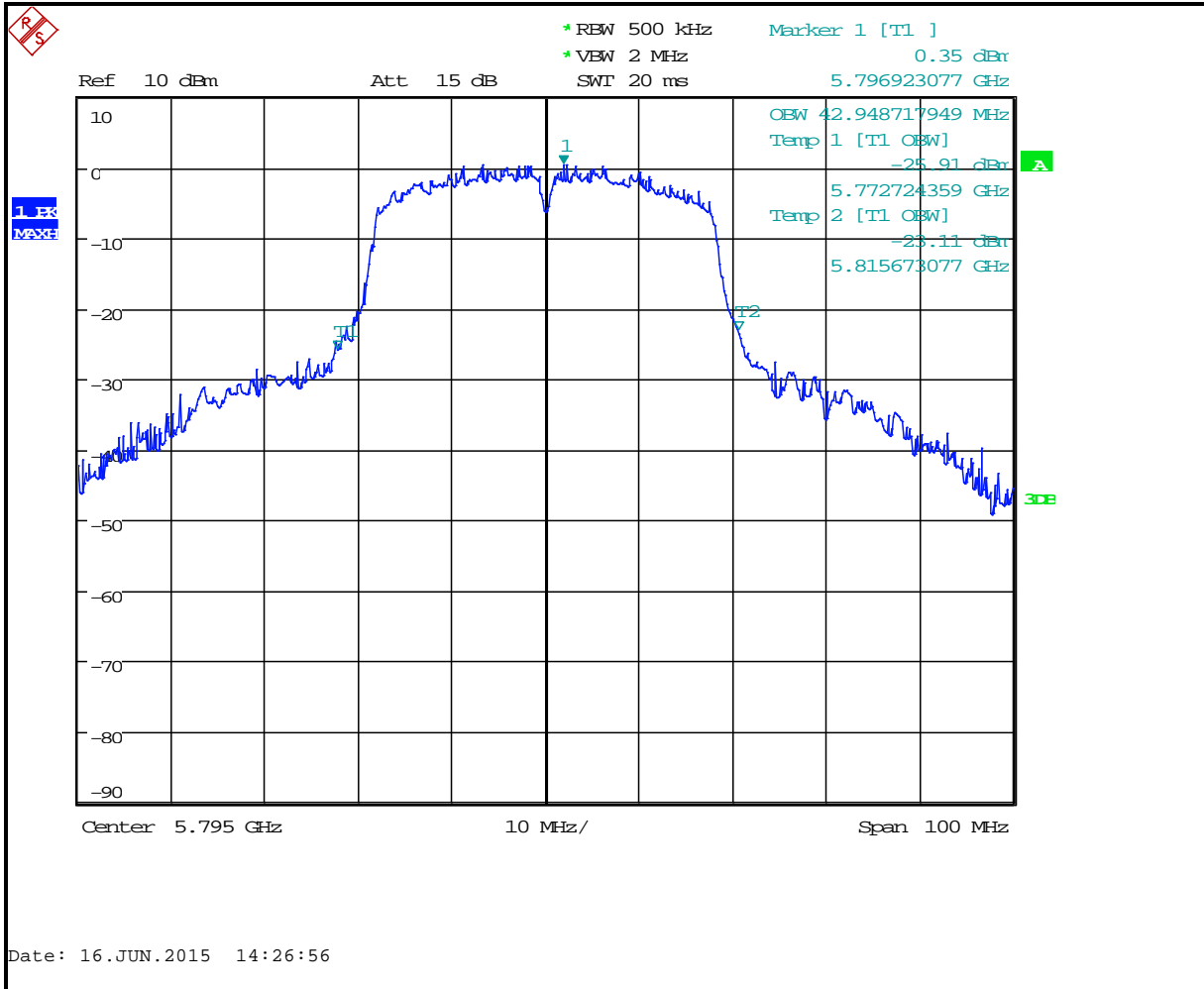
Plot 8-24: 26 dB Bandwidth (Frequency 5250 MHz) - 802.11n (40 MHz BW)



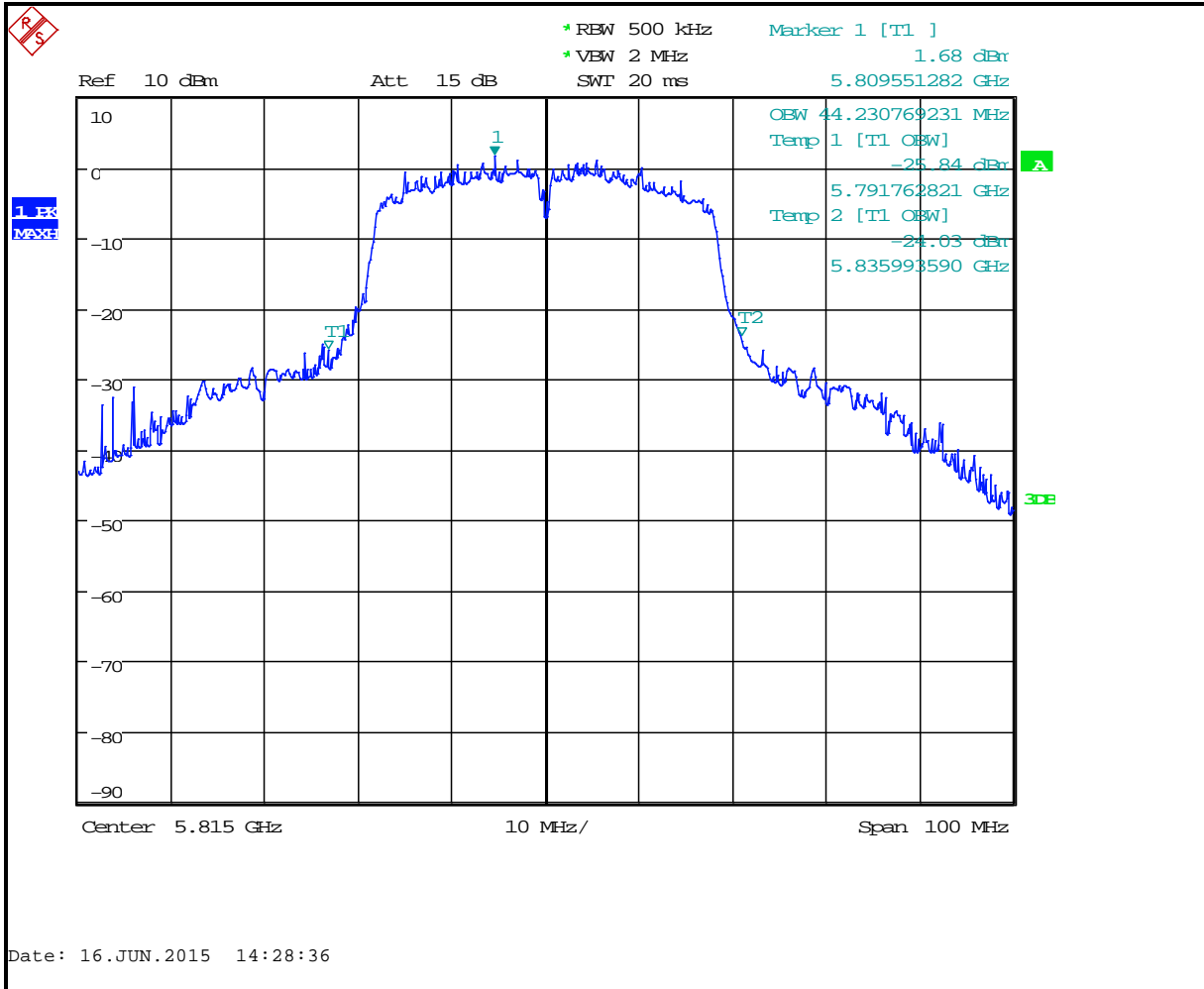
Plot 8-25: 26 dB Bandwidth (Frequency 5755 MHz) - 802.11n (40 MHz BW)



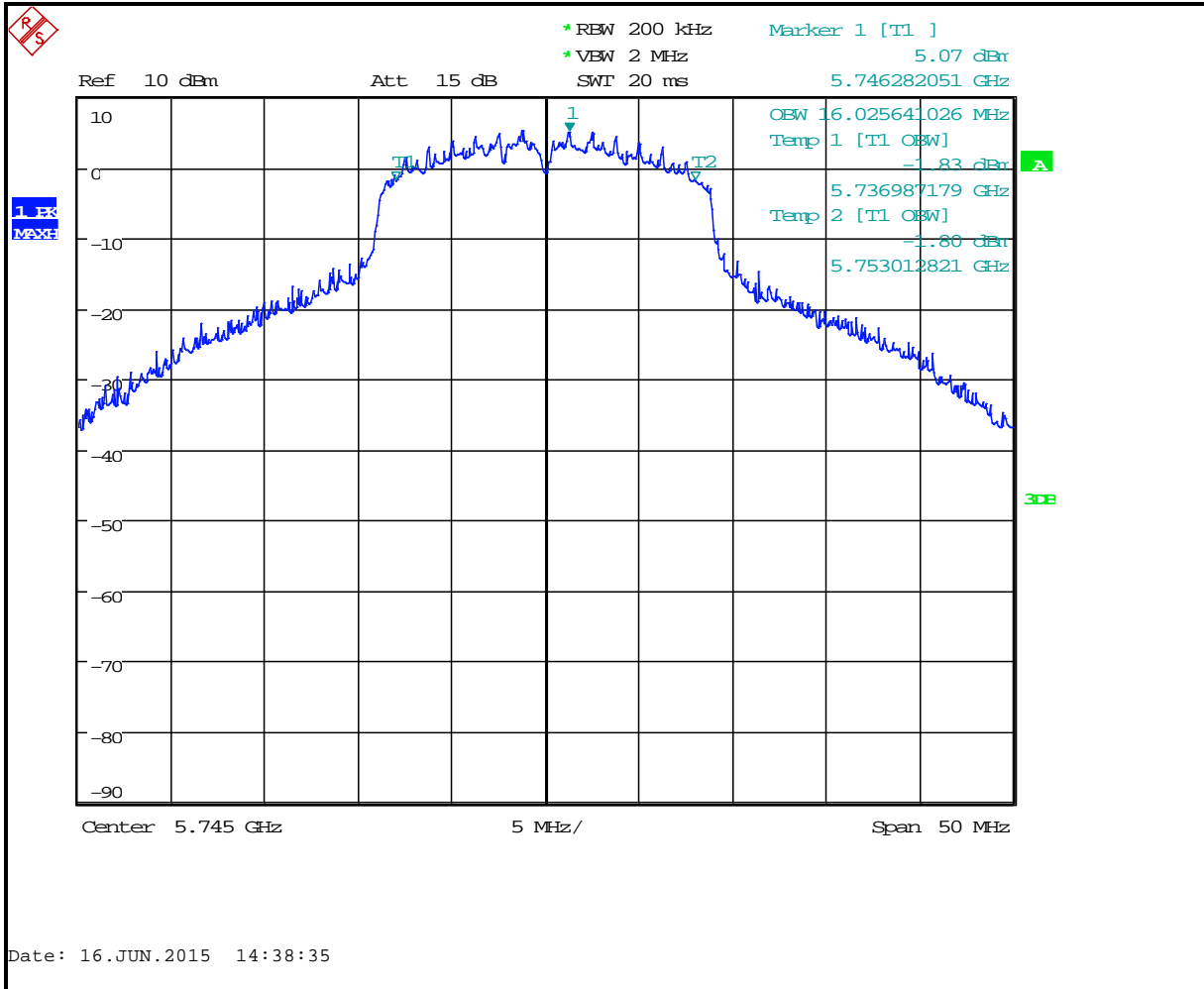
Plot 8-26: 26 dB Bandwidth (Frequency 5795 MHz) - 802.11n (40 MHz BW)



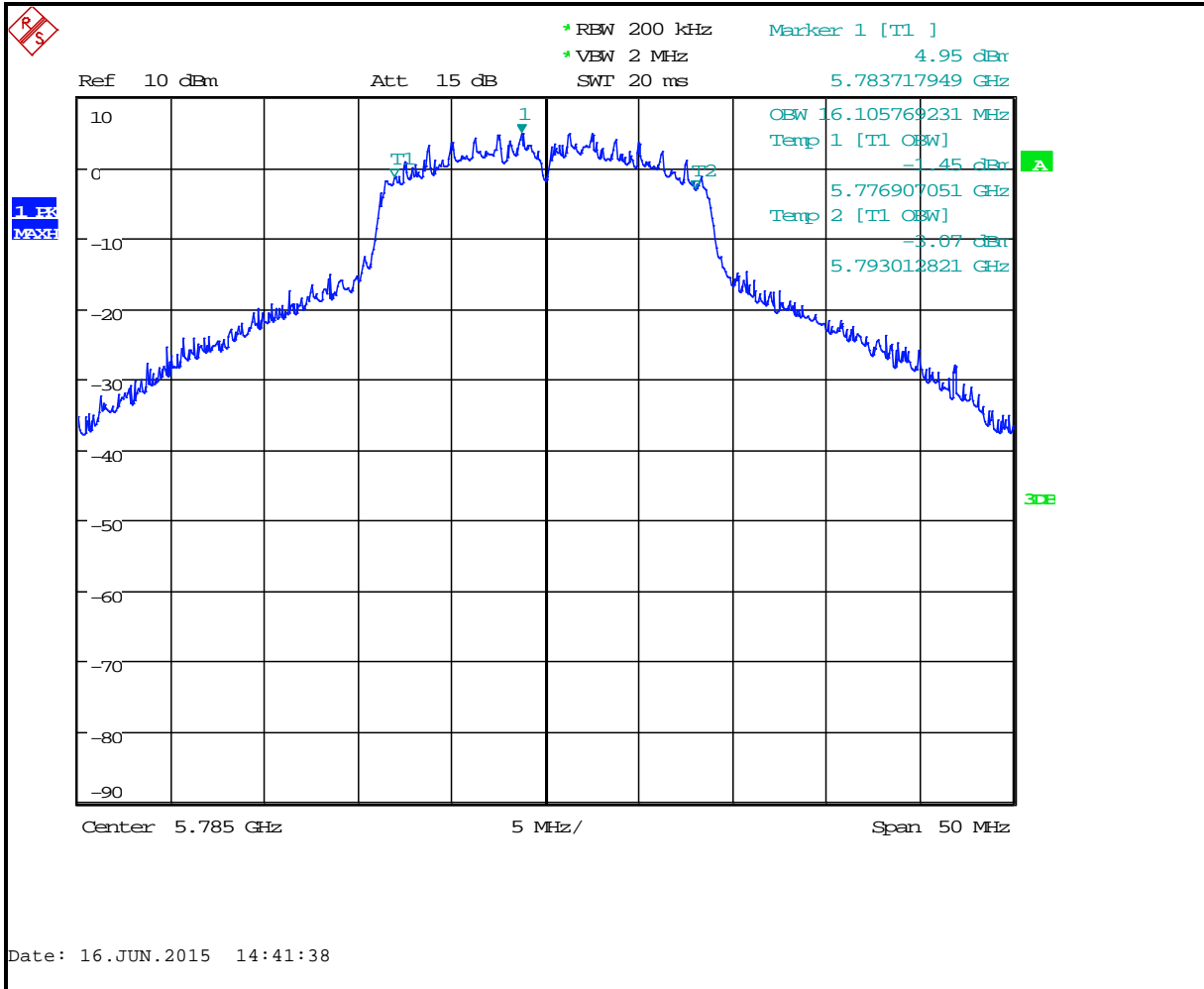
Plot 8-27: 26 dB Bandwidth (Frequency 5815 MHz) - 802.11n (40 MHz BW)



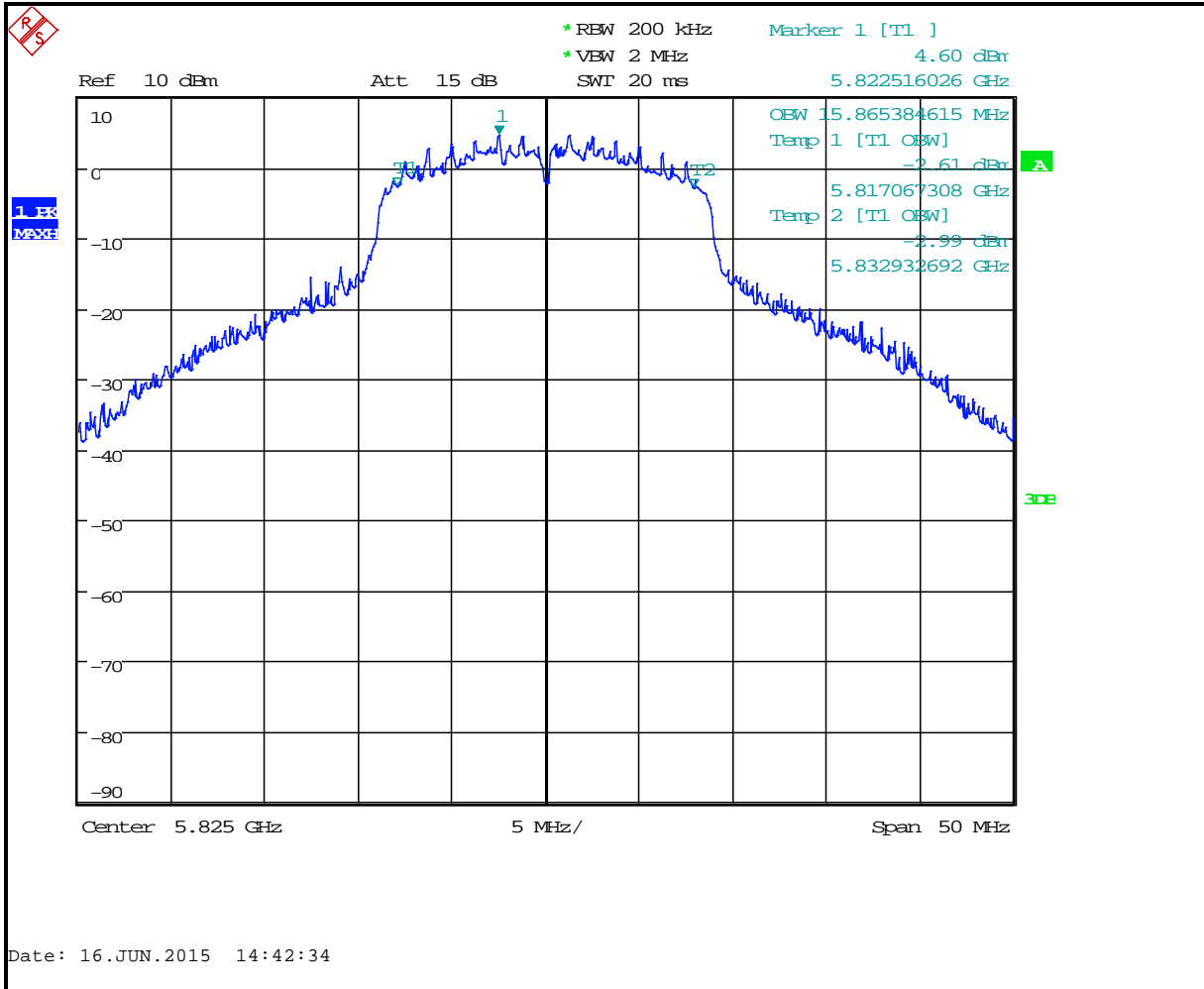
Plot 8-28: 6 dB Bandwidth Channel 149 (TX Frequency 5745 MHz) - 802.11a



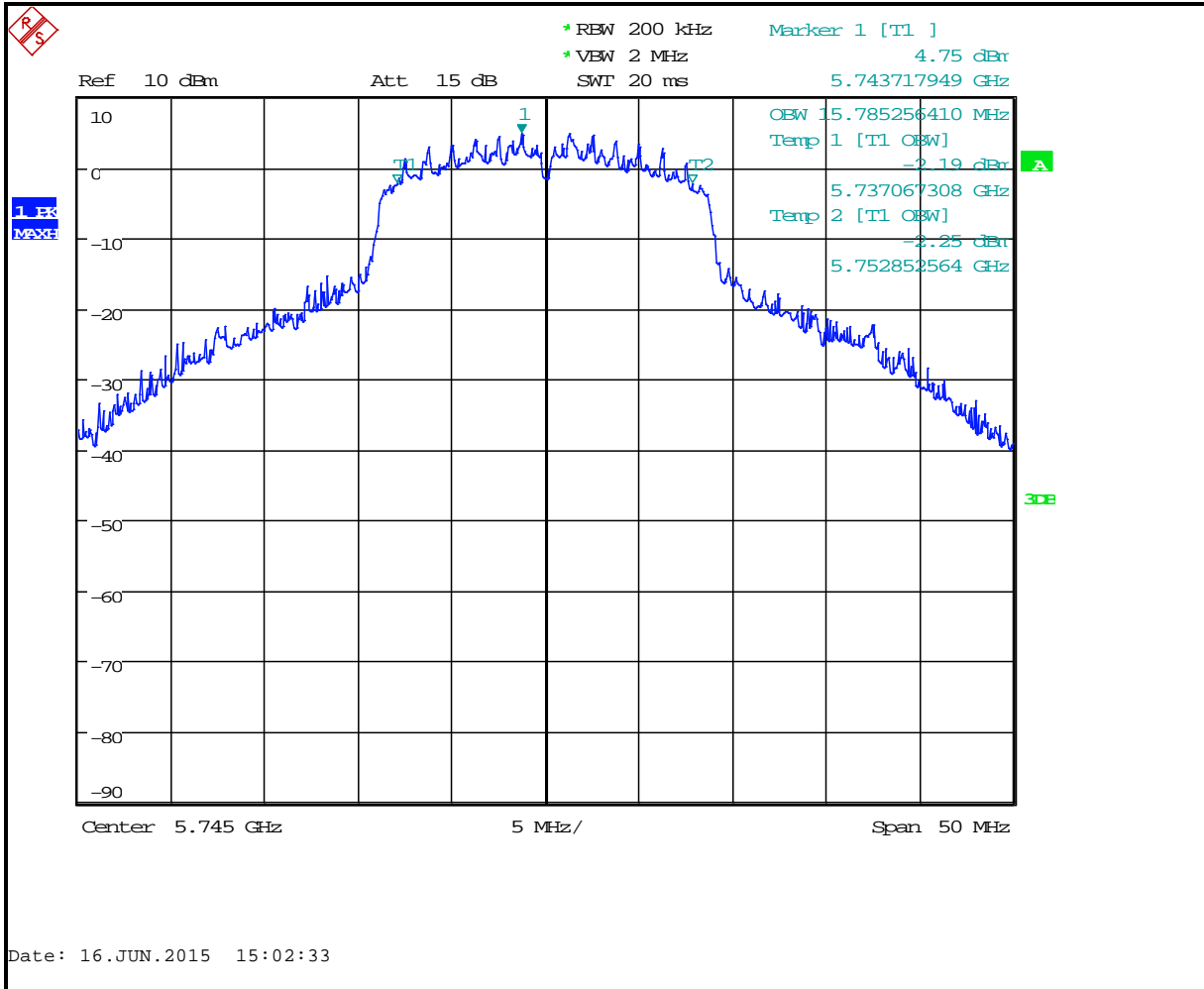
Plot 8-29: 6 dB Bandwidth Channel 157 (TX Frequency 5785 MHz) - 802.11a



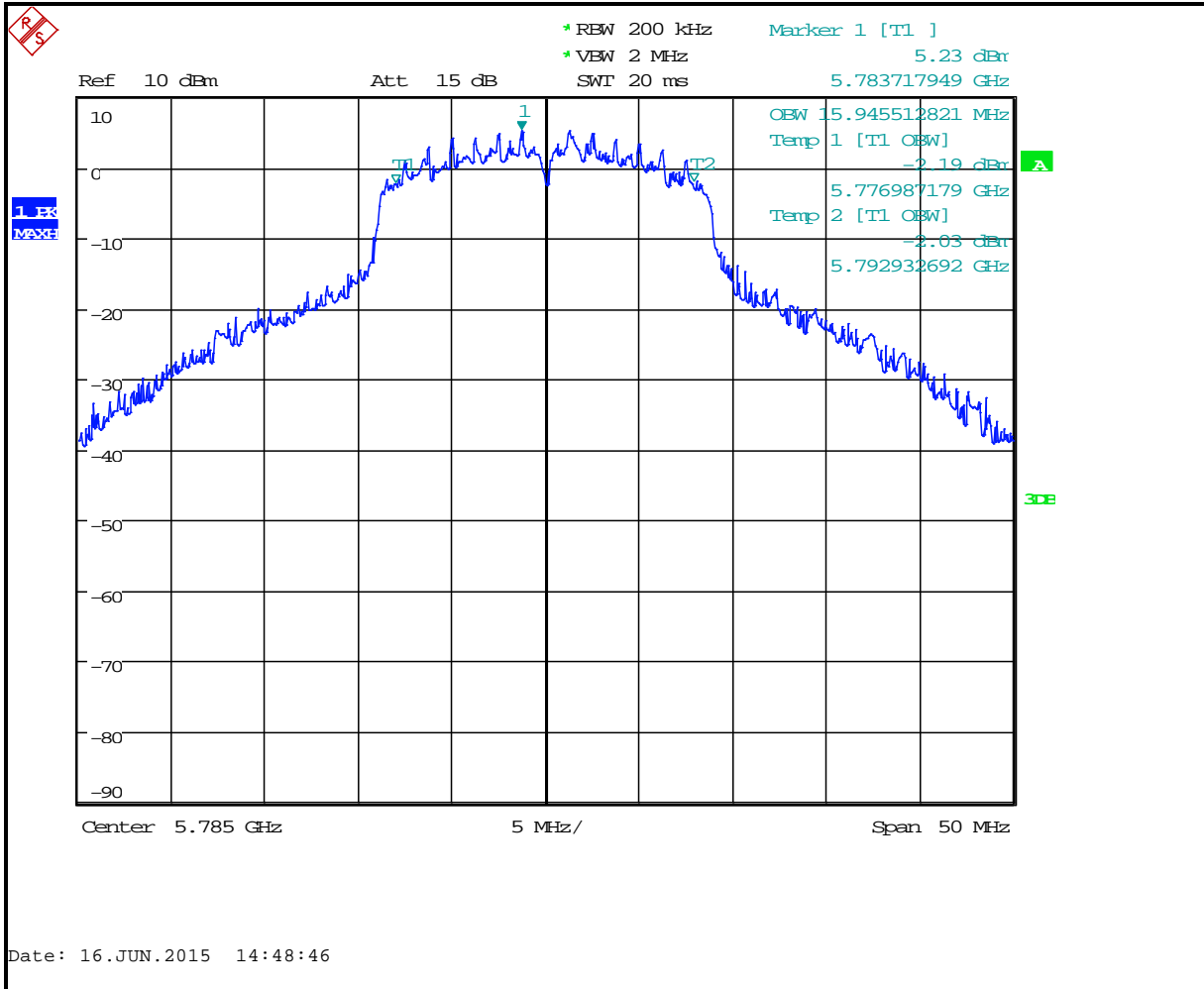
Plot 8-30: 6 dB Bandwidth Channel 165 (TX Frequency 5825 MHz) - 802.11a



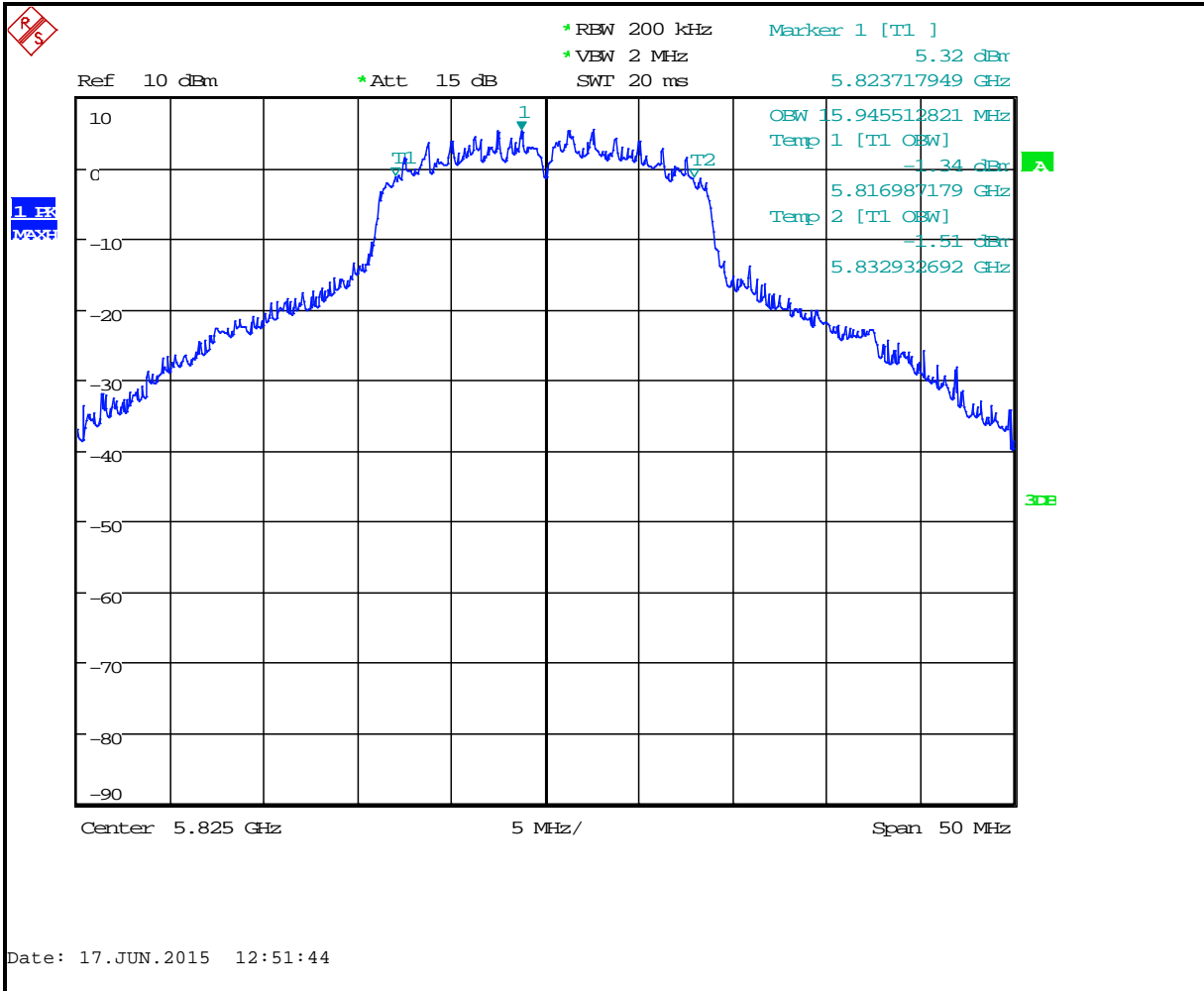
Plot 8-31: 6 dB Bandwidth Channel 149 (TX Frequency 5745 MHz) - 802.11n



Plot 8-32: 6 dB Bandwidth Channel 157 (TX Frequency 5785 MHz) - 802.11n



Plot 8-33: 6 dB Bandwidth Channel 165 (TX Frequency 5825 MHz) - 802.11n



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Signature

June 4-17, 2015
 Dates of Test

9 Radiated Emissions – FCC 15.209; RSS-247 6.2, RSS-Gen 6.13/7.1

9.1 Limits of Radiated Emissions Measurement

| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009-0.490 | 2400/f (kHz) | 300 |
| 0.490-1.705 | 2400/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 |

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

9.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the three/ten-meter, open-field test site, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 9-1: Radiated Emissions Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-------------------------|-------------------|--------------------------------------|-----------------|----------------------|
| 900878 | Rhein Tech Laboratories | AM3-1197-0005 | 3 meter antenna mast, polarizing | Outdoor Range 1 | Not Required |
| 901592 | Insulated Wire Inc. | KPS-1503-3600-KPR | SMK RF Cables 20' | N/A | 9/3/15 |
| 901593 | Insulated Wire Inc. | KPS-1503-360-KPR | SMK RF Cables 36" | N/A | 9/3/15 |
| 901242 | Rhein Tech Laboratories | WRT-000-0003 | Wood rotating table | N/A | Not Required |
| 900772 | EMCO | 3161-02 | Horn Antenna (2 - 4 GHz) | 9804-1044 | 4/9/18 |
| 900321 | EMCO | 3161-03 | Horn Antennas (4 - 8.2 GHz) | 9508-1020 | 4/9/18 |
| 900323 | EMCO | 3160-7 | Horn Antennas (8,2 - 12.4 GHz) | 9605-1054 | 4/9/18 |
| 900356 | EMCO | 3160-08 | Horn Antenna (12.4 - 18 GHz) | 9607-1044 | 4/9/18 |
| 901218 | EMCO | 3160-09 | Horn Antenna (18 - 26.5 GHz) | 960281-003 | 4/14/18 |
| 901303 | EMCO | 3160-10 | Horn Antenna (26.5 - 40.0 GHz) WR-28 | 960452-007 | 6/19/15 |
| 900791 | Chase | CBL6111B | Bilog Antenna (30 MHz - 2000 MHz) | N/A | 6/11/17 |
| 901581 | Rohde & Schwarz | FSU | Spectrum Analyzer | 1166.1660.50 | 11/13/15 |

9.3 Radiated Emissions Harmonics/Spurious Test Results

Table 9-2: Radiated Emissions Harmonics/Spurious Channel 36 (TX Frequency: 5180 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 10360 | 6.6 | -6.3 | 35.4 | 29.1 | 68.2 | -39.1 |
| 15540 | -1.2 | -13.2 | 39.9 | 26.8 | 68.2 | -41.4 |

Table 9-3: Radiated Emissions Harmonics/Spurious Channel 40 (TX Frequency: 5200 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 10400 | 5.8 | -6.2 | 35.4 | 29.2 | 68.2 | -39.0 |
| 15600 | -0.4 | -13.1 | 39.9 | 26.9 | 68.2 | -41.3 |

Table 9-4: Radiated Emissions Harmonics/Spurious Channel 44 (TX Frequency: 5220 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 10440 | 6.2 | -6.2 | 35.4 | 29.2 | 68.2 | -39.0 |
| 15660 | -1.2 | -13.3 | 39.9 | 26.7 | 68.2 | -41.5 |

Table 9-5: Radiated Emissions Harmonics/Spurious Channel 48 (TX Frequency: 5240 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 10480 | 6.7 | -5.8 | 35.5 | 29.7 | 68.2 | -38.5 |
| 15720 | -0.9 | -13.1 | 39.9 | 26.9 | 68.2 | -41.3 |

Table 9-6: Radiated Emissions Harmonics/Spurious Channel 149 (TX Frequency: 5745 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 11490 | 4.7 | -6.0 | 35.7 | 29.7 | 68.2 | -38.5 |
| 17235 | -2.1 | -14.5 | 40.0 | 25.6 | 68.2 | -42.6 |


Table 9-7: Radiated Emissions Harmonics/Spurious Channel 157 (TX Frequency: 5785 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 11570 | 5.5 | -5.4 | 35.7 | 30.3 | 68.2 | -37.9 |
| 17355 | -1.9 | -14.2 | 40.1 | 25.9 | 68.2 | -42.3 |

Table 9-8: Radiated Emissions Harmonics/Spurious Channel 165 (TX Frequency: 5825 MHz)

| Emission Frequency (MHz) | Analyzer Peak Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Analyzer RMS Detector (dBuV) (1 MHz RBW/ 3 MHz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|------------------------------------------------------------|-----------------------------------------------------------|-------------------------------|---------------------------------|------------------------|---------------------|
| 11650 | 3.7 | -5.8 | 35.8 | 30.0 | 68.2 | -38.2 |
| 17475 | -2.6 | -14.1 | 40.1 | 26.0 | 68.2 | -42.2 |

Test Personnel:

| | | |
|-------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------|
| Daniel W. Baltzell Test Engineer |  Signature | June 11, 2015 Date of Test |
|-------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------|

10 Conducted Emissions - FCC Rules and Regulations Part 15.207; RSS-Gen 8.8

The EUT is battery operated so AC conducted emissions were not tested.

11 Conclusion

The data in this measurement report shows that the EUT as tested, Harris Corporation Model XL-200P C1D1 Non-Rebanded, FCC ID: OWDTR-0146-E, IC: 3636B-0146, complies with the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and Industry Canada RSS-247.