

UN6GHZ PRE-APPROVAL GUIDANCE CHECKLIST

1. Antennas

1.1 Information for all the antennas, i.e., type, gain and relative positions within host, must be included in the filing.

Please refer to page 20 of “4790887256-1-RF-4-WIFI 6G FCC ISSED ” for antenna specification.

Please refer to document “Internal Photos” for the antenna positions.

1.2 Show how the (aggregate, if applicable) antenna gain was computed/measured (as in TCB Workshop Presentation Aggregate Antenna Gain Review, April 2021). Provide equation(s) used to calculate Directional Gain and provide example calculation showing how the DG was calculated with the antenna gain of individual antennas. Provide details (references or attached documents) on how the individual antenna gains were derived, i.e., declared by the host manufacturer, based on data sheet, or measured. Since the CBP needs to detect a small signal, the worst case scenario to consider is when the receiver has the lowest antenna gain.

The device has the same maximum antenna gain for each antenna.

According to FCC KDB 662911 D01v02r01:

CDD Directional Gain = Antenna Gain + Array Gain, Array Gain = 0 dB for $NANT \leq 4$;

please refer to page 20 of “4790887256-1-RF-4-WIFI 6G FCC ISSED”

For output power measurements:

Directional gain= GANT + Array Gain = 2 dBi

GANT : equal to the gain of the antenna having the highest gain

Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$

For power spectral density (PSD) measurements:

Directional gain= GANT + Array Gain = 5.01 dBi

Array Gain = $10 \log(NANT/NSS)$ dB.

NANT : number of transmit antennas

NSS : number of spatial streams, The worst case directional gain will occur when $NSS = 1$

For TX Beamforming:

Directional gain= GANT + $10 \log(NANT/NSS)$ = 5.01 dBi

1.3 For conducted test in MIMO cases, show that the testing was done for that path that has the lowest antenna gain.

The device has the same maximum antenna gain for each antenna.

2. Contention Based Protocol (CBP)

2.1 CBP testing shall be performed on one channel in each sub-band of operation for both narrowest and widest bandwidths.

Please refer to page 469-470 of “4790887256-1-RF-4-WIFI 6G FCC ISD” for the test channel and bandwidth information as follows. The narrowest and widest bandwidths were tested for each UNII band.

Test Mode	Antenna	EUT Frequency	AWGN Frequency	Injected	Antenna Gain	Path Loss	Adjusted Power	Limit	UT Tx Status (Note1)	Verdict				
		[MHz]	[MHz]	[dBm]	[dBi]	[dB]	[dBm]	[dBm]						
11BE20	Ant5	6115	6115	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-86.91	1.29	2	-68.20	-82	Minimal	PASS				
				-82.91	1.29	2	-62.20	-82	OFF	PASS				
		6435	6435	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-87.01	1.29	2	-68.30	-82	Minimal	PASS				
				-83.10	1.29	2	-62.39	-82	OFF	PASS				
		6535	6535	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-86.21	1.29	2	-65.50	-82	Minimal	PASS				
				-83.19	1.29	2	-62.48	-82	OFF	PASS				
		6895	6895	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-85.51	1.29	2	-64.80	-82	Minimal	PASS				
				-83.21	1.29	2	-62.50	-82	OFF	PASS				
11BE320	Ant5	6110	6110	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-86.91	1.29	2	-65.20	-82	Minimal	PASS				
				-83.08	1.29	2	-62.37	-82	OFF	PASS				
				6265	6265	-70.71	1.29	2	-70.00	-82	ON	PASS		
						-87.91	1.29	2	-67.20	-82	Minimal	PASS		
						-82.78	1.29	2	-62.07	-82	OFF	PASS		
				6420	6420	-70.71	1.29	2	-70.00	-82	ON	PASS		
						-86.96	1.29	2	-68.25	-82	Minimal	PASS		
						-83.09	1.29	2	-62.38	-82	OFF	PASS		
		6430	6430	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-86.21	1.29	2	-65.50	-82	Minimal	PASS				
				-83.20	1.29	2	-62.49	-82	OFF	PASS				
				6585	6585	-70.71	1.29	2	-70.00	-82	ON	PASS		
						-86.91	1.29	2	-68.20	-82	Minimal	PASS		
						-83.04	1.29	2	-62.33	-82	OFF	PASS		
				6740	6740	-70.71	1.29	2	-70.00	-82	ON	PASS		
						-85.91	1.29	2	-65.20	-82	Minimal	PASS		
						-83.03	1.29	2	-62.32	-82	OFF	PASS		
		6750	6750	-70.71	1.29	2	-70.00	-82	ON	PASS				
				-86.51	1.29	2	-65.80	-82	Minimal	PASS				
				-83.02	1.29	2	-62.31	-82	OFF	PASS				
				6905	6905	-70.71	1.29	2	-70.00	-82	ON	PASS		
						-87.91	1.29	2	-67.20	-82	Minimal	PASS		
						-83.11	1.29	2	-62.40	-82	OFF	PASS		
				7060	7060	-70.71	1.29	2	-70.00	-82	ON	PASS		
								-85.91	1.29	2	-65.20	-82	Minimal	PASS
								-83.10	1.29	2	-62.39	-82	OFF	PASS

Note 1: The AWGN level is reported for the following conditions:
- OFF = AWGN level at which no transmission is detected, consistently for a minimum period of 10 seconds
- Minimal: AWGN level at which the system begins to trigger the transmission switch-off, albeit not being kept off consistently
- ON = AWGN level at which no impact on the transmission is detected, consistently for a minimum period of 10 seconds.

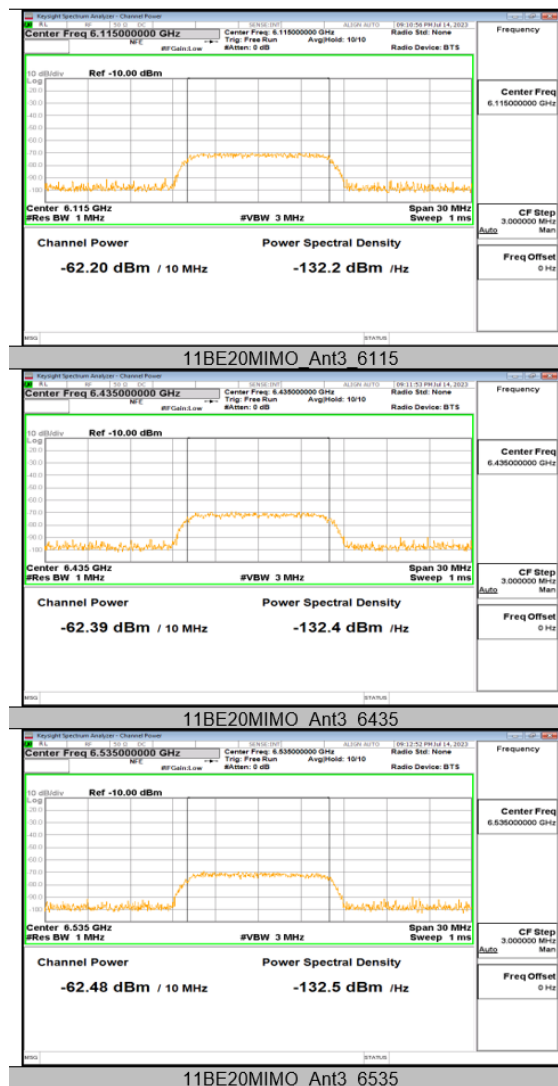
Note 2: Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

2.2 Use three separate 10 MHz AWGN signals when testing a 320 MHz channel. The simulated incumbent signal must be a 10 MHz wide AWGN signal

Please refer to page 470-472 of “4790887256-1-RF-4-WIFI 6G FCC ISSED” for the test summary information.

Test Mode	Antenna	EUT Frequency [MHz]	AWGN Interference Frequency [MHz]		Test Number [n]	Number Detected [n]	Result [%]	Limit [%]	Verdict
11BE20MIMO	Ant4	6115	Center	6115	10	10	100	90	PASS
		6435	Center	6435	10	10	100	90	PASS
		6535	Center	6535	10	10	100	90	PASS
		6895	Center	6895	10	10	100	90	PASS
11BE320MIMO	Ant4	6265	Low	6110	10	10	100	90	PASS
			Center	6265	10	10	100	90	PASS
			High	6420	10	10	100	90	PASS
		6585	Low	6430	10	10	100	90	PASS
			Center	6585	10	10	100	90	PASS
			High	6740	10	10	100	90	PASS
		6905	Low	6750	10	10	100	90	PASS
			Center	6905	10	10	100	90	PASS
			High	7060	10	10	100	90	PASS

Please refer to page 473~474 of “4790887256-1-RF-4-WIFI 6G FCC ISSED” for the AWGN signal plots.



Please refer to page 469-470 of “4790887256-1-RF-4-WIFI 6G
FCC ISFD” for lowest AWGN signal detectable by EUT.

Note 1: The AWGN level is reported for the following conditions:

- OFF = AWGN level at which no transmission is detected, consistently for a minimum period of 10 seconds
- Minimal: AWGN level at which the system begins to trigger the transmission switch-off, albeit not being kept off consistently
- ON = AWGN level at which no impact on the transmission is detected, consistently for a minimum period of 10 seconds.

Note 2: Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

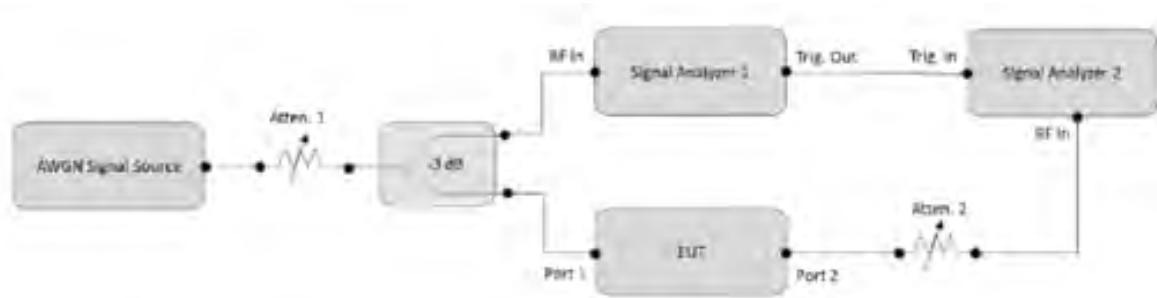
The test was performed with a lowest AWGN signal level and increased until the EUT detects and stop transmission, and the AWGN level of AWGN signal detected (Stop but with Beacon signal) and AWGN level of the stopped transmission are recorded in the report.

Test Mode	Antenna	EUT Frequency	AWGN Frequency	Injected	Antenna Gain	Path Loss	Adjusted Power	Limit	UT Tx Status (Note1)	Verdict
		[MHz]	[MHz]	[dBm]	[dBi]	[dB]	[dBm]	[dBm]		
11BE20	Ant5	6115	6115	-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.91	1.29	2	-66.20	-62	Minimal	PASS
				-62.91	1.29	2	-62.20	-62	OFF	PASS
		6435	6435	-70.71	1.29	2	-70.00	-62	ON	PASS
				-67.01	1.29	2	-66.30	-62	Minimal	PASS
				-63.10	1.29	2	-62.39	-62	OFF	PASS
		6535	6535	-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.21	1.29	2	-65.50	-62	Minimal	PASS
				-63.19	1.29	2	-62.48	-62	OFF	PASS
		6895	6895	-70.71	1.29	2	-70.00	-62	ON	PASS
				-65.51	1.29	2	-64.80	-62	Minimal	PASS
				-63.21	1.29	2	-62.50	-62	OFF	PASS
11BE320	Ant5	6110	6110	-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.91	1.29	2	-66.20	-62	Minimal	PASS
				-63.08	1.29	2	-62.37	-62	OFF	PASS
				-70.71	1.29	2	-70.00	-62	ON	PASS
				-67.91	1.29	2	-67.20	-62	Minimal	PASS
				-62.78	1.29	2	-62.07	-62	OFF	PASS
				-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.96	1.29	2	-66.25	-62	Minimal	PASS
				-63.09	1.29	2	-62.38	-62	OFF	PASS
		6265	6265	-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.21	1.29	2	-65.50	-62	Minimal	PASS
				-63.20	1.29	2	-62.49	-62	OFF	PASS
				-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.91	1.29	2	-66.20	-62	Minimal	PASS
				-63.04	1.29	2	-62.33	-62	OFF	PASS
				-70.71	1.29	2	-70.00	-62	ON	PASS
				-65.91	1.29	2	-65.20	-62	Minimal	PASS
				-63.03	1.29	2	-62.32	-62	OFF	PASS
		6420	6420	-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.51	1.29	2	-65.80	-62	Minimal	PASS
				-63.02	1.29	2	-62.31	-62	OFF	PASS
				-70.71	1.29	2	-70.00	-62	ON	PASS
				-67.91	1.29	2	-67.20	-62	Minimal	PASS
				-63.11	1.29	2	-62.40	-62	OFF	PASS
				-70.71	1.29	2	-70.00	-62	ON	PASS
				-65.91	1.29	2	-65.20	-62	Minimal	PASS
				-63.10	1.29	2	-62.39	-62	OFF	PASS
		6585	6585	-70.71	1.29	2	-70.00	-62	ON	PASS
				-66.21	1.29	2	-65.50	-62	Minimal	PASS
				-63.20	1.29	2	-62.49	-62	OFF	PASS
-70.71	1.29			2	-70.00	-62	ON	PASS		
-66.91	1.29			2	-66.20	-62	Minimal	PASS		
-63.04	1.29			2	-62.33	-62	OFF	PASS		
-70.71	1.29			2	-70.00	-62	ON	PASS		
-65.91	1.29			2	-65.20	-62	Minimal	PASS		
-63.03	1.29			2	-62.32	-62	OFF	PASS		
-70.71	1.29			2	-70.00	-62	ON	PASS		
-66.51	1.29			2	-65.80	-62	Minimal	PASS		
-63.02	1.29			2	-62.31	-62	OFF	PASS		
6740	6740	-70.71	1.29	2	-70.00	-62	ON	PASS		
		-66.91	1.29	2	-66.20	-62	Minimal	PASS		
		-63.03	1.29	2	-62.32	-62	OFF	PASS		
		-70.71	1.29	2	-70.00	-62	ON	PASS		
		-67.91	1.29	2	-67.20	-62	Minimal	PASS		
		-63.11	1.29	2	-62.40	-62	OFF	PASS		
		-70.71	1.29	2	-70.00	-62	ON	PASS		
		-65.91	1.29	2	-65.20	-62	Minimal	PASS		
		-63.10	1.29	2	-62.39	-62	OFF	PASS		
6905	6905	-70.71	1.29	2	-70.00</					

2.5 If conducted measurements are used, the detection threshold needs to be corrected to refer to a 0 dBi gain antenna and include all the applicable losses (cables, etc.). For instance, the report should show (at least): Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

Conducted test is performed for this device.

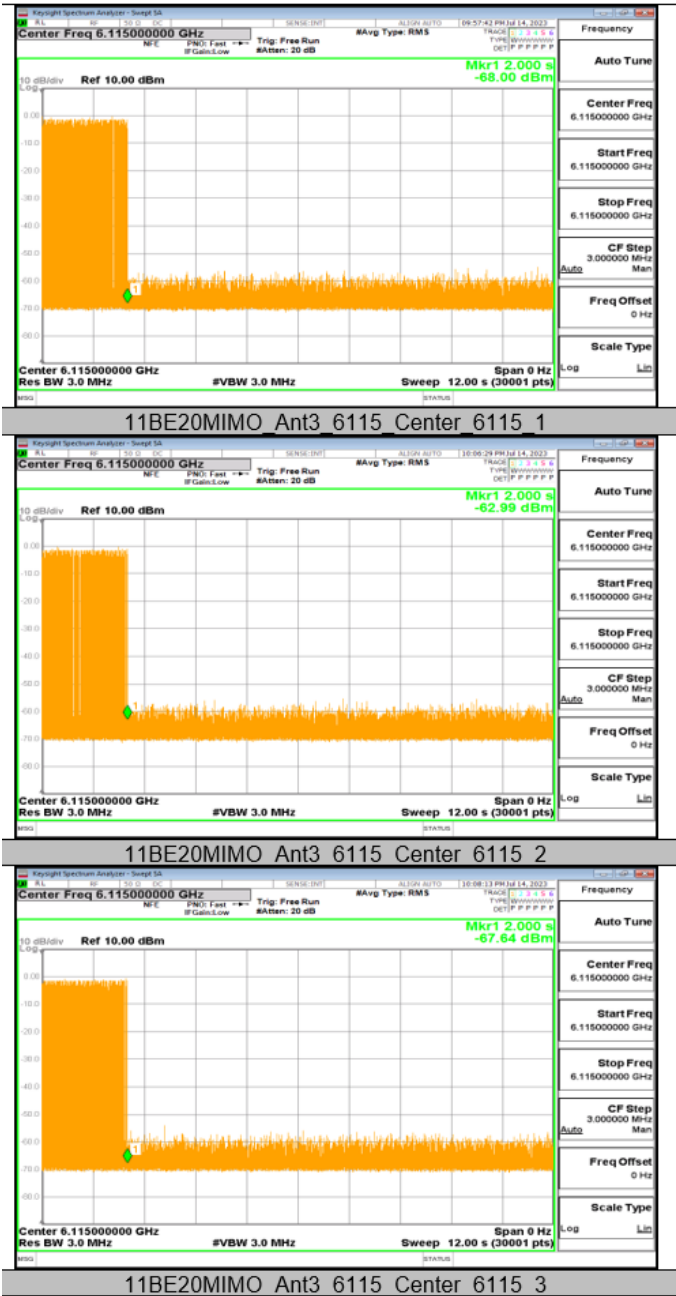
Please refer to page 39 of “4790887256-1-RF-4-WIFI 6G FCC ISSED” for the test setup diagram as below.



Please refer to page 38 of “4790887256-1-RF-4-WIFI 6G FCC ISSED” for the relevant description.

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT. Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
4. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
5. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
8. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
9. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
10. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

2.6 Include plots showing EUT has stopped transmitting after detection of AWGN signal. Please refer to page 475-488 of “4790887256-1-RF-4-WIFI 6G FCC ISER” for the test result. Following is example.



2.7 Describe whether channel puncturing and/or bandwidth reduction mechanisms supported. The report needs to include a plot as an example for at least one of the AWGN signals used.

Not Support.

2.8 If radiated testing is used, show that spot-checks were done to identify which side of the EUT has the lowest sensitivity to the incumbent signal detection, and that side was indeed chosen for the test.

Conducted test is performed for this device.

3. Client Device Limitations

This device is not a client device.

4. Emission Mask

4.1 Power spectral density suppression complies with 47 CFR § 15.407(b)(6).

Please refer to APPENDIX E Dof “4790887256-1-RF-4-WIFI 6G FCC ISSED” for the test result of power spectral density suppression.

4.2 If EUT supports OFDMA discuss testing of partial Resource Unit (RU) configurations. In any case the shape of the mask shall be based on full RU.

EUT supports one configuration only in 802.11ax/be full RU mode.
please also check page 9 on operation description.

■

4.3 OOB limits only apply outside of the 5.925-7.125 GHz band. All in-band emissions need to meet the channel mask. In case a higher RBW for the in-Band Emissions Mask is used (i.e., a more conservative case) that should be noted.

Please refer to Appendix E of “4790887256-1-RF-4-WIFI 6G FCC ISSED”
for the test result of channel mask

5. Filing

99% of the occupied bandwidth must be contained within all the U-NII sub bands authorized for that equipment class.

Please refer to Appendix A2 of “4790887256-1-RF-4-WIFI 6G FCC ISSED” for the test result of OBW

6. Hearing Aid Compatibility (HAC)

Not Applicable.

7. Labelling

7.1 Label showing indoor only for Subordinate and APs.

Please refer to the document “Label and Label Location”. The label showing “Indoor User only”.)

7.2 E-labelling may be acceptable if proper justification is provided

Not Applicable.

8. Modular Certifications (when applicable)

Not Applicable.

9. RF Exposure

9.1 Demonstrate applicable classification (portable/mobile/fixed) in reference to worst-case scenario use cases

The RF Exposure report is “4790887256-1-RF-5_FCC MPE Report”. Page 8 of the report states the calculated distance is 20 cm.

9.2 Address $f > 6$ GHz RF exposure via most recent applicable KDB or TCB Workshop procedures.

“4790887256-1-RF-5_FCC MPE Report” was used the most recent KDB to count the RF exposure.

9.3 Address all applicable simultaneous transmission conditions using the compliance condition $TER \leq 1$.

The RF Exposure report is “4790887256-1-RF-5_FCC MPE Report”. Page 8 of the report states that the device compliance simultaneous transmission conditions.

10. Security

Provide specific exhibit with device security description is required (complying with 47 CFR § 15.407(i))

please refer to "Software Security Requirements Cover Letter"

11. Spurious Emissions

Show that measurements are made at the prescribed antenna heights, per KDB Publication 987594 D01, including measurements along all three axes, as per ANSI C63.10.

Spurious Emissions test items refer to page 48-188 of "4790887256-1-RF-4-WIFI 6G FCC ISSED".

All the test is performed according to the KDB 987594 and ANSI C63.10 requirements.

For spurious emission test, every axis (X, Y, Z) was also verified. The test results shown in the report represent the worst-case emissions.

12. Standard Power Access Point and Fixed Client

Provide Co-location General Description document and Geolocation Justification Report. Additionally, if applicable, provide Geolocation Accuracy After a Power Cycle description.

This device does not support Geolocation.

13 AFC DUT Test Harness Report

A separate test report showing EUT meets the AFC testing requirements including the Tool Report that is provided from the AFC DUT test harness and the applicable DUT spectrum inquiry request/response logs as appendices.

This device does not support AFC DUT.

14. Operating Modes

List all modes of operation, such as:

1. Is channel puncturing supported?
This device does not support channel puncturing
2. If indoor AP is composite of LPI and St. power, does it support dividing a single channel between LPI client and Standard client? And if so, is power boosting supported?
This device does not support dividing a single channel between LPI client and Standard client?
3. Partial RU configurations supported?
This device does not support Partial RU configurations