Unicast Latency Report - UDP

Device Tested

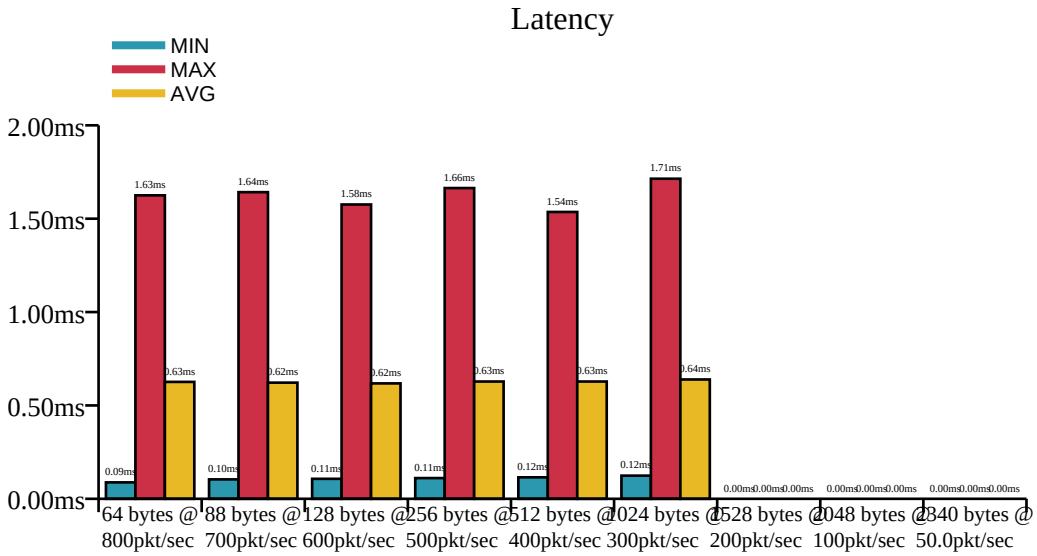
WLAN Switch Model:
WLAN Switch Version:
AP Model: FS-AP1167C
AP SW Version: V200R106C60B202SP01

Overview

The latency test measures the delay incurred by frames passing through the system under test (SUT). It also measures the amount of jitter, which is the variation in latency over many frames. Latency and jitter are key performance metrics that determine how well the SUT can handle traffic, such as voice or real-time video, that is sensitive to the delay between source and destination. This test measures latency and jitter according to RFC 2544 and RFC 3550, respectively.

Measured Latency

The following graph summarizes the measured minimum, maximum, and average latency performance of the SUT at the specified frame sizes, accumulated over all trials. Lower values indicate better performance. Also, a smaller difference between maximum and minimum latency indicates a better-performing SUT datapath.



Normal values for latency range from 1 to 1000 microseconds. Values in excess of 20 milliseconds are cause for concern, as they can pose problems for VoIP traffic.

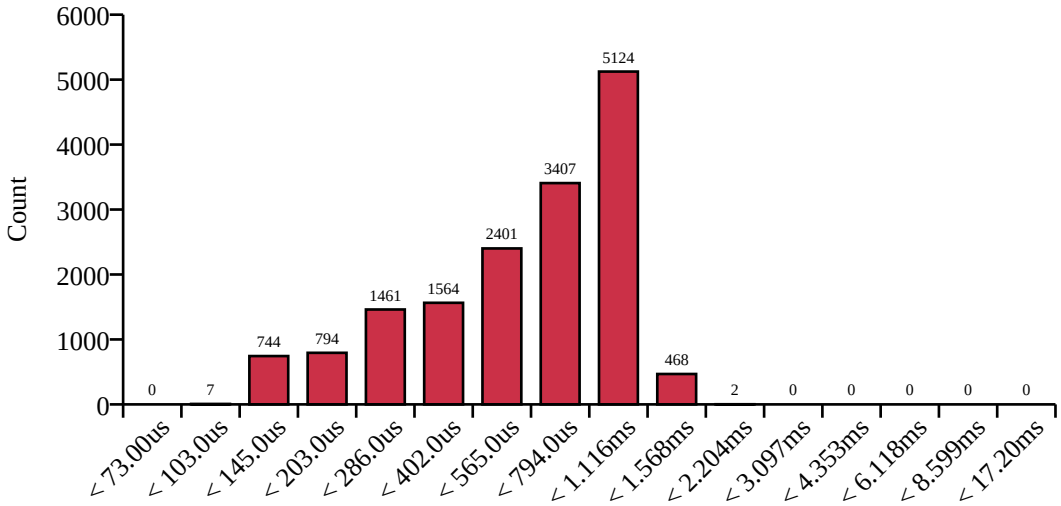
Latency Histograms

The following latency histograms show the distribution of latency values produced by the SUT. Each histogram has 16 buckets (time ranges) into which the measured latency values are placed; the bucket boundaries are determined automatically during the test. Each bucket contains the number of measured

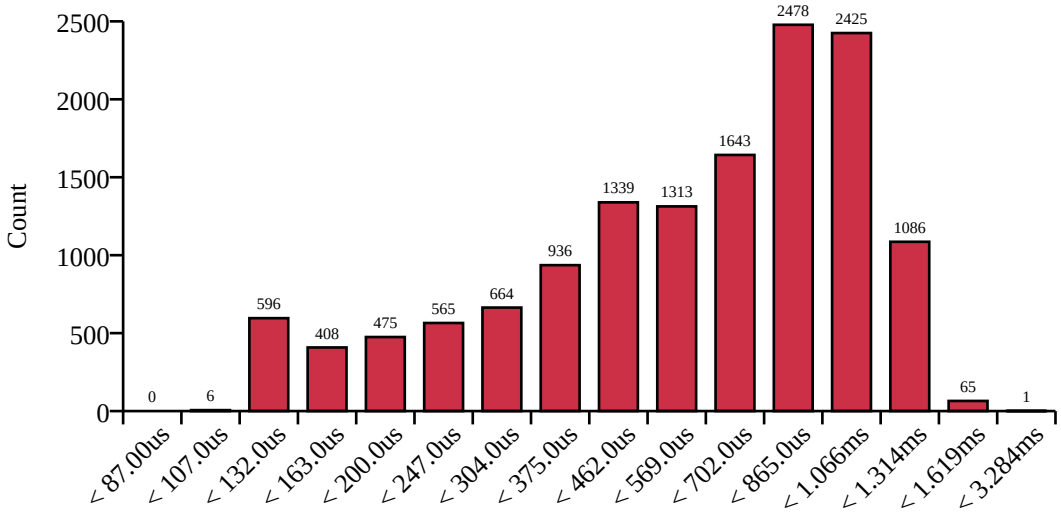
latency values that were less than the upper boundary of the bucket, and greater than the upper boundary of the preceding bucket. A separate histogram is plotted for each frame size, offered load and trial.

Ideally, all of the measured latency values should be clustered into as few buckets as possible, indicating a consistent and uniform delay through the SUT datapath.

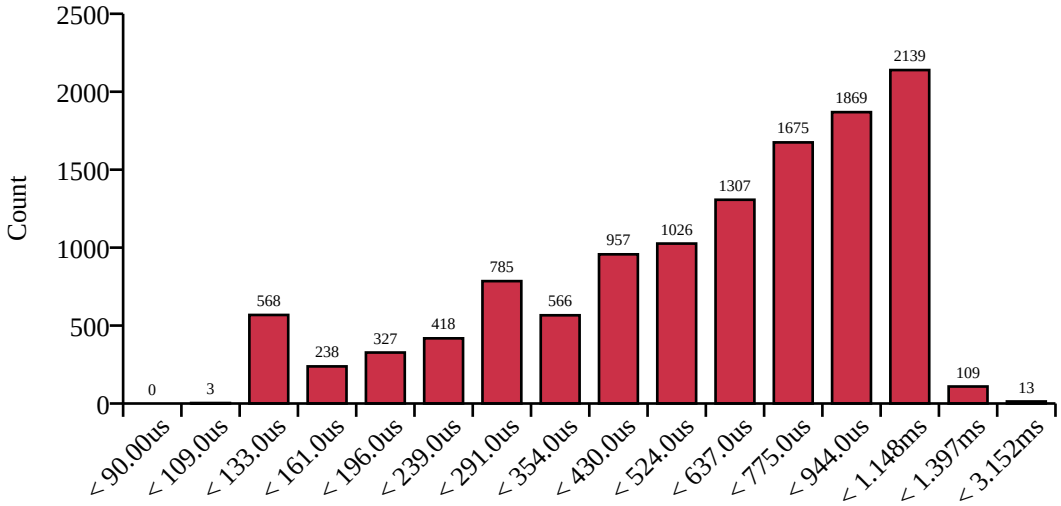
Latency Histogram Trial:1 Size:64 Rate:800.0 frames/sec



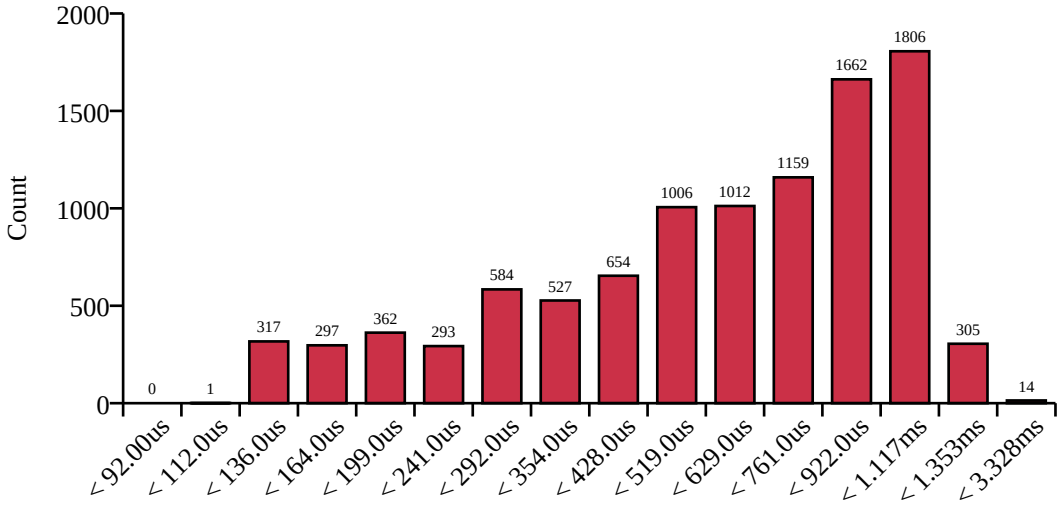
Latency Histogram Trial:1 Size:88 Rate:700.0 frames/sec



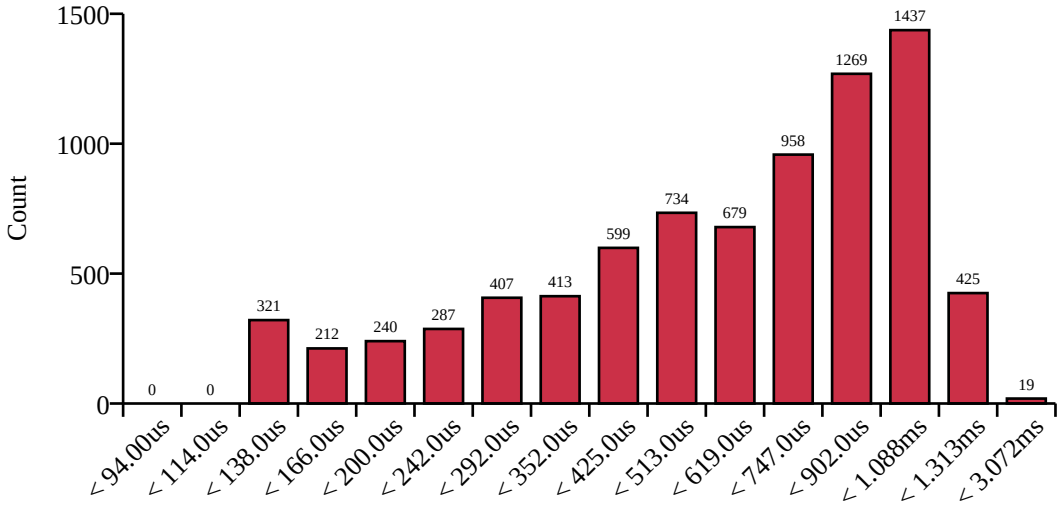
Latency Histogram Trial:1 Size:128 Rate:600.0 frames/sec



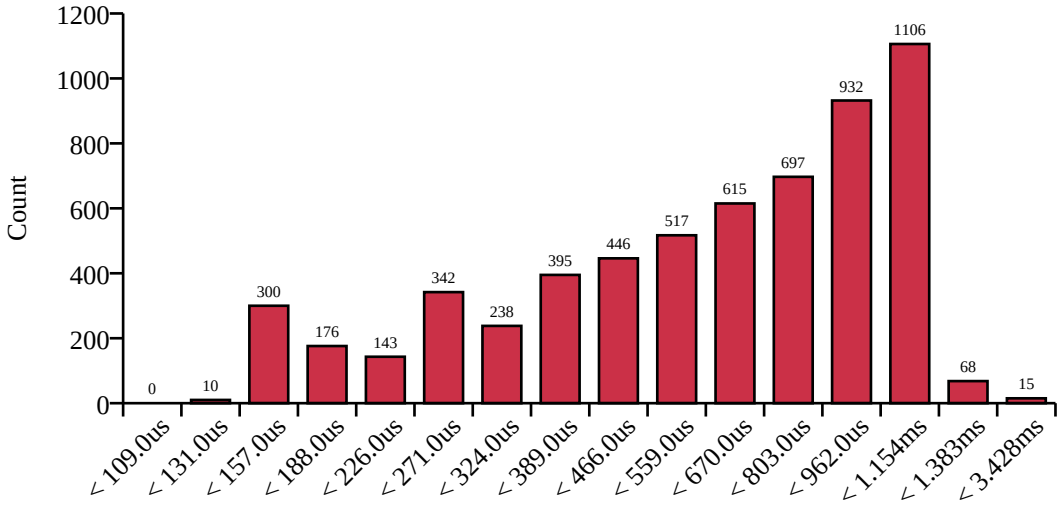
Latency Histogram Trial:1 Size:256 Rate:500.0 frames/sec



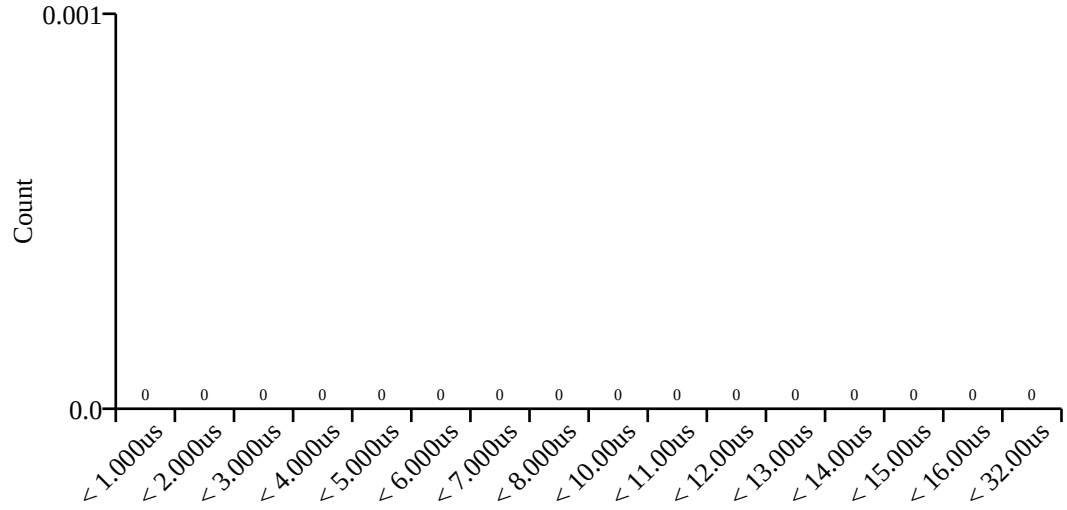
Latency Histogram Trial:1 Size:512 Rate:400.0 frames/sec



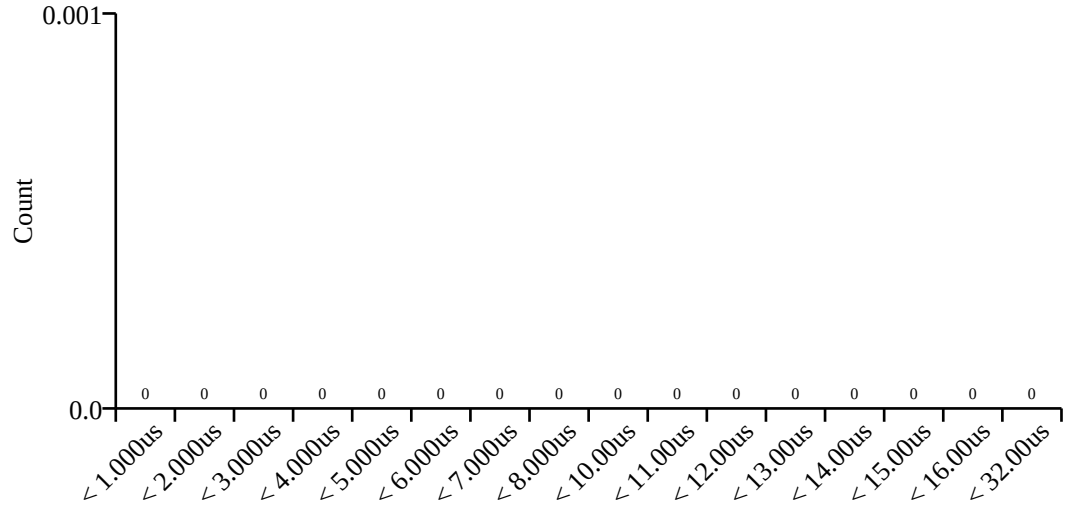
Latency Histogram Trial:1 Size:1024 Rate:300.0 frames/sec



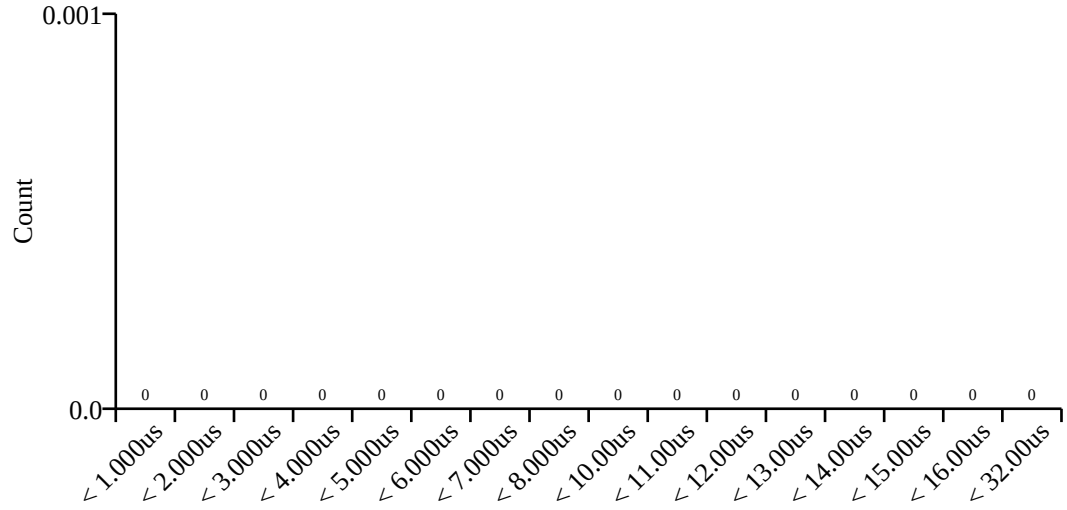
Latency Histogram Trial:1 Size:1528 Rate:200.0 frames/sec



Latency Histogram Trial:1 Size:2048 Rate:100.0 frames/sec



Latency Histogram Trial:1 Size:2340 Rate:50.0 frames/sec



Test Conditions

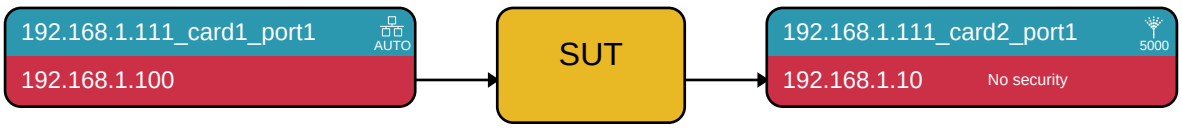
Parameter	Value	Description
Frame Sizes	[64, 88, 128, 256, 512, 1024, 1528, 2048, 2340]	Frame sizes in bytes
ILOAD	[800, 700, 600, 500, 400, 300, 200, 100, 50]	Traffic load, frames/sec

Test Configuration

Parameter	Value	Description
Learning Time	2 sec	Transmission time (seconds) for initial learning packets, to allow the SUT to set up forwarding tables
Transmit Time	20 sec	Trial duration (seconds) - i.e., duration of test traffic
Settle Time	2 sec	Idle time after test traffic transmission completes
Number of Trials	1	Number of times measurements are repeated for averaging
Prefer IPv6 addressing	False	If this flag is enabled and clients has an IPv6 address configured, then generated traffic will use IPv6 addresses. If there is no IPv6 address configured on clients then generated traffic will use IPv4 addresses.

Test Topology

The test topology is shown below. Traffic is transmitted in the direction of the arrows. The test client port identifiers and IP addresses are indicated in the boxes, together with the security mode and channel ID for WLAN clients.



A total of 2 ports were used in this test.

Client Configuration

Client Group	Rx Data MCS	Tx Data MCS	Tx Mgmt. PHY Rate (Mbps)	PHY Rate (Mbps)	IPv6	Port	Adopt Tx Data MCS
Group_001	9	9	54.0	866.7	Disabled	192.168.1.111_card2_port1	Off
Group_002	N/A	N/A	N/A	1000	Disabled	192.168.1.111_card1_port1	N/A

"Rx Data MCS Index" found in WML file will be ignored if "Adopt Tx Data MCS Index" is enabled. In this case, "Rx Data MCS Index" will be set equal to "Tx Data MCS Index".

Client MAC Configuration

Client Group	PHY Type	A-MPDU	RX A-MSDU	TX A-MSDU (Max, Target)	LDPC	Channel Bandwidth	Guard Interval	Channel Model	Dynamic Bandwidth
Group_001	11ac	On	On	On (Auto)	Off	80	short	Bypass	Off

Client MIMO Configuration

Client Group	MIMO	MU/SU-MIMO
Group_001	2x2	MU

Client 802.11k Configuration

Client Group	802.11k	Measurements Enabled	Periodicity	Max. Frames
Group_001	Off	None	N/A	N/A

Methodology

The test is performed by associating test clients with the SUT ports, performing any desired learning transmissions, and then generating test traffic between the test clients. Proprietary timestamps inserted in each test traffic frame are then used to calculate the minimum, maximum and average latency as per RFC 2544, as well as the smoothed interarrival jitter according to RFC 3550. The results are recorded separately for each combination of test conditions, as well as for each trial if multiple trials are run. Results from multiple trials are averaged into the graphs shown above.

Different intended loads (ILOADs) and frame sizes can be set up, to understand how latency varies with different types of traffic in a real environment. Each combination of ILOAD and frame size is tested separately. Test traffic may be configured to flow either from Ethernet to wireless, from wireless to Ethernet, or from wireless to wireless. If multiple APs are involved in the test, the ILOAD is divided evenly across the APs; if multiple clients are associated with an AP, the ILOAD for that AP is divided evenly between the clients.

Latency measurements are made accurately even in the presence of frame loss. However, the ILOAD should be set such that no frame loss occurs; otherwise, buffer occupancy delays can obscure actual SUT datapath delays. The throughput test may be used to determine this traffic level.

Detailed Results

Frame Size	Frame Rate	Trial Number	Minimum Latency	Maximum Latency	Average Latency	Average Jitter
64	800.0	1	88.00us	1.625ms	626.0us	317.2us
88	700.0	1	104.0us	1.642ms	622.0us	476.1us
128	600.0	1	107.0us	1.576ms	618.0us	504.8us
256	500.0	1	111.0us	1.664ms	628.0us	202.0us
512	400.0	1	115.0us	1.536ms	628.0us	482.3us
1024	300.0	1	124.0us	1.714ms	639.0us	352.5us
1528	200.0	1	0.000s	0.000s	0.000s	0.000s
2048	100.0	1	0.000s	0.000s	0.000s	0.000s
2340	50.0	1	0.000s	0.000s	0.000s	0.000s

Detailed latency histogram tables are not included in this report, but may be obtained from the file 'Results_unicast_latency.csv' in the results directory.

Access Point Information

The following table shows the SUT details. The received signal strength indication (RSSI) from the SUT is sampled on each port at the start of each trial and averaged over all of the trials.

Port Name	Type	RxAtt*	Chan	BSSID	SSID	RSSI (dBm) A,B,C,D
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-31, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-31, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A

Port Name	Type	RxAtt*	Chan	BSSID	SSID	RSSI (dBm) A,B,C,D
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A

The RSSI is measured at the WaveBlade SMA connector. RSSI values should be between -25 dBm and -35 dBm for port types of 80211 and 80211n ports when the RX attenuation (RxAtt*) option is 'off'. For 80211n port types with attenuation 'on' the RSSI values at the port should be between -5 dBm and -15 dBm. If the RSSI is not in this range, modify the external attenuation to bring it into this range.

Port Configuration

The following table shows the port configuration details like Bandwidth, Channel, Band, CenterFrequency.

PortName	Port Type	Channel	Band	Channel Bandwidth	Center Frequency
192.168.1.111_card2_port1	80211ac	149	5 GHz	80 MHz	5775 MHz

Other Information

Results Directory	C:\Users\Dell\VeriWave\WaveApps\Results\20201124-155946
WaveApps Version	7.6, 2019.04.02.18-ixia
WaveTest Version	7.6-124-ixi, 2019.04.02.17

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