# Cisco Catalyst 9115 Series Wi-Fi 6 Access Points

# Contents

## The Cisco® Catalyst® 9115 Series Wi-Fi 6 Access Points are the next generation of enterprise access points. They are resilient, secure, and intelligent.

Hyperconnectivity with steady performance in demanding environments. Exponential growth of Internet of Things (IoT) devices and next-generation applications. Advanced persistent security threats. All of these require a wireless network that provides resiliency and superior connectivity, integrated security with advanced classification and containment, and hardware and software innovations to automate, secure, and simplify networks. Updating your wireless infrastructure to one that will meet these needs is paramount for today's digital business. The new generation of Cisco Catalyst 9100 Access Points, with high-performance Wi-Fi 6 (802.11ax) capabilities and innovations in RF performance, security, and analytics, enables end-to-end digitization and helps accelerate the rollout of business services by delivering beyond Wi-Fi.

The Cisco Catalyst 9115 Series Access Points are enterprise-class products that will address your current and future needs. They are the first step to updating your network to take better example of all of the features and benefits that Wi-Fi 6 provides.

Key features:

- Wi-Fi 6 certifiable

- Three radios: 2.4 GHz (4x4), 5 GHz (4x4), and BLE

- OFDMA and MU-MIMO

- Multigigabit support

- Internal or external antenna

- Available with optional embedded wireless controller

The Cisco Catalyst 9115 Series Access Points support both Orthogonal Frequency-Division Multiple Access (OFDMA) and Multiuser Multiple Input, Multiple Output (MU-MIMO), delivering more predictable performance for advanced applications and IoT. Additionally, with up to 2.5 Gbps with NBASE-T and IEEE 802.3bz Ethernet compatibility, the Cisco Catalyst 9115 Series can seamlessly offload network traffic without any bottlenecks. With Cisco's Multigigabit technology, you can use your existing Category 5e or 6 cabling to achieve speeds up to 5 Gbps, allowing for higher throughputs with minimum cost. And with two different antenna choices, you're able to decide which option works best for you.

**Table 1.** Features and benefits

| Feature | Benefits |
|---|---|
| **802.11ax (Wi-Fi 6)** | The IEEE 802.11ax emerging standard, also known as High-Efficiency-Wireless (HEW) or Wi-Fi 6, builds on 802.11ac. It will deliver a better experience in typical environments and more predictable performance for advanced applications such as 4K or 8K video, high-density, high-definition collaboration apps, all-wireless offices, and IoT. 802.11ax is designed to use both the 2.4-Ghz and 5-GHz bands, unlike the 802.11ac standard. |
| **Uplink/downlink OFDMA** | OFDMA-based scheduling splits the bandwidth into smaller chunks called Resource Units (RUs), which can be allocated to individual clients in both the downlink and uplink directions to reduce overhead and latency. |
| **MU-MIMO technology** | Supporting four spatial streams, MU-MIMO enables access points to split spatial streams between client devices, to maximize throughput. |
| **BSS coloring** | Spatial reuse (also known as Basic Service Set [BSS] coloring) allows the Access Points (APs) and their clients to differentiate between BSSs, thus permitting more simultaneous transmissions. |
| **Target wake time** | A new power savings mode called Target Wake Time (TWT) allows the client to stay asleep and to wake up only at prescheduled (target) times to exchange data with the AP. This offers significant energy savings for battery-operated devices, up to 3x to 4x compared to 802.11n and 802.11ac. |
| **Cisco Embedded Wireless Controller** | The Catalyst 9115 Wi-Fi 6 access points is available with a built-in controller. The Cisco Embedded Wireless Controller on Catalyst 9100 Access Points provides an easy-to-deploy and manage option that does not require a physical appliance. The control resides on the access point so there is no added footprint or complexity. And, because it used Catalyst 9800 code, it's easy to migrate your network as your needs grow. |
| **Multigigabit Ethernet support** | Provides uplink speeds of 2.5 Gbps, in addition to 100 Mbps and 1 Gbps. All speeds are supported on Category 5e cabling for an industry first, as well as 10GBASE-T (IEEE 802.3bz) cabling. |
| **Bluetooth 5.0** | Integrated Bluetooth Low Energy (BLE) 5.0 radio to enable IoT use cases such as location tracking and wayfinding. |
| **Apple Features** | Apple and Cisco have partnered to create an optimal mobile experience for iOS devices on corporate networks based on Cisco technologies. Using new features in iOS 10, in combination with the latest software and hardware from Cisco, businesses can now more effectively use their network infrastructure to deliver an enhanced user experience across all business applications.<br><br>At the center of the collaboration is a unique handshake between the Cisco WLAN and Apple devices. This handshake enables the Cisco WLAN to provide an optimal Wi-Fi roaming experience to Apple devices. Additionally, the Cisco WLAN trusts Apple devices and gives priority treatment for business-critical applications specified by the Apple device. This feature is also known as Fast Lane. |

**Note:** Features available in a future releases – Uplink/downlink OFDMA, Cisco Intelligent Capture

## Resilient - Steady performance in demanding environments

Networks infrastructure that upgrade to Wi-Fi 6, also known as 802.11ax, enabled devices will get upto 4x capacity boost needed to support the additional devices connected to the network as well as the data that they generate. 802.11ax will offer multi-gigabit performance which will feature a seamless connectivity with higher throughput compared to the 802.11ac standard. This means you'll see your network performance run smoother. With support for BSS coloring, the new standard eases high device dense deployments by allowing simultaneous transmissions, ultimately increasing network capacity, customer interactions, and value-add services.

Wi-Fi 6, with better coordination of transit time to and from devices, will also bring about a reduction in latency and a greater reliability allowing for hundreds of devices per access point. This allows for IoT devices to be reliably deployed at scale. And an overall improved user experience will be seen as well, as 802.11ax will improve device battery life of devices such as smartphones, tablets and IoT when compared to prior standards. For more details about 802.11ax please check Cisco's Technical Whitepaper on 802.11ax.

## Secure infrastructure

**Trustworthy systems built with Cisco Trust Anchor Technologies** provide a highly secure foundation for Cisco products. With The Catalyst 9100 Series, these technologies enable hardware and software authenticity assurance for supply chain trust and strong mitigation against man-in-the-middle attacks that compromise software and firmware. Trust Anchor capabilities include:

- **Image signing:** Cryptographically signed images provide assurance that the firmware, BIOS, and other software are authentic and unmodified. As the system boots, the system's software signatures are checked for integrity.

- **Secure Boot:** Cisco Secure Boot technology anchors the boot sequence chain of trust to immutable hardware, mitigating threats against a system's foundational state and the software that is to be loaded, regardless of a user's privilege level. It provides layered protection against the persistence of illicitly modified firmware.

- **Cisco Trust Anchor module:** A tamper-resistant, strong cryptographic, single-chip solution provides hardware authenticity assurance to uniquely identify the product so that its origin can be confirmed to Cisco. This provides assurance that the product is genuine.

## Intelligence for proactive insights and analytics

With multi-RF support paramount for IoT devices and expanded ecosystem partnerships, the Catalyst 9100 portfolio provides unprecedented visibility from mobile devices on Cisco network. Enabling digitization with Cisco DNA Architecture, Catalyst 9100 portfolio further Cisco RF innovations for securing air with real-time telemetry, guided remediation, and optimization for Wi-Fi and IOT networks. The Cisco Catalyst 9100 series access points can support advanced spectrum intelligence, device analytics and network assurance. With capabilities such as Intelligent Capture these devices probe the network and provide Cisco DNA Center with deep analysis. The software can track over numerous anomalies and instantaneously review all packets on demand, emulating the onsite network administrator. Overall, Cisco Intelligent Capture allows for more informed decisions on your wireless networks.

## Aesthetically redesigned for next generation enterprise

The Catalyst 9100 series access points are built from the ground-up, with new aerodynamic look and smooth finish, integrating RF excellence and next generation technologies to provide the best-in-class wireless experience without compromise. While packing several high performance features, the hardware is re-designed to deliver higher efficiencies in a more compact form-factor to make visually appealing Wi-Fi deployments commonplace.

## Cisco DNA Support

Pairing the Cisco Catalyst 9115 Series Access Points with the Cisco Digital Network Architecture (Cisco DNA) allows for a total network transformation. Cisco DNA allows you to truly understand your network with real-time analytics, quickly detect and contain security threats, and easily provide networkwide consistency through automation and virtualization.

Cisco DNA with Software-Defined Access (SD-Access) is the network fabric that powers business. It is an open and extensible, software-driven architecture that accelerates and simplifies your enterprise network operations. The programmable architecture frees your IT staff from time-consuming, repetitive network configuration tasks so they can focus instead on innovation that positively transforms your business. By decoupling network functions from the hardware, you can build and manage your entire wired and wireless network from a single user interface. SD-Access enables policy-based automation from edge to cloud with foundational capabilities. These include:

- Simplified device deployment
- Unified management of wired and wireless networks
- Network virtualization and segmentation
- Group-based policies
- Context-based analytics

The Cisco Catalyst 9115 Series Access Points support Software-Defined Access, Cisco's leading enterprise architecture.

- Working together, the Cisco Catalyst 9115 Series and Cisco DNA offer such features as:
- Cisco DNA Spaces
- Cisco Identity Services Engine
- Cisco DNA Analytics and Assurance
- And much more

The result? Your network stays relevant, becomes digital ready, and is the lifeblood of your organization.

# Product specifications

| Item | Specification |
|---|---|
| Part numbers | **Cisco Catalyst 9115AXI Access Point: Indoor environments, with internal antennas**<br>• C9115AXI-x: Cisco Catalyst 9115 Series<br><br>**Cisco Catalyst 9115AXE Access Point: Indoor, challenging environments, with external antennas**<br>• C9115AXE-x: Cisco Catalyst 9115 Series<br><br>**Cisco Catalyst 9115AXI Access Point: Indoor environments, with internal antennas, with embedded wireless controller**<br>• C9115AXI-EWC-x: Cisco Catalyst 9115 Series<br><br>**Cisco Catalyst 9115AXE Access Point: Indoor, challenging environments, with external antennas, with embedded wireless controller**<br>• C9115AXE-EWC-x: Cisco Catalyst 9115 Series<br><br>**Regulatory domains: (x = regulatory domain)**<br>Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, visit https://www.cisco.com/go/aironet/compliance.<br><br>Not all regulatory domains have been approved. As they are approved, the part numbers will be available on the Global Price List.<br>**Cisco Wireless LAN Services**<br>• AS-WLAN-CNSLT: Cisco Wireless LAN Network Planning and Design Service<br>• AS-WLAN-CNSLT: Cisco Wireless LAN 802.11n Migration Service<br>• AS-WLAN-CNSLT: Cisco Wireless LAN Performance and Security Assessment Service |
| Software | • Cisco Unified Wireless Network Software Release 8.9 or later<br>• Cisco IOS® XE Software Release 16.11 or later |
| Supported wireless LAN controllers | • Cisco Catalyst 9800 Series Wireless Controllers<br>• Cisco 3500, 5520, and 8540 Series Wireless Controllers and Cisco Virtual Wireless Controller |
| 802.11n version 2.0 (and related) capabilities | • 4x4 MIMO with four spatial streams<br>• Maximal Ratio Combining (MRC)<br>• 802.11n and 802.11a/g beamforming<br>• 20- and 40-MHz channels<br>• PHY data rates up to 890 Mbps (40 MHz with 5 GHz and 20 MHz with 2.4 GHz)<br>• Packet aggregation: A-MPDU (transmit and receive), A-MSDU (transmit and receive)<br>• 802.11 Dynamic Frequency Selection (DFS)<br>• Cyclic Shift Diversity (CSD) support |
| 802.11ac | • 4x4 downlink MU-MIMO with four spatial streams<br>• MRC<br>• 802.11ac beamforming<br>• 20-, 40-, 80-, and 160-MHz channels<br>• PHY data rates up to 3.47 Gbps (160 MHz with 5 GHz)<br>• Packet aggregation: A-MPDU (transmit and receive), A-MSDU (transmit and receive)<br>• 802.11 DFS<br>• CSD support |

| Item | Specification |
|------|---------------|
| **802.11ax** | • 4x4 downlink MU-MIMO with four spatial streams<br>• Uplink/downlink OFDMA<br>• TWT<br>• BSS coloring<br>• MRC<br>• 802.11ax beamforming<br>• 20-, 40-, 80-, and 160-MHz channels<br>• PHY data rates up to 5.38 Gbps (160 MHz with 5 GHz and 20 MHz with 2.4 GHz)<br>• Packet aggregation: A-MPDU (transmit and receive), A-MSDU (transmit and receive)<br>• 802.11 DFS<br>• CSD support |
| **Integrated antenna** | • 2.4 GHz, peak gain 3 dBi, internal antenna, omnidirectional in azimuth<br>• 5 GHz, peak gain 4 dBi, internal antenna, omnidirectional in azimuth |
| **External antenna (sold separately)** | • Cisco Catalyst 9115AXE Access Points are certified for use with antenna gains up to 6 dBi (2.4 GHz and 5 GHz)<br>• Cisco offers the industry's broadest selection of antennas, delivering optimal coverage for a variety of deployment scenarios |
| **Interfaces** | • 1x 100, 1000, 2500 Multigigabit Ethernet (RJ-45) – IEEE 802.3bz<br>• Management console port (RJ-45)<br>• USB 2.0 (enabled via future software) |
| **Indicators** | • Status LED indicates boot loader status, association status, operating status, boot loader warnings, and boot loader errors |
| **Dimensions (W x L x H)** | • Access point (without mounting brackets): C9115I: 8.0 x 8.0 x 1.5 in. (20.3 x 20.3 x 3.8 cm), C9115E: 8.0 x 8.0 x 1.7 in. (20.3 x 20.3 x 4.3 cm) |
| **Weight** | **Cisco Catalyst 9115AXI**<br>• 1.98 lb (0.9 kg)<br>**Cisco Catalyst 9115AXE**<br>• 2.43 lb (1.1 kg) |
| **Input power requirements** | • 802.3at Power over Ethernet Plus (PoE+), 802.3bt Cisco Universal PoE (Cisco UPOE+, Cisco UPOE®)<br>• Cisco power injector, AIR-PWRINJ6=<br>• 802.3af PoE<br>• Cisco power injector, AIR-PWRINJ5= (Note: This injector supports only 802.3af)<br>Note: When 802.3af PoE is the source of power, both 2.4-GHz and 5-GHz radios will be reduced to 2x2 and Ethernet downgraded to 1 Gigabit Ethernet. In addition, the USB port will be off. |

| Item | Specification |
|---|---|

**Power draw**

802.3at full feature – Catalyst 9115AXI

| Power source | Power type | 2.4-GHz radio | 5-GHz radio | Link speed | USB | LLDP |
|---|---|---|---|---|---|---|
| 802.3at | PoE | 4x4 | 4x4 | 2.5G | Y | 20.4W |

802.3at full feature – Catalyst 9115AXE

| Power source | Power type | 2.4-GHz radio | 5-GHz radio | Link speed | USB | LLDP |
|---|---|---|---|---|---|---|
| 802.3at | PoE | 4x4 | 4x4 | 2.5G | Y | 21.4W |

802.3af reduced feature

| Power source | Power type | 2.4-GHz radio | 5-GHz radio | Link speed | USB | LLDP |
|---|---|---|---|---|---|---|
| 802.3af | PoE | 2x2 | 2x2 | 1G | N | 13W |

**Environmental**

**Cisco Catalyst 9115AXI**

- Nonoperating (storage) temperature: –22° to 158°F (–30° to 70°C)
- Nonoperating (storage) altitude test: 25°C, 15,000 ft.
- Operating temperature: 32° to 122°F (0° to 50°C)
- Operating humidity: 10% to 90% (noncondensing)
- Operating altitude test: 40°C, 9843 ft.

Note: When the ambient operating temperature exceeds 40°C, the access point will shift from 4x4 to 2x2 on both the 2.4-GHz and 5-GHz radios, uplink Ethernet will downgrade to 1 Gigabit Ethernet, and the USB interface will be disabled.

**Cisco Catalyst 9115AXE**

- Nonoperating (storage) temperature: –22° to 158°F (–30° to 70°C)
- Nonoperating (storage) altitude test: 25°C, 15,000 ft.
- Operating temperature: –4° to 122°F (–20° to 50°C)
- Operating humidity: 10% to 90% (noncondensing)
- Operating altitude test: 40°C, 9843 ft.

**System memory**

- 2048 MB DRAM
- 1024 MB flash

**Warranty**

Limited lifetime hardware warranty

**Available transmit power settings**

| 2.4 GHz | 5 GHz |
|---|---|
| • 23 dBm (200 mW)<br>• 20 dBm (100 mW)<br>• 17 dBm (50 mW)<br>• 14 dBm (25 mW)<br>• 11 dBm (12.5 mW)<br>• 8 dBm (6.25 mW)<br>• 5 dBm (3.13 mW)<br>• 2 dBm (1.56 mW)<br>• –1dBm (0.79mW)<br>• –4dBm (0.39mW) | • 23 dBm (200 mW)<br>• 20 dBm (100 mW)<br>• 17 dBm (50 mW)<br>• 14 dBm (25 mW)<br>• 11 dBm (12.5 mW)<br>• 8 dBm (6.25 mW)<br>• 5 dBm (3.13 mW)<br>• 2 dBm (1.56 mW)<br>• –1dBm (0.79mW)<br>• –4dBm (0.39mW) |

| Item | Specification | |
|---|---|---|
| **Frequency band and 20-MHz operating channels** | **A (A regulatory domain):**<br>• 2.412 to 2.462 GHz; 11 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz)<br>• 5.745 to 5.825 GHz; 5 channels<br><br>**B (B regulatory domain):**<br>• 2.412 to 2.462 GHz; 11 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 11 channels<br>• 5.745 to 5.865 GHz; 7 channels<br><br>**C (C regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.745 to 5.825 GHz; 5 channels<br><br>**D (D regulatory domain):**<br>• 2.412 to 2.462 GHz; 11 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.745 to 5.825 GHz; 5 channels<br><br>**E (E regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz)<br><br>**F (F regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.250 to 5.350 GHz; 4 channels<br>• 5.725 to 5.825 GHz; 4 channels<br><br>**G (G regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.745 to 5.865 GHz; 7 channels<br><br>**H (H regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.745 to 5.825 GHz; 5 channels | **I (I regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br><br>**K (K regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.620 GHz; 7 channels<br>• 5.745 to 5.805 GHz; 4 channels<br><br>**N (N regulatory domain):**<br>• 2.412 to 2.462 GHz; 11 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.745 to 5.825 GHz; 5 channels<br><br>**Q (Q regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 11 channels<br><br>**R (R regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.660 to 5,825 GHz; 8 channels (excludes 5.700 to 5.745 GHz)<br><br>**S (S regulatory domain):**<br>• 2.412 to 2.472 GHz; 13 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 11 channels<br>• 5.745 to 5.825 GHz; 5 channels<br><br>**T (T regulatory domain):**<br>• 2.412 to 2.462 GHz; 11 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 12 channels<br>• 5.745 to 5.825 GHz; 5 channels<br><br>**Z (Z regulatory domain):**<br>• 2.412 to 2.462 GHz; 11 channels<br>• 5.180 to 5.320 GHz; 8 channels<br>• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz)<br>• 5.745 to 5.825 GHz; 5 channels |
| Note: Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, visit https://www.cisco.com/go/aironet/compliance | | |
| **Maximum number of nonoverlapping channels** | **2.4 GHz**<br>• 802.11b/g:<br>  ◦ 20 MHz: 3<br>• 802.11n:<br>  ◦ 20 MHz: 3 | **5 GHz**<br>• 802.11a:<br>  ◦ 20 MHz: 26 FCC, 16 EU<br>• 802.11n:<br>  ◦ 20 MHz: 26 FCC, 16 EU |

| Item | Specification | |
|------|---------------|---|
| | • 802.11ax:<br>　◦ 20MHz:3 | 　◦ 40 MHz: 12 FCC, 7 EU<br>• 802.11ac/ax:<br>　◦ 20 MHz: 26 FCC, 16 EU<br>　◦ 40 MHz: 12 FCC, 7 EU<br>　◦ 80 MHz: 5 FCC, 3 EU<br>　◦ 160 MHz 2 FCC, 1 EU |
| Note: **This varies by regulatory domain. Refer to the product documentation for specific details for each regulatory domain.** | | |
| **Compliance standards** | • **Safety:**<br>　◦ IEC 60950-1<br>　◦ EN 60950-1<br>　◦ UL 60950-1<br>　◦ CAN/CSA-C22.2 No. 60950-1<br>　◦ AS/NZS 60950-1<br>　◦ UL 2043<br>　◦ Class III equipment<br>• **Emissions:**<br>　◦ CISPR 32 (rev. 2015)<br>　◦ EN 55032 (rev. 2012/AC:2013)<br>　◦ EN 55032 (rev. 2015)<br>　◦ EN61000-3-2 (rev. 2014)<br>　◦ EN61000-3-3 (rev. 2013)<br>　◦ KN61000-3-2<br>　◦ KN61000-3-3<br>　◦ AS/NZS CISPR 32 Class B (rev. 2015)<br>　◦ 47 CFR FCC Part 15B<br>　◦ ICES-003 (rev. 2016 Issue 6, Class B)<br>　◦ VCCI (V3)<br>　◦ CNS (rev. 13438)<br>　◦ KN-32<br>　◦ TCVN 7189 (rev. 2009)<br>• **Immunity:**<br>　◦ CISPR 24 (rev. 2010)<br>　◦ EN 55024/EN 55035 (rev. 2010)<br>• **Emissions and immunity:**<br>　◦ EN 301 489-1 (v2.1.1 2017-02)<br>　◦ EN 301 489-17 (v3.1.1 2017-02)<br>　◦ QCVN (18:2014)<br>　◦ KN 489-1<br>　◦ KN 489-17<br>　◦ EN 60601 (1-1:2015)<br>• **Radio:**<br>　◦ EN 300 328 (v2.1.1)<br>　◦ EN 301 893 (v2.1.1)<br>　◦ AS/NZS 4268 (rev. 2017) | |

| Item | Specification |
|---|---|
| | ◦ 47 CFR FCC Part 15C, 15.247, 15.407 |
| | ◦ RSP-100 |
| | ◦ RSS-GEN |
| | ◦ RSS-247 |
| | ◦ China regulations SRRC |
| | ◦ LP0002 (rev 2018.1.10) |
| | ◦ Japan Std. 33a, Std. 66, and Std. 71 |
| | • **RF safety:** |
| | ◦ EN 50385 (rev. Aug 2002) |
| | ◦ ARPANSA |
| | ◦ AS/NZS 2772 (rev. 2016) |
| | ◦ EN 62209-1 (rev. 2016) |
| | ◦ EN 62209-2 (rev. 2010) |
| | ◦ 47 CFR Part 1.1310 and 2.1091 |
| | ◦ RSS-102 |
| | • **IEEE standards:** |
| | ◦ IEEE 802.3 |
| | ◦ IEEE 802.3ab |
| | ◦ IEEE 802.3af/at |
| | ◦ IEEE 802.11 a/b/g/n/ac/ax |
| | ◦ IEEE 802.11h, 802.11d |
| | • **Security:** |
| | ◦ 802.11i, Wi-Fi Protected Access 3 (WPA3), WPA2, WPA |
| | ◦ 802.1X |
| | ◦ Advanced Encryption Standard (AES) |
| | • **Extensible Authentication Protocol (EAP) types:** |
| | ◦ EAP-Transport Layer Security (TLS) |
| | ◦ EAP-Tunneled TLS (TTLS) or Microsoft Challenge Handshake Authentication Protocol Version 2 (MSCHAPv2) |
| | ◦ Protected EAP (PEAP) v0 or EAP-MSCHAPv2 |
| | ◦ EAP-Flexible Authentication via Secure Tunneling (EAP-FAST) |
| | ◦ PEAP v1 or EAP-Generic Token Card (GTC) |
| | ◦ EAP-Subscriber Identity Module (SIM) |

| Item | Specification | | | | |
|---|---|---|---|---|---|
| **Data rates supported** | 802.11b: 1, 2, 5.5, and 11 Mbps | | | | |
| | 802.11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps | | | | |
| | 802.11n data rates on 2.4 GHz (only 20 MHz and MCS 0 to MCS 31): and 5 GHz | | | | |
| | **MCS Index[1]** | **GI[2] = 800 ns** | **GI = 800 ns** | **GI = 400 ns** | **GI = 400 ns** |
| | | **20-MHz rate (Mbps)** | **40-MHz rate (Mbps)** | **20-MHz rate (Mbps)** | **40-MHz rate (Mbps)** |
| | 0 | 6.5 | 13.5 | 7.2 | 15 |
| | 1 | 13 | 27 | 14.4 | 30 |
| | 2 | 19.5 | 40.5 | 21.7 | 45 |
| | 3 | 26 | 54 | 28.9 | 60 |
| | 4 | 39 | 81 | 43.3 | 90 |
| | 5 | 52 | 108 | 57.8 | 120 |
| | 6 | 58.5 | 121.5 | 65 | 135 |
| | 7 | 65 | 135 | 72.2 | 150 |
| | 8 | 13 | 27 | 14.4 | 30 |
| | 9 | 26 | 54 | 28.9 | 60 |
| | 10 | 39 | 81 | 43.3 | 90 |
| | 11 | 52 | 108 | 57.8 | 120 |
| | 12 | 78 | 162 | 86.7 | 180 |
| | 13 | 104 | 216 | 115.6 | 240 |
| | 14 | 117 | 243 | 130 | 270 |
| | 15 | 130 | 270 | 144.4 | 300 |
| | 16 | 19.5 | 40.5 | 21.7 | 45 |
| | 17 | 39 | 81 | 43.4 | 90 |

[1] MCS Index: The Modulation and Coding Scheme (MCS) index determines the number of spatial streams, the modulation, the coding rate, and data rate values.

[2] GI: A guard interval (GI) between symbols helps receivers overcome the effects of multipath delay spreads.

| Item | Specification | | | | |
|---|---|---|---|---|---|
| | 18 | 58.5 | 121.5 | 65 | 135 |
| | 19 | 78 | 162 | 86.7 | 180 |
| | 20 | 117 | 243 | 130 | 270 |
| | 21 | 156 | 324 | 173.3 | 360 |
| | 22 | 175.5 | 364.5 | 195 | 405 |
| | 23 | 195 | 405 | 216.7 | 450 |
| | 24 | 26 | 54 | 28.9 | 60 |
| | 25 | 52 | 108 | 57.8 | 120 |
| | 26 | 78 | 162 | 86.7 | 180 |
| | 27 | 104 | 216 | 115.6 | 240 |
| | 28 | 156 | 324 | 173.3 | 360 |
| | 29 | 208 | 432 | 231.1 | 480 |
| | 30 | 234 | 486 | 260 | 540 |
| | 31 | 260 | 540 | 288.9 | 600 |

**802.11ac data rates (5 GHz):**

| MCS Index | Spatial streams | GI = 800 ns | | | | GI = 400 ns | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) |
| 0 | 1 | 6.5 | 13.5 | 29.3 | 58.5 | 7.2 | 15 | 32.5 | 65 |
| 1 | 1 | 13 | 27 | 58.5 | 117 | 14.4 | 30 | 65 | 130 |
| 2 | 1 | 19.5 | 40.5 | 87.8 | 175.5 | 21.7 | 45 | 97.5 | 195 |
| 3 | 1 | 26 | 54 | 117 | 234 | 28.9 | 60 | 130 | 260 |
| 4 | 1 | 39 | 81 | 175.5 | 351 | 43.3 | 90 | 195 | 390 |
| 5 | 1 | 52 | 108 | 234 | 468 | 57.8 | 120 | 260 | 520 |
| 6 | 1 | 58.5 | 121.5 | 263.3 | 526.5 | 65 | 135 | 292.5 | 585 |
| 7 | 1 | 65 | 135 | 292.5 | 585 | 72.2 | 150 | 325 | 650 |
| 8 | 1 | 78 | 162 | 351 | 702 | 86.7 | 180 | 390 | 780 |

| MCS Index | Spatial streams | GI = 800 ns | | | | GI = 400 ns | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) |
| 9 | 1 | – | 180 | 390 | 780 | – | 200 | 433.3 | 866.7 |
| 0 | 2 | 13 | 27 | 58.5 | 117 | 14.4 | 30 | 65 | 130 |
| 1 | 2 | 26 | 54 | 117 | 234 | 28.9 | 60 | 130 | 260 |
| 2 | 2 | 39 | 81 | 175.5 | 351 | 43.3 | 90 | 195 | 390 |
| 3 | 2 | 52 | 108 | 234 | 468 | 57.8 | 120 | 260 | 520 |
| 4 | 2 | 78 | 162 | 351 | 702 | 86.7 | 180 | 390 | 780 |
| 5 | 2 | 104 | 216 | 468 | 936 | 115.6 | 240 | 520 | 1040 |
| 6 | 2 | 117 | 243 | 526.5 | 1053 | 130 | 270 | 585 | 1170 |
| 7 | 2 | 130 | 270 | 585 | 1170 | 144.4 | 300 | 650 | 1300 |
| 8 | 2 | 156 | 324 | 702 | 1404 | 173.3 | 360 | 780 | 1560 |
| 9 | 2 | – | 360 | 780 | 1560 | – | 400 | 866.7 | 1733.4 |
| MCS Index | Spatial streams | GI = 800 ns | | | | GI = 400 ns | | | |
| | | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) |
| 0 | 3 | 19.5 | 40.5 | 87.8 | 175.5 | 21.7 | 45 | 97.5 | 195 |
| 1 | 3 | 39 | 81 | 175.5 | 351 | 43.3 | 90 | 195 | 390 |
| 2 | 3 | 58.5 | 121.5 | 263.3 | 526.5 | 65 | 135 | 292.5 | 585 |
| 3 | 3 | 78 | 162 | 351 | 702 | 86.7 | 180 | 390 | 780 |
| 4 | 3 | 117 | 243 | 526.5 | 1053 | 130 | 270 | 585 | 1170 |
| 5 | 3 | 156 | 324 | 702 | 1404 | 173.3 | 360 | 780 | 1560 |
| 6 | 3 | 175.5 | 364.5 | 789.9 | 1579.5 | 195 | 405 | 877.5 | 1755 |
| 7 | 3 | 195 | 405 | 877.5 | 1755 | 216.7 | 450 | 975 | 1950 |
| 8 | 3 | 234 | 486 | 1053 | 2106 | 260 | 540 | 1170 | 2340 |

| 9 | 3 | 260 | 540 | 1170 | 2340 | 288.9 | 600 | 1300 | 2600.1 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Index | Spatial streams | GI = 800 ns | | | | GI = 400 ns | | | |
| | | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) |
| 0 | 4 | 26 | 54 | 117 | 234 | 28.8 | 60 | 130 | 260 |
| 1 | 4 | 52 | 108 | 234 | 468 | 57.8 | 120 | 260 | 520 |
| 2 | 4 | 78 | 162 | 351 | 702 | 86.6 | 180 | 390 | 780 |
| 3 | 4 | 104 | 216 | 468 | 936 | 115.6 | 240 | 520 | 1040 |
| 4 | 4 | 156 | 324 | 702 | 1404 | 173.4 | 360 | 780 | 1560 |
| 5 | 4 | 208 | 432 | 936 | 1872 | 231.2 | 480 | 1040 | 2080 |
| 6 | 4 | 234 | 486 | 1053 | 2106 | 260 | 540 | 1170 | 2340 |
| 7 | 4 | 260 | 540 | 1170 | 2340 | 288.8 | 600 | 1300 | 2600 |
| 8 | 4 | 312 | 648 | 1404 | 2808 | 346.6 | 720 | 1560 | 3120 |
| 9 | 4 | – | 720 | 1560 | 3120 | – | 800 | 1733 | 3466.8 |

**802.11ax data rates (20 MHz on both 2.4- and 5-GHz bands and 40, 80, and 160 MHz only on 5-GHz band):**

| MCS Index | Spatial streams | GI = 1600 ns | | | | GI = 800 ns | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) | 20-MHz rate (Mbps) | 40-MHz rate (Mbps) | 80-MHz rate (Mbps) | 160-MHz rate (Mbps) |
| 0 | 1 | 4.3 | 8 | 17 | **34** | 4.3 | 9 | 18 | **36** |
| 1 | 1 | 16 | 33 | 68 | **136** | 17 | 34 | 72 | **144** |
| 2 | 1 | 24 | 49 | 102 | **204** | 26 | 52 | 108 | **216** |
| 3 | 1 | 33 | 65 | 136 | **272** | 34 | 69 | 144 | **282** |
| 4 | 1 | 49 | 98 | 204 | **408** | 52 | 103 | 216 | **432** |
| 5 | 1 | 65 | 130 | 272 | **544** | 69 | 138 | 288 | **576** |
| 6 | 1 | 73 | 146 | 306 | **613** | 77 | 155 | 324 | **649** |
| 7 | 1 | 81 | 163 | 340 | **681** | 86 | 172 | 360 | **721** |

| Item | Specification | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| | 8 | 1 | 98 | 195 | 408 | 817 | 103 | 207 | 432 | 865 |
| | 9 | 1 | 108 | 217 | 453 | 907 | 115 | 229 | 480 | 961 |
| | 10 | 1 | 122 | 244 | 510 | 1021 | 129 | 258 | 540 | 1081 |
| | 11 | 1 | 135 | 271 | 567 | 1134 | 143 | 287 | 600 | 1201 |
| | 0 | 2 | 8.6 | 16 | 34 | 68 | 8.6 | 18 | 36 | 72 |
| | 1 | 2 | 32 | 66 | 136 | 272 | 34 | 68 | 144 | 288 |
| | 2 | 2 | 48 | 98 | 204 | 408 | 52 | 104 | 216 | 432 |
| | 3 | 2 | 66 | 130 | 272 | 544 | 68 | 138 | 288 | 564 |
| | 4 | 2 | 98 | 196 | 408 | 816 | 104 | 206 | 432 | 864 |
| | 5 | 2 | 130 | 260 | 544 | 1088 | 138 | 276 | 576 | 1152 |
| | 6 | 2 | 146 | 292 | 612 | 1226 | 154 | 310 | 648 | 1298 |
| | 7 | 2 | 162 | 326 | 680 | 1362 | 172 | 344 | 720 | 1442 |
| | 8 | 2 | 196 | 390 | 816 | 1634 | 206 | 414 | 864 | 1730 |
| | 9 | 2 | 216 | 434 | 906 | 1814 | 230 | 458 | 960 | 1922 |
| | 10 | 2 | 244 | 488 | 1020 | 2042 | 258 | 516 | 1080 | 2162 |
| | 11 | 2 | 270 | 542 | 1134 | 2268 | 286 | 574 | 1200 | 2402 |
| | 0 | 3 | 12.9 | 24 | 51 | 102 | 12.9 | 27 | 54 | 108 |
| | 1 | 3 | 48 | 99 | 204 | 408 | 51 | 102 | 216 | 432 |
| | 2 | 3 | 72 | 147 | 306 | 612 | 78 | 156 | 324 | 648 |
| | 3 | 3 | 99 | 195 | 408 | 816 | 102 | 207 | 432 | 846 |
| | 4 | 3 | 147 | 294 | 612 | 1224 | 156 | 309 | 648 | 1296 |
| | 5 | 3 | 195 | 390 | 816 | 1632 | 207 | 414 | 864 | 1728 |
| | 6 | 3 | 219 | 438 | 918 | 1839 | 231 | 465 | 972 | 1947 |
| | 7 | 3 | 243 | 489 | 1020 | 2043 | 258 | 516 | 1080 | 2163 |
| | 8 | 3 | 294 | 585 | 1224 | 2451 | 309 | 621 | 1296 | 2595 |
| | 9 | 3 | 324 | 651 | 1359 | 2721 | 345 | 687 | 1440 | 2883 |
| | 10 | 3 | 366 | 732 | 1530 | 3063 | 387 | 774 | 1620 | 3243 |

| Item | Specification | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| | 11 | 3 | 405 | 813 | 1701 | 3402 | 429 | 861 | 1800 | 3603 |
| | 0 | 4 | 17.2 | 32 | 68 | 136 | 17.2 | 36 | 72 | 144 |
| | 1 | 4 | 64 | 132 | 272 | 544 | 68 | 136 | 288 | 576 |
| | 2 | 4 | 96 | 196 | 408 | 816 | 104 | 208 | 432 | 864 |
| | 3 | 4 | 132 | 260 | 544 | 1088 | 136 | 276 | 576 | 1128 |
| | 4 | 4 | 196 | 392 | 816 | 1632 | 208 | 412 | 864 | 1728 |
| | 5 | 4 | 260 | 520 | 1088 | 2176 | 276 | 552 | 1152 | 2304 |
| | 6 | 4 | 292 | 584 | 1224 | 2452 | 308 | 620 | 1296 | 2596 |
| | 7 | 4 | 324 | 652 | 1360 | 2724 | 344 | 688 | 1440 | 2884 |
| | 8 | 4 | 392 | 780 | 1632 | 3268 | 412 | 828 | 1728 | 3460 |
| | 9 | 4 | 432 | 868 | 1812 | 3628 | 460 | 916 | 1920 | 3844 |
| | 10 | 4 | 488 | 976 | 2040 | 4084 | 516 | 1032 | 2160 | 4324 |
| | 11 | 4 | 540 | 1084 | 2268 | 4536 | 572 | 1148 | 2400 | 4804 |
| | **MCS Index** | **Spatial streams** | **GI = 3200 ns** | | | | | | | |
| | 0 | 1 | 3.9 | 7.2 | 15.3 | **30.6** | | | | |
| | 1 | 1 | 14.4 | 29.7 | 61.2 | **122.4** | | | | |
| | 2 | 1 | 21.6 | 44.1 | 91.8 | **183.6** | | | | |
| | 3 | 1 | 29.7 | 58.5 | 122.4 | **244.8** | | | | |
| | 4 | 1 | 44.1 | 88.2 | 183.6 | **367.2** | | | | |
| | 5 | 1 | 58.5 | 117.0 | 244.8 | **489.6** | | | | |
| | 6 | 1 | 65.7 | 131.4 | 275.4 | **551.7** | | | | |
| | 7 | 1 | 72.9 | 146.7 | 306.0 | **612.9** | | | | |
| | 8 | 1 | 88.2 | 175.5 | 367.2 | **735.3** | | | | |
| | 9 | 1 | 97.2 | 195.3 | 407.7 | **816.3** | | | | |
| | 10 | 1 | 109.8 | 219.6 | 459.0 | **918.9** | | | | |
| | 11 | 1 | 121.5 | 243.9 | 510.3 | **1020.6** | | | | |
| | 0 | 2 | 7.7 | 14.4 | 30.6 | **61.2** | | | | |

| Item | Specification | | | | | | | | | |
|------|---------------|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 28.8 | 59.4 | 122.4 | **244.8** | | | | |
| | 2 | 2 | 43.2 | 88.2 | 183.6 | **367.2** | | | | |
| | 3 | 2 | 59.4 | 117.0 | 244.8 | **489.6** | | | | |
| | 4 | 2 | 88.2 | 176.4 | 367.2 | **734.4** | | | | |
| | 5 | 2 | 117.0 | 234.0 | 489.6 | **979.2** | | | | |
| | 6 | 2 | 131.4 | 262.8 | 550.8 | **1103.4** | | | | |
| | 7 | 2 | 145.8 | 293.4 | 612.0 | **1225.8** | | | | |
| | 8 | 2 | 176.4 | 351.0 | 734.4 | **1470.6** | | | | |
| | 9 | 2 | 194.4 | 390.6 | 815.4 | **1632.6** | | | | |
| | 10 | 2 | 219.6 | 439.2 | 918.0 | **1837.8** | | | | |
| | 11 | 2 | 243.0 | 487.8 | 1020.6 | **2041.2** | | | | |
| | 0 | 3 | 11.6 | 21.6 | 45.9 | **91.8** | | | | |
| | 1 | 3 | 43.2 | 89.1 | 183.6 | **367.2** | | | | |
| | 2 | 3 | 64.8 | 132.3 | 275.4 | **550.8** | | | | |
| | 3 | 3 | 89.1 | 175.5 | 367.2 | **734.4** | | | | |
| | 4 | 3 | 132.3 | 264.6 | 550.8 | **1101.6** | | | | |
| | 5 | 3 | 175.5 | 351.0 | 734.4 | **1468.8** | | | | |
| | 6 | 3 | 197.1 | 394.2 | 826.2 | **1655.1** | | | | |
| | 7 | 3 | 218.7 | 440.1 | 918.0 | **1838.7** | | | | |
| | 8 | 3 | 264.6 | 526.5 | 1101.6 | **2205.9** | | | | |
| | 9 | 3 | 291.6 | 585.9 | 1223.1 | **2448.9** | | | | |
| | 10 | 3 | 329.4 | 658.8 | 1377.0 | **2756.7** | | | | |
| | 11 | 3 | 364.5 | 731.7 | 1530.9 | **3061.8** | | | | |
| | 0 | 4 | 15.5 | 28.8 | 61.2 | **122.4** | | | | |
| | 1 | 4 | 57.6 | 118.8 | 244.8 | **489.6** | | | | |
| | 2 | 4 | 86.4 | 176.4 | 367.2 | **734.4** | | | | |
| | 3 | 4 | 118.8 | 234.0 | 489.6 | **979.2** | | | | |

| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| | 4 | 4 | 176.4 | 352.8 | 734.4 | **1468.8** | | | | |
| | 5 | 4 | 234.0 | 468.0 | 979.2 | **1958.4** | | | | |
| | 6 | 4 | 262.8 | 525.6 | 1101.6 | **2206.8** | | | | |
| | 7 | 4 | 291.6 | 586.8 | 1224.0 | **2451.6** | | | | |
| | 8 | 4 | 352.8 | 702.0 | 1468.8 | **2941.2** | | | | |
| | 9 | 4 | 388.8 | 781.2 | 1630.8 | **3265.2** | | | | |
| | 10 | 4 | 439.2 | 878.4 | 1836.0 | **3675.6** | | | | |
| | 11 | 4 | 486.0 | 975.6 | 2041.2 | **4082.4** | | | | |

**Transmit power and receive sensitivity**

| | Spatial streams | 5-GHz radio | | 2.4-GHz radio | |
|------|------|------|------|------|------|
| | | Total transmit power (dBm) | Receive sensitivity (dBm) | Total transmit power (dBm) | Receive sensitivity (dBm) |
| **802.11/11b** | | | | | |
| **1 Mbps** | 1 | – | – | 23 | –98 |
| **11 Mbps** | 1 | – | – | 23 | –90 |
| **802.11a/g** | | | | | |
| **6 Mbps** | 1 | 23 | –96 | 23 | –95 |
| **24 Mbps** | 1 | 23 | –87 | 23 | –85 |
| **54 Mbps** | 1 | 23 | –76 | 23 | –76 |
| **802.11n HT20** | | | | | |
| **MCS0** | 1 | 23 | –95 | 23 | –94 |
| **MCS4** | 1 | 23 | –83 | 23 | –83 |
| **MCS7** | 1 | 23 | –76 | 23 | –76 |
| **MCS8** | 2 | 23 | –92 | 23 | –91 |
| **MCS12** | 2 | 23 | –80 | 23 | –80 |

| Item | | Specification | | | |
|---|---|---|---|---|---|
| MCS15 | 2 | 23 | −73 | 23 | −73 |
| MCS16 | 3 | 23 | −91 | 23 | −90 |
| MCS20 | 3 | 23 | −79 | 23 | −79 |
| MCS23 | 3 | 23 | −72 | 23 | −72 |
| MCS24 | 4 | 23 | −89 | 23 | −88 |
| MCS28 | 4 | 23 | −72 | 23 | −73 |
| MCS31 | 4 | 23 | −70 | 23 | −70 |
| **802.11n HT40** | | | | | |
| MCS0 | 1 | 23 | −93 | – | – |
| MCS4 | 1 | 23 | −81 | – | – |
| MCS7 | 1 | 23 | −73 | – | – |
| MCS8 | 2 | 23 | −89 | – | – |
| MCS12 | 2 | 23 | −78 | – | – |
| MCS15 | 2 | 23 | −70 | – | – |
| MCS16 | 3 | 23 | −88 | – | – |
| MCS20 | 3 | 23 | −76 | – | – |
| MCS23 | 3 | 23 | −69 | – | – |
| MCS24 | 4 | 23 | −87 | – | – |
| MCS30 | 4 | 23 | −70 | – | – |
| MCS31 | 4 | 23 | −68 | – | – |
| **802.11ac VHT20** | | | | | |
| MCS0 | 1 | 23 | −95 | – | – |
| MCS4 | 1 | 23 | −83 | – | – |
| MCS7 | 1 | 23 | −76 | – | – |
| MCS8 | 1 | 22 | −72 | – | – |
| MCS9 | 1 | 22 | NA | – | – |
| MCS0 | 2 | 23 | −92 | – | – |

| Item | | Specification | | | |
|---|---|---|---|---|---|
| MCS4 | 2 | 23 | −80 | – | – |
| MCS7 | 2 | 23 | −73 | – | – |
| MCS8 | 2 | 22 | −69 | – | – |
| MCS9 | 2 | 22 | NA | – | – |
| MCS0 | 3 | 23 | −91 | – | – |
| MCS4 | 3 | 23 | −79 | – | – |
| MCS7 | 3 | 23 | −72 | – | – |
| MCS8 | 3 | 22 | −68 | – | – |
| MCS9 | 3 | 22 | −67 | – | – |
| MCS0 | 4 | 23 | −90 | – | – |
| MCS4 | 4 | 23 | −78 | – | – |
| MCS7 | 4 | 23 | −70 | – | – |
| MCS8 | 4 | 22 | −67 | – | – |
| MCS9 | 4 | 22 | −66 | – | – |
| **802.11ac VHT40** | | | | | |
| MCS0 | 1 | 23 | −89 | – | – |
| MCS4 | 1 | 23 | −78 | – | – |
| MCS7 | 1 | 23 | −71 | – | – |
| MCS8 | 1 | 22 | −67 | – | – |
| MCS9 | 1 | 22 | −65 | – | – |
| MCS0 | 2 | 23 | −86 | – | – |
| MCS4 | 2 | 23 | −75 | – | – |
| MCS7 | 2 | 23 | −68 | – | – |
| MCS8 | 2 | 22 | −64 | – | – |
| MCS9 | 2 | 22 | −62 | – | – |
| MCS0 | 3 | 23 | −85 | – | – |
| MCS4 | 3 | 23 | −73 | – | – |

| Item | | Specification | | | |
|------|---|------|------|------|------|
| MCS7 | 3 | 23 | −66 | – | – |
| MCS8 | 3 | 22 | −63 | – | – |
| MCS9 | 3 | 22 | −61 | – | – |
| MCS0 | 4 | 23 | −84 | – | – |
| MCS4 | 4 | 23 | −72 | – | – |
| MCS7 | 4 | 23 | −65 | – | – |
| MCS8 | 4 | 22 | −61 | – | – |
| MCS9 | 4 | 22 | −59 | – | – |
| **802.11ac VHT80** | | | | | |
| MCS0 | 1 | 23 | −84 | – | – |
| MCS4 | 1 | 23 | −72 | – | – |
| MCS7 | 1 | 23 | −65 | – | – |
| MCS8 | 1 | 22 | −62 | – | – |
| MCS9 | 1 | 22 | −60 | – | – |
| MCS0 | 2 | 23 | −81 | – | – |
| MCS4 | 2 | 23 | −69 | – | – |
| MCS7 | 2 | 23 | −62 | – | – |
| MCS8 | 2 | 22 | −59 | – | – |
| MCS9 | 2 | 22 | −57 | – | – |
| MCS0 | 3 | 23 | −80 | – | – |
| MCS4 | 3 | 23 | −68 | – | – |
| MCS7 | 3 | 23 | −61 | – | – |
| MCS8 | 3 | 22 | −58 | – | – |
| MCS9 | 3 | 22 | −55 | – | – |
| MCS0 | 4 | 23 | −77 | – | – |
| MCS4 | 4 | 23 | −66 | – | – |
| MCS7 | 4 | 23 | −59 | – | – |

| Item | | Specification | | | |
|---|---|---|---|---|---|
| MCS8 | 4 | 22 | –56 | – | – |
| MCS9 | 4 | 22 | –54 | – | – |
| **802.11ac VHT160** | | | | | |
| MCS0 | 1 | 23 | –84 | – | – |
| MCS4 | 1 | 23 | –72 | – | – |
| MCS7 | 1 | 23 | –64 | – | – |
| MCS8 | 1 | 21 | –60 | – | – |
| MCS9 | 1 | 21 | –59 | – | – |
| MCS0 | 2 | 23 | –85 | – | – |
| MCS4 | 2 | 23 | –70 | – | – |
| MCS7 | 2 | 23 | –62 | – | – |
| MCS8 | 2 | 21 | –58 | – | – |
| MCS9 | 2 | 21 | –57 | – | – |
| MCS0 | 3 | 23 | –85 | – | – |
| MCS4 | 3 | 23 | –68 | – | – |
| MCS7 | 3 | 23 | –60 | – | – |
| MCS8 | 3 | 21 | –56 | – | – |
| MCS9 | 3 | 21 | –55 | – | – |
| MCS0 | 4 | 23 | –85 | – | – |
| MCS4 | 4 | 23 | –66 | – | – |
| MCS7 | 4 | 23 | –58 | – | – |
| MCS8 | 4 | 21 | –54 | – | – |
| MCS9 | 4 | 21 | –53 | – | – |
| **802.11ax VHT20** | | | | | |
| MCS0 | 1 | 23 | –94 | 23 | –93 |
| MCS4 | 1 | 23 | –81 | 23 | –81 |
| MCS7 | 1 | 23 | –75 | 23 | –74 |

| Item | Specification | | | | |
|---|---|---|---|---|---|
| MCS8 | 1 | 22 | –71 | 21 | –70 |
| MCS9 | 1 | 22 | –69 | 21 | –69 |
| MCS10 | 1 | 21 | –65 | 20 | –64 |
| MCS11 | 1 | 21 | –64 | 20 | –62 |
| MCS0 | 2 | 23 | –91 | 23 | –90 |
| MCS4 | 2 | 23 | –78 | 23 | –78 |
| MCS7 | 2 | 23 | –72 | 23 | –72 |
| MCS8 | 2 | 22 | –68 | 21 | –68 |
| MCS9 | 2 | 22 | –66 | 21 | –66 |
| MCS10 | 2 | 21 | –63 | 20 | –62 |
| MCS11 | 2 | 21 | –61 | 20 | –59 |
| MCS0 | 3 | 23 | –90 | 23 | –88 |
| MCS4 | 3 | 23 | –77 | 23 | –76 |
| MCS7 | 3 | 23 | –71 | 23 | –70 |
| MCS8 | 3 | 22 | –67 | 21 | –66 |
| MCS9 | 3 | 22 | –65 | 21 | –65 |
| MCS10 | 3 | 21 | –62 | 20 | –60 |
| MCS11 | 3 | 21 | –60 | 20 | –58 |
| MCS0 | 4 | 23 | –87 | 23 | –86 |
| MCS4 | 4 | 23 | –75 | 23 | –75 |
| MCS7 | 4 | 23 | –69 | 23 | –69 |
| MCS8 | 4 | 22 | –65 | 21 | –65 |
| MCS9 | 4 | 22 | –63 | 21 | –63 |
| MCS10 | 4 | 21 | –60 | 20 | –59 |
| MCS11 | 4 | 21 | –59 | 20 | –57 |

| Item | Specification | | | | |
|------|------|------|------|------|------|
| **802.11ax VHT40** | | | | | |
| **MCS0** | 1 | 23 | –92 | 23 | –91 |
| **MCS4** | 1 | 23 | –79 | 23 | –79 |
| **MCS7** | 1 | 23 | –72 | 23 | –72 |
| **MCS8** | 1 | 22 | –68 | 21 | –68 |
| **MCS9** | 1 | 22 | –66 | 21 | –66 |
| **MCS10** | 1 | 21 | –63 | 20 | –62 |
| **MCS11** | 1 | 21 | –60 | 20 | –60 |
| **MCS0** | 2 | 23 | –89 | 23 | –87 |
| **MCS4** | 2 | 23 | –76 | 23 | –76 |
| **MCS7** | 2 | 23 | –69 | 23 | –69 |
| **MCS8** | 2 | 22 | –65 | 21 | –65 |
| **MCS9** | 2 | 22 | –63 | 21 | –63 |
| **MCS10** | 2 | 21 | –60 | 20 | –59 |
| **MCS11** | 2 | 21 | –57 | 20 | –57 |
| **MCS0** | 3 | 23 | –88 | 23 | –85 |
| **MCS4** | 3 | 23 | –75 | 23 | –74 |
| **MCS7** | 3 | 23 | –68 | 23 | –67 |
| **MCS8** | 3 | 22 | –64 | 21 | –63 |
| **MCS9** | 3 | 22 | –62 | 21 | –61 |
| **MCS10** | 3 | 21 | –59 | 20 | –58 |
| **MCS11** | 3 | 21 | –56 | 20 | –55 |
| **MCS0** | 4 | 23 | –86 | 23 | –83 |
| **MCS4** | 4 | 23 | –73 | 23 | –73 |
| **MCS7** | 4 | 23 | –66 | 23 | –66 |
| **MCS8** | 4 | 22 | –62 | 21 | –62 |
| **MCS9** | 4 | 22 | –60 | 21 | –60 |

| Item | Specification | | | | |
|---|---|---|---|---|---|
| MCS10 | 4 | 21 | –57 | 20 | –57 |
| MCS11 | 4 | 21 | –54 | 20 | –54 |
| **802.11ax VHT80** | | | | | |
| MCS0 | 1 | 23 | –87 | – | – |
| MCS4 | 1 | 23 | –76 | – | – |
| MCS7 | 1 | 23 | –69 | – | – |
| MCS8 | 1 | 22 | –66 | – | – |
| MCS9 | 1 | 22 | –64 | – | – |
| MCS10 | 1 | 21 | –60 | – | – |
| MCS11 | 1 | 21 | –58 | – | – |
| MCS0 | 2 | 23 | –84 | – | – |
| MCS4 | 2 | 23 | –73 | – | – |
| MCS7 | 2 | 23 | –66 | – | – |
| MCS8 | 2 | 22 | –63 | – | – |
| MCS9 | 2 | 22 | –61 | – | – |
| MCS10 | 2 | 21 | –57 | – | – |
| MCS11 | 2 | 21 | –55 | – | – |
| MCS0 | 3 | 23 | –83 | – | – |
| MCS4 | 3 | 23 | –72 | – | – |
| MCS7 | 3 | 23 | –65 | – | – |
| MCS8 | 3 | 22 | –62 | – | – |
| MCS9 | 3 | 22 | –60 | – | – |
| MCS10 | 3 | 21 | –56 | – | – |
| MCS11 | 3 | 21 | –54 | – | – |
| MCS0 | 4 | 23 | –81 | – | – |
| MCS4 | 4 | 23 | –70 | – | – |
| MCS7 | 4 | 23 | –63 | – | – |

| Item | Specification | | | |
|------|---|---|---|---|
| MCS8 | 4 | 22 | –60 | – | – |
| MCS9 | 4 | 22 | –57 | – | – |
| MCS10 | 4 | 21 | –53 | – | – |
| MCS11 | 4 | 21 | –52 | – | – |
| **802.11ax VHT160** | | | | |
| MCS0 | 1 | 23 | –84 | – | – |
| MCS4 | 1 | 23 | –73 | – | – |
| MCS7 | 1 | 23 | –66 | – | – |
| MCS8 | 1 | 21 | –63 | – | – |
| MCS9 | 1 | 21 | –61 | – | – |
| MCS10 | 1 | 20 | –57 | – | – |
| MCS11 | 1 | 20 | –55 | – | – |
| MCS0 | 2 | 23 | –81 | – | – |
| MCS4 | 2 | 23 | –70 | – | – |
| MCS7 | 2 | 23 | –63 | – | – |
| MCS8 | 2 | 21 | –60 | – | – |
| MCS9 | 2 | 21 | –58 | – | – |
| MCS10 | 2 | 20 | –54 | – | – |
| MCS11 | 2 | 20 | –52 | – | – |
| MCS0 | 3 | 23 | –80 | – | – |
| MCS4 | 3 | 23 | –69 | – | – |
| MCS7 | 3 | 23 | –61 | – | – |
| MCS8 | 3 | 21 | –59 | – | – |
| MCS9 | 3 | 21 | –57 | – | – |
| MCS10 | 3 | 20 | –53 | – | – |
| MCS11 | 3 | 20 | –51 | – | – |
| MCS0 | 4 | 23 | –78 | – | – |

| Item | Specification | | | | |
|---|---|---|---|---|---|
| MCS4 | 4 | 23 | −67 | – | – |
| MCS7 | 4 | 23 | −60 | – | – |
| MCS8 | 4 | 21 | −57 | – | – |
| MCS9 | 4 | 21 | −55 | – | – |
| MCS10 | 4 | 20 | −51 | – | – |
| MCS11 | 4 | 20 | −49 | – | – |
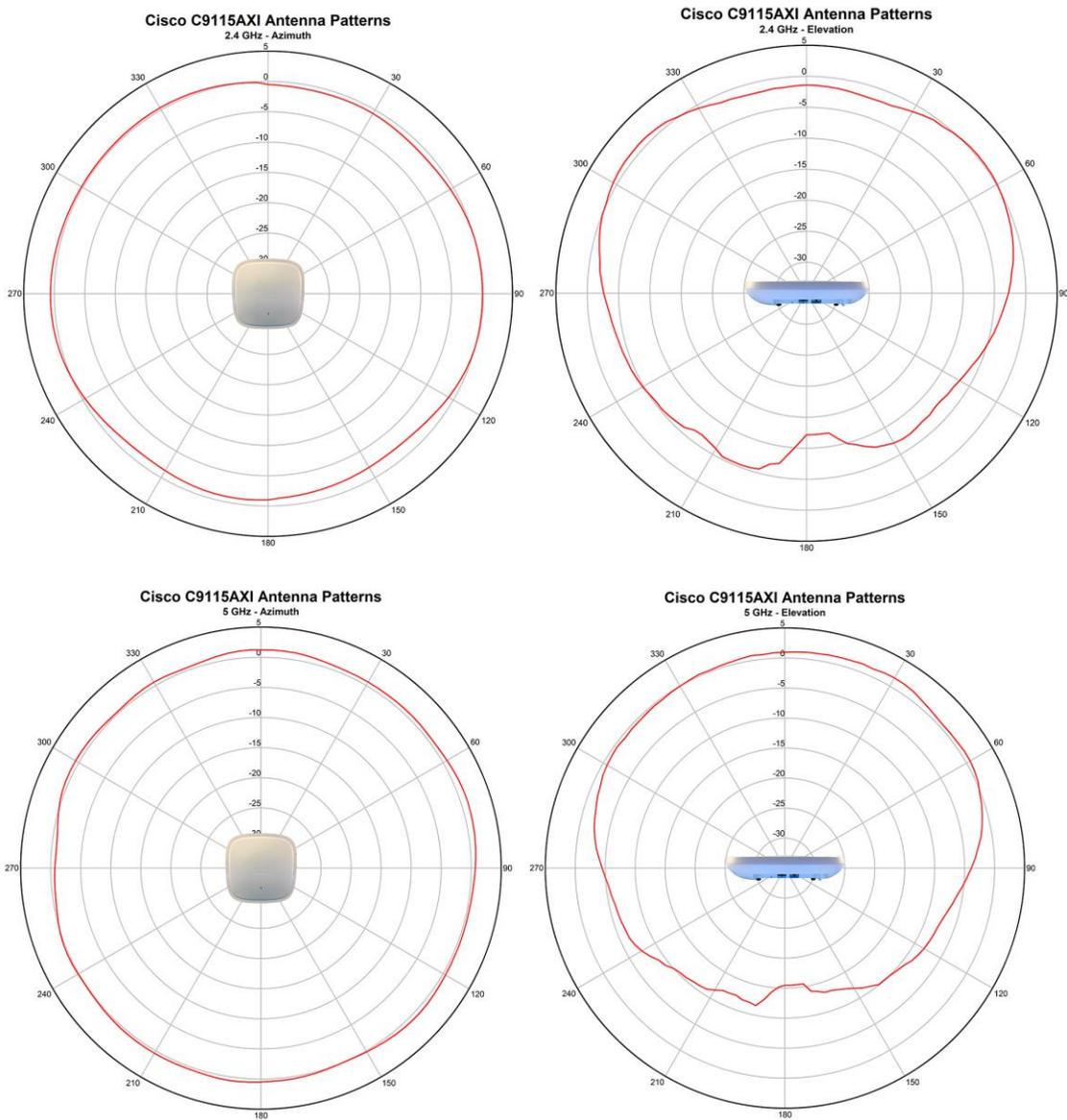


**Figure 1.**
Antenna Radiation Pattern

## Licensing and software packaging

The Cisco Catalyst 9100 Series requires mandatory Smart Licensing. This provides ease of use for Cisco DNA license management, consumption, and tracking. The Cisco Catalyst 9100 Series uses packaging that includes vastly simplified base network packages (Network Essentials and Network Advantage) and term-based software packages (Cisco DNA Essentials, Cisco DNA Advantage) as add-ons. The Cisco DNA packages, in addition to on-box capabilities, also unlock additional functionality in Cisco DNA Center, enabling controller-based software-defined automation and assurance in your network.

The Cisco Catalyst 9100 Series can support 3 types of Cisco DNA license: Cisco DNA Essentials, Cisco DNA Advantage and Cisco DNA Premier. The Cisco DNA licenses provide Cisco innovations on the AP. The Cisco DNA license also includes the Network Essentials and Network Advantage licensing options which cover wireless fundamentals such as 802.1x authentication, QoS, PnP etc, telemetry and visibility, SSO, as well as security controls. These Network essentials and Network advantage components are perpetual and is valid till the life of the AP. Cisco DNA subscription licenses have to be purchased for a 3-, 5-, or 7-year subscription term. However, upon expiry of Cisco DNA license, Cisco DNA features will expire, whereas network essentials and network advantage features will remain.

Note that it is not required to deploy Cisco DNA Center just to use one of the above packages. Refer to https://www.cisco.com/c/dam/en/us/products/collateral/software/one-wireless-subscription/q-and-a-c67-739601.pdf for additional details about the Essentials and Advantage packages.

For information about feature support please refer to the Cisco Catalyst 9100 Series Release Notes.

## Managing Licenses with Smart Accounts

Creating Smart Accounts by using the Cisco Smart Software Manager (CSSM) enables you to order devices and licensing packages and also manage your software licenses from a centralized website. You can set up the Smart Account to receive daily email alerts and to be notified of expiring add-on licenses that you want to renew. A Smart Account is mandatory for Catalyst 9100 access points. For more information on Smart Account refer to https://www.cisco.com/go/smartaccounts.

## Warranty information

The Cisco Catalyst 9115 Series Access Points come with a limited lifetime warranty that provides full warranty coverage of the hardware for as long as the original end user continues to own or use the product. The warranty includes 10-day advance hardware replacement and ensures that software media are defect-free for 90 days. For more details, visit https://www.cisco.com/go/warranty.

# Cisco environmental sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment Sustainability" section of Cisco's Corporate Social Responsibility (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the "Environment Sustainability" section of the CSR Report) are provided in the following table:

| Sustainability topic | Reference |
|---|---|
| Information on product material content laws and regulations | Materials |
| Information on electronic waste laws and regulations, including products, batteries, and packaging | WEEE compliance |

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

## Cisco Services

With Cisco Services, you can achieve infrastructure excellence faster with less risk. From initial WLAN readiness assessment to implementation, full solution support and in-depth training, our services for the Cisco Catalyst 9115 Access Points provide expert guidance to help you successfully plan, deploy, manage, and support your new access points. With unmatched networking expertise, best practices, and innovative tools, Cisco Services can help you reduce overall upgrade, refresh, and migration costs as you introduce new hardware, software, and protocols into the network. With a comprehensive lifecycle of services, Cisco experts will help you minimize disruption and improve operational efficiency to extract maximum value from your Cisco DNA ready infrastructure.

## Cisco Capital

### Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. Learn more.