

TR-398 Issue 2

WiFi Performance Test Plan

Wed Feb 16 16:34:08 PST 2022



Test Setup Information	
Device Under Test	Anonymous Enterprise AX AP
Estimated Run Time	34 m
Actual Run Time	35.137 m

Objective

The TR-398 Issue 2 WiFi Performance test plan by the Broadband forum provides a comprehensive set of tests to qualify the performance of WiFi access points (APs) designed for residential and small office environments. Radio performance, Throughput, Connection Stability, Airtime Fairness, AP Co-existence, Mu_MIMO Performance, Spatial Consistency and Long-term Stability are some of the test areas covered in this test plan. The test plan is designed for service providers deploying in home WiFi APs to qualify the APs in the lab before deployment and for equipment makers to test during the development of the APs. Candela Technologies offers a fully automated TR-398 Issue 2 test system. The user can select from the list of 11 tests available in the GUI and all selected tests are run fully automated at one click of a button. Measurements are made and compared to the specified PASS/FAIL criteria in the TR-398 Issue 2 test plan and this report will show the summary PASS/FAIL results followed more detailed results for each test.

Summary Results

Test	Result	Candela Score	Elapsed	Info
Calibrate 802.11AX Zero Attenuation RSSI	Skipped	0	0	
Calibrate 802.11AC Zero Attenuation RSSI	Skipped	0	0	
6.1.1 Receiver Sensitivity Test	Skipped	0	0	
6.2.1 Maximum Connection Test (32-STA)	Skipped	0	0	
6.2.2 Maximum TCP Throughput Test	Skipped	0	0	
6.2.3 Airtime Fairness Test	Skipped	0	0	
Issue-3 Airtime Fairness Test	2.4Ghz FAIL 5Ghz FAIL	80	34.998 m	AC 5Ghz passed 8 / 9 AX 5Ghz passed 9 / 9 N 2.4Ghz passed 5 / 9 AX 2.4Ghz passed 6 / 9
Issue-3 Quality of Service Test	Skipped	0	0	
Issue-3 Latency Test	Skipped	0	0	
Issue-3 Multicast Test	Skipped	0	0	
6.2.4 Dual-Band Throughput Test	Skipped	0	0	
6.2.5 Bidirectional UDP Throughput Test	Skipped	0	0	
6.3.1 Range Versus Rate Test	Skipped	0	0	
6.3.2 Spatial Consistency Test	Skipped	0	0	
6.3.3 AX Peak Performance TCP Throughput Test	Skipped	0	0	
6.4.1 Multiple STAs Performance Test	Skipped	0	0	
6.4.2 Multiple Association / Disassociation Stability Test	Skipped	0	0	
6.4.3 Downlink MU-MIMO Performance Test	Skipped	0	0	
6.5.2 AP Coexistence Test	Skipped	0	0	
6.5.1 Long Term Stability Test	Skipped	0	0	

Issue-3 Airtime Fairness Test

Summary

Airtime Fairness Test intends to verify the capability of Wi-Fi device to ensure the fairness of airtime usage. This test uses two stations at a time, with one station running in optimum configuration. The second station varies between optimum configuration, weaker signal, and legacy mode configurations. In each setting, TCP traffic is used to determine maximum capacity of each station running by itself. Then, UDP traffic is created on STA1 to run at 75% of the TCP throughput and UDP traffic is created on the second station at 50% of the TCP throughput for that station. This overdrives the AP and causes it to drop frames. The pass/fail criteria is that each station gets at least 45% of the TCP throughput when both stations are running the prescribed UDP traffic.

Test Procedure

1. Establish the setup using default configuration for the 802.11n 2.4 GHz frequency band with $N_{ss} = 2$ operating mode for STA1 and STA2. Use or configure a STA3 to only use 802.11b/g.
2. Associate STA1 and STA2 with DUT. Establish the LAN connection and wait for 10 seconds.
3. Measure the achievable downlink TCP throughput through STA1, using a test time of 120 seconds. Record this value as `STA1_Throughput_Max_DL_1`.
4. Measure the achievable downlink TCP throughput through STA2, using a test time of 120 seconds. Record this value as `STA2_Throughput_Max_DL_1`.
5. Configure the downlink UDP traffic streams to use a downlink data rate set to 75% of `STA1_Throughput_Max_DL_1` for STA1 and 50% of `STA2_Throughput_Max_DL_1` for STA2.
6. Simultaneously run the two UDP traffic streams for 120 seconds, recording the throughput for each stream. Record these values as `STA1_Throughput_1` and `STA2_Throughput_1` respectively.
7. Move STA2 to a medium distance to the DUT (equivalent to 38 dB@2.4GHz and 25 dB @5GHz attenuation between DUT and STA2, plus 2M distance calibrated attenuation). Wait for 10 seconds.
8. Measure the achievable downlink TCP throughput through STA2, using a test time of 120 seconds. Record this value as `STA2_Throughput_Max_DL_2`.
9. Configure the downlink UDP traffic streams to use a downlink data rate set to 75% of `STA1_Throughput_Max_DL_1` for STA1 and 50% of `STA2_Throughput_Max_DL_2` for STA2.
10. Simultaneously run the two UDP traffic streams for 120 seconds, recording the throughput for each stream. Record these values as `STA1_Throughput_2` and `STA2_Throughput_2` respectively.
11. Disassociate STA2 with the DUT. Replace STA 2 with STA 3, configured for the specified Wi-Fi operating mode, and remove the attenuation. Establish the Wi-Fi connection between STA3 and DUT and wait for 10 seconds.
12. Measure the achievable downlink TCP throughput through STA3, using a test time of 120 seconds. Record this value as `STA3_Throughput_Max_DL_3`.
13. Configure the downlink UDP traffic streams to use a downlink data rate set to 75% of `STA1_Throughput_Max_DL_1` for STA1 and 50% of `STA3_Throughput_Max_DL_3` for STA3.
14. Simultaneously run the two UDP traffic streams for 120 seconds, recording the throughput for each stream. Record these values as `STA1_Throughput_3` and `STA3_Throughput_3` respectively.
15. Set the DUT to operating mode to 802.11ac 5 GHz frequency band with $N_{ss} = 2$. Replace or reconfigure STA3 with a STA that uses only 802.11a. Repeat steps 2 through 14.
16. Set the DUT to operating mode to 802.11ax 2.4 GHz frequency band with $N_{ss} = 2$. Replace or reconfigure STA3 with a STA that uses only 802.11n. Repeat steps 2 through 14.
17. Set the DUT to operating mode 802.11ax 5 GHz frequency band with $N_{ss} = 2$. Replace or reconfigure STA3 with a STA that uses only 802.11ac. Repeat steps 2 through 14.

Pass/Fail Criteria

1. For each UDP measurement, the throughput shall be at least 45% of the TCP Throughput Max speeds reported on the station being tested. This ensures that the AP properly limits the over-driven STA1 connection and gives the other station a fair amount of airtime.

To verify over-all throughput while ensuring airtime fairness, the throughput of the DUT SHALL meet the requirements below.

1. For the test in 802.11n 2.4 GHz frequency band with $N_{ss} = 2$:
 1. The summation of `STA1_Throughput_1` and `STA2_Throughput_1` SHALL be larger than 100 Mbps.
 2. The summation of `STA1_Throughput_2` and `STA2_Throughput_2` SHALL be larger than 100 Mbps.
 3. The summation of `STA1_Throughput_3` and `STA3_Throughput_3` SHALL be larger than 60 Mbps.
2. For the test in 802.11ac 5 GHz frequency band:
 1. The summation of `STA1_Throughput_1` and `STA2_Throughput_1` SHALL be larger than 650 Mbps.
 2. The summation of `STA1_Throughput_2` and `STA2_Throughput_2` SHALL be larger than 550 Mbps.
 3. The summation of `STA1_Throughput_3` and `STA3_Throughput_3` SHALL be larger than 335 Mbps.
3. For the test in 802.11ax 2.4 GHz frequency band:
 1. The summation of `STA1_Throughput_1` and `STA2_Throughput_1` SHALL be larger than 190 Mbps.

2. The summation of STA1_throughput_2 and STA2_throughput_2 SHALL be larger than 130 Mbps.
3. The summation of STA1_throughput_3 and STA3_throughput_3 SHALL be larger than 95 Mbps.
4. For the test in 802.11ax 5 GHz frequency band:
 1. The summation of STA1_throughput_1 and STA2_throughput_1 SHALL be larger than 900 Mbps.
 2. The summation of STA1_throughput_2 and STA2_throughput_2 SHALL be larger than 750 Mbps.
 3. The summation of STA1_throughput_3 and STA3_throughput_3 SHALL be larger than 600 Mbps.

Candela Score

The Candela Score for Airtime Fairness Test is calculated as the percentage sub-tests that passed the pass/fail criteria.

Issue-3 Airtime Fairness Test Results

Type	Result	Value	P/F Value	Notes
Configuration NOTE	INFO			Traffic duration is set to: 60s, default is 120s
AX 2.4Ghz STA1 Near	INFO			Reported TCP throughput: 82.11 Mbps
AX 2.4Ghz STA2 Near	INFO			Reported TCP throughput: 79.99 Mbps
AX 2.4Ghz STA2 Medium	INFO			Reported TCP throughput: 0 Mbps
AX 2.4Ghz Near: STA1+2 Total Throughput	FAIL	96	190	STA1: Tput 56.47 Mbps Req: 61.58 Drop: 8.05% STA-RSSI: -32 Rx-Rate: 258M Tx-Rate: 270.8M STA2: Tput 39.87 Req: 40.00 Mbps Drop: 0% STA-RSSI: -28 Rx-Rate: 24M Tx-Rate: 270.8M
AX 2.4Ghz Near: STA1 ATF Throughput	PASS	56.47	36.95	
AX 2.4Ghz Near: STA2 ATF Throughput	PASS	39.87	36.00	
AX 2.4Ghz Medium: STA1+2 Total Throughput	FAIL	61	130	STA1: Tput 61.44 Req: 61.58 Mbps Drop: 0% STA-RSSI: -29 Rx-Rate: 12M Tx-Rate: 270.8M STA2: Tput 0 Req: 0 Mbps Drop: 0% STA-RSSI: -63 Rx-Rate: 12M Tx-Rate: 162.5M
AX 2.4Ghz Medium: STA1 ATF Throughput	PASS	61.44	36.95	
AX 2.4Ghz Medium: STA2 ATF Throughput	PASS	0	0	
AX 2.4Ghz STA3 Legacy	INFO			Reported TCP throughput: 33.01 Mbps
AX 2.4Ghz Legacy: STA1+3 Total Throughput	FAIL	63	95	STA1: Tput 46.29 Req: 61.58 Mbps Drop: 24.21% STA-RSSI: -29 Rx-Rate: 103.2M Tx-Rate: 270.8M STA3: Tput 16.47 Req: 16.50 Mbps Drop: 0% STA-RSSI: -28 Rx-Rate: 43.3M Tx-Rate: 72.2M
AX 2.4Ghz Legacy: STA1 ATF Throughput	PASS	46.29	36.95	
AX 2.4Ghz Legacy: STA3 ATF Throughput	PASS	16.47	14.85	
AX 5Ghz STA1 Near	INFO			Reported TCP throughput: 893.98 Mbps
AX 5Ghz STA2 Near	INFO			Reported TCP throughput: 905.35 Mbps
AX 5Ghz STA2 Medium	INFO			Reported TCP throughput: 676.55 Mbps
AX 5Ghz Near: STA1+2 Total Throughput	PASS	1,114	900	STA1: Tput 662.90 Mbps Req: 670.48 Drop: 0.86% STA-RSSI: -39 Rx-Rate: 1.297G Tx-Rate: 1.134G STA2: Tput 451.56 Req: 452.67 Mbps Drop: 0% STA-RSSI: -41 Rx-Rate: 1.201G Tx-Rate: 1.134G
AX 5Ghz Near: STA1 ATF Throughput	PASS	662.90	402.29	
AX 5Ghz Near: STA2 ATF Throughput	PASS	451.56	407.41	
AX 5Ghz Medium: STA1+2 Total Throughput	PASS	1,005	750	STA1: Tput 667.73 Req: 670.48 Mbps Drop: 0.17% STA-RSSI: -36 Rx-Rate: 12M Tx-Rate: 1.134G STA2: Tput 337.45 Req: 338.28 Mbps Drop: 0% STA-RSSI: -55 Rx-Rate: 12M Tx-Rate: 816.7M
AX 5Ghz Medium: STA1 ATF Throughput	PASS	667.73	402.29	
AX 5Ghz Medium: STA2 ATF Throughput	PASS	337.45	304.45	
AX 5Ghz STA3 Legacy	INFO			Reported TCP throughput: 343.68 Mbps
AX 5Ghz Legacy: STA1+3 Total Throughput	PASS	736	600	STA1: Tput 564.99 Req: 670.48 Mbps Drop: 15.46% STA-RSSI: -36 Rx-Rate: 1.201G Tx-Rate: 1.134G STA3: Tput 171.45 Req: 171.84 Mbps Drop: 0% STA-RSSI: -35 Rx-Rate: 433.3M Tx-Rate: 433.3M
AX 5Ghz Legacy: STA1 ATF Throughput	PASS	564.99	402.29	
AX 5Ghz Legacy: STA3 ATF Throughput	PASS	171.45	154.66	
N 2.4Ghz STA1 Near	INFO			Reported TCP throughput: 45.86 Mbps
N 2.4Ghz STA2 Near	INFO			Reported TCP throughput: 69.11 Mbps
N 2.4Ghz STA2 Medium	INFO			Reported TCP throughput: 69.78 Mbps
				STA1: Tput 25.93 Mbps Req: 34.40 Drop: 23.80%

N 2.4Ghz Near: STA1+2 Total Throughput	FAIL	60	100	STA-RSSI: -29 Rx-Rate: 65M Tx-Rate: 144.4M STA2: Tput 34.47 Req: 34.55 Mbps Drop: 0% STA-RSSI: -26 Rx-Rate: 86.7M Tx-Rate: 144.4M
N 2.4Ghz Near: STA1 ATF Throughput	PASS	25.93	20.64	
N 2.4Ghz Near: STA2 ATF Throughput	PASS	34.47	31.10	
N 2.4Ghz Medium: STA1+2 Total Throughput	FAIL	61	100	STA1: Tput 25.95 Req: 34.40 Mbps Drop: 23.68% STA-RSSI: -29 Rx-Rate: 65M Tx-Rate: 144.4M STA2: Tput 34.81 Req: 34.89 Mbps Drop: 0% STA-RSSI: -63 Rx-Rate: 86.7M Tx-Rate: 117M
N 2.4Ghz Medium: STA1 ATF Throughput	PASS	25.95	20.64	
N 2.4Ghz Medium: STA2 ATF Throughput	PASS	34.81	31.40	
N 2.4Ghz STA3 Legacy	INFO			Reported TCP throughput: 15.14 Mbps
N 2.4Ghz Legacy: STA1+3 Total Throughput	FAIL	38	60	STA1: Tput 34.28 Req: 34.40 Mbps Drop: 0% STA-RSSI: -29 Rx-Rate: 65M Tx-Rate: 144.4M STA3: Tput 3.34 Req: 7.57 Mbps Drop: 53.09% STA-RSSI: -28 Rx-Rate: 36M Tx-Rate: 54M
N 2.4Ghz Legacy: STA1 ATF Throughput	PASS	34.28	20.64	
N 2.4Ghz Legacy: STA3 ATF Throughput	FAIL	3.34	6.81	
AC 5Ghz STA1 Near	INFO			Reported TCP throughput: 683.55 Mbps
AC 5Ghz STA2 Near	INFO			Reported TCP throughput: 649.08 Mbps
AC 5Ghz STA2 Medium	INFO			Reported TCP throughput: 599.20 Mbps
AC 5Ghz Near: STA1+2 Total Throughput	PASS	739	650	STA1: Tput 414.88 Mbps Req: 512.66 Drop: 18.83% STA-RSSI: -33 Rx-Rate: 866.7M Tx-Rate: 866.7M STA2: Tput 323.79 Req: 324.54 Mbps Drop: 0% STA-RSSI: -34 Rx-Rate: 866.7M Tx-Rate: 866.7M
AC 5Ghz Near: STA1 ATF Throughput	PASS	414.88	307.60	
AC 5Ghz Near: STA2 ATF Throughput	PASS	323.79	292.09	
AC 5Ghz Medium: STA1+2 Total Throughput	PASS	730	550	STA1: Tput 431.76 Req: 512.66 Mbps Drop: 15.52% STA-RSSI: -35 Rx-Rate: 866.7M Tx-Rate: 866.7M STA2: Tput 298.14 Req: 299.60 Mbps Drop: 0.25% STA-RSSI: -55 Rx-Rate: 866.7M Tx-Rate: 866.7M
AC 5Ghz Medium: STA1 ATF Throughput	PASS	431.76	307.60	
AC 5Ghz Medium: STA2 ATF Throughput	PASS	298.14	269.64	
AC 5Ghz STA3 Legacy	INFO			Reported TCP throughput: 23.11 Mbps
AC 5Ghz Legacy: STA1+3 Total Throughput	PASS	513	335	STA1: Tput 510.95 Req: 512.66 Mbps Drop: 0.00% STA-RSSI: -34 Rx-Rate: 866.7M Tx-Rate: 866.7M STA3: Tput 1.94 Req: 11.56 Mbps Drop: 81.43% STA-RSSI: -40 Rx-Rate: 54M Tx-Rate: 54M
AC 5Ghz Legacy: STA1 ATF Throughput	PASS	510.95	307.60	
AC 5Ghz Legacy: STA3 ATF Throughput	FAIL	1.94	10.40	

ATF: Near Distance STA1+STA2 Snapshot AX 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta02500	11.523 Kbps	32.226 Mbps	0.059	270.8 Mbps	258 Mbps	802.11bgn-AX	1	48	-32	08:9B:4B:B2:F1:23	10.0.129.105	00:0a:52:06:0e:a7
1.1.11 sta03000	12.184 Kbps	23.977 Mbps	2.08	270.8 Mbps	24 Mbps	802.11bgn-AX	1	48	-28	08:9B:4B:B2:F1:23	10.0.129.134	00:0a:52:06:08:a6

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	88.065 Mbps	35.872 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta02500--1.0.0-A	19.912 Kbps	56.663 Mbps	95	270326	8	15	0	6.828
cv_udp-2.2-1.sta02500--1.0.0-B	61.423 Mbps	19.688 Kbps	290136	93	7	15	8	1.053
cv_udp-2.2-1.sta03000--1.0.0-A	19.973 Kbps	40 Mbps	100	200259	13	17	0	0
cv_udp-2.2-1.sta03000--1.0.0-B	39.916 Mbps	19.719 Kbps	198373	98	4	17	5	1.000

ATF: Medium Distance STA1+STA2 Snapshot AX 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta02500	19.573 Kbps	57.22 Mbps	0.059	270.8 Mbps	103.2 Mbps	802.11bgn-AX	1	48	-29	08:9B:4B:B2:F1:23	10.0.129.105	00:0a:52:06:0e:a7
1.1.11 sta03000	19.256 Kbps	14.21 Mbps	2.095	162.5 Mbps	103.2 Mbps	802.11bgn-AX	1	48	-63	08:9B:4B:B2:F1:23	10.0.129.134	00:0a:52:06:08:a6

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	62.211 Mbps	38.429 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta02500--1.0.0-A	19.705 Kbps	61.583 Mbps	101	313418	4	4	0	0
cv_udp-2.2-1.sta02500--1.0.0-B	61.931 Mbps	20.005 Kbps	309573	100	0	4	2	0
cv_udp-2.2-1.sta03000--1.0.0-A	19.688 Kbps	0 bps	101	0	0	1	0	0
cv_udp-2.2-1.sta03000--1.0.0-B	0 bps	19.945 Kbps	0	100	1	1	1	0

ATF: Legacy STA1+STA3 Snapshot AX 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta02500	36.908 Kbps	47.049 Mbps	0.06	270.8 Mbps	103.2 Mbps	802.11bgn-AX	1	48	-29	08:9B:4B:B2:F1:23	10.0.129.105	00:0a:52:06:0e:a7
1.1.12 sta03500	34.767 Kbps	17.232 Mbps	0.285	72.2 Mbps	43.3 Mbps	802.11bgn	1	112	-28	08:9B:4B:B2:F1:23	10.0.129.136	00:0a:52:06:04:1a

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	62.629 Mbps	425.193 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta02500--1.0.0-A	19.664 Kbps	46.435 Mbps	101	236415	308	325	0	24.427
cv_udp-2.2-1.sta02500--1.0.0-B	61.618 Mbps	19.721 Kbps	312831	101	17	325	19	0
cv_udp-2.2-1.sta03500--1.0.0-A	19.672 Kbps	16.503 Mbps	101	83964	6	17	0	0
cv_udp-2.2-1.sta03500--1.0.0-B	16.521 Mbps	19.729 Kbps	83820	100	11	17	12	0.990

ATF: Near Distance STA1+STA2 Snapshot AX 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta02000	16.766 Kbps	455.459 Mbps	0.455	1134.2 Mbps	1.297 Gbps	802.11an-AX	36	290	-39	08:9B:4B:B2:F1:22	10.0.128.227	00:0a:52:06:0f:7c
1.1.11 sta02500	1.674 Mbps	542.708 Mbps	0.314	1134.2 Mbps	1.201 Gbps	802.11an-AX	36	49	-41	08:9B:4B:B2:F1:22	10.0.128.239	00:0a:52:06:0c:1d

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	996.908 Mbps	1.843 Mbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta02000--1.0.0-A	19.786 Kbps	664.633 Mbps	101	3382133	16	30	0	0
cv_udp-2.2-1.sta02000--1.0.0-B	670.494 Mbps	19.786 Kbps	3412375	100	14	30	10	0.990
cv_udp-2.2-1.sta02500--1.0.0-A	19.769 Kbps	452.684 Mbps	101	2304648	8	21	0	0
cv_udp-2.2-1.sta02500--1.0.0-B	452.675 Mbps	19.786 Kbps	2303057	101	13	21	10	0

ATF: Medium Distance STA1+STA2 Snapshot AX 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta02000	21.673 Kbps	645.927 Mbps	0.455	1134.2 Mbps	24 Mbps	802.11an-AX	36	290	-40	08:9B:4B:B2:F1:22	10.0.128.227	00:0a:52:06:0f:7c
1.1.11 sta02500	20.44 Kbps	367.802 Mbps	0.315	544.3 Mbps	864.6 Mbps	802.11an-AX	36	49	-63	08:9B:4B:B2:F1:22	10.0.128.239	00:0a:52:06:0c:1d

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	1.028 Gbps	42.423 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta02000--1.0.0-A	19.824 Kbps	668.622 Mbps	101	3406475	4	12	0	0
cv_udp-2.2-1.sta02000--1.0.0-B	672.012 Mbps	19.982 Kbps	3396637	101	8	12	16	0
cv_udp-2.2-1.sta02500--1.0.0-A	19.784 Kbps	338.32 Mbps	101	1721515	4	13	0	0
cv_udp-2.2-1.sta02500--1.0.0-B	339.05 Mbps	19.793 Kbps	1712958	100	9	13	15	0

ATF: Legacy STA1+STA3 Snapshot AX 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta02000	23.438 Kbps	532.565 Mbps	0.457	1134.2 Mbps	1.201 Gbps	802.11an-AX	36	290	-37	08:9B:4B:B2:F1:22	10.0.128.227	00:0a:52:06:0f:7c
1.1.12 sta03000	1.249 Mbps	205.55 Mbps	0.007	433.3 Mbps	433.3 Mbps	802.11an-AC	36	51	-35	08:9B:4B:B2:F1:22	10.0.129.137	00:0a:52:06:28:8f

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	745.441 Mbps	1.958 Mbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta02000--1.0.0-A	19.736 Kbps	566.442 Mbps	101	2884694	40	60	0	14.130
cv_udp-2.2-1.sta02000--1.0.0-B	666.917 Mbps	19.653 Kbps	3359387	99	20	60	19	0
cv_udp-2.2-1.sta03000--1.0.0-A	19.753 Kbps	171.831 Mbps	101	874278	5	19	0	0
cv_udp-2.2-1.sta03000--1.0.0-B	171 Mbps	19.782 Kbps	855746	99	14	19	13	0

ATF: Near Distance STA1+STA2 Snapshot N 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01500	32.708 Kbps	18.042 Mbps	0.286	144.4 Mbps	65 Mbps	802.11bgn	1	151	-29	08:9B:4B:B2:F1:23	10.0.128.253	00:0a:52:06:22:a7
1.1.11 sta02000	541.966 Kbps	48.133 Mbps	0.892	144.4 Mbps	86.7 Mbps	802.11bgn	1	152	-26	08:9B:4B:B2:F1:23	10.0.128.149	00:0a:52:06:27:a6

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	71.478 Mbps	356.437 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01500--1.0.0-A	19.845 Kbps	25.99 Mbps	101	132269	510	524	0	23.627
cv_udp-2.2-1.sta01500--1.0.0-B	34.392 Mbps	19.858 Kbps	173189	100	14	524	10	0
cv_udp-2.2-1.sta02000--1.0.0-A	19.829 Kbps	34.537 Mbps	101	175912	5	19	0	0
cv_udp-2.2-1.sta02000--1.0.0-B	34.724 Mbps	19.847 Kbps	173204	99	14	19	10	0

ATF: Medium Distance STA1+STA2 Snapshot N 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01500	37.122 Kbps	25.507 Mbps	0.299	144.4 Mbps	65 Mbps	802.11bgn	1	151	-29	08:9B:4B:B2:F1:23	10.0.128.253	00:0a:52:06:22:a7
1.1.11 sta02000	19.821 Kbps	33.626 Mbps	0.914	78 Mbps	86.7 Mbps	802.11bgn	1	152	-63	08:9B:4B:B2:F1:23	10.0.128.149	00:0a:52:06:27:a6

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	66.598 Mbps	59.222 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01500--1.0.0-A	19.849 Kbps	26.023 Mbps	101	132413	511	529	0	23.741

cv_udp-2.2-1.sta01500--1.0.0-B	34.128 Mbps	19.655 Kbps	173636	100	18		529		14	0.990
cv_udp-2.2-1.sta02000--1.0.0-A	19.824 Kbps	34.868 Mbps	101	177646	7		50		0	0
cv_udp-2.2-1.sta02000--1.0.0-B	34.916 Mbps	19.908 Kbps	177136	101	43		50		63	0

ATF: Legacy STA1+STA3 Snapshot N 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01500	18.798 Kbps	31.619 Mbps	0.305	144.4 Mbps	58.5 Mbps	802.11bgn	1	151	-29	08:9B:4B:B2:F1:23	10.0.128.253	00:0a:52:06:22:a7
1.1.12 sta02500	90.953 Kbps	3.612 Mbps	10.525	54 Mbps	36 Mbps	802.11bg	1	107	-28	08:9B:4B:B2:F1:23	10.0.129.138	00:0a:52:06:2a:1a

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	43.147 Mbps	110.651 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01500--1.0.0-A	19.776 Kbps	34.396 Mbps	101	175082	4	12		0 0
cv_udp-2.2-1.sta01500--1.0.0-B	34.449 Mbps	19.739 Kbps	172774	99	8	12		11 0.990
cv_udp-2.2-1.sta02500--1.0.0-A	19.824 Kbps	3.347 Mbps	101	17054	3,195	3,205		3 55.142
cv_udp-2.2-1.sta02500--1.0.0-B	7.584 Mbps	19.947 Kbps	38018	100	10	3,205		12 0

ATF: Near Distance STA1+STA2 Snapshot AC 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01000	17.538 Kbps	287.06 Mbps	0.004	866.7 Mbps	866.7 Mbps	802.11an-AC	36	266	-33	08:9B:4B:B2:F1:22	10.0.128.183	00:0a:52:06:3f:7c
1.1.11 sta01500	2.451 Mbps	426.905 Mbps	0.025	866.7 Mbps	866.7 Mbps	802.11an-AC	36	48	-34	08:9B:4B:B2:F1:22	10.0.128.242	00:0a:52:06:24:1d

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	764.545 Mbps	3.308 Mbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01000--1.0.0-A	19.658 Kbps	415.883 Mbps	101	211651	235	50		0 17.324
cv_udp-2.2-1.sta01000--1.0.0-B	509.525 Mbps	19.704 Kbps	256001	299	15	50		14 0
cv_udp-2.2-1.sta01500--1.0.0-A	19.65 Kbps	324.512 Mbps	101	165185	03	16		0 0
cv_udp-2.2-1.sta01500--1.0.0-B	322.638 Mbps	19.469 Kbps	162400	98	13	16		10 0.990

ATF: Medium Distance STA1+STA2 Snapshot AC 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01000	22.064 Kbps	412.076 Mbps	0.005	866.7 Mbps	866.7 Mbps	802.11an-AC	36	266	-33	08:9B:4B:B2:F1:22	10.0.128.183	00:0a:52:06:3f:7c
1.1.11 sta01500	19.139 Mbps	297.838 Mbps	0.026	866.7 Mbps	866.7 Mbps	802.11an-AC	36	48	-55	08:9B:4B:B2:F1:22	10.0.128.242	00:0a:52:06:24:1d

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	803.07 Mbps	43.862 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01000--1.0.0-A	19.661 Kbps	432.843 Mbps	101	220266	832	46		0 15.086
cv_udp-2.2-1.sta01000--1.0.0-B	514.948 Mbps	19.862 Kbps	259399	100	14	46		14 0
cv_udp-2.2-1.sta01500--1.0.0-A	19.644 Kbps	298.894 Mbps	101	152163	74	18		0 0
cv_udp-2.2-1.sta01500--1.0.0-B	300.033 Mbps	19.735 Kbps	152087	100	14	18		17 0

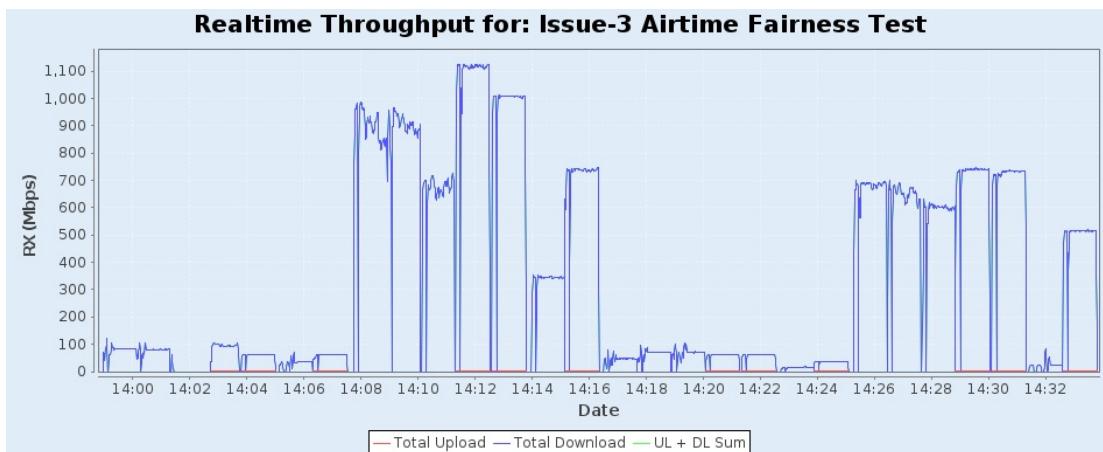
ATF: Legacy STA1+STA3 Snapshot AC 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01000	22.948 Kbps	513.267 Mbps	0.005	866.7 Mbps	866.7 Mbps	802.11an-AC	36	266	-34	08:9B:4B:B2:F1:22	10.0.128.183	00:0a:52:06:3f:7c
1.1.12 sta02000	154.202 Kbps	5.919 Mbps	9.406	54 Mbps	54 Mbps	802.11a	36	336	-40	08:9B:4B:B2:F1:22	10.0.129.139	00:0a:52:06:34:8f

Port	Tx-Bps 1m	RxBps 1m	Link-Rate	IP	MAC
1.2.2 eth2	381.093 Mbps	259.097 Kbps	5 Gbps	10.0.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	RxBps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01000--1.0.0-A	19.654 Kbps	512.604 Mbps	101	2609484	11	19	0	0
cv_udp-2.2-1.sta01000--1.0.0-B	509.019 Mbps	19.509 Kbps	2582964	99	8	19	9	0
cv_udp-2.2-1.sta02000--1.0.0-A	19.662 Kbps	1.948 Mbps	101	9909	5,701	5,708	9	83.042
cv_udp-2.2-1.sta02000--1.0.0-B	11.567 Mbps	19.804 Kbps	58432	100	7	5,708	8	0

Realtime Throughput for: Issue-3 Airtime Fairness Test



Key Performance Indicators CSV

Test configuration and LANforge software version	
Auto-Helper	true
Allow-11w (MFP/PMF)	true
Skip 2.4Ghz Tests	false
Skip 5Ghz Tests	false
Duration-120	30
Duration-60	20
Channel 2Ghz	1
Channel 5Ghz	36
Extra Download Path-loss	0
TX Power	20
Multi-Conn	5
ToS	0
Upstream Port	1.2.eth2 Firmware: 0x80000aef, 1.1876.0 Resource: ct523c-3b89
Turn-Table Chamber	TR-398
Configured 2m 2.4Ghz RSSI	-26
Configured 2m 5Ghz RSSI	-30
Opposite-Speed:	20000
Randomize Offered Load	false

Max-CX Offered Load:	1000000
Max-CX 2Ghz N rate:	2000000
Max-CX 2Ghz AX rate:	3000000
Max-CX 5Ghz AC rate:	8000000
Max-CX 5Ghz AX rate:	10000000
Throughput N 2Ghz rate:	100000000
Throughput AC 5Ghz rate:	560000000
Throughput AX 2Ghz rate:	200000000
Throughput AX 5Ghz rate:	720000000
Throughput AX 2Ghz rate:	300000000
Throughput AX 2x2 5Ghz rate:	1100000000
Throughput AX 4x4 5Ghz rate:	1100000000
ATF Max NSS:	2
ATF Attenuation:	0
Max allowed packet loss%:	0.05
Assoc/Disassoc Traffic %:	99
Requested Rx-Sens Speed	65%
RxSens Rotation Degrees:	90
RxSens Start Step:	4
Attenuation Adjustment	0
Stop RX-Sens at pass	false
Pause on zero throughput	false
Use Virtual AX Stations	true
Auto-Calibrate Interferer	false
Interferer AC 5G-80Mhz:	195.00 Mbps
Interferer AC 5G-40Mhz:	90.00 Mbps
Interferer AC 2.4G-20Mhz:	32.00 Mbps
Interferer AX 5G-80Mhz:	195.00 Mbps
Interferer AX 5G-40Mhz:	90.00 Mbps
Interferer AX 2.4G-20Mhz:	32.00 Mbps
Spatial Rotation Degrees:	30
Test Retries:	0
Stability Duration-180	180
Stability Max-Iterations	16
Stability UDP Duration	15 m
Calibration Mode:	4
Calibration NSS:	1
WiFi Radio 0	1.1.2 wiphy0 Resource: ct523c-3b29
WiFi Radio 1	1.1.3 wiphy1 Resource: ct523c-3b29
WiFi Radio 2	1.1.4 wiphy2 Resource: ct523c-3b29
WiFi Radio 3	1.1.5 wiphy3 Resource: ct523c-3b29
WiFi Radio 4	1.1.6 wiphy4 Resource: ct523c-3b29
WiFi Radio 5	1.1.7 wiphy5 Resource: ct523c-3b29
WiFi AX Radio 0	1.2.wiphy0 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 1	1.2.wiphy1 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 2	1.2.wiphy2 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 3	1.2.wiphy3 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 4	1.2.wiphy4 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 5	1.2.wiphy5 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 6	1.2.wiphy6 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 7	1.2.wiphy7 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 8	1.2.wiphy8 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 9	1.2.wiphy9 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 10	1.2.wiphy10 Firmware: release/core64::8f59b80b Resource: ct523c-3b89
WiFi AX Radio 11	1.2.wiphy11 Firmware: release/core64::8f59b80b Resource: ct523c-3b89

WiFi AX Radio 12	1.3.wiphy0 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 13	1.3.wiphy5 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 14	1.3.wiphy10 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 15	1.3.wiphy15 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 16	1.3.wiphy1 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 17	1.3.wiphy6 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 18	1.3.wiphy11 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 19	1.3.wiphy16 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 20	1.3.wiphy2 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 21	1.3.wiphy7 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 22	1.3.wiphy12 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 23	1.3.wiphy17 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 24	1.3.wiphy3 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 25	1.3.wiphy8 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 26	1.3.wiphy13 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 27	1.3.wiphy18 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 28	1.3.wiphy4 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 29	1.3.wiphy9 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 30	1.3.wiphy14 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
WiFi AX Radio 31	1.3.wiphy19 Firmware: release/core64::8f59b80b Resource: ct523c-de7c
Attenuator 0	rssi-0-2.4Ghz: -12 rssi-0-5Ghz: -35 atten: 1.1.3094.0
Attenuator 1	rssi-0-2.4Ghz: -12 rssi-0-5Ghz: -35 atten: 1.1.3094.1
Attenuator 2	rssi-0-2.4Ghz: -12 rssi-0-5Ghz: -35 atten: 1.1.3094.2
Attenuator 3	rssi-0-2.4Ghz: -12 rssi-0-5Ghz: -35 atten: 1.1.3094.3
Attenuator 4	rssi-0-2.4Ghz: -18 rssi-0-5Ghz: -35 atten: 1.1.3102.0
Attenuator 5	rssi-0-2.4Ghz: -18 rssi-0-5Ghz: -35 atten: 1.1.3102.1
Attenuator 6	rssi-0-2.4Ghz: -18 rssi-0-5Ghz: -35 atten: 1.1.3099.0
Attenuator 7	rssi-0-2.4Ghz: -18 rssi-0-5Ghz: -35 atten: 1.1.3099.1
Attenuator 8	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -42 atten: 1.1.3102.2
Attenuator 9	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -42 atten: 1.1.3102.3
Attenuator 10	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -42 atten:
Attenuator 11	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -42 atten:
AX Attenuator 0	AX rssi-0-2.4Ghz: -14 rssi-0-5Ghz: -35 atten: 1.1.3100.3
AX Attenuator 1	AX rssi-0-2.4Ghz: -14 rssi-0-5Ghz: -35 atten: 1.1.3100.2
AX Attenuator 2	AX rssi-0-2.4Ghz: -14 rssi-0-5Ghz: -35 atten: NA
AX Attenuator 3	AX rssi-0-2.4Ghz: -14 rssi-0-5Ghz: -35 atten: NA
AX Attenuator 4	AX rssi-0-2.4Ghz: -19 rssi-0-5Ghz: -35 atten: 1.1.3100.1
AX Attenuator 5	AX rssi-0-2.4Ghz: -19 rssi-0-5Ghz: -35 atten: 1.1.3100.0
AX Attenuator 6	AX rssi-0-2.4Ghz: -19 rssi-0-5Ghz: -35 atten:
AX Attenuator 7	AX rssi-0-2.4Ghz: -19 rssi-0-5Ghz: -35 atten:
AX Attenuator 8	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -42 atten: 1.1.3099.3
AX Attenuator 9	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -42 atten: 1.1.3099.2
AX Attenuator 10	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -42 atten:
AX Attenuator 11	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -42 atten:
Show Events	true
Build Date	Wed Feb 16 12:27:09 PST 2022
Git Version	bdf4e3edac688e0410ccf334d18573f0d5df623c

[CSV Data](#)

[META Information for TR-398 Issue 2](#)

