Wi-Fi 802.11n Draft 2.0 Certification Test Report for
Wireless Access Point

Certification ID (CID): WFA7886

CID Owner Company: D-LINK Systems

Company Name: Alphanetworks

Product Name: DAP-2690

Firmware Version: V1.00

Product Type: **Access Point**

Product Receive Date: 09/22/2009

Test Start Date: 09/23/2009

Report Date: 09/24/2009

Test Result: **PASS**

Company

Company Name:	D-Link Systems
Company Address:	17595 Mt. Herrmann Street, Fountain Valley, CA 92708, USA
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Device Information:

*** These are requirement fields. All testing will be held until information is completed. ***

General Information:

Device Type: Dependent

11n Information:	**None 11n Information:**		
Support Bands: 11a/b/g	**WPA2 Type:**	WPA2-Enterprise	
Channel Bandwidth: 20 / 40 MHz	**Pre-Auth Support:**	☒ Yes	☐ No
Aggregation Support: A-MPDU	**WEP Support:**	☒ Yes	☐ No
Greenfield Support:	**802.11h Support:**	☒ Yes	☐ No
☒ Yes ☐ No	**802.11d Support:**	☒ Yes	☐ No
Short Guard Interval Support:	**APUT Category:** ☐ cat 1 ☐ cat 2 ☒ cat 3		
☒ Yes ☐ No	**EAP Types (For Category 1):**		
HT Duplicate Mode Support:	☐ Not Support		
☒ Yes ☐ No	☐ TLS ☐ TTLS ☐ SIM		
	☐ PEAPv0 ☐ PEAPv1		
	☐ FAST ☐ AKA		

Tester: _____   **Authorized Signature:** _____

Project ID：ACP-AAN-WIFI-002_1

Legal Disclaimer

1. TEST RESULT IS VALID ONLY TO THE ORIGINAL TESTED DEVICE MODEL. ALLION RESERVES THE RIGHT TO PROHIBIT OTHERS TO DISTORT, ISOLATE, FALSIFY, COPIED AND/OR BY ANY PROCESS TO CHANGE THE CONTENT OF THIS TEST REPORT UNLESS IT IS PRIOR APPROVED BY ALLION.

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Notice:

- These resulting tests satisfy the Wi-Fi specifications. The same nomenclature and test procedure were used in both test plan with:

  802.11n Draft 2.0 System Interoperability Test Plan. Version 1.5.7.

- The tests defined here address only interoperability, which needs the conformance to 802.11 standards; however, conformance to the standards are not tested.

4. 802.11n Access Point Testing

4.1 Configurability Tests
4.1.1 General Configurability Tests

1	SSID.	**Pass**
2	Beacon Interval.	**Pass**
3	Wireless Operational Mode.	**Pass**
4	Channel.	**Pass**
5	Static IP Address and Netmask.	**Pass**

4.1.2 Security Configurability Tests

1	Turn WPA2 on and off.	**Pass**
2	Verify WPA2-PSK or WPA2-Enterprise running EAP method mode can be selected.	**Pass**
3	Default passphrase ("12345678") for WPA2-PSK can be entered.	**Pass**
4	Shared secret between the AP and the RAIDUS server must be capable of using 64 characters.	**Pass**
5	Open, WPA and WPA2 are required.	**Pass**

4.2.1 AP Out of the Box (OOB) – Part I

1	ESSID configuration.	**Pass**
2	Channel configuration.	**Pass**
3	Fixed IP address and sub-net mask.	**Pass**
4	Shared Secret.	**Pass**
5	Turn WPA2, WPA, or WEP (if supported) on or off.	**Pass**
6	Either WPA2/WPA STAs only associate mixed modes can be selected.	**Pass**
7	When WPA(2) is turned on, WEP can not be turned on.	**Pass**
8	When WPA(2) is turned on, WPA(2)-PSK/TLS can be selected for those APs supporting Enterprise.	**Pass**
9	Default pass phrase (12345678) for WPA(2)-PSK can be selected.	**Pass**
10	APUT must be capable of entering 64 characters for Shared Secret.	**Pass**

4.2.1 AP Out of Box (OOB) – Part II

1	HT Capability IE in beacon: 1. The Supported Channel Width Bit for 2.4GHz band is 0. 2. For 5 GHz band may be either 0 or 1.	**Pass**
2	STA1 associates with APUT within 90 seconds.	**Pass**
3	STA2 does not associate with APUT.	**Pass**
4	STA3 does not associate with APUT.	**Pass**
5	STA4 does not associate with APUT.	**Pass**

4.2.2 AP WPA2 Initial Ping Interoperability Test		
1	The APUT responds to pings from STA1 within 90 seconds.	**Pass**
2	The APUT responds to pings from STA2 within 90 seconds.	**Pass**
3	The APUT responds to pings from STA3 within 90 seconds.	**Pass**
4	The APUT responds to pings from STA4 within 90 seconds.	**Pass**

4.2.3 AP & STA Association and Throughput, Honoring NAV and PLCP		
1	Association occurs.	**Pass**
2	Data Transfer #1 (APUT → STA) TCP FILESNDL: 20.080 Mbps.	**Pass**
3	Data Transfer #2 (STA → APUT) TCP FILESNDL: 23.262 Mbps.	**Pass**
4	Data Transfer #3 (APUT → STA) TCP INQUIRYL: 1.391 Mbps.	**Pass**
5	NAV: (APUT → STA) TCP FILESNDL: 7.410 Mbps. Throughput < 80% of throughput of measured DT #1	**Pass**
6	PLCP: (APUT → STA) TCP FILESNDL: 7.960 Mbps. Throughput < 80% of throughput of measured DT #1	**Pass**

4.2.4 AP & STA Association and Throughput using WPA2-Enterprise with TLS		
1	Association occurs.	**Pass**
2	Data Transfer #1 (APUT → STA) TCP FILESNDL: 14.147 Mbps.	**Pass**
3	Data Transfer #2 (STA → APUT) TCP FILESNDL: 14.069 Mbps.	**Pass**
4	Data Transfer #3 (APUT → STA) TCP INQUIRYL: 0.967 Mbps.	**Pass**

4.2.5 AP & STA Association and Throughput using WPA2-PSK	
1	Association occurs.	**Pass**
2	Data Transfer #1 (APUT → STA) TCP FILESNDL: 4.692 Mbps.	**Pass**
3	Data Transfer #2 (STA → APUT) TCP FILESNDL: 3.115 Mbps.	**Pass**
4	Data Transfer #3 (APUT → STA) TCP INQUIRYL: 0.015 Mbps.	**Pass**

4.2.6 AP & STA Association & Throughput with Replay Counter Processing	
1	Association occurs.	**Pass**
2	Data Transfer #4 (APUT → STA) – send / receive at least 70K packets.	**Pass**
3	The test runs to completion without any errors.	**Pass**

4.2.7 AP & STA Association and Throughput using Mixed Mode WPA/WPA2-Enterprise with TLS and Message 3 Validation	
1	Association occurs.	**Pass**
2	The APUT has only a WPA IE (Tag #221).	**Pass**
3	No other IE's in the third message of the 4-way association handshake.	**Pass**
4	Data Transfer #1 (APUT → GSTA) TCP FILESNDL: 11.320 Mbps. Data Transfer #1 (APUT → BSTA) TCP FILESNDL: 11.455 Mbps.	**Pass**
5	Data Transfer #2 (GSTA → APUT) TCP FILESNDL: 13.108 Mbps. Data Transfer #2 (BSTA → APUT) TCP FILESNDL: 10.509 Mbps.	**Pass**
6	Data Transfer #3 (APUT → GSTA) TCP INQUIRYL: 0.996 Mbps. Data Transfer #3 (APUT → BSTA) TCP INQUIRYL: 1.070 Mbps.	**Pass**

	4.2.8 AP & STA Association and Throughput using Mixed Mode WPA/WPA2-PSK		
1	Association occurs.		**Pass**
2	Data Transfer #1 (APUT → GSTA) TCP FILESNDL: 9.422 Mbps. Data Transfer #1 (APUT → BSTA) TCP FILESNDL: 9.142 Mbps.		**Pass**
3	Data Transfer #2 (GSTA → APUT) TCP FILESNDL: 12.621 Mbps. Data Transfer #2 (BSTA → APUT) TCP FILESNDL: 10.317 Mbps.		**Pass**
4	Data Transfer #3 (APUT → GSTA) TCP INQUIRYL: 0.956 Mbps. Data Transfer #3 (APUT → BSTA) TCP INQUIRYL: 0.990 Mbps.		**Pass**

	4.2.9 Re-association / Bridging Tests **WPA2-PSK**		
1	WPA2 STA – 1 is first associated and authenticate with the APUT.	**Pass**
2	Ping is run and then stopped.	**Pass**
3	WPA2 AP is then started and when beaconing, APUT is stopped.	**Pass**
4	The WPA2 STA – 1 associates and authenticates with WPA2 AP.	**Pass**
5	Re-attempt to ping. Ping shall be successful within 90 seconds.	**Pass**
6	APUT is then re-started and when beaconing, WPA2 AP is stopped.	**Pass**
7	The WPA2 STA – 1 is associated and authenticated with the APUT.	**Pass**
8	Re-attempt to ping. Pings shall be successful within 90 seconds.	**Pass**

	WPA-PSK		
1	WPA STA – 1 is first associated and authenticate with the APUT.	**Pass**
2	Ping is run and then stopped.	**Pass**
3	WPA AP is then started and when beaconing, APUT is stopped.	**Pass**
4	The WPA STA – 1 associates and authenticates with WPA AP.	**Pass**
5	Re-attempt to ping. Ping shall be successful within 90 seconds.	**Pass**
6	APUT is then re-started and when beaconing, WPA AP is stopped.	**Pass**
7	The WPA STA – 1 is associated and authenticated with the APUT.	**Pass**
8	Re-attempt to ping. Pings shall be successful within 90 seconds.	**Pass**

4.2.10 Multicast WPA2-PSK Only Mode and WPA / WPA2-PSK Mixed Mode		
1	Association occurs.	**Pass**
2	The Chariot test (STA1 → APUT & STA2) can run to completion without stopping.	**Pass**
3	The Chariot test (APUT → STA2 & STA2) can run to completion without stopping.	**Pass**

4.2.11 Pre-authentication		
1	Association occurs.	**Pass**
2	Required EAP-Success frame with an Ethertype of "Pre-authentication" has been captured by the wired sniffer.	**Pass**
3	The PMKID in the association message and 4-way message 1 match.	**Pass**
4	Full EAP authentication does not occur over the air between STA and APUT.	**Pass**

4.2.12 PMK Caching		
1	Association occurs.	**Pass**
2	The PMKID in the association message and 4-way message 1 match.	**Pass**
3	Full EAP authentication does not occur over the air between STA and APUT.	**Pass**

4.2.13 WPA Specific Countermeasures		
1	Association occurs.	**Pass**
2	Ping APUT from Atheros and Broadcom STAs	**Pass**
3	Generate a single bad frame. For the next 70 seconds, both testbed stations continue with their ping session.	**Pass**
4	After 70 seconds, generate anther bad frame.	**Pass**
5	For the next 50 seconds, both testbed stations continue with ping session.	**Pass**
6	After 50 seconds, generate a third bad frame.	**Pass**
7	The APUT de-authenticates both of the testbed STAs. Both ping will stop.	**Pass**
8	After a period of 60 seconds, both testbed stations are able to associate again with the APUT. The ping sessions are re-established. (this re-establishment of the association may require manual intervention. This is acceptable).	**Pass**

	4.2.14 WPA Negative Tests – No Association with a WEP or No Encryption STA	
1	The STA1 does not receive a ping response with 90 seconds.	**Pass**
2	The STA2 does not receive a ping response with 90 seconds.	**Pass**

	4.2.15 WPA Negative Test Cases – No Association with a WPA2-Enterprise with TLS and WPA2-PSK Configured Access Point	
1	Enable WPA2-TLS security mode.	**Pass**
2	The STA1 receives a ping response with 90 seconds.	**Pass**
3	The STA2 does not receive a ping response with 90 seconds.	**Pass**
4	Enable WPA2-PSK security mode.	**Pass**
5	The STA1 does not receive a ping response with 90 seconds.	**Pass**
6	The STA2 receives a ping response with 90 seconds.	**Pass**

4.2.16 802.11d and 802.11h Testing		
1	Associate the h+d station with the APUT.	**Pass**
2	5 Countries Information Elements are identical in both the beacon and probe response.	**Pass**
3	Both codes correspond to the code specified for the configured country in the Wi-Fi Alliance list.	**Pass**
4	Associate the h+d station with the APUT.	**Pass**
5	The beacon and probe response message contain a Power Constraint Element.	**Pass**
6	Associate the h+d station with the APUT.	**Pass**
7	The Channel Switch Announcement Element (#37) is repeated in the last 5 beacons.	**Pass**
8	The AP stops beaconing on the channel within 15 seconds after issuing the channel switch command.	**Pass**

4.2.17 Extended EAP Test (Enterprise APs Only) – Category 1 & 2
#ExA1 (EAP-TTLS)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA2 (EAP-PEAPv0)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA3 (EAP-PEAPv1)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA4 (EAP-PEAPv0)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA5 (EAP-TLS)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds	**Excluded**
2	Association Negative Test – Expired Station Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA6 (EAP-TTLS)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA7 (EAP-PEAPv0)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA8 (EAP-PEAPv1)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

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#ExA9 (EAP-TLS)		
1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds	**Excluded**
2	Association Negative Test – Expired Station Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA10 (EAP-TTLS)		
1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA11 (EAP-PEAPv0)		
1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA12 (EAP-PEAPv1)

1	Association Positive Test – Valid authentication certificates installed and the ping test does successfully start within 90 seconds.	**Excluded**
2	Association Negative Test – Expired station certificate and the ping test does not successfully start within 45 seconds.	**Excluded**
3	Association Negative Test – Wrong Client Password and the ping test does not successfully start within 45 seconds.	**Excluded**
4	Association Negative Test – Expired AS Certificate and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA13 (EAP-SIM)

1	Association Positive Test – the ping test does successfully within 90 seconds.	**Excluded**
2	Association Negative Test – SIM IMSI not contained within the AS database and the ping test does not successfully start within 45 seconds.	**Excluded**

#ExA18 (EAP-AKA)

1	The simulated AUC/HLR is restarted so the sequence number is reset to its initial value.	**Excluded**
2	The STAUT's supplicant shall attempt to authenticate to a test bed AS through a test bed AP.	**Excluded**
3	The EAP-AKA server will indicate that the USIM card's sequence number needs to be resynchronized.	**Excluded**
4	The simulated AUC/HLR will indicate that a resynchronization occurred, and the supplicant shall give some indication that 802.1X authentication has been successful.	**Excluded**
5	Ping from the STAUT to a PC on the wired Ethernet side of the test bed AP. If ping is not successful, then fail the test.	**Excluded**

#ExA19 (EAP-AKA)	
1	Uses a USIM card (supplied by STAUT vendor) that is not contained in the AS and the STAUT's supplicant shall attempt to authenticate to a test bed AS through a test bed AP.	**Excluded**
2	The supplicant shall give some indication that 802.1X authentication has not been successful.	**Excluded**
3	An attempt to ping the test bed AS from the STAUT shall fail.	**Excluded**

#ExA20 (EAP-AKA)	
1	2 testbed APs are configured identically with a WPAv1 SSID. The STAUT's supplicant shall attempt to authenticate to a test bed AS through a first test bed AP.	**Excluded**
2	The supplicant shall give some indication that 802.1X authentication has been successful. The STAUT shall then be able to 'ping' the test bed AS.	**Excluded**
3	The 1st test bed AP will be switched off, causing the STAUT to roam to a 2nd test bed AP. The STAUT shall give some indication that the 802.1X (re)authentication has been successful.	**Excluded**
4	EAP-AKA fast reauthentication will be used if enabled by the STAUT when the test bed AS is (to be determined).	**Excluded**

#ExA21 (EAP-FAST)	
1	Configure the EAP-FAST PAC lifetime on the server to be one minute.	**Excluded**
2	Restart the authentication process to provision a new PAC, and wait in excess of one minute to "time out" the PAC so that the supplicant has no valid PACs which may be used for authentication.	**Excluded**
3	Configure a wireless network using WPA version 1. WPA version 1 is required for this test to disable PMK caching.	**Excluded**
4	Configure the EAP-FAST server to have a PAC lifetime of one minute, or	**Excluded**

	the shortest time supported by the EAP-FAST server. EAP-FAST should use authenticated provisioning with GTC inner authentication.	
5	Within the test bed AS's PAC lifetime, authenticate the STAUT to the network.	**Excluded**
6	The supplicant shall give some indication that the 802.1X authentication has been successful, and should give an indication that a new PAC has been provisioned.	**Excluded**
7	Ping from the supplicant to the AS. This operation should succeed.	**Excluded**
8	Wait for a time period in excess of the test bed AS's PAC lifetime to "time out" the PAC so that it is no longer valid.	**Excluded**
9	Attempt to reauthenticate from the supplicant to the AS.	**Excluded**
10	Depending on implementation, a new PAC may be generated. If authentication is successful, then a new ping test should succeed. If the ping test fails, the test fails.	**Excluded**

#ExA22 (EAP-FAST)		
1	Clear any PACs installed on the server and supplicant, and configure the EAP-FAST PAC lifetime on the server to be one minute.	**Excluded**
2	Restart the authentication process to provision a new PAC, and wait in excess of one minute to "time out" the PAC so that the supplicant has no valid PACs which may be used for authentication. Configure a wireless network using WPA version 1. WPA version 1 is required for this test to disable PMK caching.	**Excluded**
3	Configure the EAP-FAST server to have a PAC lifetime of one minute, or the shortest time supported by the EAP-FAST server. EAP-FAST should use authenticated provisioning with MSCHAPv2 inner authentication.	**Excluded**
4	Within the test bed AS's PAC lifetime, authenticate the STAUT to the network.	**Excluded**
5	The supplicant shall give some indication that the 802.1X authentication has been successful, and should give an indication that a new PAC has been provisioned.	**Excluded**

6	Ping from the supplicant to the AS. This operation should succeed.	**Excluded**
7	Wait for a time period in excess of the test bed AS's PAC lifetime to "time out" the PAC so that it is no longer valid.	**Excluded**
8	Attempt to reauthenticate from the supplicant to the AS.	**Excluded**
9	Depending on implementation, a new PAC may be generated. If authentication is successful, then a new ping test should succeed. If the ping test fails, the test fails.	**Excluded**

#ExA23 (EAP-FAST)		
1	A server certificate signed by an unknown CA must be installed on the AS. The STA's supplicant shall attempt to authenticate with the AS through the AP.	**Excluded**
2	The supplicant shall give some indication that 802.1X authentication has not been successful. Ping a testbed device from the testbed STA will fail.	**Excluded**

4.2.18 Extended EAP Tests (Enterprise APs Only) – Category 3 & 2 **#ExA14 (EAP-TTLS)**		
1	Association Positive Test – Valid authentication certificates installed and ping test does successfully start within 90 seconds.	**Pass**

#ExA15 (EAP-PEAPv0)		
1	Association Positive Test – Valid authentication certificates installed and ping test does successfully start within 90 seconds.	**Pass**

#ExA16 (EAP-PEAPv1)		
1	Association Positive Test – Valid authentication certificates installed and ping test does successfully start within 90 seconds.	**Pass**

#ExA17 (EAP-SIM)	
1	Association Positive Test – ping test does successfully within 90 seconds	**Pass**

#ExA24 (EAP-FAST)	
1	Association Positive Test – Valid authentication certificates installed and ping test does successfully start within 90 seconds.	**Pass**

#ExA15 (EAP-AKA)	
1	Association Positive Test – ping test does successfully within 90 seconds	**Pass**

4.2.19 Dual Band APs	
1	Association occurs.	**Pass**
2	(A-STA → G-STA) FILESNDL: 16.829 Mbps.	**Pass**
3	(G-STA → A-STA) FILESNDL: 16.340 Mbps.	**Pass**

4.2.20 Basic WMM Association and Transmission		
1	A Probe Request occurs and doesn't contain any WMM element.	**Pass**
2	Association Request contains WMM information element and STAUT associated.	**Pass**
3	Association occurs.	**Pass**
4	RTP_BE down, RTP_VI down, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
5	RTP_BE down, RTP_VI down, RTP_BE up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
6	RTP_BE up, RTP_VI up, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 79% or more value of RTP2 in first phase (1~9s).	**Pass**
7	RTP_VI up, RTP_VO up, RTP_VI down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 76% or more value of RTP2 in first phase (1~9s).	**Pass**
8	RTP_BK up, RTP_BE up, RTP_BK down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**

4.2.21 Traffic Differentiation in Single BSS with 2 802.11n STAs		
1	A Probe Request occurs and doesn't contain any WMM element.	**Pass**
2	Association Request contains WMM information element and STAUT associated.	**Pass**
3	Association occurs.	**Pass**
4	RTP_BE down, RTP_VI down, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
5	RTP_BE down, RTP_VI down, RTP_BE up: RTP2 in second phrase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more then RTP2 in first phrase (1~9s).	**Pass**
6	RTP_BE up, RTP_VI up, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
7	RTP_VI down, RTP_VO down, RTP_VI down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
8	RTP_VI down, RTP_VO down, RTP_VI up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
9	RTP_BK down, RTP_BE down, RTP_BK down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
10	RTP_BK down, RTP_BE down, RTP_BK up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**

4.2.22 Traffic Differentiation in Single BSS with WMM STA	
1	A Probe Request occurs and doesn't contain any WMM element.	**Pass**
2	Association Request contains WMM information element and STAUT associated.	**Pass**
3	Association occurs.	**Pass**
4	RTP_BE down, RTP_VI down, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
5	RTP_BE down, RTP_VI down, RTP_BE up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
6	RTP_BE up, RTP_VI up, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
7	RTP_VI down, RTP_VO down, RTP_VI down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
8	RTP_VI down, RTP_VO down, RTP_VI up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
9	RTP_BK down, RTP_BE down, RTP_BK down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
10	RTP_BK down, RTP_BE down, RTP_BK up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**

	4.2.23 Traffic Differentiation in Single BSS with Legacy non-WMM STA	
1	A Probe Request occurs and doesn't contain any WMM element.	**Pass**
2	Association Request contains WMM information element and STAUT associated.	**Pass**
3	Association occurs.	**Pass**
4	RTP_BE down, RTP_VI down, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 87% or more value of RTP2 in first phase (1~9s).	**Pass**
5	RTP_BE down, RTP_VI down, RTP_BE up: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
6	RTP_BE up, RTP_VI up, RTP_BE down: RTP2 in second phase (11~19s) is RTP2-P2/RTP2-P1 ≥ 90% or more value of RTP2 in first phase (1~9s).	**Pass**
7	RTP_BE down, RTP_VI up, RTP_BE down: RTP1 is less than RTP1-P2/RTP3-P2 ≥ 130% of RTP3 (Fairness with legacy test).	**Pass**

	4.2.24 APUT "No Acknowledgement" Test	
1	Association occurs.	**Pass**
2	APUT generates ACK packets, and record values of RTP1 and RTP2 throughput.	**Pass**
3	APUT doesn't generate ACK packets, and the values of RTP1 and RTP2 throughput are RTP1-T06/RTP1-T04 ≥ 73% or more of RTP1 and RTP2 in step #4.	**Pass**

4.2.25 Traffic Differentiation in Single BSS		
1	A Probe Request occurs and doesn't contain any WMM element.	**Pass**
2	Association Request contains WMM information element and STAUT associated.	**Pass**
3	Association occurs.	**Pass**
4	RTP_BE down: receives data RTP2.	**Pass**
5	RTP_BK down: receives data RTP2.	**Pass**
6	RTP_BE down: receives data RTP2.	**Pass**
7	RTP_BE down, RTP_VI down: RTP2/RTP1 ≥ 75%.	**Pass**

	4.2.26 Basic Association in 802.11n Environment	
1	The STA1 is associated with APUT, and ping goes through by using ping <STA1 IP> -l 10000 –t.	**Pass**
2	**For 2.4GHz Band:** the supported Channel Width Field in the HT Capability IE in Association Request is 0 (20MHz).	**Pass**
3	The supported list does match the submission: 　1.　Supported Channel Width, 　2.　MCS Set (1 SS or 2 SS), 　3.　Greenfield, 　4.　SGI 20 　5.　SGI 40 　6.　MCS 32	**Pass**
4	The APUT doesn't use protection (RTS/CTS or CTS to Self).	**Pass**
5	After 30 seconds, STA2 is associated with AP, and ping goes through by using ping <STA2 IP> -l 10000 –t.	**Pass**
6	The APUT doesn't use protection (RTS/CTS or CTS to Self).	**Pass**
7	After 30 seconds, STA3 is associated with AP, and ping goes through by using ping <STA3 IP> -l 10000 –t.	**Pass**
8	The APUT doesn't use protection (RTS/CTS or CTS to Self).	**Pass**
9	Disassociate with STA1 after 30 seconds, nothing change.	**Pass**
10	Disassociate with STA2 after 30 seconds, the APUT operating mode is changed into 00 (pure) or 10 (mixed 20 MHz and 20/40 MHz).	**Pass**
11	Disassociate with STA3 after 30 seconds, the APUT operating mode is changed into 00 (pure).	**Pass**

4.2.27 Ability to Receive 1 and 2 Spatial Streams		
1	Association occurs	**Pass**
2	**For 20 MHz:** Set the test STA fixed TX rate to MCS 7. The association occurs and ping goes through by using ping <APUT IP> -l 10000 –t.	**Pass**
3	**For 20 MHz:** Set the test STA fixed TX rate to MCS 15. The association occurs and ping goes through by using ping <APUT IP> -l 10000 –t.	**Pass**
4	**For 20/40 MHz:** Set the test STA fixed TX rate to MCS 7. The association occurs and ping goes through by using ping <APUT IP> -l 10000 –t.	**Pass**
5	**For 20/40 MHz:** Set the test STA fixed TX rate to MCS 15. The association occurs and ping goes through by using ping <APUT IP> -l 10000 –t.	**Pass**

4.2.28 MIMO Power Save Operation		
1	STA1 with Dynamic MIMO Power Save Mode associates with APUT.	**Pass**
2	STA2 with Static MIMO Power Save Mode associates with APUT.	**Pass**
3	Verify the association for both STAs by using ping <STA1 IP> -t –l 10000 and ping <STA2 IP> -t –l 10000.	**Pass**
4	The rate of the ping requests to STA1 traffic is less than MCS 7 or greater than MCS 7 and there's RTS/CTS before each frames send.	**Pass**
5	The rate of the ping requests to STA2 traffic is less than MCS 7.	**Pass**
6	After 30 seconds, send MIMO Power Save mode action frame to the APUT to switch from Dynamic MIMO Power Save Mode to Static MIMO Power Save Mode. The rate of the ping requests to STA1 traffic is less than MCS 7.	**Pass**
7	After 30 seconds, send MIMO Power Save mode action frame to the APUT to switch from Static MIMO Power Save to No Limitation. The pings still go through.	**Pass**
8	After 30 seconds, send MIMO Power Save mode action frame to the APUT to switch from No Limitation into Dynamic MIMO Power Save Mode. The rate of the ping requests to STA1 traffic is less than MCS 7 or greater than MCS 7 and there's RTS/CTS before each frames send.	**Pass**

4.2.29 A-MPDU Aggregation when the AP is the Recipient with and without WPA2-PSK		
1	Association occurs with No Security.	**Pass**
2	STA1 sends ADDBA Request for TID 5.	**Pass**
3	Data Transfer (STA → APUT) UDP FILESENDL-HT: 64.588 Mbps.	**Pass**
4	Check that there are BAs.	**Pass**
5	Association occurs with WPA2-PSK.	**Pass**
6	STA1 sends ADDBA Request for TID 5.	**Pass**
7	Data Transfer (STA → APUT) UDP FILESENDL-HT: 52.373 Mbps.	**Pass**
8	Check that there are BAs.	**Pass**

4.2.30 A-MSDU Aggregation when the AP is the Recipient		
1	Association occurs.	**Pass**
2	Data Transfer (STA → APUT) UDP FILESENDL-HT: 32.326 Mbps.	**Pass**
3	Check that the Broadcom STA packets are > 2346 by using sniffer.	**Pass**

4.2.31 Overlapping BSS – 2.4GHz		
1	Association occurs.	**Pass**
2	Data Transfer (APUT → STA1) TCP High Performance: 10.217 Mbps. Data Transfer (AP → STA2) TCP FILESENDL: 11.478 Mbps.	**Pass**

4.2.32 Overlapping BSS – 5GHz	
1	Association occurs.	**Pass**
2	Data Transfer (APUT → STA1) TCP High Performance:　29.565 Mbps. Data Transfer (AP → STA2) TCP FILESENDL:　18.565 Mbps.	**Pass**

4.2.33 Greenfield Operation	
1	Association occurs.	**Pass**
2	Data Transfer (STA1 → APUT) TCP High Performance:　20.939 Mbps.	**Pass**
3	The APUT non-GF device bit is not set.	**Pass**
4	STA2 with GF disabled associate with AP.	**Pass**
5	Data Transfer (STA1 → APUT) TCP High Performance:　21.076 Mbps.	**Pass**
6	Disassociate with STA2 after 30 seconds, and the APUT non-GF device bit is not set.	**Pass**

4.2.34 Short GI Operation	
1	STA1 with SGI 20 MHz enabled associates with APUT.	**Pass**
2	Data Transfer (STA1 → APUT) TCP High Performance:　20.673 Mbps.	**Pass**
3	STA2 with SGI disabled associates with APUT.	**Pass**
4	Data Transfer (STA1 → APUT) TCP High Performance:　10.428 Mbps. Data Transfer (STA2 → APUT) TCP High Performance:　12.366 Mbps.	**Pass**

4.2.35 Overlapping BSS on the Extension Channel		
1	11n APUT is configured to channel 36 and 40.	**Pass**
2	Association occurs.	**Pass**
3	Data Transfer (APUT → STA1) TCP High Performance: 29.999 Mbps. Data Transfer (AP → STA2) TCP FILESENDL: 19.538 Mbps.	**Pass**

4.2.36 HT Duplicate Mode (MCS index = 32)		
1	Set the testbed STA to send data with fixed MCS index 32.	**Pass**
2	Association occurs.	**Pass**
3	The ping goes through for 1 minute by using ping <APUT IP> - 10000 -t	**Pass**

4.2.37 AP Concurrent Operation in 2.4 and 5 GHz Frequency Bands		
1	Association occurs for both STAs.	**Pass**
2	Data Transfer (STA1 → STA2) TCP FILESENDL: 24.869 Mbps.	**Pass**
3	Data Transfer (STA2 → STA1) TCP FILESENDL: 32.239 Mbps.	**Pass**

4.2.38 RIFS Test		
1	**For 20 MHz:** Broadcom STA associates with the APUT.	**Excluded**
2	Start a long packet ping to Endpoint 1 by using "ping APUT_IP –l 30000 –v 160 –n 100" and the number of the lost pings should be less than 30%.	**Excluded**
3	Check the sniffer that there are no ACKs.	**Excluded**
4	**For 40 MHz:** Broadcom STA associates with the APUT.	**Excluded**
5	Start a long packet ping to Endpoint 1 by using "ping APUT_IP –l 30000 –v 160 –n 100" and the number of the lost pings should be less than 30%.	**Excluded**
6	Check the sniffer that there are no ACKs.	**Excluded**
7	**For 20/40 MHz:** Broadcom STA associates with the APUT.	**Pass**
8	Start a long packet ping to Endpoint 1 by using "ping APUT_IP –l 30000 –v 160 –n 100" and the number of the lost pings should be less than 30%.	**Pass**
9	Check the sniffer that there are no ACKs.	**Pass**

4.2.39 Disallow TKIP with HT Rates Test **WPA-PSK Only**		
1	If the AP prohibits the configuration of TKIP as a pairwise ciphers suite when HT is enabled, the PASS. Stop test.	**Pass**
2	1. If TKIP is not advertised in the Beacon and if TKIP is not advertised in Probe Response, the PASS. Stop test. 2. If CCMP is NOT advertised in Beacon and either information elements 45 or 61 are present, then FAIL. Stop test. 3. If CCMP is NOT advertised in Probe Response and either information elements 45 or 61 are present, then FAIL. Stop test.	**Pass**

3	1. If the Association Response status code is non-zero, then PASS. Stop test. 2. If IE 45 is present is the Association Response and the status code is zero, then FAIL. Stop test.	**Pass**
4	If any of the data packets are exchanged at HT rates, then FAIL. Stop test.	**Pass**

WPA2-PSK / WPA-PSK Mixed Mode		
1	If the AP prohibits the configuration of TKIP as a pairwise cipher suite when HT is enabled, then PASS. Stop test.	**Pass**
2	1. If the Association Response status code is non-zero, then PASS. Stop test. 2. If IE 45 is present in the Association Response and the status code is zero, then FAIL. Stop test.	**Pass**
3	If any of the data packets are exchanged at HT rates, then FAIL. Stop test.	**Pass**

Appendix A – Chariot Results

4.2.3

1. Data Transfer #1 (APUT → STA: TCP FILESENDL)

Result: <u>20.080</u> Mbps > Required: <u>15.55</u> Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	19.807	0.967	24.243			
Pair 1	20.080	0.967	24.243	0.642	88.764	3.198
Totals:	19.807	0.967	24.243			

Throughput
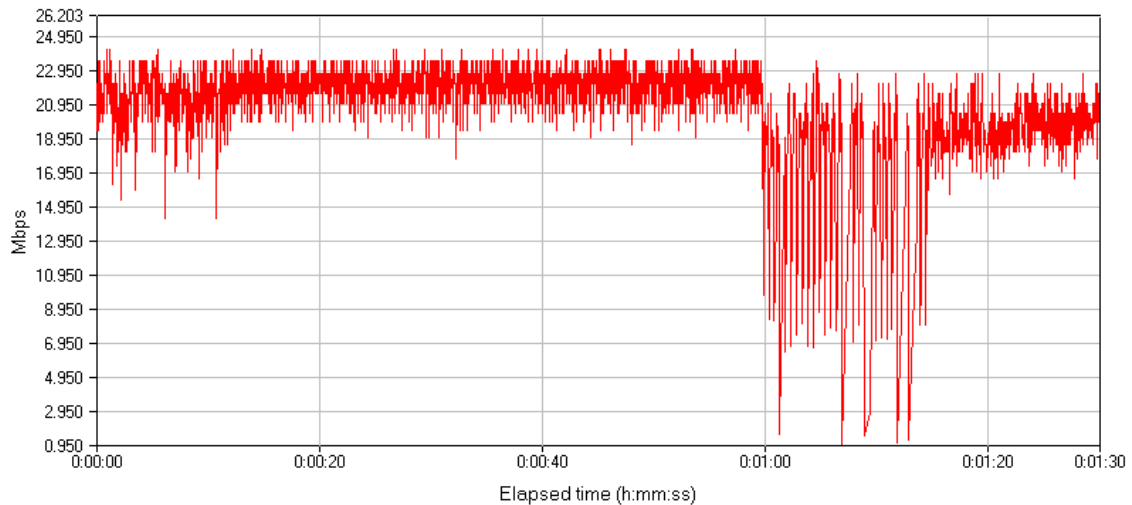
2. Data Transfer #2 (STA → APUT: TCP FILESENDL)

Result: <u>23.262</u> Mbps > Required: <u>14.85</u> Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	22.894	18.605	26.667			
Pair 1	23.262	18.605	26.667	0.040	88.558	0.170
Totals:	22.894	18.605	26.667			

Throughput
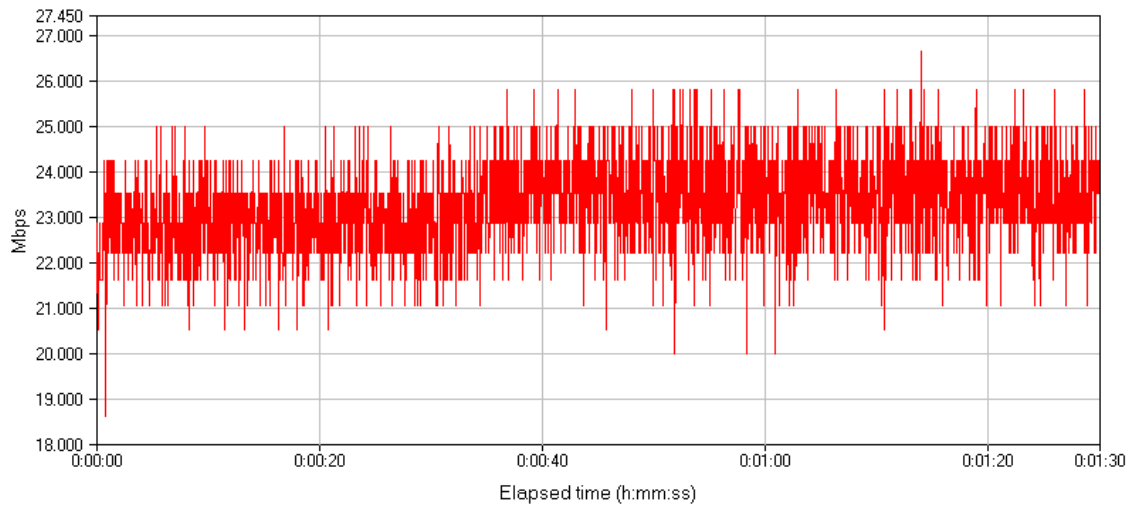
3.   **Data Transfer #3 (APUT → STA: TCP INQUIRYL)**

Result: 1.391 Mbps > Required: 1.12 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	1.378	0.860	1.509			
Pair 1	1.391	0.860	1.509	0.003	89.152	0.193
Totals:	1.378	0.860	1.509			

Throughput
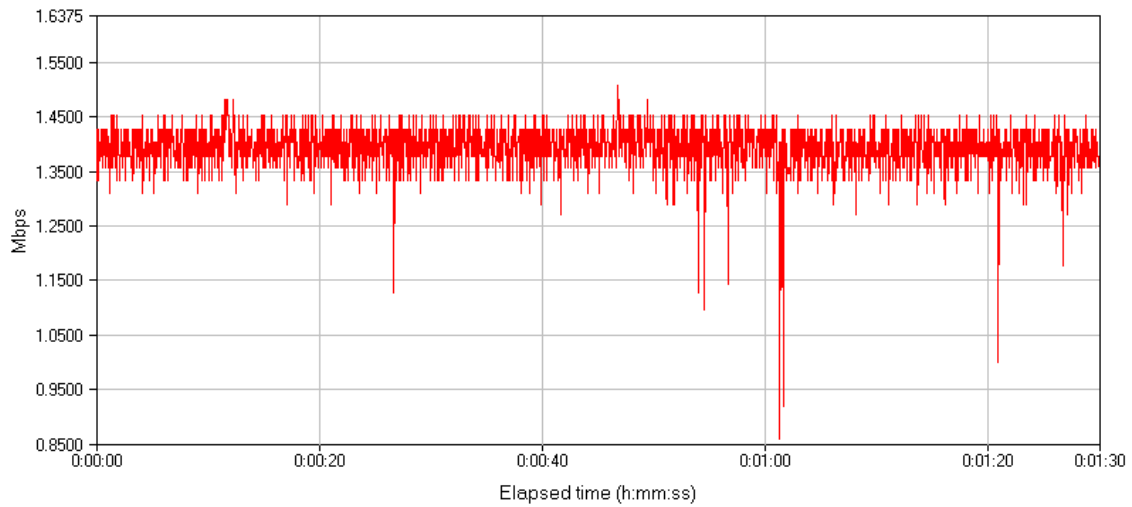
4. **Data Transfer #1 (NAV: TCP FILESENDL)**

Result: 7.410 Mbps < Required: 16.064 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	7.373	1.985	24.243			
Pair 1	7.410	1.985	24.243	0.200	89.501	2.702
Totals:	7.373	1.985	24.243			

Throughput

ALLION
ISO/IEC 17025 Qualified
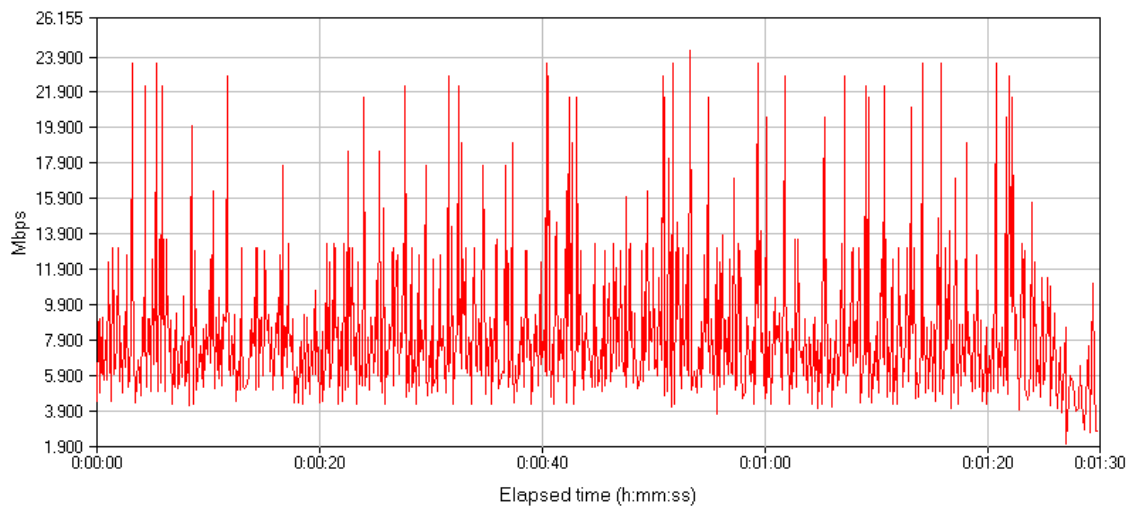
5. Data Transfer #1 (PLCP: TCP FILESENDL)

Result: **7.960** Mbps < Required: **16.064** Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	7.917	3.604	8.989			
Pair 1	7.960	3.604	8.989	0.066	89.452	0.834
Totals:	7.917	3.604	8.989			

Throughput
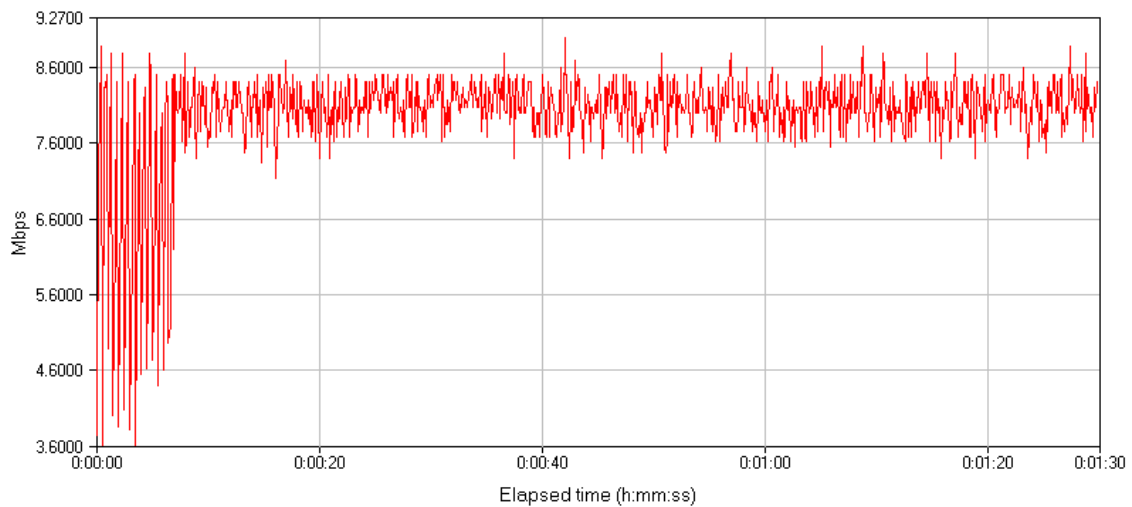
4.2.4

1. **Data Transfer #1 (APUT → STA: TCP FILESENDL)**

   Result: 14.147 Mbps > Required: 13.98 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	14.010	1.028	15.385			
Pair 1	14.147	1.028	15.385	0.276	89.120	1.949
Totals:	14.010	1.028	15.385			

Throughput
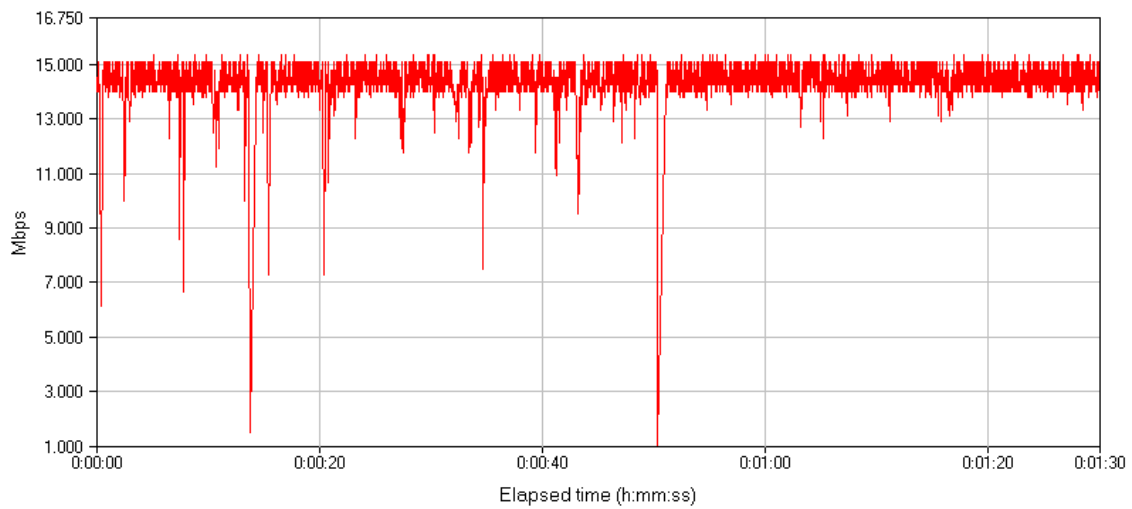
2. Data Transfer #2 (STA → APUT: TCP FILESENDL)

Result: <u>14.069</u> Mbps > Required: <u>6.85</u> Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	13.918	10.390	15.686			
Pair 1	14.069	10.390	15.686	0.036	88.991	0.259
Totals:	13.918	10.390	15.686			

Throughput

3. Data Transfer #3 (APUT → STA: TCP INQUIRYL)

Result: <u>0.967</u> Mbps > Required: <u>0.85</u> Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	0.961	0.210	1.096			
Pair 1	0.967	0.210	1.096	0.012	89.421	1.249
Totals:	0.961	0.210	1.096			

Throughput
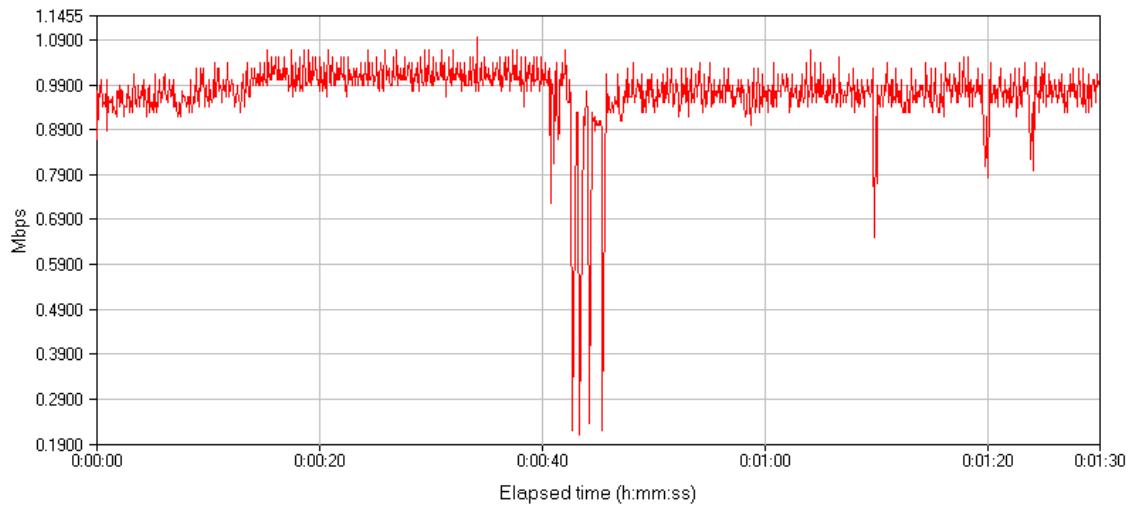
4.2.5

1. Data Transfer #1 (APUT → STA: TCP FILESENDL)

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	4.676	0.384	8.511			
Pair 1	4.692	0.384	8.511	0.344	89.520	7.334
Totals:	4.676	0.384	8.511			

Throughput
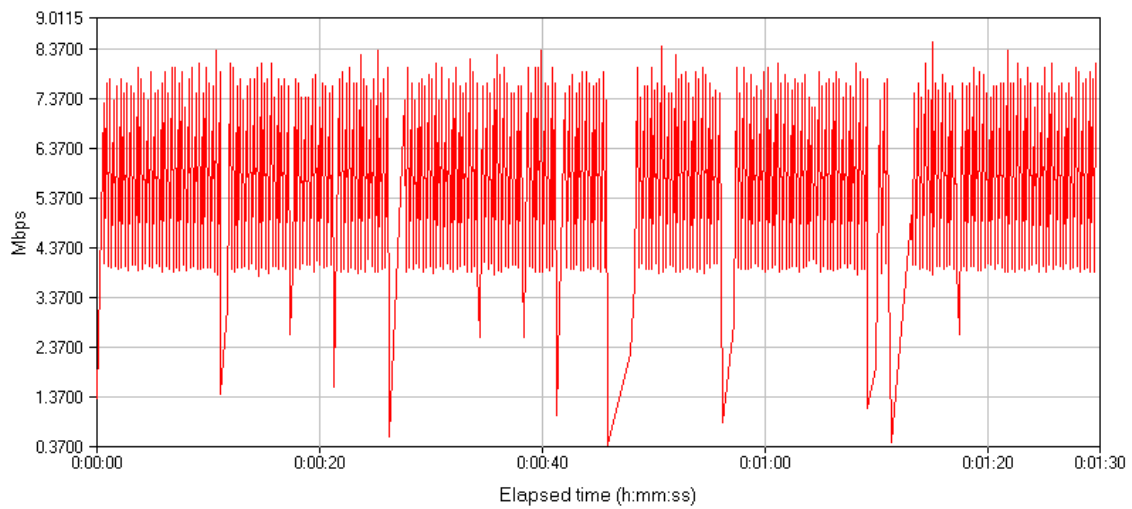
Project ID：ACP-AAN-WIFI-002_1

2. Data Transfer #2 (STA → APUT: TCP FILESENDL)

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	3.105	0.140	19.512			
Pair 1	3.115	0.140	19.512	0.631	87.591	20.269
Totals:	3.105	0.140	19.512			

Throughput
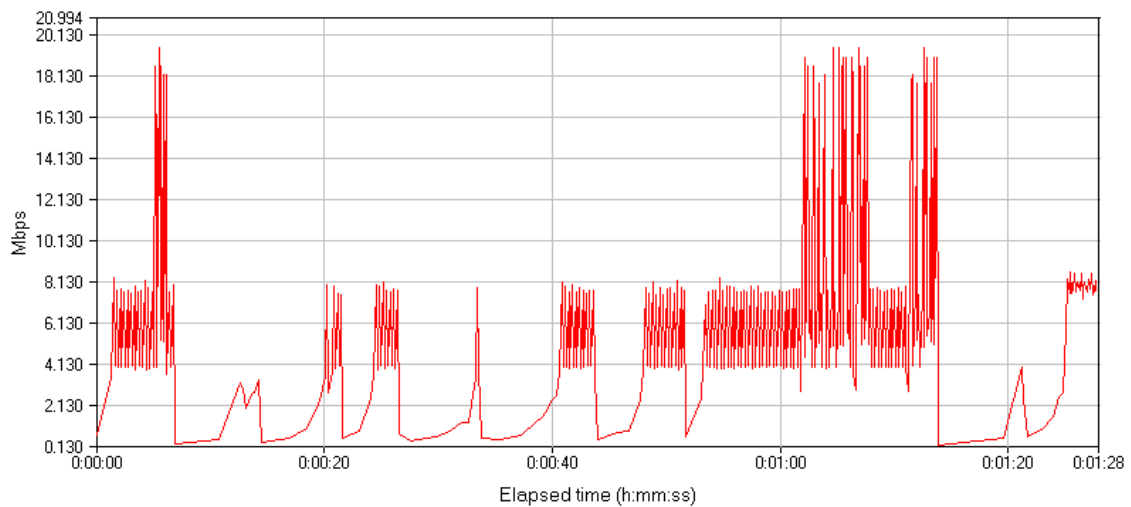
Project ID：ACP-AAN-WIFI-002_1

3. Data Transfer #3 (APUT → STA: TCP INQUIRYL)

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	0.015	0.012	0.016			
Pair 1	0.015	0.012	0.016	0.001	88.056	3.901
Totals:	0.015	0.012	0.016			

Throughput
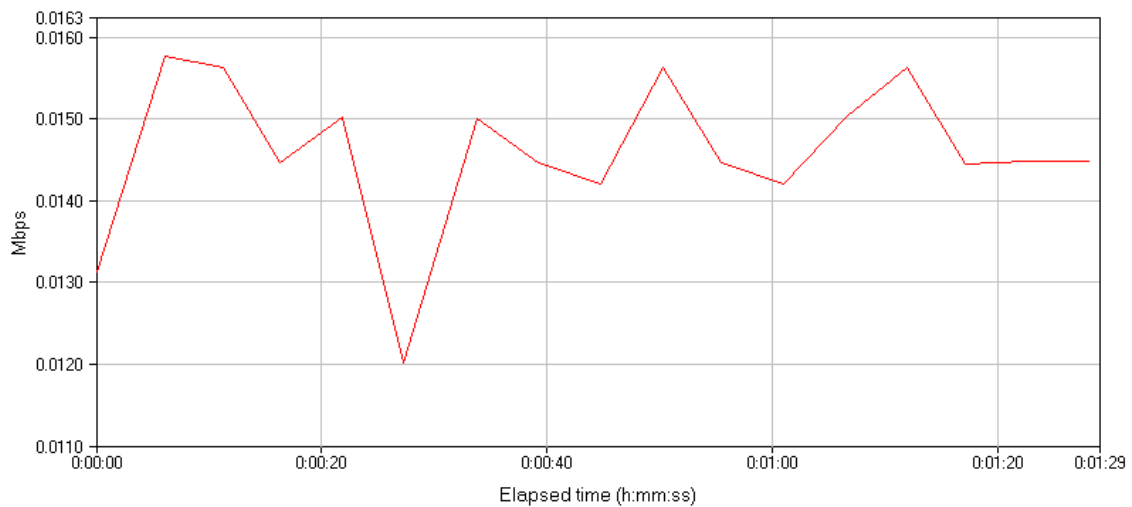
4.2.6

1. Data Transfer #1 (APUT → STA: TCP INQUIRYL-REPLAY)

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	1.017	0.117	1.194			
Pair 1	1.024	0.117	1.194	0.018	109.388	1.767
Totals:	1.017	0.117	1.194			

Throughput
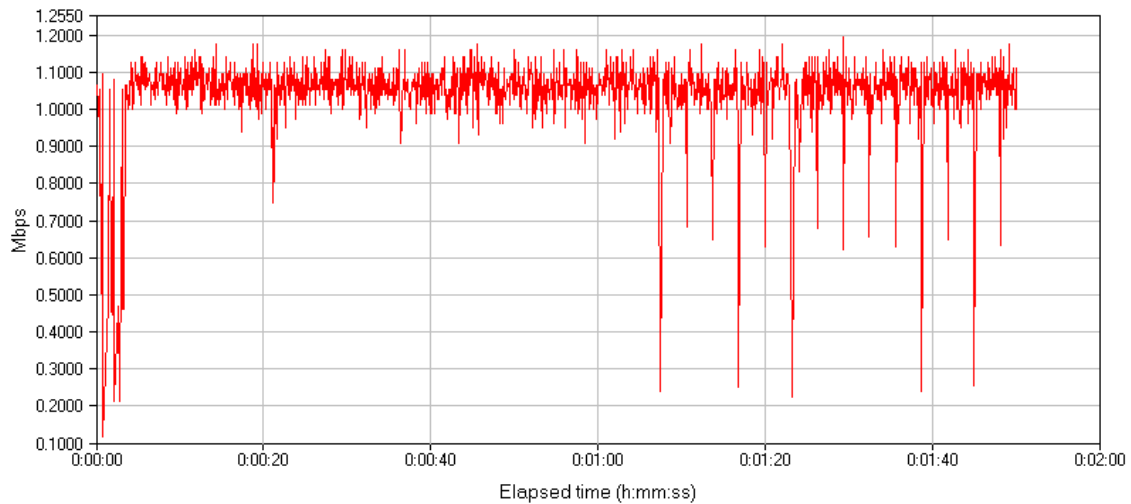
2. The number of bytes received by E1 (Endpoint 1)

Result: **6.675** MegaBytes > Required: **6.6** MegaByte

Group/ Pair	Number of Timing Records	Transaction Count	Bytes Sent by E1	Bytes Received by E1	Measured Time (secs)	Relative Precision
All Pairs	1,400	70,000	7,000,000	7,000,000		
Pair 1	1,400	70,000	7,000,000	7,000,000	109.388	1.767
Totals:	1,400	70,000	7,000,000	7,000,000		

Project ID：ACP-AAN-WIFI-002_1

4.2.7

1. **Data Transfer #1 (APUT → STA1: TCP FILESENDL)**
2. **Data Transfer #1 (APUT → STA2: TCP FILESENDL)**

   WPA2 Result: 11.320 Mbps > Required: 6.31 Mbps

   WPA Result: 11.455 Mbps > Required: 6.44 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	22.547	0.485	24.243			
Pair 1	11.320	0.558	24.243	0.353	88.834	3.114
Pair 2	11.455	0.485	24.243	0.406	89.327	3.543
Totals:	22.547	0.485	24.243			

Throughput

3. **Data Transfer #2 (STA1 → APUT: TCP FILESENDL)**

4. **Data Transfer #2 (STA2 → APUT: TCP FILESENDL)**

   WPA2 Result: 13.108 Mbps > Required: 6.93 Mbps

   WPA Result: 10.509 Mbps > Required: 7.16 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	23.410	1.342	25.807			
Pair 1	13.108	9.412	25.807	0.097	89.047	0.740
Pair 2	10.509	1.342	14.815	0.256	89.295	2.439
Totals:	23.410	1.342	25.807			

Throughput
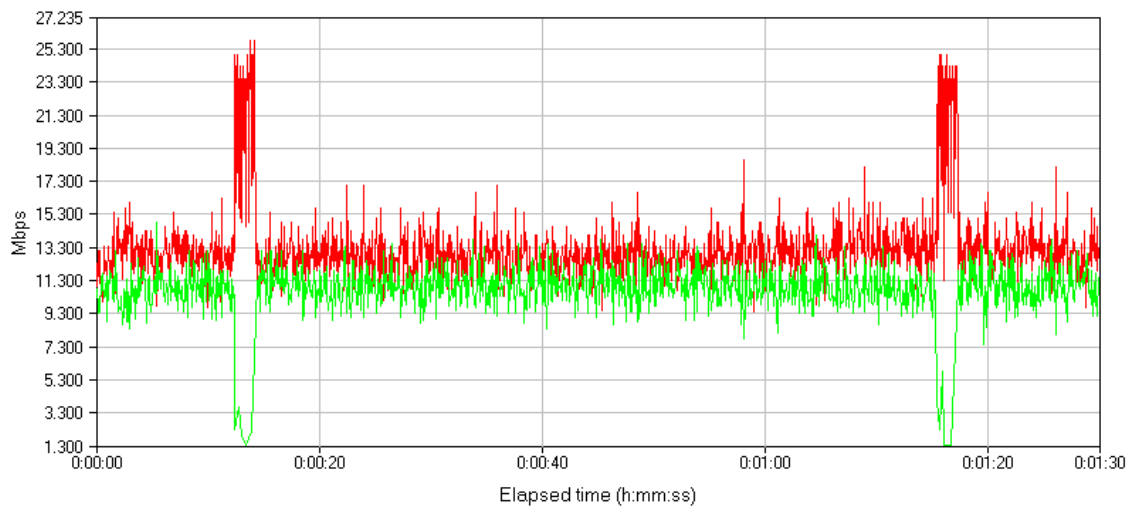
Project ID：ACP-AAN-WIFI-002_1

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5. **Data Transfer #3 (APUT → STA1: TCP INQUIRYL)**

6. **Data Transfer #3 (APUT → STA2: TCP INQUIRYL)**

WPA2 Result: 0.996 Mbps > Required: 0.35 Mbps

WPA Result: 1.070 Mbps > Required: 0.35 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	2.050	0.106	1.429			
Pair 1	0.996	0.176	1.290	0.009	89.212	0.896
Pair 2	1.070	0.106	1.429	0.027	89.339	2.507
Totals:	2.050	0.106	1.429			

Throughput
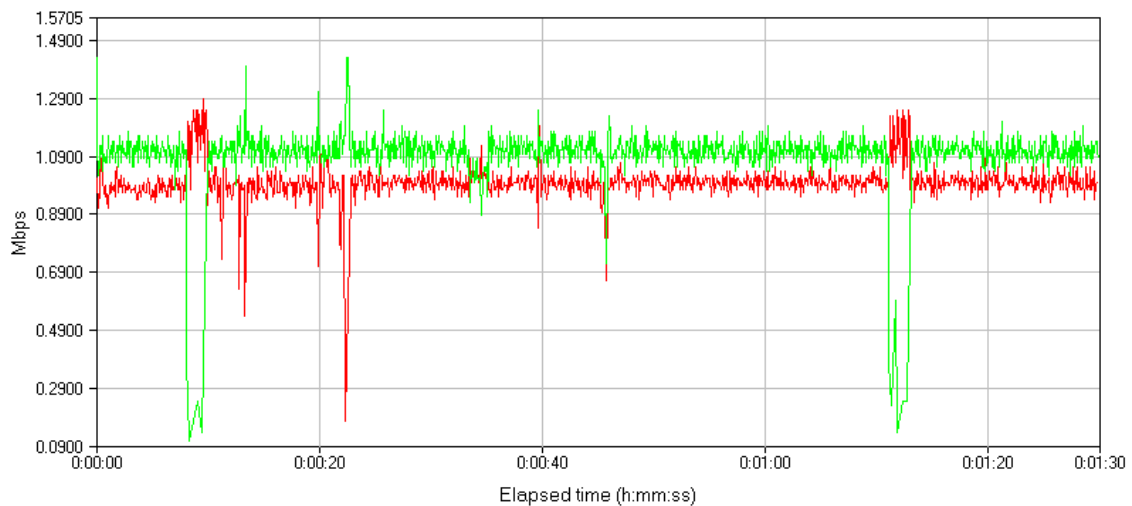
4.2.8

1. **Data Transfer #1 (APUT → STA1: TCP FILESENDL)**

2. **Data Transfer #1 (APUT → STA2: TCP FILESENDL)**

   WPA2 Result: 9.422 Mbps > Required: 7.51 Mbps

   WPA Result: 9.142 Mbps > Required: 6.80 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	18.452	0.444	21.053			
Pair 1	9.422	4.598	21.053	0.063	89.405	0.672
Pair 2	9.142	0.444	12.699	0.348	89.438	3.802
Totals:	18.452	0.444	21.053			

Throughput
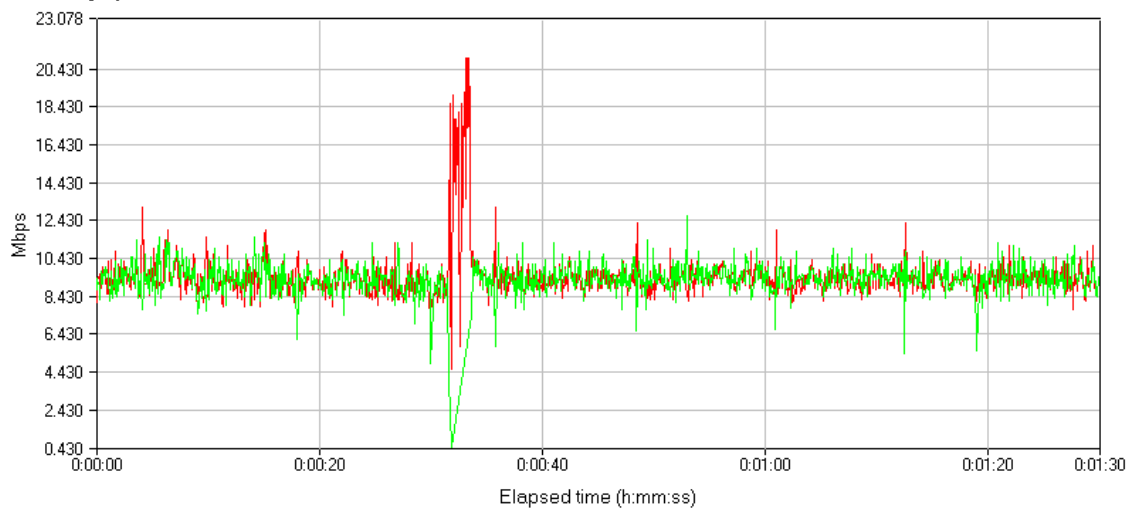
3. **Data Transfer #2 (STA1 → APUT: TCP FILESENDL)**

4. **Data Transfer #2 (STA2 → APUT: TCP FILESENDL)**

   WPA2 Result: 12.621 Mbps > Required: 6.87 Mbps

   WPA Result: 10.317 Mbps > Required: 7.15 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	22.742	0.851	25.807			
Pair 1	12.621	1.190	25.807	0.194	89.119	1.539
Pair 2	10.317	0.851	24.243	0.290	89.328	2.811
Totals:	22.742	0.851	25.807			

Throughput
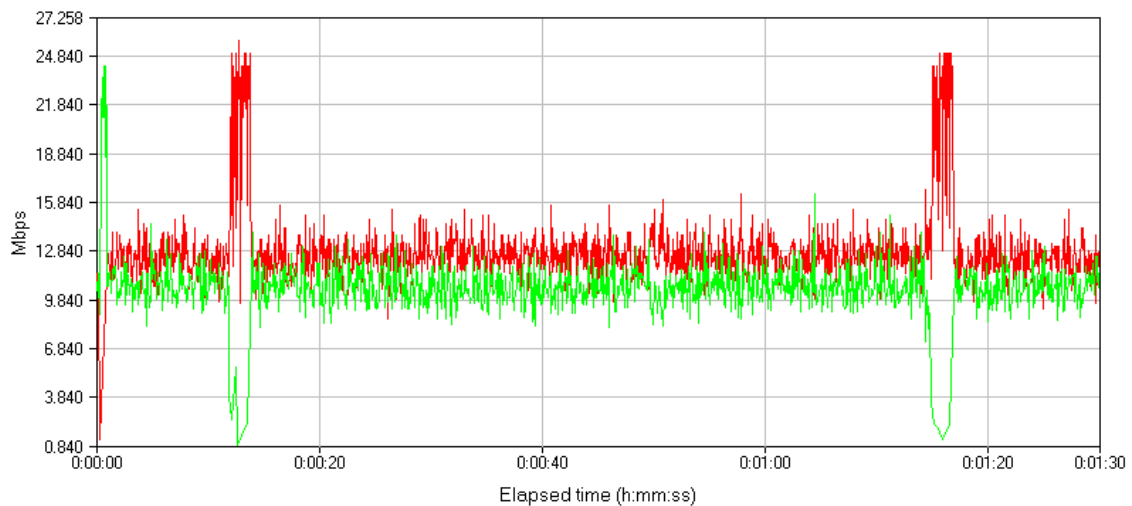
5. **Data Transfer #3 (APUT → STA1: TCP INQUIRYL)**

6. **Data Transfer #3 (APUT → STA2: TCP INQUIRYL)**

WPA2 Result: 0.956 Mbps > Required: 0.43 Mbps

WPA Result: 0.990 Mbps > Required: 0.40 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	1.933	0.128	1.250			
Pair 1	0.956	0.588	1.250	0.006	89.330	0.582
Pair 2	0.990	0.128	1.176	0.020	89.380	1.990
Totals:	1.933	0.128	1.250			

Throughput
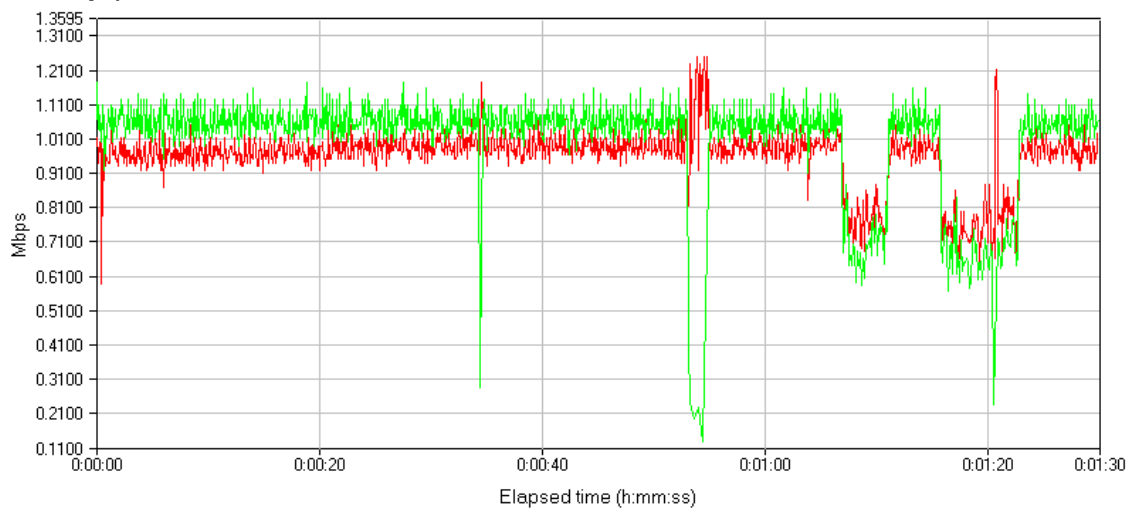
4.2.10 MCA1

1. **MC Data Transfer REALAUD for 92 seconds**

2. **MC Data Transfer REALAUD for 92 seconds**

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
Multicast	0.076	0.034	0.085			
Pair 1	0.072	0.034	0.085	0.004	93.151	5.544
Pair 2	0.076	0.061	0.084	0.002	93.241	2.521
Totals:	0.076	0.034	0.085			

Throughput
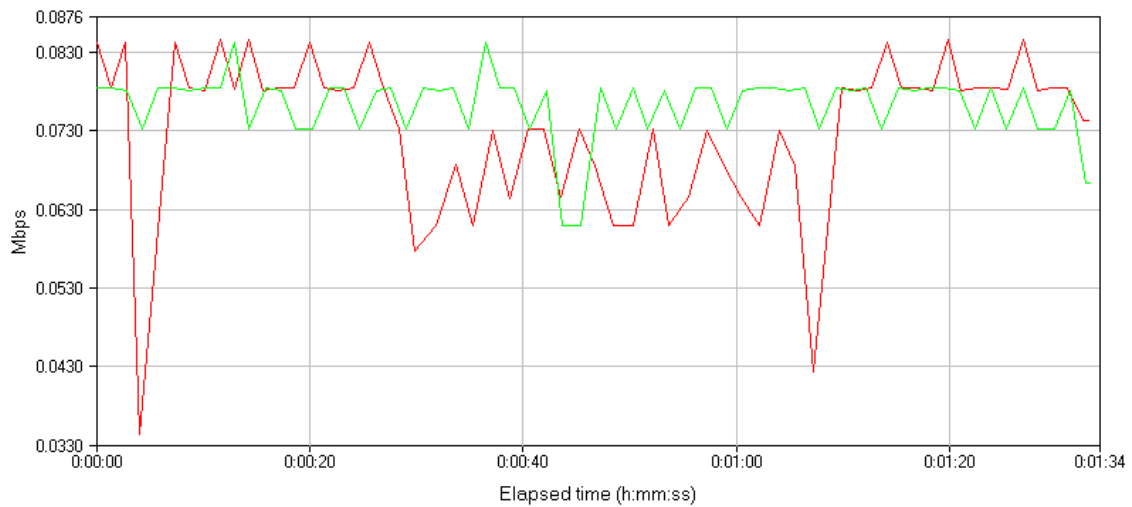
4.2.10 #MCA1_2

1. **MC Data Transfer REALAUD for 92 seconds**
2. **MC Data Transfer REALAUD for 92 seconds**

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
multicast	0.081	0.035	0.085			
Pair 1	0.081	0.078	0.085	0.000	93.165	0.199
Pair 2	0.073	0.035	0.084	0.003	93.248	4.755
Totals:	0.081	0.035	0.085			

Throughput
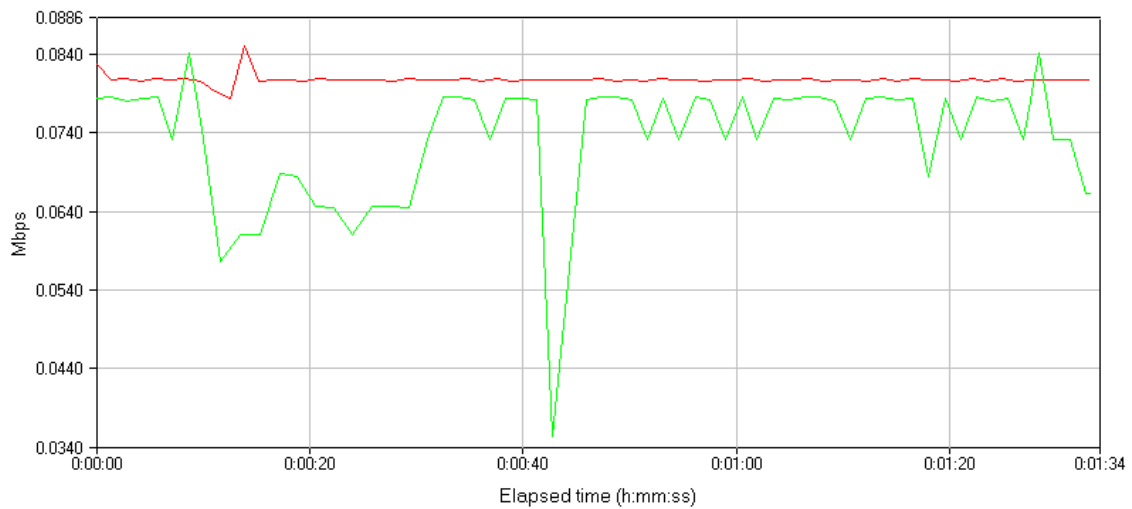
4.2.19

1. Data Transfer #1 (A STA → G STA: TCP FILESENDL)

Result: <u>16.829</u> Mbps > Required: <u>9.95</u> Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	16.606	0.648	21.622			
Pair 1	16.829	0.648	21.622	0.684	88.802	4.066
Totals:	16.606	0.648	21.622			

Throughput
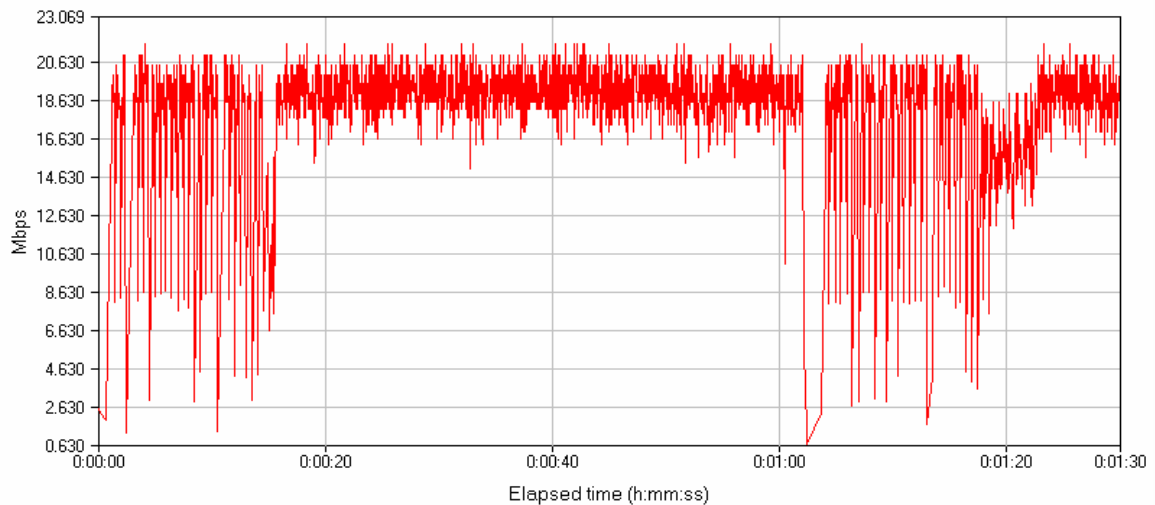
2. **Data Transfer #2 (G STA → A STA: TCP FILESENDL)**

   Result: <u>16.340</u> Mbps > Required: <u>10.91</u> Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	16.152	0.921	21.053			
Pair 1	16.340	0.921	21.053	0.680	88.961	4.165
Totals:	16.152	0.921	21.053			

Throughput

Document Number：QR-510-54F
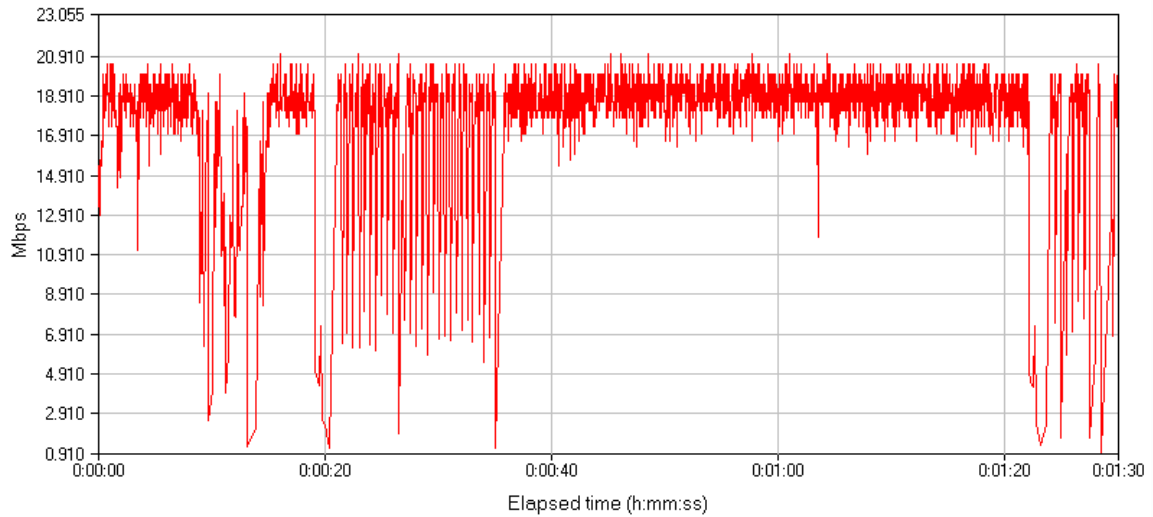
4.2.20

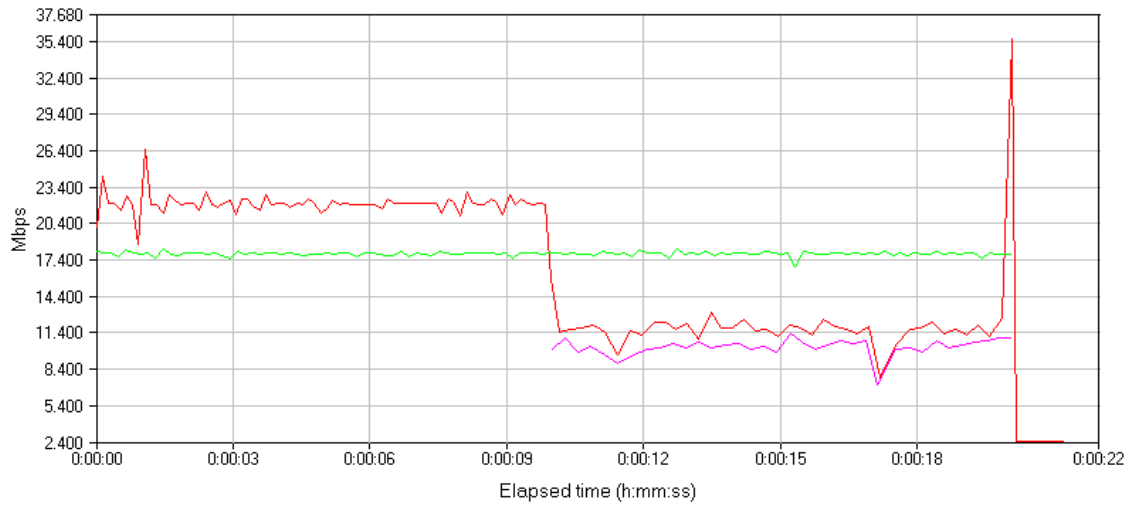### 1. RTP1_BE, RTP2_VI, RTP3_BE down stream

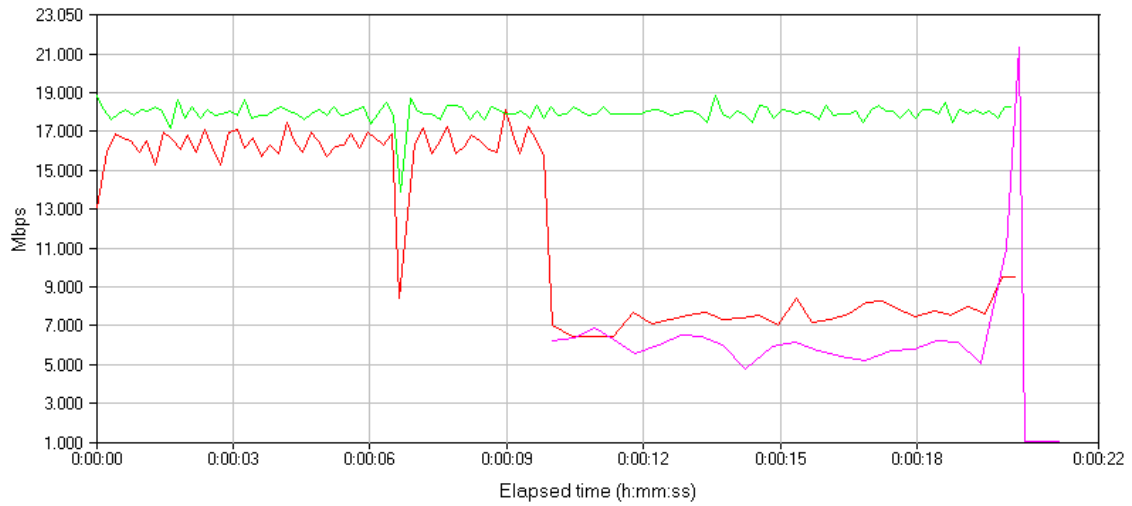| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4220-T04	17.95	17.87	99.53 %	ZERO2	22.00	17.45	ZERO	14.95

Throughput
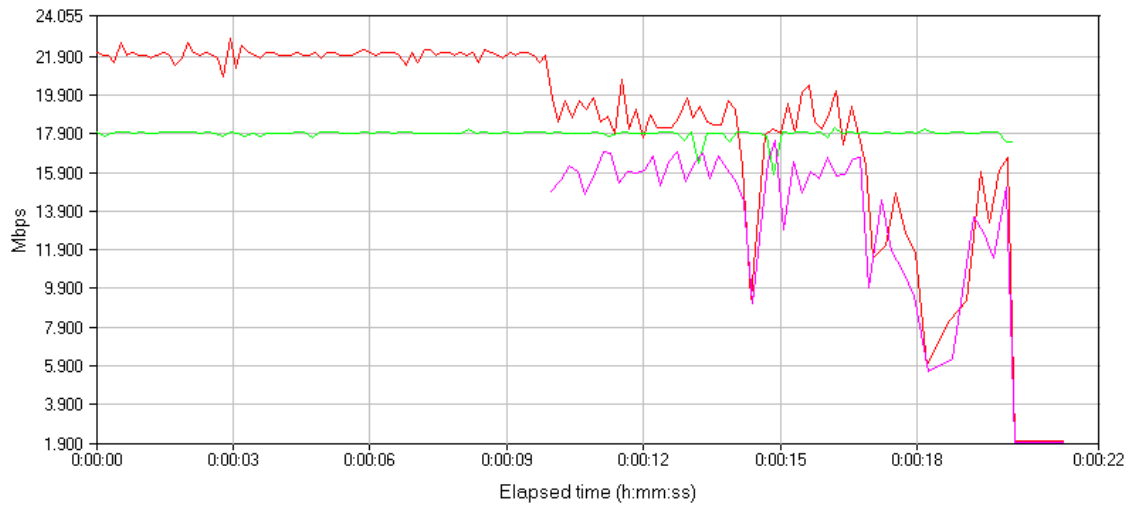
Project ID：ACP-AAN-WIFI-002_1

2. RTP1_BE, RTP2_VI down stream; RTP3_BE up stream

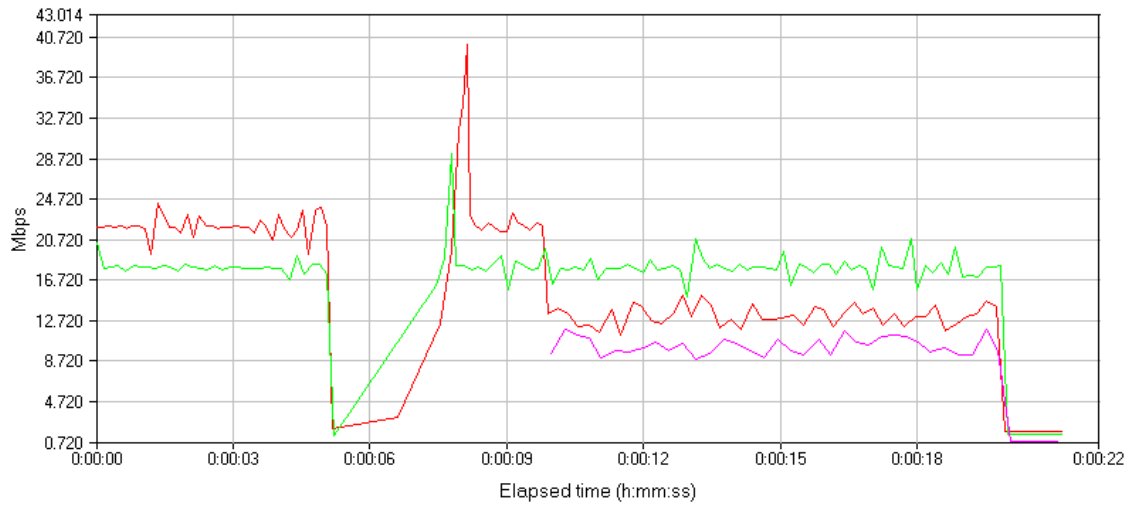| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4220-T05	17.95	17.96	100.06 %	ZERO2	21.98	13.12	ZERO	8.95

Throughput
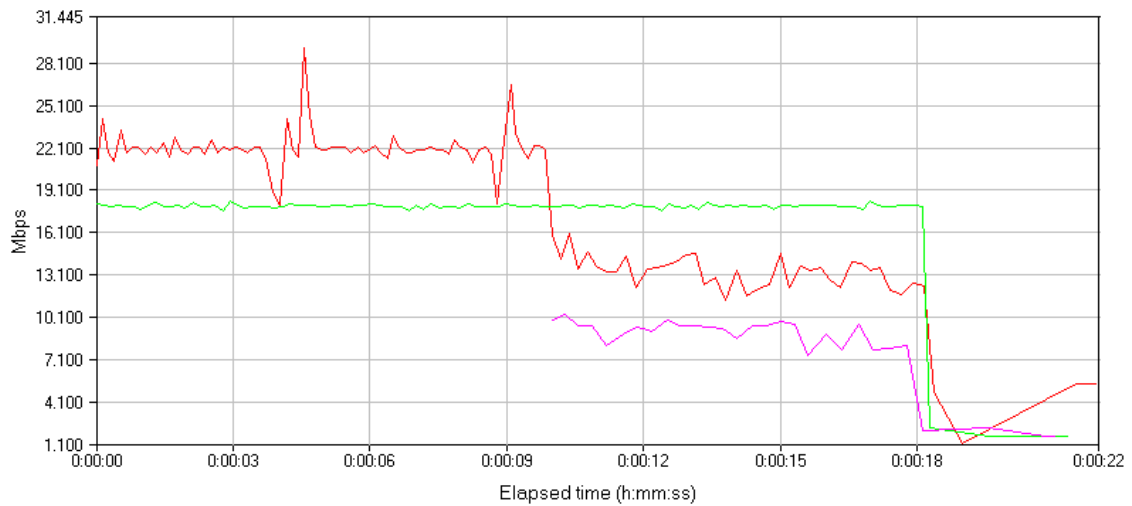
3. RTP1_BE, RTP2_VI up stream; RTP3_BE down stream

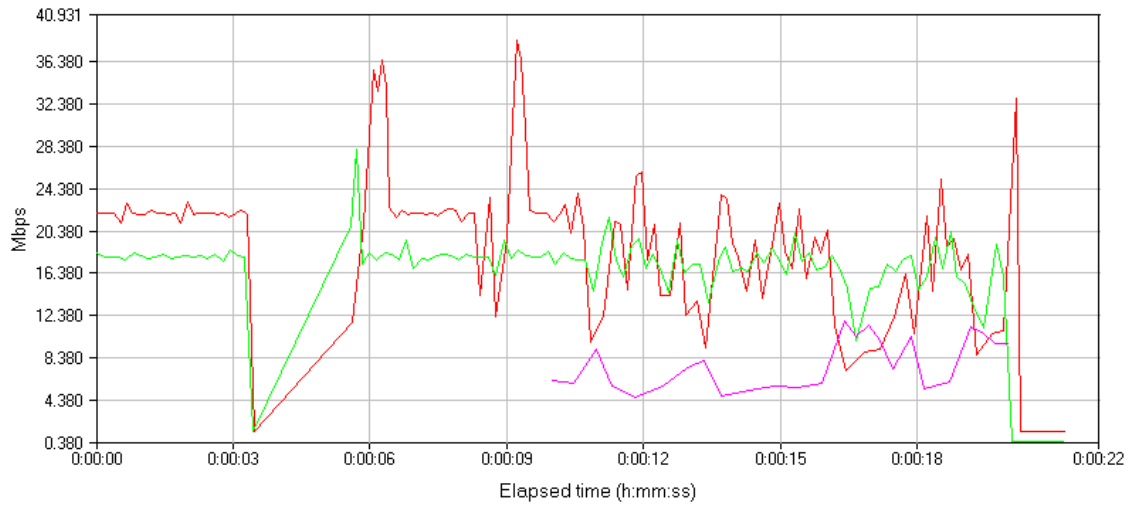| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4220-T06	17.93	18.02	100.53 %	ZERO2	16.04	10.89	ZERO	12.92

Throughput
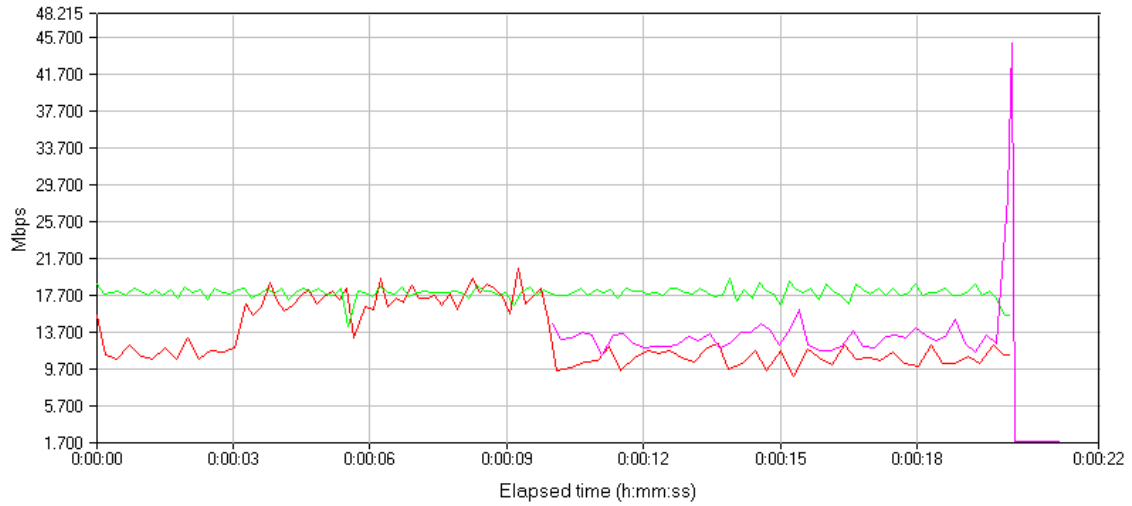
4. RTP1_VI, RTP2_VO up stream; RTP3_VI down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4220-T07	17.97	17.96	99.94 %	ZERO2	15.05	3.58	ZERO	17.93

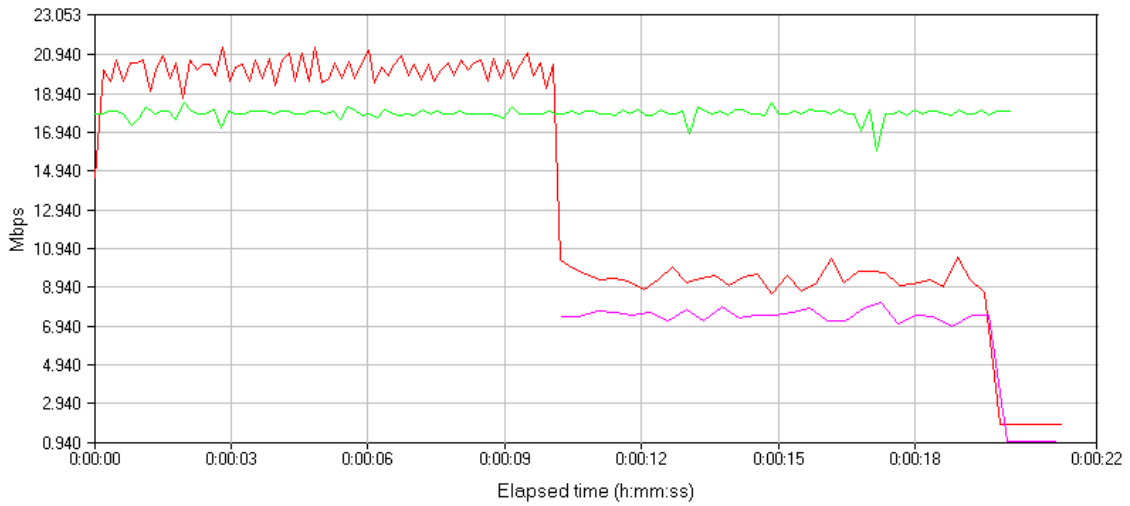Throughput

Project ID：ACP-AAN-WIFI-002_1
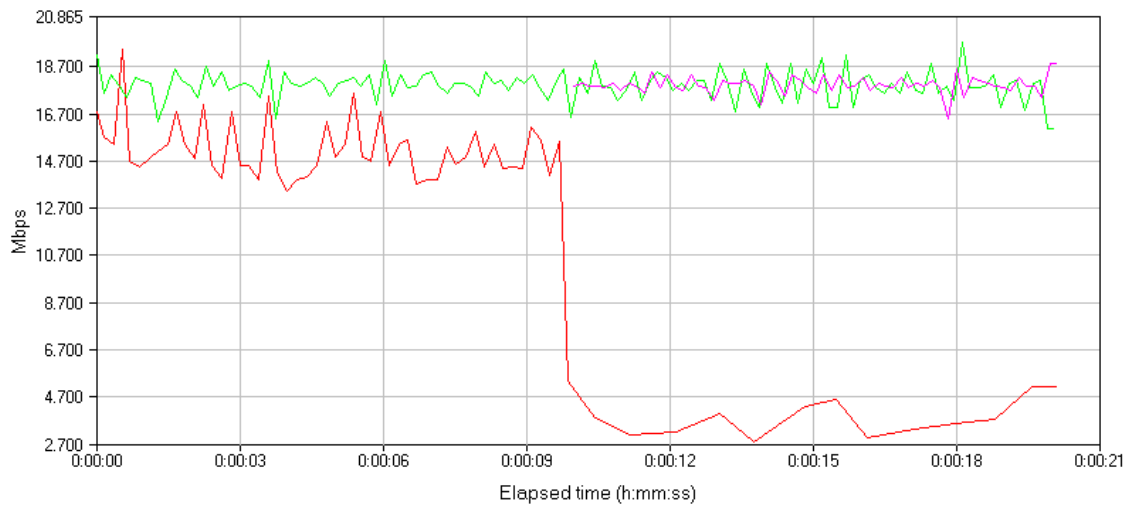
## 5.	RTP1_BK, RTP2_BE up stream; RTP3_BK down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4220-T08	16.61	17.96	108.14 %	ZERO2	15.24	7.02	ZERO	13.21

Throughput
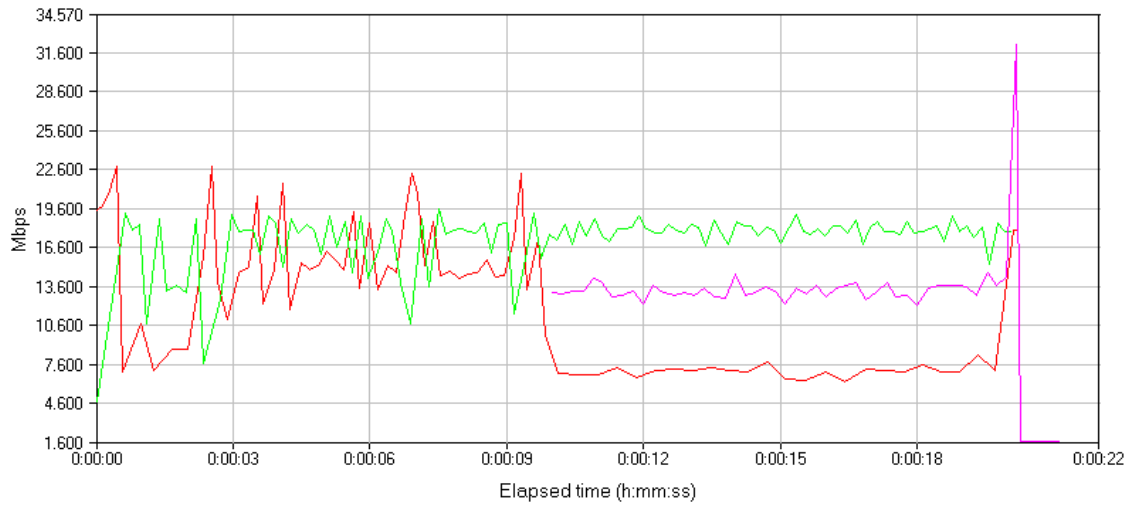
4.2.21

1.   RTP1_BE, RTP2_VI and RTP3_BE down stream

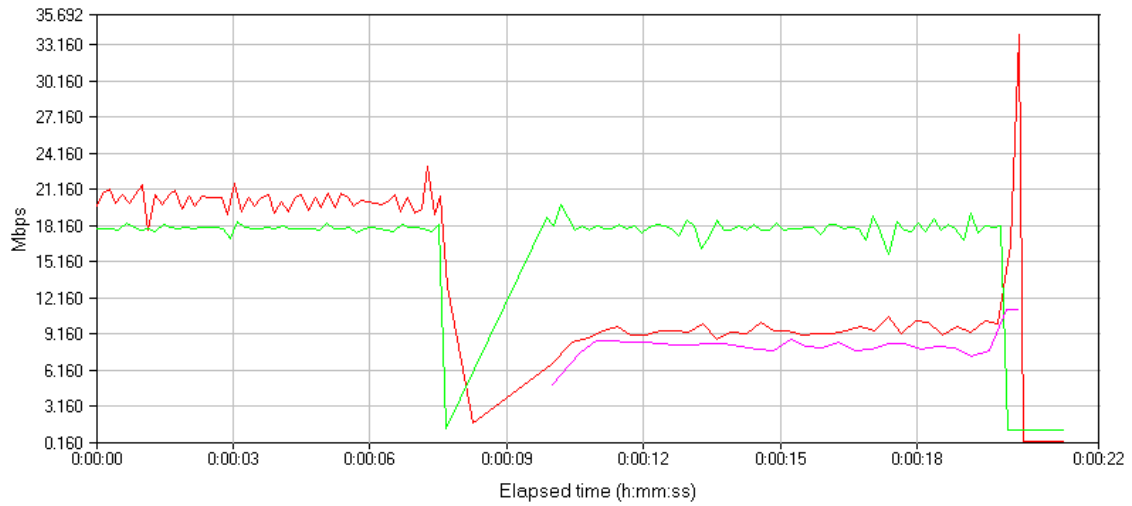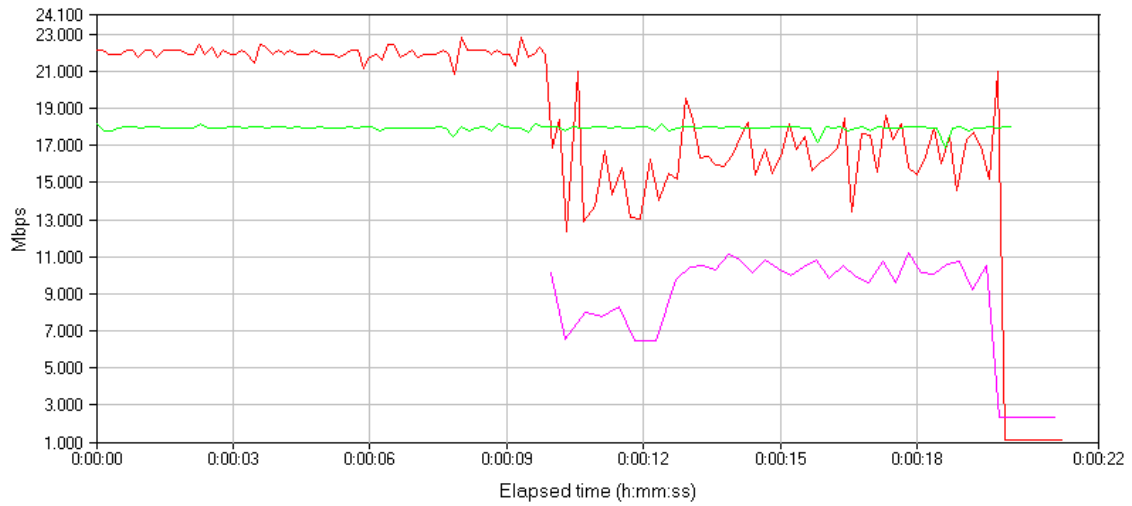| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T04	17.93	16.89	94.23 %	ZERO2	22.04	11.50	ZERO	16.81

Throughput
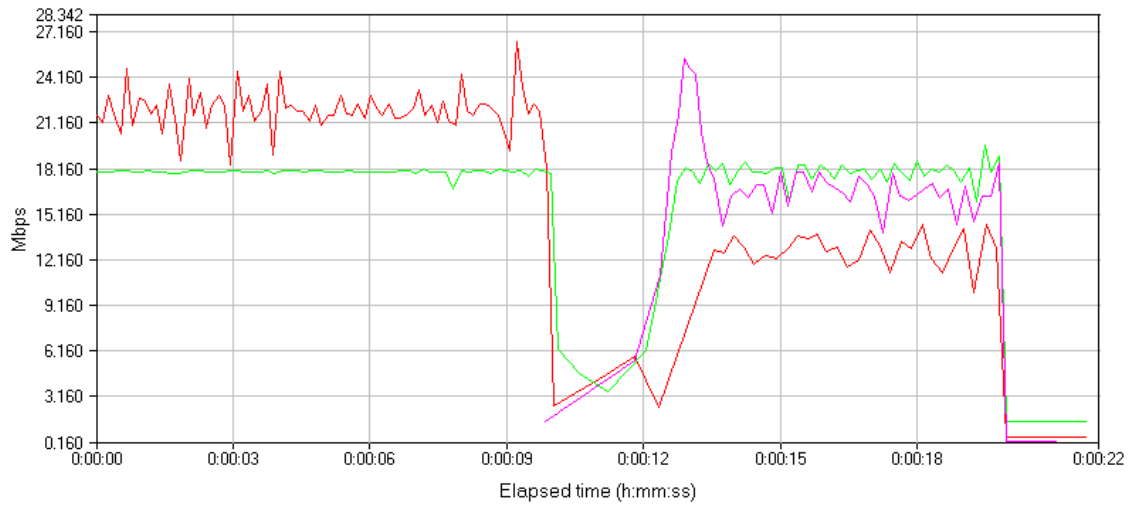
Project ID：ACP-AAN-WIFI-002_1

2. RTP1_BE, RTP2_VI down stream; RTP3_BE up stream

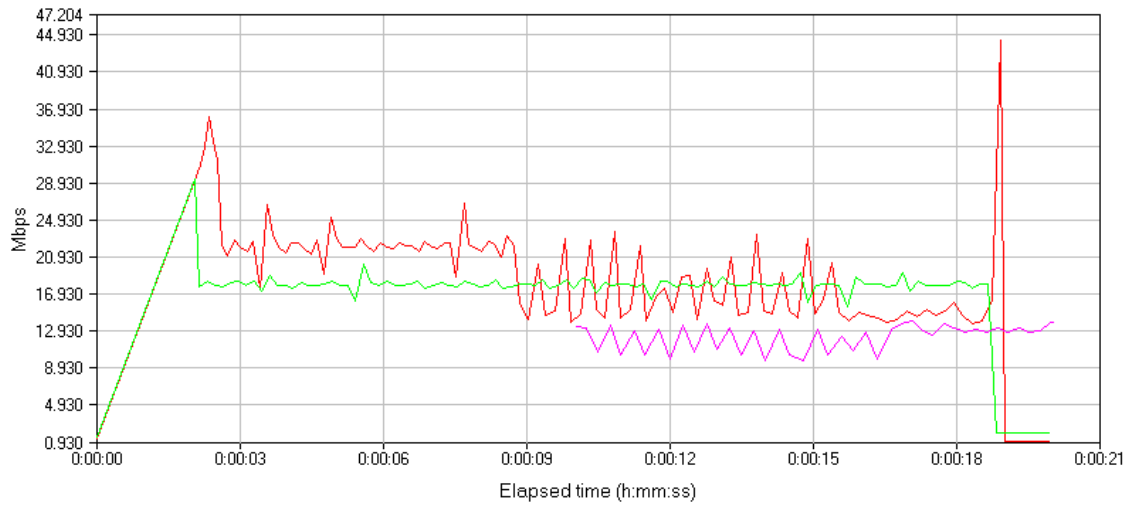| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T05	17.94	17.96	100.08 %	ZERO2	22.06	11.56	ZERO	10.15

Throughput

3. RTP1_BE, RTP2_VI down stream; RTP3_BE up stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T06	17.91	17.97	100.34 %	ZERO2	16.23	7.47	ZERO	5.91

Throughput

4. RTP1_VI, RTP2_VO and RTP3_VI down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T07	17.78	18.01	101.32 %	ZERO2	21.80	13.18	ZERO	10.19

Throughput

5. RTP1_VI, RTP2_VO down stream; RTP3_VI up stream

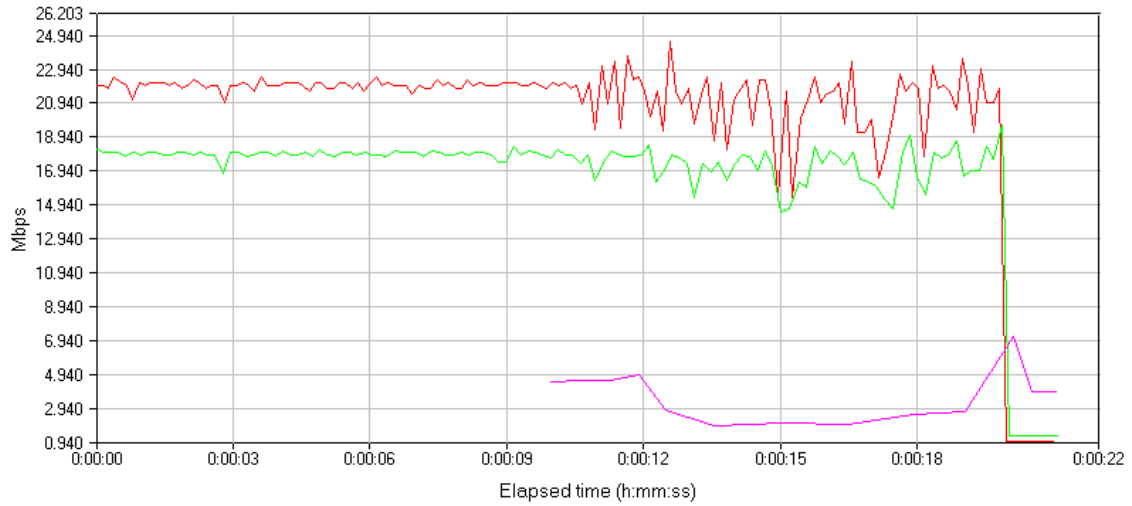| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T08	17.81	17.16	96.34 %	ZERO2	22.35	17.15	ZERO	7.47

Throughput

6. RTP1_BK, RTP2_BE and RTP3_BK down stream

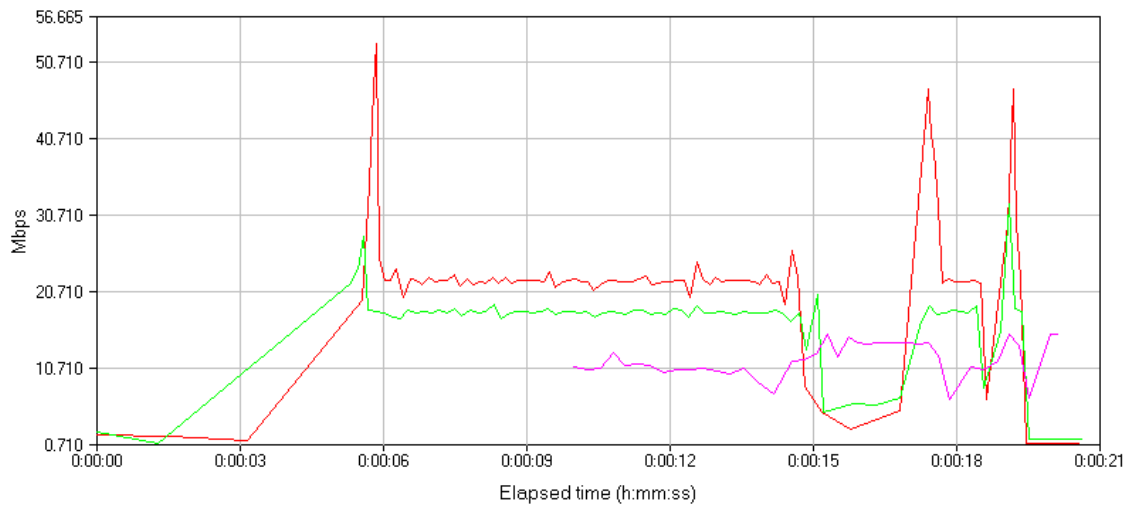| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T09	17.94	17.90	99.76 %	ZERO2	20.22	9.36	ZERO	7.53

Throughput

Project ID：ACP-AAN-WIFI-002_1

7. RTP1_BK, RTP2_BE down stream; RTP3_BK up stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4221-T10	17.93	17.89	99.78 %	ZERO2	19.79	9.44	ZERO	8.22

Throughput

4.2.22

1. RTP1_BE, RTP2_VI and RTP3_BE down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T04	17.94	17.92	99.89 %	ZERO2	22.01	16.37	ZERO	9.81

Throughput

2. RTP1_BE, RTP2_VI down stream; RTP3_BE up stream

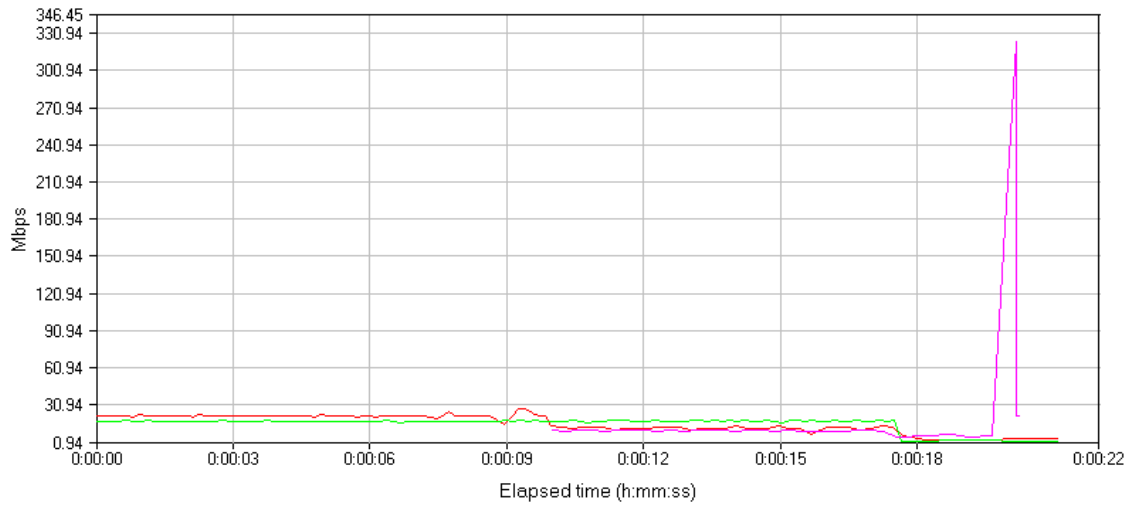| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T05	17.84	17.90	100.35 %	ZERO2	23.19	16.18	ZERO	12.08

Throughput

Document Number：QR-510-54F

3. RTP1_BE, RTP2_VI up stream; RTP3_BE down stream

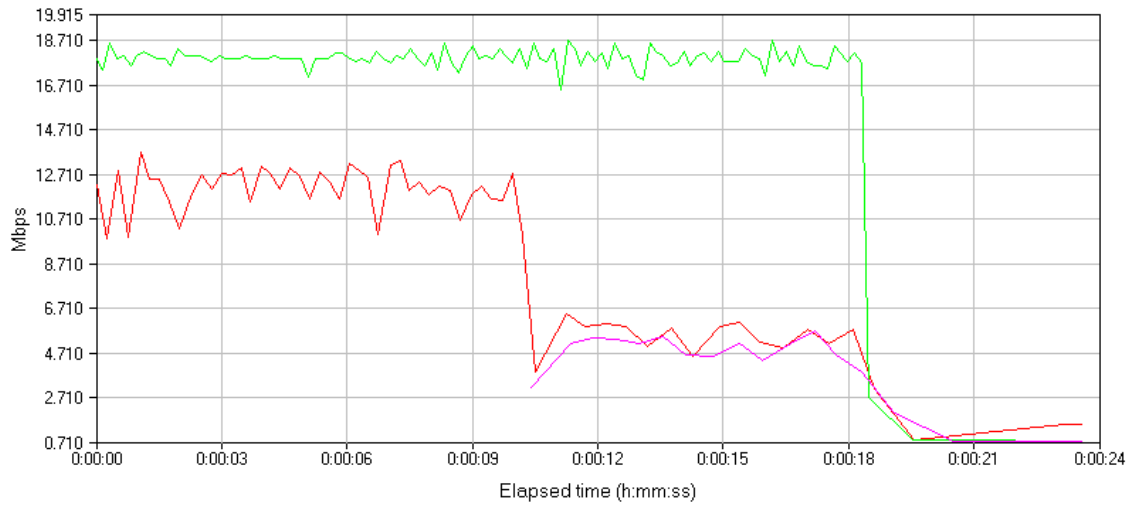| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T06	17.62	18.05	102.45 %	ZERO2	17.94	8.34	ZERO	7.02

Throughput
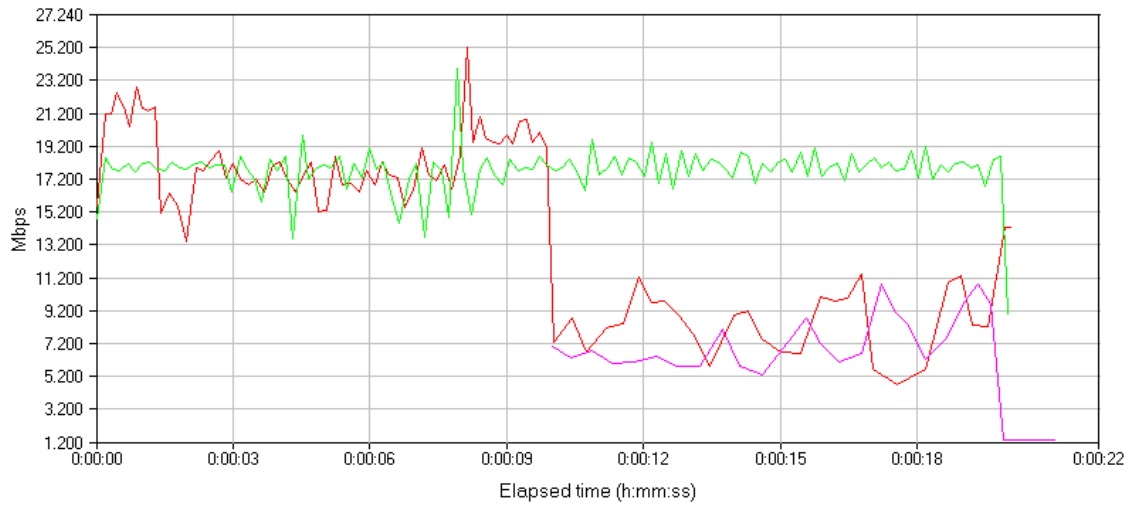
4. RTP1_VI, RTP2_VO ,RTP3_VI down stream

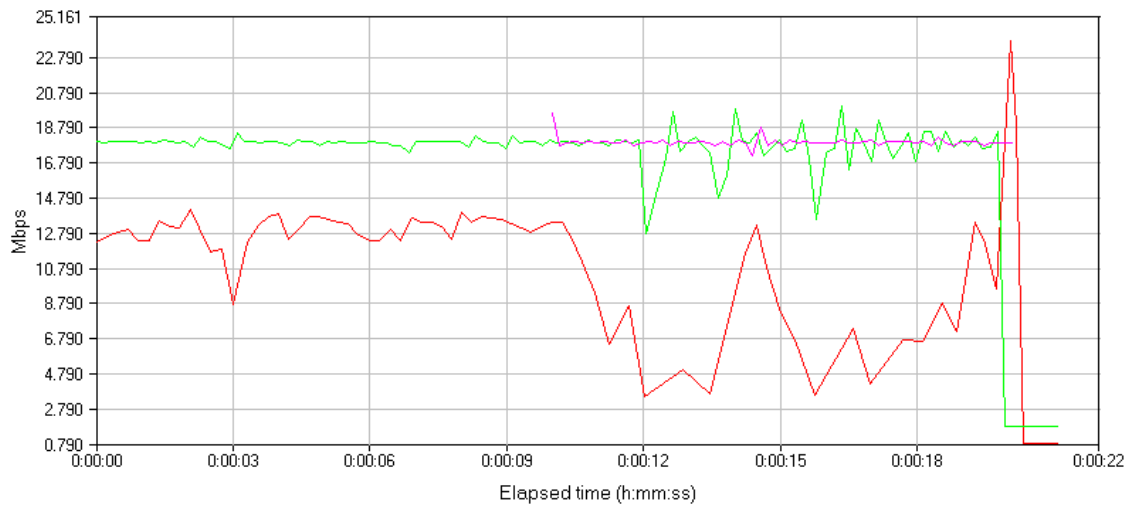| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T07	17.93	17.12	95.43 %	ZERO2	21.98	20.94	ZERO	3.27

Throughput

5. RTP1_VI, RTP2_VO down stream; RTP3_VI up stream

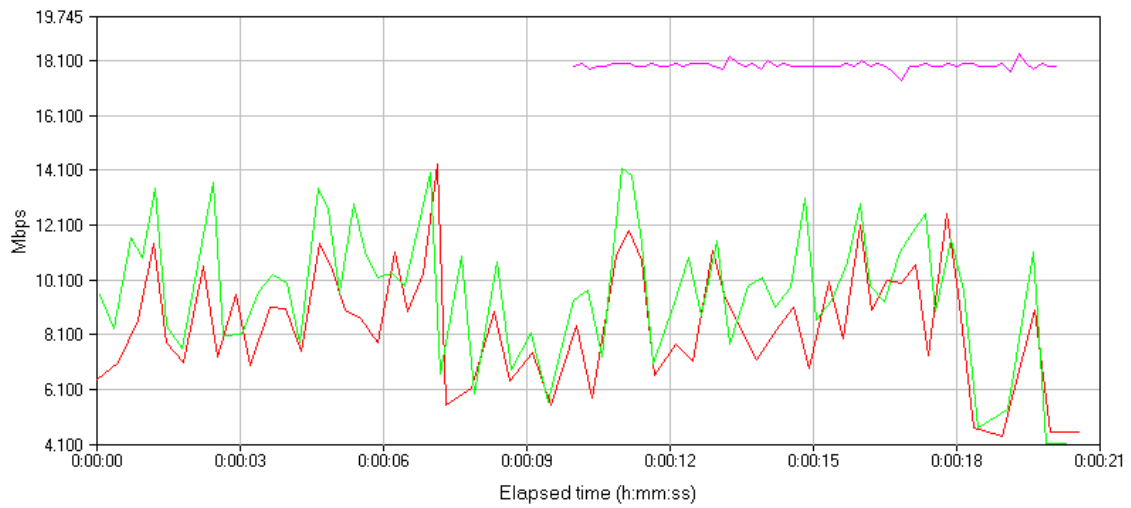| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T08	17.40	16.35	94.00 %	ZERO2	23.01	22.16	ZERO	11.73

Throughput

Project ID：ACP-AAN-WIFI-002_1

6.   RTP1_BK, RTP2_BE ,RTP3_BK down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T09	17.95	17.90	99.70 %	ZERO2	22.05	11.50	ZERO	6.64

Throughput
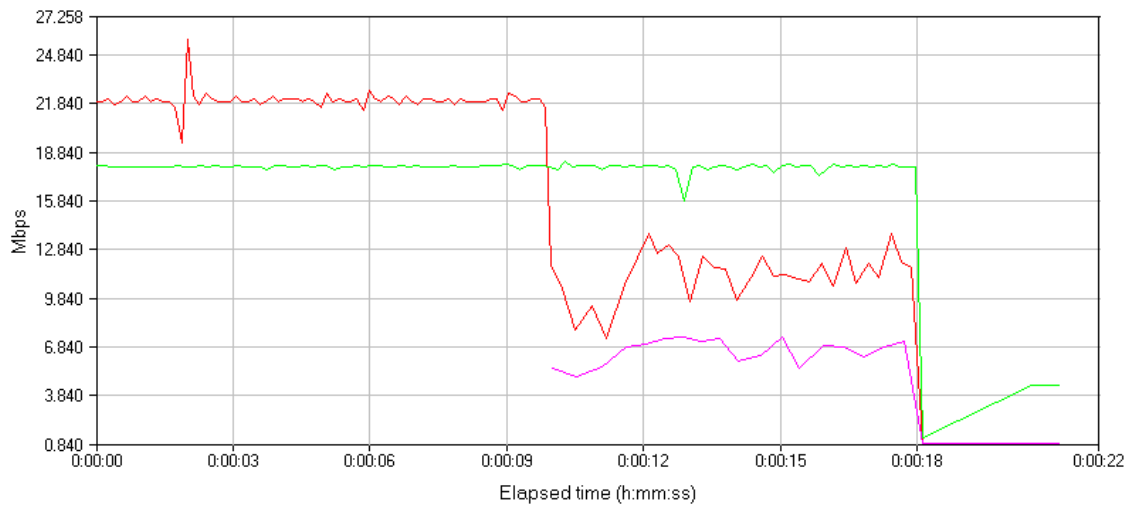
7. RTP1_BK, RTP2_BE down stream; RTP3_BK up stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4222-T10	17.93	17.89	99.75 %	ZERO2	22.01	12.03	ZERO	9.68

Throughput

4.2.23

1.   RTP1_BE, RTP2_VI, RTP3_BE down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4223-T04	17.92	17.93	100.01 %	ZERO2	12.21	5.49	ZERO	4.91

Throughput

Project ID：ACP-AAN-WIFI-002_1

2. RTP1_BE, RTP2_VI down stream; RTP3_BE up stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4223-T05	17.96	17.63	98.14 %	ZERO2	12.98	7.35	ZERO	17.96

Throughput

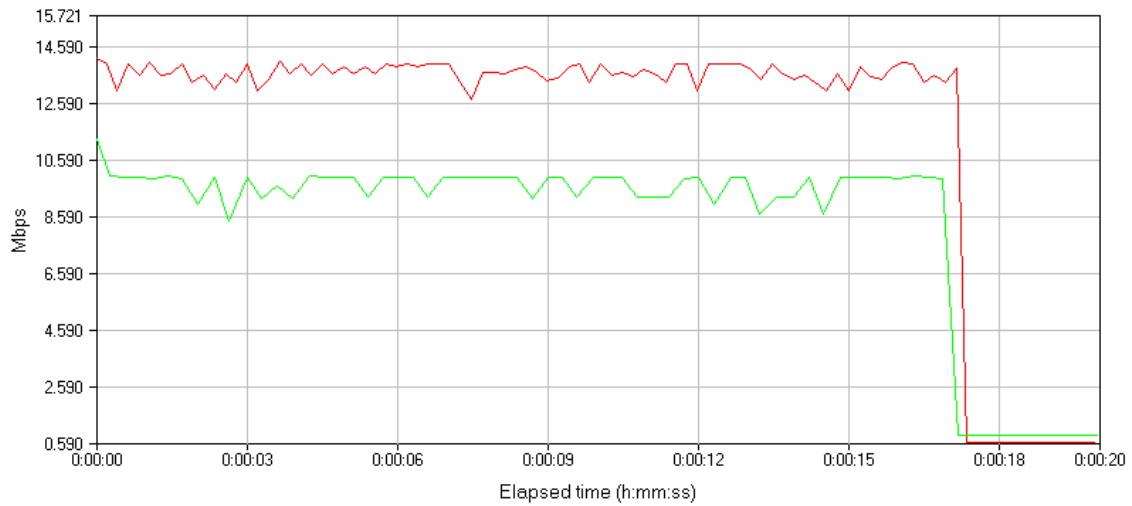## 3. RTP1_BE, RTP2_VI up stream and RTP3_BE down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4223-T06	10.38	10.51	101.26 %	ZERO2	9.03	9.15	ZERO	17.95

Throughput

4. RTP1_BE down stream; RTP2_VI up stream; RTP3_BE down stream
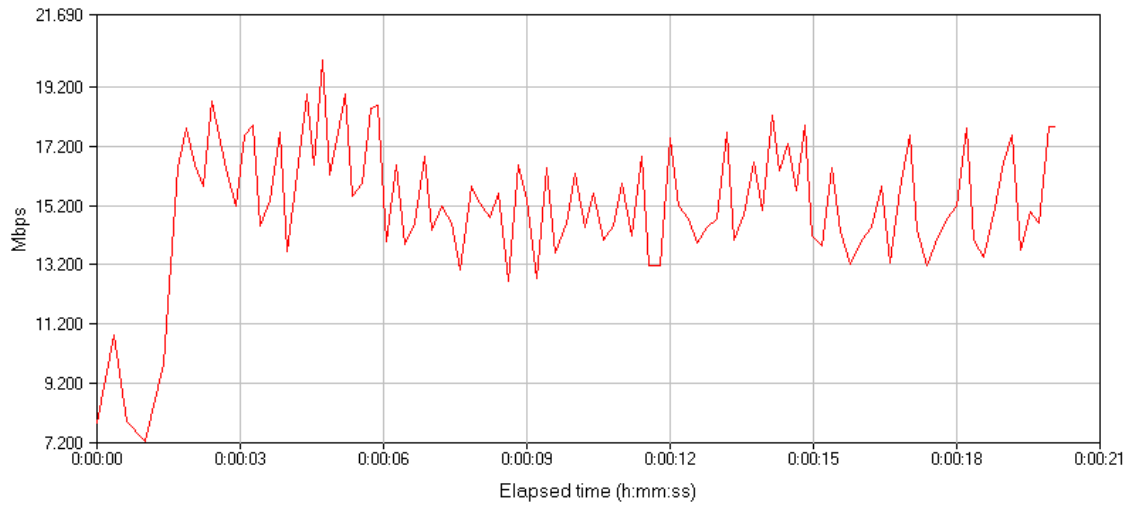
HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4223-T07	15.74	13.94	88.59 %	ZERO2	12.79	7.52	ZERO	7.73

Throughput
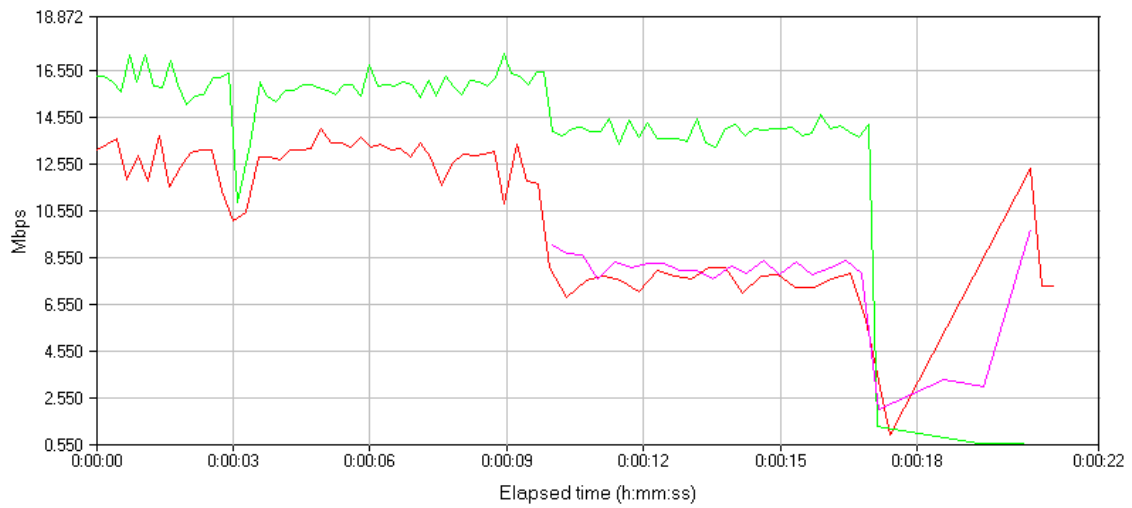
4.2.24

1. **RTP1_BE, RTP2_VI up stream; QoS data frame contains "Acknowledge"**

2. **RTP1_BE, RTP2_VI up stream; APUT doesn't generate "Acknowledge"**

ACK

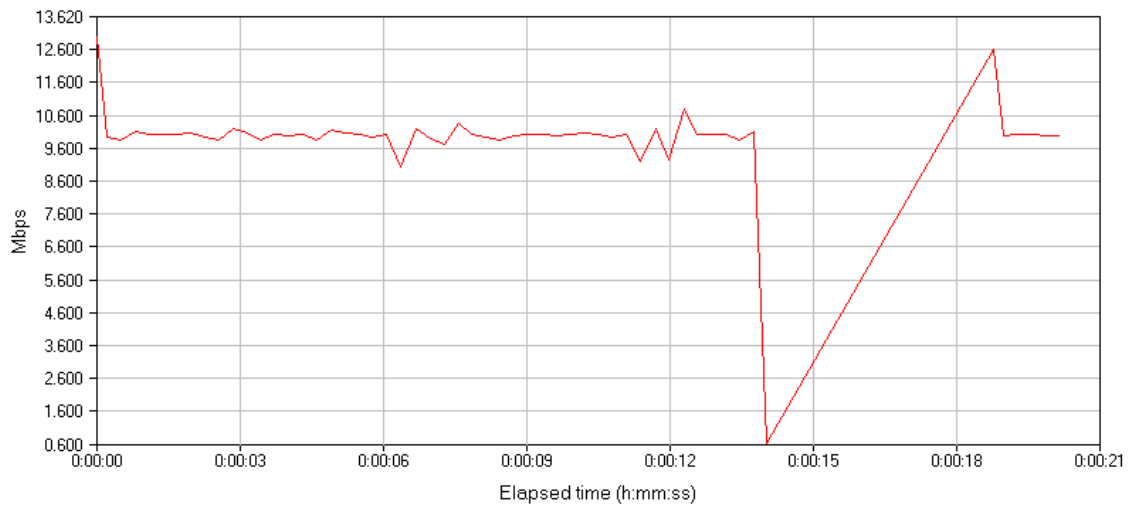| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4224-T04	9.99	9.99	100.01 %	*ZERO2*	13.94	13.95	ZERO	ZERO

Throughput
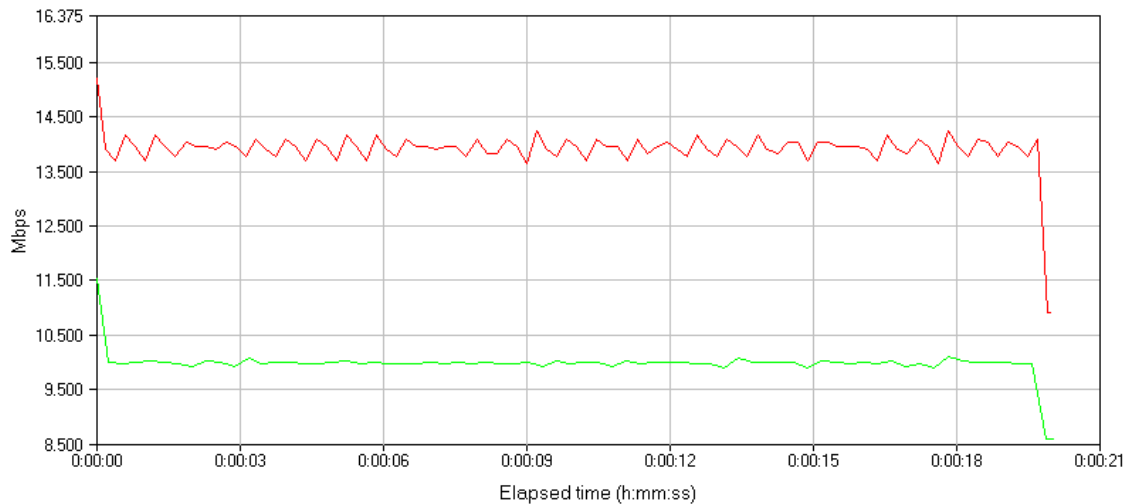
No ACK

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4224-T06	9.77	9.64	98.70 %	ZERO2	13.70	13.64	ZERO	ZERO

Throughput

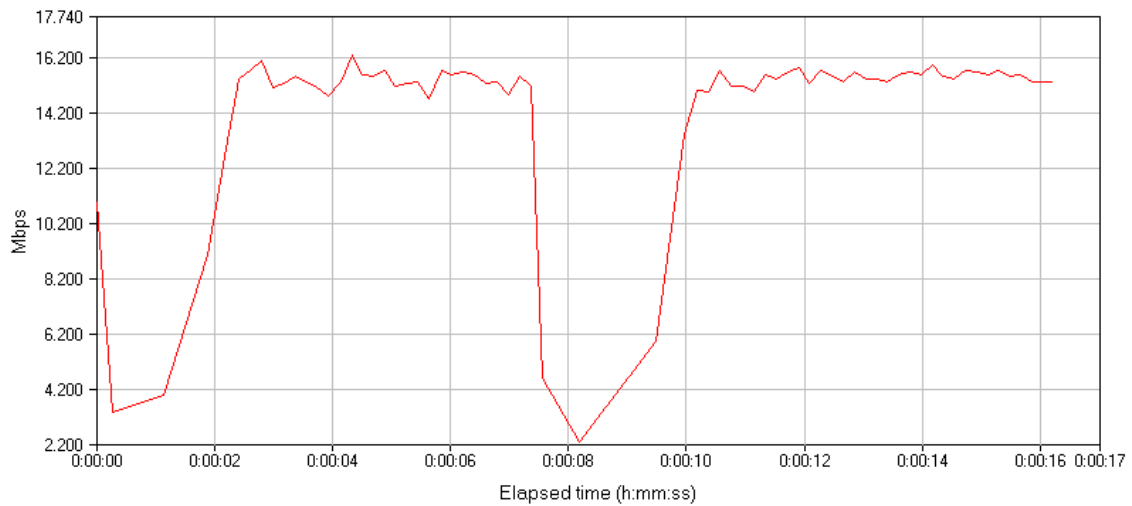Project ID：ACP-AAN-WIFI-002_1

4.2.23

1.   RTP1_BE down stream

| HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4225-T03	ZERO	ZERO	ZERO2	15.83	15.18	ZERO	ZERO	

Throughput

Project ID：ACP-AAN-WIFI-002_1

2. RTP1_BK down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4225-T04	ZERO	ZERO	*ZERO2*	9.97	9.17	ZERO	ZERO	

Throughput

3. RTP1_BE down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4225-T05	ZERO	ZERO	*ZERO2*	14.78	15.55	ZERO	ZERO	

Throughput

Project ID：ACP-AAN-WIFI-002_1

4. RTP1_BE, RTP2_VI down stream

HTML File	Pair 2 Phase_1 (1-9s)	Pair 2 Phase_2 (11-19s)	Pair 2 P2/P1	Pair 2 Phase_2 var	Pair 1 Phase_1	Pair 1 Phase_2	Pair 3 Phase_1	Pair 3 Phase_2
WMM-4225-T06	5.91	5.44	92.02 %	ZERO2	5.92	5.96	ZERO	ZERO

Throughput
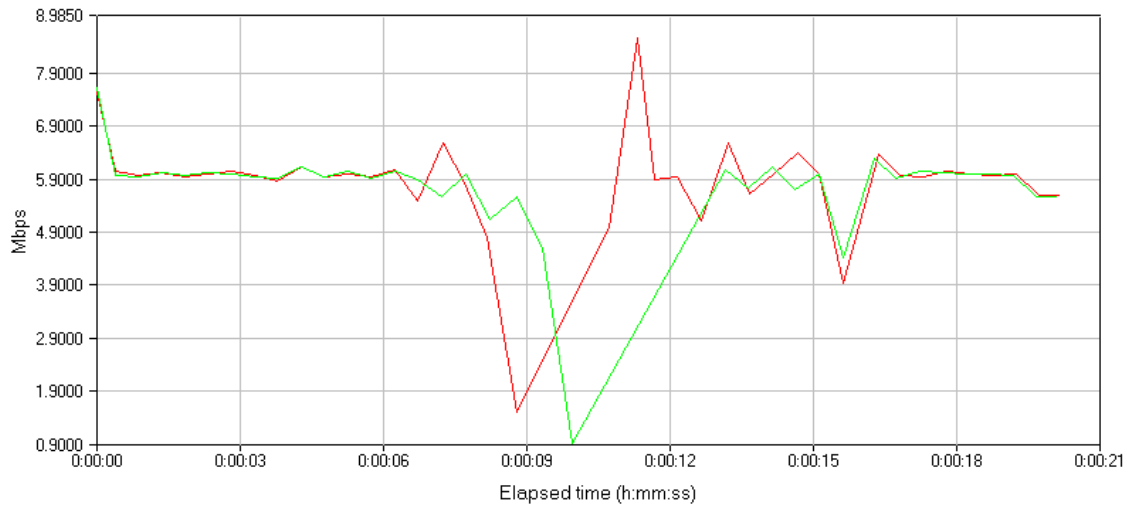
4.2.29

None Security

1. **Data Transfer #2 (STA → APUT: UDP FILESENDL-HT)**

   Result: 64.588 Mbps > Required: 46.85 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	64.096	29.942	81.270			
Pair 1	64.588	29.942	81.270	1.383	29.727	2.141
Totals:	64.096	29.942	81.270			

Throughput
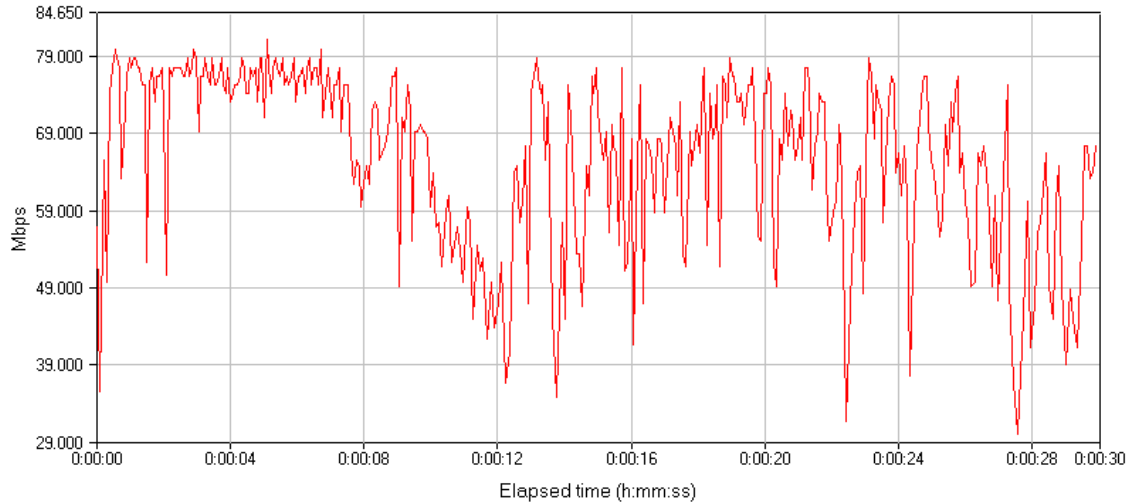
WPA2-PSK

2. Data Transfer #2 (STA → APUT: UDP FILESENDL-HT)

Result: **52.373** Mbps > Required: **44.97** Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	52.055	12.133	75.294			
Pair 1	52.373	12.133	75.294	3.037	29.817	5.799
Totals:	52.055	12.133	75.294			

Throughput
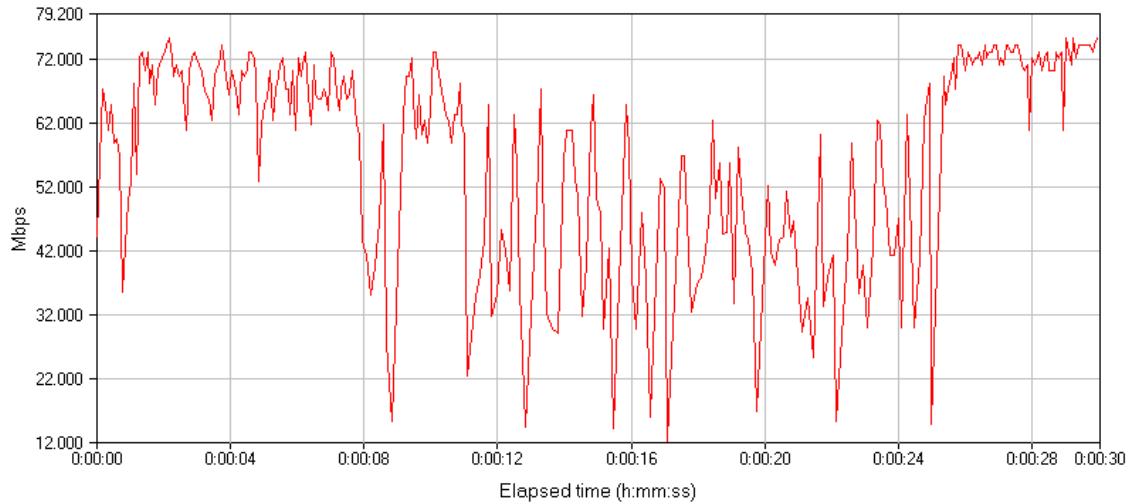
4.2.30

1. Data Transfer #2 (STA → APUT: UDP FILESENDL-HT)

Result: 32.326 Mbps > Required: 25.53 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	32.213	1.228	49.231			
Pair 1	32.326	1.228	49.231	3.211	89.646	9.932
Totals:	32.213	1.228	49.231			

Throughput chart (Mbps vs Elapsed time (h:mm:ss))
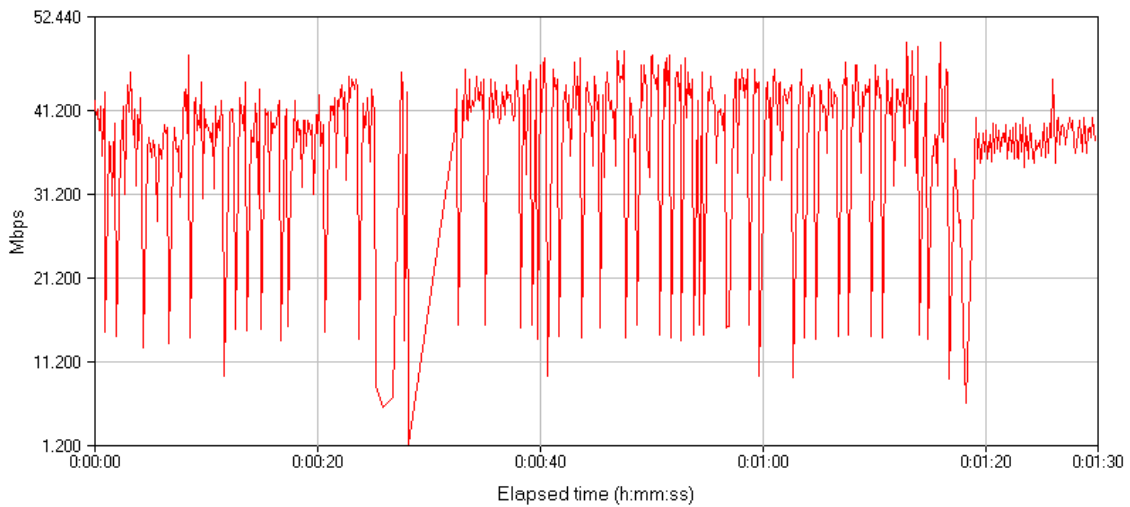
4.2.31

1. **Data Transfer #1 (APUT → STA1: TCP High Performance)**

2. **Data Transfer #1 (AP → STA2: TCP FILESENDL)**

   Result: 10.217 Mbps > Required: 8.66 Mbps

   Result: 11.478 Mbps > Required: 5.96 Mbps

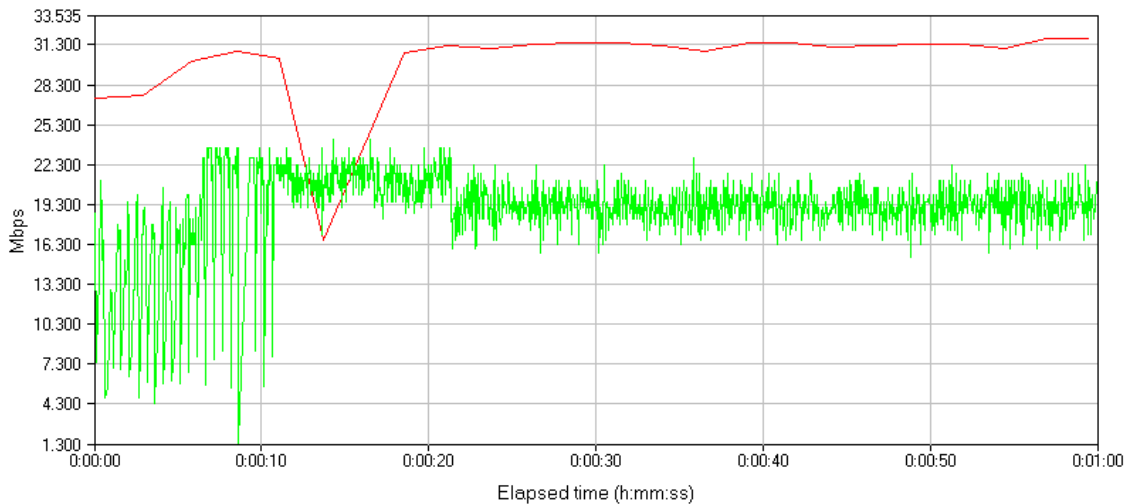| Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	20.733	0.620	26.667			
Pair 1	10.217	3.747	19.593	7.332	54.809	71.764
Pair 2	11.478	0.620	26.667	1.323	59.521	11.522
Totals:	20.733	0.620	26.667			

Throughput
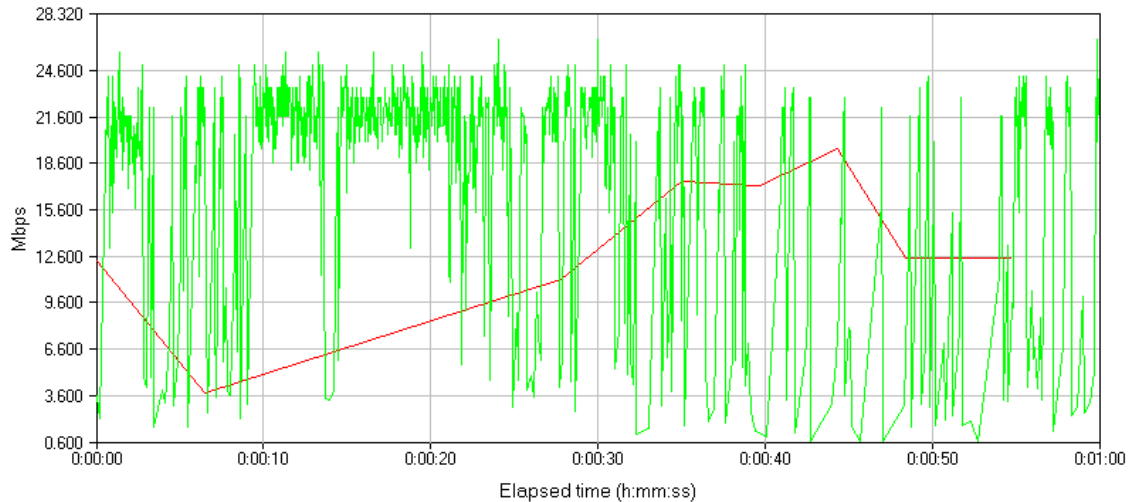
Project ID：ACP-AAN-WIFI-002_1

4.2.32

1. **Data Transfer #1 (APUT → STA1: TCP High Performance)**
2. **Data Transfer #1 (AP → STA2: TCP FILESENDL)**

   Result: 29.565 Mbps > Required: 8.38 Mbps

   Result: 18.565 Mbps > Required: 7.03 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	47.699	1.303	31.733			
Pair 1	29.565	16.567	31.733	2.356	59.530	7.970
Pair 2	18.565	1.303	24.243	0.448	59.251	2.415
Totals:	47.699	1.303	31.733			

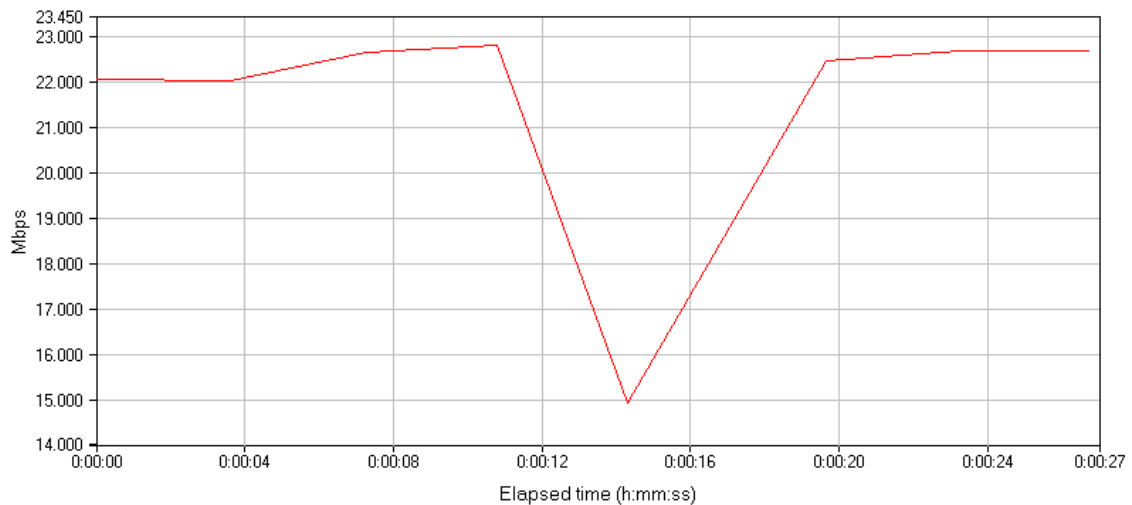

Throughput

Project ID：ACP-AAN-WIFI-002_1

4.2.33

1. **Data Transfer #2 (STA → APUT: TCP High Performance)**

   Result: 20.939 Mbps > Required: 17.73 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	20.935	14.931	22.812			
Pair 1	20.939	14.931	22.812	3.445	26.744	16.454
Totals:	20.935	14.931	22.812			

Throughput

2. Data Transfer #2 (STA → APUT: TCP High Performance)
Result: **21.076** Mbps > Required: **15.26** Mbps

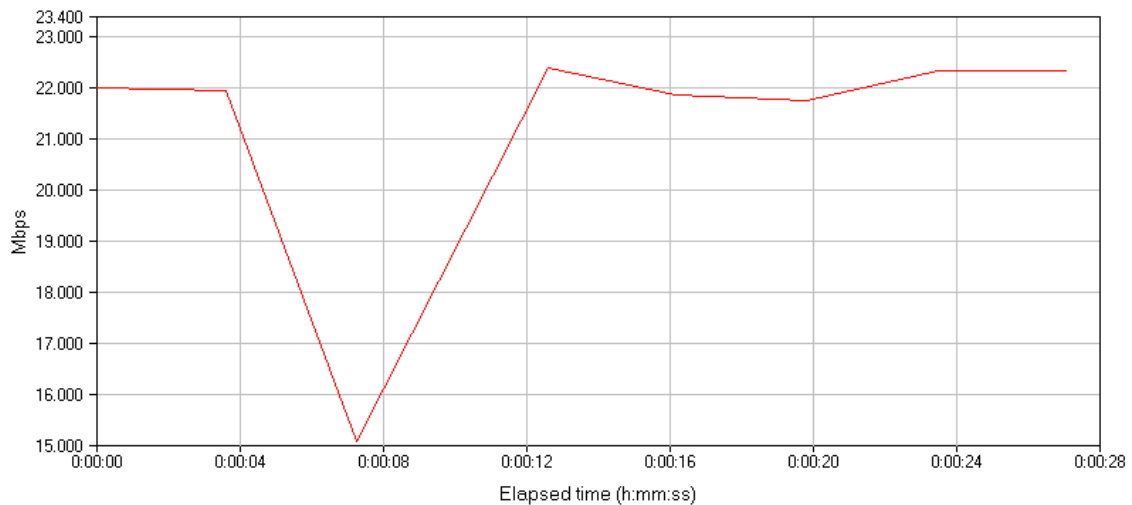| Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	21.071	15.373	23.022			
Pair 1	21.076	15.373	23.022	3.201	26.571	15.189
Totals:	21.071	15.373	23.022			

Throughput
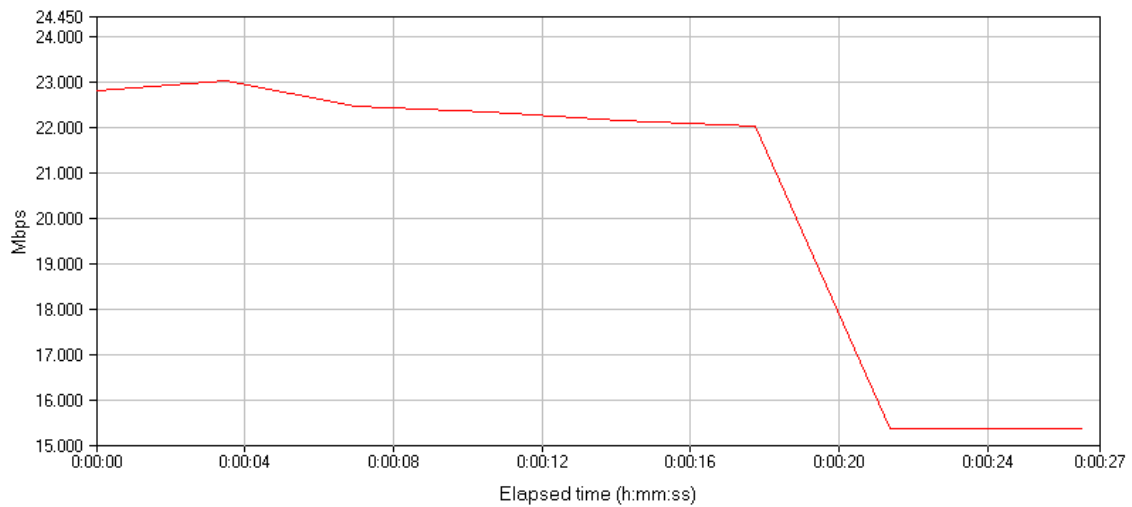
4.2.34

1. **Data Transfer #2 (STA1 → APUT: TCP High Performance)**

   Result: 20.673 Mbps > Required: 15.79 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	20.670	15.069	22.371			
Pair 1	20.673	15.069	22.371	3.142	27.088	15.196
Totals:	20.670	15.069	22.371			

Throughput

2. **Data Transfer #2 (STA1 → APUT: TCP High Performance)**
   Result: **10.428** Mbps > Required: **9.27** Mbps
3. **Data Transfer #2 (STA2 → APUT: TCP High Performance)**
   Result: **12.366** Mbps > Required: **8.02** Mbps

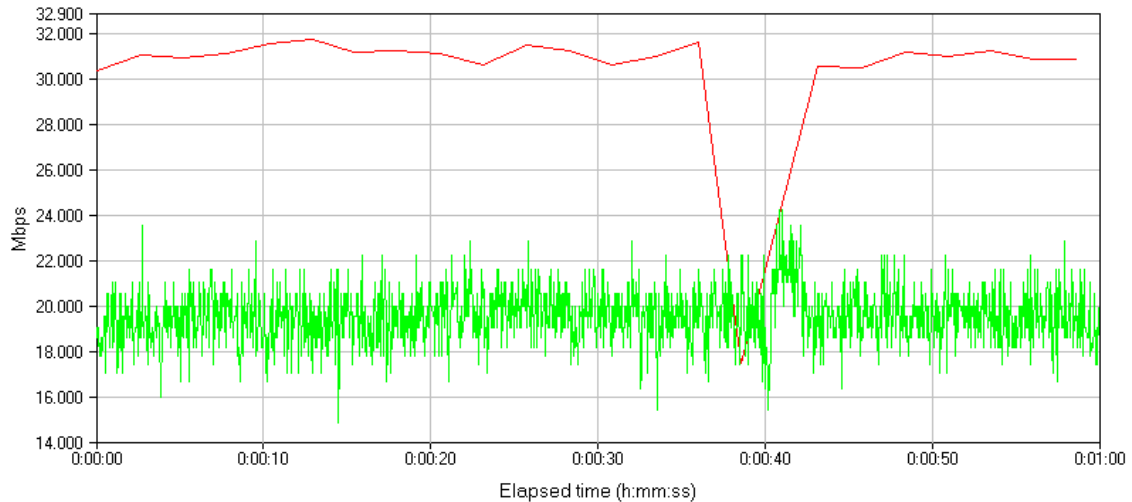| Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	21.637	9.948	12.555			
Pair 1	10.428	9.948	11.073	1.398	23.016	13.403
Pair 2	12.366	12.234	12.555	0.218	25.877	1.759
Totals:	21.637	9.948	12.555			

Throughput

Elapsed time (h:mm:ss)
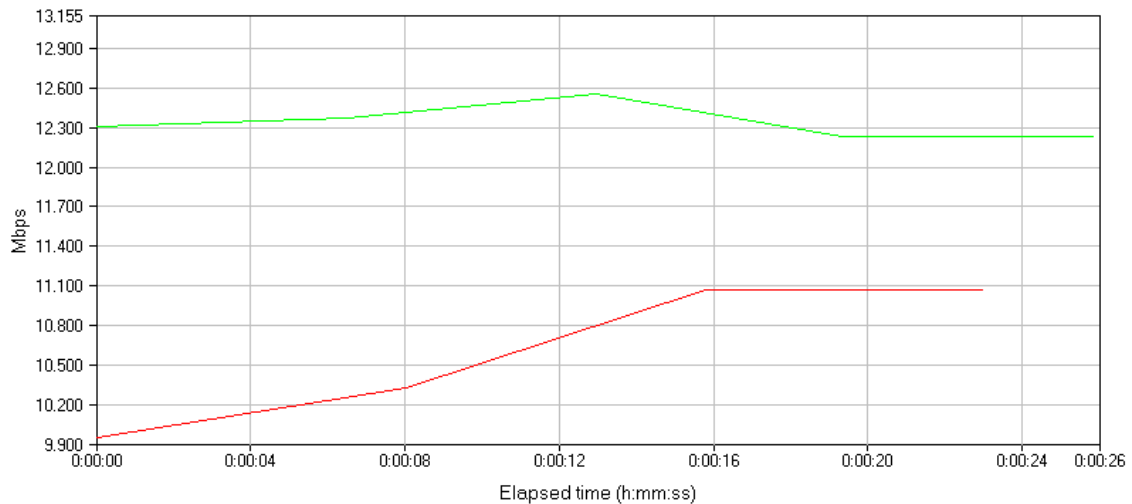
4.2.35

1. **Data Transfer #1 (APUT → STA1: TCP High Performance)**

2. **Data Transfer #1 (AP → STA2: TCP FILESENDL)**

   Result: 29.999 Mbps > Required: 9.70 Mbps

   Result: 19.538 Mbps > Required: 7.54 Mbps

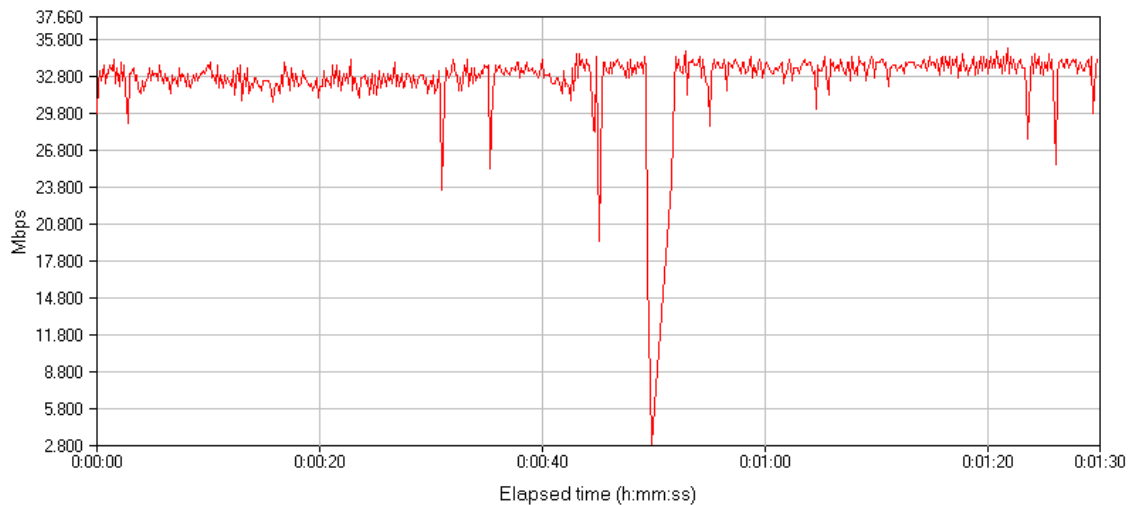| Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	48.639	14.815	31.746			
Pair 1	29.999	17.490	31.746	2.131	58.669	7.102
Pair 2	19.538	14.815	24.243	0.063	59.208	0.322
Totals:	48.639	14.815	31.746			

Throughput

4.2.37

1. **Data Transfer (STA1 → STA2: TCP FILESENDL)**

   Result: 32.239 Mbps > Required: 12.49 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	32.108	2.835	35.069			
Pair 1	32.239	2.835	35.069	1.176	89.570	3.649
Totals:	32.108	2.835	35.069			

Throughput

2. **Data Transfer (STA2 → STA1: TCP FILESENDL)**

    Result: 24.869 Mbps > Required: 11.66 Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	24.797	4.076	27.380			
Pair 1	24.869	4.076	27.380	0.685	89.557	2.756
Totals:	24.797	4.076	27.380			

Throughput
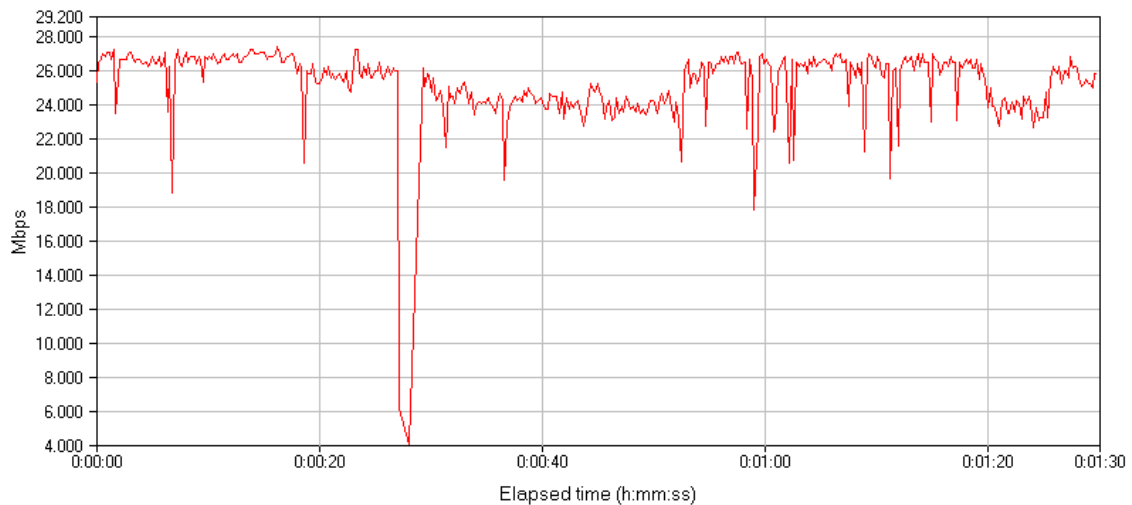
Appendix B – Problem Report: Yes ☐   No ☒