



FCC Test Report (WIFI)

FCC ID : 2A16DX98PRO

Applicant : SHENZHEN AMEDIATECH TECHNOLOGY CO., LTD
3F, Tower A, Building A, Minsheng Industrial Park, Longhua Road,
Longhua New Area, Shenzhen, China.

Sample Description

Product Name : Smart TV BOX

Model No. : X98PRO

Serial No. : X98

Trademark : N/A

Receipt Date : 2016-12-05

Test Date : 2016-12-06 to 2016-12-12

Issue Date : 2016-12-13

Test Standard(s) : FCC CFR Title 47 Part 15 Subpart C Section 15.247

Conclusions : PASSED*

*In the configuration tested, the EUT complied with the standards specified above.

Test/Witness Engineer :

Jason Deng

Approved & Authorized :

Frank Zhang

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.



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1. General Information

1.1 Client Information

| | | |
|--------------|---|---|
| Applicant | : | SHENZHEN AMEDIATECH TECHNOLOGY CO., LTD |
| Address | : | 3F, Tower A, Building A, Minsheng Industrial Park, Longhua Road, Longhua New Area, Shenzhen, China. |
| Manufacturer | : | SHENZHEN AMEDIATECH TECHNOLOGY CO., LTD |
| Address | : | 3F, Tower A, Building A, Minsheng Industrial Park, Longhua Road, Longhua New Area, Shenzhen, China. |

1.2 General Description of EUT (Equipment Under Test)

| | | | |
|---------------------|---|------------------------------------|--|
| Product Name | : | Smart TV BOX | |
| Models No. | : | X98PRO, X98 | |
| Difference | : | Only differ on appearance and name | |
| Product Description | : | Operation Frequency: | 2412MHz~2462MHz (802.11b/802.11g/802.11n(H20)/ 802.11n(H40)) |
| | | Transfer Rate: | 802.11b: 1/ 2/ 5.5/ 11Mbps 802.11g: 6/ 9/ 12/ 18/ 24/ 36/, 48/54 Mbps 802.11n: Up to 300Mbps |
| | | Number of Channel: | 11 for 802.11b/802.11g/ 802.11n(H20)/ 802.11n(H40) |
| | | Channel separation | 5MHz |
| | | Modulation Technology: | 802.11b:DSSS 802.11g/ 802.11n:OFDM |
| | | Antenna Type: | Integral Antenna |
| | | Antenna Gain: | 2.0 dBi |
| Power Supply | : | DC 5V powered by power adapter | |

Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(2) Channel List:



CH 01~CH 11 for 802.11b/ g/ n(20M)

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 01 | 2412 | 05 | 2432 | 09 | 2452 |
| 02 | 2417 | 06 | 2437 | 10 | 2457 |
| 03 | 2422 | 07 | 2442 | 11 | 2462 |
| 04 | 2427 | 08 | 2447 | | |

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 01 | | 05 | 2432 | 09 | 2452 |
| 02 | | 06 | 2437 | 10 | |
| 03 | 2422 | 07 | 2442 | 11 | |
| 04 | 2427 | 08 | 2447 | | |

1.3 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

| Test Mode | Description |
|-------------------|---|
| Transmitting mode | Keep the EUT in continuous transmitting with modulation |

Remark: The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

| | |
|---|-----------|
| Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case. | |
| Mode | Data rate |
| 802.11b | 1Mbps |



| | |
|---|-----------|
| 802.11g | 6Mbps |
| 802.11n(H20) | 6.5Mbps |
| 802.11n(H40) | 13.5 Mbps |
| Final Test Mode: | |
| According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20) and 13.5 Mbps for 802.11n(H40). Duty cycle setting during the transmission is 100% with maximum power setting for all modulations. | |

1.4 Test Instruments List

| | Test Equipment | Manufacturer | Model No. | Cal. Date | Cal. Due date |
|----|------------------------------------|--------------------------------------|-----------------------------|---------------|---------------|
| 1 | Bilog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | May 22, 2016 | May 21, 2017 |
| 2 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | BBHA9120D | May 27, 2016 | May 26, 2017 |
| 3 | Coaxial Cable | N/A | N/A | Mar. 28, 2016 | Mar. 27, 2017 |
| 4 | Coaxial Cable | N/A | N/A | Mar. 29, 2016 | Mar. 29, 2017 |
| 5 | Coaxial cable | N/A | N/A | Mar. 29, 2016 | Mar. 29, 2017 |
| 6 | Coaxial Cable | N/A | N/A | Mar. 29, 2016 | Mar. 29, 2017 |
| 7 | Coaxial Cable | N/A | N/A | Mar. 29, 2016 | Mar. 29, 2017 |
| 8 | Amplifier (10kHz-1.3GHz) | HP | 8447D | Mar. 29, 2016 | Mar. 29, 2017 |
| 9 | Amplifier (1GHz-18GHz) | Compliance Direction Systems Inc. | PAP-1G18 | Jun. 06, 2016 | Mar. 29, 2017 |
| 10 | Pre-amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | Mar. 29, 2016 | Mar. 29, 2017 |
| 11 | Horn Antenna | ETS-LINDGREN | 3160 | Mar. 27, 2016 | Mar. 27, 2017 |
| 12 | Positioning Controller | UC | UC3000 | N/A | N/A |
| 13 | Spectrum analyzer 9kHz-30GHz | Rohde & Schwarz | FSP | May 26, 2016 | May 27, 2017 |
| 14 | EMI Test Receiver | Rohde & Schwarz | ESPI | Mar. 29, 2016 | Mar. 30, 2017 |
| 15 | Loop antenna | Laplace instrument | RF300 | May 22., 2016 | May 23, 2017 |



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| | | | | | |
|----|--------------------------------------|-----------------|----------|--------------|--------------|
| 16 | Universal radio communication tester | Rhode & Schwarz | CMU200 | May 26, 2016 | May 27, 2017 |
| 17 | Signal Analyzer | Rohde & Schwarz | FSIQ3 | May 26, 2016 | May 27, 2017 |
| 18 | L.I.S.N.#1 | Rohde & Schwarz | NSLK8126 | May 26, 2016 | May 27, 2017 |
| 19 | L.I.S.N.#2 | Rohde & Schwarz | ENV216 | May 26, 2016 | May 27, 2017 |
| 20 | Power Meter | Anritsu | ML2495A | May 26, 2016 | May 27, 2017 |
| 21 | Power sensor | Anritsu | ML2491A | May 26, 2016 | May 27, 2017 |

1.5 Laboratory Location

Shenzhen TOBY technology Co., Ltd

Address: 1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, 518057, China

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562 7.

Tel:0086-755-26509301 Fax: 0086-755-26509195



2. Test Summary

| Standard Section | Test Item | Judgment |
|------------------|------------------------------------|----------|
| 15.203/15.247(c) | Antenna Requirement | PASSED |
| 15.207 | Conducted Emission | PASSED |
| 15.247(b)(3) | Conducted Peak Output Power | PASSED |
| 15.247(a)(2) | 99% OBW and 6dB Emission Bandwidth | PASSED |
| 15.247(e) | Power Spectral Density | PASSED |
| 15.247(d) | Band Edge | PASSED |
| 15.205/15.209 | Spurious Emission | PASSED |



3. Antenna Requirement

3.1. Standard Requirement

3.1.1 Test standard

FCC Part15 Section 15.203 /247(c)

3.1.2 Requirement

1) 15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

2) 15.247(c) (1)(i) requirement:

Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

3.2. Antenna Connected Construction

The antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 2.0dBi. It complies with the standard requirement.

4. Conducted Emission Test

4.1 Test Standard and Limit

4.1.1 Test Standard

FCC Part15 Section 15.207

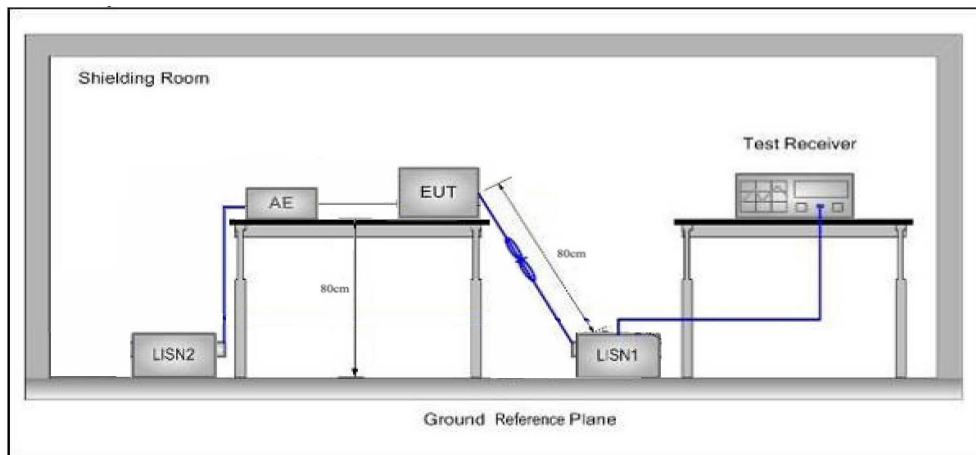
4.1.2 Test Limit

Conducted Emission Test Limit

| Frequency | Maximum RF Line Voltage (dB μ V) | |
|---------------|--------------------------------------|---------------|
| | Quasi-peak Level | Average Level |
| 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

Remark: (1) *Decreasing linearly with logarithm of the frequency.
 (2) The lower limit shall apply at the transition frequencies.

4.2 Test Setup



4.3 Test Procedure

- 1) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50 \Omega / 50 \mu\text{H} + 5 \Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal



ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

4.4 Test Data

Please refer to the following pages

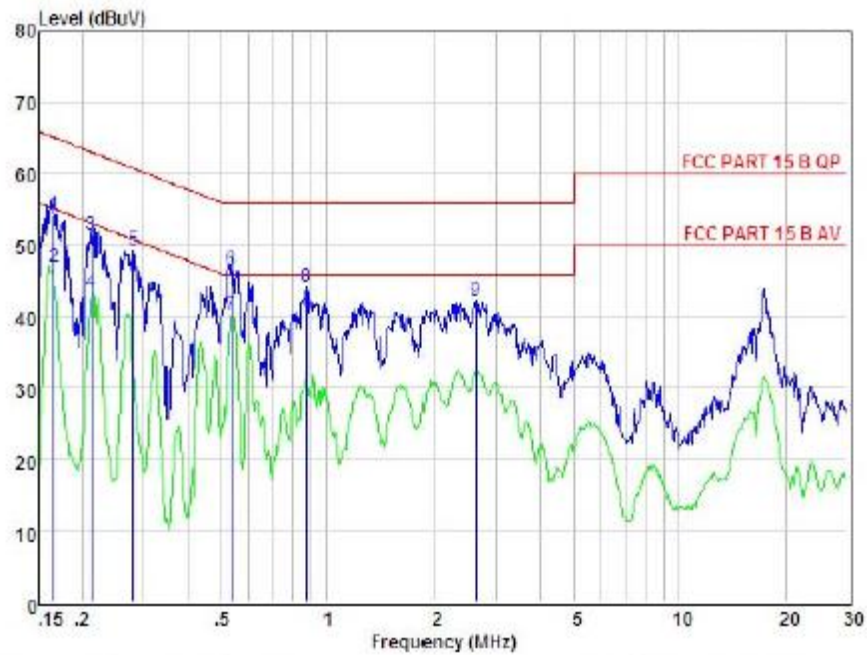


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Conducted Emission Test Data

EUT: Smart TV BOX M/N: X98PRO
 Operating Condition: WIFI mode
 Test Site: Shielded room
 Operator: Jason
 Test Specification: AC 120V/60Hz
 Polarization: Line
 Note Tem:25°C Hum:50%



| Item | Freq MHz | Read Level dBuV | LISN Factor dB | Preamp Factor dB | Cable Loss dB | Level dBuV | Limit dBuV | Margin dBuV | Remark |
|------|-------------|-----------------------|----------------------|------------------------|---------------------|---------------|---------------|----------------|---------|
| 1 | 0.166 | 44.58 | 0.03 | -9.52 | 0.10 | 54.24 | 65.16 | -10.92 | QP |
| 2 | 0.166 | 37.33 | 0.03 | -9.52 | 0.10 | 46.98 | 55.16 | -8.18 | Average |
| 3 | 0.213 | 41.80 | 0.03 | -9.52 | 0.10 | 51.45 | 63.10 | -11.65 | QP |
| 4 | 0.213 | 33.66 | 0.03 | -9.52 | 0.10 | 43.31 | 53.10 | -9.79 | Average |
| 5 | 0.280 | 39.56 | 0.03 | -9.56 | 0.10 | 49.25 | 60.81 | -11.56 | Peak |
| 6 | 0.535 | 36.87 | 0.03 | -9.58 | 0.10 | 46.58 | 56.00 | -9.42 | QP |
| 7 | 0.535 | 30.61 | 0.03 | -9.58 | 0.10 | 40.32 | 46.00 | -5.68 | Average |
| 8 | 0.871 | 34.32 | 0.04 | -9.62 | 0.10 | 44.08 | 56.00 | -11.92 | Peak |
| 9 | 2.622 | 32.33 | 0.06 | -9.76 | 0.11 | 42.26 | 56.00 | -13.74 | Peak |

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss



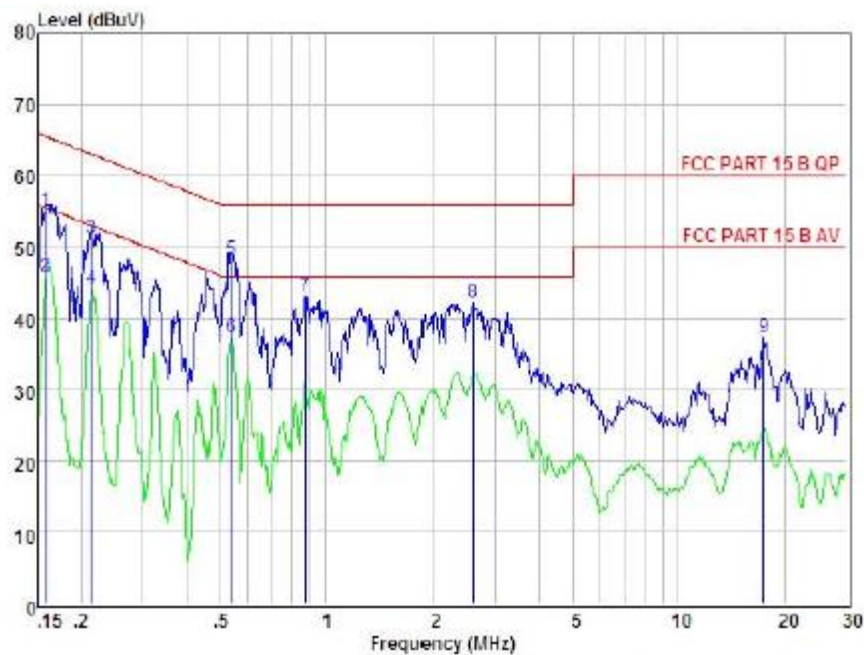
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Conducted Emission Test Data

EUT: Smart TV BOX M/N: X98PRO
 Operating Condition: WIFI mode
 Test Site: Shielded room
 Operator: Jason
 Test Specification: AC 120V/60Hz
 Polarization: Neutral
 Note: Tem:25°C Hum:50%



| Item | Freq MHz | Read Level dBuV | LISN Factor dB | Preamp Factor dB | Cable Loss dB | Level dBuV | Limit dBuV | Margin dBuV | Remark |
|------|-------------|-----------------------|----------------------|------------------------|---------------------|---------------|---------------|----------------|---------|
| 1 | 0.159 | 45.41 | 0.03 | -9.52 | 0.10 | 55.06 | 65.52 | -10.46 | QP |
| 2 | 0.159 | 36.33 | 0.03 | -9.52 | 0.10 | 45.98 | 55.52 | -9.54 | Average |
| 3 | 0.214 | 41.55 | 0.03 | -9.52 | 0.10 | 51.20 | 63.05 | -11.85 | QP |
| 4 | 0.214 | 34.52 | 0.03 | -9.52 | 0.10 | 44.17 | 53.05 | -8.88 | Average |
| 5 | 0.538 | 38.62 | 0.03 | -9.58 | 0.10 | 48.33 | 56.00 | -7.67 | QP |
| 6 | 0.538 | 27.53 | 0.03 | -9.58 | 0.10 | 37.24 | 46.00 | -8.76 | Average |
| 7 | 0.871 | 33.34 | 0.04 | -9.62 | 0.10 | 43.10 | 56.00 | -12.90 | Peak |
| 8 | 2.894 | 32.23 | 0.06 | -9.76 | 0.11 | 42.16 | 56.00 | -13.84 | Peak |
| 9 | 17.475 | 26.96 | 0.28 | -9.82 | 0.30 | 37.36 | 60.00 | -22.64 | Peak |

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss



5. Peak Output Power Test

5.1. Test Standard and Limit

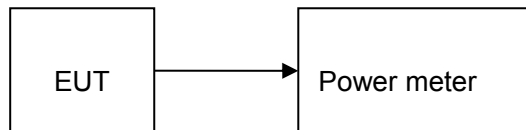
5.1.1 Test Standard

FCC Part15 C Section 15.247 (b)(3)

5.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) | | |
|-------------------------------|------------------|-----------------------|
| Test Item | Limit | Frequency Range (MHz) |
| Peak Output Power | 1 Watt or 30 dBm | 2400~2483.5 |

5.2. Test Setup



5.3. Test Procedure

- (1) The EUT was directly connected to peak power meter and antenna output port as show in the block diagram above.
- (2) Measure out each mode and each bands peak output power of EUT.
- (3) The EUT was set to continuously transmitting in the max power during the test.

5.4. Test Data

| Test CH | Maximum Conducted Output Power (dBm) | | | | Limit(dBm) | Result |
|---------|--------------------------------------|---------|--------------|--------------|------------|--------|
| | 802.11b | 802.11g | 802.11n(H20) | 802.11n(H40) | | |
| Lowest | 12.51 | 11.25 | 11.43 | 10.24 | 30.00dBm | PASSED |
| Middle | 12.46 | 11.42 | 11.25 | 10.21 | | PASSED |
| Highest | 12.33 | 11.37 | 11.19 | 10.32 | | PASSED |

Remark: Test plot as follows



6. Occupy Bandwidth Test

6.1. Test Standard and Limit

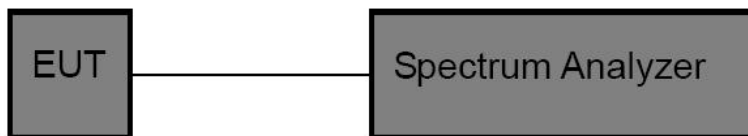
6.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(2)

6.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) | | |
|-------------------------------|--------------------------|------------------|
| Test Item | Limit | Frequency Range |
| Bandwidth | >500 kHz (6dB bandwidth) | 2400~2483.5(MHz) |

6.2. Test Setup



6.3. Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
- (3) Spectrum Setting:
Bandwidth: RBW=100 kHz, VBW=300 kHz, detector= Peak

6.4. Test Data

| Test CH | 6dB Occupy Bandwidth (MHz) | | | | Limit (kHz) | Result |
|---------|----------------------------|---------|--------------|--------------|-------------|--------|
| | 802.11b | 802.11g | 802.11n(H20) | 802.11n(H40) | | |
| Lowest | 10.11 | 16.39 | 17.60 | 35.83 | ≥500 kHz | PASSED |
| Middle | 10.08 | 16.41 | 17.62 | 35.76 | | PASSED |
| Highest | 10.08 | 16.41 | 17.61 | 36.08 | | PASSED |

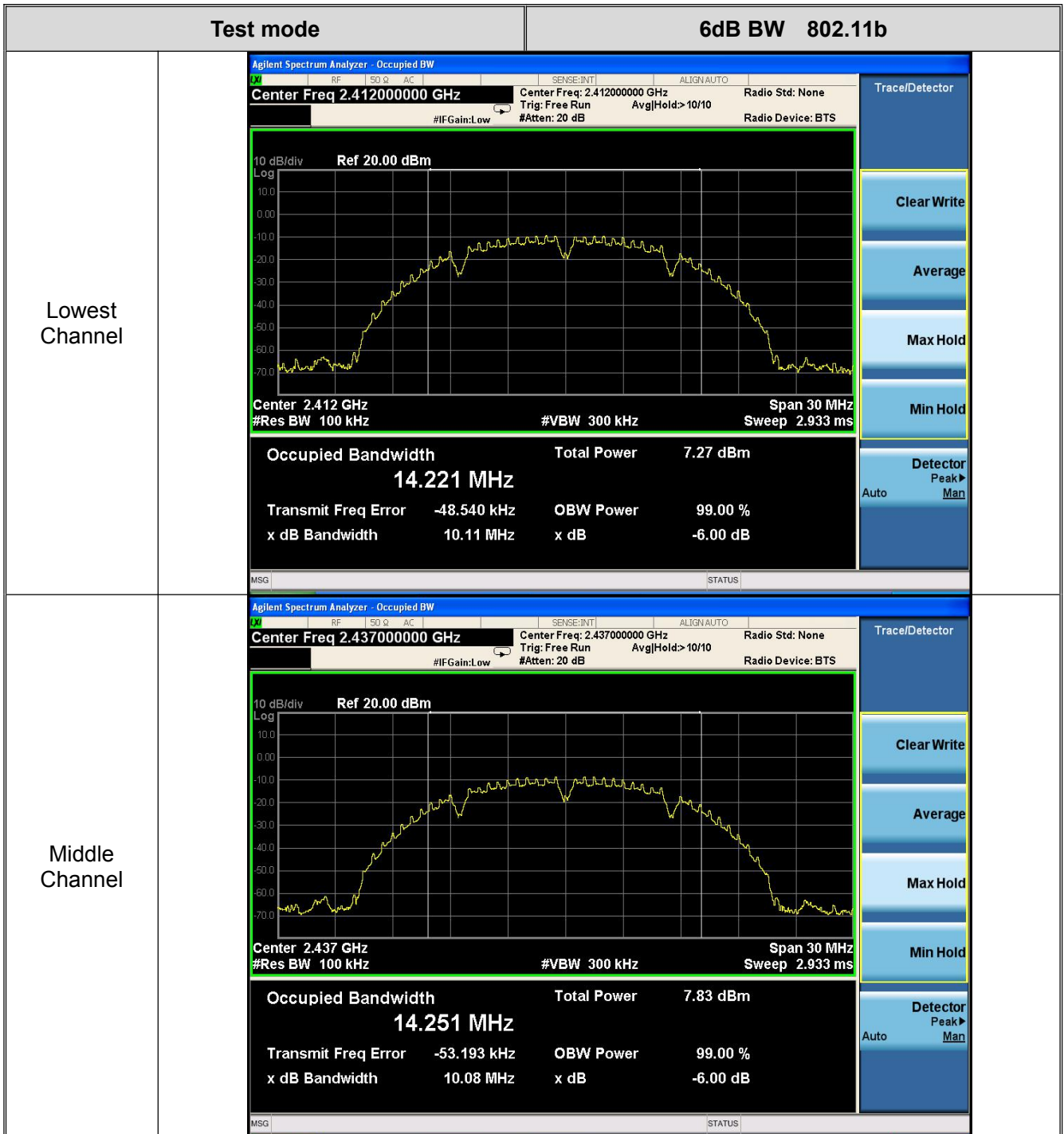
Remark: Test plot as follows



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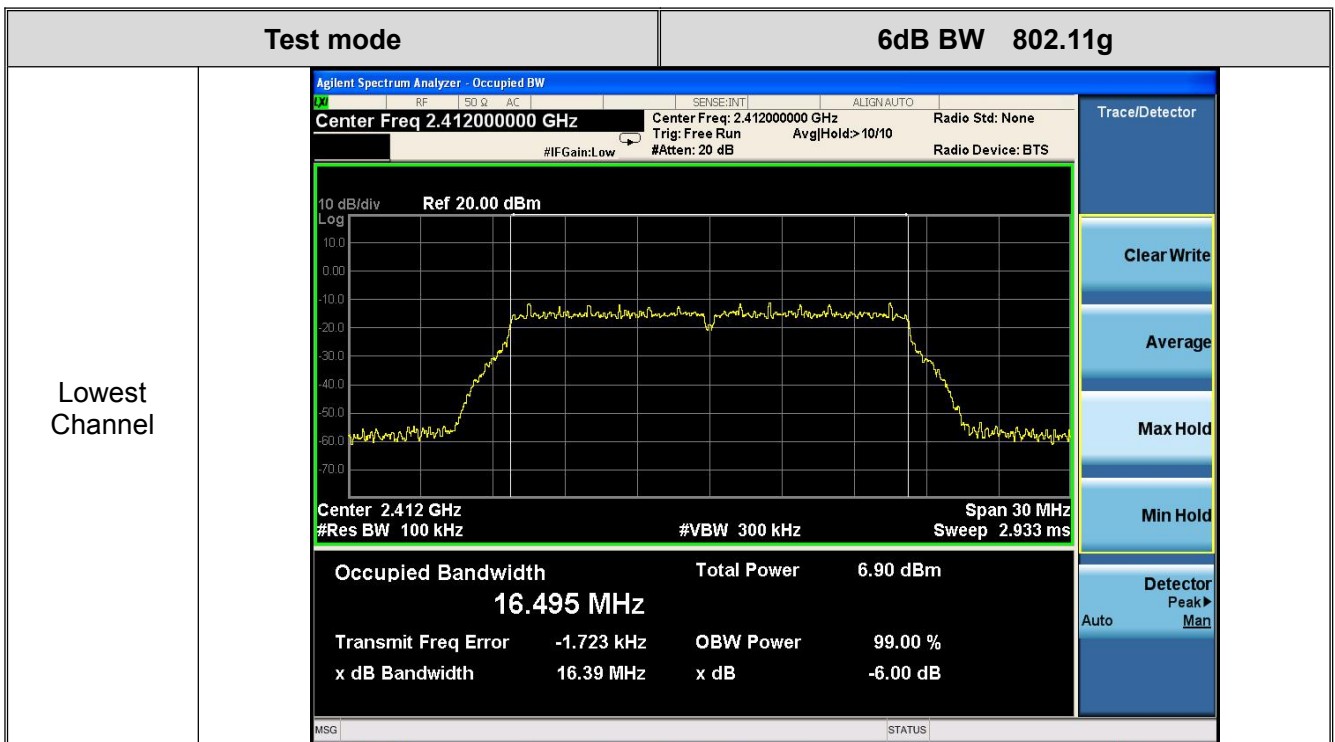
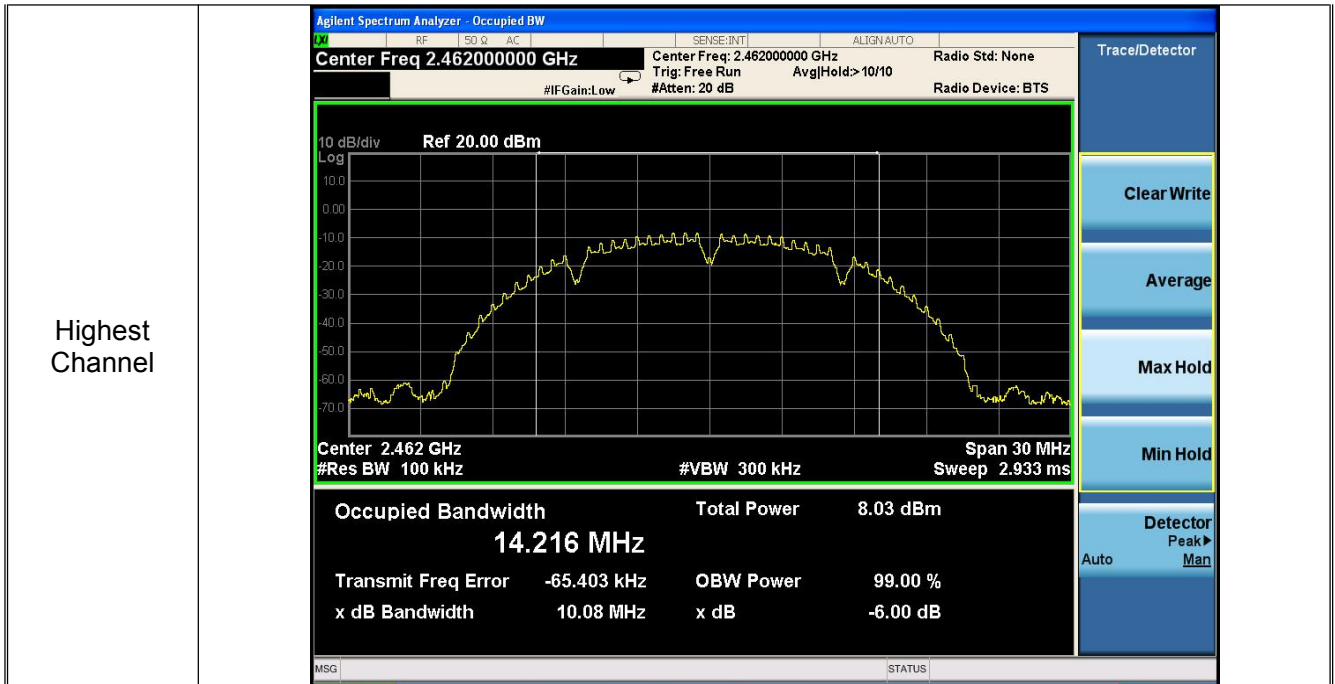




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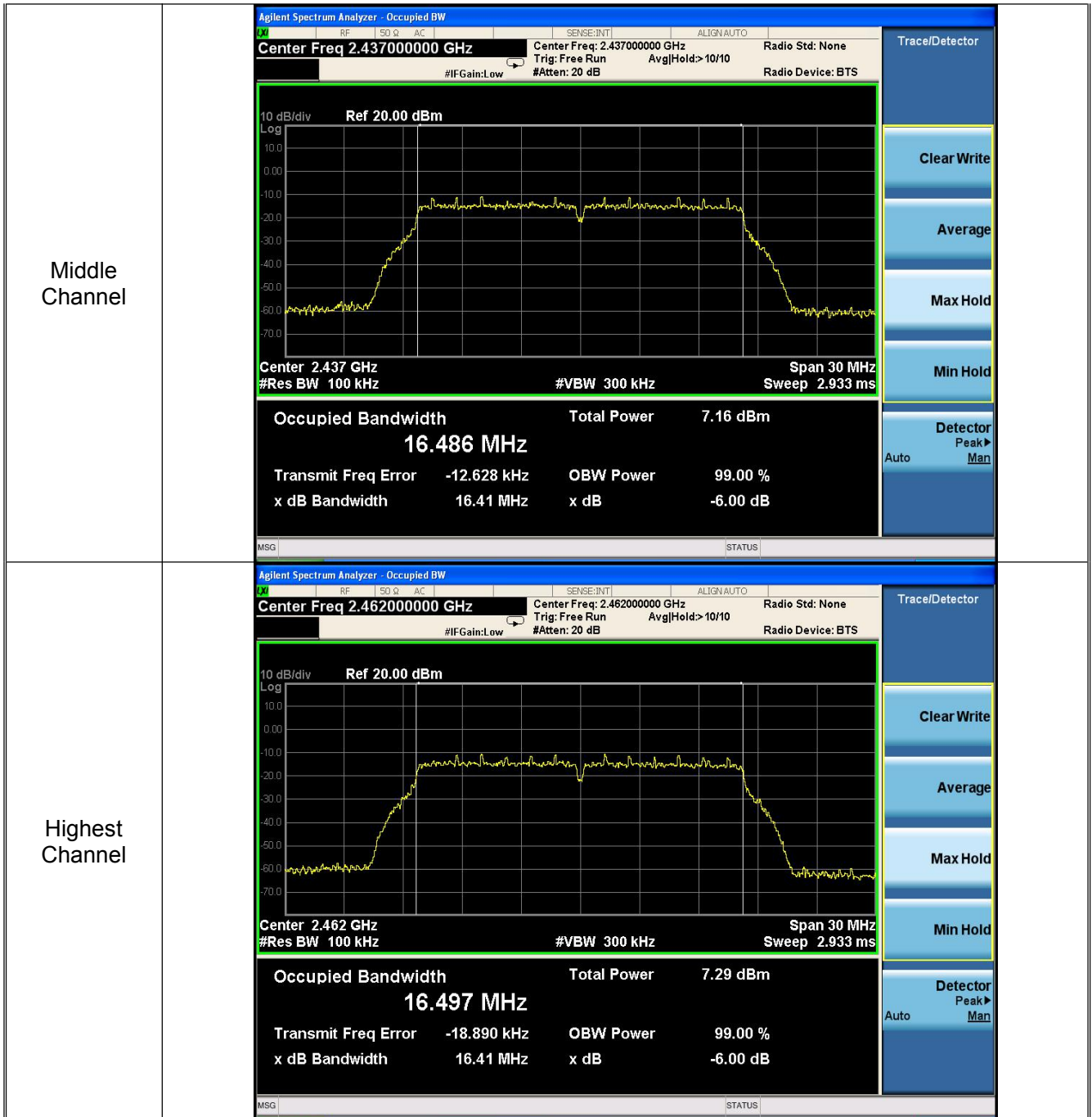




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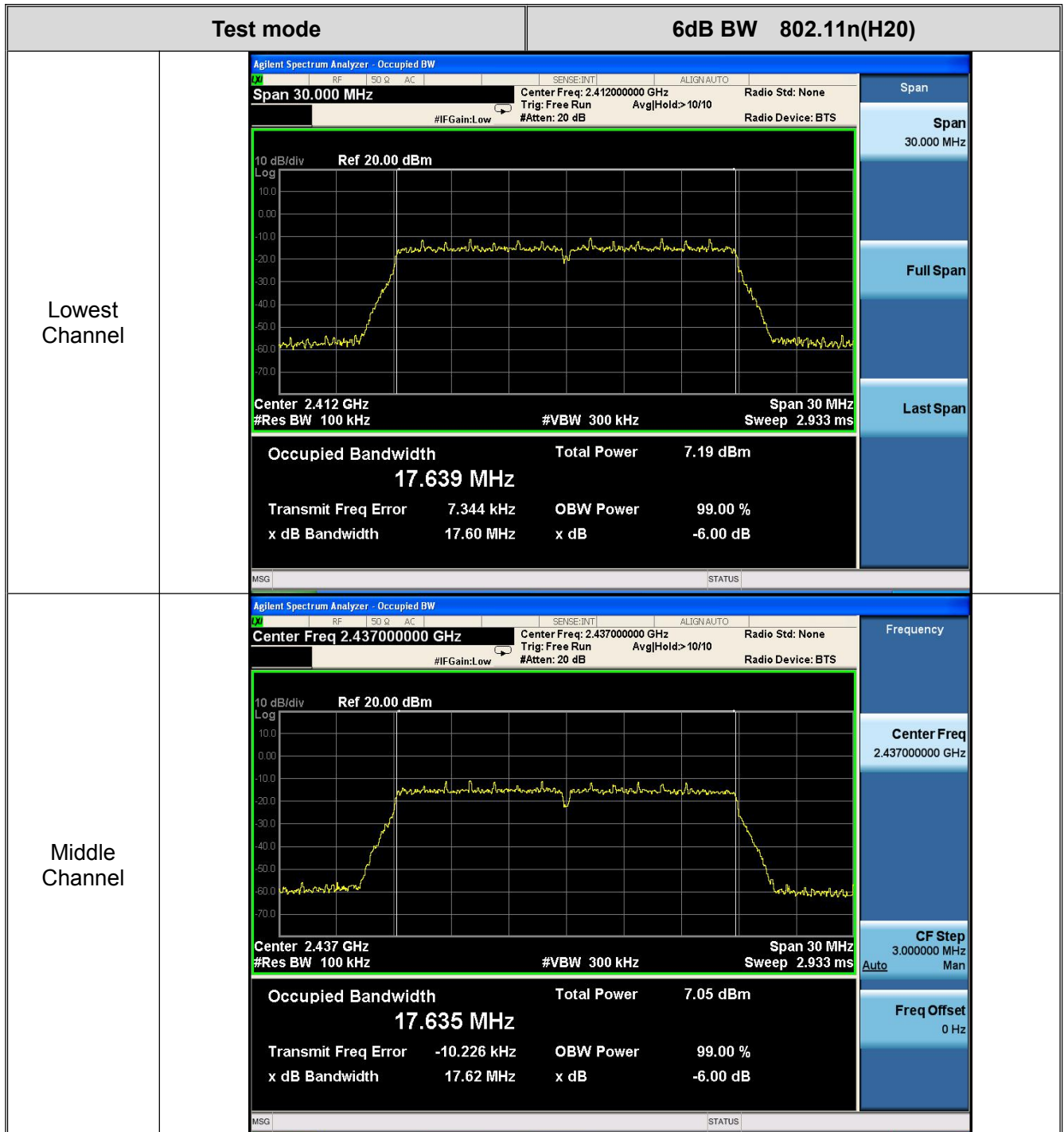




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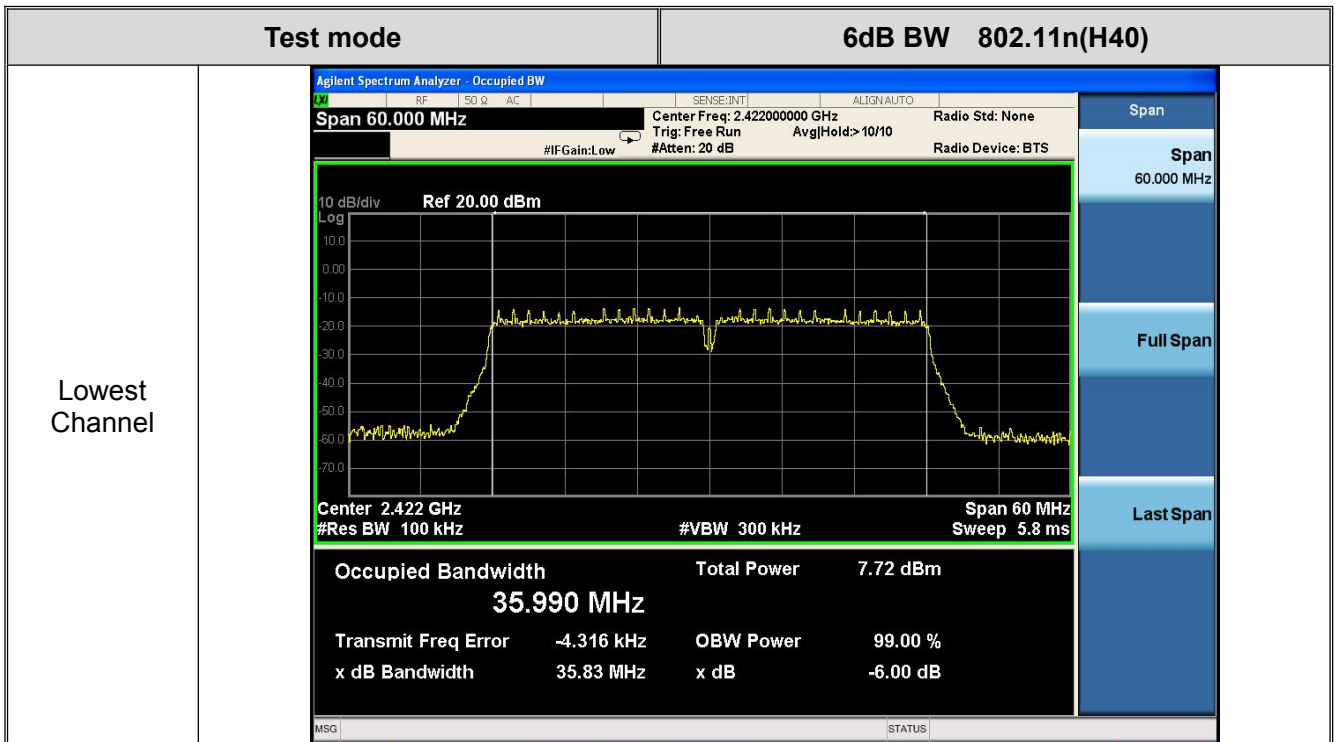
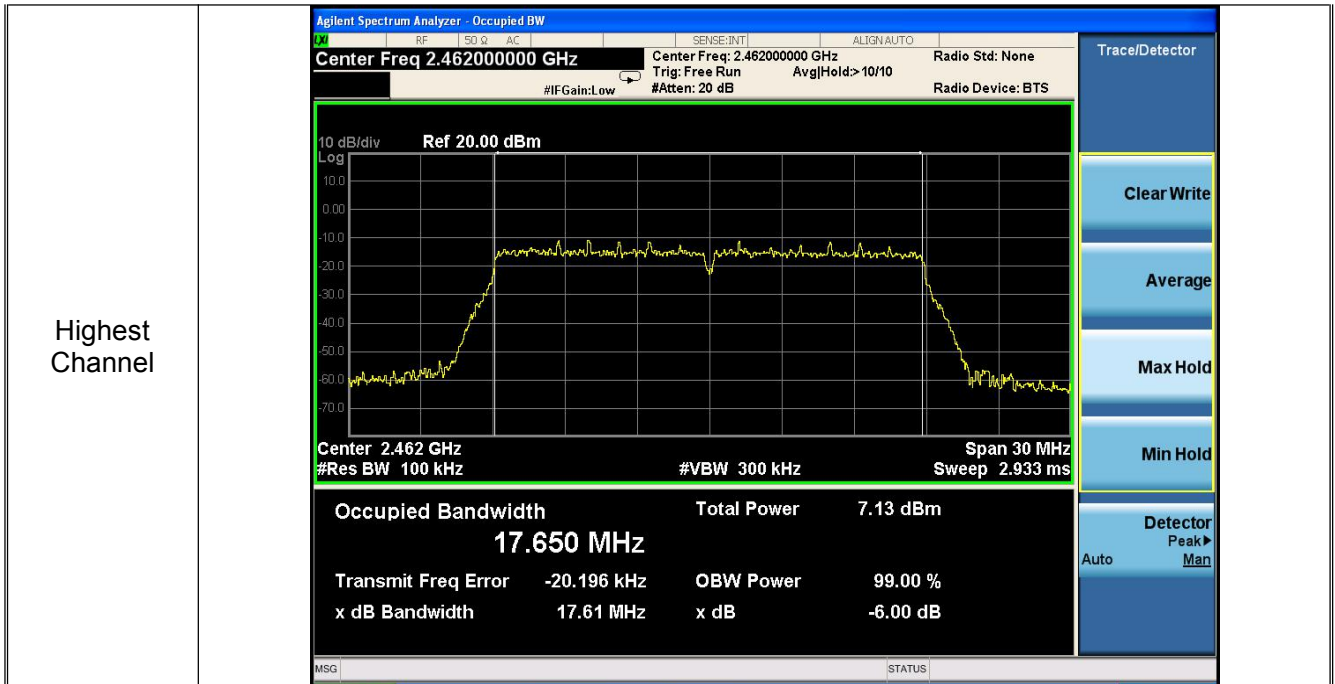




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| | | |
|-----------------------|---|---|
| <p>Middle Channel</p> | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.437000000 GHz</p> <p>Occupied Bandwidth: 36.000 MHz</p> <p>Total Power: 7.55 dBm</p> | <p>Frequency</p> <p>Center Freq: 2.437000000 GHz</p> <p>CF Step: 6.000000 MHz</p> <p>Freq Offset: 0 Hz</p> |
| | <p>Highest Channel</p> | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.452000000 GHz</p> <p>Occupied Bandwidth: 36.005 MHz</p> <p>Total Power: 7.78 dBm</p> |



7. Power Spectral Density Test

7.1. Test Standard and Limit

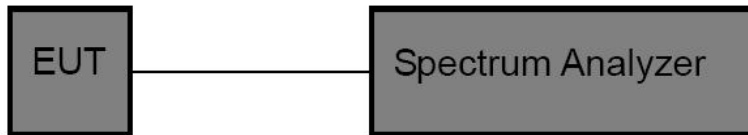
7.1.1 Test Standard

FCC Part15 C Section 15.247 (e)

7.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) | | |
|-------------------------------|--------------------|-----------------------|
| Test Item | Limit | Frequency Range (MHz) |
| Power Spectral Density | 8dBm(in any 3 kHz) | 2400~2483.5 |

7.2. Test Setup



7.3. Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Measure the spectral power density the spectrum analyzer was set to Resolution Bandwidth=100 kHz, and Video Bandwidth≥300 kHz, Detector: Peak, Span to 5%~30% greater than EBW, Sweep time auto.
- (3) Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a BWCF=-15.2 dB.

7.4. Test Data

| Test CH | Power Spectral Density (dBm) | | | | Limit (dBm) | Result |
|---------|------------------------------|---------|--------------|--------------|-------------|--------|
| | 802.11b | 802.11g | 802.11n(H20) | 802.11n(H40) | | |
| Lowest | -24.041 | -24.400 | -22.864 | -28.143 | 8 | Passed |
| Middle | -22.533 | -24.709 | -26.029 | -28.103 | | Passed |
| Highest | -22.831 | -24.302 | -24.020 | -28.750 | | Passed |

Remark: Test plot as follows



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| Test mode | | 802.11b | |
|----------------|--|---------|---|
| Lowest Channel | | | <ul style="list-style-type: none"> Peak Search Next Peak Next Pk Right Next Pk Left Marker Delta Mkr→CF Mkr→Ref Lvl More 1 of 2 |
| | | | <ul style="list-style-type: none"> Peak Search Next Peak Next Pk Right Next Pk Left Marker Delta Mkr→CF Mkr→Ref Lvl More 1 of 2 |





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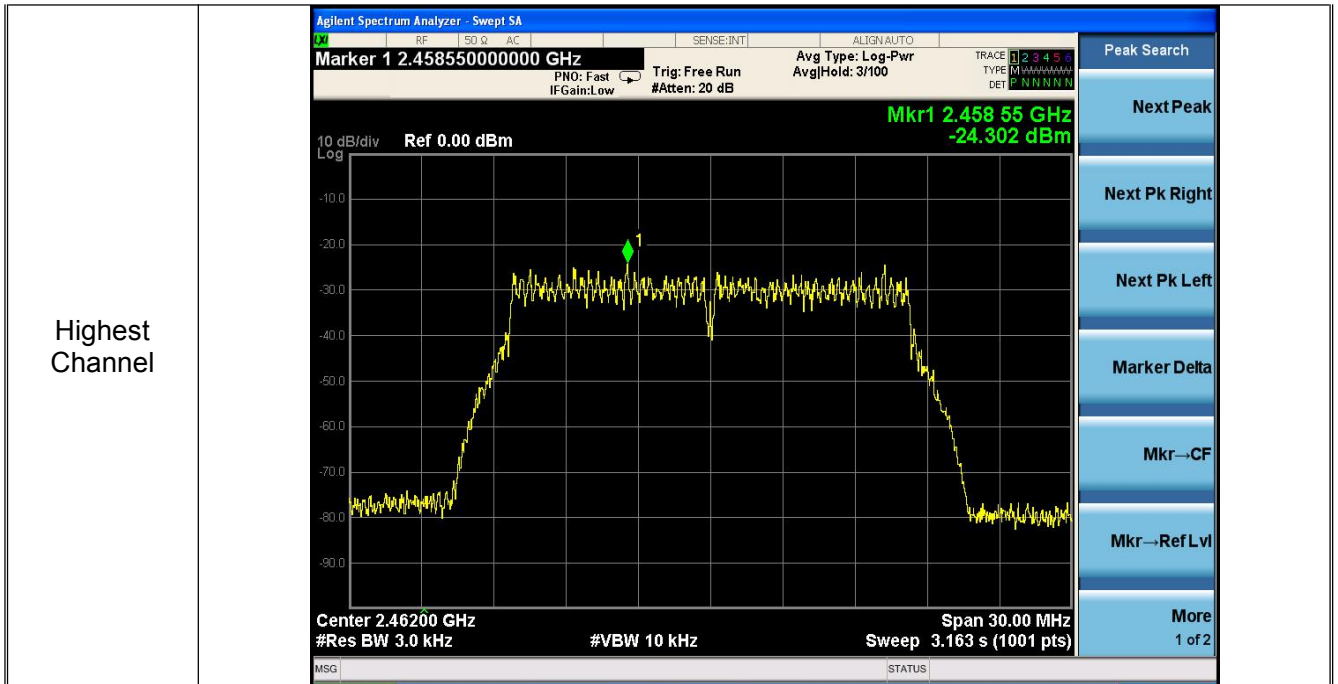
| Test mode | | 802.11g | |
|----------------|--|---------|---|
| Lowest Channel | | | <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.41137000000 GHz</p> <p>Mkr1 2.411 37 GHz -24.400 dBm</p> <p>Center 2.41200 GHz #Res BW 3.0 kHz</p> <p>Span 30.00 MHz Sweep 3.163 s (1001 pts)</p> |
| | <p>Peak Search</p> <p>Next Peak</p> <p>Next Pk Right</p> <p>Next Pk Left</p> <p>Marker Delta</p> <p>Mkr→CF</p> <p>Mkr→Ref Lvl</p> <p>More 1 of 2</p> | | |
| Middle Channel | | | <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.44201000000 GHz</p> <p>Mkr1 2.442 01 GHz -24.709 dBm</p> <p>Center 2.43700 GHz #Res BW 3.0 kHz</p> <p>Span 30.00 MHz Sweep 3.163 s (1001 pts)</p> |
| | <p>Peak Search</p> <p>Next Peak</p> <p>Next Pk Right</p> <p>Next Pk Left</p> <p>Marker Delta</p> <p>Mkr→CF</p> <p>Mkr→Ref Lvl</p> <p>More 1 of 2</p> | | |



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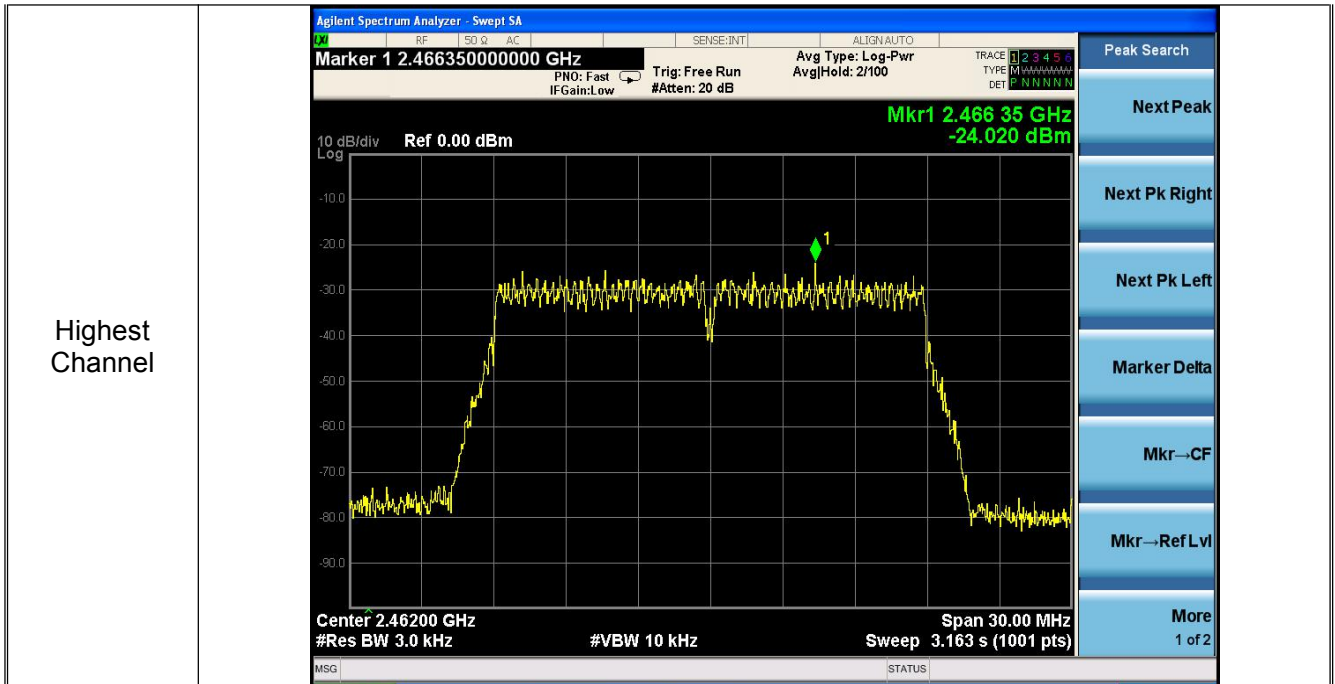
| Test mode | | 802.11n(H20) | |
|----------------|--|--------------|--|
| Lowest Channel | | | <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.412000000000 GHz</p> <p>Mkr1 2.412 00 GHz -22.864 dBm</p> <p>Center 2.41200 GHz #Res BW 3.0 kHz</p> <p>Span 30.00 MHz Sweep 3.163 s (1001 pts)</p> |
| | | | <p>Peak Search</p> <p>Next Peak</p> <p>Next Pk Right</p> <p>Next Pk Left</p> <p>Marker Delta</p> <p>Mkr→CF</p> <p>Mkr→Ref Lvl</p> <p>More 1 of 2</p> |
| Middle Channel | | | <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 2.429500000000 GHz</p> <p>Mkr1 2.429 50 GHz -25.029 dBm</p> <p>Center 2.43700 GHz #Res BW 3.0 kHz</p> <p>Span 30.00 MHz Sweep 3.163 s (1001 pts)</p> |
| | | | <p>Peak Search</p> <p>Next Peak</p> <p>Next Pk Right</p> <p>Next Pk Left</p> <p>Marker Delta</p> <p>Mkr→CF</p> <p>Mkr→Ref Lvl</p> <p>More 1 of 2</p> |



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