

## RUCKUS E510

Embedded 802.11ac Outdoor Wave 2 Wi-Fi AP with External BeamFlex+ Antennas



## Benefits

**Deployment Flexibility**

Separation of the antenna from the small radio component provides deployment flexibility that supports location constraints and aesthetic requirements.

**Great Outdoor Wi-Fi**

Deploy high-performance outdoor 802.11ac Wave 2 Wi-Fi in harshest of the outdoor environments with IP-67 weather proofing.

**Stunning Wi-Fi Performance**

Extends coverage with patented BeamFlex+™ adaptive antenna technology while mitigating interference by utilizing up to 64 directional antenna patterns.

**Multiple Management Options**

Manage the E510 with physical or virtual appliances.

**Automate Optimal Throughput**

ChannelFly™ dynamic channel technology uses machine learning to automatically find the least congested channels. You always get the highest throughput the band can support.

**Serve More Devices**

Connect more devices simultaneously with two MU-MIMO spatial streams and concurrent dual-band 2.4/5GHz radios while also enhancing non-Wave 2 device performance.

**More Than Wi-Fi**

Support services beyond Wi-Fi with [Ruckus IoT Suite](#), [Cloudpath](#) security and onboarding software, [SPoT](#) Wi-Fi locationing engine, and [SCI](#) network analytics.

**The demand for public outdoor Wi-Fi continues to explode. Users expect great Wi-Fi experience whether at a stadium or on a train. In outdoor environments, designing an optimal wireless network without interfering with the aesthetics of the environment is a challenge for operators and service providers.**

The RUCKUS E510 802.11ac Wave 2 access point (AP) is designed with a unique, diminutive two element enclosure which separates the RF components from the antenna module. This approach provides placement flexibility for the antenna which is necessary when the AP must be placed inside a vehicle or metal-shielded environment. The E510 can be placed unobtrusively inside signage at a bus or train stations, and within a vending machine and display kiosk.

The E510 RF module with its small form-factor is designed to be installed in park benches, street furniture, on light poles or other aesthetically restrictive areas. The separate low-profile antenna module is placed in a nearby un-obtrusive location. Both modules are IP-67 and industrial temperature rated and can withstand the most challenging outdoor environments allowing operators and service providers to deploy Wi-Fi in previously unreachable environments.

The Ruckus E510 incorporates patented technologies found only in the Ruckus Wi-Fi portfolio.

- Extended coverage with patented BeamFlex+™ adaptive antenna technology utilizing multi-directional antenna patterns.
- Improve throughput with ChannelFly, which dynamically finds less congested Wi-Fi channels to use.

Whether you're deploying ten or ten thousand APs, the E510 is easy to manage through Ruckus' physical and virtual appliance options.



Front and rear view of the E510 AP RF module

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## Access Point Antenna Pattern

Ruckus' BeamFlex+ adaptive antennas allow the E510 AP to dynamically choose among a host of antenna patterns (up to 64 possible combinations) in real-time to establish the best possible connection with every device. This leads to

- Better Wi-Fi coverage
- Reduced RF interference

Traditional omnidirectional antennas, found in generic access points, oversaturate the environment by needlessly radiating RF signals in all directions. In contrast, the Ruckus BeamFlex+ adaptive antenna directs the radio signals per-device on a packet-by-packet basis to optimize Wi-Fi coverage and capacity in real-time to support high device density environments. BeamFlex+ operates without the need for device feedback and hence can benefit even devices using legacy standards.

Figure 1. Example of BeamFlex+ pattern

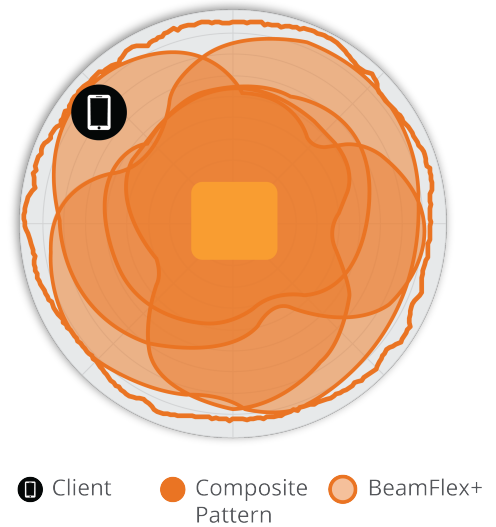


Figure 2. E510 2.4GHz Azimuth Antenna Patterns



Figure 3. E510 5GHz Azimuth Antenna Patterns



Figure 4. E510 2.4GHz Elevation Antenna Patterns

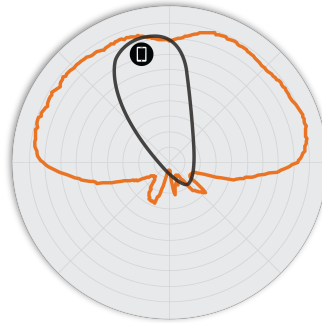
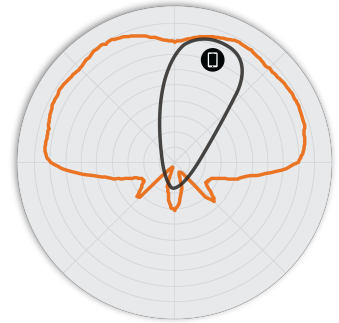


Figure 5. E510 5GHz Elevation Antenna Patterns



Note: The outer trace represents the composite RF footprint of all possible BeamFlex+ antenna patterns, while the inner trace represents one BeamFlex+ antenna pattern within the composite outer trace.

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| Wi-Fi                    |   |
|--------------------------|---|
| Wi-Fi Standards          | <ul style="list-style-type: none"><li>IEEE 802.11a/b/g/n/ac Wave 2</li></ul>  |
| Supported Rates          | <ul style="list-style-type: none"><li>802.11ac: 6.5 to 867Mbps (MCS0 to MCS9, NSS=1 to 2 for VHT20/40/80)</li><li>802.11n: 6.5 Mbps to 300Mbps (MCS0 to MCS15)</li><li>802.11a/g: 54, 48, 36, 24, 18, 12, 9, 6Mbps</li><li>802.11b: 11, 5.5, 2 and 1 Mbps</li></ul> |
| Supported Channels       | <ul style="list-style-type: none"><li>2.4GHz: 1-13</li><li>5GHz: 36-64, 100-144, 149-165</li></ul>  |
| MIMO                     | <ul style="list-style-type: none"><li>2x2 SU-MIMO</li><li>2x2 MU-MIMO</li></ul>   |
| Spatial Streams          | <ul style="list-style-type: none"><li>2 SU-MIMO</li><li>2 MU-MIMO</li></ul>   |
| Radio Chains and Streams | <ul style="list-style-type: none"><li>2x2:2</li></ul>   |
| Channelization           | <ul style="list-style-type: none"><li>20, 40, 80MHz</li></ul>   |
| Security                 | <ul style="list-style-type: none"><li>WPA-PSK, WPA-TKIP, WPA2 AES, 802.11i, Dynamic PSK</li><li>WIPS/WIDS</li></ul>   |
| Other Wi-Fi Features     | <ul style="list-style-type: none"><li>WMM, Power Save, Tx Beamforming, LDPC, STBC, 802.11r/k/v</li><li>Hotspot, Hotspot 2.0</li><li>Captive Portal</li><li>WISPr</li></ul>  |

| RF   |  |
|--|--|
| Antenna Type                                       | <ul style="list-style-type: none"><li>External BeamFlex+ adaptive antennas with polarization diversity</li><li>Adaptive antenna that provides upto 64 unique antenna patterns</li></ul>            |
| Antenna Gain (max)                                 | <ul style="list-style-type: none"><li>Up to 3dBi</li></ul>   |
| Peak Transmit Power (aggregate across MIMO chains) | <ul style="list-style-type: none"><li>2.4GHz: 22dBm</li><li>5GHz: 22dBm</li></ul>  |
| Minimum Receive Sensitivity <sup>1</sup>           | <ul style="list-style-type: none"><li>-101dBm</li></ul>  |
| Frequency Bands                                    | <ul style="list-style-type: none"><li>ISM (2.4-2.484GHz)</li><li>U-NII-1 (5.15-5.25GHz)</li><li>U-NII-2A (5.25-5.35GHz)</li><li>U-NII-2C (5.47-5.725GHz)</li><li>U-NII-3 (5.725-5.85GHz)</li></ul> |

| 2.4GHz RECEIVE SENSITIVITY |      |       |      |
|----------------------------|------|-------|------|
| HT20                       |      | VHT40 |      |
| MCS0                       | MCS7 | MCS0  | MCS7 |
| -95                        | -76  | -92   | -75  |

| 5GHz RECEIVE SENSITIVITY |      |       |      |      |       |      |      |
|--------------------------|------|-------|------|------|-------|------|------|
| VHT20                    |      | VHT40 |      |      | VHT80 |      |      |
| MCS0                     | MCS7 | MCS0  | MCS7 | MCS9 | MCS0  | MCS7 | MCS9 |
| -95                      | -77  | -93   | -74  | -68  | -90   | -71  | -65  |

| 2.4GHz TX POWER TARGET |            |
|------------------------|------------|
| Rate                   | Pout (dBm) |
| MCS0 HT20              | 22         |
| MCS7 HT20              | 17         |
| MCS0 HT40              | 22         |
| MCS7 HT40              | 17         |

| 5GHz TX POWER TARGET |            |
|----------------------|------------|
| Rate                 | Pout (dBm) |
| MCS0 VHT20           | 22         |
| MCS7 VHT20           | 18         |
| MCS9 VHT20           | 16.5       |
| MCS0 VHT40, VHT80    | 21         |
| MCS7 VHT40, VHT80    | 20         |
| MCS9 VHT40, VHT80    | 18         |

| PERFORMANCE AND CAPACITY |   |
|--------------------------|---|
| Peak PHY Rates           | <ul style="list-style-type: none"><li>2.4GHz: 300Mbps</li><li>5GHz: 867Mbps</li></ul> |
| Client Capacity          | <ul style="list-style-type: none"><li>Up to 512 clients per AP</li></ul>              |
| SSID                     | <ul style="list-style-type: none"><li>Up to 31 per AP</li></ul>                       |

| RUCKUS RADIO MANAGEMENT      |  |
|------------------------------|--|
| Antenna Optimization         | <ul style="list-style-type: none"><li>BeamFlex+</li><li>Polarization Diversity with Maximal Ratio Combining (PD-MRC)</li></ul>   |
| Wi-Fi Channel Management     | <ul style="list-style-type: none"><li>ChannelFly</li><li>Background Scan Based</li></ul>   |
| Client Density Management    | <ul style="list-style-type: none"><li>Adaptive Band Balancing</li><li>Client Load Balancing</li><li>Airtime Fairness</li><li>Airtime-based WLAN Prioritization</li></ul> |
| SmartCast Quality of Service | <ul style="list-style-type: none"><li>QoS-based scheduling</li><li>Directed Multicast</li><li>L2/L3/L4 ACLs</li></ul>  |
| Mobility                     | <ul style="list-style-type: none"><li>SmartRoam</li></ul>  |
| Diagnostic Tools             | <ul style="list-style-type: none"><li>Spectrum Analysis</li><li>SpeedFlex</li></ul>  |

<sup>1</sup> Rx sensitivity varies by band, channel width and MCS rate.

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## Embedded 802.11ac Outdoor Wave 2 Wi-Fi AP with External BeamFlex+ Antennas

| NETWORKING                  |  |
|-----------------------------|--|
| Controller Platform Support | <ul style="list-style-type: none"><li>SmartZone (Physical and Virtual)</li><li>ZoneDirector</li><li>Standalone</li></ul>   |
| Mesh                        | <ul style="list-style-type: none"><li>SmartMesh™ wireless meshing technology. Self-healing Mesh</li></ul>  |
| IP                          | <ul style="list-style-type: none"><li>IPv4, IPv6</li></ul>   |
| VLAN                        | <ul style="list-style-type: none"><li>802.1Q (1 per BSSID or dynamic per user based on RADIUS)</li><li>VLAN Pooling</li><li>Port-based</li></ul>                     |
| 802.1x                      | <ul style="list-style-type: none"><li>Authenticator &amp; Supplicant</li></ul>   |
| Tunnel                      | <ul style="list-style-type: none"><li>L2TP, GRE, Soft-GRE</li></ul>  |
| Policy Management Tools     | <ul style="list-style-type: none"><li>Application Recognition and Control</li><li>Access Control Lists</li><li>Device Fingerprinting</li><li>Rate Limiting</li></ul> |
| IoT Capable                 | <ul style="list-style-type: none"><li>Yes</li></ul>  |

| PHYSICAL INTERFACES           |   |
|-------------------------------|---|
| Ethernet                      | <ul style="list-style-type: none"><li>1 x 1GbE port, with M12 connector</li></ul> |
| USB                           | <ul style="list-style-type: none"><li>1 USB 2.0 port, Type A</li></ul>            |
| Trusted Platform Module (TPM) | <ul style="list-style-type: none"><li>HW capability for Secure Boot</li></ul>     |

| PHYSICAL CHARACTERISTICS |   |  |
|--------------------------|---|--|
|                          | E510 (RF module)  | E510 (antenna module)  |
| Physical Size            | <ul style="list-style-type: none"><li>21(L) x 14.2(W) x 3.3 (H) cm</li><li>8.3(L) x 5.6(W) x 1.3(H) in.</li></ul>               | <ul style="list-style-type: none"><li>17.5(L) x 8.0(W) x 8.0(H) cm</li><li>6.9(L) x 3.15(W) x 3.15(H) in</li></ul> |
| Weight                   | <ul style="list-style-type: none"><li>900gm</li></ul>   | <ul style="list-style-type: none"><li>310gm</li></ul>  |
| Ingress Protection       | <ul style="list-style-type: none"><li>IP-67</li></ul>   | <ul style="list-style-type: none"><li>IP-67</li></ul>  |
| Mounting                 | <ul style="list-style-type: none"><li>Wall, Pole, Cabinet, DIN Rail and others</li><li>Pole Mount Diameter 1" to 2.5"</li></ul> |  |
| Operating Temperature    | <ul style="list-style-type: none"><li>-40°C (-40°F) to 70°C (158°F)</li></ul>   |  |
| Operating Humidity       | <ul style="list-style-type: none"><li>Up to 95%, non-condensing</li></ul>   |  |

| POWER <sup>2</sup> |  |
|--------------------|--|
| Power Supply       | Max Power Consumption                                  |
| 802.3af (PoE)      | <ul style="list-style-type: none"><li>12.35W</li></ul> |
| DC (12-48VDC)      | <ul style="list-style-type: none"><li>13.88W</li></ul> |

| CERTIFICATIONS AND COMPLIANCE     |   |
|-----------------------------------|---|
| Wi-Fi Alliance <sup>3</sup>       | <ul style="list-style-type: none"><li>Wi-Fi CERTIFIED™ a, b, g, n, ac</li><li>Passpoint™, Vantage</li></ul>   |
| Standards Compliance <sup>4</sup> | <ul style="list-style-type: none"><li>EN 60950-1 Safety</li><li>EN 60601-1-2 Medical</li><li>EN 61000-4-2/3/5 Immunity</li><li>EN 50121-1 Railway EMC</li><li>EN 50121-4 Railway Immunity</li><li>IEC 61373 Railway Shock &amp; Vibration</li><li>UL 2043 Plenum</li><li>EN 62311 Human Safety/RF Exposure</li><li>WEEE &amp; RoHS</li><li>ISTA 2A Transportation</li></ul> |

| RELATED SOFTWARE AND SERVICES |   |
|-------------------------------|---|
| Location Based Services       | <ul style="list-style-type: none"><li>SPoT</li></ul>                    |
| Network Analytics             | <ul style="list-style-type: none"><li>SmartCell Insight (SCI)</li></ul> |
| Security and Policy           | <ul style="list-style-type: none"><li>Cloudpath</li></ul>               |

| ORDERING INFORMATION |   |
|----------------------|---|
| 901-E510-XX01        | <ul style="list-style-type: none"><li>E510 Radio module</li></ul>   |
| 902-2101-0000        | <ul style="list-style-type: none"><li>E510 antenna module</li></ul> |

See Ruckus price list for country-specific ordering information.  
Warranty: Sold with a limited 1 year warranty.  
For details see: <http://support.ruckuswireless.com/warranty>.

| OPTIONAL ACCESSORIES |   |
|----------------------|---|
| 902-2000-0000        | <ul style="list-style-type: none"><li>Antenna Cable (60 cm length)</li></ul>                            |
| 902-2001-0000        | <ul style="list-style-type: none"><li>Antenna Cable (150 cm length)</li></ul>                           |
| 902-2002-0000        | <ul style="list-style-type: none"><li>Antenna Cable (300 cm length)</li></ul>                           |
| 902-2004-0000        | <ul style="list-style-type: none"><li>Bracket for AP Module</li></ul>                                   |
| 902-2005-0000        | <ul style="list-style-type: none"><li>Bracket (Light) for Antenna Module</li></ul>                      |
| 902-2006-0000        | <ul style="list-style-type: none"><li>Customized bracket for Stadium mounting</li></ul>                 |
| 902-0162-XXYY        | <ul style="list-style-type: none"><li>PoE injector (24W) (Sold in quantities of 1, 10 or 100)</li></ul> |

PLEASE NOTE: When ordering Outdoor APs, you must specify the destination region by indicating -US, -WW, or -Z2 instead of XX. When ordering PoE injectors or power supplies, you must specify the destination region by indicating -US, -EU, -AU, -BR, -CN, -IN, -JP, -KR, -SA, -UK, or -UN instead of -XX.  
For access points, -Z2 applies to the following countries: Algeria, Egypt, Israel, Morocco, Tunisia, and Vietnam.

<sup>2</sup> Max power varies by country setting, band, and MCS rate.

<sup>3</sup> For complete list of WFA certifications, please see Wi-Fi Alliance website.

<sup>4</sup> For current certification status, please see price list.

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