

## WiFi 7 Testing with LANforge

WiFi 7 builds on WiFi 6 features and adds some new features of its own. The 6Ghz band now allows up to 320Mhz wide bandwidths, and MCS encoding rates are up to MCS-13. This means even a 2x2 device can reach on-air encoding rate near 5Gbps, for total data throughput in the 4Gbps range.

New features such as Multi-Link Operation (MLO) should help WiFi devices take advantage of multiple bands concurrently, allowing high throughput when close to the AP on 6Ghz band but also allowing sustained connectivity far from the AP on 2.4Ghz band.

### WiFi 7 Key Features



### Wi-Fi 7 Key Features and areas of testing



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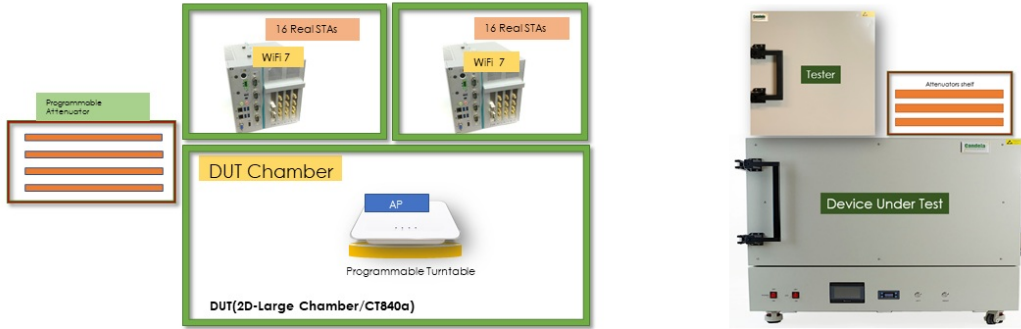
### Fully Automated

Candela Technologies offers a fully automated Wi-Fi 7 test systems. This includes all the required test hardware, including:

- multi-station emulator
- traffic generator
- RF enclosures
- turntable
- and programmable attenuators

### Test Cases

# WiFi7 Test cases/Features Covered (802.11be):



**Throughput Benchmark**  
This test gives the 4G performance with different packet sizes, channel BWs, traffic types, MIMO types.



**Client Capacity**  
WiFi Capacity test is designed to measure performance of an Access Point when handling several 4G WiFi Stations.



**Near/Far Clients, Band Steering**  
Measure the performance and stability of the 4G clients based on low and high RSSI levels



**Wider Bandwidth - 320Mhz**  
Supports bandwidth upto 320Mhz



**Rate vs Range vs Orientation**  
This test measures the 4G performance over distance and different antenna orientation of the access point.



**40% QAM**  
40%-QAM offers the potential for extremely high data rates. It also requires a high signal-to-noise ratio (SNR) for reliable communication



**Latency**  
This test intends to verify latency under low, high and maximum AP traffic load with multiple stations



**Airtime Fairness, QoS**  
Airtime Fairness Test intends to verify the capability of WiFi device to ensure the fairness of airtime usage.

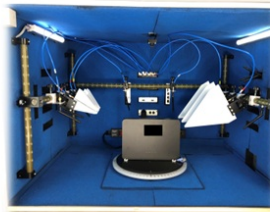
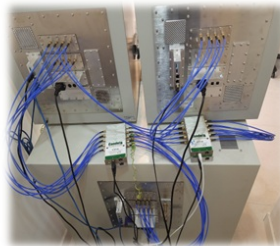


**MLO (Coming in early 2024)**  
It enables devices to simultaneously send and receive data across different frequency bands and channels.

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## Test Bed Images

### Testbed Images



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## WiFi 7 Multi-Link Operation (MLO) Feature

# Multi-Link Operation MLO:



A Client can connect only to a single band of the AP at any given time

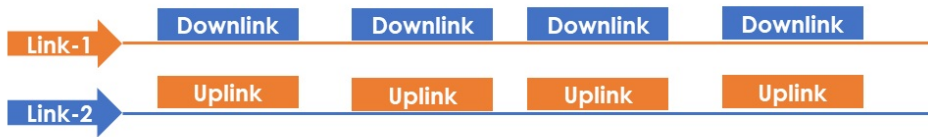
A Client can connect to multiple bands at the same time to get the best performance characteristics of each band

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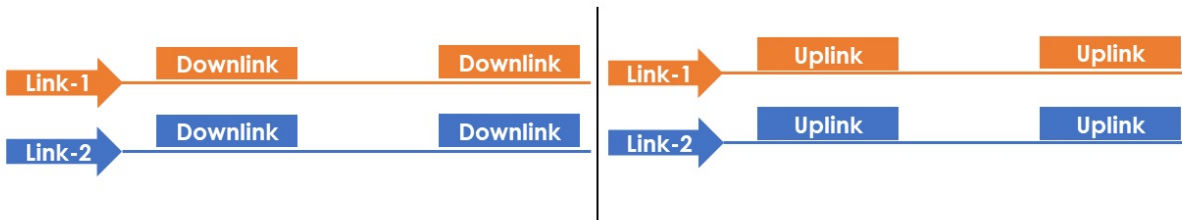
# Multi-Link Operation variants:



## STR Mode (Simultaneous Transmit and Receive Operation):



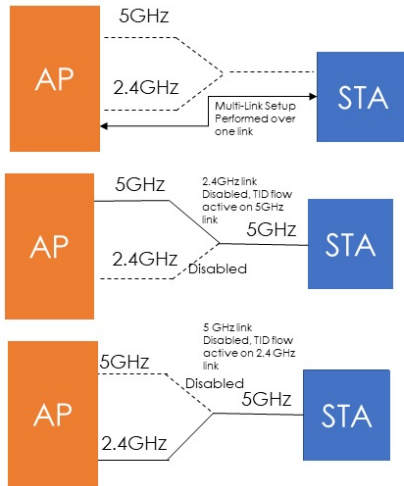
## NSTR Mode (Non simultaneous Transmit and Receive Operation):



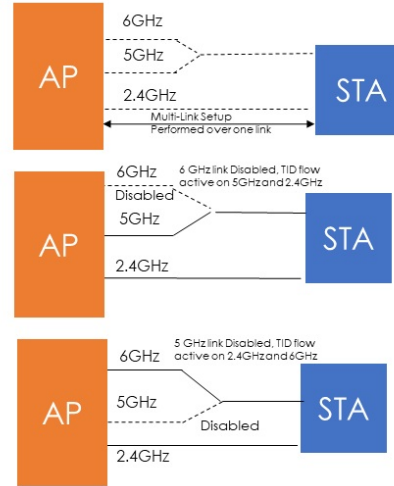
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# Types of Multi-Link Operation:

## Multi-Link Single Radio



## Multi-Link Multi Radio

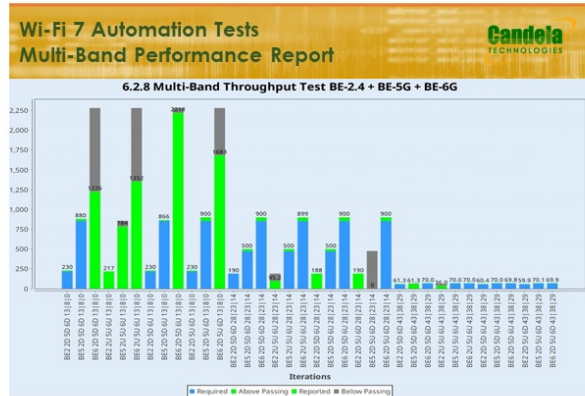
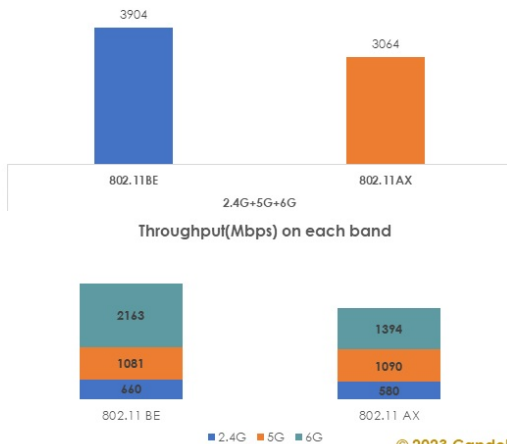


## Multi-Band throughput test

### Wi-Fi 7 Multi-Band Throughput Test:

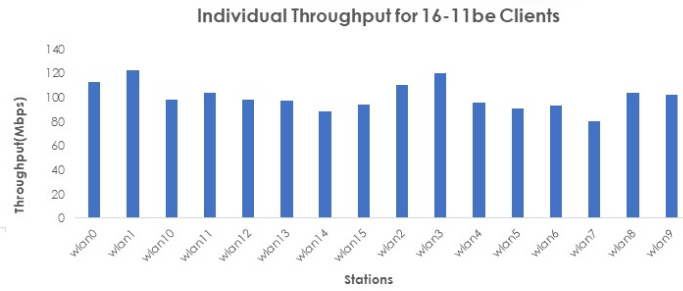
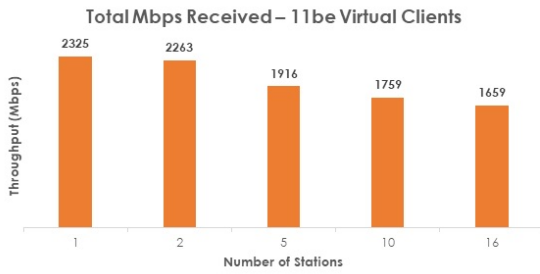
This test creates each client on 2.4, 5 and 6Ghz bands and run the traffic simultaneously. The Multi Band Performance test intends to verify that the Wi-Fi AP throughput with multiple bands active with a single station on each band. The configured speed will be 20% higher than the passing value for MTU sized frames in the throughput test. If the throughput test was skipped, then fixed values will be used.

Multi-Band Throughput-TCP Download



## WiFi-7 Capacity test with 16 Stations

# Wi-Fi 7 Client Capacity Test

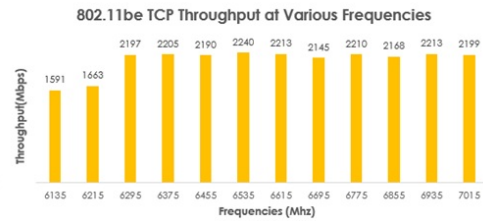
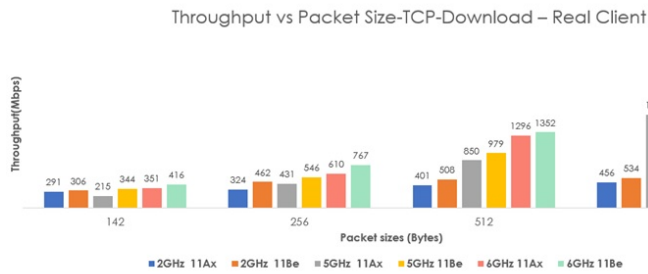


The Candela Wi-Fi Capacity test is designed to measure performance of an Access Point when handling several 6E Wi-Fi Stations. The test allows the user to increase the number of stations in user defined steps for each test iteration and measure the per station and the overall throughput for each trial. Along with throughput other measurements made are client connection times, % packet loss, DHCP times and more. The expected behavior is for the AP should be able to handle several stations (within the limitations of the AP specs) and make sure all stations get a fair amount of airtime both in the upstream and downstream.

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## WiFi-7 Throughput on Android Device

### Wi-Fi 7 Throughput Benchmarking Test:

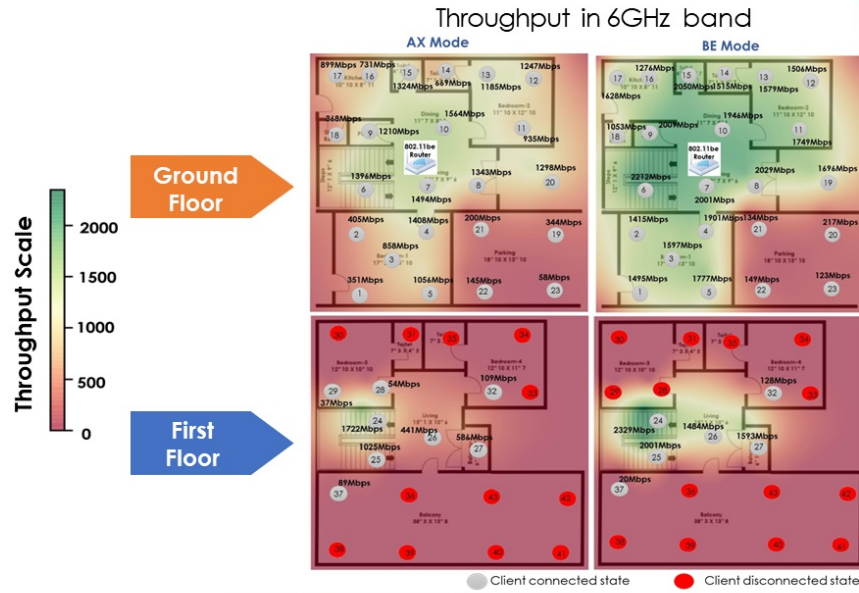


The Candela Wi-Fi data plane test is designed to conduct an automatic testing of all combinations of station types, MIMO types, Channel Bandwidths, Traffic types, Traffic direction, Frame sizes etc.... It will run a quick throughput test at every combination of these test variables and plot all the results in a set of charts to compare performance. The user is allowed to define an intended load as a percentage of the max theoretical PHY rate for every test combination. The expected behavior is that for every test combination the achieved throughput should be at least 70% of the theoretical max PHY rate under ideal test conditions. This test provides a way to go through hundreds of combinations in a fully automated fashion and very easily find patterns and problem areas which can be further debugged using more specific testing. The below chart shows the throughput with all the 6E channels.

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## Test-House coverage for WiFi-6 vs WiFi-7

# 802.11be Test-house Results:



## Lead Times

LANforge WiFi 7 Test systems are expected to be available by December of 2023. Most LANforge systems can generally be shipped within 2-3 weeks of customer PO. RF chambers and attenuators may need 6-8 weeks of lead time. Direct-from-the-factory shipping is available for the RF chambers to decrease shipping costs and lead times.

## TaaS/Onsite Support

Customers with only occasional test needs can use our Test as a Service option. Candela engineers can do the testing for you in our fully equipped test lab and provide a detailed test report with recommendations.

For more information, please contact [sales@candelatech.com](mailto:sales@candelatech.com) or give us a call at: 1-360-380-1618

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