HPE Aruba Networking 650 Series Wi-Fi 6E Campus Access Points

Flagship offering with the performance to meet growing enterprise needs with Wi-Fi 6E

HPE GreenLake

Key features

- Comprehensive tri-band coverage across 2.4 GHz, 5 GHz, and 6 GHz to deliver up to 7.8 Gbps combined peak data rate.

- 4x4 MIMO radios to deliver peak performance and increased capacity using MU-MIMO and OFDMA (uplink and downlink for both).

- Up to seven 160 MHz channels in 6 GHz support low-latency, bandwidth-hungry applications like high-definition video and augmented reality/virtual reality applications.

- Unique ultra tri-band filtering enables 5 GHz and 6 GHz to operate without restrictions or interference.

By leveraging the 6 GHz band, HPE Aruba Networking 650 Series Campus APs delivers peak performance and far greater capacity than previous generations of Wi-Fi. With up to 1200 MHz of new channels, capacity is nearly tripled — so you can meet growing demand due to bandwidth-hungry video, increasing numbers of client and IoT devices and growth in cloud. Unique to HPE Aruba Networking, the 650 Series includes ultra tri-band filtering to minimize channel interference and dual configurable 5 Gbps ethernet ports to eliminate coverage gaps, provide greater resiliency, and deliver fast, secure connectivity.

More capacity and wider channels

The 650 Series APs are designed to take advantage of the 6 GHz band, which translates into far greater speeds, wider channels for multi-gigabit traffic, and less interference. The three 4x4 MIMO radios of the platform deliver a combined peak data rate of up to 7.8 Gbps.

Advantages of 6 GHz

Wi-Fi 6E provides up to 1200 MHz in the 6 GHz band for higher throughput and improved application performance.

Table 1. Channel bandwidth and peak data rates

Band	Channel bandwidth	Peak data rate
6 GHz	160 MHz	4.8 Gbps
5 GHz	80 MHz	2.4 Gbps
2.4 GHz	20 MHz	574 Mbps
Total	X	7.8 Gbps

- High availability with configurable 5 Gbps dual Ethernet ports for hitless failover of ethernet and power.
- Built-in GPS receivers and intelligent software enable APs to self-locate and act as reference points for accurate indoor location measurements.

With up to seven 160 MHz channels, Wi-Fi 6E can better support low-latency, bandwidth hungry applications like high-definition video and artificial reality/virtual reality applications. Only Wi-Fi 6E capable devices can use the 6 GHz band so there is no interference or slowdowns due to legacy devices.

Device class support
For operation in the 6 GHz band, the 650 Series APs are part of the low power indoor (LPI) device class. This fixed indoor-only class uses lower power levels and does not require an Automated Frequency Coordination service (AFC) to manage incumbent outdoor services which is required for standard class APs.

The connectorized models will typically operate as Standard Power access points, but may also be allowed to operate as Low Power Indoor devices in some countries.

Less interference
650 Series Access Points include HPE Aruba Networking's ultra tri-band filtering, which enables enterprises to take advantage of the entire 5 GHz and 6 GHz bands without experiencing interference, while operating on any channel in either band concurrently. or islands. Since there is only 50 MHz between 5 GHz and the 6 GHz, without advanced filtering, enterprises would likely experience problems between the bands and would therefore be limited in the number of channels available. By applying advanced filtering capabilities, enterprises can take full use of available spectrum without creating coverage gaps

Business continuity
The Series 650 APs provide high availability with two HPE Smart Rate ethernet ports for hitless failover for both data and power. Configurable to 1, 2.5, or 5 Gbps, these dual ports provide business continuity for mission critical applications.

Global readiness
While the need for more Wi-Fi capacity is recognized across the globe, countries are approaching 6 GHz differently. The 650 Series APs are set up to automatically update regulatory rules once 6E regulations have been approved and certified.

Extend the benefits of Wi-Fi 6
The 650 Series APs are based on the 802.11ax standard, which means that all its efficiency and security enhancements are also available on the 6 GHz band. Wi-Fi 6 features such as Orthogonal Frequency Division Multiple Access (OFDMA), BSS coloring, Enhanced Open, and WPA3 are fully supported on the HPE Aruba Networking's Wi-Fi 6E access points as well.

Advantages of OFDMA
This capability allows HPE Aruba Networking APs to handle multiple 802.11ax 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. The 650 Series APs supports up to 37 resource units, the maximum as defined in the standard for an 80 MHz channel.

Advantages of MU-MIMO
MU-MIMO can be used to increase the capacity and aggregate performance by relying on spatial multiplexing to communicate with up to four client devices simultaneously. The 650 Series APs supports 4x4 MU-MIMO in both uplink and downlink directions.

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 organization 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)

Unique to HPE Aruba Networking, Advanced Cellular Coexistence 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)

For better insights into energy consumption, HPE Aruba Networking APs continuously monitor and report hardware energy usage. Unlike other vendor's access points, HPE Aruba Networking APs can also be configured to enable or disable capabilities based on available PoE power — ideal when wired switches have exhausted their power budget. Enterprises can deploy Wi-Fi 6E APs and update switching and power at a later if needed based on their actual usage. Other power options include adding a power injector or using Smart PoE to combine power from two cables.

Self-locating access points

Indoor location shouldn't require guesswork or costly overlay technologies. HPE Aruba Networking's Wi-Fi 6 and 6E APs help organizations leverage their wireless investment to deliver indoor location — everywhere.

The 650 Series Campus APs include built-in GPS receivers and intelligent software to allow them automatically locate themselves accurately within the universal framework of latitude and longitude. As part of HPE Aruba Networking's indoor location solution, they serve as reference points for client

devices using fine time measurements and other location technologies.

HPE Aruba Networking's Wi-Fi 6 and 6E APs support Open Locate, an emerging standard that allows APs to share their location over the air and through cloud-based APIs, enabling mobile devices to locate themselves and applications to support network analytics.

APs as an IoT platform

The 650 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. There is also a USB-port extension to provide IoT connectivity to a wider range of devices. These IoT capabilities allows organizations to leverage the HPE Aruba Networking APs as an IoT platform, which eliminates the need for an overlay infrastructure and additional IT resources and can accelerate IoT initiatives.

In addition, Target Wake Time (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, which is ideal for IoT.

HPE Aruba Networking secure infrastructure

The HPE Aruba Networking 650 Series includes build-security capabilities such as:

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. This capability requires ClearPass Policy Manager.

Simple and secure access

To improve security and ease of management, IT can centrally configure and automatically enforce role-based policies that define proper access privileges for employees, guests, contractors, and other user groups — no matter where users connect on wired and WLANs. Dynamic Segmentation eliminates the time consuming and error-prone task of managing complex and static VLANs, ACLs, and subnets by dynamically assigning policies and keeping traffic secure and separated.

Seamless handoffs to cellular

Built on the technical foundations of Passpoint® and Wi-Fi Calling, Air Pass creates a roaming network across the HPE Aruba Networking enterprise customer footprint, extending cellular coverage and enhancing the visitor and subscriber experience to deliver a great experience for your guests while reducing costs and management overhead for DAS.

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.

Summary

HPE Aruba Networking 650 Series Access Points are designed to take advantage of the 6 GHz band using three 4x4 MIMO radios for comprehensive tri-band coverage to meet the growing demands of Wi-Fi due to increased use of video, growth in client and IoT devices, and expanded use of cloud. With a maximum combined 7.8 Gbps data rate for higher throughput and faster use, the 650 Series raises the bar in terms of capacity, wider channels, hitless failover, and less interference between the 5 GHz and 6 GHz bands.

Specifications

Hardware variants
- AP-654: External antenna models
- AP-655: Internal antenna models.

Wi-Fi radio specifications
- AP type: Indoor, tri-radio, 2.4 GHz, 5 GHz and 6 GHz (concurrent) 802.11ax 4x4 MIMO.

- 2.4 GHz radio: Four spatial streams MIMO for up to 1,147 Mbps wireless data rate with HE40 802.11ax client devices (574 Mbps for HE20).

- 5 GHz radio: Four spatial streams MIMO for up to 2.4 Gbps wireless data rate with HE80 802.11ax client devices.

- 6 GHz radio: Four spatial streams MIMO for up to 4.8 Gbps wireless data rate with HE160 802.11ax client devices.

- Both downlink and uplink MU-MIMO in 6 GHz and 5 GHz, downlink only in 2.4 GHz.

- Up to 512 associated client devices per radio, and up to 16 BSSIDs per radio (limited to 8 for the 6 GHz radio when using version 8 software).

- 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

  – 5.925 to 6.425 GHz U-NII-5

  – 6.425 to 6.525 GHz U-NII-6

  – 6.525 to 6.875 GHz U-NII-7

  – 6.875 to 7.125 GHz U-NII-8

- Available bands and channels: Dependent on configured regulatory domain (country).

- Dynamic frequency selection (DFS) optimizes the use of available RF spectrum in the 5 GHz band.

  – Including Zero-Wait DFS (ZWDFS) 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 37 resource units (for an 80 MHz channel)

- Supported modulation types:

  – 802.11b: BPSK, QPSK, CCK

  – 802.11a/g/n: BPSK, QPSK, 16-QAM, 64-QAM and 256-QAM (proprietary extension)

  – 802.11ac: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM and 1024-QAM (proprietary extension)

  – 802.11ax: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM and 1024-QAM

- 802.11n high-throughput (HT) support: HT20/40

- 802.11ac very high throughput (VHT) support: VHT20/40/80/160 (80+80)

- 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: 6.5 to 600 (MCS0 to MCS31, HT20 to HT40), 800 with 256-QAM (proprietary extension)

  – 802.11ac: 6.5 to 1,733 (MCS0 to MCS9, NSS = 1 to 4, VHT20 to VHT160 (80+80); VHT80; 2,167 with 1024-QAM (MCS10 and MCS11, proprietary extension)

  – 802.11ax (2.4 GHz): 3.6 to 1,147 (MCS0 to MCS11, NSS = 1 to 4, HE20 to HE40)

  – 802.11ax (5 GHz): 3.6 to 2,402 (MCS0 to MCS11, NSS = 1 to 4, HE20 to HE160 (80+80) HE80)

  – 802.11ax (6 GHz): 3.6 to 4,804 (MCS0 to MCS11, NSS = 1 to 4, HE20 to HE160)

- 802.11n/ac 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):

  – Per radio/band (2.4 GHz / 5 GHz / 6 GHz): +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

- Ultra Tri-Band (UTB) enables ultimate flexibility in 5 GHz and 6 GHz channel selection without performance degradation

- 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-654: Two sets of four (female) RP-SMA connectors for external antennas (A0 through A3 corresponding with radio chains 0 through 3 for the 2.4 GHz and 5 GHz radios, and B0 through B3 corresponding with radio chains 0 through 3 for the 6 GHz radio). Worst-case internal loss between radio interface and external antenna connectors: 1.0dB in 2.4 GHz, 1.0dB in 5 GHz and 1.0dB in 6 GHz.

- AP-655: Integrated downtilt omni-directional antennas for 4x4 MIMO with peak antenna gain of 4.8dBi in 2.4 GHz, 5.3dBi in 5 GHz and 5.4dBi in 6 GHz. Built-in antennas are optimized for horizontal ceiling mounted orientation of the AP. The downtilt angle for maximum gain is roughly 30 to 40°.

– Combining the patterns of each of the antennas of the MIMO radios, the peak gain of the combined, average pattern is 3.3dBi in 2.4 GHz, 2.9dBi in 5 GHz and 4.0dBi in 6 GHz.

Other interfaces
- E0, E1: Two Ethernet wired network ports (RJ-45)

    – Auto-sensing link speed (100/1000/2500/5000BASE-T) and MDI/MDX

    – 2.5 Gbps and 5 Gbps speeds comply with NBase-T and 802.3bz specifications

    – POE-PD: 48Vdc (nominal) 802.3af/at/bt POE (class 3 or higher)

    – 802.3az Energy Efficient Ethernet (EEE)

    – Link aggregation (LACP) support between both network ports for redundancy and increased capacity

Table 2. Default PoE power modes (IPM disabled) — Single PoE source

Single PoE source	Class 6 (802.3bt)	Class 5 (802.3bt)	Class 4 (802.3at)	Class 3 (802.3af)
Power budget	51W	40W	25.5W	13.9W
Power mode	Unrestricted	Restricted	Restricted	
USB port	Enabled	Disabled	Disabled	
Ethernet	Both ports enabled	Second port disabled	Second port disabled	Not supported
MIMO	4x4	2x2	2x2	
Max RF power reduction	0dB	0dB	0dB	

Table 3. Default PoE power modes (IPM disabled) — Dual PoE source

Dual PoE source	Class 5 + class 3+	Class 4 + class 4	Class 4 + class 3	Class 3 + class 3
Power budget	53.9W+	51W	39.4W	27.8W
Power mode	Unrestricted	Unrestricted	Restricted	Restricted
USB port	Enabled	Enabled	Disabled	Disabled
Ethernet	Both ports enabled	Both ports enabled	Both ports enabled	Both ports enabled
MIMO	4x4	4x4	4x4	2x2
Max RF power reduction	0dB	0dB	3dB	0dB

- DC power interface: 12Vdc (nominal, +/- 5%), accepts 2.1 mm/5.5 mm center-positive circular plug with 9.5 mm length

- USB 2.0 host interface (Type A connector)

  – Capable of sourcing up to 1A / 5W to an attached device

- Bluetooth Low Energy (BLE5.0) and Zigbee (802.15.4) radio

  – BLE: up to 6 dBm transmit power and -101 dBm receive sensitivity (125 kbps)

  – Zigbee: up to 6 dBm transmit power and -99 dBm receive sensitivity (250 kbps)

  – Integrated omnidirectional antenna with roughly 30 to 40° downtilt and peak gain of 3.6dBi

- GNSS L1 (1575.42 MHz) receiver supporting GPS, Galileo, GLONASS, and BeiDou signal

  – Receive sensitivity: -162 dBm (tracking)

  – Integrated omnidirectional antenna with roughly 30 to 40° downtilt and peak gain of 3.1dBi

- Advanced IOT Coexistence (AIC) allows concurrent operation of multiple radios in the 2.4 GHz band

- Built-in Trusted Platform Module (TPM) for enhanced security and anti-counterfeiting

- Visual indictors (four multi-color LEDs): for System (1x) and Radio (3x) status

- Reset button: factory reset, LED mode control (normal/off)

- Serial console interface (proprietary, micro-B USB physical jack)

- Kensington security slot

- Automatic thermal shutdown and recovery function

Power sources and power consumption
- The AP supports direct DC power and Power over Ethernet (POE) on port E0 and/or E1

- When POE power is supplied to both Ethernet ports, the AP combines power from both sources (SmartPOE feature), using E0 as the primary source and E1 as secondary

- When both DC and POE power sources are available, DC power takes priority over POE

- Power sources are sold separately; see the 650 Series Ordering Guide for details

- The AP supports various power modes depending on the available power source(s) and configuration.

  – With IPM disabled, the AP may apply some static restrictions, see table above. No additional restrictions will be applied.

  – With IPM enabled, the AP will start up in unrestricted mode but may dynamically apply restrictions depending on the available power budget and actual consumption.

The feature restrictions and order in which these get applied are configurable.

  – When powered by direct DC power, the AP operates without restrictions.

  – Powering the AP from a single 802.3af (class 3 or lower) POE source is not supported, regardless of IPM status.

- Maximum (worst-case) power consumption (without /with a USB device attached):

  – DC powered: 36.0W/42.5W.

  – POE powered: 40.3W/46.5W.

  – This assumes that up to 5W is supplied to the attached USB device.

- Maximum (worst-case) power consumption in idle mode: 14.3W/20.2W (DC) or 16.9W/22.7W (POE).

- Maximum (worst-case) power consumption in deep-sleep mode: 2.4W (DC) or 4.0W (POE).

Using IPM to avoid platform restrictions
Operating the 650 Series AP from a single 802.3at source requires some restrictions, but the IPM feature allows doing that in a flexible way.

The following configurations (with IPM enabled) are some examples of how the AP can remain within the 802.3at budget without any additional restrictions:

- No power drawn from USB, transmit power on all radios limited to 18 dBm or less

- No power drawn from USB, single Ethernet, transmit power on all radios limited to 21 dBm or less

- No power drawn from USB, single Ethernet, any one radio disabled

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 mount kits (sold separately); see the 650 Series Ordering Guide for details.

Mechanical specifications

• Dimensions/weight (AP-655; unit without mount bracket):

  – 260 mm (W) x 260 mm (D) x 60 mm (H)

  – 1,800g

• Dimensions/weight (AP-655; shipping):

  – 285 mm (W) x 285 mm (D) x 95 mm (H)

  – 2,300g

Environmental specifications

• Operating conditions

  – Temperature: 0C to +50C / +32F to +122F

  – Relative humidity: 5% to 95%

  – ETS 300 019 class 3.2 environments

  – AP is plenum rated for use in air-handling spaces

• Storage conditions

  – Temperature: -25C to +55C / -13F to +131F

  – Relative humidity: 10% to 100%

  – ETS 300 019 class 1.2 environments

• Transportation conditions

  – Temperature: -40C to +70C / -40F to +158F

  – Relative humidity: up to 95%

  – ETS 300 019 class 2.3 environments

Reliability

Mean Time Between Failure (MTBF): 544khrs (62 years) 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

For more country-specific regulatory information and approvals, please see your HPE Aruba Networking representative.

Regulatory model numbers

• AP-654 (all models): APIN0654

• AP-655 (all models): APIN0655

Regulatory considerations for AP-654

The AP-654 will only be offered in countries where there's an existing or clear and defined path to allow operation of 6 GHz radios with external connectorized antennas, either as a Low-Power Indoor (LPI) or Standard Power (SP) product. Please contact your HPE Aruba Networking representative to confirm (existing or planned) availability for the country where the AP will be deployed.

Standard Power product class operation of the AP-634 (i.e. most countries where the platform is supported) is only supported on ArubaOS 10.7.0.0 and later deployments and ArubaOS 8.12.0.0 and later deployments that include a Mobility Conductor. Standard Power operation is not supported on Instant OS deployments or 8.x ArubaOS deployments without a Mobility Conductor.

Certifications

• UL2043 plenum rating

• Wi-Fi Alliance (WFA):

  – Wi-Fi CERTIFIED a, b, g, n, ac

  – Wi-Fi CERTIFIED 6E (ax, 6 GHz)

  – WPA, WPA2 and WPA3 – Enterprise with CNSA option, Personal (SAE), Enhanced Open (OWE)

  – WMM, WMM-PS, W-Fi Agile Multiband

  – Passpoint (release 2)

• Bluetooth SIG

• Ethernet Alliance (POE, PD device, class 6)

Warranty

HPE Aruba Networking hardware limited
lifetime warranty.

Minimum operating system software versions

• AP-654 (excluding 6 GHz support):

  – ArubaOS and HPE Aruba Networking InstantOS 8.11.2.0, ArubaOS 10.6.0.0

• AP-654 (including 6 GHz support):

  – ArubaOS and HPE Aruba Networking InstantOS 8.12.0.0, ArubaOS 10.7.0.0[1]

• AP-655:

  – ArubaOS and HPE Aruba Networking InstantOS 8.10.0.1, ArubaOS 10.4.0.0

[1] Standard Power product class operation of the AP-654 (i.e. most countries where the platform is supported) is only supported on ArubaOS 10.7.0.0 and later deployments and ArubaOS 8.12.0.0 and later deployments that include a Mobility Conductor. Standard Power operation is not supported on Instant OS deployments or 8.x ArubaOS deployments without a Mobility Conductor.
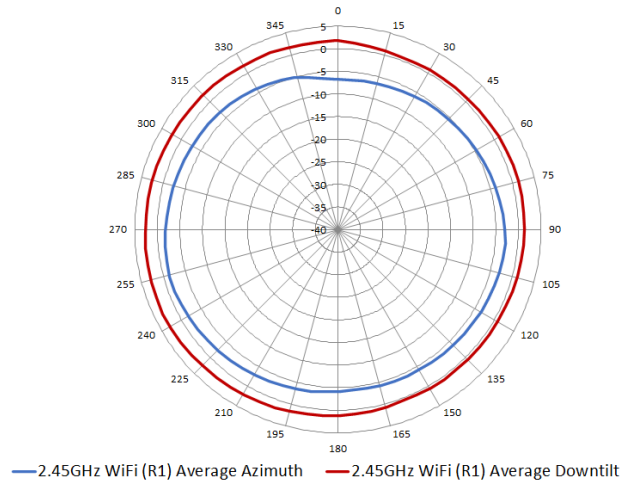
RF performance table

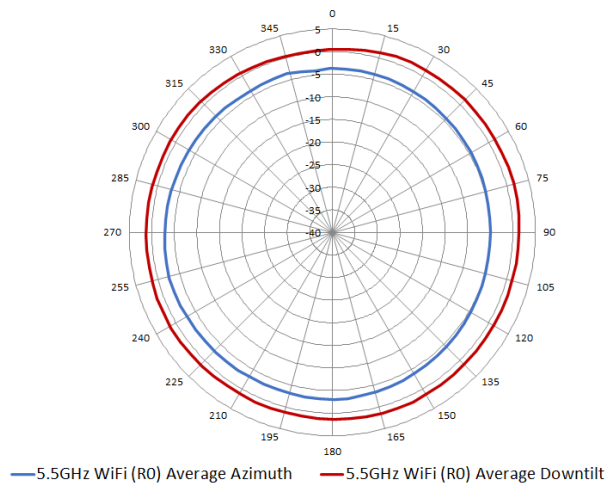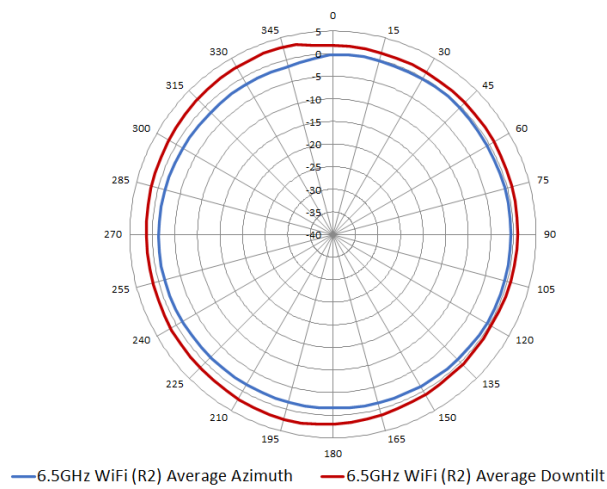| Band, rate	Maximum transmit power (dBm) per transmit chain	Receiver sensitivity (dBm) per receive chain
2.4 GHz, 802.11b		
1 Mbps	18.0	-98.0
11 Mbps	18.0	-89.0
2.4 GHz, 802.11g		
6 Mbps	18.0	-92.0
54 Mbps	18.0	-76.0
2.4 GHz, 802.11n HT20		
MCS0	18.0	-93.0
MCS7	17.0	-74.0
2.4 GHz, 802.11ax HE20		
MCS0	18.0	-93.0
MCS7	16.0	-74.0
MCS9	15.0	-70.0
MCS11	13.0	-64.0
5 GHz, 802.11a		
6 Mbps	18.0	-91.0
54 Mbps	18.0	-73.0
5 GHz, 802.11n HT20 / HT40		
MCS0	18.0 / 18.0	-91.0 / -88.0
MCS7	16.0 / 16.0	-70.0 / -67.0
5 GHz, 802.11ac VHT20 / VHT40 / VHT80/VHT (80+80)		
MCS0	18.0 / 18.0 / 18.0	-91.0 / -88.0 / -85.0 / -82.0
MCS7	16.0 / 16.0 / 16.0 / 16.0	-71.0 / -68.0 / -65.0 / -62.0
5 GHz, 802.11ax HE20 / HE40 / HE80/HE (80+80)		
MCS0	18.0 / 18.0 / 18.0 / 18.0	-91.0 / -88.0 / -85.0 / -82.0
MCS7	16.0 / 16.0 / 16.0 / 16.0	-71.0 / -68.0 / -65.0 / -62.0
MCS9	15.0 / 15.0 / 15.0 / 15.0	-66.0 / -63.0 / -60.0 / -57.0
MCS11	13.0 / 13.0 / 13.0 / 13.0	-62.0 / -59.0 / -56.0 / -53.0
6 GHz, 802.11ax HE20 / HE40 / HE80 / HE160		
MCS0	18.0 / 18.0 / 18.0 / 18.0	-90.0 / -87.0 / -84.0 / -81.0
MCS7	16.0 / 16.0 / 16.0 / 16.0	-74.0 / -71.0 / -68.0 / -65.0
MCS9	15.0 / 15.0 / 15.0 / 15.0	-68.0 / -65.0 / -62.0 / -59.0
MCS11	13.0 / 13.0 / 13.0 / 13.0	-63.0 / -60.0 / -57.0 / -54.0

Antenna patterns AP-655

Horizontal planes (top view)
Showing azimuth (0°) and 30° downtilt patterns (averaged patterns for all applicable antennas)

—2.45GHz WiFi (R1) Average Azimuth   —2.45GHz WiFi (R1) Average Downtilt

2.45 GHz Wi-Fi antenna patterns (horizontal)

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

5.5 GHz Wi-Fi antenna patterns (horizontal)

—6.5GHz WiFi (R2) Average Azimuth   —6.5GHz WiFi (R2) Average Downtilt

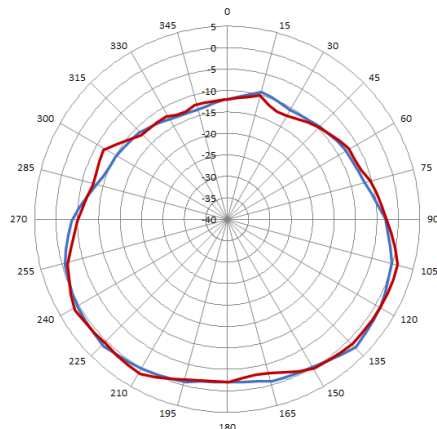**6.5 GHz Wi-Fi antenna patterns (horizontal)**

Antenna patterns AP-655

Vertical (elevation) planes (side view, AP facing down)
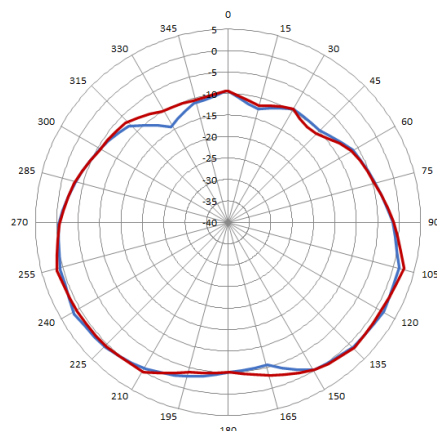Showing side view with AP rotated 0 and 90° (averaged patterns for all applicable antennas)

2.45 GHz Wi-Fi antennas patterns (vertical)

5.5 GHz Wi-Fi antenna patterns (vertical)

6.5 GHz Wi-Fi antennas patterns (vertical)

Ordering information

Part number	Description
Internal antenna access points	
R7J35A	HPE Aruba Networking AP-655 (EG) Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J36A	HPE Aruba Networking AP-655 (IL) Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J37A	HPE Aruba Networking AP-655 (JP) Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J38A	HPE Aruba Networking AP-655 (RW) Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J39A	HPE Aruba Networking AP-655 (US) Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
External antenna access points	
S1G53A	HPE Aruba Networking AP-654-RW Tri-radio 4x4:4 Wi-Fi 6E External Antennas Campus AP
S1G54A	HPE Aruba Networking AP-654-US Tri-radio 4x4:4 Wi-Fi 6E External Antennas Campus AP
Internal antenna access points — TAA models	
R7J40A	HPE Aruba Networking AP-655 (EG) TAA Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J41A	HPE Aruba Networking AP-655 (IL) TAA Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J42A	HPE Aruba Networking AP-655 (JP) TAA Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J43A	HPE Aruba Networking AP-655 (RW) TAA Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
R7J44A	HPE Aruba Networking AP-655 (US) TAA Tri-radio 4x4:4 802.11ax Wi-Fi 6E Internal Antennas Campus AP
External antenna access points — TAA models	
S1G55A	HPE Aruba Networking AP-654-RWF1 TAA Tri-radio 4x4:4 Wi-Fi 6E External Antennas Campus AP
S1G56A	HPE Aruba Networking AP-654-USF1 TAA Tri-radio 4x4:4 Wi-Fi 6E External Antennas Campus AP
For compatible accessories, see the 650 Series Ordering Guide.	

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