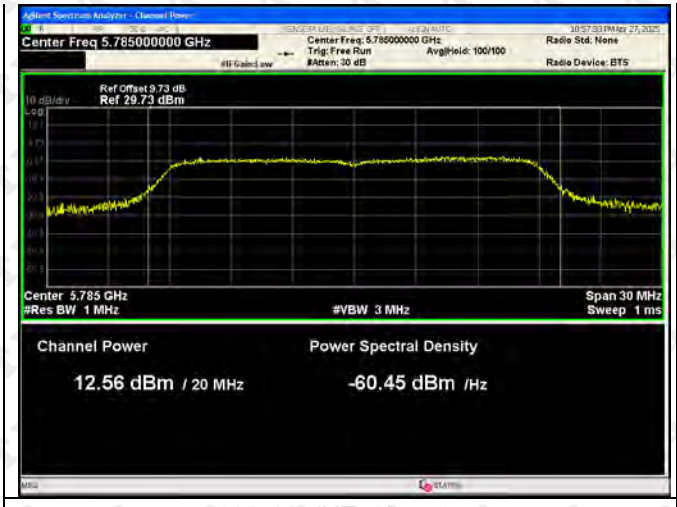
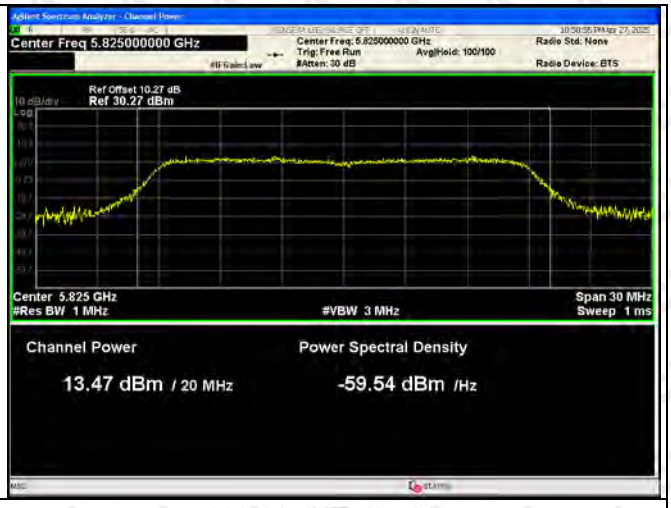
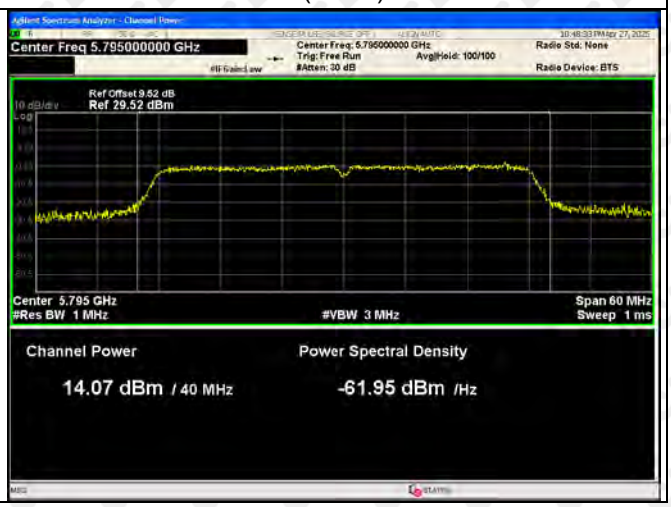


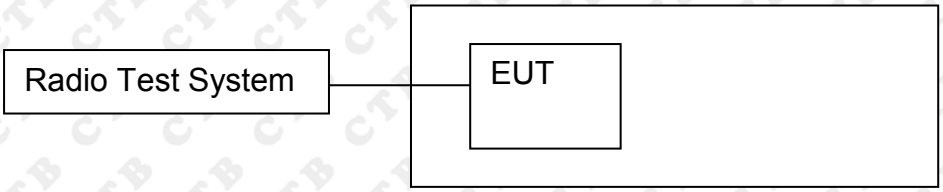

802.11n(HT40)-5795

802.11n(HT40)-5825



## 10. EMISSION BANDWIDTH& OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup




10.2 Limits

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

10.3 Test Procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

**1. Emission Bandwidth (EBW)**
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
**2. Minimum Emission Bandwidth for the band 5.725−5.85 GHz**
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725−5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 * RBW.
c) Detector = Peak.

d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described in this section. For devices that use channel aggregation refer to III.A and III.C for determining emission bandwidth.

**D. 99% Occupied Bandwidth**

The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is *required* only as a condition for using the optional band-edge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the 789033 D02 General UNII Test Procedures New Rules v02r01 Page 4 spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with Section 15.407(a).
The following procedure shall be used for measuring (99%) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.

2. Set span = 1.5 times to 5.0 times the OBW.

3. Set RBW = 1% to 5% of the OBW

4. Set VBW ≥ 3 * RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

6. Use the 99% power bandwidth function of the instrument (if available).

7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

10.4 Test Results

5150-5250MHz:
module1 Worst mode:

| Test mode | Test Channel (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5180 | 23.244 |
| | 5200 | 23.765 |
| | 5240 | 23.571 |
| 802.11ac20 | 5180 | 25.411 |
| | 5200 | 22.648 |
| | 5240 | 21.95 |
| 802.11ac40 | 5190 | 55.255 |
| | 5230 | 55.003 |
| 802.11ac80 | 5210 | 89.449 |
| 802.11n20 | 5180 | 21.441 |
| | 5200 | 21.471 |
| | 5240 | 20.969 |
| 802.11n40 | 5190 | 54.986 |
| | 5230 | 44.583 |

5150-5250MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5180 | 21.228 |
| | 5200 | 21.645 |
| | 5240 | 21.462 |
| 802.11ac20 | 5180 | 21.842 |
| | 5200 | 21.857 |
| | 5240 | 21.784 |
| 802.11ac40 | 5190 | 50.975 |
| | 5230 | 51.999 |
| 802.11ac80 | 5210 | 84.271 |
| 802.11n20 | 5180 | 20.723 |
| | 5200 | 21.743 |
| | 5240 | 21.302 |
| 802.11n40 | 5190 | 48.308 |
| | 5230 | 40.924 |

5250-5350 MHz:
module1 Worst mode:

| Test mode | Test Channel (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5260 | 21.742 |
| | 5280 | 20.844 |
| | 5320 | 23.607 |
| 802.11ac20 | 5260 | 21.908 |
| | 5280 | 22.652 |
| | 5320 | 21.9 |
| 802.11ac40 | 5270 | 40.587 |
| | 5310 | 49.255 |
| 802.11ac80 | 5290 | 81.328 |
| 802.11n(HT20) | 5260 | 21.546 |
| | 5280 | 21.367 |
| | 5320 | 26.212 |
| 802.11n(HT40) | 5270 | 40.124 |
| | 5310 | 46.054 |

5250-5350 MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5260 | 20.895 |
| | 5280 | 20.762 |
| | 5320 | 21.419 |
| 802.11ac20 | 5260 | 21.883 |
| | 5280 | 21.809 |
| | 5320 | 22.578 |
| 802.11ac40 | 5270 | 39.911 |
| | 5310 | 42.57 |
| 802.11ac80 | 5290 | 80.264 |
| 802.11n(HT20) | 5260 | 20.83 |
| | 5280 | 21.254 |
| | 5320 | 21.108 |
| 802.11n(HT40) | 5270 | 40.785 |
| | 5310 | 40.25 |

5470-5725MHz:
module1 Worst mode:

| Test mode | Test Channel (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5500 | 21.996 |
| | 5580 | 21.382 |
| | 5700 | 26.466 |
| 802.11ac20 | 5500 | 22.517 |
| | 5580 | 22.078 |
| | 5700 | 27.322 |
| 802.11ac40 | 5510 | 56.273 |
| | 5670 | 57.184 |
| 802.11ac80 | 5530 | 81.7 |
| 802.11n(HT20) | 5500 | 22.675 |
| | 5580 | 21.232 |
| | 5700 | 26.496 |
| 802.11n(HT40) | 5510 | 41.339 |
| | 5670 | 50.655 |

5470-5725MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5500 | 22.036 |
| | 5580 | 21.574 |
| | 5700 | 26.087 |
| 802.11ac20 | 5500 | 22.415 |
| | 5580 | 22.792 |
| | 5700 | 25.759 |
| 802.11ac40 | 5510 | 54.587 |
| | 5670 | 50.908 |
| 802.11ac80 | 5530 | 79.448 |
| 802.11n(HT20) | 5500 | 21.944 |
| | 5580 | 21.251 |
| | 5700 | 26.116 |
| 802.11n(HT40) | 5510 | 41.519 |
| | 5670 | 47.832 |

5725-5850MHz:
module1 Worst mode:

| Test mode | Test Channel (MHz) | 6dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5745 | 16.495 |
| | 5785 | 16.51 |
| | 5825 | 16.527 |
| 802.11ac20 | 5745 | 17.748 |
| | 5785 | 17.71 |
| | 5825 | 17.758 |
| 802.11ac40 | 5755 | 36.418 |
| | 5795 | 36.387 |
| 802.11ac80 | 5775 | 76.247 |
| 802.11n20 | 5745 | 17.72 |
| | 5785 | 17.716 |
| | 5825 | 17.727 |
| 802.11n40 | 5755 | 36.525 |
| | 5795 | 36.525 |

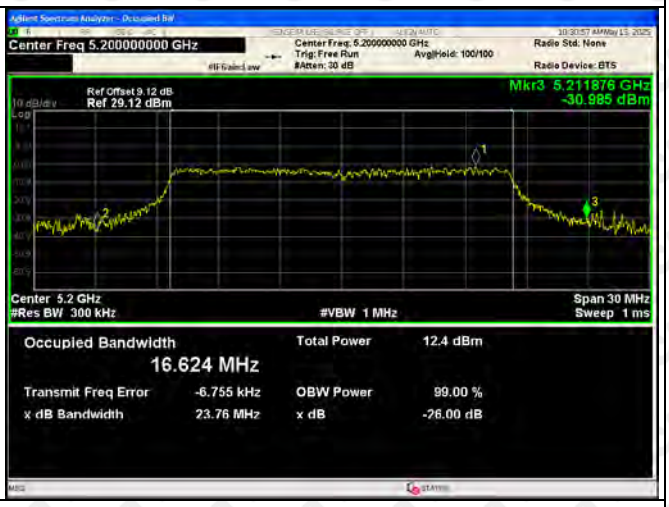
5725-5850MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | 6dB Bandwidth (MHz) |
|---|---|---|
| 802.11a | 5745 | 16.512 |
| | 5785 | 16.514 |
| | 5825 | 16.542 |
| 802.11ac20 | 5745 | 17.812 |
| | 5785 | 17.791 |
| | 5825 | 17.808 |
| 802.11ac40 | 5755 | 36.412 |
| | 5795 | 36.481 |
| 802.11ac80 | 5775 | 76.201 |
| 802.11n20 | 5745 | 17.709 |
| | 5785 | 17.727 |
| | 5825 | 17.731 |
| 802.11n40 | 5755 | 36.583 |
| | 5795 | 36.557 |

**Test Graph:**
5150-5250MHz-Power
module1 Worst mode:

802.11a-5180

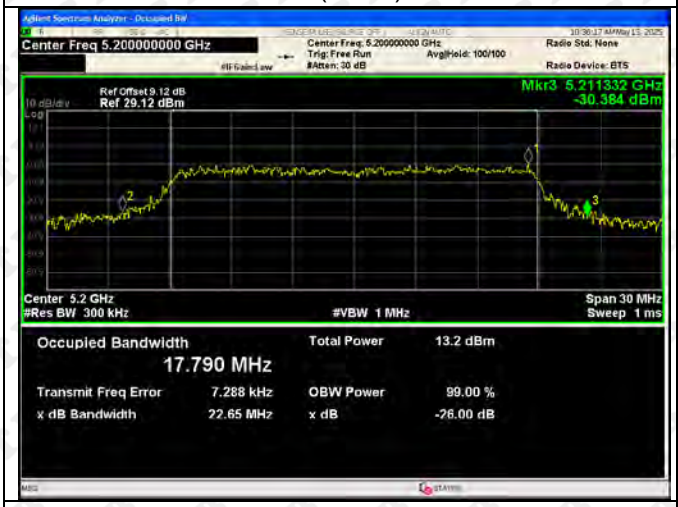
802.11a-5200



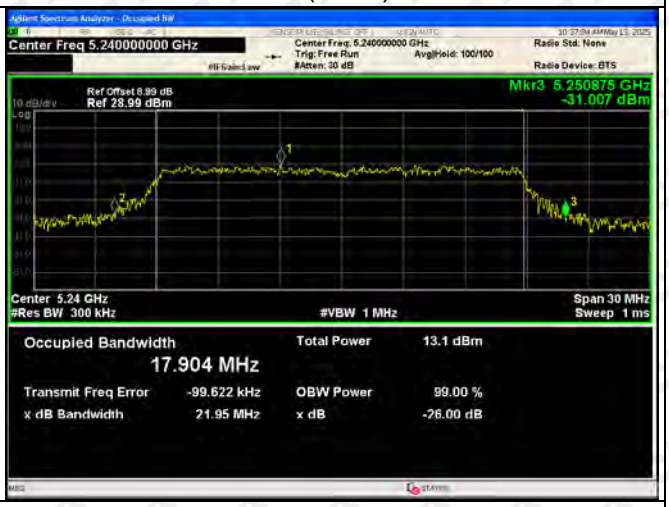

802.11a-5240

802.11ac(VH20)-5180

802.11ac(VH20)-5200



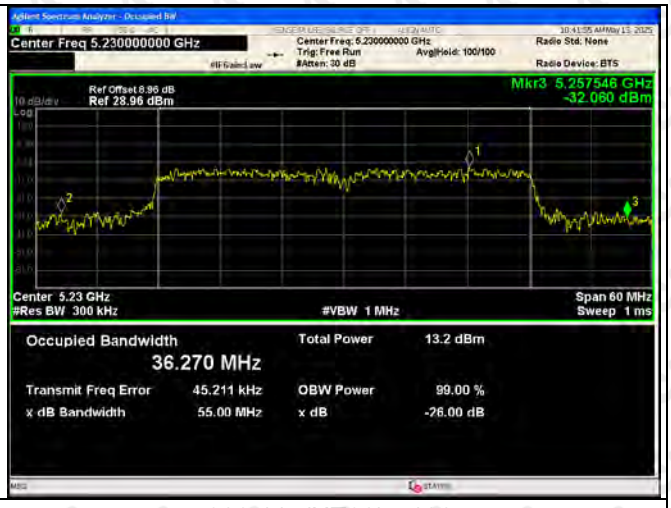

802.11ac(VH20)-5240



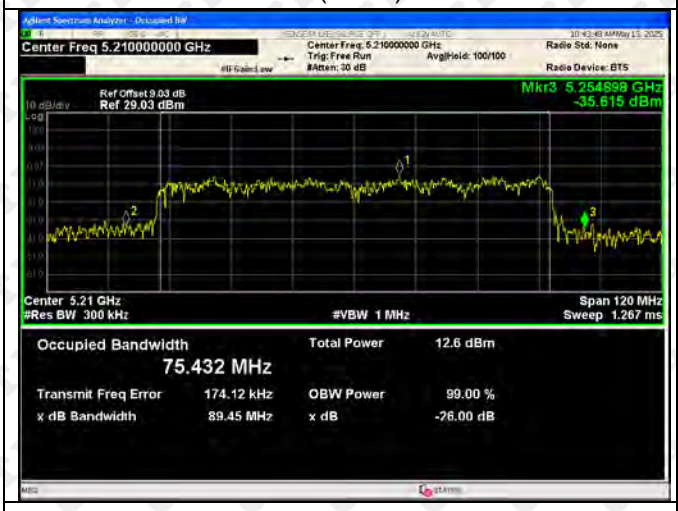

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

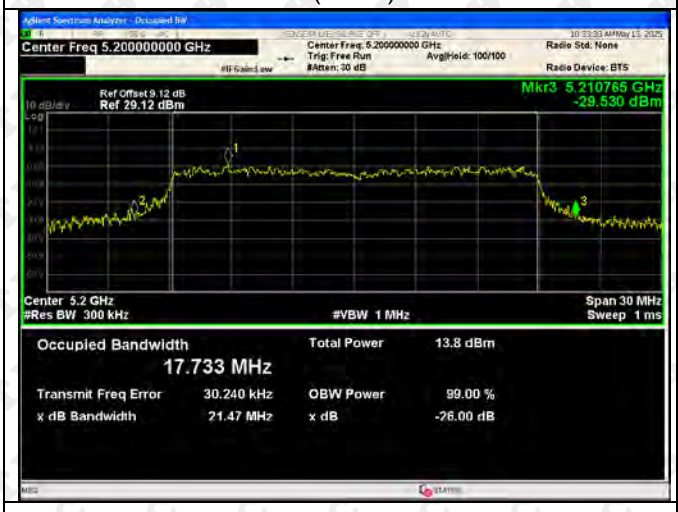



802.11n(HT20)-5180



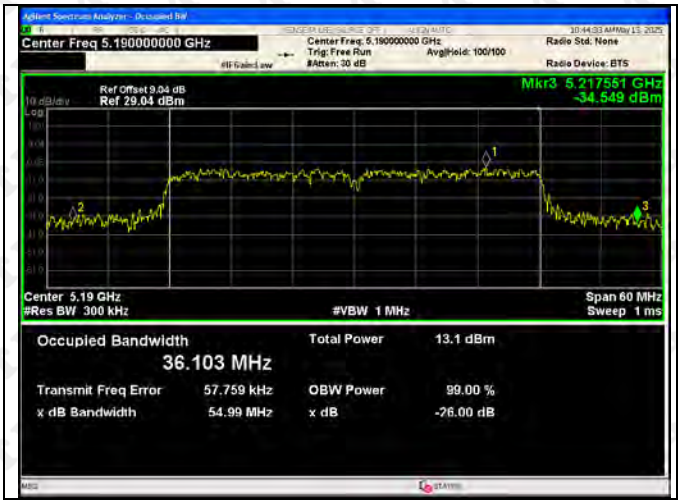

802.11n(HT20)-5200

802.11n(HT20)-5240




802.11n(HT40)-5190

802.11n(HT40)-5230



module2 (OPS computer) Worst mode:

802.11a-5180

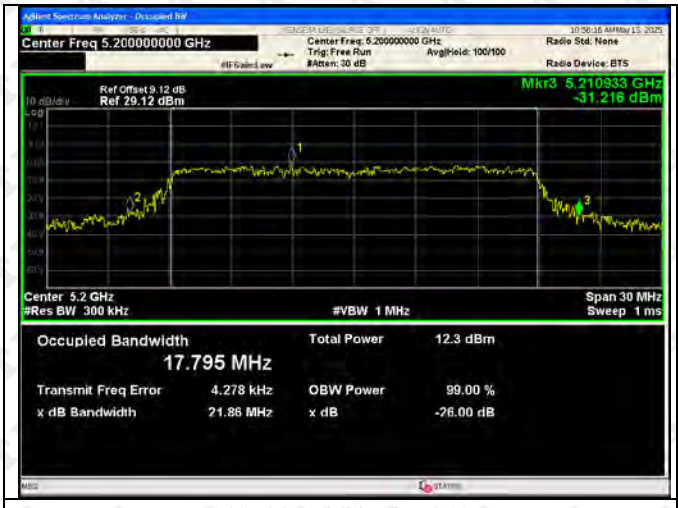
802.11a-5200

802.11a-5240

802.11ac(VH20)-5180

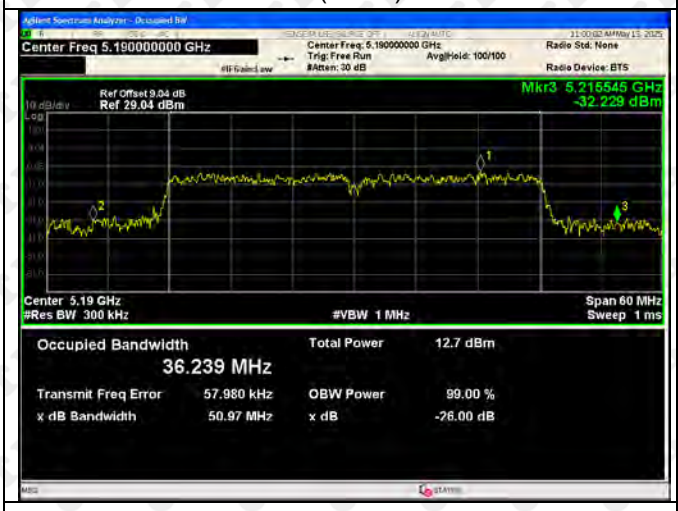
802.11ac(VH20)-5200

802.11ac(VH20)-5240

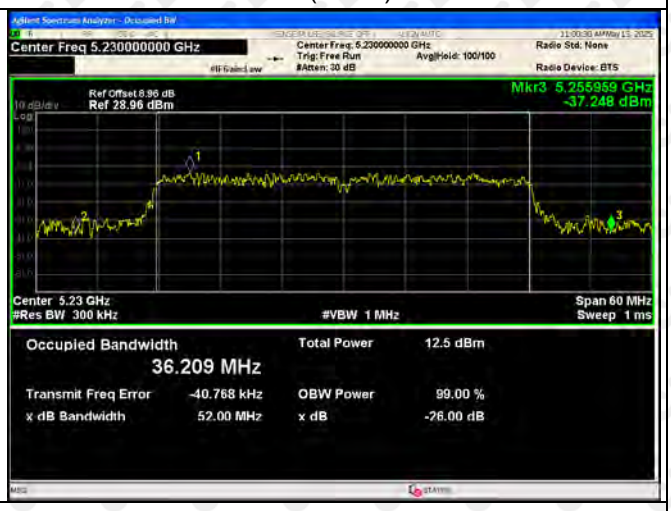



802.11ac(VH40)-5190

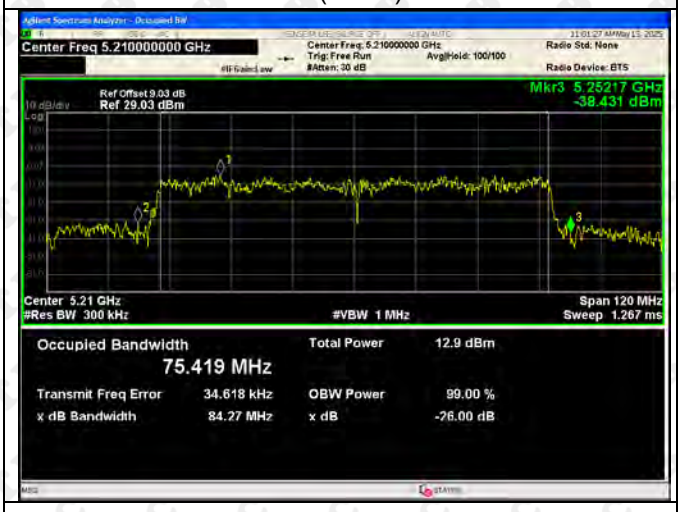
802.11ac(VH40)-5230




802.11ac(VH80)-5210




802.11n(HT20)-5180

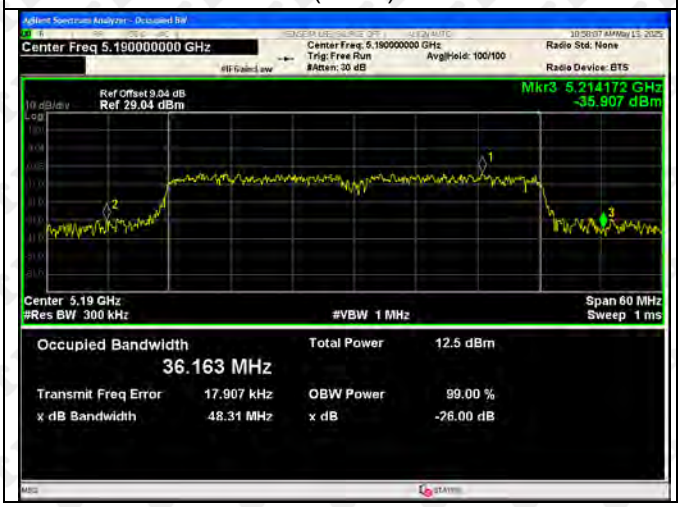



802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230



5250-5350MHz-Power
module1 Worst mode:

802.11a-5260

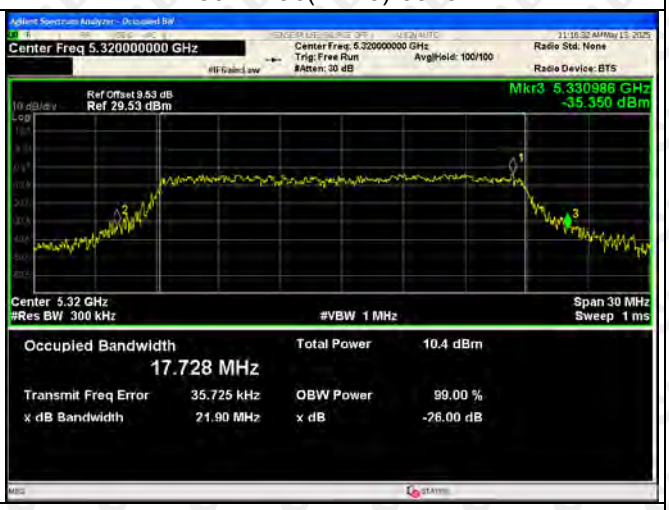
802.11a-5280

802.11a-5320

802.11ac(VH20)-5260

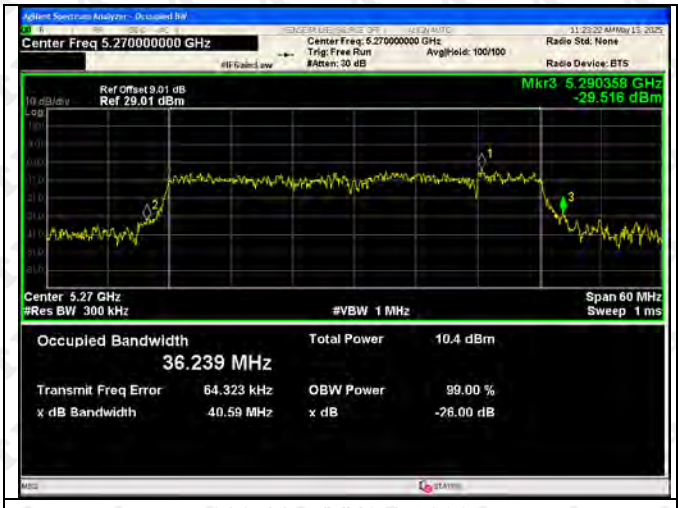
802.11ac(VH20)-5280

802.11ac(VH20)-5320

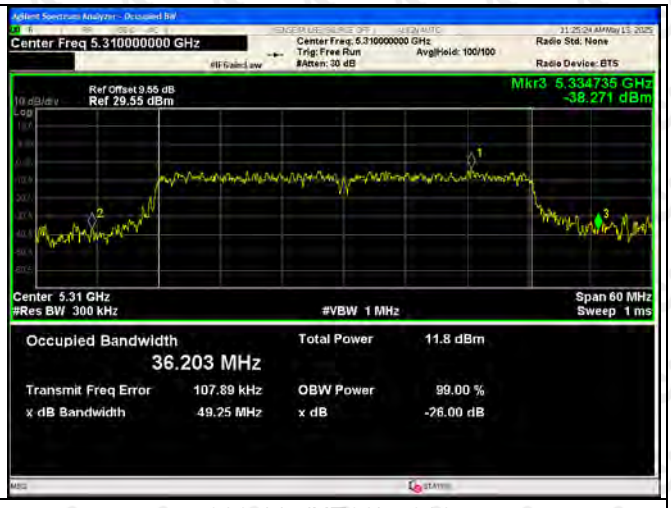



802.11ac(VH40)-5270

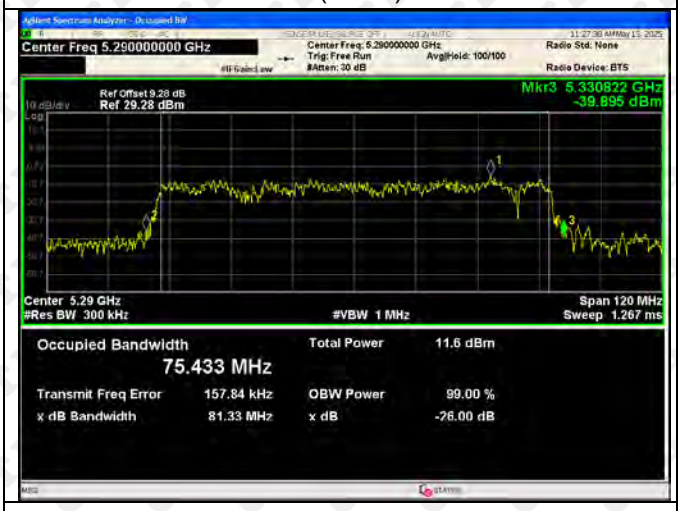
802.11ac(VH40)-5310




802.11ac(VH80)-5290



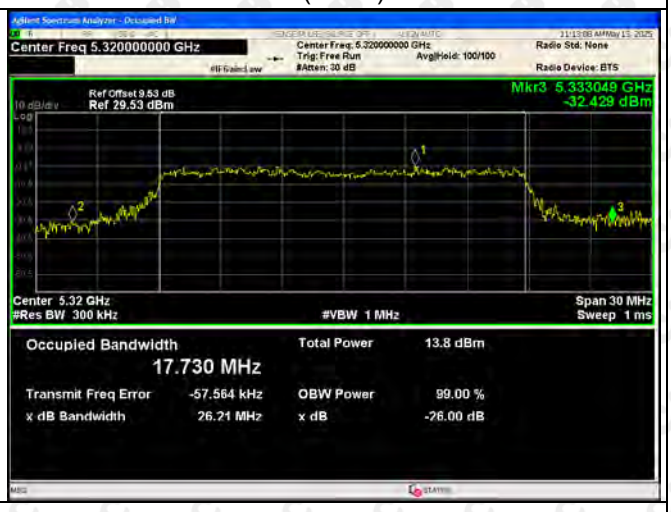

802.11n(HT20)-5260



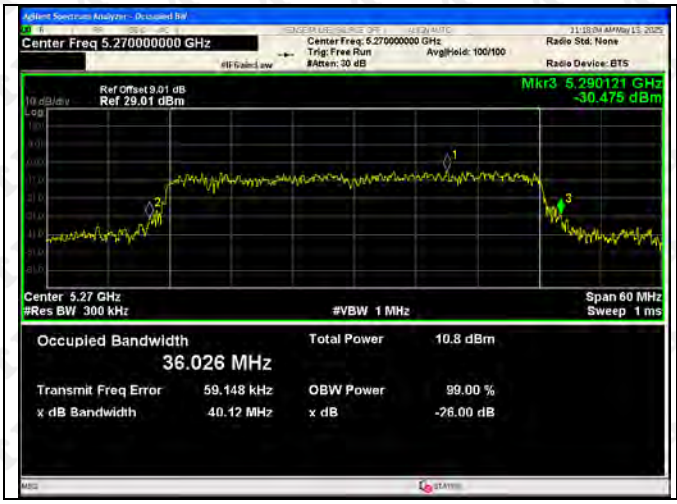

802.11n(HT20)-5280

802.11n(HT20)-5320

802.11n(HT40)-5270



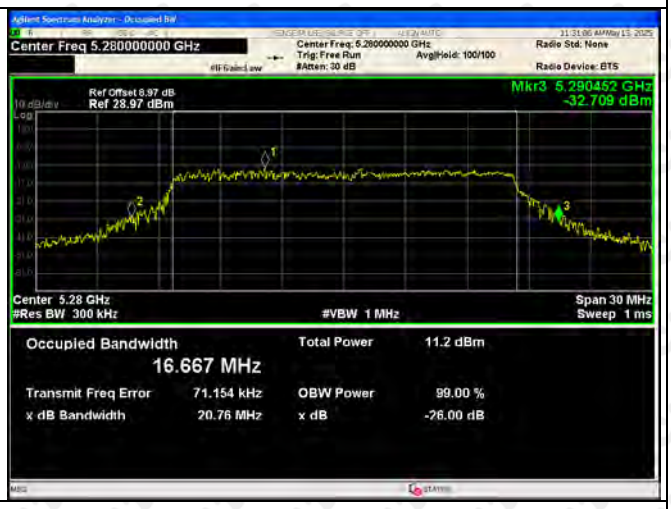

802.11n(HT40)-5310



module2 (OPS computer) Worst mode:

802.11a-5260

802.11a-5280




802.11a-5320

802.11ac(VH20)-5260

802.11ac(VH20)-5280

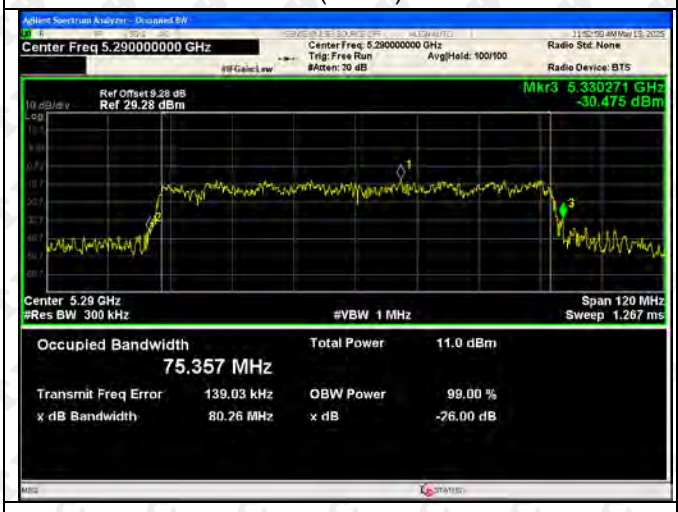
802.11ac(VH20)-5320

802.11ac(VH40)-5270

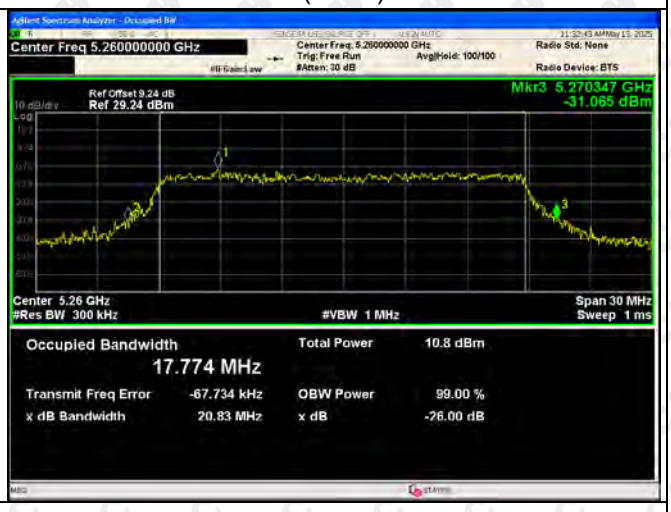
802.11ac(VH40)-5310

802.11ac(VH80)-5290

802.11n(HT20)-5260



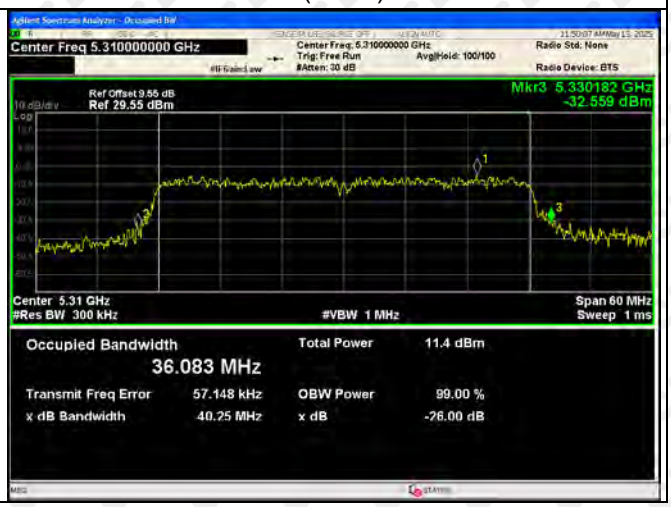

802.11n(HT20)-5280




802.11n(HT20)-5320

802.11n(HT40)-5270

802.11n(HT40)-5310



5470-5725MHz-Power
module1(OPS computer) Worst mode:

802.11a-5500

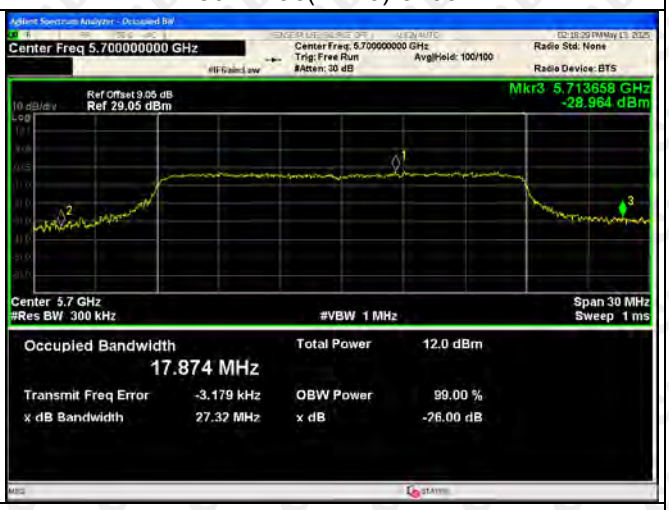
802.11a-5580

802.11a-5700

802.11ac(VH20)-5500

802.11ac(VH20)-5580

802.11ac(VH20)-5700

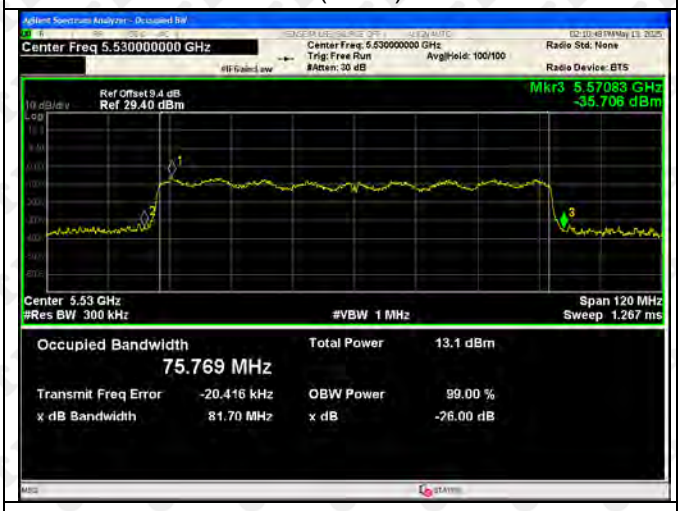



802.11ac(VH40)-5510

802.11ac(VH40)-5670

802.11ac(VH80)-5530

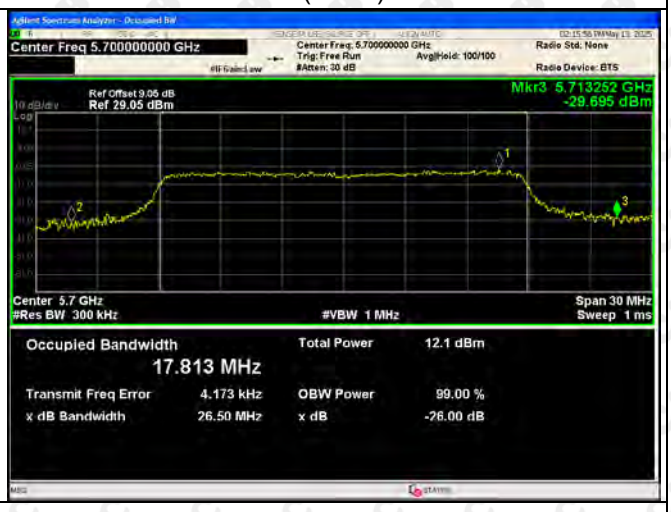
802.11n(HT20)-5500




802.11n(HT20)-5580

802.11n(HT20)-5700

802.11n(HT40)-5510

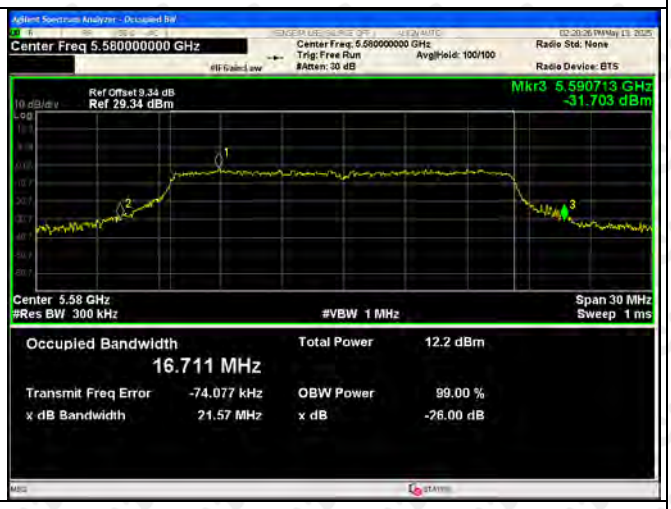



802.11n(HT40)-5670

module2 (OPS computer) Worst mode:

802.11a-5500

802.11a-5580




802.11a-5700

802.11ac(VH20)-5500

802.11ac(VH20)-5580

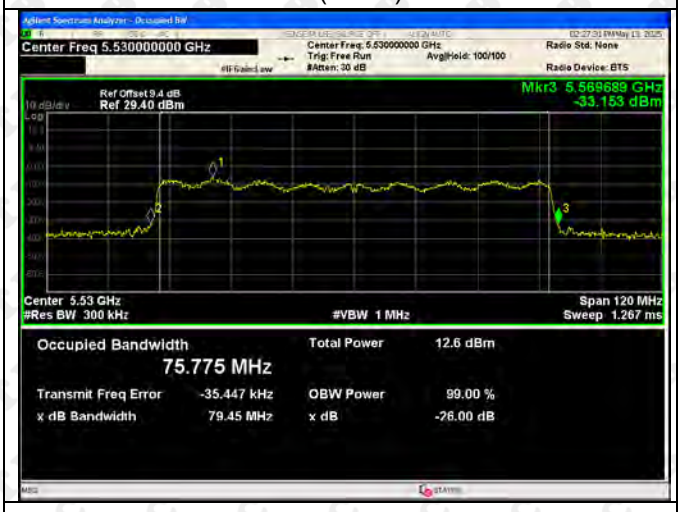
802.11ac(VH20)-5700

802.11ac(VH40)-5510

802.11ac(VH40)-5670

802.11ac(VH80)-5530

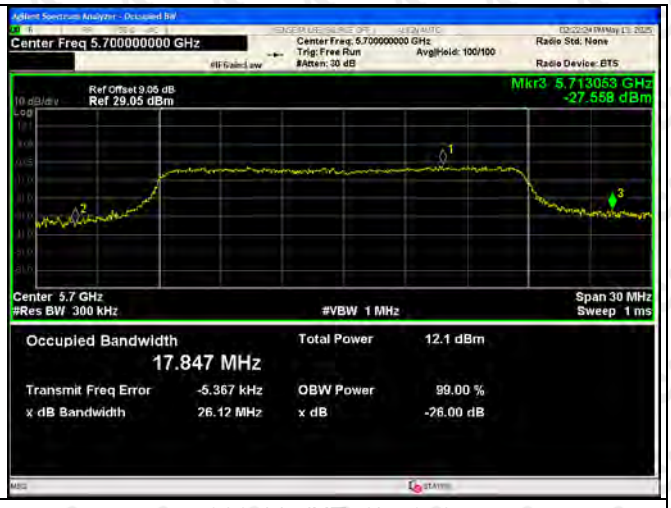
802.11n(HT20)-5500



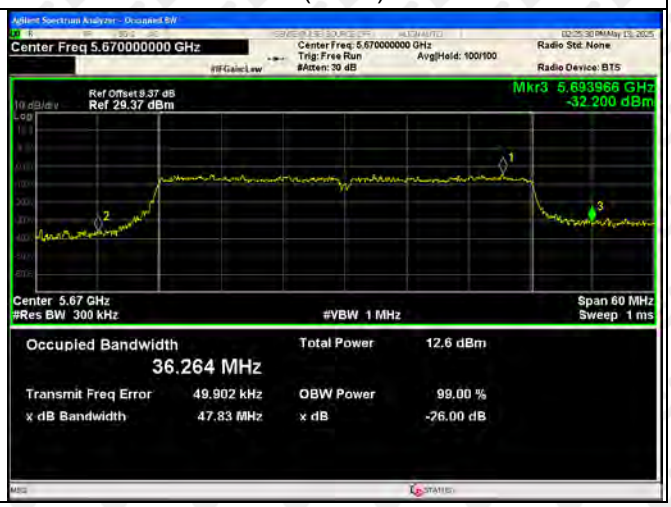

802.11n(HT20)-5580

802.11n(HT20)-5700

802.11n(HT40)-5510

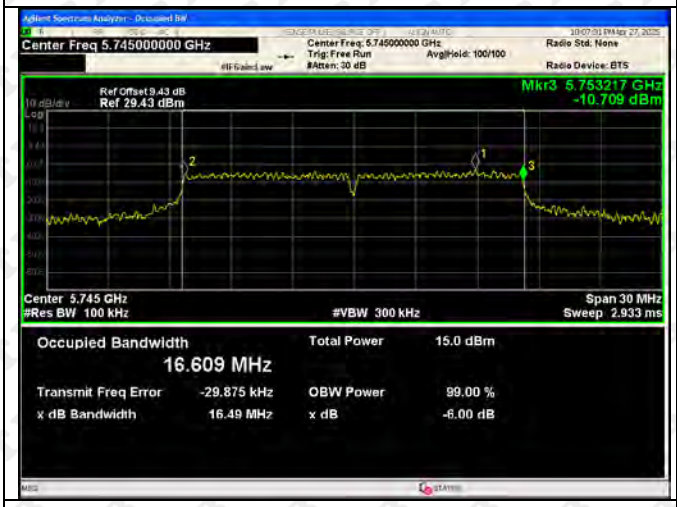



802.11n(HT40)-5670



5725-5850MHz:-Power
module1 Worst mode:

802.11a-5745



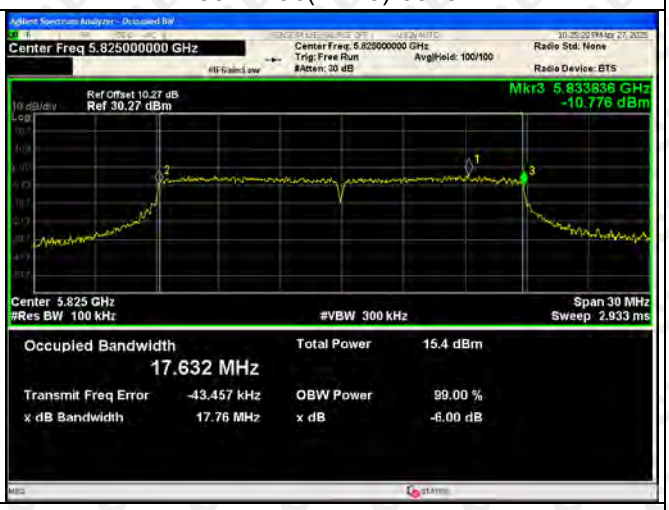

802.11a-5785

802.11a-5825

802.11ac(VH20)-5745

802.11ac(VH20)-5785

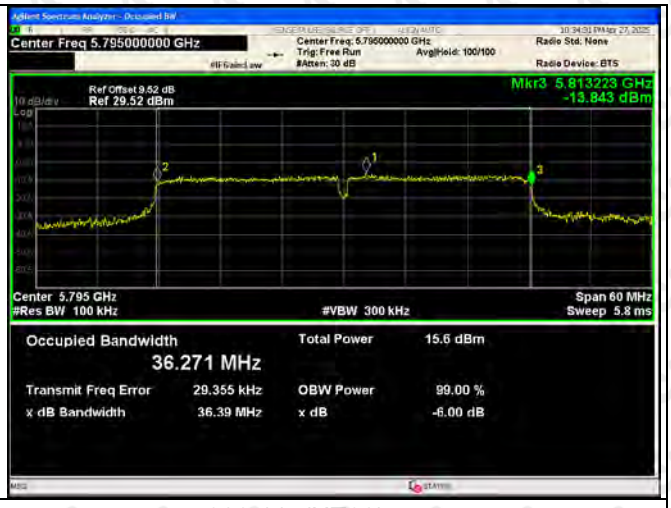
802.11ac(VH20)-5825



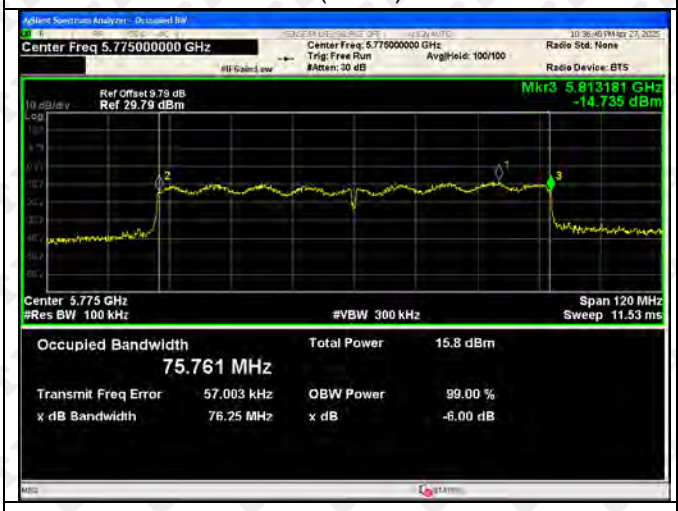

802.11ac(VH40)-5755

802.11ac(VH40)-5795

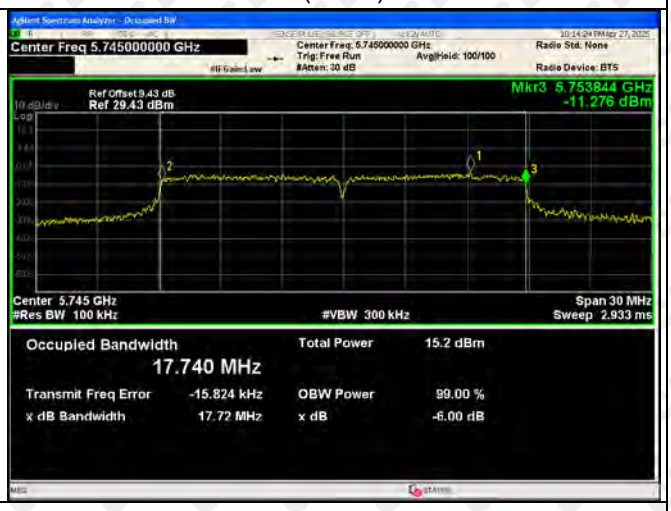
802.11ac(VH80)-5775



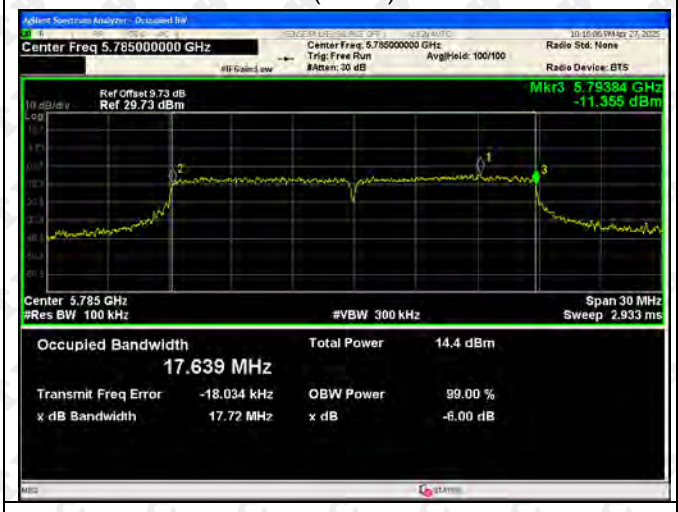

802.11n(HT20)-5745



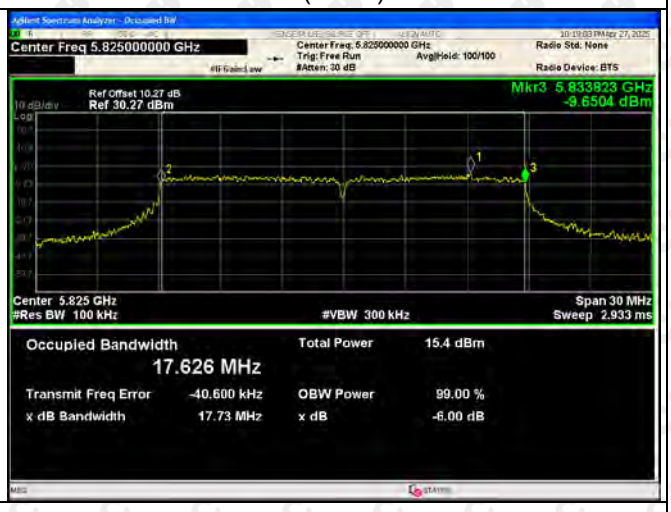

802.11n(HT20)-5785



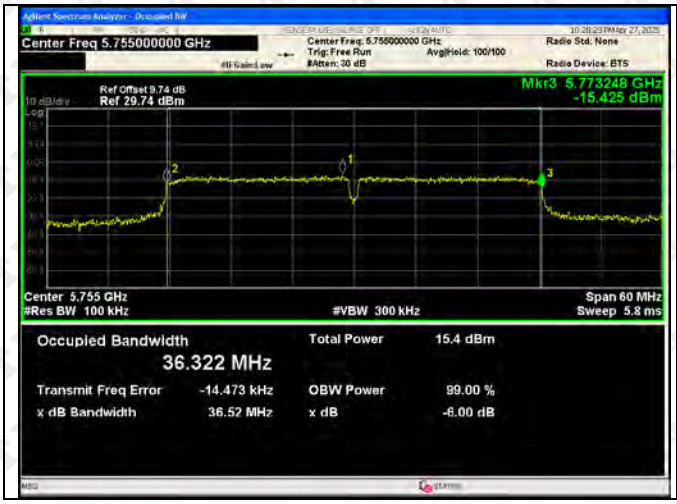

802.11n(HT20)-5825

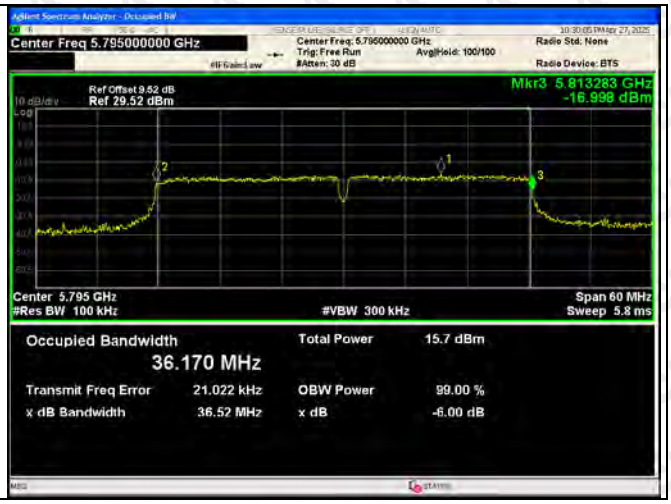



802.11n(HT40)-5795




802.11n(HT40)-5825




module2 (OPS computer) Worst mode:

802.11a-5745

802.11a-5785

802.11a-5825

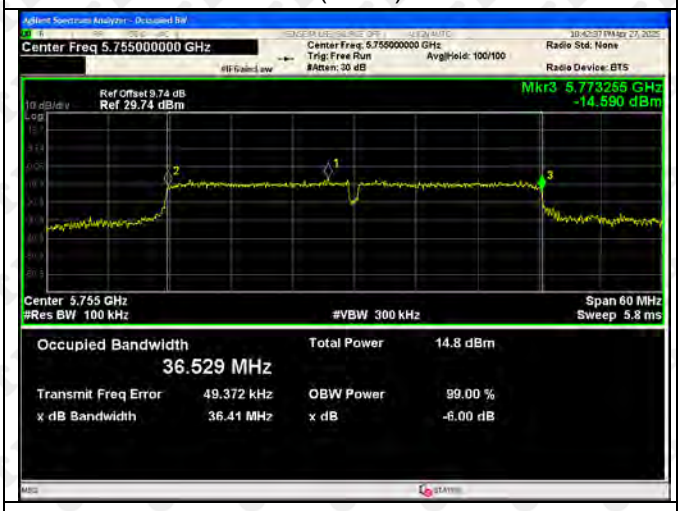
802.11ac(VH20)-5745

802.11ac(VH20)-5785

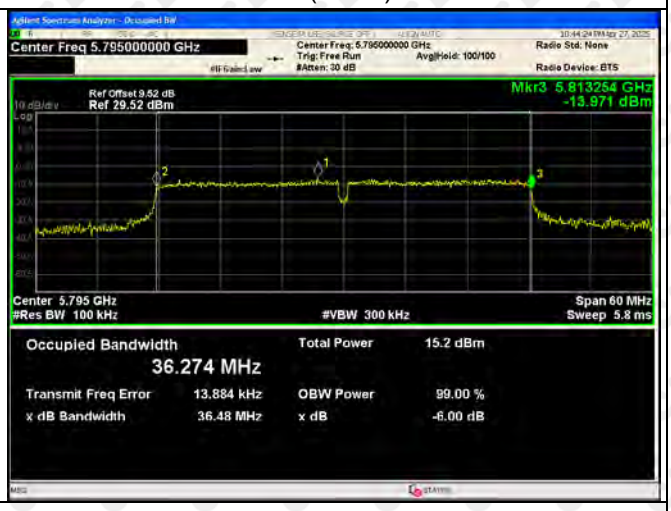
802.11ac(VH20)-5825

802.11ac(VH40)-5755

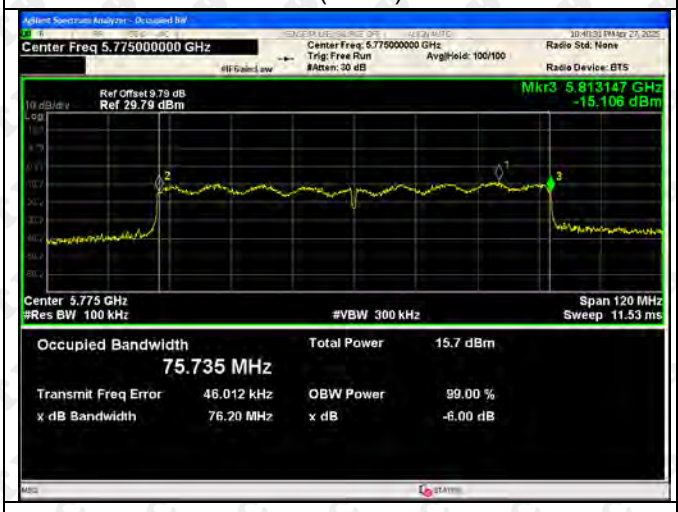
802.11ac(VH40)-5795



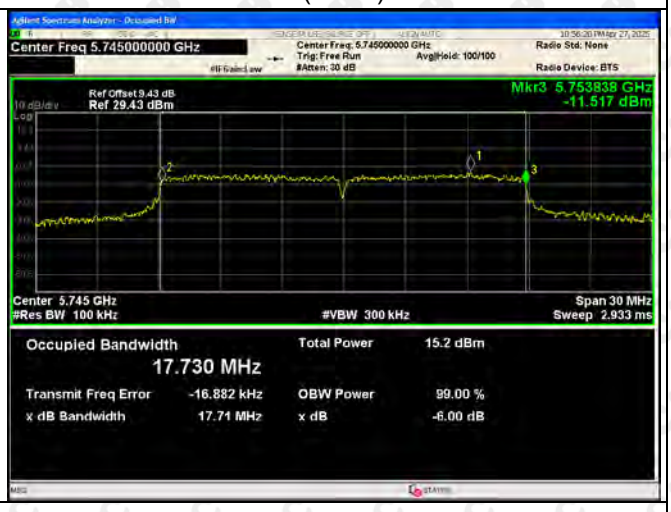

802.11ac(VH80)-5775



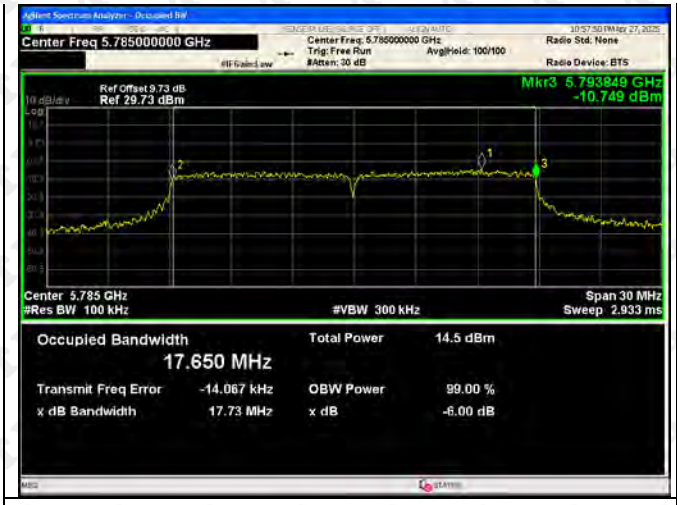

802.11n(HT20)-5745




802.11n(HT20)-5785

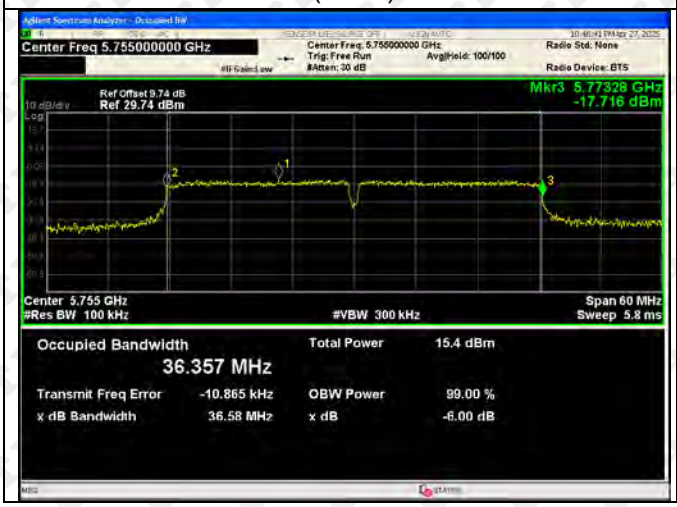


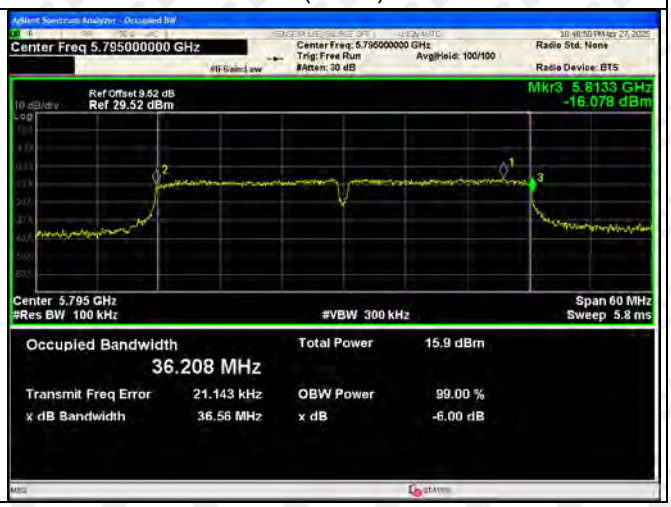

802.11n(HT20)-5825



802.11n(HT40)-5795

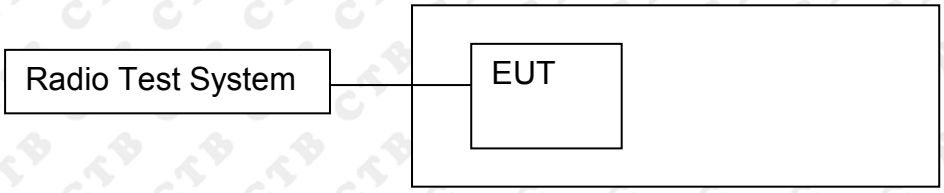
802.11n(HT40)-5825



## 11. POWER SPECTRAL DENSITY

### 11.1 Block Diagram Of Test Setup




### 11.2 Limit

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### 11.3 Test procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

For devices operating in the bands 5.15−5.25 GHz, 5.25−5.35 GHz, and 5.47−5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725−5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
a) Set RBW ≥ 1/*T*, where *T* is defined in II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the

measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

11.4 Test Result

5150-5250MHz:MHz
module1 Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] ANT 1 | PSD [dBm/MHz] ANT 2 | PSD [dBm/MHz] Total | Limit (dBm) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 5180 | 3.237 | -2.771 | / | 11 | Pass |
| | 5200 | 4.455 | -2.698 | / | 11 | Pass |
| | 5240 | 4.257 | -2.472 | / | 11 | Pass |
| 802.11ac(VH20) | 5180 | 4.239 | -2.993 | 4.991 | 11 | Pass |
| | 5200 | 3.882 | -3.132 | 4.670 | 11 | Pass |
| | 5240 | 4.493 | -2.88 | 5.223 | 11 | Pass |
| 802.11ac(VH40) | 5190 | 0.565 | -5.933 | 1.443 | 11 | Pass |
| | 5230 | 0.532 | -5.986 | 1.406 | 11 | Pass |
| 802.11ac(VH80) | 5230 | -7.633 | -7.808 | -4.709 | 11 | Pass |
| 802.11n(VH20) | 5210 | 3.707 | -2.903 | 4.564 | 11 | Pass |
| | 5180 | 4.051 | -3.064 | 4.822 | 11 | Pass |
| | 5200 | 4.097 | -3.074 | 4.859 | 11 | Pass |
| 802.11n (VH40) | 5240 | 0.724 | -5.776 | 1.601 | 11 | Pass |
| | 5190 | 0.523 | -6.02 | 1.393 | 11 | Pass |

5150-5250MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] | Limit [dBm/MHz] | Result |
|---|---|---|---|---|
| 802.11a | 5180 | 3.402 | 11 | Pass |
| | 5200 | 3.867 | 11 | Pass |
| | 5240 | 4.1 | 11 | Pass |
| 802.11ac(VH20) | 5180 | 4.011 | 11 | Pass |
| | 5200 | 4.228 | 11 | Pass |
| | 5240 | 3.536 | 11 | Pass |
| 802.11ac(VH40) | 5190 | 0.564 | 11 | Pass |
| | 5230 | 1.042 | 11 | Pass |
| 802.11ac(VH80) | 5230 | -6.869 | 11 | Pass |
| 802.11n(VH20) | 5180 | 3.58 | 11 | Pass |
| | 5200 | 4.492 | 11 | Pass |
| | 5240 | 3.436 | 11 | Pass |
| 802.11n (VH40) | 5190 | 1.178 | 11 | Pass |
| | 5230 | 0.907 | 11 | Pass |

5250-5350 MHzMHz
module1 Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] ANT 1 | PSD [dBm/MHz] ANT 2 | PSD [dBm/MHz] Total | Limit (dBm) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 5260 | 2.488 | -2.236 | / | 11 | Pass |
| | 5280 | 2.666 | -2.368 | / | 11 | Pass |
| | 5320 | 2.919 | -2.085 | / | 11 | Pass |
| 802.11ac(VH20) | 5260 | 1.944 | -2.645 | 3.240 | 11 | Pass |
| | 5280 | 2.306 | -2.655 | 3.509 | 11 | Pass |
| | 5320 | 2.662 | -2.514 | 3.814 | 11 | Pass |
| 802.11ac(VH40) | 5270 | -0.87 | -5.59 | 0.392 | 11 | Pass |
| | 5310 | -0.37 | -5.438 | 0.807 | 11 | Pass |
| 802.11ac(VH80) | 5290 | -2.62 | -7.48 | -1.393 | 11 | Pass |
| 802.11n(VH20) | 5260 | 2.269 | -2.568 | 3.502 | 11 | Pass |
| | 5280 | 2.379 | -2.789 | 3.533 | 11 | Pass |
| | 5320 | 2.631 | -2.553 | 3.781 | 11 | Pass |
| 802.11n(VH40) | 5270 | -0.785 | -5.509 | 0.476 | 11 | Pass |
| | 5310 | -0.456 | -5.364 | 0.760 | 11 | Pass |

5250-5350 MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] | Limit (dBm) | Result |
|---|---|---|---|---|
| 802.11a | 5260 | 2.095 | 11 | Pass |
| | 5280 | 2.699 | 11 | Pass |
| | 5320 | 2.818 | 11 | Pass |
| 802.11ac(HT20) | 5260 | 2.084 | 11 | Pass |
| | 5280 | 2.351 | 11 | Pass |
| | 5320 | 2.474 | 11 | Pass |
| 802.11ac(HT40) | 5270 | -0.695 | 11 | Pass |
| | 5310 | -0.05 | 11 | Pass |
| 802.11ac(HT80) | 5290 | -2.759 | 11 | Pass |
| 802.11n(VH20) | 5260 | 2.053 | 11 | Pass |
| | 5280 | 2.248 | 11 | Pass |
| | 5320 | 2.575 | 11 | Pass |
| 802.11n(VH40) | 5270 | -0.409 | 11 | Pass |
| | 5310 | -0.113 | 11 | Pass |

5470-5725MHz:
module1 Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] ANT 1 | PSD [dBm/MHz] ANT 2 | PSD [dBm/MHz] Total | Limit (dBm) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 5500 | 1.486 | -2.647 | / | 30 | Pass |
| | 5580 | 0.581 | -5.579 | / | 30 | Pass |
| | 5700 | 1.071 | -3.325 | / | 30 | Pass |
| 802.11ac(VH20) | 5500 | 0.961 | -2.657 | 2.529 | 30 | Pass |
| | 5580 | 0.402 | -3.281 | 1.950 | 30 | Pass |
| | 5700 | 0.873 | -2.665 | 2.465 | 30 | Pass |
| 802.11ac(VH40) | 5510 | -2.139 | -5.25 | -0.411 | 30 | Pass |
| | 5670 | -2.65 | -6.188 | -1.058 | 30 | Pass |
| 802.11ac(VH80) | 5670 | -3.969 | -8.251 | -2.592 | 30 | Pass |
| 802.11n(HT20) | 5530 | 0.945 | -2.423 | 2.590 | 30 | Pass |
| | 5500 | 0.236 | -3.241 | 1.847 | 30 | Pass |
| | 5580 | 0.911 | -2.701 | 2.480 | 30 | Pass |
| 802.11n(HT40) | 5700 | -1.864 | -5.351 | -0.256 | 30 | Pass |
| | 5510 | -2.581 | -6.301 | -1.044 | 30 | Pass |

5470-5725MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] | Limit (dBm) | Result |
|---|---|---|---|---|
| 802.11a | 5500 | 1.465 | 30 | Pass |
| | 5580 | 0.655 | 30 | Pass |
| | 5700 | 1.077 | 30 | Pass |
| 802.11ac(VH20) | 5530 | 1.028 | 30 | Pass |
| | 5500 | 0.327 | 30 | Pass |
| | 5580 | 0.896 | 30 | Pass |
| 802.11ac(VH40) | 5700 | -2.005 | 30 | Pass |
| | 5510 | -2.802 | 30 | Pass |
| 802.11ac(VH80) | 5670 | -3.98 | 30 | Pass |
| 802.11n(HT20) | 5500 | 0.841 | 30 | Pass |
| | 5580 | 0.361 | 30 | Pass |
| | 5700 | 1.04 | 30 | Pass |
| 802.11n(HT40) | 5510 | -1.811 | 30 | Pass |
| | 5670 | -2.49 | 30 | Pass |

5725-5850MHz:
module1 Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/MHz] ANT 1 | PSD [dBm/MHz] ANT 2 | PSD [dBm/MHz] Total | Limit (dBm) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 5745 | 1.517 | -5.245 | / | 30 | Pass |
| | 5785 | 2.448 | -3.918 | / | 30 | Pass |
| | 5825 | 3.642 | -2.916 | / | 30 | Pass |
| 802.11ac(VH20) | 5745 | 1.595 | -5.278 | 2.406 | 30 | Pass |
| | 5785 | 1.047 | -4.191 | 2.184 | 30 | Pass |
| | 5825 | 1.663 | -4.899 | 2.529 | 30 | Pass |
| 802.11ac(VH40) | 5755 | -2.056 | -9.33 | -1.310 | 30 | Pass |
| | 5795 | -1.837 | -8.24 | -0.942 | 30 | Pass |
| 802.11ac(VH80) | 5775 | -3.547 | -9.971 | -2.656 | 30 | Pass |
| 802.11n(HT20) | 5745 | 0.754 | -5.444 | 1.688 | 30 | Pass |
| | 5785 | 0.716 | -4.201 | 1.929 | 30 | Pass |
| | 5825 | 1.674 | -3.001 | 2.948 | 30 | Pass |
| 802.11n(HT40) | 5755 | -1.774 | -9.363 | -1.077 | 30 | Pass |
| | 5795 | -0.872 | -8.163 | -0.129 | 30 | Pass |

5725-5850MHz:
module2 (OPS computer) Worst mode:

| Test mode | Test Channel (MHz) | PSD [dBm/500kHz] | Limit [dBm/MHz] | Result |
|---|---|---|---|---|
| 802.11a | 5745 | 1.653 | 30 | Pass |
| | 5785 | 1.589 | 30 | Pass |
| | 5825 | 2.077 | 30 | Pass |
| 802.11ac(VH20) | 5745 | 1.581 | 30 | Pass |
| | 5785 | 1.804 | 30 | Pass |
| | 5825 | 1.785 | 30 | Pass |
| 802.11ac(VH40) | 5755 | -1.941 | 30 | Pass |
| | 5795 | -1.983 | 30 | Pass |
| 802.11ac(VH80) | 5775 | -3.337 | 30 | Pass |
| 802.11n(HT20) | 5745 | 1.63 | 30 | Pass |
| | 5785 | 1.196 | 30 | Pass |
| | 5825 | 1.874 | 30 | Pass |
| 802.11n(HT40) | 5755 | -1.904 | 30 | Pass |
| | 5795 | -1.716 | 30 | Pass |

**Test Graph:**
5150-5250MHz
module1 Worst mode:

802.11a-5180

802.11a-5200

802.11a-5240

802.11ac(VH20)-5180

802.11ac(VH20)-5200

802.11ac(VH20)-5240

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230

module2 (OPS computer) Worst mode:

| 802.11a-5180 | 802.11a-5200 |
|---|---|
| | |
| 802.11a-5240 | 802.11ac(VH20)-5180 |
| | |
| 802.11ac(VH20)-5200 | 802.11ac(VH20)-5240 |

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230

5250-5350MHz
module1 Worst mode:

802.11a-5260

802.11a-5280

802.11a-5320

802.11ac(VH20)-5260

802.11ac(VH20)-5280

802.11ac(VH20)-5320

802.11ac(VH40)-5270

802.11ac(VH40)-5310

802.11ac(VH80)-5290

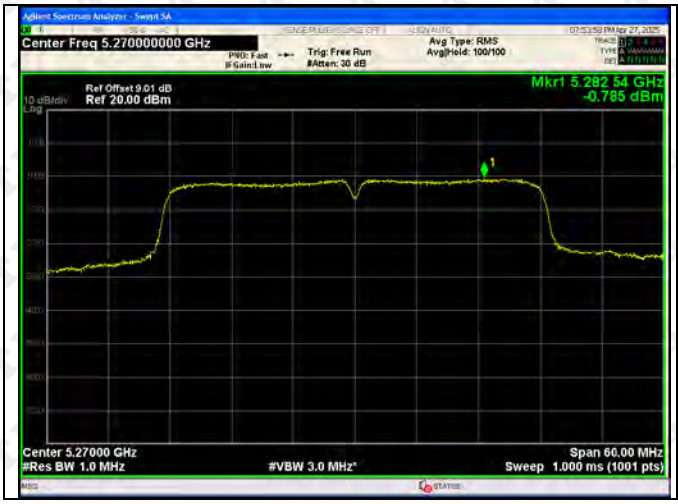
802.11n(HT20)-5260

802.11n(HT20)-5280

802.11n(HT20)-5320

802.11n(HT40)-5270

802.11n(HT40)-5310



module2 (OPS computer) Worst mode:

| 802.11a-5260 | 802.11a-5280 |
|---|---|
| | |
| 802.11a-5320 | 802.11ac(VH20)-5260 |
| | |
| 802.11ac(VH20)-5280 | 802.11ac(VH20)-5320 |

802.11ac(VH40)-5270

802.11ac(VH40)-5310

802.11ac(VH80)-5290

802.11n(HT20)-5260

802.11n(HT20)-5280

802.11n(HT20)-5320

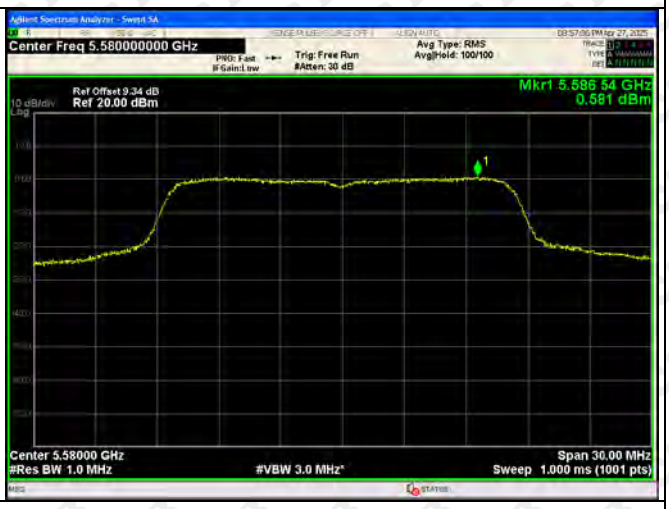
802.11n(HT40)-5270

802.11n(HT40)-5310

5470-5725MHz
module1 Worst mode:

802.11a-5500

802.11a-5580

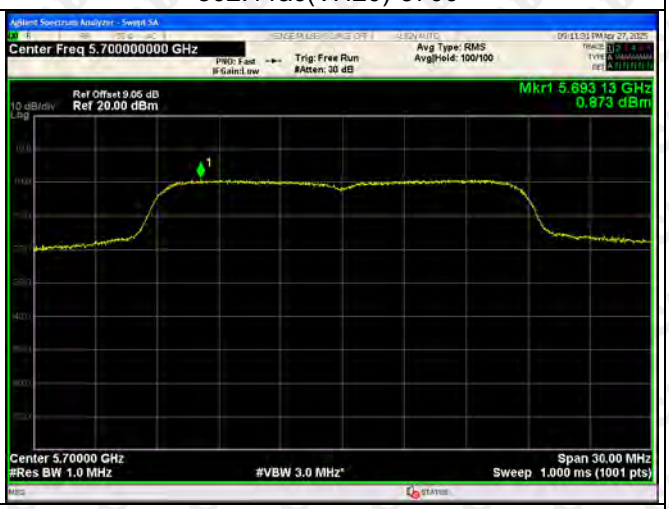



802.11a-5700

802.11ac(VH20)-5500

802.11ac(VH20)-5580

802.11ac(VH20)-5700



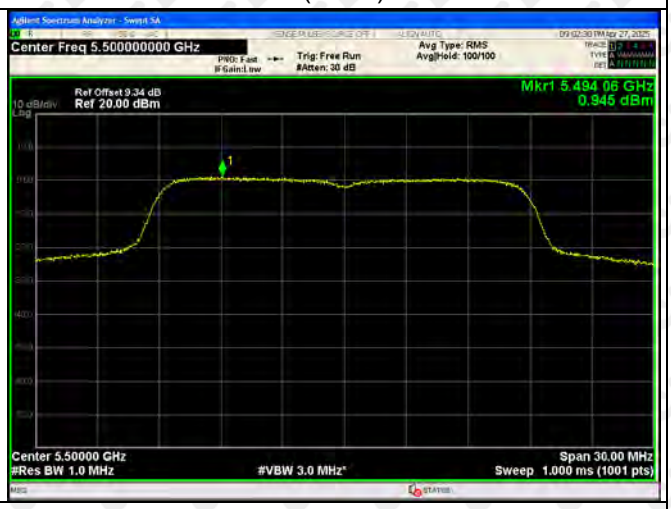

802.11ac(VH40)-5510

802.11ac(VH40)-5670

802.11ac(VH80)-5530

802.11n(HT20)-5500

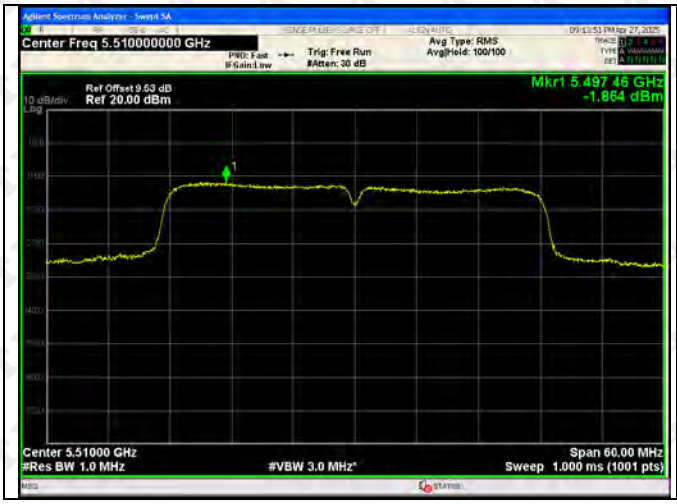
802.11n(HT20)-5580




802.11n(HT20)-5700

802.11n(HT40)-5510

802.11n(HT40)-5670



module2 (OPS computer) Worst mode:

| 802.11a-5500 | 802.11a-5580 |
|---|---|
| | |
| 802.11a-5700 | 802.11ac(VH20)-5500 |
| | |
| 802.11ac(VH20)-5580 | 802.11ac(VH20)-5700 |

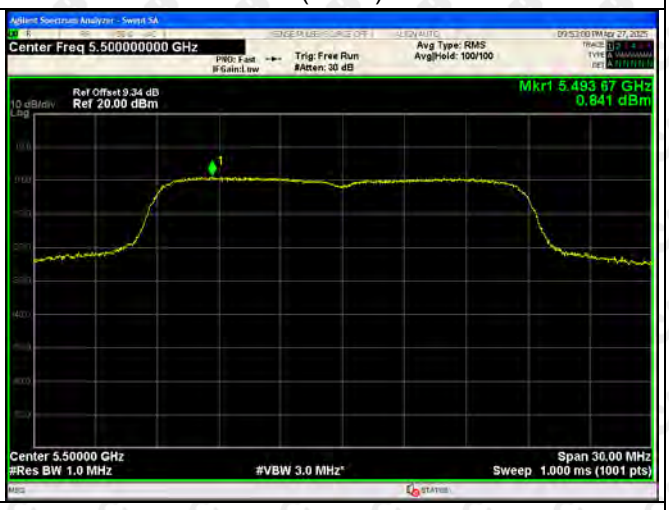
802.11ac(VH40)-5510

802.11ac(VH40)-5670

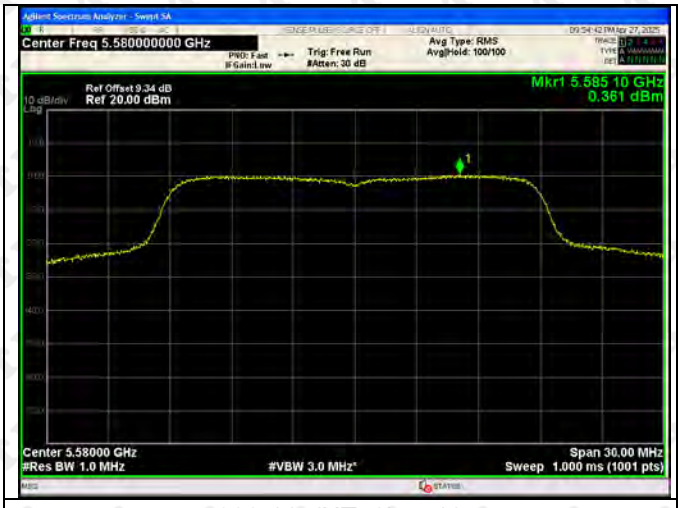
802.11ac(VH80)-5530

802.11n(HT20)-5500

802.11n(HT20)-5580




802.11n(HT20)-5700




802.11n(HT40)-5510

802.11n(HT40)-5670

5725-5850MHz:
module1 Worst mode:

802.11a-5745

802.11a-5785

802.11a-5825

802.11ac(VH20)-5745

802.11ac(VH20)-5785

802.11ac(VH20)-5825

802.11ac(VH40)-5755

802.11ac(VH40)-5795

802.11ac(VH80)-5775

802.11n(HT20)-5745

802.11n(HT20)-5785

802.11n(HT20)-5825

802.11n(HT40)-5795

802.11n(HT40)-5825

module2 (OPS computer) Worst mode:

| 802.11a-5745 | 802.11a-5785 |
|---|---|
| | |
| 802.11a-5825 | 802.11ac(VH20)-5745 |
| | |
| 802.11ac(VH20)-5785 | 802.11ac(VH20)-5825 |

802.11ac(VH40)-5755

802.11ac(VH40)-5795

802.11ac(VH80)-5775

802.11n(HT20)-5745

802.11n(HT20)-5785

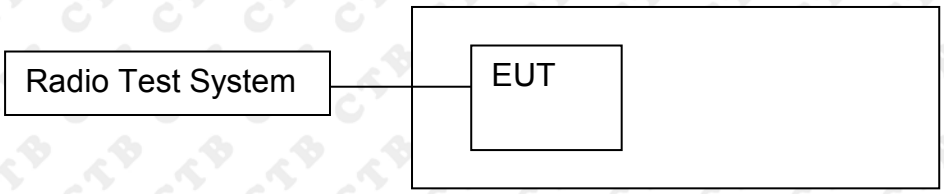
802.11n(HT20)-5825

802.11n(HT40)-5795

802.11n(HT40)-5825

## 12. FREQUENCY STABILITY

### 12.1 Block Diagram Of Test Setup




### 12.2 Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### 12.3 Test procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.

2. Set EUT as normal operation.

3. Turn the EUT on and couple its output to spectrum.

4. Turn the EUT off and set the chamber to the highest temperature specified.

5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.

6. Repeat step with the temperature chamber set to the lowest temperature.

12.4 Test Result

TX Frequency (5150-5250MHz)
module1 Worst mode:
Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5180MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5180.0162 | 5180 | 0.0162 | 3.1362 |
| | | V max (V) | 132 | 5180.0689 | 5180 | 0.0689 | 13.3002 |
| | | V min (V) | 108 | 5180.0667 | 5180 | 0.0667 | 12.8836 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5180MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5180.0006 | 5180 | 0.0006 | 0.1166 |
| | | T (°C) | 10 | 5180.0134 | 5180 | 0.0134 | 2.5916 |
| | | T (°C) | 20 | 5180.0077 | 5180 | 0.0077 | 1.4918 |
| | | T (°C) | 30 | 5180.0042 | 5180 | 0.0042 | 0.8097 |
| | | T (°C) | 40 | 5180.0367 | 5180 | 0.0367 | 7.0806 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5200MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5200.0466 | 5200 | 0.0466 | 8.9613 |
| | | V max (V) | 132 | 5200.0197 | 5200 | 0.0197 | 3.7905 |
| | | V min (V) | 108 | 5200.0392 | 5200 | 0.0392 | 7.5398 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5200MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5200.0118 | 5200 | 0.0118 | 2.2693 |
| | | T (°C) | 10 | 5200.0224 | 5200 | 0.0224 | 4.3022 |
| | | T (°C) | 20 | 5200.0231 | 5200 | 0.0231 | 4.4464 |
| | | T (°C) | 30 | 5200.0212 | 5200 | 0.0212 | 4.0731 |
| | | T (°C) | 40 | 5200.0055 | 5200 | 0.0055 | 1.0547 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5240MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5240.0081 | 5240 | 0.0081 | 1.5512 |
| | | V max (V) | 132 | 5240.0203 | 5240 | 0.0203 | 3.8805 |
| | | V min (V) | 108 | 5240.0160 | 5240 | 0.0160 | 3.0495 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5240MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5240.0279 | 5240 | 0.0279 | 5.3202 |
| | | T (°C) | 10 | 5240.0445 | 5240 | 0.0445 | 8.4871 |
| | | T (°C) | 20 | 5240.0282 | 5240 | 0.0282 | 5.3897 |
| | | T (°C) | 30 | 5240.0063 | 5240 | 0.0063 | 1.2025 |
| | | T (°C) | 40 | 5240.0322 | 5240 | 0.0322 | 6.1402 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

TX Frequency (5250-5350MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5260MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5260.0287 | 5260 | 0.0287 | 5.4587 |
| | | V max (V) | 132 | 5260.0274 | 5260 | 0.0274 | 5.2132 |
| | | V min (V) | 108 | 5260.0250 | 5260 | 0.0250 | 4.7497 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5260MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5260.0535 | 5260 | 0.0535 | 10.1650 |
| | | T (°C) | 10 | 5260.0276 | 5260 | 0.0276 | 5.2392 |
| | | T (°C) | 20 | 5260.0408 | 5260 | 0.0408 | 7.7564 |
| | | T (°C) | 30 | 5260.0767 | 5260 | 0.0767 | 14.5850 |
| | | T (°C) | 40 | 5260.0440 | 5260 | 0.0440 | 8.3706 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5280MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5280.0348 | 5280 | 0.0348 | 6.5964 |
| | | V max (V) | 132 | 5280.0566 | 5280 | 0.0566 | 10.7155 |
| | | V min (V) | 108 | 5280.0801 | 5280 | 0.0801 | 15.1788 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5280MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5280.0244 | 5280 | 0.0244 | 4.6304 |
| | | T (°C) | 10 | 5280.0261 | 5280 | 0.0261 | 4.9461 |
| | | T (°C) | 20 | 5280.0327 | 5280 | 0.0327 | 6.1851 |
| | | T (°C) | 30 | 5280.0449 | 5280 | 0.0449 | 8.4996 |
| | | T (°C) | 40 | 5280.0091 | 5280 | 0.0091 | 1.7289 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5320MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5320.0601 | 5320 | 0.0601 | 11.2919 |
| | | V max (V) | 132 | 5320.0134 | 5320 | 0.0134 | 2.5192 |
| | | V min (V) | 108 | 5320.0508 | 5320 | 0.0508 | 9.5495 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5320MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5320.0672 | 5320 | 0.0672 | 12.6327 |
| | | T (°C) | 10 | 5320.0633 | 5320 | 0.0633 | 11.9038 |
| | | T (°C) | 20 | 5320.0321 | 5320 | 0.0321 | 6.0310 |
| | | T (°C) | 30 | 5320.0111 | 5320 | 0.0111 | 2.0811 |
| | | T (°C) | 40 | 5320.0532 | 5320 | 0.0532 | 9.9981 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

TX Frequency (5470-5725MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5500MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5500.0237 | 5500 | 0.0237 | 4.3016 |
| | | V max (V) | 132 | 5500.0917 | 5500 | 0.0917 | 16.6641 |
| | | V min (V) | 108 | 5500.0307 | 5500 | 0.0307 | 5.5804 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5500MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5500.0637 | 5500 | 0.0637 | 11.5729 |
| | | T (°C) | 10 | 5500.0018 | 5500 | 0.0018 | 0.3189 |
| | | T (°C) | 20 | 5500.0520 | 5500 | 0.0520 | 9.4630 |
| | | T (°C) | 30 | 5500.0350 | 5500 | 0.0350 | 6.3690 |
| | | T (°C) | 40 | 5500.0725 | 5500 | 0.0725 | 13.1895 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5580MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5580.0746 | 5580 | 0.0746 | 13.3687 |
| | | V max (V) | 132 | 5580.0152 | 5580 | 0.0152 | 2.7253 |
| | | V min (V) | 108 | 5580.0933 | 5580 | 0.0933 | 16.7194 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5580MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5580.0447 | 5580 | 0.0447 | 8.0029 |
| | | T (°C) | 10 | 5580.0565 | 5580 | 0.0565 | 10.1295 |
| | | T (°C) | 20 | 5580.0359 | 5580 | 0.0359 | 6.4348 |
| | | T (°C) | 30 | 5580.0092 | 5580 | 0.0092 | 1.6402 |
| | | T (°C) | 40 | 5580.0710 | 5580 | 0.0710 | 12.7283 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5700MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5700.0556 | 5700 | 0.0556 | 9.7619 |
| | | V max (V) | 132 | 5700.0445 | 5700 | 0.0445 | 7.8090 |
| | | V min (V) | 108 | 5700.0177 | 5700 | 0.0177 | 3.1091 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5700MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5700.0256 | 5700 | 0.0256 | 4.4907 |
| | | T (°C) | 10 | 5700.0405 | 5700 | 0.0405 | 7.0993 |
| | | T (°C) | 20 | 5700.0322 | 5700 | 0.0322 | 5.6520 |
| | | T (°C) | 30 | 5700.0372 | 5700 | 0.0372 | 6.5320 |
| | | T (°C) | 40 | 5700.0024 | 5700 | 0.0024 | 0.4154 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

TX Frequency (5725-5850MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5745MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5745.0094 | 5745 | 0.0094 | 1.6430 |
| | | V max (V) | 132 | 5745.0887 | 5745 | 0.0887 | 15.4374 |
| | | V min (V) | 108 | 5745.0094 | 5745 | 0.0094 | 1.6430 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5745MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5745.0122 | 5745 | 0.0122 | 2.1302 |
| | | T (°C) | 10 | 5745.0762 | 5745 | 0.0762 | 13.2641 |
| | | T (°C) | 20 | 5745.0729 | 5745 | 0.0729 | 12.6868 |
| | | T (°C) | 30 | 5745.0161 | 5745 | 0.0161 | 2.8092 |
| | | T (°C) | 40 | 5745.0751 | 5745 | 0.0751 | 13.0774 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5785MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5785.0014 | 5785 | 0.0014 | 0.2454 |
| | | V max (V) | 132 | 5785.0635 | 5785 | 0.0635 | 10.9698 |
| | | V min (V) | 108 | 5785.0789 | 5785 | 0.0789 | 13.6347 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5785MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5785.0524 | 5785 | 0.0524 | 9.0522 |
| | | T (°C) | 10 | 5785.0126 | 5785 | 0.0126 | 2.1719 |
| | | T (°C) | 20 | 5785.0777 | 5785 | 0.0777 | 13.4329 |
| | | T (°C) | 30 | 5785.0063 | 5785 | 0.0063 | 1.0873 |
| | | T (°C) | 40 | 5785.0166 | 5785 | 0.0166 | 2.8630 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5825MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5825.0341 | 5825 | 0.0341 | 5.8527 |
| | | V max (V) | 132 | 5825.0341 | 5825 | 0.0341 | 5.8582 |
| | | V min (V) | 108 | 5825.0583 | 5825 | 0.0583 | 10.0156 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5825MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5825.0538 | 5825 | 0.0538 | 9.2360 |
| | | T (°C) | 10 | 5825.0491 | 5825 | 0.0491 | 8.4215 |
| | | T (°C) | 20 | 5825.0307 | 5825 | 0.0307 | 5.2661 |
| | | T (°C) | 30 | 5825.0238 | 5825 | 0.0238 | 4.0887 |
| | | T (°C) | 40 | 5825.0680 | 5825 | 0.0680 | 11.6774 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

module2 (OPS computer) Worst mode:

TX Frequency (5150-5250MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5180MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5180.0070 | 5180 | 0.0070 | 1.3560 |
| | | V max (V) | 132 | 5180.0047 | 5180 | 0.0047 | 0.9051 |
| | | V min (V) | 108 | 5180.0763 | 5180 | 0.0763 | 14.7213 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5180MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5180.0586 | 5180 | 0.0586 | 11.3134 |
| | | T (°C) | 10 | 5180.0884 | 5180 | 0.0884 | 17.0714 |
| | | T (°C) | 20 | 5180.0080 | 5180 | 0.0080 | 1.5492 |
| | | T (°C) | 30 | 5180.0567 | 5180 | 0.0567 | 10.9548 |
| | | T (°C) | 40 | 5180.0408 | 5180 | 0.0408 | 7.8812 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5200MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5200.0067 | 5200 | 0.0067 | 1.2891 |
| | | V max (V) | 132 | 5200.0385 | 5200 | 0.0385 | 7.3963 |
| | | V min (V) | 108 | 5200.0625 | 5200 | 0.0625 | 12.0207 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5200MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5200.0547 | 5200 | 0.0547 | 10.5267 |
| | | T (°C) | 10 | 5200.0491 | 5200 | 0.0491 | 9.4519 |
| | | T (°C) | 20 | 5200.0624 | 5200 | 0.0624 | 11.9958 |
| | | T (°C) | 30 | 5200.0637 | 5200 | 0.0637 | 12.2463 |
| | | T (°C) | 40 | 5200.0682 | 5200 | 0.0682 | 13.1212 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5240MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5240.0808 | 5240 | 0.0808 | 15.4259 |
| | | V max (V) | 132 | 5240.0173 | 5240 | 0.0173 | 3.3005 |
| | | V min (V) | 108 | 5240.0725 | 5240 | 0.0725 | 13.8283 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5240MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5240.0251 | 5240 | 0.0251 | 4.7974 |
| | | T (°C) | 10 | 5240.0193 | 5240 | 0.0193 | 3.6743 |
| | | T (°C) | 20 | 5240.0400 | 5240 | 0.0400 | 7.6397 |
| | | T (°C) | 30 | 5240.0033 | 5240 | 0.0033 | 0.6253 |
| | | T (°C) | 40 | 5240.0138 | 5240 | 0.0138 | 2.6296 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

TX Frequency (5250-5350MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5260MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5260.0652 | 5260 | 0.0652 | 12.4017 |
| | | V max (V) | 132 | 5260.0445 | 5260 | 0.0445 | 8.4587 |
| | | V min (V) | 108 | 5260.0649 | 5260 | 0.0649 | 12.3405 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5260MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5260.0029 | 5260 | 0.0029 | 0.5514 |
| | | T (°C) | 10 | 5260.0129 | 5260 | 0.0129 | 2.4568 |
| | | T (°C) | 20 | 5260.0440 | 5260 | 0.0440 | 8.3624 |
| | | T (°C) | 30 | 5260.0753 | 5260 | 0.0753 | 14.3062 |
| | | T (°C) | 40 | 5260.0203 | 5260 | 0.0203 | 3.8530 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5280MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5280.0029 | 5280 | 0.0029 | 0.5473 |
| | | V max (V) | 132 | 5280.0443 | 5280 | 0.0443 | 8.3983 |
| | | V min (V) | 108 | 5280.0138 | 5280 | 0.0138 | 2.6231 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5280MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5280.0681 | 5280 | 0.0681 | 12.8885 |
| | | T (°C) | 10 | 5280.0602 | 5280 | 0.0602 | 11.4022 |
| | | T (°C) | 20 | 5280.0106 | 5280 | 0.0106 | 2.0129 |
| | | T (°C) | 30 | 5280.0389 | 5280 | 0.0389 | 7.3716 |
| | | T (°C) | 40 | 5280.0598 | 5280 | 0.0598 | 11.3183 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5320MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5320.0630 | 5320 | 0.0630 | 11.8485 |
| | | V max (V) | 132 | 5320.0560 | 5320 | 0.0560 | 10.5265 |
| | | V min (V) | 108 | 5320.0799 | 5320 | 0.0799 | 15.0216 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5320MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | -20 | 5320.0075 | 5320 | 0.0075 | 1.4164 |
| | | T (°C) | -10 | 5320.0596 | 5320 | 0.0596 | 11.2030 |
| | | T (°C) | 0 | 5320.0786 | 5320 | 0.0786 | 14.7801 |
| | | T (°C) | 10 | 5320.0580 | 5320 | 0.0580 | 10.8954 |
| | | T (°C) | 20 | 5320.0857 | 5320 | 0.0857 | 16.1184 |
| | | T (°C) | 30 | 5320.0474 | 5320 | 0.0474 | 8.9038 |
| | | T (°C) | 40 | 5320.0802 | 5320 | 0.0802 | 15.0814 |
| | | T (°C) | 50 | 5320.0782 | 5320 | 0.0782 | 14.6956 |
| | | T (°C) | 60 | 5320.0432 | 5320 | 0.0432 | 8.1276 |
| | | T (°C) | 70 | 5320.0532 | 5320 | 0.0532 | 10.0019 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

TX Frequency (5470-5725MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5500MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5500.0341 | 5500 | 0.0341 | 6.2035 |
| | | V max (V) | 132 | 5500.0551 | 5500 | 0.0551 | 10.0234 |
| | | V min (V) | 108 | 5500.0284 | 5500 | 0.0284 | 5.1581 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5500MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5500.0451 | 5500 | 0.0451 | 8.1920 |
| | | T (°C) | 10 | 5500.0481 | 5500 | 0.0481 | 8.7370 |
| | | T (°C) | 20 | 5500.0853 | 5500 | 0.0853 | 15.5018 |
| | | T (°C) | 30 | 5500.0571 | 5500 | 0.0571 | 10.3875 |
| | | T (°C) | 40 | 5500.0004 | 5500 | 0.0004 | 0.0660 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5580MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5580.0026 | 5580 | 0.0026 | 0.4657 |
| | | V max (V) | 132 | 5580.0226 | 5580 | 0.0226 | 4.0551 |
| | | V min (V) | 108 | 5580.0484 | 5580 | 0.0484 | 8.6773 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5580MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5580.0626 | 5580 | 0.0626 | 11.2172 |
| | | T (°C) | 10 | 5580.0279 | 5580 | 0.0279 | 5.0064 |
| | | T (°C) | 20 | 5580.0629 | 5580 | 0.0629 | 11.2653 |
| | | T (°C) | 30 | 5580.0653 | 5580 | 0.0653 | 11.6980 |
| | | T (°C) | 40 | 5580.0689 | 5580 | 0.0689 | 12.3404 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5700MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5700.0388 | 5700 | 0.0388 | 6.8034 |
| | | V max (V) | 132 | 5700.0140 | 5700 | 0.0140 | 2.4624 |
| | | V min (V) | 108 | 5700.0333 | 5700 | 0.0333 | 5.8444 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5700MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5700.0191 | 5700 | 0.0191 | 3.3514 |
| | | T (°C) | 10 | 5700.0105 | 5700 | 0.0105 | 1.8335 |
| | | T (°C) | 20 | 5700.0233 | 5700 | 0.0233 | 4.0932 |
| | | T (°C) | 30 | 5700.0431 | 5700 | 0.0431 | 7.5546 |
| | | T (°C) | 40 | 5700.0476 | 5700 | 0.0476 | 8.3533 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

TX Frequency (5725-5850MHz)

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5745MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5745.0001 | 5745 | 0.0001 | 0.0163 |
| | | V max (V) | 132 | 5745.0717 | 5745 | 0.0717 | 12.4833 |
| | | V min (V) | 108 | 5745.0829 | 5745 | 0.0829 | 14.4352 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5745MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5745.0637 | 5745 | 0.0637 | 11.0797 |
| | | T (°C) | 10 | 5745.0682 | 5745 | 0.0682 | 11.8744 |
| | | T (°C) | 20 | 5745.0921 | 5745 | 0.0921 | 16.0326 |
| | | T (°C) | 30 | 5745.0749 | 5745 | 0.0749 | 13.0384 |
| | | T (°C) | 40 | 5745.0812 | 5745 | 0.0812 | 14.1353 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5785MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5785.0520 | 5785 | 0.0520 | 8.9878 |
| | | V max (V) | 132 | 5785.0560 | 5785 | 0.0560 | 9.6859 |
| | | V min (V) | 108 | 5785.0221 | 5785 | 0.0221 | 3.8288 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5785MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5785.0927 | 5785 | 0.0927 | 16.0213 |
| | | T (°C) | 10 | 5785.0277 | 5785 | 0.0277 | 4.7845 |
| | | T (°C) | 20 | 5785.0404 | 5785 | 0.0404 | 6.9890 |
| | | T (°C) | 30 | 5785.0930 | 5785 | 0.0930 | 16.0681 |
| | | T (°C) | 40 | 5785.0061 | 5785 | 0.0061 | 1.0544 |
| | | T (°C) | 50 | 5785.0823 | 5785 | 0.0823 | 14.2325 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Voltage vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5825MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| T nom (°C) | 20 | V nom (V) | 120 | 5825.0719 | 5825 | 0.0719 | 12.3492 |
| | | V max (V) | 132 | 5825.0886 | 5825 | 0.0886 | 15.2021 |
| | | V min (V) | 108 | 5825.0080 | 5825 | 0.0080 | 1.3680 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

Temperature vs. Frequency Stability

| TEST CONDITIONS | | | | Reference Frequency：5825MHz | | | |
|---|---|---|---|---|---|---|---|
| | | | | f | fc | Max. Deviation (MHz) | Max. Deviation (ppm) |
| V nom (V) | 120 | T (°C) | 0 | 5825.0264 | 5825 | 0.0264 | 4.5252 |
| | | T (°C) | 10 | 5825.0768 | 5825 | 0.0768 | 13.1849 |
| | | T (°C) | 20 | 5825.0856 | 5825 | 0.0856 | 14.6969 |
| | | T (°C) | 30 | 5825.0796 | 5825 | 0.0796 | 13.6599 |
| | | T (°C) | 40 | 5825.0129 | 5825 | 0.0129 | 2.2167 |
| Limits | | | | ±20ppm | | | |
| Result | | | | Complies | | | |

## 13. OPERATION IN THE ABSENCE OF INFORMATION TO THE TRANSMIT

### 13.1 Requirement

15.407(c) requirement:
The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signal ling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

### 13.2 Test Results

Operation in the absence of information to the transmit:

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling
signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission. (manufacturer declare )

## 14. ANTENNA REQUIREMENT

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.
15.247(b) (4) requirement:
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.

**EUT Antenna:**

The antenna is Dipole antenna and no consideration of replacement. The best case gain of the antenna is
WiFi (5G) module1:
WiFi (5.2G): ANT1: 2.56dBi, ANT2: 2.56dBi
WiFi (5.3G): ANT1: 3.2dBi, ANT2: 3.2dBi
WiFi (5.6G): ANT1: 2.87dBi, ANT2: 2.87dBi
WiFi (5.8G): ANT1: 3.43dBi, ANT2: 3.43dBi
WiFi (5G) module2 (OPS computer):
WiFi (5.2G): 1.11dBi
WiFi (5.3G): 2.68dBi
WiFi (5.6G): 5.40dBi
WiFi (5.8G): 4.26dBi

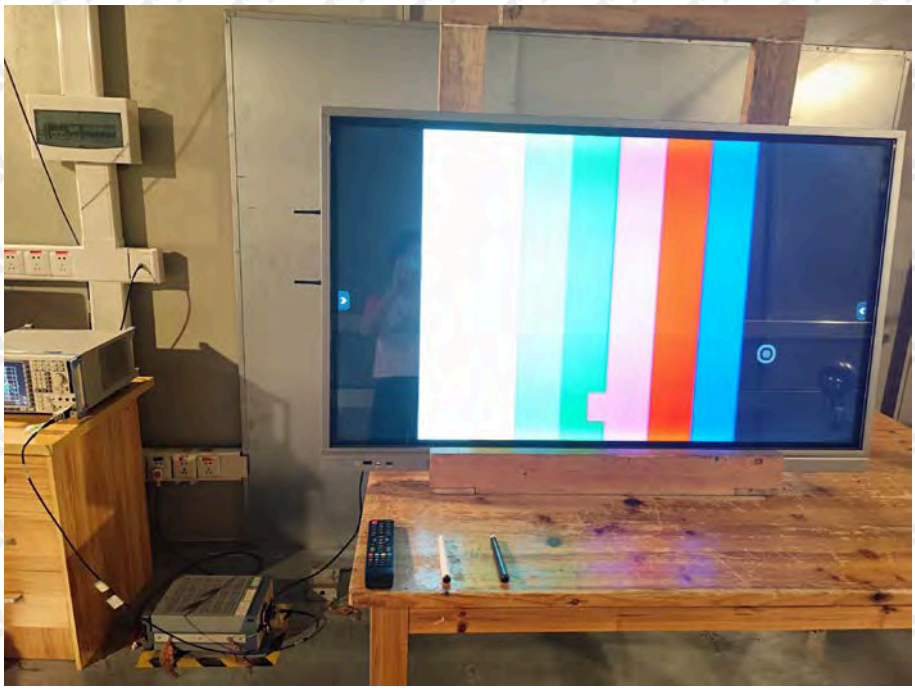
## 15. EUT TEST SETUP PHOTOGRAPHS

Spurious emissions

Below 1G

Above 1G

Conducted emissions



※※※※※ **END OF REPORT** ※※※※※