

# HPE Aruba Networking 510 Series campus access points

Very high Wi-Fi 6 (802.11ax) performance with dual radios



## Key features

- Up to 2.69 Gbps combined peak data rate
- WPA3 and Enhanced Open security
- Built-in technology that resolves sticky client issues for Wi-Fi 6 and Wi-Fi 5 devices
- OFDMA and MU-MIMO for enhanced multi-user efficiency
- IoT-ready Bluetooth 5 and Zigbee support
- Embedded ranging technology for accurate indoor location measurements

HPE Aruba Networking Wi-Fi 6 access points provide high-performance connectivity for any organization experiencing growing numbers of IoT and mobility requirements. With a combined peak data rate of up to 2.69 Gbps, they deliver the speed and reliability needed for any enterprise environment.

## Incredible efficiency

The 510 Series APs are also designed to optimize user experience by maximizing Wi-Fi efficiency and dramatically reducing airtime contention between clients.

Features include Orthogonal frequency-division multiple access (OFDMA), multi-user MIMO and cellular optimization. With up to 4 spatial streams (4SS) and 160MHz channel bandwidth (VHT160), the 510 Series provides groundbreaking wireless capabilities for any enterprise.

Read the Multi-User [802.11ax white paper](#) for further information.

## Advantages of OFDMA

This capability allows HPE Aruba Networking's APs to handle multiple Wi-Fi 6 capable clients on each channel

simultaneously, regardless of device or traffic type. Channel utilization is optimized by handling each transaction via smaller sub-carriers or resource units (RUs), which means that clients are sharing a channel and not competing for airtime and bandwidth.

## Multi-user MIMO (MU-MIMO)

The 510 Series APs support downlink MU-MIMO (5GHz radio) to maximize the use of its MIMO radio capabilities by simultaneously exchanging data with multiple single or dual stream client devices.

## Wi-Fi optimization

### Client optimization

HPE Aruba Networking's patented AI-powered ClientMatch technology eliminates sticky client issues by steering a client to the AP where it receives the best radio signal. Client Match steers traffic from the noisy 2.4 GHz band to the preferred 5 GHz or 6 GHz band depending on client capabilities.

ClientMatch also dynamically steers traffic to load balance APs to improve the user experience.

**Automated Wi-Fi radio frequency management**

To optimize the user experience and provide greater stability, HPE Aruba Networking AirMatch allows organizations to automate network optimization using machine learning. AirMatch provides dynamic bandwidth adjustments to support changing device density, enhanced roaming using an even distribution of Effective Isotropic Radiated Power (EIRP) to radios, and real-time channel assignments to mitigate co-channel interference.

**Application assurance**

With Air Slice, organizations can provide application assurance to their users that goes beyond the traditional capabilities of airtime fairness. After the SLAs are configured, Air Slice monitors network usage, automatically allocates radio resources, and dynamically adjusts radio resources as new users connect, and applications sessions begin or end.

**HPE Aruba Networking Advanced Cellular Coexistence (ACC)**

This feature uses built-in filtering to automatically minimize the impact of interference from cellular networks, distributed antenna systems (DAS), and commercial small cell or femtocell equipment.

**Intelligent Power Monitoring (IPM)**

HPE Aruba Networking APs continuously monitor and report hardware energy consumption. They can also be configured to enable or disable capabilities based on available PoE power—ideal when wired switches have exhausted their power budget.

**IOT ready**

The 510 Series includes an integrated Bluetooth 5 and 802.15.4 radio (for Zigbee support) to simplify deploying and managing IoT-based location services, asset tracking services, security solutions and IoT sensors. This allows organizations to leverage the 510 Series as an IoT platform, which eliminates the need for an overlay infrastructure and additional IT resources.

**Target Wake Time (TWT)**

Ideal for IoTs that communicate infrequently, TWT establishes a schedule for when clients need to communicate with an AP. This helps improve client power savings and reduces airtime contention with other clients.

**Foundation for accurate indoor location**

HPE Aruba Networking APs act as a foundation for accurate indoor location so that location-aware services can be deployed at scale. Using embedded

GPS receivers, HPE Aruba Networking Wi-Fi 6E APs are able to self-locate and work with Wi-Fi 6 APs to establish reference points that can be used to accurately determine indoor client location.

Because they use universal latitude and longitude coordinates, there is no need for custom map development or to create separate applications for indoor and outdoor environments.

**HPE Aruba Networking secure infrastructure**

The HPE Aruba Networking 510 Series includes components of HPE Aruba Networking's Zero Trust and SASE framework to help protect user authentication and wireless traffic. Select capabilities include:

**WPA3 and Enhanced Open**

Support for stronger encryption and authentication is provided via the latest version of WPA for enterprise protected networks.

Enhanced Open offers seamless new protection for users connecting to open networks where each session is automatically encrypted to protect user passwords and data on guest networks.

**WPA2-MPSK**

MPSK enables simpler passkey management for WPA2 devices—should the Wi-Fi password on one device or device type change, no additional changes are needed for other devices. Requires ClearPass Policy Manager.

**VPN tunnels**

In Remote AP (RAP) and IAP-VPN deployments, the 510 Series can be used to establish a secure SSL/IPSec VPN tunnel to a Mobility Controller that is acting as a VPN concentrator.

**Trusted Platform Module (TPM)**

For enhanced device assurance, all HPE Aruba Networking APs have an installed TPM for secure storage of credentials and keys, and boot code.

**Simple and secure access**

To simplify policy enforcement, the HPE Aruba Networking 510 Series uses HPE Aruba Networking's policy enforcement firewall (PEF) feature to encapsulate all traffic from the AP to the Mobility Controller (or Gateway) for end-to-end encryption and inspection. Policies are applied based on user role, device type, applications, and location. This reduces the manual configuration of SSIDs, VLANs and ACLs. PEF also serves as the underlying technology for HPE Aruba Networking [Dynamic Segmentation](#).



## Flexible operation and management

Our unified APs can operate as standalone access points or with a gateway for greater scalability, security, and manageability. APs can be deployed using zero touch provisioning—without on-site technical expertise—for ease of implementation in branch offices and for remote work.

HPE Aruba Networking APs can be managed using cloud-based or on-premises solutions for any campus, branch, or remote work environment. As the management and orchestration console for HPE Aruba Networking ESP (Edge Services Platform), HPE Aruba Networking Central provides a single pane of glass for overseeing every aspect of wired and wireless LANs, WANs, and VPNs. AI-powered analytics, end-to-end orchestration and automation, and advanced security features are built natively into the solution.

## Additional Wi-Fi features

Each AP also includes the following standards-based technologies:

### Transmit Beamforming (TxBF)

Increased signal reliability and range

### Passpoint Wi-Fi (Release 2) (Hotspot 2.0)

Seamless cellular-to-Wi-Fi carryover for guests

### Dynamic Frequency Selection (DFS)

Optimized use of available RF spectrum

### Maximum Ratio Combining (MRC)

Improved receiver performance

### Cyclic Delay/Shift Diversity (CDD/CSD)

Greater downlink RF performance

### Space-Time Block Coding

Increased range and improved reception

### Low-Density Parity Check (LDPC)

High-efficiency error correction for increased throughput

## Specifications

### Hardware variants

- AP-514: External antenna models
- AP-515: Internal antenna models

### Wi-Fi radio specifications

- AP type: Indoor, dual radio, 5GHz 802.11ax 4x4 MIMO and 2.4 GHz 802.11ax 2x2 MIMO

### • 5GHz radio:

- Four spatial stream Single User (SU) MIMO for up to 4.8Gbps wireless data rate to individual 4SS HE160 802.11ax client devices (max)
- Two spatial stream Single User (SU) MIMO for up to 1.2Gbps wireless data rate to individual 2SS HE80 802.11ax client devices (typical)
- Four spatial stream Multi User (MU) MIMO for up to 4.8Gbps wireless data rate to up to four 1SS or two 2SS HE160 802.11ax DL-MU-MIMO capable client devices simultaneously (max)
- Four spatial stream Multi User (MU) MIMO for up to 2.4Gbps wireless data rate to up to four 1SS or two 2SS HE80 802.11ax DL-MU-MIMO capable client devices simultaneously (typical)

### • 2.4GHz radio:

- Two spatial stream Single User (SU) MIMO for up to 574Mbps wireless data rate to 2SS HE40 802.11ax client devices (max)
- Two spatial stream Single User (SU) MIMO for up to 287Mbps wireless data rate to 2SS HE20 802.11ax client devices (typical)

- Support for up to 512 associated client devices per radio, and up to 16 BSSIDs per radio

- Supported frequency bands (country-specific restrictions apply):

– 2.400 to 2.4835 GHz	ISM
– 5.150 to 5.250 GHz	U-NII-1
– 5.250 to 5.350 GHz	U-NII-2A
– 5.470 to 5.725 GHz	U-NII-2C
– 5.725 to 5.850 GHz	U-NII-3/ISM
– 5.850 to 5.895 GHz	U-NII-4

- Available channels: Dependent on configured regulatory domain
- Dynamic Frequency Selection (DFS) optimizes the use of available RF spectrum
  - Including Zero-Wait DFS (ZWDIFS) to accelerate channel changes

- Supported radio technologies:

- 802.11b: Direct-Sequence Spread-Spectrum (DSSS)
- 802.11a/g/n/ac: Orthogonal frequency-division multiplexing (OFDM)
- 802.11ax: Orthogonal frequency-division multiple access (OFDMA) with up to 16 resource units (for an 80MHz channel)



- Supported modulation types:
  - 802.11b: BPSK, QPSK, CCK
  - 802.11a/g/n: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM (proprietary extension)
  - 802.11ac: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM (proprietary extension)
  - 802.11ax: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM
- 802.11n high-throughput (HT) support: HT20/40
- 802.11ac very high throughput (VHT) support: VHT20/40/80/160
- 802.11ax high efficiency (HE) support: HE20/40/80/160
- Supported data rates (Mbps):
  - 802.11b: 1, 2, 5.5, 11
  - 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54
  - 802.11n (2.4 GHz): 6.5 to 300 (MCS0 to MCS15, HT20 to HT40)
  - 802.11n (5 GHz): 6.5 to 600 (MCS0 to MVC31, HT20 to HT40)
  - 802.11ac: 6.5 to 3,467 (MCS0 to MCS9, NSS = 1 to 4, VHT20 to VHT160)
  - 802.11ax (2.4 GHz): 3.6 to 574 (MCS0 to MCS11, NSS = 1 to 2, HE20 to HE40)
  - 802.11ax (5GHz): 3.6 to 4,803 (MCS0 to MCS11, NSS = 1 to 4, HE20 to HE160)
- 802.11n/ac/ax packet aggregation: A-MPDU, A-MSDU
- Transmit power: Configurable in increments of 0.5 dBm
- Maximum (aggregate, conducted total) transmit power (limited by local regulatory requirements):
  - 2.4 GHz band: +21 dBm (18dBm per chain)
  - 5 GHz band: +24 dBm (18 dBm per chain)
  - Note: conducted transmit power levels exclude antenna gain. For total (EIRP) transmit power, add antenna gain.
- Advanced Cellular Coexistence (ACC) minimizes the impact of interference from cellular networks
- Maximum Ratio Combining (MRC) for improved receiver performance
- Cyclic Delay/Shift Diversity (CDD/CSD) for improved downlink RF performance
- Space-Time Block Coding (STBC) for increased range and improved reception

- Low-Density Parity Check (LDPC) for high-efficiency error correction and increased throughput
- Transmit Beam-Forming (TxBF) for increased signal reliability and range
- 802.11ax Target Wait Time (TWT) to support low-power client devices
- 802.11mc Fine Timing Measurement (FTM) for precision distance ranging

#### Wi-Fi antennas

- AP-514: Four (female) RP-SMA connectors for external dual band antennas (A0 through A3, corresponding with radio chains 0 through 3 for 5GHz; 2.4GHz radio uses A0/A1 and chains 0/1 only). Worst-case internal loss between radio interface and external antenna connectors (due to diplexing circuitry): 1.3dB in 2.4GHz and 1.7dB in 5GHz.
- AP-515: Four integrated dual-band downtilt omnidirectional antennas for 4x4 MIMO (2x2 MIMO for 2.4GHz) with peak antenna gain of 4.2dBi in 2.4GHz and 7.5dBi in 5GHz. Built-in antennas are optimized for horizontal ceiling mounted orientation of the AP. The downtilt angle for maximum gain is roughly 30 degrees.
  - Combining the patterns of each of the antennas of the MIMO radios, the peak gain of the effective per-antenna pattern is 3.8dBi in 2.4 GHz and 4.6dBi in 5 GHz.

#### Additional interfaces

- E0: HPE SmartRate port (RJ-45, maximum negotiated speed 2.5 Gbps)
  - Auto-sensing link speed (100/1000/2500BASE-T) and MDI/ MDX
  - 2.5Gbps speeds comply with NBase-T and 802.3bz specifications
  - PoE-PD: 48Vdc (nominal) 802.3af/at/bt (class 3 or higher)
  - 802.3az Energy Efficient Ethernet (EEE)
- E1: 10/100/1000BASE-T Ethernet network interface (RJ-45)
  - Auto-sensing link speed and MDI/MDX
  - 802.3az Energy Efficient Ethernet (EEE)
- Link Aggregation (LACP) support between both network ports for redundancy and increased capacity
- DC power interface: 12Vdc (nominal, +/-5%), accepts 2.1mm/5.5mm center-positive circular plug with 9.5mm length
- USB 2.0 host interface (Type A connector)



- Capable of sourcing up to 1A/5W to an attached device
- Bluetooth 5 and Zigbee (802.15.4) radio (2.4GHz)
  - Bluetooth 5: up to 8dBm transmit power (class 1) and -95dBm receive sensitivity
  - Zigbee: up to 8dBm transmit power and -97dBm receive sensitivity
  - Integrated vertically polarized omnidirectional antenna with roughly 30 degrees downtilt and peak gain of 3.5dBi (AP-515) or 4.9dBi (AP-514)
- Visual indicators (two multi-color LEDs): for System and Radio status
- Reset button: factory reset, LED mode control (normal/off)
- Serial console interface (proprietary, micro-B USB physical jack)
- Kensington security slot

#### Power sources and power consumption

- The AP supports direct DC power and Power over Ethernet (PoE; on port E0)
- When both power sources are available, DC power takes priority over PoE
- Power sources are sold separately; see the ordering Information section below for details
- When powered by DC or 802.3at (class 4)/802.3bt (class 5) PoE, the AP will operate without restrictions.
- When powered by 802.3af (class 3) PoE and with the IPM feature enabled, the AP will start up in unrestricted mode, but it may apply restrictions depending on the PoE budget and actual power. What IPM restrictions to apply, and in what order, is programmable.
- Operating the AP with an 802.3af (class 3 or lower) PoE source and IPM disabled is not supported (except for AP staging; no radios will be enabled).
- Maximum (worst-case) power consumption:
  - DC powered: 16.0W
  - PoE powered (802.3af, IPM enabled): 13.5W
  - PoE powered (802.3at/bt): 20.8W
  - All numbers above are without an external USB device connected. When sourcing the full 5W power budget to such a device, the incremental (worst-case) power consumption for the AP is up to 5.7W (PoE powered) or 5.5W (DC powered).
- Maximum (worst-case) power consumption in idle mode: 12.6W (POE) or 9.7W (DC)

- Maximum (worst-case) power consumption in deep-sleep mode: 5.9W (POE) or 1.5W (DC)

#### Mounting details

A mounting bracket has been pre-installed on the back of the AP. This bracket is used to secure the AP to any of the (sold separately) mount kits; see the ordering Information section below for details.

#### Mechanical specifications

- Dimensions/weight (AP-515; unit, excluding mount bracket):
  - 200mm (W) x 200mm (D) x 46mm (H)/7.9" (W) x 7.9" (D) x 1.8" (H)
  - 810g/28.5oz
- Dimensions/weight (AP-515; shipping):
  - 230mm (W) x 220mm (D) x 72mm (H)/9.1" (W) x 8.7" (D) x 2.8" (H)
  - 1010g/35.5oz

#### Environmental specifications

- Operating conditions
  - Temperature: 0C to +50C/+32F to +122F
  - Humidity: 5% to 93% non-condensing
  - AP is plenum rated for use in air-handling spaces
  - ETS 300 019 class 3.2 environments
- Storage and transportation conditions
  - Temperature: -40C to +70C/-40F to +158F
  - Humidity: 5% to 93% non-condensing
  - ETS 300 019 classes 1.2 and 2.3 environments

#### Reliability

Mean Time Between Failure (MTBF): 560,000hrs (64yrs) at +25C operating temperature.

#### Regulatory compliance

- FCC/ISED
- CE Marked
- RED Directive 2014/53/EU
- EMC Directive 2014/30/EU
- Low Voltage Directive 2014/35/EU
- UL/IEC/EN 62368-1
- EN 60601-1-1, EN60601-1-2
- Railway Certs (AP-515 Only):
  - EN 50155:2017—Railway Applications
  - EN 50121-1:2017—Railway EMC
  - EN 50121-3-2—Railway EMC



- EN 50121-4:2016—Railway Immunity
- IEC 61373 ed2:2008—Railway Shock and Vibration

For more country-specific regulatory information and approvals, please see your [HPE Aruba Networking representative](#).

**Regulatory model numbers**

- AP-514: APIN0514
- AP-515: APIN0515

**Certifications**

- UL2043 plenum rating
- Wi-Fi Alliance:
  - Wi-Fi CERTIFIED a, b, g, n, ac, ax
  - WPA, WPA2 and WPA3—Enterprise with CNSA option, Personal (SAE), Enhanced Open (OWE)
  - WMM, WMM-PS, W-Fi Agile Multiband
  - Passpoint (release 2)
  - Wi-Fi CERTIFIED Location™
- Bluetooth SIG

**Warranty**

[HPE Aruba Networking's hardware limited lifetime warranty](#).

**Minimum operating system software versions**

- HPE Aruba Networking Operating System and HPE Aruba Networking InstantOS 8.4.0.0 (with some restrictions). For unrestricted operation, use 8.6.0.0 or later.
- HPE Aruba Networking Operating System 10.0.0.0



## RF performance table

Band, rate	Maximum transmit power (dBm) per transmit chain	Receiver sensitivity (dBm) per receive chain
<b>2.4GHz, 802.11b</b>		
1Mbps	18	-96
11Mbps	18	-88
<b>2.4GHz, 802.11g</b>		
6Mbps	18	-93
54Mbps	17	-75
<b>2.4GHz, 802.11n HT20</b>		
MCS0	18	-93
MCS7	16	-75
<b>2.4GHz, 802.11n HE20</b>		
MCS0	18	-92
MCS11	14	-62
<b>5GHz, 802.11a</b>		
6Mbps	18	-93
54Mbps	17	-75
<b>5GHz, 802.11n HT20</b>		
MCS0	18	-93
MCS7	16	-73
<b>5GHz, 802.11n HT40</b>		
MCS0	18	-90
MCS7	16	-70
<b>5GHz, 802.11ac VHT20</b>		
MCS0	18	-93
MCS9	16	-68
<b>5GHz, 802.11ac VHT40</b>		
MCS0	18	-90
MCS9	16	-65



Band, rate	Maximum transmit power (dBm) per transmit chain	Receiver sensitivity (dBm) per receive chain
<b>5GHz, 802.11ac VHT80</b>		
MCS0	18	-87
MCS9	16	-62
<b>5GHz, 802.11ac VHT160</b>		
MCS0	18	-84
MCS9	16	-59
<b>5GHz, 802.11ax HE20</b>		
MCS0	18	-90
MCS11	14	-60
<b>5GHz, 802.11ax HE40</b>		
MCS0	18	-87
MCS11	14	-57
<b>5GHz, 802.11ax HE80</b>		
MCS0	18	-84
MCS11	14	-54
<b>5GHz, 802.11ax HE160</b>		
MCS0	18	-81
MCS11	13	-51

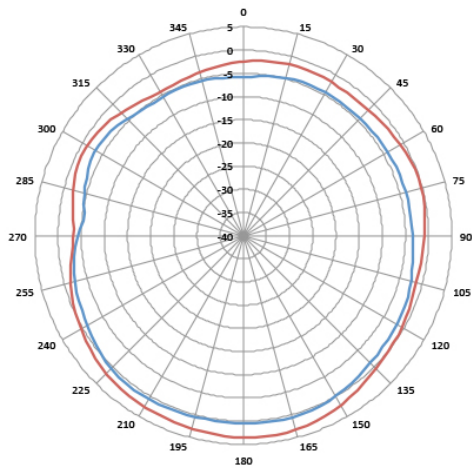




## Antenna patterns plots

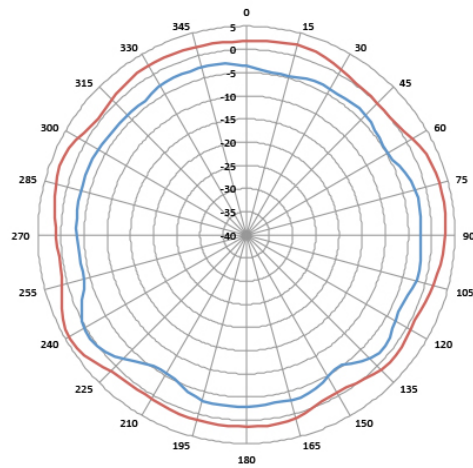
### Horizontal planes (top view)

Showing azimuth (0 degrees) and 30 degrees downtilt patterns (averaged patterns for all applicable antennas)



— 2.4GHz WiFi (R1) Average Azimuth — 2.4GHz WiFi (R1) Average Downtilt

2.4GHz Wi-Fi (antennas 1, 2)

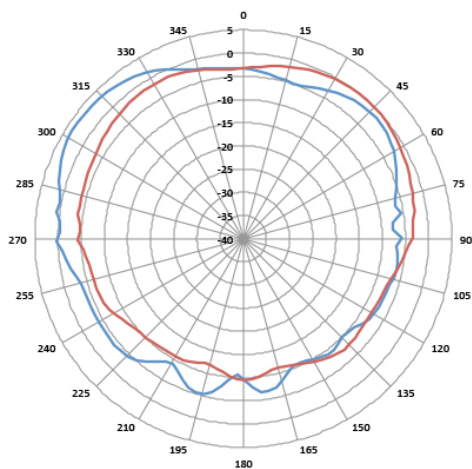


— 5.5GHz WiFi (R0) Average Azimuth — 5.5GHz WiFi (R0) Average Downtilt

5.5GHz Wi-Fi (antennas 1, 2, 3, 4)

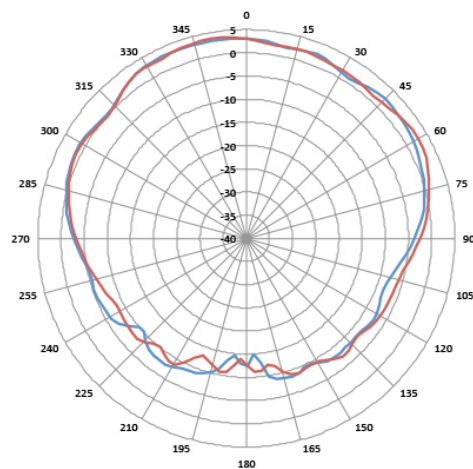
### Vertical (elevation) planes (side view, AP facing up)

Showing side view with AP rotated 0 and 90 degrees (averaged patterns for all applicable antennas)



— 2.4GHz WiFi (R1) Average Elevation 0 — 2.4GHz WiFi (R1) Average Elevation 90

2.4GHz Wi-Fi (antennas 1, 2)



— 5.5GHz WiFi (R0) Average Elevation 0 — 5.5GHz WiFi (R0) Average Elevation 90

5.5GHz Wi-Fi (antennas 1, 2, 3, 4)



## Ordering information

Part number	Description
<b>HPE Aruba Networking 510 Series campus access points</b>	
Q9H54A	HPE Aruba Networking AP-514 (EG) Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H55A	HPE Aruba Networking AP-514 (IL) Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H56A	HPE Aruba Networking AP-514 (JP) Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H57A	HPE Aruba Networking AP-514 (RW) Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H58A	HPE Aruba Networking AP-514 (US) Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H59A	HPE Aruba Networking AP-515 (EG) Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H60A	HPE Aruba Networking AP-515 (IL) Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H61A	HPE Aruba Networking AP-515 (JP) Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H62A	HPE Aruba Networking AP-515 (RW) Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H63A	HPE Aruba Networking AP-515 (US) Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H64A	HPE Aruba Networking AP-514 (EG) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H65A	HPE Aruba Networking AP-514 (IL) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H66A	HPE Aruba Networking AP-514 (JP) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H67A	HPE Aruba Networking AP-514 (RW) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H68A	HPE Aruba Networking AP-514 (US) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax External Antennas Unified Campus AP
Q9H69A	HPE Aruba Networking AP-515 (EG) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H70A	HPE Aruba Networking AP-515 (IL) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H71A	HPE Aruba Networking AP-515 (JP) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H72A	HPE Aruba Networking AP-515 (RW) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP
Q9H73A	HPE Aruba Networking AP-515 (US) TAA Dual Radio 4x4:4 + 2x2:2 802.11ax Internal Antennas Unified Campus AP

For more ordering information and compatible accessories, please refer to the [ordering guide](#).

**Make the right purchase decision.  
Contact our presales specialists.**

