

# Report for: Wifi Capacity Test

Thu Aug 04 23:48:32 PDT 2022

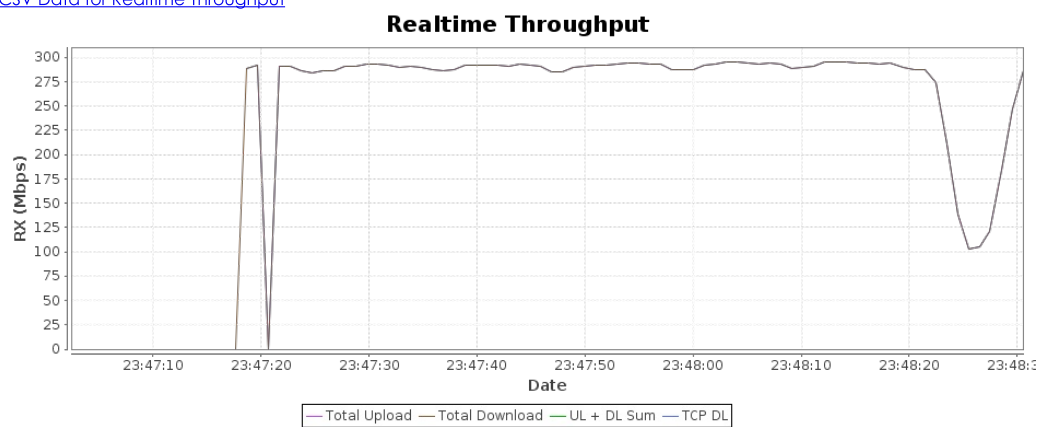


## Objective

The Candela WiFi Capacity test is designed to measure performance of an Access Point when handling different amounts of WiFi 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, Fairness, % packet loss, DHCP times and more. The expected behavior is for the AP to 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. An AP that scales well will not show a significant over-all throughput decrease as more stations are added.

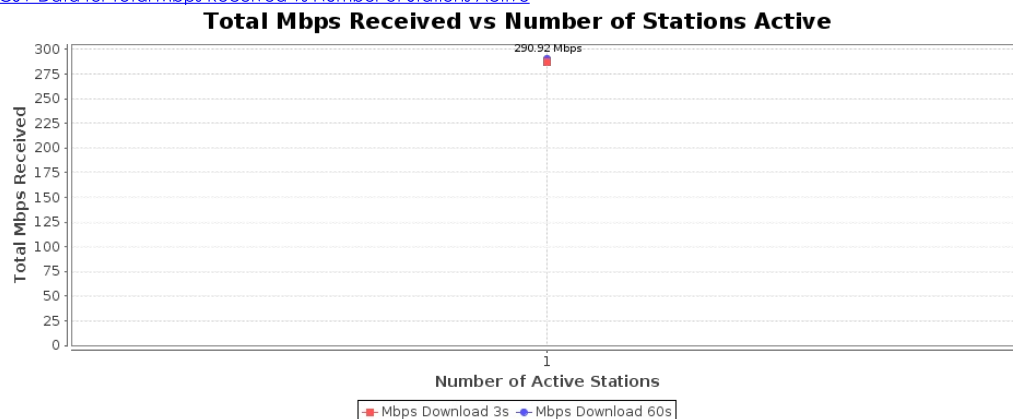
Realtime Graph shows summary download and upload RX Goodput rate of connections created by this test. Goodput does not include Ethernet, IP, UDP/TCP header overhead.

[CSV Data for Realtime Throughput](#)



Total Megabits-per-second transferred. This only counts the protocol payload, so it will not count the Ethernet, IP, UDP, TCP or other header overhead. A well behaving system will show about the same rate as stations increase. If the rate decreases significantly as stations increase, then it is not scaling we

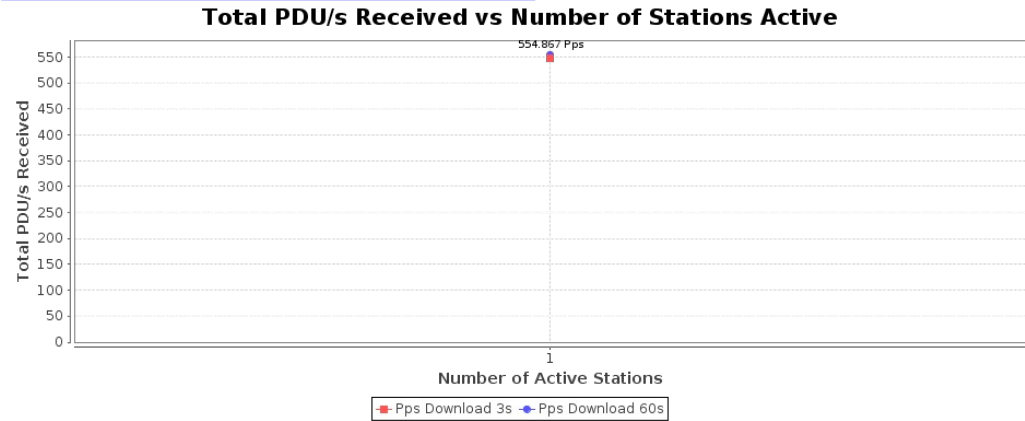
[CSV Data for Total Mbps Received vs Number of Stations Active](#)



Protocol-Data-Units received. For TCP, this does not mean much, but for UDP connections, this correlates to packet size. If the PDU size is larger than what fits into a single frame, then the network stack will

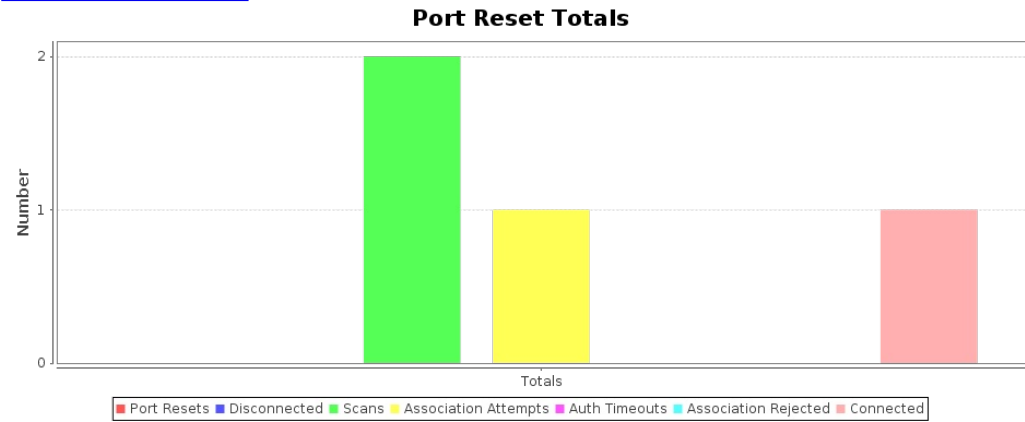
segment it accordingly. A well behaving system will show about the same rate as stations increase. If the rate decreases significantly as stations increase, then it is not scaling well.

[CSV Data for Total PDU/s Received vs Number of Stations Active](#)



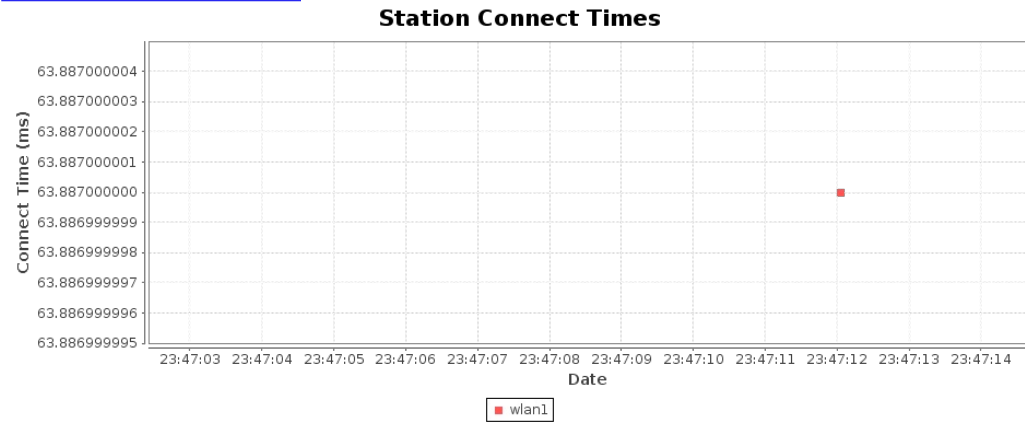
Station disconnect stats. These will be only for the last iteration. If the 'Clear Reset Counters' option is selected, the stats are cleared after the initial association. Any re-connects reported indicate a potential stability issue. Can be used for long-term stability testing in cases where you bring up all stations in one iteration and then run the test for a longer duration.

[CSV Data for Port Reset Totals](#)



Station connect time is calculated from the initial Authenticate message through the completion of Open or RSN association/authentication.

[CSV Data for Station Connect Times](#)



Wifi-Capacity Test requested values

|                    |   |
|--------------------|---|
| Station Increment: | 1 |
|--------------------|---|

|                           |   |
|---------------------------|---|
| Loop Iterations:          | Single (1)  |
| Duration:                 | 1 min (1 m)   |
| Protocol:                 | TCP-IPv4  |
| Layer 4-7 Endpoint:       | NONE  |
| Payload Size:             | AUTO  |
| MSS                       | AUTO  |
| Total Download Rate:      | 1G (1 Gbps)   |
| Total Upload Rate:        | Zero (0 bps)  |
| Percentage TCP Rate:      | 10% (10%)   |
| Set Bursty Minimum Speed: | Burst Mode Disabled (-1)                                      |
| Randomize Rates           | true  |
| Leave Ports Up            | false   |
| Socket buffer size:       | OS Default  |
| Settle Time:              | 5 sec (5 s)   |
| Rpt Timer:                | fast (1 s)  |
| IP ToS:                   | Best Effort (0)   |
| Multi-Conn:               | AUTO  |
| Show-Per-Iteration-Charts | true  |
| Show-Per-Loop-Totals      | true  |
| Hunt-Lower-Rates          | false   |
| Show Events               | true  |
| Clear Reset Counters      | false   |
| CSV Reporting Dir         | /home/lanforge/report-data/wifi-cap-csv-data-2022-08-04_23.47 |
| Build Date                | Fri 17 Jun 2022 05:02:03 PM PDT                               |
| Build Version             | 5.4.5   |
| Git Version               | e4afc0739ee746116945e553e48705b0b0eeb7a5                      |
| Ports                     | 1.1.eth1 1.1.wlan1  |
| Firmware                  | 0. 6-1  |
| Machines                  | ct523c-0b31   |

## Requested Parameters:

|                          |              |                      |      |                      |
|--------------------------|--------------|----------------------|------|----------------------|
| Download Rate:           | Per station: | 1000000000 ( 1 Gbps) | All: | 1000000000 ( 1 Gbps) |
| Upload Rate:             | Per station: | 0 ( 0 bps)           | All: | 0 ( 0 bps)           |
| Total:                   |              |                      |      | 1000000000 ( 1 Gbps) |
| Station count:           |              |                      |      | 1                    |
| Connections per station: |              |                      |      | 1                    |
| Payload (PDU) sizes:     |              |                      |      | AUTO (AUTO)          |

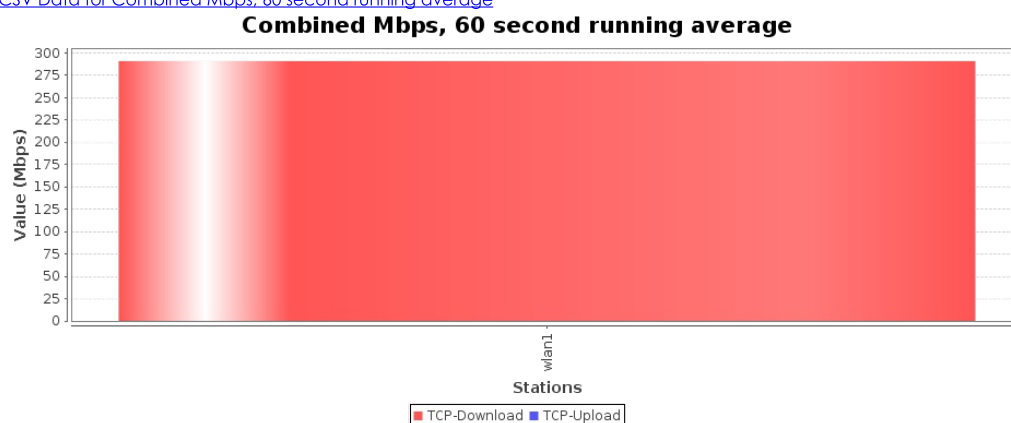
## Observed Rate:

|  |    |        |    |        |    |        |     |        |
|--|----|--------|----|--------|----|--------|-----|--------|
|  | Cx | 290.92 | Cx | 290.92 | Cx | 290.92 | All | 290.92 |
|--|----|--------|----|--------|----|--------|-----|--------|

|                  |         |             |         |             |         |             |         |             |
|------------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| Download Rate:   | Min:    | Mbps        | Ave:    | Mbps        | Max:    | Mbps        | Cx:     | Mbps        |
| Upload Rate:     | Cx Min: | 0 bps       | Cx Ave: | 0 bps       | Cx Max: | 0 bps       | All Cx: | 0 bps       |
| Total:           |         |             |         |             |         |             |         | 290.92 Mbps |
| Aggregated Rate: | Min:    | 290.92 Mbps | Avg:    | 290.92 Mbps | Max:    | 290.92 Mbps |         |             |

This graph shows fairness. On a fair system, each station should get about the same throughput. In the download direction, it is mostly the device-under-test that is responsible for this behavior, but in the upload direction, LANforge itself would be the source of most fairness issues unless the device-under-test takes specific actions to ensure fairness.

[CSV Data for Combined Mbps, 60 second running average](#)



## Requested Parameters:

|                          |              |                      |      |                      |
|--------------------------|--------------|----------------------|------|----------------------|
| Download Rate:           | Per station: | 1000000000 ( 1 Gbps) | All: | 1000000000 ( 1 Gbps) |
| Upload Rate:             | Per station: | 0 ( 0 bps)           | All: | 0 ( 0 bps)           |
| Total:                   |              |                      |      | 1000000000 ( 1 Gbps) |
| Station count:           |              |                      |      | 1                    |
| Connections per station: |              |                      |      | 1                    |
| Payload (PDU) sizes:     |              |                      |      | AUTO (AUTO)          |

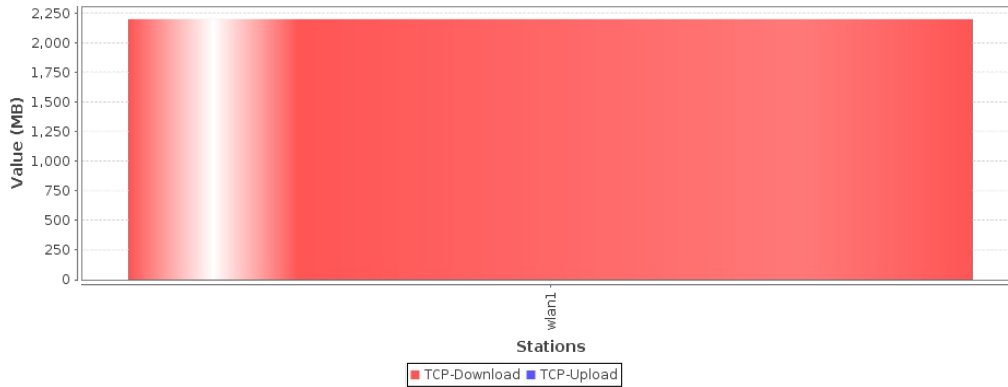
## Observed Amount:

|                  |         |          |         |          |         |          |         |          |
|------------------|---------|----------|---------|----------|---------|----------|---------|----------|
| Download Amount: | Cx Min: | 2.048 GB | Cx Ave: | 2.048 GB | Cx Max: | 2.048 GB | All Cx: | 2.048 GB |
| Upload Amount:   | Cx Min: | 0 B      | Cx Ave: | 0 B      | Cx Max: | 0 B      | All Cx: | 0 B      |
| Total:           |         |          |         |          |         |          |         | 2.048 GB |

This graph shows fairness. On a fair system, each station should get about the same throughput. In the download direction, it is mostly the device-under-test that is responsible for this behavior, but in the upload direction, LANforge itself would be the source of most fairness issues unless the device-under-test takes specific actions to ensure fairness.

[CSV Data for Combined Received Megabytes, for entire 1 m run](#)

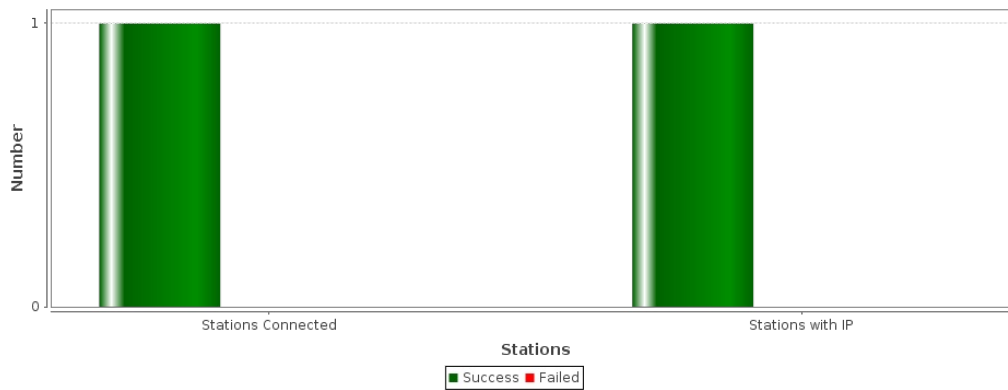
**Combined Received Megabytes, for entire 1 m run**



Maximum Stations Connected: 1  
 Stations NOT connected at this time: 0  
 Maximum Stations with IP Address: 1  
 Stations without IP at this time: 0

[CSV Data for Station Maximums](#)

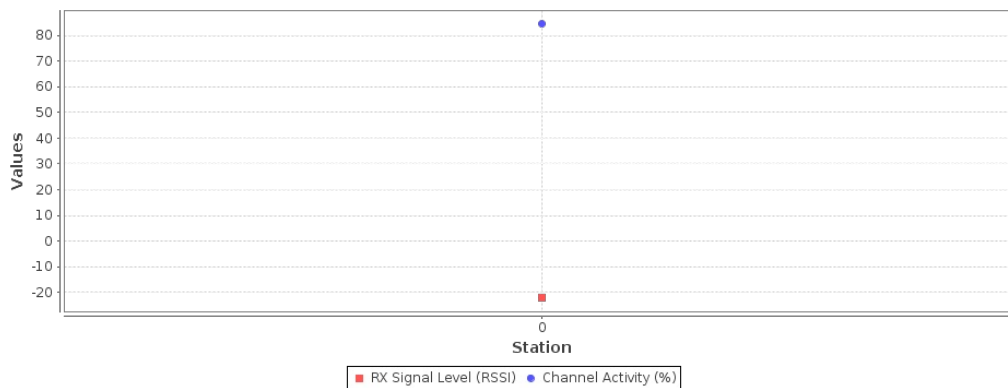
**Station Maximums**



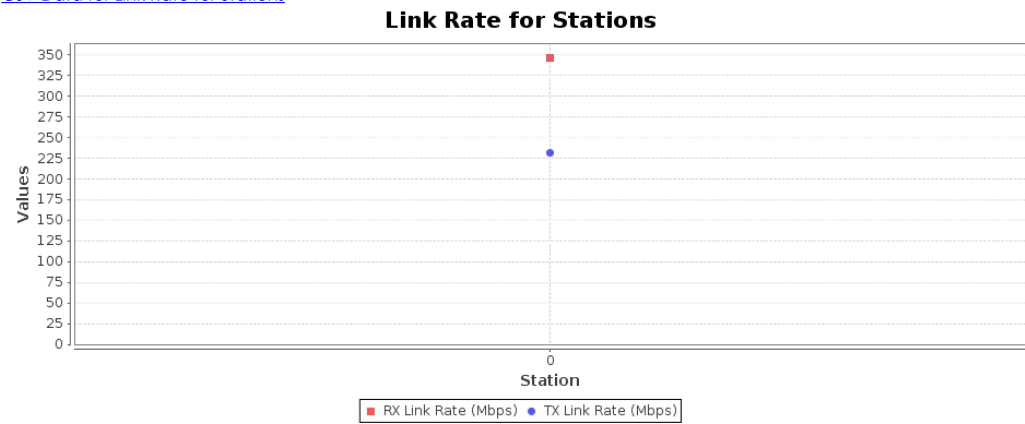
RF stats give an indication of how well how congested is the RF environment. Channel activity is what the wifi radio reports as the busy-time for the RF environment. It is expected that this be near 100% when LANforge is running at max speed, but at lower speeds, this should be a lower percentage unless the RF environment is busy with other systems.

[CSV Data for RF Stats for Stations](#)

**RF Stats for Stations**



Link rate stats give an indication of how well the rate-control is working. For rate-control, the 'RX' link rate corresponds to what the device-under-test is transmitting. If all of the stations are on the same radio, then the TX and RX encoding rates should be similar for all stations. If there is a definite pattern where some stations do not get good RX rate, then probably the device-under-test has rate-control problems. The TX rate is what LANforge is transmitting at.



[Key Performance Indicators CSV](#)

Scan Results for SSIDs used in this test.

BSS cc:19:a8:e6:cd:81(on wlan1) -- associated

last seen: 404521.633s [boottime]  
 TSF: 112916604 usec (0d, 00:01:52)  
 freq: 5180  
 beacon interval: 100 TUs  
 capability: ESS Privacy RadioMeasure (0x1011)  
 signal: -9.00 dBm  
 last seen: 257 ms ago  
 Information elements from Probe Response frame:  
 SSID: client\_connectivity\_al  
 Supported rates: 6.0\* 9.0 12.0 18.0 24.0\* 36.0 48.0 54.0  
 TPC report: TX power: 23 dBm  
 RSN:
 

\* Version: 1  
 \* Group cipher: CCMP  
 \* Pairwise ciphers: CCMP  
 \* Authentication suites: PSK  
 \* Capabilities: 16-PTKSA-RC 1-GTKSA-RC MFP-capable (0x008c)

BSS Load:

\* station count: 1  
 \* channel utilisation: 247/255  
 \* available admission capacity: 0 [\*32us]

RM enabled capabilities:

Capabilities: 0x32 0x00 0x00 0x00 0x00  
 Neighbor Report  
 Beacon Passive Measurement  
 Beacon Active Measurement  
 Nonoperating Channel Max Measurement Duration: 0  
 Measurement Pilot Capability: 0

HT capabilities:

Capabilities: 0x1ad  
 RX LDPC  
 HT20  
 SM Power Save disabled  
 RX HT20 SGI  
 TX STBC  
 RX STBC 1-stream  
 Max AMSDU length: 3839 bytes  
 No DSSS/CKK HT40  
 Maximum RX AMPDU length 65535 bytes (exponent: 0x003)  
 Minimum RX AMPDU time spacing: 4 usec (0x05)  
 HT RX MCS rate indexes supported: 0-31  
 HT TX MCS rate indexes are undefined

HT operation:

\* primary channel: 36  
 \* secondary channel offset: no secondary  
 \* STA channel width: 20 MHz  
 \* RIFS: 0  
 \* HT protection: no  
 \* non-GF present: 1  
 \* OBSS non-GF present: 0  
 \* dual beacon: 0  
 \* dual CTS protection: 0  
 \* STBC beacon: 0  
 \* L-SIG TXOP Prot: 0  
 \* PC0 active: 0  
 \* PC0 phase: 0

Extended capabilities:

\* Extended Channel Switching  
 \* BSS Transition  
 \* Interworking  
 \* QoS Map  
 \* Operating Mode Notification  
 \* Channel Schedule Management  
 \* Channel Schedule Management  
 \* 6  
 \* Max Number Of MSDUs In A-MSDU is

VHT capabilities:

VHT Capabilities (0x0f8b69b1):  
 Max MPDU length: 7991  
 Supported Channel Width: neither 160 nor 80+80  
 RX LDPC  
 short GI (80 MHz)  
 TX STBC  
 SU Beamformer  
 MU Beamformer

```

VHT RX MCS set:
  1 streams: MCS 0-9
  2 streams: MCS 0-9
  3 streams: MCS 0-9
  4 streams: MCS 0-9
  5 streams: not supported
  6 streams: not supported
  7 streams: not supported
  8 streams: not supported
VHT RX highest supported: 0 Mbps
VHT TX MCS set:
  1 streams: MCS 0-9
  2 streams: MCS 0-9
  3 streams: MCS 0-9
  4 streams: MCS 0-9
  5 streams: not supported
  6 streams: not supported
  7 streams: not supported
  8 streams: not supported
VHT TX highest supported: 0 Mbps
VHT operation:
  * channel width: 0 (20 or 40 MHz)
  * center freq segment 1: 36
  * center freq segment 2: 0
  * VHT basic MCS set: 0x0000
Transmit Power Envelope:
  * Local Maximum Transmit Power For 20 MHz: 25 dBm
HE capabilities:
  HE MAC Capabilities (0x000512081000):
    +HTC HE Supported
    TWT Responder
    BSR
    OM Control
    Maximum A-MPDU Length Exponent: 2
    OM Control UL MU Data Disable RX
  HE PHY Capabilities: (0x42002c00f438518000c00):
    HE40/HE80/5GHz
    242 tone RUs/5GHz
    LDPC Coding in Payload
    NDP with 4x HE-LTF and 3.2us GI
    Rx HE MU PPDU from Non-AP STA
    SU Beamformer
    SU Beamformee
    MU Beamformer
    Beamformee STS <= 80MHz: 3
    Sounding Dimensions <= 80MHz: 3
    Ng = 16 SU Feedback
    Codebook Size SU Feedback
    Triggered SU Beamforming Feedback
    PPE Threshold Present
    Max NC: 3
    TX 1024-QAM
    RX 1024-QAM
  HE RX MCS and NSS set <= 80 MHz
    1 streams: MCS 0-11
    2 streams: MCS 0-11
    3 streams: MCS 0-11
    4 streams: MCS 0-11
    5 streams: not supported
    6 streams: not supported
    7 streams: not supported
    8 streams: not supported
  HE TX MCS and NSS set <= 80 MHz
    1 streams: MCS 0-11
    2 streams: MCS 0-11
    3 streams: MCS 0-11
    4 streams: MCS 0-11
    5 streams: not supported
    6 streams: not supported
    7 streams: not supported
    8 streams: not supported
PPE Threshold 0x7b 0x1c 0xc7 0x71 0x1c 0xc7 0x71 0x1c 0xc7 0x71 0x1c 0xc7 0x71
WPS:
  * Version: 1.0
  * Wi-Fi Protected Setup State: 2 (Configured)
  * Response Type: 3 (AP)
  * UUID: adf4e098-1169-2efb-52cd-30431a11b6fd
  * Manufacturer: AlticeLabs
  * Model: AlticeLabs GR140DG
  * Model Number: GR140DG
  * Serial Number: 5054494EA8E6CD7F
  * Primary Device Type: 6-0050f204-1
  * Device name: FiberGateway
  * Config methods: Display
  * RF Bands: 0x3
  * Version2: 2.0
WMM:
  * Parameter version 1
  * u-APSD
  * BE: CW 15-1023, AIFS 3
  * BK: CW 15-1023, AIFS 7
  * VI: CW 7-15, AIFS 2, TXOP 3008 usec
  * VO: CW 3-7, AIFS 2, TXOP 1504 usec
802.11u Advertisement:
  Query Response Info: 0x7f
    Query Response Length Limit: 127
    ANQP

```

[Auxiliary files: wifi-cap-csv-data](#)

[META Information for Report for: Wifi Capacity Test](#)

